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(54) **ADAPTIVE SIDE PLATE FOR AUTOMOTIVE HEAT EXCHANGER**

(57) An angular assembly arrangement for a heat exchanger, comprising a manifold (13, 15) including a tubular metal vessel (13a, 15a), and a side plate (19) consisting of a flat metal plate extending orthogonally to the manifold (13, 15) and attached to the end thereof, wherein the side plate (19) comprises an end tab (21) that extends in a zigzag pattern from a respective end of the side plate (19) and comprises a support end (21a) in contact with a wall of the manifold (13, 15), the support end having, according to a plan view, a concavity configured to fit the wall of the manifold (13, 15).

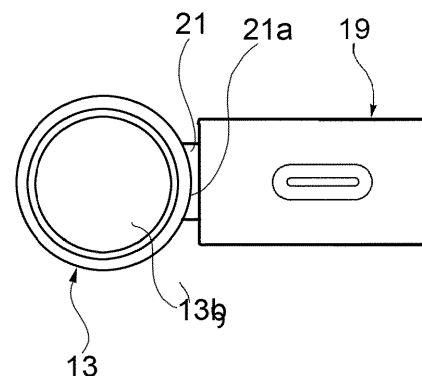


FIG. 4

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Description

[0001] The present invention relates generally to the field of heat exchangers for automotive applications and more specifically to heat exchangers comprising manifolds formed from metal tubular vessels.

[0002] In said type of heat exchanger, it has been noted that the manufacturing process causes the side plates, which serve to reinforce the pack forming the heat exchanger, to generally have ends that are separated from the manifolds by gaps of varying sizes. This fact is undesirable from a structural point of view.

[0003] One object of the present invention is to provide a device to compensate for the tolerances of the heat exchanger and ensure proper contact between the side plate and the manifold.

[0004] For this object, according to the present invention, an angular assembly arrangement for a heat exchanger is proposed, comprising

a manifold including a tubular metal vessel, and a side plate consisting of a flat metal plate that extends orthogonally to the manifold and is attached to the end thereof,

wherein the side plate comprises an end tab having a width that is less than the width of the remaining part of the side plate, wherein the end tab extends in a zigzag pattern from a respective end of the side plate and comprises a support end that is in contact with a wall of the manifold, said support end having, according to a plan view, a concavity configured to fit the wall of the manifold, wherein the end tab comprises a descending part extending from the side plate and an ascending part that is connected to the descending part by a bend and provides said support end.

[0005] With the arrangement according to the invention, the end tab acts as an adapter for the tolerance of the pack in press-fit. Moreover, the contour on the circumference of the manifold, cooperating with the support end of the end tab, prevents the side plate from moving during the production process. Advantageously, the arrangement according to the invention is also an improvement for bursting pressures.

[0006] Preferred embodiments of the invention are defined in the dependent claims, which are to be understood as an integral part of the present description.

[0007] Other features and advantages of the arrangement according to the invention will become clearer from the following detailed description of an embodiment of the invention, made with reference to the accompanying drawings, provided purely for illustrative and non-limiting purposes, in which:

Fig. 1 is a front elevation view of a corner portion of a heat exchanger according to the invention;
Fig. 2 is an enlarged scale view of another corner

portion of the heat exchanger in Fig. 1;

Fig. 3 and 4 are a perspective view and a plan view of a manifold/side plate assembly, respectively; and Fig. 5-7 are a perspective view, a plan view, and a cross-sectional view (taken along the line B-B of Fig. 6) of a side plate, respectively.

[0008] With reference to Fig. 1 and 2, a heat exchanger for automotive applications is depicted, denoted collectively as 1.

[0009] The heat exchanger 1 comprises a plurality of parallel tubes 11 extending between two opposite sides of the heat exchanger (depicted in Fig. 1 and 2, respectively), and a first and second manifold 13, 15 respectively arranged at each of said two opposite sides of the heat exchanger. The tubes 11 are fluidly connected to the manifolds 13, 15 for the transport of a refrigerant fluid to allow said fluid to exchange thermal energy with a gaseous fluid, specifically air, which is passed between the tubes 11 in a direction substantially perpendicular to the plane defined by the bundle of tubes 11. For this purpose, fins 17 are interposed between the adjacent tubes 11.

[0010] In Fig. 3 and 4, only one end of only one manifold is shown for convenience, but it is understood that the end not shown and the manifold not shown have a similar structure to that shown in the drawings.

[0011] Each manifold 13, 15 includes a tubular metal vessel 13a, 15a extending along a respective longitudinal axis z, and an end closure element 13b, also made of metal material, arranged at each end of the tubular vessel 13a, 15a (for convenience only one end of the manifolds is shown in the figures).

[0012] The heat exchanger 1 further comprises a first and second side plate 19 ("panel") each arranged at a respective further side of the heat exchanger, orthogonal to the two opposite sides of the heat exchanger at which the manifolds 13, 15 are arranged. Only one such plate 19 is shown in the figures, but it is understood that the one not shown has a similar structure to the one shown in the drawings.

[0013] Each side plate 19 consists of a flat metal plate that extends orthogonally to the manifolds 13, 15, and has at each of its ends an end tab 21 having a width less than the width of the remaining part of the side plate 19.

[0014] In general, the structural union between the various metal components of the exchanger described above is achieved by material coupling, such as by welding and/or brazing.

[0015] Specifically, with reference to Fig. 3 through 7, at each of the corners of the heat exchanger 1, each end of the manifolds 13 and 15 is joined to one of the respective plates 19 in the following way.

[0016] Each end tab 21 extends in a zigzag pattern from the respective end of the side plate 19 and comprises a support end 21a in contact with the wall of the tubular vessel 13a, 15a. As may be seen in particular in Fig. 4 and 6, the support end 21a has, according to a plan view, a concavity facing the respective manifold 13, 15 config-

ured to fit the curvature of the wall of the manifold.

[0017] Specifically, the end tab 21 comprises a descending part 21', which extends from the side plate 21, and an ascending part 21'', which is connected to the descending part 21' by a bend 21''' and provides the supporting end 21a. For the purposes of this description, "descending" means that the relevant part of the end tab 21 extends from the elevation of the side plate 19 so as to approach the bundle of tubes 11 of the heat exchanger 1, ending in the bend 21''', while "ascending" means that the relevant part of the end tab 21 extends from the bend 21''' so as to move away from the bundle of tubes 11. Said zigzag pattern therefore refers to a direction parallel to the longitudinal axis z of the manifold 13, 15, that is, to the direction of the thickness of the side plate 19.

[0018] With the arrangement described above, the end tab 21 acts as an adapter for the tolerance in the distances between the side plate and the manifold. Further, the curved shape of the manifold, cooperating with the support end 21a of the end tab 21 prevents the side plate 19 from moving during the production process.

sides of the heat exchanger,

characterized by comprising, at each respective corner of the heat exchanger, a corner assembly arrangement according to any of the preceding claims.

Claims

1. A corner assembly arrangement for a heat exchanger, comprising

a manifold (13, 15) including a tubular metal vessel (13a, 15a), and
 a side plate (19) consisting of a flat metal sheet, which extends orthogonally to the manifold (13, 15) and is fixed to the end thereof,
characterized in that the side plate (19) comprises an end tab (21) having a width less than the width of the remaining part of the side plate (19), wherein the end tab (21) extends in a zigzag pattern from a respective end of the side plate (19) and comprises a support end (21a) in contact with a wall of the manifold (13, 15), said support end having, according to a plan view, a concavity configured to fit the wall of the manifold (13, 15), wherein the end tab (21) comprises a descending part (21'), which extends from the side plate (19), and an ascending part (21''), which is connected to the descending part (21') by a bend (21''') and provides said support end.

2. A heat exchanger comprising

a plurality of parallel tubes (11) extending between two opposite sides of the heat exchanger, a first and a second manifold (13, 15) respectively arranged at each of said two opposite sides of the heat exchanger,
 a first and a second side plate (19) each arranged at a respective further side of the heat exchanger, orthogonal to said two opposite

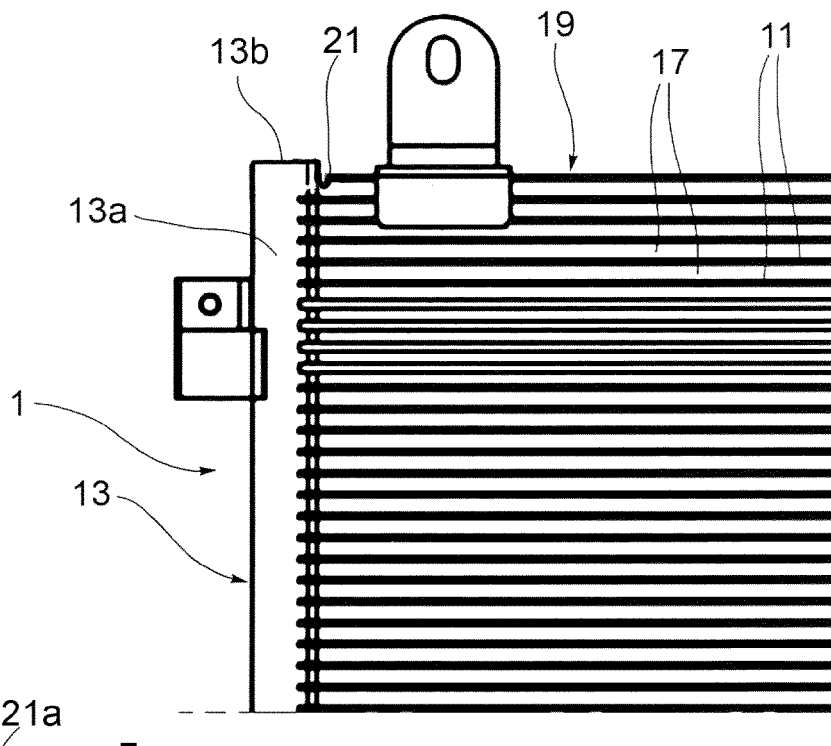


FIG. 1

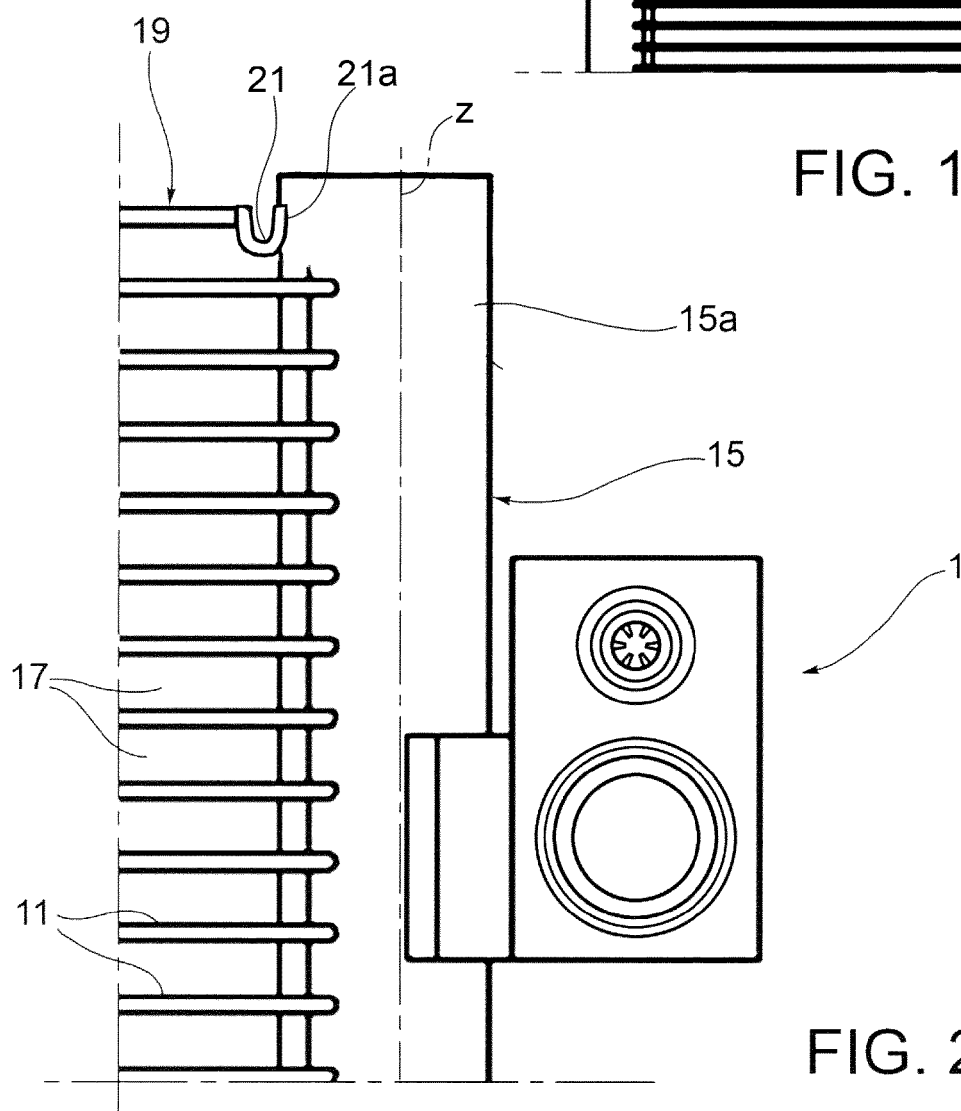


FIG. 2

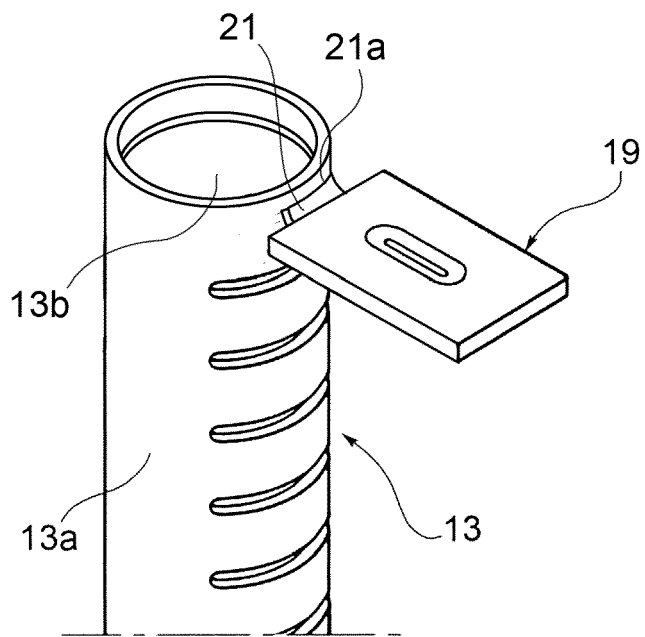


FIG. 3

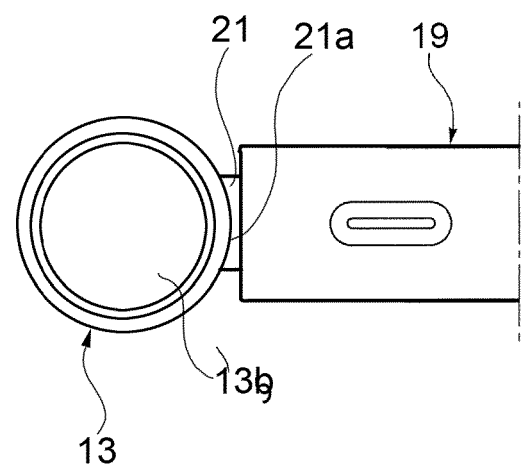


FIG. 4

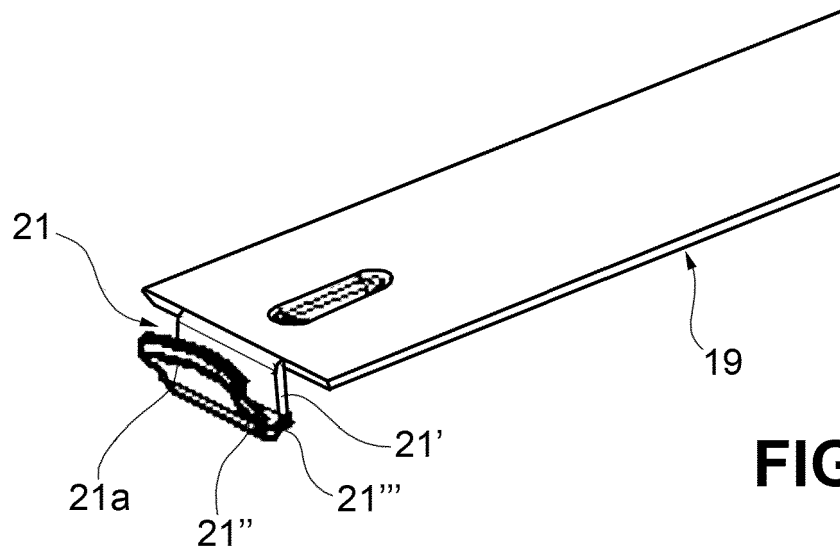


FIG.5

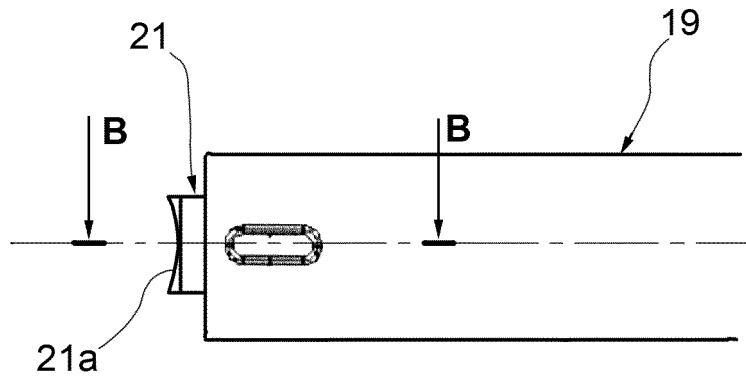


FIG.6

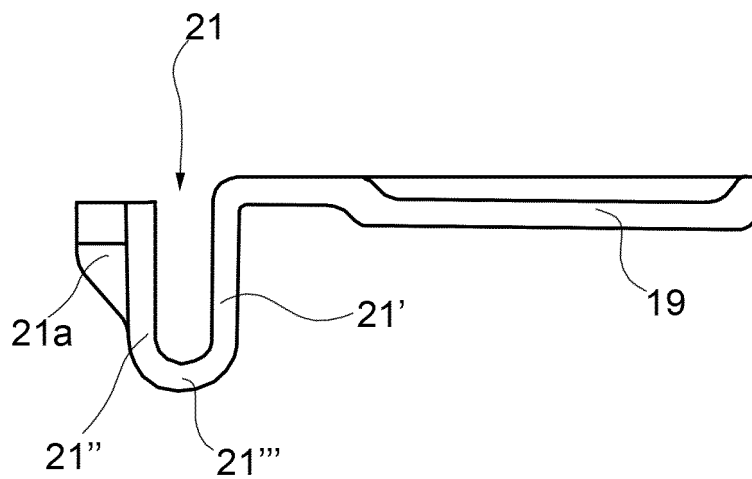


FIG.7



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Application Number

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 20 October 2022	Examiner Leclaire, Thomas
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