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(54) **CONDENSER**

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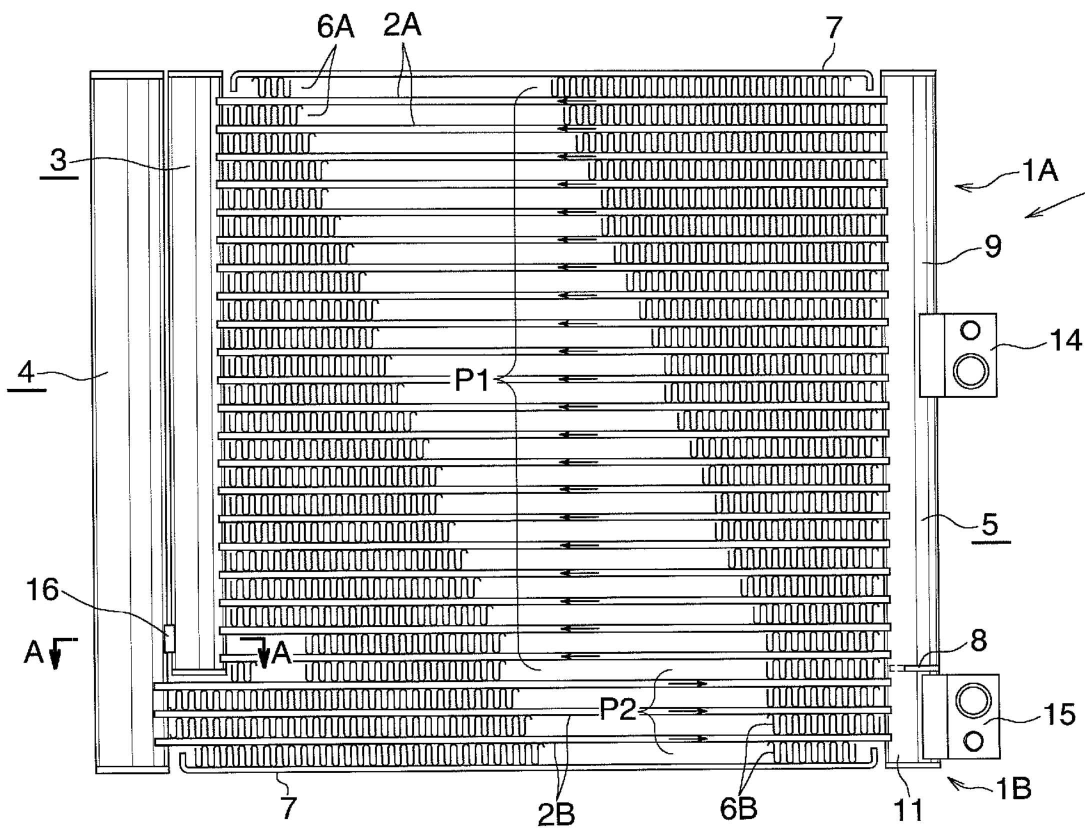
(57) **ABSTRACT**

A condenser includes first and second header tanks provided at one end thereof such that the latter is located on the outer side of the former. First heat exchange tubes forming a first heat exchange path provided in a condensation part are connected to the first header tank. Second heat exchange tubes forming a second heat exchange path provided in a supercooling part are connected to the second header tank. The first header tank has one communication section which communicates with the second header tank through a communication part and to which all the heat exchange tubes forming the first heat exchange path are connected. The communication part is provided at a height below the uppermost heat exchange tube among all the heat exchange tubes connected to the communication section. The upper end of the first header tank is located above the lower end of the second header tank.



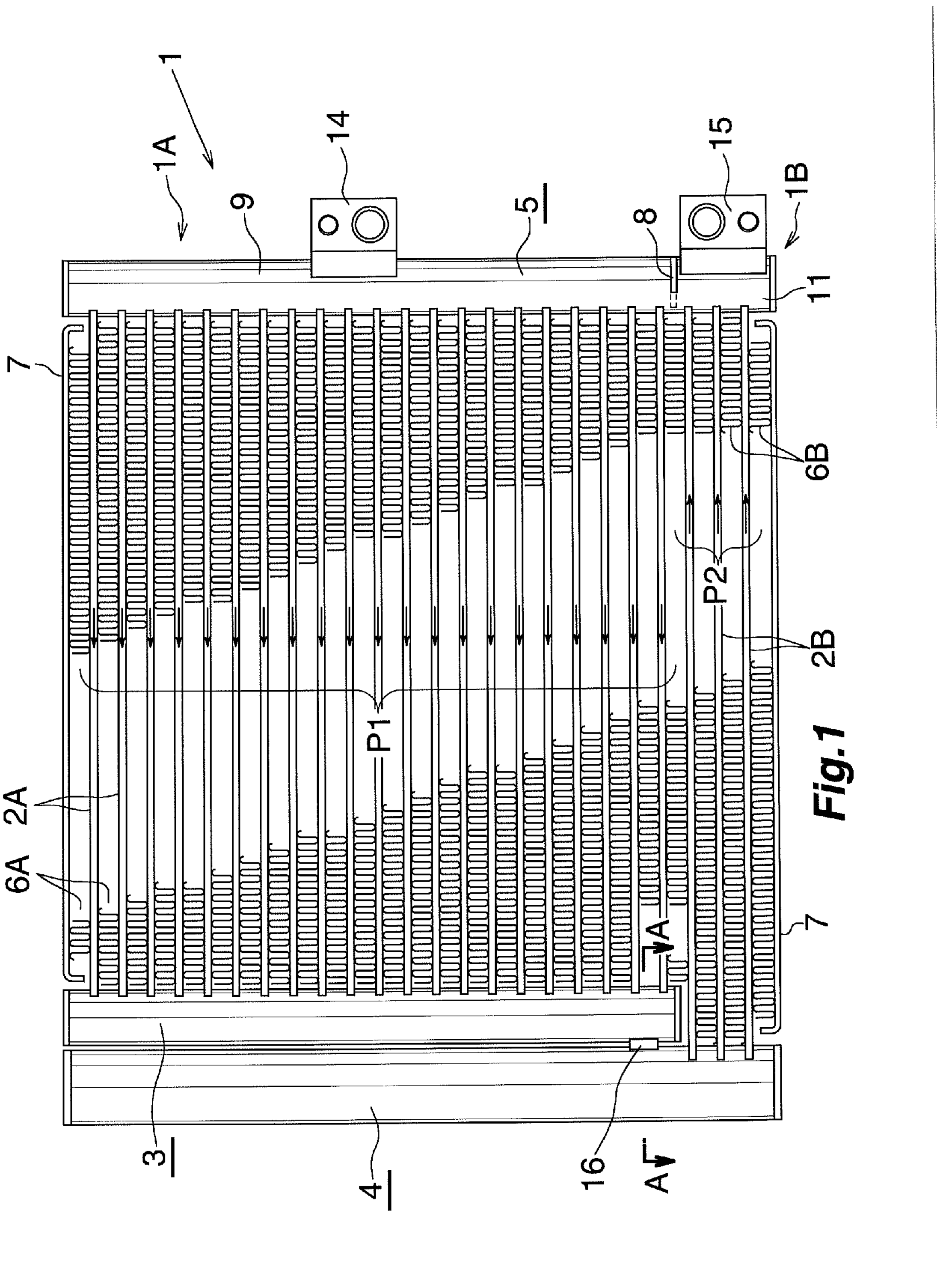


Fig.1

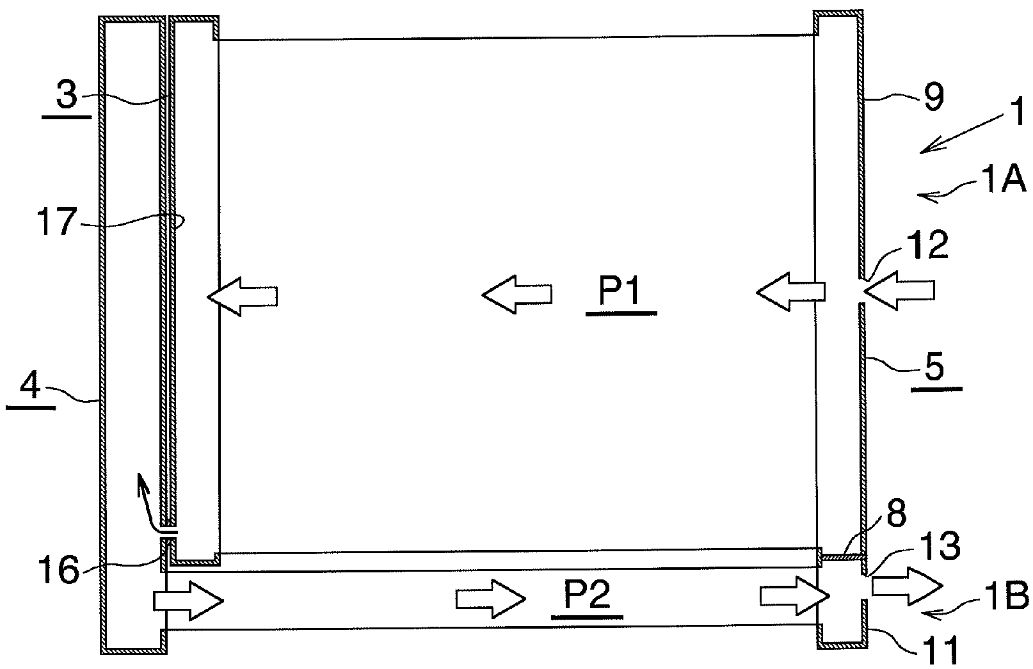


Fig.2

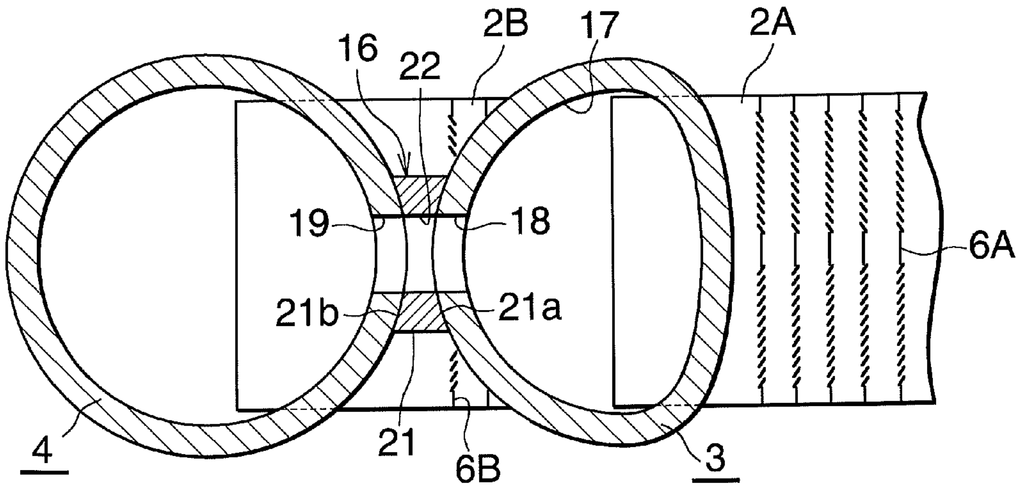


Fig.3

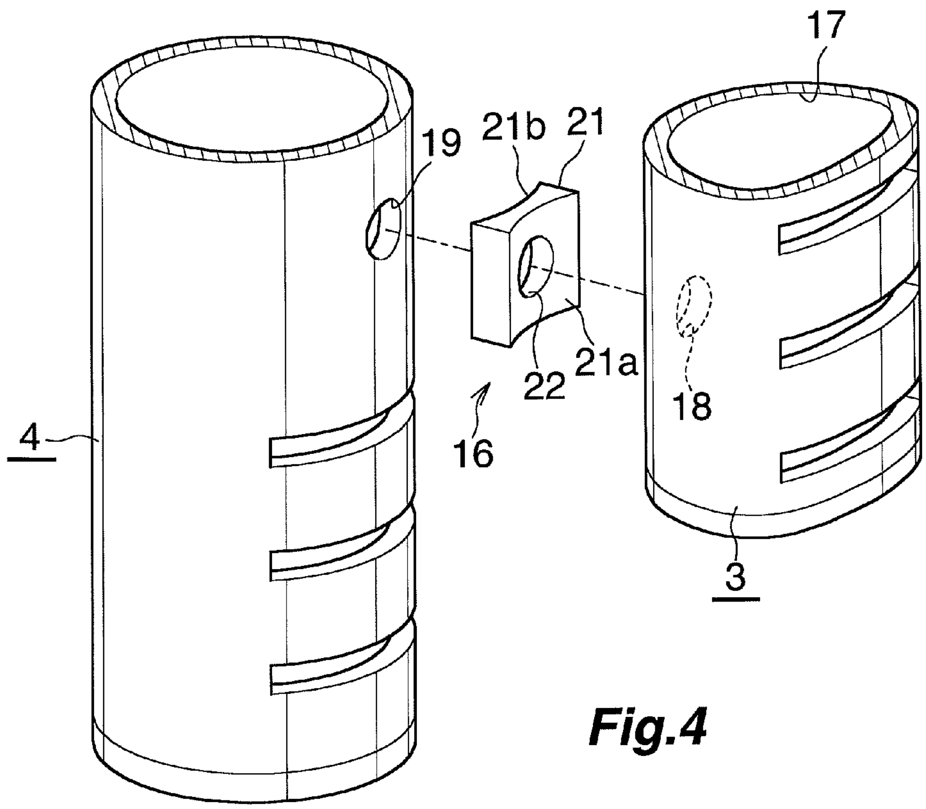


Fig.4

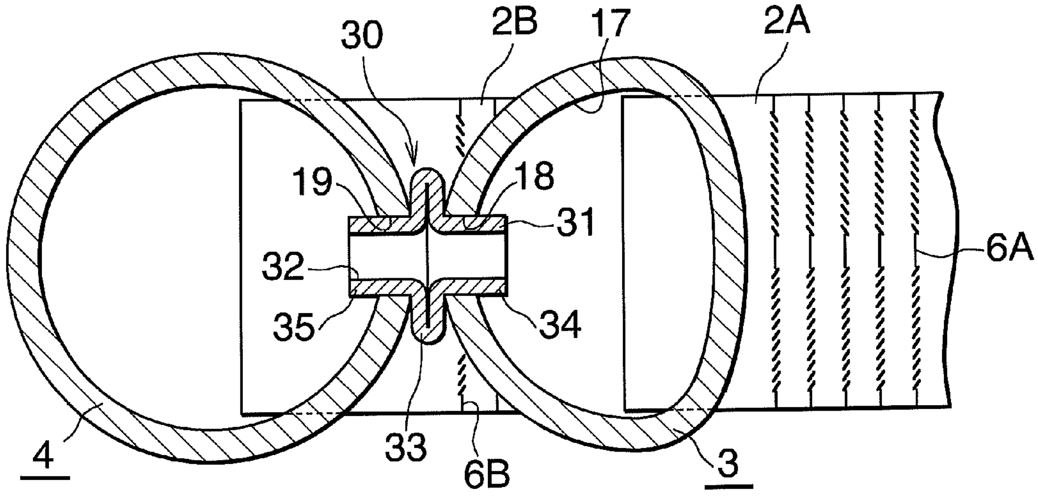


Fig.5

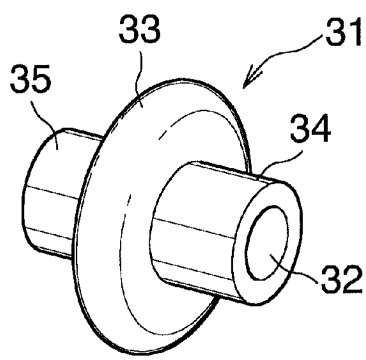
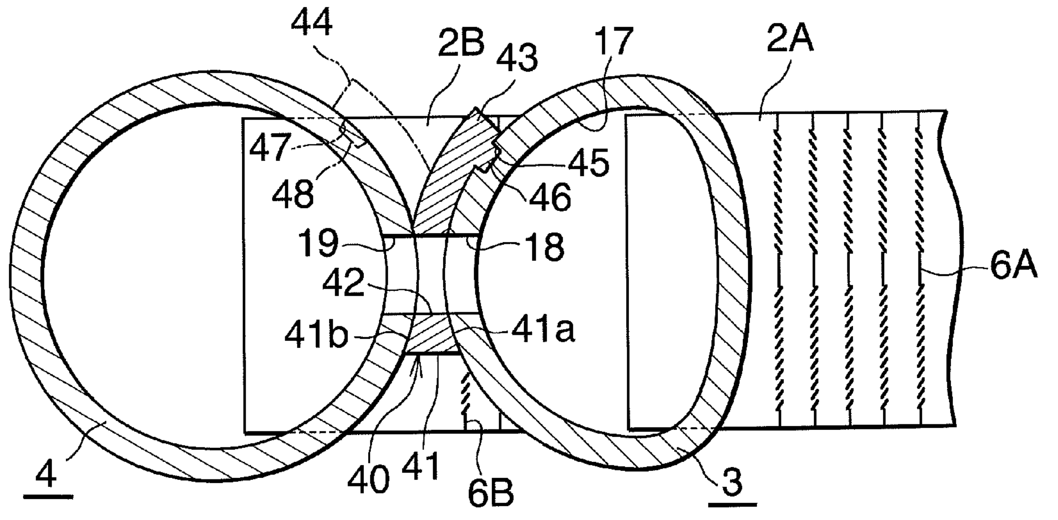


Fig.6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2B
43
17
2A
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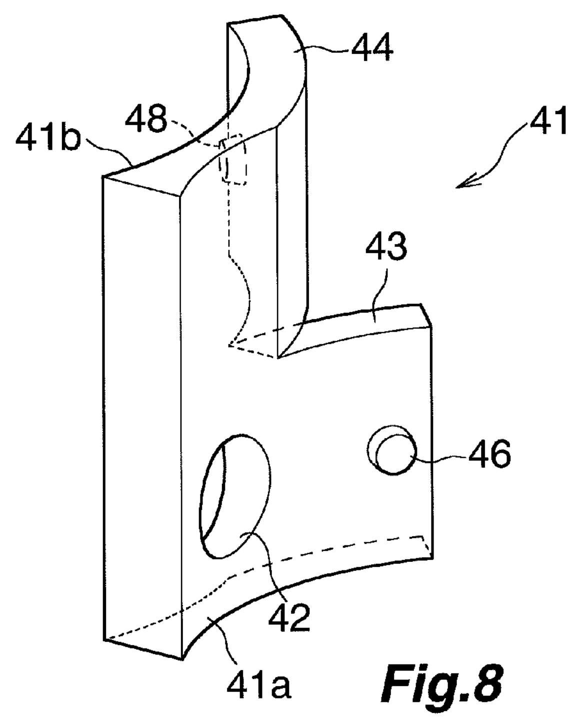
48
45
46
19
18
42
6A
41b
41a
4
40
41
6B
3

Fig.7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48
41b
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43
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42
41a

Fig.8

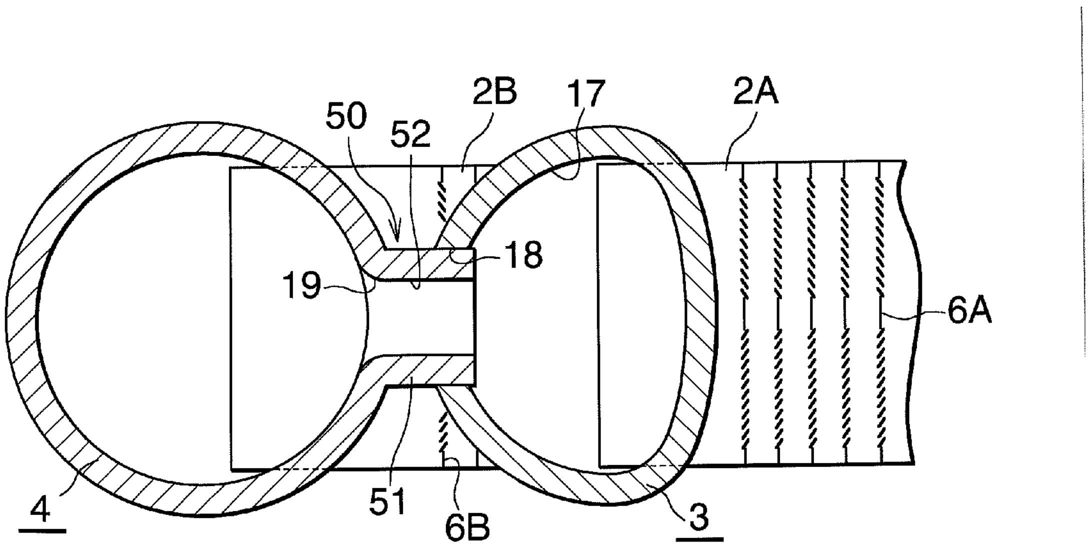


Fig.9

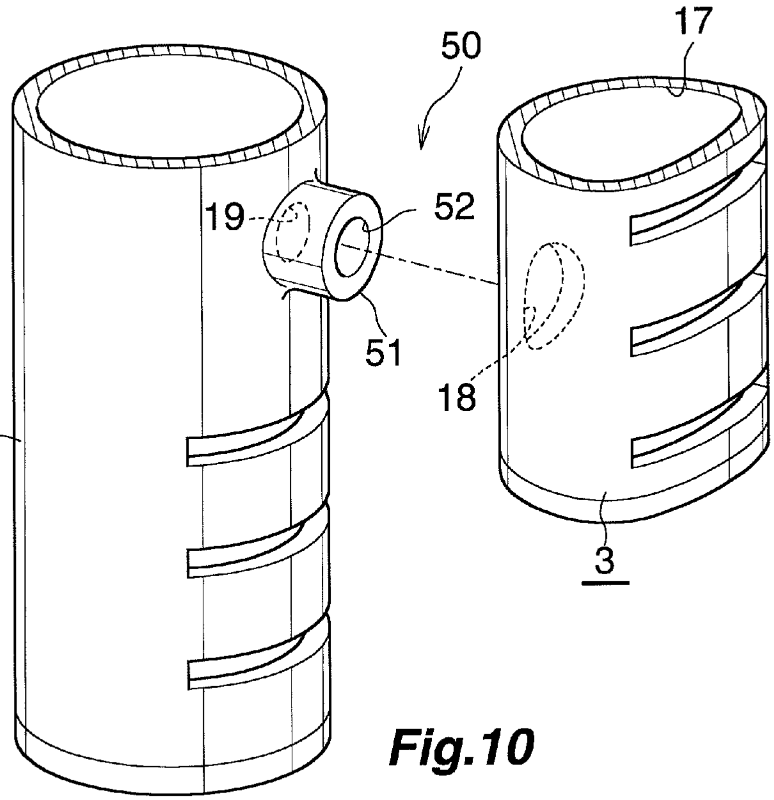


Fig.10

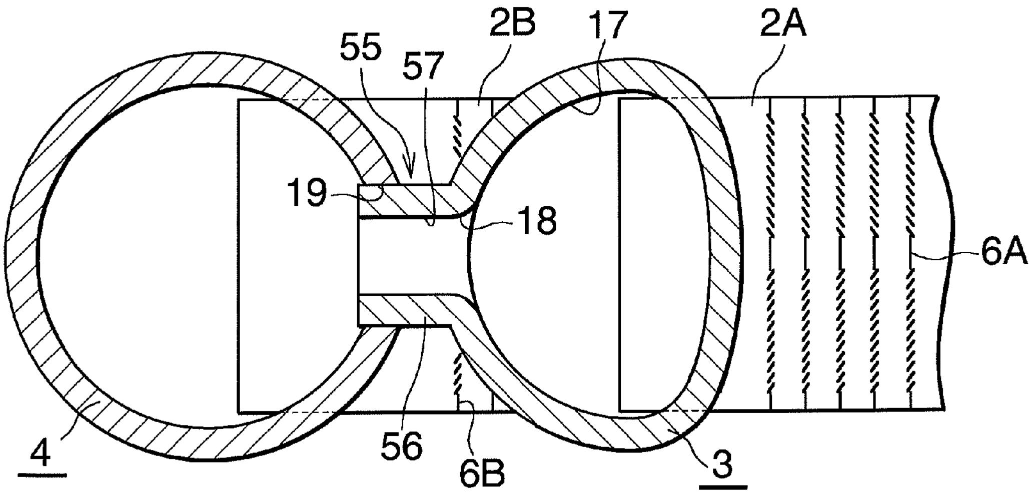


Fig.11

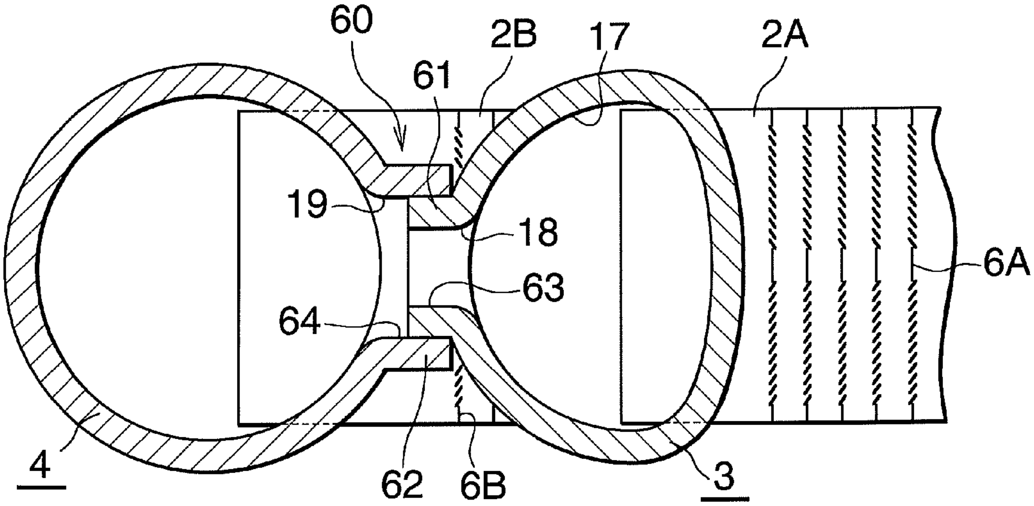


Fig.12

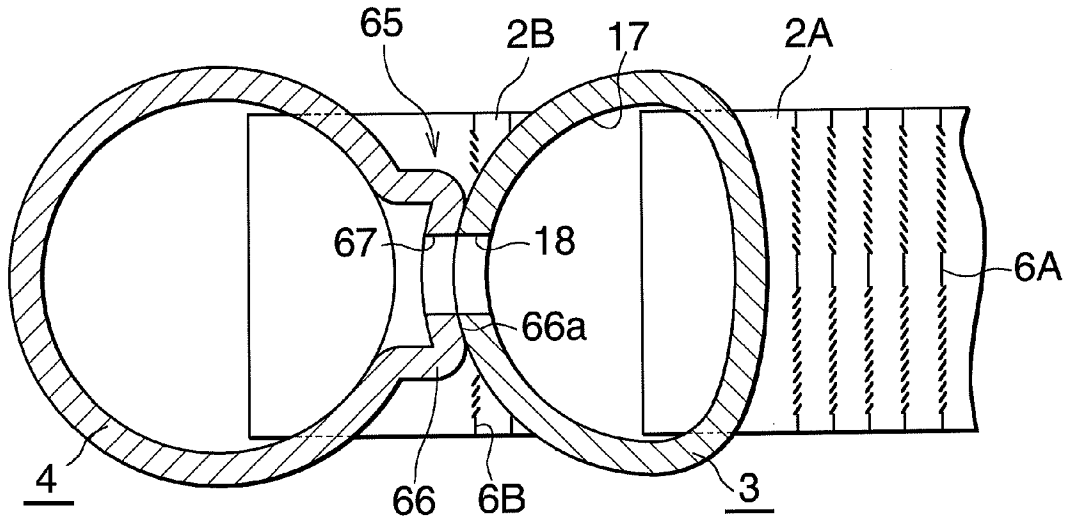


Fig.13

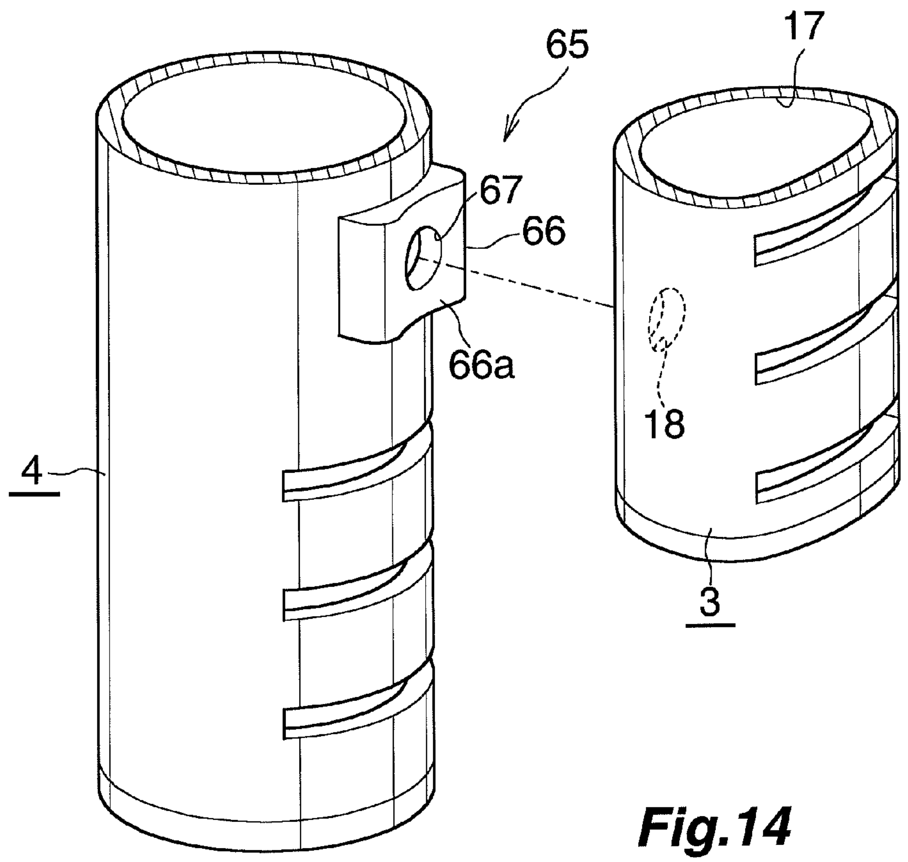
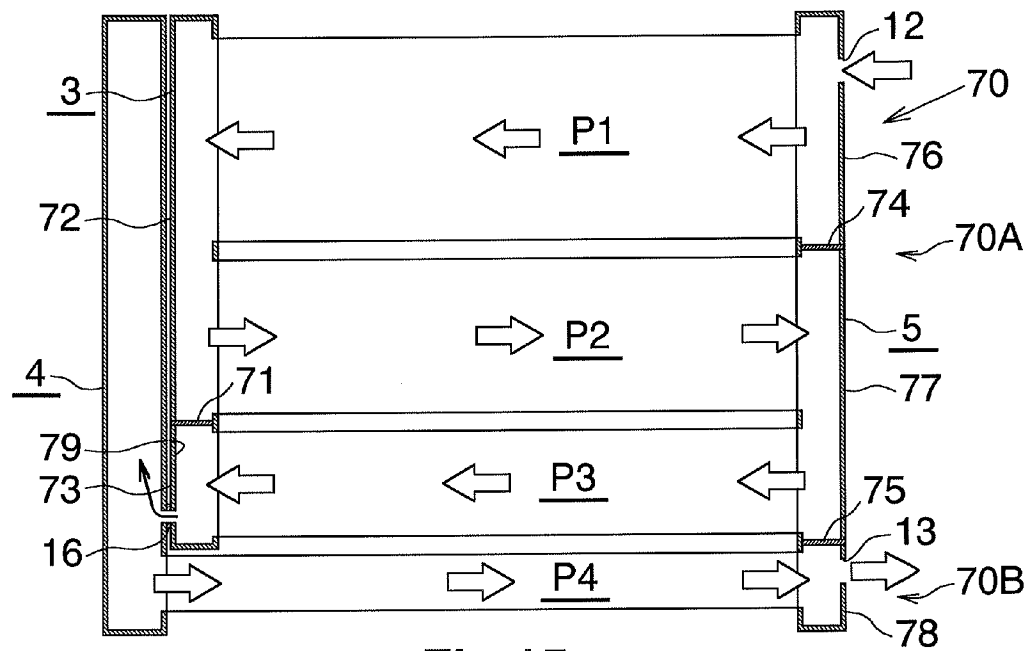


Fig.14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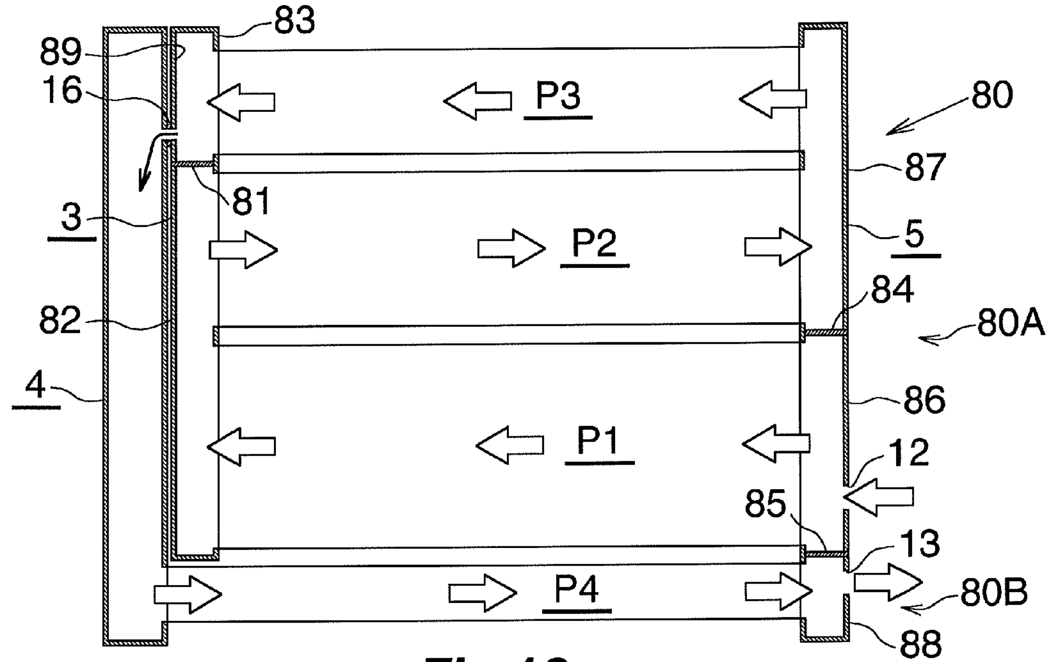
70
3
P1
76
74
72
70A
P2
5
4
77
71
79
P3
73
75
13
16
P4
70B
78

Fig.15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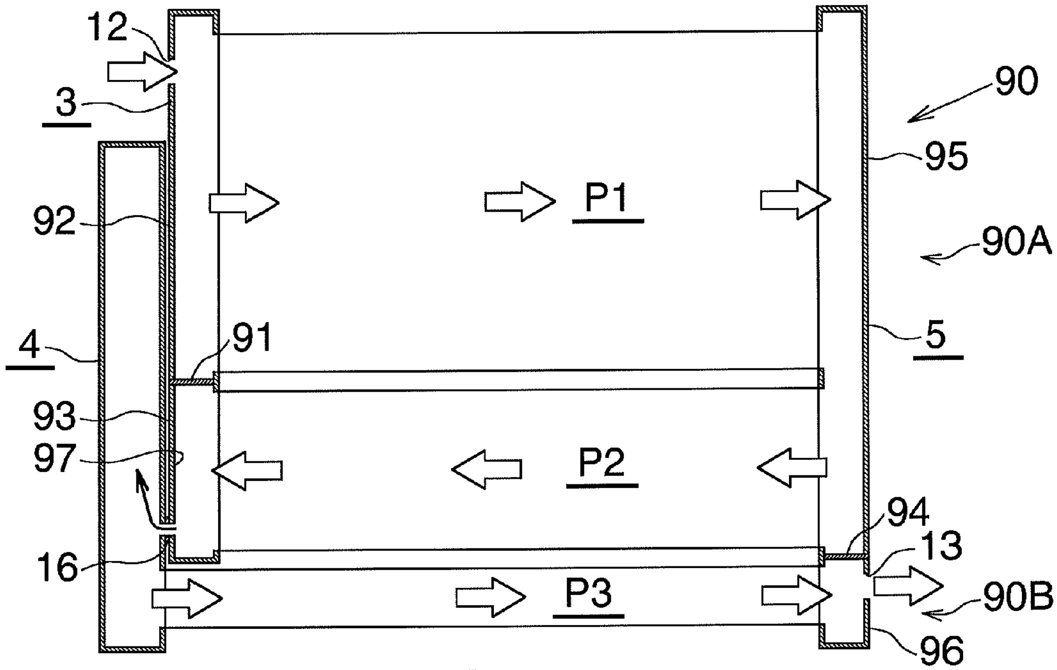
89
16
P3
80
87
81
3
P2
5
82
84
80A
4
86
P1
12
85
13
P4
80B
88

Fig.16


12
3
92
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97
16
90
95
P1
90A
5
P2
94
13
P3
90B
96

Fig.17

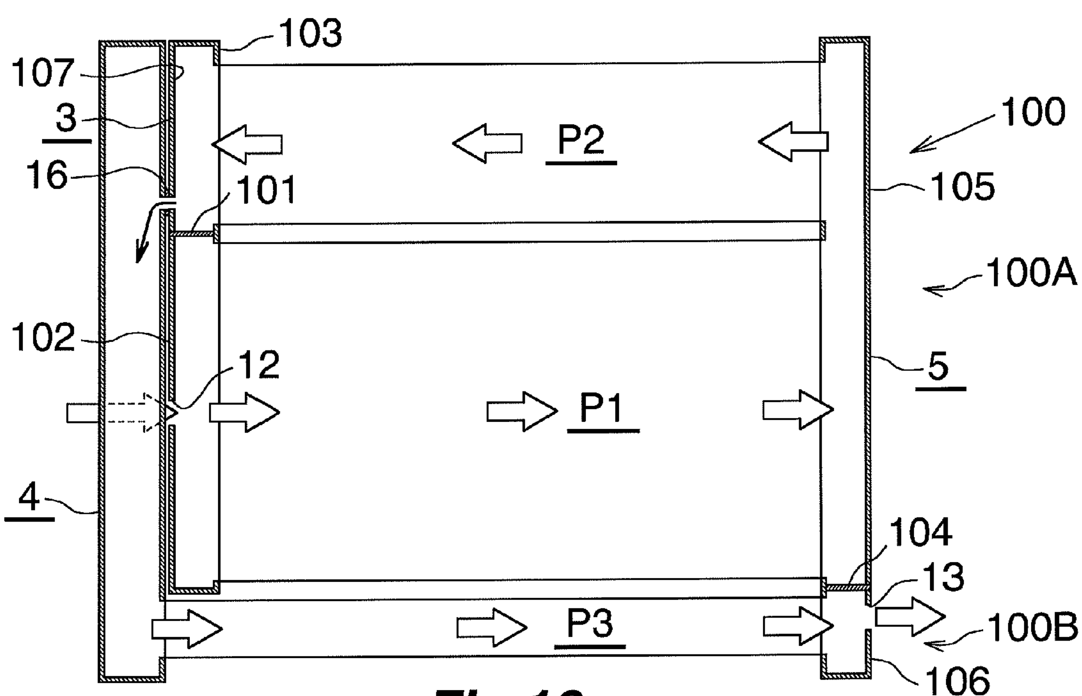
103
107
3
16
101
102
12
4
P2
P1
P3
100
105
100A
5
104
13
100B
106

Fig.18

CONDENSER

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a condenser suitable for use in, for example, a car air conditioner mounted on an automobile.

[0002] Herein and in the appended claims, the upper side, lower side, left-hand side, and right-hand side of FIGS. **1** and **2** will be referred to as "upper," "lower," "left," and "right," respectively.

[0003] A condenser for a car air conditioner is known (see Japanese Patent Application Laid-Open (kokai) No. 2001-33121). The known condenser has a condensation part and a super-cooling part provided such that the former is located above the latter. The condenser includes a plurality of heat exchange tubes disposed in parallel such that their length direction coincides with the left-right direction and they are spaced apart from one another in the vertical direction; fins each disposed between adjacent heat exchange tubes; and header tanks which are disposed such that their length direction coincides with the vertical direction and to which left and right end portions of the heat exchange tubes are connected, respectively. All the heat exchange tubes have the same length. One heat exchange path formed by a plurality of heat exchange tubes successively arranged in the vertical direction is provided in each of the condensation part and the super-cooling part. The heat exchange path provided in the condensation part serves as a refrigerant condensation path for condensing refrigerant, and the heat exchange path provided in the super-cooling part serves as a refrigerant super-cooling path for super-cooling the refrigerant. The two header tanks, to which all the heat exchange tubes are connected, are provided at the left and right ends of the condenser such that one header tank is provided at each of the left and right ends of the condenser. The interior of each of the two header tanks is divided into upper and lower header sections by a partition provided at a vertical position between the refrigerant condensation path and the refrigerant super-cooling path. Left and right end portions of the heat exchange tubes of the refrigerant condensation path are connected to the upper header sections of the two header tanks, and left and right end portions of the heat exchange tubes of the refrigerant super-cooling path are connected to the lower header sections of the two header tanks. A refrigerant inlet is provided at the upper header section of one header tank, and a refrigerant outlet is provided at the lower header section of the header tank. A liquid receiver which separates gas and liquid from each other and stores the liquid is joined to the other header tank, and a refrigerant communication is established between the interior of the liquid receiver and the interiors of the upper and lower header sections of the other header tank. In operation, refrigerant flows into the liquid receiver from the upper header section of the other header tank, and the gas and liquid portions of the refrigerant are separated from each other in the liquid receiver. After that, the liquid portion; i.e., liquid-predominant mixed phase refrigerant, flows into the lower header section of the other header tank.

[0004] However, in the condenser disclosed in the above-mentioned publication, all the heat exchange tubes have the same length; the interior of each of the two header tanks is divided into upper and lower header sections by a partition provided at a vertical position between the refrigerant condensation path and the refrigerant super-cooling path; the left and right end portions of the heat exchange tubes of the refrigerant condensation path are connected to the upper header sections of the two header tanks; and the left and right end portions of the heat exchange tubes of the refrigerant super-cooling path are connected to the lower header sections of the two header tanks. Thus, the condensation part and the super-cooling part have the same length as measured in the left-right direction. Therefore, in the case where the dimensions of the condenser, including the liquid receiver, as measured in the vertical direction and the left-right direction are fixed to certain dimensions, the areas of the heat exchange portions of the condensation part and the super-cooling part become insufficient, and further improvement of the refrigerant condensation efficiency and the refrigerant super-cooling efficiency cannot be attained.

[0005] In view of the above, the present applicant has proposed a condenser for a car air conditioner which can further improve the refrigerant condensation efficiency and the refrigerant super-cooling efficiency (see the pamphlet of WO2010/047320). The proposed condenser has a condensation part and a super-cooling part provided such that the former is located above the latter. The condenser includes a plurality of heat exchange tubes disposed in parallel such that their length direction coincides with the left-right direction and they are spaced apart from one another in the vertical direction; and header tanks which are disposed such that their length direction coincides with the vertical direction and to which left and right end portions of the heat exchange tubes are connected, respectively. Three heat exchange paths each formed by a plurality of heat exchange tubes successively arranged in the vertical direction are provided such that the heat exchange paths are juxtaposed in the vertical direction. The condensation part has a first tube group composed of two heat exchange paths each serving as a refrigerant condensation path. The super-cooling part has a second tube group located below the first tube group and composed of a single heat exchange path serving as a refrigerant super-cooling path. A first header tank and a second header tank are provided at one of the left and right ends of the condenser, and a third header tank is provided at the other of the left and right ends of the condenser. The heat exchange tubes of the refrigerant condensation paths, excluding the refrigerant condensation path located furthest downstream with respect to the refrigerant flow direction, are connected to the first header tank. The heat exchange tubes of the refrigerant condensation path located furthest downstream with respect to the refrigerant flow direction and the heat exchange tubes of the refrigerant super-cooling path are connected to the second header tank. All the heat exchange tubes are connected to the third header tank. The second header tank is disposed on the outer side of the first header tank with respect to the left-right direction, and the upper end of the second header tank is located above the lower end of the first header tank. The second header thank has a function of separating gas and liquid from each other and storing the liquid.

[0006] According to the condenser disclosed in the pamphlet, the portions of the heat exchange tubes connected to the second header tank, the portions being located on the side toward the second header tank, have projection portions which project outward in the left and right direction in relation to the ends of the heat exchange tubes connected to the first header, the ends being located on the side toward the first header tank, and fins are disposed between adjacent projection portions. Thus, a heat exchange section is formed by the projection portions of the exchange tubes connected to the second header tank and the fins disposed between adjacent projection portions. Accordingly, the area of the heat exchange section increases as compared with the heat exchanger disclosed in the publication, and refrigerant condensation efficiency and refrigerant super-cooling efficiency are improved.

[0007] Incidentally, a condenser is generally required to have a wide stable range which appears when refrigerant is charged into the condenser and in which a constant degree of super cooling is attained such that the condenser has a super-cooling characteristic which is more stable against load fluctuation and/or leakage of refrigerant. Therefore, even the condenser which is disclosed in the pamphlet and which has improved refrigerant condensation efficiency and refrigerant super-cooling efficiency as compared with the heat exchanger disclosed in the publication is required to increase the width of the stable range in which a constant degree of super cooling is attained.

SUMMARY OF THE INVENTION

[0008] In view of the above-described circumstances, an object of the present invention is to provide a condenser which can increase the width of the stable range while securing its performance to the greatest degree.

[0009] To achieve the above object, the present invention comprises the following modes.

[0010] 1) A condenser which has a condensation part and a super-cooling part provided such that the condensation part is located above the super-cooling part and which comprises a plurality of heat exchange tubes disposed in parallel such that their length direction coincides with a left-right direction and they are spaced apart from one another in a vertical direction; and header tanks which are disposed such that their length direction coincides with the vertical direction and to which left and right end portions of the heat exchange tubes are connected, each of the condensation part and the super-cooling part including at least one heat exchange path formed by a plurality of heat exchange tubes successively arranged in the vertical direction, the condenser configured such that all refrigerant having flowed through the heat exchange tubes of the condensation part flows into the heat exchange tubes of the super-cooling part,

[0011] wherein a first header tank to which all the heat exchange tubes of the condensation part are connected and a second header tank to which all the heat exchange tubes of the super-cooling part are connected are provided at one of left and right ends of the condenser; the first header tank has one communication section which communicates with the second header tank through a communication part and to which all the heat exchange tubes forming one heat exchange path are connected; the communication part is provided at a height below the uppermost heat exchange tube among all the heat exchange tubes connected to the communication section; the second header tank is disposed on the outer side of the first header tank with respect to the left-right direction; an upper end of the second header tank is located above a lower end of the first header tank; the second header tank has a function of separating gas and liquid from each other and storing the separated liquid; and all the refrigerant having passed through the heat exchange tubes of the condensation part flows into the communication section of the first header tank and flows into the second header tank through the communication part.

[0012] 2) A condenser according to par. 1), wherein the condensation part has one heat exchange path; the first header tank has one communication section to which all the heat exchange tubes forming the heat exchange path of the condensation part are connected; and the communication part establishes a refrigerant communication between the second header tank and a portion of the communication section of the first header tank, the portion extending downward from an approximate center of the communication section with respect to the vertical direction.

[0013] 3) A condenser according to par. 1), wherein the condensation part has two or more heat exchange paths; the condenser is configured such that refrigerant flows from a heat exchange path at one end with respect to the vertical direction toward a heat exchange path at the other end with respect to the vertical direction; the first header tank has one communication section to which all the heat exchange tubes forming a furthest downstream heat exchange path of the condensation part are connected; and the communication part establishes a refrigerant communication between the second header tank and a portion of the communication section of the first header tank, the portion extending downward from an approximate center of the communication section with respect to the vertical direction.

[0014] According to a condenser according to pars. 1) to 3), a first header tank to which all the heat exchange tubes of the condensation part are connected and a second header tank to which all the heat exchange tubes of the super-cooling part are connected are provided at one of left and right ends of the condenser; the first header tank has one communication section which communicates with the second header tank through a communication part and to which all the heat exchange tubes forming one heat exchange path are connected; the communication part is provided at a height below the uppermost heat exchange tube among all the heat exchange tubes connected to the communication section; the second header tank is disposed on the outer side of the first header tank with respect to the left-right direction; an upper end of the second header tank is located above a lower end of the first header tank; the second header tank has a function of separating gas and liquid from each other and storing the separated liquid; and all the refrigerant having passed through the heat exchange tubes of the condensation part flows into the communication section of the first header tank and flows into the second header tank through the communication part. Thus, when refrigerant within the communication section of the first header tank reaches the communication part during charging thereof, the refrigerant flows into the second header tank through the communication part and then flows into the heat exchange tubes of the refrigerant super-cooling path. Therefore, as compared with the case where the refrigerant within the communication section flows into the second header tank after reaching the uppermost heat exchange tube among all the heat exchange tubes connected to the communication section, the interiors of the heat exchange tubes forming the refrigerant super-cooling path can be filled with liquid-phase refrigerant at an early stage. Therefore, the width of a stable range within which a constant degree of super cooling is attained; i.e., the width of a range regarding the refrigerant charge amount within which a constant degree of super cooling is attained, increases. As a result, a super-cooling characteristic which is more stable against load fluctuation and/or leakage of refrigerant can be attained, and the performance of a car air conditioner using this condenser can be maintained for a long period of time.

[0015] Also, since the length of the heat exchange tubes of all the heat exchange paths of the super-cooling part becomes greater than the length of the heat exchange tubes of all the heat exchange paths of the condensation part, as compared with the condenser disclosed in the above-mentioned publication, the area of the heat exchange section increases, and the refrigerant super-cooling efficiency increases.

[0016] In the case where the first header tank to which all the heat exchange tubes of the condensation part are connected and the second header tank to which all the heat exchange tubes of the super-cooling part are connected are provided at one of the left and right ends as in the condenser of par. 1), if a refrigerant communication is not established between the first header tank and the second header tank via the communication part, it is impossible to separate gas and liquid in the second header tank and fill the interiors of the heat exchange tubes of the super-cooling part with the obtained liquid-predominant mixed phase refrigerant as in the condenser described in the above-mentioned pamphlet. However, even in such a case, if communication is established between the first header tank and the second header tank via the communication part, it becomes possible to separate gas and liquid in the second header tank and fill the interiors of the heat exchange tubes of the super-cooling part with the obtained liquid-predominant mixed phase refrigerant.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] FIG. **1** is a front view specifically showing the overall structure of a first embodiment of a condenser according to the present invention;

[0018] FIG. **2** is a front view schematically showing the condenser of FIG. **1**;

[0019] FIG. **3** is an enlarged sectional view taken along line A-A of FIG. **1**;

[0020] FIG. **4** is an exploded perspective view showing a main portion of the condenser of FIG. **1**;

[0021] FIG. **5** is a view corresponding to FIG. **3** and showing a first modification of a communication part;

[0022] FIG. **6** is a perspective view showing a communication member of the communication part of FIG. **5**.

[0023] FIG. **7** is a view corresponding to FIG. **3** and showing a second modification of the communication part;

[0024] FIG. **8** is a perspective view showing a communication member of the communication part of FIG. **7**.

[0025] FIG. **9** is a view corresponding to FIG. **3** and showing a third modification of the communication part;

[0026] FIG. **10** is an exploded perspective view showing a portion of a condenser which includes the communication part of FIG. **9**;

[0027] FIG. **11** is a view corresponding to FIG. **3** and showing a fourth modification of the communication part;

[0028] FIG. **12** is a view corresponding to FIG. **3** and showing a fifth modification of the communication part;

[0029] FIG. **13** is a view corresponding to FIG. **3** and showing a sixth modification of the communication part;

[0030] FIG. **14** is an exploded perspective view showing a portion of a condenser which includes the communication part of FIG. **13**;

[0031] FIG. **15** is a front view schematically showing a second embodiment of the condenser according to the present invention;

[0032] FIG. **16** is a front view schematically showing a third embodiment of the condenser according to the present invention;

[0033] FIG. **17** is a front view schematically showing a fourth embodiment of the condenser according to the present invention; and

[0034] FIG. **18** is a front view schematically showing a fifth embodiment of the condenser according to the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0035] Embodiments of the present invention will next be described with reference to the drawings.

[0036] In the following description, the reverse side of the sheet on which FIG. **1** is drawn will be referred to as the "front," and the opposite side as the "rear."

[0037] The term "aluminum" as used in the following description encompasses aluminum alloys in addition to pure aluminum.

[0038] Like portions and components are denoted by like reference numerals throughout the drawings, and they will not be described redundantly.

[0039] FIG. **1** specifically shows the overall structure of a first embodiment of a condenser according to the present invention. FIG. **2** schematically shows the condenser of FIG. **1**. FIGS. **3** and **4** show the structure of a main portion of the condenser of FIG. **1**. In FIG. **2**, individual heat exchange tubes are not illustrated, and corrugate fins, side plates, a refrigerant inlet member, and a refrigerant outlet member are also not illustrated.

[0040] In FIGS. **1** and **2**, a condenser **1** has a condensation part **1**A and a super-cooling part **1**B provided such that the former is located above the latter. The condenser **1** includes a plurality of flat heat exchange tubes **2**A, **2**B formed of aluminum, three header tanks **3**, **4**, **5** formed of aluminum, corrugate fins **6**A, **6**B formed of aluminum, and side plates **7** formed of aluminum. The heat exchange tubes **2**A, **2**B are disposed such that their width direction coincides with an air passage direction, their length direction coincides with a left-right direction, and they are spaced from one another in a vertical direction. The header tanks **3**, **4**, **5** are disposed such that their length direction coincides with the vertical direction, and left and right end portions of the heat exchange tubes **2**A, **2**B are brazed to the header tanks **3**, **4**, **5**. Each of the corrugate fins **6**A, **6**B is disposed between and brazed to adjacent heat exchange tubes **2**A, **2**B, or is disposed on the outer side of the uppermost or lowermost heat exchange tube **2**A, **2**B and brazed to the corresponding heat exchange tube **2**A, **2**B. The side plates **7** are disposed on the corresponding outer sides of the uppermost and lowermost corrugate fins **6**A, **6**B, and are brazed to these corrugate fins **6**A, **6**B.

[0041] Each of the condensation part **1**A and super-cooling part **1**B of the condenser **1** includes at least one (only one in the present embodiment) heat exchange path P**1**, P**2** formed by a plurality of heat exchange tubes **2**A, **2**B successively arranged in the vertical direction. The heat exchange path P**1** provided in the condensation part **1**A serves as a refrigerant condensation path. The heat exchange path P**2** provided in the super-cooling part **1**B serves as a refrigerant super-cooling path. The flow direction of refrigerant is the same among all the heat exchange tubes **2**A, **2**B which form the respective heat exchange paths P**1**, P**2**. The flow direction of refrigerant in the heat exchange tubes **2**A, **2**B which form a certain heat exchange path is opposite the flow direction of refrigerant in the heat exchange tubes **2**A, **2**B which form another heat exchange path adjacent to the certain heat exchange path. The heat exchange path P1 of the condensation part 1A will be referred to as the first heat exchange path, and the heat exchange path P2 of the super-cooling part 1B will be referred to as the second heat exchange path.

[0042] The first header tank 3 and the second header tank 4 are individually provided at the left end of the condenser 1. Left end portions of all the heat exchange tubes 2A, which form the first heat exchange path P1 provided in the condensation part 1A, are connected to the first header tank 3 through brazing. Left end portions of the heat exchange tubes 2B, which form the second heat exchange path P2 provided in the super-cooling part 1B, are connected to the second header tank 4 through brazing. The upper end of the second header tank 4 is located above the lower end of the first header tank 3. In the present embodiment, the upper end of the second header tank 4 is located at substantially the same height as the upper end of the first header tank 3. The lower end of the second header tank 4 is located below the lower end of the first header tank 3. The heat exchange tubes 2B, which form the second heat exchange path P2, are brazed to a portion of the second header tank 4 located below the first header tank 3. The inner volume of the second header tank 4 is determined such that a portion of gas-liquid mixed phase refrigerant having flowed into the second header tank 4; i.e., liquid-predominant mixed phase refrigerant, accumulates in a lower region within the second header tank 4 because of gravitational force, and the gas phase component of the gas-liquid mixed phase refrigerant accumulates in an upper region within the second header tank 4 because of gravitational force, whereby gas and liquid are separated from each other. Accordingly, the second header tank 4 serves as a liquid receiving section which separates gas and liquid from each other through utilization of gravitational force and stores the liquid.

[0043] Herein, the heat exchange tubes 2A connected to the first header tank 3 will be referred to as the first heat exchange tubes, and the heat exchange tubes 2B connected to the second header tank 4 will be referred to as the second heat exchange tubes. The corrugate fins 6A disposed between the adjacent first heat exchange tubes 2A, that between the uppermost first heat exchange tube 2A and the upper side plate 7, and that between the lowermost first heat exchange tube 2A and the uppermost second heat exchange tube 2B will be referred to as the first corrugate fins. The corrugate fins 6B disposed between the adjacent second heat exchange tubes 2B, and that between the lowermost second heat exchange tube 2B and the lower side plate 7 will be referred to as the second corrugate fins.

[0044] The third header tank 5 is disposed at the right end of the condenser 1. Right end portions of all the heat exchange tubes 2A, 2B which form the first and second heat exchange paths P1, P2 are connected to the third header tank 5. The third header tank 5 has a transverse cross-sectional shape identical with that of the first header tank 3.

[0045] The interior of the third header tank 5 is divided into an upper header section 9 and a lower header section 11 by an aluminum partition plate 8 provided at a height between the first heat exchange path P1 and the second heat exchange path P2. A refrigerant inlet 12 is formed in the upper header section 9 of the third header tank 5 at a vertically middle position, and a refrigerant outlet 13 is formed in the lower header section 11. A refrigerant inlet member 14 communicating with the refrigerant inlet 12 and a refrigerant outlet member 15 communicating with the refrigerant outlet 13 are joined to the third header tank 5.

[0046] The first header tank 3 has one communication section 17 to which all the first heat exchange tubes 2A of the first heat exchange path P1 provided in the condensation part 1A are connected and which communicates with the second header tank 4 via a communication part 16. That is, the entire interior of the first header tank 3 serves as the communication section 17. The communication part 16 is provided at a height below the uppermost first heat exchange tube 2A among all the first heat exchange tubes 2A connected to the communication section 17 (in the present embodiment, at a position which is below the vertically middle position of the communication section 17 and close to the lower end thereof.

[0047] As shown in FIGS. 3 and 4, the communication part 16 includes a through hole 18 formed in the circumferential wall of the first header tank 3, a through hole 19 formed in the circumferential wall of the second header tank 4, and a communication member 21 formed of aluminum. The communication member 21 is disposed between the first header tank 3 and the second header tank 4, is brazed to the two header tanks 3, 4, and has a flow channel 22 for establishing a refrigerant communication between the through hole 18 of the first header tank 3 and the through hole 19 of the second header tank 4. The communication member 21 has a first concave arcuate surface 21*a* which is provided on its right side surface and which matches the outer circumferential surface of the first header tank 3, and a second concave arcuate surface 21*b* which is provided on its left side surface and which matches the outer circumferential surface of the second header tank 4. Opposite ends of the flow channel 22 are open to the two concave arcuate surfaces 21*a* and 21*b*.

[0048] The condenser 1 is manufactured by brazing all the components thereof together.

[0049] The condenser 1 constitutes a refrigeration cycle in cooperation with a compressor, an expansion valve (pressure reducer), and an evaporator; and the refrigeration cycle is mounted on a vehicle as a car air conditioner.

[0050] In the condenser 1 having the above-described structure, gas phase refrigerant of high temperature and high pressure compressed by the compressor flows into the upper header section 9 of the third header tank 5 through the refrigerant inlet member 14 and the refrigerant inlet 12. The gas phase refrigerant is condensed while flowing leftward within the first heat exchange tubes 2A of the first heat exchange path P1, and flows into the communication section 17 of the first header tank 3. The refrigerant having flowed into the communication section 17 of the first header tank 3 flows into the second header tank 4 through the through hole 18 of the first header tank 3, the flow channel 22 of the communication member 21, and the through hole 19 of the second header tank 4, which constitute the communication part 16.

[0051] The refrigerant having flowed into the second header tank 4 is gas-liquid mixed phase refrigerant. A portion of the gas-liquid mixed phase refrigerant; i.e., liquid-predominant mixed phase refrigerant, accumulates in a lower region within the second header thank 4 because of gravitational force, and flows into the second heat exchange tubes 2B of the second heat exchange path P2.

[0052] The liquid-predominant mixed phase refrigerant having flowed into the second heat exchange tubes 2B of the second heat exchange path P2 is super-cooled while flowing rightward within the second heat exchange tubes 2B. After that, the super-cooled refrigerant enters the lower header section **11** of the third header tank **5**, and flows out through the refrigerant outlet **13** and the refrigerant outlet member **15**. The refrigerant is then fed to the evaporator via the expansion valve.

[0053] Meanwhile, the gas phase component of the gas-liquid mixed phase refrigerant having flowed into the second header tank **4** stays in an upper region of the second header tank **4**.

[0054] FIGS. **5** to **14** show modifications of the communication part for establishing a refrigerant communication between the communication section **17** of the first header tank **3** and the second header tank **4**.

[0055] A communication part **30** shown in FIGS. **5** and **6** includes the through hole **18** formed in the circumferential wall of the first header tank **3**, the through hole **19** formed in the circumferential wall of the second header tank **4**, and a communication member **31** formed of aluminum and having the shape of a cylindrical tube. The communication member **31** is brazed to the first header tank **3** and the second header tank **4**, and has a flow channel **32** for establishing a refrigerant communication between the through hole **18** of the first header tank **3** and the through hole **19** of the second header tank **4**. The communication member **31** has an annular bead **33** which is formed at a center portion of the communication member **31** with respect to the length direction and is located between the two header tanks header tanks **3** and **4**. A first insertion portion **34** inserted into the through hole **18** of the first header tank **3** is provided on the right side of the annular bead **33** of the communication member **31**, and a second insertion portion **35** inserted into the through hole **19** of the second header tank **4** is provided on the left side of the annular bead **33** of the communication member **31**.

[0056] A communication part **40** shown in FIGS. **7** and **8** includes the through hole **18** formed in the circumferential wall of the first header tank **3**, the through hole **19** formed in the circumferential wall of the second header tank **4**, and a communication member **41** formed of aluminum. The communication member **41** is disposed between the first header tank **3** and the second header tank **4**, is brazed to the two header tanks **3** and **4**, and has a flow channel **42** for establishing a refrigerant communication between the through hole **18** of the first header tank **3** and the through hole **19** of the second header tank **4**. The communication member **41** has a first concave arcuate surface **41***a* which is provided on its right side surface and which matches the outer circumferential surface of the first header tank **3**, and a second concave arcuate surface **41***b* which is provided on its left side surface and which matches the outer circumferential surface of the second header tank **4**. Opposite ends of the flow channel **42** are open to the two concave arcuate surfaces **41***a* and **41***b*.

[0057] A first extension portion **43** is provided at a lower half portion of the communication member **41**. The first extension portion **43** extends in one of the air flow directions and along the outer circumferential surface of the first header tank **3**, and is brazed to the first header tank **3**. A second extension portion **44** is provided at an upper half portion of the communication member **41**. The second extension portion **44** extends in the same direction as the extension direction of the first extension portion **43** and along the outer circumferential surface of the second header tank **4**, and is brazed to the second header tank **4**. A first protrusion **46** is formed on the right side surface of the first extension portion **43**, and is fitted into a blind hole **45** formed on the outer circumferential surface of the first header tank **3**. A second protrusion **48** is formed on the left side surface of the second extension portion **44**, and is fitted into a blind hole **47** formed on the outer circumferential surface of the second header tank **4**.

[0058] A communication part **50** shown in FIGS. **9** and **10** includes the through hole **18** formed in the circumferential wall of the first header tank **3**, the through hole **19** formed in the circumferential wall of the second header tank **4**, and a tubular portion **51** which is integrally formed on the circumferential wall of the second header tank **4** such that the tubular portion **51** surrounds the through hole **19** and projects outward. The tubular portion **51** is inserted into the through hole **18** of the first header tank **3**, and is brazed to the first header tank **3**. The interior of the tubular portion **51** serves as a flow channel **52** for establishing a refrigerant communication between the through holes **18** and **19** of the two header tanks **3** and **4**.

[0059] A communication part **55** shown in FIG. **11** includes the through hole **18** formed in the circumferential wall of the first header tank **3**, the through hole **19** formed in the circumferential wall of the second header tank **4**, and a tubular portion **56** which is integrally formed on the circumferential wall of the first header tank **3** such that the tubular portion **56** surrounds the through hole **18** and projects outward. The tubular portion **56** is inserted into the through hole **19** of the second header tank **4**, and is brazed to the second header tank **4**. The interior of the tubular portion **56** serves as a flow channel **57** for establishing a refrigerant communication between the through holes **18** and **19** of the two header tanks **3** and **4**.

[0060] A communication part **60** shown in FIG. **12** includes the through hole **18** formed in the circumferential wall of the first header tank **3**, the through hole **19** formed in the circumferential wall of the second header tank **4**, a first tubular portion **61** which is integrally formed on the circumferential wall of the first header tank **3** such that the first tubular portion **61** surrounds the through hole **18** and projects outward, and a second tubular portion **62** which is integrally formed on the circumferential wall of the second header tank **4** such that the second tubular portion **62** surrounds the through hole **19** and projects outward. The second tubular portion **62** is fitted onto the circumference of the first tubular portion **61** of the first header tank **3**, and is brazed to the first tubular portion **61**. The interiors of the two tubular portions **61** and **62** serve as flow channels **63** and **64** for establishing a refrigerant communication between the through holes **18** and **19** of the two header tanks **3** and **4**.

[0061] A communication part **65** shown in FIGS. **13** and **14** includes the through hole **18** formed in the circumferential wall of the first header tank **3**, an outward bulging portion **66** formed on the circumferential wall of the second header tank **4** and brazed to the first header tank **3**, and a through hole **67** formed in the bulging top wall of the outward bulging portion **66** and communicating with the through hole **18** of the first header tank **3**. A concave arcuate surface **66***a* which fits the outer circumferential surface of the first header tank **3** is provided on the outer surface of the bulging top wall of the outward bulging portion **66**.

[0062] FIGS. **15** to **18** show other embodiments of the condenser of the present invention. Each of FIGS. **15** to **18** schematically shows a condenser, and shows none of the individual heat exchange tubes, the corrugate fins, the side plates, the refrigerant inlet member, and the refrigerant outlet member.

[0063] In the case of a condenser 70 shown in FIG. 15, a condensation part 70A and a super-cooling part 70B are provided such that the former is located above the latter. The condensation part 70A includes at least one heat exchange path formed by a plurality of heat exchange tubes 2A successively arranged in the vertical direction. In the present embodiment, the condensation part 70A includes three heat exchange paths P1, P2, P3 which are juxtaposed in the vertical direction. The super-cooling part 70B includes at least one heat exchange path formed by a plurality of heat exchange tubes 2B successively arranged in the vertical direction. In the present embodiment, the super-cooling part 70B includes one heat exchange path P4. The heat exchange paths P1, P2, P3 provided in the condensation part 70A serve as refrigerant condensation paths. The heat exchange path P4 provided in the super-cooling part 70B serves as a refrigerant super-cooling path. The flow direction of refrigerant is the same among all the heat exchange tubes 2A, 2B which form the respective heat exchange paths P1, P2, P3, P4. The flow direction of refrigerant in the heat exchange tubes 2A, 2B which form a certain heat exchange path is opposite the flow direction of refrigerant in the heat exchange tubes 2A, 2B which form another heat exchange path adjacent to the certain heat exchange path. The three heat exchange paths provided in the condensation part 70A will be referred to as the first, second, and third heat exchange paths P1, P2, P3 from the upper side. The heat exchange path P4 of the super-cooling part 70B will be referred to as the fourth heat exchange path P4. Left end portions of all the heat exchange tubes 2A, which form the first to third heat exchange paths P1, P2, P3, are connected to the first header tank 3 through brazing. Left end portions of all the heat exchange tubes 2B, which form the fourth heat exchange path P4, are connected to a portion of the second header tank 4 through brazing, the portion being located below the first header tank 3. Herein, the heat exchange tubes 2A connected to the first header tank 3 will be referred to as the first heat exchange tubes, and the heat exchange tubes 2B connected to the second header tank 4 will be referred to as the second heat exchange tubes.

[0064] The interior of the first header tank 3, which is disposed at the left end of the condenser 70 and to which left end portions of all the heat exchange tubes 2A of the first through third heat exchange paths P1, P2, P3 provided in the condenser section 70A are connected through brazing, is divided into an upper header section 72 and a lower header section 73 by an aluminum partition plate 71 provided at a height between the second heat exchange path P2 and the third heat exchange path P3.

[0065] The interior of the third header tank 5, which is disposed at the right end of the condenser 70 and to which right end portions of all the heat exchange tubes 2A, 2B of the first through fourth heat exchange paths P1, P2, P3, P4 are connected through brazing, is divided into an upper header section 76, an intermediate header section 77, and a lower header section 78 by aluminum partition plates 74, 75 provided at a height between the first heat exchange path P1 and the second heat exchange path P2 and a height between the third heat exchange path P3 and the fourth heat exchange path P4, respectively. The refrigerant inlet 12 is formed in the upper header section 76 of the third header tank 5, and the refrigerant outlet 13 is formed in the lower header section 78 of the third header tank 5. A refrigerant inlet member (not shown) communicating with the refrigerant inlet 12 and a refrigerant outlet member (not shown) communicating with the refrigerant outlet 13 are joined to the third header tank 5.

[0066] The lower header section 73 of the first header tank 3 has one communication section 79 to which all the first heat exchange tubes 2A of the third heat exchange path P3 are connected and which communicates with the second header tank 4 via the communication part 16. Of the first through third heat exchange paths P1, P2, P3 provided in the condensation part 70A, the third heat exchange path P3 is located furthest downstream with respect to the refrigerant flow direction. The communication part 16 is provided at a height below the uppermost first heat exchange tube 2A among all the first heat exchange tubes 2A of the third heat exchange path P3 connected to the communication section 79 (in the present embodiment, at a position which is below the vertically middle position of the communication section 79 and close to the lower end thereof).

[0067] The structure of the remaining portion is identical with that of the condenser shown in FIGS. 1 to 4.

[0068] In the condenser 70 having the above-described structure, gas phase refrigerant of high temperature and high pressure compressed by the compressor flows into the upper header section 76 of the third header tank 5 through the refrigerant inlet member and the refrigerant inlet 12. The gas phase refrigerant is condensed while flowing leftward within the first heat exchange tubes 2A of the first heat exchange path P1, and flows into the upper header section 72 of the first header tank 3. The refrigerant having flowed into the upper header section 72 of the first header tank 3 is condensed while flowing rightward within the first heat exchange tubes 2A of the second heat exchange path P2, and flows into the intermediate header section 77 of the third header tank 5. The refrigerant having flowed into the intermediate header section 77 of the third header tank 5 is condensed while flowing leftward within the first heat exchange tubes 2A of the third heat exchange path P3, and flows into the communication section 79 of the lower header section 73 of the first header tank 3. The refrigerant having flowed into the communication section 79 of the lower header section 73 of the first header tank 3 flows into the second header tank 4 through the through hole 18 of the first header tank 3, the flow channel 22 of the communication member 21, and the through hole 19 of the second header tank 4, which constitute the communication part 16.

[0069] The refrigerant having flowed into the second header tank 4 is gas-liquid mixed phase refrigerant. A portion of the gas-liquid mixed phase refrigerant; i.e., liquid-predominant mixed phase refrigerant, accumulates in a lower region within the second header thank 4 because of gravitational force, and flows into the second heat exchange tubes 2B of the fourth heat exchange path P4.

[0070] The liquid-predominant mixed phase refrigerant having flowed into the second heat exchange tubes 2B of the fourth heat exchange path P4 is super-cooled while flowing rightward within the second heat exchange tubes 2B. After that, the super-cooled refrigerant enters the lower header section 78 of the third header tank 5, and flows out through the refrigerant outlet 13 and the refrigerant outlet member. The refrigerant is then fed to the evaporator via the expansion valve.

[0071] Meanwhile, the gas phase component of the gas-liquid mixed phase refrigerant having flowed into the second header tank 4 stays in an upper region of the second header tank 4.

[0072] In the case of a condenser **80** shown in FIG. **16**, a condensation part **80**A and a super-cooling part **80**B are provided such that the former is located above the latter. The condensation part **80**A includes at least one heat exchange path formed by a plurality of heat exchange tubes **2**A successively arranged in the vertical direction. In the present embodiment, the condensation part **80**A includes three heat exchange paths P**1**, P**2**, P**3** which are juxtaposed in the vertical direction. The super-cooling part **80**B includes at least one heat exchange path formed by a plurality of heat exchange tubes **2**B successively arranged in the vertical direction. In the present embodiment, the super-cooling part **80**B includes one heat exchange path P**4**. The heat exchange paths P**1**, P**2**, P**3** provided in the condensation part **80**A serve as refrigerant condensation paths. The heat exchange path P**4** provided in the super-cooling part **80**B serves as a refrigerant super-cooling path. The flow direction of refrigerant is the same among all the heat exchange tubes **2**A, **2**B which form the respective heat exchange paths P**1**, P**2**, P**3**, P**4**. The flow direction of refrigerant in the heat exchange tubes **2**A, **2**B which form a certain heat exchange path is opposite the flow direction of refrigerant in the heat exchange tubes **2**A, **2**B which form another heat exchange path adjacent to the certain heat exchange path. The three heat exchange paths provided in the condensation part **80**A will be referred to as the first, second, and third heat exchange paths P**1**, P**2**, P**3** from the lower side. The heat exchange path P**4** of the super-cooling part **80**B will be referred to as the fourth heat exchange path P**4**. Left end portions of all the heat exchange tubes **2**A, which form the first to third heat exchange paths P**1**, P**2**, P**3**, are connected to the first header tank **3** through brazing. Left end portions of all the heat exchange tubes **2**B, which form the fourth heat exchange path P**4**, are connected to a portion of the second header tank **4** through brazing, the portion being located below the first header tank **3**. Herein, the heat exchange tubes **2**A connected to the first header tank **3** will be referred to as the first heat exchange tubes, and the heat exchange tubes **2**B connected to the second header tank **4** will be referred to as the second heat exchange tubes.

[0073] The interior of the first header tank **3**, which is disposed at the left end of the condenser **80** and to which left end portions of all the heat exchange tubes **2**A of the first through third heat exchange paths P**1**, P**2**, P**3** provided in the condenser section **80**A are connected through brazing, is divided into a lower header section **82** and an upper header section **83** by an aluminum partition plate **81** provided at a height between the second heat exchange path P**2** and the third heat exchange path P**3**.

[0074] The interior of the third header tank **5**, which is disposed at the right end of the condenser **80** and to which right end portions of all the heat exchange tubes **2**A, **2**B forming the first through fourth heat exchange paths P**1**, P**2**, P**3**, P**4** are connected through brazing, is divided into an intermediate header section **86**, an upper header section **87**, and a lower header section **88** by aluminum partition plates **84**, **85** provided at a height between the first heat exchange path P**1** and the second heat exchange path P**2** and a height between the first heat exchange path P**1** and the fourth heat exchange path P**4**, respectively. The refrigerant inlet **12** is formed in the intermediate header section **86** of the third header tank **5**, and the refrigerant outlet **13** is formed in the lower header section **88** of the third header tank **5**. A refrigerant inlet member (not shown) communicating with the refrigerant inlet **12** and a refrigerant outlet member (not shown) communicating with the refrigerant outlet **13** are joined to the third header tank **5**.

[0075] The upper header section **83** of the first header tank **3** has one communication section **89** to which all the first heat exchange tubes **2**A of the third heat exchange path P**3** are connected and which communicates with the second header tank **4** via the communication part **16**. Of the first through third heat exchange paths P**1**, P**2**, P**3** provided in the condensation part **80**A, the third heat exchange path P**3** is located furthest downstream with respect to the refrigerant flow direction. The communication part **16** is provided at a height below the uppermost first heat exchange tube **2**A among all the first heat exchange tubes **2**A of the third heat exchange path P**3** connected to the communication section **89** (in the present embodiment, at a position which is below the vertically middle position of the communication section **89** and close to the lower end thereof).

[0076] The structure of the remaining portion is identical with that of the condenser shown in FIGS. **1** to **4**.

[0077] In the condenser **80** having the above-described structure, gas phase refrigerant of high temperature and high pressure compressed by the compressor flows into the intermediate header section **86** of the third header tank **5** through the refrigerant inlet member and the refrigerant inlet **12**. The gas phase refrigerant is condensed while flowing leftward within the first heat exchange tubes **2**A of the first heat exchange path P**1**, and flows into the lower header section **82** of the first header tank **3**. The refrigerant having flowed into the lower header section **82** of the first header tank **3** is condensed while flowing rightward within the first heat exchange tubes **2**A of the second heat exchange path P**2**, and flows into the upper header section **87** of the third header tank **5**. The refrigerant having flowed into the upper header section **87** of the third header tank **5** is condensed while flowing leftward within the first heat exchange tubes **2**A of the third heat exchange path P**3**, and flows into the communication section **89** of the upper header section **83** of the first header tank **3**. The refrigerant having flowed into the communication section **89** of the upper header section **83** of the first header tank **3** flows into the second header tank **4** through the through hole **18** of the first header tank **3**, the flow channel **22** of the communication member **21**, and the through hole **19** of the second header tank **4**, which constitute the communication part **16**.

[0078] The refrigerant having flowed into the second header tank **4** is gas-liquid mixed phase refrigerant. A portion of the gas-liquid mixed phase refrigerant; i.e., liquid-predominant mixed phase refrigerant, accumulates in a lower region within the second header thank **4** because of gravitational force, and flows into the second heat exchange tubes **2**B of the fourth heat exchange path P**4**.

[0079] The liquid-predominant mixed phase refrigerant having flowed into the second heat exchange tubes **2**B of the fourth heat exchange path P**4** is super-cooled while flowing rightward within the second heat exchange tubes **2**B. After that, the super-cooled refrigerant enters the lower header section **88** of the third header tank **5**, and flows out through the refrigerant outlet **13** and the refrigerant outlet member. The refrigerant is then fed to the evaporator via the expansion valve.

[0080] Meanwhile, the gas phase component of the gas-liquid mixed phase refrigerant having flowed into the second header tank **4** stays in an upper region of the second header tank **4**.

[0081] In the case of a condenser **90** shown in FIG. **17**, a condensation part **90**A and a super-cooling part **90**B are provided such that the former is located above the latter. The condensation part **90**A includes at least one heat exchange path formed by a plurality of heat exchange tubes **2**A successively arranged in the vertical direction. In the present embodiment, the condensation part **90**A includes two heat exchange paths P**1**, P**2** which are juxtaposed in the vertical direction. The super-cooling part **90**B includes at least one heat exchange path formed by a plurality of heat exchange tubes **2**B successively arranged in the vertical direction. In the present embodiment, the super-cooling part **90**B includes one heat exchange path P**3**. The heat exchange paths P**1**, P**2** provided in the condensation part **90**A serve as refrigerant condensation paths. The heat exchange path P**3** provided in the super-cooling part **90**B serves as a refrigerant super-cooling path. The flow direction of refrigerant is the same among all the heat exchange tubes **2**A, **2**B which form the respective heat exchange paths P**1**, P**2**, P**3**. The flow direction of refrigerant in the heat exchange tubes **2**A, **2**B which form a certain heat exchange path is opposite the flow direction of refrigerant in the heat exchange tubes **2**A, **2**B which form another heat exchange path adjacent to the certain heat exchange path. The two heat exchange paths provided in the condensation part **90**A will be referred to as the first and second heat exchange paths P**1**, P**2** from the upper side. The heat exchange path P**3** provided in the super-cooling part **90**B will be referred to as the third heat exchange path P**3**. Left end portions of all the heat exchange tubes **2**A, which form the first and second heat exchange paths P**1**, P**2**, are connected to the first header tank **3** through brazing. Left end portions of all the heat exchange tubes **2**B, which form the third heat exchange path P**3**, are connected to a portion of the second header tank **4** through brazing, the portion being located below the first header tank **3**. Herein, the heat exchange tubes **2**A connected to the first header tank **3** will be referred to as the first heat exchange tubes, and the heat exchange tubes **2**B connected to the second header tank **4** will be referred to as the second heat exchange tubes. The first and second heat exchange paths P**1**, P**2** serve as refrigerant condensation paths, and the third heat exchange path P**3** serves as a refrigerant super-cooling path.

[0082] The interior of the first header tank **3**, which is disposed at the left end of the condenser **90** and to which left end portions of all the heat exchange tubes **2**A of the first and second heat exchange paths P**1**, P**2** provided in the condenser section **90**A are connected through brazing, is divided into an upper header section **92** and a lower header section **93** by an aluminum partition plate **91** provided at a height between the first heat exchange path P**1** and the second heat exchange path P**2**. The upper end of the first header tank **3** is located below the upper end of the second header tank **4**, which is disposed at the left end of the condenser **90** and to which left end portions of all the heat exchange tubes **2**B of the third heat exchange path P**3** provided in the super-cooling part **90**B are connected through brazing. The refrigerant inlet **12** is formed in a portion of the upper header section **92** of the first header tank **3**, the portion projecting upward in relation to the second header tank **4**. A refrigerant inlet member (not shown) communicating with the refrigerant inlet **12** is joined to the first header tank **3**.

[0083] The interior of the third header tank **5**, which is disposed at the right end of the condenser **90** and to which right end portions of all the heat exchange tubes **2**A, **2**B of the first through third heat exchange paths P**1**, P**2**, P**3** are connected through brazing, is divided into an upper header section **95** and a lower header section **96** by an aluminum partition plate **94** provided at a height between the second heat exchange path P**2** and the third heat exchange path P**3**. The refrigerant outlet **13** is formed in the lower header section **96** of the third header tank **5**. A refrigerant outlet member (not shown) communicating with the refrigerant outlet **13** is joined to the third header tank **5**.

[0084] The lower header section **93** of the first header tank **3** has one communication section **97** to which all the first heat exchange tubes **2**A of the second heat exchange path P**2** are connected and which communicates with the second header tank **4** via the communication part **16**. Of the first and second heat exchange paths P**1**, P**2** provided in the condensation part **90**A, the second heat exchange path P**2** is located furthest downstream with respect to the refrigerant flow direction. The communication part **16** is provided at a height below the uppermost first heat exchange tube **2**A among all the first heat exchange tubes **2**A of the second heat exchange path P**2** connected to the communication section **97** (in the present embodiment, at a position which is below the vertically middle position of the communication section **97** and close to the lower end thereof).

[0085] The structure of the remaining portion is identical with that of the condenser shown in FIGS. **1** to **4**.

[0086] In the condenser **90** having the above-described structure, gas phase refrigerant of high temperature and high pressure compressed by the compressor flows into the upper header section **92** of the first header tank **3** through the refrigerant inlet member and the refrigerant inlet **12**. The gas phase refrigerant is condensed while flowing rightward within the first heat exchange tubes **2**A of the first heat exchange path P**1**, and flows into the upper header section **95** of the third header tank **5**. The refrigerant having flowed into the upper header section **95** of the third header tank **5** is condensed while flowing leftward within the first heat exchange tubes **2**A of the second heat exchange path P**2**, and flows into the communication section **97** of the lower header section **93** of the first header tank **3**. The refrigerant having flowed into the communication section **97** of the lower header section **93** of the first header tank **3** flows into the second header tank **4** through the through hole **18** of the first header tank **3**, the flow channel **22** of the communication member **21**, and the through hole **19** of the second header tank **4**, which constitute the communication part **16**.

[0087] The refrigerant having flowed into the second header tank **4** is gas-liquid mixed phase refrigerant. A portion of the gas-liquid mixed phase refrigerant; i.e., liquid-predominant mixed phase refrigerant, accumulates in a lower region within the second header thank **4** because of gravitational force, and flows into the second heat exchange tubes **2**B of the third heat exchange path P**3**.

[0088] The liquid-predominant mixed phase refrigerant having flowed into the second heat exchange tubes **2**B of the third heat exchange path P**3** is super-cooled while flowing rightward within the second heat exchange tubes **2**B. After that, the super-cooled refrigerant enters the lower header section **96** of the third header tank **5**, and flows out through the refrigerant outlet **13** and the refrigerant outlet member. The refrigerant is then fed to the evaporator via the expansion valve.

[0089] Meanwhile, the gas phase component of the gas-liquid mixed phase refrigerant having flowed into the second header tank **4** stays in an upper region of the second header tank **4**.

[0090] In the case of a condenser **100** shown in FIG. **18**, a condensation part **100**A and a super-cooling part **100**B are provided such that the former is located above the latter. The condensation part **100**A includes at least one heat exchange path formed by a plurality of heat exchange tubes **2**A successively arranged in the vertical direction. In the present embodiment, the condensation part **100**A includes two heat exchange paths P**1**, P**2** which are juxtaposed in the vertical direction. The super-cooling part **100**B includes at least one heat exchange path formed by a plurality of heat exchange tubes **2**B successively arranged in the vertical direction. In the present embodiment, the super-cooling part **100**B includes one heat exchange path P**3**. The heat exchange paths P**1**, P**2** provided in the condensation part **100**A serve as refrigerant condensation paths. The heat exchange path P**3** provided in the super-cooling part **100**B serves as a refrigerant super-cooling path. The flow direction of refrigerant is the same among all the heat exchange tubes **2**A, **2**B which form the respective heat exchange paths P**1**, P**2**, P**3**. The flow direction of refrigerant in the heat exchange tubes **2**A, **2**B which form a certain heat exchange path is opposite the flow direction of refrigerant in the heat exchange tubes **2**A, **2**B which form another heat exchange path adjacent to the certain heat exchange path. The two heat exchange paths provided in the condensation part **100**A will be referred to as the first and second heat exchange paths P**1**, P**2**. The heat exchange path P**3** of the super-cooling part **100**B will be referred to as the third heat exchange path P**3**. Left end portions of all the heat exchange tubes **2**A, which form the first and second heat exchange paths P**1**, P**2**, are connected to the first header tank **3** through brazing. Left end portions of all the heat exchange tubes **2**B, which form the third heat exchange path P**3**, are connected to a portion of the second header tank **4** through brazing, the portion being located below the first header tank **3**. Herein, the heat exchange tubes **2**A connected to the first header tank **3** will be referred to as the first heat exchange tubes, and the heat exchange tubes **2**B connected to the second header tank **4** will be referred to as the second heat exchange tubes. The first and second heat exchange paths P**1**, P**2** serve as refrigerant condensation paths, and the third heat exchange path P**3** serves as a refrigerant super-cooling path.

[0091] The interior of the first header tank **3**, which is disposed at the left end of the condenser **100** and to which left end portions of all the heat exchange tubes **2**A of the first and second heat exchange paths P**1**, P**2** provided in the condenser section **100**A are connected through brazing, is divided into a lower header section **102** and an upper header section **103** by an aluminum partition plate **101** provided at a height between the first heat exchange path P**1** and the second heat exchange path P**2**. The refrigerant inlet **12** is formed in the lower header section **102** of the first header tank **3**. A refrigerant inlet member (not shown) communicating with the refrigerant inlet **12** is joined to the first header tank **3**.

[0092] The interior of the third header tank **5**, which is disposed at the right end of the condenser **100** and to which right end portions of all the heat exchange tubes **2**A, **2**B of the first through third exchange paths P**1**, P**2**, P**3** are connected through brazing, is divided into an upper header section **105** and a lower header section **106** by an aluminum partition plate **104** provided at a height between the first heat exchange path P**1** and the third heat exchange path P**3**. The refrigerant outlet **13** is formed in the lower header section **106** of the third header tank **5**. A refrigerant outlet member (not shown) communicating with the refrigerant outlet **13** is joined to the third header tank **5**.

[0093] The upper header section **103** of the first header tank **3** has one communication section **107** to which all the first heat exchange tubes **2**A of the second heat exchange path P**2** are connected and which communicates with the second header tank **4** via the communication part **16**. Of the first and second heat exchange paths P**1**, P**2** provided in the condensation part **100**A, the second heat exchange path P**2** is located furthest downstream with respect to the refrigerant flow direction. The communication part **16** is provided at a height below the uppermost first heat exchange tube **2**A among all the first heat exchange tubes **2**A of the second heat exchange path P**2** connected to the communication section **107** (in the present embodiment, at a position which is below the vertically middle position of the communication section **107** and close to the lower end thereof).

[0094] The structure of the remaining portion is identical with that of the condenser shown in FIGS. **1** to **4**.

[0095] In the condenser **100** having the above-described structure, gas phase refrigerant of high temperature and high pressure compressed by the compressor flows into the lower header section **102** of the first header tank **3** through the refrigerant inlet member and the refrigerant inlet **12**. The gas phase refrigerant is condensed while flowing rightward within the first heat exchange tubes **2**A of the first heat exchange path P**1**, and flows into the upper header section **105** of the third header tank **5**. The refrigerant having flowed into the upper header section **105** of the third header tank **5** is condensed while flowing leftward within the first heat exchange tubes **2**A of the second heat exchange path P**2**, and flows into the communication section **107** of the upper header section **103** of the first header tank **3**. The refrigerant having flowed into the communication section **107** of the upper header section **103** of the first header tank **3** flows into the second header tank **4** through the through hole **18** of the first header tank **3**, the flow channel **22** of the communication member **21**, and the through hole **19** of the second header tank **4**, which constitute the communication part **16**.

[0096] The refrigerant having flowed into the second header tank **4** is gas-liquid mixed phase refrigerant. A portion of the gas-liquid mixed phase refrigerant; i.e., liquid-predominant mixed phase refrigerant, accumulates in a lower region within the second header thank **4** because of gravitational force, and flows into the second heat exchange tubes **2**B of the third heat exchange path P**3**.

[0097] The liquid-predominant mixed phase refrigerant having flowed into the second heat exchange tubes **2**B of the third heat exchange path P**3** is super-cooled while flowing rightward within the second heat exchange tubes **2**B. After that, the super-cooled refrigerant enters the lower header section **106** of the third header tank **5**, and flows out through the refrigerant outlet **13** and the refrigerant outlet member. The refrigerant is then fed to the evaporator via the expansion valve.

[0098] Meanwhile, the gas phase component of the gas-liquid mixed phase refrigerant having flowed into the second header tank **4** stays in an upper region of the second header tank **4**.

[0099] In the case of the condensers **70**, **80**, **90**, **100** shown in FIGS. **15** to **18** as well, in stead of the communication part

16, any of the communication parts **30**, **40**, **50**, **55**, **60**, **65** shown in FIGS. **5** to **14** may be used in order to establish a refrigerant communication between the communication section **79**, **89**, **97**, **107** of the first header tank **3** and the second header tank **4**.

[0100] In the condensers **1**, **70**, **80**, **90**, **100** shown in FIGS. **1** to **4** and FIGS. **15** to **18**, a desiccant or a filter may be disposed in the second header tank **4**.

What is claimed is:

1. A condenser which has a condensation part and a super-cooling part provided such that the condensation part is located above the super-cooling part and which comprises a plurality of heat exchange tubes disposed in parallel such that their length direction coincides with a left-right direction and they are spaced apart from one another in a vertical direction; and header tanks which are disposed such that their length direction coincides with the vertical direction and to which left and right end portions of the heat exchange tubes are connected, each of the condensation part and the super-cooling part including at least one heat exchange path formed by a plurality of heat exchange tubes successively arranged in the vertical direction, the condenser configured such that all refrigerant having flowed through the heat exchange tubes of the condensation part flows into the heat exchange tubes of the super-cooling part,

wherein a first header tank to which all the heat exchange tubes of the condensation part are connected and a second header tank to which all the heat exchange tubes of the super-cooling part are connected are provided at one of left and right ends of the condenser; the first header tank has one communication section which communicates with the second header tank through a communication part and to which all the heat exchange tubes forming one heat exchange path are connected; the communication part is provided at a height below the uppermost heat exchange tube among all the heat exchange tubes connected to the communication section; the second header tank is disposed on the outer side of the first header tank with respect to the left-right direction; an upper end of the second header tank is located above a lower end of the first header tank; the second header tank has a function of separating gas and liquid from each other and storing the separated liquid; and all the refrigerant having passed through the heat exchange tubes of the condensation part flows into the communication section of the first header tank and flows into the second header tank through the communication part.

2. A condenser according to claim **1**, wherein the condensation part has one heat exchange path; the first header tank has one communication section to which all the heat exchange tubes forming the heat exchange path of the condensation part are connected; and the communication part establishes a refrigerant communication between the second header tank and a portion of the communication section of the first header tank, the portion extending downward from an approximate center of the communication section with respect to the vertical direction.

3. A condenser according to claim **1**, wherein the condensation part has two or more heat exchange paths; the condenser is configured such that refrigerant flows from a heat exchange path at one end with respect to the vertical direction toward a heat exchange path at the other end with respect to the vertical direction; the first header tank has one communication section to which all the heat exchange tubes forming a furthest downstream heat exchange path of the condensation part are connected; and the communication part establishes a refrigerant communication between the second header tank and a portion of the communication section of the first header tank, the portion extending downward from an approximate center of the communication section with respect to the vertical direction.

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