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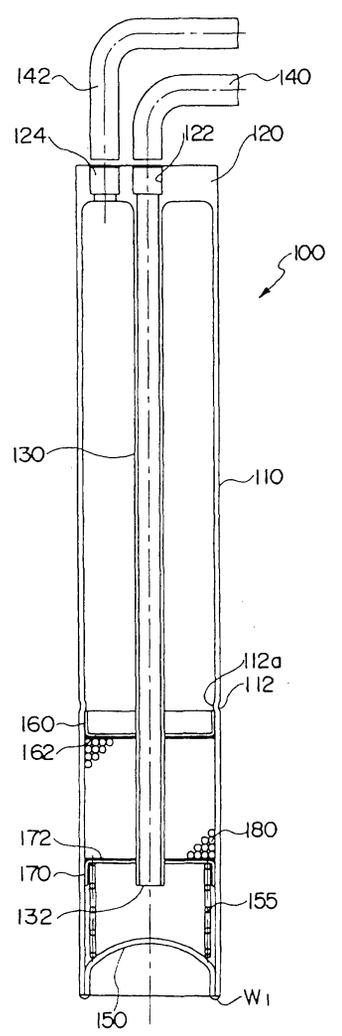
(54) Receiver-Drier

(57) The receiver-drier shown as a whole by reference (100) comprises a body (110) formed by forging an aluminium alloy material into a cylinder body with a bottom. A first passage hole (122) and a second passage hole (124) for the refrigerant are formed to the bottom portion (120) of the body (110). One of the two refrigerant passage holes is used as the refrigerant entrance, and the other is used as the refrigerant exit. Copper alloy pipes (140,142) are respectively inserted to the two holes (122,124), which are bonded thereto by infurnace brazing. The opening of the body (110) opposite the bottom member (120) has an aluminium alloy lid member (150) fit thereto. The pipe member (130) formed to the center area of the body (110) is integrally formed with the body (110) when forging and creating the body.

Fig. 1



EP 1 193 455 A1

Description

[0001] The present invention relates to a receiver-drier for storing the refrigerant used in an air conditioning device of a vehicle and the like.

[0002] The air conditioning device mounted on a vehicle and the like is equipped with a receiver-drier that stores the refrigerant compressed by a compressor and liquidized by a condenser, and removes the moisture within the refrigerant.

[0003] The receiver-drier is formed of a cylindrical body, a refrigerant entrance through which the refrigerant enters the body, and a refrigerant exit.

[0004] The entrance and the exit of the refrigerant are positioned in the opposite sides in the axial direction of the body, and a drying chamber filled with a drying agent is equipped between the entrance and the exit.

[0005] The receiver-drier body comprises a cylindrical shape with one end being opened, formed of aluminum alloy so as to reduce the weight of the member.

[0006] The aluminum alloy has advantageous plasticity and fluidity, so the cylindrical body and a pipe that penetrates through the center portion of the body can be formed together integrally by forging.

[0007] For example, Japanese Laid-Open Patent Publication No. 5-305381 discloses a method for forming a double walled cylinder having one closed end by forging an aluminum alloy material.

SUMMARY OF THE INVENTION

[0008] In order to form a receiver-drier having as its body a double wall cylinder formed according to the above-mentioned prior-art method, it is necessary to cover the open end with a lid member, and to fix a pipe and the like to the opening portion that communicates to the entrance and the exit of the refrigerant.

[0009] The lid member is made of the same aluminum alloy material as the body, and the lid is fixed to the body by MIG welding means and the like.

[0010] The pipe, the plug and the like that are connected to the body are made of copper alloy material, so these members are joined to the body using for example a mechanical bonding means or a brazing means.

[0011] The present invention provides a receiver-drier applying an improved bonding means for fixing the pipe etc. onto the body.

[0012] The receiver-drier according to the present invention comprises as basic means a double wall cylinder body with a bottom and having a pipe member mounted to the center portion thereof, a pair of cap members penetrated by the pipe member and positioned inside said body, a drying agent filled to the space between the pair of cap members, and a lid member that covers the opening portion of said body. The present receiver-drier further comprises a body made of aluminum alloy which is forged integrally with a bottom member including a hole that communicates to said pipe member, a pipe inserted to the hole formed to the bottom member of the body and joined thereto by in-furnace brazing, and a coil spring positioned between the lid member and one of the cap members.

[0013] According to another aspect of the invention, the receiver-drier can be equipped with a body made of aluminum alloy which is forged integrally with a bottom member including a hole that communicates to the pipe member, a pipe inserted to a first hole formed to the bottom member of the body and bonded thereto by in-furnace brazing, a plug screwed onto a second hole either formed to the bottom member of the body or to the body, and a coil spring mounted between the lid member and one of the cap members.

[0014] The present receiver-drier can also include a body made of aluminum alloy which is forged integrally with a bottom member including a hole that communicates to the pipe member, a head having both a protrusion inserted to the hole formed to the bottom member of the body and a hole to which a protrusion formed to the bottom member of the body is inserted, and a bolt for fixing the head to the bottom portion of the body.

[0015] According to another aspect of the invention, the present receiver-drier further comprises a groove formed by knurling or punching the outside of said body, the groove protruding inwardly to the body so as to position the cap member.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016]

FIG. 1 is a cross-sectional view showing the first embodiment of the present invention;
FIG. 2 is a plan view of FIG. 1;
FIG. 3 is a cross-sectional view showing the second embodiment of the present invention;
FIG. 4 is a plan view of FIG. 3;
FIG. 5 is a cross-sectional view showing the third embodiment of the present invention;
FIG. 6 is a cross-sectional view showing the fourth embodiment of the present invention;
FIG. 7 is a plan view of FIG. 6; and
FIG. 8 is a cross-sectional view showing the fifth embodiment of the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0017] FIG. 1 is a cross-sectional view showing the first embodiment of the present invention, and FIG. 2 is a plan view thereof.

[0018] The receiver-drier shown as a whole by reference number 100 comprises a body 110 formed by creating a cylindrical body with a bottom by forging an aluminum alloy material. The bottom member 120 of the body 110 is equipped with a first passage hole 122 and

a second passage hole 124 for the refrigerant. One of the two passage holes for the refrigerant becomes the entrance hole of the refrigerant, and the other becomes the exit hole.

[0019] Pipes 140 and 142 made of copper alloy are respectively inserted to the two holes 122 and 124, and bonded thereto by in-furnace brazing.

[0020] A lid member 150 made of aluminum alloy is fit to the other end of the body 110 opposite the bottom member 120, which is fixed to position by TIG welding W_1.

[0021] A pipe member 130 formed to the center portion of the body 110 is integrally formed when forging the body 110.

[0022] A pair of cap members 160 and 170 penetrated by the pipe member 130 are positioned opposing one another in the body. The inner side of the cap members 160 and 170 are equipped with metallic mesh members 162 and 172, respectively, and the space defined by the body and the cap members is filled with a drying agent 180.

[0023] A groove 112 protruding inwardly is formed on the outer periphery of the body 110 by a knurling process or a punching process. The groove 112 creates a protrusion 112a that protrudes inwardly to the body, which is used for positioning the first cap member 160 in the axial direction that is positioned at a determined distance from the lid member 150.

[0024] A coil spring 155 is inserted between the lid member 150 and the second cap member 170, constantly pressing the second cap member 170 toward the first cap member 160. According to this structure, the density of the drying agent 180 is maintained uniformly, and the moisture within the refrigerant can be absorbed and removed effectively.

[0025] In a receiver-drier where the first pipe 140 is used as the entrance of the refrigerant, the refrigerant entering the body travels through the pipe member 130 formed integrally to the center of the body 110, and exits through the open end 132 into the space formed between the lid member 150 and the second cap member 170. The refrigerant passes through the second cap member 170 having gaps and the mesh member 172 into the drying agent 180, by which the moisture of the refrigerant is removed.

[0026] Thereafter, the refrigerant passes through the mesh member 162 and the first cap member 160 having gaps and is stored in the space formed between the first cap member 160 and the bottom member 120 of the body 110, before being sent out to other members of the air conditioning device through the second pipe 142.

[0027] When manufacturing the receiver-drier, the body 110 having two holes 122 and 124 formed to the bottom member 120 thereof and including a pipe member 130 integrally formed thereto is manufactured by forging, to which are assembled cap members 160, 170 and mesh members 162, 172. Then, the drying agent 180 is filled in the determined space, and the coil spring 155 is inserted thereto before fitting the lid member 150 to the body, which is welded by TIG welding W_1.

[0028] Next, pipes 140 and 142 are inserted to the assembled body, to which are performed in-furnace brazing so as to bond the pipes 140 and 142 to the holes 122 and 124 formed to the bottom member 120 of the body 110.

[0029] According to the method disclosed above, the receiver-drier is manufactured by a less number of manufacturing steps.

[0030] Moreover, as for the in-furnace brazing, the whole body is heated up to approximately 600 °C within the furnace, but the heat resistance of the receiver-drier can be secured by using metallic material for forming the cap members and the mesh members.

[0031] FIG. 3 is a cross-sectional view showing the second embodiment of the present invention, and FIG. 4 is a plan view thereof.

[0032] The receiver-drier shown as a whole by reference number 200 comprises a body 210 formed by brazing an aluminum alloy material into a cylindrical shape with a bottom. A first passage hole 222 and a second passage hole 224 are formed to the bottom member 220 of the body 210. One of the two passage holes for the refrigerant is used as the entrance hole of the refrigerant, and the other is used as the exit hole.

[0033] A pipe 240 and a plug 242 made of copper alloy are respectively inserted to the holes 222 and 224, and the pipe 240 and the plug 242 are welded to position by in-furnace brazing.

[0034] A lid member 250 made of aluminum alloy is fit to the opening of the body 210 opposite the bottom member 220, which is fixed to position by TIG welding W_1.

[0035] The pipe member 230 formed to the center area of the body 210 is formed integrally with the body when forging the body 210.

[0036] A pair of cap members 260 and 270 penetrated by the pipe member 230 is positioned so as to oppose to one another inside the body 210. Metallic mesh members 262 and 272 are respectively positioned inside the cap members 260 and 270, and the space formed by these members within the body is filled with a drying agent 280.

[0037] A groove 212 protruding inwardly is formed on the outer periphery of the body 210 by a knurling process or a punching process. The groove 212 creates a protrusion 212a that protrudes inwardly to the body, which is used for positioning the first cap member 260 in the axial direction that is positioned at a determined distance from the lid member 250.

[0038] A coil spring 255 is inserted between the lid member 250 and the second cap member 270, constantly pressing the second cap member 270 toward the first cap member 260. According to this structure, the density of the drying agent 280 is maintained uniformly, and the moisture within the refrigerant can be absorbed and removed effectively.

[0039] The refrigerant entering the body travels through the pipe member 230 formed integrally to the center of the body 210, and exits through the open end 232 into the space formed between the lid member 250 and the second cap member 270. The refrigerant passes through the second cap member 270 having gaps and the mesh member 272 into the drying agent 280, by which the moisture in the refrigerant is removed.

[0040] Thereafter, the refrigerant passes through the mesh member 262 and the first cap member 260 having gaps and is stored in the space between the first cap member 260 and the bottom member 220 of the body 210, before being sent out to other members of the air conditioning device through the hole 224 formed to the bottom member 220 of the body and through the hole 244 of the plug 242.

[0041] When manufacturing the receiver-drier, the body 210 having a hole 222 utilized as the first passage hole of the refrigerant formed to the bottom member 220 thereof and including a pipe member 230 integrally formed thereto is manufactured by forging, and thereafter, a side hole 224 utilized as the second passage hole of the refrigerant is formed by after-processing as the second hole. Then, the cap members 260, 270 and mesh members 262, 272 are assembled to the body, the drying agent 280 is filled into the determined space, and the coil spring 255 is inserted in position before fitting the lid member 250 to the body, which is fixed by TIG welding W_1.

[0042] Next, the pipe 240 and the plug 242 are inserted to the hole 222 and the hole 224 formed to the bottom member 220 of the assembled body, and the pipe 240 and the plug 242 is respectively fixed to the hole 222 and hole 224 on the bottom member 220 of the body 210 by in-furnace brazing.

[0043] According to the method disclosed above, the receiver-drier is manufactured by a less number of manufacturing steps.

[0044] Moreover, as for the in-furnace brazing, the whole body is heated up to approximately 600 °C within the furnace, but the heat resistance of the receiver-drier can be secured by using metallic material to form the cap members and the mesh members.

[0045] According further to the present invention, the position of the second hole formed as a side hole 224 in the embodiment of FIG. 3 is not limited to the bottom member 220, but the second hole or side hole 224 can be formed on the body 210 close to the bottom member 220 by after-processing, as shown in the third embodiment of FIG. 5. According also to the third embodiment, the plug 242 is inserted to the side hole 224 and fixed thereto by in-furnace brazing.

[0046] FIG. 6 is a cross-sectional view showing the fourth embodiment of the present invention, and FIG. 7 is a plan view thereof.

[0047] The receiver-drier shown as a whole by reference number 300 comprises a body 310 formed by forging an aluminum alloy material into a cylinder-shaped body with a bottom. The bottom member 320 of the body 310 is equipped with a first refrigerant passage hole 322 formed roughly to the center of the bottom member 320, and a second passage hole 324 formed to a protrusion 326 equipped to the bottom member 320. One of the two passage holes for the refrigerant becomes the entrance for the refrigerant, and the other passage becomes the exit of the refrigerant.

[0048] A corresponding member of a head 340 is inserted to the two holes 322 and 324 and bonded thereto.

[0049] A lid member 350 made of aluminum alloy is fit to the other end of the body 310 opposite the bottom portion 320, which is fixed to position by TIG welding W_1.

[0050] A pipe member 330 formed to the center portion of the body 310 is integrally formed when forging the body 310.

[0051] A pair of cap members 360 and 370 penetrated by the pipe member 330 are positioned so as to oppose to one another in the body. The inner side of the cap members 360 and 370 are equipped with sponge-like filter members 362 and 372, respectively, and the space defined by the body and the cap members is filled with a drying agent 380.

[0052] A groove 312 protruding inwardly is formed on the outer periphery of the body 310 by a knurling process or a punching process. The groove 312 creates a protrusion 312a that protrudes inwardly to the body, which is used for positioning the first cap member 360 in the axial direction that is positioned at a determined distance from the lid member 350.

[0053] The second cap member 370 is also positioned by a groove 314 formed similarly by a knurling process or a punching process . By the elasticity of the sponge-like filter members 362 and 372, the density of the drying agent 380 is maintained uniformly, and the moisture within the refrigerant can be absorbed and removed effectively.

[0054] The head 340 comprises a protrusion 342 that fits into the first hole 322. Similarly, the bottom member 320 of the body 310 comprises a protrusion 326 formed integrally with the body 310 and fits to the hole 344 of the head 340.

[0055] Seal members 343 and 327 are fit respectively to each protrusion 342 and 326, and then the protrusions are respectively inserted to the corresponding holes 322 and 344. A bolt 345 is used to secure the head 340 to the body 310.

[0056] The refrigerant entering the body through the first hole 322 travels through the pipe member 330 formed integrally to the center of the body 310, and exits through the open end 332 into the space formed between the lid member 350 and the second cap member 370. The refrigerant passes through the second cap member 370 having gaps and the filter member 372 into the drying agent 380, by which the moisture in the refrigerant is removed.

[0057] Thereafter, the refrigerant passes through the filter member 362 and the first cap member 360 having

gaps and is stored in the space between the first cap member 360 and the bottom member 320 of the body 310, before being sent out to other members of the air conditioning device through the second hole 342.

[0058] When manufacturing the receiver-drier, the body 310 having the hole 322 and the protrusion 326 including the hole 324 formed to the bottom member 320 thereof and including the pipe member 330 integrally formed thereto is manufactured by forging. Then, cap members 360, 370 and filter members 362, 372 are assembled to the body, the drying agent 180 is filled to the determined space, and the lid member 150 is fit to the body, which is fixed by TIG welding W_1.

[0059] Next, a head 340 is fit to the assembled body, which is fixed by a bolt 345.

[0060] According to the manufacturing method explained above, the receiver-drier can be manufactured by a smaller number of steps .

[0061] According to the embodiment shown in FIG. 6, the first passage hole 322 is formed to the substantial center of the bottom member 320 of the body, and the second passage hole 324 is formed to the protrusion 326 equipped to the bottom member 320 of the body. However, it should be noted that the position to which the protrusion 326 is equipped could be varied from the embodiment shown in FIG. 6. That is, as explained in the fifth embodiment shown in FIG. 8, the protrusion 326 formed to fit into the hole 344 of the plug 340 is integrally formed to the body 310 at the substantial center of the bottom member 320, and the first passage hole 322 is formed to the protrusion 326. Further, the second passage hole 324 to which a protrusion 342 formed to the plug 340 is inserted is formed to the bottom member 320 of the body.

[0062] As explained above, the receiver-drier according to the present invention integrally forms a double wall cylinder body by forging an aluminum alloy material, which assembles necessary members in its structure. Therefore, the present receiver drier can be manufactured by a smaller number of processes or assembly steps.

[0063] Further, since the pipe or plug member made of copper alloy is joined to the body by in-furnace brazing, the required strength of the body can be secured by a simple structure.

Claims

1. A receiver-drier comprising a double wall cylinder body with a bottom and having a pipe member mounted to the center area thereof, a pair of cap members penetrated by the pipe member and positioned inside said body, a drying agent filled to the space formed between said pair of cap members, and a lid member that covers the opening portion of said body:

   wherein said receiver-drier characterizes in comprising a body made of aluminum alloy which is forged integrally with a bottom member including a hole that communicates to said pipe member;
   a pipe inserted to the hole formed to the bottom member of the body and joined thereto by in-furnace brazing; and
   a coil spring positioned between the lid member and one of the cap members.

2. A receiver-drier comprising a double wall cylinder body with a bottom and having a pipe member mounted to the center area thereof, a pair of cap members penetrated by the pipe member and positioned inside said body, a drying agent filled to the space formed between said pair of cap members, and a lid member that covers the opening portion of said body:

   wherein said receiver-drier characterizes in comprising a body made of aluminum alloy which is forged integrally with a bottom member including a hole that communicates to said pipe member;
   a pipe inserted to a first hole formed to the bottom member of the body and bonded thereto by in-furnace brazing;
   a plug screwed onto a second hole formed to the bottom member of the body; and
   a coil spring mounted between said lid member and one of said cap members.

3. A receiver-drier comprising a double wall cylinder body with a bottom and having a pipe member mounted to the center area thereof, a pair of cap members penetrated by the pipe member and positioned inside said body, a drying agent filled to the space formed between said pair of cap members, and a lid member that covers the opening portion of said body:

   wherein said receiver-drier characterizes in comprising a body made of aluminum alloy which is forged integrally with a bottom member including a hole that communicates to said pipe member;
   a pipe inserted to the hole formed to said bottom member of the body and bonded thereto by in-furnace brazing;
   a plug screwed onto the hole formed to said body; and
   a coil spring mounted between said lid member and one of said cap members.

4. A receiver-drier comprising a double wall cylinder body with a bottom and having a pipe member mounted to the center area thereof, a pair of cap

members penetrated by the pipe member and positioned inside said body, a drying agent filled to the space formed between said pair of cap members, and a lid member that covers the opening portion of said body:

wherein said receiver-drier characterizes in comprising a body made of aluminum alloy which is forged integrally with a bottom member including a hole that communicates to said pipe member;
a head having a protrusion and a hole, said protrusion being inserted to the hole formed to the bottom member of the body and said hole to which is inserted a protrusion formed to the bottom member of said body; and
a bolt for fixing said head to the bottom portion of the body.

5. A receiver-drier according to any one of claims 1, 2, 3 or 4, wherein said receiver-drier comprises a groove formed by knurling or punching the outside of said body, said groove protruding inwardly to the body so as to position said cap member.

Fig. 1

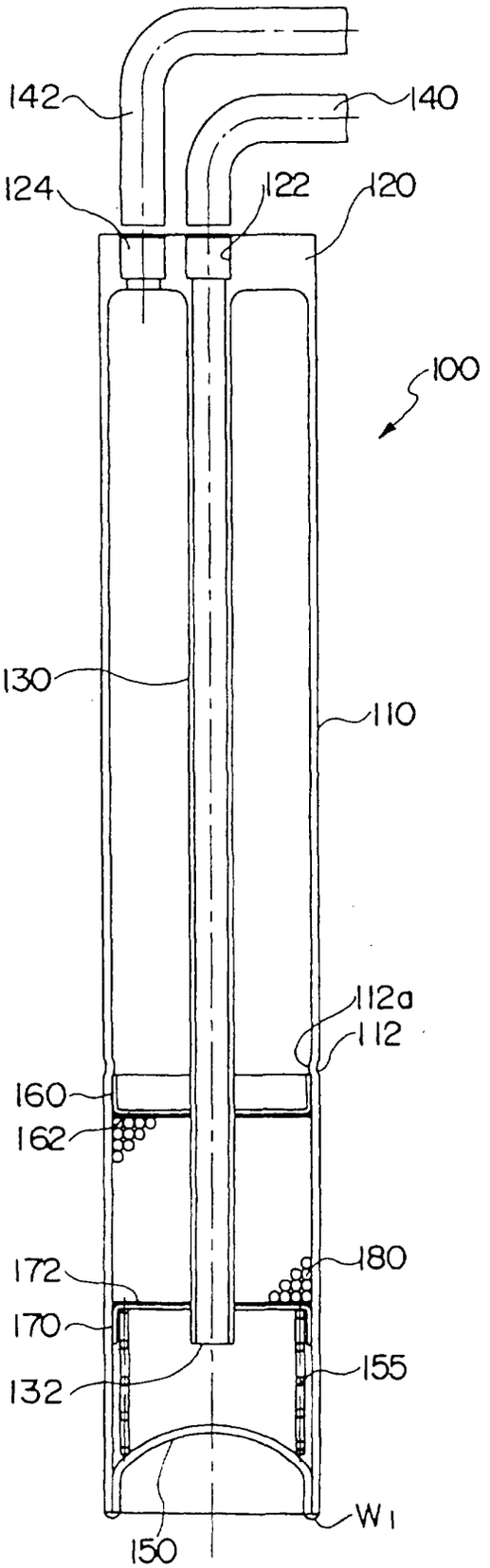

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Fig. 2

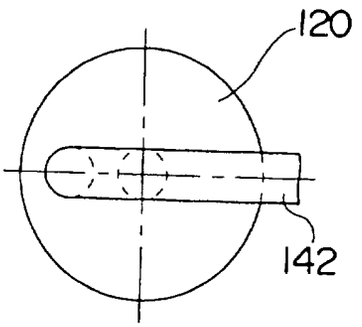

Fig. 3

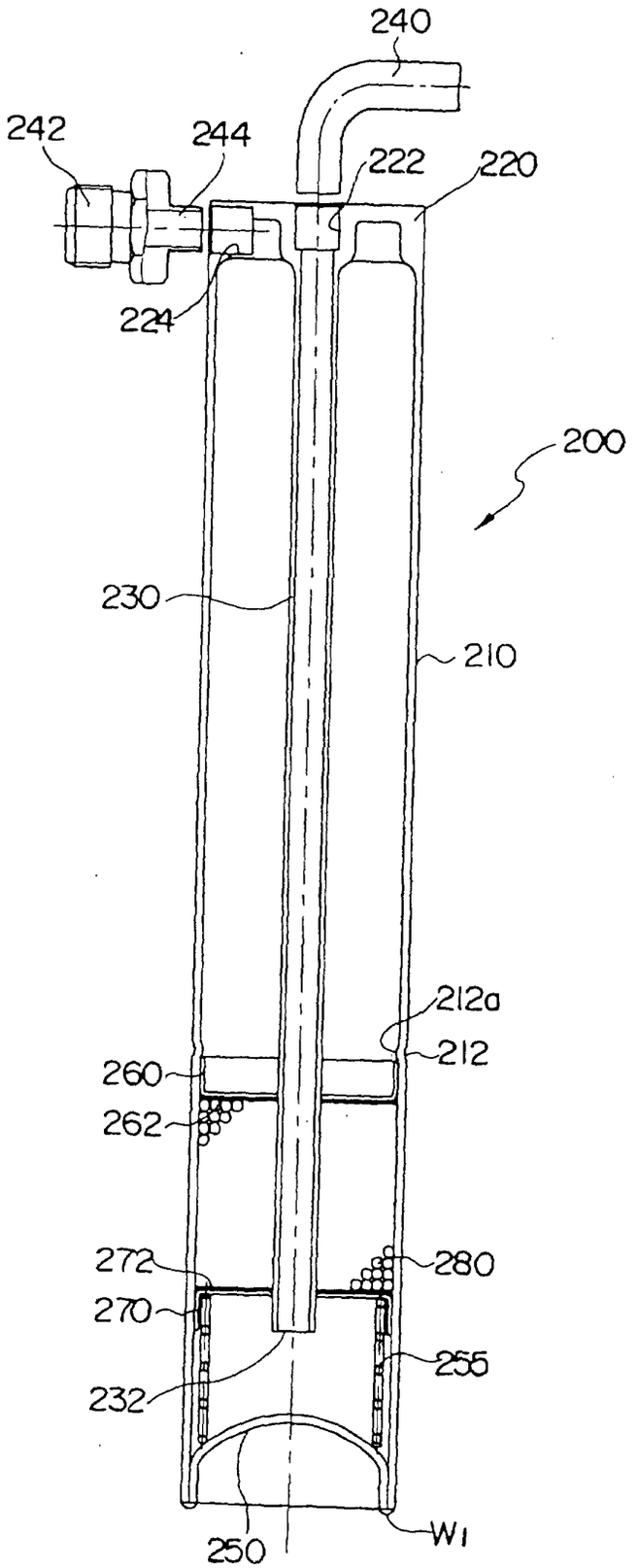
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Fig. 4

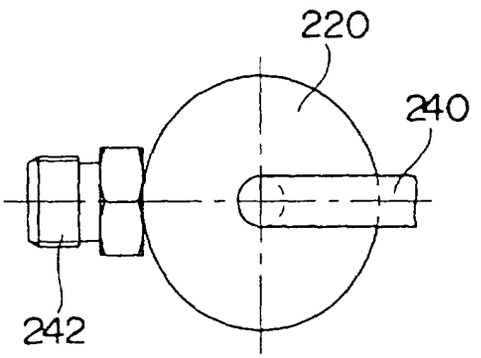

Fig. 5

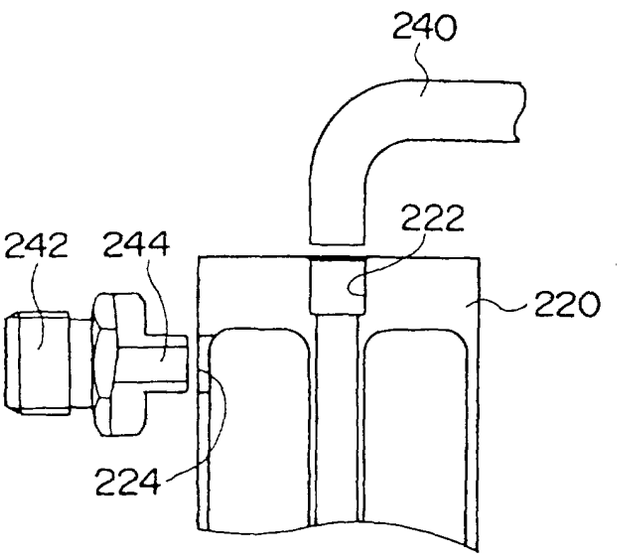

Fig. 6

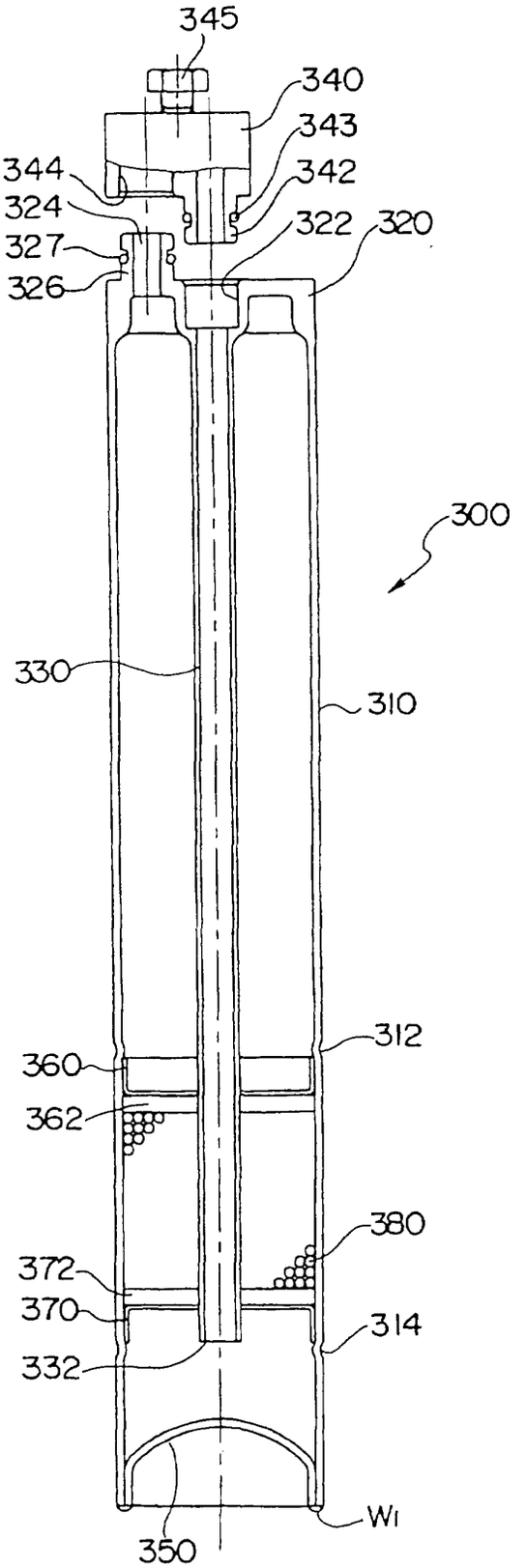
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Fig. 7

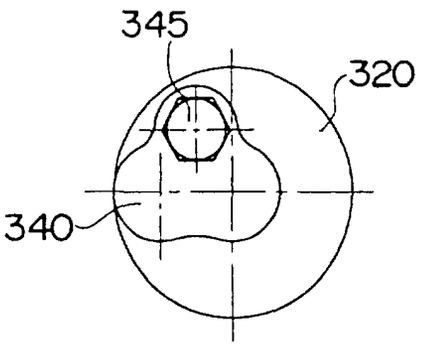
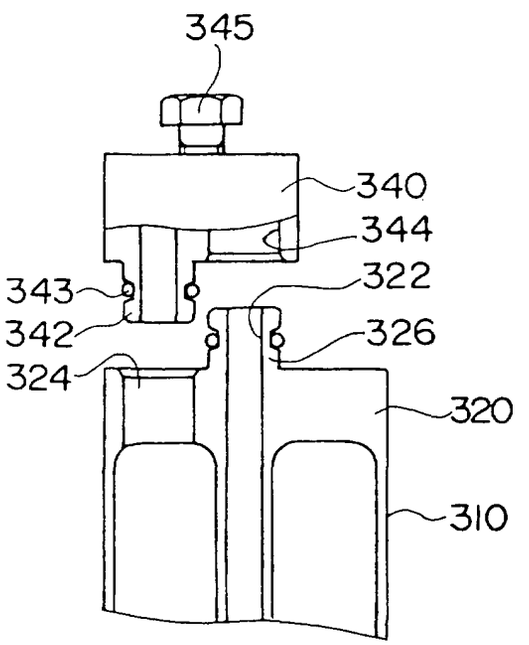


Fig. 8



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 01 12 2367

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	31 October 2001	Busuiocescu, B

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

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EUROPEAN SEARCH REPORT

Application Number
EP 01 12 2367

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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A	US 5 375 327 A (SEARFOSS JERRY R ET AL) 27 December 1994 (1994-12-27) * the whole document * * column 4, line 30 - line 35 *		
A	US 4 707 999 A (OHTA HIROMI ET AL) 24 November 1987 (1987-11-24) * the whole document *		
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 01 12 2367

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