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(54) **A TANK ASSEMBLY**

(57) A tank assembly (100) includes a tank cover (10) and a header (20). The tank cover (10) includes longitudinally extending first channels (10a) and (10b). The header (20) includes portions (20a) and (20b) that in conjunction with the first channels (10a) and (10b) defines a first and a second manifold (30a) and (30b). The header (20) further includes apertures (22a) and (22b) that receive the corresponding first set of tubular elements (42a) and second set of tubular elements (42b). At least one of the tank cover (10) and the header (20) includes an extension portion (10c, 20c) extending therefrom beyond the heat exchanger core (40) to form a connection system. The connection system includes an inlet (50a), an outlet (50b) and fluid flow passages (30c) and (30d) configuring fluid communication between the inlet (50a) and the outlet (50b) and the respective first and second manifolds (30a) and (30b).

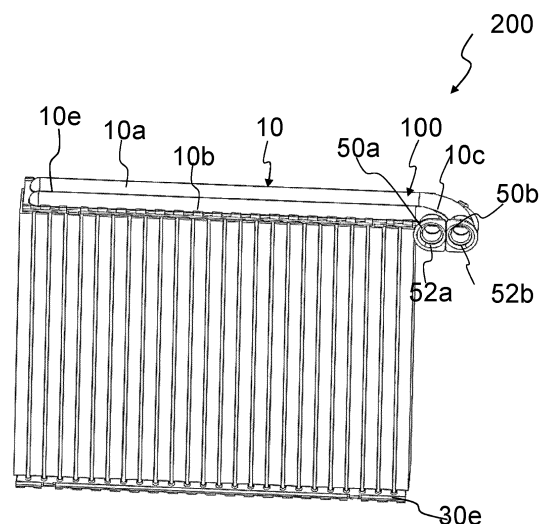


FIG. 3

Description

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

[0002] Generally, a vehicle heat exchanger, such as for example, an inner condenser is disclosed. The inner condenser is a heat exchanger used in the heat pump systems for electric vehicles. It may be used for the heating of the passenger cabin and this heating system allows to prolong the driving distance of the electric vehicle. The inner condenser may use tetrafluoropropene (R1234yf) as refrigerant. The heat exchanger includes tank assemblies configuring a first manifold and a second manifold disposed on opposite sides of a heat exchanger core defined by tubular elements and fins. The tubular elements configure fluid communication between the first manifold and the second manifold. Separate connection conduits are connected to the first manifold and the second manifold to respectively supply heat exchange fluid to and collect heat exchange fluid therefrom. However, such configuration of the heat exchanger faces packaging, connection, routing issues, as the connection conduits are disposed on both sides of the heat exchanger.

[0003] To address the above issues, prior art suggests a heat exchanger 1, for example, a gas cooler, for a vehicle that includes a first manifold, particularly, an inlet manifold 2a and a second manifold, particularly, an outlet manifold 2b, a heat exchanger core 4 and a connector block 6 as illustrated in FIG. 1. The first manifold 2a and the second manifold 2b are disposed on same side of the heat exchanger core 4. The heat exchanger core 4 includes tubular elements 4a, 4b separated by fins 5a, 5b. The first manifold 2a is supplied heat exchange fluid from an inlet port 6a of the connector block 6 via by an inlet conduit 7a for ingress of the first heat exchange fluid into the heat exchanger 1. The second manifold 2b delivers the first heat exchange fluid to an outlet port 6b of the connector 6 via an outlet conduit 7b for egress of the first heat exchange fluid from the heat exchanger, after the first heat exchange fluid had undergone heat exchange with air surrounding the tubular elements 4a, 4b while passing through the tubular elements 4a, 4b. In such configuration, the tubular elements 4a, 4b are divided into a first set of tubular elements 4a and a second set of tubular elements 4b that are disposed adjacent to each other and interconnected and in fluid communication with each other via an intermediate manifold 2c to define a first pass and a second pass respectively. Also, the connector block 6 with the inlet port 6a and the outlet port 6b is disposed proximal to the first and second manifolds 2a and 2b. Accordingly, shorter lengths of inlet and outlet conduits 7a and 7b can be used for configuring connection and fluid communication between the inlet port 6a and the first manifold 2a and between the second manifold 2b and the outlet port 6b respectively. The first manifold 2a distributes the heat exchange fluid received thereby to the first set of tubular elements 4a. The heat

exchange fluid undergoes heat exchange with a second heat exchange fluid, particularly, air around the first set of tubular elements 4a as the first heat exchange fluid flows through the first set of tubular elements 4a. The second set of tubular elements 4b receive the heat exchange fluid from the first set of tubular elements 4a via the intermediate manifold 2c and the second heat exchange fluid undergoes further heat exchange as it passes through the second set of tubular elements 4b. The second manifold 2b collects the first heat exchange fluid from the second tubular elements 4b after the first heat exchange fluid had rejected heat to the air flowing across the tubular elements 4a and 4b as it passes through the the tubular elements 4a and 4b. The second manifold 2b delivers the first heat exchange fluid collected thereby to the outlet conduit 7b for egress of the first heat exchange fluid from the heat exchanger 1 via the outlet port 6b. The tubular elements 4a are separated by fins 5a disposed there-between and the tubular elements 4b are separated by fins 5b disposed there-between. The fins 5a and 5b retard flow of the second heat exchange fluid, particularly, the air outside the tubular elements 4a and 4b to improve the heat exchange between the heat exchange fluid flowing inside and air flowing outside the tubular elements 4a and 4b.

[0004] The connector block 6 with the inlet port 6a and the outlet port 6b for ingress and egress of fluid with respect to the heat exchanger 1 is generally mounted on a vehicle frame proximal to the first and second manifolds 2a and 2b. The inlet and outlet conduits 7a and 7b configures fluid communication between the inlet port 6a and first manifold 2a and between the second manifold 2b and the outlet port 6b. However, use of inlet and outlet conduits 7a and 7b involves routing of the connecting inlet and outlet conduits 7a and 7b in limited space, particularly, in areas proximal to the lateral side of the heat exchanger 1. Moreover, the inlet an outlet conduits 7a and 7b inherently cause an unutilized space "X" along lateral side of the heat exchanger 1. The inlet and outlet conduits 7a and 7b and connections thereof with manifolds 2a and 2b on one side and with the connector block 6 on the other side cause packaging issues and pressure losses due to length of the inlet and outlet conduits 7a and 7b and bends in the inlet and outlet conduits 7a and 7b.

[0005] Accordingly, there is a need of a tank assembly for a heat exchanger that eliminates connection conduits renders the heat exchanger compact and addresses the packaging issues, particularly, along lateral sides of the heat exchanger and longitudinal direction of the first and second manifolds. Further, there is a need of a tank assembly for a heat exchanger that eliminates inlet and outlet conduits, thereby preventing problems such as energy losses and pressure drop between the inlet / outlet ports and corresponding first / second manifolds due to lengthy inlet and outlet connection conduits and bends in the inlet and outlet connection conduits. Further, there is a need for a tank assembly for a heat exchanger that

improves efficiency and reliability of the heat exchanger by preventing fluid flow losses by eliminating connection conduits. There is a need of a tank assembly for a heat exchanger that reduces the number of parts, thereby reducing maintenance and enhancing reliability of the heat exchanger.

[0006] An object of the present invention is to obviate the problems associated with conventional tank assembly for heat exchanger that require inlet and outlet connection conduits.

[0007] Another object of the present invention is that the tank assembly renders compactness to the heat exchanger and addresses the packaging issues, particularly, along lateral sides of the heat exchanger and longitudinal direction of the first and second manifolds.

[0008] Yet another object of the present invention is to provide a tank assembly for a heat exchanger that improves efficiency of the heat exchanger by reducing the pressure losses.

[0009] Still another object of the present invention is to provide a tank assembly for heat exchanger that reduces the number of parts, thereby reducing maintenance and enhancing reliability of the heat exchanger.

[0010] 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.

SUMMARY OF THE INVENTION

[0011] A tank assembly for a heat exchanger is disclosed in accordance with an embodiment of the present invention. The tank assembly includes a tank cover and a header. The tank cover is formed with longitudinally extending first channels. The header includes portions that in conjunction with the first channels formed on tank cover define a first manifold and a second manifold when the tank cover is assembled to the header. The header further includes apertures configured on the respective portions thereof. The apertures receives the corresponding first set of tubular elements and second set of tubular elements of a heat exchanger core therein to configure fluid communication between the first manifold and the first set of tubular elements and fluid communication between the second set of tubular elements and the second manifold. At least one of the tank cover and the header includes an extension portion extending therefrom beyond the heat exchanger core to form a connection system. The connection system is formed with an inlet, an outlet and fluid flow passages that configure fluid communication between the inlet and the outlet and the respective first and second manifolds.

[0012] Generally, the tank cover includes the tank cov-

er extension portion extending along the plane of the tank cover and the header includes the header extension portion extending along the plane of the header, wherein the tank cover extension portion in conjunction with the header extension portion when assembled together define the first fluid flow passage and the second fluid flow passage. The first fluid flow passage defines curved fluid flow trajectory and fluid communication between the inlet and the first manifold. The second fluid flow passage defines curved fluid flow trajectory and fluid communication between the second manifold and the outlet.

[0013] Particularly, the first channels extend to free end of the tank cover extension portion to define a first set of profiles at free end thereof. The header extension portion includes second channels corresponding to the first channels that extend to free end thereof to define a second set of profiles at the free end thereof. The profiles of the second set of profiles are complementary to the respective profiles of the first set of profiles. As the tank cover extension portion is assembled to the header extension portion, the first set of profiles get aligned to the second set of profiles and the sleeves hold the first set of profiles aligned to the corresponding second set of profiles to define the inlet and outlet respectively.

[0014] Particularly, the second channels are integrally formed with the header, whereas the first set of profiles are inherently formed at the free end of the respective first channels integrally formed with the tank cover.

[0015] Specifically, the first and second fluid flow passages are formed by the second channels formed on and extending to the free end of the header extension portion and portions of the respective first channels extending to free end of the tank extension portion.

[0016] Preferably, the inlet and the outlet are disposed along an axis extending orthogonally to the longitudinal axis of the first and second manifolds and the longitudinal axis of the tubular elements.

[0017] Generally, the first channels are separated by a first intermediate gap that extends along the tank cover extension portion.

[0018] Further, the second channels are separated by a second intermediate gap.

[0019] Specifically, the tank cover extension portion and the header extension portion extends along a curve and along a plane at the interface between the tank cover and the header.

[0020] Specifically, at least one of the tank cover and the header is formed with respective tabs disposed along longitudinal sides thereof to configure crimping connection there-between.

[0021] More specifically, at least one of the tank cover extension portion and the header extension portion is also formed with respective tabs disposed along peripheral portion thereof to configure crimping connection there-between.

[0022] Generally, the inlet and the outlet are symmetrical with respect with respect to each other about a plane passing through center of the second intermediate gap

at extreme end of the second intermediate gap.

[0023] Alternatively, the inlet and the outlet are asymmetrical with respect with respect to each other about a plane passing through center of the second intermediate gap at extreme end of the second intermediate gap.

[0024] Generally, the first and second fluid flow passages are of varying cross section along the length thereof.

[0025] Also is disclosed a heat exchanger in accordance with an embodiment of the present invention. The heat exchanger includes a heat exchanger core, a tank assembly and an intermediate manifold. The heat exchanger core includes a first set of tubular elements and second set of tubular elements disposed adjacent to the first set of tubular elements and respectively defining a first pass and a second pass. The tank assembly includes a first manifold and a second manifold disposed on same side of the heat exchanger core. The first manifold delivers fluid to the first set of tubular elements and the second manifold collects fluid from and the second set of tubular elements after the fluid had undergone heat exchange while passing through the first and the second set of tubular elements. The tank assembly extends beyond the heat exchanger core to configure a connection system formed with an inlet and an outlet and fluid flow passages. The first fluid flow passage configures fluid communication between the first manifold and the inlet whereas the second fluid flow passage configure fluid communication between the second manifold and the outlet. The intermediate manifold configures fluid communication between the first set of tubular elements and the second set of tubular elements to define U-flow trajectory of the fluid flow there-between to enable configuring of the first and second manifolds on the same side of the heat exchanger core.

BRIEF DESCRIPTION OF DRAWINGS

[0026] 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 an isometric view of a conventional tank assembly for heat exchanger forming inlet and second manifolds, wherein a separate connector block is connected to and fluid communication with the manifolds by means of inlet an outlet conduits;

FIG. 2 illustrates a front view of the conventional tank assembly, depicting unused space inherently created at the lateral side of the heat exchanger core because of the inlet and outlet conduits;

FIG. 3 illustrates an assembled view of a heat exchanger configured with a tank assembly of the present invention forming a connection system;

FIG. 4 illustrates an exploded view of the heat exchanger of FIG. 3;

FIG. 5 illustrates a side view of a header tank assembly of FIG. 3;

FIG. 6 illustrates a top view of the header tank assembly of FIG. 3;

FIG. 7 illustrates a sectional view of the header tank assembly along sectional plane B-B depicted in FIG. 6;

FIG. 8 illustrates an isometric view of a tank cover of the tank assembly of FIG. 3; and

FIG. 9 illustrates an isometric view of a header of the tank assembly of FIG. 3.

DETAILED DESCRIPTION

[0027] The present invention envisages a tank assembly for a heat exchanger, wherein the tank assembly configures a first manifold and a second manifold on same side of the heat exchanger to render compact configuration to the heat exchanger. Particularly, the tank assembly includes a tank cover and a header that extend beyond the heat exchanger core along lateral side of the heat exchanger core. The tank cover and the header are assembled to configure the manifolds and a connector system. Particularly, portions of tank cover and header aligned with respect to the heat exchanger core and secured to each other configure the manifolds, whereas portions of the tank cover and the header extending beyond the heat exchanger core and secured to each other configure the connection system. The header and the tank cover are secured to each other by crimping and brazing. The connection system is formed with an inlet, an outlet and fluid flow passages. The fluid flow passage configures fluid communication between the inlet for ingress of fluid into the heat exchanger and the first manifold, whereas the second fluid flow passage configures fluid communication between the second manifold and the outlet for egress of fluid from the heat exchanger. Such configuration of fluid flow passages formed in the tank assembly avoids inlet and outlet conduits and packaging, connection and routing issues faced due to the inlet and outlet conduits. The first flow passage configures a curved fluid flow trajectory and fluid communication between the inlet and the first manifold. The second fluid flow passage also configures curved flow trajectory and fluid communication between the second manifold and the outlet. Accordingly, the inlet and the outlet extend orthogonally to the longitudinal axis of the manifold and

the longitudinal axis of the tubular elements, thereby rendering the heat exchanger compact, particularly, along longitudinal side of the manifolds, thereby addressing packaging issues. Although, the present invention is explained in the forthcoming description and accompanying drawings with example of tank assembly for a condenser for use in vehicle air conditioning system, however, the tank assembly of the present invention is also applicable in any other heat exchanger used in vehicular or non-vehicular applications, where the first and the second manifold are required to be on same side of the heat exchanger and the heat exchanger is required to be compact, particularly, along longitudinal side of the manifold by eliminating connection conduits to address packaging issues.

[0028] A tank assembly 100 configured on a vehicle heat exchanger 200, particularly, an air conditioning gas coolers, gas coolers or evaporators is disclosed. FIG. 3 illustrates an isometric view of the heat exchanger 200 configured with the tank assembly 100 of the present invention in the assembled configuration. FIG. 4 illustrates an exploded view of the heat exchanger 200. The header tank-assembly 100 includes a tank cover 10 and a header 20.

[0029] FIG. 5 and FIG. 6 illustrates side view and top view of the tank assembly 100. The FIG. 7 illustrates a sectional view of the tank assembly 100 along sectional plane B-B' depicted in FIG. 6. Referring to FIG. 8, the tank cover 10 includes longitudinally extending first channels 10a and 10b. The first channels 10a and 10b are separated by a first intermediate gap 10d that extends to free end of the tank cover extension portion 10c.

[0030] Further, referring to FIG. 9, the header 20 includes portions 20a and 20b along longitudinal sides thereof. The first and the second portions 20a and 20b of the header 20 in conjunction with the corresponding first channels 10a and 10b of the tank cover 10 define a first manifold 30a and a second manifold 30b when the tank cover 10 is secured to the header 20. The first and the second manifolds are depicted in the sectional view of the tank assembly 100 depicted in the FIG. 7. Generally, the tank cover 10 and the header 20 are secured to each other by crimping and brazing. However, the tank cover 10 and the header 20 can be secured to each other by any other means that can form secure connection between the tank cover 10 and the header 20. The header 20 includes apertures 22a and 22b configured on the respective first and second portions 20a and 20b thereof. The apertures 22a and 22b receives corresponding first set of tubular elements 42a and second set of tubular elements 42b of a heat exchanger core 40 therein to configure fluid communication between the first manifold 30a and the first set of tubular elements 42a and fluid communication between the second set of tubular elements 42b and the second manifold 30b. The first and the second manifolds 30a and 30b are disposed on one side of the heat exchanger core 40.

[0031] Such configuration of the heat exchanger 200

with the first manifold 30a and the second manifold 30b disposed adjacent to each other and on same side of the heat exchanger core 40 provides certain advantages. For example, such configuration renders the heat exchanger 200 compact and addresses the packaging issues, connection issues and prevents clutter due to manifolds being disposed on opposite sides and connection conduits connected to opposite sides of the heat exchanger core. Further, such configuration reduces the number of connection parts and hence reduces maintenance and improves reliability. However, such configuration requires the heat exchange fluid entering the heat exchanger to follow a U-turn trajectory within the heat exchanger core 40 that is achieved by providing first and second sets of tubular elements 42a and 42b disposed side by side and an intermediate manifold 30e configuring fluid communication between the first and the second set of tubular elements 42a and 42b. More specifically, the intermediate manifold 30e interconnects and configures fluid communication between the first set of tubular elements 42a defining the first pass and the second set of tubular elements 42b defining the second pass or return pass.

[0032] Generally, at least one of the tank cover 10 and the header 20 includes an extension portion 10c, 20c extending therefrom beyond the heat exchanger core 40 to form a connection system. The connection system is formed with an inlet 50a, an outlet 50b and fluid flow passages 30c and 30d configuring fluid communication between the inlet and the outlet 50a and 50b and the respective first and second manifolds 30a and 30b. The connection system can be configured by the tank cover extension portion 10c alone or header extension portion 20c alone or by assembling the tank cover extension portion 10c and the header extension portion 20c.

[0033] According to a preferred embodiment, the tank cover 10 includes the tank cover extension portion 10c extending along the plane of the tank cover 10 and the header 20 includes the header extension portion 20c extending along the plane of the header 20. The first channels 10a and 10b extend along the tank cover extension portion 10c. The header extension portion 20c includes second channels 23a and 23b formed thereon. The second channels 23a and 23b are integrally formed with the header 20. The first set of profiles 12a and 12b are inherently formed at the end of the respective first channels 10a and 10b integrally formed with the tank cover 10. The second channels 23a and 23b are complementary to the portion of the first channels 10a and 10b extending to the tank extension portion 10c. The portions 10a and 10b of tank cover 10 and portions 20a and 20b of the header 20 aligned with respect to the heat exchanger core 40 and secured to each other configure the manifolds 30a and 30b. Particularly, portions of at least one of the tank cover 10 and the header 20 forming the manifolds is formed with respective tabs 14 and 24 disposed along longitudinal sides thereof to configure crimping connection between the tank cover 10 and the header 20. The portions of the tank cover 10 and the header 20

forming the manifolds are further secured to each other by brazing.

[0034] The tank cover extension portion 10c and header extension portion 20c of the tank cover 10 and the header 20 respectively extend beyond the heat exchanger core 40 and are secured to each other to configure the connection system. At least one of the tank cover extension portion 10c and the header extension portion 20c is also formed with respective tabs 14a and 24a disposed along peripheral portion thereof to configure crimping connection between tank cover extension portion 10c and the header extension portion 20c. The tank cover extension portion 10c and the header extension portion 20c are further secured to each other by brazing. The tank cover extension portion 10c in conjunction with the header extension portion 20c when assembled together define the first fluid flow passage 30c and the second fluid flow passage 30d of the connection system. More specifically, the first and second fluid flow passages 30c and 30d are formed by assembly between the second channels 23a and 23b formed on the header extension portion 20c and extending to free end thereof and portions of the respective first channels 10a and 10b extending to the free end of the tank cover extension portion 10c. The first flow passage 30c and the second flow passage 30d are of variable cross section. The first flow passage 30c and the second flow passage 30d are both diverging from the manifold side to the inlet and outlet side respectively. The second channels 23a and 23b are separated by a second intermediate gap 23c. The second intermediate gap 23c between the second channels 23a and 23b is corresponding to and complementary to the first intermediate gap 10d between portions of the first channels 10a and 10b extending to the free end of the tank cover extension portion 10c. The first intermediate gap 10d between portion of the channels 10a and 10b extending to the tank cover extension portion 10c is aligned to the second intermediate gap 23c, when the header 20 and the tank cover 10 are assembled to each other. Such configuration facilitates alignment of a first set of profiles 12a and 12b at extreme end of the tank cover 10 with a second set of profiles 26a and 26b at extreme end of the header 20 for configuring the inlet 50a and the outlet 50b. The first fluid flow passage 30c defines curved fluid flow trajectory and fluid communication between the inlet 50a and the first manifold 30a. Similarly, the second fluid flow passage 30d defines curved fluid flow trajectory and fluid communication between the second manifold 30b and the outlet 50b. With the portions of the tank cover 10 and the header 20 forming the connection system, the need for connection conduits is eliminated and pressure losses are avoided, thereby improving the efficiency and performance of the heat exchanger 200. Further, with the elimination of the connection conduits, the reliability of the heat exchanger is increased.

[0035] Again referring to the FIG. 8, the first channels 10a and 10b extends along the tank cover extension portion 10c to free end of the tank cover extension portion

10c to define the first set of profiles 12a and 12b at free end thereof. The header extension portion 20c includes the second set of profiles 26a and 26b at the free end thereof. The profiles of the second set of profiles 26a and 26b are complementary to the respective profiles of the first set of profiles 12a and 12b. As the tank cover extension portion 10c is assembled to the header extension portion 20c, the first set of profiles 12a and 12b get aligned to the second set of profiles 26a and 26b and sleeves 52a and 52b hold the first set of profiles 12a and 12b aligned to the corresponding second set of profiles 26a and 26b to define the inlet 50a and the outlet 50b respectively. The tank cover extension portion 10c and the header extension portion 20c extends along a curve along a plane at the interface between the tank cover 10 and the header 20. Accordingly, the first and the second fluid flow passages 30c and 30d follow such curved profile that the inlet 50a and the outlet 50b are disposed along an axis extending orthogonally to the longitudinal axis of the first and second manifold 30a and 30b and the longitudinal axis of the tubular elements 42a and 42b. Such configuration of the tank assembly 100 renders compactness to the heat exchanger 200 and addresses the packaging issues, particularly, along lateral sides of the heat exchanger core 40 and longitudinal direction of the first and second manifolds 30a and 30b.

[0036] Also is disclosed the heat exchanger 200 in accordance with an embodiment of the present invention. Referring to the FIG. 3 and FIG. 4, the heat exchanger 200 includes a heat exchanger core 40, a tank assembly 100 and an intermediate manifold 30e. The heat exchanger core 40 includes a first set of tubular elements 42a and second set of tubular elements 42b disposed adjacent to the first set of tubular elements 42a and respectively defining a first pass and a second pass. The tank assembly 100 includes a first manifold 30a and a second manifold 30b disposed on same side of the heat exchanger core 40. The first manifold 30a delivers fluid to the first set of tubular elements 42a and the second manifold 30b collects fluid from and the second set of tubular elements 42b after the fluid had undergone heat exchange while passing through the first and the second set of tubular elements 42a and 42b. The tank assembly 100 extends beyond the heat exchanger core 40 to configure a connection system formed with an inlet 50a, an outlet 50b and fluid flow passages 30c and 30d. The first fluid flow passage 30c configures fluid communication between the first manifold 30a and the inlet 50a whereas the second fluid flow passage 30d configures fluid communication between the second manifold 30b and the outlet 50b. The intermediate manifold 30e configures fluid communication between the first set of tubular elements 42a and the second set of tubular elements 42b to define U-flow trajectory of the fluid flow there-between to enable configuring of the first and second manifolds 30a and 30b on the same side of the heat exchanger core 40.

[0037] 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 tank assembly (100) for a heat exchanger (200), the tank assembly (100) comprising:

- a tank cover (10) formed with longitudinally extending first channels (10a) and (10b);
- a header (20) comprising portions (20a) and (20b) that in conjunction with the first channels (10a) and (10b) formed on tank cover (10) adapted to define a first manifold (30a) and a second manifold (30b) when the tank cover (10) is assembled to the header (20), the header (20) further comprising apertures (22a) and (22b) configured on the respective portions (20a) and (20b) thereof, the apertures (22a) and (22b) are adapted to receive corresponding first set of tubular elements (42a) and second set of tubular elements (42b) of a heat exchanger core (40) therein to configure fluid communication between the first manifold (30a) and the first set of tubular elements (42a) and fluid communication between the second set of tubular elements (42b) and the second manifold (30b),

characterized in that at least one tank cover (10) and the header (20) comprise an extension portion (10c, 20c) extending therefrom beyond the heat exchanger core (40) to form a connection system formed with an inlet (50a), an outlet (50b) and fluid flow passages (30c) and (30d) configuring fluid communication between the inlet and the outlet (50a) and (50b) and the respective first and second manifolds (30a) and (30b).

2. The tank assembly (100) as claimed in the previous claim, wherein the tank cover (10) comprises the tank cover extension portion (10c) extending along the plane of the tank cover (10) and the header (20) comprises the header extension portion (20c) extending along the plane of the header (20), the tank cover extension portion (10c) in conjunction with the header extension portion (20c) when assembled together is adapted to define the first fluid flow passage (30c) and the second fluid flow passage (30d), the first fluid flow passage (30c) defines curved fluid flow trajectory and fluid communication between the inlet (50a) and the first manifold (30a), whereas the second fluid flow passage (30d) defines curved fluid flow trajectory and fluid communication between the second manifold (30b) and the outlet (50b).

3. The tank assembly (100) as claimed in any of the preceding claims, wherein

- the first channels (10a) and a (10b) extend to free end of the tank cover extension portion (10c) to define a first set of profiles (12a) and (12b) at free end thereof;
- the header extension portion (20c) comprises second channels (23a) and (23b) corresponding to the first channels (10a) and (10b) that extend to free end thereof to define a second set of profiles (26a) and (26b) at the free end thereof, the profiles of the second set of profiles (26a) and (26b) are complementary to the respective profiles of the first set of profiles (12a) and (12b), as the tank cover extension portion (10c) is assembled to the header extension portion (20c), the first set of profiles (12a) and (12b) get aligned to the second set of profiles (26a) and (26b) and sleeves (52a) and (52b) hold the first set of profiles (12a) and (12b) aligned to the corresponding second set of profiles (26a) and (26b) to define the inlet and outlet (50a) and (50b) respectively.

4. The tank assembly as claimed in Claim 3, wherein the second channels (23a) and (23b) are integrally formed with the header (20), whereas the first set of profiles (12a) and (12b) are inherently formed at the free end of the respective first channels (10a) and (10b) integrally formed with the tank cover (10).

5. The tank assembly (100) as claimed in the previous claim, wherein the first and second fluid flow passages (30c) and (30d) are formed by the second channels (23a) and (23b) formed on and extending to free end of the header extension portion (20c) and portions of the respective first channels (10a) and (10b) extending to free end of the tank cover extension portion (10c).

6. The tank assembly (100) as claimed in any of the preceding claims, wherein the inlet (50a) and the outlet (50b) are disposed along an axis extending orthogonally to the longitudinal axis of the first and second manifold (30a) and (30b) and the longitudinal axis of the tubular elements (42a) and (42b).

7. The tank assembly (100) as claimed in any of the preceding claims, wherein the first channels (10a) and (10b) are separated by a first intermediate gap (10d) that extends along the tank cover extension portion (10c).

8. The tank assembly (100) as claimed in any of the claim 3, wherein the second channels (23a) and (23b) are separated by a second intermediate gap (23c).

9. The tank assembly (100) as claimed in any of the preceding claims wherein the tank cover extension portion (10c) and the header extension portion (20c) extends along a curve along a plane at the interface between the tank cover (10) and the header (20). 5
10. The tank assembly (100) as claimed in any of the preceding claims, wherein at least one of the tank cover (10) and the header (20) is formed with respective tabs (14) and (24) disposed along longitudinal sides thereof and adapted to configure crimping connection there-between. 10
11. The tank assembly (100) as claimed in any of the preceding claims, wherein at least one of the tank cover extension portion (10c) and the header extension portion (20c) also formed with respective tabs (14a) and (24a) disposed along peripheral portion thereof to configure crimping connection there-between. 15 20
12. The tank assembly (100) as claimed in claim 8, wherein the inlet (50a) and the outlet (50b) are symmetrical with respect with respect to each other about a plane "A" passing through center of the second intermediate gap (23c) at extreme end of the second intermediate gap (23c). 25
13. The tank assembly (100) as claimed in claim 8, wherein the inlet (50a) and the outlet (50b) are asymmetrical with respect with respect to each other about a plane passing through center of the second intermediate gap (23c) at an extreme end at extreme end of the second intermediate gap (23c). 30 35
14. The tank assembly (100) as claimed in any of the preceding claims, wherein the first and second fluid flow passages (30c) and (30d) are of varying cross section along the length thereof. 40
15. A heat exchanger (200) comprising :
- a heat exchanger core (40) comprising first set of tubular elements (42a) and second set of tubular elements (42b) disposed adjacent to the first set of tubular elements and respectively defining a first pass and a second pass; 45
 - a tank assembly (100) as claimed in any of the preceding claims comprising a first manifold (30a) and a second manifold (30b) disposed on same side of the heat exchanger core, the first manifold (30a) is adapted to deliver fluid to the first set of tubular elements (42a) and the second manifold (30b) adapted to collect fluid from and the second set of tubular elements (42b) after the fluid had undergone heat exchange while passing through the first and the second set of tubular elements (42a) and (42b), the tank as- 50 55

sembly (100) extending beyond the heat exchanger core (40) and adapted to configure a connection system formed with an inlet (50a) and an outlet (50b) and fluid flow passages (30c) and (30d), wherein the first fluid flow passage (30c) configures fluid communication between the first manifold (30a) and the inlet (50a) whereas the second fluid flow passage (30d) configures fluid communication between the second manifold (30b) and the outlet (50b); and

- an intermediate manifold (30e) configuring fluid communication between the first set of tubular elements (42a) and the second set of tubular elements (42b) to define U-flow trajectory of the fluid there-between to enable configuring of the first and second manifolds (30a) and (30b) on the same side of the heat exchanger core (40).

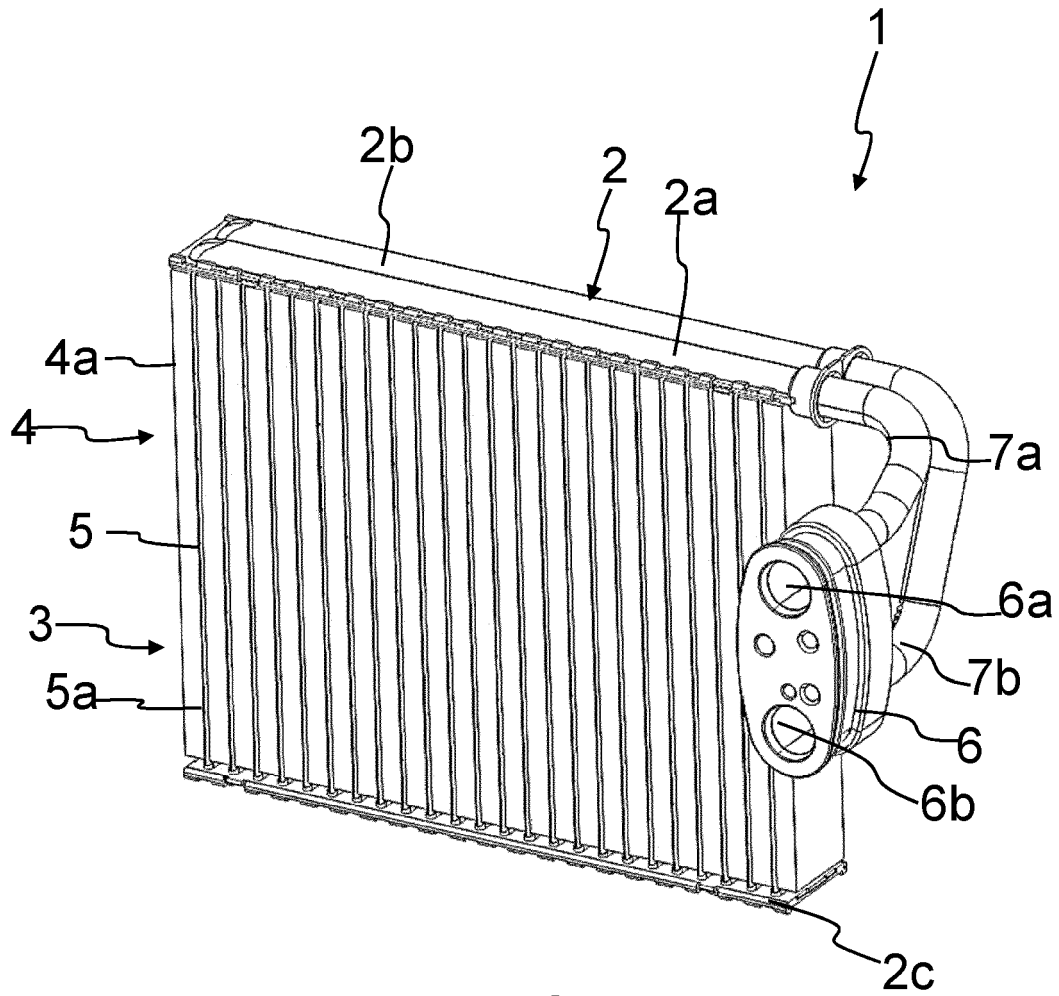


FIG. 1
(PRIOR ART)

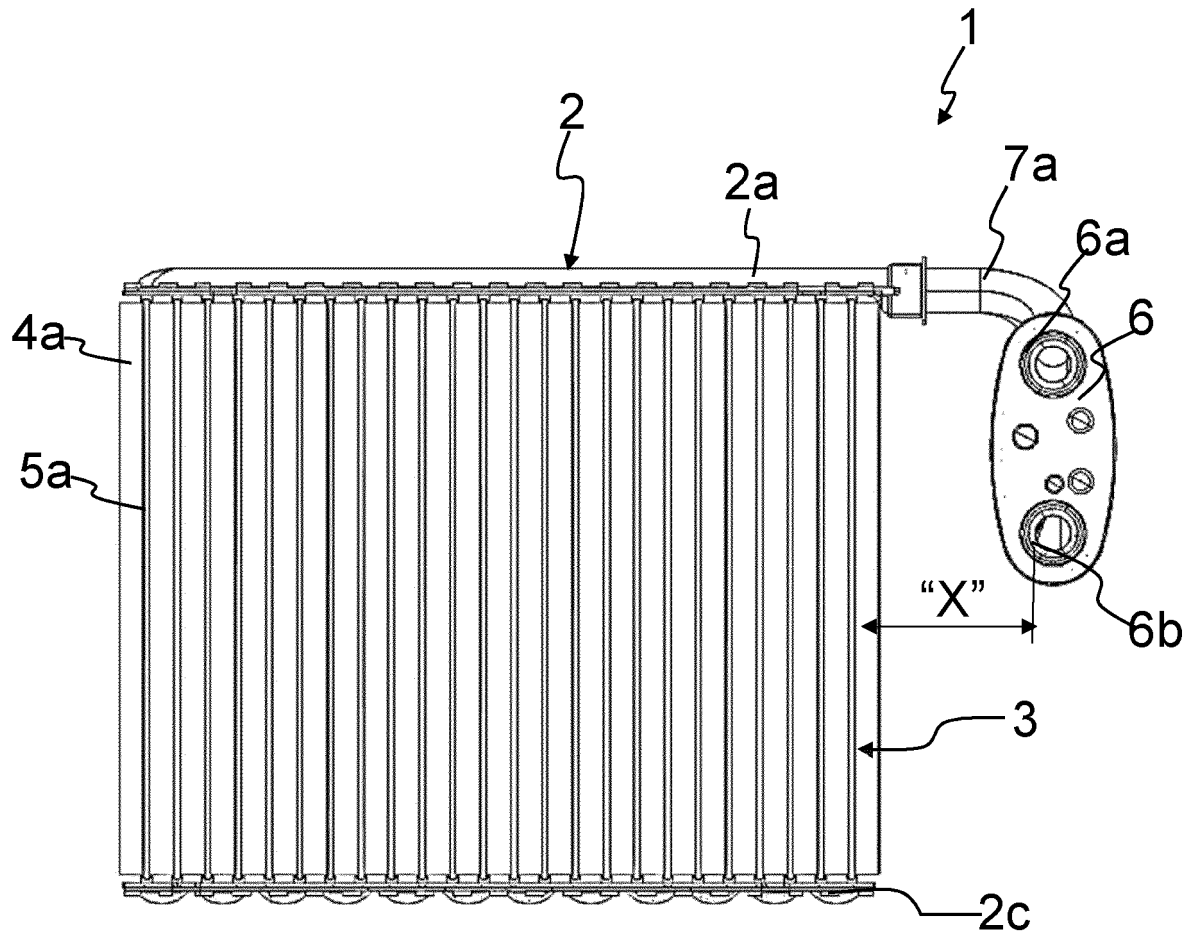


FIG. 2
(PRIOR ART)

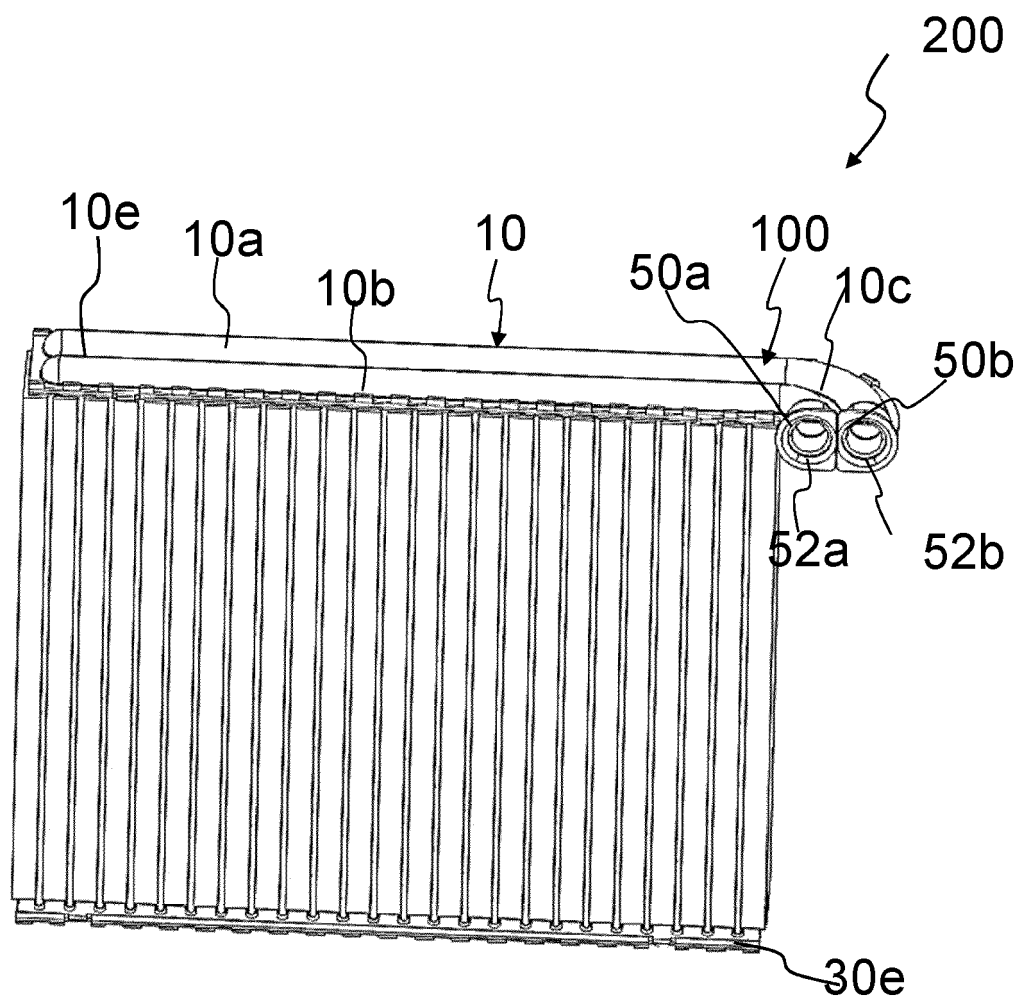


FIG. 3

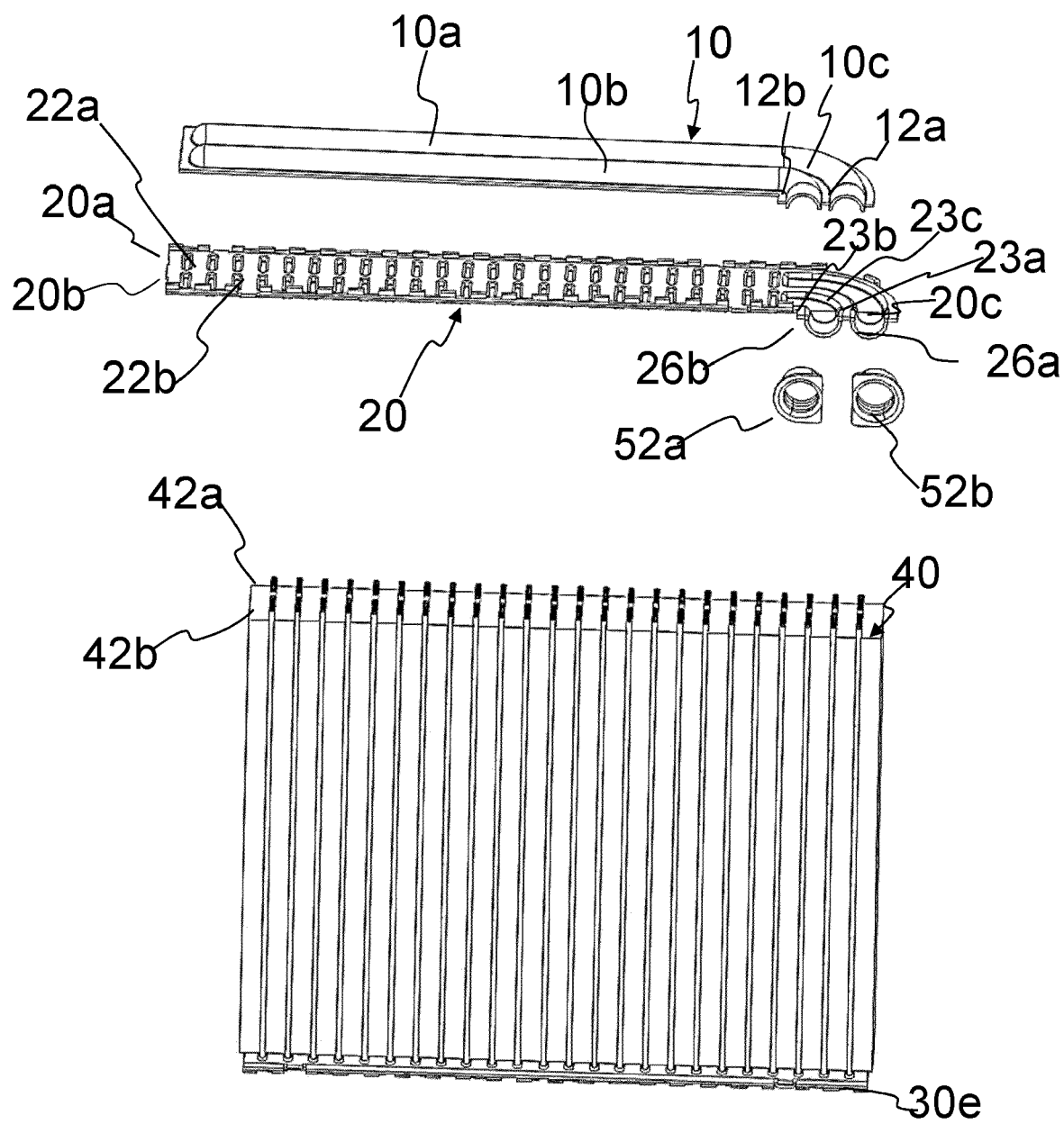


FIG. 4

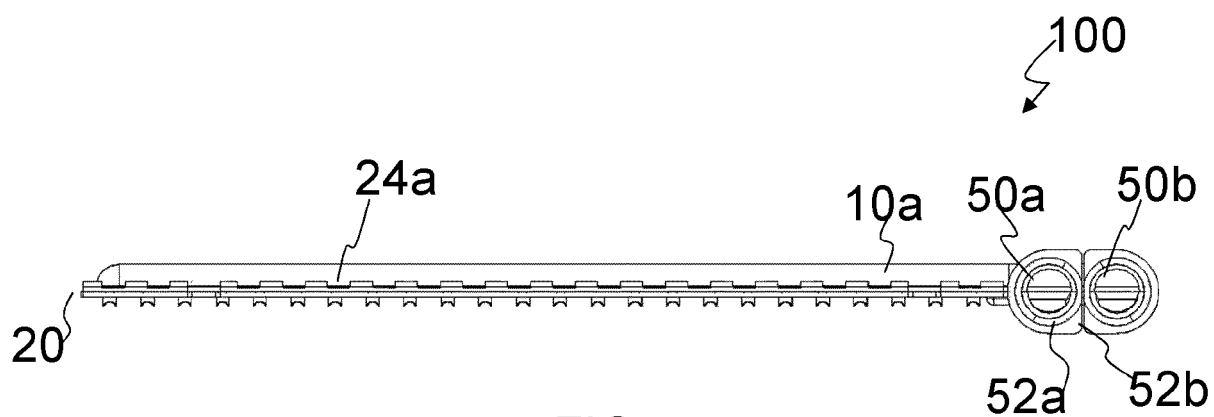


FIG. 5

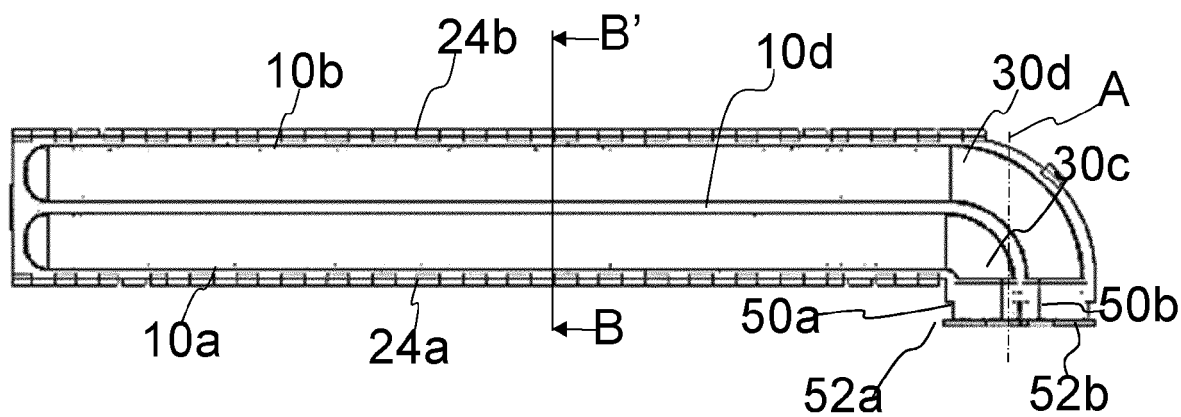


FIG. 6

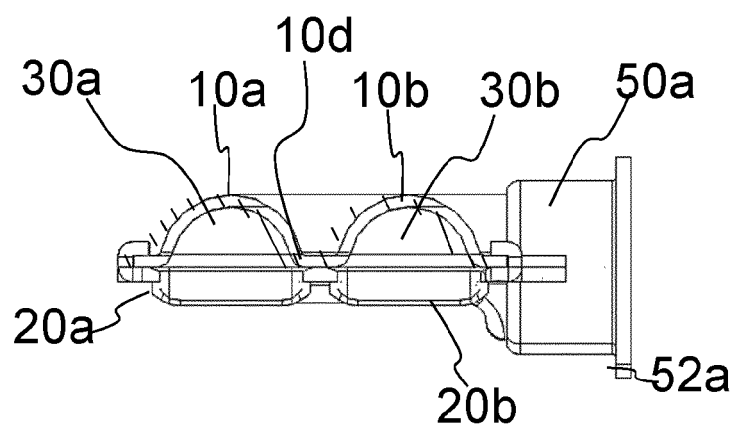


FIG. 7

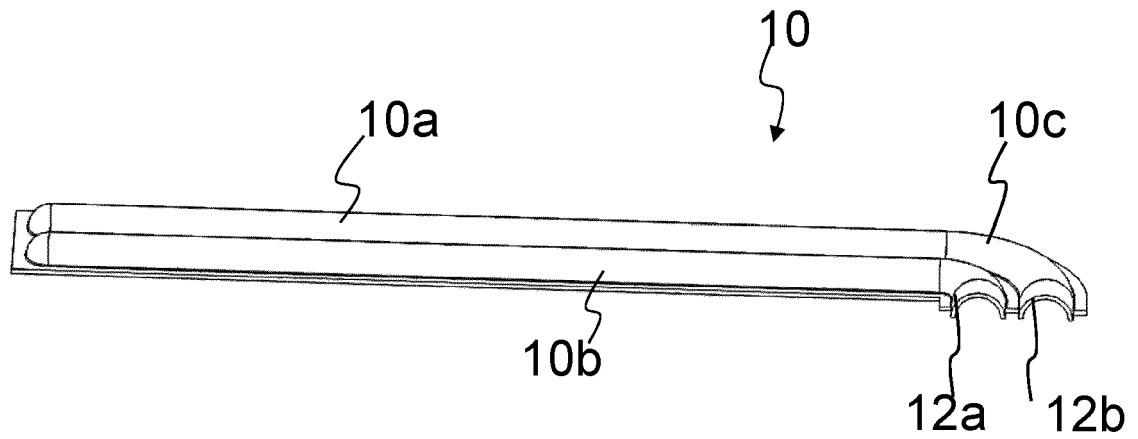


FIG. 8

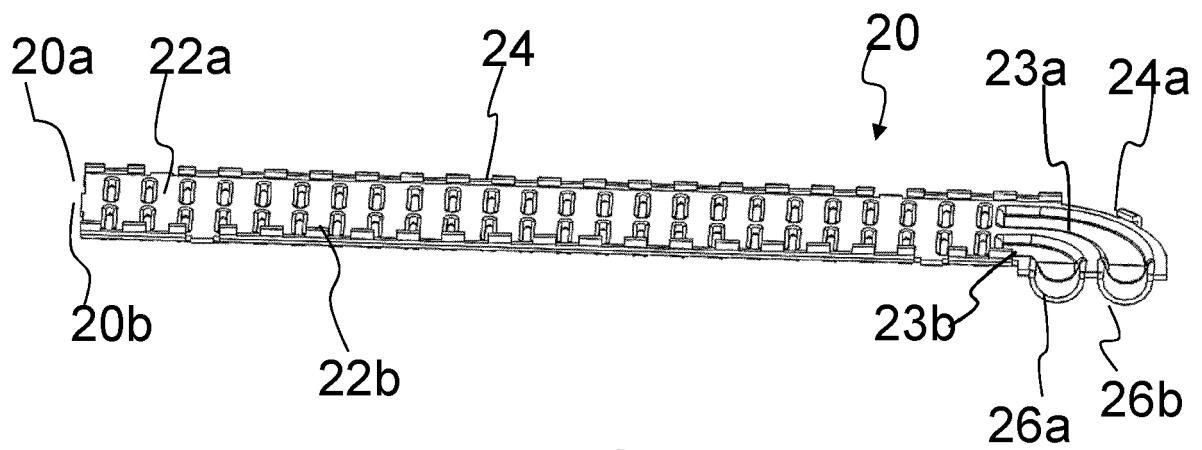


FIG. 9



EUROPEAN SEARCH REPORT

Application Number

EP 22 18 8336

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			TECHNICAL FIELDS SEARCHED (IPC)
			F28F F28D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 18 January 2023	Examiner Bain, David
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

**ANNEX TO THE EUROPEAN SEARCH REPORT
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The members are as contained in the European Patent Office EDP file on
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18-01-2023

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