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(54) Title: A GASKET FOR A PLATE-TYPE GASKETED HEAT EXCHANGER

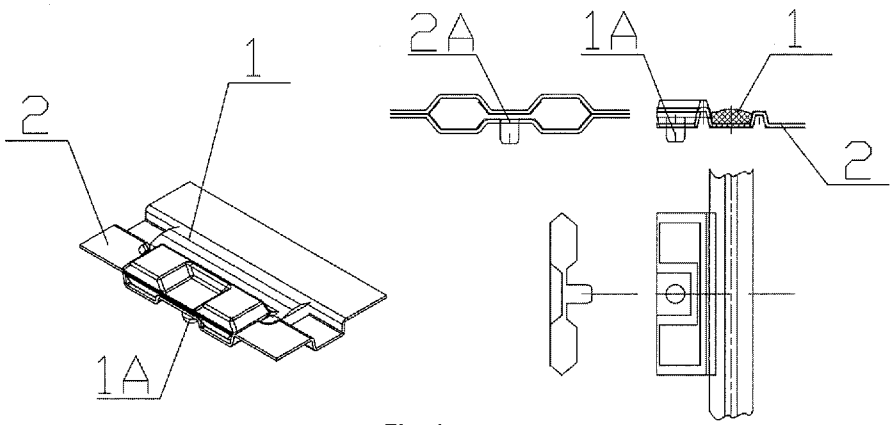

Fig. 4

(57) Abstract: A gasket for a plate-type gasketed heat exchanger has on its surface at least 1 protrusion (1A) and at least 1 catch (1 B), which enable the assembly of the gasket (1) to the heating plate (2) along the axis of heating plate manufacturing/pressing, with a press-in method (each protrusion 1A is pressed into the corresponding cutout 2A in the heating plate) and perpendicular to the axis of heating plate manufacturing/pressing, with a catch-on method (each catch 1B catches on the corresponding fragment of the profiled edge 2B of the heating plate).

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A gasket for a plate-type gasketed heat exchanger

The subject of the invention is a gasket for a plate-type gasketed heat exchanger.

There are known from patents: EP 2396617, EP 2361365 and EP 2045557 gaskets for gasketed heat exchangers, mounted according to the catching method to the profiled edge of the plate or (alternatively) according to the press-in method in embossings or holes of the heat exchanger heating plate. The pressed-in gasket is firmly embedded in the heating plate socket at the stage of pre-assembly of the heating plate package, which ensures its good position in the socket during work of the heat exchanger. The gasket fastened to the catch (to the profiled edge of the heating plate) is relatively well embedded in the heating plate socket at the stage of pre-assembly of the heating plate package, which ensures its stable position in the socket during work of the heat exchanger.

The known solutions relate to gaskets for plate heat exchangers made of similar materials. These solutions ensure adequate tightness of the plate package of the gasketed heat exchanger during work, however, they are characterized by difficulties in the scope of assembly and/or disassembly in/from the heating plate package in the exchanger. The assembly and disassembly of gaskets in/from plate-type gasketed heat exchangers can be problematic due to the necessity of even positioning of the gasket in the heating plate. The gasket must be flawlessly laid in the designated groove (embossing on the surface of the heating plate). The gasket is mounted to the heating plate, and then the complete set – the heating plate and the gasket – they are placed on the leading beam of the heat exchanger frame, creating together with the remaining pairs a package of heating plates. The package of heating plates with gaskets is screwed together with cover plates. Stability of the gasket position during assembly or disassembly on the leading beam of the frame of heat exchanger is very important due to the pre-preparation of the gasket for subsequent screwing the heating plate package with the cover plates.

A heat exchanger as a pressure device works using working media at a certain pressure. A gasket seated correctly in a dedicated socket (embossing on the surface of the heating plate) ensures tightness of the structure. It prevents mixing of working

media or leakage. During heat exchanger work, there is a risk of displacement of the gasket in the socket, which can directly lead to the external leakage or internal leakage of media into contiguous channel. Displacement in the socket during heat exchanger work may occur as a result of incorrect assembly of gaskets in the heating plates (incorrect placing in the heating plate groove, displacement due to instability during assembly of the heating plate package on the leading beam of the frame). Displacement can also be the result of (in the case of correct pre-assembly) extremely high operating parameters (temperatures, pressures) of the device or as a result of a cyclic pressure increase/decrease between the sides (media circulations) in the heat exchanger.

The gasket according to the invention has on its surface at least one protrusion and at least one catch, which enable the assembly of the gasket to the heating plate along the axis of heating plate manufacturing/pressing, with a press-in method (each protrusion is pressed into the corresponding cutout in the heating plate) and perpendicular to the axis of heating plate manufacturing/pressing, with a catch-on method (each catch catches on the corresponding fragment of the profiled edge of the heating plate). This hybrid gasket assembly on the heating plate connects two previously used solutions: press-in assembly along the axis of heating plate pressing using protrusions and cutouts prepared for them in the heating plate, as well as catch-on assembly perpendicular to the axis of heating plate pressing using catches and prepared profiled edges of the heating plate.

The applying of the solution according to the invention improves the stability of the seating gaskets in the heating plate of the plate-type gasketed heat exchanger, both during assembly/disassembly as well as during the work of the device. It reduces the risk of misplacement of gaskets in the heating plate package and ensures increased durability of their positioning during work, which in turn reduces the risk of internal and/or external leakage. As a consequence, the service life of the gasketed heat exchanger is extended. In addition, the stability of the gasket position facilitates the disassembly of the heating plates package in order to discharge dirtiness. Assembly or disassembly of the gasket according to the invention is therefore easier, faster and more stable.

In addition, the heating plate surface prepared for the gasket (having profiled edges for catches and cutouts for protrusions) allows the mounting gasket only on the catch/catches, or only using protrusion/protrusions, or at the same time on the catch/catches and using protrusion/protrusions. The heating plate is therefore compatible with previously known solutions. The manufacturing/pressing process of the heating plate remains the same (the cutouts for the protrusions are trimmed together with port holes, which allow the flow of the medium in the heat exchanger). Hybrid assembly of the gasket enforces the use of a hybrid gaskets, and as a consequence a properly prepared heating plate.

The object of the invention is illustrated in the drawing, in which fig. 1 shows the gasket in a front view with details relating to its assembly, fig. 2 shows generally the seating of the gasket in the heating plate socket of the plate-type gasketed heat exchanger, fig. 3 – gasket catch and corresponding edge of the heating plate, fig. 4 – protrusion on the gasket surface and the corresponding cutout in the heating plate, and fig. 5 shows a view of an exemplary gasketed plate heat exchanger (with heating plates and gaskets according to the invention).

The hybrid gasket is made of NBR material with a maximum operating temperature 110°C, its overall width is 155 mm, and the overall length is 350 mm. The gasket has on its surface 4 protrusions (1A) and 3 catches (1B) that allow hybrid (using press-in protrusions and catch-on catches) installation of the gasket in the heating plate (2) of a plate-type gasketed heat exchanger. The heating plate (2) has 4 cutouts (2A) for protrusions (1A) and 3 fragments of the profiled edge (2B) for catches (1B). The protrusions (1A) and the catches (1B) are located longitudinally the sides of the heating plate (2) of the gasketed heat exchanger and/or along port holes (6) in the heating plate (2) of the gasketed plate heat exchanger at a distance of not less than 15 mm from each other. Mounting the gasket (1) to the heating plate (2) is non-invasive, impermanent. Plate heat exchanger (fig. 5) has heating plates (2) with port holes (6) and gaskets (1) forming a heating plate package (3), which is mounted on the leading beam of the heat exchanger frame (7) and screwed with screws (5) and cover plates (4). Components of heat exchanger, in particular heating plates (2), are made of stainless steel, but they can also be made of titanium, its alloys or various metals and/or alloys of metals and/or non-metals and/or plastics

and/or composite materials. The gaskets (1) are made of NBR, but they can also be made of its varieties or different types of EPDM, FKM and/or various plastics and/or composite materials. Connecting the heat exchanger components is made by screwing. It provides a wide range of applications of gasketed heat exchangers in industry, among others: energy, pharmaceutical, food, petrochemical, chemical, mining, at pool installations, HVAC, HVACR and in sewage treatment plants.

Claim

1. A gasket for a plate-type gasketed heat exchanger, **characterized in that** it has on its surface at least 1 protrusion (1A) and at least 1 catch (1B), which enable the assembly of the gasket (1) to the heating plate (2) along the axis of heating plate manufacturing/pressing, with a press-in method (each protrusion 1A is pressed into the corresponding cutout 2A in the heating plate) and perpendicular to the axis of heating plate manufacturing/pressing, with a catch-on method (each catch 1B catches on the corresponding fragment of the profiled edge 2B of the heating plate).

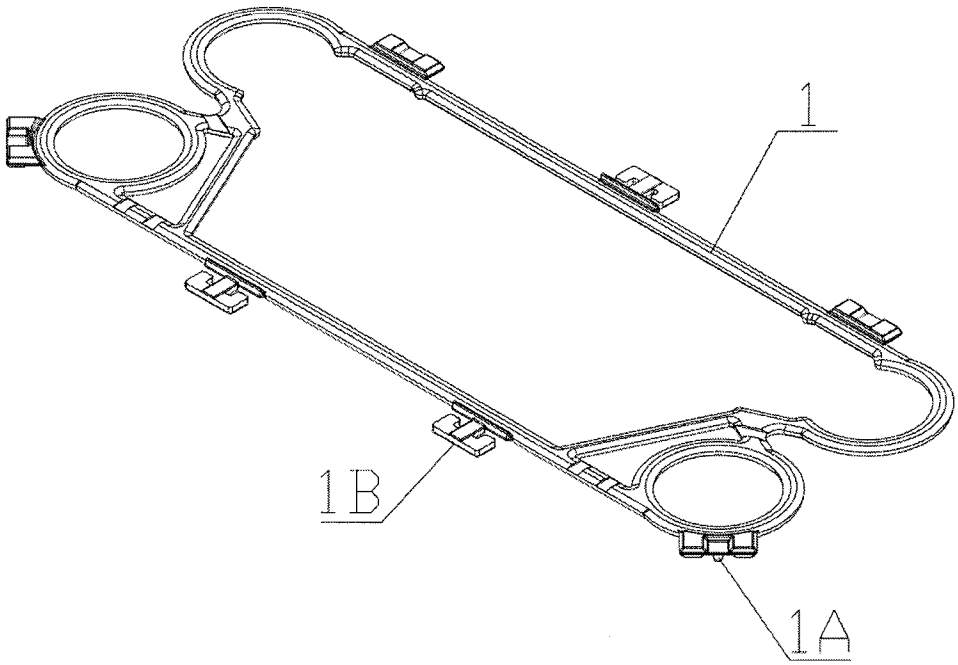

Fig. 1

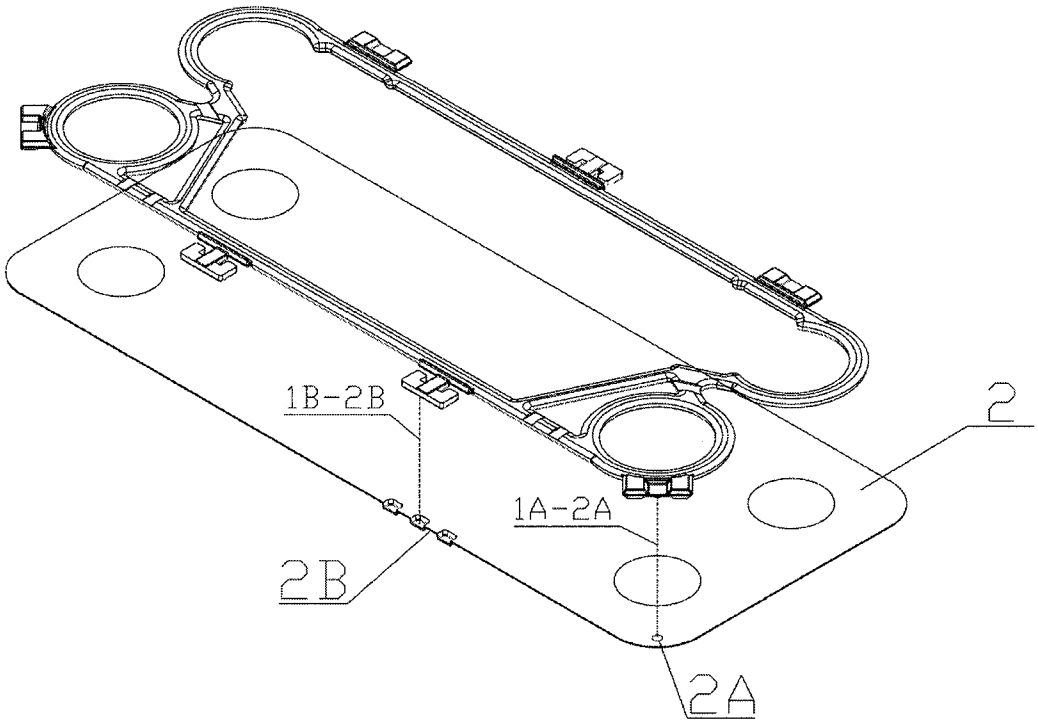

Fig. 2

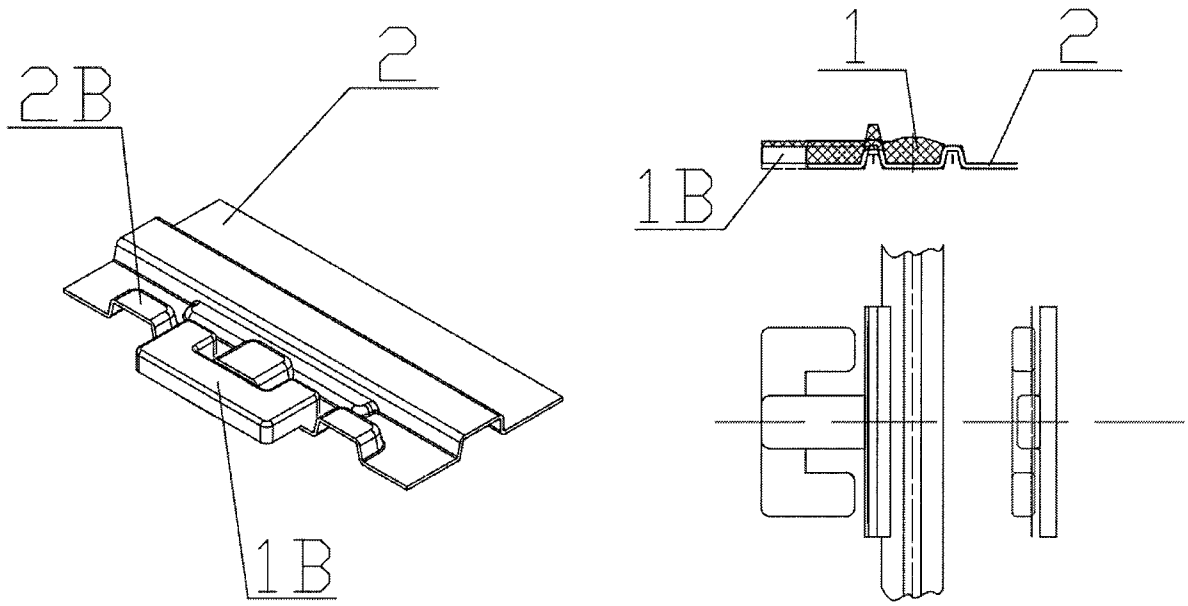

Fig. 3

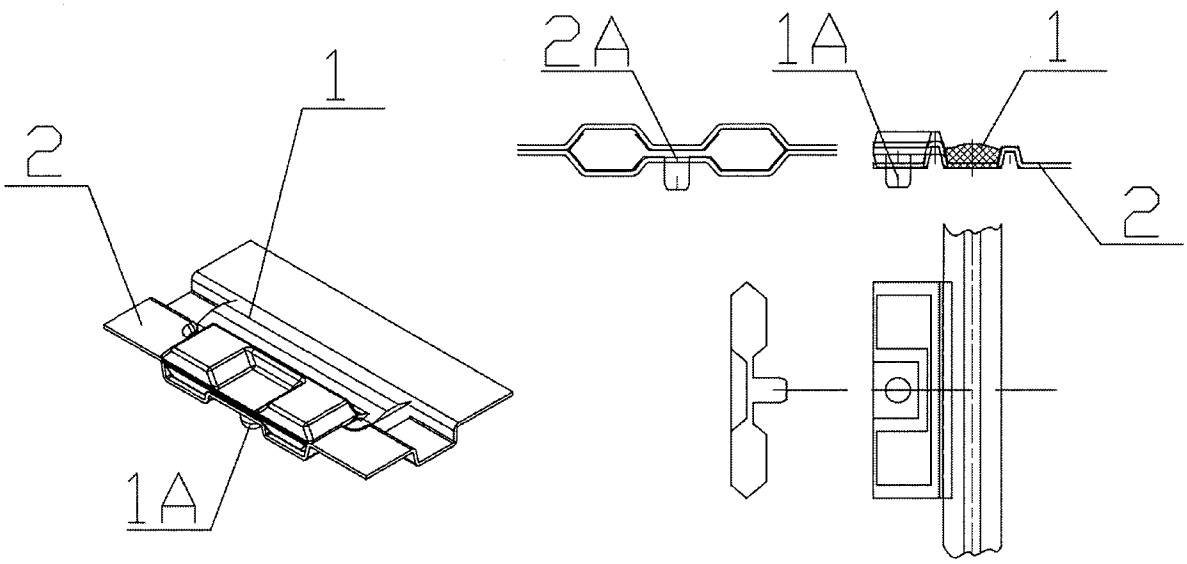

Fig. 4

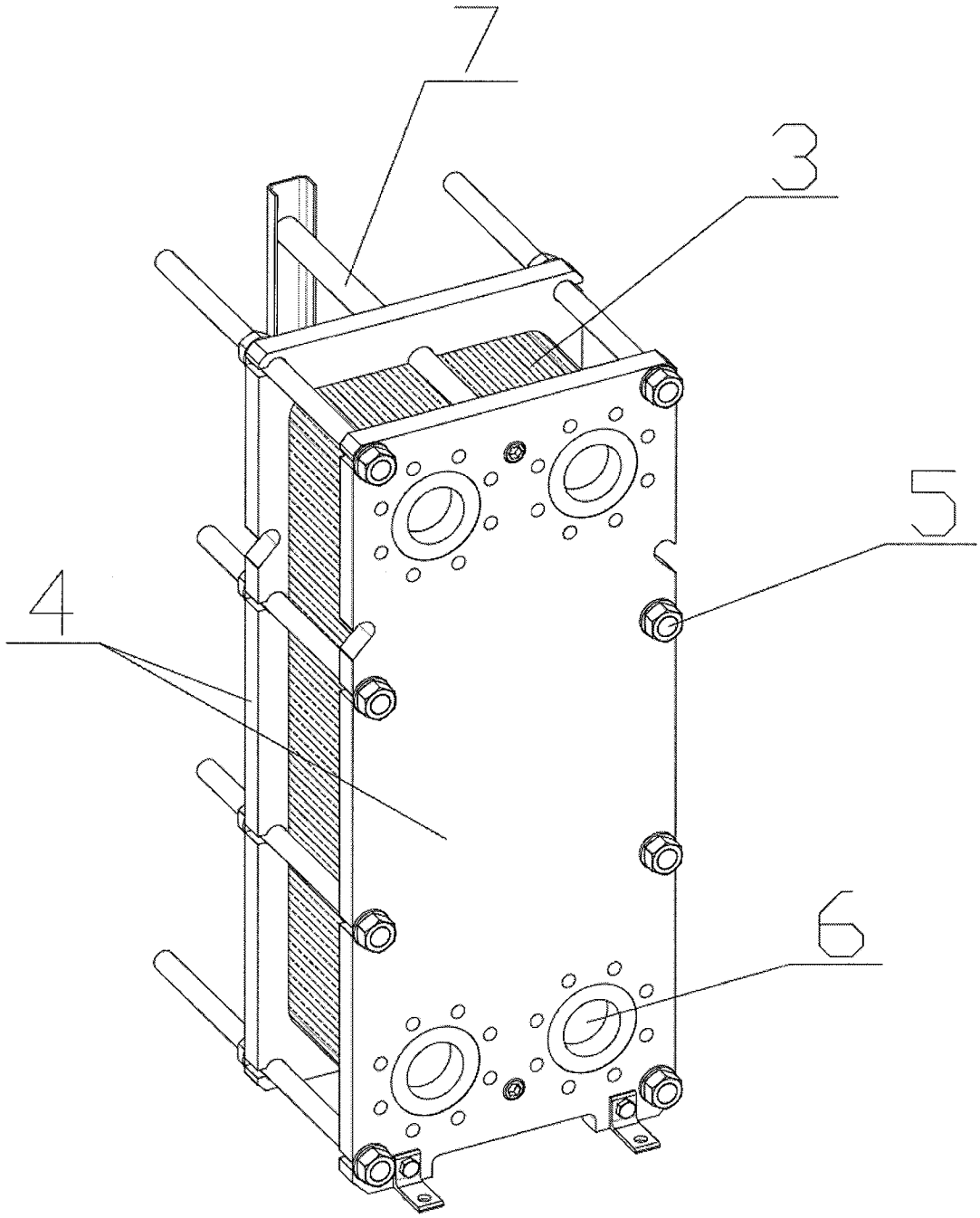

Fig. 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/PL2019/000049

A. CLASSIFICATION OF SUBJECT MATTER
INV. F28F3/00 F28F3/08 F28F3/10
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F28F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 186 224 B1 (SEIDEL PESSACH [IL]) 13 February 2001 (2001-02-13) column 8, line 20 - column 9, line 7; figures 1-2B	1
X	US 5 988 268 A (USAMI TOSHIYA [JP] ET AL) 23 November 1999 (1999-11-23) figures 9,13,6	1
A	JP H01 101083 U (XXXX) 6 July 1989 (1989-07-06) the whole document	1
A	WO 2016/046119 A1 (ALFA LAVAL CORP AB [SE]) 31 March 2016 (2016-03-31) figure 10	1

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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"P" document published prior to the international filing date but later than the priority date claimed

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
1 October 2019	11/10/2019

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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