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(54) A HEAT EXCHANGER

(57) The heat exchanger plate (10, 20) includes a planar surface (11, 21), wherein the planar surface comprises corrugations (12, 22) and at least one hole (13, 23) are provided on the planar surface (11, 21) to define the coolant or refrigerant fluid flow. In addition, the heat exchanger plate comprises a peripheral rim (14, 24) circumscribing the corrugation and defining boundary of the heat exchange plate, characterized in that the heat exchanger plate (10, 20) further comprises at least one supporting member (16a, 16b, 26a, 26b) protruding directly from the peripheral rim (14, 24) and at least one receiving member (18a, 18b, 28a, 28b) provided on the peripheral rim (14, 24).

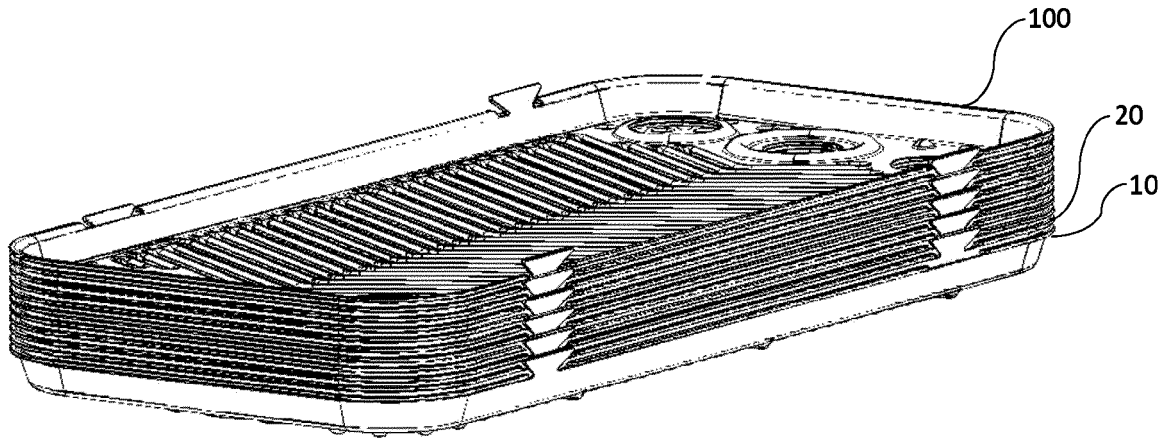

FIG. 1

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Description

FIELD OF INVENTION

[0001] The present invention relates to a heat exchanger. More specifically, the present invention relates to a plate type heat exchanger.

BACKGROUND OF THE INVENTION

[0002] A plate type heat exchangers may include a core and manifolds for distribution and collection of fluids. The core is configured by a plurality of corrugated plates stacked with respect to each other for defining heat transfer surfaces. Particularly, two different types of plates are arranged alternately with respect to each other to define the heat exchange passages on both sides of the plates. Generally, the plates of same type are formed with same pattern and dimensions of corrugations. The plates are usually stamped to form a pattern of bulges and recesses on their surface. The plates are assembled and later joined by a joining process such as, for example, but not limited to, brazing. Brazing allows forming the fluid-tight assembly, for example for fluid flow channels for turbulent flow of a coolant and a refrigerant on either sides of the plates respectively. The plates are also provided with openings appropriately positioned to form inlet and outlet channels for heat transfer media when the stack of plates are assembled and joined.

[0003] The characteristic features of plate heat exchangers consists in that the flow paths of heat transfer media are interleaved, i.e. the spaces between successive plates in the stack of plates alternately configure compartments for a heat-emitting medium and a heat-absorbing medium. Additionally, the channels formed by the patterns formed on the neighboring plates, split the stream of each medium into many smaller streams and impart turbulences to the fluid stream flow, which results in enhanced heat transfer between the media.

[0004] The core of the plate-type heat exchanger is made of at least two different plates such as A-type and B-type. The A-type plates and the B-type plates are alternately stacked and brazed together to configure the heat exchanger core. For configuring the heat exchanger core by alternately arranging the different types of heat exchange plate, at least one plate from a stack of A-type plates is picked and then at least one plate from a stack of B-type plates is picked and the A-type plate and the B-type plates are arranged alternately with respect to each other. However, since the A-type plates are closely stacked with respect to each other to configure the stack of A-type plates, thereby causing the surfaces of the adjacent A-type plate to abut and stick with respect to each other. Accordingly, separating A-type plate from the stack of A-type plates is difficult. Similarly, separating B-type plate from the stack of B-type plates is difficult.

[0005] Therefore, there is a need for heat exchanger plates for a plate type heat exchanger that can be maintained spaced apart with respect to adjacent heat exchanger plates of same type when arranged in a stack, thereby preventing the sticking between adjacent heat exchanger plates in the stack of same type of heat exchanger plates and problem arising from such sticking. Particularly, there is a need for heat exchanger plates that can be easily separated from stack of same type of the heat exchanger plates.

[0006] An objective of the present invention is to provide means for providing spacing between the adjacent plates to prevent the sticking between adjacent plates stacked together to form a stack of same type of plates.

SUMMARY OF THE INVENTION

[0007] The present invention discloses a plate type exchanger (hereinafter, also referred to as heat exchanger or stacked plate type heat exchanger) for a motor vehicle includes a plurality of improved heat exchanger plate that can obviate the sticking tendency between the adjacent plates in a stack. The heat exchanger includes a core with a plurality of first and second type of heat exchanger plates (hereinafter, also referred to as heat transfer plates), wherein each of the first and second type of heat exchanger plates are configured with a planar surface with a plurality of corrugations and at least one hole are provided on the surface to define the coolant or refrigerant fluid flow. The first and second type heat exchanger plates also include a peripheral rim circumscribing the corrugation and defining boundary of the plate. At least one supporting member and at least one receiving member provided on the peripheral rim wherein, the supporting member protruding from the peripheral rim of the first type plate is configured to be received in the corresponding receiving member on the peripheral rim of the adjacent second type plate. And the receiving member on the peripheral rim of the second type plate is configured to receive the supporting member on the peripheral rim of the adjacent first type plate.

[0008] Preferably, the heat exchanger plate is configured with at least two supporting members and are positioned diagonally opposite to each other on the peripheral rim, and proximal to the corner of the heat exchanger plate.

[0009] Similarly, the heat exchanger plate is configured with at least two receiving members and are positioned diagonally opposite to each other on the peripheral rim, and proximal to the corner of the heat exchanger plate.

[0010] In accordance with an embodiment of the present invention, the supporting member can be flexible or rigid enough to adapt to the receiving member.

[0011] In accordance with an embodiment of the present invention, the supporting member is protruding aligned to the rim or can be protruding with an angle from the rim.

[0012] In accordance with another embodiment of the present invention, the supporting member is of essen-

tially triangular shape, further, the supporting member is protruding diverging from the peripheral rim of the heat exchanger plate to the distal end of the supporting member.

[0013] In accordance with another embodiment of the present invention, the longer dimension of the supporting member of the first plate is lesser than the dimension of the receiving member formed on the corresponding adjacent second plate.

[0014] In accordance with another embodiment of the present invention, the dimension of the cut on the peripheral rim of the adjacent first heat exchanger plate is smaller than the longer dimension of the supporting member formed on the corresponding first heat exchanger plate.

[0015] In accordance with another embodiment of the present invention, the longer longitudinal dimension of the supporting member is smaller than the dimension of the receiving member formed on the peripheral rim of the adjacent heat exchanger plate. Further, the longitudinal dimension of the cut on the peripheral rim of the heat exchanger plate is smaller than the longer longitudinal dimension of the supporting member formed on the peripheral rim of the adjacent heat exchanger plate.

BRIEF DESCRIPTION OF DRAWINGS

[0016] Other characteristics, details and advantages of the invention may 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 depicting a core of a plate type heat exchanger configured by assembling and joining alternately arranged different types of plates.

FIG. 2 illustrates an exploded view depicting the core of the plate type heat exchanger of FIG. 1.

FIG. 3 shows a first type plate of the core of the plate type heat exchanger of FIG. 1.

FIG. 4 shows a second type plate of the core of the plate type heat exchanger of FIG. 1.

FIG. 5 illustrates the heat transfer plate in accordance with another embodiment with two rectangular shaped supporting members.

FIG. 6 shows a stack of a plurality of first type plates.

FIG. 7 shows an enlarged cross sectional view of the stack of the first type plates illustrated in FIG. 6.

FIG.8 shows an enlarged cross sectional view of the core of the plate type heat exchanger of FIG. 1.

FIG. 9 illustrates an enlarged view depicting the interaction between supporting members and receiving members of first and second type of plates, also depicting the longitudinal dimensions of supporting members and receiving members.

DETAILED DESCRIPTION OF THE INVENTION

[0017] It must be noted that the figures disclose the invention in a detailed enough way to be implemented, said figures helping to better define the invention if needs be. The invention should however not be limited to the embodiment disclosed in the description.

[0018] FIG. 1 of the accompanying drawings illustrates an isometric view of a core 100 of a plate type heat exchanger in accordance with an embodiment of the present invention. The core 100 of the plate type heat exchanger includes at least one first type heat transfer plate 10 (hereinafter, also referred to as first type plate) and at least one second type heat transfer plate 20 (hereinafter, also referred to as second type plate), which are stacked together alternately with respect to each other.

[0019] FIG. 2 illustrates an exploded view of the core 100 of the plate type heat exchanger. The first type plate 10 and the second type plate 20 are configured with a planar surface 11, 21 wherein a plurality of corrugations 12, 22 and at least one hole 13, 23 is provided on the planar surface of the plate for defining the flow of coolant or refrigerant fluid. The corrugations 12, 22 are delimited by a peripheral rim 14, 24 which also defines the boundary of the heat transfer plate.

[0020] FIG. 3 and 4 show an exemplary embodiment of the present invention in which FIG. 3 illustrates first type plate 10 of the core 100 of the plate type heat exchanger. The first type plate 10 includes at least two supporting members 16a, 16b disposed along the peripheral rim 14 of the plate. The supporting members 16a, 16b may extend either from the planar surface 11 of the first plate 10 or from the peripheral rim 14. Further, the two supporting members 16a, 16b are diagonally opposite to each other and positioned proximal to the corners of the peripheral rim 14. However, the present invention is not limited to any number(s) or any position for the supporting members 16a, 16b as far as these supporting members 16a, 16b pass through the receiving members 28a, 28b on the adjacent plate of second type 20 and the cut on the peripheral rim of the adjacent plate of the same type, particularly, the adjacent plate of first type 10 to support the rim of the adjacent plate of the first type 10. In addition, the first type plate 10 includes at least two receiving members 18a, 18b located on the peripheral rim 14 of the plate. Further, the two receiving members 18a, 18b are diagonally opposite to each other and positioned proximal to the other corners of the peripheral rim 14. However, the present invention is not limited to any number(s)

or any position for the receiving members 18a, 18b as far as the receiving members 18a, 18b allow passage of the supporting members formed on the adjacent plate of the second type, particularly, the second type plate 20.

[0021] FIG. 4 shows the second type plate 20 of the core 100 of the plate type heat exchanger. At least two supporting members 26a, 26b and at least two receiving members 28a, 28b are configured on the peripheral rim 24 of the plate in such a way that, wherever plates of first and second types are assembled together, the supporting members 26a, 26b formed on the peripheral rim 24 of the first type plate 20 pass through the corresponding receiving members 18a, 18b formed on the peripheral rim 14 of the first type plate 10 and cut formed on the adjacent second type plate 20 to support the peripheral rim portion on sides of the cut formed on the adjacent second type plate 20. Further, the receiving members 28a, 28b formed on the peripheral rim 24 of the second type plate 20 allow passage of the supporting members 16a, 16b configured on the peripheral rim 14 of the first type plate 10 that support the peripheral rim portion on sides of the cut formed on the adjacent first type plate 10. However, the present invention is not limited to any positions for the supporting members 16a, 16b, 26a, 26b and for the receiving members 18a, 18b, 28a, 28b.

[0022] In accordance with an embodiment of the present invention, the supporting members 16a, 16b, 26a, 26b are of substantially triangular or substantially trapezoidal shape and are protruding divergently from the peripheral rim 14, 24 of the first and second type plates 10, 20. Terms substantially triangular and substantially trapezoidal may include embodiments and shape variations which are of similar shape to these figures and do not represent their shape described by commonly known definitions. For example, the substantially triangular of supporting member 16a, 16b, 26a, 26b may comprise rounded corners, incisions on its outline, etc. Thus, the present invention is not limited to any shape for the supporting members 16a, 16b, 26a, 26b.

[0023] In accordance with another embodiment of the present invention, the supporting members 16a, 16b, 26a, 26b are protruding with the same alignment with the peripheral rim 14, 24.

[0024] In accordance with another embodiment of the present invention, the supporting members 16a, 16b, 26a, 26b are protruding with an angle from the peripheral rim 14, 24.

[0025] In accordance with an another embodiment of the present invention, shown in FIG. 5, the heat transfer plate 30 includes at least two essentially rectangular shaped supporting members 36a, 36b located on the peripheral rim 34 of the plate 30. Further the two supporting members 36a, 36b are diagonally opposite to each other and positioned proximal to the corners of the peripheral rim 34. In addition, the heat transfer plate 30 includes at least two receiving members 38a, 38b located on the peripheral rim 34 of the plate complementary to the corresponding support elements formed on adjacent heat exchange plate of type other than the type of the heat exchanger plate configured with the receiving members 38a, 38b to allow passage of the corresponding support elements there through. Further, the two receiving members 38a, 38b are diagonally opposite to each other and positioned proximal to the other corners of the peripheral rim 34.

[0026] FIG. 6 shows a stack 200 includes a plurality of first type plates 10 with at least two essentially triangular shaped supporting members 16a, 16b and at least two receiving members 18a, 18b configured on the peripheral rim 14 of each first type plate 10 in the stack 200. The supporting members 16a, 16b in each heat transfer plate of first type interacts with corresponding rim portion of the adjacent heat transfer plate of first type to create a gap between the adjacent heat transfer plates, thereby limiting the contact between the heat transfer plates of first type. Thus the supporting members 16a, 16b in each heat transfer plate may help to prevent the sticking of the adjacent heat transfer plates in a stack 200 of same type of heat transfer plates. Also, the two supporting members 16a, 16b are positioned diagonally opposite to properly support and adapt in a stack and preventing tilting of the heat transfer plates. Referring to FIG. 7, it shows a cross sectional view of the stack 200 of the first type plate 10, wherein the supporting member 16a of a first type plate 10 is made a point of contact with peripheral rim 14 of the upper adjacent first type plate 10 and there by providing a gap between the adjacent heat transfer plates.

[0027] FIG. 8 shows a cross sectional view of the core 100 of the plate type heat exchanger. The core 100 is configured with a plurality of first type plates 10 and second type plates 20, which are alternately stacked together in such a way that the supporting member 16a, 16b protruding from the peripheral rim 14 of the first type plate 10 is adapted to be received in the corresponding receiving members 28a, 28b on the peripheral rim 24 of the upper adjacent second type plate 20. And the receiving members 28a, 28b on the peripheral rim 24 of the upper adjacent second type plate 20 is configured to receive the supporting members 16a, 16b on the peripheral rim 14 of the adjacent first type plate 10. Further, the supporting members 26a, 26b protruding from the peripheral rim 24 of the second type plate 20 is adapted to be received at the corresponding receiving members 18a, 18b on the peripheral rim 14 of the upper adjacent first type plate 10. This arrangement may help to prevent the collision between the supporting members and the peripheral rim of the adjacent plates in a core 100.

[0028] In accordance with an embodiment of the present invention shown in FIG. 9, the longer longitudinal dimension (A) of the first supporting member 16a, 16b formed on the first heat exchanger plate 10 is smaller than the dimension (C) of the second receiving member 28a, 28b formed on the adjacent second heat transfer plate 20. Also, the peripheral rim 14 of the first heat exchanger plate 10 is having cut with longitudinal dimension (B) smaller than the longer longitudinal dimension (A) of

the supporting member 16a, 16b formed on adjacent heat exchange plate 10 of same type. This adjustment in the predefined dimension may help to accommodate the supporting members properly in the receiving members.

Claims

1. A heat exchanger plate (10, 20) comprises:

- a planar surface (11, 21);
- a plurality of corrugations (12, 22) and at least one hole (13, 23) are provided on the planar surface (11, 21) to define the coolant or refrigerant fluid flow;
- a peripheral rim (14, 24) circumscribing the corrugation and defining boundary of the heat exchange plate;

characterized in that the heat exchanger plate (10, 20) further comprises at least one supporting member (16a, 16b, 26a, 26b) protruding directly from the peripheral rim (14, 24) and at least one receiving member (18a, 18b, 28a, 28b) provided on the peripheral rim (14, 24).

2. The heat exchanger plate (10, 20) according to claim 1, wherein the supporting members (16a, 16b, 26a, 26b) are positioned diagonally opposite to each other along the peripheral rim (14, 24) and proximal to the corners of the heat exchanger plate (10, 20).

3. The heat exchanger plate (10, 20) according to claim 1, wherein the receiving members (18a, 18b, 28a, 28b) are positioned diagonally opposite to each other along the peripheral rim (14, 24) and proximal to the corners of the heat exchanger plate (10, 20).

4. The heat exchanger plate (10, 20) according to claim 1, wherein the supporting member (16a, 16b, 26a, 26b) can be flexible or rigid.

5. The heat exchanger plate (10, 20) according to claim 1, wherein supporting member (16a, 16b, 26a, 26b) is protruding aligned to the rim.

6. The heat exchanger plate (10, 20) according to claim 1, wherein the supporting member (16a, 16b, 26a, 26b) is angularly protruding from the rim.

7. The heat exchanger plate (10, 20) according to claim 1, wherein the supporting member (16a, 16b, 26a, 26b) is diverging from the peripheral rim (14, 24) to the distal end of the supporting member (16a, 16b, 26a, 26b).

8. The heat exchanger plate (10, 20) according to claim 1, wherein the supporting member (16a, 16b, 26a, 26b) is having longer dimension smaller than the dimension of the receiving member (18a, 18b, 28a, 28b) formed on the adjacent plate (10, 20).

9. The heat exchanger plate (10, 20) according to claim 1, the peripheral rim (14, 24) of the heat exchanger plate (10, 20) is having cut of dimension smaller than the longer dimension of the supporting member (16a, 16b, 26a, 26b) formed on adjacent heat exchange plate (10, 20) of same type.

10. A heat exchanger comprising a core 100 comprising a plurality of first and second type of plates (10, 20) stacked alternately, the first and second type of plates (10, 20) comprising;

- at least one first supporting member (16a, 16b) and at least one first receiving member (18a, 18b) are provided along the peripheral rim (14) of the corresponding first type plate (10); and
- at least one second supporting member (26a, 26b) and at least one second receiving member (28a, 28b) are provided along the peripheral rim (24) of the corresponding second type plate (20);

characterized in that the first supporting member (16a, 16b) is adapted to be received in the corresponding second receiving member (28a, 28b), whereas the second supporting member (26a, 26b) is adapted to be received by the first receiving member (18a, 18b).

11. The heat exchanger plate (10, 20) according to claim 8, wherein the first supporting member (16a, 16b) formed on the first heat exchanger plate (10) is having longer longitudinal dimension smaller than the dimension of the second receiving member (28a, 28b,) formed on the adjacent second plate (20).

12. The heat exchanger plate (10, 20) according to claim 8, wherein the second supporting member (26a, 26b) formed on the second heat exchanger plate (20) is having greater longitudinal dimension smaller than the dimension of the first receiving member (18a, 18b,) formed on the adjacent first plate (10).

13. The heat exchanger plate (10, 20) according to claim 9, wherein the peripheral rim (14) of the first heat exchanger plate (10) is having cut with longitudinal dimension smaller than the longer longitudinal dimension of the supporting member (16a, 16b) formed on adjacent heat exchange plate (10) of same type.

14. The heat exchanger plate (10, 20) according to claim 9, wherein the peripheral rim (24) of the second heat exchanger plate (20) is having cut with longitudinal dimension smaller than the longer longitudinal di-

mension of the supporting member (26a, 26b) formed on adjacent heat exchange plate (20) of same type.

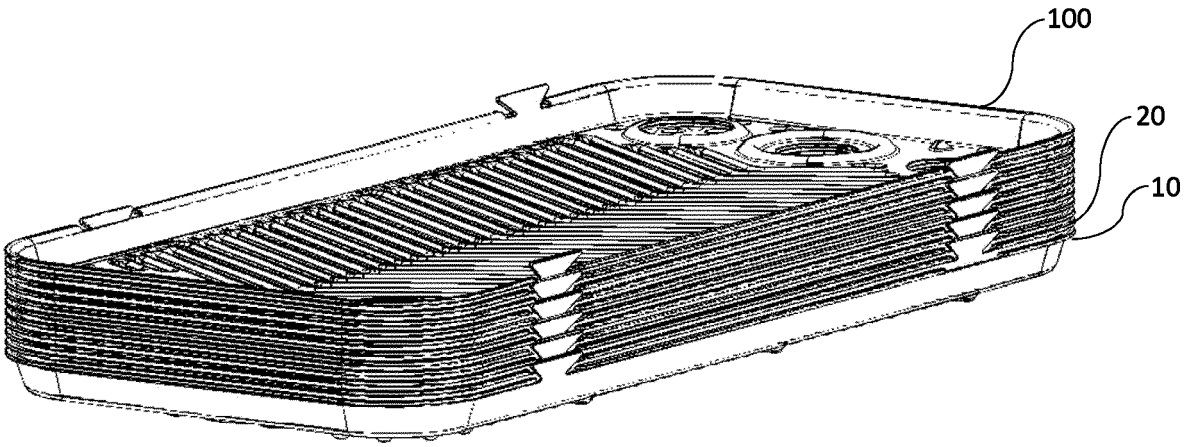

FIG. 1

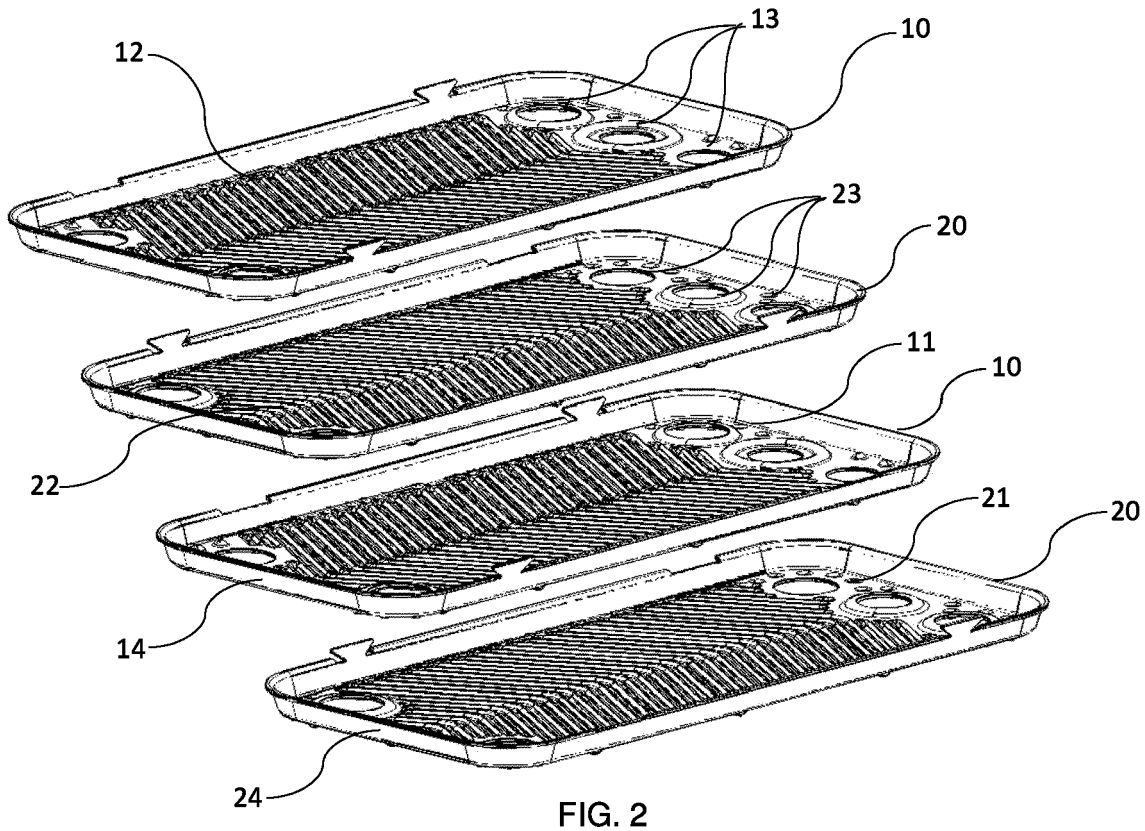

FIG. 2

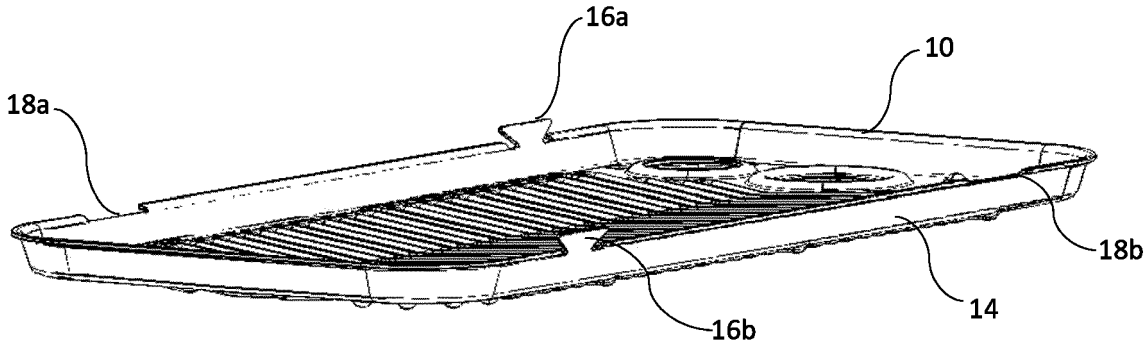

FIG. 3

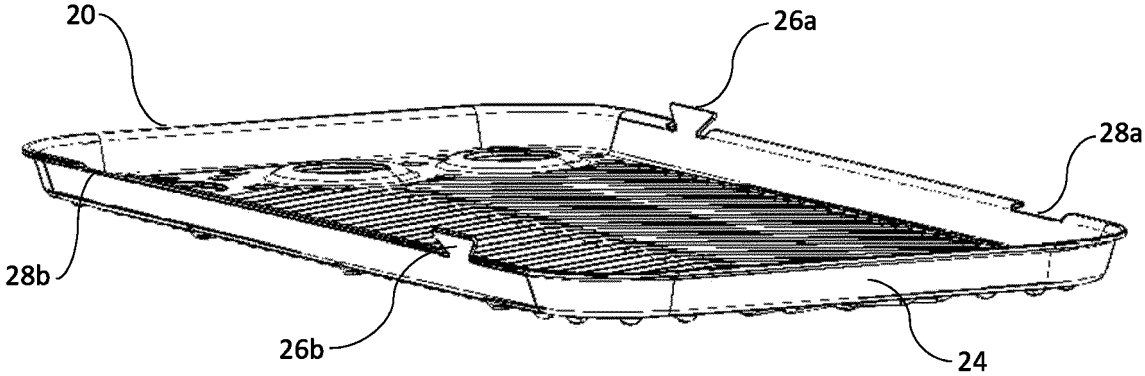

FIG. 4

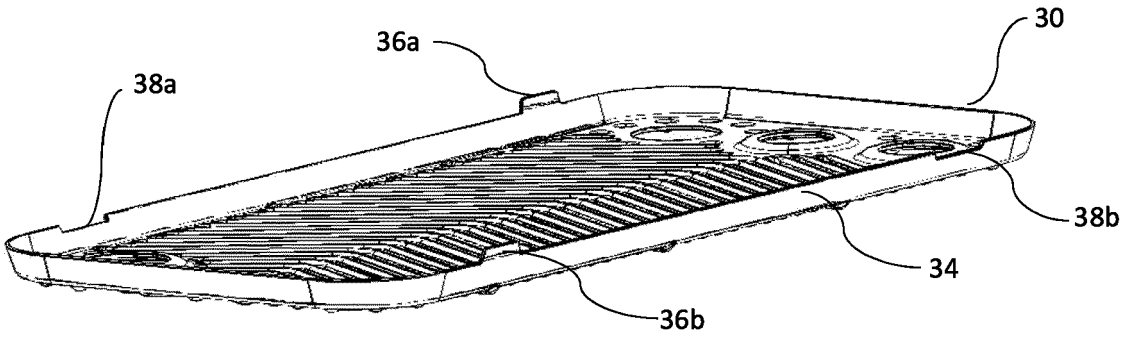

FIG. 5

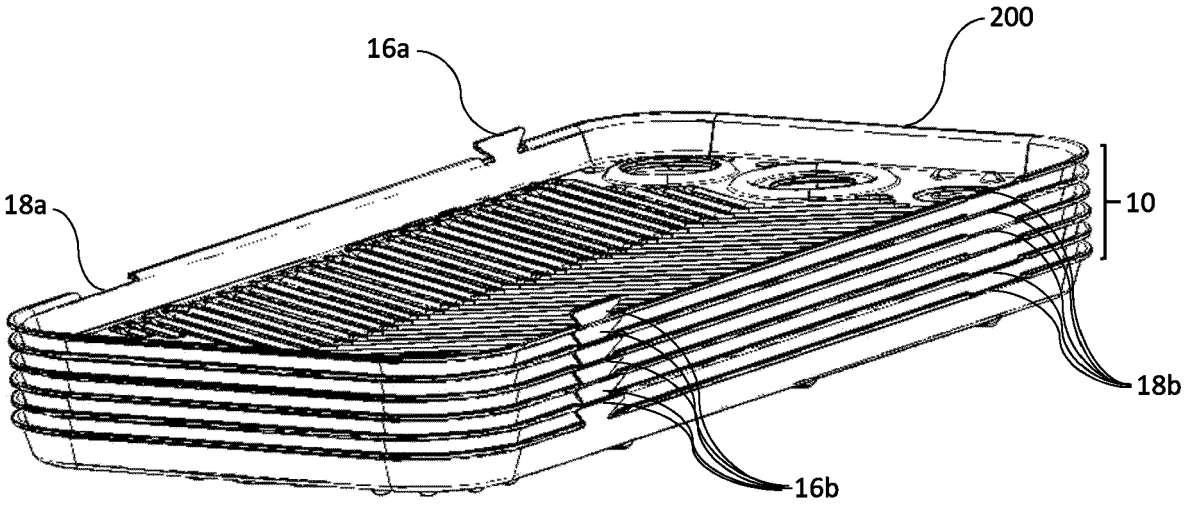

FIG. 6

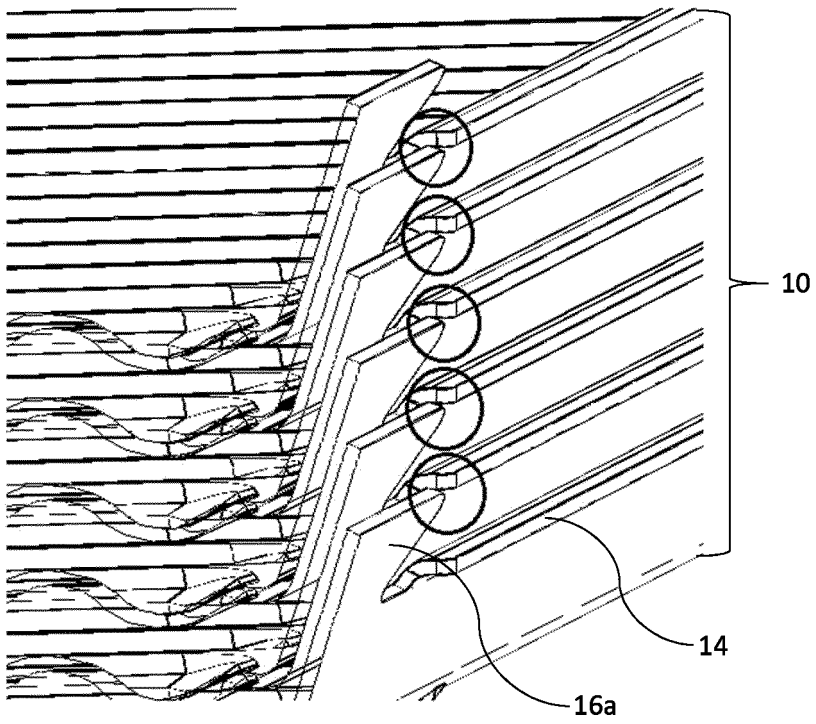

FIG. 7

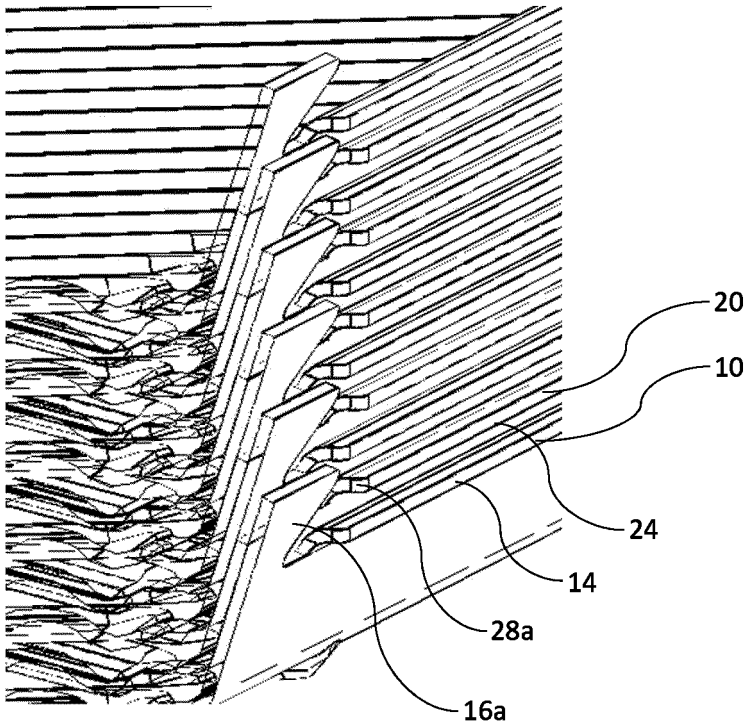

FIG. 8

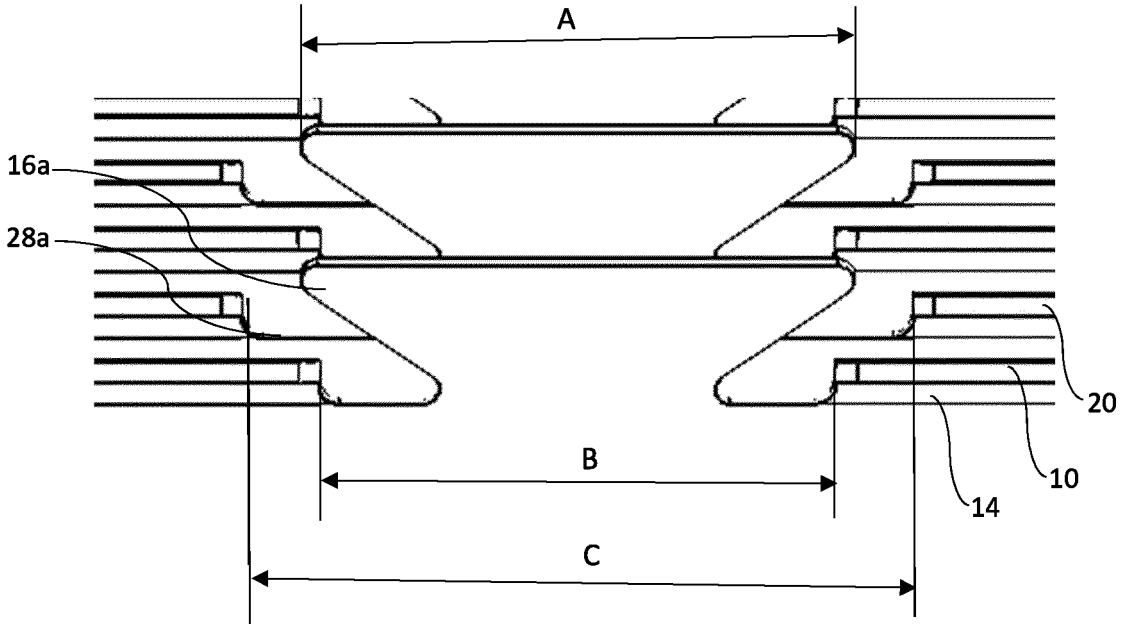

FIG. 9

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EUROPEAN SEARCH REPORT

Application Number
EP 23 17 8526

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	2 November 2023	Vassoille, Bruno

CATEGORY OF CITED DOCUMENTS

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