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(54) **HEAT EXCHANGER FOR FITTING IN A TANK WHICH FORMS PART OF A VEHICLE RADIATOR**

**WÄRMETAUSCHER ZUR BEFESTIGUNG AN EINEM BEHÄLTER ALS BESTANDTEIL EINES
KRAFTFAHRZEUGSKÜHLER**

**ECHANGEUR THERMIQUE DESTINE A ETRE INSTALLE DANS UN RESERVOIR FORMANT UNE
PARTIE D'UN RADIATEUR DE VEHICULE**

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Description

The present invention relates to a heat exchanger for fitting in a tank which forms part of a vehicle radiator, comprising a number of plate pairs stacked one on another, each pair consisting of a larger and a smaller elongate plate, which plates have all-round edge flanges which are bent towards one another and which, when the smaller plate is arranged in the larger, form a lap joint, surface-area enlargers being arranged both between the plates in each plate pair and between plate pairs lying adjacent to one another, and the plates being provided with holes at their ends for forming inlets and outlets respectively for the fluid which is to be cooled.

Heat exchangers of the abovementioned type are described in SE 8605488-9. On the plates in this document, the holes are circular and project outwards to form cylindrical collars which seal the heat exchanger unit to the external surroundings. Introduced into the holes is an inlet nipple for the oil which is to be cooled. However, circulation difficulties arise for the oil between the nipple and the collars, for which reason it is desirable to move away from these collars. In this connection, however, problems arise with the plate pairs sliding in relation to one another during the manufacturing process.

A heat exchanger with another type of plate is described in WO 93/10415. The plates according to this document lack bent-up, all-round edge flanges, for which reason not only the plate pairs but also the plates within each pair slide in relation to one another during the manufacturing process. It is attempted to remedy this by means of two external pins on each plate which are at right angles to the plane of the plate and which are arranged in diametrically opposite "corners" and which face one another within a plate pair. These external pins prevent sliding of the plates within each pair in relation to one another.

To prevent sliding of the plate pairs in relation to one another, each plate is provided, at the hole at only one end, with three pins which are at right angles to the plane of the plate and which are arranged to engage with the hole at one end of an adjacent plate pair.

All the plates in a heat exchanger of this type are the same, which means that the plates within each pair must be turned so that the internal pins of one plate end up at one end of the heat exchanger unit and the other plate must be turned so that its pins end up at the other end of the heat exchanger unit. Furthermore, the pairs must be turned in relation to one another so that those plates lying adjacent to one another of two plates have their pins arranged at different ends of the heat exchanger unit, otherwise the pins would bang into one another and it would not be possible to assemble the unit. Moreover, the plate pairs would be capable of sliding in relation to one another at the end where there are no pins. This renders more difficult and complicates manufacturing the heat exchanger since great attention has to be paid the whole time that all plates are turned

in the right direction.

One aim of the present invention is to produce a heat exchanger in which the plates do not slide in relation to one another during the manufacturing process without for this reason having to use a complicated manufacturing method.

According to the present invention there is provided a heat exchanger for fitting in a tank which forms part of a vehicle radiator, comprising a number of plate pairs stacked one on another, each pair consisting of a larger and a smaller elongate plate, which plates have all-round edge flanges which are bent towards one another and which, when the smaller plate is arranged in the larger, form a lap joint, surface-area enlargers being arranged both between the plates in each plate pair and between plate pairs lying adjacent to one another, and the plates being provided with holes at their ends for forming inlets and outlets respectively for the fluid which is to be cooled, characterized in that one plate of each pair is provided at each of its holes with at least two slots which extend from the hole parallel to the longitudinal axis of the plate, and in that the other plate of each pair is provided at each of its holes with at least two slots which extend from the hole parallel to the longitudinal axis of the plate, said other plate further having at least one tongue formed between the slots and bent out from the plate, to the side of the plate opposite to the direction of the edge flange, which tongue engages in the at least one slot of an adjacent plate in an adjacent plate pair.

An exemplary embodiment of a heat exchanger according to the present invention is to be described below in greater detail with reference to the attached drawings.

Fig. 1 shows one of the larger plates seen from the side which faces inwards in the pair.

Fig. 2 shows one of the smaller plates seen from the side which faces inwards in the pair.

Fig. 3 shows a part of a heat exchanger unit seen from above with a large plate arranged at the top.

Fig. 4 shows the same part of a heat exchanger unit which is shown in Fig. 3, sectioned according to the arrows IV-IV in Fig. 3.

From Fig. 4, it can be seen how a heat exchanger for fitting in a tank which forms part of a vehicle radiator comprises a number of plate pairs 1 stacked one on another, each pair consisting of a larger and a smaller elongate plate 2, 3. The plates have all-round edge flanges 4 which are bent towards one another and which, when the smaller plate 3 is arranged in the larger, form a lap joint. Surface-area enlargers 5 are arranged both between the plates in each plate pair and between plate pairs lying adjacent to one another, as is shown diagrammatically in Fig. 4. The arrangement of surface-area enlargers in a heat exchanger is self-evident for the expert in the field, for which reason no further description of the surface-area enlargers will be given.

The plates are provided with holes 6 at their ends for forming inlets and outlets respectively for the fluid which is to be cooled. The fluid which is to be cooled will

flow inside the plate pairs and can progress from one plate pair to the next via the holes 6 in the plates. The cooling medium will flow outside and between the plate pairs. On the outside of the stack of plate pairs there is both at the top and at the bottom a plate made of heavier material. The upper of these plates has a hole at each end for forming an inlet and outlet respectively for the fluid which is to be cooled. The lower of these plates lacks holes and thus seals the heat exchanger to the surroundings.

According to the invention, the plates 2, 3 cannot slide in relation to one another within a plate pair during the manufacturing process by virtue of the fact that the plates have all-round edge flanges 4 which are bent towards one another and which form a lap joint when the smaller plate 3 is arranged in the larger 2. These edge flanges can be seen best in Figs 1, 2 and 4.

In order to prevent the plate pairs sliding in relation to one another during the manufacturing process, the larger plates 2 are provided with slots 7 and the smaller plates 3 are provided with tongues 8 which engage therein.

In this embodiment, the holes 6 are essentially D-shaped with the straight part facing the centre of the plate. The slots 7 in the larger plates 2 are arranged in the straight part of the holes 6. There are two slots 7 at each hole, the slots being centred in relation to the central longitudinal axis of the plate and extending from the hole parallel to the longitudinal axis of the plate, which can be seen best in Fig. 1.

The smaller plates 3 are, in the straight part of each of their holes 6, provided with three slots 9 which extend from the hole parallel to the longitudinal axis of the plate and two tongues 8 formed between the slots. In reality, only one of the tongues 8 at each hole, namely the tongue 8a, is active in this embodiment, and only one of the slots 9 at each hole, namely the slot 9a, is active. The function of the slot 9a will be described later.

The tongues 8 also extend parallel to the longitudinal axis of the plate, and the tongue 8a is bent out from the plate on the opposite side of this in relation to the edge flange 4. In this embodiment, the tongue 8a is bent out at 45° in relation to the plate. Other bending-out angles are also possible in principle, at least in the range 30-90°.

The slots 9 and the tongues 8 of the smaller plate 3 are, at both ends of the plate, offset from the central longitudinal axis of the plate towards one of its longitudinal sides so that the bent-out tongue 8a of a plate pair not only fits in the slots 7 in the larger plate 2 but also in the slot 9a in the smaller plate 3 of an adjacent plate pair. On stacking a number of plate pairs 1 one on another to form a heat exchanger, the plate pairs are stacked with a smaller plate 3 bearing against a larger plate 2 in the whole stack, except at one point where two smaller plates face one another. By virtue of the design of the tongue 8a and the slot 9a, the two smaller plates cannot slide in relation to one another during the

manufacturing process either.

It is of no importance how the two plates within a plate pair face in relation to one another, i.e. which end of the smaller plate faces a given end of the larger plate. Nor is it of importance how the plate pairs face in relation to one another except at the one place where two smaller plates face one another. As a result, the manufacturing method is simplified compared with the documents mentioned in the introduction, and the number of tools for manufacturing can be kept low.

In the embodiment described, the larger plates are provided with only slots while the smaller plates are provided with both engagement tongues and slots. It is, however, possible to change around so that the larger plates are provided with both engagement tongues and slots and that the smaller are provided with only slots. Then, however, the size of the outermost plates made of heavier material must also be adapted to this.

In the embodiment described, the larger plates also have two slots, and the smaller plates have two tongues and three slots. For operation, at least two slots are required in one plate and at least one tongue and at least one slot in the other. In the manner in which the tongue is made from plate material, an extra slot is obtained moreover on the other side of the tongue.

Claims

1. Heat exchanger for fitting in a tank which forms part of a vehicle radiator, comprising a number of plate pairs (1) stacked one on another, each pair consisting of a larger (2) and a smaller (3) elongate plate, which plates have all-round edge flanges (4) which are bent towards one another and which, when the smaller plate (3) is arranged in the larger (2), form a lap joint, surface-area enlargers (5) being arranged both between the plates in each plate pair and between plate pairs lying adjacent to one another, and the plates being provided with holes (6) at their ends for forming inlets and outlets respectively for the fluid which is to be cooled, characterized in that one plate of each pair is provided at each of its holes (6) with at least two slots (7) which extend from the hole (6) parallel to the longitudinal axis of the plate, and in that the other plate of each pair is provided at each of its holes (6) with at least two slots (8a, 9a) which extend from the hole parallel to the longitudinal axis of the plate, said other plate further having at least one tongue (8a) formed between the slots and bent out from the plate, to the side of the plate opposite to the direction of the edge flange, which tongue (8a) engages in the at least one slot (7,9a) of an adjacent plate in an adjacent plate pair.
2. Heat exchanger according to Claim 1, wherein the slots (7) of one plate are centred in relation to the

central longitudinal axis of the plate and in that the tongues (8a) and the slots (9a) of the other plate are offset from the central longitudinal axis of the plate towards one of its longitudinal sides.

3. Heat exchanger according to any one of the preceding claims, wherein the holes (6) are D-shaped with the straight part facing the centre of the plate (2, 3), the tongues (8a) and the slots (7, 9a) being arranged in the straight part.
4. Heat exchanger according to any one of the preceding claims, wherein the tongues (8a) are bent out at 45° in relation to the plate.

Patentansprüche

1. Wärmetauscher zum Einbau in einen Behälter, der Bestandteil eines Fahrzeugkühlers ist, wobei dieser Wärmetauscher eine Anzahl stapelförmig aufeinandergelegter Plattenpaare (1) umfaßt, die jeweils aus einer größeren (2) und einer kleineren (3) langgestreckten Platte bestehen, und diese Platten an ihrem Umfang jeweils vollständig umlaufende Kantenflansche (4) aufweisen, welche beim Einlegen der kleineren Platte (3) in die größere Platte (4) eine Überlapptstoßverbindung eingehen, und wobei sowohl zwischen den Platten jeden Plattenpaares als auch zwischen nebeneinanderliegenden Plattenpaaren jeweils oberflächenvergrößernde Elemente (5) angeordnet sind und die Platten über endseitige Öffnungen (6) zur Bildung von Ein- und Auslässen für die zu kühlende Flüssigkeit verfügen, **dadurch gekennzeichnet, daß** eine Platte jedes Paares an jeder ihrer Öffnungen (6) mindestens zwei Schlitz (7) aufweist, die sich ausgehend von der Öffnung (6) parallel zur Längsachse der Platte erstrecken, und die andere Platte jedes Paares an jeder ihrer Öffnungen (6) über mindestens zwei Schlitz (8a, 9a) verfügt, die sich ausgehend von der Öffnung parallel zur Längsachse der Platte erstrecken, wobei diese andere Platte zusätzlich mindestens eine zwischen den Schlitz (8a, 9a) ausgebildete, aus der Platte herausgebogene Zunge (8a) aufweist, die von der der Richtung des Kantenflansches entgegengesetzten Plattenseite vorsteht und in den mindestens einen Schlitz (7, 9a) der angrenzenden Platte eines angrenzenden Plattenpaares eingreift.
2. Wärmetauscher gemäß Anspruch 1, wobei die Schlitz (7) einer Platte relativ zu der Längsmittachse der Platte zentriert sind und die Zungen (8a) sowie die Schlitz (9a) der anderen Platte gegenüber der Längsmittachse der Platte in Richtung auf eine Plattenlängsseite versetzt sind.

3. Wärmetauscher gemäß einem der vorstehenden Ansprüche, wobei die Öffnungen (6) einen D-förmigen Querschnitt aufweisen und ihre gerade Seite der Mitte der Platte (2, 3) zugewandt ist, wobei auch die Zungen (8a) und Schlitz (7, 9a) in der geraden Seite liegen.

4. Wärmetauscher gemäß einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß die Zungen (8a) in einem Winkel von 45° zur Platte herausgebogen sind.

Revendications

1. Echangeur de chaleur destiné à être monté dans un réservoir qui fait partie d'un radiateur de véhicule, comprenant un certain nombre de paires de plaques (1) empilées les unes sur les autres, chaque paire étant constituée d'une grande plaque allongée (2) et d'une petite plaque allongée (3), lesquelles plaques ont des bords périphériques (4) qui sont relevés l'un vers l'autre et, lorsque la petite plaque (3) est montée dans la grande (2), forment un joint à recouvrement, des agrandisseurs de surface (5) étant montés à la fois entre les plaques de chaque paire et entre les paires voisines de plaques, et les plaques étant pourvues à leurs extrémités de trous (6) destinés à former respectivement des entrées et des sorties pour le fluide à refroidir, caractérisé par le fait qu'une plaque de chaque paire est pourvue à chacun de ses trous (6) d'au moins deux fentes (7) qui s'étendent à partir du trou (6) parallèlement à l'axe longitudinal de la plaque, et en ce que l'autre plaque de chaque paire est pourvue à chacun de ses trous (6) d'au moins deux fentes (8a, 9a) qui s'étendent à partir du trou parallèlement à l'axe longitudinal de la plaque, cette autre plaque ayant en outre au moins une languette (8a) formée entre les fentes et relevée hors de la plaque du côté de celle-ci opposé à la direction du bord, laquelle languette (8a) s'engage dans ladite fente au nombre d'au moins un (7, 9a) d'une plaque voisine d'une paire de plaques voisine.
2. Echangeur de chaleur selon la revendication 1, dans lequel les fentes (7) d'une plaque sont centrées par rapport à l'axe longitudinal de celle-ci et les languettes (8a) et les fentes (9a) de l'autre plaque sont décalées de l'axe longitudinal de celle-ci vers un de ses côtés longitudinaux.
3. Echangeur de chaleur selon l'une des revendications précédentes, dans lequel les trous (6) sont en forme de D, avec la partie droite faisant face au centre de la plaque (2, 3), les languettes (8a) et les fentes (7, 9a) étant situées dans la partie droite.

4. Echangeur de chaleur selon l'une des revendications précédentes, dans lequel les languettes (8a) sont relevées à 45° par rapport à la plaque.

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FIG.1

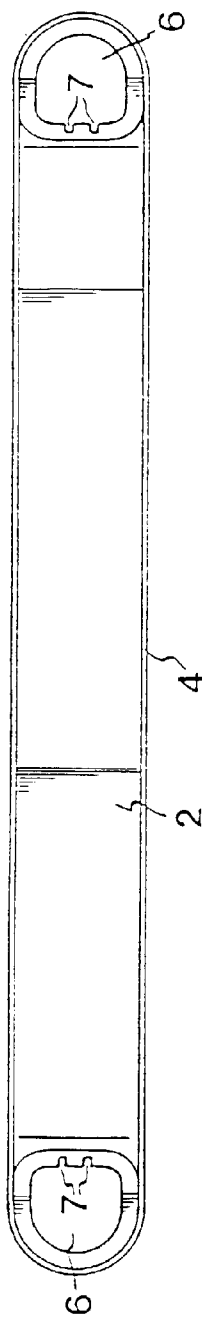


FIG.2

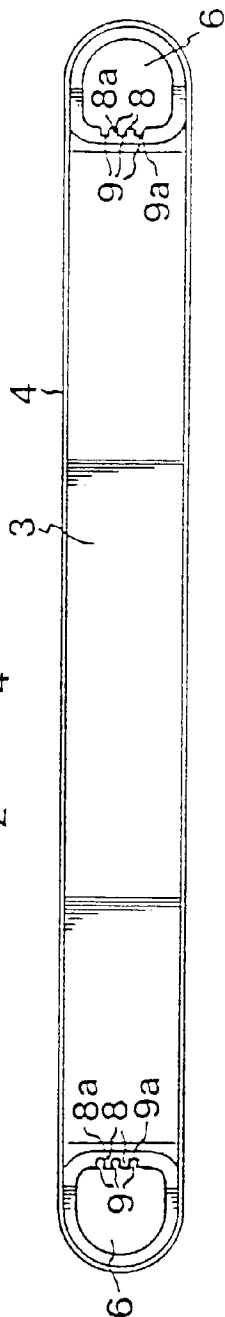


FIG.3

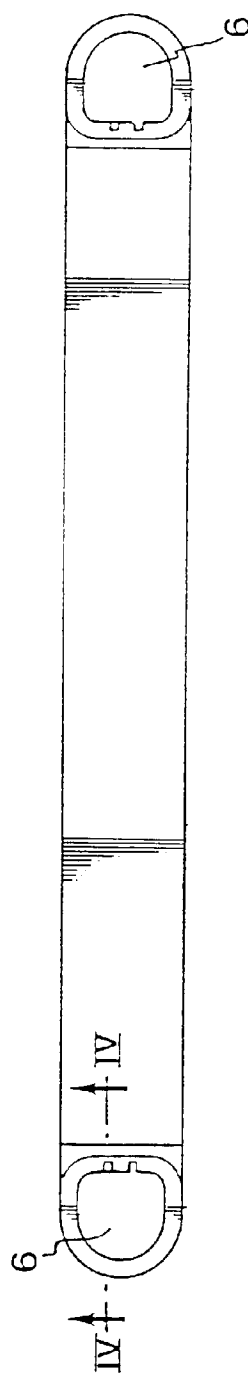


FIG.4

