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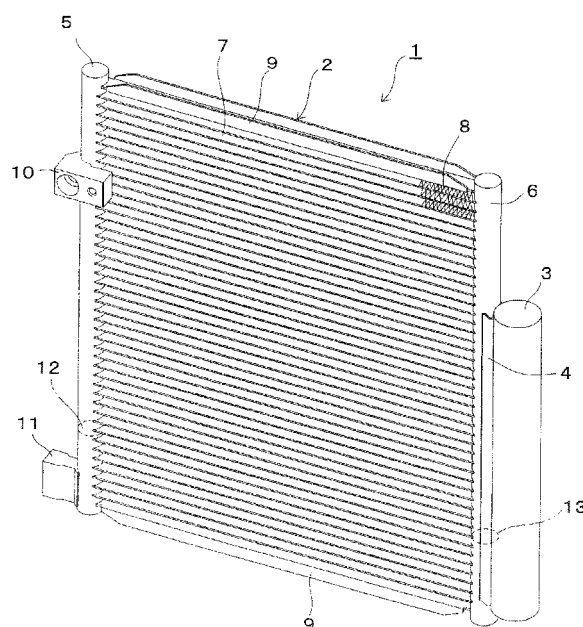
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(54) **Refrigerant condenser equipped with receiver**

(57) Disclosed is a refrigerant condenser (2) equipped with a receiver (3), in which the receiver (3) is disposed on a side surface of one header pipe (6) of the condenser (2) and the receiver (3) is connected to the header pipe (6) via a connection member (4) by brazing, wherein the connection member (4) is processed from a plate material, a pair of pipe portions (21, 22) for refrigerant passage are formed integrally on the connection member (4), tip parts of the pipe portions (21, 22) are inserted into holes formed on an object member of the header pipe (6) or the receiver (3), and a surface portion of the connection member (4) around each pipe portion (21, 22) present on a side opposite to a pipe portion projecting side is formed as a ring-like surface (25, 26) at a condition where holes (27, 28) or a hole (28) and a notch (29) are provided on both sides of the ring-like surface. The manufacture and assembly of the refrigerant condenser (2) equipped with a receiver can be facilitated by improving the structure of the pipe portions and the portions therearound of the connection member.

FIG. 1



Description

[0001] The present invention relates to a refrigerant condenser equipped with a receiver, and specifically, to a refrigerant condenser equipped with a receiver in which the connection structure between the condenser and the receiver is improved and which is suitable in use for an air conditioning system for a vehicle.

[0002] A refrigerant condenser equipped with a receiver is known, wherein the receiver is connected integrally with the condenser by brazing and the like. In such a refrigerant condenser equipped with a receiver, when connecting the receiver integrally with the condenser, if a connection member is interposed between the condenser and the receiver and they are connected to each other via the connection member, the workability for the connection and the sealability of refrigerant after connection may be ensured to be good.

[0003] For example, JP-A-2003-336939 discloses a connection member for connecting a cylindrical header pipe of a condenser and a schematic cylindrically formed receiver to each other. This connection member has a plate-like member on which arc portions capable of being connected to the header pipe and the receiver are formed respectively, and pipe members are fitted into two holes provided on the connection surface of the plate-like member and fixed to the plate-like member by caulking.

[0004] In this structure, however, because the plate-like member and the pipe members are members basically separate from each other, the number of parts increases and the process for caulking is required. Further, because the area for connection of the plate-like member and the receiver and header pipe is relatively large, an accuracy of a curved-surface shape for contact between the respective members is required, and if the accuracy is poor, a gap may become great and a brazing material clad on the surface of the plate-like member may be distributed improperly, and as a result, an improper brazing may occur. Furthermore, because the connection member is formed in shape so as to be connected to the header pipe and the receiver alternately in the longitudinal direction of the connection member, the mold for molding the connection member must be made in accordance with change of its longitudinal dimension.

[0005] On the other hand, JP-A-2003-21490 discloses a structure wherein the above-described connection member comprises a plate-like member having a first arc connection surface for contact with the header pipe side, a second arc connection surface for contact with the receiver side and burring portions capable of being fitted into communication ports for introduction and discharge of refrigerant provided on the header pipe and the receiver.

[0006] In this structure disclosed in JP-A-2003-21490, because the pipe member of JP-A-2003-336939 is formed integrally with the plate-like member as the form of the burring portion, the problems of increase of the number of parts and increase of the caulking process are

solved once at least. However, because passages for introduction and discharge of refrigerant are formed only by burring of the plate-like member, at the time of the burring a material portion around the burring portion is drawn toward the burring portion, and it becomes difficult to form the arc connection surfaces for contact with the header pipe and the receiver at predetermined shapes at a high accuracy. As a result, there remains a problem that an undesired gap may be generated between the arc connection surface and the connection surface of the header pipe or the receiver, or the dimension of the gap may vary, thereby generating an improper brazing. In order to reduce this problem associated with the burring, for example, it is considered to increase the thickness of the material for forming the plate-like member or to increase the pressing ability for the processing of the burring, but if carried out so, an undesired problem may occur such as increase of the weight or the cost for manufacture of the whole of the refrigerant condenser equipped with the receiver.

[0007] Further, as long as the burring portion is accurately fitted into the communication port of an object member, this portion may be brazed at a good condition with no problems, but in the surface of the connection member opposite to the burring portion projecting side, the arc surface must be accurately brought into contact with the object member and at a condition ensuring a good sealability the brazing must be carried out. However, as described above, because the accuracy of the member is disturbed at a portion around the burring portion, it may be difficult to achieve a good brazing by flowing a brazing material uniformly and to ensure a desirable sealed condition.

[0008] Accordingly, it would be desirable to provide a refrigerant condenser equipped with a receiver, in which particularly with respect to a member for connection interposed between a header pipe and a receiver, while suppressing cost up by simplifying the structure without increasing the number of parts, an accuracy required for the connection portion of the member can be easily ensured, and a necessary sealability can be easily ensured by concentrating a brazing material into a necessary portion and achieving an excellent brazing condition, thereby facilitating both the manufacture and the assembly.

[0009] A refrigerant condenser equipped with a receiver according to the present invention, in which the receiver is disposed on a side surface of one of a pair of header pipes provided on both ends of a core part of the condenser and the receiver is connected to the one header pipe via a connection member by brazing, is characterized in that the connection member is processed from a plate material, a pair of pipe portions for refrigerant passage are formed on the connection member integrally with the connection member, tip parts of the pipe portions are inserted into holes formed on an object member which is the one header pipe or the receiver, and a surface portion of the connection member around each of the pipe portions present on a side opposite to a pipe

portion projecting side is formed as a ring-like surface at a condition where holes or a hole and a notch are provided on both sides of the ring-like surface. This ring-like surface is a surface contacted with an outer surface of the object member at a tight contact condition or a condition close thereto.

[0010] In such a structure, in particular, by forming the surface portion of the connection member around the pipe portion present on a side opposite to the pipe portion projecting side as a ring-like surface, when a brazing material clad on the connection member, which is required to be brazed, is entering positively into a gap between the connection member and the receiver during brazing in a furnace, the molten brazing material is gathered along the ring-like surface by surface tension, and it becomes possible to improve the brazing property without increasing the dimensional accuracy of the connection surface at this portion so much. In this surface portion on the side opposite to the pipe portion projecting side positioned around the pipe portion, although a sufficient sealability is required relative to the refrigerant passage formed by the pipe portion, by carrying out the brazing at a condition where a sufficient amount of the brazing material is gathered as a ring-like form, this requirement of sealability may be surely satisfied. Moreover, the ring-like surface for achieving this ring-like brazing can be easily processed and formed by providing holes or a hole and a notch on both sides of the ring-like surface, also as shown in the embodiment described later.

[0011] In the refrigerant condenser equipped with a receiver according to the present invention, the tip parts of the pipe portions may be inserted into holes formed on the header pipe, and the ring-like surface may form a part of a connection surface of the connection member to the receiver. Alternatively, it may be structured wherein the tip parts of the pipe portions are inserted into holes formed on the receiver, and the ring-like surface forms a part of a connection surface of the connection member to the header pipe. However, because generally the receiver is larger in diameter than the header pipe, the former structure may be better from the viewpoint of facilitating the manufacture and the assembly.

[0012] Further, it is preferred that a non-pipe-forming portion of the connection member, on which the pipe portions are not formed, has a substantially constant cross section in a longitudinal direction of the connection member. In such a structure, by setting the size of a mold larger in its longitudinal direction relative to the length of the non-pipe-forming portion, it becomes possible to easily mold a connection member having an arbitrary length within a predetermined range by an identical mold.

[0013] Further, it can be structured wherein, in a non-pipe-forming portion of the connection member, on which the pipe portions are not formed, only both sides of the connection member in a transverse direction of the connection member are formed as contact parts with the object member, and a central portion of the connection member in the transverse direction of the connection

member is formed as a non-contact part with the object member. Namely, this is a structure wherein the central portion of the connection member positioned between the contact parts with the object member on both sides of the connection member in the transverse direction is recessed. In such a structure, because the brazing material positively enters into the portions of the contact parts with the object member on both sides of the connection member in the transverse direction, similarly to the pipe forming portions, the brazing property may be improved without increasing the dimensional accuracy of the contact surface.

[0014] Further, it can be structured wherein arms extending up to an outer surface of the object member are formed by bending on both sides of the connection member in the transverse direction of the connection member. In such a structure, the object member may be nipped between both arms, the object member and the connection member may be easily positioned at a predetermined positional relationship with each other, and the assembly may be facilitated. Moreover, because both arms come into contact with the object member locally, the brazing material may positively enter into the contact parts, and therefore, the brazing property may be improved without increasing the dimensional accuracy of the contact surface.

[0015] Furthermore, the pipe portion may be formed, for example, by drawing a portion of the plate material to be formed as a pipe portion (drawing the portion to be formed as a pipe portion so as to be projected up to a predetermined height), opening a hole on a tip part of the drawn portion, and thereafter pressing the drawn portion to be formed as a pipe portion and a portion around the drawn portion to a predetermined shape. In such a forming, because pipe portions can be formed on the plate-like connection member integrally with the connection member, it becomes unnecessary to increase the thickness of the plate-like material or to increase the pressing ability for burring as in the conventional method. Further, by the integral forming, the number of parts does not increase, and the process for caulking the plate-like member and the pipe member is not necessary.

[0016] With respect to such a connection member, although it is possible to form the object member as a member clad with a brazing material, from the viewpoint of easiness of manufacture, assembly and brazing, it is preferred that the connection member itself is formed as a member clad with a brazing material, in particular, formed from an aluminum material clad with a brazing material.

[0017] Thus, in the present invention, in the pipe forming portion of the connection member for connecting the header pipe of the refrigerant condenser and the receiver, by forming the portion around the pipe forming portion as the ring-like surface by providing the holes or the hole and the notch on both sides of the pipe forming portion, a desired pipe portion can be easily formed integrally with the connection member, and a desired brazing can be achieved by gathering a brazing material to the ring-like

surface. By the integration, the number of parts can be suppressed and it becomes possible to facilitate the manufacture and assembly and to reduce the cost thereof, and by the brazing via the ring-like surface, occurrence of improper brazing can be prevented and an excellent sealability at this portion can be achieved easily and surely.

[0018] Further, by giving the same cross section to the non-pipe-forming portion along its longitudinal direction and preparing a mold having a longer size in the longitudinal direction, it becomes possible to mold a connection member having an arbitrary length within a predetermined range by an identical mold.

[0019] Furthermore, by employing a structure wherein in the non-pipe-forming portion only both sides of the connection member in the transverse direction of the connection member are formed as contact parts with the object member, and a central portion thereof is formed as a non-contact part, or by employing a structure wherein arms extending up to an outer surface of the object member are formed by bending on both sides of the connection member in the transverse direction of the connection member, it becomes possible to further facilitate the assembly and to further facilitate and stabilize the brazing.

[0020] Further features and advantages of the present invention will be understood from the following detailed description of a preferred embodiment of the present invention with reference to the accompanying figures, of which:

Fig. 1 is a perspective view of a refrigerant condenser equipped with a receiver according to an embodiment of the present invention

Fig. 2 is an exploded partial perspective view of the refrigerant condenser equipped with a receiver depicted in Fig. 1.

Fig. 3 is an elevational view of a connection member in the refrigerant condenser equipped with a receiver depicted in Fig. 1.

Fig. 4 is a plan view of the connection member depicted in Fig. 3.

Fig. 5 is a perspective view of the connection member depicted in Fig. 3, viewed from its front surface side.

Fig. 6 is a perspective view of the connection member depicted in Fig. 3, viewed from its back surface side.

Fig. 7 is a cross-sectional view of a plate material showing a step of a forming process of the connection member depicted in Fig. 3.

Fig. 8 is a cross-sectional view of a pipe forming portion showing a next step of the step depicted in Fig. 7.

Fig. 9 is a cross-sectional view of a pipe forming portion showing a next step of the step depicted in Fig. 8.

Fig. 10 is a cross-sectional view of a pipe forming portion showing a next step of the step depicted in Fig. 9.

Fig. 11 is a cross-sectional view of a pipe forming portion showing a next step of the step depicted in Fig. 10.

Fig. 12 is an enlarged cross-sectional view of a connection portion including a pipe portion in the refrigerant condenser equipped with a receiver depicted in Fig. 1.

Fig. 13 is an enlarged cross-sectional view of a connection portion including a non-pipe-forming portion in the refrigerant condenser equipped with a receiver depicted in Fig. 1.

[0021] Hereinafter, a desirable embodiment of a refrigerant condenser equipped with a receiver according to the present invention will be explained referring to figures.

[0022] Figs. 1 and 2 depict a refrigerant condenser equipped with a receiver according to an embodiment of the present invention, and in particular, show a refrigerant condenser equipped with a receiver suitable for use in an air conditioning system for a vehicle. A refrigerant condenser equipped with a receiver 1 is formed by integrally brazing a refrigerant condenser 2 and a receiver 3 to each other via a connection member 4. Condenser 2 comprises a pair of header pipes 5 and 6 disposed on both ends of its core part, a plurality of heat exchange tubes 7 extending between the header pipes 5 and 6, outer fins 8 disposed between tubes 7 and outside of the outermost tubes 7, side plates 9 disposed outside of the outermost fins 8, and an inlet 10 and outlet 11 for refrigerant provided on header pipe 5. In this header pipe 5, a partition 12 is provided, and to another header pipe 6, receiver formed as a cylindrical structure is connected integrally by brazing via connection member 4. A partition 13 is provided also in header pipe 6, refrigerant introduced into the upper part in header pipe 5 through inlet 10 is sent to the upper part in header pipe 6 through heat exchange tubes 7, therefrom the refrigerant is sent into receiver 3 through communication port 14 of header pipe 6 and passage 15 of connection member 4, from the inside of receiver the refrigerant is sent to the lower part of header pipe 6 through passage 16 of connection member 4 and communication port 17 of header pipe 6, and after the refrigerant is sent to the lower part in header pipe 5 through heat exchange tubes 7, it is discharged to outside through outlet 11.

[0023] The detailed structure of connection member 4 will be explained referring to Figs. 3 to 6 in addition to Fig. 2.

[0024] In this embodiment, connection member 4 is formed from an aluminum alloy material clad with a brazing material on its both surfaces, and in the connection member 4, a pipe forming portion 23 in which a pair of pipe portions 21 and 22 for refrigerant passage are projected in parallel to each other, and a non-pipe-forming portion 24 in which pipe portions are not formed and which is formed in a substantially constant cross section in its longitudinal direction, are integrally molded by

pressing as described later. In this embodiment, the tip parts of pipe portions 21 and 22 are inserted into and brazed to communication ports 14 and 17 formed on header pipe 6 as holes, and the insides of pipe portions 21 and 22 are formed as passages 15 and 16 for refrigerant. The surface opposite to the surface of the pipe portion projecting side of connection member 4 is connected to receiver 3, and the surface portions of connection member 4 around respective pipe portions 21 and 22, which are present on the side opposite to the pipe portion projecting side, are formed as ring-like surfaces 25 and 26. As aforementioned, these ring-like surfaces 25 and 26 are surfaces brought into contact with the outer surface of the object member (in this embodiment, receiver 3) at a tight contact condition or a condition close thereto.

[0025] In the stage for manufacturing connection member 4, holes or a hole and a notch are provided on both sides of a portion for forming ring-like surface 25 or 26 so that the ring-like surface 25 or 26 is formed as such a predetermined surface shape. In this embodiment, holes 27 and 28 are provided relative to ring-like surface 25 around pipe portion 21, and hole 28 and a notch 29 are provided relative to ring-like surface 26 around pipe portion 22, respectively. Namely, notch 29 is provided on the end of connection member 4 in its longitudinal direction from the viewpoint of easiness of molding, and as to other portions, holes 27 and 28 are provided.

[0026] Further, in the side of connection member 4 connected to header pipe 6, arms 30 extending up to the outer surface of header pipe 6 are formed by bending on both sides of connection member 4 in the transverse direction of connection member 4, over the entire length of connection member 4. In this structure, a formation is structured wherein header pipe 6 is nipped between both arms 30, and the positioning and the assembly are facilitated. On the side of connection member 4 connected to receiver 3, the portions on both sides of connection member 4 in the transverse direction of connection member 4, which follow the above-described arms 30, are formed as contact parts 31 with receiver 3 each of which is protruded toward receiver 3 side. Particularly, in non-pipe-forming portion 24, these contact parts 31 are formed as contact parts with an object member (receiver 3) which are formed only on both sides of connection member 4 in the transverse direction of connection member 4, and a central portion between contact parts 31 is formed in a recessed part 32 which is formed as a non-contact part with the object member.

[0027] The above-described connection member 4 is formed, for example, by the method shown in Figs. 7 to 11. A plate material 41 is used as shown in Fig. 7, first, portions, on which pipe portions 21 and 22 are to be formed, are drawn so as to be projected up to a predetermined height in the pipe projecting side, as shown in Fig. 8 (drawn portion 42), and on the tip part of this drawn portion 42, a hole 43 is processed as shown in Fig. 9. Succeedingly, as shown in Fig. 10, the drawn portion 42

with hole 43 is formed, for example, by pressing, so as to be formed as a predetermined pipe portion 21 or 22. Then, as shown in Fig. 11, arms 30 on both sides are formed by bending, for example, by pressing, to a predetermined curved shape. In such a forming of pipe portions 21 and 22, because holes 27 and 28 or hole 28 and notch 29 are provided on both sides of each pipe forming portion, each of the pipe portions 21 and 22 is smoothly formed in a predetermined shape, and each of ring-like surfaces 25 and 26 having a predetermined shape is formed smoothly and easily at a condition where an affection to the portion around the pipe forming portion is greatly reduced.

[0028] Where, in the above-described forming, it is possible to perform the pressing step shown in Fig. 10 and the pressing step shown in Fig. 11 substantially simultaneously or at a single pressing step. Further, although a figure is omitted, the tip part of pipe portion 21 or 22 may be formed as a tapered shape in which the diameter is set to be made gradually smaller as approached to the tip or a shape having a stepped portion, in order to insert the tip part into the hole of the object member more smoothly.

[0029] Header pipe 6 and receiver 3 are connected integrally to each other via the above-described connection member 4. In the connected state, in pipe portions 21 and 22, as shown in Fig. 12, the tip parts of pipe portions 21 and 22 are inserted into holes 14 and 17 of header pipe 6 and pipe portions 21 and 22 are brazed to header pipe 6 together with both arms 30, and ring-like surfaces 25 and 26 are brought into contact with the portions around holes 51 and 52 provided on receiver 3 and brazed to receiver 3. Because these ring-like surfaces 25 and 26 are formed so as to be along the outer surface of receiver 3, even before brazing, the ring-like surfaces 25 and 26 are brought into contact with receiver 3 at a tight contact condition or a condition close thereto. At the time of brazing in a furnace, the molten brazing material is efficiently gathered to the contact portions of ring-like surfaces 25 and 26 by its surface tension, a sufficient amount of brazing material is ensured, and a desired brazing condition is achieved. Therefore, particularly in these portions, a fear of an improper brazing is completely removed, and a desired sealability can be ensured.

[0030] Further, in non-pipe-forming portion 24, as shown in Fig. 13, contact parts 31 on both sides are brought into contact with the outer surface of receiver 3 and connected to receiver 3 by brazing, and by providing recessed part 32 at the central portion as a non-contact part, the contact of contact parts 31 on both sides with receiver 3 is facilitated, and a high accuracy is not required to these contact parts 31. Moreover, by bringing only contact parts 31 on both sides into contact with receiver 3, similarly to the condition in the above-described the portions of ring-like surfaces 25 and 26, the molten brazing material is efficiently gathered to the contact portions by its surface tension, a sufficient amount of brazing material is ensured, and a desired brazing condition is

achieved. Furthermore, because this non-pipe-forming portion 24 is formed at a constant cross section in the longitudinal direction, by preparing a long mold, even in a case where a connection member having a different length is molded, it can be easily formed with no problems. Also from this point of view, facilitation and cost down of manufacture may be expected.

[0031] Thus, a desired brazing condition can be achieved via connection member which has a simple structure and which can be manufactured easily and inexpensively, and at the same time, cost down can be achieved by preventing increase of the number of parts and omitting the conventional caulking process.

[0032] Although the field applied with the refrigerant condenser equipped with a receiver according to the present invention is not particularly limited, especially it is suitable for use in an air conditioning system for a vehicle which strongly requires cost down, facilitation of manufacture and simplification of process.

Claims

1. A refrigerant condenser equipped with a receiver, in which said receiver is disposed on a side surface of one of a pair of header pipes provided on both ends of a core part of said condenser and said receiver is connected to said one header pipe via a connection member by brazing, **characterized in that** said connection member is processed from a plate material, a pair of pipe portions for refrigerant passage are formed on said connection member integrally with said connection member, tip parts of said pipe portions are inserted into holes formed on an object member which is said one header pipe or said receiver, and a surface portion of said connection member around each of said pipe portions present on a side opposite to a pipe portion projecting side is formed as a ring-like surface at a condition where holes or a hole and a notch are provided on both sides of said ring-like surface.
2. The refrigerant condenser equipped with a receiver according to claim 1, wherein said tip parts of said pipe portions are inserted into holes formed on said one header pipe, and said ring-like surface forms a part of a connection surface of said connection member to said receiver.
3. The refrigerant condenser equipped with a receiver according to claim 1 or 2, wherein a non-pipe-forming portion of said connection member, on which said pipe portions are not formed, has a substantially constant cross section in a longitudinal direction of said connection member.
4. The refrigerant condenser equipped with a receiver according to any of claims 1 to 3, wherein, in a non-

pipe-forming portion of said connection member, on which said pipe portions are not formed, only both sides of said connection member in a transverse direction of said connection member are formed as contact parts with said object member, and a central portion of said connection member in the transverse direction of said connection member is formed as a non-contact part with said object member.

5. The refrigerant condenser equipped with a receiver according to any of claims 1 to 4, wherein arms extending up to an outer surface of said object member are formed by bending on both sides of said connection member in the transverse direction of said connection member.
6. The refrigerant condenser equipped with a receiver according to any of claims 1 to 5, wherein each of said pipe portions is formed by drawing a portion of said plate material to be formed as a pipe portion, opening a hole on a tip part of said drawn portion, and thereafter pressing said drawn portion to be formed as a pipe portion and a portion around the drawn portion to a predetermined shape.
7. The refrigerant condenser equipped with a receiver according to any of claims 1 to 6, wherein said connection member is formed from an aluminum material clad with a brazing material.
8. The refrigerant condenser equipped with a receiver according to any of claims 1 to 7, wherein said refrigerant condenser equipped with a receiver is used for an air conditioning system for a vehicle.

FIG. 1

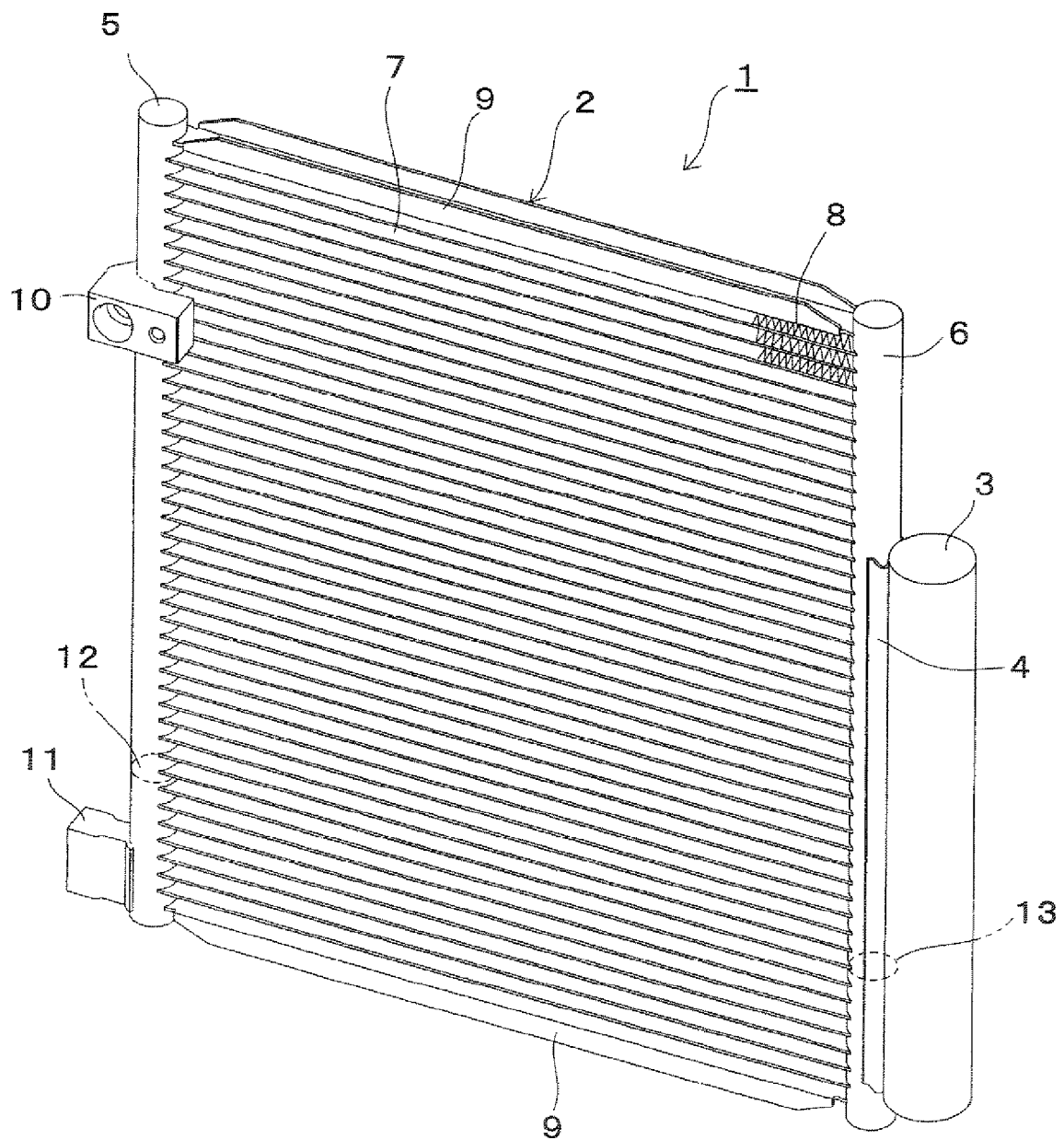


FIG. 2

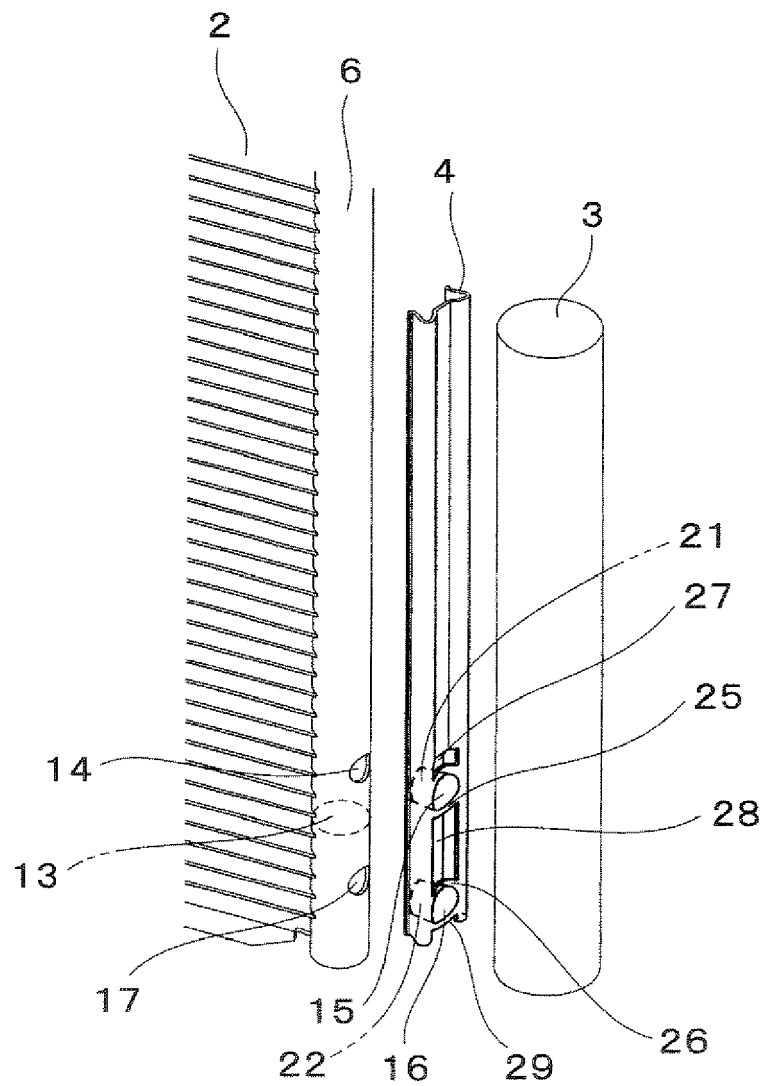


FIG. 3

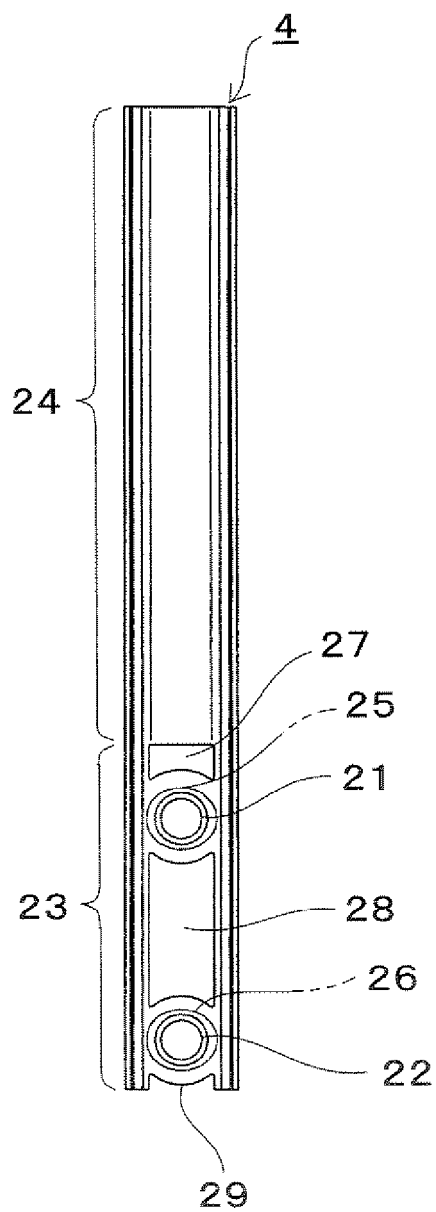


FIG. 4



FIG. 5

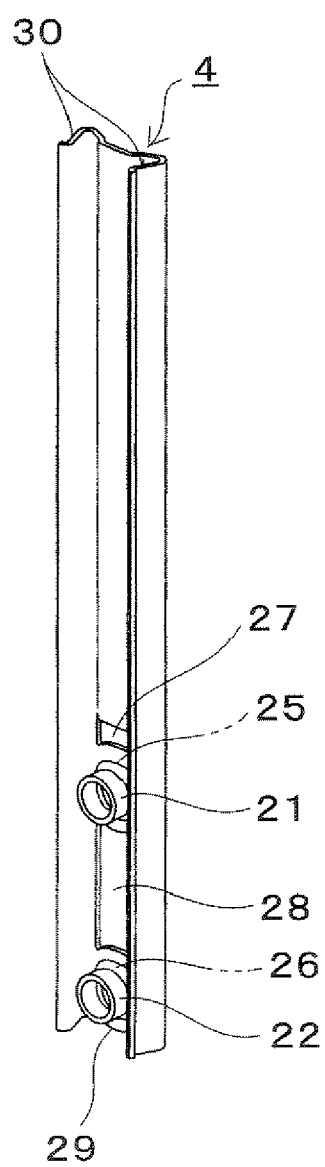


FIG. 6

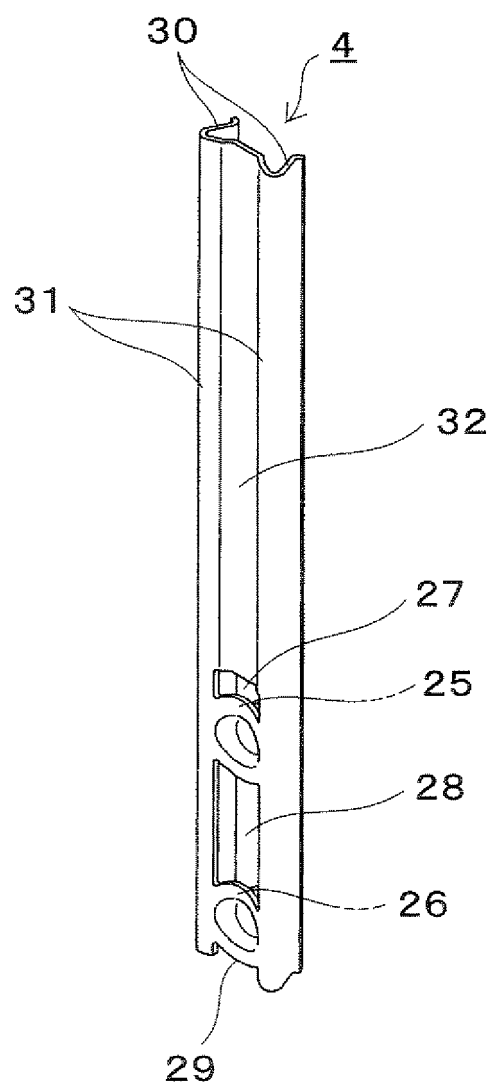


FIG. 7

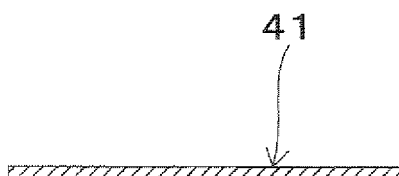


FIG. 8

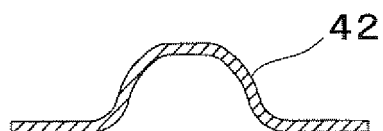


FIG. 9

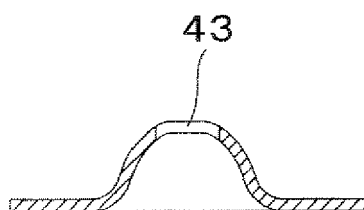


FIG. 10

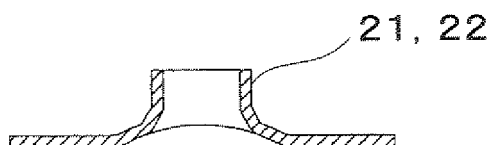


FIG. 11

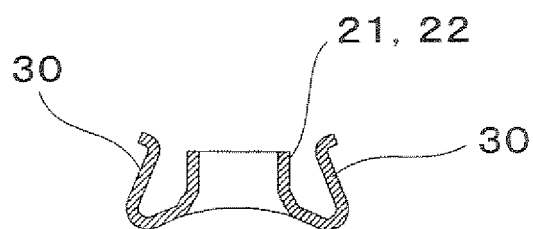


FIG. 12

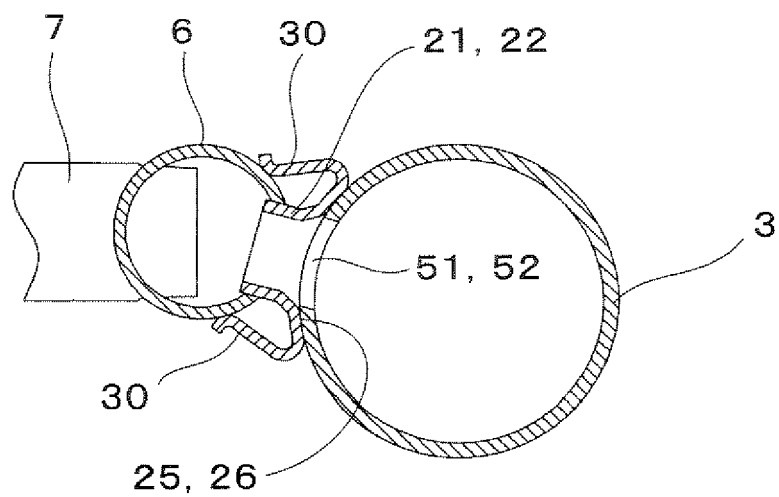
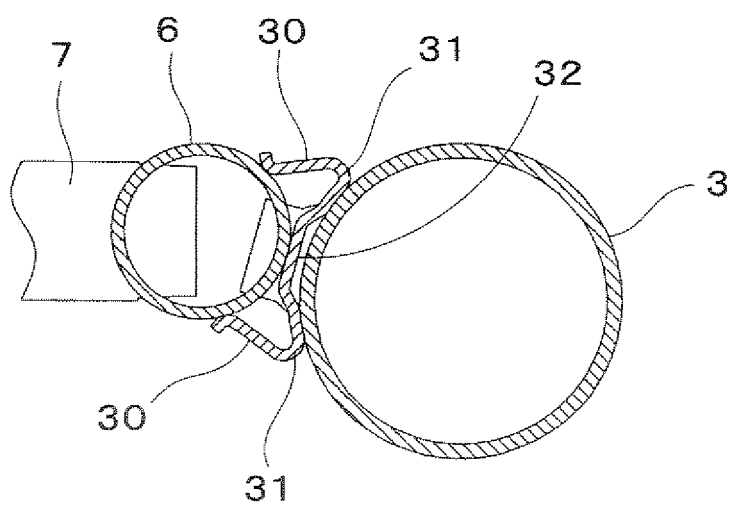


FIG. 13



REFERENCES CITED IN THE DESCRIPTION

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