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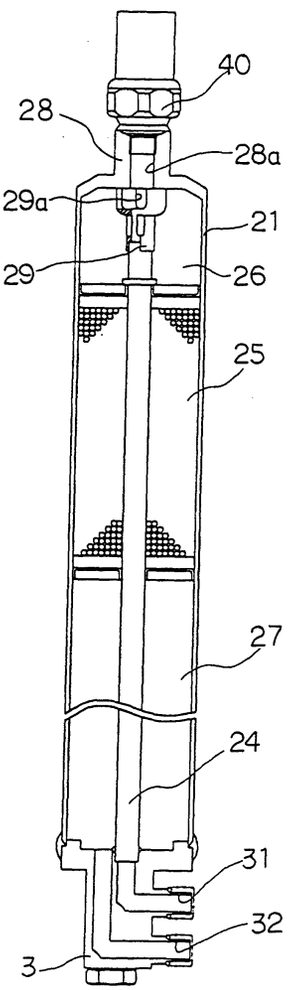
(54) **RECEIVER TANK**

(57) A receiver tank (2) to be connected to a heat exchanger (1) is configured so that the receiver tank is formed a mounting portion (28) having a diameter smaller than that of a body (21) of the receiver tank, and the mounting portion (28) is provided with a mounting member (50) such as a bracket to connect to another member such as a header pipe of the heat exchanger. The mounting projection (28) has its interior communicated with the interior of the body of the receiver tank. And, the mounting projection (28) has its end formed to have an opening (28a), in which a control member such as a pressure switch (40) is mounted.

FIG. 3



EP 1 130 346 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to a receiver tank used for an automobile refrigeration cycle.

BACKGROUND ART

[0002] Generally, a heat-exchanging medium condensing device, for example, a laminated heat exchanger, is known for an automobile refrigeration cycle, and such a heat exchanger is connected a receiver tank for preventing a cooling capacity from being degraded.

[0003] This receiver tank is a device for removing a gas refrigerant remained without being condensed from a liquid refrigerant liquefied by the heat exchanger and returning only the heat-exchanging medium in a single liquid phase to the cooling cycle for circulation. Thus, the receiver tank is connected as above, and the heat-exchanging medium is divided into gas and liquid so to be a heat-exchanging medium in the single liquid phase not containing the gas medium.

[0004] The receiver tank is designed to have a predetermined inside volume so to enable the storage of the liquefied refrigerant in a sufficient amount.

[0005] Thus, the receiver tank enables to secure the refrigerant in a stable circulating amount at all times regardless of a change in the external atmospheric conditions and the operation setting and the like by a user or the like, thereby preventing the cooling capacity and the like from being lowered.

[0006] The receiver tank is also provided with a filter, a desiccant and the like, which serve to remove foreign matters and water from the medium, so that the heat-exchanging medium can be circulated to flow in a clean state.

[0007] This type of the receiver tank is provided with a control member which is a relief valve such as a fusible plug or a pressure switch for externally discharging the refrigerant when a pressure becomes abnormally high on the high-pressure side of the refrigeration cycle equipment of the receiver tank body or the heat exchanger body.

[0008] For example, the invention described in Japanese Patent Application Laid-Open Publication No. Hei 8-219590 teaches a structure of the heat exchanger having its receiver tank integrally formed with the header pipe. Specifically, the receiver tank is integrally connected to the header pipe of the heat exchanger by means of rear brazing and caulking by caulking pieces to the header pipe of the heat exchanger. And, according to the invention described in Japanese Patent Application Laid-Open Publication No. Hei 8-219590, a fusible plug itself is used as a sealing means for the receiver tank, and a bolt-shaped body configuring the fusible plug is mounted to a cylinder disposed on the bottom end of the receiver tank body via an O-ring.

[0009] The invention described in Japanese Patent Application Laid-Open Publication No. Hei 9-53868 has a desiccant container, in which a desiccant is charged, suspended from an end lid for closing the top opening of the receiver tank. And, a pressure switch for detecting a refrigerant pressure and a fusible plug are disposed on a head portion of the desiccant container.

[0010] The invention described in Japanese Patent Application Laid-Open Publication No. Hei 9-170854 has a receiver tank and a header pipe independently provided, which are communicably connected to each other by a connection block which has inlet and outlet ports communicated with medium inlet and outlet ports of the receiver tank and by the header pipe and by a mounting block having a refrigerant passage.

[0011] Japanese Patent Application Laid-Open Publication No. Hei 9-217967 describes that communication ports of a receiver tank and a header pipe are communicably connected by a connection block, and a connecting device is connected to the heat exchanger on the top of the receiver tank. This connecting device has a receiving bracket with a locking recess fixed to the external surface at the other end of the header pipe, a lid for closing the opening at the end of a tubular receiver tank constituting the receiver tank, and a hook piece which is a locking projection externally protruded from the outer periphery of the lid toward a direction of its diameter, with its leading end bent from the receiver tank in the axial direction. The locking projection of the hook piece is engaged with the locking recess of the receiving bracket to connect one end of the header pipe with the base end of the receiver tank with the other end of the header pipe connected with the leading end of the case.

[0012] But, when the control member such as a pressure switch or a fusible plug is mounted on the opening having the same diameter as that of the receiver tank body as described in the invention of Japanese Patent Application Laid-Open Publication No. Hei 8-219590 or No. 9-53868, it is difficult to mount the control member so to be communicable with the inside of the receiver tank body. For example, in the invention described in Japanese Patent Application Laid-Open Publication No. Hei 8-219590, the fusible plug itself also functions as a sealing means for the bottom end of the receiver tank, so that the fusible plug itself must be formed in a large size to match the opening of the receiver tank. According to the invention described in Japanese Patent Application Laid-Open Publication No. Hei 9-53868, the fusible plug or the like is mounted on the head of the desiccant container suspended within the receiver tank, so that the head has a complex structure.

[0013] Where the header pipe of the heat exchanger and the receiver tank are integrally formed by caulking pieces or the like as in the inventions described in Japanese Patent Application Laid-Open Publications No. Hei 8-219590 and No. Hei 9-53868, a brazing area is so large that there is a problem of considerable loss is in case of a brazing failure. And, it is necessary to sepa-

rately place in or remove from the receiver tank a dryer and a filter which are the functional components of the receiver tank, and this causes a problem that storage of these functional components and operation for their replacement become complex.

[0014] In the invention described in Japanese Patent Application Laid-Open Publication No. Hei 9-170854, the pressure switch is mounted to protrude on the mounting block, resulting in a problem that the pressure switch obstructs the mounting of the receiver tank on a vehicle body.

[0015] In addition, as shown in Fig. 6, the invention described in Japanese Patent Application Laid-Open Publication No. Hei 9-170854 connects the receiver tank 2 and the header pipe 6 by a spacer 80 taking into consideration vibrations applied when mounted on the vehicle body, and a belt 81 is mounted between and around the receiver tank 2 and the header pipe 6 to stably connect the receiver tank 2 with the header pipe 6 of the heat exchanger.

[0016] There is a problem, however, that when the belt 81 is mounted between and around the receiver tank 2 and the header pipe 6, its diameter becomes larger than that of the outer periphery of the receiver tank 2 to externally protrude from the diameter of the body of the receiver tank, causing a problem that it makes an obstacle in a vehicle having a limited mounting space.

[0017] The connecting device according to the invention described in Japanese Patent Application Laid-Open Publication No. Hei 9-217967 does not externally protrude from the diameter of the body of the receiver tank, but it is necessary to form the bracket having the locking recess constituting the connecting device and the lid or the like to be locked by the bracket. Thus, there is a problem that the connecting device is difficult to form.

[0018] Therefore, in view of the problems described above, it is an object of the present invention to provide a receiver tank which can be connected to other members such as a header pipe without protruding a mounting member such as a bracket from the receiver tank body and can have a control member such as a pressure switch mounted with ease.

DISCLOSURE OF THE INVENTION

[0019] The invention described in claim 1 is a receiver tank which is connected to a heat exchanger and stores therein a liquid refrigerant to continuously supply the liquid refrigerant by discharging it, characterized in that:

the receiver tank is formed a mounting portion having a diameter smaller than that of the body of the receiver tank, and the mounting portion is provided with a mounting member such as a bracket to connect to another member such as a header pipe of the heat exchanger.

[0020] Thus, when the mounting portion having a diameter smaller than that of the receiver tank body is formed and the mounting member such as a bracket is contacted with the mounting portion, the heat exchanger can be connected with the receiver tank without protruding the contacted portion out of the outer periphery of the receiver tank. Thus, the receiver tank can be connected to another member without disturbing the mounting on a vehicle in which a mounting space is limited.

[0021] The invention described in claim 2 is a receiver tank which is connected to a heat exchanger and stores therein a liquid refrigerant to continuously supply the liquid refrigerant by discharging it, characterized in that:

a mounting projection having a diameter smaller than that of the body of the receiver tank is formed on one end of the receiver tank.

[0022] Thus, when the mounting projection having a diameter smaller than that of the receiver tank body is formed, the receiver tank can be connected to the heat exchanger by mounting a contact portion such as a bracket or a belt of the mounting member to the mounting projection, without making the mounting member have a diameter larger than that of the body to protrude from the receiver tank, and the heat exchanger and the receiver tank can be connected without requiring a larger mounting space.

[0023] And, the receiver tank is stably connected to the heat exchanger by the bracket or the like, and a vibration resistance can be improved.

[0024] The invention described in claim 3 is the receiver tank according to claim 2, wherein the mounting projection has its interior communicated with the interior of the body of the receiver tank.

[0025] Thus, the formation of the mounting projection communicated with the interior enables mounting of a relief valve such as a pressure switch on the mounting projection. Accordingly, the control member can be mounted readily without separately disposing a relief passage or the like.

[0026] The invention described in claim 4 is the receiver tank according to claim 2, wherein the mounting projection has its end formed to have an opening, in which a control member such as a relief valve is mounted.

[0027] When the control member such as a relief valve is mounted on the opening of the mounting projection formed to have a diameter smaller than that of the body, the control member is fixed to the mounting projection, and the control member can be mounted readily without separately disposing a relief passage or the like.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028]

Fig. 1 is a front view of a heat exchanger and a receiver tank according to an embodiment of the present invention;

Fig. 2 is a side view of the heat exchanger and the

receiver tank according to the embodiment of the invention;

Fig. 3 is a partly vertical sectional side view of the receiver tank according to the embodiment of the invention;

Fig. 4 is a plan view of the heat exchanger and the receiver tank according to a first embodiment of the invention;

Fig. 5 is a partly sectional view taken along line X-X of Fig. 2 according to a second embodiment of the invention; and

Fig. 6 is a plan view showing a joint structure of a heat exchanger and a receiver tank according to a conventional embodiment.

BEST MODE FOR CARRYING OUT THE INVENTION

[0029] Embodiments of the invention will be described with reference to the accompanying drawings.

[0030] A receiver tank 2 of this embodiment is used for an automobile air conditioner mounted in the engine room of an automobile to temporarily stores a refrigerant condensed by a condenser of the air conditioner.

[0031] Fig. 1 is a front view of a heat exchanger 1 and the receiver tank 2. Fig. 2 is a side view of the heat exchanger and the receiver tank 2.

[0032] As shown in Fig. 1, the heat exchanger 1 has a plurality of flat tubes 4 and corrugated fins 5 alternately stacked, and both ends of the stacked flat tubes 4, 4 respectively inserted to connect into tube insertion holes 8, 8 of header pipes 6, 7. A side plate 9 having a square U-shaped cross section is disposed on top and bottom sides of the stacked tubes 4. Openings on the top and bottom ends of the header pipes 6, 7 are sealed by a cap 10. The receiver tank 2 is connected to the header pipe 6, and an inlet joint 12 and an outlet pipe 13 are arranged on the other header pipe 7. And, unillustrated outlet and inlet ports for flowing a heat-exchanging medium are formed on the header pipe 6 connected with the receiver tank 2.

[0033] Fig. 3 is a partly vertical sectional side view showing the internal structure of the receiver tank.

[0034] As shown in Fig. 3, the receiver tank 2 has within a tank member 21 a desiccant layer 25 for removing water from the refrigerant, an upper chamber 26 and a lower chamber 27 which are divided by the desiccant layer 25, and a suck-up pipe 24 for sucking the refrigerant from the lower chamber 27 to the upper chamber 26 through the desiccant layer 25.

[0035] The receiver tank 2 of this embodiment is formed on the top of the upper chamber 26 a mounting projection 28 which has a diameter smaller than that of the tank member 21. This mounting projection 28 is formed an opening to communicate with the interior of the tank member 21. A pressure switch 40 is mounted on an opening 28a of the mounting projection 28.

[0036] A communication member 29 which is communicated with the opening of the mounting projection 28 is mounted on the upper part of the suck-up pipe 24, and a discharge port 29a for discharging the refrigerant sucked up through the suck-up pipe 24 into the tank member 21 is formed in the communication member 29.

[0037] A connector 3 which communicates the receiver tank 2 with the header pipe 6 is connected to the bottom ends of the tank member 21 and the suck-up pipe 24.

[0038] A passage 31 for communicating the outlet port of the header pipe 6 with the suck-up pipe 24 and a passage 32 for communicating with the inlet port of the header pipe 6 are formed on the connector 3.

[0039] Accordingly, the refrigerant cooled by flowing through the heat exchanger 1 flows through the passage 31 of the connector from the outlet port of the header pipe 6 and is sucked up by the suck-up pipe 24 to flow into the upper chamber 26 within the tank member 21 through the discharge port 29a of the communication member 29, dehydrated while passing through the desiccant layer 25 and stored in the lower chamber 27. After flowing through the passage 32 of the connector 3, the refrigerant flows again into the heat exchanger 1 through the inlet port of the header pipe 6 to remove water, impurities and others from the refrigerant. Thus, it is configured to smoothly flow the refrigerant in a refrigeration cycle.

[0040] The pressure switch 40 mounted on the opening 28a of the mounting projection 28 which is mounted on the top of the receiver tank 2 of this embodiment opens the refrigeration cycle when a pressure becomes equal to or higher than a predetermined value so to secure the safety of the refrigeration cycle.

[0041] The header pipe 6 of the heat exchanger and the receiver tank 2 are connected to be communicable by means of the connector 3. But, vibrations applied to the heat exchanger mounted on a vehicle may degrade the connector section to make it hard to secure a connection strength.

[0042] In such a case, it may be generally configured to improve a vibration resistance by connecting the top of the receiver tank 2 and the header pipe 6 by means of a mounting member 50 such as a bracket thereby to support the receiver tank 2 at two points, namely, by the bracket and the connector.

[0043] Fig. 4 is a plan view showing a state that the receiver tank 2 is connected to the heat exchanger 1 by the mounting member 50 according to a first embodiment of the invention.

[0044] As shown in Fig. 4, the mounting member 50 connects the receiver tank 2 and the header pipe 6 by contacting a belt member 51 disposed on the mounting member 50 to the mounting projection 28 formed on the top of the tank member 21.

[0045] The mounting member 50 is formed a mounting face 52 having a curvature agreeing with the outer periphery of the header pipe 6, and a belt-mounting face 53 which becomes parallel to the tube 4 is formed when the mounting face 52 is contacted with a predetermined

position of the header pipe 6. The belt member 51 is placed around the mounting projection 28 to connect both ends , 51b of the belt member 51 to the mounting face 52 by a connecting member 60.

[0046] In this case, even when the belt member 51 of the mounting member 50 is mounted, the belt member 51 does not protrude out of the body of the tank member 21 because the mounting projection 28 has a diameter smaller than that of the tank member 21, thus the receiver tank 2 is connected to the heat exchanger 1 without expanding a mounting space in the vehicle body.

[0047] Fig. 5 is a partial sectional view taken along line X-X of Fig. 2, showing a second embodiment of the invention.

[0048] As shown in Fig. 2 and Fig. 5, a mounting member 70 connects the receiver tank 2 and the header pipe 6 by contacting a belt 71 of the mounting member 70 to the mounting projection 28 formed on the top of the tank member 21.

[0049] The mounting member 70 is formed a mounting face 72 having a curvature which agrees with the outer periphery of the header pipe 6, and the belt 71 is formed from the mounting face 72 toward the receiver tank 2.

[0050] In this case, even when the belt 71 of the mounting member 70 is mounted, the mounting member 70 does not protrude out of the body of the tank member 21 because the mounting projection 28 is formed to have a diameter smaller than that of the tank member 21, and the receiver tank 2 is connected to the heat exchanger 1 without expanding a mounting space within a vehicle body.

[0051] A coupling strength is improved and a vibration resistance is secured because the receiver tank 2 is connected to the header pipe 6 of the heat exchanger 1 by the connector 3 and the mounting member 70.

[0052] Since the mounting projection 28 having a diameter smaller than that of the body of the tank member 21 is formed to have an opening to communicate with the interior of the tank member 21, a control member such as a pressure switch can be mounted on the opening 28a. Thus, it is not necessary to provide a new part for mounting the control member at a separate position, thereby the number of parts can be decreased, resulting in reduction of costs.

[0053] In this embodiment, the mounting projection 28 having a diameter smaller than that of the body portion of the tank member 21 is formed on the top of the tank member 21. In addition to the mounting on the top, a small diameter portion for mounting may also be formed at a middle portion of the tank member 21 to which the connection member is mounted.

INDUSTRIAL APPLICABILITY

[0054] The present invention is a receiver tank which can be connected to another member such as a header pipe without protruding a mounting member such as a bracket out of the body of the receiver tank, and suitable for a refrigeration cycle for automobiles in which a mounting space is small.

Claims

1. A receiver tank which is connected to a heat exchanger and stores therein a liquid refrigerant to continuously supply the liquid refrigerant by discharging it, **characterized in that**:

   the receiver tank is formed a mounting portion having a diameter smaller than that of the body of the receiver tank, and the mounting portion is provided with a mounting member such as a bracket to connect to another member such as a header pipe of the heat exchanger.

2. A receiver tank which is connected to a heat exchanger and stores therein a liquid refrigerant to continuously supply the liquid refrigerant by discharging it, **characterized in that**:

   a mounting projection having a diameter smaller than that of the body of the receiver tank is formed on one end of the receiver tank.

3. The receiver tank according to claim 2, wherein the mounting projection has its interior communicated with the interior of the body of the receiver tank.

4. The receiver tank according to claim 2, wherein the mounting projection has its end formed to have an opening, in which a control member such as a relief valve is mounted.

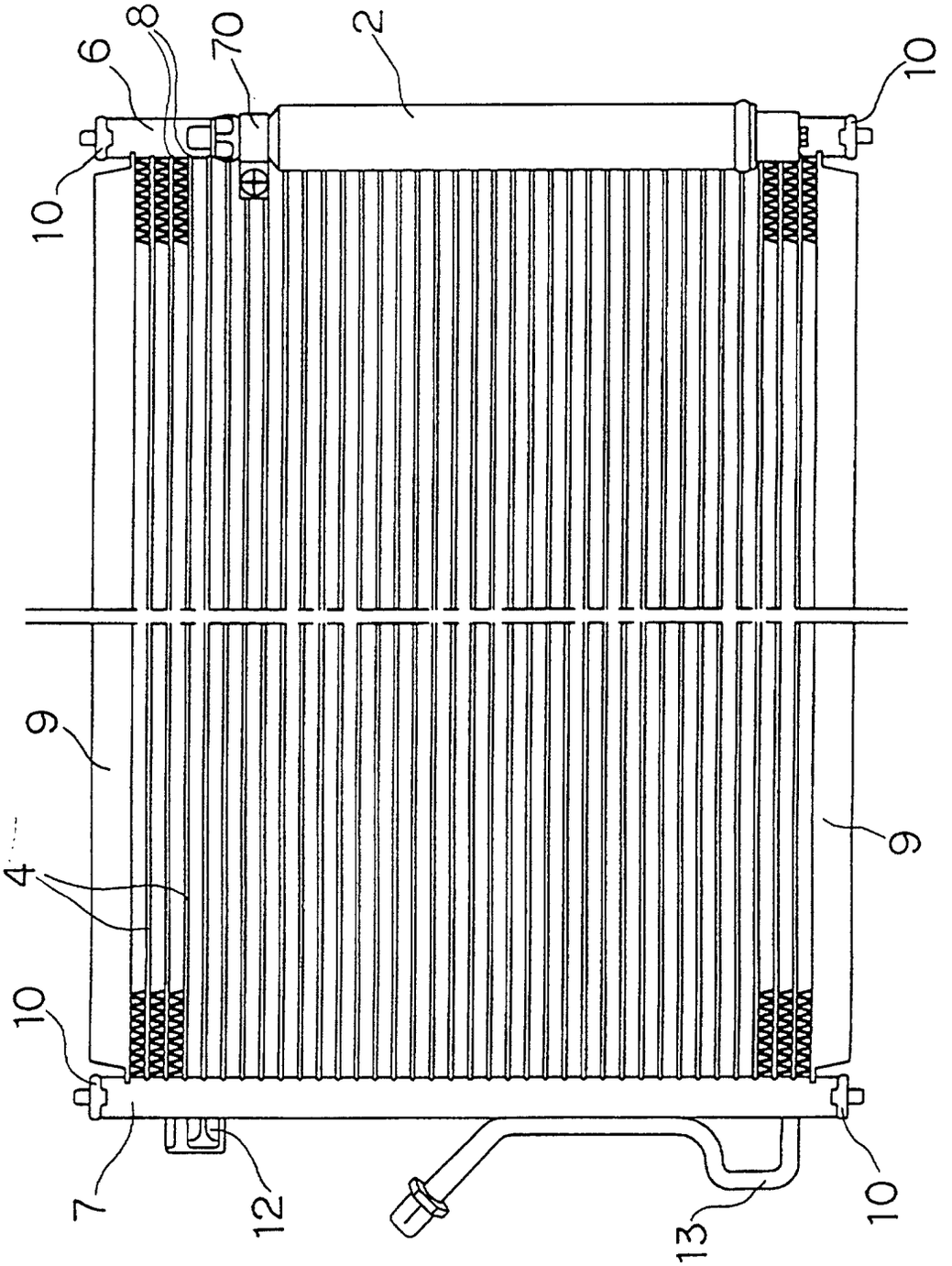


FIG. 1

FIG. 2

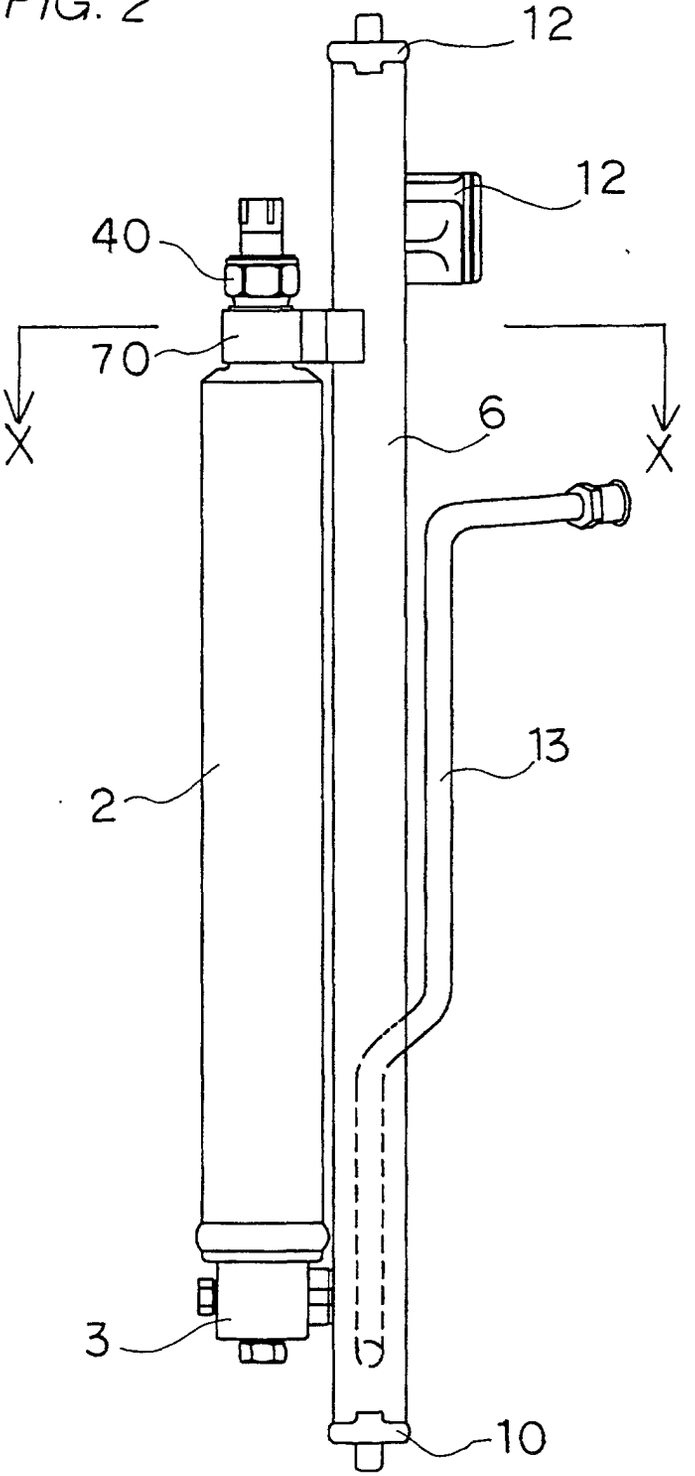


FIG. 3

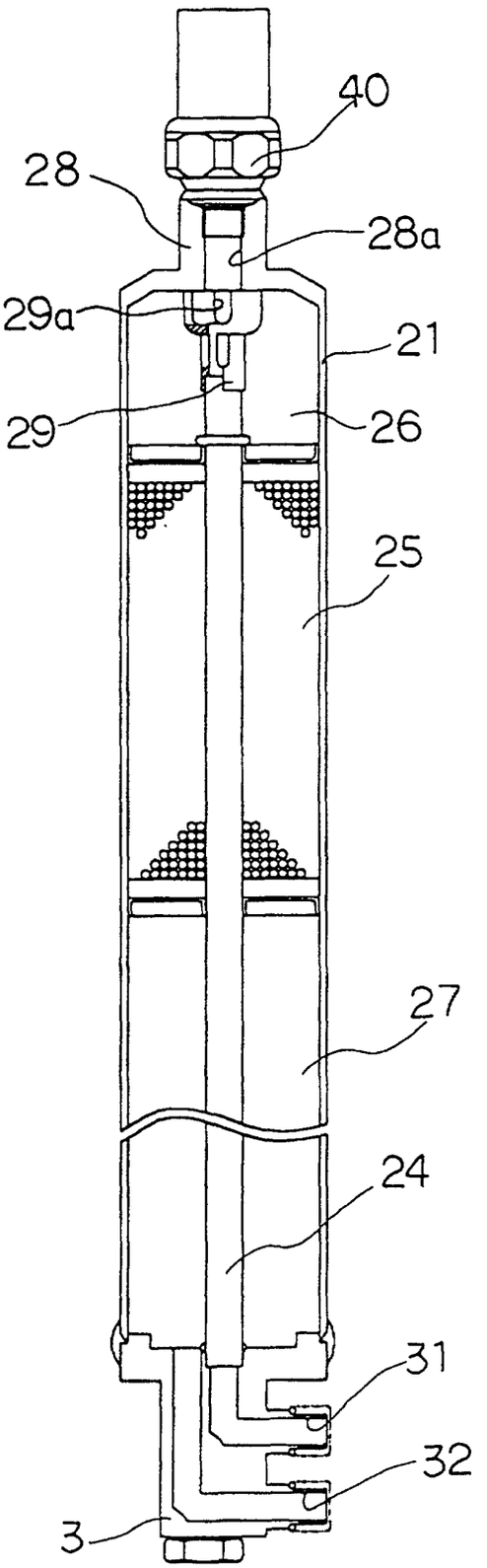


FIG. 4

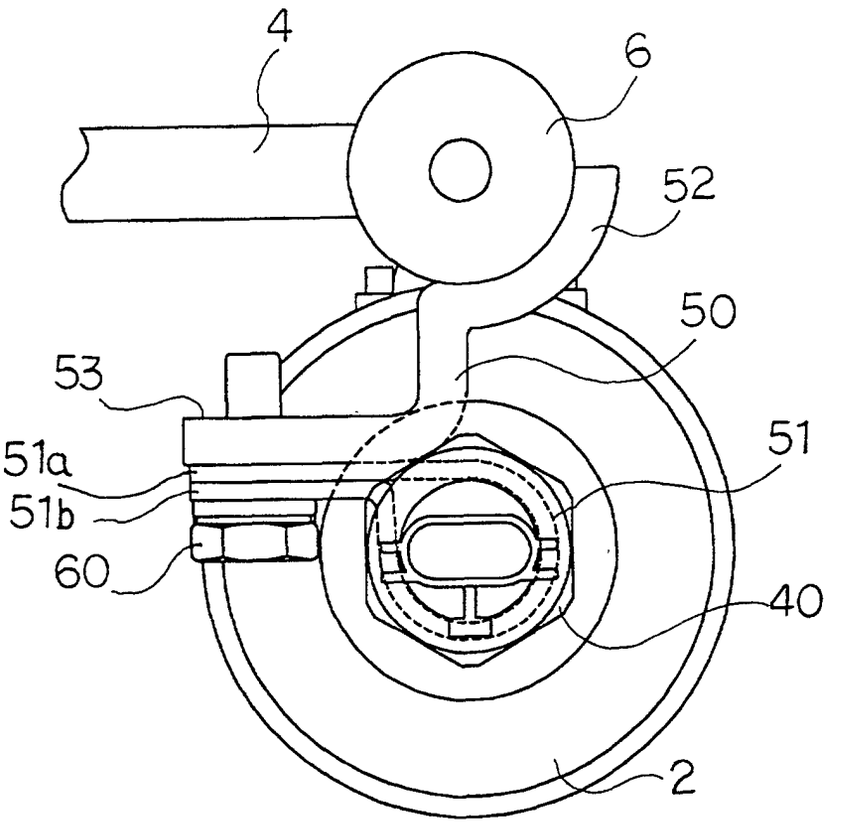


FIG. 5

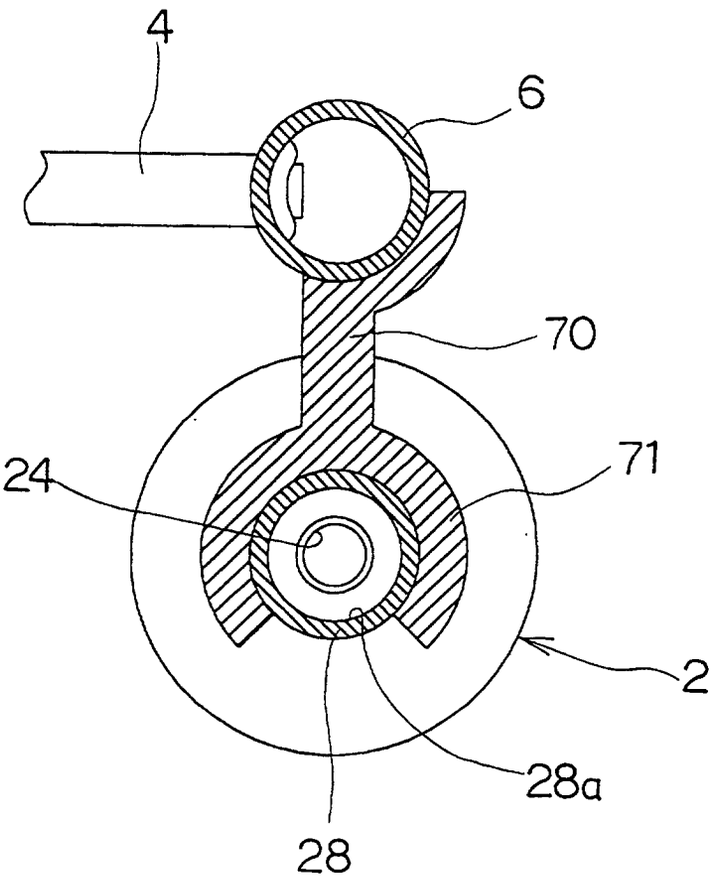
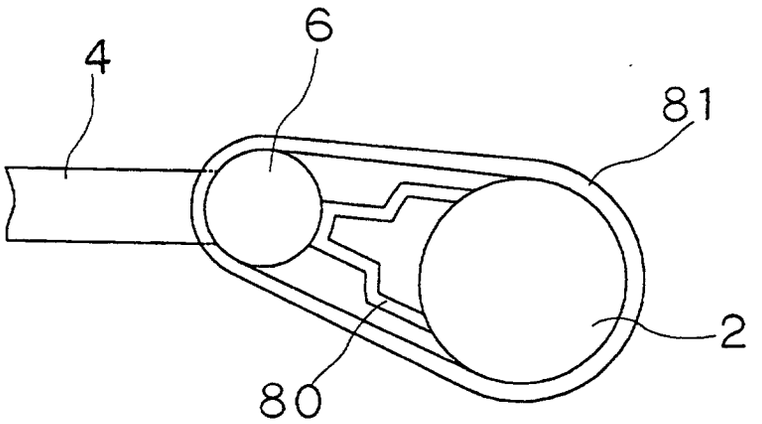


FIG. 6



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP98/04975

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[6] F25B43/00, F28F9/26

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl[6] F25B39/04, F25B43/00, F28F9/26

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1926-1999 Toroku Jitsuyo Shinan Koho 1994-1999
Kokai Jitsuyo Shinan Koho 1971-1999

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	JP, 10-96570, A (Showa Aluminium Corp.), 14 April, 1998 (14. 04. 98), Page 4, right column, lines 40 to 47 ; Fig. 1 (Family: none)	1, 2 3, 4
X A	JP, 8-327186, A (Showa Aluminium Corp.), 13 December, 1996 (13. 12. 96), Page 3, right column, line 18 to page 4, left column, line 29 ; Figs. 1, 2 (Family: none)	1, 2 3, 4

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
1 February, 1999 (01. 02. 99)	16 February, 1999 (16. 02. 99)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 1992)