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(54) A TANK ASSEMBLY

TANKANORDNUNG

ENSEMBLE RÉSERVOIR

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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. More specifically, the present invention relates to a tank assembly as defined in the preamble of claim 1, and as illustrated in US 2015/330681.

[0002] Generally, a vehicle heat exchanger,i such as for example, an inner condenser. 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 separated by fins. The tubular elements configure fluid communication between the first manifold and the second manifold. Separate connection conduits connected to the first manifold and the second manifold respectively supply heat exchange fluid to and collect heat exchange fluid therefrom. However, such configuration of the heat exchanger with connection conduits 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 condenser for a vehicle that includes a tank assembly, a heat exchanger core 4 and a connector block 6 as illustrated in FIG. 1. The tank assembly includes a tank cover 2 and a tank header 3. The tank cover 2 includes channels 2a and 2b formed thereon that are longitudinally extending along length of the tank cover 2. The tank header 3 includes portions with apertures formed thereon. The tank cover 2 and the tank header 3 are assembled together by crimping and brazing so that the channels 2a and 2b of the tank cover 2 aligned to and in conjunction with the corresponding tank header portions define a first manifold, particularly, an inlet manifold and a second manifold, particularly, an outlet manifold. The first manifold and the second manifold are disposed on same side of the heat exchanger core 4. The heat exchanger core 4 includes tubular elements 4a separated by fins 5a. The first set of adjacent tubular elements 4a are separated by first set of fins 5a whereas the second set of adjacent tubular elements are separated by second set of fins. For ingress of the first heat exchange fluid into the heat exchanger 1, the first manifold is supplied heat exchange fluid from an inlet port 6a of the connector block 6 via by an inlet conduit 7a. For egress of the first heat exchange fluid from the heat exchanger after heat exchange with air surrounding the tubular elements 4a while passing through the tubular elements 4a, the second manifold delivers the first heat exchange fluid to an outlet port 6b of the connector block 6 via an outlet conduit 7b. Further, the tubular elements 4a are divided into a first set of tubular elements 4a and a second set of tubular elements that are disposed adjacent to each other, wherein the second set of tubular elements are disposed behind the first set of tubular elements 4a, more specifically, downstream of the first set of tubular elements in second flow direction. The first set of tubular elements 4a and the second set of tubular element are 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. Accordingly, shorter lengths of inlet and outlet conduits 7a and 7b can be used for configuring fluid communication between the inlet port 6a and the first manifold and between the second manifold and the outlet port 6b respectively. The first manifold 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 receive the heat exchange fluid from the first set of tubular elements 4a via the intermediate manifold 2c configuring fluid communication between the tubular elements 4a, and the second heat exchange fluid undergoes further heat exchange as it passes through the second set of tubular elements. The second manifold collects the first heat exchange fluid from the second tubular elements, after the first heat exchange fluid had rejected heat to the air flowing across the tubular elements as it passes through the tubular elements. The second manifold 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 first set of tubular elements 4a are separated by first set of fins 5a disposed there-between and the second set of tubular elements are separated by second set of fins disposed there-between. The fins retard flow of the second heat exchange fluid, particularly, the air outside the tubular elements to improve the heat exchange between the heat exchange fluid flowing inside and air flowing outside the tubular elements.

[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. The inlet and outlet conduits 7a and 7b configures fluid communication between the inlet port 6a and the first manifold and between the second manifold and the outlet port 6b respectively. 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 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 and 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 requires inlet and outlet connection conduits.

[0007] Another object of the present invention is that the tank assembly 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.

[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 by eliminating the connection conduits.

[0009] 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

[0010] A tank assembly for a heat exchanger in accordance with the present invention is defined in claim 1.

[0011] Preferably, the intermediate plate in conjunction with the end cover when assembled together define a first fluid flow passage and a second fluid flow passage. The first fluid flow passage defines fluid flow trajectory and fluid communication between the inlet and the first manifold. The second fluid flow passage defines fluid flow trajectory and fluid communication between the second manifold and the outlet.

[0012] Generally, the first set of channels longitudinally extend along the length of the tank cover to free end thereof to define a first set of concave profiles at free end thereof. Further, the tank header includes extension portions with a second set of concave profiles at the free end thereof. The profiles of the second set of concave profiles at free end thereof, the profiles of the second set of concave profiles being complementary to the respective profiles of the first set of concave profiles.

[0013] Generally, the extension portions with the second set of concave profiles 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.

[0014] Particularly, the first set of concave profiles get aligned to the second set of concave profiles to define respective manifold inlet and outlet as the tank cover is assembled to the tank header.

[0015] Further, the end cover includes a second set of channels and either one of tabs and notches. The second set of channels are spaced apart from each other and emanating from portions of the end cover corresponding to and aligned with sleeves formed on the intermediate plate and extending along plane of the end cover to one side of the end cover for configuring fourth set of concave profiles. Either one of tabs and notches for configuring crimping connection with the heat exchanger core. As the end cover is assembled to the intermediate cover, the fourth set of concave profiles get aligned with the third set of concave profiles and are held together within a second set of sleeves to define the inlet and outlet respectively.

[0016] Still further, the second set of channels form fluid flow passages when the end cover is assembled to the intermediate cover. Particularly, the first fluid flow passage configures fluid communication between the inlet and the corresponding first manifold and the second fluid flow passage configures fluid communication between the second manifold and the outlet.

[0017] The inlet and the outlet are disposed along an axis extending orthogonally to the longitudinal axis of the first and second manifold and the longitudinal axis of the tubular elements, either one of the inlet and outlet is disposed underneath the other.

[0018] Generally, the first set of channels are separated by a first intermediate gap.

[0019] Further, the second set of channels are separated by a second intermediate gap.

[0020] In accordance with an embodiment, at least a portion of the second set of channels about the diameter is formed on the intermediate plate.

[0021] Preferably, at least one channel of the second set of channels follows a curved profile while the other follows a straight profile.

[0022] Generally, the inlet and outlet are symmetrical about a plane passing through center of the second intermediate gap at extreme end of the second intermediate gap.

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

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

[0025] In accordance with an embodiment of the present invention, substantial portions of the channels of the second set of channels are parallel to each other with substantial portion of one channel being disposed underneath the other and the outlet being disposed underneath the inlet.

[0026] A heat exchanger is disclosed in accordance with an embodiment of the present invention. The head exchanger includes a heat exchanger core, a tank assembly, an intermediate manifold and at least one of an intermediate plate and an end cover forming a connection system. The heat exchanger core includes a first set of tubular elements and a second set of tubular element disposed adjacent to the first set of tubular elements and respectively defining a first pass and a second pass. The tank assembly is as disclosed above and forms 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 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. At least one of an intermediate plate and an end cover orthogonally assembled with respect to longitudinal axis of the first and second manifolds to form the connection system. The connection system is formed with an inlet, an outlet and fluid flow passages. The first fluid flow passage configures fluid communication between the inlet and the first manifold and the second fluid flow passage configures 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 therebetween to enable configuring of the first and second manifolds on the same side of the heat exchanger core.

BRIEF DESCRIPTION OF DRAWINGS

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

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

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

FIG. 4 illustrates another isometric view of the heat exchanger of FIG. 3;

FIG. 5 illustrates an isometric view of the tank assembly of the FIG. 3 in an assembled configuration;

FIG. 6 illustrates an isometric view of a tank cover of the tank assembly of FIG. 5;

FIG. 7 illustrates an isometric view of a tank header of the tank assembly of FIG. 5;

FIG. 8 illustrates a front view of the tank assembly of FIG. 5;

FIG. 9 illustrates a cross sectional view of the tank assembly of the FIG. 8 along a sectional plane A-A' passing through a crimping tab disposed between adjacent apertures formed on the tank header;

FIG. 10a - 10d illustrate different views of the connection system formed by orthogonally assembling an intermediate plate and a cover plate with respect to longitudinal axis of the first and second manifolds;

FIG. 11 illustrates an isometric view of an intermediate plate forming a part of the connection system of FIG 10a;

FIG. 12 illustrates an isometric view of a cover plate forming a part of the connection system of FIG. 10a: and

FIG. 13 illustrates another isometric view of the cover plate of FIG. 12.

DETAILED DESCRIPTION

[0028] The present invention envisages a tank assembly for a vehicle heat exchanger. The tank assembly includes a tank cover and a tank header. The tank cover separately covers two separate sections of the tank header formed with individual apertures, thereby configuring a first manifold and a second manifold on same side of the heat exchanger to render the heat exchanger compact. Further, the heat exchanger includes a connection system to avoid connection conduits, thereby rendering further compactness to the heat exchanger, particularly, along the lateral side thereof. Specifically, the tank cover and the tank header are assembled to configure the manifolds formed with a manifold inlet and a manifold outlet. The tank header and the tank cover aligned with respect to the heat exchanger core are secured to each other by crimping and brazing to configure the manifolds with the manifold inlet and the manifold outlet. Further at least one of an intermediate plate and an end cover is orthogonally assembled with respect to longitudinal axis of the first and second manifolds to form the connection system. The connection system is formed with an inlet, an outlet and fluid flow passages. 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 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, wherein either one of the inlet and outlet is disposed underneath the other, thereby rendering the heat exchanger compact, particularly, along longitudinal side of the manifolds, thereby addressing packaging issues. Such configuration of fluid flow passages avoids inlet and outlet conduits and packaging, connection and routing issues faced due to the inlet and outlet conduits. 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, 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.

[0029] A tank assembly 100 configured on a vehicle heat exchanger 200, particularly, an air-conditioning gas cooler, condenser, gas cooler or evaporator is disclosed. FIG. 3 illustrates an exploded view of the vehicle heat exchanger 200, hereinafter simply referred to as heat exchanger 200 configured with the tank assembly 100 of the present invention along with a connection system 80. FIG. 4 illustrates another isometric view of the heat exchanger 200 configured with the tank assembly 100 of the present invention.

[0030] Referring to the FIG. 5, the tank assembly 100 includes an axis of elongation. The tank assembly 100 incudes a tank cover 10 as illustrated in FIG. 6 and a tank header 20 as illustrated in FIG. 7. The tank cover 10 extends along the axis of extension of the tank assembly 100 and is formed with longitudinally extending first set of channels 10a and 10b. The first set of channels 10a and 10b longitudinally extend along the length of the tank cover 10 to free end thereof to define a first set of concave profiles 12a and 12b at free end thereof. The first set of channels 10a and 10b are separated by a first intermediate gap 10c. The intermediate gap 10c provides thermal insulation between fluid flowing through the respective channels of the first set of channel 10a and 10b.

[0031] Further, referring to the FIG. 7, the tank header 20 includes portions 20a and 20b disposed along opposite longitudinal sides of the tank header 20. The portions 20a and 20b in conjunction with the first set of channels 10a and 10b formed on the tank cover 10 define a first manifold 30a and a second manifold 30b when the tank header 20 and the tank cover 10 are assembled with respect to each other as illustrated in FIG. 5. FIG. 8 also depicts the side view of the tank assembly 100. The first and the second manifolds 30a and 30b are depicted in the sectional view of the tank assembly 100 depicted in the FIG. 9. The first and the second manifolds 30a and 30b are disposed side by side to each other and on one side of a heat exchanger core 40 of the heat exchanger 200. Generally, the tank cover 10 and the tank header 20 are secured to each other by crimping and brazing. Particularly, the first set of channels 10a and 10b of the tank cover 10 and the portions 20a and 20b of the tank header 20 aligned with respect to the heat exchanger core 40 and secured to each other configure the manifolds 30a and 30b. More specifically, at least one of the tank cover 10 and the tank header 20 forming the manifolds 30a and 30b is formed with tabs 24 disposed along longitudinal sides thereof to configure crimping connection between the tank cover 10 and the tank header 20. The tank cover 10 and the tank header 20 forming the manifolds are further secured to each other by brazing. However, the tank cover 10 and the tank header 20 can be secured to each other by any other means that can form secure connection between the tank cover 10 and the tank header 20.

[0032] The tank header 20 includes a second set of concave profiles 26a and 26b at the free end thereof. The profiles of the second set of concave profiles 26a and 26b being complementary to the respective profiles of the first set of concave profiles 12a and 12b. Particularly, the tank header 20 includes the extension portions 23a and 23b with the second set of concave profiles 26a and 26b are integrally formed with the header 20. The extension portions are extending beyond the heat exchanger core. 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. As the tank cover 10 is assembled to the tank header 20, the first set of concave profiles 12a and 12b get aligned to the second set of concave profiles 26a and 26b as the free end of the respective first channels 10a and 10b are aligned to the extension portions 23a and 23b to define respective manifold inlet and outlet 32a and 32b as illustrated in FIG. 5. The manifold inlet 32a is for ingress of fluid into the first manifold 30a and the manifold outlet 32b is for egress of fluid from the second manifold 30b.

The tank header 20 further includes apertures 22a and 22b configured on the respective portions 20a and 20b thereof. The apertures 22a and 22b receive respective tubular elements 42a and 42b of the 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,

[0033] 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. 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 the first and second set 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.

[0034] At least one of an intermediate plate 60 and an end cover 70 is orthogonally assembled with respect to longitudinal axis of the first and second manifolds 30a and 30b to form the connection system 80 as illustrated in FIG. 10a-10d. The connection system 80 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 80 can be configured by the intermediate plate 60 alone, the end cover 70 alone or by assembling together the intermediate plate 60 and the end cover 70.

[0035] According to a preferred embodiment as illustrated in FIG. 3 and FIG. 10a-10d, the intermediate plate 60 in conjunction with the end cover 70 when assembled together form the connection system 80. The connection system 80 is formed with the inlet 50a, the outlet 50b, the first fluid passage 30c and the second fluid flow passage 30d. The first fluid flow passage 30c defines fluid flow trajectory and fluid communication between the inlet 50a and the first manifold 30a, whereas the second fluid flow passage 30d defines fluid flow trajectory and fluid communication between the second manifold 30b and the outlet 50b. With the intermediate plate 60 and the end cover 70 forming the connection system 80, 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, compactness of the heat exchanger 200 is achieved. With compact configuration of the heat exchanger of the present invention, more number of heat exchange tubes can be configured in same space occupied by the conventional heat exchanger, thereby improving the heat exchange capacity of the heat exchanger 200 of the present invention compared to the conventional heat exchanger.

[0036] In accordance with an embodiment of the present invention, the intermediate plate 60 is of rectangular configuration and includes a first set of sleeves 62a and 62b, a third set of concave profiles 64a and 64b and either one of tabs and notches 66 as illustrated in FIG. 11. The first set of sleeves 62a and 62b are disposed along a first side of the intermediate plate 60. The intermediate plate 60 is so positioned with respect to the manifolds 30a and 30b that the first set of sleeves 62a and 62b are aligned to receive and hold respective manifold inlet 32a and outlet 32b. The third set of concave profiles 64a and 64b are configured along a second side of the intermediate plate 60 orthogonal to the first side. Either one of tabs and notches 66 are formed on the sides of the intermediate plate 60 for configuring crimping connection of the intermediate plate 60 with the heat exchanger core 40.

[0037] Further, the end cover 70 includes a second set of channels 70a and 70b and either one of tabs and notches 76. The second set of channels 70a and 70b are spaced apart from each other and emanating from portions of the end cover 70 corresponding to and aligned with first set of sleeves 62a and 62b formed on the intermediate plate 60. The second set of channels 70a and 70b extend along the plane of the end cover 70 to one side of the end cover 70 for configuring a fourth set of concave profiles 74a and 74b. Either one of tabs and notches 76 formed on the sides of the end cover 70 for configuring crimping connection with the heat exchanger core 40. The end cover 70 is secured to the heat exchanger core 40 with the intermediate plate 60 disposed between the end cover 70 and the manifolds 30a and 30b. As the end cover 70 is assembled with respect to the intermediate plate 60, the fourth set of concave profiles 74a and 74b get aligned with the third set of concave profiles 64a and 64b and are held together within a second set of sleeves 72a and 72b to define the inlet and outlet 50a and 50b respectively. Still further, in the aligned and assembled configuration of the intermediate plate 60 and the end cover 70, the second set of channels 70a and 70b form the fluid flow passages 30c and 30d along the plane of the end plate 70. The first fluid flow passage 30c configures fluid communication between the inlet 50a and the first manifold 30a and the second fluid flow passage 30d configures fluid communication between the second manifold 30b and outlet 50b. The first and second fluid flow passages 30c and 30d are of varying cross section along the length thereof. Alternatively, cross section of the first and second fluid flow passages 30c and 30d is uniform along the length thereof. The channels of the second set of channels 70a and 70b are separated by a second intermediate gap 70c.

The second intermediate gap 70c provides thermal insulation between fluid flowing through the channels of the second set of channels 70a and 70b. Preferably, the second set of channels 70a and 70b are entirely formed on the end cover 70. In accordance with another embodiment of the present invention, the second set of channels 70a and 70b are partially formed on the end plate 70 and partially formed on the intermediate plate 60. Particularly, at least a portion of the second set of channels 70a and 70b is formed on the intermediate plate 60 and the fluid flow passages 30c and 30d are formed when the end plate 70 is assembled to the intermediate plate 60. However, the present invention is not limited to any particular configuration and placement of the second set of channels 70a and 70b as far as the second set of channels are configuring the fluid flow passages 30c and 30d for configuring fluid communication between the inlet and the outlet 50a and 50b and the respective first and second manifolds 30a and 30b.

[0038] The connection system 80 formed by assembling the intermediate plate 60 and the end plate 70 is disposed orthogonally with respect to the longitudinal axis of the manifold 30a and 30b and is in fluid communication with the manifolds 30a and 30b. The first and the second fluid flow passages 30c and 30d are disposed along the plane of the connection system 80. At least one channel of the second set of channels 70a and 70b follows a curved profile while the other channel follows a straight profile. The first flow passage 30c formed by the channel 70a follows a curved profile between the inlet 50a and the manifold inlet 32a. The second fluid flow passage 30d formed by the channel 70b follows a straight path between the manifold outlet 32b and outlet 50b. Further, substantial portions of the channels of the second set of channels 70a and 70b are parallel to each other, with substantial portion of one channel being disposed underneath the other and the outlet 50b being disposed underneath the inlet 50a. With such configuration, 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.

[0039] Preferably, the inlet and outlet 50a and 50b are symmetrical about a plane passing through center of the second intermediate gap 70c at extreme end of the second intermediate gap 70c. Alternatively, the inlet and outlet 50a and 50b are asymmetrical about a plane passing through center of the second intermediate gap 70c at extreme end of the second intermediate gap 70c, wherein the inlet 50a is larger than the outlet 50b.

[0040] A heat exchanger 200 is disclosed in accordance with an embodiment of the present invention. The heat exchanger 200 includes a heat exchanger core 40, a tank assembly 100, an intermediate manifold 30e and a connection system 80 formed by at least one of an intermediate plate 60 and an end cover 70. The heat exchanger core 40 includes a first set of tubular elements 42a and a 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 is as disclosed above and forms 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 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. At least one of the intermediate plate 60 and the end cover 70 orthogonally assembled with respect to longitudinal axis of the first and second manifold 30a and 30b to form the connection system 80. The connection system 80 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 inlet 50a and the first manifold 30a and 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 there-between to enable configuring of the first and second manifolds 30a and 30b on the same side of the heat exchanger core.

[0041] 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 is defined in the appended set of claims.

Claims

1. A tank assembly (100) comprising an axis of elongation, wherein the tank assembly (100) further comprising:

    • a tank cover (10) extending along the axis of elongation of the tank assembly (100) and formed with first set of channels (10a and 10b); a tank header (20) comprising portions (20a and 20b) that in conjunction with the first set of channels (10a and 10b) formed on the tank cover (10) are adapted to define a first manifold (30a) and a second manifold (30b) when the tank header (20) and the tank cover (10) are assembled with respect to each other, the tank header (20) further comprising apertures (22a and 22b) configured on the respective portions (20a and 20b) thereof, wherein at least one of an intermediate plate (60) and an end cover (70) is orthogonally assembled with respect to longitudinal axis of the first and second manifolds (30a and 30b) to form a connection system (80), the connection system (80) is formed with an inlet (50a), an outlet (50b) and fluid flow passages (30c and 30d) configuring fluid commu-

nication between the inlet and the outlet (50a and 50b) and the respective first and second manifolds (30a and 30b),
wherein the intermediate plate (60) of rectangular configuration comprises:

- a set of concave profiles (64a) and (64b) configured along a second side orthogonal to a first thereof; and
- either one of tabs and notches (66) formed on the sides thereof for configuring crimping connection with the heat exchanger core (40), the tank assembly being **characterized in that** the intermediate plate (60) further comprises a first set of sleeves (62a and 62b) disposed along the first side being aligned to and adapted to receive and hold respective manifold inlet (32a) and outlet (32b).

2. The tank assembly (100) as claimed in the previous claim, wherein the intermediate plate (60) in conjunction with the end cover (70) when assembled together define a first fluid passage (30c) and a second fluid flow passage (30d), the first fluid flow passage (30c) defines fluid flow trajectory and fluid communication between the inlet (50a) and the first manifold (30a), whereas the second fluid flow passage (30d) defines 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 set of channels (10a) and (10b) longitudinally extend along the length of the tank cover (10) to free end thereof to define a first set of concave profiles (12a) and (12b) at free end thereof;
- the tank header (20) comprises a extension portions (23a) and (23b) with second set of concave profiles (26a) and (26b) at the free end thereof, the profiles of the second set of concave profiles (26a) and (26b) being complementary to the respective profiles of the first set of concave profiles (12a) and (12b).

4. The tank assembly as claimed in Claim 3, wherein the extension portions (23a) and (23b) with the second set of concave profiles (26a) and (26b) 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 (1 0a) and (10b) integrally formed with the tank cover (10).

5. The tank assembly (100) as claimed in claim 3, wherein the first set of concave profiles (12a) and (12b) are aligned to the second set of concave profiles (26a) and (26b) to define respective manifold inlet and outlet (32a) and (32b) as the tank cover (10) is assembled to the tank header (20).

6. The tank assembly as claimed in any of the preceding claims, wherein the end cover (70) comprises:

- a second set of channels (70a) and (70b) spaced apart from each other, emanating from portions of the end cover (70) corresponding to and aligned with the first set of sleeves (62a) and (62b) formed on the intermediate plate (60) and extending along plane of the end cover (70) to one side of the end cover (70) for configuring a fourth set of concave profiles (74a) and (74b);
- one of tabs and notches (76) for configuring crimping connection with the heat exchanger core (40),

as the end cover (70) is assembled to the intermediate cover (60), the fourth set of concave profiles (74a) and (74b) get aligned with the third set of concave profiles (64a) and (64b) and are held together within a second set of sleeves (72a) and (72b) to define the inlet and outlet (50a) and (50b) respectively,

7. The tank assembly (100) as claimed in the claim 6, wherein the second set of channels (70a) and (70b) form the fluid flow passages (30c) and (30d) when the end cover (70) is assembled to the intermediate cover (60), the first fluid flow passage (30c) configures fluid communication between the inlet (50a) and the corresponding first manifold (30a) and the second fluid flow passage (30d) configures fluid communication between the second manifold (30b) and outlet (50b).

8. 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), either one of the inlet (50a) and outlet (50b) is disposed underneath the other.

9. The tank assembly (100) as claimed in any of the preceding claims, wherein the first set of channels (10a) and (10b) are separated by a first intermediate gap (10c).

10. The tank assembly (100) as claimed in claim 6, wherein the second set of channels (70a) and (70b) are separated by a second intermediate gap (70c).

11. The tank assembly (100) as claimed in claim 6, wherein at least a portion of the second set of channels (70a) and (70b) is formed on the intermediate plate (60).

12. The tank assembly (100) as claimed in claim 6, wherein at least one channel of the second set of channels (70a) and (70b) follows a curved profile while the other follows a straight profile.

13. The tank assembly (100) as claimed in claim 10, wherein the inlet and outlet (50a) and (50b) are symmetrical about a plane passing through center of the second intermediate gap (70c) at extreme end of the second intermediate gap (70c).

14. The tank assembly (100) as claimed in claim 10, wherein the inlet and outlet (50a) and (50b) are asymmetrical about a plane passing through center of the second intermediate gap (70c) at extreme end of the second intermediate gap (70c).

15. The tank assembly (100) as claimed in claim 2, wherein the first and second fluid flow passages (30c) and (30d) are of varying cross section along the length thereof.

16. The tank assembly (100) as claimed in any of the preceding claims, wherein substantial portions of the channels of the second set of channels (70a) and (70b) are parallel to each other with substantial portion of one channel being disposed underneath the other and the outlet (50b) being disposed underneath the inlet (50a).

17. A heat exchanger (200) comprising :

• a heat exchanger core (40) comprising a first set of tubular elements (42a) and a second set of tubular element (42b) disposed adjacent to the first set of tubular elements and respectively defining a first pass and a second pass;
• a tank assembly (100) as claimed in any of the preceding claims forming a first manifold (30a) and a second manifold (30b) disposed on same side of the heat exchanger core (40), the first manifold (30a) 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),
• at least one of an intermediate plate (60) and an end cover (70) orthogonally assembled with respect to longitudinal axis of the first and second manifolds (30a) and (30b) to form a connection system (80), the connection system (80) formed with an inlet (50a), an outlet (50b) and fluid flow passages (30c) and (30d), the first fluid flow passage (30c) adapted to configure fluid communication between the inlet (50a) and the first manifold (30a) and the second fluid flow passage (30d) adapted to configure 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).

Patentansprüche

1. Tankbaugruppe (100) mit einer Längsachse, wobei die Tankbaugruppe (100) ferner Folgendes umfasst:

• eine Tankabdeckung (10), die sich entlang der Längsachse der Tankbaugruppe (100) erstreckt und mit einem ersten Satz von Kanälen (10a und 10b) gebildet ist; ein Tankkopfstück (20), das Abschnitte (20a und 20b) umfasst, die in Verbindung mit dem ersten Satz von Kanälen (10a und 10b), die auf der Tankabdeckung (10) gebildet sind, dazu ausgelegt sind, einen ersten Verteiler (30a) und einen zweiten Verteiler (30b) zu definieren, wenn das Tankkopfstück (20) und die Tankabdeckung (10) in Bezug zueinander zusammengebaut sind, wobei das Tankkopfstück (20) ferner Öffnungen (22a und 22b) umfasst, die an den jeweiligen Abschnitten (20a und 20b) davon konfiguriert sind, wobei mindestens eine einer Zwischenplatte (60) und einer Endabdeckung (70) in Bezug auf die Längsachse der ersten und zweiten Verteiler (30a und 30b) orthogonal zusammengebaut ist, um ein Verbindungssystem (80) zu bilden, wobei das Verbindungssystem (80) mit einem Einlass (50a), einem Auslass (50b) und Fluidströmungsdurchgänge (30c und 30d) gebildet ist, welche eine Fluidkommunikation zwischen dem Einlass und dem Auslass (50a und 50b) und den jeweiligen ersten und zweiten Verteilern (30a und 30b) konfigurieren,

wobei die Zwischenplatte (60) mit rechteckiger Konfiguration Folgendes umfasst:

• einen Satz von konkaven Profilen (64a) und (64b), die entlang einer zweiten Seite orthogonal zu einer ersten davon konfiguriert sind, und
• eines von Laschen und Kerben (66), die an den

Seiten davon zur Konfiguration einer Crimpverbindung mit dem Wärmetauscherkern (40) gebildet sind, wobei die Tankbaugruppe **dadurch gekennzeichnet ist, dass** die Zwischenplatte (60) ferner einen ersten Satz von Muffen (62a und 62b) umfasst, die entlang der ersten Seite angeordnet sind, die mit dem jeweiligen Verteilereinlass (32a) und -auslass (32b) ausgerichtet und dazu ausgelegt sind, diese aufzunehmen und zu halten.

2. Tankbaugruppe (100) nach dem vorhergehenden Anspruch, wobei die Zwischenplatte (60) in Verbindung mit der Endabdeckung (70) im zusammengebauten Zustand gemeinsam einen ersten Fluiddurchgang (30c) und einen zweiten Fluidströmungsdurchgang (30d) definiert, wobei der erste Fluidströmungsdurchgang (30c) eine Fluidströmungsbahn und eine Fluidkommunikation zwischen dem Einlass (50a) und dem ersten Verteiler (30a) definiert, während der zweite Fluidströmungsdurchgang (30d) eine Fluidströmungsbahn und eine Fluidkommunikation zwischen dem zweiten Verteiler (30b) und dem Auslass (50b) definiert.

3. Tankbaugruppe (100) nach einem der vorhergehenden Ansprüche, wobei

- sich der erste Satz von Kanälen (10a) und (10b) in Längsrichtung entlang der Länge der Tankabdeckung (10) zu einem freien Ende davon erstreckt, um einen ersten Satz von konkaven Profilen (12a) und (12b) am freien Ende davon zu definieren;
- das Tankkopfstück (20) Verlängerungsabschnitte (23a) und (23b) mit einem zweiten Satz von konkaven Profilen (26a) und (26b) am freien Ende davon umfasst, wobei die Profile des zweiten Satzes von konkaven Profilen (26a) und (26b) zu den jeweiligen Profilen des ersten Satzes von konkaven Profilen (12a) und (12b) komplementär sind.

4. Tankanordnung nach Anspruch 3, wobei die Verlängerungsabschnitte (23a) und (23b) mit dem zweiten Satz von konkaven Profilen (26a) und (26b) integral mit dem Kopfstück (20) gebildet sind, während der erste Satz von Profilen (12a) und (12b) inhärent am freien Ende der jeweiligen ersten Kanäle (10a) und (10b) integral mit der Tankabdeckung (10) gebildet ist.

5. Tankbaugruppe (100) nach Anspruch 3, wobei der erste Satz von konkaven Profilen (12a) und (12b) mit dem zweiten Satz von konkaven Profilen (26a) und (26b) ausgerichtet ist, um einen jeweiligen Verteilereinlass und -auslass (32a) und (32b) zu definieren, wenn die Tankabdeckung (10) mit dem Tankkopfstück (20) zusammengebaut ist.

6. Tankbaugruppe nach einem der vorhergehenden Ansprüche, wobei die Endabdeckung (70) Folgendes umfasst:

- einen zweiten Satz von Kanälen (70a) und (70b), die voneinander beabstandet sind, die von Abschnitten der Endabdeckung (70) ausgehen, die dem ersten Satz von Muffen (62a) und (62b) entsprechen und damit ausgerichtet sind, die auf der Zwischenplatte (60) gebildet sind und sich entlang der Ebene der Endabdeckung (70) zu einer Seite der Endabdeckung (70) erstrecken, um einen vierten Satz von konkaven Profilen (74a) und (74b) zu konfigurieren;
- eines von Laschen und Kerben (76) zur Konfiguration der Crimpverbindung mit dem Wärmetauscherkern (40),

wobei, wenn die Endabdeckung (70) mit der Zwischenabdeckung (60) zusammengebaut ist, der vierte Satz von konkaven Profilen (74a) und (74b) mit dem dritten Satz von konkaven Profilen (64a) und (64b) ausgerichtet wird und in einem zweiten Satz von Muffen (72a) und (72b) zusammengehalten wird, um den Einlass bzw. den Auslass (50a) und (50b) zu definieren.

7. Tankbaugruppe (100) nach Anspruch 6, wobei der zweite Satz von Kanälen (70a) und (70b) die Fluidströmungsdurchgänge (30c) und (30d) bildet, wenn die Endabdeckung (70) mit der Zwischenabdeckung (60) zusammengebaut ist, wobei der erste Fluidströmungsdurchgang (30c) eine Fluidkommunikation zwischen dem Einlass (50a) und dem entsprechenden ersten Verteiler (30a) konfiguriert und der zweite Fluidströmungsdurchgang (30d) eine Fluidkommunikation zwischen dem zweiten Verteiler (30b) und dem Auslass (50b) konfiguriert.

8. Tankbaugruppe (100) nach einem der vorhergehenden Ansprüche, wobei der Einlass (50a) und der Auslass (50b) entlang einer Achse angeordnet sind, die sich orthogonal zur Längsachse des ersten und zweiten Verteilers (30a) und (30b) und der Längsachse der röhrenförmigen Elemente (42a) und (42b) erstreckt, wobei einer des Einlasses (50a) und des Auslasses (50b) unterhalb des anderen angeordnet ist.

9. Tankbaugruppe (100) nach einem der vorhergehenden Ansprüche, wobei der erste Satz von Kanälen (10a) und (10b) durch einen ersten Zwischenspalt (10c) getrennt ist.

10. Tankbaugruppe (100) nach Anspruch 6, wobei der zweite Satz von Kanälen (70a) und (70b) durch einen zweiten Zwischenspalt (70c) getrennt ist.

11. Tankbaugruppe (100) nach Anspruch 6, wobei wenigstens ein Abschnitt des zweiten Satzes von Kanälen (70a) und (70b) auf der Zwischenplatte (60) gebildet ist.

12. Tankbaugruppe (100) nach Anspruch 6, wobei wenigstens ein Kanal des zweiten Satzes von Kanälen (70a) und (70b) einem gekrümmten Profil folgt, während der andere einem geraden Profil folgt.

13. Tankbaugruppe (100) nach Anspruch 10, wobei der Einlass und der Auslass (50a) und (50b) symmetrisch um eine Ebene sind, die durch eine Mitte des zweiten Zwischenspalts (70c) am äußersten Ende des zweiten Zwischenspalts (70c) verläuft.

14. Tankbaugruppe (100) nach Anspruch 10, wobei der Einlass und der Auslass (50a) und (50b) asymmetrisch um eine Ebene sind, die durch eine Mitte des zweiten Zwischenspalts (70c) am äußersten Ende des zweiten Zwischenspalts (70c) verläuft.

15. Tankbaugruppe (100) nach Anspruch 2, wobei die ersten und zweiten Fluidströmungsdurchgänge (30c) und (30d) über die Länge davon einen variierenden Querschnitt aufweisen.

16. Tankbaugruppe (100) nach einem der vorhergehenden Ansprüche, wobei wesentliche Abschnitte der Kanäle des zweiten Satzes von Kanälen (70a) und (70b) parallel zueinander sind, wobei ein wesentlicher Abschnitt eines Kanals unterhalb des anderen angeordnet ist und der Auslass (50b) unterhalb des Einlasses (50a) angeordnet ist.

17. Wärmetauscher (200), umfassend:

- einen Wärmetauscherkern (40), der einen ersten Satz von röhrenförmigen Elementen (42a) und einen zweiten Satz von röhrenförmigen Elementen (42b) umfasst, die angrenzend an den ersten Satz von röhrenförmigen Elementen angeordnet sind und jeweils einen ersten Durchlass und einen zweiten Durchlass definieren;
- eine Tankbaugruppe (100) nach einem der vorhergehenden Ansprüche, die einen ersten Verteiler (30a) und einen zweiten Verteiler (30b) bildet, die auf derselben Seite des Wärmetauscherkerns (40) angeordnet sind, wobei der erste Verteiler (30a) dazu ausgelegt ist, Fluid zum ersten Satz von röhrenförmigen Elementen (42a) zu liefern, und der zweite Verteiler (30b) dazu ausgelegt ist, Fluid aus dem Satz von röhrenförmigen Elementen (42b) aufzufangen, nachdem das Fluid während eines Durchgangs durch den ersten und den zweiten Satz von röhrenförmigen Elementen (42a) und (42b) einem Wärmeaustausch unterzogen wurde,
- mindestens eine einer Zwischenplatte (60) und einer Endabdeckung (70), die in Bezug auf die Längsachse der ersten und zweiten Verteiler (30a) und (30b) orthogonal zusammengebaut ist, um ein Verbindungssystem (80) zu bilden, wobei das Verbindungssystem (80) mit einem Einlass (50a), einem Auslass (50b) und Fluidströmungsdurchgängen (30c) und (30d) gebildet ist, wobei der erste Fluidströmungsdurchgang (30c) dazu ausgelegt ist, eine Fluidkommunikation zwischen dem Einlass (50a) und dem ersten Verteiler (30a) zu konfigurieren, und der zweite Fluidströmungsdurchgang (30d) dazu ausgelegt ist, eine Fluidkommunikation zwischen dem zweiten Verteiler (30b) und dem Auslass (50b) zu konfigurieren; und
- einen Zwischenverteiler (30e), der eine Fluidkommunikation zwischen dem ersten Satz von röhrenförmigen Elementen (42a) und dem zweiten Satz von röhrenförmigen Elementen (42b) konfiguriert, um eine U-Strömungsbahn des Fluids dazwischen zu definieren, um eine Konfiguration der ersten und zweiten Verteiler (30a) und (30b) auf derselben Seite des Wärmetauscherkerns (40) zu ermöglichen.

Revendications

1. Ensemble réservoir (100) comprenant un axe d'allongement, dans lequel l'ensemble réservoir (100) comprend en outre :

- un couvercle de réservoir (10) s'étendant le long de l'axe d'allongement de l'ensemble réservoir (100) et formé avec un premier groupe de canaux (10a et 10b) ; un collecteur de réservoir (20) comprenant des parties (20a et 20b) qui, conjointement avec le premier groupe de canaux (10a et 10b) formés sur le couvercle de réservoir (10), sont adaptées pour définir une première tubulure (30a) et une seconde tubulure (30b) lorsque le collecteur de réservoir (20) et le couvercle de réservoir (10) sont assemblés l'un par rapport à l'autre, le collecteur de réservoir (20) comprenant en outre des ouvertures (22a et 22b) configurées sur les parties respectives (20a et 20b) de celui-ci, dans lequel au moins un d'une plaque intermédiaire (60) et d'un couvercle d'extrémité (70) est orthogonalement assemblé par rapport à l'axe longitudinal des première et seconde tubulures (30a et 30b) pour former un système de raccordement (80), le système de raccordement (80) est formé avec une entrée (50a), une sortie (50b) et des passages d'écoulement de fluide (30c et 30d) configurant une communication fluidique entre l'entrée et la sortie (50a et 50b) et les première et seconde tubulures respectives (30a et 30b),

dans lequel la plaque intermédiaire (60) de configuration rectangulaire comprend :

- un groupe de profils concaves (64a) et (64b) configurés le long d'un second côté orthogonal à un premier de celle-ci ; et
- des pattes ou des encoches (66) formées sur les côtés de celle-ci pour configurer un raccordement par sertissage avec le faisceau d'échangeur de chaleur (40), l'ensemble réservoir étant **caractérisé en ce que** la plaque intermédiaire (60) comprend en outre un premier groupe de manchons (62a et 62b) disposés le long du premier côté étant alignés avec et adaptés pour recevoir et retenir une entrée (32a) et une sortie (32b) de tubulure respectives.

2. Ensemble réservoir (100) tel que revendiqué dans la revendication précédente, dans lequel la plaque intermédiaire (60) conjointement avec le couvercle d'extrémité (70), lorsqu'ils sont assemblés ensemble, définissent un premier passage de fluide (30c) et un second passage d'écoulement de fluide (30d), le premier passage d'écoulement de fluide (30c) définit une trajectoire d'écoulement de fluide et une communication fluidique entre l'entrée (50a) et la première tubulure (30a), alors que le second passage d'écoulement de fluide (30d) définit une trajectoire d'écoulement de fluide et une communication fluidique entre la seconde tubulure (30b) et la sortie (50b).

3. Ensemble réservoir (100) tel que revendiqué dans de quelconques des revendications précédentes, dans lequel,

- le premier groupe de canaux (10a) et (10b) s'étendent longitudinalement le long de la longueur du couvercle de réservoir (10) jusqu'à une extrémité libre de celui-ci pour définir un premier groupe de profils concaves (12a) et (12b) à l'extrémité libre de celui-ci ;
- le collecteur de réservoir (20) comprend des parties d'extension (23a) et (23b) avec un deuxième groupe de profils concaves (26a) et (26b) à l'extrémité libre de celui-ci, les profils du deuxième groupe de profils concaves (26a) et (26b) étant complémentaires aux profils respectifs du premier groupe de profils concaves (12a) et (12b).

4. Ensemble réservoir tel que revendiqué dans la revendication 3, dans lequel les parties d'extension (23a) et (23b) avec le deuxième groupe de profils concaves (26a) et (26b) sont formées de façon monobloc avec le collecteur (20), alors que le premier groupe de profils (12a) et (12b) sont formés de façon inhérente à l'extrémité libre des premiers canaux (10a) et (10b) respectifs formés de façon monobloc avec le couvercle de réservoir (10).

5. Ensemble réservoir (100) tel que revendiqué dans la revendication 3, dans lequel le premier groupe de profils concaves (12a) et (12b) sont alignés avec le deuxième groupe de profils concaves (26a) et (26b) pour définir des entrée et sortie (32a) et (32b) de tubulures respectives quand le couvercle de réservoir (10) est assemblé avec le collecteur de réservoir (20).

6. Ensemble réservoir tel que revendiqué dans de quelconques des revendications précédentes, dans lequel le couvercle d'extrémité (70) comprend :

- un second groupe de canaux (70a) et (70b) espacés l'un de l'autre, provenant de parties du couvercle d'extrémité (70) correspondant au premier groupe de manchons (62a) et (62b), et alignées avec ceux-ci, formés sur la plaque intermédiaire (60) et s'étendant le long d'un plan du couvercle d'extrémité (70) jusqu'à un côté du couvercle d'extrémité (70) pour configurer un quatrième groupe de profils concaves (74a) et (74b) ;
- des pattes ou des encoches (76) pour configurer un raccordement par sertissage avec le faisceau d'échangeur de chaleur (40),

quand le couvercle d'extrémité (70) est assemblé avec le couvercle intermédiaire (60), le quatrième groupe de profils concaves (74a) et (74b) sont alignés avec le troisième groupe de profils concaves (64a) et (64b) et sont retenus ensemble à l'intérieur d'un second groupe de manchons (72a) et (72b) pour définir l'entrée et la sortie (50a) et (50b) respectivement.

7. Ensemble réservoir (100) tel que revendiqué dans the la revendication 6, dans lequel le second groupe de canaux (70a) et (70b) forment les passages d'écoulement de fluide (30c) et (30d) lorsque le couvercle d'extrémité (70) est assemblé avec le couvercle intermédiaire (60), le premier passage d'écoulement de fluide (30c) configure une communication fluidique entre l'entrée (50a) et la première tubulure correspondante (30a) et le second passage d'écoulement de fluide (30d) configure une communication fluidique entre la seconde tubulure (30b) et la sortie (50b).

8. Ensemble réservoir (100) tel que revendiqué dans de quelconques des revendications précédentes, dans lequel l'entrée (50a) et la sortie (50b) sont disposées le long d'un axe s'étendant orthogonalement à l'axe longitudinal des première et seconde tubulure (30a) et (30b) et à l'axe longitudinal des éléments tubulaires (42a) et (42b), l'une ou l'autre de l'entrée (50a) et de la sortie (50b) est disposée en dessous de l'autre.

9. Ensemble réservoir (100) tel que revendiqué dans de quelconques des revendications précédentes, dans lequel le premier groupe de canaux (10a) et (10b) sont séparés par un premier espace intermédiaire (10c).

10. Ensemble réservoir (100) tel que revendiqué dans la revendication 6, dans lequel le second groupe de canaux (70a) et (70b) sont séparés par un second espace intermédiaire (70c).

11. Ensemble réservoir (100) tel que revendiqué dans la revendication 6, dans lequel au moins une partie du second groupe de canaux (70a) et (70b) est formée sur la plaque intermédiaire (60).

12. Ensemble réservoir (100) tel que revendiqué dans la revendication 6, dans lequel au moins un canal du second groupe de canaux (70a) et (70b) suit un profil courbé alors que l'autre suit un profil droit.

13. Ensemble réservoir (100) tel que revendiqué dans la revendication 10, dans lequel l'entrée et la sortie (50a) et (50b) sont symétriques relativement à un plan passant à travers un centre du second espace intermédiaire (70c) à l'extrémité finale du second espace intermédiaire (70c).

14. Ensemble réservoir (100) tel que revendiqué dans la revendication 10, dans lequel l'entrée et la sortie (50a) et (50b) sont asymétriques relativement à un plan passant à travers un centre du second espace intermédiaire (70c) à l'extrémité finale du second espace intermédiaire (70c).

15. Ensemble réservoir (100) tel que revendiqué dans la revendication 2, dans lequel les premier et second passages d'écoulement de fluide (30c) et (30d) sont de section transversale diverse le long de la longueur de ceux-ci.

16. Ensemble réservoir (100) tel que revendiqué dans de quelconques des revendications précédentes, dans lequel des parties importantes des canaux du second groupe de canaux (70a) et (70b) sont parallèles l'une à l'autre, avec une partie importante d'un canal disposée en dessous de l'autre et la sortie (50b) disposée en dessous de l'entrée (50a).

17. Échangeur de chaleur (200), comprenant :

- un faisceau d'échangeur de chaleur (40) comprenant un premier groupe d'éléments tubulaires (42a) et un second groupe d'éléments tubulaires (42b) disposés de façon adjacente au premier groupe d'éléments tubulaires et définissant respectivement un premier chemin et un second chemin ;
- un ensemble réservoir (100) tel que revendiqué dans de quelconques des revendications précédentes formant une première tubulure (30a) et une seconde tubulure (30b) disposée sur un même côté du faisceau d'échangeur de chaleur (40), la première tubulure (30a) étant adaptée pour livrer un fluide au premier groupe d'éléments tubulaires (42a) et la seconde tubulure (30b) étant adaptée pour collecter un fluide à partir du deuxième groupe d'éléments tubulaires (42b) après que le fluide a subi un échange de chaleur alors qu'il passe à travers le premier et le second groupe d'éléments tubulaires (42a) et (42b),
- au moins un d'une plaque intermédiaire (60) et d'un couvercle d'extrémité (70) orthogonalement assemblé par rapport à un axe longitudinal des première et seconde tubulures (30a) et (30b) pour former un système de raccordement (80), le système de raccordement (80) étant formé avec une entrée (50a), une sortie (50b), et des passages d'écoulement de fluide (30c) et (30d), le premier passage d'écoulement de fluide (30c) étant adapté pour configurer une communication fluidique entre l'entrée (50a) et la première tubulure (30a) et le second passage d'écoulement de fluide (30d) étant adapté pour configurer une communication fluidique entre la seconde tubulure (30b) et la sortie (50b) ; et
- une tubulure intermédiaire (30e) configurant une communication fluidique entre le premier groupe d'éléments tubulaires (42a) et le second groupe d'éléments tubulaires (42b) pour définir une trajectoire d'écoulement en U du fluide entre ceux-ci pour permettre la configuration des première et seconde tubulures (30a) et (30b) sur le même côté du faisceau d'échangeur de chaleur (40).

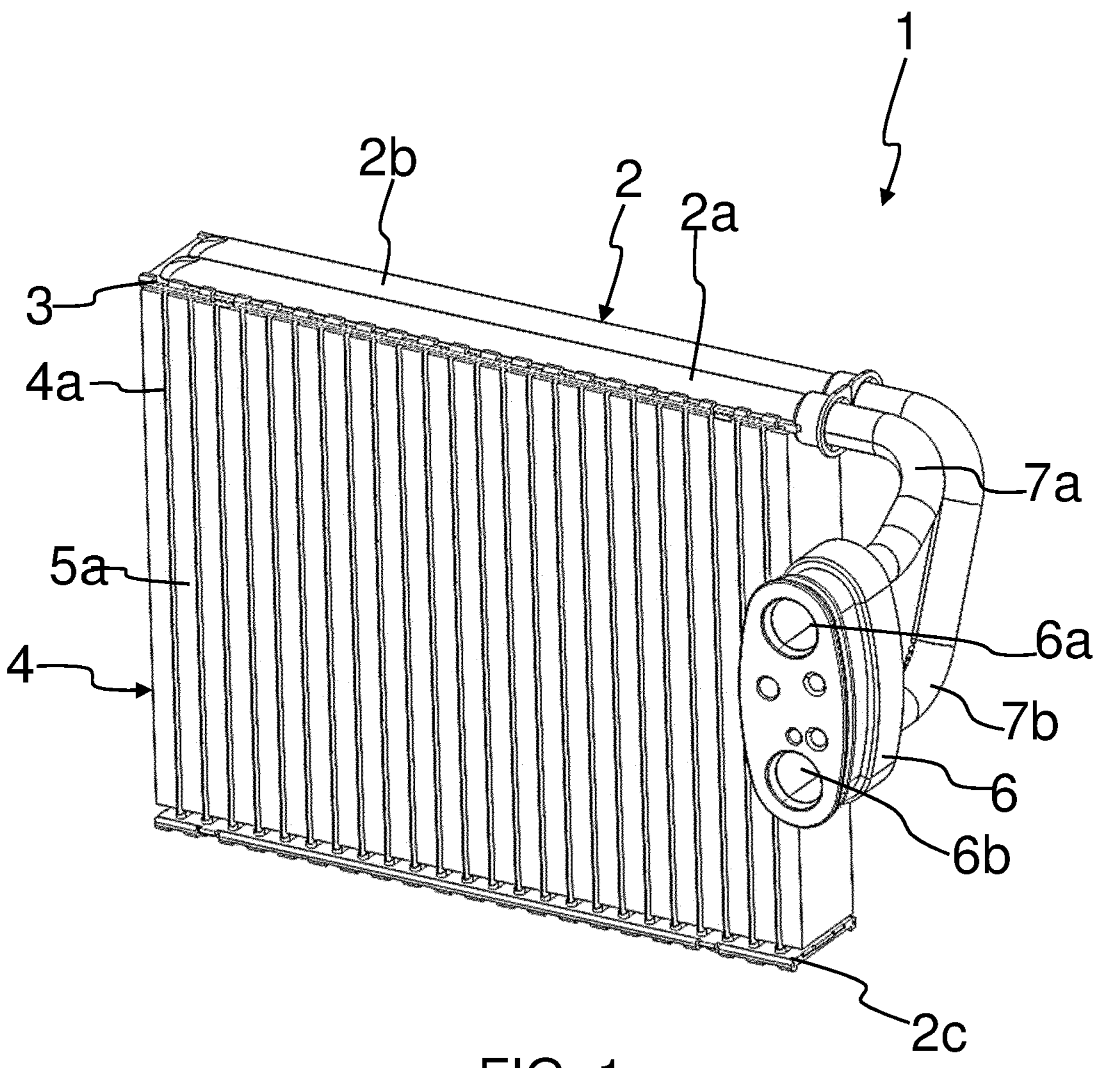

FIG. 1
(PRIOR ART)

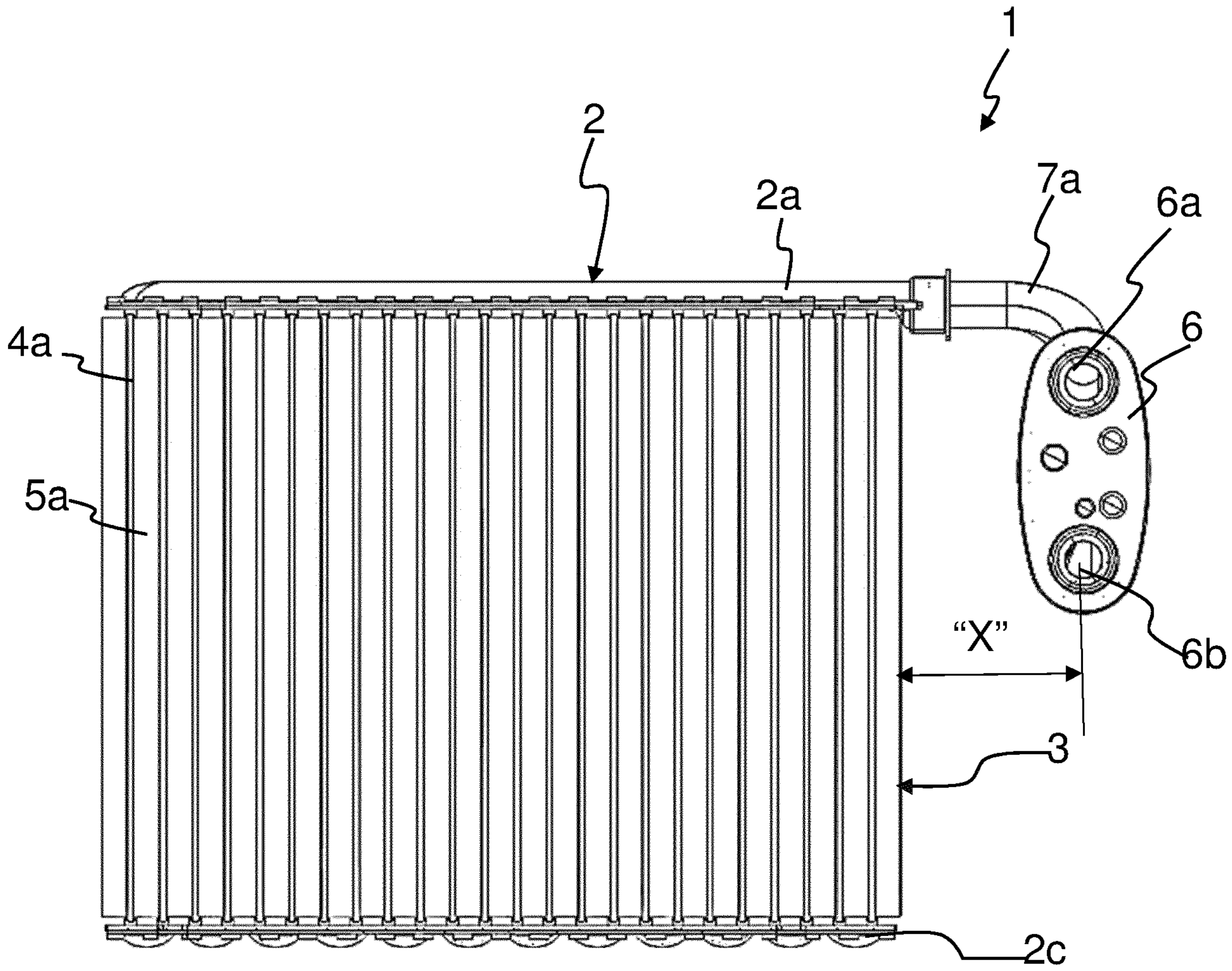

FIG. 2
(PRIOR ART)

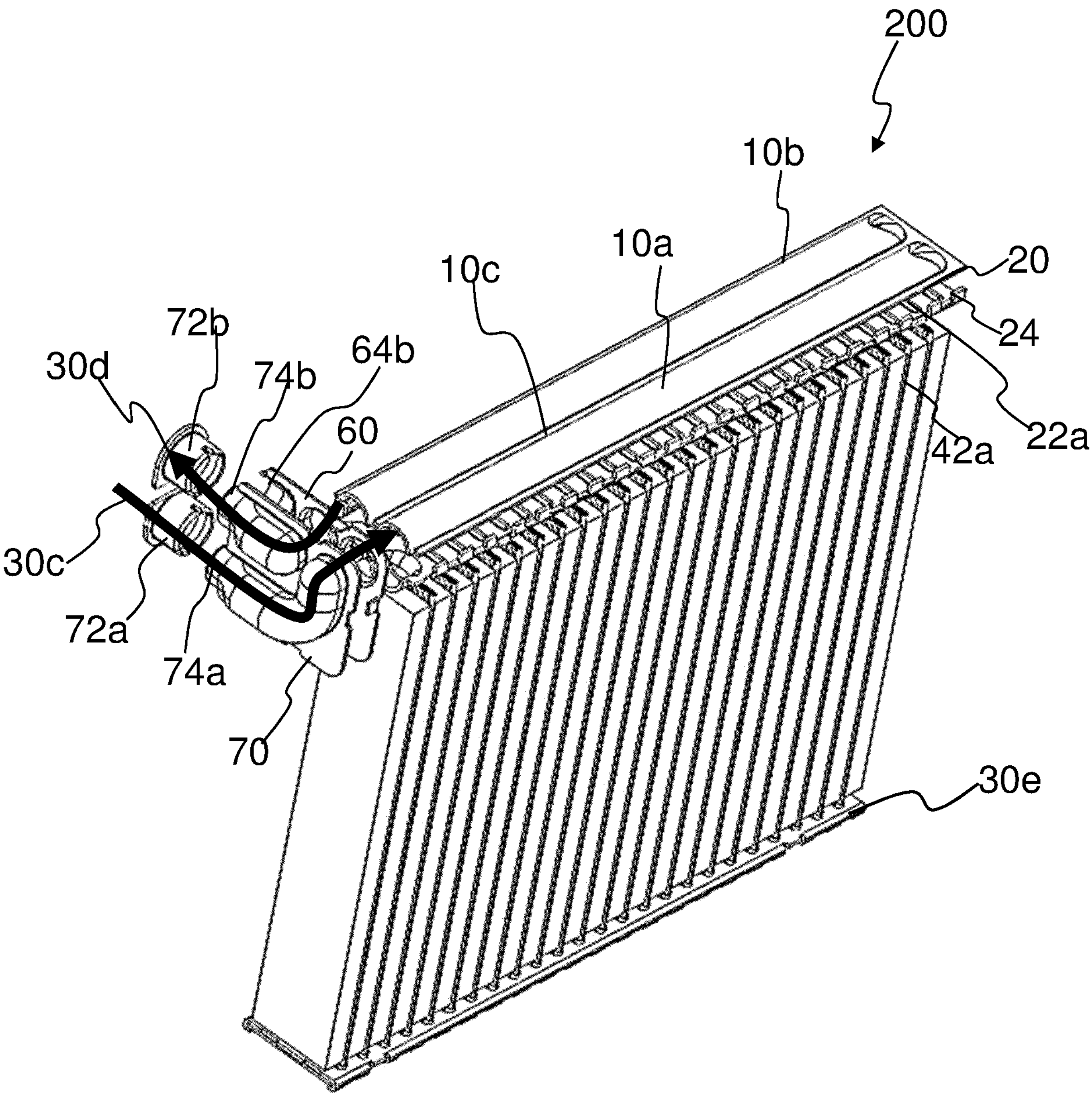
200
10b
10a
10c
20
72b
24
30d
74b
64b
60
22a
42a
30c
72a
74a
70
30e

FIG. 3

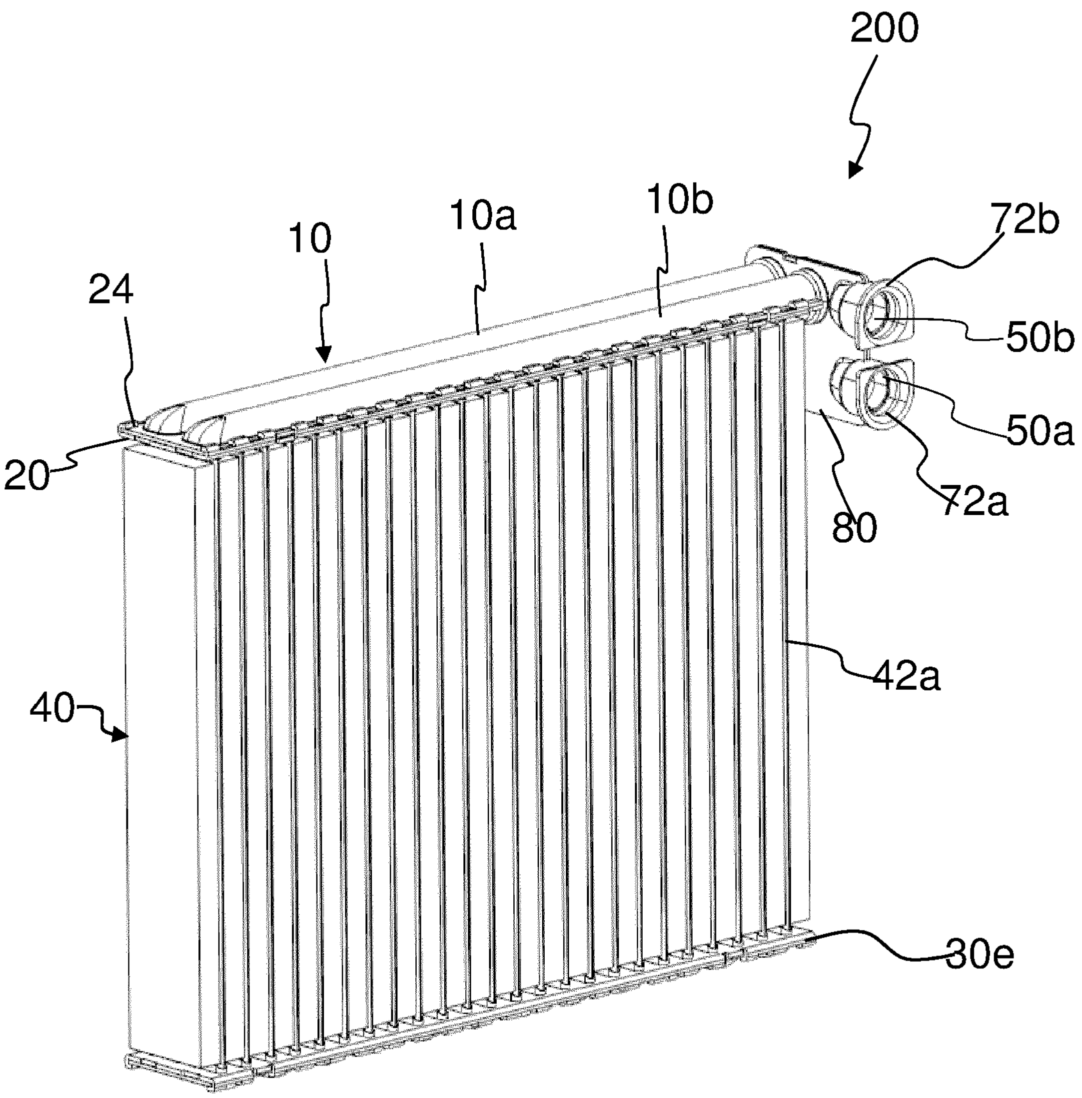

FIG. 4

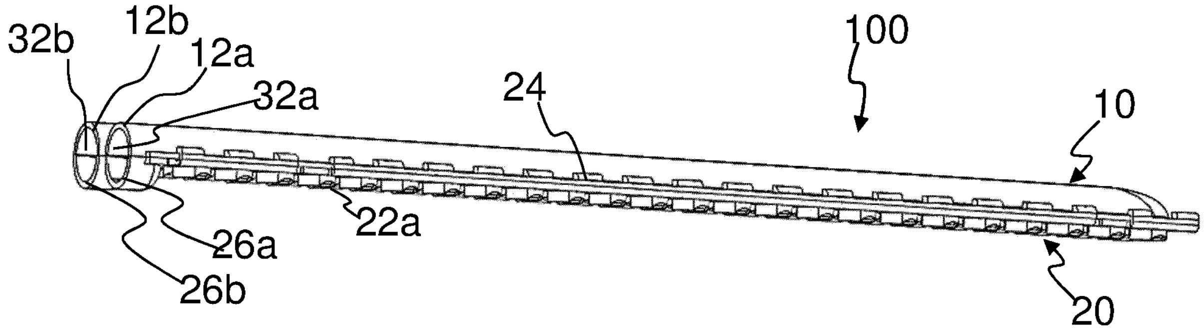

FIG. 5

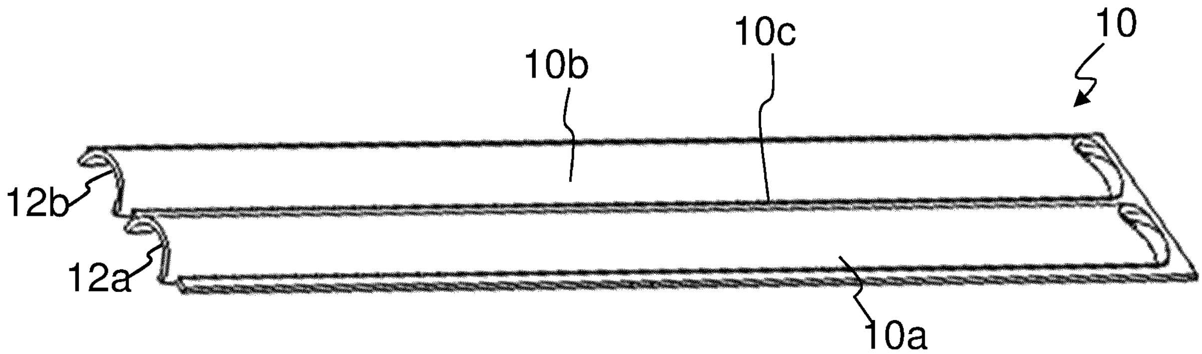

FIG. 6

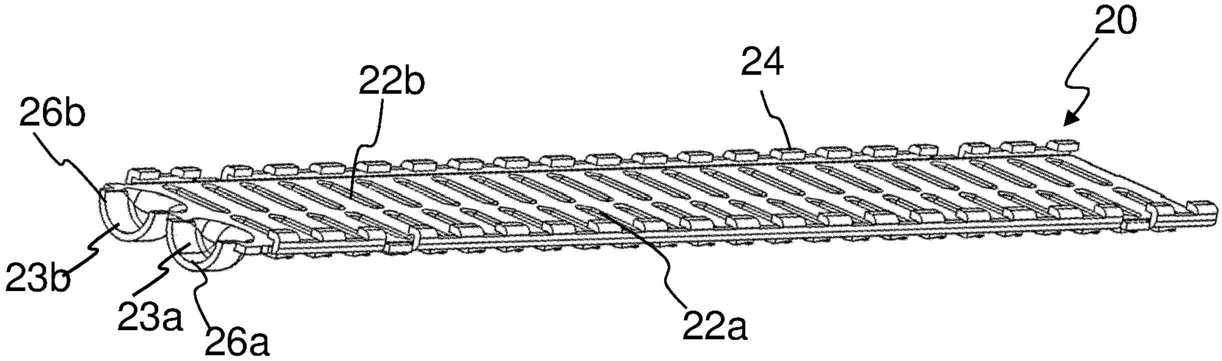

FIG. 7

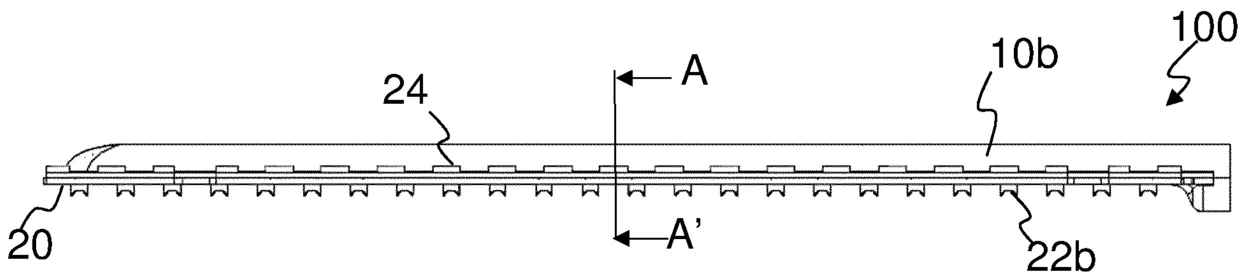

FIG. 8

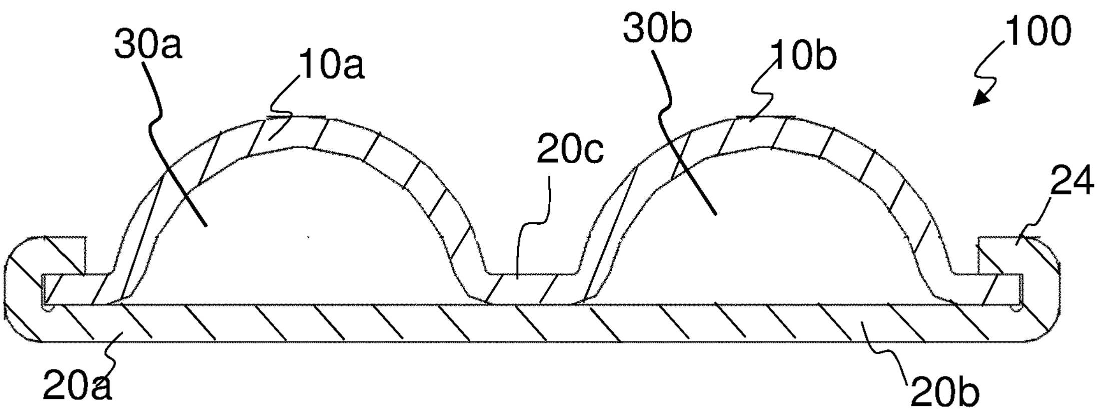

FIG. 9

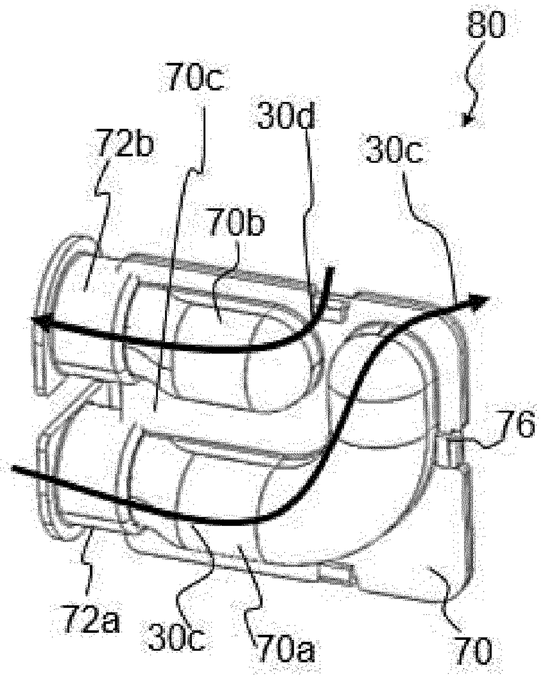

FIG. 10a

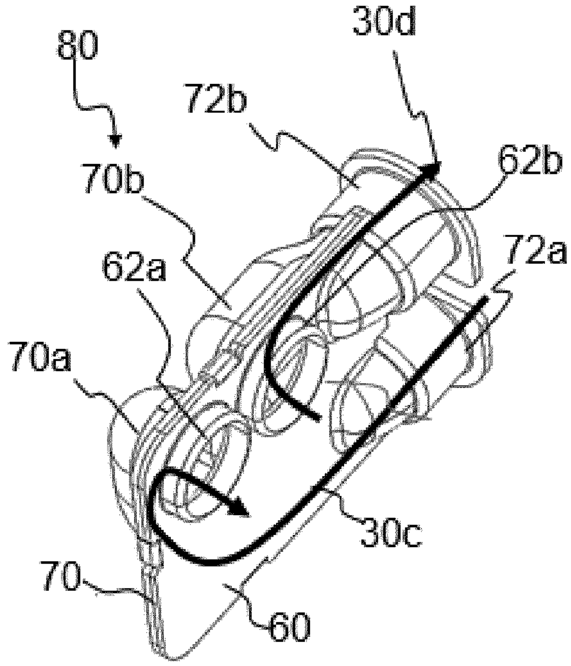

FIG. 10b

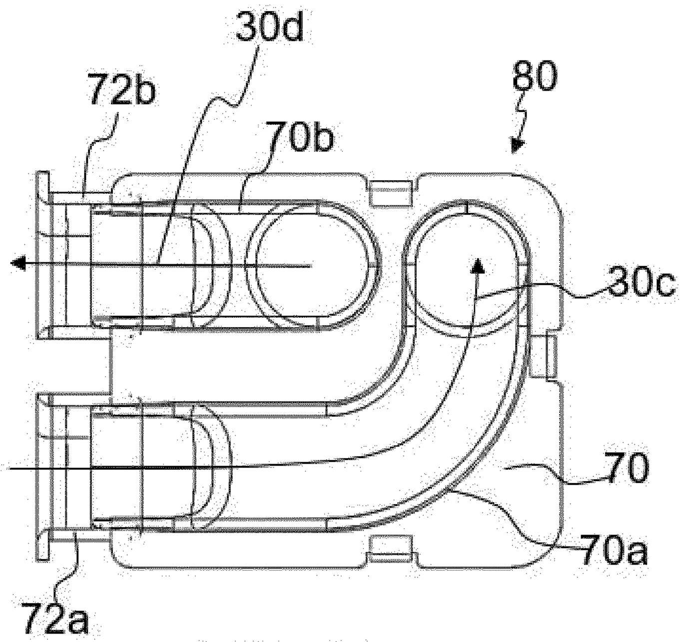

FIG. 10c

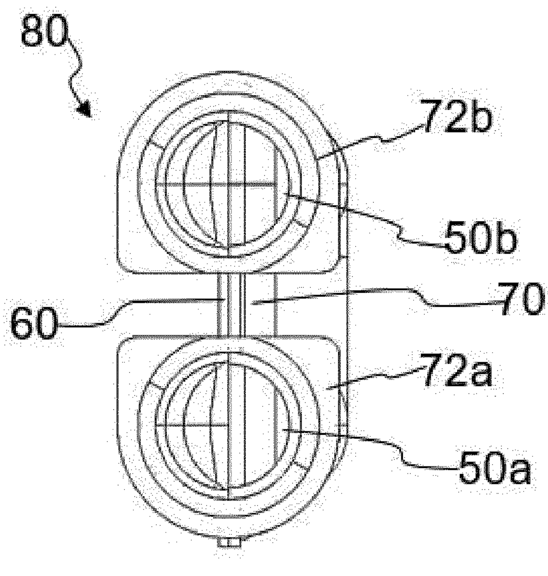

FIG. 10d

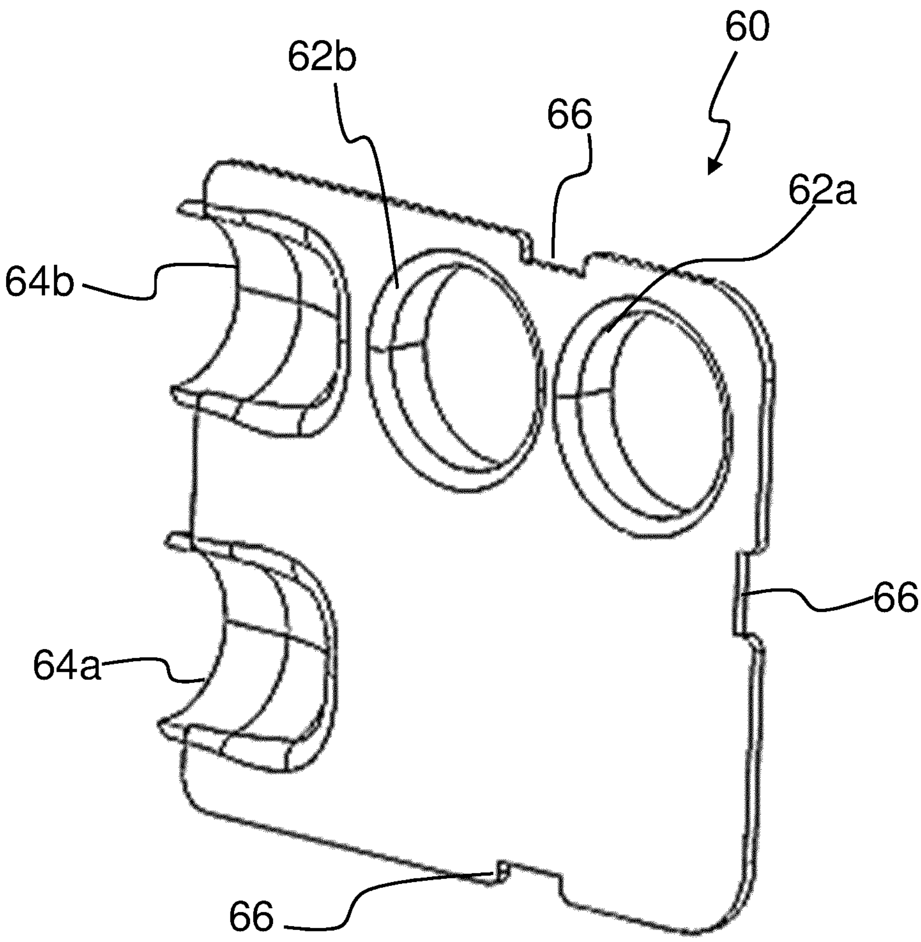

FIG. 11

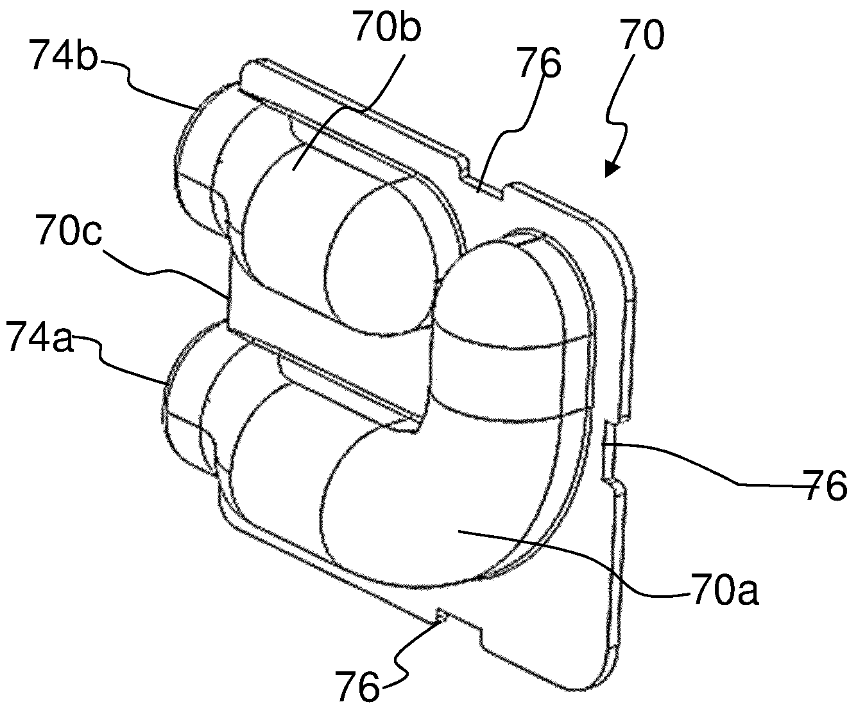

FIG. 12

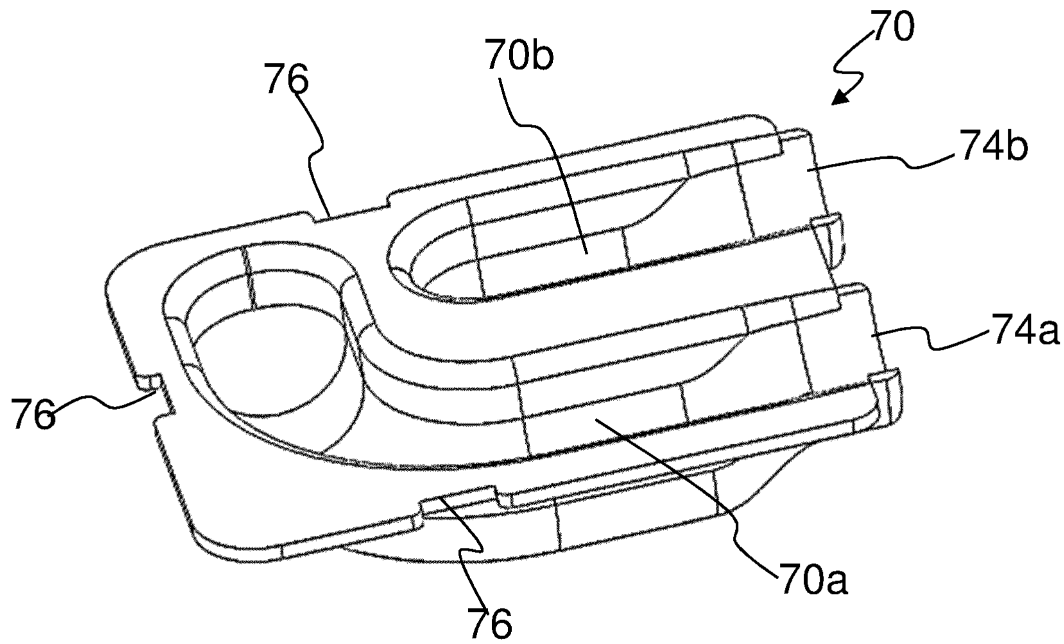

FIG. 13

REFERENCES CITED IN THE DESCRIPTION

Patent documents cited in the description

- US 2015330681 A **[0001]**