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(54) **HEAT EXCHANGER ASSEMBLY**

(57) An embodiment of the invention herein provides a heat exchanger assembly. The heat exchanger assembly comprises a plate heat exchanger and a bottle with a connector. The connector comprises an inlet directly connected to the heat exchanger and an outlet config-

ured as an outlet of the heat exchanger assembly. The bottle comprises a tubular section forming a bottle volume and a closing section for closing the bottle volume. The connector is integral with the closing portion.

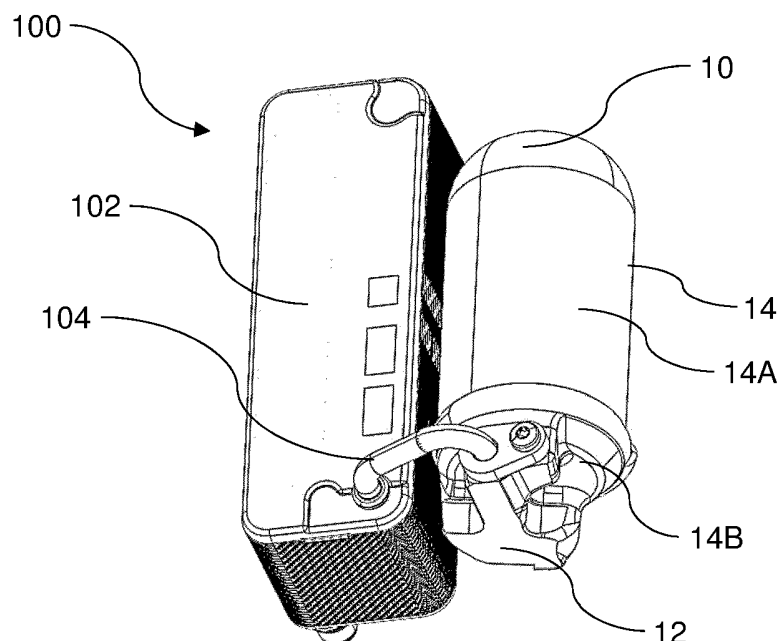


FIG. 1

Description

[0001] The present invention relates to a heat exchanger assembly, in particular to a heat exchanger assembly provided with a bottle having a connector.

[0002] Heat exchangers, in particular condensers, are provided with a receiver drier to act as reservoir to the refrigerant flowing therein. The receiver drier is installed between the condenser and an expansion valve of the air conditioning system to temporarily store the liquid refrigerant flowing from the condenser so that the required amount can be supplied to the evaporator according to the cooling load. In addition, at the same time, the receiver drier filters the refrigerant to remove water or foreign substances contained in the refrigerant. The receiver drier may include a cylindrical housing with an inlet connector and an outlet connector. The inlet connector of the receiver drier is fluidically coupled to the outlet of the condenser core to receive refrigerant therefrom. The outlet connector of the receiver drier is fluidically coupled to the inlet of the expansion valve or any other customer interface to deliver the refrigerant in liquid phase through a conduit fluidically connected to the outlet connector. It may also return the refrigerant to a different portion of the condenser core for subcooling.

[0003] Generally, the receiver drier is formed as a separate unit from the inlet connector and the outlet connector. Further, the receiver drier is to be placed downstream of the condenser and upstream of the expansion device. The inlet connector and the outlet connector need to be assembled to the receiver drier and connected to the respective conduits of the condenser and the expansion valve. In such a situation, the packaging space is increased by an amount at least that of the space occupied by the receiver drier. It is also necessary to secure the receiver drier to the vehicle body in such a manner that it is sufficiently durable against vibration independent of the condenser. Further, multiple components are required to connect the receiver drier with the condenser core and the expansion valve. Furthermore, manufacturing of component required for assembly, and assembly work of the connectors to the receiver drier eventually increase the cost of the vehicle air-conditioner.

[0004] Accordingly, there remains a need for a receiver drier with an integral connector that mitigates spacing constraints and reduces number of components required for installation of the receiver drier.

[0005] In the present description, some elements or parameters may be indexed, such as a first element and a second element. In this case, unless stated otherwise, this indexation is only meant to differentiate and name elements, which are similar but not identical. No idea of priority should be inferred from such indexation, as these terms may be switched without betraying the invention. Additionally, this indexation does not imply any order in mounting or use of the elements of the invention.

[0006] In view of the foregoing, an embodiment of the invention herein provides a heat exchanger assembly

comprising a plate heat exchanger and a bottle with a connector. The connector comprises an inlet and an outlet. The inlet is directly connected to the heat exchanger and configured for supplying the heat exchange medium to the bottle. The outlet is configured as an outlet of the heat exchanger assembly. The bottle comprises a tubular section forming the bottle volume and a closing section for closing the bottle volume. The connector is integrally formed with the closing section. In one embodiment, the tubular section and the closing section are connected to each other by means of welding or brazing.

[0007] The inlet and the outlet are fluidically connected to at least one channel formed within the bottle.

[0008] In one embodiment, the inlet and the outlet are formed on the opposite sides of the connector. In another embodiment, the inlet and the outlet are formed on the same side of the connector.

[0009] In one embodiment, the inlet and outlet are coaxial. In one embodiment, the inlet is arranged parallel to the stacking direction of the plate heat exchanger. In one embodiment, the outlet is arranged parallel to the stacking direction of the plate heat exchanger. In one embodiment, the inlet of the bottle is directly attached to a terminal plate of the plate heat exchanger.

[0010] In one embodiment, the tubular section and the closing section are connected to each other by means of welding or brazing.

[0011] In one embodiment, the connector comprises at least one threaded opening for a screw connection. In one embodiment, the connector is shaped by means of machining.

[0012] In one embodiment, the bottle is arranged so that its general axis of extension is parallel to the general axis of extension of the plate heat exchanger.

[0013] In one embodiment, the bottle is connected to the plate heat exchanger by means of a tube.

[0014] Other characteristics, details and advantages of the invention can be inferred from the description of the invention hereunder. A more complete appreciation of the invention and many of the attendant advantages thereof will be readily obtained as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying figures, wherein:

Fig. 1 illustrates a perspective view of a plate heat exchanger fluidically coupled to a bottle with integral connector, according to an embodiment of the present invention.

Fig. 2 exemplarily illustrates a perspective view of the bottle with integral connector of Fig. 1;

Fig. 3 exemplarily illustrates another perspective view of the bottle with integral connector of Fig. 1;

Fig. 4 exemplarily illustrates a cross sectional view of the bottle with integral connector of Fig. 1;

[0015] It must be noted that the figures disclose the invention in a detailed enough way to be implemented, said figures helping to better define the invention if needs be. The invention should however not be limited to the embodiment disclosed in the description.

[0016] The present invention generally relates to a heat exchanger provided with a bottle having an integral connector to mitigate spacing constraints and reduce number of components required for installation of the bottle. In conventional bottle, two different connectors are required to connect with a heat exchanger and an expansion valve or any other customer interface. As there are two different connectors attached to the bottle, the optimal placement of the bottle is compromised. Further, multiple components are required to connect the bottle with the condenser core and the customer interface. To address such shortcomings, the bottle is provided with an integral connector.

[0017] Referring to Fig. 1, a heat exchanger assembly 100 comprises a heat exchanger, particularly a plate heat exchanger 102, and a bottle 10. The bottle 10 is connected to a downstream of the heat exchanger 102. The heat exchanger 102, particularly condenser, is having two fluid flows, one being a refrigerant flow and other being a coolant flow. The bottle 10 comprises a housing 14 with an integrally formed connector 12. In one embodiment, the bottle 10 is a receiver drier. The housing 14 includes a tubular section 14A forming the bottle volume 16 and a closing section 14B for closing the bottle volume 16 (shown in Fig. 4). The tubular section 14A is coupled to the closing section 14B in such a manner that it is integrally engaged to the periphery of the tubular section 14A by means, for example, welding or brazing. Although a two section housing construction is described, one skilled in the art will appreciate that there are other viable designs for the housing 14.

[0018] The housing 14 is made of a material such as aluminum having lightweight and capable of being easily formed. The connector 12 is integrally formed on the closing section 14B of the housing 14 by means, for example, welding or brazing. The connector 12 further includes at least one threaded opening 18 (shown in Fig. 2) for a screw connection. In one embodiment, the connector 12 is shaped by means including, but not limited to, machining. Still referring to Fig. 1, in one embodiment, the heat exchanger is a condenser or any other heat exchanger. The plate heat exchanger 102 is connected to the bottle 10 by a tube 104.

[0019] Referring to Fig. 2 and Fig. 3, the connector 12 includes an inlet 12A and an outlet 12B. The inlet 12A and outlet 12B are fluidically connected to at least one channel disposed within the bottle volume 16 of the housing 14. The inlet 12A and the outlet 12B are formed on substantially on opposite sides of the connector 12. In one embodiment, the inlet 12A and the outlet 12B are formed on the same sides of the connector 12. In another embodiment, the inlet 12A and the outlet 12B are formed at a predefined distance from one another on any side

of the connector 12. In yet another embodiment, the inlet 12A and outlet 12B are formed on a same side of a plane of the connector 12. The inlet 12A of the connector 12 is directly connected to a refrigerant outlet of the plate heat exchanger 102. The outlet 12B of the connector 12 is configured as an outlet of the heat exchanger assembly 100.

[0020] Referring to Fig. 4, the inlet 12A and the outlet 12B extends from the exterior walls of the connector 12 and opens into the bottle volume 16 of the housing 14. In one embodiment, the inlet 12A is coaxial to the outlet 12B. Referring to Fig. 1, the bottle 10 is arranged so that its general axis of extension is parallel to the general axis of extension of the plate heat exchanger 102. The inlet 12A of the connector 12 is configured to fluidically couple with the tube 104 to be connected to the plate heat exchanger 102 and the outlet 12B is configured to fluidically couple with a tube member to be connected to an expansion valve. In one embodiment, the inlet 12A is directly attached to a terminal plate of the plate heat exchanger 102.

[0021] In one embodiment, the inlet 12A is arranged parallel to the stacking direction of the plate heat exchanger 102. In another embodiment, the outlet 12B is arranged parallel to the stacking direction of the heat plate exchanger. During operation of the heat exchanger assembly 100, the refrigerant from the plate heat exchanger 102 is introduced through the inlet 12A formed in the connector 12 and is passed through a desiccant portion disposed at an intermediate position of the housing 14 (not shown in Fig). Then, the refrigerant in the form of liquid is stored at the bottom of the tubular section 14A of the housing 14. The stored liquid refrigerant is arranged to flow out through the outlet 12B formed in the connector 12.

[0022] Advantageously, the present invention provides a simple and relatively low cost solution to mitigate spacing constraints and reduce number of components required for installation of the bottle. In addition, the present invention decreases bill of materials cost, reduces the time required for production, and simplifies the process of production.

[0023] All the above-described embodiments are just to explain the present invention while more embodiments and combinations thereof might exist. Hence, the present invention should not be limited to the above-described embodiments alone.

Claims

1. A heat exchanger assembly (100) comprising a plate heat exchanger (102) and a bottle (10) with a connector (12), wherein the connector (12) comprises an inlet (12A) directly connected to the heat exchanger (102) and configured for supplying the heat exchange medium to the bottle (10) and an outlet (12B) configured as an outlet of the heat exchanger

assembly (100), **characterized in that** the bottle (10) comprises a tubular section (14A) forming the bottle volume (16) and a closing section (14B) for closing the bottle volume (16), wherein the connector (12) is integral with the closing section (14B).

2. The heat exchanger assembly (100) according to claim 1, wherein the tubular section (14A) and the closing section (14B) are connected to each other by means of welding or brazing. 10
3. The heat exchanger assembly (100) according to any preceding claim, wherein the inlet (12A) and the outlet (12B) are fluidically connected to at least one channel formed within the bottle (10). 15
4. The heat exchanger assembly (100) as claimed in any of the preceding claims, wherein the inlet (12A) and the outlet (12B) are formed on the opposite sides of the connector (12). 20
5. The heat exchanger assembly (100) according to any of claims 1-3, wherein the inlet (12A) and the outlet (12B) are formed on a same side of a plane of the connector (12). 25
6. The heat exchanger assembly (100) according to any preceding claim, wherein the connector (12) comprises at least one threaded opening (18) for a screw connection. 30
7. The heat exchanger assembly (100) according to any preceding claim, wherein the connector (12) is shaped by means of machining. 35
8. The heat exchanger assembly (100) according to any preceding claim, wherein the bottle (10) is arranged so that its general axis of extension is parallel to the general axis of extension of the plate heat exchanger (102). 40
9. The heat exchanger assembly (100) according to any preceding claim, wherein the inlet (12A) and the outlet (12B) are co-axial. 45
10. The heat exchanger assembly (100) according to any preceding claim, wherein the inlet (12A) is arranged parallel to the stacking direction of the plate heat exchanger (102). 50
11. The heat exchanger assembly (100) according to any preceding claim, wherein the outlet (12B) is arranged in parallel to the stacking direction of the plate heat exchanger (102). 55
12. The heat exchanger assembly (100) according to any preceding claim, wherein the bottle (10) is connected to the plate heat exchanger (102) by means

of a tube (104).

13. The heat exchanger assembly (100) according to any of claims 1-11, wherein the inlet (12A) of the bottle (10) is directly attached to a terminal plate of the plate heat exchanger (102).

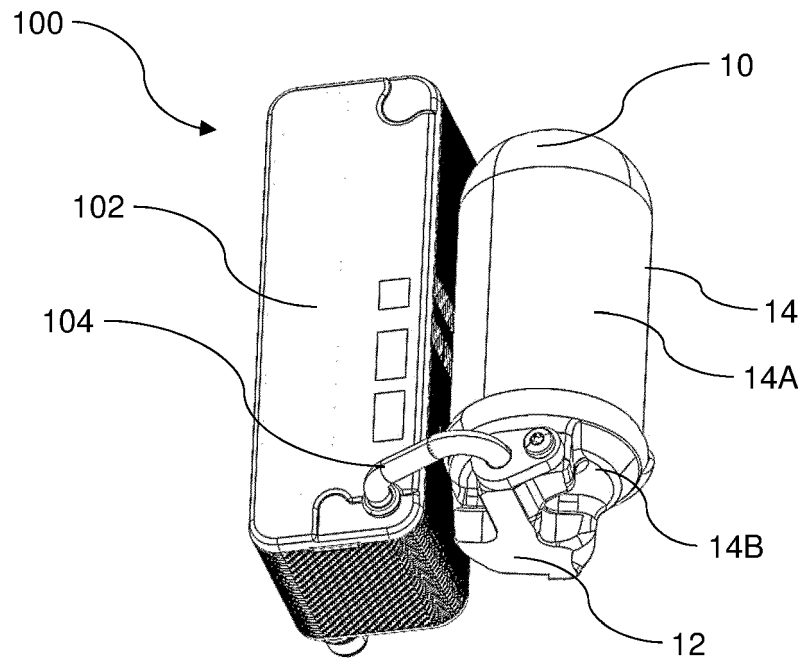


FIG. 1

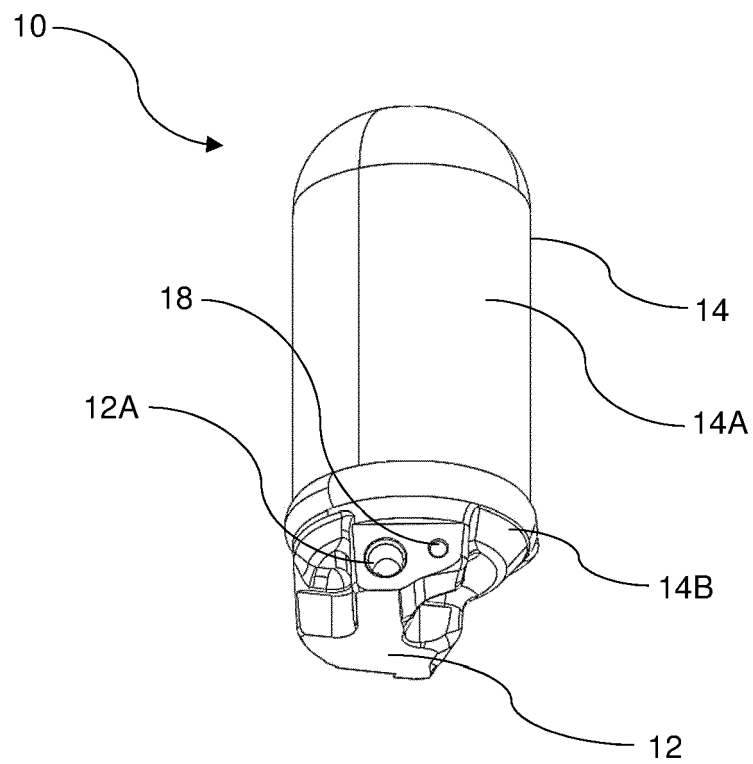


FIG. 2

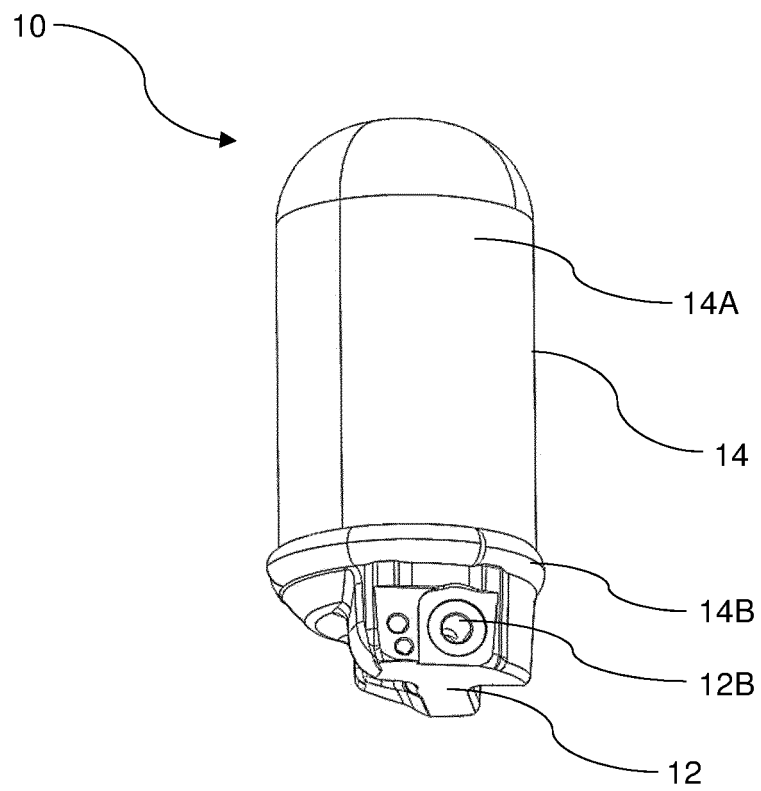


FIG. 3

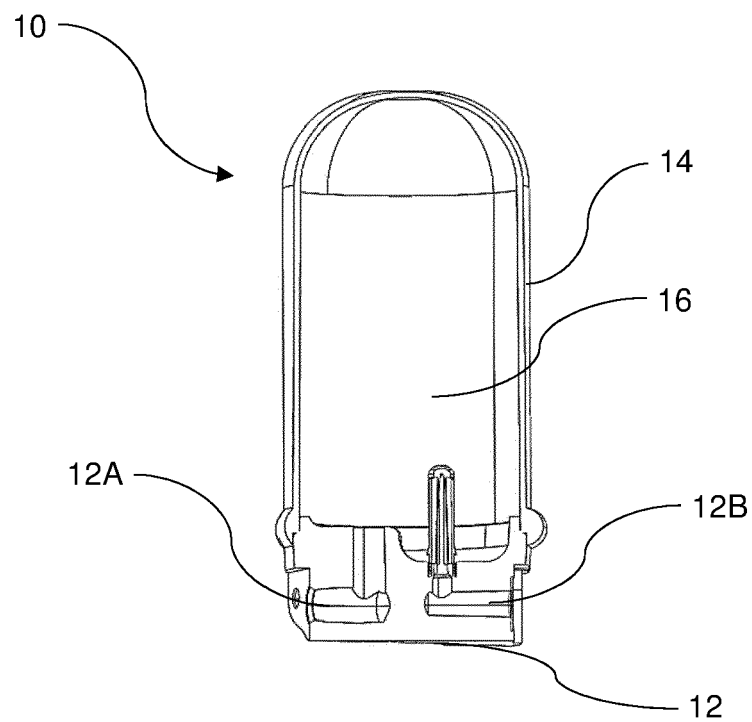


FIG. 4



EUROPEAN SEARCH REPORT

 Application Number
 EP 20 46 1590

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			TECHNICAL FIELDS SEARCHED (IPC)
			F25B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 10 May 2021	Examiner Lucic, Anita
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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