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(54) **REFRIGERANT CONTAINER**

KÄLTEMITTELBEHÄLTER

RÉCIPIENT POUR RÉFRIGÉRANT

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Description

Technical Field

[0001] The present invention relates to refrigerant containers for use in the heat pump refrigeration cycles of car air-conditioners, for example (hereinafter referred to as heat pump systems). In particular, the present invention relates to a refrigerant container that is adapted to separate a refrigerant into a liquid-phase refrigerant and a gas-phase refrigerant and has both the function of a receiver that guides only the liquid-phase refrigerant after the separation to the side of an expansion valve, and the function of an accumulator that guides the gas-phase refrigerant (including oil) after the separation to the suction side of a compressor.

Background Art

[0002] As a heat pump system forming a car air-conditioner, for example, as described in Patent Literature 1, for example, there is known a system that includes, in addition to a compressor, a condenser, an evaporator, an expansion valve, a flow channel switching valve, an on-off valve, and the like, a receiver adapted to perform gas-liquid separation for guiding only a liquid-phase refrigerant after the separation to the expansion valve, and an accumulator adapted to perform gas-liquid separation for guiding a gas-phase refrigerant (including oil) after the separation to the suction side of the compressor.

[0003] In such a heat pump system with a receiver and an accumulator, a reduction in the space occupied by the entire system as well as a reduction in the number of components is demanded.

[0004] In response to such demand, the inventors of the present invention previously proposed, as described in Patent Literature 2, a refrigerant container including a tank capable of temporarily storing a refrigerant; and a gas/liquid inlet port, a liquid-phase outlet port, and a gas-phase outlet port that are provided in the upper portion of the tank, the refrigerant container being adapted to separate a refrigerant introduced through the gas/liquid inlet port into a liquid-phase refrigerant and a gas-phase refrigerant, and having the function of a receiver that guides only the liquid-phase refrigerant after the separation to the side of an expansion valve via the liquid-phase outlet port, and the function of an accumulator that guides the gas-phase refrigerant after the separation to the suction side of a compressor via the gas-phase outlet port together with oil contained in the liquid-phase refrigerant.

[0005] In the refrigerant container proposed above, an upper-face opening of the tank is hermetically closed by a cap member that includes the gas/liquid inlet port, the liquid-phase outlet port, and the gas-phase outlet port therein; a gas-liquid separator is disposed below the cap member in the tank, the gas-liquid separator having the shape of a conical hat or an inverted wide bowl and having a diameter smaller than the inside diameter of the tank; a gas/liquid outlet pipe is disposed between the cap member and the bottom of the tank, the gas/liquid outlet pipe being segmented into a downward-feed flow channel portion, an upward-feed inner pipe portion, and a liquid-phase inner pipe portion; and a strainer is provided at the lower end of the gas/liquid outlet pipe. Specifically, the downward-feed flow channel portion is open at its upper end to the lower portion of the gas-liquid separator and is adapted to guide the gas-phase refrigerant in the upper portion of the tank to a portion around the bottom of the tank; the upward-feed inner pipe portion protrudes upward at its upper portion beyond the upper end of the downward-feed flow channel portion and is adapted to guide the gas-phase refrigerant from the downward-feed flow channel portion to the gas-phase outlet port; and the liquid-phase inner pipe portion is adapted to guide the liquid-phase refrigerant around the bottom of the tank to the liquid-phase outlet port.

[0006] WO 2018/123215 A1 discloses a refrigerant container which is provided with a rational structure having a low number of components, and which has both a receiver function and an accumulator function. It is provided with a tank which is capable of temporarily storing a refrigerant. A gas-liquid inflow port, a liquid phase outflow port, and a gas phase outflow port are provided to an upper part of the tank.

Citation List

Patent Literature

[0007]

Patent Literature 1: JP 2013-184596 A
Patent Literature 2: JP 2018-105552 A

Summary of Invention

Technical Problem

[0008] The refrigerant container proposed above has a single gas/liquid outlet pipe that combines an outlet pipe for a receiver and an outlet pipe for an accumulator (which are usually provided as a double pipe structure) that are originally needed to have both the functions of the receiver and the accumulator. Thus, the receiver and the accumulator can share the tank portion, the inlet port portion, the gas-liquid separator portion, the outlet pipe portion, the strainer portion, and the like in common. Therefore, a reduction in the number of components and a reduction in the size can be achieved, for example.

[0009] However, the cap member as well as the connected portion of the outlet pipe and the outlet ports has a complex structure, with a sideways L-shaped passage portion being required to be provided in the cap member, for example. This tends to increase the component costs and the machining and assembly costs.

[0010] The present invention has been made in view of the foregoing circumstances, and it is an object of the present invention to provide a refrigerant side by side on the baffle plate portion 43.

Solution to Problem

[0011] To achieve the aforementioned object, a refrigerant container according to the present invention which is defined in claim 1 basically includes a closed-bottomed tubular tank with an upper-face opening hermetically closed by a cap portion including a gas/liquid inlet port, a liquid-phase outlet port, and a gas-phase outlet port; a gas-liquid separator disposed in the tank at a position below the cap portion, the gas-liquid separator facing the gas/liquid inlet port; an outlet pipe portion for a receiver, the outlet pipe portion for the receiver including a liquid-phase refrigerant drawing port and being adapted to guide only a liquid-phase refrigerant separated by the gas-liquid separator to a side of an expansion valve via the liquid-phase outlet port; an outlet pipe portion for an accumulator, the outlet pipe portion for the accumulator including an oil return hole and being adapted to guide a gas-phase refrigerant separated by the gas-liquid separator to a suction side of a compressor via the gas-phase outlet port together with oil contained in the liquid-phase refrigerant; and a strainer for trapping foreign matter contained in a refrigerant. The strainer includes a tubular case portion adapted to be placed at a bottom of the tank, a baffle plate portion partially covering an upper-face opening of the tubular case portion, and a mesh filter covering at least a portion of the upper-face opening of the tubular case portion not covered with the baffle plate portion. The outlet pipe portion for the receiver and the outlet pipe portion for the accumulator are arranged side by side on the baffle plate portion.

[0012] In a preferred embodiment, the outlet pipe portion for the receiver and the outlet pipe portion for the accumulator are arranged side by side on the baffle plate portion with a gap between the outlet pipe portion for the receiver and the outlet pipe portion for the accumulator.

[0013] In another preferred embodiment, the liquid-phase outlet port has an intermediate large-diameter portion formed therein, the gas-phase outlet port has an intermediate large-diameter portion formed therein, and upper ends of the outlet pipe portion for the receiver and the outlet pipe portion for the accumulator are fixed to the respective intermediate large-diameter portions of the liquid-phase outlet port and the gas-phase outlet port through pipe expansion.

[0014] In another preferred embodiment, upper ends of the outlet pipe portion for the receiver and the outlet pipe portion for the accumulator are respectively inserted into the liquid-phase outlet port and the gas-phase outlet port, and portions of the outlet pipe portion for the receiver and the outlet pipe portion for the accumulator at positions below the inserted portions are fixed to the cap portion through swaging.

[0015] In another preferred embodiment, the outlet pipe portion for the receiver includes a liquid-phase pipe with an upper end inserted into the liquid-phase outlet port, and a liquid-phase pipe holding portion provided on the baffle plate portion so as to hold the liquid-phase pipe.

[0016] In further another preferred embodiment, the gas-liquid separator has formed therein a through-hole, the through-hole being adapted to pass the upper end of the liquid-phase pipe, an upper portion of the liquid-phase pipe is provided with a lower-side latch portion adapted to engage with the gas-liquid separator on a lower side of the gas-liquid separator, and the gas-liquid separator is tightly held between a lower face of the cap portion and the lower-side latch portion.

[0017] In further another preferred embodiment, the upper portion of the liquid-phase pipe is provided with a flanged portion or a thick-walled portion as the lower-side latch portion.

[0018] In another preferred embodiment, the outlet pipe portion for the accumulator includes a double pipe of an inner pipe and an outer pipe, the inner pipe having an upper end inserted into the gas-phase outlet port, and the outer pipe being provided on the baffle plate portion so as to hold the inner pipe.

[0019] In another preferred embodiment, the outlet pipe portion for the accumulator includes a double pipe of an inner pipe and an outer pipe, the inner pipe having an upper end inserted into the gas-phase outlet port, and the outer pipe being integrated with the inner pipe, and a gas-phase pipe holding portion provided on the baffle plate portion so as to hold the double pipe.

[0020] In further another preferred embodiment, the gas-liquid separator has formed therein a through-hole, the through-hole being adapted to pass the upper end of the inner pipe, an upper portion of the inner pipe is provided with a lower-side latch portion adapted to engage with the gas-liquid separator on a lower side of the gas-liquid separator, and the gas-liquid separator is tightly held between a lower face of the cap portion and the lower-side latch portion.

[0021] In further another preferred embodiment, the upper portion of the inner pipe is provided with a flanged portion or a thick-walled portion as the lower-side latch portion.

[0022] In another preferred embodiment, the gas-liquid separator is fixed to the cap portion through swaging.

[0023] In further another preferred embodiment, the gas-liquid separator is fixed to the cap portion through swaging at a position around the outlet pipe portion for the accumulator or the outlet pipe portion for the receiver.

[0024] In another preferred embodiment, the tubular case portion of the strainer is fitted into the bottom of the tank in a press-fit manner.

[0025] In another preferred embodiment, the gas-liquid separator has formed therein a through-hole, the through-hole being adapted to pass the inner pipe of the outlet pipe portion for the accumulator, and at least one rib is provided between the inner pipe and the outer pipe of the outlet pipe portion for the accumulator, the least one rib coupling the inner pipe and the outer pipe together and serving as a lower-side latch portion adapted to engage with the gas-liquid separator on a lower side of the gas-liquid separator.

[0026] In another preferred embodiment, the outlet pipe portion for the receiver and the outlet pipe portion for the accumulator are integrally coupled together by at least an upper end of a coupling portion serving as the lower-side latch portion.

[0027] In further another preferred embodiment, a lower end of the coupling portion is coupled to the baffle plate portion.

[0028] In another preferred embodiment, the outlet pipe portion for the accumulator includes a double pipe of the inner pipe and the outer pipe, the outer pipe being integrally provided on the baffle plate portion so as to hold the inner pipe. The at least one rib is provided on the outer pipe in a manner protruding radially inward, and an extension portion of the rib that extends upward beyond an upper end of the outer pipe serves as the lower-side latch portion.

[0029] In further another preferred embodiment, the inner pipe at a position above the lower-side latch portion is provided with an upper-side flanged portion, a large-diameter portion, or a thick-walled portion that serves as an upper-side pressing portion capable of pressing the gas-liquid separator from an upper side of the gas-liquid separator, and the gas-liquid separator is tightly held between the lower-side latch portion and the upper-side pressing portion.

[0030] In another preferred embodiment, the outlet pipe portion for the accumulator includes a double pipe of the inner pipe and the outer pipe integrally provided with the inner pipe, and a gas-phase pipe holding portion integrally provided on the baffle plate portion so as to hold the double pipe.

[0031] In further another preferred embodiment, the inner pipe and the outer pipe are integrated by the at least one rib provided between the inner pipe and the outer pipe, and an extension portion of the rib that extends upward beyond an upper end of the outer pipe serves as the lower-side latch portion.

[0032] In further another preferred embodiment, the gas-liquid separator is tightly held between the lower-side latch portion and a lower face of the cap portion serving as an upper-side pressing portion capable of pressing the gas-liquid separator from an upper side of the gas-liquid separator.

[0033] In another preferred embodiment, an annular seal member is provided on the strainer so as to close a gap formed between an inner peripheral face of the tank and the strainer, the annular seal member being adapted to be always resiliently pressure-joined to the inner peripheral face of the tank.

[0034] In another preferred embodiment, the annular seal member is attached to the tubular case portion so as to close a gap formed between the inner peripheral face of the tank and the tubular case portion.

[0035] In further another preferred embodiment, the annular seal member has a shape of an annular disk in a natural state, and when the annular seal member is inserted into the tank, an outer peripheral portion of the annular seal member flexes upward, and a resulting tubular flexure portion is always resiliently pressure-joined to the inner peripheral face of the tank.

[0036] In further another preferred embodiment, an outer periphery of the tubular case portion is provided with a seal holding portion including upper and lower holding plate portions, and an inner peripheral portion of the annular seal member is adapted to be fitted into and held between the upper and lower holding plate portions.

[0037] In further another preferred embodiment, an outer periphery of the tubular case portion is provided with a flanged portion, and the annular seal member includes an annular pressure-joined portion with a semi-circular cross-section or a C-shaped cross-section, the annular pressure-joined portion being adapted to be always resiliently pressure-joined to the inner peripheral face of the tank, and a pair of upper and lower tightly holding portions continuous with opposite ends of the annular pressure-joined portion and adapted to tightly hold the flanged portion.

[0038] In further another preferred embodiment, an outer periphery of the tubular case portion is provided with a flanged portion, and the annular seal member includes a tubular pressure-joined portion adapted to be always resiliently pressure-joined to the inner peripheral face of the tank, and a pair of upper and lower tightly holding portions continuous with an inner peripheral side of the tubular pressure-joined portion and adapted to tightly hold the flanged portion.

[0039] In further another preferred embodiment, an upper portion or each of an upper portion and a lower portion of an outer peripheral side of the annular seal member is provided with an annular protrusion, the annular protrusion protruding radially outward in a natural state and being adapted to be strongly pushed against the inner peripheral face of the tank when the annular seal member is inserted into the tank.

[0040] In further another preferred embodiment, a corner at a lower end of an outer peripheral side of the tubular pressure-joined portion is provided with a rounded or chamfered portion.

[0041] In further another preferred embodiment, the tubular case portion has a cutout portion formed therein, the cutout portion being adapted to circulate a refrigerant on an inner peripheral side and an outer peripheral side of the tubular case portion.

[0042] In another preferred embodiment, the tubular case portion includes the annular seal member so as to close a gap formed between the inner peripheral face of the tank and the tubular case portion, the annular seal member including an annular inner peripheral coupling portion with a wave-like cross-section and a tubular contact portion, the annular inner peripheral coupling portion being coupled to the baffle plate portion and being elastically deformable in a radial direction and a vertical direction, and the tubular contact portion being continuous with an outer peripheral side of the annular inner peripheral coupling portion and being adapted to be in contact with the inner peripheral face and the bottom of the tank so that an end face of the tubular contact portion is always resiliently pressure-joined to the inner peripheral face and the bottom of the tank.

[0043] In another preferred embodiment, the strainer, at least a part of the outlet pipe portion for the receiver, and at least a part of the outlet pipe portion for the accumulator are integrally molded using synthetic resin.

[0044] In another preferred embodiment, the outlet pipe portion for the receiver includes a liquid-phase pipe with an upper end inserted into the liquid-phase outlet port, the outlet pipe portion for the accumulator includes a double pipe of an inner pipe and an outer pipe, the inner pipe having an upper end inserted into the gas-phase outlet port, and the outer pipe holding the inner pipe, and the strainer, the liquid-phase pipe, and the outer pipe are integrally molded using synthetic resin.

[0045] In further another preferred embodiment, the liquid-phase pipe and the outer pipe are integrally coupled together by a coupling portion.

[0046] In further another preferred embodiment, the coupling portion serves as a lower-side latch portion adapted to engage with the gas-liquid separator on a lower side of the gas-liquid separator.

[0047] In further another preferred embodiment, the coupling portion is also coupled to the strainer.

[0048] In further another preferred embodiment, the gas-liquid separator has through-holes formed therein, the through-holes being adapted to pass the liquid-phase pipe and the inner pipe, respectively, each of the liquid-phase pipe and the inner pipe is provided with a lower-side latch portion adapted to engage with the gas-liquid separator on a lower side of the gas-liquid separator, the inner pipe at a position above the lower-side latch portion is provided with an upper-side pressing portion capable of pressing the gas-liquid separator from an upper side of the gas-liquid separator, and the gas-liquid separator is tightly held between the lower-side latch portion and the upper-side pressing portion.

[0049] In further another preferred embodiment, at least one rib is provided on the outer pipe in a manner protruding radially inward, and an extension portion of the rib that extends upward beyond an upper end of the outer pipe serves as the lower-side latch portion.

[0050] In further another preferred embodiment, the inner pipe is provided with an upper-side flanged portion, a large-diameter portion, or a thick-walled portion as the upper-side pressing portion.

[0051] In further another preferred embodiment, the liquid-phase pipe is provided with a flanged portion, a large-diameter portion, a thick-walled portion, or a rib as the lower-side latch portion.

Advantageous Effects of Invention

[0052] The refrigerant container according to the present invention has both the functions of a receiver and an accumulator, and the receiver and the accumulator can share the tank portion, the inlet port portion, the gas-liquid separator portion, the strainer portion, and the like in common. Therefore, a rational structure with a small number of components can be provided.

[0053] In addition, since the outlet pipe portion for the receiver and the outlet pipe portion for the accumulator are arranged side by side on the baffle plate portion of the strainer, it is only necessary to provide the cap portion with a liquid-phase outlet port and a gas-phase outlet port that are straight and penetrate through the cap member in the vertical direction, for example. Therefore, in comparison with the aforementioned conventional refrigerant container proposed so far, it is possible to simplify the structure of the cap portion as well as the connected portions of the outlet pipes and the outlet ports, for example.

[0054] Further, other than the tank and the cap portion that are the joined together (by welding or brazing, for example), components, such as the cap portion, the outlet pipe portion for the receiver, the outlet pipe portion for the accumulator, the strainer (or the baffle plate portion), and the tank, are mechanically attached together through press fit, pipe expansion, or swaging that does not involve heating, for example. Thus, assembly can be carried out easily and promptly. In addition, an inexpensive synthetic resin material can be used as the material of the outlet pipe portion for the receiver, the outlet pipe portion for the accumulator, and the strainer (or the baffle plate portion) more than before.

[0055] In addition, since the tubular case portion of the strainer is inserted (or fitted) into the tank in a press-fit manner so as to be placed at the bottom of the tank, it is possible to reliably and stably hold the strainer as well as the outlet pipe portion for the receiver and the outlet pipe portion for the accumulator, which are provided on the strainer, without additionally requiring a fastening means.

[0056] Therefore, it is possible to suppress the component costs and the machining and assembly costs, and thus can effectively reduce the space occupied by the entire system, the number of components, the cost, and the size, for example.

[0057] Further, in the refrigerant container of the present invention, the gas-liquid separator is not supported by engaging on its lower side with a lower-side latch portion that is formed by partially reducing the thickness of the outlet pipe. Instead, the outlet pipe portion for the accumulator is formed as a double pipe of an inner pipe and an outer pipe, and the gas-liquid separator is supported by engaging on its lower side with lower-side latch portions including ribs that are provided between the inner pipe and the outer pipe so as to couple the inner pipe and the outer pipe together. In such a case, the ribs serving as the lower-side latch portions are integrally provided on the baffle plate portion or provided on the outlet pipe portion that is press-fitted into and held by the baffle plate portion, while the baffle plate portion is provided on the strainer that is substantially fixed to the tank (i.e., fitted into the tank in a press-fit manner). Thus, even when the gas-liquid separator is pushed downward by a refrigerant in a gas-liquid mixed state, which has blown into the tank through the gas/liquid inlet port, the pressure is received by the strainer (or the baffle plate portion) via the outlet pipe portion. Therefore, there is no possibility that the gas-liquid separator will be pushed downward.

[0058] Accordingly, in comparison with the conventional refrigerant container in which a lower-side latch portion is formed only by partially reducing the thickness of an outlet pipe, the refrigerant container of the present invention has an increased force of holding the gas-liquid separator (in particular, a support force acting from below) and thus has increased stability. Thus, backlash and tilt of the gas-liquid separator can be suppressed, and the desired gas-liquid separation performance can be obtained.

[0059] Further, in the refrigerant container according to the present invention, the strainer (or the tubular case portion) is provided with an annular seal member that is adapted to be always resiliently pressure-joined to the inner peripheral face of the tank so as to close a gap formed between the inner peripheral face of the tank and the strainer (or the tubular case portion). Thus, even when the amount of thermal expansion and contraction of the tank and that of the strainer greatly differ, such a difference is absorbed through elastic deformation of the annular seal member. Therefore, it is possible to prevent a refrigerant containing foreign matter from entering the strainer without passing through the mesh filter or prevent damage to the strainer.

[0060] Since it is possible to prevent a refrigerant containing foreign matter from entering the strainer (or the tubular case portion) without passing through the mesh filter as described above, it is possible to reduce the amount of foreign matter in the circulating refrigerant. Therefore, it is possible to prevent clogging of a gap, an orifice (i.e., a small hole), or the like, which is formed between slide portions of a component (e.g., a compressor, a four-way switching valve, or an expansion valve) in the system, with the foreign matter, and thus reduce operation failures, troubles, and the like.

[0061] Further, the strainer, at least a part of the outlet pipe portion for the receiver, and at least a part of the outlet pipe portion for the accumulator, specifically, for example, the tubular case portion and the baffle plate portion forming the strainer, the liquid-phase pipe forming the outlet pipe portion for the receiver, and the outer pipe forming the outlet pipe portion for the accumulator are integrally molded using synthetic resin. Thus, it is possible to further simplify the structure and increase the proportion of synthetic resin portions that can be produced at a low cost while securing the desired rigidity and heat resistance, for example. Therefore, it is possible to provide a refrigerant container with a rational structure with reduced component costs and machining and assembly costs. Consequently, it is possible to effectively reduce the space occupied by the entire system, the number of components, the cost, and the size, for example.

Brief Description of Drawings

[0062]

Fig. 1 is a longitudinal cross-sectional view illustrating a first embodiment of a refrigerant container according to the present invention.
Fig. 2 is a top view of a cap member portion of the refrigerant container illustrated in Fig. 1.
Fig. 3 is a partial cross-sectional view taken in the direction of arrows V-V passing through O in Fig. 2.
Fig. 4 is a longitudinal cross-sectional view of a strainer integrally provided with a liquid-phase pipe holding portion and an outer pipe illustrated in Fig. 1.
Fig. 5 is a cross-sectional view taken in the direction of arrows A-A in Fig. 1.
Fig. 6 is a longitudinal cross-sectional view illustrating a second embodiment of a refrigerant container according to the present invention.
Fig. 7 is a longitudinal cross-sectional view of a strainer integrally provided with a liquid-phase pipe holding portion and a gas-phase pipe holding portion illustrated in Fig. 6.
Fig. 8 is a cross-sectional view taken in the direction of arrows B-B in Fig. 6.
Fig. 9 is a longitudinal cross-sectional view illustrating a third embodiment of a refrigerant container according to the present invention.
Fig. 10A is a view illustrating the state before fixed attachment (i.e., swaging) used for illustration of a step of assembling the refrigerant container illustrated in Fig. 9 (i.e., a swaging step).
Fig. 10B is a view illustrating the state after fixed attachment (i.e., swaging) used for illustration of the step of assembling the refrigerant container illustrated in Fig. 9 (i.e., the swaging step).
Fig. 11 is a longitudinal cross-sectional view illustrating a fourth embodiment of a refrigerant container according to the present invention.
Fig. 12 is a longitudinal cross-sectional view illustrating a fifth embodiment of a refrigerant container according to the present invention.
Fig. 13 is a top view of a cap member portion of the refrigerant container illustrated in Fig. 12.
Fig. 14 is a partial cross-sectional view taken in the direction of arrows V-V passing through O in Fig. 13.
Fig. 15 is a longitudinal cross-sectional view illustrating a strainer portion in Fig. 12 together with an outer pipe and a liquid-phase pipe, which are integrally provided on the strainer portion, and a gas-liquid separator.

Fig. 16 is a cross-sectional view taken in the direction of arrows A-A in Fig. 12.

Fig. 17 is a longitudinal cross-sectional view illustrating a sixth embodiment of a refrigerant container according to the present invention.

Fig. 18 is a longitudinal cross-sectional view illustrating a strainer portion in Fig. 17 together with a liquid-phase pipe and an outer pipe that are integrally provided on the strainer portion.

Fig. 19 is a cross-sectional view taken in the direction of arrows B-B in Fig. 17.

Fig. 20 is a longitudinal cross-sectional view illustrating a seventh embodiment of a refrigerant container according to the present invention.

Fig. 21 is a cross-sectional view taken in the direction of arrows C-C in Fig. 20.

Fig. 22 is a longitudinal cross-sectional view illustrating an eighth embodiment of a refrigerant container according to the present invention.

Fig. 23 is a longitudinal cross-sectional view illustrating a ninth embodiment of a refrigerant container according to the present invention.

Fig. 24 is a top view of a cap member portion of the refrigerant container illustrated in Fig. 23.

Fig. 25 is a partial cross-sectional view taken in the direction of arrows V-V passing through O in Fig. 24.

Fig. 26 is a cross-sectional view taken in the direction of arrows A-A in Fig. 23.

Fig. 27A is a partial enlarged view illustrating the natural state before a portion indicated by J1 in Fig. 23 is inserted into the tank.

Fig. 27B is a partial enlarged view illustrating the state in which the portion indicated by J1 in Fig. 23 is inserted in the tank.

Fig. 28 is a longitudinal cross-sectional view illustrating a tenth embodiment of a refrigerant container according to the present invention.

Fig. 29 is a cross-sectional view taken in the direction of arrows B-B in Fig. 28.

Fig. 30A is a partial enlarged view illustrating the natural state before a portion indicated by J2 in Fig. 28 is inserted into the tank.

Fig. 30B is a partial enlarged view illustrating the state in which the portion indicated by J2 in Fig. 28 is inserted in the tank.

Fig. 31A is a partial enlarged view illustrating the natural state before a modified example (Ver. 1) of the portion indicated by J2 in Fig. 28 is inserted into the tank.

Fig. 31B is a partial enlarged view illustrating the state in which the modified example (Ver. 1) of the portion indicated by J2 in Fig. 28 is inserted in the tank.

Fig. 32A is a partial enlarged view illustrating the natural state before a modified example (Ver. 2) of the portion indicated by J2 in Fig. 28 is inserted into the tank.

Fig. 32B is a partial enlarged view illustrating the state in which the modified example (Ver. 2) of the portion indicated by J2 in Fig. 28 is inserted in the tank.

Fig. 32C is a partial enlarged view illustrating the state in which the modified example (Ver. 2) of the portion indicated by J2 in Fig. 28 is detached.

Fig. 33 is a longitudinal cross-sectional view illustrating an eleventh embodiment of a refrigerant container according to the present invention.

Fig. 34 is a cross-sectional view taken in the direction of arrows C-C in Fig. 33.

Fig. 35A is a partial enlarged view illustrating the natural state before a portion indicated by J3 in Fig. 33 is inserted into the tank.

Fig. 35B is a partial enlarged view illustrating the state in which the portion indicated by J3 in Fig. 33 is inserted in the tank.

Fig. 36A is a partial enlarged view illustrating the natural state before a modified example (Ver. 1) of the portion indicated by J3 in Fig. 33 is inserted into the tank.

Fig. 36B is a partial enlarged view illustrating the state in which the modified example (Ver. 1) of the portion indicated by J3 in Fig. 33 is inserted in the tank.

Fig. 37A is a partial enlarged view illustrating the natural state before a modified example (Ver. 2) of the portion indicated by J3 in Fig. 33 is inserted into the tank.

Fig. 37B is a partial enlarged view illustrating the state in which the modified example (Ver. 2) of the portion indicated by J3 in Fig. 33 is inserted in the tank.

Fig. 38A is a partial enlarged view illustrating the natural state before a modified example (Ver. 3) of the portion indicated by J3 in Fig. 33 is inserted into the tank.

Fig. 38B is a partial enlarged view illustrating the state in which the modified example (Ver. 3) of the portion indicated by J3 in Fig. 33 is inserted in the tank.

Fig. 39 is a longitudinal cross-sectional view illustrating a twelfth embodiment of a refrigerant container according to the present invention.

Fig. 40 is a cross-sectional view taken in the direction of arrows D-D in Fig. 39.

Fig. 41A is a partial enlarged view illustrating the natural state before a portion indicated by J4 in Fig. 39 is inserted into the tank.

Fig. 41B is a partial enlarged view illustrating the state in which the portion indicated by J4 in Fig. 39 is inserted in the tank.

Fig. 42 is a longitudinal cross-sectional view illustrating a thirteenth embodiment of a refrigerant container according to the present invention.

Fig. 43 is a top view of a cap member portion of the refrigerant container illustrated in Fig. 42.

Fig. 44 is a partial cross-sectional view taken in the direction of arrows V-V passing through O in Fig. 43.

Fig. 45 is a longitudinal cross-sectional view illustrating a strainer portion in Fig. 42 together with a liquid-phase pipe and an outer pipe that are integrally provided on the strainer portion.

Fig. 46 is a cross-sectional view taken in the direction of arrows A-A in Fig. 42.

Fig. 47 is a cross-sectional view taken in the direction of arrows A-A in Fig. 42, illustrating another example of an outlet pipe portion for an accumulator of the refrigerant container illustrated in Fig. 42.

Description of Embodiments

[0063] Hereinafter, embodiments of the present invention will be described with reference to the accompanying drawings. Hereinafter, operational advantages of the respective embodiments will be described individually.

<First to fourth embodiments>

[First embodiment]

[0064] Fig. 1 is a longitudinal cross-sectional view illustrating a first embodiment of a refrigerant container according to the present invention. Fig. 2 is a top view of a cap member portion of the refrigerant container illustrated in Fig. 1. Fig. 3 is a partial cross-sectional view taken in the direction of arrows V-V passing through O in Fig. 2. Fig. 4 is a longitudinal cross-sectional view of a strainer 40 integrally provided with a liquid-phase pipe holding portion 51 and an outer pipe 32 illustrated in Fig. 1. Fig. 5 is a cross-sectional view taken in the direction of arrows A-A in Fig. 1.

[0065] A refrigerant container 1 of the first embodiment illustrated in the drawings is used for a heat pump system forming a car air-conditioner for an electric vehicle, for example. The refrigerant container 1 includes a closed-bottomed cylindrical tank 10 made of metal, such as stainless steel or aluminum alloy. The upper-face opening of the tank 10 is hermetically closed by a cap member (i.e., a cap portion) 12 made of the same metal. It should be noted that the refrigerant container 1 (or the tank 10) of the present embodiment is placed in a vertical position as illustrated in the drawings. That is, the refrigerant container 1 is placed with the cap member 12 positioned on the upper side and a bottom 13 of the tank 10 positioned on the lower side.

[0066] The cap member 12 includes a gas/liquid inlet port 15, a stepped, small-diameter liquid-phase outlet port 16 having an intermediate large-diameter portion 16b, and a stepped, large-diameter gas-phase outlet port 17 having an intermediate large-diameter portion 17b, all of which penetrate through the cap member 12 such that they are open on the top and bottom sides thereof. Although the cap member 12 has a conduit connection adapter attached to its upper side, for example, such a conduit connection adapter as well as an internal screw portion for screwing the adapter is not illustrated.

[0067] A gas-liquid separator 18, which has the shape of a conical hat or an inverted wide bowl and has a diameter smaller than the inside diameter of the tank 10, is disposed below the cap member 12 such that the gas-liquid separator 18 faces the gas/liquid inlet port 15. The liquid-phase outlet port 16 has coupled to its lower portion the upper end of an outlet pipe portion 20 (or a liquid-phase pipe 21 thereof) for a receiver that is adapted to guide only a liquid-phase refrigerant separated by the gas-liquid separator 18 to the side of an expansion valve via the liquid-phase outlet port 16. In addition, the gas-phase outlet port 17 has coupled to its lower portion the upper end of an outlet pipe portion 30 (or an inner pipe 31 thereof) for an accumulator with a double pipe structure, which includes the inner pipe 31 and the outer pipe 32, that is adapted to guide a gas-phase refrigerant separated by the gas-liquid separator 18 to the suction side of a compressor via the gas-phase outlet port 17 together with oil contained in the liquid-phase refrigerant (each member will be described in detail later).

[0068] The strainer 40 for trapping foreign matter in the refrigerant is disposed at the bottom 13 of the tank 10. The strainer 40 includes a short cylindrical tubular case portion 42, which is adapted to be inserted (fitted) into the tank 10 in a press-fit manner so as to be placed at the bottom (i.e., the bottom face) 13 of the tank 10, and a cross-shaped baffle plate portion 43 integrally provided on the upper end of the tubular case portion 42 so as to partially cover the upper-face opening thereof. The cross-shaped baffle plate portion 43 has a plate-like shape as seen in a side view, and includes a sideways bridge portion 43a and a depthways bridge portion 43b as seen in a plan view (Fig. 5). A reinforcing rib-like projection 43f is provided on the upper end face of the tubular case portion 42 and on the center of each of the upper faces of the sideways bridge portion 43a and the depthways bridge portion 43b.

[0069] In the present embodiment, as is clearly seen in Figs. 4 and 5 in addition to Fig. 1, a portion around the left end of the sideways bridge portion 43a of the baffle plate portion 43 is integrally provided with the small-diameter short cylindrical liquid-phase pipe holding portion 51 that is adapted to have fixed thereto by press fit the lower end of the liquid-phase pipe 21 made of metal, such as aluminum alloy, and forming the outlet pipe portion 20 for the receiver. A liquid-phase refrigerant drawing port 25, which has a diameter slightly smaller than the inside diameter of the liquid-phase pipe holding portion 51, is formed in a portion of the baffle plate portion 43 (or the sideways bridge portion 43a thereof) corresponding to the bottom of the liquid-phase pipe holding portion 51.

[0070] In addition, the outer pipe 32 forming the outlet pipe portion 30 for the accumulator is integrally provided on and extends from a portion where the sideways bridge portion 43a and the depthways bridge portion 43b cross each other on the right side of the center of the baffle plate portion 43. An oil return hole 35 is formed in the center of a portion of the baffle plate portion 43 provided with the outer pipe 32 (i.e., a portion corresponding to the bottom of the outer pipe 32). The diameter of the oil return hole 35 is set to about 1 mm, for example.

[0071] Further, a circular mesh filter 45 is integrally provided on the lower face side of the baffle plate portion 43 so as to cover the entire upper-face opening of the tubular case portion 42. The mesh filter 45 is produced using a metallic mesh or a mesh material of synthetic resin, for example. Accordingly, as is clearly seen in Fig. 5, the mesh filter 45 is stretched across two pairs of (i.e., a total of four) large and small blade-shaped window portions 44a and 44b that are provided in portions of the upper-face opening of the tubular case portion 42 not covered with the baffle plate portion 43 and are defined by the tubular case portion 42, the sideways bridge portion 43a, and the depthways bridge portion 43b. The tubular case portion 42 of the strainer 40 is inserted into the tank 10 in a press-fit manner with the outer periphery of the tubular case portion 42 abutting the inner wall of the tank 10 so that the tubular case portion 42 is placed at the bottom 13 of the tank 10. Thus, the entire liquid-phase refrigerant falling from the upper portion of the tank 10 toward the bottom 13 passes through the mesh filter 45. This allows foreign matter in the liquid-phase refrigerant, which flows into the tubular case portion 42 via the mesh filter 45, to be trapped by the mesh filter 45 and thus removed from the circulating refrigerant.

[0072] Although the mesh filter 45 is stretched across the four window portions 44a, 44a, 44b, and 44b in the present example, the mesh filter 45 may also be attached to the liquid-phase refrigerant drawing port 25 and the oil return hole 35.

[0073] It should be noted that the mesh filter 45 need not cover the entire upper-face opening of the tubular case portion 42 as described above. The mesh filter 45 has only to cover at least a portion of the upper-face opening of the tubular case portion 42 not covered with the baffle plate portion 43.

[0074] Herein, the aforementioned tubular case portion 42, baffle plate portion 43, liquid-phase pipe holding portion 51, and outer pipe 32 are integrally molded using synthetic resin. During the integral molding, the mesh filter 45 is also integrated as an insert, for example.

[0075] In the present embodiment, the inside diameter of the tank 10 is set to 60 to 90 mm, the diameter of the tubular case portion 42 (or the baffle plate portion 43) is set substantially equal to the inside diameter of the tank 10, the plate thickness of the baffle plate portion 43 is set to about 1 to 2 mm, and the height H (Fig. 1) from the bottom face of the tank 10 to the baffle plate portion 43 (or the lower face thereof) is set to 5 to 10 mm.

[0076] A plurality of (four in the example illustrated in the drawing) plate-like ribs 36 are provided in a manner protruding radially inward on the inner periphery of the lower portion of the outer pipe 32, which is integrally provided on the baffle plate portion 43, along the longitudinal direction (i.e., the vertical direction) and at equal angular intervals. The width (i.e., the radial width or the inward protrusion amount) of each plate-like rib 36 at a portion above its lower end 36m is slightly narrower the width of the lower end 36m. The inner pipe 31 (or the lower portion thereof) made of metal, such as aluminum alloy, is inserted in a press-fit manner on the inner peripheral side of a narrow-width portion 36n until the lower end of the inner pipe 31 engages with the upper end of the lower end 36m (i.e., a step portion adjacent to the narrow-width portion 36n) of each plate-like rib 36. Herein, to allow the inner pipe 31 to be easily press-fitted, the height (i.e., the vertical length) of each plate-like rib 36 is set to about 1/3 or 1/2 of the height of the outer pipe 32. The upper portion of the inner pipe 31 protrudes upward beyond the upper end of the outer pipe 32. Although the plate-like ribs 36 are provided on the side of the outer pipe 32 in the present example, the plate-like ribs 36 may be provided on the side of the inner pipe 31 or on both sides. In addition, it is needless to mention that the number of the plate-like ribs 36 is not limited to that illustrated in the drawing as long it is more than one. A pressure equalization hole 31f for preventing a liquid backflow to the side of the compressor while the system stops operation (ON→OFF) is provided in a portion of the inner pipe 31 at about the same level as the gas-liquid separator 18.

[0077] In addition, the liquid-phase pipe 21 (or the lower end thereof) made of metal, such as aluminum alloy, and forming the outlet pipe portion 20 for the receiver is press-fitted into and held by the liquid-phase pipe holding portion 51 that is integrally provided on the baffle plate portion 43 (until it abuts the baffle plate portion 43).

[0078] The upper end (i.e., an expanded pipe portion) 21a of the outlet pipe portion 20 (or the liquid-phase pipe 21 thereof) for the receiver is expanded and fixed into the intermediate large-diameter portion 16b of the liquid-phase outlet port 16. The upper end (i.e., an expanded pipe portion) 31a of the outlet pipe portion 30 (or the inner pipe 31 thereof) for the accumulator is expanded and fixed into the intermediate large-diameter portion 17b of the gas-phase outlet port 17.

[0079] The gas-liquid separator 18 is made of metal, such as stainless steel or aluminum alloy, and includes a disk-like ceiling portion 18a and a cylindrical peripheral wall portion 18b continuous with and extending downward from the outer periphery of the ceiling portion 18a. The gas-liquid separator 18 is disposed at a position below the lower end face of the gas/liquid inlet port 15 in the cap member 12 by a predetermined distance so as to cover the upper-end opening of the outer pipe 32 of the outlet pipe portion 30 for the accumulator (i.e., the upper portion of a space between the outer pipe 32 and the inner pipe 31, which is a downward-feed flow channel portion 33 described below) (i.e., so as to allow the upper end of the outer pipe 32 to be located between the ceiling portion 18a and the lower end of the peripheral wall portion 18b; see Fig. 3).

[0080] The ceiling portion 18a of the gas-liquid separator 18 has through-holes 18u and 18v formed therein (side by side) that respectively allow the upper ends of the liquid-phase pipe 21 and the inner pipe 31, which are straight before being expanded, to be tightly inserted therethrough.

[0081] In response, the upper portions of the liquid-phase pipe 21 and the inner pipe 31 are respectively provided with flanged portions 21k and 31k, which have been subjected to compression bending, such as bulge forming, as lower-side latch portions adapted to engage with the gas-liquid separator 18 (or the peripheral edges of the through-holes 18u and 18v) on its lower side. The gas-liquid separator 18 is tightly held between the lower face of the cap member 12 (specifically, thick-walled cylindrical downward projections 12d and 12e provided in a protruding manner on the lower face of the cap member 12 around the liquid-phase outlet port 16 and the gas-phase outlet port 17) and the flanged portions 21k and 31k. It should be noted that the flanged portion 21k of the liquid-phase pipe 21 and the flanged portion 31k of the inner pipe 31 are located at the same level from the bottom 13 of the tank 10. Thus, the gas-liquid separator 18 (or the ceiling portion 18a thereof) is held horizontally.

[0082] Although the flanged portions 21k and 31k are used as the lower-side latch portions in the present example, it is also possible to use thick-walled portions, which have been obtained by forming parts of the liquid-phase pipe 21 and the inner pipe 31 (i.e., at positions below the gas-liquid separator 18) to be thicker than the upper ends thereof passing through the through-holes 18u and 18v in the gas-liquid separator 18, so as to tightly hold the gas-liquid separator 18 between the lower face of the cap member 12 and the thick-walled portions, for example.

[0083] Though not illustrated, a bag containing desiccants therein is usually disposed in the tank 10 by being wound around the outer pipe 32, for example. For the bag containing desiccants therein and the like, see Patent Literature 2, if necessary.

[0084] The refrigerant container 1 with such a structure can be assembled as follows, for example.

(1) First, the liquid-phase pipe 21 provided with a lower-side latch portion, which includes the flanged portion 21k, is press-fitted into the liquid-phase pipe holding portion 51 provided on the strainer 40 (or the baffle plate portion 43 thereof). Likewise, the inner pipe 31 provided with a lower-side latch portion, which includes the flanged portion 31k, is also press-fitted into the outer pipe 32 (or the inner peripheral side of its plate-like ribs 36) provided on the strainer 40 (or the baffle plate portion 43 thereof).

(2) Next, the upper ends, which are not expanded yet, of the liquid-phase pipe 21 and the inner pipe 31 are respectively inserted through the through-holes 18u and 18v formed in the gas-liquid separator 18 so that the gas-liquid separator 18 is placed on the lower-side latch portions including the flanged portions 21k and 31k.

(3) Next, the upper ends of the liquid-phase pipe 21 and the inner pipe 31 are respectively inserted into the liquid-phase outlet port 16 and the gas-phase outlet port 17 in the cap member 12 so that the cap member 12 is placed on the gas-liquid separator 18.

(4) Next, an upper end 21a of the liquid-phase pipe 21 is expanded and fixed into the intermediate large-diameter portion 16b of the liquid-phase outlet port 16, and an upper end 31a of the inner pipe 31 is expanded and fixed into the intermediate large-diameter portion 17b of the gas-phase outlet port 17. Accordingly, the liquid-phase pipe 21 and the inner pipe 31 are integrally coupled to the cap member 12, and also, the gas-liquid separator 18 is tightly held between the lower face of the cap member 12 (or the downward projections 12d and 12e thereof) and the flanged portions 21k and 31k.

(5) Thus, an assembly including the strainer 40, the liquid-phase pipe 21, the inner pipe 31, the gas-liquid separator 18, and the cap member 12 is obtained. Then, the tank 10 is disposed around an interior member 60 (i.e., a portion other than and below the cap member 12) of the assembly (from below; see Fig. 1), and the strainer 40 is pushed into the tank 10 in a press-fit manner so as to be placed at the bottom 13 of the tank 10.

(6) Finally, the cap member 12 is joined to the upper end of the tank 10 by welding. This allows the tank 10 to be hermetically sealed.

[0085] The operations of the refrigerant container 1 with the aforementioned structure during the cooling operation and the heating operation will be described.

[0086] In each of the cooling operation and the heating operation, a refrigerant in a gas-liquid mixed state, which has been introduced into the tank 10 from a condenser via the gas/liquid inlet port 15, collides with the gas-liquid separator 18 (or the ceiling portion 18a thereof) as illustrated in Fig. 3, and diffuses radially, and is then separated into a liquid-phase refrigerant and a gas-phase refrigerant. The liquid-phase refrigerant (including oil) is guided into the lower space of the tank 10 by falling along the inner peripheral face of the tank 10, and the gas-phase refrigerant is guided into the upper space of the tank 10.

[0087] During the cooling operation, for example, one or more on-off valves provided in a refrigerant flow path (not illustrated) are operated (see Patent Literature 2) so that the liquid-phase refrigerant guided to the lower space of the tank 10 passes through the mesh filter 45 of the strainer 40 and then accumulates in the tubular case portion 42. When the liquid-phase refrigerant passes through the mesh filter 45, foreign matter, such as sludge, in the liquid-phase refrigerant is trapped by the mesh filter 45 and thus is removed from the circulating refrigerant. The liquid-phase refrigerant that has accumulated in the tubular case portion 42 is drawn into the liquid-phase pipe 21 through the liquid-phase refrigerant drawing port 25, and is then guided to the expansion valve via the liquid-phase outlet port 16.

[0088] Therefore, during the cooling operation, the refrigerant container 1 of the present embodiment functions as a receiver (also referred to as a receiver drier).

[0089] In contrast, during the heating operation, one or more on-off valves provided in the refrigerant flow path (not illustrated) are switched (see Patent Literature 2) so that the gas-phase refrigerant separated by the gas-liquid separator 18 is suctioned to the suction side of the compressor via the upper space of the tank 10 → a space between the outer pipe 32 and the inner pipe 31 (i.e., the downward-feed flow channel portion 33) → the lower end of the outer pipe 32 → the inside of the inner pipe 31 → the gas-phase outlet port 17, and thus is circulated.

[0090] During the heating operation, the liquid-phase refrigerant that has accumulated in the tubular case portion 42 hardly flows to the expansion valve due to the relationship of the pressure difference.

[0091] In addition, oil that has accumulated in the tubular case portion 42 together with the liquid-phase refrigerant moves toward the bottom 13 of the tank 10 due to the difference in specific gravity, properties, and the like between the oil and the liquid-phase refrigerant, and is absorbed into the aforementioned gas-phase refrigerant to be suctioned to the suction side of the compressor via the downward-feed flow channel portion 33 → the lower end of the outer pipe 32 → the inside of the inner pipe 31 → the gas-phase outlet port 17. Thus, the oil is returned to the suction side of the compressor together with the gas-phase refrigerant through the oil return hole 35 provided in the baffle plate portion 43 at a position corresponding to the bottom of the outer pipe 32 → the inner pipe 31, and thus is circulated.

[0092] Therefore, during the heating operation, the refrigerant container 1 of the present embodiment functions as an accumulator.

[0093] As described above, the refrigerant container 1 of the present embodiment has both the functions of a receiver and an accumulator, and the receiver and the accumulator share the tank portion (i.e., the tank 10), the inlet port portion (i.e., the gas/liquid inlet port 15), the gas-liquid separation portion (i.e., the gas-liquid separator 18), and the strainer portion (i.e., the strainer 40) in common. Therefore, a rational structure with a small number of components can be provided.

[0094] In addition, the liquid-phase pipe holding portion 51 for the outlet pipe portion 20 for the receiver and the outer pipe 32 of the outlet pipe portion 30 for the accumulator are arranged side by side (with a gap therebetween) on the baffle plate portion 43 of the strainer 40. Further, the liquid-phase pipe 21 is press-fitted into and held by the liquid-phase pipe holding portion 51, and the inner pipe 31 is press-fitted into and held by the outer pipe 32. Thus, for example, it is only necessary to provide the cap member 12 with the liquid-phase outlet port 16 and the gas-phase outlet port 17 that are straight and penetrate through the cap member 12 in the vertical direction. Therefore, in comparison with the aforementioned conventional refrigerant container proposed so far, it is possible to simplify the structure of the cap member 12 and the connected portion of the outlet pipe portion 20 (or the liquid-phase pipe 21) for the receiver and the liquid-phase outlet port 16, for example.

[0095] Further, other than the tank 10 and the cap member 12 that are the joined together (by welding or brazing, for example), components, such as the cap member 12, the outlet pipe portion 20 for the receiver, the outlet pipe portion 30 for the accumulator, the strainer 40 (or the baffle plate portion 43), and the tank 10, are mechanically attached together through press fit, pipe expansion, or swaging that does not involve heating, for example. Thus, assembly can be carried out easily and promptly. In addition, an inexpensive synthetic resin material can be used as the material of the outlet pipe portion 20 for the receiver, the outlet pipe portion 30 for the accumulator, and the strainer 40 (or the baffle plate portion 43) more than before.

[0096] In particular, since the tubular case portion 42 of the strainer 40 is inserted (or fitted) into the tank 10 in a press-fit manner so as to be placed at the bottom 13 of the tank 10, it is possible to reliably and stably hold the strainer 40 as well as the outlet pipe portion 20 for the receiver and the outlet pipe portion 30 for the accumulator, which are provided on the strainer 40, without additionally requiring a fastening means.

[0097] Therefore, it is possible to suppress the component costs and the machining and assembly costs, and thus effectively reduce the space occupied by the entire system, the number of components, the cost, and the size, for example.

[0098] It has been confirmed through prototype experiments that when the inside diameter of the tank 10 is set to 60 to 90 mm, and the height H of the baffle plate portion 43 from the bottom 13 of the tank 10 is set to 5 to 10 mm, the gas-liquid separation performance as well as the oil return performance toward the compressor can be maintained at the same level as that of the present product.

[Second embodiment]

[0099] Fig. 6 is a longitudinal cross-sectional view illustrating a second embodiment of a refrigerant container according to the present invention. Fig. 7 is a longitudinal cross-sectional view of a strainer 40' integrally provided with the liquid-phase pipe holding portion 51 and a gas-phase pipe holding portion 52 illustrated in Fig. 6. Fig. 8 is a cross-sectional view taken in the direction of arrows B-B in Fig. 6.

[0100] A refrigerant container 2 of the second embodiment illustrated in the drawings differs from the refrigerant container 1 of the aforementioned first embodiment only in the portion related to an outlet pipe portion 30' for the accumulator. The other portions related to the outlet pipe portion 20 for the receiver and the like have the same structures as those of the refrigerant container 1 in the first embodiment. Therefore, portions corresponding to the respective portions of the refrigerant container 1 in the first embodiment are denoted by the same reference signs, and repeated description will be omitted. Hereinafter, the differences will be mainly described.

[0101] That is, in the refrigerant container 2 of the present embodiment, the baffle plate portion 43 of strainer 40' is provided with a large-diameter short cylindrical gas-phase pipe holding portion 52 instead of the outer pipe 32 of the refrigerant container 1 in the first embodiment. The gas-phase pipe holding portion 52 is adapted to have press-fitted thereinto the lower portion of an outer pipe 32' of a double pipe 30A that includes an inner pipe 31' and the outer pipe 32' (until it abuts the baffle plate portion 43). In addition, the oil return hole 35 is formed in the center of a portion of the baffle plate portion 43 corresponding to the bottom of the gas-phase pipe holding portion 52. Thus, in the present embodiment, the outlet pipe portion 30' for the accumulator includes the gas-phase pipe holding portion 52 and the double pipe 30A. The upper portion of the inner pipe 31' of the outlet pipe portion 30' for the accumulator protrudes upward beyond the upper end of the outer pipe 32', and the upper end 31a of the inner pipe 31' is expanded and fixed into the intermediate large-diameter portion 17b of the gas-phase outlet port 17 as in the first embodiment.

[0102] The double pipe 30A of the present embodiment is integrally molded by extrusion using metal, such as aluminum alloy, for example. The inner pipe 31' and the outer pipe 32' of the double pipe 30A are integrally coupled together by a plurality of (three in the example illustrated in the drawing) plate-like ribs 37 that are provided radially at equal angular intervals in the longitudinal direction between the inner pipe 31' and the outer pipe 32'. The upper ends of the plurality of plate-like ribs 37 extend upward beyond the upper end of the outer pipe 32', and such extension portions 37e (or the upper ends thereof) are adapted to serve as lower-side latch portions for the gas-liquid separator 18 as with the flanged portion 31k of the first embodiment. Each of such extension portions 37e may also be referred to as a thick-walled portion formed thicker than the upper end thereof that passes through the through-holes 18v in the gas-liquid separator 18.

[0103] Thus, the gas-liquid separator 18 is tightly held between the lower face of the cap member 12 (or the downward projections 12d and 12e thereof) and the flanged portion 21k provided on the liquid-phase pipe 21 as well as the extension portions 37e of the plurality of plate-like ribs 37 on the double pipe 30A.

[0104] Although the inner pipe 31' and the outer pipe 32' are integrated via the plate-like ribs 37 in the present example, the inner pipe 31' and the outer pipe 32' may be formed separately (as separate members), and the plate-like ribs 37 may be provided on one or both of the inner pipe 31' and the outer pipe 32' as in the first embodiment.

[0105] The refrigerant container 2 of the present second embodiment with such a structure can obtain operational advantages substantially similar to those of the refrigerant container 1 in the first embodiment. In addition, since the baffle plate portion 43 of the strainer 40' is provided with the short cylindrical gas-phase pipe holding portion 52 instead of the long outer pipe 32 of the refrigerant container 1 in the first embodiment, the strainer 40' can be molded more easily than that of the first embodiment, resulting in a lower production cost.

[0106] In addition, since the double pipe 30A integrally molded by extrusion is used as the outlet pipe portion 30' for the accumulator, the assembly performance improves in comparison with the refrigerant container of the first embodiment in which the inner pipe and the outer pipe are formed separately and using different materials. Further, since the upper end 31a of the inner pipe 31' is expanded and fixed into the intermediate large-diameter portion 17b of the gas-phase outlet port 17 as in the first embodiment, and the extension portions 37e of the plate-like ribs 37 are adapted to serve as the lower-side latch portions for the gas-liquid separator 18 as with the flanged portion 31k of the first embodiment, there is no need to provide the inner pipe 31' with the flanged portion 31k in the present embodiment. Thus, the machining and assembly costs can be suppressed.

[Third embodiment]

[0107] Fig. 9 is a longitudinal cross-sectional view illustrating a third embodiment of a refrigerant container according to the present invention.

[0108] A refrigerant container 3 in the third embodiment illustrated in the drawing differs from the refrigerant container 1 in the aforementioned first embodiment in the method of fixedly attaching the liquid-phase pipe 21 and the inner pipe 31 to the cap member 12 and in the method of fixedly attaching the gas-liquid separator 18. Portions other than the portions related to the fixed attachment methods have the same structures as those of the refrigerant container 1 in the first embodiment. Therefore, portions corresponding to the respective portions of the refrigerant container 1 in the first embodiment are denoted by the same reference signs, and repeated description will be omitted. Hereinafter, the differences will be mainly described.

[0109] In the refrigerant container 3 of the present embodiment, the liquid-phase pipe 21 forming the outlet pipe portion 20 for the receiver and the inner pipe 31 forming the outlet pipe portion 30 for the accumulator are substantially straight pipes without irregularities, steps, or protrusions over their entire length before being attached to the cap member 12. Even after the liquid-phase pipe 21 and the inner pipe 31 are attached to the cap member 12, their upper ends are only inserted into the lower portions (i.e., the lower large-diameter portions) of the liquid-phase outlet port 16 and the gas-phase outlet port 17, respectively, in the cap member 12, and are not expanded.

[0110] Fig. 10A is a view illustrating the state in which the upper ends of the liquid-phase pipe 21 and the inner pipe 31 are respectively inserted into the lower portions of the liquid-phase outlet port 16 and the gas-phase outlet port 17 (i.e., the state before they are fixedly attached (fixed by swaging)). Fig. 10B is a view illustrating the state in which the liquid-phase pipe 21, the inner pipe 31, and the gas-liquid separator 18 are fixedly attached to the cap member 12 by swaging (i.e., fixed by swaging).

[0111] As illustrated in Fig. 10A, a short cylindrical portion 12i, which has an inside diameter substantially equal to the outside diameter of the liquid-phase pipe 21, is provided in a downwardly protruding manner around the peripheral edge of the lower end of the liquid-phase outlet port 16 in the cap member 12. In addition, a thick-walled short cylindrical portion 12j, which has an inside diameter substantially equal to the outside diameter of the inner pipe 31, is provided around the peripheral edge of the lower end of the gas-phase outlet port 17 in the cap member 12 (or the downward projection 12e thereof). Also, a thin-walled short cylindrical portion 12k, which has an outside diameter substantially equal to the opening diameter of the through-hole 18v' formed in the gas-liquid separator 18, is provided in a downwardly protruding manner, continuously with the lower end of the outer peripheral portion of the thick-walled short cylindrical portion 12j (that is, around the inner pipe 31 inserted into the gas-phase outlet port 17).

[0112] In the present example, the through-hole portion, which is adapted to pass the liquid-phase pipe 21, in the gas-liquid separator 18 is a short cylindrical through-hole 18u' formed by partially bending the gas-liquid separator 18 downward to increase the holding property.

[0113] To assemble the refrigerant container 3 with such a structure, for example, the upper end of the liquid-phase pipe 21 is first inserted into the lower portion (i.e., the lower large-diameter portion) of the liquid-phase outlet port 16, and the short cylindrical portion 12i is swaged inward so as to attach the liquid-phase pipe 21 to the cap member 12 (i.e., a swaged portion 12i'). Next, the upper end of the inner pipe 31 is inserted into the lower portion (i.e., the lower large-diameter portion) of the gas-phase outlet port 17, and also, the liquid-phase pipe 21 and the inner pipe 31 are respectively passed through the through-holes 18u' and 18v' in the gas-liquid separator 18 from below. Then, the gas-liquid separator 18 is moved until its ceiling face 18a abuts the downward projection 12e (or the lower face thereof) of the cap member 12. In such a state, the thick-walled short cylindrical portion 12j and the thin-walled short cylindrical portion 12k are swaged using a swaging jig 65 as illustrated in Fig. 10B.

[0114] Herein, the swaging jig 65 includes a cylindrical base portion 65a adapted to be slidably arranged around the inner pipe 31, an annular blade portion 65b provided in a protruding manner on the upper-end inner peripheral portion of the cylindrical base portion 65a and having a cutting edge, which has a substantially right triangular cross-section, and a flat face portion 65c extending to the outer peripheral side than does the annular blade portion 65b on the upper end face of the cylindrical base portion 65a. Thus, as the swaging jig 65 is arranged around the inner pipe 31 and is hammered against the thick-walled short cylindrical portion 12j and the thin-walled short cylindrical portion 12k, the inner peripheral side of the thick-walled short cylindrical portion 12j is bent radially inward so as to slightly bite into the inner pipe 31 (i.e., a swaged portion 12j'). Accordingly, the inner pipe 31 is attached to the cap member 12, and at the same time, the thin-walled short cylindrical portion 12k is bent outward by the flat face portion 65c (i.e., a swaged portion 12k'). Accordingly, the peripheral edge of the through-hole 18v' in the gas-liquid separator 18 is sandwiched and held between the thin-walled short cylindrical portion 12k (i.e., the swaged portion 12k') and the lower face of the cap member 12 (or the downward projection 12e thereof).

[0115] After the liquid-phase pipe 21, the inner pipe 31, and the gas-liquid separator 18 are fixedly attached to (i.e., fixed by swaging) to the cap member 12 in this manner, the lower end of the liquid-phase pipe 21 is press-fitted into the liquid-phase pipe holding portion 51, and also, the inner pipe 31 is press-fitted into the outer pipe 32 so that an assembly including the cap member 12, the liquid-phase pipe 21, the inner pipe 31, the gas-liquid separator 18, and the strainer 40 is obtained. After that, the tank 10 is disposed around the interior member 60 (i.e., a portion other than and below the cap member 12) of the assembly (from below; see Fig. 9), and the strainer 40 is pushed into the tank 10 in a press-fit manner so as to be placed at the bottom 13 of the tank 10. Finally, the cap member 12 is joined to the upper end of the tank 10 by welding.

[0116] The refrigerant container 3 of the present third embodiment with such a structure can obtain operational advantages substantially similar to those of the refrigerant container 1 in the first embodiment. In addition, in the present embodiment, it is possible to fixedly attach the liquid-phase pipe 21, the inner pipe 31, and the gas-liquid separator 18 to the cap member 12 only by fixing the strainer 40 (or the baffle plate portion 43 thereof) to the tank 10 in a press-fit manner, and also fixing the inner pipe 31 to the outer pipe 32 integrally provided on the baffle plate portion 43 by press fit so as to allow the lower portion of the inner pipe 31 to be fixedly held, and then performing a swaging step once on the side of the outlet pipe portion 20 (the liquid-phase pipe 21) for the receiver and also performing a swaging step once on the side of the outlet pipe portion 30 (the inner pipe 31) for the accumulator, without performing a pipe expansion step. Therefore, the assembly step can be simplified and the production cost can be suppressed.

[0117] In addition, since the liquid-phase pipe 21 and the inner pipe 31 need not be machined at all and the gas-liquid separator 18 need not be modified to a great degree, the machining and assembly costs can be further suppressed.

[0118] In the present embodiment, although the gas-liquid separator 18 is fixed to the cap member 12 by swaging at a position around the outlet pipe portion 30 (or the inner pipe 31 thereof) for the accumulator coupled to the gas-phase outlet port 17, the gas-liquid separator 18 may be fixed to the cap member 12 by swaging at a position around the outlet pipe portion 20 (or the liquid-phase pipe 21 thereof) for the receiver coupled to the liquid-phase outlet port 16.

[Fourth embodiment]

[0119] Fig. 11 is a longitudinal cross-sectional view illustrating a fourth embodiment of a refrigerant container according to the present invention.

[0120] A refrigerant container 4 in the fourth embodiment illustrated in the drawing differs from the refrigerant container 3 in the aforementioned third embodiment only in that the thick-walled short cylindrical portion 12j for fixing the inner pipe 31 to the cap member 12 by swaging is not provided and also in that an O-ring 67 is provided as a sealant between the gas-phase outlet port 17 in the cap member 12 and the upper end of the inner pipe 31. Therefore, portions corresponding to the respective portions of the refrigerant container 3 in the third embodiment are denoted by the same reference signs, and repeated description will be omitted. Hereinafter, the differences will be mainly described.

[0121] In the refrigerant container 4 of the present embodiment, the lower portion of the inner pipe 31 is press-fitted into the outer pipe 32 provided on the baffle plate portion 43 of the strainer 40. However, the upper end of the inner pipe 31 is only inserted into the lower portion (i.e., the lower large-diameter portion) of the gas-phase outlet port 17 and is not fixed. In addition, to prevent unwanted leakage of a refrigerant from the gas-phase outlet port 17, the O-ring 67 is provided as a sealant between the gas-phase outlet port 17 and the upper end of the inner pipe 31 (specifically, an inner peripheral groove provided in the gas-phase outlet port 17). The other structures are substantially the same as those in the aforementioned third embodiment.

[0122] The refrigerant container 4 of the present fourth embodiment with such a structure can obtain operational advantages substantially similar to those of the refrigerant container 1 in the first embodiment. In addition, in the present embodiment, the inner pipe 31 is not attached to the cap member 12 through pipe expansion or swaging, but the inner pipe 31 is fixedly held by fixing the strainer 40 (or the baffle plate portion 43 thereof) to the tank 10 in a press-fit manner and also fixing the inner pipe 31 to the outer pipe 32 integrally provided on the baffle plate portion 43 by press fit, and further providing the O-ring 67 between the gas-phase outlet port 17 in the cap member 12 and the upper end of the inner pipe 31. Therefore, the assembly step can be simplified and the production cost can be suppressed. In such a case, since the O-ring 67 is provided between the gas-phase outlet port 17 and the upper end of the inner pipe 31, there is no possibility that a refrigerant will undesirably leak from the gas-phase outlet port 17.

[0123] <Fifth to eighth embodiments>

[Fifth embodiment]

[0124] Fig. 12 is a longitudinal cross-sectional view illustrating a fifth embodiment of a refrigerant container according to the present invention. Fig. 13 is a top view of a cap member portion of the refrigerant container illustrated in Fig. 12. Fig. 14 is a partial cross-sectional view taken in the direction of arrows V-V passing through O in Fig. 13. Fig. 15 is a longitudinal cross-sectional view illustrating a strainer portion in Fig. 12 together with an outer pipe and a liquid-phase pipe, which are integrally provided on the strainer portion, and a gas-liquid separator. Fig. 16 is a cross-sectional view taken in the direction of arrows A-A in Fig. 12.

[0125] A refrigerant container 5 of the fifth embodiment illustrated in the drawings is used for a heat pump system forming a car air-conditioner for an electric vehicle, for example. The refrigerant container 5 includes a closed-bottomed cylindrical tank 10 made of metal, such as stainless steel or aluminum alloy. The upper-face opening of the tank 10 is hermetically closed by a cap member (i.e., a cap portion) 12 made of the same metal. It should be noted that the refrigerant container 5 (or the tank 10) of the present embodiment is placed in a vertical position as illustrated in the drawings. That is, the refrigerant container 5 is placed with the cap member 12 positioned on the upper side and a bottom 13 of the tank 10 positioned on the lower side.

[0126] The cap member 12 includes a gas/liquid inlet port 15, a stepped, small-diameter liquid-phase outlet port 16 having a lower large-diameter portion 16a, and a stepped, large-diameter gas-phase outlet port 17 having a lower large-diameter portion 17a, all of which penetrate through the cap member 12 such that they are open on the top and bottom sides thereof. Although the cap member 12 has a conduit connection adapter attached to its upper side, for example, such a conduit connection adapter as well as an internal screw portion for screwing the adapter is not illustrated.

[0127] A gas-liquid separator 18, which has the shape of a conical hat or an inverted wide bowl and has a diameter smaller than the inside diameter of the tank 10, is disposed below the cap member 12 such that the gas-liquid separator 18 faces the gas/liquid inlet port 15. The lower large-diameter portion 16a of the liquid-phase outlet port 16 has inserted thereinto an upper end 21a of an outlet pipe portion 20 (or a liquid-phase pipe 21 thereof) for a receiver that is adapted to guide only a liquid-phase refrigerant separated by the gas-liquid separator 18 to the side of an expansion valve via the liquid-phase outlet port 16. In addition, the lower large-diameter portion 17a of the gas-phase outlet port 17 has inserted thereinto an upper end 31a of an outlet pipe portion 30 (or an inner pipe 31 thereof) for an accumulator with a double pipe structure, which includes the inner pipe 31 and the outer pipe 32 provided around the outer periphery of the inner pipe 31, that is adapted to guide a gas-phase refrigerant separated by the gas-liquid separator 18 to the suction side of a compressor via the gas-phase outlet port 17 together with oil contained in the liquid-phase refrigerant (which will be described in detail later).

[0128] The gas-liquid separator 18 is made of metal, such as stainless steel or aluminum alloy, and includes a disk-like ceiling portion 18a and a cylindrical peripheral wall portion 18b continuous with and extending downward from the outer periphery of the ceiling portion 18a. The gas-liquid separator 18 is disposed at a position below the lower end face of the gas/liquid inlet port 15 in the cap member 12 by a predetermined distance so as to cover the upper-end opening of the outer pipe 32 of the outlet pipe portion 30 for the accumulator (i.e., the upper portion of a space between the outer pipe 32 and the inner pipe 31, which is a downward-feed flow channel portion 33 described below) (i.e., so as to allow the upper end of the outer pipe 32 to be located between the ceiling portion 18a and the lower end of the peripheral wall portion 18b; see Fig. 14).

[0129] The ceiling portion 18a of the gas-liquid separator 18 has through-holes 18u and 18v formed therein (side by side) that respectively allow the upper end 21a of the straight liquid-phase pipe 21 and the upper end 31a of the straight inner pipe 31 to be tightly inserted therethrough (see also Fig. 15).

[0130] The strainer 40 for trapping foreign matter in the refrigerant is disposed at the bottom 13 of the tank 10. The strainer 40 includes a short cylindrical tubular case portion 42, which is adapted to be inserted (fitted) into the tank 10 in a press-fit manner so as to be placed at the bottom (i.e., the bottom face) 13 of the tank 10, and a cross-shaped baffle plate portion 43 integrally provided on the upper end of the tubular case portion 42 so as to partially cover the upper-face opening thereof. The cross-shaped baffle plate portion 43 has a plate-like shape as seen in a side view, and includes a sideways bridge portion 43a and a depthways bridge portion 43b as seen in a plan view (Fig. 16). A reinforcing rib-like projection 43f is provided on the upper end face of the tubular case portion 42 and on the center of each of the upper faces of the sideways bridge portion 43a and the depthways bridge portion 43b.

[0131] In the present embodiment, as is clearly seen in Figs. 15 and 16 in addition to Fig. 12, a portion around the left end of the sideways bridge portion 43a of the baffle plate portion 43 is integrally provided with a small-diameter short cylindrical liquid-phase pipe holding portion 51 that is adapted to have fixed thereto by press fit the lower end of the liquid-phase pipe 21 made of metal, such as aluminum alloy, and forming the outlet pipe portion 20 for the receiver. A liquid-phase refrigerant drawing port 25, which has a diameter slightly smaller than the inside diameter of the liquid-phase pipe holding portion 51, is formed in a portion of the baffle plate portion 43 (or the sideways bridge portion 43a thereof) corresponding to the bottom of the liquid-phase pipe holding portion 51.

[0132] In addition, the outer pipe 32 forming the outlet pipe portion 30 for the accumulator is integrally provided on and extends from a portion where the sideways bridge portion 43a and the depthways bridge portion 43b cross each other on the right side of the center of the baffle plate portion 43. An oil return hole 35 is formed in the center of a portion of the baffle plate portion 43 provided with the outer pipe 32 (i.e., a portion corresponding to the bottom of the outer pipe 32). The diameter of the oil return hole 35 is set to about 1 mm, for example. The outer pipe 32 has the straight inner pipe 31 made of metal, such as aluminum alloy, fixed thereto by press fit (which will be described in detail later).

[0133] Further, a circular mesh filter 45 is integrally provided on the lower face side of the baffle plate portion 43 so as to cover the entire upper-face opening of the tubular case portion 42. The mesh filter 45 is produced using a metallic mesh or a mesh material of synthetic resin, for example. Accordingly, as is clearly seen in Fig. 16, the mesh filter 45 is stretched across two pairs of (i.e., a total of four) large and small blade-shaped window portions 44a and 44b that are provided in portions of the upper-face opening of the tubular case portion 42 not covered with the baffle plate portion 43 and are defined by the tubular case portion 42, the sideways bridge portion 43a, and the depthways bridge portion 43b. The tubular case portion 42 of the strainer 40 is inserted into the tank 10 in a press-fit manner with the outer periphery of the tubular case portion 42 abutting the inner wall of the tank 10 so that the tubular case portion 42 is placed at the bottom 13 of the tank 10. Thus, the entire liquid-phase refrigerant falling from the upper portion of the tank 10 toward the bottom 13 passes through the mesh filter 45. This allows foreign matter in the liquid-phase refrigerant, which flows into the tubular case portion 42 via the mesh filter 45, to be trapped by the mesh filter 45 and thus removed from the circulating refrigerant.

[0134] Although the mesh filter 45 is stretched across the four window portions 44a, 44a, 44b, and 44b in the present example, the mesh filter 45 may also be attached to the liquid-phase refrigerant drawing port 25 and the oil return hole 35.

[0135] It should be noted that the mesh filter 45 need not cover the entire upper-face opening of the tubular case portion 42 as described above. The mesh filter 45 has only to cover at least a portion of the upper-face opening of the tubular case portion 42 not covered with the baffle plate portion 43.

[0136] Herein, in the present embodiment, the aforementioned tubular case portion 42, baffle plate portion 43, liquid-phase pipe holding portion 51, and outer pipe 32 are integrally molded using synthetic resin. During the integral molding, the mesh filter 45 is also integrated as an insert, for example.

[0137] In the present embodiment, the inside diameter of the tank 10 is set to 60 to 90 mm, the diameter of the tubular case portion 42 (or the baffle plate portion 43) is set substantially equal to the inside diameter of the tank 10, the plate thickness of the baffle plate portion 43 is set to about 1 to 2 mm, and the height H (Fig. 12) from the bottom face of the tank 10 to the baffle plate portion 43 (or the lower face thereof) is set to 5 to 10 mm.

[0138] The lower end of the liquid-phase pipe 21, which is made of metal, such as aluminum alloy, and forms the outlet pipe portion 20 for the receiver, is press-fitted into the liquid-phase pipe holding portion 51 integrally provided on the baffle plate portion 43 (until it abuts the baffle plate portion 43). The upper portion of the liquid-phase pipe 21, which is press-fitted into and held by the liquid-phase pipe holding portion 51, is provided with a lower-side flanged portion 21b, which has been subjected to compression bending, such as bulge forming, as a lower-side latch portion adapted to engage with the gas-liquid separator 18 (or the peripheral edge of the through-hole 18u therein) on its lower side.

[0139] Although the lower-side flanged portion 21b is used as the lower-side latch portion in the present example, it is also possible to use a large-diameter portion, which has a diameter larger than that of the upper end 21a passing through the through-hole 18u in the gas-liquid separator 18, a rib, which protrudes radially outward on the side below the through-hole 18u in the gas-liquid separator 18, or a thick-walled portion, for example, and allow it to engage with the gas-liquid separator 18 (or the peripheral edge of the through-hole 18u therein) on its lower side, for example.

[0140] A plurality of (four in the example illustrated in the drawing) plate-like ribs 36 are provided in a manner protruding radially inward on the inner periphery of the outer pipe 32, which is integrally provided on the baffle plate portion 43, along the longitudinal direction (i.e., the vertical direction) and at equal angular intervals. Each plate-like rib 36 includes, from its lower end side to its upper end side, a lowermost wide-width portion 36a, which is adapted to have the lower end of the inner pipe 31 disposed thereon and engage therewith, a lower narrow-width portion 36b having a width (i.e., a radial width or an inward protrusion amount) slightly smaller than that of the lowermost wide-width portion 36a, and an upper narrow-width portion 36c having a width slightly smaller than that of the lower narrow-width portion 36b. The inner pipe 31 (or the lower portion thereof) made of metal, such as aluminum alloy, is inserted and fixed on the inner peripheral side of the lower narrow-width portion 36b by press fit until the lower end of the inner pipe 31 engages with the upper end of the lowermost wide-width portion 36a (i.e., a step portion adjacent to the lower narrow-width portion 36b). Herein, to allow the inner pipe 31 to be easily press-fitted, the position of the upper end of the lower narrow-width portion 36b is set to about 1/3 or 1/2 of the height of the outer pipe 32, the height (i.e., the vertical length) of the lower narrow-width portion 36b is set to about 1/4 or 1/3 of the height of the outer pipe 32, and a gap is formed between the inner end of the upper narrow-width portion 36c and the outer peripheral face of the inner pipe 31. Although the plate-like ribs 36 are provided on the side of the outer pipe 32 in the present example, the plate-like ribs 36 may be provided on the side of the inner pipe 31 or on both sides. In addition, it is needless to mention that the number of the plate-like ribs 36 provided between the inner pipe 31 and the outer pipe 32 is not limited to that illustrated in the drawing as long it is more than one.

[0141] The upper ends of the plurality of plate-like ribs 36 (or the upper narrow-width portions 36c thereof) extend upward beyond the upper end of the outer pipe 32, and such extension portions 36e (or the upper ends thereof) are adapted to serve as lower-side latch portions for the gas-liquid separator 18 as with the lower-side flanged portion 21b of the liquid-phase pipe 21 that is adapted to engage with the gas-liquid separator 18 (or the peripheral edge of the through-hole 18v therein) on its lower side. It should be noted that the lower-side flanged portion 21b (or the upper end thereof) of the liquid-phase pipe 21 and the extension portions 36e (or the upper ends thereof) of the plate-like ribs 36 are located at the same level from the bottom 13 of the tank 10. Thus, the gas-liquid separator 18 (or the ceiling portion 18a thereof) is held horizontally.

[0142] The upper portion of the inner pipe 31, which is fixed at its lower portion to the outer pipe 32 (or the lower narrow-width portion 36b thereof) by press fit, protrudes upward beyond the upper end of the outer pipe 32 (and the plate-like ribs 36).

[0143] In addition, the upper portion of the inner pipe 31 (at a predetermined position below its upper end 31a inserted into the lower large-diameter portion 17a of the gas-phase outlet port 17) is provided with an upper-side flanged portion 31b, which has been subjected to compression bending, such as bulge forming, as an upper-side pressing portion capable of pressing the gas-liquid separator 18 (or the peripheral edge of the through-hole 18v therein) from its upper side. The gas-liquid separator 18 is tightly held between the lower-side flanged portion 21b formed on the liquid-phase pipe 21 and the extension portions 36e of the plate-like ribs 36 formed on the outer pipe 32, each serving as the lower-side latch portion, and the upper-side flanged portion 31b formed on the inner pipe 31 and serving as the upper-side pressing portion.

[0144] Although the upper-side flanged portion 31b is used as the upper-side pressing portion in the present example, it is also possible to use a large-diameter portion, which has a diameter larger than that of the upper end 31a passing through the through-hole 18v in the gas-liquid separator 18, or a thick-walled portion, for example, and allow it to engage with the gas-liquid separator 18 (or the peripheral edge of the through-hole 18v therein) on its upper side.

[0145] It should be noted that a pressure equalization hole 31f for preventing a liquid backflow to the side of the compressor while the system stops operation (ON→ OFF) is provided in a portion of the inner pipe 31 at about the same level as the gas-liquid separator 18.

[0146] The upper end 21a of the outlet pipe portion 20 (or the liquid-phase pipe 21 thereof) for the receiver is inserted into the lower large-diameter portion 16a of the liquid-phase outlet port 16 (through the through-hole 18u in the gas-liquid separator 18). The upper end 31a of the outlet pipe portion 30 (or the inner pipe 31 thereof) for the accumulator is inserted into the lower large-diameter portion 17a of the gas-phase outlet port 17 (through the through-hole 18v in the gas-liquid separator 18).

[0147] Though not illustrated, a bag containing desiccants therein is usually disposed in the tank 10 by being wound around the outer pipe 32, for example. For the bag containing desiccants therein and the like, see Patent Literature 2, if necessary.

[0148] The refrigerant container 5 with such a structure can be assembled as follows, for example.

(1) First, the liquid-phase pipe 21, which has the lower-side flanged portion 21b formed thereon, is press-fitted into the liquid-phase pipe holding portion 51 provided on the strainer 40 (or the baffle plate portion 43 thereof).

(2) Next, the liquid-phase pipe 21 (or the upper end 21a thereof) is inserted through the through-hole 18u in the gas-liquid separator 18, and the gas-liquid separator 18 is pushed from above so as to be placed on the lower-side flanged portion 21b (i.e., the lower-side latch portion on the side of the outlet pipe portion 20 for the receiver) and on the extension portions 36e of the plate-like ribs 36 on the outer pipe 32 (i.e., the lower-side latch portions on the side of the outlet pipe portion 30 for the accumulator) (i.e., the state illustrated in Fig. 15).

(3) Next, the lower end of the inner pipe 31 is passed through the through-hole 18v in the gas-liquid separator 18, and the lower portion of the inner pipe 31 is press-fitted on the inner peripheral side of the lower narrow-width portions 36b of the plate-like ribs 36 on the outer pipe 32. Then, the inner pipe 31 is pushed until its lower end engages with the upper ends of the lowermost wide-width portions 36a. In such a case, the lower face side of the gas-liquid separator 18 engages with the lower-side flanged portion 21b and the extension portions 36e of the plate-like ribs 36. Therefore, when the inner pipe 31 is press-fitted in a manner described above, the upper-side flanged portion 31b formed on the inner pipe 31 and serving as the upper-side pressing portion is pressure-joined to the upper face of the gas-liquid separator 18 (or the peripheral edge of the through-hole 18v therein) so that the gas-liquid separator 18 is tightly held between the lower-side flanged portion 21b and the extension portions 36e of the plate-like ribs 36, each serving as the lower-side latch portion, and the upper-side flanged portion 31b serving as the upper-side pressing portion.

(4) Next, the cap member 12 is placed on the liquid-phase pipe 21 and the inner pipe 31 such that the liquid-phase outlet port 16 (or the lower large-diameter portion 16a thereof) in the cap member 12 has inserted therein (i.e., is arranged around) the upper end 21a of the liquid-phase pipe 21 and the gas-phase outlet port 17 (or the lower large-diameter portion 17a thereof) has inserted therein (i.e., is arranged around) the upper end 31a of the inner pipe 31.

(5) Accordingly, an assembly including the strainer 40, the outlet pipe portion 20 for the receiver, the outlet pipe portion 30 for the accumulator, the gas-liquid separator 18, and the cap member 12 is obtained. Then, the tank 10 is disposed around an interior member 60 (i.e., a portion other than and below the cap member 12) of the assembly (from below, see Fig. 12), and the strainer 40 (or the tubular case portion 42 thereof) is pushed into the tank 10 in a press-fit manner so as to be placed at the bottom 13 of the tank 10.

(6) Finally, the cap member 12 is joined to the upper end of the tank 10 by welding. This allows the tank 10 to be hermetically sealed.

[0149] The operations of the refrigerant container 5 with the aforementioned structure during the cooling operation and the heating operation will be described.

[0150] In each of the cooling operation and the heating operation, a refrigerant in a gas-liquid mixed state, which has been introduced into the tank 10 from a condenser via the gas/liquid inlet port 15, collides with the gas-liquid separator 18 (or the ceiling portion 18a thereof) as illustrated in Fig. 14, and diffuses radially, and is then separated into a liquid-phase refrigerant and a gas-phase refrigerant. The liquid-phase refrigerant (including oil) is guided into the lower space of the tank 10 by falling along the inner peripheral face of the tank 10, and the gas-phase refrigerant is guided into the upper space of the tank 10.

[0151] During the cooling operation, for example, one or more on-off valves provided in a refrigerant flow path (not illustrated) are operated (see Patent Literature 2) so that the liquid-phase refrigerant guided to the lower space of the tank 10 passes through the mesh filter 45 of the strainer 40 and then accumulates in the tubular case portion 42. When the liquid-phase refrigerant passes through the mesh filter 45, foreign matter, such as sludge, in the liquid-phase refrigerant is trapped by the mesh filter 45 and thus is removed from the circulating refrigerant. The liquid-phase refrigerant that has accumulated in the tubular case portion 42 is drawn into the liquid-phase pipe 21 through the liquid-phase refrigerant drawing port 25, and is then guided to the expansion valve via the liquid-phase outlet port 16.

[0152] Therefore, during the cooling operation, the refrigerant container 5 of the present embodiment functions as a receiver (also referred to as a receiver drier).

[0153] In contrast, during the heating operation, one or more on-off valves provided in the refrigerant flow path (not illustrated) are switched (see Patent Literature 2) so that the gas-phase refrigerant separated by the gas-liquid separator 18 is suctioned to the suction side of the compressor via the upper space of the tank 10 → a space between the outer pipe 32 and the inner pipe 31 (i.e., the downward-feed flow channel portion 33) → the lower end of the outer pipe 32 → the inside of the inner pipe 31 → the gas-phase outlet port 17, and thus is circulated.

[0154] During the heating operation, the liquid-phase refrigerant that has accumulated in the tubular case portion 42 hardly flows to the expansion valve due to the relationship of the pressure difference.

[0155] In addition, oil that has accumulated in the tubular case portion 42 together with the liquid-phase refrigerant moves toward the bottom 13 of the tank 10 due to the difference in specific gravity, properties, and the like between the oil and the liquid-phase refrigerant, and is absorbed into the aforementioned gas-phase refrigerant to be suctioned to the suction side of the compressor via the downward-feed flow channel portion 33 → the lower end of the outer pipe 32 → the inside of the inner pipe 31 → the gas-phase outlet port 17. Thus, the oil is returned to the suction side of the compressor together with the gas-phase refrigerant through the oil return hole 35 provided in the baffle plate portion 43 at a position corresponding to the bottom of the outer pipe 32 → the inner pipe 31, and thus is circulated.

[0156] Therefore, during the heating operation, the refrigerant container 5 of the present embodiment functions as an accumulator.

[0157] As described above, the refrigerant container 5 of the present embodiment has both the functions of a receiver and an accumulator, and the receiver and the accumulator share the tank portion (i.e., the tank 10), the inlet port portion (i.e., the gas/liquid inlet port 15), the gas-liquid separation portion (i.e., the gas-liquid separator 18), and the strainer portion (i.e., the strainer 40) in common. Therefore, a rational structure with a small number of components can be provided.

[0158] In addition, the liquid-phase pipe holding portion 51 for the outlet pipe portion 20 for the receiver and the outer pipe 32 of the outlet pipe portion 30 for the accumulator are arranged side by side (with a gap therebetween) on the baffle plate portion 43 of the strainer 40. Further, the liquid-phase pipe 21 is press-fitted into and held by the liquid-phase pipe holding portion 51, and the inner pipe 31 is press-fitted into and held by the outer pipe 32. Thus, for example, it is only necessary to provide the cap member 12 with the liquid-phase outlet port 16 and the gas-phase outlet port 17 that are straight and penetrate through the cap member 12 in the vertical direction. Therefore, in comparison with the aforementioned conventional refrigerant container proposed so far, it is possible to simplify the structure of the cap member 12 and the connected portion of the outlet pipe portion 20 (or the liquid-phase pipe 21) for the receiver and the liquid-phase outlet port 16, for example.

[0159] Further, in the refrigerant container 5 of the present embodiment, the gas-liquid separator is not supported by engaging on its lower side with a lower-side latch portion that is formed by partially reducing the thickness of the outlet pipe. Instead, the outlet pipe portion 30 for the accumulator is formed as a double pipe (structure) of the inner pipe 31 and the outer pipe 32, and the gas-liquid separator 18 is supported by engaging on its lower side with lower-side latch portions including the extension portions 36e of the plurality of plate-like ribs 36 that are provided between the inner pipe 31 and the outer pipe 32 (specifically, on the inner periphery of the outer pipe 32) so as to couple the inner pipe 31 and the outer pipe 32 together (and the lower-side flanged portion 21b provided on the liquid-phase pipe 21). Thus, even when the gas-liquid separator 18 is pushed downward by a refrigerant in a gas-liquid mixed state, which has blown into the tank 10 through the gas/liquid inlet port 15, the pressure is received by the baffle plate portion 42 of the strainer 40, which has been fixed to the bottom 13 of the tank 10 by press fit, via the outer pipe 32 (and the liquid-phase pipe 21). Therefore, there is no possibility that the gas-liquid separator 18 will be pushed downward.

[0160] Accordingly, in comparison with the conventional refrigerant container in which a lower-side latch portion is formed only by partially reducing the thickness of an outlet pipe, the refrigerant container 5 of the present embodiment has an increased force of holding the gas-liquid separator 18 (in particular, a support force acting from below) and thus has increased stability. Thus, backlash and tilt of the gas-liquid separator 18 can be suppressed, and the desired gas-liquid separation performance can be obtained.

[0161] **In** addition, other than the tank 10 and the cap member 12 that are the joined together (by welding or brazing, for example), components, such as the cap member 12, the outlet pipe portion 20 for the receiver, the outlet pipe portion 30 for the accumulator, the strainer 40 (or the baffle plate portion 43), and the tank 10, are mechanically attached together by press fit that does not involve heating, for example. Thus, assembly can be carried out easily and promptly. In addition, an inexpensive synthetic resin material can be used as the material of the outlet pipe portion 20 for the receiver, the outlet pipe portion 30 for the accumulator, and the strainer 40 (or the baffle plate portion 43) more than before.

[0162] In particular, since the tubular case portion 42 of the strainer 40 is inserted (or fitted) into the tank 10 in a press-fit manner so as to be placed at the bottom 13 of the tank 10, it is possible to reliably and stably hold the strainer 40 as well as the outlet pipe portion 20 for the receiver and the outlet pipe portion 30 for the accumulator, which are provided on the strainer 40, without additionally requiring a fastening means.

[0163] As described above, according to the present embodiment, it is possible to suppress the component costs and the machining and assembly costs and also provide a refrigerant container with a rational structure that can effectively increase a force of holding the gas-liquid separator 18, and consequently effectively reduce the space occupied by the entire system, the number of components, the cost, and the size, for example.

[0164] It has been confirmed through prototype experiments that when the inside diameter of the tank 10 is set to 60 to 90 mm, and the height H of the baffle plate portion 43 from the bottom 13 of the tank 10 is set to 5 to 10 mm, the gas-liquid separation performance as well as the oil return performance toward the compressor can be maintained at the same level as that of the present product.

[Sixth embodiment]

[0165] Fig. 17 is a longitudinal cross-sectional view illustrating a sixth embodiment of a refrigerant container according to the present invention. Fig. 18 is a longitudinal cross-sectional view illustrating a strainer portion in Fig. 17 together with a liquid-phase pipe and an outer pipe. Fig. 19 is a cross-sectional view taken in the direction of arrows B-B in Fig. 17.

[0166] A refrigerant container 6 of the sixth embodiment illustrated in the drawings differs from the refrigerant container 5 of the aforementioned fifth embodiment mainly in the portion related to an outlet pipe portion 20' for the receiver. The other portions related to the outlet pipe portion 30 for the accumulator and the like basically have the same structures as those of the refrigerant container 5 in the fifth embodiment. Therefore, portions corresponding to the respective portions of the refrigerant container 5 in the fifth embodiment are denoted by the same reference signs, and repeated description will be omitted. Hereinafter, the differences will be mainly described.

[0167] In the refrigerant container 6 of the present embodiment, a portion corresponding to the liquid-phase pipe holding portion 51 of the fifth embodiment is not provided. That is, the outlet pipe portion 20' for the receiver includes only a liquid-phase pipe 21' that is integrally provided on and extends from the baffle plate portion 43 of the strainer 40. The liquid-phase refrigerant drawing port 25, which has a diameter equal to the inside diameter of the liquid-phase pipe 21', is formed in a portion of the baffle plate portion 43 (or the sideways bridge portion 43a thereof) corresponding to the bottom of the liquid-phase pipe 21'.

[0168] The right side face portion of the liquid-phase pipe 21' and the left side face portion of the outer pipe 32 that is also integrally provided on the baffle plate portion 43 (that is, portions of the liquid-phase pipe 21' and the outer pipe 32 facing each other) are integrally coupled together by a frame-shaped rectangular coupling plate (i.e., coupling portion) 24, which has an elongated rounded rectangular opening 24a in the center, for reinforcement purposes, for example. Specifically, the coupling plate 24 is integrally coupled at its lower side portion (i.e., lower end) to the sideways bridge portion 43a of the baffle plate portion 43, is integrally coupled at its right side portion to the left side face portion of the outer pipe 32 (or the plate-like rib 36 on the left side coupled thereto), and is integrally coupled at its left side portion to the right side face portion of the liquid-phase pipe 21'. **In** addition, the upper end face of the coupling plate 24 (or the upper side portion thereof) is flush with (at the same level as) the upper end faces of the extension portions 36e of the plate-like ribs 36.

[0169] The upper end of the liquid-phase pipe 21' at a position above the upper end face of the coupling plate 24 is formed slightly thinner than the other portions of the liquid-phase pipe 21' (that is, a portion of the liquid-phase pipe 21' at a position below the upper end face of the coupling plate 24 is formed slightly thicker than the other portions of the liquid-phase pipe 21'). A stepped face (i.e., a shoulder face) 21c defined by an upper-end thin-walled portion 21a' and a portion below the upper-end thin-walled portion 21a' (i.e., a thick-walled portion or a large-diameter portion) of the liquid-phase pipe 21' is flush with (at the same level as) the upper end face of the coupling plate 24.

[0170] As described above, in the refrigerant container 6 of the present sixth embodiment, the tubular case portion 42 of the strainer 40, the baffle plate portion 43, the outlet pipe portion 20' (or the liquid-phase pipe 21') for the receiver, and the outer pipe 32 of the outlet pipe portion 30 for the accumulator are integrally molded using synthetic resin. In addition, the liquid-phase pipe 21' is not provided with the lower-side flanged portion 21b in the fifth embodiment. Instead, the stepped face (i.e., the shoulder face) 21c of the liquid-phase pipe 21', the coupling plate 24 (or the upper end face thereof), and the extension portions 36e of the plate-like ribs 36 are provided as lower-side latch portions that are adapted to engage with the gas-liquid separator 18 on its lower side.

[0171] It should be noted that the opening 24a in the aforementioned coupling plate 24 is used for winding a bag containing desiccants therein around the outer pipe 32 and thus allowing the bag to be held thereon, for example. For the bag containing desiccants therein and the like, see Patent Literature 2, if necessary. In addition, with the opening 24a, reductions in the weight and material cost can also be achieved, for example.

[0172] The refrigerant container 6 with such a structure can be assembled as follows, for example.

(1) The upper-end thin-walled portion 21a' of the liquid-phase pipe 21' is inserted through the through-hole 18u in the gas-liquid separator 18, and the gas-liquid separator 18 is pushed from above so as to be placed on the lower-side latch portions including the stepped face (i.e., the shoulder

face) 21c of the liquid-phase pipe 21', the upper end face of the coupling plate 24, and the upper end faces of the extension portions 36e of the plate-like ribs 36.

(2) After that, as in the fifth embodiment, the lower end of the inner pipe 31 is passed through the through-hole 18v in the gas-liquid separator 18, and the lower portion of the inner pipe 31 is press-fitted on the inner peripheral side of the lower narrow-width portions 36b of the plate-like ribs 36 on the outer pipe 32. Then, the inner pipe 31 is pushed until its lower end engages with the upper ends of the lowermost wide-width portions 36a. In such a case, the lower face side of the gas-liquid separator 18 engages with the stepped face (i.e., the shoulder face) 21c, the coupling plate 24, and the extension portions 36e of the plate-like ribs 36. Therefore, when the inner pipe 31 is press-fitted in a manner described above, the upper-side flanged portion 31b formed on the inner pipe 31 and serving as the upper-side pressing portion is pressure-joined to the upper face of the gas-liquid separator 18 (or the peripheral edge of the through-hole 18v therein) so that the gas-liquid separator 18 is tightly held between the stepped face (i.e., the shoulder face) 21c, the coupling plate 24, and the extension portions 36e of the plate-like ribs 36, each serving as the lower-side latch portion, and the upper-side flanged portion 31b serving as the upper-side pressing portion.

(3) Next, the cap member 12 is placed on the liquid-phase pipe 21' and the inner pipe 31 such that the liquid-phase outlet port 16 (or the lower large-diameter portion 16a thereof) in the cap member 12 has inserted therein (i.e., is arranged around) the upper-end thin-walled portion 21a' of the liquid-phase pipe 21' and the gas-phase outlet port 17 (or the lower large-diameter portion 17a thereof) has inserted therein (i.e., is arranged around) the upper end 31a of the inner pipe 31.

(4) Accordingly, an assembly including the strainer 40, the outlet pipe portion 20' for the receiver, the outlet pipe portion 30 for the accumulator, the gas-liquid separator 18, and the cap member 12 is obtained. Then, an operation of winding the aforementioned bag containing desiccants therein around the outer pipe 32 and thus allowing the bag to be held thereon is performed, for example. After that, the tank 10 is disposed around the interior member 60 (i.e., a portion other than and below the cap member 12) of the assembly (from below; see Fig. 17), and the strainer 40 (or the tubular case portion 42 thereof) is pushed into the tank 10 in a press-fit manner so as to be placed at the bottom 13 of the tank 10.

(5) Finally, the cap member 12 is joined to the upper end of the tank 10 by welding. This allows the tank 10 to be hermetically sealed.

[0173] The refrigerant container 6 of the present sixth embodiment with such a structure can obtain operational advantages substantially similar to those of the refrigerant container 5 in the fifth embodiment. **In** addition, in the present embodiment, since the tubular case portion 42 of the strainer 40, the baffle plate portion 43, the outlet pipe portion 20' (or the liquid-phase pipe 21') for the receiver, and the outer pipe 32 of the outlet pipe portion 30 for the accumulator are integrally molded using synthetic resin, there is no need to separately prepare the liquid-phase pipe 21' made of metal. Therefore, it is possible to reduce the number of components and production steps, and increase the proportion of synthetic resin portions that can be produced at a lower cost than metal components as compared to the refrigerant container 5 in the fifth embodiment. This can further suppress the component costs and the machining and assembly costs.

[0174] In addition, the liquid-phase pipe 21' and the outer pipe 32 are integrally coupled together by the coupling plate 24, and the coupling plate 24 serves as a reinforcing member for the outlet pipe portion 20' (or the liquid-phase pipe 21') for the receiver and also as a lower-side latch portion. Thus, rigidity is increased, and the stability of holding the gas-liquid separator 18 is also increased, for example.

[Seventh embodiment]

[0175] Fig. 20 is a longitudinal cross-sectional view illustrating a seventh embodiment of a refrigerant container according to the present invention. Fig. 21 is a cross-sectional view taken in the direction of arrows C-C in Fig. 20.

[0176] In a refrigerant container 7 of the seventh embodiment illustrated in the drawings also, portions corresponding to the respective portions of the refrigerant containers 5 and 6 in the aforementioned fifth and sixth embodiments are denoted by the same or related reference signs, and repeated description will be omitted. Hereinafter, the differences will be mainly described.

[0177] In the refrigerant container 7 of the present embodiment, the baffle plate portion 43 is integrally provided with the liquid-phase pipe 21' and the gas-phase pipe holding portion 52 instead of the liquid-phase pipe holding portion 51 and the outer pipe 32 in the fifth embodiment.

[0178] Specifically, a portion corresponding to the liquid-phase pipe holding portion 51 of the fifth embodiment is not provided. That is, as in the refrigerant container 6 of the sixth embodiment, the outlet pipe portion 20' for the receiver includes only the liquid-phase pipe 21' that is integrally provided on and extends from the baffle plate portion 43 of the strainer 40'. The liquid-phase refrigerant drawing port 25, which has a diameter equal to the inside diameter of the liquid-phase pipe 21', is formed in a portion of the baffle plate portion 43 (or the sideways bridge portion 43a thereof) corresponding to the bottom of the liquid-phase pipe 21'.

[0179] In addition, as is clearly seen in Fig. 21, one or more (three in the example illustrated in the drawing) plate-like ribs 26 are provided radially at equal angular intervals on the outer peripheral portion of the liquid-phase pipe 21'. Herein, the plate-like ribs 26 are provided along the longitudinal direction across a region from the lower end of the liquid-phase pipe 21' (or the baffle plate portion 43) to the stepped face (i.e., the shoulder face) 21c at the lower end of the upper-end thin-walled portion 21a'. The plate-like ribs 26 are adapted to serve the function of reinforcing the liquid-phase pipe 21' and also serve the function of a lower-side latch portion for the gas-liquid separator 18.

[0180] The baffle plate portion 43 of the strainer 40' is integrally provided with the large-diameter short cylindrical gas-phase pipe holding portion 52 instead of the outer pipe 32 in the refrigerant container 5 of the fifth embodiment. The gas-phase pipe holding portion 52 is adapted to have press-fitted thereinto the lower portion of the outer pipe 32' of the double pipe 30A that includes the inner pipe 31' and the outer pipe 32' provided on the outer periphery of the inner pipe 31' (until it abuts the baffle plate portion 43). In addition, the oil return hole 35 is formed in the center of a portion of the baffle plate portion 43 corresponding to the bottom of the gas-phase pipe holding portion 52. Thus, in the present embodiment, the outlet pipe portion 30' for the accumulator includes the gas-phase pipe holding portion 52 and the double pipe 30A. The upper portion of the inner pipe 31' of the outlet pipe portion 30' for the accumulator protrudes upward beyond the upper end of the outer pipe 32'. An upper end 31a' of the inner pipe 31' is inserted into the lower large-diameter portion 17a of the gas-phase outlet port 17 as in the fifth and sixth embodiments.

[0181] The double pipe 30A of the present embodiment is integrally molded by extrusion using metal, such as aluminum alloy, for example. The inner pipe 31' and the outer pipe 32' of the double pipe 30A are integrally coupled together by a plurality of (three in the example illustrated in the drawing) plate-like ribs 37 that are provided radially at equal angular intervals in the longitudinal direction between the inner pipe 31' and the outer pipe 32'. The upper ends of the plurality of plate-like ribs 37 extend upward beyond the upper end of the outer pipe 32', and such extension portions 37e (or the upper ends thereof) are adapted to serve as lower-side latch portions for the gas-liquid separator 18 as with the extension portions 36e of the fifth embodiment.

[0182] Herein, the stepped face (i.e., the shoulder face) 21c of the liquid-phase pipe 21', the upper end faces of the plate-like ribs 26, and the upper end faces of the extension portions 37e of the plate-like ribs 37 on the double pipe 30A are located at the same level.

[0183] Although the inner pipe 31' and the outer pipe 32' are integrated via the plate-like ribs 37 in the present example, the inner pipe 31' and the outer pipe 32' may be formed separately (as separate members) and the plate-like ribs 37 may be provided on one or both of the inner pipe 31' and the outer pipe 32' as in the fifth and sixth embodiments. In addition, it is needless to mention that the number of the plate-like ribs 37 is not limited to that illustrated in the drawing as long it is more than one.

[0184] In the present embodiment, since a portion corresponding to the upper-side flanged portion 31b of the fifth embodiment is not provided (since it is difficult to form the upper-side flanged portion 31b when the double pipe 30A is molded by extrusion), the gas-liquid separator 18 is tightly held between the lower face of the cap member 12 (specifically, the thick-walled cylindrical downward projection 12e provided on the lower face of the cap member 12 in a manner protruding from the periphery of the gas-phase outlet port 17) and the extension portions 37e of the plate-like ribs 37 serving as the lower-side latch portions. That is, in the present embodiment, the lower face of the cap member 12 (or the downward projection 12e thereof) serves as an upper-side pressing portion capable of pressing the gas-liquid separator 18 (or the peripheral edge of the through-hole 18v therein) from its upper side.

[0185] As described above, in the refrigerant container 7 of the present seventh embodiment, the tubular case portion 42 and the baffle plate portion 43 of the strainer 40', the outlet pipe portion 20' (or the liquid-phase pipe 21') for the receiver, and the gas-phase pipe holding portion 52 for the outlet pipe portion 30' for the accumulator are integrally molded using synthetic resin. In addition, the metal double pipe 30A with an integral structure is used as the outlet pipe portion 30' for the accumulator, for example. The stepped face (i.e., the shoulder face) 21c of the liquid-phase pipe 21', the plate-like ribs 26, and the extension portions 37e of the plate-like ribs 37 are provided as the lower-side latch portions adapted to engage with the gas-liquid separator 18 on its lower side. Meanwhile, the lower face of the cap member 12 (or the downward projection 12e thereof) serves as the upper-side pressing portion capable of pressing the gas-liquid separator 18 from its upper side.

[0186] Although the upper-side pressing portion is provided only on the side of the outlet pipe portion 30' for the accumulator (that is, around the peripheral edge of the through-hole 18v) in the present example, it is also possible to provide an upper-side pressing portion with the same shape as the downward projection 12e on the side of the outlet pipe portion 20' for the receiver (that is, around the peripheral edge of the through-hole 18u) or on each of the side of the outlet pipe portion 30' for the accumulator and the side of the outlet pipe portion 20' for the receiver, for example, and allow the upper-side pressing portion to press the gas-liquid separator 18 (or the peripheral edge of the through-hole 18u therein or the peripheral edges of the through-holes 18u and 18v therein) from its upper side.

[0187] The refrigerant container 7 with such a structure can be assembled as follows, for example.

(1) First, the outer pipe 32' of the double pipe 30A is press-fitted into the gas-phase pipe holding portion 52 integrally provided on the strainer 40' (or the baffle

plate portion 43 thereof) until the lower end of the outer pipe 32' abuts the baffle plate portion 43.

(2) Next, the upper-end thin-walled portion 21a' of the liquid-phase pipe 21' and the upper end 31a' of the inner pipe 31' of the double pipe 30A are respectively inserted through the through-holes 18u and 18v formed in the gas-liquid separator 18. Then, the gas-liquid separator 18 is pushed from above so as to be placed on the stepped face (i.e., the shoulder face) 21c of the liquid-phase pipe 21', the plate-like ribs 26 (i.e., the lower-side latch portions on the side of the outlet pipe portion 20' for the receiver), and the extension portions 37e of the plate-like ribs 37 on the double pipe 30A (i.e., the lower-side latch portions on the side of the outlet pipe portion 30' for the accumulator).

(3) Next, the cap member 12 is placed on the gas-liquid separator 18 such that the liquid-phase outlet port 16 (or the lower large-diameter portion 16a thereof) in the cap member 12 has inserted therein (i.e., is arranged around) the upper-end thin-walled portion 21a' of the liquid-phase pipe 21' and the gas-phase outlet port 17 (or the lower large-diameter portion 17a thereof) has inserted therein (i.e., is arranged around) the upper end 31a' of the inner pipe 31'.

(4) Accordingly, an assembly including the strainer 40', the outlet pipe portion 20' for the receiver, the outlet pipe portion 30' for the accumulator, the gas-liquid separator 18, and the cap member 12 is obtained. Then, an operation of winding the aforementioned bag containing desiccants therein around the outer pipe 32' and thus allowing the bag to be held thereon is performed, for example. After that, the tank 10 is disposed around the interior member 60 (i.e., a portion other than and below the cap member 12) of the assembly (from below; see Fig. 20), and the strainer 40' (or the tubular case portion 42 thereof) is pushed into the tank 10 in a press-fit manner so as to be placed at the bottom 13 of the tank 10. In such a case, the lower face side of the gas-liquid separator 18 engages with the stepped face (i.e., the shoulder face) 21c of the liquid-phase pipe 21', the plate-like ribs 26, and the extension portions 37e of the plate-like ribs 37 on the double pipe 30A. Meanwhile, the upper face side of the gas-liquid separator 18 has placed thereon the lower face of the cap member 12 (or the downward projection 12e thereof). When the tank 10 is disposed in a press-fit manner as described above, the lower face of the cap member 12 (or the downward projection 12e thereof) is pressure-joined to the upper face of the gas-liquid separator 18 (or the peripheral edge of the through-hole 18v therein) so that the gas-liquid separator 18 is tightly held between the stepped face (i.e., the shoulder face) 21c of the liquid-phase pipe 21', the plate-like ribs 26, and the extension portions 37e of the plate-like ribs 37 on the double pipe 30A, each serving as the lower-side latch portion, and the lower face of the cap member 12 (or the downward projection 12e thereof) serving as the upper-side pressing portion.

(5) Finally, the cap member 12 is joined to the upper end of the tank 10 by welding. This allows the tank 10 to be hermetically sealed.

[0188] The refrigerant container 7 of the present seventh embodiment with such a structure can obtain operational advantages substantially similar to those of the refrigerant container 5 in the fifth embodiment. In addition, since the metal double pipe 30A integrally molded by extrusion is used as the outlet pipe portion 30' for the accumulator, for example, it is possible to increase the assembly performance, rigidity, and the stability of holding the gas-liquid separator 18, for example, in comparison with the refrigerant containers of the fifth and sixth embodiments in which the inner pipe and the outer pipe are formed separately and using different materials.

[Eighth embodiment]

[0189] Fig. 22 is a longitudinal cross-sectional view illustrating an eighth embodiment of a refrigerant container according to the present invention.

[0190] In a refrigerant container 8 of the eighth embodiment illustrated in the drawing also, portions corresponding to the respective portions of the refrigerant containers 5, 6, and 7 in the aforementioned fifth, sixth, seventh embodiments are denoted by the same or related reference signs, and repeated description will be omitted. Hereinafter, the differences will be mainly described.

[0191] In the refrigerant container 8 of the present embodiment, the outlet pipe portion 20 for the receiver has the same structure as that of the fifth embodiment, and the outlet pipe portion 30' for the accumulator has the same structure as that of the seventh embodiment.

[0192] That is, the small-diameter short cylindrical liquid-phase pipe holding portion 51 is integrally provided on a portion around the left end of the baffle plate portion 43, and the lower end of the liquid-phase pipe 21, which has the lower-side flanged portion 21b as a lower-side latch portion, is press-fitted into the liquid-phase pipe holding portion 51.

[0193] In addition, the large-diameter short cylindrical gas-phase pipe holding portion 52 is integrally provided on a portion around the right end of the baffle plate portion 43, and the lower end of the outer pipe 32' of the metal double pipe 30A is fixed into the gas-phase pipe holding portion 52 by press fit, for example. Further, an extension portion(s) 37e of one or more plate-like ribs 37, which serve(s) as a lower-side latch portion(s), is/are provided in the double pipe 30A (i.e., between the inner pipe 31' and the outer pipe 32' thereof) to tightly hold the gas-liquid separator 18. Meanwhile, the lower end of the cap member 12 (or the downward projection 12e thereof) serves as an upper-side pressing portion capable of pressing the gas-liquid separator 18 from its upper side.

[0194] When the refrigerant container 8 of the present embodiment is assembled, the liquid-phase pipe 21, which has the lower-side flanged portion 21b formed thereon, is press-fitted into the liquid-phase pipe holding portion 51 integrally provided on the strainer 40' (or the baffle plate portion 43 thereof), and also, the double pipe 30A (or the outer pipe 32' thereof) is press-fitted into the gas-phase pipe holding portion 52 integrally provided on the strainer 40' (or the baffle plate portion 43 thereof) until the lower end of the double pipe 30A (or the outer pipe 32' thereof) abuts the baffle plate portion 43.

[0195] Next, the upper end 21a of the liquid-phase pipe 21 and the upper end 31a' of the inner pipe 31' of the double pipe 30A are respectively inserted through the through-holes 18u and 18v formed in the gas-liquid separator 18, and the gas-liquid separator 18 is pushed from above so as to be placed on the lower-side flanged portion 21b of the liquid-phase pipe 21 (i.e., the lower-side latch portion on the side of the outlet pipe portion 20 for the receiver) and on the extension portions 37e of the plate-like ribs 37 on the double pipe 30A (i.e., the lower-side latch portions on the side of the outlet pipe portion 30' for the accumulator).

[0196] After that, the cap member 12 is placed on the gas-liquid separator 18 such that the liquid-phase outlet port 16 (or the lower large-diameter portion 16a thereof) in the cap member 12 has inserted therein (i.e., is arranged around) the upper end 21a of the liquid-phase pipe 21 and the gas-phase outlet port 17 (or the lower large-diameter portion 17a thereof) has inserted therein (i.e., is arranged around) the upper end 31a' of the inner pipe 31'. Then, an operation of winding the aforementioned bag containing desiccants therein around the outer pipe 32' and thus allowing the bag to be held thereon is performed, for example. After that, the tank 10 is disposed around the interior member 60 (i.e., a portion other than and below the cap member 12) (from below; see Fig. 22), and the strainer 40' (or the tubular case portion 42 thereof) is pushed into the tank 10 in a press-fit manner so as to be placed at the bottom 13 of the tank 10. At this time, the gas-liquid separator 18 is tightly held between the lower-side flanged portion 21b of the liquid-phase pipe 21 and the extension portions 37e of the plate-like ribs 37 on the double pipe 30A, each serving as the lower-side latch portion, and the lower face of the cap member 12 (or the downward projection 12e thereof) serving as the upper-side pressing portion. Then, joining the cap member 12 to the upper end of the tank 10 by welding can assemble the refrigerant container 8.

[0197] Although the upper-side pressing portion is provided only on the side of the outlet pipe portion 30' for the accumulator (that is, around the peripheral edge of the through-hole 18v) in the present example also, it is needless to mention that an upper-side pressing portion with the same shape as the downward projection 12e may be provided on the side of the outlet pipe portion 20 for the receiver (that is, around the peripheral edge of the through-hole 18u) or on each of the side of the outlet pipe portion 30' for the accumulator and the side of the outlet pipe portion 20 for the receiver, for example.

[0198] The refrigerant container 8 of the present eighth embodiment with such a structure can obtain operational advantages substantially similar to those of the refrigerant containers 5 and 7 in the fifth and seventh embodiments. In addition, in the present embodiment, since the metal liquid-phase pipe 21 and the metal double pipe 30A are respectively used for the outlet pipe portion 20 for the receiver and the outlet pipe portion 30' for the accumulator, rigidity is increased, and the stability of holding the gas-liquid separator 18 is also increased, for example. Meanwhile, when the outlet pipe portion for the receiver and the outlet pipe portion for the accumulator are made of synthetic resin, the influence of heat for joining the cap member 12 to the tank 10 by welding is of concern. In contrast, in the present embodiment, there is an advantage in that the influence of heat is low.

<Ninth to twelfth embodiments>

[Ninth embodiment]

[0199] Fig. 23 is a longitudinal cross-sectional view illustrating a ninth embodiment of a refrigerant container according to the present invention. Fig. 24 is a top view of a cap member portion of the refrigerant container illustrated in Fig. 23. Fig. 25 is a partial cross-sectional view taken in the direction of arrows V-V passing through O in Fig. 24. Fig. 26 is a cross-sectional view taken in the direction of arrows A-A in Fig. 23.

[0200] A refrigerant container 9 of the ninth embodiment illustrated in the drawings is used for a heat pump system forming a car air-conditioner for an electric vehicle, for example. The refrigerant container 9 includes a closed-bottomed cylindrical tank 10 made of metal, such as stainless steel or aluminum alloy. The upper-face opening of the tank 10 is hermetically closed by a cap member (i.e., a cap portion) 12 made of the same metal. It should be noted that the refrigerant container 9 (or the tank 10) of the present embodiment is placed in a vertical position as illustrated in the drawings. That is, the refrigerant container 9 is placed with the cap member 12 positioned on the upper side and a bottom 13 of the tank 10 positioned on the lower side.

[0201] The cap member 12 includes a gas/liquid inlet port 15 (see Figs. 24 and 25), a stepped, small-diameter liquid-phase outlet port 16, and a stepped, large-diameter gas-phase outlet port 17, all of which penetrate through the cap member 12 such that they are open on the top and bottom sides thereof. Although the cap member 12 has a conduit connection adapter attached to its upper side, for example, such a conduit connection adapter as well as an internal screw portion for screwing the adapter is not illustrated.

[0202] A gas-liquid separator 18, which has the shape of a conical hat or an inverted wide bowl and has a diameter smaller than the inside diameter of the tank 10, is disposed below the cap member 12 such that the gas-liquid separator 18 faces the gas/liquid inlet port 15. The lower portion (i.e., a lower intermediate-diameter portion 16c) of the liquid-phase outlet port 16 has inserted therein the upper end of an outlet pipe portion 20 (or a liquid-phase pipe 21 thereof) for a receiver that is adapted to guide only a liquid-phase refrigerant separated by the gas-liquid separator 18 to the side of an expansion valve via the liquid-phase outlet port 16. In addition, the lower portion (i.e., a lower intermediate-diameter portion 17c) of the gas-phase outlet port 17 has inserted therein the upper end of an outlet pipe portion 30 (or an inner pipe 31 thereof) for an accumulator with a double pipe structure, which includes the inner pipe 31 and the outer pipe 32, that is adapted to guide a gas-phase refrigerant separated by the gas-liquid separator 18 to the suction side of a compressor via the gas-phase outlet port 17 together with oil contained in the liquid-phase refrigerant (each member will be described in detail later).

[0203] A strainer 40 for trapping foreign matter in the refrigerant is disposed at the bottom 13 of the tank 10. The strainer 40 includes a short cylindrical tubular case portion 42, which has a diameter smaller than the inside diameter Da of the tank 10 and is adapted to be inserted into the tank 10 in an upright position so as to be placed at the bottom (i.e., the bottom face) 13 of the tank 10, a plate-like baffle plate portion 43 integrally provided on the upper end of the tubular case portion 42 so as to partially cover the upper-face opening thereof, a mesh filter 45 provided near the upper end of the tubular case portion 42 and on the lower face side of the baffle plate portion 43 so as to trap foreign matter in the refrigerant, and an annular seal member 71 attached to the tubular case portion 42.

[0204] In the present example, the annular seal member 71 is produced using an elastic material, such as rubber (e.g., EPDM or HNBR), and is in the shape of an annular disk with an outside diameter Dd larger than the inside diameter Da (Fig. 23) of the tank 10 in the natural state as illustrated in Fig. 27A.

[0205] The outer periphery of the upper end of the tubular case portion 42 is integrally provided with a seal holding portion 42A that includes upper and lower annular disk-like holding plate portions 42a and 42b. The inner peripheral portion of the annular seal member 71 is adapted to be fitted into and held between the upper and lower annular disk-like holding plate portions 42a and 42b such that the outer peripheral portion of the annular seal member 71 protrudes beyond the upper and lower annular disk-like holding plate portions 42a and 42b. The outside diameter of the seal holding portion 42A is smaller than the inside diameter Da of the tank 10 by a predetermined length (in the present example, a length corresponding to about 1.5 to 2 times the thickness of the annular seal member 71).

[0206] With such a structure, when the strainer 40 is inserted into the tank 10, the outer peripheral portion of the annular seal member 71 touches the inner peripheral face (i.e., the inner wall surface) of the tank 10 and thus elastically flexes upward. The outermost peripheral portion of the resulting tubular flexure portion 71u, which is in a short cylindrical or inverted truncated cone shape, is always resiliently pressure-joined to the inner peripheral face of the tank 10 as illustrated in Fig. 27B. Accordingly, a gap S1 formed between the inner peripheral face of the tank 10 and the strainer 40 (or the tubular case portion 42) is always completely closed.

[0207] In addition, the tubular case portion 42 has formed therein a plurality of cutout portions 42e, which are open at their lower ends and have a rectangular shape as seen in a side view, at predetermined angular intervals so as to allow a refrigerant to circulate on the inner peripheral side and the outer peripheral side of the tubular case portion 42 in the state in which the gap S1 is completely closed by the annular seal member 71.

[0208] The baffle plate portion 43 includes, as is clearly seen in Fig. 26, an outer annular disk portion 43A, which has an outside diameter equal to the outside diameter of the tubular case portion 42 and is flush with and coupled to the inner peripheral side of the upper holding plate portion 42a of the seal holding portion 42A, and a sideways bridge portion 43B that has large and small circular plate portions 43c and 43d arranged thereon (side by side) and passes through the center of the outer annular disk portion 43A.

[0209] In the present embodiment, the small-diameter circular plate portion 43d around the left end of the sideways bridge portion 43B of the baffle plate portion 43 is integrally provided with a small-diameter short cylindrical liquid-phase pipe holding portion 51 that is adapted to have fixed thereto by press fit the lower end of the liquid-phase pipe 21 made of metal, such as aluminum alloy, and forming the outlet pipe portion 20 for the receiver. A liquid-phase refrigerant drawing port 25, which has a diameter slightly smaller than the inside diameter of the liquid-phase pipe holding portion 51, is formed in a portion of the baffle plate portion 43 (or the circular plate portion 43d thereof) provided with the liquid-phase pipe holding portion 51 (that is, a portion corresponding to the bottom of the liquid-phase pipe holding portion 51).

[0210] In addition, the outer pipe 32 forming the outlet pipe portion 30 for the accumulator is integrally provided on and extends from the large-diameter circular plate portion 43c around the right end of the sideways bridge portion 43B located to the right of the center of the baffle plate portion 43. An oil return hole 35 is formed in the center of a portion of the baffle plate portion 43 (or the circular plate portion 43c thereof) provided with the outer pipe 32 (i.e., a portion corresponding to the bottom of the outer pipe 32). The diameter of the oil return hole 35 is set to about 1 mm, for example.

[0211] Further, a circular mesh filter 45 is integrally provided on the lower face side of the baffle plate portion 43 so as to cover the entire upper-face opening of the tubular case portion 42. The mesh filter 45 is produced using a metallic mesh or a mesh material of synthetic resin, for example. Accordingly, as is clearly seen in Fig. 26, the mesh filter 45 is stretched across a pair of blade-shaped window portions 44 that are provided in portions of the upper-face opening of the tubular case portion 42 not covered with the baffle plate portion 43 and are defined by the outer annular disk portion 43A and the sideways bridge portion 43B.

[0212] As described above, since the gap S1 formed between the inner peripheral face of the tank 10 and the tubular case portion 42 is completely closed by the annular seal member 71, the entire liquid-phase refrigerant falling from the upper portion of the tank 10 toward the bottom 13 passes through the mesh filter 45. This allows foreign matter in the liquid-phase refrigerant, which flows into the tubular case portion 42 via the mesh filter 45, to be trapped by the mesh filter 45 and thus removed from the circulating refrigerant.

[0213] Although the mesh filter 45 is stretched across the two window portions 44 in the present example, the mesh filter 45 may also be attached to the liquid-phase refrigerant drawing port 25 and the oil return hole 35.

[0214] Herein, the tubular case portion 42, the baffle plate portion 43, the liquid-phase pipe holding portion 51, and the outer pipe 32 are integrally molded using synthetic resin. During the integral molding, the mesh filter 45 is also integrated as an insert, for example.

[0215] It should be noted that the mesh filter 45 need not cover the entire upper-face opening of the tubular case portion 42 as described above. The mesh filter 45 has only to cover at least a portion of the upper-face opening of the tubular case portion 42 not covered with the baffle plate portion 43.

[0216] In the present embodiment, the inside diameter of the tank 10 is set to 60 to 90 mm, the plate thickness of the baffle plate portion 43 is set to about 1 to 2 mm, and the height H (Fig. 23) from the bottom face of the tank 10 to the baffle plate portion 43 (or the lower face thereof) is set to 5 to 10 mm.

[0217] A plurality of (four in the example illustrated in the drawing) plate-like ribs 36 are provided in a manner protruding radially inward on the inner periphery of the lower portion of the outer pipe 32, which is integrally provided on the baffle plate portion 43, along the longitudinal direction (i.e., the vertical direction) and at equal angular intervals. The width (i.e., the radial width or the inward protrusion amount) of each plate-like rib 36 at a portion above its lower end 36m is slightly narrower than the width of the lower end 36m. The inner pipe 31 (or the lower portion thereof) made of metal, such as aluminum alloy, is inserted in a press-fit manner on the inner peripheral side of a narrow-width portion 36n until the lower end of the inner pipe 31 engages with the upper end of the lower end 36m (i.e., a step portion adjacent to the narrow-width portion 36n) of each plate-like rib 36. Herein, to allow the inner pipe 31 to be easily press-fitted, the height (i.e., the vertical length) of each plate-like rib 36 is set to about 1/3 or 1/2 of the height of the outer pipe 32. The upper portion of the inner pipe 31 protrudes upward beyond the upper end of the outer pipe 32. Although the plate-like ribs 36 are provided on the side of the outer pipe 32 in the present example, the plate-like ribs 36 may be provided on the side of the inner pipe 31 or on both sides. In addition, it is needless to mention that the number of the plate-like ribs 36 is not limited to that illustrated in the drawing as long it is more than one. A pressure equalization hole 31f for preventing a liquid backflow to the side of the compressor while the system stops operation (ON→OFF) is provided in a portion of the inner pipe 31 at about the same level as the gas-liquid separator 18.

[0218] The upper end of the outlet pipe portion 20 (or the liquid-phase pipe 21 thereof) for the receiver, which is fixed at its lower end to the liquid-phase pipe holding portion 51, is inserted into the lower portion (i.e., the lower intermediate-diameter portion 16c) of the liquid-phase outlet port 16. The upper end of the outlet pipe portion 30 (or the inner pipe 31 thereof) for the accumulator is inserted into the lower portion (i.e., the lower intermediate-diameter portion 17c) of the gas-phase outlet port 17. In addition, the liquid-phase pipe 21 and the inner pipe 31 are fixed to the cap member 12 (or the lower face thereof) by swaging (i.e., swaged portions 12i and 12j).

[0219] The gas-liquid separator 18 is made of metal, such as stainless steel or aluminum alloy, and includes a disk-like ceiling portion 18a and a cylindrical peripheral wall portion 18b continuous with and extending downward from the outer periphery of the ceiling portion 18a. The ceiling portion 18a has through-holes 18u and 18v formed therein (side by side) to respectively allow the upper ends of the liquid-phase pipe 21 and the inner pipe 31 to be inserted therethrough. The gas-liquid separator 18 is disposed at a position below the lower end face of the gas/liquid inlet port 15 in the cap member 12 by a predetermined distance so as to cover the upper-end opening of the outer pipe 32 of the outlet pipe portion 30 for the accumulator (that is, the upper portion of a space between the inner pipe 31 and the outer pipe 32, which is a downward-feed flow channel portion 33 described below) (i.e., so as to allow the upper end of the outer pipe 32 to be located between the ceiling portion 18a and the lower end of the peripheral wall portion 18b; see Fig. 25). The gas-liquid separator 18 is fixed to the cap member 12 (or the lower face thereof) at a position around the through-hole 18v by swaging together with the inner pipe 31 (i.e., swaged portion 12k).

[0220] It is needless to mention that the method of disposing and fixing the outlet pipe portion 20 for the receiver (the liquid-phase pipe 21), the outlet pipe portion 30 for the accumulator (i.e., the inner pipe 31 and the outer pipe 32), and the gas-liquid separator 18 is not limited to the example described above. For example, the outlet pipe portion 20 (or the liquid-phase pipe 21) for the receiver may be integrally formed with the strainer 40 (or the baffle plate portion 43 thereof). **In** addition, the outer pipe 32 may be formed separately from the strainer 40 (or the baffle plate portion 43 thereof). Further, the inner pipe 31, the outer pipe 32, and the plate-like ribs 36 may be formed as an integral body (i.e., an integrally molded article) by extrusion, for example. Furthermore, the outlet pipe portion 20 (or the liquid-phase pipe 21) for the receiver, the outlet pipe portion 30 (or the inner pipe 31) for the accumulator, and the gas-liquid separator 18 may be fixed through press fit, pipe expansion, or tight holding by means of flanged portions, for example, instead of fixation through swaging.

[0221] Though not illustrated, a bag containing desiccants therein is usually disposed in the tank 10 by being wound around the outer pipe 32, for example. For the bag containing desiccants therein and the like, see Patent Literature 2, if necessary.

[0222] The refrigerant container 9 with such a structure can be assembled as follows, for example.

[0223] First, the upper end of the liquid-phase pipe 21 is inserted into the lower portion (i.e., the lower intermediate-diameter portion 16c) of the liquid-phase outlet port 16, and the liquid-phase pipe 21 is fixed to the cap member 12 by swaging (i.e., a swaged portion 12i). Next, the upper end of the inner pipe 31 is inserted into the lower portion (i.e., the lower intermediate-diameter portion 17c) of the gas-phase outlet port 17, and also, the liquid-phase pipe 21 and the inner pipe 31 are respectively passed through the through-holes 18u and 18v in the gas-liquid separator 18 from below. Then, the gas-liquid separator 18 is moved so that its ceiling face 18a abuts the downward projection 12e of the cap member 12. In such a state, the inner pipe 31 and the gas-liquid separator 18 are fixed to the cap member 12 by swaging at the same time (i.e., swaged portions 12j and 12k) using a swaging jig (not illustrated).

[0224] Next, the inner peripheral portion of the annular seal member 71 is pushed into the seal holding portion 42A (i.e., between the upper and lower holding plate portions 42a and 42b), which is provided on the tubular case portion 42 of the strainer 40, while being stretched, and thus is fitted into the seal holding portion 42A deep inside across the entire circumference so that the annular seal member 71 is held by the seal holding portion 42A.

[0225] After that, the lower end of the liquid-phase pipe 21 is press-fit into the liquid-phase pipe holding portion 51 integrally provided on the strainer 40, and also, the lower portion of the inner pipe 31 is press-fitted into the outer pipe 32 integrally provided on the strainer 40.

[0226] In this manner, an interior assembly 61 including the cap member 12, the liquid-phase pipe 21, the inner pipe 31, the gas-liquid separator 18, the strainer 40, and the annular seal member 71 is obtained. Then, a portion of the interior assembly 61 at a position below the cap member 12 is inserted into the tank 10 (that is, the tank 10 is arranged around a portion of the interior assembly 61 at a position below the cap member 12), and is then, the strainer 40 is placed at the bottom 13 of the tank 10.

[0227] When the strainer 40 is inserted and placed, the outer peripheral portion of the annular seal member 71 attached to the strainer 40 flexes upward. The resulting tubular flexure portion 71u is always resiliently pressure-joined to the inner peripheral face of the tank 10 as illustrated in Fig. 27B.

[0228] After the strainer 40 is inserted and placed, the cap member 12 is joined to the upper end of the tank 10 by welding. Accordingly, the tank 10 is hermetically sealed, and the assembly ends.

[0229] The operations of the refrigerant container 9 with the aforementioned structure during the cooling operation and the heating operation will be described.

[0230] In each of the cooling operation and the heating operation, a refrigerant in a gas-liquid mixed state, which has been introduced into the tank 10 from a condenser via the gas/liquid inlet port 15, collides with the gas-liquid separator 18 (or the ceiling portion 18a thereof) as illustrated in Fig. 25, and diffuses radially, and is then separated into a liquid-phase refrigerant and a gas-phase refrigerant. The liquid-phase refrigerant (including oil) is guided into the lower space of the tank 10 by falling along the inner peripheral face of the tank 10, and the gas-phase refrigerant is guided into the upper space of the tank 10.

[0231] During the cooling operation, for example, one or more on-off valves provided in a refrigerant flow path (not illustrated) are operated (see Patent Literature 2) so that the liquid-phase refrigerant guided to the lower space of the tank 10 passes through the mesh filter 45 of the strainer 40 and then accumulates in the tubular case portion 42. When the liquid-phase refrigerant passes through the mesh filter 45, foreign matter, such as sludge, in the liquid-phase refrigerant is trapped by the mesh filter 45 and thus is removed from the circulating refrigerant. The liquid-phase refrigerant that has accumulated in the tubular case portion 42 is drawn into the liquid-phase pipe 21 through the liquid-phase refrigerant drawing port 25, and is then guided to the expansion valve via the liquid-phase outlet port 16.

[0232] Therefore, during the cooling operation, the refrigerant container 9 of the present embodiment functions as a receiver (also referred to as a receiver drier).

[0233] In contrast, during the heating operation, one or more on-off valves provided in the refrigerant flow path (not illustrated) are switched (see Patent Literature 2) so that the gas-phase refrigerant separated by the gas-liquid separator 18 is suctioned to the suction side of the compressor via the upper space of the tank 10 → a space between the outer pipe 32 and the inner pipe 31 (i.e., the downward-feed flow channel portion 33) → the lower end of the outer pipe 32 → the inside of the inner pipe 31 → the gas-phase outlet port 17, and thus is circulated.

[0234] During the heating operation, the liquid-phase refrigerant that has accumulated in the tubular case portion 42 hardly flows to the expansion valve due to the relationship of the pressure difference.

[0235] In addition, oil that has accumulated in the tubular case portion 42 together with the liquid-phase refrigerant moves toward the bottom 13 of the tank 10 due to the difference in specific gravity, properties, and the like between the oil and the liquid-phase refrigerant, and is absorbed into the aforementioned gas-phase refrigerant to be suctioned to the suction side of the compressor via the downward-feed flow channel portion 33 → the lower end of the outer pipe 32 → the inside of the inner pipe 31 → the gas-phase outlet port 17. Thus, the oil is returned to the suction side of the compressor together with the gas-phase refrigerant through the oil return hole 35 provided in the baffle plate portion 43 at a position corresponding to the bottom of the outer pipe 32 → the inner pipe 31, and thus is circulated.

[0236] Therefore, during the heating operation, the refrigerant container 9 of the present embodiment functions as an accumulator.

[0237] As described above, the refrigerant container 9 of the present embodiment has both the functions of a receiver and an accumulator, and the receiver and the accumulator share the tank portion (i.e., the tank 10), the inlet port portion (i.e., the gas/liquid inlet port 15), the gas-liquid separation portion (i.e., the gas-liquid separator 18), and the strainer portion (i.e., the strainer 40) in common. Therefore, a rational structure with a small number of components can be provided.

[0238] In addition, the liquid-phase pipe holding portion 51 for the outlet pipe portion 20 for the receiver and the outer pipe 32 of the outlet pipe portion 30 for the accumulator are arranged side by side (with a gap therebetween) on the baffle plate portion 43 of the strainer 40. Further, the liquid-phase pipe 21 is press-fitted into and held by the liquid-phase pipe holding portion 51, and the inner pipe 31 is press-fitted into and held by the outer pipe 32. Thus, for example, it is only necessary to provide the cap member 12 with the liquid-phase outlet port 16 and the gas-phase outlet port 17 that are straight and penetrate through the cap member 12 in the vertical direction. Therefore, in comparison with the aforementioned conventional refrigerant container proposed so far, it is possible to simplify the structure of the cap member 12 and the connected portion of the outlet pipe portion 20 (or the liquid-phase pipe 21) for the receiver and the liquid-phase outlet port 16, for example, and also reduce the component costs and the machining and assembly costs. Consequently, it is possible to effectively reduce the space occupied by the entire system, the number of components, the cost, and the size, for example.

[0239] Further, in the refrigerant container 9 of the present embodiment, when the strainer 40 is inserted into the tank 10, the outer peripheral portion of the annular seal member 71 made of an elastic material, such as rubber, elastically flexes upward, and the outermost peripheral portion of the resulting tubular flexure portion 71u, which is in a short cylindrical or inverted truncated cone shape, is always resiliently pressure-joined to the inner peripheral face of the tank 10 as illustrated in Fig. 27B. Accordingly, the gap S1 formed between the inner peripheral face of the tank 10 and the strainer 40 (or the tubular case portion 42) is always completely closed. Thus, even when the amount of thermal expansion and contraction of the tank 10 and that of the strainer 40 (or the tubular case portion 42) greatly differ, such a difference is absorbed through elastic deformation of the annular seal member 71. Therefore, it is possible to prevent a refrigerant containing foreign matter from entering the strainer 40 (or the tubular case portion 42) without passing through the mesh filter 45 or prevent damage to the strainer 40.

[0240] Further, since it is possible to prevent a refrigerant containing foreign matter from entering the strainer 40 (or the tubular case portion 42) without passing through the mesh filter 45 as described above, it is possible to reduce the amount of foreign matter in the circulating refrigerant. Therefore, it is possible to prevent clogging of a gap, an orifice (i.e., a small hole), or the like, which is formed between slide portions of a component (e.g., a compressor, a four-way switching valve, or an expansion valve) in the system, with the foreign matter, and thus reduce operation failures, troubles, and the like.

[Tenth embodiment]

[0241] Fig. 28 is a longitudinal cross-sectional view illustrating a tenth embodiment of a refrigerant container according to the present invention. Fig. 29 is a cross-sectional view taken in the direction of arrows B-B in Fig. 28. Figs. 30A and 30B are partial enlarged views each illustrating a portion indicated by J2 in Fig. 28. Figs. 31A, 31B, 32A, 32B, and 32C are partial enlarged views each illustrating a modified example of the portion indicated by J2 in Fig. 28.

[0242] A refrigerant container 1A of the tenth embodiment illustrated in the drawings differs from the refrigerant container 9 of the aforementioned ninth embodiment only in a portion around an annular seal member (72A, 72B, or 72C). The other portions basically have the same structures as those of the refrigerant container 9 in the ninth embodiment. Therefore, portions corresponding to the respective portions of the refrigerant container 9 in the ninth embodiment are denoted by the same reference signs, and repeated description will be omitted. Hereinafter, the differences will be mainly described.

[0243] In the refrigerant container 1A of the present embodiment, the outer periphery of the upper end of the tubular case portion 42 of the strainer 40 is integrally provided with a flanged portion 42B (that protrudes outward) such that the flanged portion 42B is flush with the baffle plate portion 43. The outside diameter of the flanged portion 42B is smaller than the inside diameter Da of the tank 10 by a predetermined length.

[0244] The flanged portion 42B has attached thereto the annular seal member 72A of the present embodiment. The annular seal member 72 of the present embodiment is also produced using an elastic material, such as rubber, as in the ninth embodiment.

[0245] The annular seal member 72A of the present tenth embodiment is substantially in the shape of a semi-race track with its one side open, and has an annular band portion including an outer peripheral portion 72u, which has a semicircular cross-section, and a pair of annular disk-like inner peripheral portions 72v and 72v that are continuous with the upper and lower ends on the inner peripheral side (i.e., the upper inner end and the lower inner end) of the outer peripheral portion 72u. In the annular seal member 72A, the pair of upper and lower inner peripheral portions 72v and 72v serve as tightly holding portions adapted to tightly hold the flanged portion 42B, and the outer peripheral portion 72u with a semicircular cross-section serves as an annular pressure-joined portion adapted to be always resiliently pressure-joined to the inner peripheral face of the tank 10.

[0246] Specifically, as illustrated in Fig. 30A, the annular seal member 72A has an annular disk shape with its outside diameter De larger than the inside diameter Da of the tank 10 in the natural state, and the width of the annular band portion at this time is La.

[0247] When the annular seal member 72A is attached to the flanged portion 42B, the inner peripheral portions 72v and 72v of the annular seal member 72A are stretched out so as to sandwich the outer peripheral portion of the flanged portion 42B therebetween. At this time, a relatively large void α is formed between the outer periphery of the flanged portion 42B and the inner periphery of the outer peripheral portion 72u with a semicircular cross-section.

[0248] Then, when the strainer 40 is inserted into the tank 10, as illustrated in Fig. 30B, the annular seal member 72A is pushed into the tank 10 with the outer peripheral portion 72u of the annular seal member 72A made to contact the inner peripheral face (i.e., the inner wall face) of the tank 10. Accordingly, the annular seal member 72A is compressed radially inward. Specifically, the outside diameter De of the annular seal member 72A is reduced down to the inside diameter Da of the tank 10, and along with this, the void formed between the outer periphery of the flanged portion 42B and the inner periphery of the outer peripheral portion 72u with a semicircular cross-section is reduced from α to α', and also, the width of the annular band portion of the annular seal member 72A is slightly reduced from La in the natural state to La'. Accordingly, the outer peripheral portion (i.e., the annular pressure-joined portion) 72u with a semicircular cross-section is always resiliently pressure-joined to the inner peripheral face of the tank 10 with the flanged portion 42B tightly held between the annular disk-like inner peripheral portions (i.e., tightly holding portions) 72v and 72v, and a gap S2 formed between the inner peripheral face of the tank 10 and the strainer 40 (or the tubular case portion 42) is always completely closed.

[0249] Figs. 31A and 31B each illustrate a modified example (Ver. 1) of the example illustrated in Figs. 30A and 30B. In the modified example, the annular seal member 72B is, as with the aforementioned annular seal member 72A, substantially in the shape of a semi-race track with its one side open, and has an annular band portion including an outer peripheral portion 72u, which has a semicircular cross-section, and a pair of annular disk-like inner peripheral portions 72v and 72v that are continuous with the upper and lower ends on the inner peripheral side (i.e., the upper inner end and the lower inner end) of the outer peripheral portion 72u. In the annular seal member 72B, the pair of upper and lower inner peripheral portions 72v and 72v serve as tightly holding portions adapted to tightly hold the flanged portion 42B. In addition, as illustrated in Fig. 31A, the upper portion of the outer peripheral side of the annular seal member 72B, that is, the upper portion of the outer peripheral portion 72u with a semicircular cross-section is provided with an annular protrusion 72t that protrudes radially outward in the natural state and has an outside diameter Df larger than the outside diameter De of the outer peripheral portion 72u. The annular protrusion 72t has a mountain-like shape as seen in cross-section that is roundish at its tip end (i.e., outer peripheral portion) and protrudes slightly upward rather than horizontally. When the strainer 40 is inserted into the tank 10, the annular protrusion 72t is always resiliently pressure-joined to the inner peripheral face of the tank 10.

[0250] Specifically, when the strainer 40 is inserted into the tank 10, as illustrated in Fig. 31B, the annular seal member 72B is pushed into the tank 10 with the annular protrusion 72t of the outer peripheral portion 72u of the annular seal member 72A made to contact the inner peripheral face (i.e., the inner wall face) of the tank 10. Accordingly, the annular protrusion 72t is squashed (i.e., substantially a half thereof is squashed in the example illustrated in the drawing), and the outside diameter Df of the annular seal member 72B (or the annular protrusion 72t) is reduced down to the inside diameter Da of the tank 10, and along with this, the void formed between the outer periphery of the flanged portion 42B and the inner periphery of the outer peripheral portion 72u with a semicircular cross-section is reduced from α to α'', and also, the width of the annular band portion of the annular seal member 72B is slightly reduced from that in the natural state. In such a case, the outer peripheral portion 72u with a semicircular cross-section moves slightly away from the inner peripheral face of the tank 10. Thus, the compressed amount of the annular seal member 72B of the present modified example (in particular, the compressed amount of the upper side of the annular seal member 72B) is larger than that of the aforementioned annular seal member 72A. Further, the area of the portion of the annular seal member 72B (or the annular protrusion 72t with a mountain-like shape as seen in cross-section) of the present modified example that is pressure-joined to the inner peripheral face of the tank 10 is smaller than that of the aforementioned annular seal member 72A (or the outer peripheral portion 72u with a semicircular cross-section). Therefore, the annular seal member 72B of the present modified example is pressure-joined to the inner peripheral face of the tank 10 with stronger contact pressure than is the aforementioned annular seal member 72A. Accordingly, the property of sealing the gap S2 formed between the inner peripheral face of the tank 10 and the strainer 40 (or the tubular case portion 42) is higher in the modified example.

[0251] Figs. 32A to 32C each illustrate a modified example (Ver. 2) of the example illustrated in Figs. 30A and 30B. In the modified example, the annular seal member 72C has an annular band portion including an outer peripheral portion 72u, which has a C-shaped cross-section, and a pair of annular disk-like inner peripheral portions 72v and 72v that are continuous with the upper and lower ends on the inner peripheral side (i.e., the upper inner end and the lower inner end) of the outer peripheral portion 72u. In the annular seal member 72C, the pair of upper and lower inner peripheral portions 72v and 72v are in contact with each other in a detached state (i.e., when seen alone or when not attached to the flanged portion 42B yet) as illustrated in Fig. 32C. In addition, in the annular seal member 72C, as with the aforementioned annular seal member 72A, the pair of upper and lower inner peripheral portions 72v and 72v serve as tightly holding portions adapted to hold the flanged portion 42B, and the outer peripheral portion 72u with a semicircular cross-section serves as an annular pressure-joined portion adapted to be always resiliently pressure-joined to the inner peripheral face of the tank 10. When the annular seal member 72C is attached to the flanged portion 42B, the outer peripheral portion 72u with a C-shaped cross-section is elastically deformed so to separate the pair of upper and lower inner peripheral portions 72v and 72v in contact with each other. Then, the flanged portion 42B is inserted into and sandwiched between the pair of upper and lower inner peripheral portions 72v and 72v.

[0252] As illustrated in Fig. 32A, the annular seal member 72C of the present modified example is also formed in the shape of an annular disk that has an outside diameter De larger than the inside diameter Da of the tank 10 in the natural state before it is inserted into the tank 10, and the width of the annular band portion at this time is Lc.

[0253] Then, when the strainer 40 is inserted into the tank 10, as illustrated in Fig. 32B, the annular seal member 72C is pushed into the tank 10 with the outer peripheral portion 72u of the annular seal member 72C made to contact the inner peripheral face (i.e., the inner wall face) of the tank 10. Accordingly, the annular seal member 72C is compressed radially inward. More specifically, the outside diameter De of the annular seal member 72C is reduced down to the inside diameter Da of the tank 10, and along with this, the void formed between the outer periphery of the flanged portion 42B and the inner periphery of the outer peripheral portion 72u with a C-shaped cross-section is reduced from α to α', and also, the width of the annular band portion of the annular seal member 72C is slightly reduced from Lc in the natural state to Lc'. Accordingly, the outer peripheral portion (i.e., the annular pressure-joined portion) 72u with a C-shaped cross-section is always resiliently pressure-joined to the inner peripheral face of the tank 10 while the flanged portion 42B is tightly held between the annular disk-like inner peripheral portions (i.e., the tightly holding portions) 72v and 72v, and the gap S2 formed between the inner peripheral face of the tank 10 and the strainer 40 (or the tubular case portion 42) is always completely closed.

[0254] In the refrigerant container 1A with such a structure of the present tenth embodiment also, even when the amount of thermal expansion and contraction of the tank 10 and that of the strainer 40 (or the tubular case portion 42) greatly differ, such a difference is absorbed through elastic deformation of the annular seal member 72A, 72B, or 72C. Thus, operational advantages substantially similar to those of the refrigerant container 9 in the ninth embodiment can be obtained.

[Eleventh embodiment]

[0255] Fig. 33 is a longitudinal cross-sectional view illustrating an eleventh embodiment of a refrigerant container according to the present invention. Fig. 34 is a cross-sectional view taken in the direction of arrows C-C in Fig. 33. Figs. 35A and 35B are partial enlarged views each illustrating a portion indicated by J3 in Fig. 33. Figs. 36A, 36B, 37A, 37B, 38A, and 38B are partial enlarged views each illustrating a modified example of the portion indicated by J3 in Fig. 33.

[0256] A refrigerant container 1B of the eleventh embodiment illustrated in the drawings differs from the refrigerant container 9 of the aforementioned ninth embodiment and the refrigerant container 1A of the aforementioned tenth embodiment only in a portion around an annular seal member (73A, 73B, 73C, 73D). The other portions basically have the same structures as those of the refrigerant container 9 in the ninth embodiment and the refrigerant container 1A in the tenth embodiment. Therefore, portions corresponding to the respective portions of the refrigerant container 9 in the ninth embodiment and the refrigerant container 1A in the tenth embodiment are denoted by the same reference signs, and repeated description will be omitted. Hereinafter, the differences will be mainly described.

[0257] In the refrigerant container 1B of the present embodiment also, the outer periphery of the upper end of the tubular case portion 42 of the strainer 40 is integrally provided with a flanged portion 42B (that protrudes outward) such that the flanged portion 42B is flush with the baffle plate portion 43 as with the refrigerant container 1A of the aforementioned tenth embodiment. The outside diameter of the flanged portion 42B is smaller than the inside diameter Da of the tank 10 by a predetermined length.

[0258] The flanged portion 42B has attached thereto the annular seal member 73A of the present embodiment. The annular seal member 73 of the present embodiment is also produced using an elastic material, such as rubber, as in the ninth and tenth embodiments.

[0259] The annular seal member 73A of the present eleventh embodiment includes, as illustrated in Fig. 35A, a tubular pressure-joined portion 73u, which is a short cylindrical outer peripheral portion with a curved outer peripheral face that is recessed radially inward in the natural state before the annular seal member 73A is inserted into the tank 10, and a pair of upper and lower tightly holding portions 73v and 73v that are annular disk-like inner peripheral portions continuous with the inner peripheral side of the tubular pressure-joined portion 73u. The pair of upper and lower annular disk-like tightly holding portions 73v and 73v are located away from each other by a distance corresponding to the thickness of the flanged portion 42B.

[0260] In the present example, the outside diameter Dh of the middle portion of the outer peripheral face of the tubular pressure-joined portion 73u, which is most recessed radially inward, is smaller than the inside diameter Da of the tank 10, and the upper and lower portions thereof, that is, the upper and lower portions of the curved outer peripheral face are annular protrusions 73t and 73t each having a substantially triangular cross-section and having a maximum outside diameter Dk larger than Dh. Each of the annular protrusions 73t and 73t protrudes radially outward and has a diameter larger than the inside diameter Da of the tank 10 in the natural state and is adapted to be strongly pushed against the inner peripheral face of the tank 10 when the annular seal member 73A is inserted into the tank 10.

[0261] When the annular seal member 73A is attached to the flanged portion 42B, the tightly holding portions 73v and 73v, which are the inner peripheral portions of the annular seal member 73A, are stretched out so as to sandwich the outer peripheral portion of the flanged portion 42B therebetween. At this time, a void is formed between the outer periphery of the flanged portion 42B and the inner periphery of the outer peripheral portion 72u with a semicircular cross-section.

[0262] Then, when the strainer 40 is inserted into the tank 10, as illustrated in Fig. 35B, the annular seal member 73A is pushed into the tank 10 with the annular protrusions 73t and 73t of the tubular pressure-joined portion 73u, which is the outer peripheral portion of the annular seal member 73A, made to contact the inner peripheral face (i.e., the inner wall face) of the tank 10. Accordingly, the maximum outside diameter Dk (>Dh) of the annular seal member 73A (or the annular protrusions 73t) is reduced to down to the inside diameter Da of the tank 10, and along with this, the void formed between the outer periphery of the flanged portion 42B and the inner periphery of the tubular pressure-joined portion 73u is reduced, and also, the width of the annular band portion of the annular seal member 73A is reduced from that in the natural state. In such a case, the annular protrusions 73t and 73t are always resiliently pressure-joined to the inner peripheral face of the tank 10 strongly while the flanged portion 42B is tightly held between the annular disk-like tightly holding portions 73v and 73v. Therefore, in comparison with when the outer peripheral face of the tubular pressure-joined portion 73u is not curved and the annular protrusions 73t and 73t are not provided, for example, contact pressure applied to the inner peripheral face of the tank 10 is increased. Thus, the property of sealing a gap S3 formed between the inner peripheral face of the tank 10 and the strainer 40 (or the tubular case portion 42) is enhanced.

[0263] Figs. 36A and 36B each illustrate a modified example (Ver. 1) of the example illustrated in Figs. 35A and 35B. In the annular seal member 73B of the modified example, as illustrated in Fig. 36A, the outer peripheral face of the tubular pressure-joined portion 73u is not curved in the natural state before the annular seal member 73B is inserted into the tank 10, and the upper and lower portions of the outer periphery of the tubular pressure-joined portion 73u are provided with annular protrusions 73t and 73t each having an outside diameter Dk and a semicircular cross-section. The other structures are the same as those of the annular seal member 73A in the example illustrated in Figs. 35A and 35B.

[0264] When the annular seal member 73B of the modified example is used, operational advantages similar to those when the aforementioned annular seal member 73A is used are obtained. Further, since the lower annular protrusion 73t has a semicircular cross-section, the annular seal member 73B can be more easily inserted into the tank 10 in comparison with when the annular seal member 73A is used in which the lower annular protrusion 73t has a substantially triangular cross-section. Thus, the assembly performance improves.

[0265] Figs. 37A and Fig. 37B each illustrate a modified example (Ver. 2) of the example illustrated in Figs. 35A and 35B. In the annular seal member 73C of the modified example, as illustrated in Fig. 37A, only the upper portion of the outer periphery of the tubular pressure-joined portion 73u is provided with an annular protrusion 73t with a substantially triangular cross-section in the natural state before the annular seal member 73C is inserted into the tank 10. Meanwhile, a corner at the lower end of the outer peripheral side of the tubular pressure-joined portion 73u is provided with a rounded or chamfered portion 73r. The other structures are the same as those of the aforementioned annular seal member 73A in the example illustrated in Figs. 35A and 35B.

[0266] Figs. 38A and 38B each illustrate a modified example (Ver. 3) of the example illustrated in Figs. 35A and 35B. In the annular seal member 73D of the modified example, as illustrated in Fig. 38A, only the upper portion of the outer periphery of the tubular pressure-joined portion 73u is provided with an annular protrusion 73t with a semicircular cross-section similar to that in the example illustrated in Fig. 36A in the natural state before the annular seal member 73D is inserted into the tank 10. Meanwhile, a corner at the lower end of the outer peripheral side of the tubular pressure-joined portion 73u is provided with a rounded or chamfered portion 73r similar to that in the example illustrated in Fig. 37A. The other structures are the same as those of the aforementioned annular seal member 73A in the example illustrated in Figs. 35A and 35B.

[0267] When such an annular seal member 73C or 73D of the modified example is used, operational advantages similar to those when the aforementioned annular seal member 73A or 73B is used are obtained. Further, since a corner at the lower end of the outer periphery of the tubular pressure-joined portion 73u, which is a corner on the side of the tank 10 when the annular seal member 73C or 73D is inserted into the tank 10, is provided with the rounded or chamfered portion 73r, the annular seal member 73C or 73D can be more easily inserted into the tank 10 in comparison with when the annular seal member 73A or 73B is used that has nothing at its corner. Thus, the assembly performance improves.

[0268] In the refrigerant container 1B with such a structure of the present eleventh embodiment also, even when the amount of thermal expansion and contraction of the tank 10 and that of the strainer 40 (or the tubular case portion 42) greatly differ, such a difference is absorbed through elastic deformation of the annular seal member 73A, 73B, 73C, or 73D. Thus, operational advantages substantially similar to those of the refrigerant container 9 in the ninth embodiment and the refrigerant container 1A in the tenth embodiment can be obtained.

[Twelfth embodiment]

[0269] Fig. 39 is a longitudinal cross-sectional view illustrating a twelfth embodiment of a refrigerant container according to the present invention. Fig. 40 is a cross-sectional view taken in the direction of arrows D-D in Fig. 39.

[0270] A refrigerant container 1C of the twelfth embodiment illustrated in the drawings differs from the refrigerant container 9 of the aforementioned ninth embodiment, the refrigerant container 1A of the aforementioned tenth embodiment, and the refrigerant container 1B of the aforementioned eleventh embodiment only in a portion around a tubular case portion 47 of the strainer 40. Therefore, portions corresponding to the respective portions of the refrigerant container 9 in the ninth embodiment, the refrigerant container 1A in the tenth embodiment, and the refrigerant container 1B in the eleventh embodiment are denoted by the same reference signs, and repeated description will be omitted. Hereinafter, the differences will be mainly described.

[0271] In the refrigerant container 1C of the present twelfth embodiment, the tubular case portion 47 of the strainer 40 is formed using an annular seal member. A gap S4 formed between the tank 10 and the strainer 40 is sealed by the end face (i.e., the outer peripheral face and the lower end face) of the tubular case portion 47 of the strainer 40. It should be noted that the mesh filter 45 is stretched on the side above the baffle plate portion 43 since the structure of the tubular case portion 47 differs from those of the ninth, tenth, and eleventh embodiments.

[0272] The tubular case portion 47 of the present embodiment is produced using nylon-based resin (or rubber) that is one of elastic materials, and includes an annular inner peripheral coupling portion 47R with a wave-like cross section, which is integrally coupled to the outer periphery of the baffle plate portion 43 and can elastically deform in the radial direction and the vertical direction, and a short cylindrical tubular contact portion 47Q that is continuous with the outer peripheral side of the annular inner peripheral coupling portion 47R and is adapted to be in contact with the inner peripheral face and the bottom (i.e., the bottom face) 13 of the tank 10. The end face (i.e., the outer peripheral face and the lower end face) of the tubular contact portion 47Q are always resiliently pressure-joined to the inner peripheral face and the bottom (i.e., the bottom face) 13 of the tank 10.

[0273] More specifically, in the tubular case portion 47 in the natural state, the annular inner peripheral coupling portion 47R with a wave-like cross-section extends and expands radially outward than when the tubular case portion 47 is disposed in the tank 10 as illustrated in Fig. 39. The outside diameter Dr of the annular inner peripheral coupling portion 47R (Fig. 41A) in the natural state is larger than the inside diameter Da of the tank 10.

[0274] Therefore, when the refrigerant container 1C of the present embodiment is assembled, as illustrated in Fig. 41B, the annular inner peripheral coupling portion 47R with a wave-like cross-section is compressed radially inward so that the outside diameter of the annular inner peripheral coupling portion 47R becomes smaller, and an interior assembly 61 including the strainer 40 is inserted into the tank 10. Then, the tubular contact portion 47Q is pushed into the tank 10 while sliding on the inner peripheral face of the tank 10 so that the lower end face of the tubular contact portion 47Q is pushed against the bottom 13 of the tank 10. In such a state, the interior assembly 61 (or the cap member 12) is further pushed from above so that the cap member 12 is pushed against the upper end face of the tank 10. With such a state maintained, the cap member 12 is welded to the tank 10.

[0275] Accordingly, the end face of the tubular contact portion 47Q of the tubular case portion 47 is always resiliently pressure-joined to the inner peripheral face and the bottom (i.e., the bottom face) 13 of the tank 10 due to the elasticity of the annular inner peripheral coupling portion 47R with a wave-like cross-section (and the elasticity of the tubular contact portion 47Q). This allows the gap S4 between the tank 10 (or the inner peripheral face and the bottom (i.e., the bottom face) 13 thereof) and the strainer 40 (or the tubular case portion 47) to be completely sealed.

[0276] Therefore, in the refrigerant container 1C of the present twelfth embodiment also, even when the amount of thermal expansion and contraction of the tank 10 and that of the strainer 40 (or the tubular case portion 47) greatly differ, such a difference is absorbed through elastic deformation of the annular inner peripheral coupling portion 47R with a wave-like cross-section (and the short cylindrical tubular contact portion 47Q). Therefore, it is possible to prevent a refrigerant containing foreign matter from entering the strainer 40 (or the tubular case portion 47) without passing through the mesh filter 45 or prevent damage to the strainer 40.

[0277] Further, since it is possible to prevent a refrigerant containing foreign matter from entering the strainer 40 (or the tubular case portion 47) without passing through the mesh filter 45 as described above, it is possible to reduce the amount of foreign matter in the circulating refrigerant. Therefore, it is possible to prevent clogging of a gap, an orifice (i.e., a small hole), or the like, which is formed between slide portions of a component (e.g., a compressor, a four-way switching valve, or an expansion valve) in the system, with the foreign matter, and thus reduce operation failures, troubles, and the like.

<Thirteenth embodiment>

[0278] Fig. 42 is a longitudinal cross-sectional view illustrating a thirteenth embodiment of a refrigerant container according to the present invention. Fig. 43 is a top view of a cap member portion of the refrigerant container illustrated in Fig. 42. Fig. 44 is a partial cross-sectional view taken in the direction of arrows V-V passing through O in Fig. 43. Fig. 45 is a longitudinal cross-sectional view illustrating a strainer portion in Fig. 42 together with a liquid-phase pipe and an outer pipe that are integrally provided on the strainer portion. Fig. 46 is a cross-sectional view taken in the direction of arrows A-A in Fig. 42.

[0279] The structure of the thirteenth embodiment is substantially the same as that of the aforementioned sixth embodiment. Hereinafter, the overall structure as well as the operational advantages of the thirteenth embodiment will be described.

[0280] A refrigerant container 1D of the thirteenth embodiment illustrated in the drawings is used for a heat pump system forming a car air-conditioner for an electric vehicle, for example. The refrigerant container 1D includes a closed-bottomed cylindrical tank 10 made of metal, such as stainless steel or aluminum alloy. The upper-face opening of the tank 10 is hermetically closed by a cap member (i.e., a cap portion) 12 made of the same metal. It should be noted that the refrigerant container 1D (or the tank 10) of the present embodiment is placed in a vertical position as illustrated in the drawings. That is, the refrigerant container ID is placed with the cap member 12 positioned on the upper side and a bottom 13 of the tank 10 positioned on the lower side.

[0281] The cap member 12 includes a gas/liquid inlet port 15, a stepped, small-diameter liquid-phase outlet port 16 with a lower large-diameter portion 16a, and a stepped, large-diameter gas-phase outlet port 17 with a lower large-diameter portion 17a, all of which penetrate through the cap member 12 such that they are open on the top and bottom sides thereof. Although the cap member 12 has a conduit connection adapter attached to its upper side, for example, such a conduit connection adapter as well as an internal screw portion for screwing the adapter is not illustrated.

[0282] A gas-liquid separator 18, which has the shape of a conical hat or an inverted wide bowl and has a diameter smaller than the inside diameter of the tank 10, is disposed below the cap member 12 such that the gas-liquid separator 18 faces the gas/liquid inlet port 15. The lower large-diameter portion 16a of the liquid-phase outlet port 16 has inserted therein an upper end 21a of an outlet pipe portion 20 (or a liquid-phase pipe 21 thereof) for a receiver that is adapted to guide only a liquid-phase refrigerant separated by the gas-liquid separator 18 to the side of an expansion valve via the liquid-phase outlet port 16. In addition, the lower large-diameter portion 17a of the gas-phase outlet port 17 has inserted therein an upper end 31a of an outlet pipe portion 30 (or an inner pipe 31 thereof) for an accumulator with a double pipe structure, which includes the inner pipe 31 and an outer pipe 32, that is adapted to guide a gas-phase refrigerant separated by the gas-liquid separator 18 to the suction side of a compressor via the gas-phase outlet port 17 together with oil contained in the liquid-phase refrigerant (each member will be described in detail later).

[0283] The gas-liquid separator 18 is made of metal, such as stainless steel or aluminum alloy, and includes a disk-like ceiling portion 18a and a cylindrical peripheral wall portion 18b continuous with and extending downward from the outer periphery of the ceiling portion 18a. The gas-liquid separator 18 is disposed at a position below the lower end face of the gas/liquid inlet port 15 in the cap member 12 by a predetermined distance so as to cover the upper-end opening of the outer pipe 32 of the outlet pipe portion 30 for the accumulator (that is, the upper portion of a space between the inner pipe 31 and the outer pipe 32, which is a downward-feed flow channel portion 33 described below) (i.e., so as to allow the upper end of the outer pipe 32 to be located between the ceiling portion 18a and the lower end of the peripheral wall portion 18b; see Fig. 44).

[0284] The ceiling portion 18a of the gas-liquid separator 18 has through-holes 18u and 18v formed therein (side by side) to respectively allow the upper end 21a of the straight liquid-phase pipe 21 and the upper end 31a of the straight inner pipe 31 to be tightly inserted therethrough.

[0285] A strainer 40 for trapping foreign matter in the refrigerant is disposed at the bottom 13 of the tank 10. The strainer 40 includes a short cylindrical tubular case portion 42, which is adapted to be inserted (fitted) into the tank 10 in a press-fit manner so as to be placed at the bottom (i.e., the bottom face) 13 of the tank 10, and a cross-shaped baffle plate portion 43 integrally provided on the upper end of the tubular case portion 42 so as to partially cover the upper-face opening thereof. The cross-shaped baffle plate portion 43 has a plate-like shape as seen in a side view, and includes a sideways bridge portion 43a and a depthways bridge portion 43b as seen in a plan view (Fig. 46). A reinforcing rib-like projection 43f is provided on the upper end face of the tubular case portion 42 and on the center of each of the upper faces of the sideways bridge portion 43a and the depthways bridge portion 43b.

[0286] In the present embodiment, as is clearly seen in Figs. 45 and 46 in addition to Fig. 42, the liquid-phase pipe 21 forming the outlet pipe portion 20 for the receiver is integrally provided on and extends from a portion around the left end of the sideways bridge portion 43a of the baffle plate portion 43. A liquid-phase refrigerant drawing port 25, which has a diameter equal to the inside diameter of the liquid-phase pipe 21, is formed in a portion of the baffle plate portion 43 (or the sideways bridge portion 43a thereof) corresponding to the bottom of the liquid-phase pipe 21.

[0287] In addition, the outer pipe 32 forming the outlet pipe portion 30 for the accumulator is integrally provided on and extends from a portion where the sideways bridge portion 43a and the depthways bridge portion 43b cross each other on the right side of the center of the baffle plate portion 43. An oil return hole 35 is formed in the center of a portion of the baffle plate portion 43 provided with the outer pipe 32 (i.e., a portion corresponding to the bottom of the outer pipe 32). The diameter of the oil return hole 35 is set to about 1 mm, for example. The outer pipe 32 has the straight inner pipe 31 made of metal, such as aluminum alloy, fixed thereto by press fit (which will be described in detail later).

[0288] Further, a circular mesh filter 45 is integrally provided on the lower face side of the baffle plate portion 43 so as to cover the entire upper-face opening of the tubular case portion 42. The mesh filter 45 is produced using a metallic mesh or a mesh material of synthetic resin, for example. Accordingly, as is clearly seen in Fig. 46, the mesh filter 45 is stretched across two pairs of (i.e., a total of four) large and small blade-shaped window portions 44a and 44b that are provided in portions of the upper-face opening of the tubular case portion 42 not covered with the baffle plate portion 43 and are defined by the tubular case portion 42, the sideways bridge portion 43a, and the depthways bridge portion 43b. The tubular case portion 42 of the strainer 40 is inserted into the tank 10 in a press-fit manner with the outer periphery of the tubular case portion 42 abutting the inner wall of the tank 10 so that the tubular case portion 42 is placed at the bottom 13 of the tank 10. Thus, the entire liquid-phase refrigerant falling from the upper portion of the tank 10 toward the bottom 13 passes through the mesh filter 45. This allows foreign matter in the liquid-phase refrigerant, which flows into the tubular case portion 42 via the mesh filter 45, to be trapped by the mesh filter 45 and thus removed from the circulating refrigerant.

[0289] Although the mesh filter 45 is stretched across the four window portions 44a, 44a, 44b, and 44b in the present example, the mesh filter 45 may also be attached to the liquid-phase refrigerant drawing port 25 and the oil return hole 35.

[0290] It should be noted that the mesh filter 45 need not cover the entire upper-face opening of the tubular case portion 42 as described above. The mesh filter 45 has only to cover at least a portion of the upper-face opening of the tubular case portion 42 not covered with the baffle plate portion 43.

[0291] A plurality of (four in the example illustrated in the drawing) plate-like ribs 36 are provided in a manner protruding radially inward on the inner periphery of the outer pipe 32, which is integrally provided on the baffle plate portion 43, along the longitudinal direction (i.e., the vertical direction) and at equal angular intervals. Each plate-like rib 36 includes, from its lower end side to its upper end side, a lowermost wide-width portion 36a, which is adapted to have the lower end of the inner pipe 31 disposed thereon and engage therewith, a lower narrow-width portion 36b having a width (i.e., a radial width or an inward protrusion amount) slightly smaller than that of the lowermost wide-width portion 36a, and an upper narrow-width portion 36c having a width slightly smaller than that of the lower narrow-width portion 36b. The inner pipe 31 (or the lower portion thereof) made of metal, such as aluminum alloy, is inserted and fixed on the inner peripheral side of the lower narrow-width portion 36b by press fit until the lower end of the inner pipe 31 engages with the upper end of the lowermost wide-width portion 36a (i.e., a step portion adjacent to the lower narrow-width portion 36b). Herein, to allow the inner pipe 31 to be easily press-fitted, the position of the upper end of the lower narrow-width portion 36b is set to about 1/3 or 1/2 of the height of the outer pipe 32, the height (i.e., the vertical length) of the lower narrow-width portion 36b is set to about 1/4 or 1/3 of the height of the outer pipe 32, and a gap is formed between the inner end of the upper narrow-width portion 36c and the outer peripheral face of the inner pipe 31. Although the plate-like ribs 36 are provided on the side of the outer pipe 32 in the present example, the plate-like ribs 36 may be provided on the side of the inner pipe 31 or on both sides. In addition, it is needless to mention that the number of the plate-like ribs 36 is not limited to that illustrated in the drawing as long it is more than one. For example, as illustrated in Fig. 47, three plate-like ribs 36 may be provided at intervals of 120° between the outer pipe 32 and the inner pipe 31.

[0292] The upper ends of the plurality of plate-like ribs 36 (or the upper narrow-width portions 36c thereof) extend upward beyond the upper end of the outer pipe 32, and such extension portions 36e (or the upper ends thereof) are adapted to serve as lower-side latch portions for the gas-liquid separator 18 that are adapted to engage with the gas-liquid separator 18 (or the peripheral edge of the through-hole 18v therein) on its lower side.

[0293] In addition, the right side face portion of the liquid-phase pipe 21, which is integrally provided on the baffle plate portion 43 of the strainer 40, and the left side face portion of the outer pipe 32, which is also integrally provided on the baffle plate portion 43, are integrally coupled together by a frame-shaped rectangular coupling plate (i.e., coupling portion) 24, which has an elongated rounded rectangular opening 24a in the center, for reinforcement purposes, for example. Specifically, the coupling plate 24 is integrally coupled at its lower side portion (i.e., lower end) to the sideways bridge portion 43a of the baffle plate portion 43, is integrally coupled at its right side portion to the left side face portion of the outer pipe 32 (or the plate-like rib 36 on the left side coupled thereto), and is integrally coupled at its left side portion to the right side face portion of the liquid-phase pipe 21. In addition, the upper end face of the coupling plate 24 (or the upper side portion thereof) is flush with (at the same level as) the upper end faces of the extension portions 36e of the plate-like ribs 36.

[0294] The upper end of the liquid-phase pipe 21 at a position above the upper end face of the coupling plate 24 is formed slightly thinner than the other portions of the liquid-phase pipe 21 (that is, a portion of the liquid-phase pipe 21 at a position below the upper end face of the coupling plate 24 is formed slightly thicker than the other portions of the liquid-phase pipe 21). A stepped face (i.e., a shoulder face) 21c defined by an upper-end thin-walled portion 22 and a portion below the upper-end thin-walled portion 22 (i.e., a thick-walled portion or a large-diameter portion) of the liquid-phase pipe 21 is flush with (at the same level as) the upper end face of the coupling plate 24 (and the upper end faces of the extension portions 36e of the plate-like ribs 36).

[0295] The upper portion of the inner pipe 31, which is fixed at its lower portion to the outer pipe 32 (or the lower narrow-width portion 36b thereof) by press fit, protrudes upward beyond the upper end of the outer pipe 32 (and the plate-like ribs 36).

[0296] In addition, the upper portion of the inner pipe 31 (at a predetermined position below its upper end 31a inserted into the lower large-diameter portion 17a of the gas-phase outlet port 17) is provided with an upper-side flanged portion 31b, which has been subjected to compression bending, such as bulge forming, as an upper-side pressing portion capable of pressing the gas-liquid separator 18 (or the peripheral edge of the through-hole 18v therein) from its upper side.

[0297] In addition, a pressure equalization hole 31f for preventing a liquid backflow to the side of the compressor while the system stops operation (ON→OFF) is provided in a portion of the inner pipe 31 at about the same level as the gas-liquid separator 18.

[0298] The upper end 21a (i.e., the upper-end thin-walled portion 22) of the liquid-phase pipe 21 forming the outlet pipe portion 20 for the receiver is inserted into the lower large-diameter portion 16a of the liquid-phase outlet port 16 (through the through-hole 18u in the gas-liquid separator 18). The upper end 31a of the inner pipe 31 forming the outlet pipe portion 30 for the accumulator is inserted into the lower large-diameter portion 17a of the gas-phase outlet port 17 through the through-hole 18v in the gas-liquid separator 18.

[0299] As described above, in the refrigerant container 1D of the present thirteenth embodiment, the tubular case portion 42 and the baffle plate portion 43 of the strainer 40, the outlet pipe portion 20 (or the liquid-phase pipe 21) for the receiver, and the outer pipe 32 of the outlet pipe portion 30 for the accumulator are integrally molded using synthetic resin. During the integral molding, the mesh filter 45 is also integrated as an insert, for example. In addition, the gas-liquid separator 18 (or the ceiling portion 18a thereof) is tightly held between the stepped face (i.e., the shoulder face) 21c of the liquid-phase pipe 21, the coupling plate 24, and the extension portions 36e of the plate-like ribs 36 formed on the outer pipe 32, each serving as the lower-side latch portion adapted to engage with the gas-liquid separator 18 on its lower side, and the upper-side flanged portion 31b formed on the inner pipe 31 and serving as the upper-side pressing portion capable of pressing the gas-liquid separator 18 from its upper side, and is held horizontally.

[0300] It is needless to mention that the method of fixing (or holding) the gas-liquid separator 18 is not limited to that in the aforementioned embodiment. Although the upper-side flanged portion 31b is used as the upper-side pressing portion of the inner pipe 31 in the aforementioned embodiment, it is also possible to use a large-diameter portion, which has a diameter larger than that of the upper end of the inner pipe 31 passing through the through-hole 18v in the gas-liquid separator 18, or a thick-walled portion, for example, and allow it to press the gas-liquid separator 18 from its upper side. In addition, although the stepped face (i.e., the shoulder face) 21c formed of a large-diameter portion or a thick-walled portion is used as the lower-side latch portion of the liquid-phase pipe 21, it is also possible to use a flanged portion or a rib, which protrudes radially outward at a position below the through-hole 18u in the gas-liquid separator 18, for example, and allow it to engage with the gas-liquid separator 18 on its lower side. Further, it is also possible to fix (or hold) the gas-liquid separator 18 through swaging or pipe expansion, for example.

[0301] It should be noted that the opening 24a in the aforementioned coupling plate 24 is used for winding a bag containing desiccants therein around the outer pipe 32 and thus allowing the bag to be held thereon, for example. For the bag containing desiccants therein and the like, see Patent Literature 2, if necessary. In addition, with the opening 24a, reductions in the weight and material cost can also be achieved, for example.

[0302] In the present embodiment, the inside diameter of the tank 10 is set to 60 to 90 mm, the diameter of the tubular case portion 42 (or the baffle plate portion 43) is set substantially equal to the inside diameter of the tank 10, the plate thickness of the baffle plate portion 43 is set to about 1 to 2 mm, and the height H (Fig. 42) from the bottom face of the tank 10 to the baffle plate portion 43 (or the lower face thereof) is set to 5 to 10 mm.

[0303] The refrigerant container 1D with such a structure can be assembled as follows, for example.

(1) First, the upper end 21a (i.e., the upper-end thin-walled portion 22) of the liquid-phase pipe 21 is inserted through the through-hole 18u in the gas-liquid separator 18, and the gas-liquid separator 18 is pushed from above so as to be placed on the lower-side latch portions including the stepped face (i.e., the shoulder face) 21c of the liquid-phase pipe 21, the upper end face of the coupling plate 24, and the upper end faces of the extension portions 36e of the plate-like ribs 36.
(2) Next, the lower end of the inner pipe 31 is passed through the through-hole 18v in the gas-liquid separator 18, and the lower portion of the inner pipe 31 is press-fitted on the inner peripheral side of the lower narrow-width portions 36b of the plate-like ribs 36 on the outer pipe 32. Then, the inner pipe 31 is pushed until its lower end engages with the upper ends of the lowermost wide-width lowermost portions 36a. In such a case, the lower face side of the gas-liquid separator 18 engages with the stepped face (i.e., the shoulder face) 21c, the coupling plate 24, and the extension portions 36e of the plate-like ribs 36. Therefore, when the inner pipe 31 is press-fitted in a manner described above, the upper-side flanged portion 31b formed on the inner pipe 31 and serving as the upper-side pressing portion is pressure-joined to the upper face of the gas-liquid separator 18 (or the peripheral edge of the through-hole 18v therein) so that the gas-liquid separator 18 is tightly held between the stepped face (i.e., the shoulder face) 21c, the coupling plate 24, and the extension portions 36e of the plate-like ribs 36, each serving as the lower-side latch portion, and the upper-side flanged portion 31b serving as the upper-side pressing portion.
(3) Next, the cap member 12 is placed on the liquid-phase pipe 21 and the inner pipe 31 such that the liquid-phase outlet port 16 (or the lower large-diameter portion 16a thereof) in the cap member 12 has inserted therein (i.e., is arranged around) the upper end 21a (i.e., the upper-end thin-walled portion 22) of the liquid-phase pipe 21 and the gas-phase outlet port 17 (or the lower large-diameter portion 17a thereof) has inserted therein (i.e., is arranged around) the upper end 31a of the inner pipe 31.
(4) Accordingly, an assembly including the strainer 40, the outlet pipe portion 20 for the receiver, the outlet pipe portion 30 for the accumulator, the gas-liquid separator 18, and the cap member 12 is obtained. Then, an operation of winding the aforementioned bag containing desiccants therein around the outer pipe 32 and thus allowing the bag to be held thereon is performed, for example. After that, the tank 10 is disposed around the interior member 60 (i.e., a portion other than and below the cap member 12) of the assembly (from below; see Fig. 42), and the strainer 40 (or the tubular case portion 42 thereof) is pushed into the tank 10 in a press-fit manner so as to be placed at the bottom 13 of the tank 10.
(5) Finally, the cap member 12 is joined to the upper end of the tank 10 by welding. This allows the tank 10 to be hermetically sealed.

[0304] The operations of the refrigerant container 1D with the aforementioned structure during the cooling operation and the heating operation will be described.

[0305] In each of the cooling operation and the heating operation, a refrigerant in a gas-liquid mixed state, which has been introduced into the tank 10 from a condenser via the gas/liquid inlet port 15, collides with the gas-liquid separator 18 (or the ceiling portion 18a thereof) as illustrated in Fig. 44, and diffuses radially, and is then separated into a liquid-phase refrigerant and a gas-phase refrigerant. The liquid-phase refrigerant (including oil) is guided into the lower space of the tank 10 by falling along the inner peripheral face of the tank 10, and the gas-phase refrigerant is guided into the upper space of the tank 10.

[0306] During the cooling operation, for example, one or more on-off valves provided in a refrigerant flow path (not illustrated) are operated (see Patent Literature 2) so that the liquid-phase refrigerant guided to the lower space of the tank 10 passes through the mesh filter 45 of the strainer 40 and then accumulates in the tubular case portion 42. When the liquid-phase refrigerant passes through the mesh filter 45, foreign matter, such as sludge, in the liquid-phase refrigerant is trapped by the mesh filter 45 and thus is removed from the circulating refrigerant. The liquid-phase refrigerant that has accumulated in the tubular case portion 42 is drawn into the liquid-phase pipe 21 through the liquid-phase refrigerant drawing port 25, and is then guided to the expansion valve via the liquid-phase outlet port 16.

[0307] Therefore, during the cooling operation, the refrigerant container 1D of the present embodiment functions as a receiver (also referred to as a receiver drier).

[0308] In contrast, during the heating operation, one or more on-off valves provided in the refrigerant flow path (not illustrated) are switched (see Patent Literature 2) so that the gas-phase refrigerant separated by the gas-liquid separator 18 is suctioned to the suction side of the compressor via the upper space of the tank 10 → a space between the outer pipe 32 and the inner pipe 31 (i.e., the downward-feed flow channel portion 33) → the lower end of the outer pipe 32 → the inside of the inner pipe 31 → the gas-phase outlet port 17, and thus is circulated.

[0309] During the heating operation, the liquid-phase refrigerant that has accumulated in the tubular case portion 42 hardly flows to the expansion valve due to the relationship of the pressure difference.

[0310] In addition, oil that has accumulated in the tubular case portion 42 together with the liquid-phase refrigerant moves toward the bottom 13 of the tank 10 due to the difference in specific gravity, properties, and the like between the oil and the liquid-phase refrigerant, and is absorbed into the aforementioned gas-phase refrigerant to be suctioned to the suction side of the compressor via the downward-feed flow channel portion 33 → the lower end of the outer pipe 32 → the inside of the inner pipe 31 → the gas-phase outlet port 17. Thus, the oil is returned to the suction side of the compressor together with the gas-phase refrigerant through the oil return hole 35 provided in the baffle plate portion 43 at a position corresponding to the bottom of the outer pipe 32 → the inner pipe 31, and thus is circulated.

[0311] Therefore, during the heating operation, the refrigerant container 1D of the present embodiment functions as an accumulator.

[0312] As described above, the refrigerant container 1D of the present embodiment has both the functions of a receiver and an accumulator, and the receiver and the accumulator share the tank portion (i.e., the tank 10), the inlet port portion (i.e., the gas/liquid inlet port 15), the gas-liquid separation portion (i.e., the gas-liquid separator 18), and the strainer portion (i.e., the strainer 40) in common. Therefore, a rational structure with a small number of components can be provided.

[0313] In addition, the liquid-phase pipe 21 of the outlet pipe portion 20 for the receiver and the outer pipe 32 of the outlet pipe portion 30 for the accumulator are arranged side by side (with a gap therebetween) on the baffle plate portion 43 of the strainer 40, and the inner pipe 31 is press-fitted into and held by the outer pipe 32. Thus, for example, it is only necessary to provide the cap member 12 with the liquid-phase outlet port 16 and the gas-phase outlet port 17 that are straight and penetrate through the cap member 12 in the vertical direction. Therefore, in comparison with the aforementioned conventional refrigerant container proposed so far, it is possible to simplify the structure of the cap member 12 and the connected portion of the outlet pipe portion 20 (or the liquid-phase pipe 21) for the receiver and the liquid-phase outlet port 16, for example.

[0314] Further, the strainer 40, at least a part of the outlet pipe portion 20 for the receiver, and at least a part of the outlet pipe portion 30 for the accumulator, specifically, for example, the tubular case portion 42 and the baffle plate portion 43 forming the strainer 40, the liquid-phase pipe 21 forming the outlet pipe portion 20 for the receiver, and the outer pipe 32 forming the outlet pipe portion 30 for the accumulator are integrally molded using synthetic resin. Thus, it is possible to further simplify the structure and increase the proportion of synthetic resin portions that can be produced at a lower cost than metal components while securing the desired rigidity and heat resistance, for example. Therefore, it is possible to provide a refrigerant container with a rational structure with further reduced component costs and machining and assembly costs. Consequently, it is possible to effectively reduce the space occupied by the entire system, the number of components, the cost, and the size, for example.

[0315] In addition, the liquid-phase pipe 21 and the outer pipe 32 are integrally coupled together by the coupling plate 24, and the coupling plate 24 serves as a reinforcing member for the outlet pipe portion 20 (or the liquid-phase pipe 21) for the receiver and also as a lower-side latch portion for the gas-liquid separator 18 . Thus, rigidity is increased, and the stability of holding the gas-liquid separator 18 is also increased, for example.

[0316] Further, in the refrigerant container 1D of the present embodiment, the cap member 12 is not used for holding the gas-liquid separator 18 (that is, the gas-liquid separator is not held by being sandwiched between the cap member and the lower-side latch portion provided on the outlet pipe). Instead, the gas-liquid separator 18 is tightly held between the lower-side latch portions (i.e., the lower-side flanged portion 21b and the extension portions 36e of the plate-like ribs 36) provided on the liquid-phase pipe 21 and the inner pipe 31 and the upper-side pressing portion (i.e., the upper-side flanged portion 31b). Thus, even when the gas-liquid separator 18 is pushed downward by a refrigerant in a gas-liquid mixed state, which has blown into the tank 10 through the gas/liquid inlet port 15, the pressure is received by the baffle plate portion 42 of the strainer 40, which has been fixed to the bottom 13 of the tank 10 by press fit, via the liquid-phase pipe 21 and the inner pipe 31. Therefore, there is no possibility that the gas-liquid separator 18 will be pushed downward.

[0317] Accordingly, in comparison with the conventional refrigerant container in which the upper end of an outlet pipe provided with a lower-side latch portion is fixed to a cap member only through pipe expansion or swaging, for example, the refrigerant container 1D of the present embodiment has an increased force of holding the gas-liquid separator 18 and thus has increased stability. Thus, backlash and tilt of the gas-liquid separator 18 can be suppressed, and the desired gas-liquid separation performance can be obtained.

[0318] It has been confirmed through prototype experiments that when the inside diameter of the tank 10 is set to 60 to 90 mm, and the height H of the baffle plate portion 43 from the bottom 13 of the tank 10 is set to 5 to 10 mm, the gas-liquid separation performance as well as the oil return performance toward the compressor can be maintained at the same level as that of the present product.

Reference Signs List

[0319]

1 Refrigerant container (first embodiment)
2 Refrigerant container (second embodiment)
3 Refrigerant container (third embodiment)
4 Refrigerant container (fourth embodiment)
5 Refrigerant container (fifth embodiment)
6 Refrigerant container (sixth embodiment)
7 Refrigerant container (seventh embodiment)

8 Refrigerant container (eighth embodiment)
9 Refrigerant container (ninth embodiment)
1A Refrigerant container (tenth embodiment)
1B Refrigerant container (eleventh embodiment)
1C Refrigerant container (twelfth embodiment)
1D Refrigerant container (thirteenth embodiment)
10 Tank
12 Cap member (cap portion)
12d Downward projection on side of outlet pipe portion for receiver
12e Downward projection on side of outlet pipe portion for accumulator
13 Bottom of tank
15 Gas/liquid inlet port
16 Liquid-phase outlet port
16a Lower large-diameter portion of liquid-phase outlet port (fifth to eighth and thirteenth embodiments)
16b Intermediate large-diameter portion of liquid-phase outlet port
16c Lower intermediate-diameter portion of liquid-phase outlet port (ninth to twelfth embodiments)
17 Gas-phase outlet port
17a Lower large-diameter portion of gas-phase outlet port (fifth to eighth, and thirteenth embodiments)
17b Intermediate large-diameter portion of gas-phase outlet port
17c Lower intermediate-diameter portion of gas-phase outlet port (ninth to twelfth embodiments)
18 Gas-liquid separator
18a Ceiling portion
18b Peripheral wall
18u Through-hole for liquid-phase pipe
18v Through-hole for inner pipe
20 Outlet pipe portion for receiver
21 Liquid-phase pipe
21a Upper end (i.e., expanded pipe portion) of liquid-phase pipe
21b Lower-side flanged portion (i.e., lower-side latch portion) (fifth embodiment)
21c Stepped face (i.e., shoulder face) (i.e., lower-side latch portion) (sixth and thirteenth embodiments)
21k Flanged portion (i.e., lower-side latch portion) of liquid-phase pipe
22 Upper-end thin-walled portion (thirteenth embodiment)
24 Coupling plate (i.e., coupling portion) (sixth and thirteenth embodiments)
24a Opening (sixth and thirteenth embodiments)
25 Liquid-phase refrigerant drawing port
26 Plate-like rib (seventh embodiment)
30 Outlet pipe portion for accumulator
30A Double pipe (second and seventh embodiments)
31 Inner pipe
31a Upper end (i.e., expanded pipe portion) of inner pipe
31b Upper-side flanged portion (i.e., upper-side pressing portion) (fifth and thirteenth embodiments)
31k Flanged portion (i.e., lower-side latch portion) of inner pipe
31f Pressure equalization hole
32 Outer pipe
33 Downward-feed flow channel portion
35 Oil return hole
36 Plate-like rib
36a Lowermost wide-width portion (fifth and thirteenth embodiments)
36b Lower narrow-width portion (fifth and thirteenth embodiments)
36c Upper narrow-width portion (fifth and thirteenth embodiments)
36e Extension portion (i.e., lower-side latch portion) of plate-like rib (fifth and thirteenth embodiments)
36 m Lower end of plate-like rib
36n Narrow-width portion of plate-like rib
37 Plate-like rib (second, seventh , and eighth embodiments)
37e Extension portion (i.e., lower-side latch portion) of plate-like rib (second, seventh, and eighth embodiments)
40 Strainer
42 Tubular case portion
42A Seal holding portion (ninth embodiment)
42a, 42b Holding plate portions (ninth embodiment)
42B Flanged portion (tenth and eleventh embodiments)
42e Cutout portion (ninth to eleventh embodiments)
43 Baffle plate portion
43a Sideways bridge portion
43b Depthways bridge portion
43A Outer annular disk portion (ninth to twelfth embodiments)
43B Sideways bridge portion (ninth to twelfth embodiments)
43c, 43d Circular plate portions (ninth to twelfth embodiments)
43f Rib-like projection
44 Window portion (ninth to twelfth embodiments)
44a, 44b Window portions
45 Mesh filter
47 Tubular case portion (twelfth embodiment)
47Q Tubular contact portion (twelfth embodiment)
47R Annular inner peripheral coupling portion (twelfth embodiment)
51 Liquid-phase pipe holding portion
52 Gas-phase pipe holding portion (second, seventh, and eighth embodiments)
60 Interior member
61 Interior assembly (ninth to twelfth embodiments)
67 O-ring (fourth embodiment)
71 Annular seal member (ninth embodiment)
71u Tubular flexure portion (ninth embodiment)
72A Annular seal member (tenth embodiment)
72B Annular seal member (modified example (Ver.

1) of tenth embodiment)
72C Annular seal member (modified example (Ver. 2) of tenth embodiment)
72u Outer peripheral portion (i.e., annular pressure-joined portion)
72v Inner peripheral portion (i.e., tightly holding portion)
72t Annular protrusion
73A Annular seal member (eleventh embodiment)
73B Annular seal member (modified example (Ver. 1) of eleventh embodiment)
73C Annular seal member (modified example (Ver. 2) of eleventh embodiment)
73D Annular seal member (modified example (Ver. 3) of eleventh embodiment)
73u Tubular pressure-joined portion
73v Tightly holding portion
73t Annular protrusion
73r Rounded or chamfered portion

Claims

1. A refrigerant container (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) comprising: a cap portion (12);

a closed-bottomed tubular tank (10) with an upper-face opening hermetically closed by the cap portion (12) including a gas/liquid inlet port (15), a liquid-phase outlet port (16), and a gas-phase outlet port (17);
a gas-liquid separator (18) disposed in the tank (10) at a position below the cap portion, the gas-liquid separator (18) facing the gas/liquid inlet port (15);
an outlet pipe portion (20) for a receiver, the outlet pipe portion (20) for the receiver including a liquid-phase refrigerant drawing port (25) and being adapted to guide only a liquid-phase refrigerant separated by the gas-liquid separator (18) to a side of an expansion valve via the liquid-phase outlet port (16);
an outlet pipe portion (30) for an accumulator, the outlet pipe portion (30) for the accumulator including an oil return hole (35) and being adapted to guide a gas-phase refrigerant separated by the gas-liquid separator (18) to a suction side of a compressor via the gas-phase outlet port (17) together with oil contained in the liquid-phase refrigerant; and
a strainer (40) for trapping foreign matter contained in a refrigerant,
wherein:

the strainer (40) includes

a tubular case portion (42) adapted to be placed at a bottom of the tank (10),
a baffle plate portion (43) partially covering an upper-face opening of the tubular case portion (42), and
a mesh filter (45) covering at least a portion of the upper-face opening of the tubular case portion (42) not covered with the baffle plate portion (43), and

the outlet pipe portion (20) for the receiver and the outlet pipe portion (30) for the accumulator are arranged side by side on the baffle plate portion (43).

2. The refrigerant container (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) according to claim 1, wherein the outlet pipe portion (20) for the receiver and the outlet pipe portion (30) for the accumulator are arranged side by side on the baffle plate portion (43) with a gap between the outlet pipe portion (20) for the receiver and the outlet pipe portion (30) for the accumulator.

3. The refrigerant container (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) according to claim 1,
wherein:

the liquid-phase outlet port (16) has an intermediate large-diameter portion formed therein, the gas-phase outlet port (17) has an intermediate large-diameter portion formed therein, and upper ends (21a, 31a) of the outlet pipe portion (20) for the receiver and the outlet pipe portion (30) for the accumulator are fixed to the respective intermediate large-diameter portions (16b, 17b) of the liquid-phase outlet port (16) and the gas-phase outlet port (17) through pipe expansion.

4. The refrigerant container (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) according to claim 1,
wherein:

upper ends (21a, 31a) of the outlet pipe portion (20) for the receiver and the outlet pipe portion (30) for the accumulator are respectively inserted into the liquid-phase outlet port (16) and the gas-phase outlet port (17), and
portions of the outlet pipe portion (20) for the receiver and the outlet pipe portion (30) for the accumulator at positions below the inserted portions are fixed to the cap portion through swaging.

5. The refrigerant container (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) according to claim 1, wherein the outlet pipe portion (20) for the receiver includes

a liquid-phase pipe (21) with an upper end (21a) inserted into the liquid-phase outlet port (16),

and
a liquid-phase pipe holding portion (51) provided on the baffle plate portion (43) so as to hold the liquid-phase pipe (21).

6. The refrigerant container (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) according to claim 5, wherein:

the gas-liquid separator (18) has formed therein a through-hole (18u), the through-hole (18u) being adapted to pass the upper end of the liquid-phase pipe (21),
an upper portion of the liquid-phase pipe (21) is provided with a lower-side latch portion adapted to engage with the gas-liquid separator (18) on a lower side of the gas-liquid separator (18), and the gas-liquid separator (18) is tightly held between a lower face of the cap portion and the lower-side latch portion.

7. The refrigerant container (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) according to claim 6, wherein the upper portion of the liquid-phase pipe (21) is provided with a flanged portion (21k) or a thick-walled portion as the lower-side latch portion.

8. The refrigerant container (6, 7) according to claim 1, wherein the outlet pipe portion (30) for the accumulator includes a double pipe (30A) of an inner pipe (31) and an outer pipe (32), the inner pipe (31) having an upper end (31a) inserted into the gas-phase outlet port (17), and the outer pipe (32) being provided on the baffle plate portion (43) so as to hold the inner pipe (31).

9. The refrigerant container (6, 7) according to claim 1, wherein the outlet pipe portion (30) for the accumulator includes

a double pipe (30A) of an inner pipe (31) and an outer pipe (32), the inner pipe (31) having an upper end (31a) inserted into the gas-phase outlet port (17), and the outer pipe (32) being integrated with the inner pipe (31), and
a gas-phase pipe holding portion (52) provided on the baffle plate portion (43) so as to hold the double pipe (30A).

10. The refrigerant container (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) according to claim 8 or 9, wherein:

the gas-liquid separator (18) has formed therein a through-hole (18v), the through-hole (18v) being adapted to pass the upper end of the inner pipe (31),
an upper portion of the inner pipe (31) is provided with a lower-side latch portion adapted to engage with the gas-liquid separator (18) on a lower side of the gas-liquid separator (18), and the gas-liquid separator (18) is tightly held between a lower face of the cap portion and the lower-side latch portion.

11. The refrigerant container (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) according to claim 10, wherein the upper portion of the inner pipe (31) is provided with a flanged portion (31b) or a thick-walled portion as the lower-side latch portion.

12. The refrigerant container (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) according to claim 1, wherein the gas-liquid separator (18) is fixed to the cap portion through swaging.

13. The refrigerant container (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) according to claim 12, wherein the gas-liquid separator (18) is fixed to the cap portion through swaging at a position around the outlet pipe portion (30) for the accumulator or the outlet pipe portion (20) for the receiver.

14. The refrigerant container (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) according to claim 1, wherein the tubular case portion (42) of the strainer (40) is fitted into the bottom of the tank (10) in a press-fit manner.

15. The refrigerant container (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) according to claim 8 or 9, wherein:

the gas-liquid separator (18) has formed therein a through-hole (18v), the through-hole (18v) being adapted to pass the inner pipe (31) of the outlet pipe portion (30) for the accumulator, and
at least one rib (36) is provided between the inner pipe (31) and the outer pipe (32) of the outlet pipe portion (30) for the accumulator, the least one rib (36) coupling the inner pipe (31) and the outer pipe (32) together and serving as a lower-side latch portion adapted to engage with the gas-liquid separator (18) on a lower side of the gas-liquid separator (18).

16. The refrigerant container (1C) according to claim 15, wherein the outlet pipe portion (20) for the receiver and the outlet pipe portion (30) for the accumulator are integrally coupled together by at least an upper end of a coupling portion (47R) serving as the lower-side latch portion.

17. The refrigerant container (1C) according to claim 16, wherein a lower end of the coupling portion (47R) is coupled to the baffle plate portion (43).

18. The refrigerant container (6, 7) according to claim 15, wherein the outlet pipe portion (30) for the accumulator includes a double pipe (30A) of the inner pipe and the outer pipe (32), the outer pipe (32) being integrally provided on the baffle plate portion (43) so as to hold the inner pipe (31).

19. The refrigerant container (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) according to claim 18, wherein:

the at least one rib (36) is provided on the outer pipe (32) in a manner protruding radially inward, and
an extension portion of the rib (36) that extends upward beyond an upper end of the outer pipe (32) serves as the lower-side latch portion.

20. The refrigerant container (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) according to claim 19, wherein:

the inner pipe (31) at a position above the lower-side latch portion is provided with an upper-side flanged portion (31b), a large-diameter portion, or a thick-walled portion that serves as an upper-side pressing portion capable of pressing the gas-liquid separator (18) from an upper side of the gas-liquid separator (18), and
the gas-liquid separator (18) is tightly held between the lower-side latch portion and the upper-side pressing portion.

21. The refrigerant container (6, 7, 8) according to claim 15, wherein the outlet pipe portion (30) for the accumulator includes

a double pipe (30A) of the inner pipe (31) and the outer pipe (32) integrally provided with the inner pipe (31), and
a gas-phase pipe holding portion (52) integrally provided on the baffle plate portion (43) so as to hold the double pipe (30A).

22. The refrigerant container (5, 1D) according to claim 21, wherein:

the inner pipe (31) and the outer pipe (32) are integrated by the at least one rib (36) provided between the inner pipe (31) and the outer pipe (32), and
an extension portion (36e) of the rib (36) that extends upward beyond an upper end of the outer pipe (32) serves as the lower-side latch portion.

23. The refrigerant container (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) according to claim 22, wherein the gas-liquid separator (18) is tightly held between the lower-side latch portion and a lower face of the cap portion serving as an upper-side pressing portion capable of pressing the gas-liquid separator (18) from an upper side of the gas-liquid separator (18).

24. The refrigerant container (9, 1A, 1B, 1C) according to claim 1, wherein an annular seal member (71, 72A, 72B, 72C, 73A, 73B, 73C, 73D) is provided on the strainer (40) so as to close a gap (S1) formed between an inner peripheral face of the tank (10) and the strainer (40), the annular seal member (71, 72A, 72B, 72C, 73A, 73B, 73C, 73D) being adapted to be always resiliently pressure-joined to the inner peripheral face of the tank (10).

25. The refrigerant container (9, 1A, 1B) according to claim 24, wherein the annular seal member (71, 72A, 72B, 72C, 73A, 73B, 73C, 73D) is attached to the tubular case portion (42) so as to close a gap (S1) formed between the inner peripheral face of the tank (10) and the tubular case portion (42).

26. The refrigerant container (9) according to claim 25, wherein:

the annular seal member (71) has a shape of an annular disk in a natural state, and
when the annular seal member (71) is inserted into the tank (10), an outer peripheral portion of the annular seal member (71) flexes upward, and a resulting tubular flexure portion (71u) is always resiliently pressure-joined to the inner peripheral face of the tank (10).

27. The refrigerant container (9) according to claim 26, wherein:

an outer periphery of the tubular case portion (42) is provided with a seal holding portion (42A) including upper and lower holding plate portions (42a, 42b), and
an inner peripheral portion of the annular seal member (71) is adapted to be fitted into and held between the upper and lower holding plate portions (42a, 42b).

28. The refrigerant container (1A) according to claim 25, wherein:

an outer periphery of the tubular case portion (42) is provided with a flanged portion (42B), and the annular seal member (72A, 72B, 72C) includes

an annular pressure-joined portion (72u) with a semicircular cross-section or a C-

shaped cross-section, the annular pressure-joined portion being adapted to be always resiliently pressure-joined to the inner peripheral face of the tank (10), and
a pair of upper and lower tightly holding portions (72v) continuous with opposite ends of the annular pressure-joined portion and adapted to tightly hold the flanged portion (42B).

29. The refrigerant container (1B) according to claim 25, wherein:

an outer periphery of the tubular case portion (42) is provided with a flanged portion (42B), and the annular seal member (73A, 73B, 73C, 73D) includes

a tubular pressure-joined portion (73u) adapted to be always resiliently pressure-joined to the inner peripheral face of the tank (10), and
a pair of upper and lower tightly holding portions (73v) continuous with an inner peripheral side of the tubular pressure-joined portion (73u) and adapted to tightly hold the flanged portion (42B).

30. The refrigerant container (1A, 1B) according to claim 28 or 29,
wherein:
an upper portion or each of an upper portion and a lower portion of an outer peripheral side of the annular seal member (72A, 72B, 72C, 73A, 73B, 73C, 73D) is provided with an annular protrusion (72t, 73t), the annular protrusion (72t, 73t) protruding radially outward in a natural state and being adapted to be strongly pushed against the inner peripheral face of the tank (10) when the annular seal member (72A, 72B, 72C, 73A, 73B, 73C, 73D) is inserted into the tank (10).

31. The refrigerant container (1B) according to claim 29, wherein a corner at a lower end of an outer peripheral side of the tubular pressure-joined portion (73u) is provided with a rounded or chamfered portion (73r).

32. The refrigerant container (9, 1A, 1B) according to any one of claims 25 to 31, wherein the tubular case portion (42) has a cutout portion (42e) formed therein, the cutout portion (42e) being adapted to circulate a refrigerant on an inner peripheral side and an outer peripheral side of the tubular case portion (42).

33. The refrigerant container (1C) according to claim 24, wherein the tubular case portion (42) includes the annular seal member (71, 72A, 72B, 72C, 73A, 73B, 73C, 73D) so as to close a gap (S1) formed between the inner peripheral face of the tank (10) and the tubular case portion (42), the annular seal member (71, 72A, 72B, 72C, 73A, 73B, 73C, 73D) including an annular inner peripheral coupling portion (47R) with a wave-like cross-section and a tubular contact portion (47Q), the annular inner peripheral coupling portion (47R) being coupled to the baffle plate portion (43) and being elastically deformable in a radial direction and a vertical direction, and the tubular contact portion (47Q) being continuous with an outer peripheral side of the annular inner peripheral coupling portion (47R) and being adapted to be in contact with the inner peripheral face and the bottom of the tank (10) so that an end face of the tubular contact portion (47Q) is always resiliently pressure-joined to the inner peripheral face and the bottom of the tank (10).

34. The refrigerant container (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) according to claim 1, wherein the strainer (40), at least a part of the outlet pipe portion (20) for the receiver, and at least a part of the outlet pipe portion (30) for the accumulator are integrally molded using synthetic resin.

35. The refrigerant container (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) according to claim 34,
wherein:

the outlet pipe portion (20) for the receiver includes a liquid-phase pipe (21) with an upper end inserted into the liquid-phase outlet port (16),
the outlet pipe portion (30) for the accumulator includes a double pipe (30A) of an inner pipe (31) and an outer pipe (32), the inner pipe (31) having an upper end inserted into the gas-phase outlet port (17), and the outer pipe (32) holding the inner pipe (31), and
the strainer (40), the liquid-phase pipe (21), and the outer pipe (32) are integrally molded using synthetic resin.

36. The refrigerant container (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) according to claim 35, wherein the liquid-phase pipe (21) and the outer pipe (32) are integrally coupled together by a coupling portion (47R).

37. The refrigerant container (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) according to claim 36, wherein the coupling portion (47R) serves as a lower-side latch portion adapted to engage with the gas-liquid separator (18) on a lower side of the gas-liquid separator (18).

38. The refrigerant container (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) according to claim 36 or 37, wherein the coupling portion (47R) is also coupled to the strainer

(40).

39. The refrigerant container (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) according to any one of claims 35 to 38, wherein:

the gas-liquid separator (18) has through-holes (18u, 18v) formed therein, the through-holes (18u, 18v) being adapted to pass the liquid-phase pipe (21) and the inner pipe (31), respectively,
each of the liquid-phase pipe (21) and the inner pipe (31) is provided with a lower-side latch portion adapted to engage with the gas-liquid separator (18) on a lower side of the gas-liquid separator (18),
the inner pipe (31) at a position above the lower-side latch portion is provided with an upper-side pressing portion capable of pressing the gas-liquid separator (18) from an upper side of the gas-liquid separator (18), and
the gas-liquid separator (18) is tightly held between the lower-side latch portion and the upper-side pressing portion.

40. The refrigerant container (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) according to claim 39, wherein:

at least one rib (36) is provided on the outer pipe (32) in a manner protruding radially inward, and an extension portion of the rib (36) that extends upward beyond an upper end of the outer pipe (32) serves as the lower-side latch portion.

41. The refrigerant container (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) according to claim 39, wherein the inner pipe (31) is provided with an upper-side flanged portion, a large-diameter portion, or a thick-walled portion as the upper-side pressing portion.

42. The refrigerant container (7) according to claim 39, wherein the liquid-phase pipe (21) is provided with a flanged portion, a large-diameter portion, a thick-walled portion, or a rib (26) as the lower-side latch portion.

Patentansprüche

1. Ein Kältemittelbehälter (1, 2, 3, 4, 5, 6, 7, 8, 9, IA, IB, IC, ID), umfassend:

- eine Verschlusskappe (12);
- einen röhrenförmigen Tank (10) mit geschlossenem Boden, der eine obere Öffnung aufweist, die hermetisch durch die Verschlusskappe (12) verschlossen ist, die einen Gas-/Flüssigkeitseinlass (15), einen Flüssigkeitsphasen-Auslass (16) und einen Gasphasen-Auslass (17) umfasst;
- einen Gas-Flüssigkeits-Trenner (18), der im Tank (10) in einer Position unterhalb der Verschlusskappe angeordnet ist und der dem Gas-/Flüssigkeitseinlass (15) zugewandt ist;
- einen Auslassrohrabschnitt (20) für einen Empfänger, wobei der Auslassrohrabschnitt (20) einen Flüssigkeitsphasen-Kältemittelauszug (25) umfasst und dazu eingerichtet ist, ausschließlich ein vom Gas-Flüssigkeits-Trenner (18) getrenntes Flüssigkeitsphasen-Kältemittel über den Flüssigkeitsphasen-Auslass (16) zu einer Seite eines Expansionsventils zu führen;
- einen Auslassrohrabschnitt (30) für einen Auffangbehälter, wobei der Auslassrohrabschnitt (30) ein Öl-Rückführungsloch (35) umfasst und dazu eingerichtet ist, ein vom Gas-Flüssigkeits-Trenner (18) getrenntes Gasphasen-Kältemittel zusammen mit im Flüssigkeitsphasen-Kältemittel enthaltenem Öl über den Gasphasen-Auslass (17) zu einer Ansaugseite eines Kompressors zu führen;
- ein Sieb (40) zum Abscheiden von im Kältemittel enthaltenen Fremdkörpern,

wobei

das Sieb (40) umfasst:

einen röhrenförmigen Gehäuseabschnitt (42), der eingerichtet ist, am Boden des Tanks (10) angeordnet zu werden,
einen Sperrplatten-Abschnitt (43), der einen Teil der oberen Öffnungsfläche des röhrenförmigen Gehäuseabschnitts (42) abdeckt, und
einen Maschenfilter (45), der zumindest einen Teil der nicht vom Sperrplatten-Abschnitt (43) bedeckten oberen Öffnungsfläche des röhrenförmigen Gehäuseabschnitts (42) abdeckt, und

der Auslassrohrabschnitt (20) für den Empfänger und der Auslassrohrabschnitt (30) für den Auffangbehälter seitlich am Sperrplatten-Abschnitt (43) angeordnet sind.

2. Der Kältemittelbehälter (1, 2, 3, 4, 5, 6, 7, 8, 9, IA, IB, IC, ID) nach Anspruch 1, wobei der Auslassrohrabschnitt (20) für den Empfänger und der Auslassrohrabschnitt (30) für den Auffangbehälter nebeneinander am Sperrplatten-Abschnitt (43) mit einem Spalt zwischen dem Auslassrohrabschnitt (20) für den Empfänger und dem Auslassrohrabschnitt (30) für den Auffangbehälter angeordnet sind.

3. Der Kältemittelbehälter (1, 2, 3, 4, 5, 6, 7, 8, 9, IA, IB, IC, ID) nach Anspruch 1, wobei

im Flüssigkeitsphasen-Auslass (16) ein mittlerer Abschnitt mit großem Durchmesser ausgeformt ist,
im Gasphasen-Auslass (17) ein mittlerer Abschnitt mit großem Durchmesser ausgeformt ist, und
obere Enden (21a, 31a) des Auslassrohrabschnitts (20) für den Empfänger und des Auslassrohrabschnitts (30) für den Auffangbehälter durch Rohrausdehnung an den jeweiligen mittleren Abschnitt mit großem Durchmesser (16b, 17b) des Flüssigkeitsphasen-Auslass (16) und Gasphasen-Auslasses (17) befestigt sind.

4. Der Kältemittelbehälter (1, 2, 3, 4, 5, 6, 7, 8, 9, IA, IB, IC, ID) nach Anspruch 1, wobei

obere Enden (21a, 31a) des Auslassrohrabschnitts (20) für den Empfänger und des Auslassrohrabschnitts (30) für den Auffangbehälter jeweils in den Flüssigkeitsphasen-Auslass (16) und den Gasphasen-Auslass (17) eingeführt sind, und
Abschnitte der Auslassrohrabschnitte (20) für den Empfänger und des Auslassrohrabschnitts (30) für den Auffangbehälter in Bereichen unterhalb der eingeführten Abschnitte durch Umschweißen an der Verschlusskappe befestigt sind.

5. Der Kältemittelbehälter (1, 2, 3, 4, 5, 6, 7, 8, 9, IA, IB, IC, ID) nach Anspruch 1, wobei der Auslassrohrabschnitt (20) für den Empfänger umfasst:

ein Flüssigkeitsphasen-Rohr (21) mit einem oberen Ende (21a), das in den Flüssigkeitsphasen-Auslass (16) eingeführt ist, und
eine Halteeinrichtung für das Flüssigkeitsphasen-Rohr (51), das am Sperrplatten-Abschnitt (43) bereitgestellt ist, um das Flüssigkeitsphasen-Rohr (21) zu halten.

6. Der Kältemittelbehälter (1, 2, 3, 4, 5, 6, 7, 8, 9, IA, IB, IC, ID) nach Anspruch 5, wobei

im Gas-Flüssigkeits-Trenner (18) ein Durchgangsloch (18u) ausgeformt ist, das dazu eingerichtet ist, das obere Ende des Flüssigkeitsphasen-Rohrs (21) zu passieren,
ein oberer Teil des Flüssigkeitsphasen-Rohrs (21) mit einem seitlich unteren Verriegelungsabschnitt versehen ist, der eingerichtet ist, an einem unteren Bereich des Gas-Flüssigkeits-Trenners (18) mit dem Gas-Flüssigkeits-Trenners (18) einzugreifen, und
der Gas-Flüssigkeits-Trenner (18) zwischen einer Unterseite der Verschlusskappe und dem seitlich unteren Verriegelungsabschnitt festgehalten wird.

7. Der Kältemittelbehälter (1, 2, 3, 4, 5, 6, 7, 8, 9, IA, IB, IC, ID) nach Anspruch 6, wobei der obere Teil des Flüssigkeitsphasen-Rohrs (21) mit einem Flanschabschnitt (21k) oder einem dickwandigen Abschnitt als seitlich unterem Verriegelungsabschnitt versehen ist.

8. Der Kältemittelbehälter (6, 7) nach Anspruch 1, wobei der Auslassrohrabschnitt (30) für den Auffangbehälter ein Doppelrohr (30A) mit einem Innenrohr (31) und einem Außenrohr (32) umfasst, wobei das Innenrohr (31) ein oberes Ende (31a) aufweist, das in den Gasphasen-Auslass (17) eingeführt ist, und wobei das Außenrohr (32) am Sperrplatten-Abschnitt (43) angebracht ist, um das Innenrohr (31) zu halten.

9. Der Kältemittelbehälter (6, 7) nach Anspruch 1, wobei der Auslassrohrabschnitt (30) für den Auffangbehälter umfasst:

ein Doppelrohr (30A) mit einem Innenrohr (31) und einem Außenrohr (32), wobei das Innenrohr (31) ein oberes Ende (31a) aufweist, das in den Gasphasen-Auslass (17) eingeführt ist, und wobei das Innenrohr (31) in dem Außenrohr (32) integriert ist, und
einen Gasphasen-Rohr-Halteabschnitt (52), der am Sperrplatten-Abschnitt (43) bereitgestellt ist, um das Doppelrohr (30A) zu fixieren.

10. Der Kältemittelbehälter (1, 2, 3, 4, 5, 6, 7, 8, 9, IA, IB, IC, ID) nach Anspruch 8 oder 9, wobei

im Gas-Flüssigkeits-Trenner (18) ein Durchgangsloch (18v) ausgeformt ist, das dazu eingerichtet ist, das obere Ende des Innenrohrs (31) zu passieren,
oberer Abschnitt des Innenrohrs (31) mit einem seitlich unteren Verriegelungsabschnitt versehen ist, der eingerichtet ist, an einem unteren Bereich des Gas-Flüssigkeits-Trenners (18) mit dem Gas-Flüssigkeits-Trenners (18) einzugreifen, und
der Gas-Flüssigkeits-Trenner (18) zwischen einer Unterseite der Verschlusskappe und dem seitlich unteren Verriegelungsabschnitt festgehalten wird .

11. Der Kältemittelbehälter (1, 2, 3, 4, 5, 6, 7, 8, 9, IA, IB, IC, ID) nach Anspruch 10, wobei der obere Teil des Innenrohrs (31) mit einem Flanschabschnitt (31b) oder einem dickwandigen Abschnitt als seitlich unterem Verriegelungsabschnitt versehen ist.

12. Der Kältemittelbehälter (1, 2, 3, 4, 5, 6, 7, 8, 9, IA, IB, IC, ID) nach Anspruch 1, wobei der Gas-Flüssigkeits-Trenner (18) durch Umschweißen an der Verschlusskappe befestigt ist.

13. Der Kältemittelbehälter (1, 2, 3, 4, 5, 6, 7, 8, 9, IA, IB, IC, ID) nach Anspruch 12, wobei der Gas-Flüssigkeits-Trenner (18) an einer Position um den Auslassrohrabschnitt (30) für den Auffangbehälter oder den Auslassrohrabschnitt (20) für den Empfänger durch Umschweißen an der Verschlusskappe fixiert ist.

14. Der Kältemittelbehälter (1, 2, 3, 4, 5, 6, 7, 8, 9, IA, IB, IC, ID) nach Anspruch 1, wobei der röhrenförmige Gehäuseabschnitt (42) des Siebs presspassend in den Boden des Tanks (10) eingesetzt ist.

15. Der Kältemittelbehälter (1, 2, 3, 4, 5, 6, 7, 8, 9, IA, IB, IC, ID) nach Anspruch 8 oder 9, wobei

im Gas-Flüssigkeits-Trenner (18) ein Durchgangsloch (18v) ausgeformt ist, das dazu eingerichtet ist, das Innenrohr (31) des Auslassrohrabschnitts (30) für den Auffangbehälter zu passieren, und
mindestens eine Rippe (36), die zwischen dem Innenrohr (31) und dem Außenrohr (32) des Auslassrohrabschnitts (30) für den Auffangbehälter angeordnet ist, wobei die Rippe (36) das Innenrohr (31) und das Außenrohr (32) miteinander koppelt und als seitlich unterer Verriegelungsabschnitt dient, der eingerichtet ist, an einem unteren Bereich des Gas-Flüssigkeits-Trenners (18) mit dem Gas-Flüssigkeits-Trenners (18) einzugreifen.

16. Der Kältemittelbehälter (1C) nach Anspruch 15, wobei der Auslassrohrabschnitt (20) für den Empfänger und der Auslassrohrabschnitt (30) für den Auffangbehälter durch mindestens ein oberes Ende eines Kopplungsabschnitts (47R), das als seitlich unterer Verriegelungsabschnitt dient, integral miteinander gekoppelt sind.

17. Der Kältemittelbehälter (1C) nach Anspruch 16, wobei ein unteres Ende des Kopplungsabschnitts (47R) mit dem Sperrplatten-Abschnitt (43) verbunden ist.

18. Der Kältemittelbehälter (6, 7) nach Anspruch 15, wobei der Auslassrohrabschnitt (30) für den Auffangbehälter ein Doppelrohr (30A) mit einem Innenrohr und einem Außenrohr (32) umfasst, wobei das Außenrohr (32) integral am Sperrplatten-Abschnitt (43) angeordnet ist, um das Innenrohr (31) zu halten.

19. Der Kältemittelbehälter (1, 2, 3, 4, 5, 6, 7, 8, 9, IA, IB, IC, ID) nach Anspruch 18, wobei

die mindestens eine Rippe (36) derart am Außenrohr (32) angeordnet ist, dass sie in radialer Weise nach innen hervorragt, und
ein Erweiterungsabschnitt der Rippe (36), der sich über das obere Ende des Außenrohrs (32) hinaus erstreckt, als seitlich unterer Verriegelungsabschnitt dient.

20. Der Kältemittelbehälter (1, 2, 3, 4, 5, 6, 7, 8, 9, IA, IB, IC, ID) nach Anspruch 19, wobei

das Innenrohr (31) in einem Bereich oberhalb des seitlich unteren Verriegelungsabschnitts mit einem Flanschabschnitt (31b), einem Abschnitt mit großem Durchmesser oder einem dickwandigen Abschnitt versehen ist, der als oberseitiger Druckabschnitt dient, der eingerichtet ist, den Gas-Flüssigkeits-Trenner (18) von einer oberen Seite des Gas-Flüssigkeits-Trenners (18) zu drücken, und
der Gas-Flüssigkeits-Trenner (18) zwischen dem seitlich unteren Verriegelungsabschnitt und dem oberseitigen Druckabschnitt festgehalten wird.

21. Der Kältemittelbehälter (6, 7, 8) nach Anspruch 15, wobei der Auslassrohrabschnitt (30) für den Auffangbehälter umfasst:

ein Doppelrohr (30A) mit dem Innenrohr (31) und dem Außenrohr (32), das einstückig mit dem Innenrohr (31) ausgebildet ist, und
eine Gasphasen-Rohr-Halteeinrichtung (52) einstückig am Sperrplatten-Abschnitt (43) ausgebildet ist, um das Doppelrohr (30A) zu fixieren.

22. Der Kältemittelbehälter (5, ID) nach Anspruch 21, wobei

das Innenrohr (31) und das Außenrohr (32) durch die mindestens eine zwischen ihnen vorgesehene Rippe (36) einstückig sind, und
ein Erweiterungsabschnitt (36e) der Rippe (36), der sich über das obere Ende des Außenrohrs (32) hinaus erstreckt, als seitlich unterer Verriegelungsabschnitt dient.

23. Der Kältemittelbehälter (1, 2, 3, 4, 5, 6, 7, 8, 9, IA, IB, IC, ID) nach Anspruch 22, wobei der Gas-Flüssigkeits-Trenner (18) zwischen dem seitlich unteren Verriegelungsabschnitt und der Unterseite der Verschlusskappe, welche als oberseitiger Druckabschnitt dient, der eingerichtet ist, den Gas-Flüssigkeits-Trenner (18) von einer oberen Seite des Gas-

Flüssigkeits-Trenners (18) zu drücken, festgehalten wird.

24. Der Kältemittelbehälter (9, IA, IB, IC) nach Anspruch 1, wobei ein ringförmiges Dichtungsmittel (71, 72A, 72B, 72C, 73A, 73B, 73C, 73D) am Sieb (40) angebracht ist, um einen Spalt (S1) zu schließen, der zwischen einer inneren Umfangsfläche des Tanks (10) und dem Sieb (40) ausgebildet ist, wobei das ringförmige Dichtungsmittel (71, 72A, 72B, 72C, 73A, 73B, 73C, 73D) eingerichtet ist, stets elastisch druckgepresst an der inneren Umfangsfläche des Tanks (10) anzuliegen.

25. Der Kältemittelbehälter (9, IA, IB) nach Anspruch 24, wobei das ringförmige Dichtungsmittel (71, 72A, 72B, 72C, 73A, 73B, 73C, 73D) am röhrenförmigen Gehäuseabschnitt (42) befestigt ist, um einen Spalt (S1) zwischen der inneren Umfangsfläche des Tanks (10) und dem Gehäuseabschnitt (42) zu schließen.

26. Der Kältemittelbehälter (9) nach Anspruch 25, wobei

das ringförmige Dichtungsmittel (71) in seinem natürlichen Zustand die Form einer Scheibe aufweist, und
wenn das ringförmige Dichtungsmittel (71) in den Tank (10) eingeführt ist, sich ein äußerer Umfangsabschnitt des Dichtungsmittels (71) nach oben biegt, und wobei ein daraus resultierender röhrenförmiger Biegebereich (71u) stets elastisch druckgepresst an der inneren Umfangsfläche des Tanks (10) anliegt.

27. Der Kältemittelbehälter (9) nach Anspruch 26, wobei

ein äußerer Umfang des röhrenförmigen Gehäuseabschnitts (42) einen Dichtungs-Halteabschnitt (42A) mit oberen und unteren Halteplatten (42a, 42b) aufweist, und
ein innerer Umfangsabschnitt des ringförmigen Dichtungsmittels (71) eingerichtet ist, in die Halteplatten (42a, 42b) eingefügt und zwischen diesen gehalten zu werden.

28. Der Kältemittelbehälter (1A) nach Anspruch 25, wobei

ein äußerer Umfang des röhrenförmigen Gehäuseabschnitts (42) einen Flanschabschnitt (42B) aufweist, und
das ringförmige Dichtungsmittel (72A, 72B, 72C) umfasst:

einen ringförmigen, druckgepressten Abschnitt (72u) mit halbkreisförmigem oder C-förmigem Querschnitt, wobei der ringförmige, druckgepresste Abschnitt eingerichtet ist, stets elastisch druckgepresst an der inneren Umfangsfläche des Tanks (10) anzuliegen;
ein Paar aus oberen und unteren festhaltenden Abschnitten (72v), die fortlaufend an den gegenüberliegenden Enden des druckgepressten Abschnitts anschließen und eingerichtet sind, den Flanschabschnitt (42B) festzuhalten.

29. Der Kältemittelbehälter (1B) nach Anspruch 25, wobei

ein äußerer Umfang des röhrenförmigen Gehäuseabschnitts (42) einen Flanschabschnitt (42B) aufweist, und
das ringförmige Dichtungsmittel (73A, 73B, 73C, 73D) umfasst:

einen röhrenförmigen druckgepressten Abschnitt (73u), der eingerichtet ist, stets elastisch druckgepresst an der inneren Umfangsfläche des Tanks (10) anzuliegen, und
ein Paar aus oberen und unteren festhaltenden Abschnitten (73v), die fortlaufend an einer inneren Umfangsseite des druckgepressten Abschnitts (73u) anschließen und eingerichtet sind, den Flanschabschnitt (42B) festzuhalten.

30. Der Kältemittelbehälter (IA, 1B) nach Anspruch 28 oder 29, wobei

- ein oberer Teil oder ein oberer und ein unterer Teil einer äußeren Umfangsseite des ringförmigen Dichtungsmittels (72A, 72B, 72C, 73A, 73B, 73C, 73D) einen ringförmigen Vorsprung (72t, 73t) aufweisen, der in natürlichem Zustand radial nach außen hervorragt und eingerichtet ist, beim Einsetzen des Dichtungsmittels (72A, 72B, 72C, 73A, 73B, 73C, 73D) in den Tank (10) kräftig gegen die innere Umfangsfläche des Tanks gedrückt zu werden.

31. Der Kältemittelbehälter (1B) nach Anspruch 29, wobei eine Ecke an einem unteren Ende einer äußeren Umfangsseite des röhrenförmigen druckgepressten Abschnitts (73u) einen abgerundeten oder abgeschrägten Abschnitt (73r) aufweist.

32. Der Kältemittelbehälter (9, 1A, IB) nach einem der Ansprüche 25 bis 31, wobei der röhrenförmige Gehäuseabschnitt (42) einen Ausschnittsabschnitt (42e) aufweist, der eingerichtet ist, ein Kältemittel auf einer inneren und einer äußeren Umfangsseite des Gehäuseabschnitts (42) zirkulieren zu lassen.

33. Der Kältemittelbehälter (1C) nach Anspruch 24, wobei der röhrenförmige Gehäuseabschnitt (42) das ringförmige Dichtungsmittel (71, 72A, 72B, 72C, 73A, 73B, 73C, 73D) umfasst, um einen Spalt (S1), der zwischen der inneren Umfangsfläche des Tanks (10) und dem Gehäuseabschnitt (42) ausgebildet ist, zu schließen, wobei das Dichtungsmittel (71, 72A, 72B, 72C, 73A, 73B, 73C, 73D) einen ringförmigen inneren Kopplungsabschnitt (47R) mit wellenförmigem Querschnitt und einen röhrenförmigen Kontaktabschnitt (47Q) umfasst, wobei der ringförmige innere Kopplungsabschnitt (47R) mit dem Sperrplatten-Abschnitt (43) gekoppelt ist und in radialer sowie vertikaler Richtung elastisch verformbar ist, und wobei der röhrenförmige Kontaktabschnitt (47Q) fortlaufend an der äußeren Umfangsseite des Kopplungsabschnitts (47R) anschließt und eingerichtet ist, in Kontakt mit der inneren Umfangsfläche und dem Boden des Tanks (10) zu stehen, sodass eine Endfläche des Kopplungsabschnitts (47Q) stets elastisch druckgepresst an der inneren Umfangsfläche und dem Boden des Tanks (10) anliegt.

34. Der Kältemittelbehälter (1, 2, 3, 4, 5, 6, 7, 8, 9, IA, IB, IC, ID) nach Anspruch 1, wobei das Sieb (40), zumindest ein Teil des Auslassrohrabschnitts (20) für den Empfänger sowie zumindest ein Teil des Auslassrohrabschnitts (30) für den Auffangbehälter einstückig aus synthetischem Harz geformt sind.

35. Der Kältemittelbehälter (1, 2, 3, 4, 5, 6, 7, 8, 9, IA, IB, IC, ID) nach Anspruch 34, wobei

der Auslassrohrabschnitt (20) für den Empfänger ein Flüssigkeitsphasen-Rohr (21) mit einem oberen Ende, das in den Flüssigkeitsphasen-Auslass (16) eingeführt wird, umfasst,
der Auslassrohrabschnitt (30) für den Auffangbehälter ein Doppelrohr (30A) mit einem Innenrohr (31) und einem Außenrohr (32) umfasst, wobei das Innenrohr (31) ein oberes Ende besitzt, das in den Gasphasen-Auslass (17) eingeführt wird, und wobei das Außenrohr (32) das Innenrohr (31) hält, und
das Sieb (40), das Flüssigkeitsphasen-Rohr (21) und das Außenrohr (32) einstückig aus synthetischem Harz geformt sind.

36. Der Kältemittelbehälter (1, 2, 3, 4, 5, 6, 7, 8, 9, IA, IB, IC, ID) nach Anspruch 35, wobei das Flüssigkeitsphasen-Rohr (21) und das Außenrohr (32) durch einen Kopplungsabschnitt (47R) einstückig miteinander verbunden sind.

37. Der Kältemittelbehälter (1, 2, 3, 4, 5, 6, 7, 8, 9, IA, IB, IC, ID) nach Anspruch 36, wobei der Kopplungsabschnitt (47R) als seitlich unterer Verriegelungsabschnitt dient, der dazu geeignet ist, an einem unteren Bereich des Gas-Flüssigkeits-Trenners (18) mit dem Gas-Flüssigkeits-Trenners (18) einzugreifen.

38. Der Kältemittelbehälter (1, 2, 3, 4, 5, 6, 7, 8, 9, IA, IB, IC, ID) nach Anspruch 36 oder 37, wobei der Kopplungsabschnitt (47R) ebenfalls mit dem Sieb (40) gekoppelt ist.

39. Der Kältemittelbehälter (1, 2, 3, 4, 5, 6, 7, 8, 9, IA, IB, IC, ID) nach einem der Ansprüche 35 bis 38, wobei

im Gas-Flüssigkeits-Trenner (18) Durchgangslöcher (18u, 18v) ausgeformt sind, die eingerichtet sind, das Flüssigkeitsphasen-Rohr (21) und das Innenrohr (31) zu passieren,
sowohl das Flüssigkeitsphasen-Rohr (21) als auch das Innenrohr (31) jeweils einen seitlich unteren Verriegelungsabschnitt aufweisen, der dazu geeignet ist, an einem unteren Bereich des Gas-Flüssigkeits-Trenners (18) mit dem Gas-Flüssigkeits-Trenners (18) einzugreifen,
das Innenrohr (31) oberhalb des seitlich unteren Verriegelungsabschnitts einen oberseitigen Druckabschnitt aufweist, der eingerichtet ist, den Gas-Flüssigkeits-Trenner (18) von einer oberen Seite des Gas-Flüssigkeits-Trenners (18) zu drücken, und
der Gas-Flüssigkeits-Trenner (18) zwischen dem seitlich unteren Verriegelungsabschnitt und dem oberseitigen Druckabschnitt festgehalten wird.

40. Der Kältemittelbehälter (1, 2, 3, 4, 5, 6, 7, 8, 9, IA, IB, IC, ID) nach Anspruch 39, wobei

mindestens eine Rippe (36) derart am Außenrohr (32) angeordnet ist, dass sie in radialer Weise nach innen hervorragt, und
ein Erweiterungsabschnitt der Rippe (36), der sich über das obere Ende des Außenrohrs (32) hinaus erstreckt, als seitlich unterer Verriegelungsabschnitt dient.

41. Der Kältemittelbehälter (1, 2, 3, 4, 5, 6, 7, 8, 9, IA, IB, IC, ID) nach Anspruch 39, wobei das Innenrohr (31) einen Flanschabschnitt, einen Abschnitt mit großem Durchmesser oder einen dickwandigen Abschnitt als oberseitigem Druckabschnitt aufweist.

42. Der Kältemittelbehälter (7) nach Anspruch 39, wobei das Flüssigkeitsphasen-Rohr (21) mit einen Flanschabschnitt, einen Abschnitt mit großem Durchmesser, einen dickwandigen Abschnitt oder mit einer Rippe (26) als oberseitigem Druckabschnitt aufweist.

Revendications

1. Contenant de fluide frigorigène (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) comportant :

   une portion de couvercle (12) ;
   un réservoir tubulaire à fond fermé (10) avec une ouverture de face supérieure fermée hermétiquement par la portion de couvercle (12), incluant un orifice d'entrée de gaz/liquide (15), un orifice de sortie de phase liquide (16) et un orifice de sortie de phase gazeuse (17) ;
   un séparateur de gaz-liquide (18) disposé dans le réservoir (10) à une position située en dessous de la portion de couvercle, le séparateur de gaz-liquide (18) faisant face à l'orifice d'entrée de gaz/liquide (15) ;
   une portion de tuyau de sortie (20) pour un récepteur, la portion de tuyau de sortie (20) pour le récepteur incluant un orifice de tirage de fluide frigorigène en phase liquide (25) et étant adaptée pour guider uniquement un fluide frigorigène en phase liquide séparé par le séparateur de gaz-liquide (18) jusqu'à un côté d'une soupape de détente via l'orifice de sortie de phase liquide (16) ;
   une portion de tuyau de sortie (30) pour un accumulateur, la portion de tuyau de sortie (30) pour l'accumulateur incluant un trou de retour d'huile (35) et étant adaptée pour guider un fluide frigorigène en phase gazeuse séparé par le séparateur de gaz-liquide (18) jusqu'à un côté d'aspiration d'un compresseur via l'orifice de sortie de phase gazeuse (17) en association avec l'huile contenue dans le fluide frigorigène en phase liquide ; et
   une crépine (40) pour piéger des corps étrangers contenus dans un fluide frigorigène,
   dans lequel :
   la crépine (40) inclut :

      une portion de boîtier tubulaire (42) adaptée pour être placée au fond du réservoir (10), une portion de plaque déflectrice (43) recouvrant partiellement une ouverture de face supérieure de la portion de boîtier tubulaire (42), et
      un filtre à mailles (45) recouvrant au moins une portion de l'ouverture de face supérieure de la portion de boîtier tubulaire (42) non recouverte de la portion de plaque déflectrice (43), et
      la portion de tuyau de sortie (20) pour le récepteur et la portion de tuyau de sortie (30) pour l'accumulateur sont agencées côte à côte sur la portion de plaque déflectrice (43).

2. Contenant de fluide frigorigène (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) selon la revendication 1, dans lequel la portion de tuyau de sortie (20) pour le récepteur et la portion de tuyau de sortie (30) pour l'accumulateur sont agencées côte à côte sur la portion de plaque déflectrice (43) avec un espace entre la portion de tuyau de sortie (20) pour le récepteur et la portion de tuyau de sortie (30) pour l'accumulateur.

3. Contenant de fluide frigorigène (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) selon la revendication 1,
   dans lequel :

   l'orifice de sortie de phase liquide (16) a une portion intermédiaire de grand diamètre formée dans celui-ci,
   l'orifice de sortie de phase gazeuse (17) a une portion intermédiaire de grand diamètre formée dans celui-ci, et
   des extrémités supérieures (21a, 31a) de la portion de tuyau de sortie (20) pour le récepteur et de la portion de tuyau de sortie (30) pour l'accumulateur sont fixées aux portions intermédiaires de grand diamètre (16b, 17b) respectives de l'orifice de sortie de phase liquide (16) et de l'orifice de sortie de phase gazeuse (17) par expansion de tuyau.

4. Contenant de fluide frigorigène (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) selon la revendication 1,
   dans lequel :

   des extrémités supérieures (21a, 31a) de la portion de tuyau de sortie (20) pour le récepteur et de la portion de tuyau de sortie (30) pour l'accumulateur sont respectivement insérées dans l'orifice de sortie de phase liquide (16) et l'orifice de sortie de phase gazeuse (17), et
   des portions de la portion de tuyau de sortie (20) pour le récepteur et de la portion de tuyau de sortie (30) pour l'accumulateur à des positions situées en dessous des portions insérées sont fixées à la portion de couvercle par sertissage.

5. Contenant de fluide frigorigène (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) selon la revendication 1, dans lequel la portion de tuyau de sortie (20) pour le récepteur inclut :

   un tuyau de phase liquide (21) avec une extrémité supérieure (21a) insérée dans l'orifice de sortie de phase liquide (16), et
   une portion de maintien de tuyau de phase liquide (51) agencée sur la portion de plaque déflectrice (43) de manière à maintenir le tuyau de phase liquide (21).

6. Contenant de fluide frigorigène (1, 2, 3, 4, 5, 6, 7, 8, 9,

1A, 1B, 1C, 1D) selon la revendication 5, dans lequel :

le séparateur de gaz-liquide (18) a un trou traversant (18u) formé dans celui-ci, le trou traversant (18u) étant adapté pour faire passer l'extrémité supérieure du tuyau de phase liquide (21),
une portion supérieure du tuyau de phase liquide (21) est pourvue d'une portion de verrou côté inférieur adaptée pour venir en prise avec le séparateur de gaz-liquide (18) sur un côté inférieur du séparateur de gaz-liquide (18), et
le séparateur de gaz-liquide (18) est maintenu de manière serrée entre une face inférieure de la portion de couvercle et la portion de verrou côté inférieur.

7. Contenant de fluide frigorigène (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) selon la revendication 6, dans lequel la portion supérieure du tuyau de phase liquide (21) est pourvue d'une portion à collerette (21k) ou d'une portion à paroi épaisse en tant que portion de verrou côté inférieur.

8. Contenant de fluide frigorigène (6, 7) selon la revendication 1, dans lequel la portion de tuyau de sortie (30) pour l'accumulateur inclut un tuyau double (30A) constitué d'un tuyau intérieur (31) et d'un tuyau extérieur (32), le tuyau intérieur (31) ayant une extrémité supérieure (31a) insérée dans l'orifice de sortie de phase gazeuse (17), et le tuyau extérieur (32) étant agencé sur la portion de plaque déflectrice (43) de manière à maintenir le tuyau intérieur (31).

9. Contenant de fluide frigorigène (6, 7) selon la revendication 1, dans lequel la portion de tuyau de sortie (30) pour l'accumulateur inclut :

un tuyau double (30A) constitué d'un tuyau intérieur (31) et d'un tuyau extérieur (32), le tuyau intérieur (31) ayant une extrémité supérieure (31a) insérée dans l'orifice de sortie de phase gazeuse (17), et le tuyau extérieur (32) étant intégré au tuyau intérieur (31), et
une portion de maintien de tuyau de phase gazeuse (52) agencée sur la portion de plaque déflectrice (43) de manière à maintenir le tuyau double (30A).

10. Contenant de fluide frigorigène (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) selon la revendication 8 ou 9, dans lequel :

le séparateur de gaz-liquide (18) a un trou traversant (18v) formé dans celui-ci, le trou traversant (18v) étant adapté pour faire passer l'extrémité supérieure du tuyau intérieur (31),
une portion supérieure du tuyau intérieur (31) est pourvue d'une portion de verrou côté inférieur adaptée pour venir en prise avec le séparateur de gaz-liquide (18) sur un côté inférieur du séparateur de gaz-liquide (18), et
le séparateur de gaz-liquide (18) est maintenu de manière serrée entre une face inférieure de la portion de couvercle et la portion de verrou côté inférieur.

11. Contenant de fluide frigorigène (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) selon la revendication 10, dans lequel la portion supérieure du tuyau intérieur (31) est pourvue d'une portion à collerette (31b) ou d'une portion à paroi épaisse en tant que portion de verrou côté inférieur.

12. Contenant de fluide frigorigène (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) selon la revendication 1, dans lequel le séparateur de gaz-liquide (18) est fixé à la portion de couvercle par sertissage.

13. Contenant de fluide frigorigène (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) selon la revendication 12, dans lequel le séparateur de gaz-liquide (18) est fixé à la portion de couvercle par sertissage à une position située autour de la portion de tuyau de sortie (30) pour l'accumulateur ou de la portion de tuyau de sortie (20) pour le récepteur.

14. Contenant de fluide frigorigène (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) selon la revendication 1, dans lequel la portion de boîtier tubulaire (42) de la crépine (40) est montée dans le fond du réservoir (10) par ajustement serré.

15. Contenant de fluide frigorigène (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) selon la revendication 8 ou 9, dans lequel :

le séparateur de gaz-liquide (18) a un trou traversant (18v) formé dans celui-ci, le trou traversant (18v) étant adapté pour faire passer le tuyau intérieur (31) de la portion de tuyau de sortie (30) pour l'accumulateur, et
au moins une nervure (36) est agencée entre le tuyau intérieur (31) et le tuyau extérieur (32) de la portion de tuyau de sortie (30) pour l'accumulateur, la au moins une nervure (36) couplant ensemble le tuyau intérieur (31) et le tuyau extérieur (32) et servant de portion de verrou côté inférieur adaptée pour venir en prise avec le séparateur de gaz-liquide (18) sur un côté inférieur du séparateur de gaz-liquide (18).

16. Contenant de fluide frigorigène (1C) selon la revendication 15, dans lequel la portion de tuyau de sortie (20) pour le récepteur et la portion de tuyau de sortie

(30) pour l'accumulateur sont couplées ensemble d'un seul tenant par au moins une extrémité supérieure d'une portion de couplage (47R) servant de portion de verrou côté inférieur.

17. Contenant de fluide frigorigène (1C) selon la revendication 16, dans lequel une extrémité inférieure de la portion de couplage (47R) est couplée à la portion de plaque déflectrice (43).

18. Contenant de fluide frigorigène (6, 7) selon la revendication 15, dans lequel la portion de tuyau de sortie (30) pour l'accumulateur inclut un tuyau double (30A) constitué du tuyau intérieur et du tuyau extérieur (32), le tuyau extérieur (32) étant agencé d'un seul tenant sur la portion de plaque déflectrice (43) de manière à maintenir le tuyau intérieur (31).

19. Contenant de fluide frigorigène (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) selon la revendication 18,
dans lequel :

la au moins une nervure (36) est agencée sur le tube extérieur (32) d'une manière faisant radialement saillie vers l'intérieur, et
une portion d'extension de la nervure (36) qui s'étend vers le haut au-delà d'une extrémité supérieure du tuyau extérieur (32) sert de portion de verrou côté inférieur.

20. Contenant de fluide frigorigène (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) selon la revendication 19,
dans lequel :

le tuyau intérieur (31) à une position située au-dessus de la portion de verrou côté inférieur est pourvu d'une portion à collerette côté supérieur (31b), d'une portion de grand diamètre ou d'une portion à paroi épaisse qui sert de portion de pression côté supérieur capable de presser le séparateur de gaz-liquide (18) à partir d'un côté supérieur du séparateur de gaz-liquide (18), et
le séparateur de gaz-liquide (18) est maintenu de manière serrée entre la portion de verrou côté inférieur et la portion de pression côté supérieur.

21. Contenant de fluide frigorigène (6, 7, 8) selon la revendication 15, dans lequel la portion de tuyau de sortie (30) pour l'accumulateur inclut :

un tuyau double (30A) constitué du tuyau intérieur (31) et du tuyau extérieur (32) agencé d'un seul tenant avec le tuyau intérieur (31), et
une portion de maintien de tuyau de phase gazeuse (52) agencée d'un seul tenant sur la portion de plaque déflectrice (43) de manière à maintenir le tuyau double (30A).

22. Contenant de fluide frigorigène (5, 1D) selon la revendication 21,
dans lequel :

le tuyau intérieur (31) et le tuyau extérieur (32) sont intégrés par la au moins une nervure (36) agencée entre le tuyau intérieur (31) et le tuyau extérieur (32), et
une portion d'extension (36e) de la nervure (36) qui s'étend vers le haut au-delà d'une extrémité supérieure du tuyau extérieur (32) sert de portion de verrou côté inférieur.

23. Contenant de fluide frigorigène (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) selon la revendication 22, dans lequel le séparateur de gaz-liquide (18) est maintenu de manière serrée entre la portion de verrou côté inférieur et une face inférieure de la portion de couvercle servant de portion de pression côté supérieur capable de presser le séparateur de gaz-liquide (18) à partir d'un côté supérieur du séparateur de gaz-liquide (18).

24. Contenant de fluide frigorigène (9, 1A, 1B, 1C) selon la revendication 1, dans lequel un élément d'étanchéité annulaire (71, 72A, 72B, 72C, 73A, 73B, 73C, 73D) est agencé sur la crépine (40) de manière à fermer un espace (S1) formé entre une face périphérique intérieure du réservoir (10) et la crépine (40), l'élément d'étanchéité annulaire (71, 72A, 72B, 72C, 73A, 73B, 73C, 73D) étant adapté pour être toujours assemblé élastiquement par pression à la face périphérique du réservoir (10).

25. Contenant de fluide frigorigène (9, 1A, 1B) selon la revendication 24, dans lequel l'élément d'étanchéité annulaire (71, 72A, 72B, 72C, 73A, 73B, 73C, 73D) est fixé à la portion de boîtier tubulaire (42) de manière à fermer un espace (S1) formé entre la face périphérique intérieure du réservoir (10) et la portion de boîtier tubulaire (42).

26. Contenant de fluide frigorigène (9) selon la revendication 25,
dans lequel :

l'élément d'étanchéité annulaire (71) a une forme de disque annulaire dans un état naturel, et
lorsque l'élément d'étanchéité annulaire (71) est inséré dans le réservoir (10), une portion périphérique extérieure de l'élément d'étanchéité annulaire (71) fléchit vers le haut, et une portion de flexion tubulaire (71u) résultante est toujours assemblé élastiquement par pression à la face périphérique intérieure du réservoir (10).

27. Contenant de fluide frigorigène (9) selon la revendi-

cation 26,
dans lequel :

une périphérie extérieure de la portion de boîtier tubulaire (42) est pourvue d'une portion de maintien d'étanchéité (42A) incluant des portions de plaque de maintien supérieure et inférieure (42a, 42b), et
une portion périphérique intérieure de l'élément d'étanchéité annulaire (71) est adaptée pour être montée dans les portions de plaque de maintien supérieure et inférieure (42a, 42b) et maintenue entre celles-ci.

28. Contenant de fluide frigorigène (1A) selon la revendication 25,
dans lequel :

une périphérie extérieure de la portion de boîtier tubulaire (42) est pourvue d'une portion à collerette (42B), et
l'élément d'étanchéité annulaire (72A, 72B, 72C) inclut :

une portion annulaire assemblée par pression (72u), ayant une section transversale semi-circulaire ou une section transversale en forme de C, la portion annulaire assemblée par pression étant adaptée pour être toujours assemblée élastiquement par pression à la face périphérique intérieure du réservoir (10), et
une paire de portions supérieure et inférieure de maintien serré (72v) continue avec des extrémités opposées de la portion annulaire assemblée par pression et adaptées pour maintenir la portion à collerette (42B) de manière serrée.

29. Contenant de fluide frigorigène (1B) selon la revendication 25,
dans lequel :

une périphérie extérieure de la portion de boîtier tubulaire (42) est pourvue d'une portion à collerette (42B), et
l'élément d'étanchéité annulaire (73A, 73B, 73C, 73D) inclut :

une portion tubulaire assemblée par pression (73u) adaptée pour être toujours assemblé élastiquement par pression à la face périphérique intérieure du réservoir (10), et
une paire de portions supérieure et inférieure de maintien serré (73v) continue avec un côté périphérique intérieur de la portion tubulaire assemblée par pression (73u) et adaptées pour maintenir la portion à collerette (42B) de manière serrée.

30. Contenant de fluide frigorigène (1A, 1B) selon la revendication 28 ou 29,
dans lequel :
une portion supérieure ou chaque portion parmi une portion supérieure et une portion inférieure d'un côté périphérique extérieur de l'élément d'étanchéité annulaire (72A, 72B, 72C, 73A, 73B, 73C, 73D) est pourvue d'une saillie annulaire (72t, 73t), la saillie annulaire (72t, 73t) faisant radialement saillie vers l'extérieur dans un état naturel et étant adaptée pour être fortement poussée contre la face périphérique intérieure du réservoir (10) lorsque l'élément d'étanchéité annulaire (72A, 72B, 72C, 73A, 73B, 73C, 73D) est inséré dans le réservoir (10).

31. Contenant de fluide frigorigène (1B) selon la revendication 29, dans lequel un coin à une extrémité inférieure d'un côté périphérique extérieur de la portion tubulaire assemblée par pression (73u) est pourvu d'une portion arrondie ou chanfreinée (73r).

32. Contenant de fluide frigorigène (9, 1A, 1B) selon l'une quelconque des revendications 25 à 31, dans lequel la portion de boîtier tubulaire (42) a une portion découpée (42e) formée dans celle-ci, la portion découpée (42e) étant adaptée pour faire circuler un fluide frigorigène sur un côté périphérique intérieur et un côté périphérique extérieur de la portion de boîtier tubulaire (42).

33. Contenant de fluide frigorigène (1C) selon la revendication 24, dans lequel la portion de boîtier tubulaire (42) inclut l'élément d'étanchéité annulaire (71, 72A, 72B, 72C, 73A, 73B, 73C, 73D) de manière à fermer un espace (S1) formé entre la face périphérique intérieure du réservoir (10) et la portion de boîtier tubulaire (47), l'élément d'étanchéité annulaire (71, 72A, 72B, 72C, 73A, 73B, 73C, 73D) incluant une portion de couplage périphérique intérieure annulaire (47R) ayant une section transversale ondulée et une portion de contact tubulaire (47Q), la portion de couplage périphérique intérieure annulaire (47R) étant couplée à la portion de plaque déflectrice (43) et étant élastiquement déformable dans une direction radiale et une direction verticale, et la portion de contact tubulaire (47Q) étant continue avec un côté périphérique extérieur de la portion de couplage périphérique intérieure annulaire (47R) et étant adaptée pour être en contact avec la face périphérique intérieure et le fond du réservoir (10) de sorte qu'une face d'extrémité de la portion de contact tubulaire (47Q) est toujours assemblée élastiquement par pression à la face périphérique intérieure et le fond du réservoir (10).

34. Contenant de fluide frigorigène (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) selon la revendication 1, dans lequel la crépine (40), au moins une partie de la portion de tuyau de sortie (20) pour le récepteur, et au moins une partie de la portion de tuyau de sortie (30) pour l'accumulateur sont moulées d'un seul tenant en utilisant une résine synthétique.

35. Contenant de fluide frigorigène (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) selon la revendication 34, dans lequel :

la portion de tuyau de sortie (20) pour le récepteur inclut un tuyau de phase liquide (21) avec une extrémité supérieure insérée dans l'orifice de sortie de phase liquide (16),
la portion de tuyau de sortie (30) pour l'accumulateur inclut un tuyau double (30A) constitué d'un tuyau intérieur (31) et d'un tuyau extérieur (32), le tuyau intérieur (31) ayant une extrémité supérieure insérée dans l'orifice de sortie de phase gazeuse (17), et le tuyau extérieur (32) maintenant le tuyau intérieur (31), et
la crépine (40), le tuyau de phase liquide (21) et le tuyau extérieur (32) sont moulés d'un seul tenant en utilisant une résine synthétique.

36. Contenant de fluide frigorigène (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) selon la revendication 35, dans lequel le tuyau de phase liquide (21) et le tuyau extérieur (32) sont couplés ensemble d'un seul tenant par une portion de couplage (47R).

37. Contenant de fluide frigorigène (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) selon la revendication 36, dans lequel la portion de couplage (47R) sert de portion de verrou côté inférieur adaptée pour venir en prise avec le séparateur de gaz-liquide (18) sur un côté inférieur du séparateur de gaz-liquide (18).

38. Contenant de fluide frigorigène (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) selon la revendication 36 ou 37, dans lequel la portion de couplage (47R) est également couplée à la crépine (40).

39. Contenant de fluide frigorigène (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) selon l'une quelconque des revendications 35 à 38, dans lequel :

le séparateur de gaz-liquide (18) a des trous traversants (18u, 18v) formés dans celui-ci, les trous traversants (18u, 18v) étant adaptés pour faire passer le tuyau de phase liquide (21) et le tuyau intérieur (31), respectivement,
chaque tuyau parmi le tuyau de phase liquide (21) et le tuyau intérieur (31) est pourvu d'une portion de verrou côté inférieur adaptée pour venir en prise dans le séparateur de gaz-liquide (18) sur un côté inférieur du séparateur de gaz-liquide (18),
le tuyau intérieur (31) à une position située au-dessus de la portion de verrou côté inférieur est pourvu d'une portion de pression côté supérieur capable de presser le séparateur de gaz-liquide (18) à partir d'un côté supérieur du séparateur de gaz-liquide (18), et
le séparateur de gaz-liquide (18) est maintenu de manière serrée entre la portion de verrou côté inférieur et la portion de pression côté supérieur.

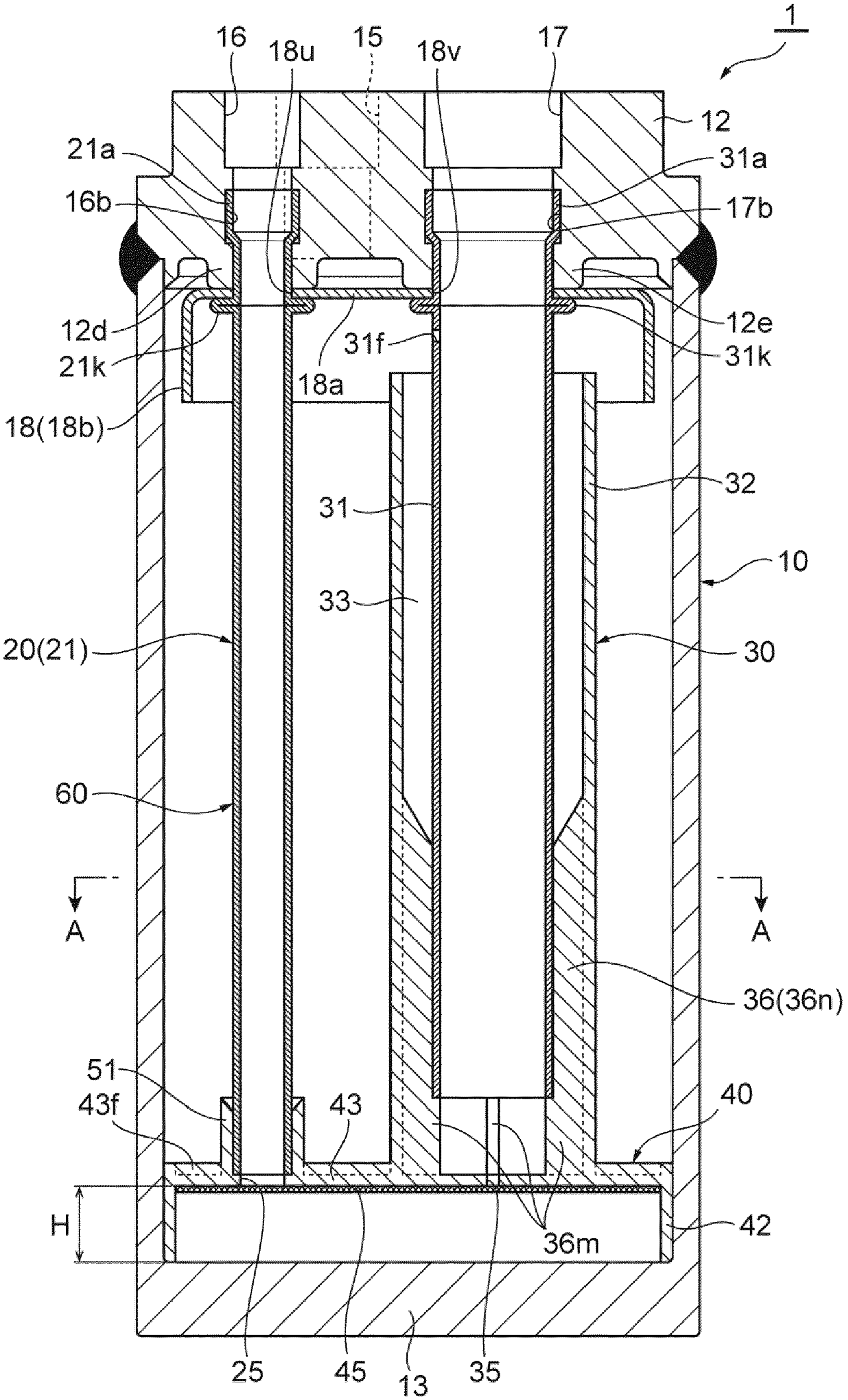
40. Contenant de fluide frigorigène (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) selon la revendication 39, dans lequel :

au moins une nervure (36) est agencée sur le tube extérieur (32) de manière à faire radialement saillie vers l'intérieur, et
une portion d'extension de la nervure (36) qui s'étend vers le haut au-delà d'une extrémité supérieure du tuyau extérieur (32) sert de portion de verrou côté inférieur.

41. Contenant de fluide frigorigène (1, 2, 3, 4, 5, 6, 7, 8, 9, 1A, 1B, 1C, 1D) selon la revendication 39, dans lequel le tuyau intérieur (31) est muni d'une portion à collerette côté supérieur, d'une portion de grand diamètre ou d'une portion à paroi épaisse en tant que portion de pression côté supérieur.

42. Contenant de fluide frigorigène (7) selon la revendication 39, dans lequel le tuyau en phase liquide (21) est pourvu d'une portion à bride, d'une portion de grand diamètre, d'une portion à paroi épaisse ou d'une nervure (26) en tant que portion de verrou côté inférieur.

Fig. 1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20(21)
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Fig. 2

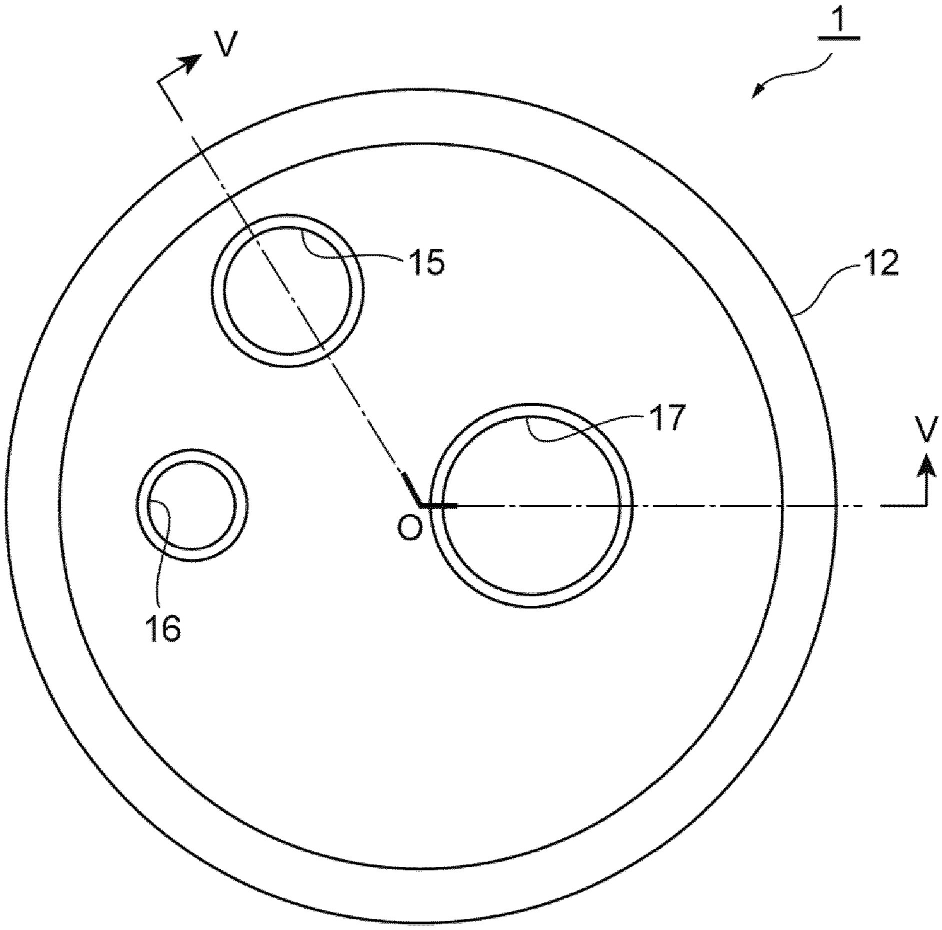


Fig. 3

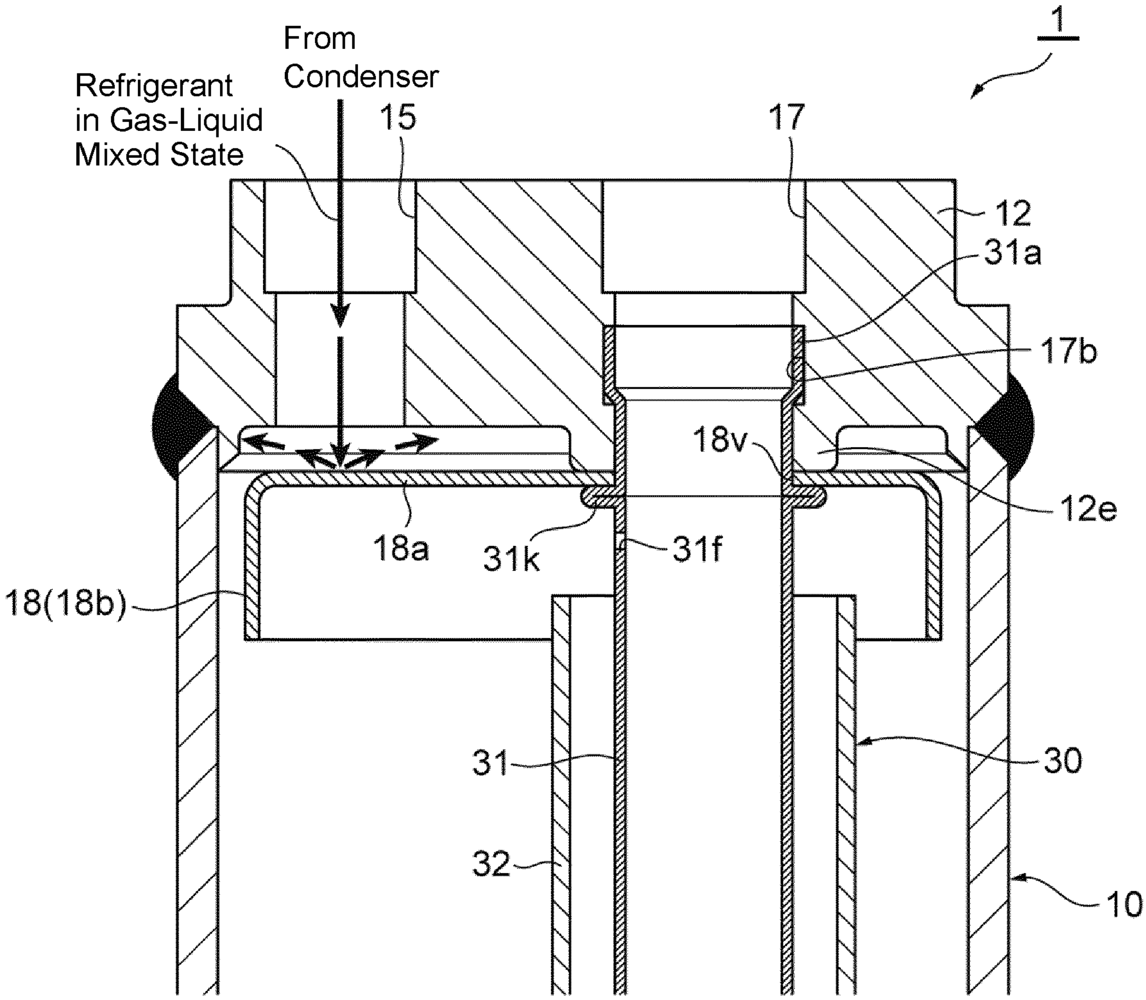

From
Condenser
Refrigerant
in Gas-Liquid
Mixed State
15
17
1
12
31a
17b
18v
12e
18a
31k
31f
18(18b)
31
30
32
10

Fig. 4

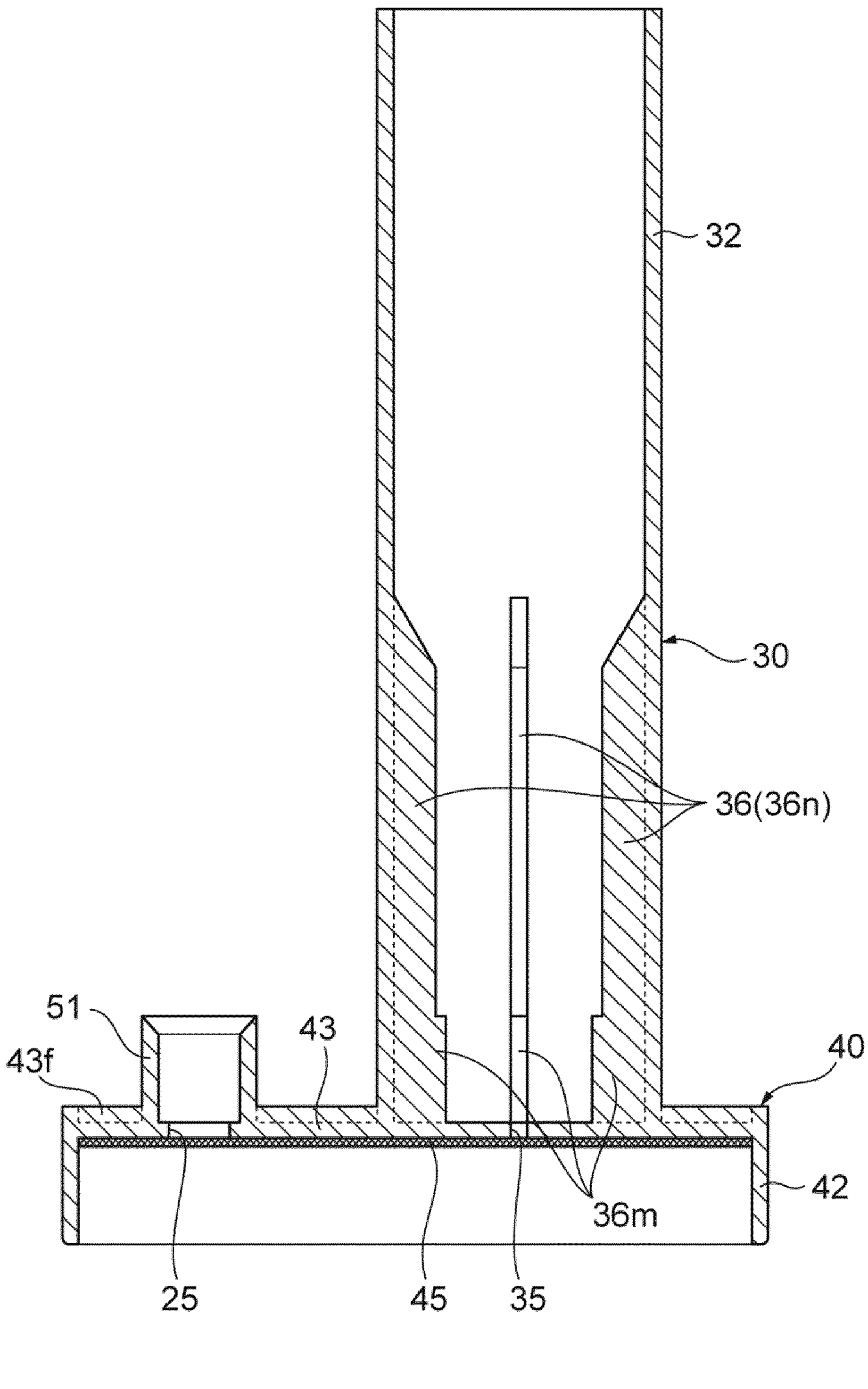


Fig. 5

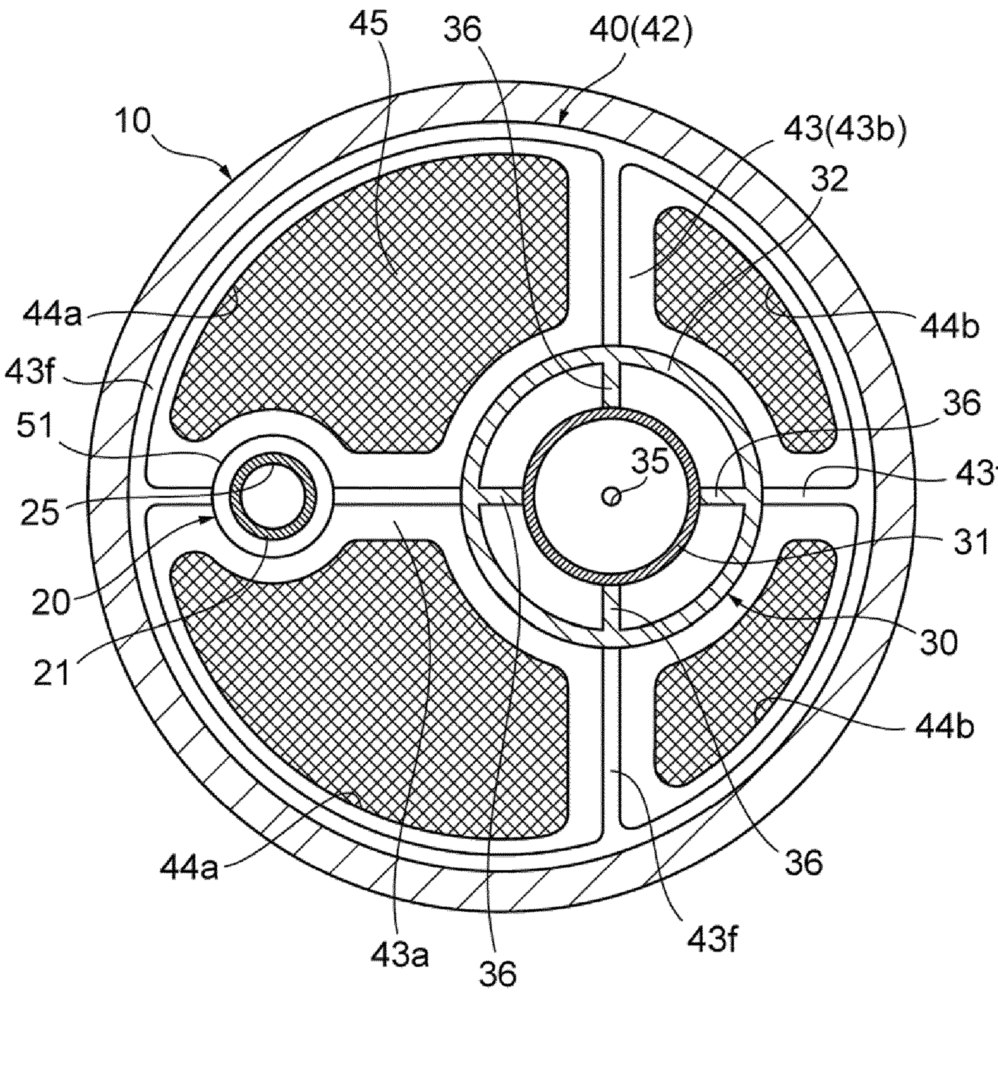

45
36
40(42)
10
43(43b)
32
44a
44b
43f
36
51
35
43f
25
31
20
30
21
44b
44a
36
43f
43a
36

Fig. 6

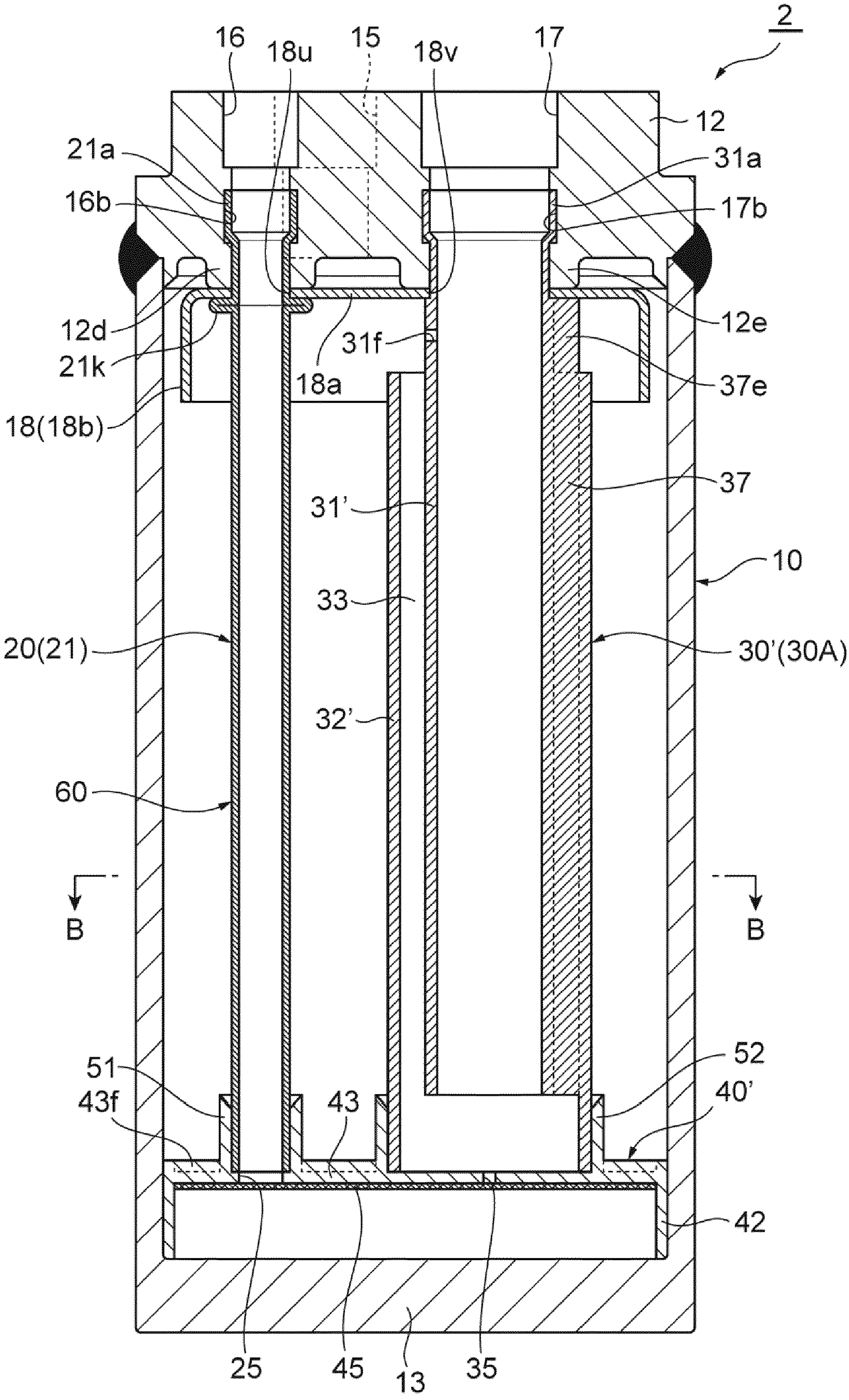

2
16
18u
15
18v
17
12
21a
31a
16b
17b
12d
12e
21k
31f
18a
37e
18(18b)
37
31'
10
33
20(21)
30'(30A)
32'
60
B
B
51
52
43f
43
40'
42
25
45
13
35

Fig. 7

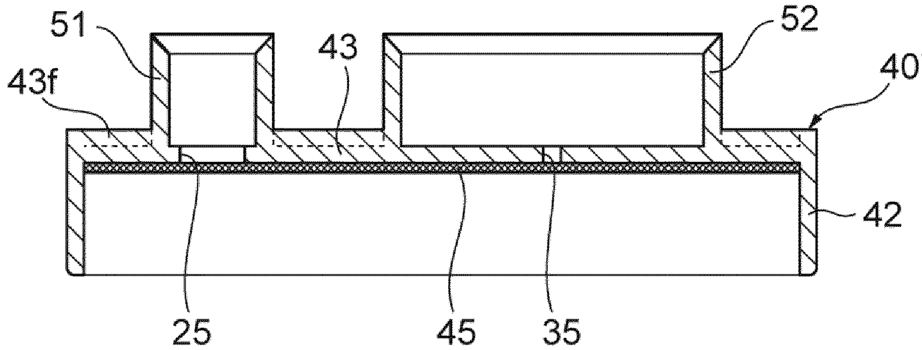


Fig. 8

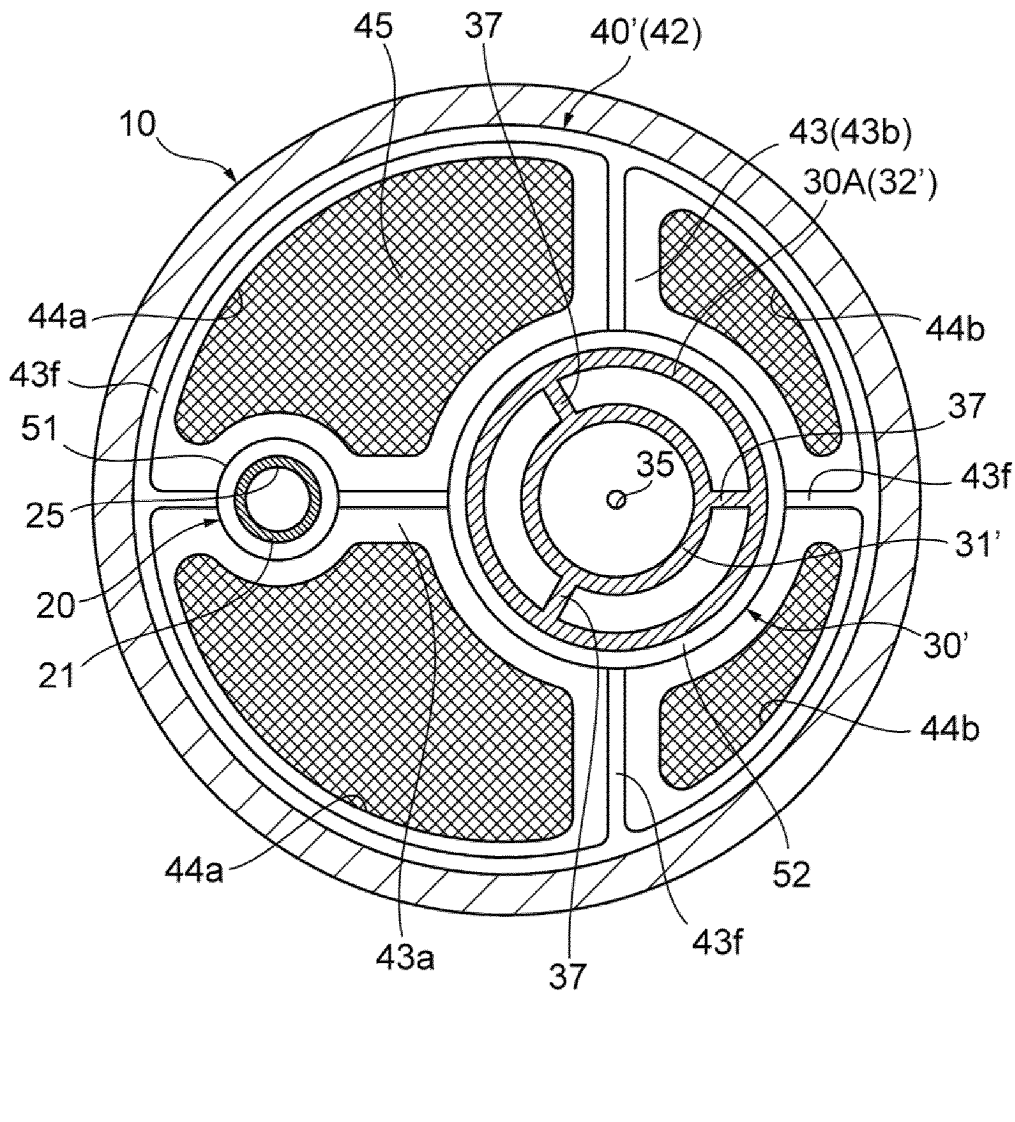

45
37
40'(42)
10
43(43b)
30A(32')
44a
44b
43f
37
51
35
43f
25
31'
20
30'
21
44b
44a
52
43a
37
43f

Fig. 9

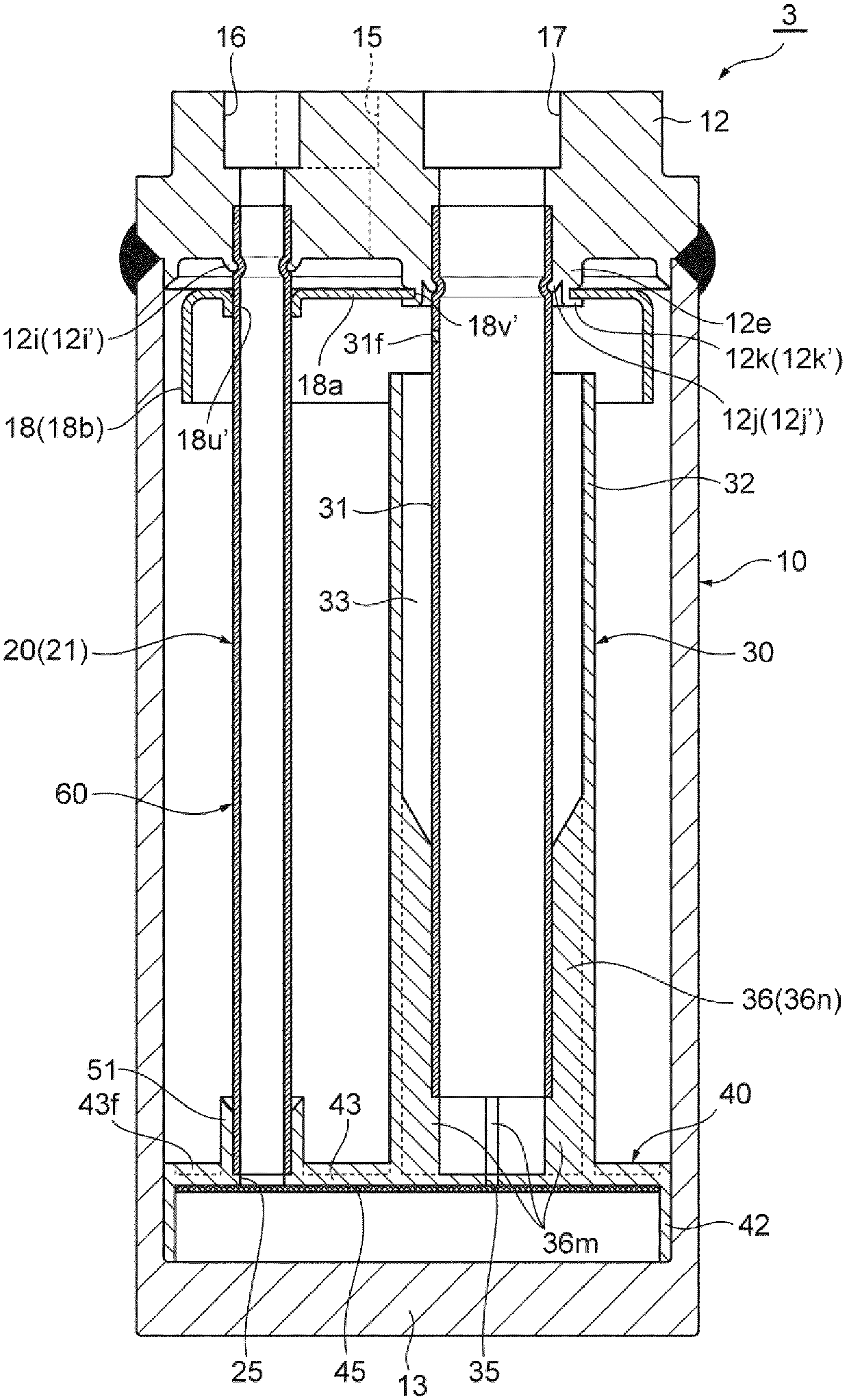

3
16
15
17
12
12e
12k(12k')
12j(12j')
12i(12i')
18v'
31f
18a
18(18b)
18u'
32
31
33
10
20(21)
30
60
36(36n)
51
43f
43
40
42
36m
25
45
13
35

Fig. 10A

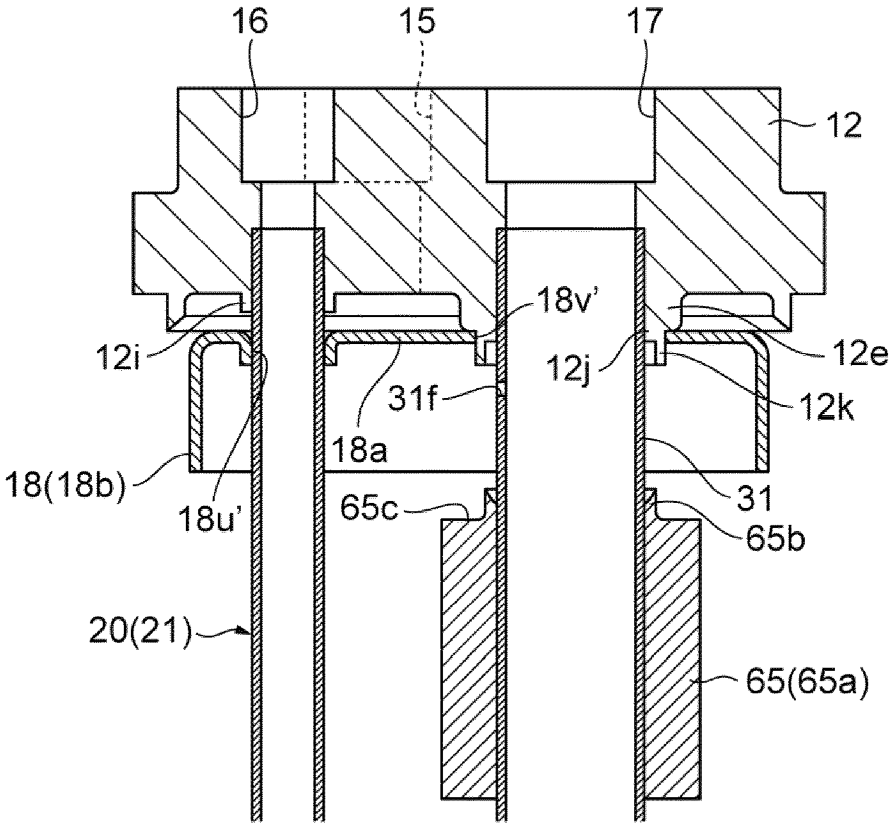


Fig. 10B

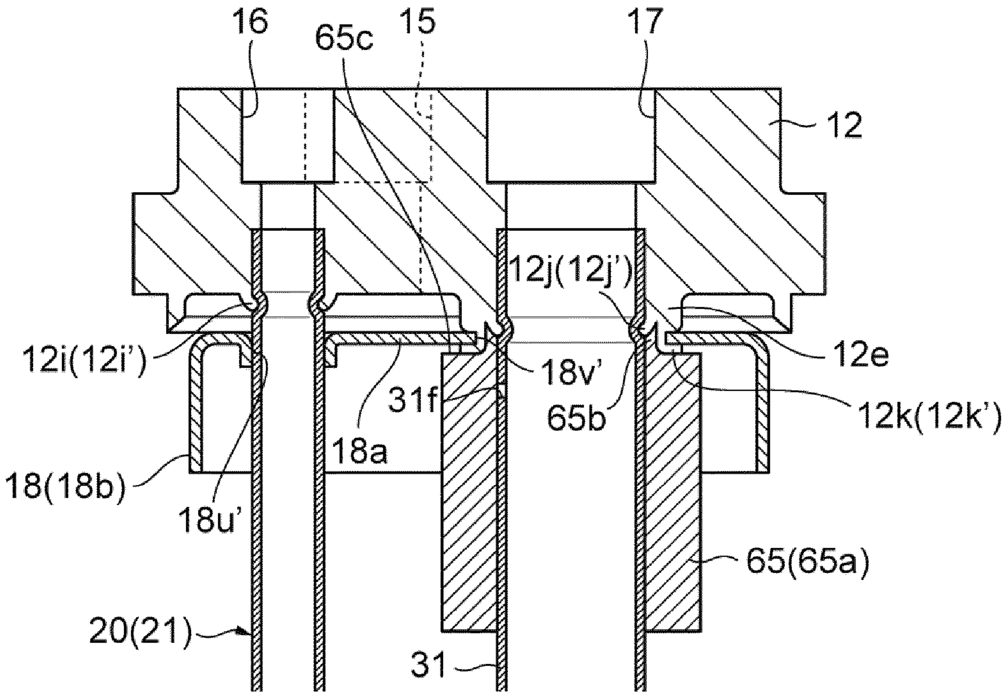


Fig. 11

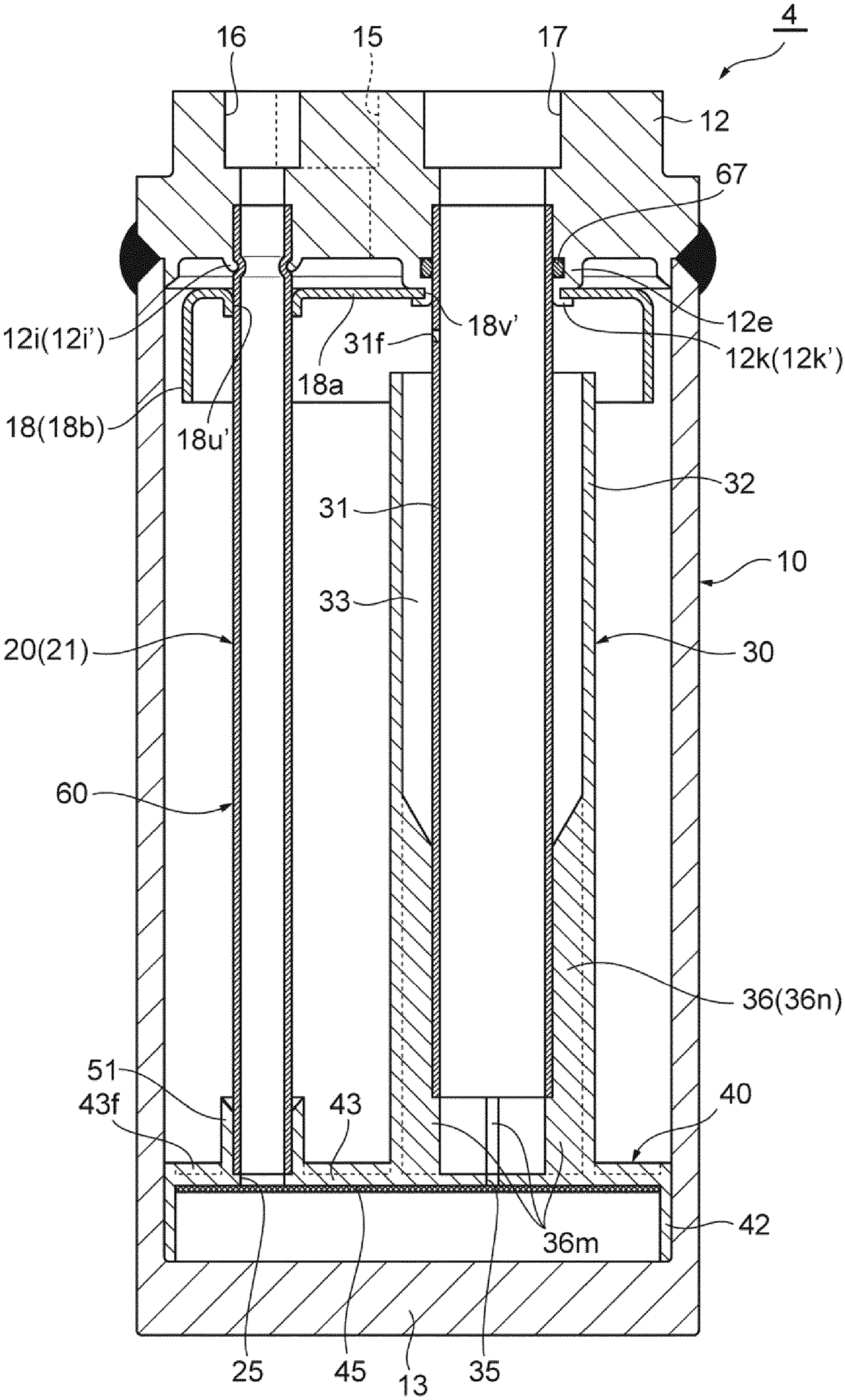
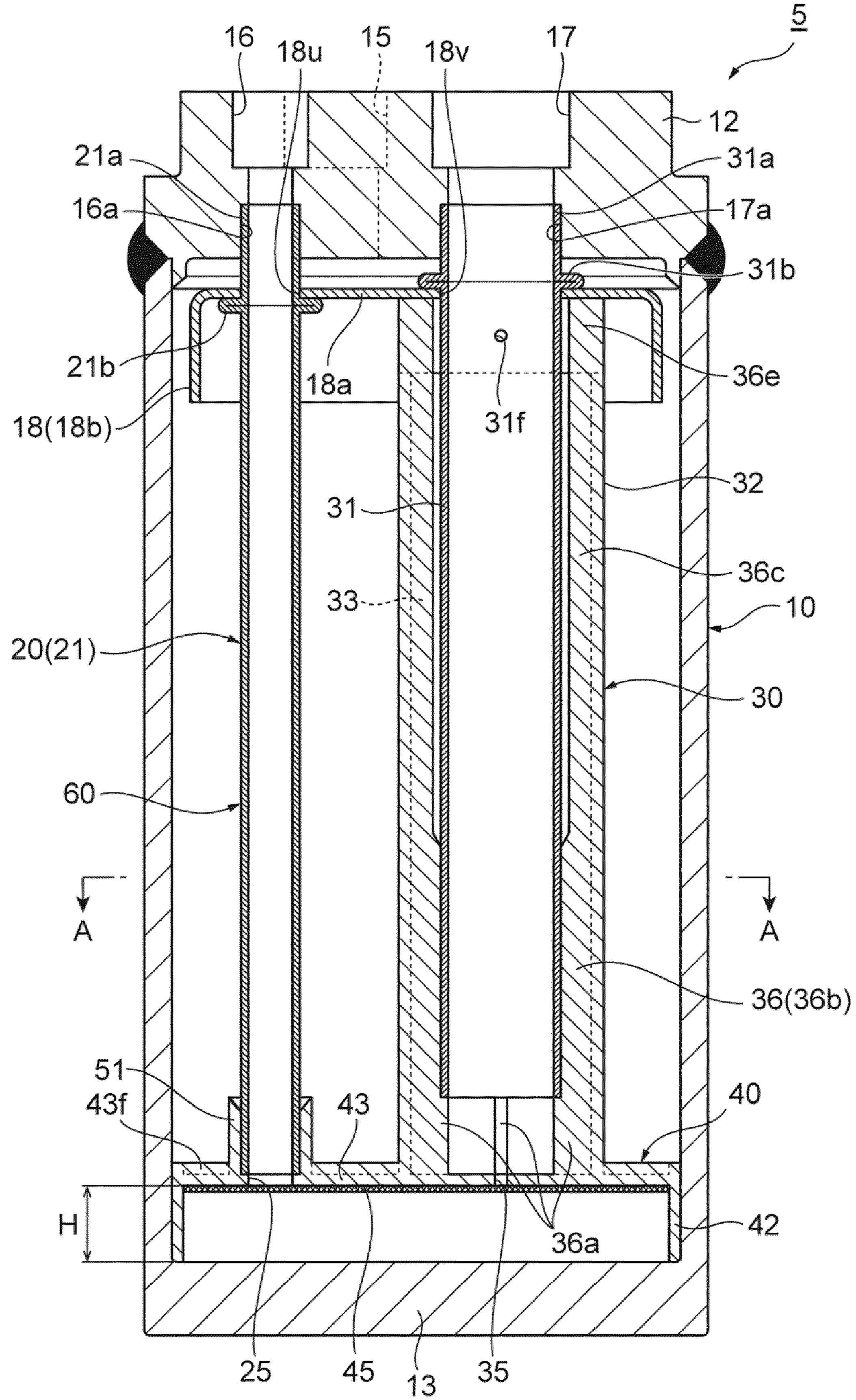

4
16
15
17
12
67
12e
12i(12i')
18v'
31f
18a
12k(12k')
18(18b)
18u'
32
31
10
33
20(21)
30
60
36(36n)
51
43f
43
40
42
36m
25
45
13
35

Fig. 12



5
16
18u
15
18v
17
12
21a
31a
16a
17a
31b
21b
18a
36e
18(18b)
31f
32
31
36c
33
10
20(21)
30
60
A
A
36(36b)
51
43f
43
40
H
42
36a
25
45
13
35

Fig. 13

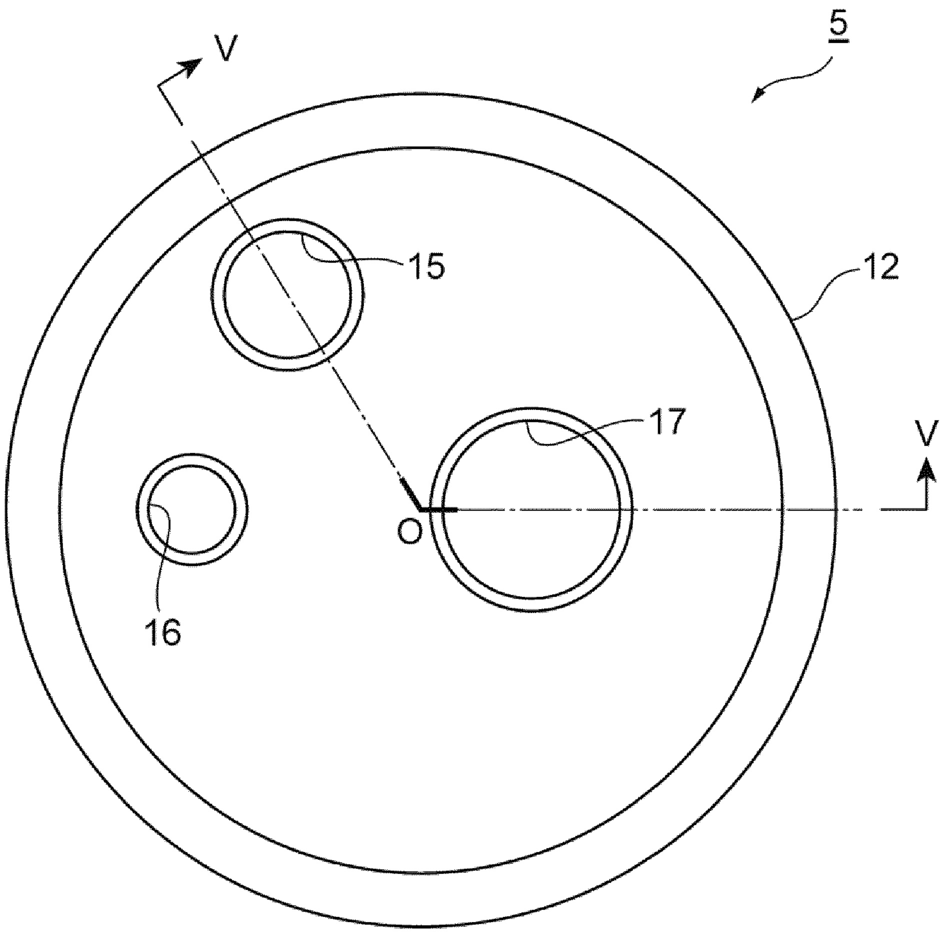


Fig. 14

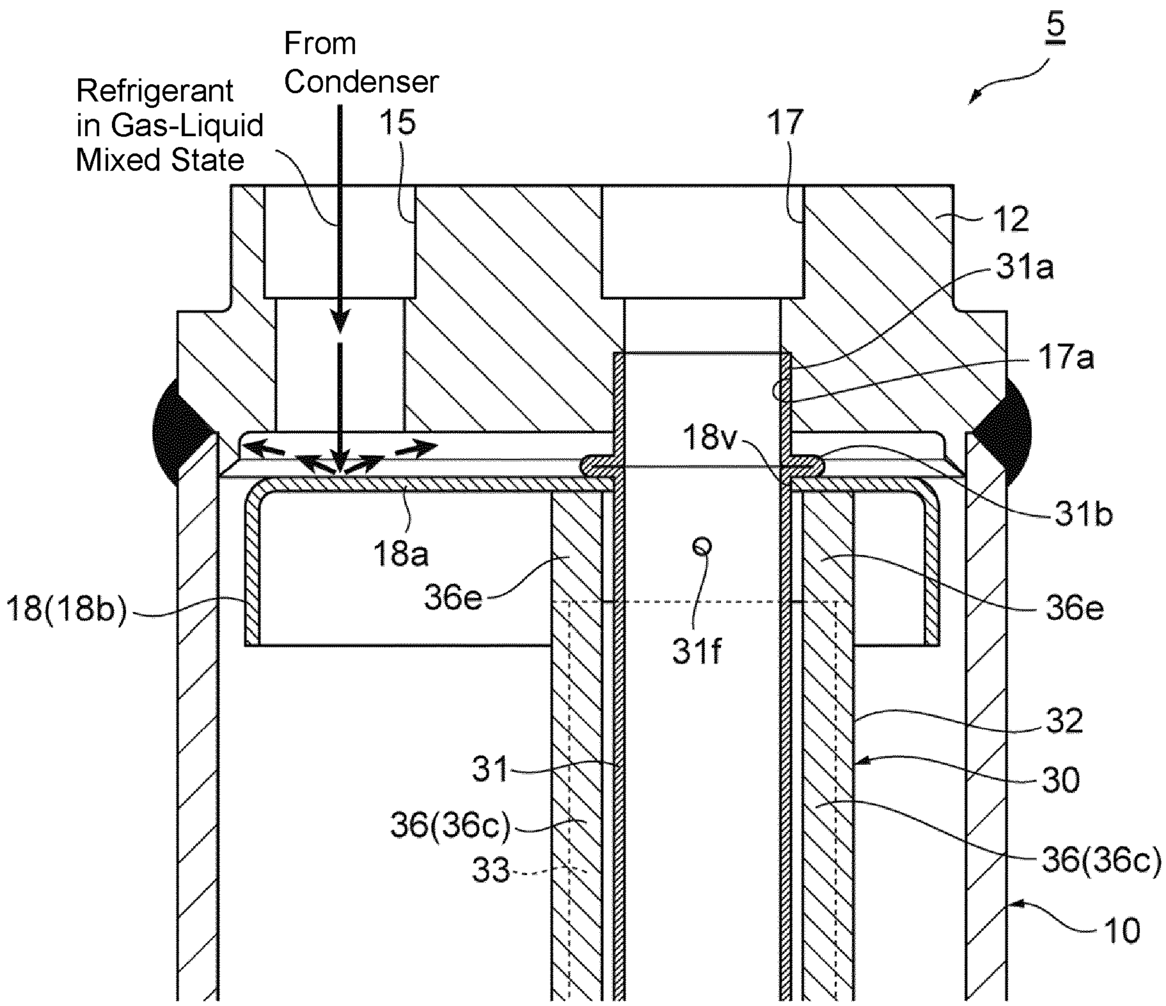

5
From
Condenser
Refrigerant
in Gas-Liquid
Mixed State
15
17
12
31a
17a
18v
31b
18a
18(18b)
36e
31f
36e
32
31
30
36(36c)
33
36(36c)
10

Fig. 15

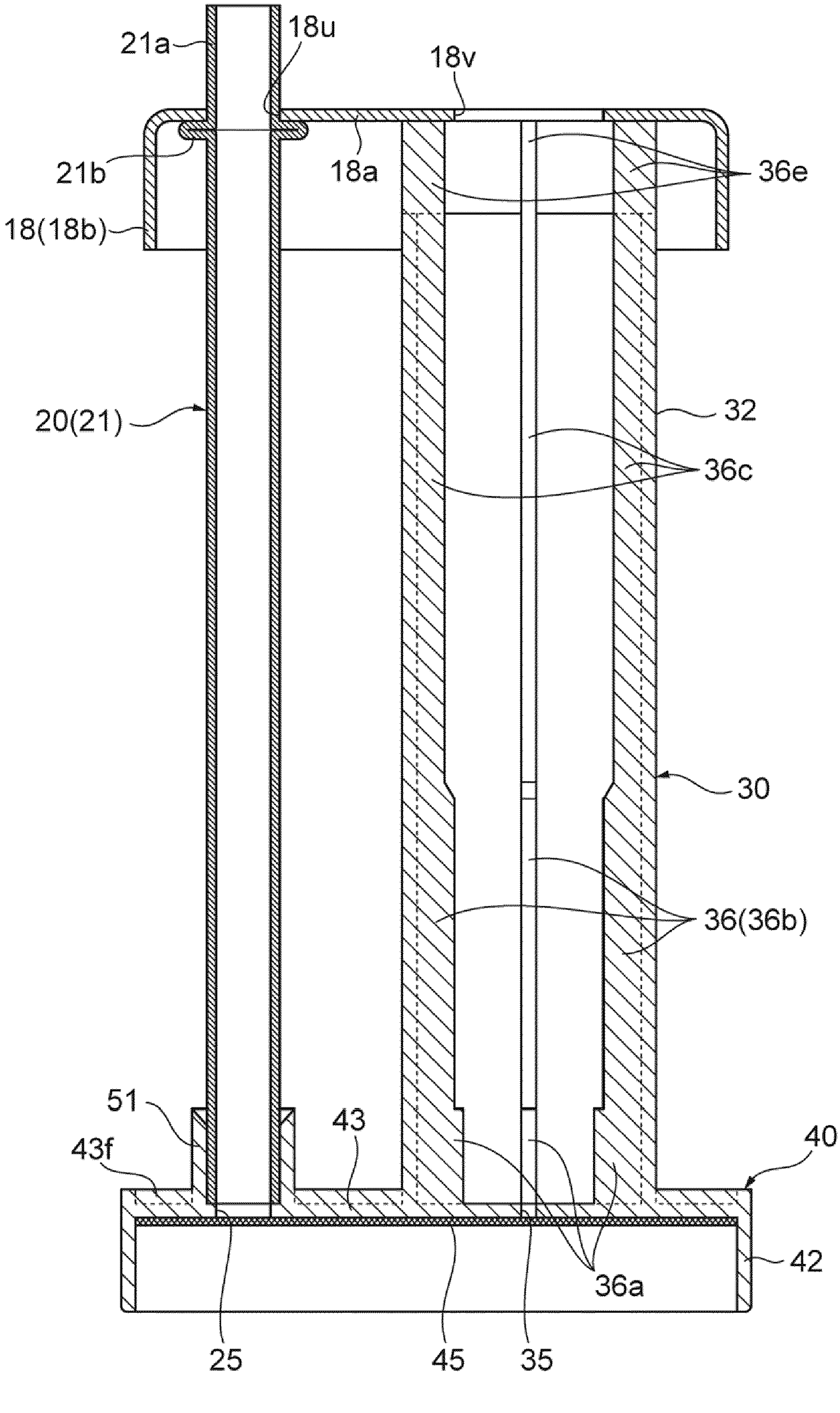

21a
18u
18v
21b
18a
36e
18(18b)
20(21)
32
36c
30
36(36b)
51
43
40
43f
42
36a
25
45
35

Fig. 16

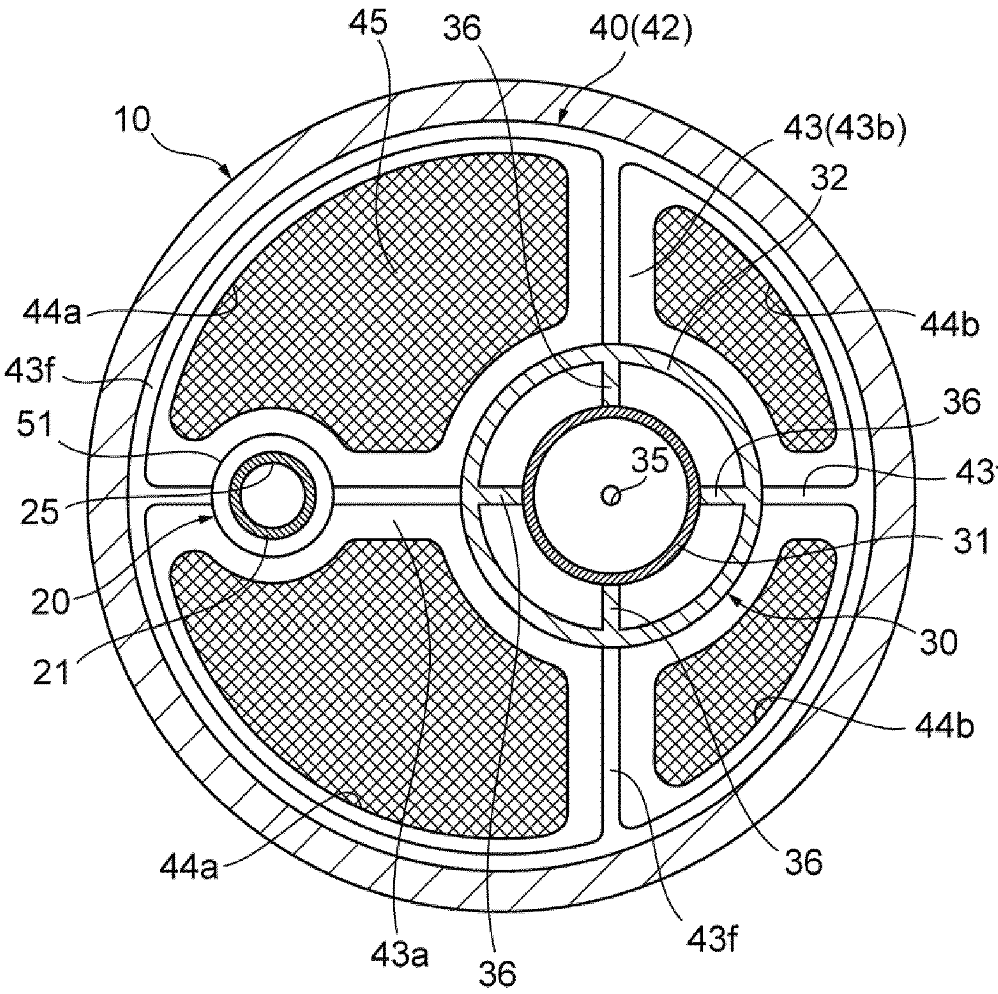

45
36
40(42)
10
43(43b)
32
44a
44b
43f
36
51
35
43f
25
31
20
30
21
44b
44a
36
43f
43a
36

Fig. 17

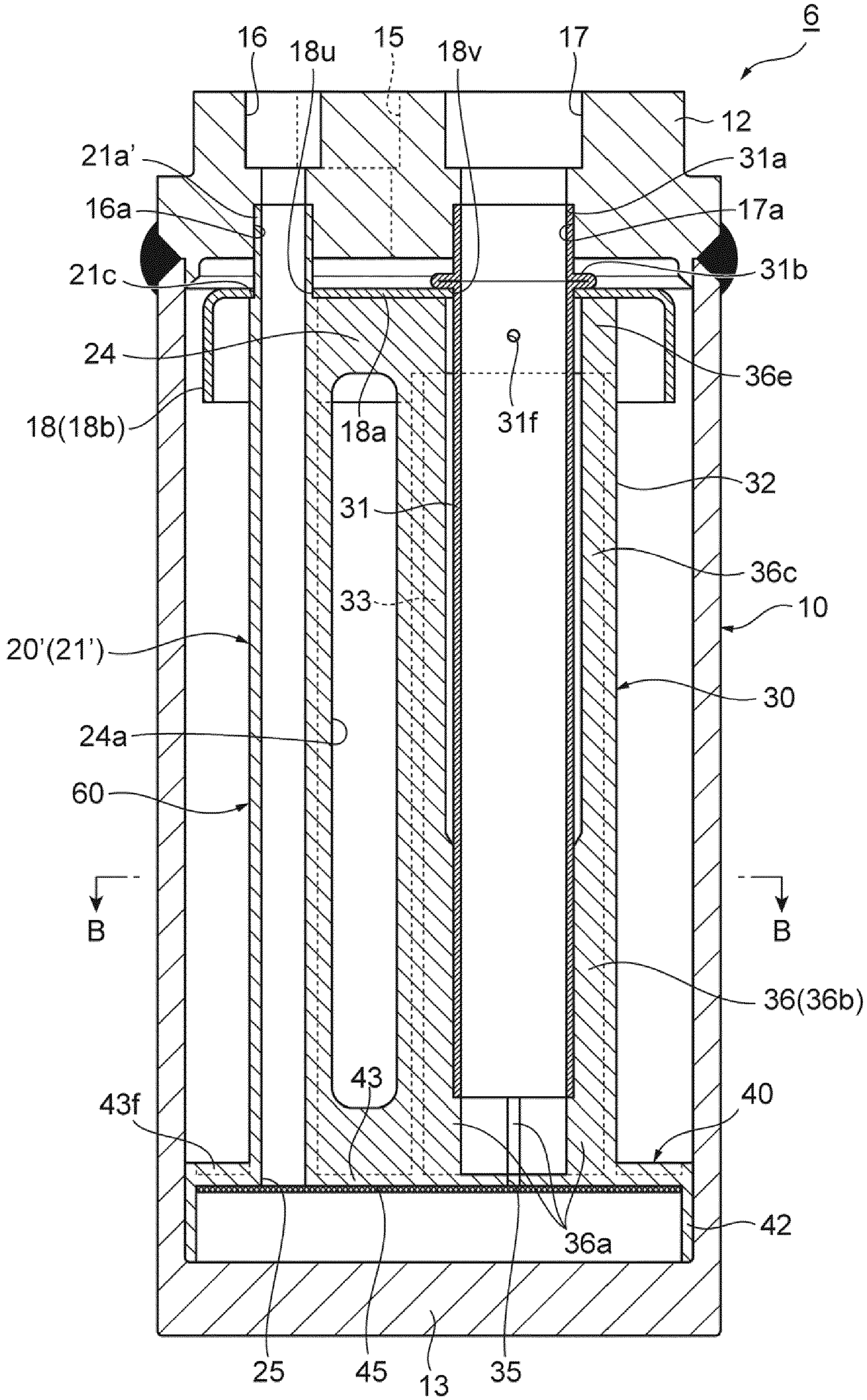

6
16
18u
15
18v
17
12
21a'
31a
16a
17a
21c
31b
24
36e
18(18b)
18a
31f
32
31
36c
33
10
20'(21')
30
24a
60
B
B
36(36b)
43
43f
40
42
36a
25
45
13
35

Fig. 18

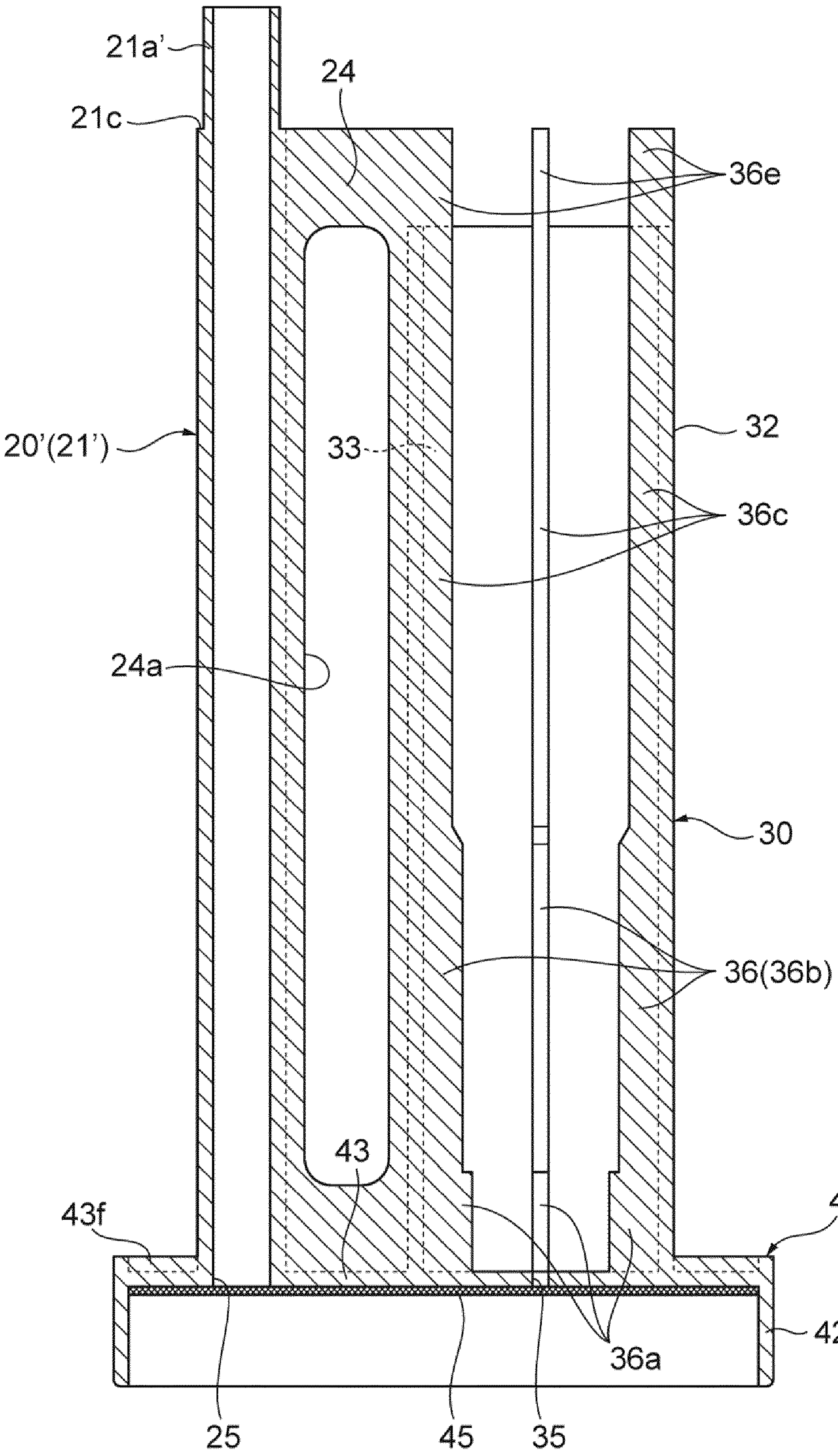

21a'
21c
24
36e
32
20'(21')
33
36c
24a
30
36(36b)
43
43f
40
42
36a
25
45
35

Fig. 19

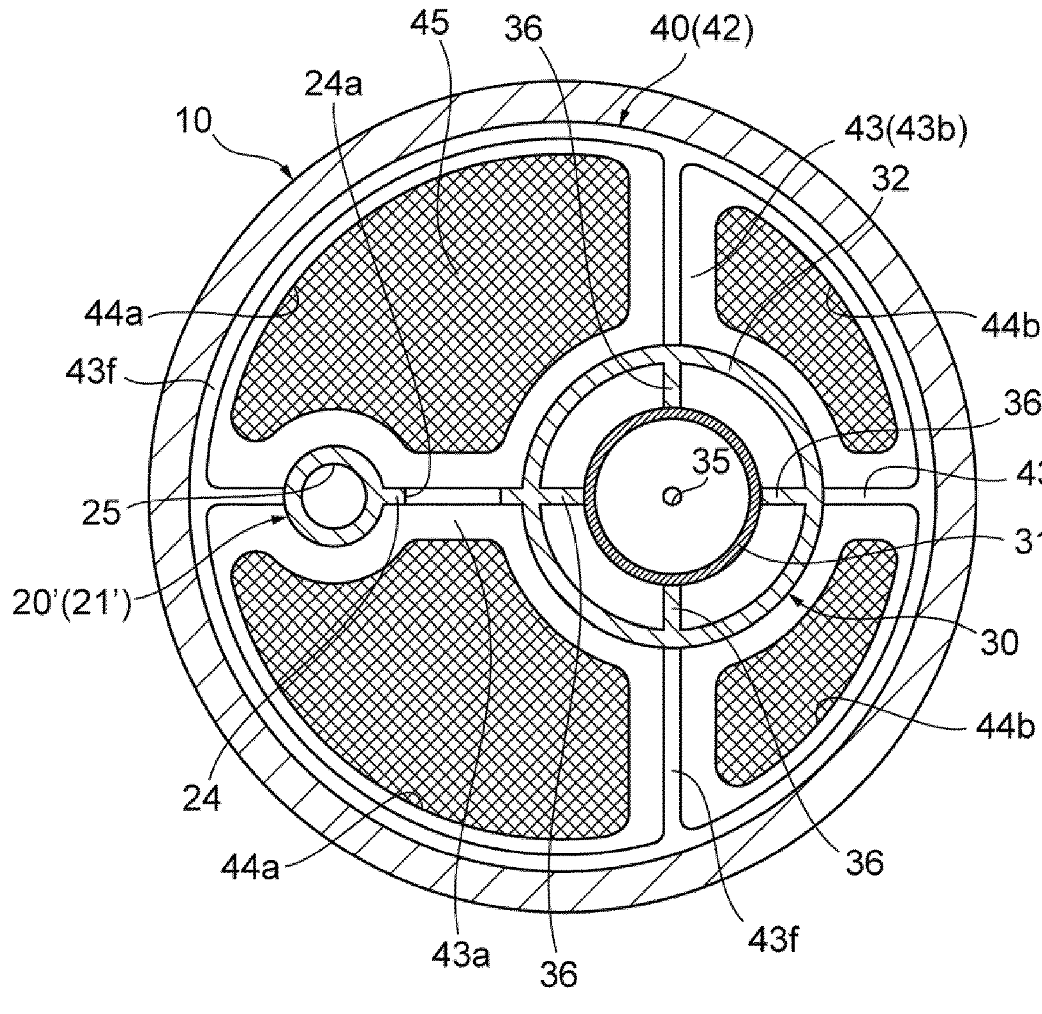

45
36
40(42)
24a
10
43(43b)
32
44a
44b
43f
36
35
43f
25
31
20'(21')
30
44b
24
36
44a
43f
43a
36

Fig. 20

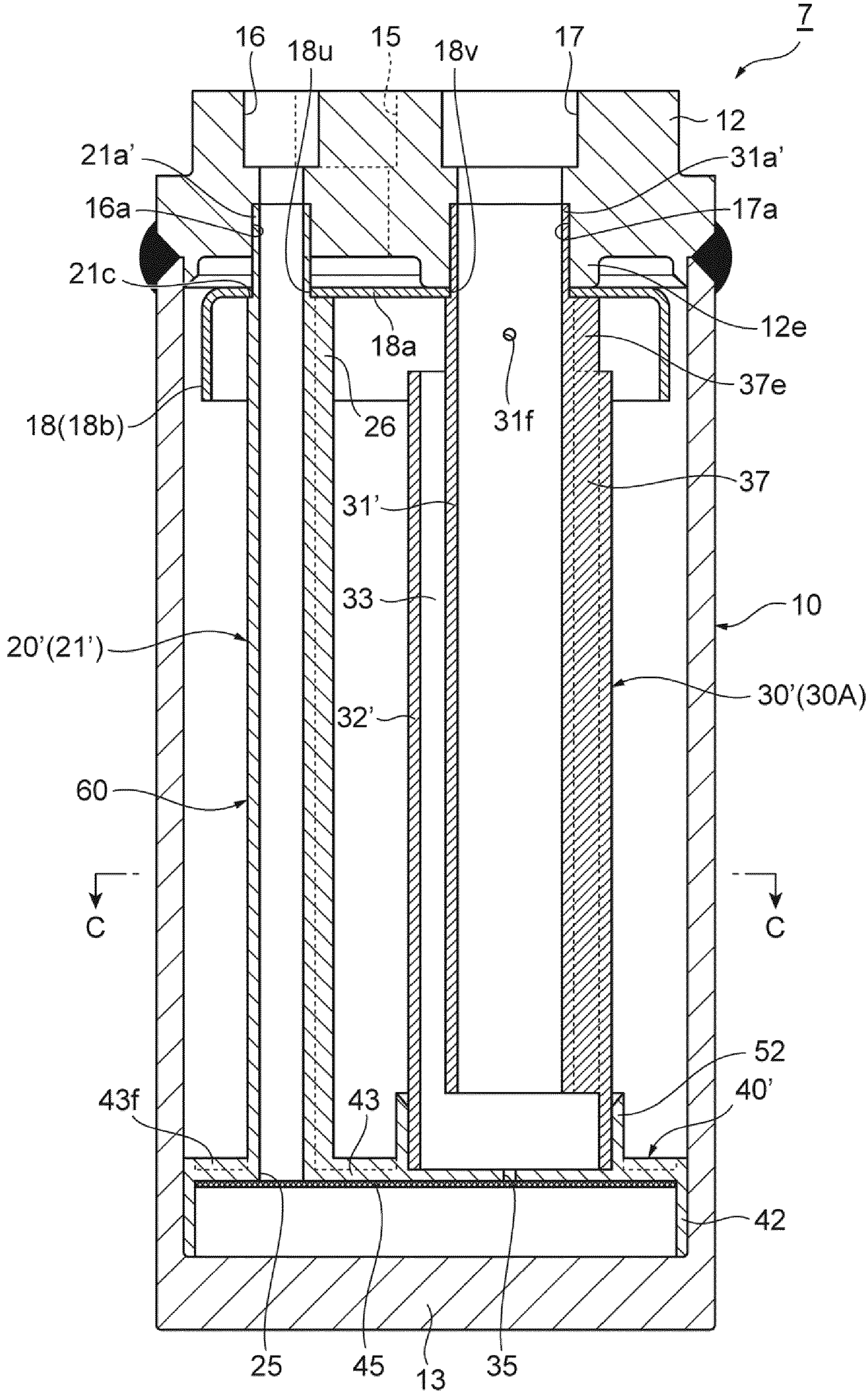

7
16
18u
15
18v
17
12
21a'
31a'
16a
17a
21c
12e
18a
37e
31f
18(18b)
26
37
31'
33
10
20'(21')
30'(30A)
32'
60
C
C
52
43f
43
40'
42
25
45
13
35

Fig. 21

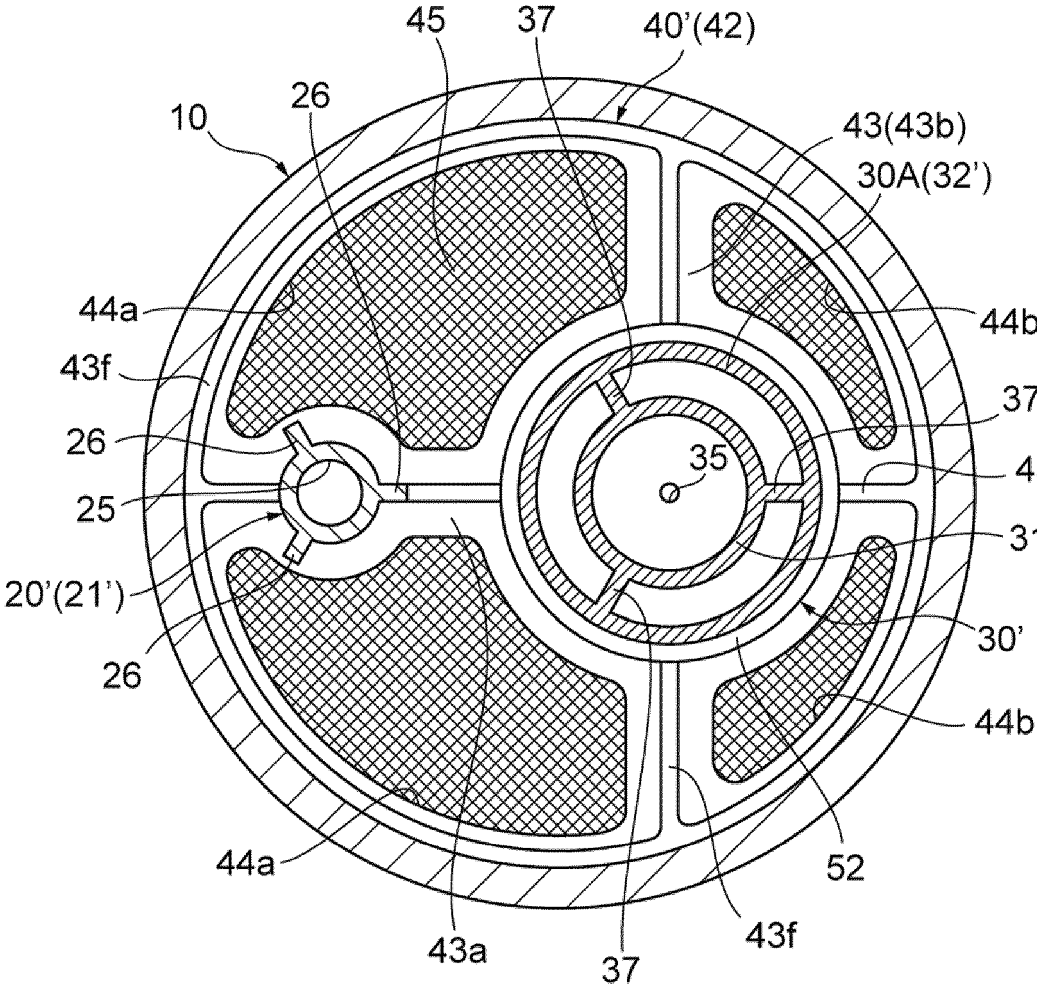

45
37
40'(42)
26
10
43(43b)
30A(32')
44a
44b
43f
37
26
35
43f
25
31'
20'(21')
30'
26
44b
52
44a
43a
43f
37

Fig. 22

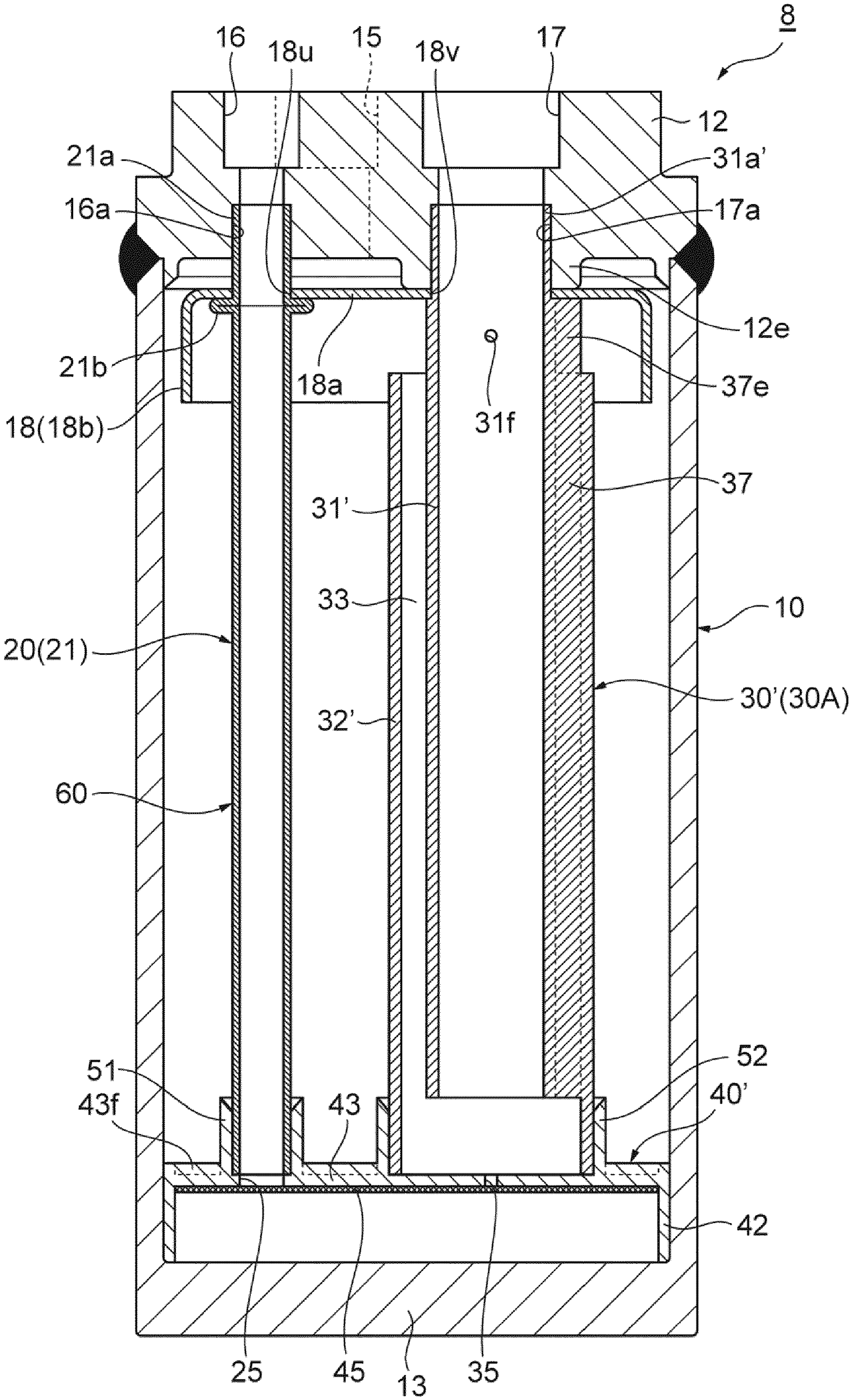
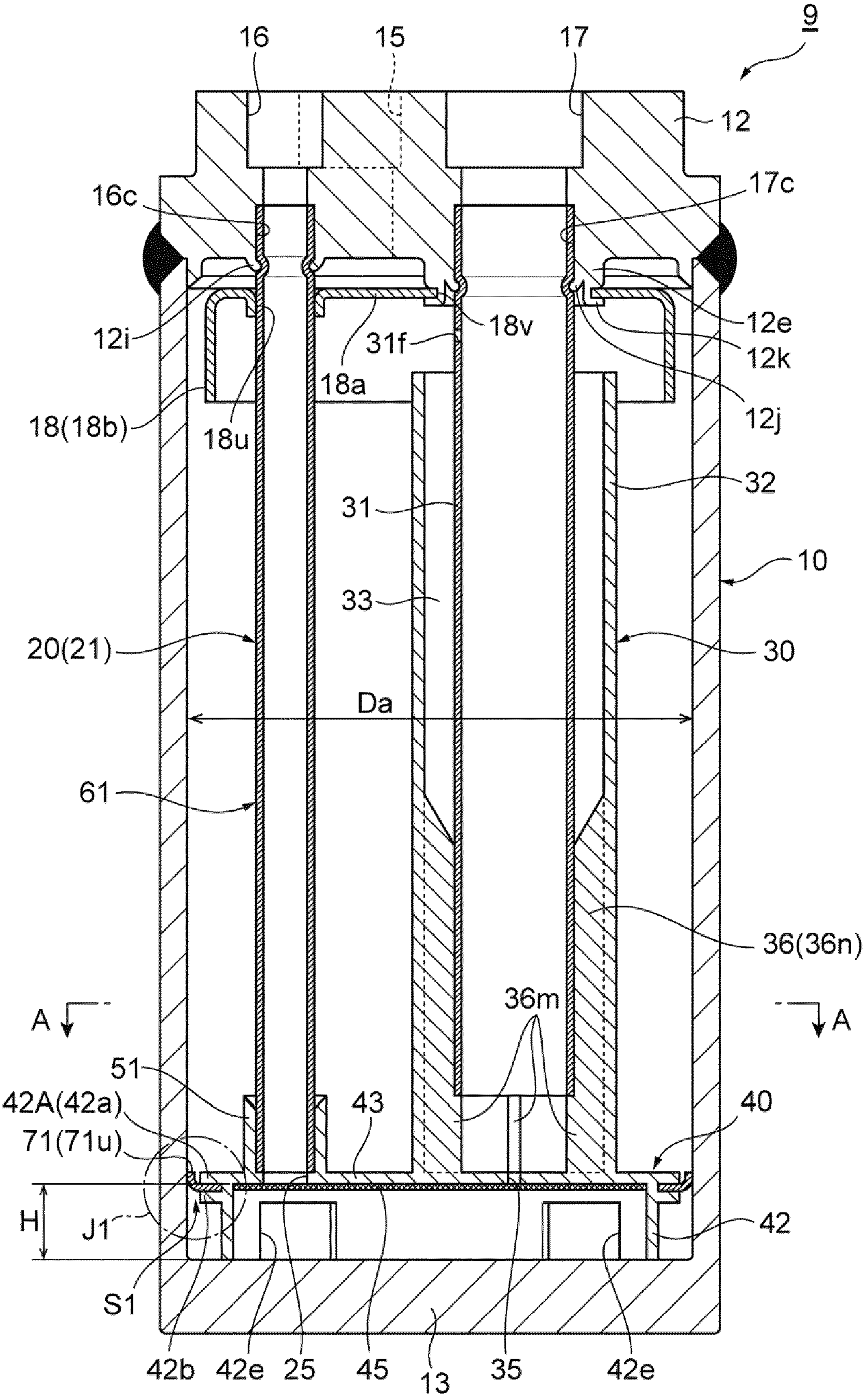

8
16
18u
15
18v
17
12
21a
31a'
16a
17a
12e
21b
18a
37e
18(18b)
31f
37
31'
33
10
20(21)
30'(30A)
32'
60
51
52
43f
43
40'
42
25
45
13
35

Fig. 23



9
16
15
17
12
16c
17c
12i
18v
12e
31f
12k
18a
18(18b)
12j
18u
31
32
33
10
20(21)
30
Da
61
36(36n)
36m
A
A
51
43
40
42A(42a)
71(71u)
H
J1
42
S1
42b
42e
25
45
13
35
42e

Fig. 24

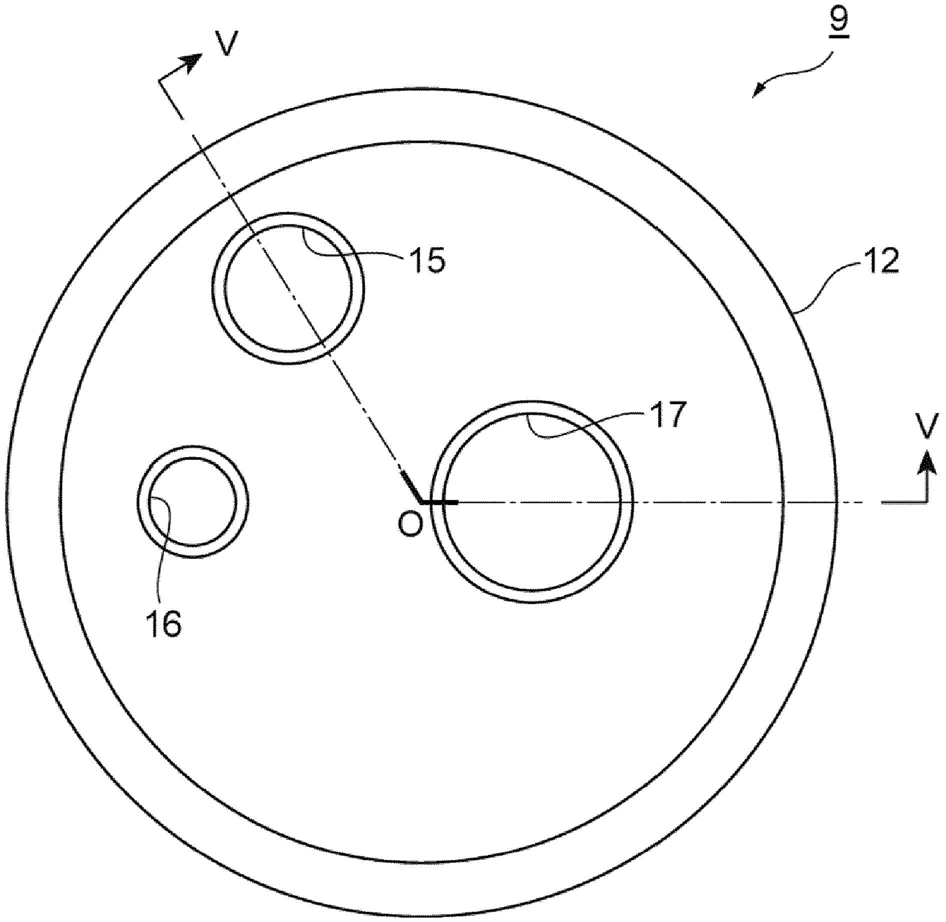
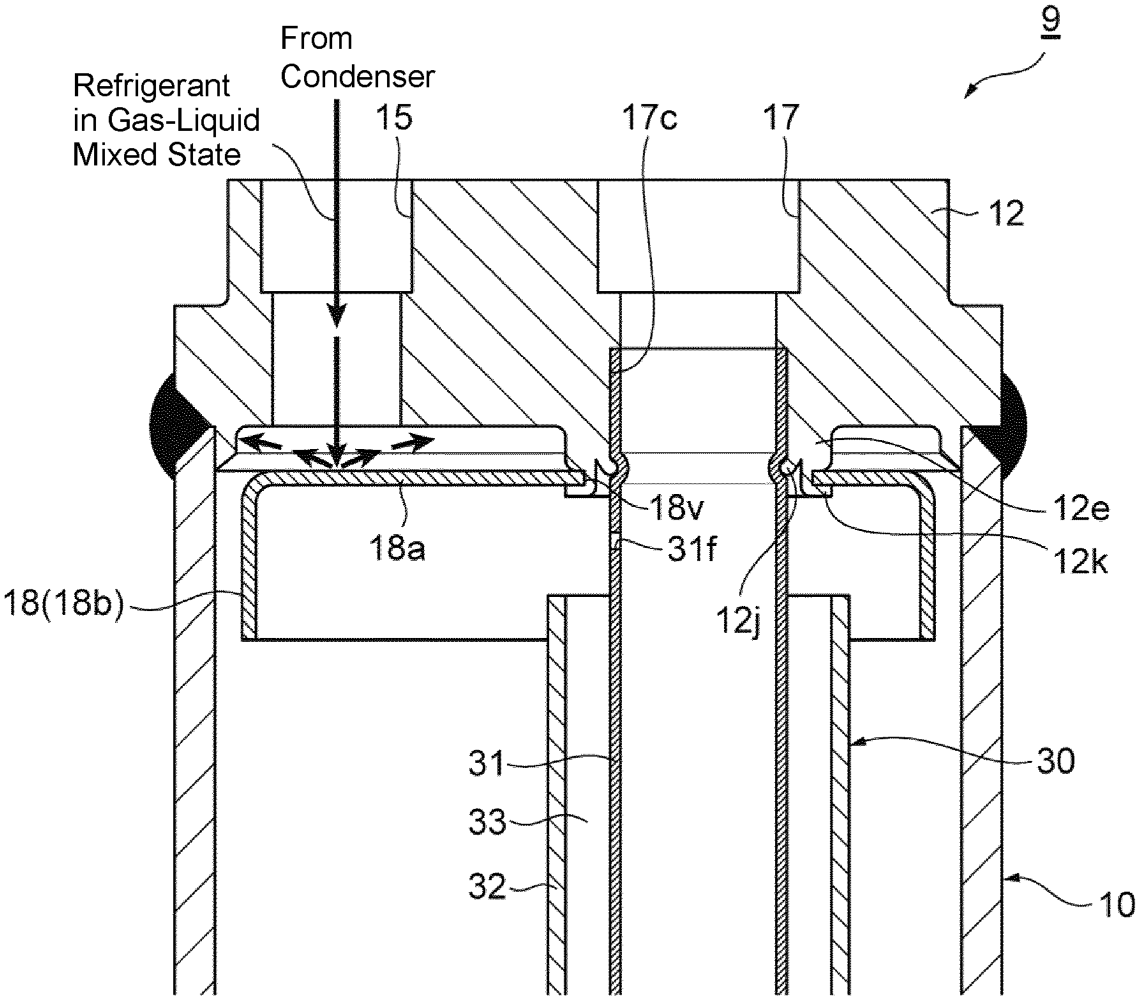


Fig. 25



9
From
Condenser
Refrigerant
in Gas-Liquid
Mixed State
15
17c
17
12
12e
18v
18a
31f
12k
18(18b)
12j
31
30
33
32
10

Fig. 26

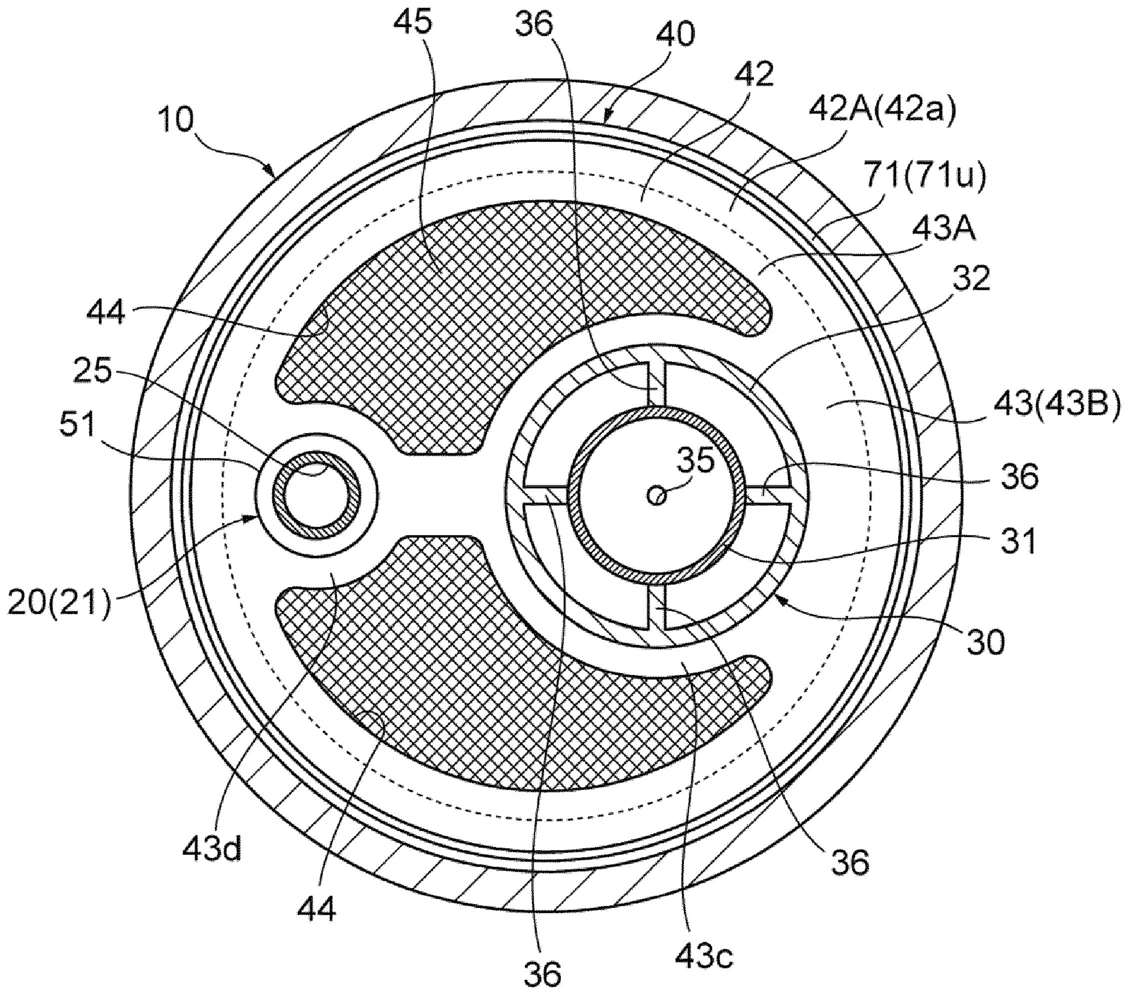

45
36
40
42
42A(42a)
10
71(71u)
43A
32
44
25
43(43B)
51
35
36
31
20(21)
30
43d
36
44
36
43c

Fig. 27A

Natural State

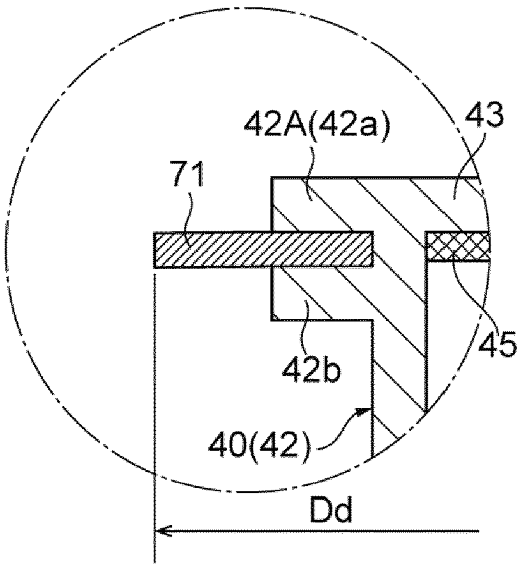


Fig. 27B

State Inserted in Tank

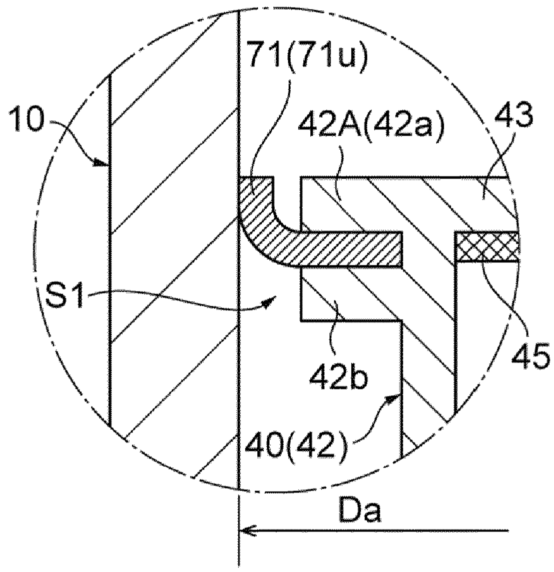


Fig. 28

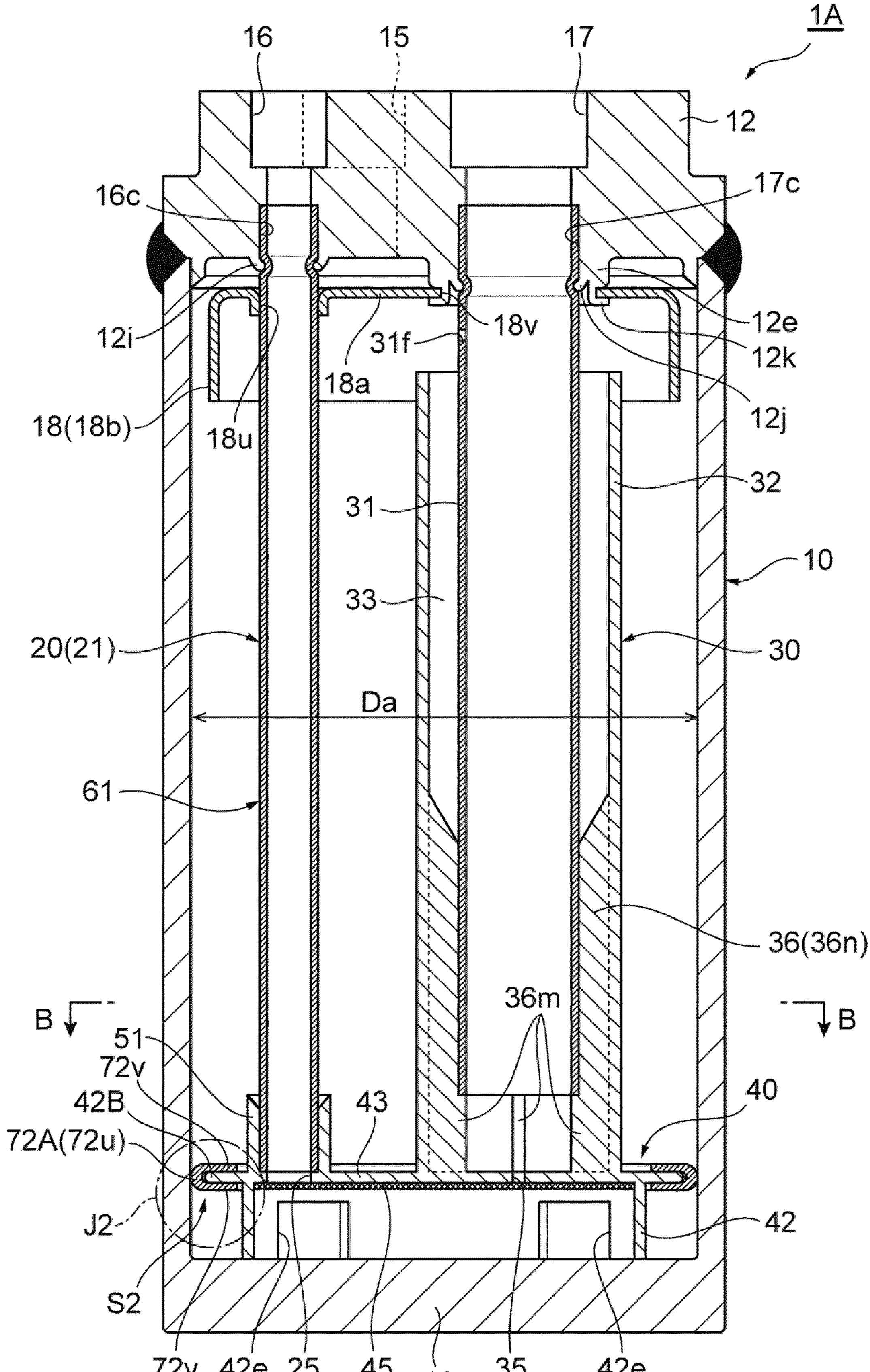

1A
16
15
17
12
16c
17c
12i
12e
18v
31f
12k
18a
12j
18(18b)
18u
32
31
10
33
20(21)
30
Da
61
36(36n)
36m
B
B
51
72v
42B
43
40
72A(72u)
J2
42
S2
72v
42e
25
45
13
35
42e

Fig. 29

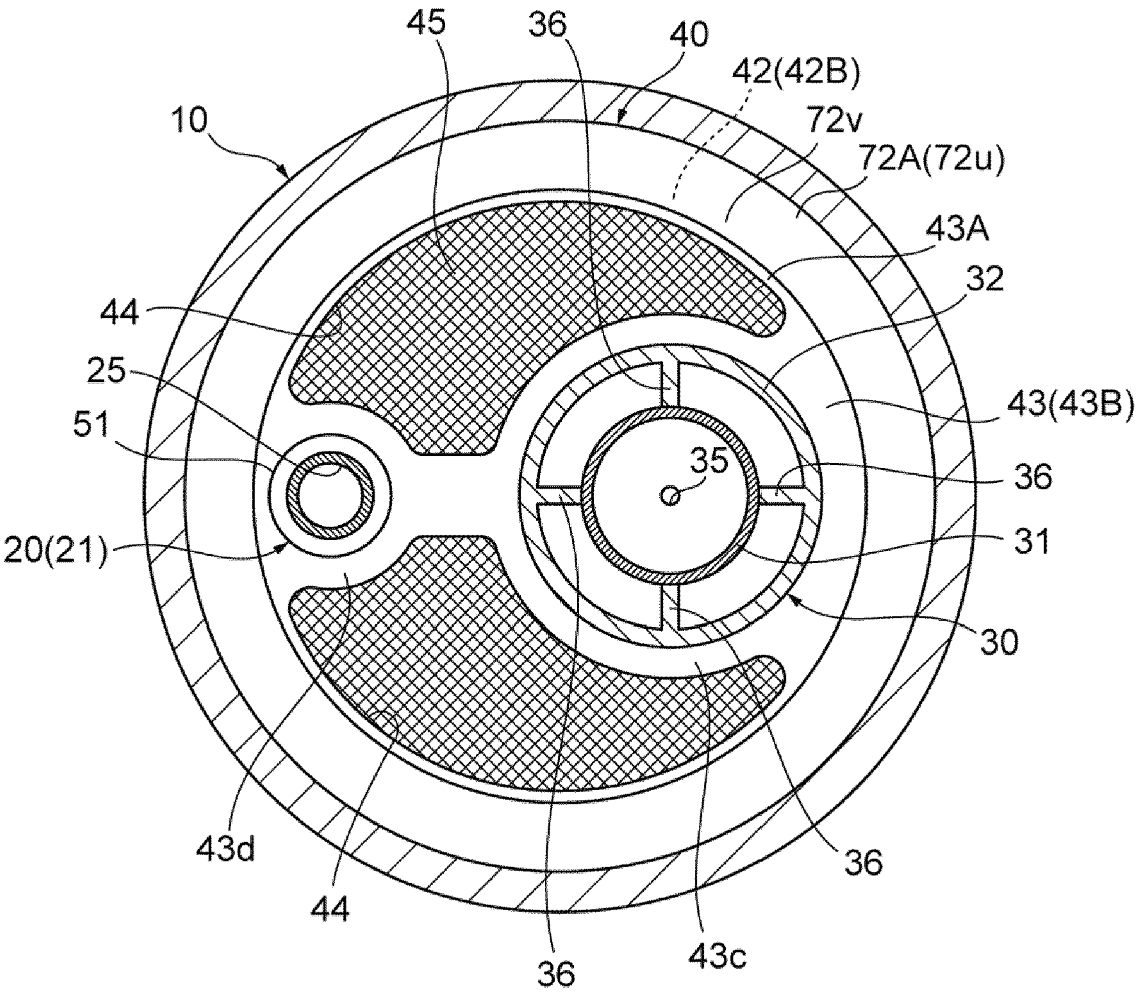

45
36
40
42(42B)
10
72v
72A(72u)
43A
32
44
25
43(43B)
51
35
36
20(21)
31
30
43d
36
44
36
43c

Fig. 30A

Natural State

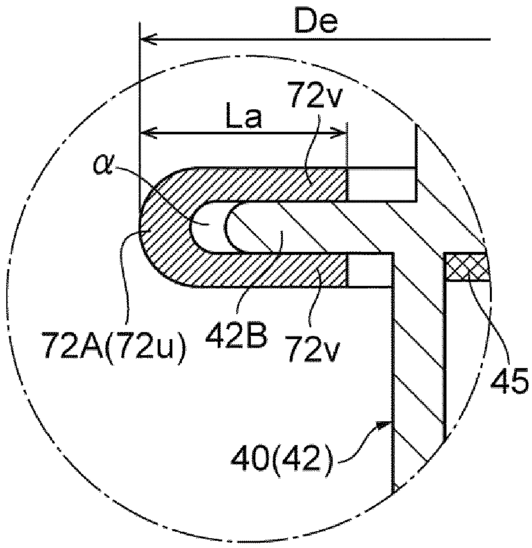


Fig. 30B

State Inserted in Tank

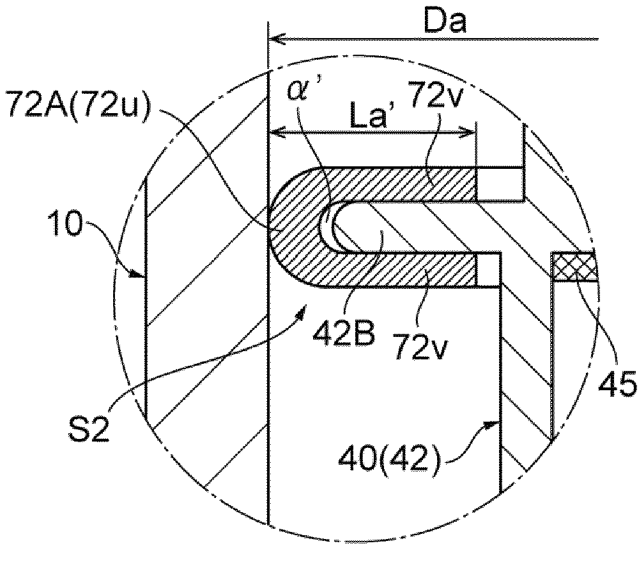


Fig. 31A

Natural State

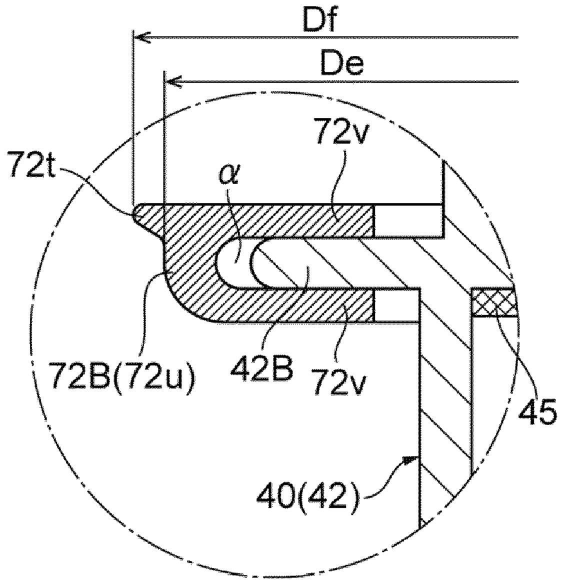


Fig. 31B

State Inserted in Tank

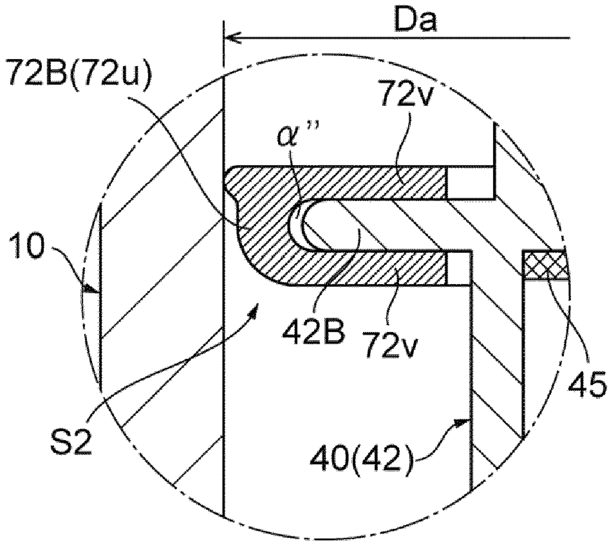


Fig. 32A

Natural State

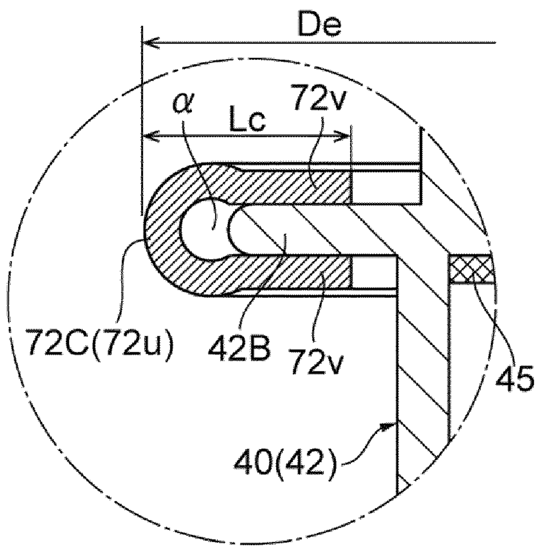


Fig. 32B

State Inserted in Tank

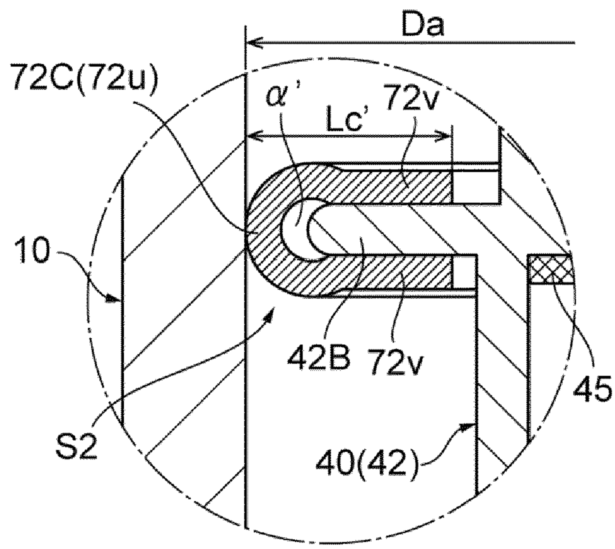


Fig. 32C

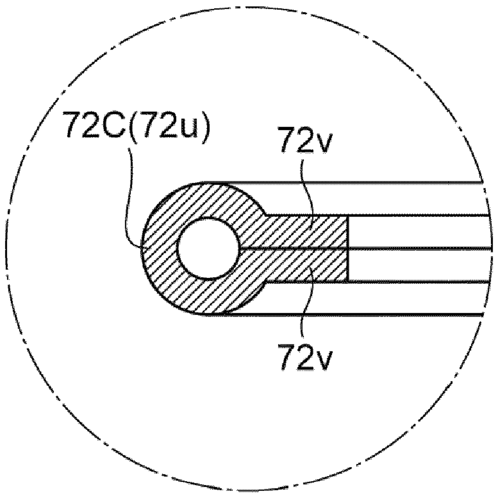


Fig. 33

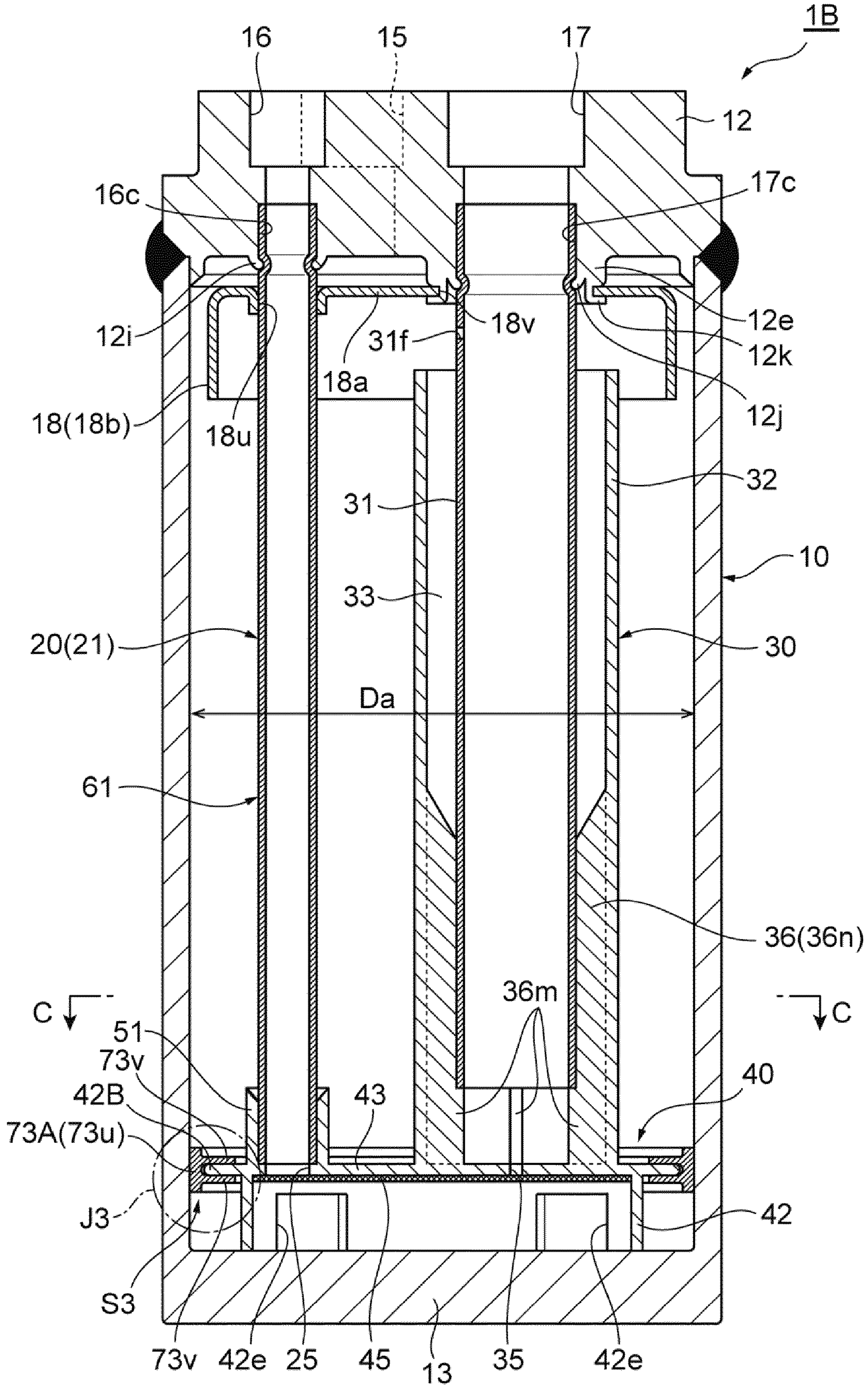

1B
16
15
17
12
16c
17c
12i
12e
18v
31f
12k
18a
18(18b)
18u
12j
32
31
10
33
20(21)
30
Da
61
36(36n)
36m
C
C
51
73v
40
42B
43
73A(73u)
J3
42
S3
73v
42e
25
45
13
35
42e

Fig. 34

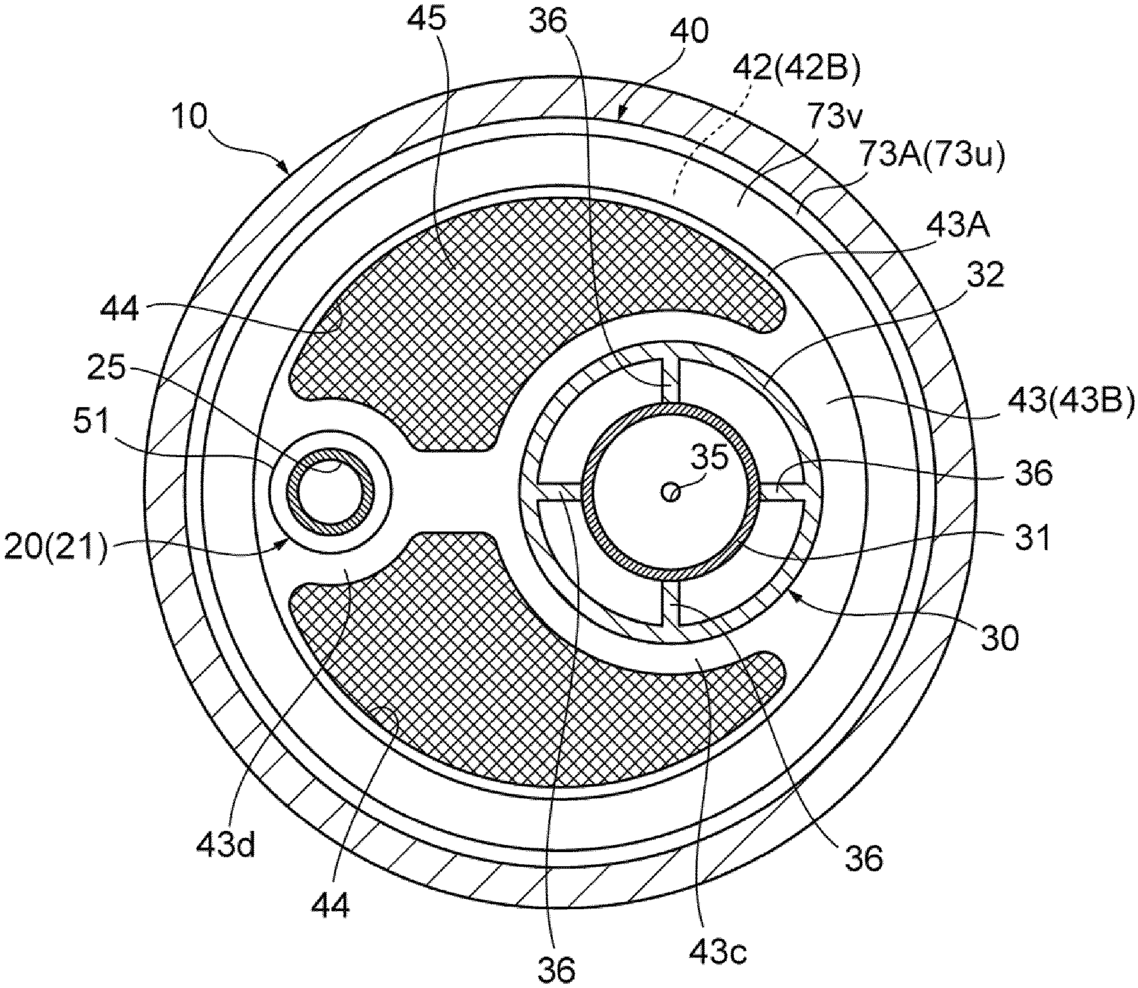

45
36
40
42(42B)
10
73v
73A(73u)
43A
32
44
25
43(43B)
51
35
36
20(21)
31
30
43d
36
44
36
43c

Fig. 35A

Natural State

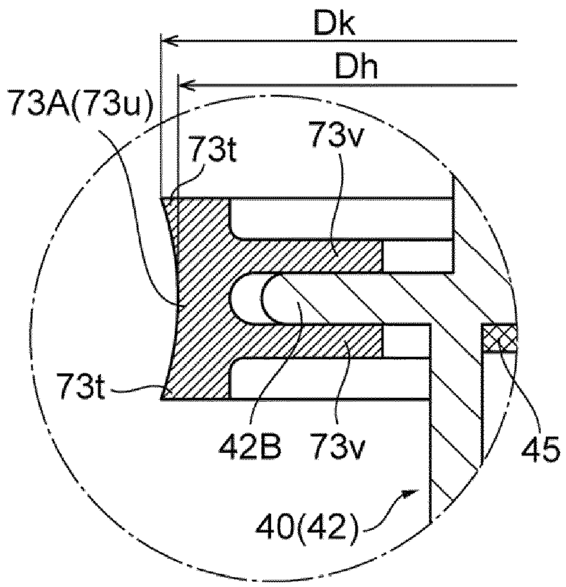


Fig. 35B

State Inserted in Tank

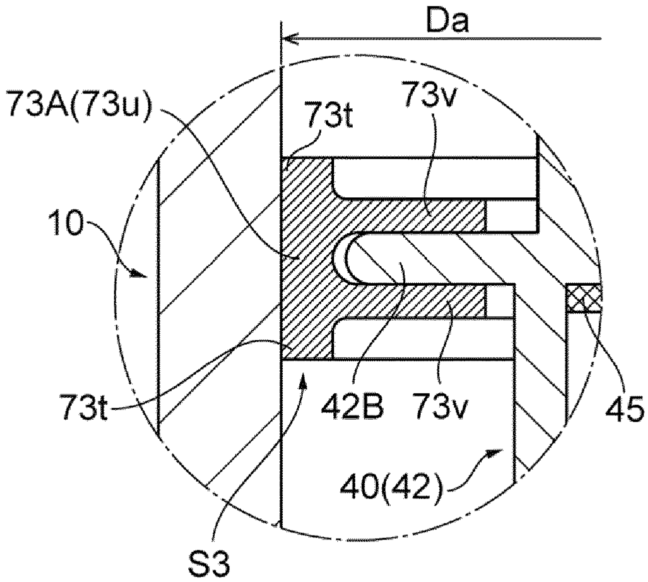


Fig. 36A

Natural State

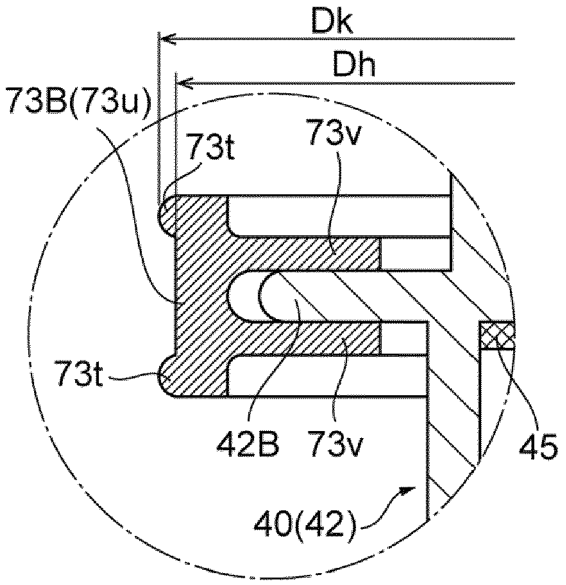


Fig. 36B

State Inserted in Tank

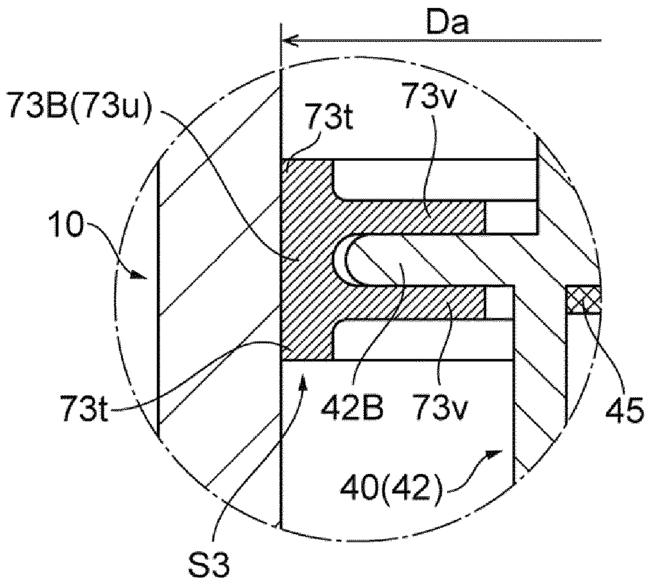


Fig. 37A

Natural State

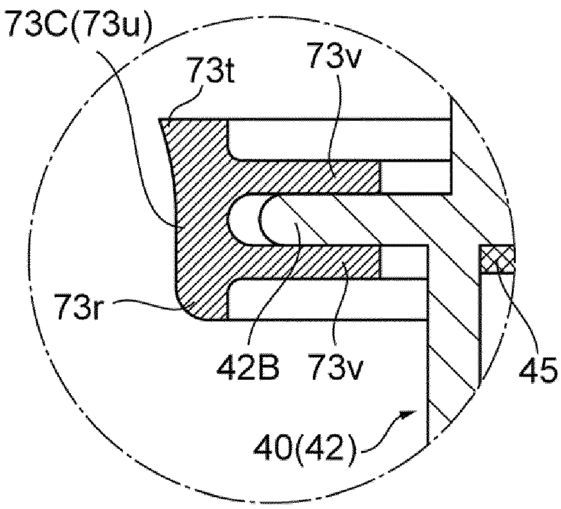


Fig. 37B

State Inserted in Tank

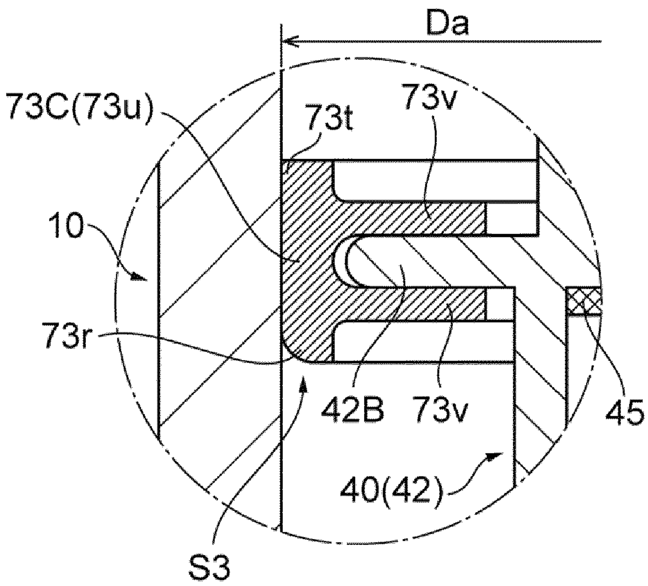


Fig. 38A

Natural State

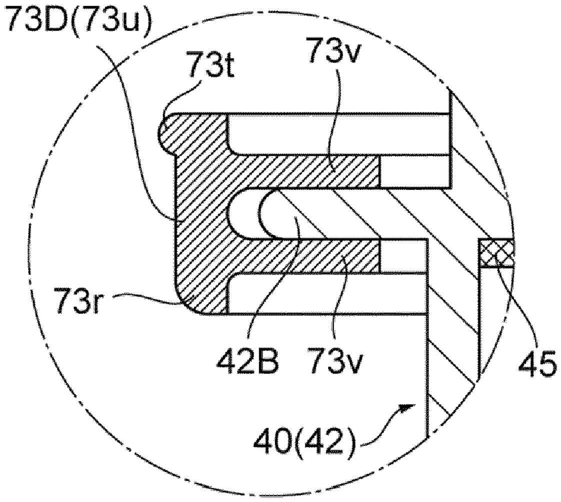


Fig. 38B

State Inserted in Tank

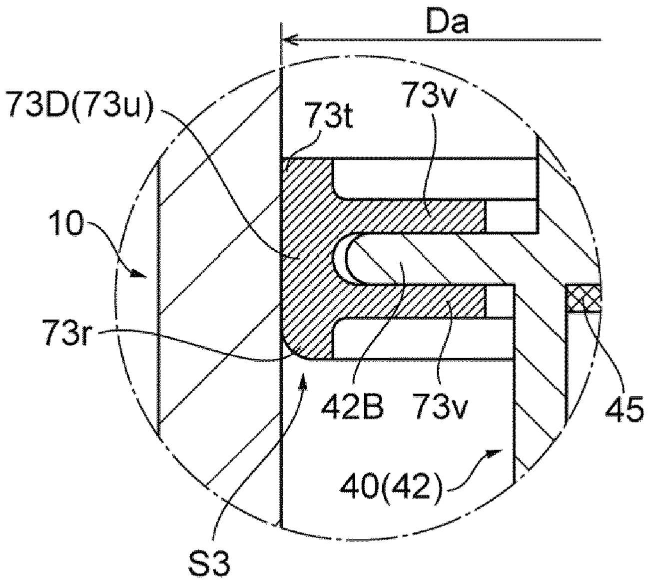


Fig. 39

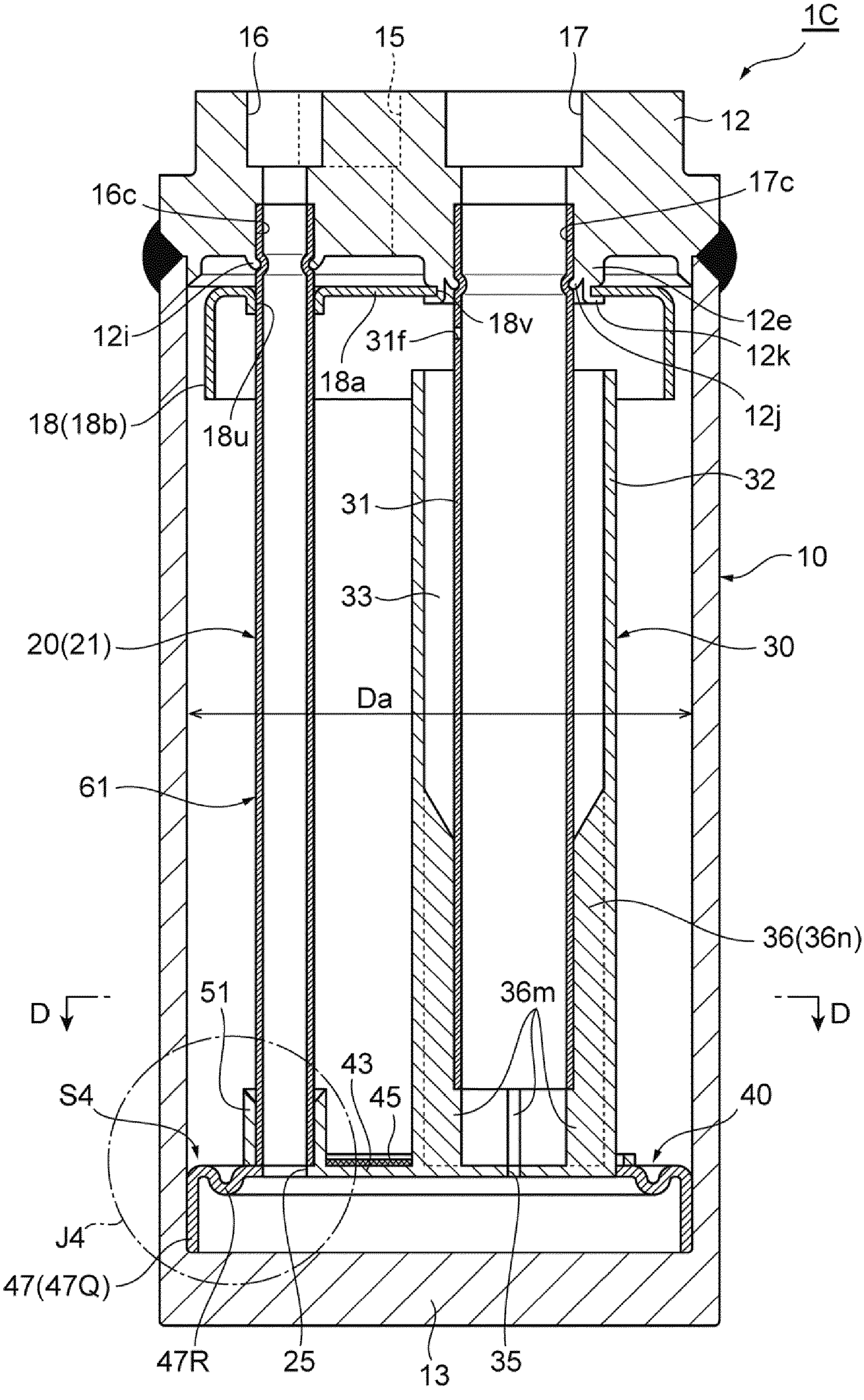

1C
16
15
17
12
16c
17c
12i
18v
12e
31f
12k
18a
18(18b)
18u
12j
32
31
10
33
20(21)
30
Da
61
36(36n)
D
51
36m
D
43
S4
45
40
J4
47(47Q)
47R
25
13
35

Fig. 40

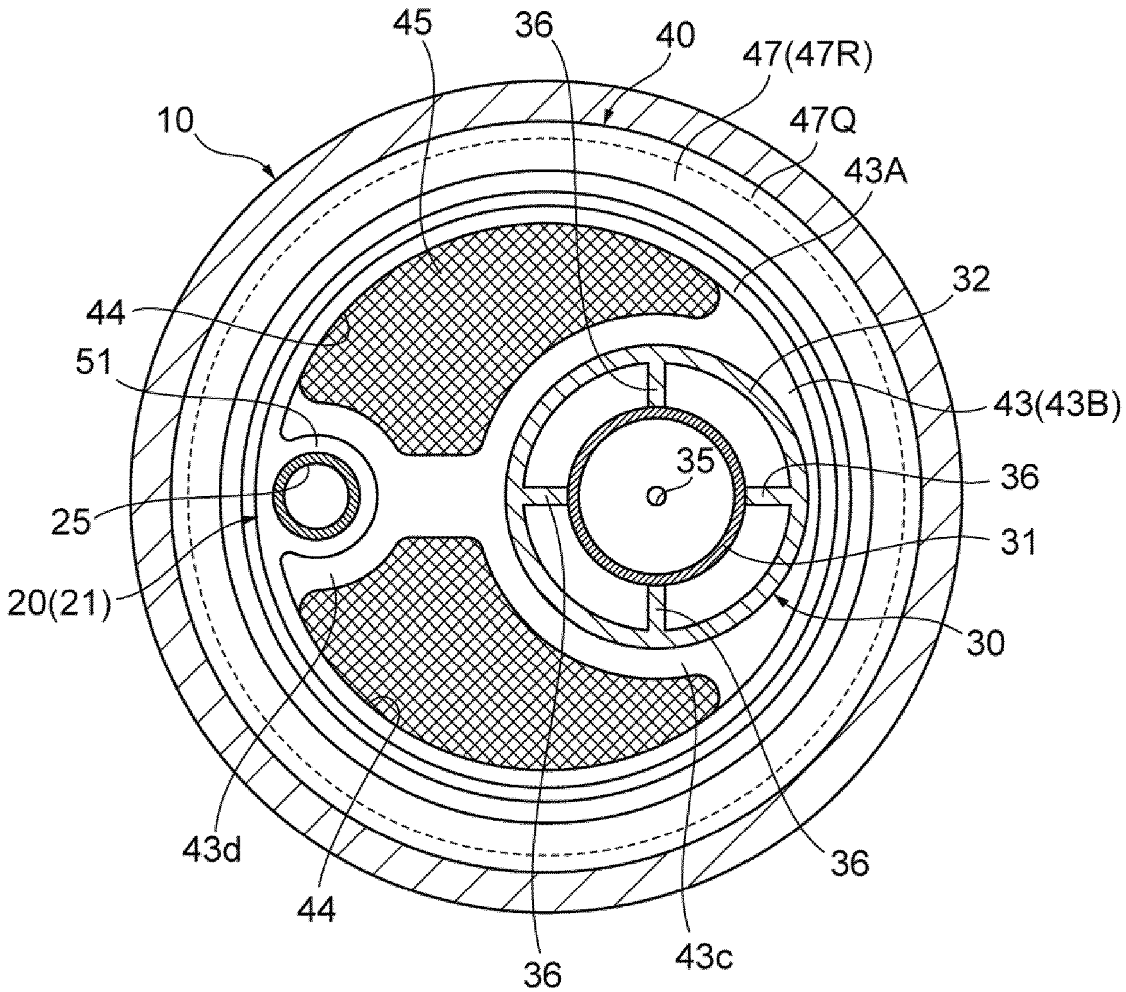

45
36
40
47(47R)
10
47Q
43A
32
44
51
43(43B)
35
36
25
31
20(21)
30
43d
36
44
36
43c

Fig. 41A

Natural State

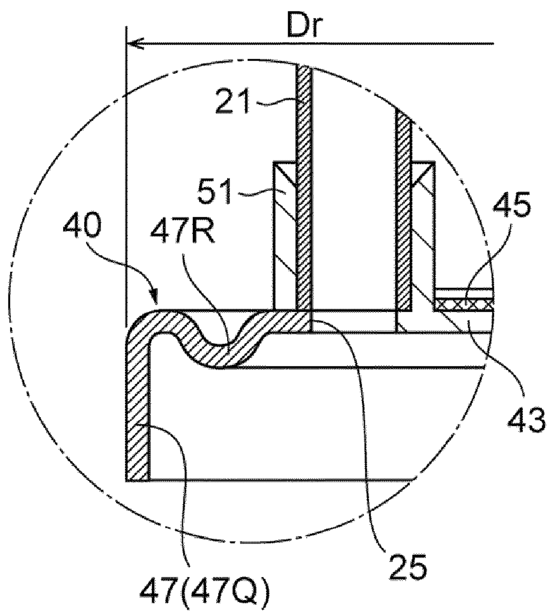


Fig. 41B

State Inserted in Tank

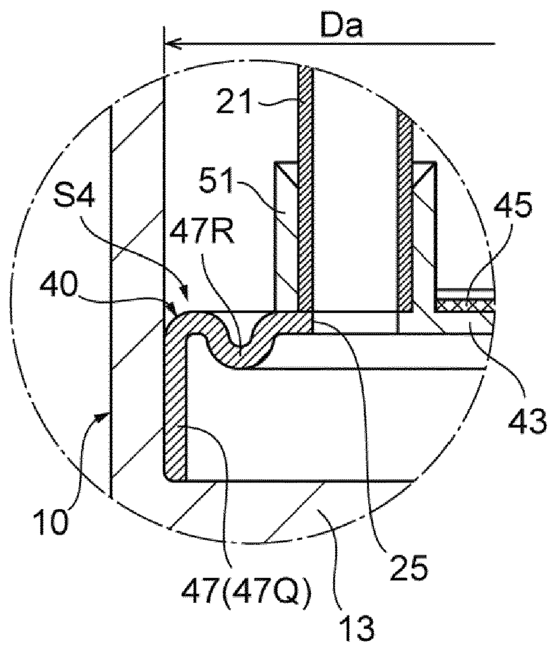


Fig. 42

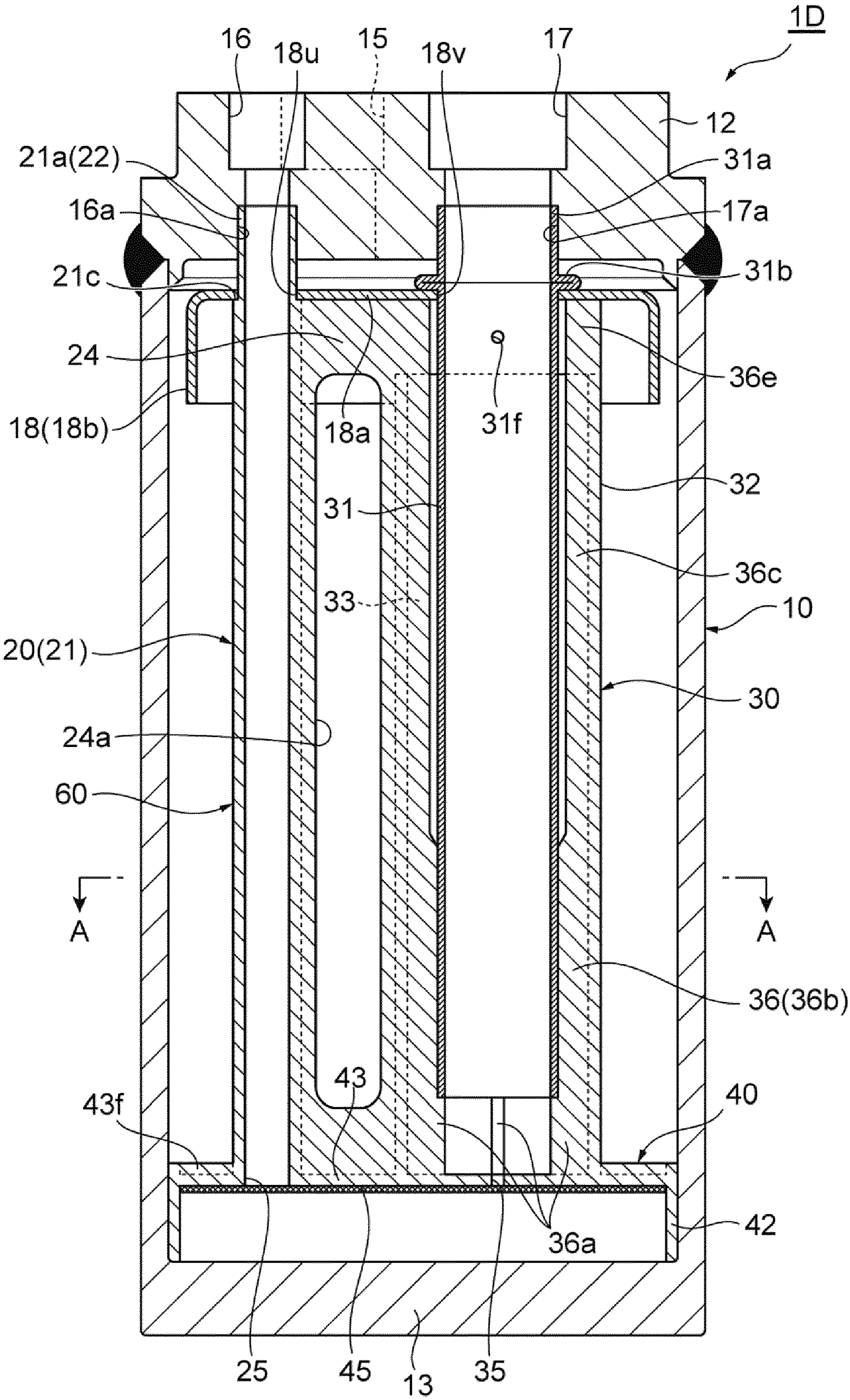

1D
16
18u
15
18v
17
12
21a(22)
31a
16a
17a
21c
31b
24
36e
18(18b)
18a
31f
32
31
36c
33
10
20(21)
30
24a
60
A
A
36(36b)
43
43f
40
42
36a
25
45
13
35

Fig. 43

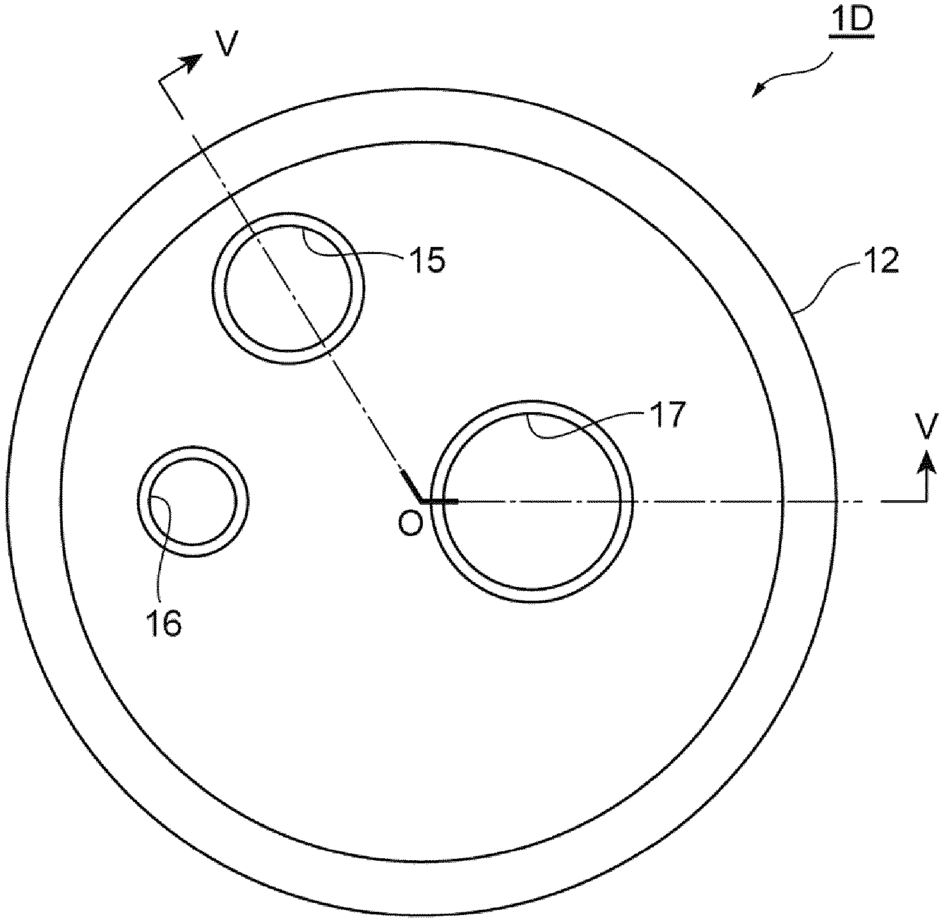


Fig. 44

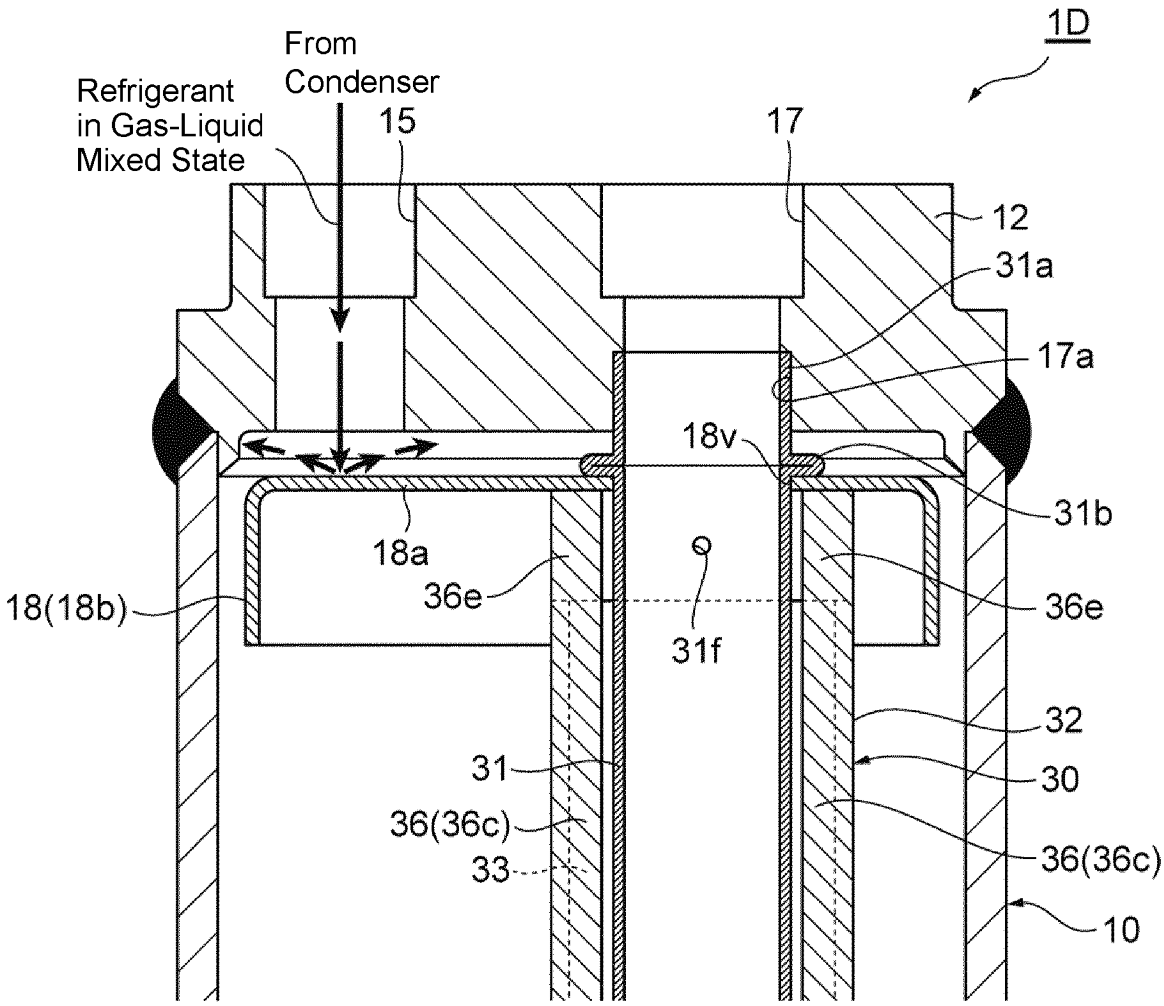

1D
From
Condenser
Refrigerant
in Gas-Liquid
Mixed State
15
17
12
31a
17a
18v
31b
18a
18(18b)
36e
36e
31f
32
31
30
36(36c)
33
36(36c)
10

Fig. 45

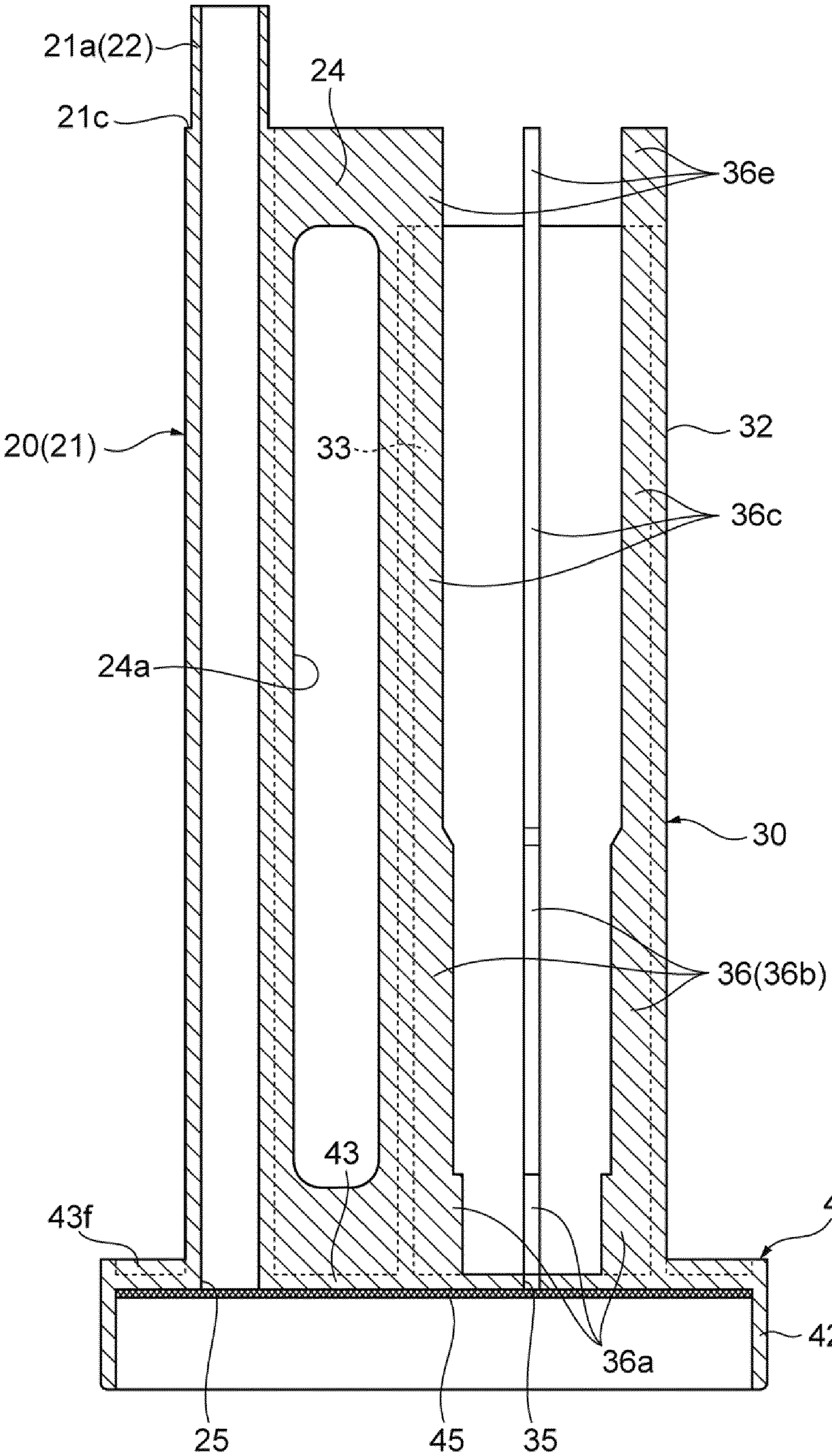

21a(22)
24
21c
36e
32
20(21)
33
36c
24a
30
36(36b)
43
40
43f
42
36a
25
45
35

Fig. 46

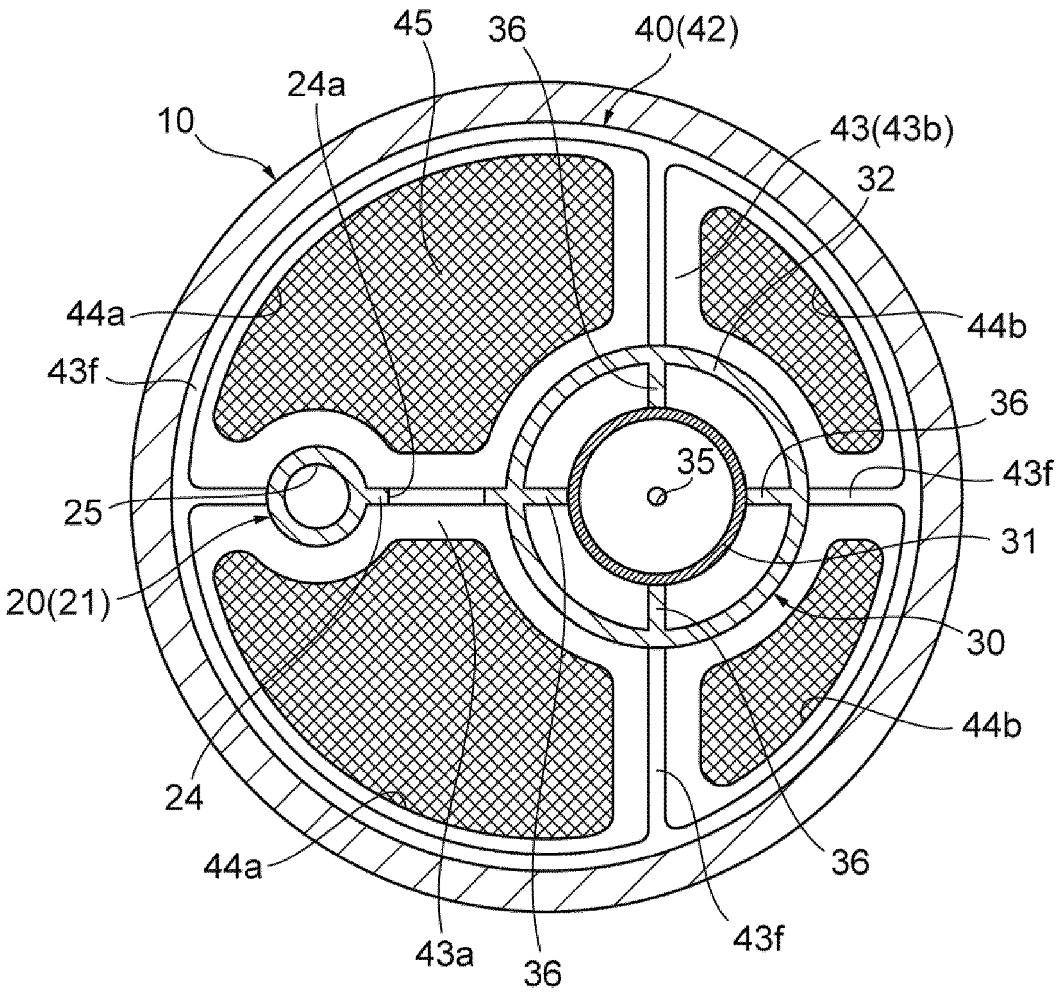
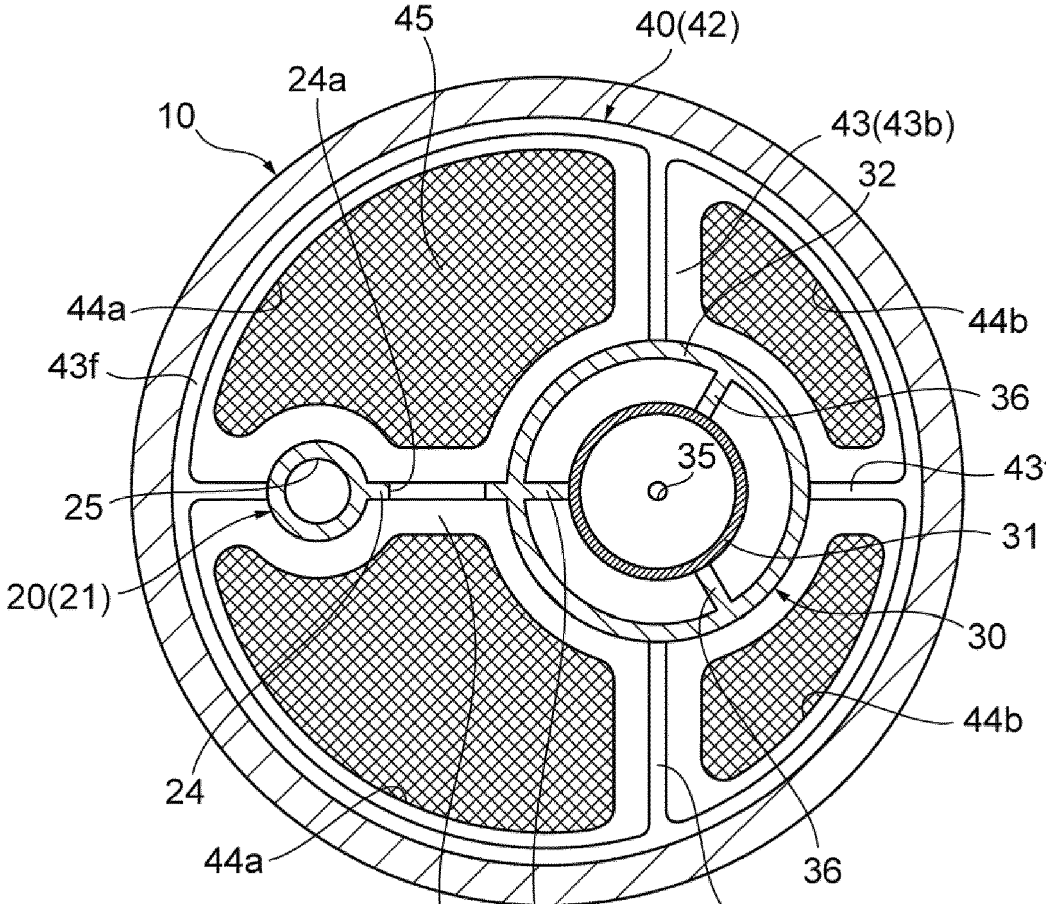

45
36
40(42)
24a
10
43(43b)
32
44a
44b
43f
36
35
43f
25
31
20(21)
30
44b
24
36
44a
43f
43a
36

Fig. 47


45
40(42)
24a
10
43(43b)
32
44a
44b
43f
36
35
43f
25
31
20(21)
30
44b
24
44a
36
43f
43a
36

REFERENCES CITED IN THE DESCRIPTION

Patent documents cited in the description

- WO 2018123215 A1 **[0006]**
- JP 2013184596 A **[0007]**
- JP 2018105552 A **[0007]**