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(54) A HEAT EXCHANGE ASSEMBLY

(57) A heat exchanger assembly (200) includes a first and a second heat exchanger (10a) and (10b), a bottle (50) and a connection system (100) configured to provide a fluidal communication between the first and the second heat exchanger (10a) and (10b). The connection system (100) includes a connection block (20) with a first and a second opening (22a) and (22b). The first opening (22a) receives fluid from the first heat exchanger (10a) and the second opening (22b) delivers fluid to the second heat exchanger (10b). The connection block (20) includes an intermediate portion (20c) that includes a delivery plug (30a) for fluid communication between the first opening (22a) and the bottle (50) and a collection plug (30b) for fluid communication between the bottle (50) and the second opening (22b), so that the fluidal communication between the first opening (22a) and the second opening (22b) is provided via the bottle (50).

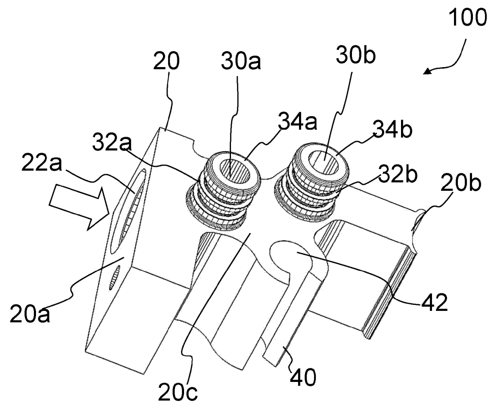

FIG. 7

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Description

[0001] The present disclosure relates to a heat exchanger assembly. In particular, the invention refers to a heat exchanger assembly for a motor vehicle.

[0002] Conventional air conditioning system includes a condenser, an evaporator, an expansion device, a compressor and a heater. The conventional condenser generally includes a condenser section and a sub-cooling section, particular a single heat exchanger includes the condenser section and the sub-cooling section.

[0003] The conventional air conditioning system also includes a receiver drier that may be disposed between a condenser and an expansion valve in the air conditioning loop. The receiver drier is disposed along an outlet side of the condenser, particularly, along a length of an outlet collector of a pair of manifolds of the condenser. The receiver drier includes a tubular casing or bottle in the form of an airtight container with an inlet and an outlet. The inlet of the receiver drier receives liquid refrigerant along with some uncondensed refrigerant, debris and incompressible moisture, if any, from a first pass defining the condensing section of the condenser via a first portion of the outlet manifold. The outlet of the receiver drier bottle delivers the condensed liquid refrigerant from which incompressible moisture and debris is removed, to a second pass defining the sub-cooling section of the condenser via a second section of the outlet manifold. However, there are various drawbacks associated with a condenser of such conventional configuration. Particularly, the conventional condenser with condensing and sub-cooling section configured therein and the receiver drier disposed along the manifold is bulky. The conventional condenser with condensing and sub-cooling section configured therein and the receiver drier disposed along the manifold faces packaging issues due to limited space in a front of the vehicle, the packaging issue is further aggravated in case the vehicle is an electric vehicle, in which the front portion of the electric vehicle is utilized as utility such as for example, a cargo-space or in case the condenser includes two separate cores disposed in a co-planar, non-overlapping configuration to achieve better heat exchange.

[0004] To overcome the packaging issues, a heat exchanger assembly 1 configured by assembling separate heat exchangers, for example: a first heat exchanger, particularly, a condenser 2, and a second heat exchanger, particularly, a sub-cooler 4, is already known. The condenser 2 and the sub-cooler 4 can be arranged in overlapping configuration or side by side as depicted in Fig. 1. Further, a receiver drier 6 is disposed parallel with respect to the heat exchange tubes of the first heat exchanger acting as the condenser 2 and the second heat exchanger acting as the sub cooler 4 and configures fluid communication between the condenser 2 and the sub cooler 4. The refrigerant enters a first inlet manifold 2a via a first inlet 3a and is distributed to the heat exchange tubes of the condenser 2 by the first inlet manifold 2a. The refrigerant after passing through the heat exchange tubes of the condenser 2 is condensed refrigerant that is collected in a first outlet manifold 2b, the condensed refrigerant also includes some uncondensed refrigerant, debris and incompressible moisture, if any. The condensed refrigerant along with the uncondensed refrigerant, debris and incompressible moisture collected in the first outlet manifold 2b is delivered from the first outlet manifold 2b to an inlet 6a of the receiver drier 6 by a first outlet 3b and through the fluid line 7a. The debris and the moisture in the condensed refrigerant is removed by a filter and a desiccant bag respectively held in the receiver drier. The condensed refrigerant with moisture and debris removed there form by the receiver drier 6 egresses from the receiver drier 6 through receiver drier outlet 6b and is delivered to a second inlet manifold 4a of the second heat exchanger 4 via a second inlet 5a and fluid line 7b. The second inlet manifold 4a distributes the condensed refrigerant to the heat exchange tubes of the second heat exchanger 4 for sub-cooling thereof and the subcooled refrigerant collected by a second outlet manifold 4b egresses the second outlet manifold 4b through the second outlet 5b.

[0005] However, such an arrangement of separate heat exchangers 2 and 4 for condensing and sub-cooling of the refrigerant and interconnected by the receiver drier 6 involves problems / drawbacks. More specifically, the fluid line 7a is required for forming fluid communication between the first outlet 3b to the first outlet manifold 2b and the inlet 6a to the receiver drier 6. Similarly, fluid line 7b is required for forming fluid communication between the outlet 6b of the receiver drier 6 and the second inlet 5a to the second inlet manifold 4a. The fluid lines 7a and 7b cause pressure drop due to fluid flow losses, accordingly, the efficiency and performance of the receiver drier 6 and the sub-cooler 4 is reduced. Further, use of the fluid lines 7a and 7b for configuring fluid communication between the first outlet manifold 2b for the first heat exchanger 2, the receiver drier 6 and the second inlet manifold 4a for the second heat exchanger 4 is complex and the heat exchanger assembly 10 is difficult to assemble and requires more assembly time. Further, the conventional heat exchanger assembly configured with the fluid lines 7a and 7b is bulky and involves packaging issues, Furthermore, the fluid lines 7a and 7b may interfere with operation of adjacent elements. Still further, the conventional heat exchanger assembly requires separate dedicated mounting arrangement for stably mounting the receiver drier. Furthermore, the conventional heat exchanger assembly configured with the fluid lines 7a and 7b involves more connections, more elements, particularly, more connecting elements, accordingly, the heat exchanger assembly is less reliable and involves more maintenance and maintenance costs.

[0006] Accordingly, there is a need for a heat exchanger assembly that not only configures fluid communication between a first outlet manifold for a first heat exchanger, a receiver drier and a second inlet manifold for a second heat exchanger, but also provides stable mounting arrangement for the receiver drier. Further, there is a need of a heat exchanger assembly that is compact to addresses packing issues and that is simple and convenient to assemble. Further, there is a need for a heat exchanger assembly that involves fewer components and connections, accordingly is comparatively more reliable and requires less maintenance than conventional heat exchanger assembly involving fluid lines.

[0007] An object of the present invention is to provide a heat exchanger assembly with a connection system that obviates the drawbacks associated conventional heat exchanger assembly that require fluid lines/ fluid conduits for connection between a first and second heat exchanger through a receiver drier.

[0008] Another object of the present invention is to provide a heat exchanger assembly with a connection system that is compact and accordingly addresses packing issues.

[0009] Yet another object of the present invention is to provide a heat exchanger assembly with a connection system that involves fewer components and connections, accordingly, is comparatively more reliable and requires less maintenance than conventional heat exchanger assembly involving fluid lines.

[0010] Still another object of the present invention is to provide a heat exchanger assembly with a connection system that not only configures fluid communication between a first and second heat exchanger through a receiver drier, but also provides stable mounting arrangement for the receiver drier.

[0011] Yet another object of the present invention is to provide a heat exchanger assembly with a connection system that improves efficiency and performance of at least one heat exchanger and receiver drier by preventing pressure losses and fluid flow losses.

[0012] Yet another object of the present invention is to provide a heat exchanger assembly with a connection system that is simple in construction.

[0013] Still another of the present invention is to provide a heat exchanger assembly with a connection system that is convenient to assembly and requires comparatively less assembly time than the conventional heat exchanger assembly that requires fluid lines for connection between the heat exchangers and the receiver drier.

[0014] Another object of the present invention is to provide a heat exchanger assembly with a connection system that requires fewer connections and components and as such is comparatively more reliable and requires less maintenance compared to conventional heat exchanger systems that require fluid lines for connection between the heat exchangers and the receiver drier.

[0015] Still another object of the present invention is to provide a heat exchanger assembly that provides a neat aesthetic appeal by eliminating the fluid lines/ conduits for connection between the heat exchangers and the receiver drier.

[0016] 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.

[0017] A heat exchanger assembly, hereinafter referred to as "assembly" is disclosed in accordance with an embodiment of the present disclosure. The assembly includes at least one first heat exchanger and at least one second heat exchanger, a bottle and a connection system configured to provide a fluidal communication between the first heat exchanger and the second heat exchanger. The connection system includes a connection block with a first opening and a second opening. The first opening receives fluid from the first heat exchanger, whereas the second opening delivers fluid to the second heat exchanger. The connection block further includes an intermediate portion. The intermediate portion is located between the first opening and the second opening and includes a delivery plug and a collection plug. The delivery plug forms fluid communication between the first opening and the bottle and the collection plug forms fluid communication between the bottle and the second opening, so that the fluidal communication between the first opening and the second opening is provided via the bottle.

[0018] Further, the connection block includes a mounting arrangement to mount the bottle on the connection block.

[0019] Specifically, the mounting arrangement includes an essentially C-shaped portion configured to facilitate fixing of the bottle to the connection block.

[0020] Generally, the connection block includes a first portion and a second portion. The first portion is formed with the first opening to receive fluid from the first heat exchanger. The second portion is formed with the second opening to deliver fluid to the second heat exchanger. The first and the second portions are made of one piece.

[0021] Preferably, the first portion, the second portion and the intermediate portion are integrally formed with respect to each other, the first portion and the second portion are orthogonal to each other.

[0022] Generally, at least one of the delivery plug and the collection plug includes at least one rib formed thereon, The rib in conjunction with at least one of the lateral walls radially extending from the respective plug and another adjacent rib configures channels for receiving sealing elements therein to configure sealing connection between the bottle and the connection block.

[0023] In accordance with an embodiment of the present invention, the mounting arrangement includes at least one hole formed on the connection block and a bolt. The hole is aligned with a corresponding hole on the bottle and the bolt pass through the aligned holes configured on the connection block and the bottle to mount the bottle on the connection block.

[0024] Specifically, the first heat exchanger is a condenser, the second heat exchanger is a sub-cooler and the bottle is a receiver drier bottle disposed between the condenser and the sub-cooler.

[0025] Generally, the connection block is of aluminum material.

[0026] Specifically, the connection block is brazed to the to the second inlet manifold.

[0027] 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 schematic representation of a conventional heat exchanger assembly, wherein fluid lines configure fluid communication between a receiver drier and a first and a second heat exchanger;

Fig. 2 illustrates an isometric view of a heat exchanger assembly with a connection system in accordance with the present invention to configure fluid communication between a receiver drier and a first and a second heat exchanger;

Fig. 3 illustrates another isometric view of the heat exchanger assembly of **Fig. 2;**

Fig. 4 illustrates an exploded view of the heat exchanger assembly of **Fig. 2** and **Fig. 3;**

Fig. 5 illustrates another isometric view of the heat exchanger assembly without the receiver drier for better depiction of the connection system;

Fig. 6 illustrates another isometric view of the heat exchanger assembly of **Fig. 5;**

Fig. 7 illustrates an isometric view of the connection system of **Fig. 2;**

Fig. 8 illustrates another isometric view of the connection system of **Fig. 7;** and

Fig. 9 illustrates an isometric view of the receiver drier bottle.

[0028] 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.

[0029] Although, the present invention discloses a heat exchanger assembly configured with a connection system that configures fluid communication between a receiver drier and pair heat exchangers in a vehicular environment, with the receiver drier disposed between the heat exchangers, the connection system also provides stable mounting arrangement for the receiver drier. However, the present invention is not limited to a heat exchanger assembly and the connection system can also configure fluid communication between two or more fluid processing elements, wherein one fluid processing element is required to be disposed between and in fluid communication with other two fluid processing elements used in vehicular or non-vehicular environment to eliminate conventional fluid lines.

[0030] **Fig. 2** illustrates an isometric view of a heat exchanger assembly 200, herein after referred to "assembly" 200, comprising a connection system 100 in accordance with an embodiment of the present invention. **Fig. 3** illustrates another isometric view of the heat exchanger assembly 200. **Fig. 4** illustrates an exploded view of the heat exchanger assembly 200. The assembly 200 includes at least one first heat exchanger 10a and at least one, second heat exchanger 10b, a receiver drier bottle 50, also simply referred to as "bottle" and a connection system 100 configured to provide a fluidal communication between the first heat exchanger 10a and the second heat exchanger 10b via the bottle 50.

[0031] In one example, the first heat exchanger is a condenser 10a. The condenser 10a includes a first pair of manifolds 12a and 14a, particularly, a first inlet manifold 12a and a first outlet manifold 14a in fluid communication with each other through a plurality of heat exchange tubes 16a disposed between and in fluid communication with the first inlet and outlet manifolds 12a and 14a respectively. The condenser 10a further includes first mounting brackets 13a for mounting the condenser 10a on a vehicle frame. The first mounting brackets 13a formed on the first inlet and outlet manifolds 12a and 14a respectively on opposite sides of the condenser 10a are configured to mount the condenser 10a to the vehicle frame. The first inlet manifold 12a distributes vapor refrigerant received therein to the heat exchange tubes 16a. The vapor refrigerant condenses to liquid refrigerant as the vapor refrigerant flows from the first inlet manifold 12a to the first outlet manifold 14a through the heat exchange tubes 16a by rejecting heat to outside air. The condensed liquid refrigerant reaching the first outlet manifold 14a also includes some un-condensed refrigerant, debris and moisture if any. The debris and moisture, if not removed, can damage other elements disposed downstream of the condenser 10a in the air conditioning loop of which the condenser 10a is a part of. The condensed liquid refrigerant along with uncondensed refrigerant, debris and moisture, if any, is passed through the bottle 50 for removal of the debris and moisture. More specifically, the debris and the moisture is removed by a filter and a desiccant bag respectively held inside the bottle 50, as the condensed liquid refrigerant along with uncondensed refrigerant, debris and moisture passes through the bottle 50.

[0032] In accordance with an embodiment of the present invention, the bottle 50 includes an inlet 51a and an outlet 51b formed on a same side thereof as illustrated in Fig. 9. The inlet of the bottle 50 receives condensed liquid refrigerant along with some uncondensed refrigerant, debris and incompressible moisture, if any, from a first outlet 18 formed on the first outlet manifold 14a through a jumper line 19 and at least a section of the connector system 100. The outlet of the bottle 50 delivers the condensed liquid refrigerant after removal of debris and incompressible moisture therefrom by the filter and the desiccant bag respectively held inside the bottle 50 to the second heat exchanger 10b, particularly, to the sub cooler 10b through at least a portion of the connection system 100. Fig. 4 is an exploded view of the heat exchanger assembly depicting the various elements of the heat exchanger assembly 200 and the connection system 100 for configuring the fluid communication between the condenser 10a and the sub cooler 10b. A first connection element 15a may form connection between a first outlet 18a on the first outlet manifold 14a and a first end 19a of the jumper line 19. The second end 19b of the jumper line 19 may be connected to a second connection element 15b that configures connection and fluid communication between the jumper line 19 and a first opening 22a of the connection system 100.

[0033] **Fig. 5** illustrates another isometric view of the heat exchanger assembly 200 without the bottle 50 for better depiction of the connection system 100. **Fig. 6** illustrates another isometric view of the heat exchanger assembly 100.

[0034] Referring to the Figs. 5a and 5b, the connection system 100 comprises a connection block 20 with the first opening 22a and a second opening 22b. The first opening 22a receives fluid, for example, condensed refrigerant along with uncondensed refrigerant, debris and moisture from the condenser 10a via the jumper line 19. The second opening 22b delivers fluid, particularly condensed refrigerant after removal of debris and moisture therefrom in the bottle 50 to the second heat exchanger 10b, particularly, the sub cooler 10b via the connection system 100. More specifically, the connection block 20 may comprise an intermediate portion 20c located between the first opening 22a and the second opening 22b. The intermediate portion 20c may comprise a delivery plug 30a and a collection plug 30b. The delivery plug 30a may form fluid communication between the first opening 22a and the bottle 50 and the collection plug 30b may form fluid communication between the bottle 50 and the second opening 22b, so that the fluidal communication between the first opening 22a and the second opening 22b is provided via the bottle 50.

[0035] The condensed refrigerant after removal of moisture and debris therefrom by the desiccant bag and the filter respectively disposed in the bottle 50 egresses the bottle 50 and is delivered to a second inlet manifold 12b of the second heat exchanger 10b via at least a portion of the connection system 100 through a second inlet 18b. The second inlet manifold 12b may be configured to distribute the condensed refrigerant almost free of debris and moisture to the heat exchange tubes 16b of the second heat exchanger 10b, particularly, the sub-cooler 10b, for sub-cooling thereof and the subcooled refrigerant collected by a second outlet manifold 14b. The sub-cooled refrigerant egresses the second outlet manifold 14b through the second outlet. The sub-cooler 10b may further comprise second mounting brackets 13b for mounting the sub-cooler 10b on a vehicle frame. The second mounting brackets 13b may be formed on the second inlet and outlet manifolds 12b and 14b respectively on opposite sides of the sub-cooler 10b to provide mounting for the sub-cooler 10b to the vehicle frame.

[0036] Again referring to Figs. 7 and 8 of the accompanying drawing, the connection block 20 may comprise a first portion 20a, a second portion 20b and an intermediate portion 20c.

[0037] The first portion 20a may be formed with the first opening 22a to receive fluid, particularly, condensed refrigerant from the condenser 10a via the jumper line 19. The condensed refrigerant received by the first opening 22a includes debris, moisture and some uncondensed refrigerant, if any. Particularly, the second end 19b of the jumper line 19 connected to the first opening 22a via the second connecting element 15b configures fluid communication between the condenser 10a and the connection system 100. The delivery plug 30a formed on the intermediate portion 20c forms fluid communication between the first opening 22a and the bottle 50. The collection plug 30b formed on the intermediate portion 20c forms fluid communication between the bottle 50 and the second opening 22b. With such configuration, fluid communication between the first opening 22a and the second opening 22b via the bottle 50 is provided. The delivery plug 30a and the collection plug 30b may be configured to provide an air air-tight or sealing connection with the bottle 50. More specifically, the delivery plug 30a may comprise at least one first rib 32a formed thereon. The first rib 32a in conjunction with at least one of first lateral walls 34a radially extending from the delivery plug 30a and another adjacent first rib 32a configures first channels 36a for receiving first sealing elements therein to configure sealing connection between the bottle 50 and the connection block 20. Similarly, the collection plug 30b may comprise at least one second rib 32b formed thereon. The second rib 32b in conjunction with at least one of second lateral walls 34b radially extending from the collection plug 30b and another adjacent second rib 32b configures second channels 36b for receiving second sealing elements therein to configure sealing connection between the bottle 50 and the connection block 20. The first and/or second sealing elements may be provided as deformable O-ring configured to seals the gap between inlet 51a and outlet 51b of the bottle 50 and the respective plug 30a, 30b.

[0038] The second portion 20b may comprise the second opening 22b to deliver fluid, particularly, condensed refrigerant received from the bottle 50 through the collection plug 30b and almost free of debris and moisture to the second heat exchanger, particularly, the sub-cooler 10b.

[0039] Preferably, the first portion 20a, the second portion 20b and the intermediate portion 20c of the connection system 100 may be integrally formed with respect to each other. More specifically, the first portion 20a, the second portion 20b and the intermediate portion 20c may be made of aluminum material and formed by single step molding process. The connection block 20 of aluminum material is brazed to the second inlet manifold 12b. Generally, the first portion 20a, the second portion 20b and the intermediate portion 20c are made of one piece. In another embodiment, the connection system 100 is of modular construction, wherein the first portion 20a, the second portion 20b and the intermediate portion 20c separate from each other and are assembled together to configure the connection system 100. In a preferred embodiment, the first portion 20a and the second portion 20b are orthogonal to each other. In another embodiment, the first portion 20a and the second portion 20b can be disposed at any angular orientation with respect to each other based on the packing constrains or to address packaging issues. However, the present invention is not limited to modular or integral construction of the connection system 100, the number, configuration and orientation of the first and the second portions, the number, placement and orientation of the first and second openings 22a and 22b, the number, configuration and orientation of the delivery plug 30a and the collection plug 30b as far as the connection system 100 is capable of configuring fluid communication between the condenser 10a and the sub-cooler 10b via the bottle 50,

[0040] The connection block 20 may further comprise a mounting arrangement 40 to mount the bottle 50 on the connection block 20. The mounting arrangement 40 comprises an essentially C-shaped portion configured to facilitate fixing of the bottle 50 to the connection block 20. The mounting arrangement 40 may comprise at least one hole 42 formed on the connection block 20 and a corresponding bolt 44. The hole 42 illustrated on Fig. 8 is aligned with a corresponding hole 52 on the bottle 50 illustrated in Fig. 9 and the bolt 44 pass through the aligned holes 42 and 52 configured on the connection block 20 and the bottle 50 to mount the bottle 50 on the connection block 20. However, the present invention is not limited to any particular configuration of securing the bottle 50 to the connection block 20. The mounting arrangement 40 further may comprise a mounting ring 17 secured to the second inlet manifold 12b by means of a bolt 17a, the mounting ring 17 circumscribes the bottle 50 and holds the bottle 50 against the second inlet manifold 12b. With such configuration, the connection block 20 not only configures fluid communication between the condenser 10a and the sub-cooler 10b via the bottle 50 but also provide stable mounting of the bottle 50 thereon.

[0041] The connection system 100 of such configuration eliminates the fluid lines that were required to configure fluid communication between the condenser 10a and the sub cooler 10b via the receiver drier bottle 50. Accordingly, the heat exchanger assembly 200 configured with the connection system 100 of the present invention eliminates the fluid lines and drawbacks such as fluid flow losses associated with the use of the fluid lines. Further, the heat exchanger assembly 200 configured with the connection system 100 of the present invention provides a neat aesthetic appeal by eliminating the fluid lines/ conduits for connection between the heat exchangers and the receiver drier.

[0042] The flow passages configured within the connection block, particularly, the flow passage formed between the first opening 22a and the delivery plug 30a and the collector plug 30b and the second opening 22b are short and do not involve abrupt change in flow direction and accordingly fluid flow losses are reduced to minimum.

[0043] In any case, the invention cannot and should not be limited to the embodiments specifically described in this document, as other embodiments might exist. The invention shall spread to any equivalent means and any technically operating combination of means.

Claims

1. A heat exchanger assembly (200) comprising :

at least one first heat exchanger (10a) and at least one second heat exchanger (10b), a bottle (50) and a connection system (100) configured to provide a fluidal communication between the first heat exchanger (10a) and the second heat exchanger (10b), wherein

the connection system (100) comprises a connection block (20) with a first opening (22a) and a second opening (22b), wherein the first opening (22a) is adapted to receive fluid from the first heat exchanger (10a), and the second opening (22b) is adapted to deliver fluid to the second heat exchanger (10b),

characterized in that the connection block (20) further comprises an intermediate portion (20c) located between the first opening (22a) and the second opening (22b) and comprising:

- a delivery plug (30a) forming fluid communication between the first opening (22a) and the bottle (50); and
- a collection plug (30b) forming fluid communication between the bottle (50) and the second opening (22b),

so that the fluidal communication between the first opening (22a) and the second opening (22b) is provided via the bottle (50).

2. The heat exchanger assembly (200) as claimed in the previous claim, wherein the connection block (20) further comprises a mounting arrangement (40) adapted to mount the bottle (50) on the connection block (20).

3. The heat exchanger assembly (200) according to claim 2, wherein the mounting arrangement (40) comprises an essentially C-shaped portion configured to facilitate fixing of the bottle (50) to the connection block (20).

4. The heat exchanger assembly (200) as claimed in the any of the preceding claims, wherein the connection block (20) comprises:

◦ a first portion (20a) formed with the first opening (22a) adapted to receive fluid from the first heat exchanger (10a); and
◦ a second portion (20b) formed with the second opening (22b) adapted to deliver fluid to the second heat exchanger (10b), wherein the first and the second portions are made of one piece.

5. The heat exchanger assembly (200) as claimed in the previous claim, wherein the first portion (20a), the second portion (20b) and the intermediate portion (20c) are integrally formed with respect to each other, the first portion (20a) and the second portion (20b) are orthogonal to each other.

6. The heat exchanger assembly (200) as claimed in any of the preceding claims, wherein at least one of the delivery plug (30a) and the collection plug (30b) comprises at least one rib (32a, 32b) formed thereon, the rib (32a, 32b) in conjunction with at least one of the lateral walls (34a, 34b) radially extending from the respective plug (30a, 30b) and another adjacent rib (32a, 32b) adapted to configure channels (36a, 36b) for receiving sealing elements therein to configure sealing connection between the bottle (50) and the connection block (20).

7. The heat exchanger assembly (200) as claimed in claim 2, wherein mounting arrangement (40) comprises at least one hole (42) formed on the connection block (20) and a bolt (44), the hole (42) is aligned with a corresponding hole (52) on the bottle (50) and the bolt (44) pass through the aligned holes (42) and (52) configured on the connection block (20) and the bottle (50) to mount the bottle (50) on the connection block (20).

8. The connection system (100) as claimed in any of the preceding claims, wherein the first heat exchanger is a condenser (10a), the second heat exchanger is a sub-cooler (10b) and the bottle (50) is a receiver drier bottle disposed between the condenser (10a) and the sub-cooler (10b).

9. The connection system (100) as claimed in any of the preceding claims, wherein the connection block (20) is of aluminum material.

10. The connection system (100) as claimed in any of the preceding claims, wherein the connection block (20) is brazed to the to the second inlet manifold 12b.

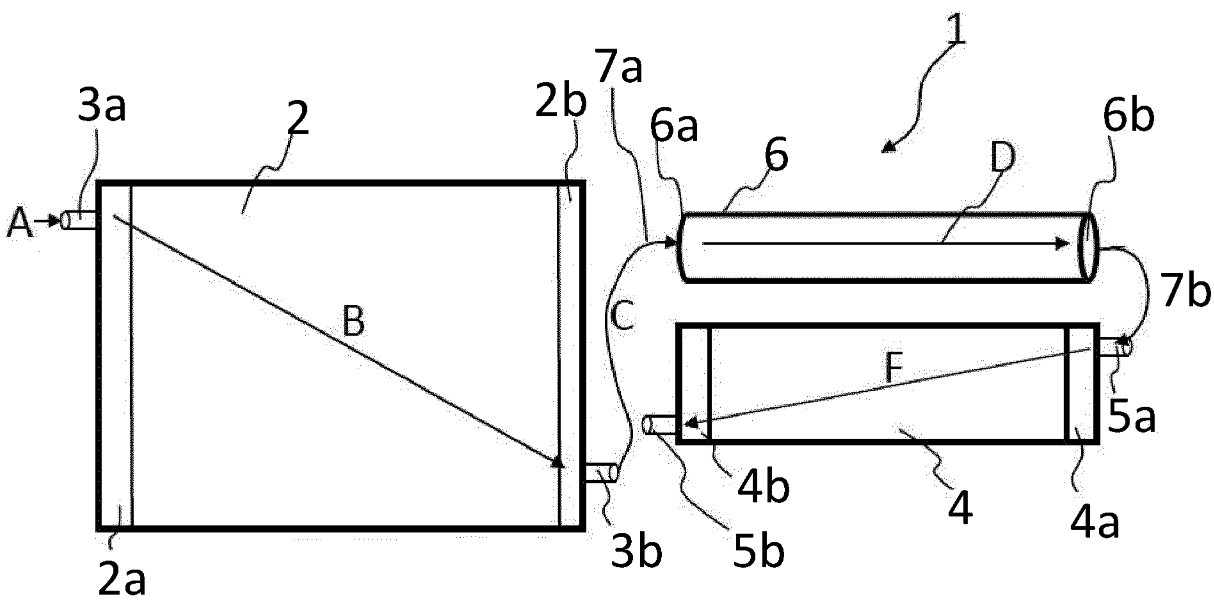

FIG. 1

(Prior art)

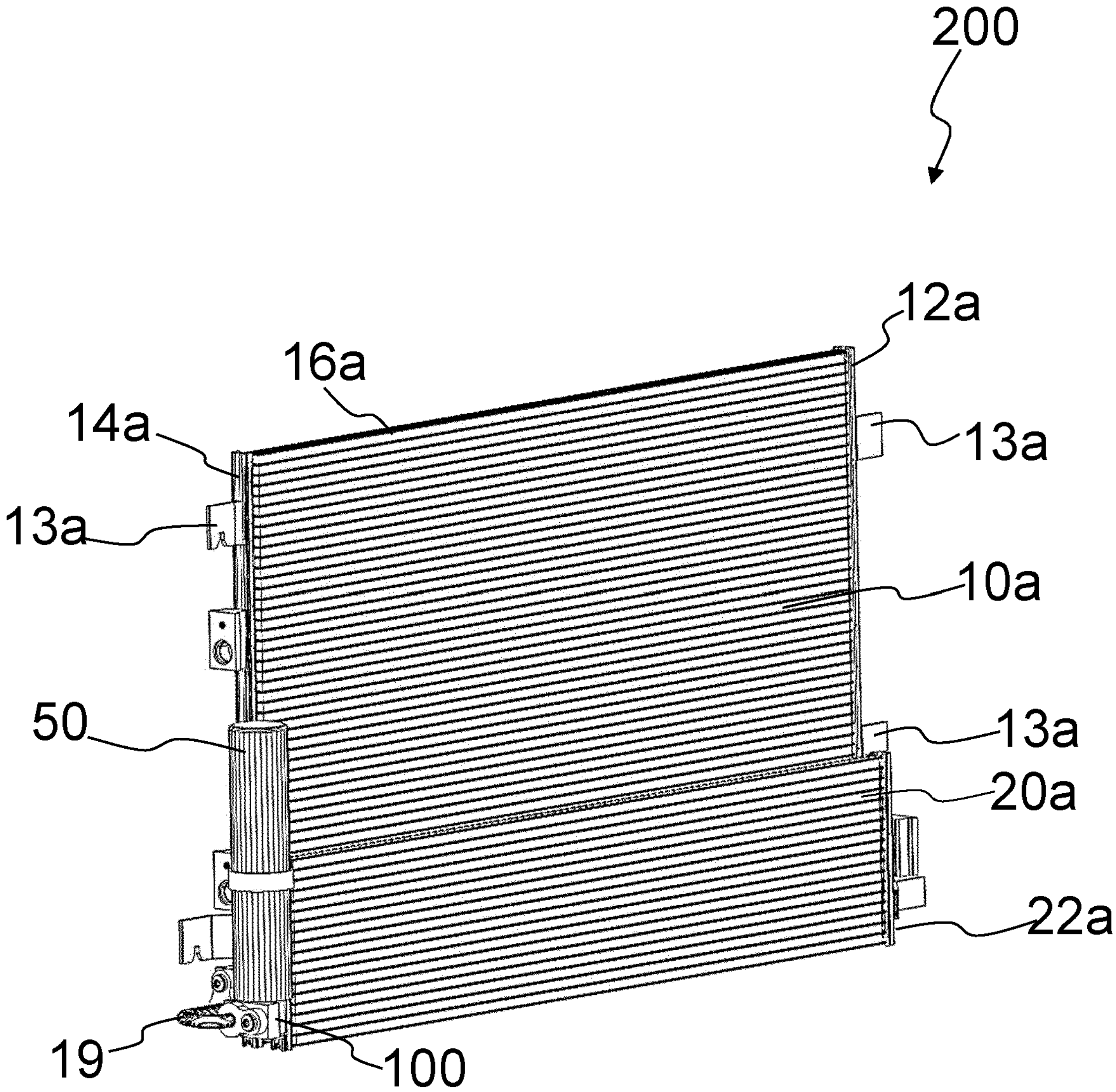

FIG. 2

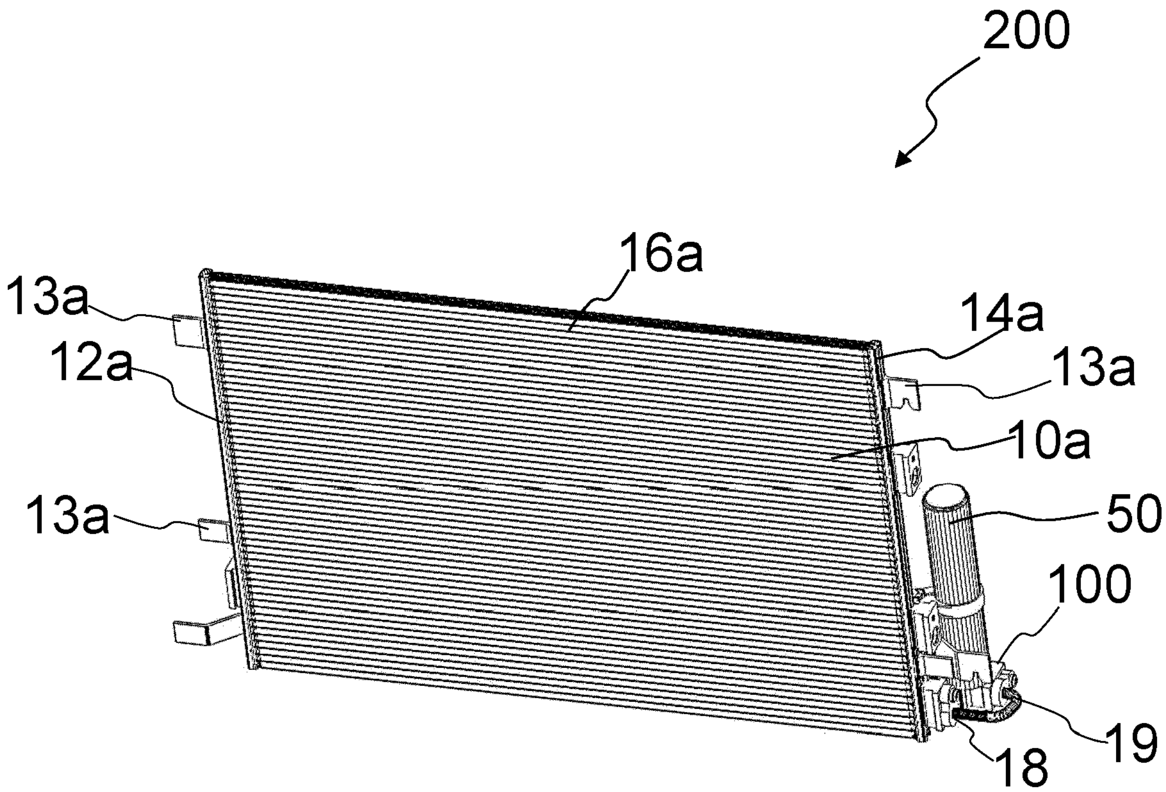

FIG. 3

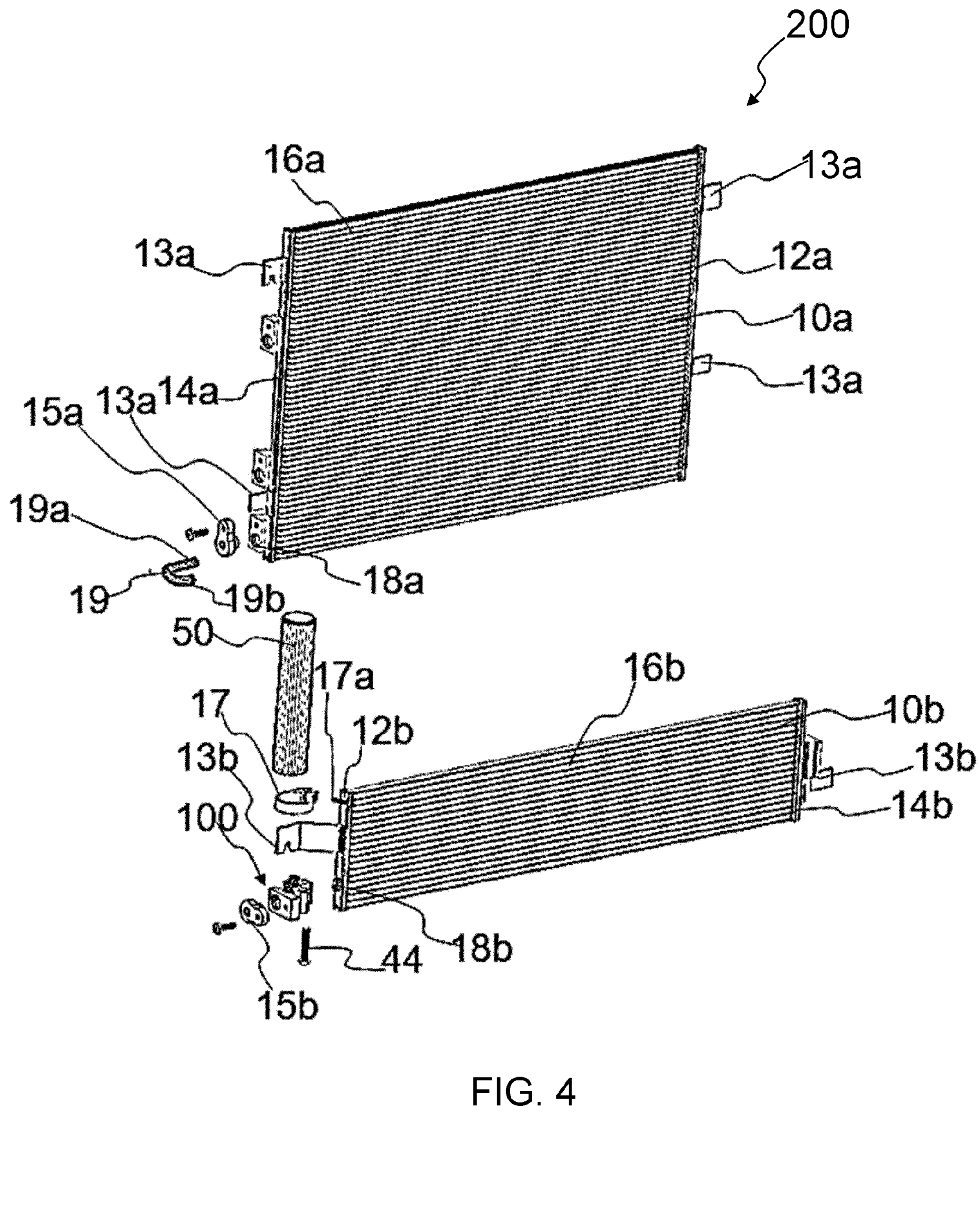
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FIG. 4

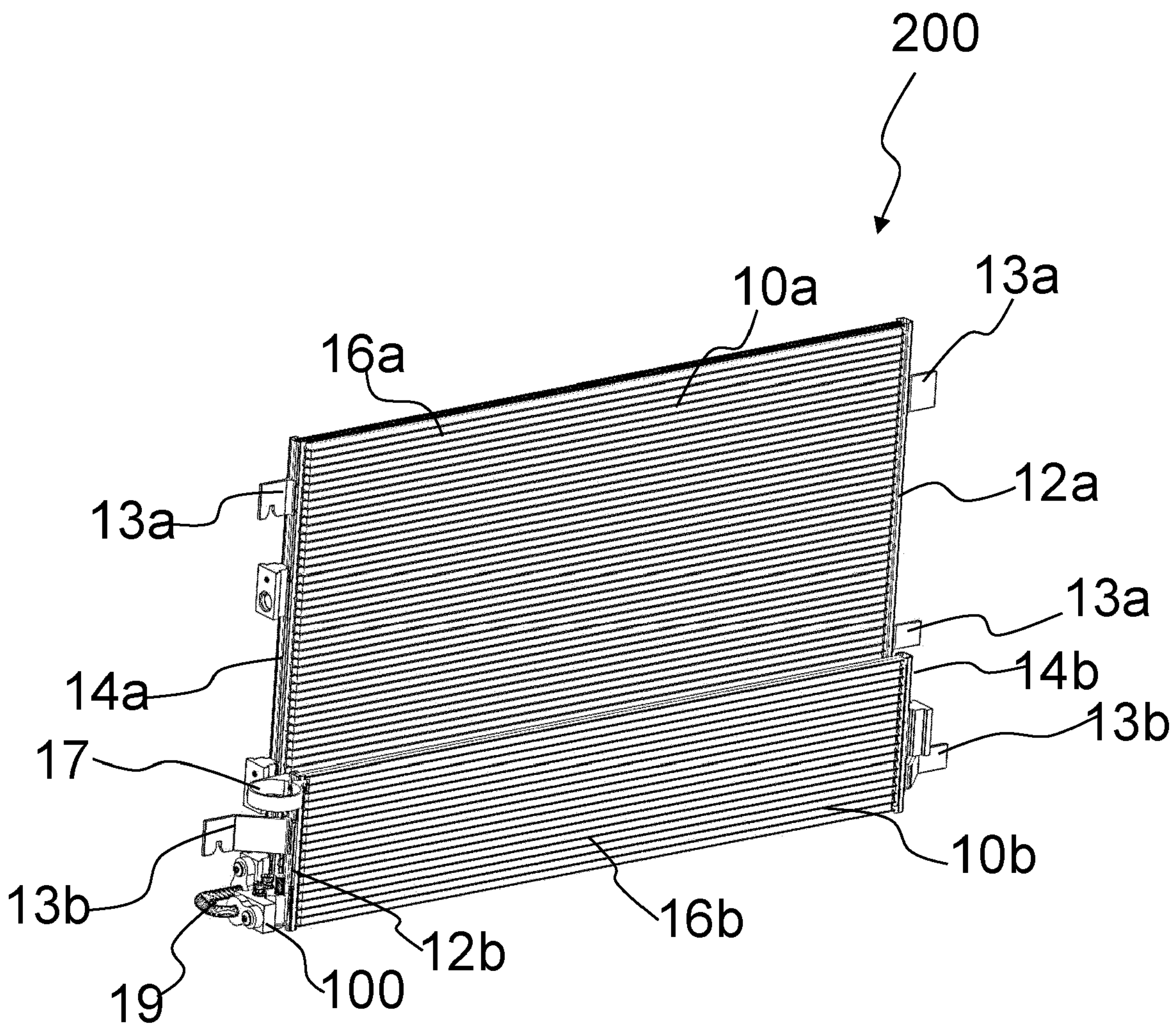

FIG. 5

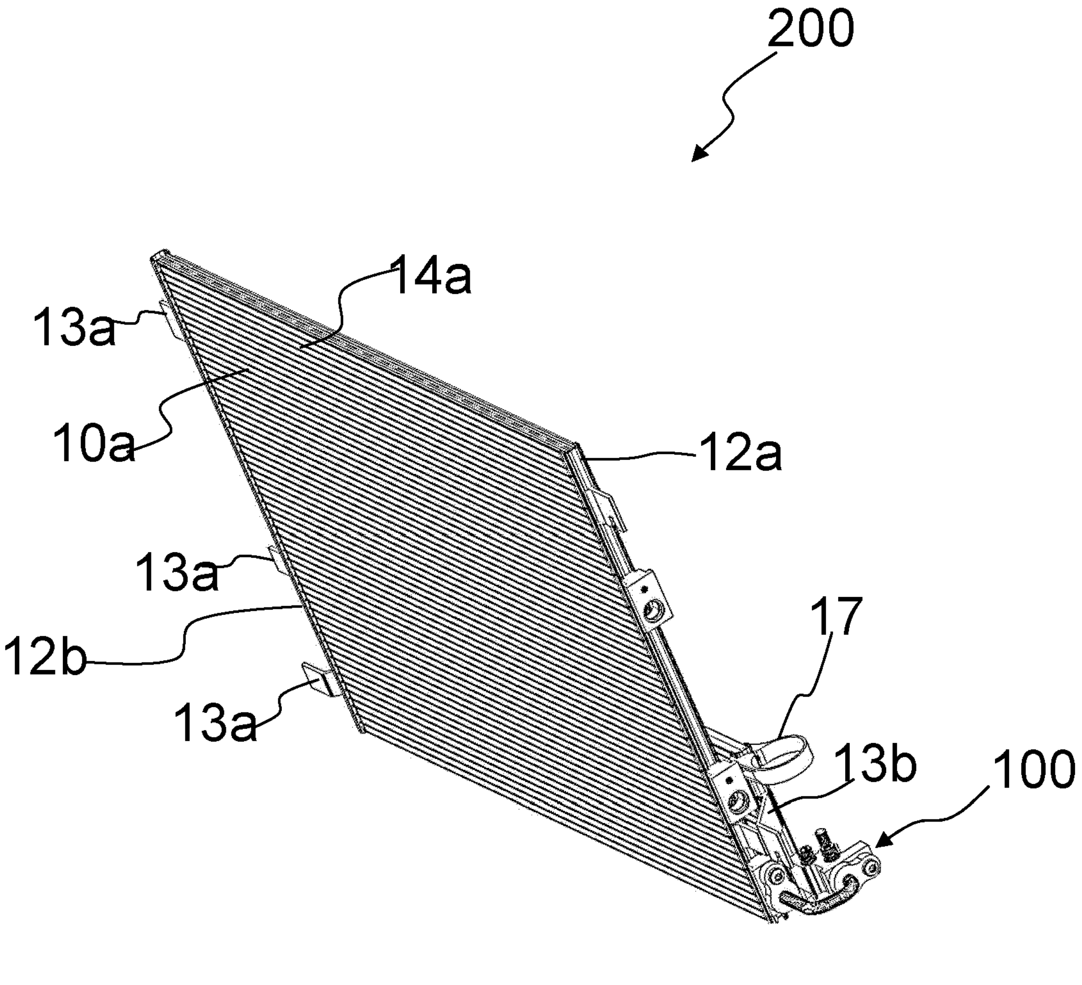

FIG. 6

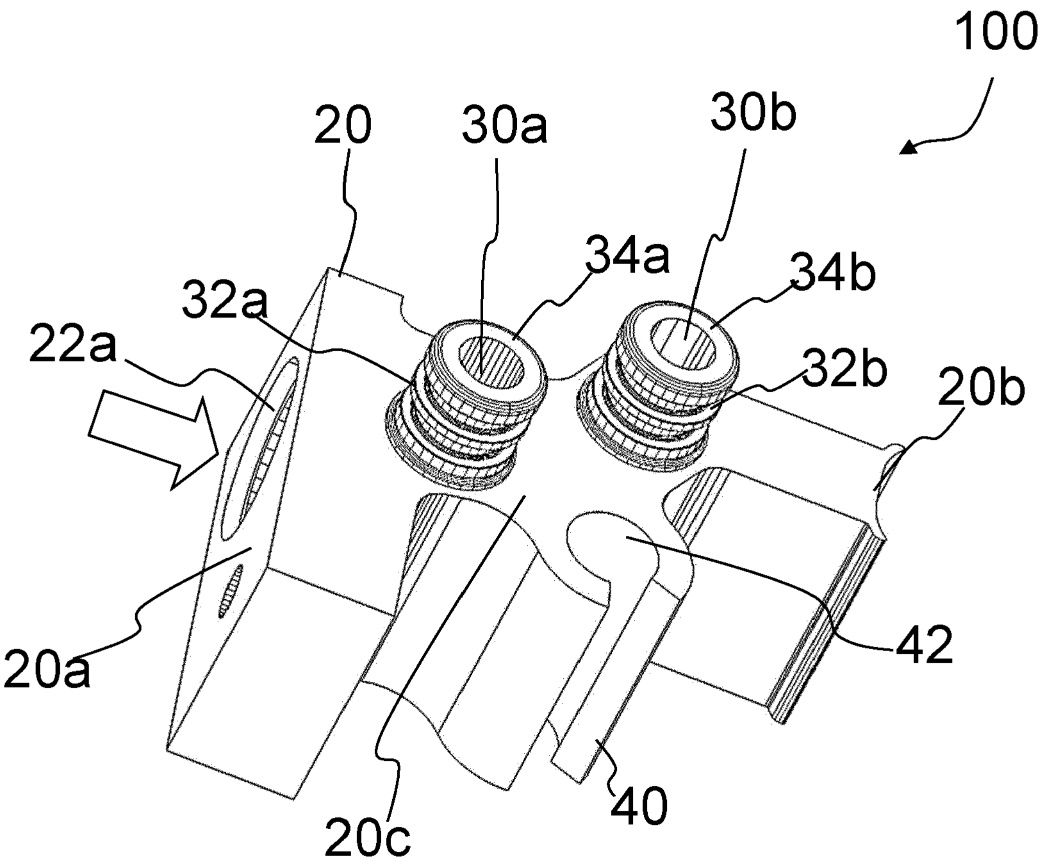

FIG. 7

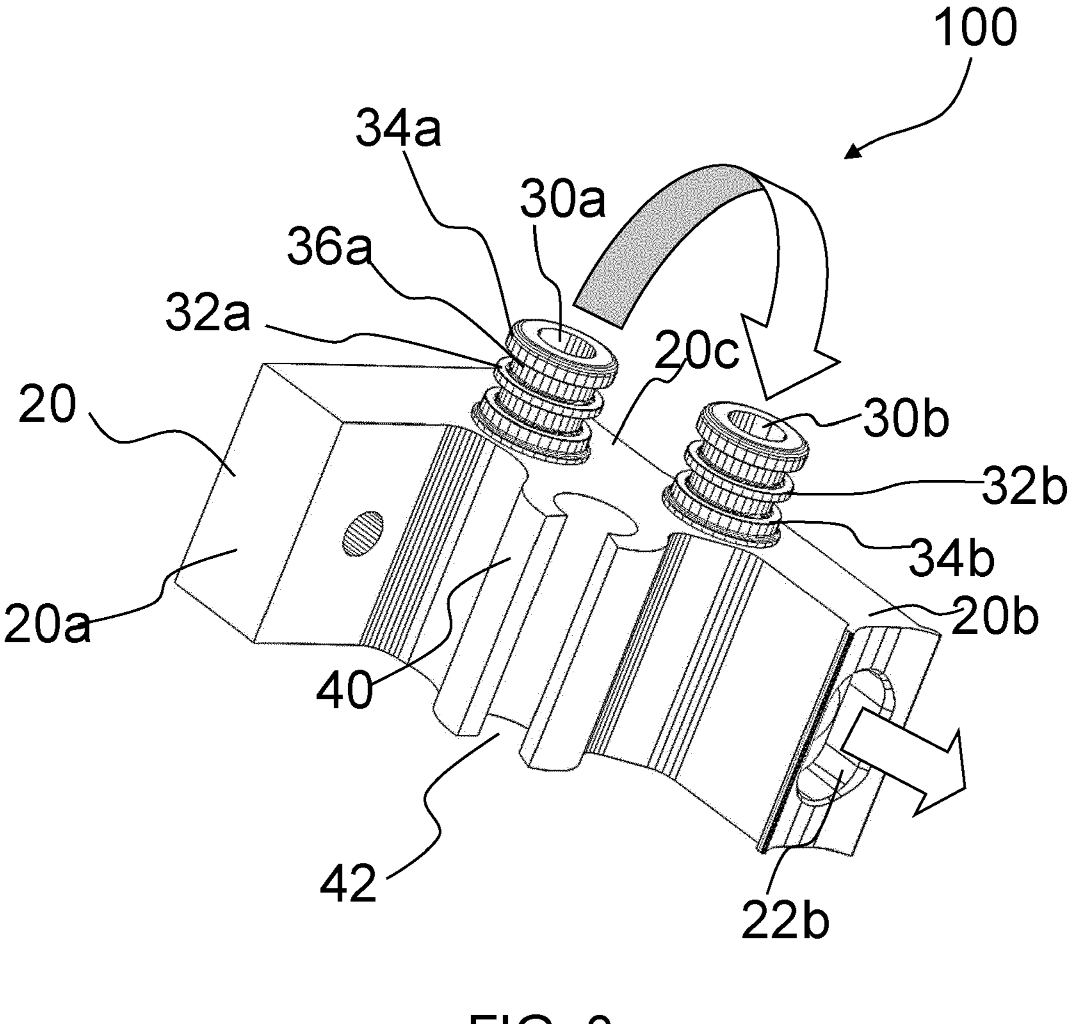

FIG. 8

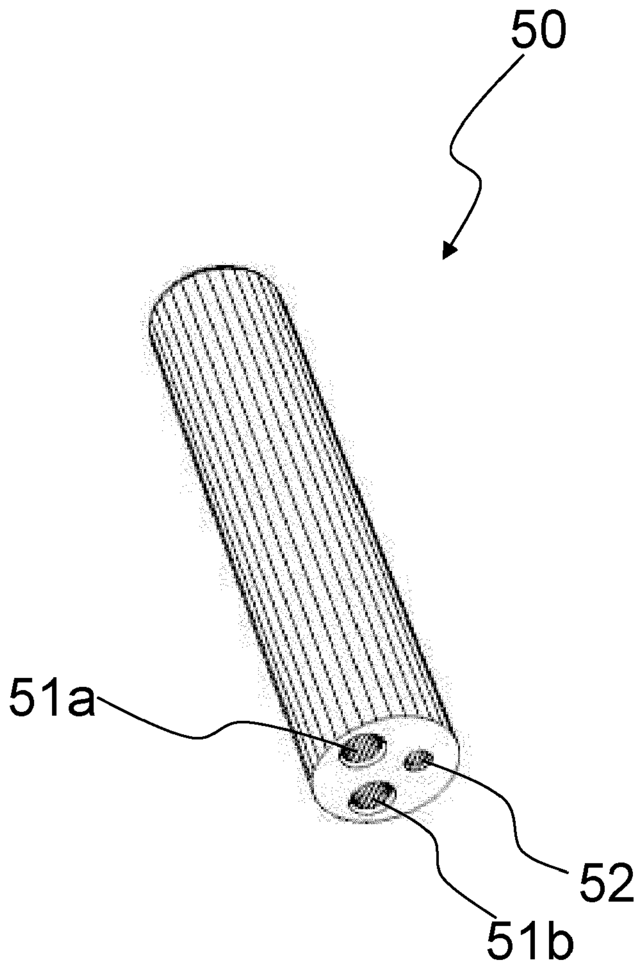

FIG. 9

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EUROPEAN SEARCH REPORT

Application Number
EP 21 19 5562

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	2 February 2022	Bloch, Gregor

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