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54 RECEIVER TANK FOR REFRIGERATION CYCLE, HEAT EXCHANGER WITH THE RECEIVER TANK, AND CONDENSATION DEVICE FOR REFRIGERATION CYCLE

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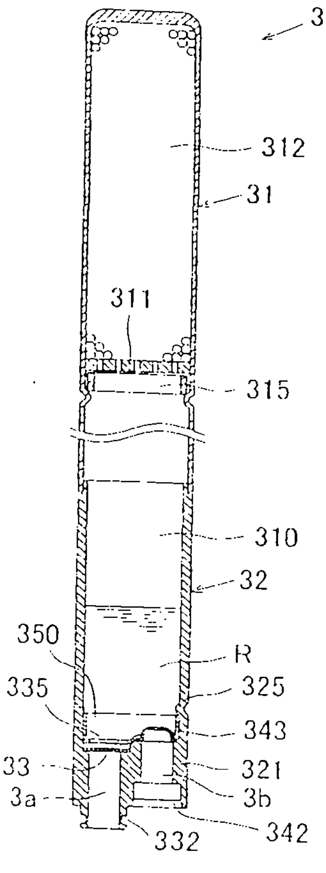

(57) Abstract: A receiver tank has a tubular tank body (30) with a refrigerant inlet hole (3a) and a refrigerant outlet hole (3b) that are formed in its lower wall (321). The upper end of the opening of the refrigerant inlet hole (3a) is positioned lower than the upper end of the opening of the refrigerant outlet hole (3b). At the upper end of the opening of the refrigerant inlet hole (3a) is provided a resistance layer (335) at which the speed of flow of a refrigerant is reduced by permeation of the refrigerant. The refrigerant flowing in from the refrigerant inlet hole (3a) permeates upward the resistance layer (335) to form a collection (R) of liquid in a space in the tank. A liquid refrigerant in the collection (R) is discharged through the refrigerant outlet hole (3b). Because of the structure above, the refrigerant can be saved, the structure can be simplified, and costs can be reduced.

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DESCRIPTION

RECEIVER TANK FOR REFRIGERANT CYCLE, HEAT EXCHANGER WITH THE RECEIVER TANK, AND CONDENSATION DEVICE FOR REFEIRERATION CYCLE

This application claims priority to Japanese Patent Application No. 2002-378979 filed on December 27, 2002, the entire disclosure of which is incorporated herein by reference in its entirety.

Technical Field

The present invention relates to a receiver tank for refrigeration cycle for use in an automobile, household, or business air-conditioning system, a heat exchanger with such a receiver tank, and a condensation device for refrigeration cycle.

Background Art

In an expansion valve type refrigeration cycle which is one of typical refrigeration cycle systems, as shown in Fig. 13, high temperature and high pressure gaseous refrigerant discharged from a compressor CP is introduced into a condenser CD to be cooled and condensed by exchanging heat with the ambient air. The refrigerant which is mainly into a liquefied state is introduced in a receiver tank RT to be completely separated into gaseous refrigerant and liquefied refrigerant, and only the liquefied refrigerant is discharged therefrom. The liquefied refrigerant is immediately decompressed and expanded in an expansion valve EV and then introduced into an evaporator EP as low pressure and low temperature misty refrigerant. While passing through this evaporator EP, the refrigerant evaporates by absorbing heat from the ambient air. Then it is discharged from the evaporator as gaseous refrigerant and inhaled by the compressor CP.

In the meantime, in a recent refrigeration cycle for automobiles, there has been a technical proposal in which refrigerant condensed in a condenser CD is increased in radiation amount by subcooling it to lower the temperature by a few degrees, and then introduced to an expansion valve EV and an evaporator EP to improve the cooling performance. This proposed technique employs a system in which a subcooling portion for subcooling the refrigerant condensed by the condenser CD to temperature lower than the condensing temperature by a few degrees is provided so that the refrigerant is stably supplied to the evaporator side as liquefied refrigerant. In general, this subcooling portion is disposed at a downstream side of a receiver tank RT. However, in view of the space efficiency, a structure in which the subcooling portion is integrally mounted in the condenser CD (i.e., a subcool system condenser) has been popularly employed.

On the other hand, as disclosed in Figs 23A to 23D, etc., of

International Patent Publication WO 02/14756, as the aforementioned receiver tank RT, the so-called receiver dryer to which a function of removing the moisture contained in the refrigerant is given by forming a drying agent filled layer therein has been widely used. In such a receiver tank, there are a sandwich type in which spaces 133 and 134 above and below the drying agent filled layer 132 are provided within the vertical type tank 131 as shown in Figs. 14A and 14B, and a bag type in which the drying agent filled layer 132 is provided at one side within the vertical type tank 131 as shown in Fig. 14D.

Fig. 14A shows a suction pipe type receiver tank in which the refrigerant introduced into the upper side space 133 via the top refrigerant inlet 135 is introduced into the lower side space 134 after passing through the drying agent filled layer 132, and the liquefied refrigerant separated from the gaseous refrigerant is discharged from the top refrigerant outlet 137 through the suction pipe 136. Fig. 14B shows a supplying pipe type receiver tank in which the refrigerant introduced via the bottom refrigerant inlet 135 is introduced into the upper side space 133 through the supplying pipe 138, then introduced into the lower side space 134 after passing the drying agent filled layer 132, and the liquefied refrigerant separated from the gaseous refrigerant is discharged from the bottom refrigerant outlet 137 through the suction pipe 136. Furthermore, Fig. 14C shows an inlet-outlet facing type in which the refrigerant introduced into the upper side space 133 via the top refrigerant inlet 135 is introduced into the lower side space 134 after passing through the drying agent filled layer 132, and the liquefied refrigerant separated from the gaseous refrigerant is discharged from the bottom refrigerant outlet 137.

In the bag type receiver tank shown in Fig. 14D, the refrigerant introduced via the side refrigerant inlet 135 comes into contact with the drying agent filled layer 132, and the liquefied refrigerant separated from the gaseous refrigerant at the bottom of the tank is discharged from the bottom refrigerant outlet 137.

Furthermore, in the receiver tank disclosed by Figs. 6, 7, etc., of Japanese Unexamined Laid-open Patent Publication No. JP 11-211275, A, as shown in Fig. 15, the refrigerant introduced via the bottom refrigerant inlet 135 in introduced into the upper side space 133 after passing through the drying agent filled layer 132, and the liquefied refrigerant separated from the gaseous refrigerant in the upper side space is discharged from the bottom refrigerant outlet 137.

In an air conditioning system, it has always been a conventional issue to improve the space efficiency and enhance the performance. Especially, in an automobile air conditioning system, it has been required to reduce the entire system size to effectively utilize the limited vehicle body space. To cope with it, it is necessary to decrease the refrigerant amount sealed in the refrigerant cycle, while enhancing the stability of performance against load fluctuations (overcharge toughness) and inhibiting performance deterioration due to the continuous running (deterioration of leakage toughness). To satisfy the above, it is desired to keep the steady area, i.e., the stable area in the refrigerant subcooled state with respect to the refrigerant sealed amount, as large as possible.

However, in a normal refrigerant cycle, the refrigerant flow speed flowing into the receiver tank RT from the condenser CD side is large. Accordingly, in the sandwich type as shown in Figs. 14A to 14C, a large turbulent flow area of liquefied refrigerant is generated at the upper space 133 to which the refrigerant is introduced, resulting in stagnation of liquefied refrigerant in the upper side space 133. This causes insufficient supply of the liquefied refrigerant to the lower side space 134, which in turn causes turbulence of the liquefied refrigerant slightly accumulated in the lower side space 134 due to the fast liquid flow passing through the drying agent filled layer 132. At the same time, bubbles of the gaseous refrigerant are generated. As a result, the gaseous refrigerant flows out of the refrigerant outlet 137 exposed to the gas phase due to a large liquid level change, or a large amount of bubbles are sucked into the liquefied refrigerant to be flowed out. This causes deterioration of performance stability relative to load fluctuations, a narrower stable area, and difficulty in decreasing of refrigerant amount and reducing in size and weight.

Furthermore, in the receiver tank as shown in Figs. 14A and 14B, it is required to mount the refrigerant pipe 136 and 138 in the tank. This may cause an increased number of parts, increased structural complexity and increased cost.

Furthermore, in the bag type receiver tank as shown in Fig. 14D, the refrigerant flow speed in the tank is faster than that in the sandwich type receiver tank and the flow turbulence is large. Therefore, the refrigerant liquid surface near the refrigerant outlet 137 becomes more unstable, causing easier outflow of the gaseous refrigerant, which in turn causes the same problems as mentioned above.

In the receiver tank as shown in Fig. 15, it is required to mount the refrigerant pipe 39 in the tank. This may cause an increased number of parts, increased complexity in structure and increased cost in the same manner as in the receiver as shown in Fig. 14A and 14B.

The present invention aims to solve the problems of the aforementioned prior art, and provide a receiver tank for a refrigeration cycle capable of decreasing the size and weight, the refrigerant amount, the structural complexity and the cost and also capable of stably supplying refrigerant to the following cycle portion, a heat exchanger with the receiver tank, and a condensation device for a refrigeration cycle.

Disclosure of Invention

To attain the aforementioned objects, the present invention has the following structure.

[1] A receiver tank for refrigeration cycle in which condensed refrigerant is accumulated and only liquefied refrigerant is extracted,

the receiver tank, comprising:

a cylindrical tank main body having a refrigerant inlet hole and a refrigerant outlet hole formed in a lower wall so as to communicate with a tank inside space,

wherein an upper end opening position of the refrigerant inlet hole is set to be lower than an upper end opening position of the refrigerant outlet hole,

wherein a resistance layer for decreasing a refrigerant flow speed by making the refrigerant permeate is provided at an upper end opening of the refrigerant inlet hole,

wherein the refrigerant introduced from the refrigerant inlet hole upwardly goes through the resistance layer and forms a liquid stagnation in the tank inside space, and wherein liquid refrigerant of the liquid stagnation is discharged through the refrigerant outlet hole.

In this receiver tank for refrigeration cycle, immediately after entering into the tank main body via the refrigerant inlet hole, the condensed refrigerant in a gas-liquid mixed state decreases in flow speed by passing through the resistance layer. As a result, the liquid refrigerant which is slower in flow speed as compared with gaseous refrigerant is sufficiently decreased in flow speed at the time of reaching the tank inside space after passing through the resistance layer, and therefore liquid stagnation is generated without causing any turbulence in the tank inside space. On the other hand, in the same manner as the liquid refrigerant, the gaseous refrigerant is decreased in flow speed while going through the resistance layer upwards. Therefore, the gaseous refrigerant goes up through the liquid stagnation formed in the tank inside space as gentle bubbles when it reaches the liquid stagnation without causing any turbulence. Thus, the bubbles vanish smoothly at the boundary between the liquid stagnation and the gaseous refrigerant, and goes up to be accumulated as gaseous refrigerant.

Furthermore, since the upper end of the refrigerant outlet hole is opened in the stable liquid stagnation in the tank inside space, only the liquefied refrigerant in the liquid stagnation is discharged through the outlet hole.

As explained above, in the receiver tank according to the present invention, since only the liquefied refrigerant can be discharged, it becomes possible to attain an appropriate refrigerant sealed amount in the refrigeration cycle at an earlier stage, resulting in an enlarged stable region ranging from the most appropriate refrigeration point to the excessive point by utilizing the surplus space in the receiver tank as a buffering space, which in turn can operate the entire refrigeration cycle in a stabilized state.

Furthermore, in the tank main body, it is not required to dispose any piping such as a refrigerant suction pipe. This results in a reduced number of parts and simplified structure.

In the first invention, the following structure as recited in Items 2 to 11 can be preferably employed.

[2] The receiver tank for refrigeration cycle as recited in the aforementioned Item 1, wherein a dented stepped portion is formed at an upper end opening periphery of the refrigerant inlet hole located at a lower wall upper surface side of the tank main body.

In this structure, since the refrigerant introduced from the refrigerant inlet hole is suddenly and widely diffused at the dented stepped portion, the flow speed is further decreased, resulting in stable formation of liquid stagnation, which enables more stabilized operation of the entire refrigeration cycle.

[3] The receiver tank for refrigeration cycle as recited in the aforementioned Item 1, wherein an upper surface position of the resistance layer is set to be lower than the upper end opening position of the refrigerant outlet hole.

In this structure, the liquid stagnation can be formed in the tank main body in a more stabilized manner.

[4] The receiver tank for refrigeration cycle as recited in the aforementioned Item 1, wherein the resistance layer has a number of dispersing passages for dispersing the refrigerant in a radial direction of the tank main body.

Here, as the resistance layer, a layer formed by filling a number of particle-shaped substances, a layer formed by woven fabric or nonwoven fabric in which a number of line-like members are knitted or secured, a layer made of a porous members or plate or made of laminating them, or a combination thereof, can be preferably employed.

[5] The receiver tank for refrigeration cycle as recited in the aforementioned Item 1, wherein the resistance layer is

constituted by a filter layer made of fiber tangled member.

In this structure, the resistance layer can also be functioned as a filter for removing impurities contained in the refrigerant.

[6] The receiver tank for refrigeration cycle as recited in the aforementioned Item 1, wherein an inlet side strainer is disposed on the upper end opening of the refrigerant inlet hole at a lower face side of the resistance layer.

In this structure, the inlet side strainer prevents impurities from entering into the refrigerant inlet hole, thereby preventing clogging of the inlet apertures. In addition, resistance can be given to the refrigerant to be introduced into the tank main body, further decreasing the flow speed of the refrigerant, which enables formation of the liquid stagnation in a more stabilized manner.

[7] The receiver tank for refrigeration cycle as recited in one of the aforementioned Items 1 to 6, wherein an outlet side strainer is disposed on the upper end opening of the refrigerant outlet hole.

In this structure, the inlet side strainer prevents impurities from entering into the refrigerant inlet hole, thereby preventing clogging of the inlet apertures.

Here, as the inlet side and outlet side strainers, a metal mesh sheet can be preferably used.

[8] The receiver tank for refrigeration cycle as recited in the aforementioned Item 1, wherein a pressing member for holding the resistance layer in a downwardly pressed manner is provided in the tank main body.

In this structure, the resistance layer can be assuredly mounted in the tank main body in a downwardly pressed state.

[9] The receiver tank for refrigeration cycle as recited in the aforementioned Item 1, wherein the tank main body is provided with an inlet-outlet member constituting a lower portion including the lower wall and a main tank member constituting an intermediate portion and an upper portion.

In this structure, the structured as recited in the aforementioned Item 1 can be realized more assuredly.

[10] The receiver tank for refrigeration cycle as recited in the aforementioned Item 1, wherein a drying agent filled layer is disposed in a fixed state in an upper side portion of the tank inside space.

In this structure, water contents contained in the refrigerant can be removed in the receiver tank, which enables the first invention to utilize as a receiver dryer.

[11] The receiver tank for refrigeration cycle as recited in the aforementioned Item 1, wherein a drying agent filled members is disposed in a free state in an upper side portion of the tank inside space.

In this structure, in the same manner as in the aforementioned Item 10, water contents contained in the refrigerant can be removed in the receiver tank, which enables the first invention to utilize as a receiver dryer. Furthermore, a fixing member for fixing drying agent filled members can be omitted, resulting in further simplified structure, and easy tank assembling and/or maintenance operation.

The second invention is directed to a heat exchanger with a receiver tank utilizing the receiver tank according to the first invention, and has the following structure.

[12] A heat exchanger with a receiver tank, comprising:

a heat exchanger main body including a pair of headers disposed in parallel with each other at a distance, a plurality of heat exchanging tubes with opposite ends thereof connected to both the headers in a fluid communication, and a condensing portion outlet for discharging refrigerant condensed while passing through the heat exchanging tubes;

a cylindrical receiver tank having a receiver tank inlet hole and a receiver tank outlet hole formed in a lower wall so as to communicate with a tank inside space; and

a refrigerant passage for introducing the refrigerant discharged from the condensing portion outlet into the receiver tank inlet hole,

wherein an upper end opening position of the receiver tank inlet hole is set to be lower than an upper end opening position of the receiver tank outlet hole,

wherein a resistance layer for decreasing a refrigerant flow speed by making the refrigerant permeate is provided at an upper end opening of the receiver tank inlet hole,

wherein the refrigerant introduced from the receiver tank inlet hole upwardly goes through the resistance layer and forms a liquid stagnation in the tank inside space, and

wherein liquid refrigerant of the liquid stagnation is discharged through the receiver tank outlet hole.

In the heat exchanger with a receiver tank according to the second invention, in the same manner as mentioned above, the same functions and results can be obtained.

In the second invention, in the same manner as in the first invention, the following structures as recited in the aforementioned Item 13 to 16 can be preferably employed.

[13] The heat exchanger with a receiver tank as recited in the aforementioned Item 12, wherein a dented stepped portion is formed at an upper end opening periphery of the receiver tank inlet hole located at a lower wall upper surface side of the receiver tank.

[14] The heat exchanger with a receiver tank as recited in the aforementioned Item 12, wherein an upper surface position of the resistance layer is set to be lower than the upper end opening position of the receiver tank outlet hole.

[15] The heat exchanger with a receiver tank as recited in the aforementioned Item 12, wherein the resistance layer has a number of dispersing passages for dispersing the refrigerant in a radial direction of the receiver tank.

[16] The heat exchanger with a receiver tank as recited in the aforementioned Item 12, wherein the resistance layer is constituted by a filter layer made of fiber tangled member.

In the second invention, the following structures as recited in the aforementioned Item 6 to 11 can be preferably employed.

The second invention is directed to a heat exchanger with a receiver tank such as a subcool system condenser, utilizing the receiver tank according to the first invention, and has the following structure.

[17] A heat exchanger with a receiver tank, comprising:

a heat exchanger main body including a pair of headers disposed in parallel with each other at a distance, a plurality of heat exchanging tubes with opposite ends thereof connected to both the headers in a fluid communication, a partitioning member for partitioning the plurality of heat exchanging tubes into a condensing portion and a subcooling portion by dividing an inside of each of the headers, a condensing portion outlet for discharging refrigerant condensed while passing through the condensing portion, and a subcooling portion inlet for introducing the refrigerant into the subcooling portion;

a cylindrical tank main body having a refrigerant inlet hole and a refrigerant outlet hole formed in a lower wall so as to communicate with a tank inside space; and

a refrigerant passage for introducing the refrigerant discharged from the condensing portion outlet into the receiver tank inlet hole and introducing the refrigerant discharged from the receiver tank outlet hole into the subcooling portion inlet,

wherein an upper end opening position of the receiver tank inlet hole is set to be lower than an upper end opening position of the receiver tank outlet hole, wherein a resistance layer for decreasing a refrigerant flow speed by making the refrigerant permeate is provided at an upper end opening of the receiver tank inlet hole,

wherein the refrigerant introduced from the receiver tank inlet hole upwardly goes through the resistance layer and forms a liquid stagnation in the tank inside space, and

wherein liquid refrigerant of the liquid stagnation is discharged through the receiver tank outlet hole.

In the heat exchanger with a receiver tank according to the third invention, in the same manner as mentioned above, the same functions and results can be obtained.

In the third invention, in the same manner as in the first invention, the following structures as recited in the aforementioned Item 18 to 21 can be preferably employed.

[18] The heat exchanger with a receiver tank as recited in the aforementioned Item 17, wherein a dented stepped portion is formed at an upper end opening periphery of the receiver tank inlet hole located at a lower wall upper surface side of the receiver tank.

[19] The heat exchanger with a receiver tank as recited in the aforementioned Item 17, wherein an upper surface position of the resistance layer is set to be lower than the upper end opening

position of the receiver tank outlet hole.

[20] The heat exchanger with a receiver tank as recited in the aforementioned Item 17, wherein the resistance layer has a number of dispersing passages for dispersing the refrigerant in a radial direction of the receiver tank.

[21] The heat exchanger with a receiver tank as recited in the aforementioned Item 17, wherein the resistance layer is constituted by a filter layer made of fiber tangled member.

In the third invention, the structures as recited in the aforementioned Items 6 to 11 can also be preferably employed.

The fourth invention is directed to a condensation device for refrigeration cycle, utilizing the receiver tank according to the first invention, and has the following structure.

[22] A condensation device for refrigeration cycle, comprising:

a condenser having a condensing portion for condensing refrigerant and a condensing portion outlet for discharging the refrigerant condensed by the condensing portion;

a cylindrical receiver tank having a receiver tank inlet hole and a receiver tank outlet hole formed in a lower wall so as to communicate with a tank inside space; and a refrigerant passage for introducing the refrigerant discharged from the condensing portion outlet into the receiver tank inlet hole,

wherein an upper end opening position of the receiver tank inlet hole is set to be lower than an upper end opening position of the receiver tank outlet hole,

wherein a resistance layer for decreasing a refrigerant flow speed by making the refrigerant permeate is provided at an upper end opening of the receiver tank inlet hole,

wherein the refrigerant introduced from the receiver tank inlet hole upwardly goes through the resistance layer and forms a liquid stagnation in the tank inside space, and

wherein liquid refrigerant of the liquid stagnation is discharged through the receiver tank outlet hole.

In the condensation device for refrigeration cycle according to the fourth invention, in the same manner as mentioned above, the same functions and results can be obtained.

In the fourth invention, in the same manner as in the first invention, the structures as recited in the following Items 23 to 26 can be preferably employed.

[23] The condensation device for refrigeration cycle as recited in the aforementioned Item 22, wherein a dented stepped portion is formed at an upper end opening periphery of the receiver

tank inlet hole located at a lower wall upper surface side of the receiver tank.

[24] The condensation device for refrigeration cycle as recited in the aforementioned Item 22, wherein an upper surface position of the resistance layer is set to be lower than the upper end opening position of the receiver tank outlet hole.

[25] The condensation device for refrigeration cycle as recited in one of the aforementioned Items 22 to 24, wherein the resistance layer has a number of dispersing passages for dispersing the refrigerant in a radial direction of the receiver tank.

[26] The condensation device for refrigeration cycle as recited in the aforementioned Item 22, wherein the resistance layer is constituted by a filter layer made of fiber tangled member.

In the fourth invention, the structures as recited in the aforementioned Items 6 to 11 can also be preferably employed.

The fifth invention is directed to a condensation device with a subcooler for refrigeration cycle, utilizing the receiver tank according to the first invention, and has the following structure.

[27] A condensation device for refrigeration cycle, comprising:

a condenser having a condensing portion for condensing refrigerant and a condensing portion outlet for discharging the refrigerant condensed by the condensing portion;

a cylindrical receiver tank having a receiver tank inlet hole and a receiver tank outlet hole formed in a lower wall so as to communicate with a tank inside space;

a subcooler having a subcooling portion for subcooling liquefied refrigerant and a subcooling portion inlet for introducing the liquefied refrigerant into the subcooling portion;

a first refrigerant passage for introducing the refrigerant discharged from the condensing portion outlet into the receiver tank inlet hole; and

a second refrigerant passage for supplying the refrigerant discharged from the receiver tank outlet hole into the subcooler inlet,

wherein an upper end opening position of the receiver tank inlet hole is set to be lower than an upper end opening position of the receiver tank outlet hole,

wherein a resistance layer for decreasing a refrigerant flow speed by making the refrigerant permeate is provided at an upper end opening of the receiver tank inlet hole,

wherein the refrigerant introduced from the receiver tank inlet hole upwardly goes through the resistance layer and forms a liquid stagnation in the tank inside space, and

wherein the liquid refrigerant of the liquid stagnation is discharged through the receiver tank outlet hole.

In the condensation device for refrigeration cycle according to the fifth invention, in the same manner as mentioned above, the same functions and results can be obtained.

In the fifth invention, in the same manner as in the first invention, the structures as recited in the following Items 28 to 31 can be preferably employed.

[28] The condensation device for refrigeration cycle as recited in the aforementioned Item 27, wherein a dented stepped portion is formed at an upper end opening periphery of the receiver tank inlet hole located at a lower wall upper surface side of the receiver tank.

[29] The condensation device for refrigeration cycle as recited in the aforementioned Item 27, wherein an upper surface position of the resistance layer is set to be lower than the upper end opening position of the receiver tank outlet hole.

[30] The condensation device for refrigeration cycle as recited in the aforementioned Item 27, wherein the resistance layer has a number of dispersing passages for dispersing the refrigerant in a radial direction of the receiver tank.

[31] The condensation device for refrigeration cycle as

recited in the aforementioned Item 27, wherein the resistance layer is constituted by a filter layer made of fiber tangled member.

In the fifth invention, the structures as recited in the aforementioned Items 6 to 11 can be preferably employed.

As mentioned above, according to the receiver tank for refrigeration cycle of the first invention, the condensed refrigerant in a gas-liquid mixed state forms liquid stagnation without causing any turbulence in the tank inside space, and the gaseous refrigerant goes up in the liquid as calm bubbles and vanishes without causing the liquid surface. Accordingly, since only the stable liquefied refrigerant can be discharged, it becomes possible to attain an appropriate sealed amount of refrigerant in the refrigeration cycle at an earlier stage, enabling reduction in size and weight and reduction in refrigerant amount. Furthermore, stable refrigerant can be supplied to the following cycle portion. Furthermore, since the receiver tank does not require to provide any inner piping such as a refrigerant suction pipe, the number of parts can be decreased, resulting in simplified structure, reduced cost and easy assembly.

According to the heat exchanger with a receiver tank and a condensation device for refrigeration cycle according to the second to fifth inventions, since they utilize the receiver tank of the first invention, the same effects can be obtained in the same manner as mentioned above.

Brief Description of Drawings

Fig. 1 is a front view showing both side portions of a heat exchanger with a receiver tank according to an embodiment of this invention.

Fig. 2 is a front cross-sectional view showing the receiver tank according to the embodiment.

Fig. 3 is a front cross-sectional view showing an outlet-inlet portion of the receiver tank according to the embodiment.

Fig. 4 is an exploded front cross-sectional view showing the outlet-inlet portion according to the embodiment .

Fig. 5 is a horizontal cross-sectional view showing the outlet-inlet portion according to the embodiment.

Fig. 6 is a bottom view showing the outlet-inlet portion according to the embodiment.

Fig. 7 is an enlarged front cross-sectional view showing the block flange and therearound of the heat exchanger according to the embodiment.

Fig. 8 is an exploded front cross-sectional view showing the block flange and therearound according to the embodiment .

Fig. 9 is a perspective view showing the block flange according to the embodiment.

Fig. 10 is a front view showing the block flange according to the embodiment.

Fig. 11 is a front cross-sectional view showing the block flange according to the embodiment.

Fig. 12 is an enlarged front view showing an inlet of an inlet passage of the block flange and therearound according to the embodiment.

Fig. 13 is a refrigerant circuit of the refrigeration cycle.

Fig. 14A is a schematic cross-sectional view showing a receiver tank as a first conventional example, Fig. 14B is a schematic cross-sectional view showing a receiver tank as a second conventional example, Fig. 14C is a schematic cross-sectional view showing a receiver tank as a third conventional example, and Fig.

14D is a schematic cross-sectional view showing a receiver tank as a fourth conventional example.

Fig. 15 is a schematic cross-sectional view showing a receiver tank as a fifth conventional example.

Best Mode for Carrying Out the Invention

Fig. 1 is a front view showing both sides of a heat exchanger with a receiver tank according to an embodiment of this invention. As shown in this figure, this heat exchanger is provided with a heat exchanger main body 10 of a multi-flow type, a receiver tank 3, and a block flange 4 which is a connecting member for connecting the receiver tank 3 to the heat exchanger main body 10.

The heat exchanger main body 10 is provided with a pair of headers 11 disposed vertically at a certain distance. Between these headers 11, a plurality of flat tubes 12 as heat exchanging tubes are disposed horizontally with their both ends connected to the headers 11 in a fluid communication at certain intervals in an up-and-down direction. Furthermore, between the adjacent flat tubes 12 and at the outside of the outermost flat tube 12, a corrugate fin 13 is disposed respectively. At the outside of the outermost corrugate fin 13, a side plate 14 is disposed.

At a certain height position of one of the headers 11 of the heat exchanger main body 10, a flange-like partitioning portion 50 of the block flange 4 is mounted. At the same height position of the other header 11 as that of the aforementioned partitioning portion 50, a partitioning plate 16 is mounted. With these partitioning members such as the partitioning portion 50 and the partitioning plate 16, both the headers 11 and 11 are partitioned at the same height. The flat tubes 12 located above the partitioning plate 16 and partitioning portion 50 constitute a condensing portion 1, and the flat tubes 12 located below the partitioning plate 16 and partitioning portion 50 constitute a subcooling portion 2 independent with respect to the aforementioned condensing portion 1.

Furthermore, in the portion of the header 11 constituting the condensing portion 1, refrigerant turning partitioning plates 17 are mounted at certain height positions, so that the condensing portion 1 is divided into three passes, i.e., the first to third passes P1 to P3, in the heat exchanging main body 10 of this embodiment.

Furthermore, at the upper portion of the other header 11 of the heat exchanger main body 10, a condensing portion inlet 1a corresponding to the first pass P1 is provided, and at the lower portion thereof, a subcooling portion outlet 2b corresponding to the subcooling portion 2 is provided.

As shown in Fig. 2, the receiver tank 3 includes a tank main body 30 equipped with a main tank member 31 constituting the upper and middle portions of the tank main body 30 and an outlet-inlet member 32 constituting the lower portion of the tank main body 30.

The main tank member 31 has a vertically extended shape with the upper end closed and the lower end opened. The outlet-inlet member 32 has a cylindrical shape with the upper end opened and the lower end closed with a lower wall 321.

As shown in Figs. 2 to 6, in the outlet-inlet member 32, one half side region of the upper side of the lower wall 321 is downwardly dented and constituted as a lower dented stepped portion 330, and the other half thereof is constituted as a higher portion 340.

Formed in the lower wall 321 of the outlet-inlet member 32 corresponding to the dented stepped portion 330 is a receiver tank inlet hole 3a penetrating the lower wall in the up-and-down direction. The upper end of this receiver tank inlet hole 3a is opened to the bottom surface of the dented stepped portion 330. Furthermore, at the region of the lower wall 321 corresponding to the receiver tank inlet hole 3a, an inlet side protruded portion 332 is formed in a downwardly protruded manner. At the lower end face of this protruded portion 332, the lower end of the receiver tank inlet hole 3a is opened.

Furthermore, formed in the lower wall 321 of the outlet-inlet member 32 corresponding to the higher portion 340 is a receiver tank outlet hole 3b penetrating the lower wall in the up-and-down direction. The upper end of this receiver tank outlet hole 3b is opened at the higher portion 340. Furthermore, at the region of the lower wall 321 corresponding to the receiver tank outlet hole 3b, an outlet side dented portion 342 is formed in an upwardly dented manner. At the bottom of this dented portion 342, the lower end of the receiver tank outlet hole 3b is opened.

At the dented stepped portion 330 on the lower wall 321 of the outlet-inlet member 32, an inlet side strainer 333 made of a metal mesh sheet is disposed so as o close the receiver tank inlet hole 3a. Furthermore, on the upper surface of this strainer 333, a filter layer 335 made of nonwoven fabric as a resistance layer for decreasing the flow speed of the refrigerant is disposed so as to be filled in the dented stepped portion 330.

Furthermore, at the higher portion 340 of the lower wall 321 of the outlet-inlet member 32, a hat-shaped outlet side strainer 343 made of a metal mesh sheet is disposed so as to close the upper end portion of the receiver tank outlet hole 3b.

In addition, at the upper surface side of the lower wall of the outlet-inlet member 32, a pressing member 350 is disposed.

This pressing member 350 is constituted by a metal press molded member with a circular bottom plate and a peripheral wall portion upwardly extending from the external peripheral edge portion of the circular bottom plate. This pressing member 350 is formed to have a size capable of being fitted in the outlet-inlet member 320.

A first region 353 which is one half side of the bottom wall of the pressing member 350 is formed in a downwardly protruded manner so as to correspond to the dented stepped portion 330. In this region, a number of refrigerant passing apertures 353a are formed. In a second region 354 which is the other half side of the bottom wall, an aperture 354a corresponding to the receiver tank outlet hole 3b is formed.

This pressing member 350 is fitted in the outlet-inlet member 32 from the upper end opening portion thereof, so that the filter layer 335 is pressed from the above in the first region 353. Furthermore, in a state in which the outlet side strainer 343 is fitted in the aperture 354a formed in the second region 353, the peripheral portion of the outlet side strainer 343 is pressed from the above by the peripheral portion of the aperture formed in the second region 353. The pressing member 350 is held in a state in which the pressing member 350 is pressed against the lower wall

321 side when the protrusion 325 formed on the inner peripheral surface of the inlet-outlet member 23 is engaged with the upper end of the peripheral wall portion of the pressing member 350.

In this embodiment, the upper surface position of the filter layer 335 is set to be lower than the upper end opening position of the receiver tank outlet hole 3b.

As shown in Fig. 2, in the upper portion of the main tank member 31, a multi-bored plate 311 is fixed via the fixing member 315, and a certain amount of drying agents in the shape of spherical particle such as molecular sieve is filled above the multi-bored plate 311, so that an upper drying agent filled layer 312 as a drying agent filled member is formed.

An upper end opening portion of the outlet-inlet member 32 is fixed to the lower opening portion of the main tank member 31, thereby forming a receiver tank 3 according to this embodiment.

On the other hand, as shown in Figs. 7 to 11, a block flange 4 for connecting the receiver tank 3 to a heat exchanger main body 10 is provided with a main body 41, an embedding portion 42 integrally protruded sideways from the main body 41.

At the upper surface of the flange main body 41, an inlet side dented portion 45 capable of being fitted by the inlet side protruded portion 332 of the receiver tank 3 and an outlet side protruded portion 46 capable of fitting into the inlet side dented portion 342 of the receiver tank 3 are formed.

In this block flange 4, an inlet passage 4a for communicating the condensing portion 1 with the receiver tank 3 and an outlet passage 4b for communicating the receiver tank 3 with the subcooling portion 3 are provided.

The one end (inlet side end) of the inlet passage 4a is opened at the upper end of the embedding portion 42, and the other end (outlet side end) thereof is opened at the bottom surface in the inlet side dented portion 45.

The inlet passage 4a includes an inlet side half thereof constituting a refrigerant descending passage 40a inclined obliquely downward and an outlet side half hereof constituting a refrigerant ascending passage ascending vertically.

The one end (inlet side end) of the outlet passage 4b is opened at the upper end of the outlet side protruded portion 46, and the other end (outlet side end) thereof is opened at the side external surface of the embedding portion 42.

Furthermore, on the upper end periphery of the embedding portion 42 of the block flange 4, an outwardly extended flange-like partitioning portion 50 is integrally formed. This flange-like partitioning portion 50 has an external contour capable of fitting to the internal surface of one of the headers 11.

As shown in Figs. 7 and 12, the embedding portion 42 of the block flange 4 is embedded in one of the headers 11 between the condensing portion 1 and the subcooling portion 2 in a manner such that the embedding portion 42 is fitted therein from the side of the header, so that the peripheral portions 41a and 41a formed at the embedding portion side of the flange main body 41 are fixed to the header 11 in an airtight manner. Furthermore, as shown in Figs. 7 and 12, the external peripheral edge of the flange-like partitioning portion 50 formed at the upper portion of the embedding portion is secured to the internal peripheral surface of the header 11 along the circumferential direction in a continuous manner. This flange-like partitioning portion 50 constitutes a partitioning member for partitioning the inside of one of the headers into the condensing portion 1 and the subcooling portion 2 as mentioned above.

In this secured state, the inlet side end portion of the inlet passage 4a is opened to and communicated with the condensing portion 1 so as to constitute a condensing portion outlet 1b, and the outlet side end portion of the outlet passage 4b is opened to and communicated with the subcooling portion 2 so as to constitute a subcooling portion inlet 2a.

Here, in this embodiment, the outlet side end portion of the inlet passage 4a is positioned at a height corresponding to the upper end portion of the subcooling portion 2, and that the outlet side end portion of the inlet passage 4a is positioned at a height lower than the inlet side end portion of the inlet passage 4a, i.e., the condensing portion outlet 1b.

As shown in Figs. 7 and 8, the protruded portion 332 of the receiver tank 3 is air-tightly fitted in the dented portion 45 of the block flange 4, and the protruded portion 46 of the block flange 4 is air-tightly fitted in the dented portion 342 of the receiver tank 3, whereby the lower end of the receiver tank 3 is assembled to the block flange 4.

Furthermore, as shown in Fig. 1, the upper portion of the receiver tank 3 is fixed to one of the headers 11 via the bracket 6.

In this embodiment, the inlet passage 4a and the outlet passage 4b of the block flange 4 constitute a refrigerant passage respectively.

In the heat exchanger with the receiver tank, each of the core components, such as the header 11, the flat tube 12, the fin 13, the side plate 14, the receiver tank 3 and the block flange 4, is made of aluminum (or its alloy) or constituted by an aluminum brazing sheet, etc., and these components are integrally secured by brazing them in a furnace in a provisionally assembled manner with brazing materials.

In this embodiment, the flange-like partitioning portion 50 of the block flange 4 is secured to the internal peripheral surface of the header 11 at the time of the aforementioned integral brazing.

The heat exchanger with the receiver tank of the aforementioned structure is used as a condenser for use in an automobile air-conditioning refrigeration system together with a compressor, a decompressing means such as an expansion valve and an evaporator. In this refrigeration cycle, the high temperature and high pressure gaseous refrigerant is introduced into the condensing portion 1 via the condensing inlet 1a and condensed therein by exchanging heat with the ambient air while passing through the first to third passes P1-P3 in a zigzag manner.

This condensed refrigerant is introduced into the inlet passage 4a of the block flange 4 via the condensing portion outlet 1b, and then introduced into the receiver tank 3 via the receiver tank inlet hole 3a.

The refrigerant introduced into the receiver tank inlet hole 3a is immediately and widely diffused and decreased in flow speed immediately after being introduced into the tank via the upper end of the inlet hole 3a, and then goes through the inlet side strainer 333 and goes up through the filter layer 335. At this time, since the filter layer functions as a resistance layer against the refrigerant flow, the refrigerant is further decreased in raising speed dramatically, and goes up while changing the flow directions by passing through the fibers of the nonwoven fabric constituting the filter layer 335. Due to this rectification function, the local high speed flow and uneven flow will be vanished, resulting in an entirely even upward flow. Thus, the refrigerant is introduced into the tank inside space 310 by passing through the refrigerant passing apertures 353a.

Thus, the liquefied refrigerant introduced into the tank inside space 310 forms a liquid stagnation R without causing any turbulence. Gas (gaseous refrigerant) mixed into or generated in the liquefied refrigerant flowing upward through the filter layer 335 suddenly decreases in flow speed when going up through the filter layer 335 and reaches the liquid stagnation R. After reaching the liquid stagnation R, the gas goes up through the liquid and smoothly vanishes without causing any turbulence of the liquid surface. Thus, the gas further goes up beyond the boundary between the gas and the liquid and accumulates as gaseous refrigerant.

Among the liquefied refrigerant accumulated in the liquid stagnation R, only the liquefied refrigerant stably accumulated at the bottom portion is introduced into the receiver tank outlet hole 3b after passing through the outlet side strainer 343 of the pressing member 350.

The refrigerant introduced into the receiver tank outlet hole 3b is introduced in the outlet passage 4b of the block flange 4 and then introduced into the subcooling portion 2 after passing through the outlet passage 4b.

The liquefied refrigerant introduced in the subcooling portion 2 is subcooled by the ambient air while passing through the subcooling portion 2, and then discharged from the subcooling portion outlet 2b.

After being decompressed and expanded by the expansion valve, the liquefied refrigerant discharged from the heat exchanger with the receiver tank is evaporated in the evaporator by absorbing heat from the ambient air, and then returns to the compressor. A prescribed refrigeration performance can be secured by circulating the refrigerant in the refrigeration cycle of the refrigeration system.

As explained above, according to this embodiment, the liquefied refrigerant introduced in the receiver tank 3 is slow in flow speed and therefore calmly forms the liquid stagnation R and the gases vanish smoothly and effectively. This results in an enlarged stable region of the refrigerant sealed amount and a stable extraction of only liquefied refrigerant. Accordingly, the liquefied refrigerant can be stably supplied to the subcooling portion of the heat exchanger, enabling a stable operation of the refrigeration cycle, which in turn results in excellent refrigeration performance. Furthermore, since the enlarged stable region enables stable supplying of liquefied refrigerant, the receiver tank can be decreased in diameter and enhanced in performance, resulting in miniaturized entire refrigeration system, enhanced performance and deceased refrigerant amount.

Furthermore, since the receiver tank 3 does not require to provide any inner piping such as a refrigerant suction pipe, the number of parts can be decreased, resulting in simplified structure, reduced cost and easy assembly.

Furthermore, in this embodiment, since the filter layer forms a resistance layer, it is not necessary to further provide a resistance layer, resulting in further decreased number of parts, further simplified structure and further reduced cost.

Furthermore, in this embodiment, since the receiver tank connecting block flange 4 is secured to the header 11 of the heat exchanger main body 10 with the embedding portion 42 embedded in the header, the installation space can be eliminated. As a result, miniaturization can be attained.

Furthermore, the flange-like partitioning portion 50 is integrally formed at around the inlet of the inlet passage 4a located at the upper end of the embedding portion 42, and one of the headers 11 is divided into the condensing portion 1 and the subcooling portion 2 with the partitioning portion 50. Therefore, a partitioning member for partitioning the condensing portion 1 and the subcooling portion 2 is not required, resulting in decreased number of parts, simplified assembling, and cost reduction.

Furthermore, since a part 42 of he block flange 4 is embedded in one of the headers 11, the receiver tank 4 to be secured to the block flange 4 can be disposed closer to the header 11. As a result, the entire heat exchanger can be further reduced in size.

Furthermore, in this embodiment, the inlet side of the inlet passage 4a is inclined downwardly and the outlet side end of the inlet passage 4a is positioned lower than the inlet side end. Therefore, the overall installation position of the receiver tank 3 can be lowered, which allows the use of the longer receiver tank 3. Accordingly, sufficiently large tank capacity of the receiver tank 3 can be secured, which in turn enlarges the stable region in the subcooling state of the refrigerant. This prevents excessive or insufficient sealed amount of refrigerant, resulting in stabilized refrigeration performance and enhanced refrigeration performance.

Furthermore, as the receiver tank 3, a long size receiver tank can be employed. Therefore, a receiver tank with a smaller diameter can be employed while securing sufficient tank capacity, which in turn can attain further miniaturization.

Furthermore, in this embodiment, the descending passage 40a of the inlet passage 4a formed in the block flange 4 is inclined relative to the axis of the header 11 and the upper end face of the descending passage 40a is positioned so as to be perpendicular to the axis of the header 11. Therefore, the upper end opening area of the descending passage 40a can be formed to be larger than the passage cross-sectional area of the descending passage 40a. Thus, the upper end opening area of the descending passage 40a can be formed to be large, enabling efficient and smooth introduction of refrigerant, decreased pressure loss, and stable refrigeration supply, which in turn can further improve the refrigeration performance.

For reference, in this embodiment, the upper end opening area (condensing portion outlet 1b) of the descending passage 40a is set to be large, i.e., 62 mm^2.

In this embodiment, although the inlet-outlet member is formed separately from the tank main body, the present invention is not limited to it and can also be applied to a receiver tank in which an inlet-outlet portion is integrally formed to a tank main body.

Furthermore, needless to say, the number of passes of the heat exchanger main body, the number of heat exchanging tubes of each pass, etc., are not limited to the above.

Furthermore, in the aforementioned embodiment, a case in which the receiver tank 3 is attached to a heat exchanger integrally provided with a subcooling portion is exemplified. However, the present invention is not limited to it. The receiver tank 3 can be attached to a heat exchanger such as a condenser with no subcooling portion.

Furthermore, in cases where the receiver tank 3 is attached to a heat exchanger, it is not necessary to employ a block flange. The receiver tank 3 can be connected using refrigerant pipes.

Furthermore, in the aforementioned embodiment, although the drying agent layer 312 is provided at the upper end portion of the tank main body 30, the present invention is not limited to it. The drying agent layer 312 can be fixed at an intermediate portion or a lower portion of the tank main body 30. Furthermore, the drying agent layer can be disposed in the tank main body in a free state.

Furthermore, as the filter layer 335, it is not always necessary to use nonwoven fabric. Another fiber tangled member, such as woven fabric and knitted fabric, can be used. Furthermore, in place of such a fiber product, a filter layer made of drying agent such as molecular sieve can be used. In short, anything can be used so long as it gives resistance to refrigerant flow.

Industrial Applicability

A receiver tank for refrigeration cycle, a heat exchanger with the receiver tank, and a condensation device for refrigeration cycle according to the present invention can be preferably used for automobile, household or business air-conditioning systems.

CLAIMS

1. A receiver tank for refrigeration cycle in which condensed refrigerant is accumulated and only liquefied refrigerant is extracted,

the receiver tank, comprising:

a cylindrical tank main body having a refrigerant inlet hole and a refrigerant outlet hole formed in a lower wall so as to communicate with a tank inside space,

wherein an upper end opening position of the refrigerant inlet hole is set to be lower than an upper end opening position of the refrigerant outlet hole,

wherein a resistance layer for decreasing a refrigerant flow speed by making the refrigerant permeate is provided at an upper end opening of the refrigerant inlet hole,

wherein the refrigerant introduced from the refrigerant inlet hole upwardly goes through the resistance layer and forms a liquid stagnation in the tank inside space, and

wherein liquid refrigerant of the liquid stagnation is discharged through the refrigerant outlet hole.

2. The receiver tank for refrigeration cycle as recited in claim 1, wherein a dented stepped portion is formed at an upper end opening periphery of the refrigerant inlet hole located at a lower wall upper surface side of the tank main body.

3. The receiver tank for refrigeration cycle as recited in claim 1, wherein an upper surface position of the resistance layer is set to be lower than the upper end opening position of the refrigerant outlet hole.

4. The receiver tank for refrigeration cycle as recited in claim 1, wherein the resistance layer has a number of dispersing passages for dispersing the refrigerant in a radial direction of the tank main body.

5. The receiver tank for refrigeration cycle as recited in claim 1, wherein the resistance layer is constituted by a filter layer made of fiber tangled member.

6. The receiver tank for refrigeration cycle as recited in claim 1, wherein an inlet side strainer is disposed on the upper end opening of the refrigerant inlet hole at a lower face side of the resistance layer.

7. The receiver tank for refrigeration cycle as recited in claim 1, wherein an outlet side strainer is disposed on the upper end opening of the refrigerant outlet hole.

8. The receiver tank for refrigeration cycle as recited in claim 1, wherein a pressing member for holding the resistance layer in a downwardly pressed manner is provided in the tank main body.

9. The receiver tank for refrigeration cycle as recited in claim 1, wherein the tank main body is provided with an inlet-outlet member constituting a lower portion including the lower wall and a main tank member constituting an intermediate portion and an upper portion.

10. The receiver tank for refrigeration cycle as recited in claim 1, wherein a drying agent filled layer is disposed in a fixed state in an upper side portion of the tank inside space.

11. The receiver tank for refrigeration cycle as recited in claim 1, wherein a drying agent filled member is disposed in a free state in an upper side portion of the tank inside space.

12. A heat exchanger with a receiver tank, comprising:

a heat exchanger main body including a pair of headers disposed in parallel with each other at a distance, a plurality of heat exchanging tubes with opposite ends thereof connected to both the headers in a fluid communication, and a condensing portion outlet for discharging refrigerant condensed while passing through the heat exchanging tubes;

a cylindrical receiver tank having a receiver tank inlet hole and a receiver tank outlet hole formed in a lower wall so as to communicate with a tank inside space; and

a refrigerant passage for introducing the refrigerant discharged from the condensing portion outlet into the receiver tank inlet hole,

wherein an upper end opening position of the receiver tank inlet hole is set to be lower than an upper end opening position of the receiver tank outlet hole,

wherein a resistance layer for decreasing a refrigerant flow speed by making the refrigerant permeate is provided at an upper end opening of the receiver tank inlet hole,

wherein the refrigerant introduced from the receiver tank inlet hole upwardly goes through the resistance layer and forms a liquid stagnation in the tank inside space, and

wherein liquid refrigerant of the liquid stagnation is discharged through the receiver tank outlet hole.

13. The heat exchanger with a receiver tank as recited in claim 12, wherein a dented stepped portion is formed at an upper end opening periphery of the receiver tank inlet hole located at a lower wall upper surface side of the receiver tank.

14. The heat exchanger with a receiver tank as recited in claim 12, wherein an upper surface position of the resistance layer is set to be lower than the upper end opening position of the receiver tank outlet hole.

15. The heat exchanger with a receiver tank as recited in claim 12, wherein the resistance layer has a number of dispersing

passages for dispersing the refrigerant in a radial direction of the receiver tank.

16. The heat exchanger with a receiver tank as recited in claim 12, wherein the resistance layer is constituted by a filter layer made of fiber tangled member.

17. A heat exchanger with a receiver tank, comprising:

a heat exchanger main body including a pair of headers disposed in parallel with each other at a distance, a plurality of heat exchanging tubes with opposite ends thereof connected to both the headers in a fluid communication, a partitioning member for partitioning the plurality of heat exchanging tubes into a condensing portion and a subcooling portion by dividing an inside of each of the headers, a condensing portion outlet for discharging refrigerant condensed while passing through the condensing portion, and a subcooling portion inlet for introducing the refrigerant into the subcooling portion;

a cylindrical tank main body having a refrigerant inlet hole and a refrigerant outlet hole formed in a lower wall so as to communicate with a tank inside space; and

a refrigerant passage for introducing the refrigerant discharged from the condensing portion outlet into the receiver tank inlet hole and introducing the refrigerant discharged from the receiver tank outlet hole into the subcooling portion inlet,

wherein an upper end opening position of the receiver tank inlet hole is set to be lower than an upper end opening position of the receiver tank outlet hole,

wherein a resistance layer for decreasing a refrigerant flow speed by making the refrigerant permeate is provided at an upper end opening of the receiver tank inlet hole,

wherein the refrigerant introduced from the receiver tank inlet hole upwardly goes through the resistance layer and forms a liquid stagnation in the tank inside space, and

wherein liquid refrigerant of the liquid stagnation is discharged through the receiver tank outlet hole.

18. The heat exchanger with a receiver tank as recited in claim 17, wherein a dented stepped portion is formed at an upper end opening periphery of the receiver tank inlet hole located at a lower wall upper surface side of the receiver tank.

19. The heat exchanger with a receiver tank as recited in claim 17, wherein an upper surface position of the resistance layer is set to be lower than the upper end opening position of the receiver tank outlet hole.

20. The heat exchanger with a receiver tank as recited in claim 17, wherein the resistance layer has a number of dispersing passages for dispersing the refrigerant in a radial direction of the receiver tank.

21. The heat exchanger with a receiver tank as recited in claim 17, wherein the resistance layer is constituted by a filter layer made of fiber tangled member.

22. A condensation device for refrigeration cycle, comprising:

a condenser having a condensing portion for condensing refrigerant and a condensing portion outlet for discharging the refrigerant condensed by the condensing portion;

a cylindrical receiver tank having a receiver tank inlet hole and a receiver tank outlet hole formed in a lower wall so as to communicate with a tank inside space; and

a refrigerant passage for introducing the refrigerant discharged from the condensing portion outlet into the receiver tank inlet hole,

wherein an upper end opening position of the receiver tank inlet hole is set to be lower than an upper end opening position of the receiver tank outlet hole,

wherein a resistance layer for decreasing a refrigerant flow speed by making the refrigerant permeate is provided at an upper end opening of the receiver tank inlet hole,

wherein the refrigerant introduced from the receiver tank inlet hole upwardly goes through the resistance layer and forms a liquid stagnation in the tank inside space, and

wherein liquid refrigerant of the liquid stagnation is discharged through the receiver tank outlet hole.

23. The condensation device for refrigeration cycle as recited in claim 22, wherein a dented stepped portion is formed at an upper end opening periphery of the receiver tank inlet hole located at a lower wall upper surface side of the receiver tank.

24. The condensation device for refrigeration cycle as recited in claim 22, wherein an upper surface position of the resistance layer is set to be lower than the upper end opening position of the receiver tank outlet hole.

25. The condensation device for refrigeration cycle as recited in claim 22, wherein the resistance layer has a number of dispersing passages for dispersing the refrigerant in a radial direction of the receiver tank.

26. The condensation device for refrigeration cycle as recited in claim 22, wherein the resistance layer is constituted by a filter layer made of fiber tangled member.

27. A condensation device for refrigeration cycle, comprising:

a condenser having a condensing portion for condensing refrigerant and a condensing portion outlet for discharging the refrigerant condensed by the condensing portion;

a cylindrical receiver tank having a receiver tank inlet hole and a receiver tank outlet hole formed in a lower wall so as to communicate with a tank inside space;

a subcooler having a subcooling portion for subcooling liquefied refrigerant and a subcooling portion inlet for introducing the liquefied refrigerant into the subcooling portion;

a first refrigerant passage for introducing the refrigerant discharged from the condensing portion outlet into the receiver tank inlet hole; and

a second refrigerant passage for supplying the refrigerant discharged from the receiver tank outlet hole into the subcooler inlet,

wherein an upper end opening position of the receiver tank inlet hole is set to be lower than an upper end opening position of the receiver tank outlet hole,

wherein a resistance layer for decreasing a refrigerant flow speed by making the refrigerant permeate is provided at an upper end opening of the receiver tank inlet hole,

wherein the refrigerant introduced from the receiver tank inlet hole upwardly goes through the resistance layer and forms a liquid stagnation in the tank inside space, and

wherein the liquid refrigerant of the liquid stagnation is discharged through the receiver tank outlet hole.

28. The condensation device for refrigeration cycle as recited in claim 27, wherein a dented stepped portion is formed at an upper end opening periphery of the receiver tank inlet hole

located at a lower wall upper surface side of the receiver tank.

29. The condensation device for refrigeration cycle as recited in claim 27, wherein an upper surface position of the resistance layer is set to be lower than the upper end opening position of the receiver tank outlet hole.

30. The condensation device for refrigeration cycle as recited in claim 27, wherein the resistance layer has a number of dispersing passages for dispersing the refrigerant in a radial direction of the receiver tank.

31. The condensation device for refrigeration cycle as recited in claim 27, wherein the resistance layer is constituted by a filter layer made of fiber tangled member.

32. A heat exchanger with a receiver tank substantially as herein described with reference to Figures 1 and 7 to 12.

33. A receiver tank for refrigeration cycle substantially as herein described with reference to Figures 2 to 6.

34. A condensation device substantially as herein described with reference to Figures 1 to 12.