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(54) Fixing gasket in plate type heat exchanger

(57) The present invention relates to a heat exchanger comprising a stack of heat exchanger plates formed of sheet metal having a three-dimensional structured pattern, each heat exchanger plate having a gasket groove, a gasket being arranged in said gasket groove and resting against an adjacent heat exchanger plate, said groove having a bottom, said bottom having at least a protrusion directed to said adjacent heat exchanger plate.

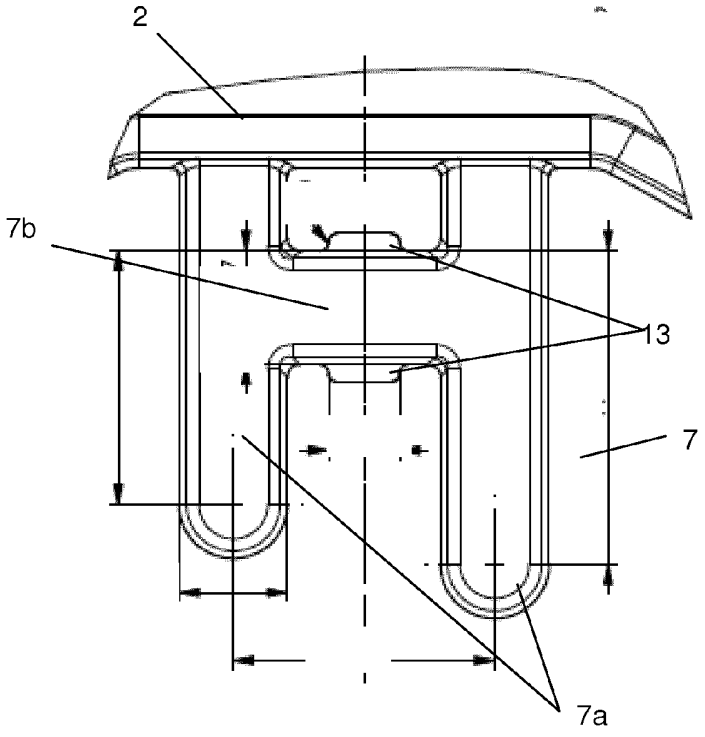


Fig. 3

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Description

[0001] The present invention relates to a heat exchanger comprising a stack of heat exchanger plates formed of sheet metal having a three-dimensional structured pattern, each heat exchanger plate having a gasket groove, a gasket being arranged in said gasket groove and resting against an adjacent heat exchanger plate, said groove having a bottom, said bottom having at least a protrusion directed to said adjacent heat exchanger plate.

BACKGROUND

[0002] Such heat exchangers are commonly known and may have a pattern, such as a so-called herringbone pattern, i.e. a pattern which has indentations consisting of straight ridges and valleys. The ridges and valleys change direction in the centre, producing the pattern that resembles a herringbone. In a heat exchanger pack, alternate plates are turned so that the indentations cross one another. Heat exchangers can be sealed by rubber gaskets.

[0003] Other designs of the pattern known includes the so-called dimple pattern where a plurality of heat exchanger plates comprises at least one section showing indentations intended to be placed against corresponding indentations of a heat exchanger plate of a corresponding design. Such designs are disclosed e.g. in EP1794529, EP2455694 and EP2455695.

[0004] The present invention relates to gasket heat exchangers with any kind of pattern, where in a gasket heat exchanger the plates typically are kept under tension by external forces, for example by introducing bolds through bores of the plates. Consequently, in a gasket heat exchanger the heat exchanger plates are kept under a pretension.

[0005] In order to prevent gaskets from falling off the heat plates and be misaligned within the gasket groove during assembly and servicing of the heat exchanger, they must be fixed to the heat plate.

[0006] Thus, in order to prevent gaskets from falling off the heat plates and be misaligned within the gasket groove during assembly and servicing of the heat exchanger, they must be fixed to the heat plate within the gasket grooves

[0007] Therefore the present invention relates to fixing the gaskets within the grooves.

[0008] Such fixing is known in the art, such as seen in US5988268 disclosing a plate with a heat transfer surface formed with a suitable uneven pattern. The portion of the plate surrounding the heat transfer surface is formed with a gasket groove. The fixing element comprises a pair of projections projecting from the core, and a connecting portion connecting said projections and extending parallel with the core, while the recess comprises recesses adapted to fit on the projections of the fixing element, and a hole adapted to fit on the connecting portion of the fixing element. Because of such three-dimensional fitting arrangement, the joining strength between the gasket and the plate is high. Furthermore, the connecting portion of the fixing element is parallel with the core and hence with the gasket groove and is adapted to fit in the hole in the form of an elongated slit hole which is likewise parallel with the gasket groove; therefore, some versatility is given to the fixing element in the direction parallel with the gasket groove.

[0009] The fixing in this disclosure however has some drawbacks. Firstly, the plates in the pressing tool may during the formation of the patterns be misaligned with up to a millimetre or even more. The one may risk that the gasket is well positioned along one edge of the exchanger but not along the opposing parallel edge, thus giving the risk of leakage.

SUMMARY OF THE INVENTION

[0010] The present idea is to introduce an extension of the gasket to be fixing into a recess as in US5988268, but where these extensions helps to give a feeling that the gasket is positioned further where the positioning of the gasket is easier during assembly of the heat exchanger.

[0011] The present invention thus relates to a fixing of the gasket according to the claims.

FIGURES

[0012]

Fig. 1 Illustration of a heat exchanger plate with a gasket having gasket extensions according to the present invention

Fig. 2 Illustrate a groove extension for fixation of the gasket.

Fig. 3 Illustrate a gasket extension embodiment for fixation of the gasket.

Fig. 4 Illustrate a further embodiment of a gasket having gasket extensions.

DETAILED DESCRIPTION

[0013] Fig. 1 illustrates a simple heat exchanger plate (1) having a gasket (2) in the proximity of the edge encircling the heat exchanging area (3). As it is commonly known in heat exchangers formed of a stack of such heat exchanger plates (1), a first pair of port openings (4a, 4b) forms inlet and outlet respectively for a first fluid to flow through a first channel system formed between neighbouring plates by their patterns, and a second pair of port openings (5a, 5b) forms inlet and outlet respectively for a second fluid to flow through a second channel system also formed between neighbouring plates by their pat-

terns. Every second such channels formed between two neighbouring plates forms part of the first channel system, and the others forms part of the second channel system, where preferably most of the heat exchanger plates then has a first kind channel system at one surface side and the second kind channel system at the opposing surface side of the plate. For every first channel system the second pair of port openings (5a, 5b) will be sealed off (2a) from the heat exchanging area (3) as seen in Fig. 1, and in the same manner for every second channel system the first pair of port openings (4a, 4b) will be sealed off, this is not illustrated.

[0014] The gasket (2) is positioned within a gasket groove (6) where a part in the vicinity of a port opening like (4a) is seen in Fig. 2. The gasket (2) comprises gasket extensions (7) for fixing it in the gasket groove (6), where these gasket extensions (7) essentially are H-shaped having two first parts (7a) reaching in a direction away from the gasket (2) and a second part (7b) connecting the two first parts (7a). For this the gasket groove (6) forms groove extensions (8) also essentially H-shaped having two first groove sections (8a) extending in a direction away from the main gasket groove (6) of the heat exchanger and one section groove section (8b) extending in a direction to connect the two first groove sections (6). The gasket extensions (7) and groove extensions (8) are formed such that a gasket extension (7) may be positioned within a groove extension (8).

[0015] In one embodiment of the present invention at least one of the two first parts (7a) is substantially perpendicular to the gasket (2), at least seen where the gasket extension (7) is connected to the gasket (2)

[0016] In a further embodiment of the present invention the second part (7b) is substantially parallel to the gasket (2), at least seen where the gasket extension (7) is connected to the gasket (2)

[0017] The groove extensions (8) are such that a opening (9) is formed in the edge of the heat exchanger plate (1) and at least one of the two first parts (7a) has a length such that when positioned within a groove extension (8) it extends through the opening (9) into the externals. Hereby is achieved that during construction of the heat exchanger when the gasket is mounted, the gasket may be contacted at these first parts (7a) reaching out of the heat exchanger and thus re-positioned at the one side or the other.

[0018] The groove extensions (8) are formed by having two projections (10a, 10b) seen relative to the bottom surface of the groove (6, 8)

[0019] The first projection (10a) being the one closest to the gasket groove (6) is formed such that is has the side (11 a) facing the gasket groove (6) being closed and the side (11 b) away from the gasket groove (6) being open. The closed side (11 a) is to prevent any damaging of the gasket due to potential burrs after cutting the heat plate material to form the first (10a) and second (10b) projections. The second projection (10b) being farthest away from the gasket groove (6) has the side (12) facing the gasket groove (6) being open.

[0020] The first (10a) and second (10b) projections has surfaces at the same level as other patterns of the heat exchanger plates (1) such as those of the heat exchanging section (3) being herringbone shaped, dimple shaped etc. In this manner they in addition provide support to the neighbouring plate. The slope of the non-closed sides of the projections (10a, 10b) preferably with a slope in the range of 40-50 degrees, more preferably in the vicinity of 45 degrees, for maximal elongation of the heat plate material ensuring stable production process.

[0021] Fig. 3 shows one embodiment of gasket extension (7) also showing wings (13) at the second part (7b) extending in opposing sides and formed such that they are adapted to fit into the openings of the open sides (11b) and (12) of the first (10a) and second (10b) projections respectively. When the gasket extension is (7) is correctly positioned within the groove extension (8) these wings (13) thus will fit into the open sides (11b) and (12) helping to kept the gasket (2) firmly in position, but they also has the effect that during assembly a feeling of the gasket 'clicking' into position may be observed when the wings (13) 'clicks' into the open sides (11b) and (12).

[0022] With this design it is ensured that the gasket will be always perfectly positioned relative to the plate pattern and prevents misalignment of the gasket (2) within gasket groove (6) due to the poor alignment of the heat plate material within pressing tool.

[0023] Fig. 3 further illustrates an embodiment where one of the two first parts (7a) is longer than the other and may be the only one reaching out of the opening (9). This may e.g. be due to a tightening bold reaching through the heat exchanger plates (1) at this position.

[0024] Fig. 4 illustrates another design of the gasket (2) where each gasket extension (7) is also accommodated by an 'inwards shaping' (14) of the gasket towards to heat exchanging section (2). Further illustrated is another feature embodiment of the first parts (7a) of the gasket extensions (7) reaching out of the heat exchanger, then sections (15) with information prints may be attached to one or more of the gasket extensions (7) such as wear a trademark, a serial number, product number etc.

Claims

1. Gasket (2) to be positioned within a gasket groove (6) formed in a heat exchanger plate (1) for a heat exchanger, where the gasket (2) comprises gasket extensions (7) for fixing the gasket (2) in the gasket groove (6),
   characterized in that the gasket extensions (7) are essentially H-shaped having two first parts (7a) reaching in a direction away from the gasket (2) and a second part (7b) connecting the two first parts (7a).

2. Gasket (2) according to claim 1, wherein at least one

of the two first parts (7a) is substantially perpendicular to the gasket (2).

3. Gasket (2) according to claim 1 or 2, wherein the second part (7b) is substantially parallel to the gasket (2).

4. Heat exchanger plate (1) forming a gasket groove (6) forming groove extensions (8) essentially H-shaped having two first groove sections (8a) extending in a direction away from the main gasket groove (6) of the heat exchanger and one section groove section (8b) extending in a direction to connect the two first groove sections (6) and where the gasket extensions (7) according to any of claims 1-3 and said groove extensions (8) are formed such that a gasket extension (7) may be positioned within a groove extension (8).

5. Heat exchanger plate (1) according to claim 4, where the groove extension (8) is formed by a first projection (10a) being closest to the gasket groove (6) and formed such that is has the side (11 a) facing the gasket groove (6) being closed and the side (11b) away from the gasket groove (6) being open, and a second projection (10b) being farthest away from the gasket groove (6) has the side (12) facing the gasket groove (6) being open.

6. Heat exchanger plate (1) according to claim 5, where the first (10a) and second (10b) projections has surfaces at the same level as other patterns of the heat exchanger plates.

7. Gasket (2) and Heat exchanger plate (1) according to any of the preceding claims, where the groove extensions (8) are such that a opening (9) is formed in the edge of the heat exchanger plate (1) and a least one of the two first parts (7a) has a length such that when positioned within a groove extension (8) it extends through the opening (9) into the externals.

8. Gasket (2) and Heat exchanger plate (1) according to any of the preceding claims, where the gasket extension (7) has wings (13) at the second part (7b) extending in opposing sides and formed such that they are adapted to fit into the openings of the open sides (11b) and (12) of the first (10a) and second (10b) projections respectively.

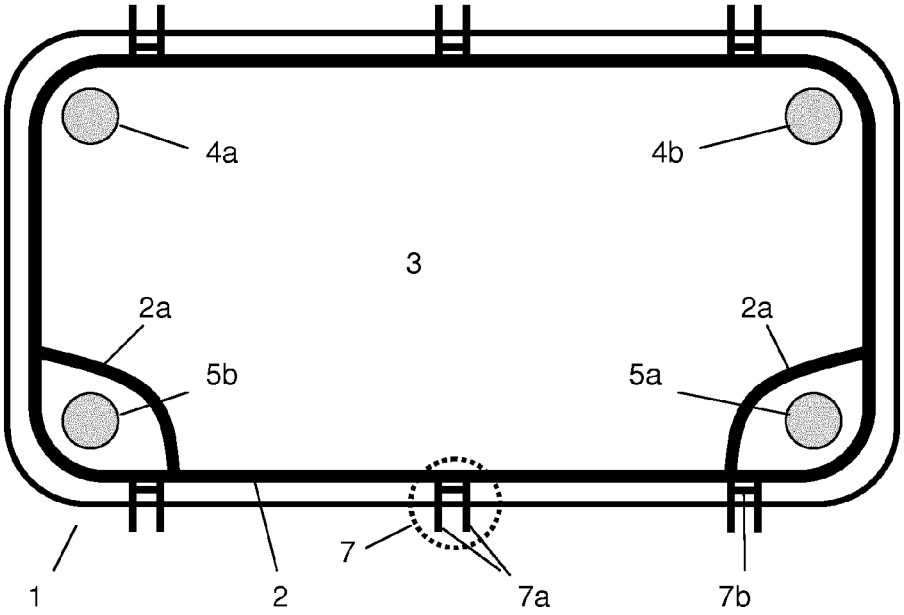


Fig. 1

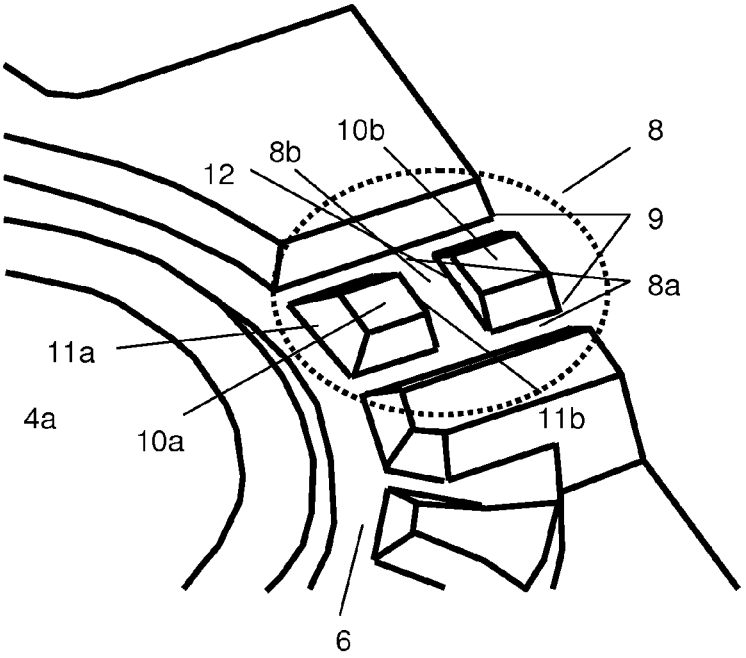


Fig. 2

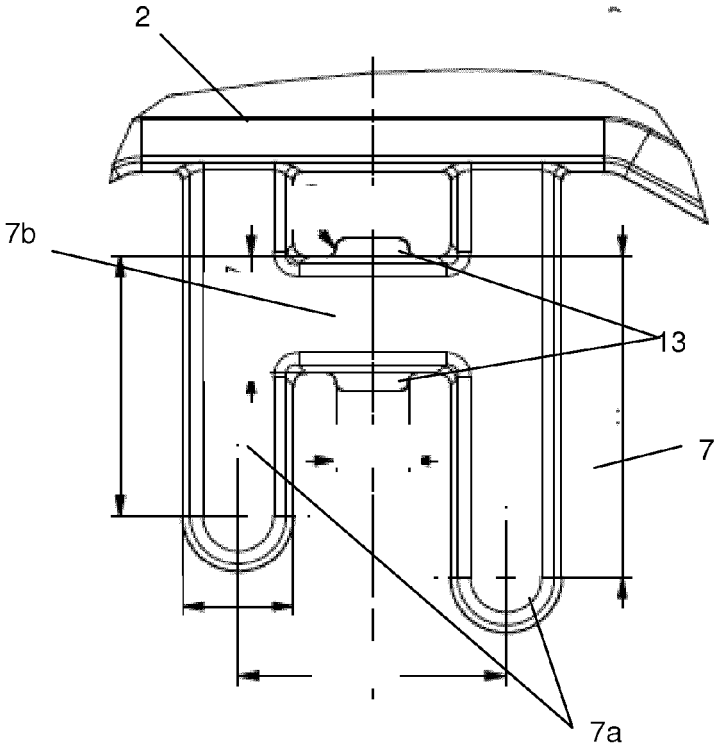


Fig. 3

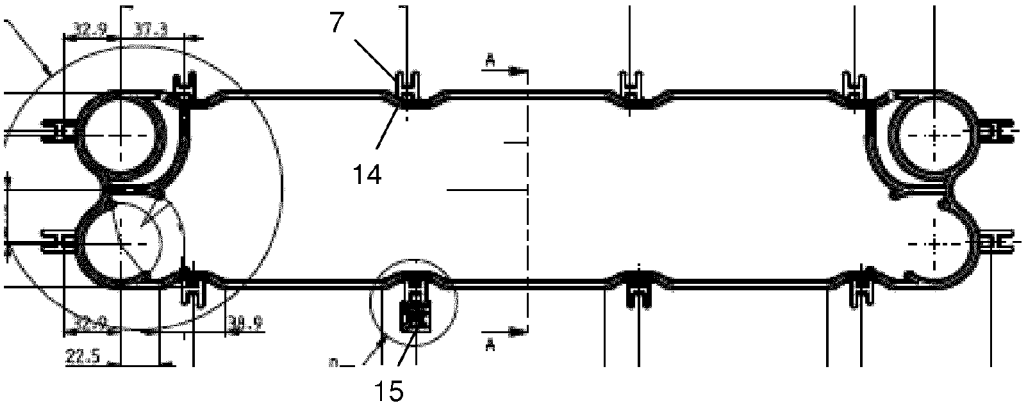


Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 14 15 3155

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TECHNICAL FIELDS SEARCHED (IPC)

F28F
F28D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	15 May 2014	Mellado Ramirez, J

CATEGORY OF CITED DOCUMENTS

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