



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
12.05.2010 Bulletin 2010/19

(51) Int Cl.:
F25B 41/00 (2006.01) F16L 13/00 (2006.01)

(21) Application number: **09175199.0**

(22) Date of filing: **06.11.2009**

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

- **Kim, Hong Seong**
153-802, Seoul (KR)
- **Lee, Sang Yeul**
153-802, Seoul (KR)
- **Sa, Yong Cheol**
153-802, Seoul (KR)

(30) Priority: **10.11.2008 KR 20080111321**

(71) Applicant: **LG Electronics, Inc.**
Seoul 150-721 (KR)

(74) Representative: **Vossius & Partner**
Siebertstraße 4
81675 München (DE)

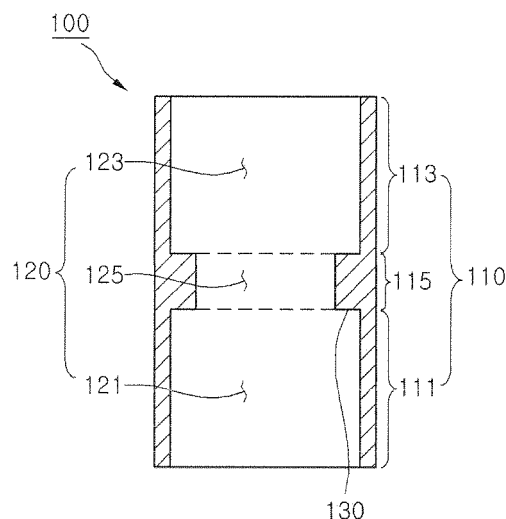
(72) Inventors:
• **Lee, Han Choon**
153-802, Seoul (KR)

(54) **Connection pipe and refrigerant flowing system comprising the same**

(57) The embodiment provides a connection pipe (100) and a refrigerant flowing system comprising the same. The connection pipe and the refrigerant flowing system include: a connection pipe main body (100) of which both ends are coupled to first (10) and second (20) refrigerant pipes through which refrigerant is flowed and

that has a channel (120) through which refrigerant transferred from the first refrigerant pipe to be transferred to the second refrigerant pipe is flowed; and a flow interfering part (130) that is provided on the channel to interfere the flow of the refrigerant in the direction transferred from the first refrigerant pipe to the channel.

FIG.1



Description

[0001] The embodiment relates to an air conditioner, and more particularly, to a connection pipe that connects refrigerant pipes through which refrigerant is flowed and a refrigerant flowing system comprising the same.

[0002] In general, an air conditioner is an electric home appliance that keeps the room cool or heat. The air conditioner as above includes an outdoor unit and an indoor unit, and keeps the room cool or heat as refrigerant circulating the outdoor unit and the indoor unit performs a heat-exchange with outdoor air and indoor air. Refrigerant pipes are provided for circulating the refrigerant. A connection pipe is also provided for connecting the ends of the refrigerant pipes adjacent to each other. One ends of the refrigerant pipes adjacent to each other are inserted into both ends of the connection pipe, respectively.

[0003] However, when any one of the refrigerant pipes connected to the connection pipe is formed in a curved line shape such as U shape in the related art, liquid-phase refrigerant of refrigerant flowing through the refrigerant pipe is flowed along the inner circumferential surface of the refrigerant pipe. Therefore, a problem may arise in that the refrigerant flowing inside the refrigerant pipe cannot be evenly flowed inside the refrigerant pipe according to the phase.

[0004] The embodiment relates to a connection pipe. In the embodiment, a flow cross-sectional area of a portion of channels provided inside the connection pipe that connects two refrigerant pipes is reduced so that liquid-phase refrigerant and gas-phase refrigerant flowing through the channels are mixed. Therefore, the embodiment has an advantage in that the refrigerant flowing through the inside of the refrigerant can be flowed evenly irrespective of the phase.

FIG. 1 is a longitudinal sectional view showing the first embodiment of the connection pipe according to the present invention.

FIG. 2 is a longitudinal sectional view showing a state where the refrigerant pipes are connected by the first embodiment of the present invention.

FIG. 3 is a longitudinal sectional view showing the second embodiment of the connection pipe according to the present invention.

[0005] Reference will now be made in detail to the embodiments of the present disclosure, examples of which are illustrated in the accompanying drawings.

[0006] In the following detailed description of the preferred embodiments, reference is made to the accompanying drawings that form a part hereof, and in which is shown by way of illustration specific preferred embodiments in which the invention may be practiced. These embodiments are described in sufficient detail to enable those skilled in the art to practice the invention, and it is

understood that other embodiments may be utilized and that logical structural, mechanical, electrical, and chemical changes may be made without departing from the scope of the invention. To avoid detail not necessary to enable those skilled in the art to practice the invention, the description may omit certain information known to those skilled in the art. The following detailed description is, therefore, not to be taken in a limiting sense, and the scope of the present invention is defined only by the appended claims.

[0007] Hereinafter, the constitution of a first embodiment of a connection pipe according to the present invention will be described in more detail with reference to the accompanying drawings.

[0008] FIG. 1 is a longitudinal sectional view showing the first embodiment of the connection pipe according to the present invention.

[0009] Referring to FIG. 1, the connection pipe 100 serves to connect first and second refrigerant pipes 10 and 20 (see FIG. 2) adjacent to each other. The connection pipe 100 includes a connection pipe main body 110 and a plurality of channels 120. The connection pipe main body 110 includes first and second coupling parts 111 and 113 and a mixing part 115, and the channel 120 includes inlet and outlet channels 121 and 123 and a mixing channel 125.

[0010] More specifically, the first and second coupling parts 111 and 113 are provided at both ends of the connection pipe main body 110, respectively, as shown in the drawing. The first and second coupling parts 111 and 113 are places where the first and second refrigerant pipes 10 and 20 are coupled. At this time, the outer diameter and the inner diameter of the first and second coupling parts 111 and 113 are determined to have the same value.

[0011] The mixing part 115 is provided in the central portion of the connection pipe main body 10 corresponding to between the first and second coupling parts 111 and 113, as shown in the drawing. The mixing part 115 is to mix refrigerant that is received from the first refrigerant pipe 10 coupled to the first coupling part 111 to be transferred to the second refrigerant pipe 20 coupled to the second coupling part 113. More specifically, the mixing part 115 mixes the liquid-phase or gas-phase refrigerant transferred from the first refrigerant pipe 10 to transfer it into the second refrigerant pipe 20. At least the inner diameter of the mixing part 115 is determined to have a relatively smaller value compared to the inner diameter of the first and second coupling parts 111 and 113. And, in the embodiment, although the outer diameter of the mixing part 115 is determined to have the same value of the outer diameter of the first and second coupling parts 111 and 113, it is not always limited thereto.

[0012] The inlet and outlet channels 121 and 123 and the mixing channel 125 are provided inside the first and second coupling parts 111 and 113 and the mixing part 115, respectively. In other words, the inlet channel 121 is provided inside the first coupling part 111, the outlet

channel 123 is provided inside the second coupling part 113, and the mixing channel 125 is provided inside the mixing part 115. Therefore, the inlet and output channels 121 and 123 are substantially communicated with each other by the mixing channel 125.

[0013] More specifically, the refrigerant transferred from the first refrigerant pipe 10 is flowed inside the inlet channel 121. The refrigerant transferred to the second refrigerant pipe 20 is flowed inside the outlet channel 123. The refrigerant transferred from the first refrigerant pipe 10 to be flowed through the inlet channel 121 and is flowed through the outlet channel 123 to be transferred to the second refrigerant pipe 20 is flowed inside the mixing channel 125. In other words, the refrigerant transferred from the first refrigerant pipe 10 is transferred to the second refrigerant pipe 20 by being flowed through the inlet channel 121, the mixing channel 125, and the outlet channel 123.

[0014] Meanwhile, the mixing channel 125 has a relatively smaller flow cross-sectional area. This is to mix the liquid-phase and gas-phase refrigerant of the refrigerant flowed through the inlet channel 121 and to allow it to be flowed through the outlet channel 123. More specifically, the liquid-phase refrigerant has a relatively larger specific gravity compared to the gas-phase refrigerant. Therefore, for example, when the liquid-phase and the gas-phase refrigerant flowed into the inlet channel 21 is flowed having the trace of a curved line rather than a straight line such as the case where the first refrigerant pipe 10 coupled to the first coupling part 111 is formed in J shape, the liquid-phase refrigerant is mainly flowed on one side of the inlet channel 121 adjacent to the inner circumferential surface of the first coupling part 111 by the centrifugal force and the gas-phase refrigerant is flowed on other portions of the inlet channel 121. And, the flow direction of the liquid-phase and gas-phase refrigerant flowed through the inlet channel 121, while being partitioned from each other, is changed, while being flowed through the mixing channel 125 of the relatively smaller flow cross-sectional area, thereby being mixed.

[0015] The relative reduction in the flow cross-sectional area of the mixing channel 125 as described above is made by a flow interfering part 130 positioned inside the mixing part 115, that is, on the mixing channel 125. The flow interfering part 130 is radially extended from the inner circumferential surface of the mixing part 115. Therefore, the mixing channel 125 may be considered to be formed as the diameter of the boundary portions between the inlet and outlet channels 121 and 123 is relatively reduced compared to that of other portions of the inlet and outlet channels 121 and 123 by the flow interfering part 130.

[0016] Meanwhile, the connection pipe 100 may be considered to be symmetrical in the orthogonal direction to the direction that the refrigerant is substantially flowed. In other words, with the connection 100, the first and second coupling parts 111 and 113 are symmetrical with each other in the orthogonal direction to the direction the

refrigerant is flowed based on the mixing part 115. Therefore, the inlet and outlet channels 121 and 123 may also be symmetrical in the orthogonal direction to the direction that the refrigerant is flowed based on the mixing channel 125. This is for the connection pipe 100 to connect the first and second refrigerant pipes 10 and 20, irrespective of the direction thereof. Therefore, a worker can connect the first and second refrigerant pipes 10 and 20 to the connection pipe 100, irrespective of the direction of the connection pipe 100.

[0017] Hereinafter, the application of the first embodiment of the connection pipe according to the present invention will be described in more detail with reference to the accompanying drawings.

[0018] FIG. 2 is a longitudinal sectional view showing a state where the refrigerant pipes are connected by the first embodiment of the present invention.

[0019] Referring to FIG. 2, the first and second refrigerant pipes 10 and 20 are connected by the connection pipe 100. At this time, the first and second channels 11 and 21 are provided inside the first and second refrigerant pipes 10 and 20, respectively. In the embodiment, the first refrigerant pipe 10 is formed in J shape and the second refrigerant pipe 20 is formed in Y shape to distribute the refrigerant in two directions. And, one ends of the first and second refrigerant pipes 10 and 20 are coupled to the first and second coupling parts 111 and 113 of the connection pipe 100, respectively.

[0020] Meanwhile, in a state where the first and second refrigerant pipes 10 and 20 are coupled to the first and second coupling parts 111 and 113, respectively, the first and second channels 11 and 21 are connected to the inlet and outlet channels 121 and 123, respectively. Therefore, the first and second channels 11 and 21 are substantially communicated with each other by the inlet and outlet channels 121 and 123 and the mixing channel 125 that communicates the inlet and outlet channels 121 and 123.

[0021] The refrigerant flowed through the first channel 11 is transferred to the inlet channel 121. At this time, the refrigerant transferred to the inlet channel 121 includes liquid-phase refrigerant (indicated in dotted lines on the drawing) and gas-phase refrigerant (indicated in dotted lines on the drawing). Also, owing to the difference in centrifugal force according to the difference in a specific gravity between the liquid-phase refrigerant and gas-phase refrigerant, the liquid-phase refrigerant will be mainly flowed through a portion of the first channel 11 adjacent to the inner circumferential surface of the first refrigerant pipe 10 to be transferred to the inlet channel 121, and the gas-phase refrigerant will be flowed through other portions of the first channel 11 to be transferred to the inlet channel 121. Also, the liquid-phase refrigerant of the refrigerant transferred to the inlet channel 121 will be flowed a long a portion of the inlet channel 121 adjacent to the inner circumferential surface of the first coupling part 111, and the gas-phase refrigerant will be flowed through other portions of the inlet channel 121.

[0022] Meanwhile, the liquid-phase and gas-phase refrigerant flowed through the inlet channel 121 is transferred to the mixing channel 125. And, the liquid-phase and gas-phase refrigerant transferred to the mixing channel 125 is flowed through the mixing channel 125 to be transferred to the outlet channel 123. However, the flow cross-sectional area of the mixing channel 125 is relatively reduced compared to the inlet channel 121, as described above. Therefore, the liquid-phase and gas-phase refrigerant is transferred to the outlet channel 123 in a mixed state, while being flowed through the mixing channel 125.

[0023] More specifically, the flow of the liquid-phase and gas-phase refrigerant flowed through the inlet channel 121 to be transferred to the mixing channel 125 is interfered by the flow interfering part 130. Therefore, the liquid-phase refrigerant flowed through a portion of the inlet channel 121 adjacent to the inner circumferential surface of the first coupling part 111 and the gas-phase refrigerant flowed through other portions of the inlet channel 121 may be mixed with each other.

[0024] And, the liquid-phase and gas-phase refrigerant mixed, while being flowed through the mixing channel 125, is flowed through the outlet channel 123 to be transferred to the second channel 21. Therefore, while the refrigerant is branched by the second refrigerant pipe 20, a phenomenon that the liquid-phase or gas-phase refrigerant is concentrated in any one direction is prevented.

[0025] Hereinafter, the constitution of a second embodiment of a connection pipe according to the present invention will be described in more detail with reference to the accompanying drawings.

[0026] FIG. 3 is a longitudinal sectional view showing the second embodiment of the connection pipe according to the present invention.

[0027] Referring to FIG. 3, the connection pipe 200 according to the embodiment includes first and second coupling parts 211 and 213 and a mixing part 215. Inlet and output channels 221 and 223 and a mixing channel 225 are provided inside the connection pipe 200, and a flow interfering part 230 is provided on the mixing channel 225. The constitution of the embodiment as described above is the same as the aforementioned first embodiment.

[0028] Guide surfaces 231 are provided at upper and lower surfaces of the flow interfering part 230 that the upstream side of the inlet channel 221 and the downstream side of the outlet channel 223 face each other on the drawing. The guide surfaces 231 are to prevent swirling phenomenon from being generated by the edges between the inner circumferential surface of the first coupling part corresponding to the upstream of the inlet channel 221 and one surface of the flow interfering part 230, while the liquid-phase and gas-phase refrigerant is transferred to the mixing channel 225.

[0029] Although the present invention has been described in detail reference to its presently preferred embodiment, it will be understood by those skilled in the art

that various modifications and equivalents can be made without departing from the spirit and scope of the present invention, as set forth in the appended claims.

[0030] In the embodiment as described above, the constituent forming the mixing channel is named as the flow interfering part but the name thereof is not limited to the flow interfering part. In other words, so far as the inlet direction of the refrigerant flowed into the inlet channel can be substantially changed, if the flow interfering part is named as other name, that is, a direction changing part, it would be substantially the same constituent.

[0031] In the connection pipe and the refrigerant flowing system comprising the same according to the present invention constituted as described above, the liquid-phase and gas-phase refrigerant is evenly mixed, passing through the connection pipe connecting the refrigerant pipes adjacent to each other. Therefore, the phenomenon that the refrigerant is locally concentrated on one side of the inside of the refrigerants according to the phase can be prevented.

Claims

1. A connection pipe that connects refrigerant pipes adjacent to each other, comprising:

a connection pipe main body of which both ends are coupled to first and second refrigerant pipes through which refrigerant is flowed and that has a channel through which refrigerant transferred from the first refrigerant pipe to be transferred to the second refrigerant pipe is flowed; and a flow interfering part that is provided on the channel to interfere the flow of the refrigerant in the direction transferred from the first refrigerant pipe to the channel.

2. The connection pipe according to claim 1, wherein the flow interfering part is formed by radially extending a portion of the inner circumferential surface of the connection pipe main body.
3. The connection pipe according to claim 1, wherein guide surfaces that prevents swirling from being generated by the edges between the inner circumferential surface of the connection pipe main body and the upper and lower surfaces of the flow interfering part are formed at the upper and lower surfaces of the flow interfering part corresponding to the upstream side and the downstream side in the direction that the flow is flowed.
4. The connection pipe according to claim 3, wherein the guide surfaces are formed by rounding at least portions of the upper and lower surfaces of the flow interfering part.

5. The connection pipe according to claim 1, wherein the flow interfering part changes the flow direction of the refrigerant transferred from the first refrigerant pipe to the channel.

6. The connection pipe according to claim 5, wherein the flow interfering part allows the refrigerant to be flowed in the orthogonal direction to the direction that the refrigerant is transferred from the first refrigerant pipe to the channel.

7. The connection pipe according to claim 1, wherein the connection pipe main body includes:

an inlet channel through which liquid-phase and gas-phase refrigerant transferred from the first refrigerant pipe is flowed;
an outlet channel through which the liquid-phase and gas-phase refrigerant transferred to the second refrigerant pipe connected to the first refrigerant pipe is flowed; and
a mixing channel that has a relatively smaller flow cross-sectional area compared to the inlet and outlet channels and mixes the liquid-phase and gas-phase refrigerant transferred from the inlet channel to transfer it to the outlet channel, wherein the flow interfering part is positioned on the mixing part.

8. The connection pipe according to claim 7, wherein the inlet and outlet channels are symmetrical with each other based on the mixing channel in the orthogonal direction to the direction that the refrigerant is flowed through the inlet and outlet channels and the mixing channel.

9. A connection pipe that connects refrigerant pipes adjacent to each other, comprising:

a first coupling part that is coupled to a first refrigerant pipe through which refrigerant is flowed and receives the refrigerant from the first refrigerant pipe;
a second coupling part that is coupled to a second refrigerant pipe connected to the first refrigerant pipe and transfers the refrigerant to the second refrigerant pipe; and
a mixing part that is positioned between the first and second coupling parts and mixes the liquid-phase and gas-phase refrigerant of the refrigerant transferred to the first coupling part with each other to transfer it to the second coupling part.

10. The connection pipe according to claim 9, wherein a channel provided inside the mixing part has a relatively smaller flow cross-sectional area compared to the channels provided inside the first and second coupling parts.

11. The connection pipe according to claim 9 or 10, wherein the outer diameter of the mixing part has the same value as the outer diameter of the first and second coupling parts.

12. The connection pipe according to claim 9, wherein the inner diameter of the mixing part has a relatively smaller value compared to the inner diameter of the first and second coupling parts.

13. The connection pipe according to claim 9, wherein the first and second coupling parts are symmetrical with each other based on the mixing part.

14. A refrigerant flowing system comprising:

a first refrigerant pipe through which refrigerant is flowed;
a second refrigerant pipe that receives the refrigerant flowed through the first refrigerant pipe; and
the connection pipe in any one of claims 1 to 13 that connects the first and second refrigerant pipes.

15. The refrigerant flowing system according to claim 14, wherein the first refrigerant pipe is formed in U shape or in J shape.

FIG.1

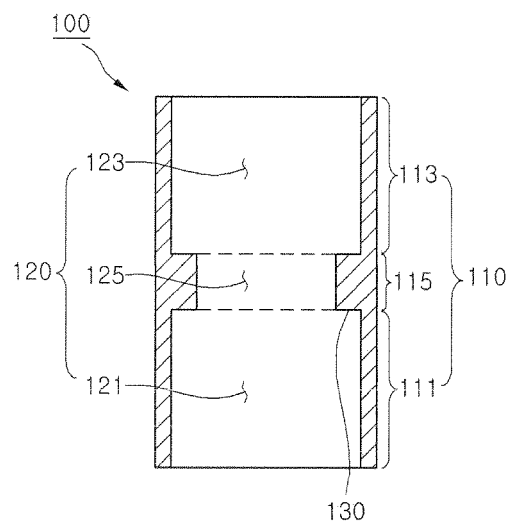


FIG.2

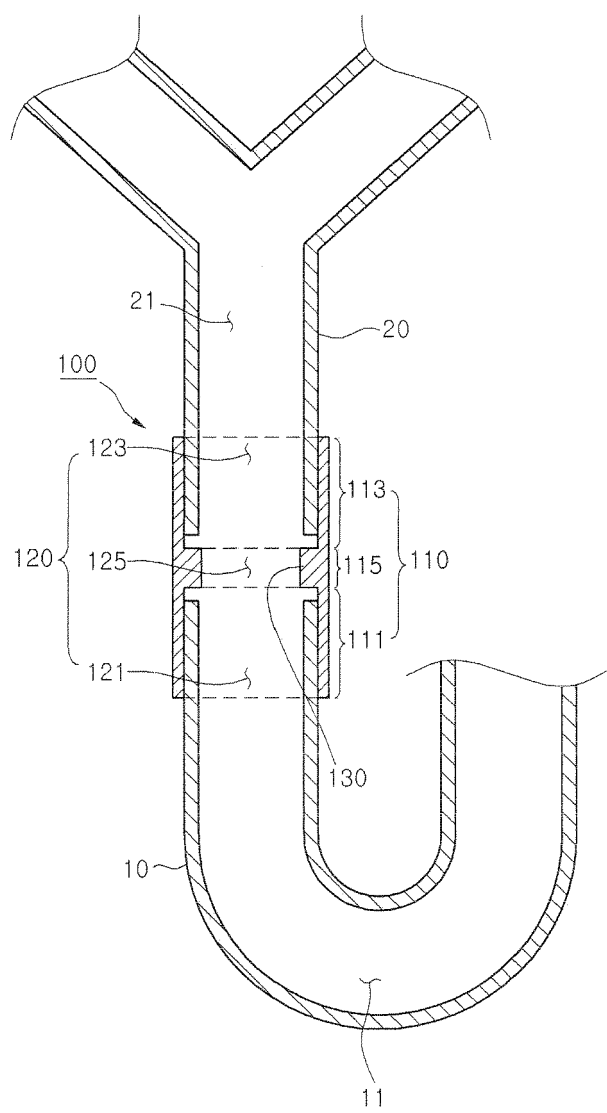


FIG.3

