



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
18.01.2017 Bulletin 2017/03

(51) Int Cl.:
F25B 43/00 (2006.01)

(21) Application number: **16173246.6**

(22) Date of filing: **07.06.2016**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

(71) Applicant: **Fujikoki Corporation**
Tokyo 158-0082 (JP)

(72) Inventor: **HOSOKAWA, Kouji**
Setagaya-ku, Tokyo 158-0082 (JP)

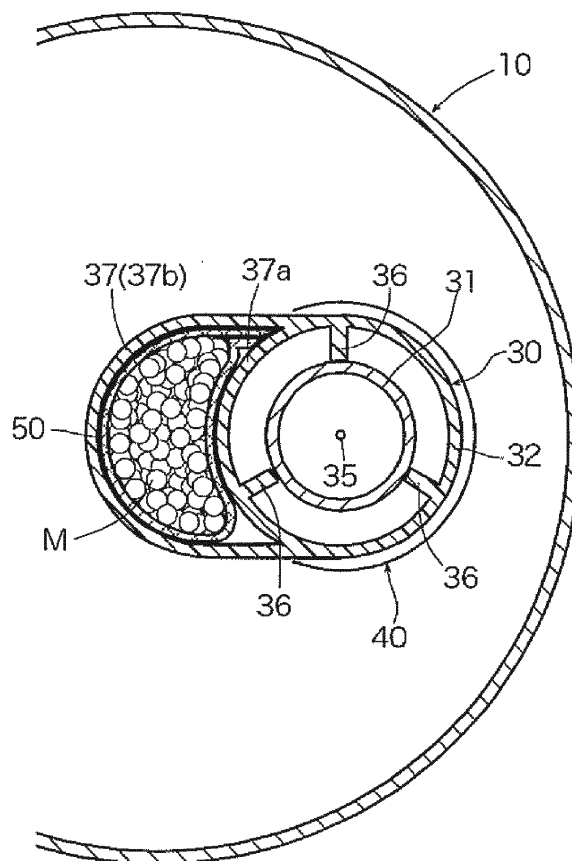
(74) Representative: **Schweiger, Martin**
Schweiger & Partners
Intellectual Property Law Firm
Elsenheimer Strasse 1
80687 München (DE)

(30) Priority: **17.07.2015 JP 2015142953**

(54) **ACCUMULATOR**

(57) [Object] To provide an accumulator capable of easily fixing a drying agent containing bag and hence decreasing a component cost or an assembly cost. [Solving Means] A bag insertion cylindrical portion (37) into which a bag (50) containing a drying agent (M) is inserted through press-fitting is provided in an outer portion of an outer pipe (32). Further, the bag insertion cylindrical portion (37) is integrally molded with the outer pipe (32).

FIG. 2



Description

TECHNICAL FIELD

[0001] The present invention relates to an accumulator (a gas-liquid separator) that is used in a heat pump type refrigeration cycle (hereinafter, referred to as a heat pump system) such as a car air conditioner, a room air conditioner, and a refrigerator.

BACKGROUND ART

[0002] In general, a heat pump system 200 constituting a car air conditioner or the like includes an accumulator 250 in addition to a compressor 210, an outdoor heat exchanger 220, an indoor heat exchanger 230, an expansion valve 260, a four-way switching valve 240, and the like as in an example illustrated in Fig. 7.

[0003] In such a system 200, a cooling operation and a heating operation are switched (a passage is switched) by the four-way switching valve 240. In the cooling operation, a refrigerant is circulated in a cycle illustrated in Fig. 7(A). At this time, the outdoor heat exchanger 220 serves as a condenser and the indoor heat exchanger 230 serves as an evaporator. Meanwhile, in the heating operation, a refrigerant is circulated in a cycle illustrated in Fig. 7(B). At this time, the outdoor heat exchanger 220 serves as the evaporator and the indoor heat exchanger 230 serves as the condenser. In any operation mode, a low-temperature and low-pressure gas-liquid refrigerant is introduced from the evaporator (the indoor heat exchanger 230 or the outdoor heat exchanger 220) into the accumulator 250 through the four-way switching valve 240.

[0004] As the accumulator 250, for example, Patent Document 1 discloses an accumulator including: a bottomed cylindrical tank of which an upper surface opening is air-tightly closed by a lid member provided with an inflow port and an outflow port, a gas-liquid separation body which has a hat shape or an inverse thin bowl shape and has a diameter smaller than the inner diameter of the tank, an outflow pipe which has a double pipe structure provided with an inner pipe and an outer pipe and has an upper end connected to the outflow port so as to be suspended, and a strainer which is provided in the vicinity of a bottom portion of the outflow pipe (the outer pipe thereof) and traps and removes the foreign material included in the liquid phase refrigerant and the oil (the refrigerator oil) mixed with the refrigerant.

[0005] The refrigerant which is introduced into the accumulator 250 collides with the gas-liquid separation body so as to be diffused radially and separated into a liquid phase refrigerant and a gas phase refrigerant, the liquid phase refrigerant (including oil) flows downward along the inner peripheral surface of the tank so as to be accumulated in the lower portion of the tank, and the gas phase refrigerant flows downward in the space (the downward gas phase refrigerant flowing passage)

formed between the outer pipe and the inner pipe of the outflow pipe and moves upward in the space inside the inner pipe so as to be suctioned to the suction side of the compressor 210. In this way, the refrigerant is circulated.

[0006] Further, the oil accumulated in the lower portion of the tank along with the liquid phase refrigerant moves toward the bottom portion of the tank due to a difference in property with respect to the liquid phase refrigerant or a difference in specific weight in a case where the specific weight of the oil is larger than the specific weight of the liquid phase refrigerant, is suctioned to the gas phase refrigerant suctioned to the suction side of the compressor through the outflow pipe, and is returned to the suction side of the compressor along with the gas phase refrigerant while sequentially passing through the strainer (the mesh filter thereof), the oil returning hole formed in the bottom portion of the outflow pipe (the outer pipe), and the space inside the inner pipe of the outflow pipe. In this way, the oil can be circulated. When the oil passes through the mesh filter, a foreign material such as sludge is trapped and the foreign material is removed from the circulated refrigerant (including oil). Further, the flow of the liquid phase refrigerant and the oil is substantially the same as a case where the specific weight of the oil is smaller than the specific weight of the liquid phase refrigerant.

[0007] Further, in the above-described accumulator, for example, Patent Document 2 discloses an accumulator without a bag containing a drying agent for absorbing and removing moisture in a refrigerant in a tank.

CITATION LIST

PATENT DOCUMENT

[0008]

Patent Document 1: JP 2014-70869 A

Patent Document 2: JP 2014-202440 A

SUMMARY OF THE INVENTION

PROBLEM TO BE SOLVED BY THE INVENTION

[0009] Incidentally, the accumulator disclosed in Patent Document 2 uses a countermeasure in which a bag is wound on an outer periphery of an outer pipe and a connection band is fixed while being wound on an outer periphery thereof in order to prevent the rotation or the movement of the drying agent containing bag inside the tank. However, such a countermeasure has a problem in which a considerable time is spent and a component cost or an assembly cost increase.

[0010] The invention is made in view of the above-described circumstances and an object thereof is to provide an accumulator capable of easily fixing a drying agent containing bag and hence decreasing a component cost or an assembly cost.

MEANS FOR SOLVING PROBLEM

[0011] In order to attain the above-described object, according to an aspect of the invention, there is provided an accumulator including: a tank closed by a lid member provided with an inflow port and an outflow port; an outflow pipe having a double pipe structure including an inner pipe connected to the outflow port so as to be suspended inside the tank and an outer pipe disposed on an outer periphery of the inner pipe; and a drying agent containing bag for absorbing and removing moisture in a refrigerant, in which a bag insertion cylindrical portion having the drying agent containing bag inserted thereto is provided in an outer portion of the outer pipe.

[0012] Preferably, the bag insertion cylindrical portion is integrally molded with the outer pipe.

[0013] As a more preferable aspect, the outer pipe and the bag insertion cylindrical portion are integrally molded with each other so that a part thereof is formed as a common peripheral wall portion.

[0014] Preferably, the drying agent containing bag is inserted into the bag insertion cylindrical portion through press-fitting.

[0015] Preferably, a slit-shaped notch portion is formed in the bag insertion cylindrical portion in the up and down direction.

[0016] As a preferable aspect, an upper end and/or a lower end of the drying agent containing bag is exposed from the bag insertion cylindrical portion.

[0017] As another preferable aspect, a gas-liquid separation body is provided at the upper side of the outer pipe and the drying agent containing bag is disposed so as to be stretched between the gas-liquid separation body and a bottom portion of the tank.

EFFECT OF THE INVENTION

[0018] In the accumulator according to the invention, the bag insertion cylindrical portion into which the drying agent containing bag is inserted through press-fitting is provided on the outer portion of the outer pipe. For this reason, the drying agent containing bag can be simply and easily fixed compared with a case where the bag is wound on the outer periphery of the outer pipe and a connection band is wound on the outer periphery thereof as in the related art. As a result, the component cost or the assembly cost can be decreased.

[0019] Further, the drying agent containing bag inserted into the bag insertion cylindrical portion is disposed so as to be stretched between the bottom portion of the tank and the gas-liquid separation body provided at the upper side of the outer pipe. As a result, it is possible to prevent the crushing or the powdering of the drying agent and further to prevent the drying agent from leaking from the drying agent containing bag through a minute gap of the drying agent containing bag.

BRIEF DESCRIPTION OF DRAWINGS

[0020]

5 Fig. 1 is a partially cutaway front view illustrating a first embodiment of an accumulator according to the invention;

Fig. 2 is an enlarged cross-sectional view taken along an arrow U-U of Fig. 1;

10 Fig. 3 is an enlarged half cross-sectional view illustrating a main part of a strainer of the accumulator of the first embodiment;

Fig. 4 is a cross-sectional view taken along an arrow V-V of Fig. 3;

15 Fig. 5 is a partially cutaway front view illustrating a second embodiment of an accumulator according to the invention;

Fig. 6 is an enlarged cross-sectional view taken along an arrow U-U of Fig. 5; and

20 Fig. 7 illustrate an example of a heat pump system, where Fig. 7(A) is a schematic configuration diagram illustrating a flow (a cycle) of a refrigerant in a cooling operation and Fig. 7(B) is a schematic configuration diagram illustrating a flow (a cycle) of a refrigerant in a heating operation.

MODE(S) FOR CARRYING OUT THE INVENTION

[0021] Hereinafter, embodiments of the invention will be described with reference to the drawings.

[First Embodiment]

35 **[0022]** Fig. 1 is a partially cutaway front view illustrating a first embodiment of an accumulator according to the invention and Fig. 2 is an enlarged cross-sectional view taken along an arrow U-U of Fig. 1.

40 **[0023]** An accumulator 1 of the first embodiment illustrated in the drawing is used as, for example, an accumulator 250 of a heat pump system 200 constituting a car air conditioner of an electric vehicle as illustrated in Fig. 7 described above and includes a bottomed cylindrical tank 10 which is formed of metal such as stainless steel or aluminum. Here, an upper surface opening of the tank 10 is air-tightly closed by a lid member 12 formed of metal. In addition, the accumulator 1 of the embodiment is disposed, for example, in the vertical direction as illustrated in drawing. That is, the accumulator is installed so that the lid member 12 faces the upper (sky) side and the bottom portion of the tank 10 faces the lower (earth) side.

50 **[0024]** The lid member 12 is provided with an inflow port 15 and a stepped outflow port 16 side by side. Here, a gas-liquid separation body 18 having a hat shape or an inverse thin bowl shape and having a diameter smaller than the inner diameter of the tank 10 is disposed at the lower side of the lid member 12 and an upper end of an outflow pipe 30 is connected to a lower portion of the

outflow port 16.

[0025] The outflow pipe 30 is formed as a double pipe structure including an inner pipe 31 which is formed of metal so as to be suspended inside the tank 10 while an upper end thereof is connected to the lower portion of the outflow port 16 through caulking or press-inserting and a bottomed outer pipe 32 which is formed of synthetic resin and is disposed on the outer periphery of the inner pipe 31. Then, a bag insertion cylindrical portion 37 which fixes a bag 50 containing a drying agent M in an insertion state is integrally molded with the outer portion of the outer pipe 32.

[0026] The lower end of the outer pipe 32 is fitted and fixed into an inner peripheral stepped upper portion 42a of a casing 42 of a strainer 40 to be described later through press-fitting or the like. The lower end of the inner pipe 31 is located at the slight upper position in relation to a bottom portion 32b of the outer pipe 32 and the upper end of the outer pipe 32 is located at the slight lower position in relation to the lid member 12. An oil returning hole 35 is formed in the center of the bottom portion 32b of the outer pipe 32. A hole diameter of the oil returning hole 35 is set to, for example, about 1 mm.

[0027] Three plate-shaped ribs 36 are provided at the same angular interval so as to protrude inward in the radial direction inside the outer pipe 32 along the longitudinal direction (the up and down direction) as illustrated in the cross-section of Fig. 2. Here, the inner pipe 31 is inserted and fixed to the inner peripheral sides of three plate-shaped ribs 36 through press-fitting.

[0028] A flange-shaped portion 31 f which is compressed and curved by bulging is provided near the upper end of the inner pipe 31. When the gas-liquid separation body 18 and the inner pipe 31 are assembled to the lid member 12, the upper end of the inner pipe 31 is press-fitted or expand-fixed to the outflow port 16 from the downside while passing through a passage hole 19 provided in the gas-liquid separation body 18. Accordingly, the gas-liquid separation body 18 is held and fixed so as to be sandwiched between the flange-shaped portion 31f and the lower end surface of the lid member 12 at the upside of the outer pipe 32.

[0029] Additionally, the inner pipe 31, the outer pipe 32, and the plate-shaped rib 36 may be integrally molded with one another by using metal such as aluminum or synthetic resin. In this molding, for example, an extruding technique can be employed.

[0030] The strainer 40 is fixed while being placed on the bottom portion of the tank 10. As understood from Figs. 3 and 4, the strainer includes a bottomed cylindrical casing 42 which is formed of synthetic resin and a cylindrical mesh filter 45 which is integrated with the casing 42 through insert-molding. The mesh filter 45 is made by, for example, a wire net or a mesh member formed of synthetic resin. In addition, Figs. 3 and 4 do not show the bag 50 containing the drying agent M to be described later or the bag insertion cylindrical portion 37.

[0031] The casing 42 of the strainer 40 includes the

inner peripheral stepped upper portion 42a into which the lower end of the outer pipe 32 is fitted and fixed, a bottom plate portion 42c, four column-shaped portions 42b which are formed uprightly on the outer periphery of the bottom plate portion 42c at the same angular interval, and circular band-shaped mesh end embedded portions 42d and 42d each of which has a predetermined thickness and a predetermined band width while including the upper and lower ends of the column-shaped portion 42b. The upper and lower ends of the mesh filter 45 are integrally sealed to the upper and lower mesh end embedded portions 42d and 42d during the insert-molding process. Further, the portion of the column-shaped portion 42b of the mesh filter 45 is also integrally sealed to the column-shaped portion 42b during the insert-molding process. In other words, four windows 44 each having a rectangular shape in the side view are defined by four column-shaped portions 42b and the upper and lower mesh end embedded portions 42d and 42d and the mesh filter 45 is stretched on each window 44. Further, four column-shaped portions 42b have a drawing gradient. However, four column-shaped portions 42b and the upper and lower mesh end embedded portions 42d and 42d have substantially the same radial width.

[0032] In the accumulator 1 with such a configuration, as in the related art, a low-temperature and low-pressure gas-liquid-phase refrigerant is introduced from the evaporator into the tank 10 through the inflow port 15, the introduced refrigerant collides with the gas-liquid separation body 18 so as to be diffused radially and separated into a liquid phase refrigerant and a gas phase refrigerant, the liquid phase refrigerant (including oil) flows downward along the inner peripheral surface of the tank 10 so as to be accumulated into the lower space of the tank 10, and the gas phase refrigerant is suctioned to the suction side of the compressor 210 while sequentially passing through the space (the downward gas phase refrigerant flowing passage) formed between the inner pipe 31 and the outer pipe 32 of the outflow pipe 30 and the space in the inner pipe 31. In this way, the refrigerant can be circulated.

[0033] Further, the oil which is accumulated in the lower space of the tank 10 along with the liquid phase refrigerant moves toward the bottom portion 13 of the tank 10 by a difference in specific weight or property with respect to the liquid phase refrigerant, is suctioned to the gas phase refrigerant suctioned to the suction side of the compressor through the outflow pipe 30, and is returned to the suction side of the compressor along with the gas phase refrigerant while sequentially passing through the mesh filter 45 of the strainer 40, the oil returning hole 35, and the space in the inner pipe 31. In this way, the oil can be circulated. When the oil passes through the mesh filter 45, a foreign material such as sludge is trapped and the foreign material is removed from the circulated refrigerant (including oil).

[0034] In addition to the above-described configuration, in the accumulator 1 of the embodiment, the bag

insertion cylindrical portion 37 of which upper and lower sides are opened so as to fix the bag 50 containing the drying agent M to the outer portion of the outer pipe 32 through press-fitting in an insertion state is integrally molded with the outer pipe 32 by extruding.

[0035] Specifically, the bag insertion cylindrical portion 37 has a crescent moon shape or a half moon shape in the cross-sectional view. A part of the outer pipe 32 and the bag insertion cylindrical portion 37 is formed as a common peripheral wall portion. In other words, a half of the outer pipe 32 (a portion having a semi-circular shape in the cross-section and located near the center portion of the tank 10) is formed as an inner wall portion 37a of the bag insertion cylindrical portion 37 and an outer wall portion 37b of the bag insertion cylindrical portion 37 has an outer shape of a half coin in the cross-section including a semi-circular portion as in the inner wall portion 37a.

[0036] Further, the bag insertion cylindrical portion 37 is located at the substantial center of the tank 10. Here, the upper end of the bag insertion cylindrical portion is located at the same position as the upper end of the outer pipe 32 and the lower end thereof is located at the slight upper position in relation to the lower end of the outer pipe 32.

[0037] Meanwhile, the bag 50 contained in the bag insertion cylindrical portion 37 is formed as a cloth body such as felt having a ventilation/water passing property and a necessary shape keeping property and the granular drying agent M is fully charged therein. In order to fix the bag 50 containing the drying agent M, the bag 50 containing the drying agent M may be press-inserted into the bag insertion cylindrical portion 37. That is, when the bag 50 containing the drying agent M is press-inserted into the bag insertion cylindrical portion 37, the bag is fixed in an insertion state through press-fitting so that most part excluding the upper and lower ends each having a triangular cross-section substantially comes into press-contact with the entire area of the inner peripheral surface of the bag insertion cylindrical portion 37.

[0038] Further, in the embodiment, in a state where the bag 50 containing the drying agent M is inserted and fixed into the bag insertion cylindrical portion 37, the upper and lower ends of the bag 50 containing the drying agent M are exposed from the bag insertion cylindrical portion 37. At the same time, the upper end of the bag comes into press-contact with the ceiling surface of the gas-liquid separation body 18 and the lower end thereof comes into press-contact with the bottom portion 13 of the tank so as to improve the safety and the vibration resistance. In other words, the dimensions of each component are set so that the bag 50 containing the drying agent M is stretched between the gas-liquid separation body 18 and the bottom portion 13 of the tank. Accordingly, it is possible to prevent a vibration of the bag 50 containing the drying agent M inside the tank 10. As a result, it is possible to effectively prevent the crushing or the powdering of the drying agent M and to prevent the drying agent M from leaking from the bag 50 through a

minute gap of the bag 50.

[0039] Further, in the accumulator 1 of the embodiment, the maximal liquid level height position Hmax of the liquid phase portion including the oil and the liquid phase refrigerant accumulated in the tank 10 when the compressor is stopped is located at the height position of 1/2 to 3/5 from the lower side of the bag 50 containing the drying agent M inserted and fixed to the bag insertion cylindrical portion 37 and the upper portion of the bag 50 containing the drying agent M is located at the upper side of the maximal liquid level height position Hmax.

[0040] As described above, in the accumulator 1 of the above-described embodiment, the bag insertion cylindrical portion 37 into which the bag 50 containing the drying agent M is inserted through press-fitting is integrally molded with the outer pipe 32, that is, the outer portion of the outer pipe 32. For this reason, the bag 50 containing the drying agent M can be simply and easily fixed compared with a case where the bag is wound on the outer periphery of the outer pipe and a connection band is wound on the outer periphery thereof as in the related art. As a result, the component cost or the assembly cost can be decreased.

[Second Embodiment]

[0041] Fig. 5 is a partially cutaway front view illustrating a second embodiment of an accumulator according to the invention and Fig. 6 is an enlarged cross-sectional view taken along an arrow U-U of Fig. 5.

[0042] An accumulator 2 of the second embodiment illustrated in the drawing is similar to the accumulator 1 of the first embodiment except that the center portion of the outer wall portion 37b of the bag insertion cylindrical portion 37 is provided with a slit-shaped notch portion 38 in the up and down direction (the axial direction of the outer pipe 32). Further, in Figs. 5 and 6 illustrating the accumulator 2 of the second embodiment, a common reference numeral is given to a component corresponding to the component of the accumulator 1 of the first embodiment.

[0043] As described above, since the bag insertion cylindrical portion 37 is provided with the slit-shaped notch portion 38, the bag insertion cylindrical portion 37 is easily elastically deformed (widened and opened) when the bag 50 containing the drying agent M is inserted into the bag insertion cylindrical portion 37 through press-fitting. For this reason, since the bag 50 containing the drying agent M is easily inserted into the bag insertion cylindrical portion and the exposure area of the bag 50 containing the drying agent M increases, it is possible to obtain an effect in which the moisture of the refrigerant is absorbed well.

[0044] Additionally, in the above-described embodiment, the bag insertion cylindrical portion 37 and the outer pipe 32 are integrally molded with each other so that a part thereof is formed as the common peripheral wall portion, but the invention is not limited to such a configuration. That is, the bag insertion cylindrical portion 37

and the outer pipe 32 may be formed independently from each other (as separate members).

[0045] Further, in the above-described embodiment, the bag 50 containing the drying agent M is fixed to the bag insertion cylindrical portion 37 through press-fitting in an insertion state, but the bag 50 containing the drying agent M may be, of course, inserted thereto so as not to be movable.

[0046] The accumulators 1 and 2 of the above-described embodiments can be applied to a refrigeration cycle that uses HFO1234yf or HFC134a as a refrigerant and uses POE oil (having a specific weight smaller than the refrigerant) as oil. However, the accumulators can be also applied to a refrigeration cycle that uses the refrigerant or the oil other than the above-described examples. Further, it is needless to mention that a relation between the specific weight values of the refrigerant and the oil may be reversed.

direction.

6. The accumulator according to any one of claims 1 to 5, wherein an upper end and/or a lower end of the drying agent containing bag is exposed from the bag insertion cylindrical portion.
7. The accumulator according to any one of claims 1 to 6, wherein a gas-liquid separation body is provided at the upper side of the outer pipe, and wherein the drying agent containing bag is disposed so as to be stretched between the gas-liquid separation body and a bottom portion of the tank.

Claims

1. An accumulator comprising:

a tank closed by a lid member provided with an inflow port and an outflow port;
 an outflow pipe having a double pipe structure including an inner pipe connected to the outflow port so as to be suspended inside the tank and an outer pipe disposed on an outer periphery of the inner pipe; and
 a drying agent containing bag for absorbing and removing moisture in a refrigerant, wherein a bag insertion cylindrical portion having the drying agent containing bag inserted thereto is provided in an outer portion of the outer pipe.

2. The accumulator according to claim 1, wherein the bag insertion cylindrical portion is integrally molded with the outer pipe.
3. The accumulator according to claim 2, wherein the outer pipe and the bag insertion cylindrical portion are integrally molded with each other so that a part thereof is formed as a common peripheral wall portion.
4. The accumulator according to any one of claims 1 to 3, wherein the drying agent containing bag is inserted into the bag insertion cylindrical portion through press-fitting.
5. The accumulator according to any one of claims 1 to 4, wherein a slit-shaped notch portion is formed in the bag insertion cylindrical portion in the up and down

FIG. 1

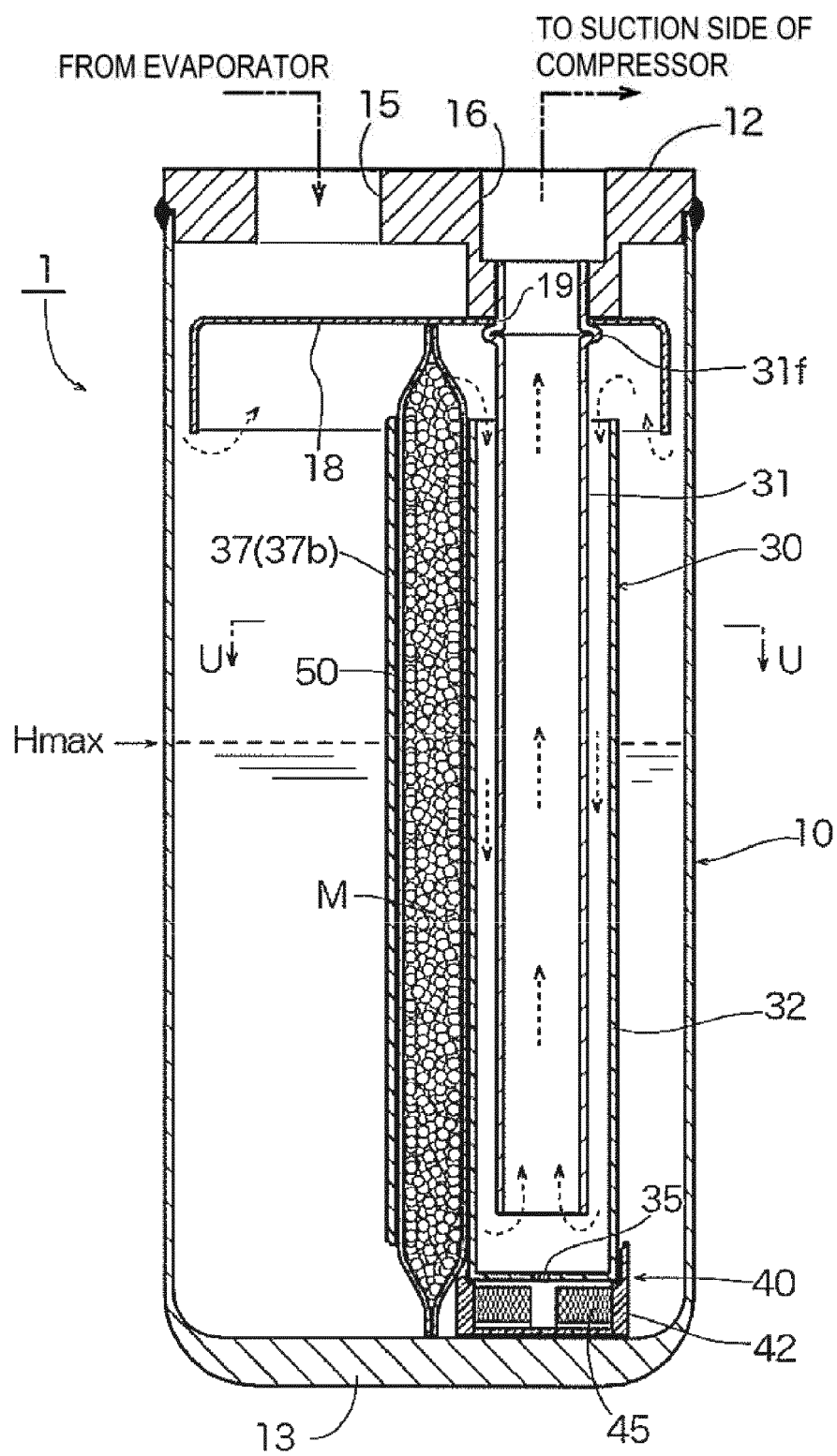


FIG. 2

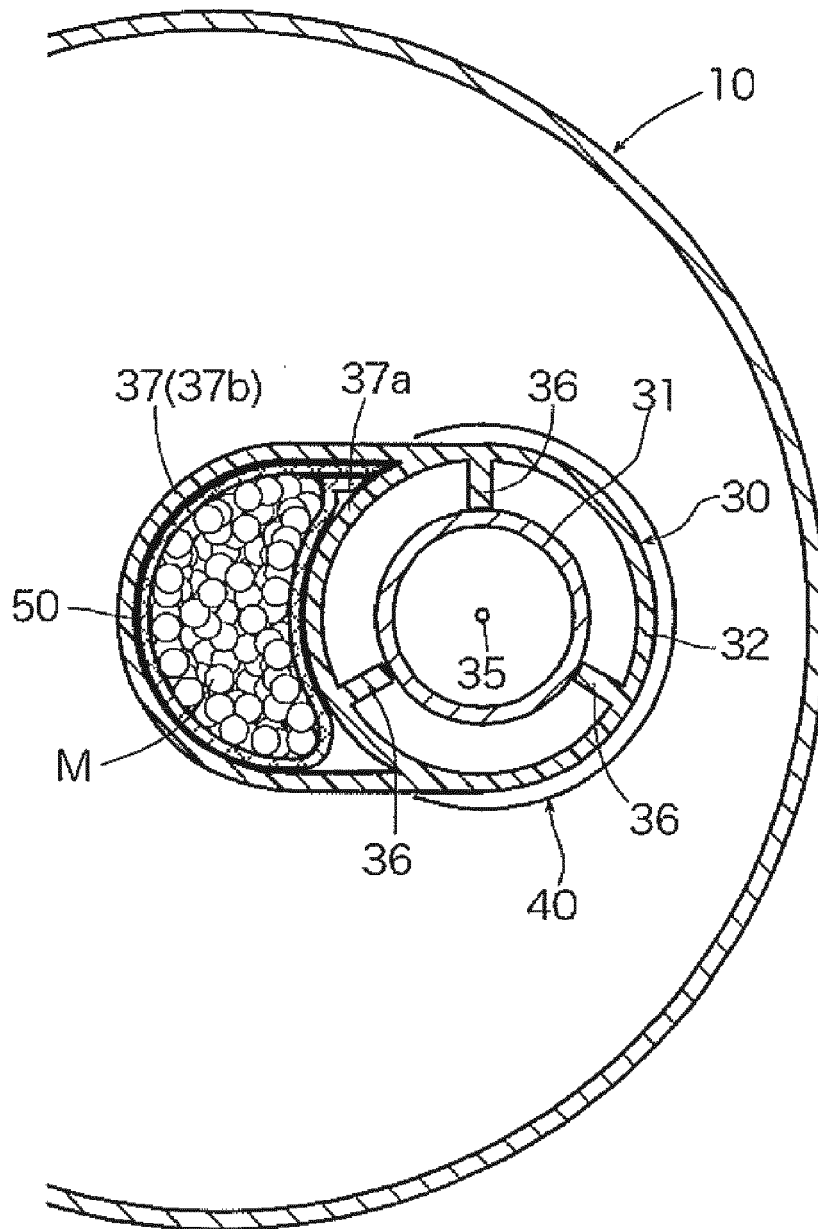


FIG. 3

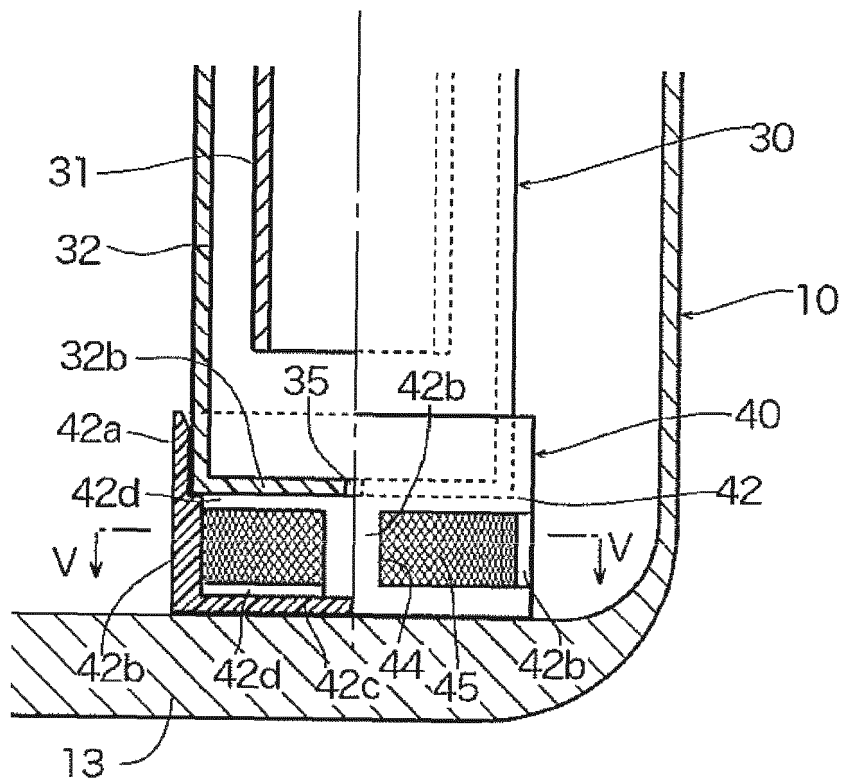


FIG. 4

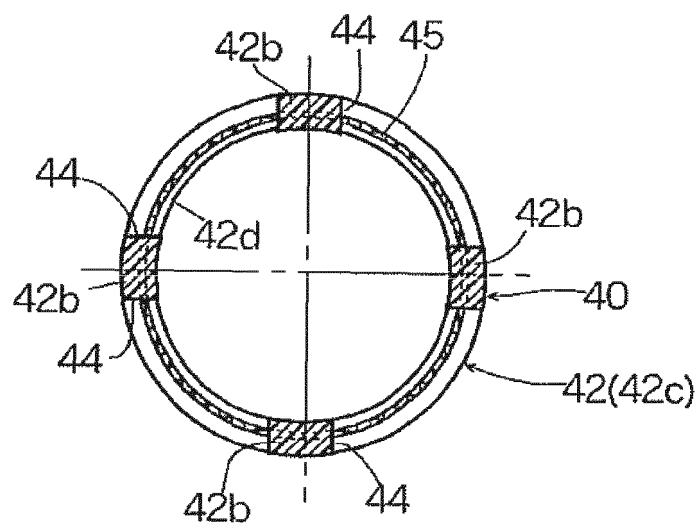


FIG. 5

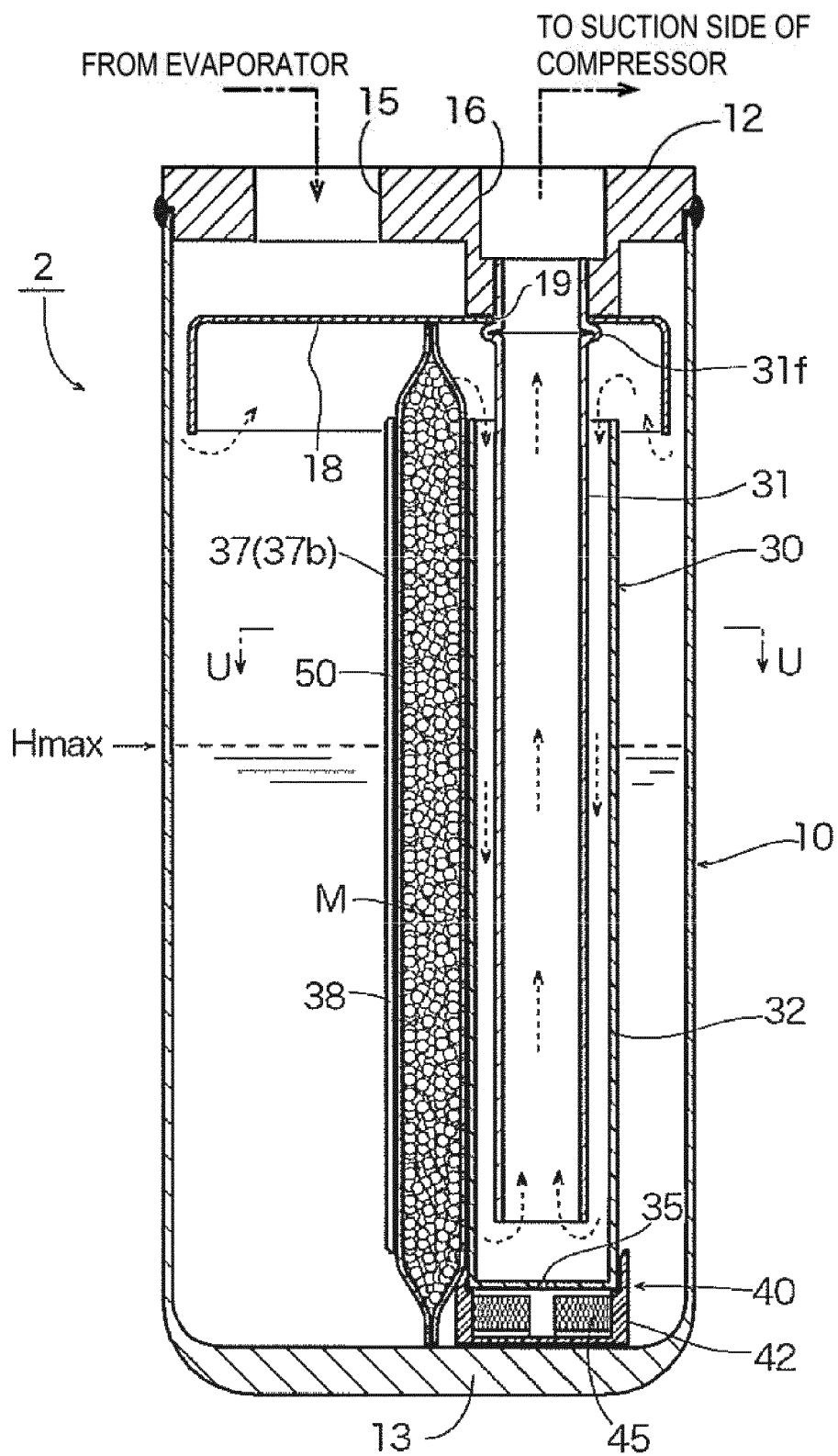


FIG. 6

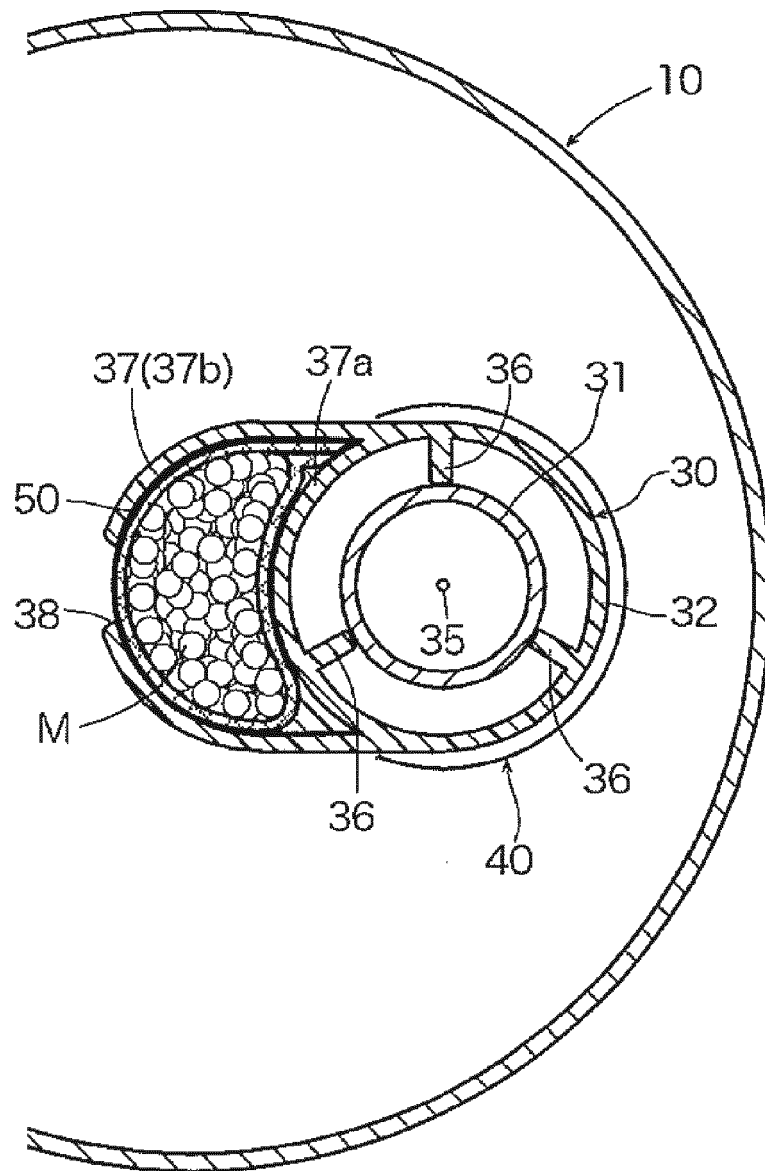


FIG. 7A

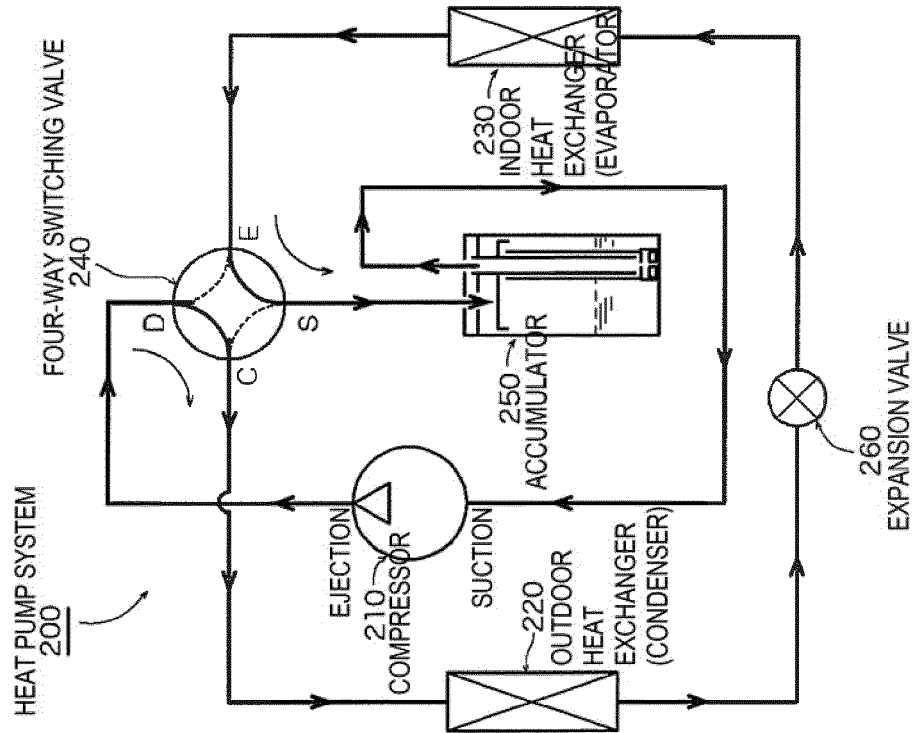
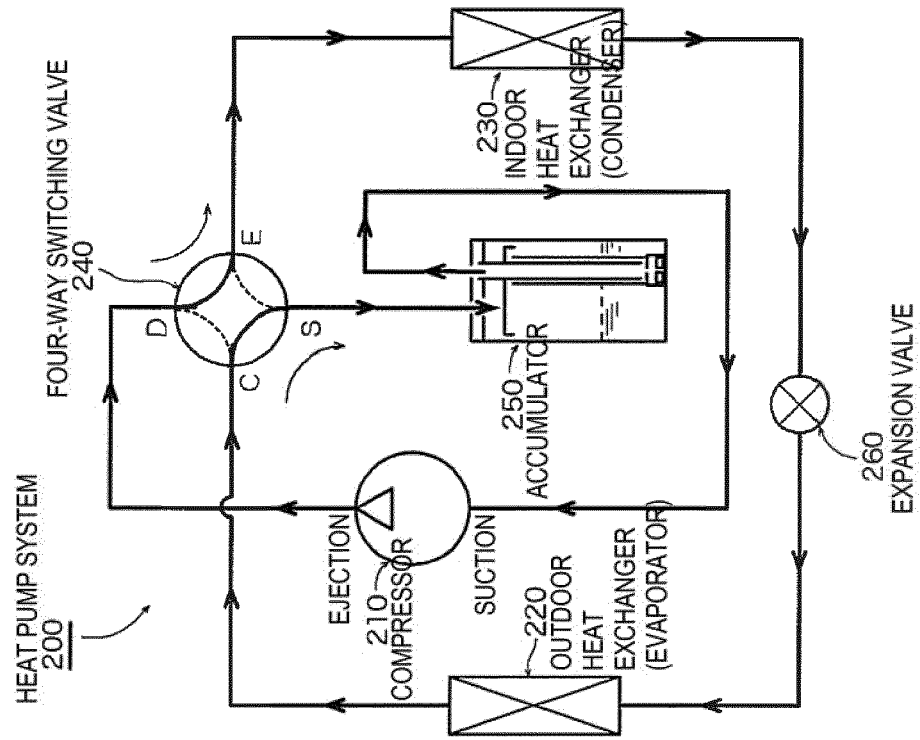


FIG. 7B





EUROPEAN SEARCH REPORT

Application Number
EP 16 17 3246

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	CN 104 603 555 A (DENSO CORP) 6 May 2015 (2015-05-06) * figures *	1-7	INV. F25B43/00
X	----- JP 2014 077606 A (FUJI KOKI KK) 1 May 2014 (2014-05-01) * figures *	1-7	
X,D	----- JP 2014 202440 A (FUJI KOKI KK) 27 October 2014 (2014-10-27) * figures *	1-7	
A	----- JP 2000 356439 A (DENSO CORP) 26 December 2000 (2000-12-26) * abstract; figure 9 *	1-7	
			TECHNICAL FIELDS SEARCHED (IPC)
			F25B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 25 November 2016	Examiner Ritter, Christoph
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure 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			

 1
EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 16 17 3246

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

25-11-2016

10

15

20

25

30

35

40

45

50

55

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CN 104603555 A	06-05-2015	CN 104603555 A	06-05-2015
		EP 2896914 A1	22-07-2015
		JP 5849909 B2	03-02-2016
		JP 2014052139 A	20-03-2014
		US 2015231549 A1	20-08-2015
		WO 2014038127 A1	13-03-2014

JP 2014077606 A	01-05-2014	NONE	

JP 2014202440 A	27-10-2014	CN 104101141 A	15-10-2014
		JP 2014202440 A	27-10-2014

JP 2000356439 A	26-12-2000	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 2014070869 A [0008]
- JP 2014202440 A [0008]