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(54) **Flow module, reactor or heat exchanger plate clamping device**

(57) A flow module, reactor or heat exchanger plate clamping device comprises two U-section formed end plates 2, springs 11, and tensioning rods 7, wherein at least one end plate 2 comprises, an elongated beam flange 3 and on each side of said beam flange 3 a beam

web 4, where the long sides 8 of the beam webs 4 each has a groove 5 in which the beam flange 3 is fitted, in such a way that an end plate 2 with a U-section is formed. The construction aims to give a clamping device which may carry and better distribute bigger loads.

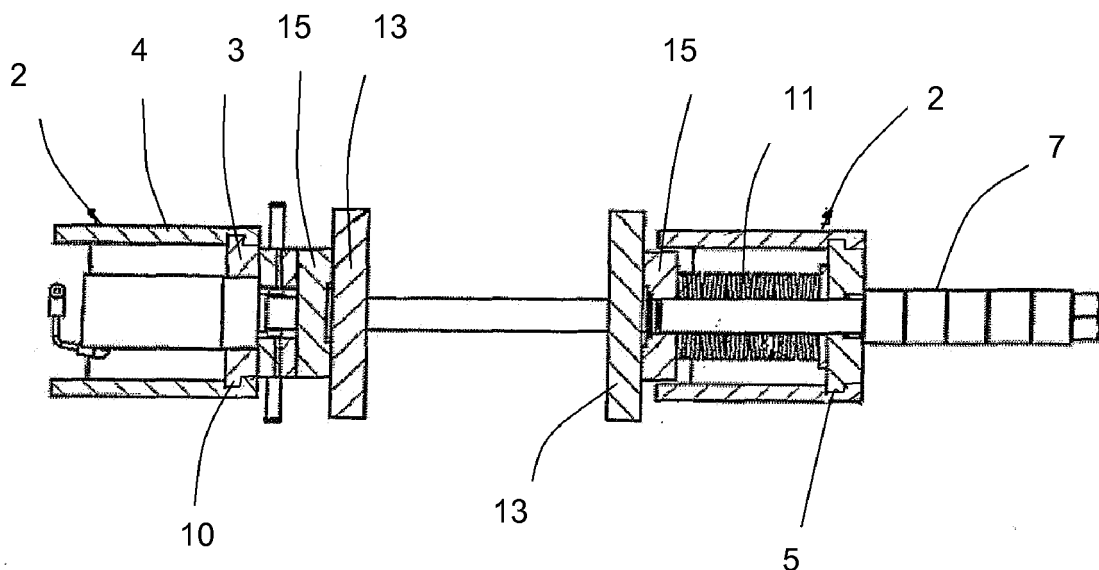


FIG 2

Description

[0001] The present invention relates to a flow module, reactor or heat exchanger plate clamping device.

BACKGROUND

[0002] The vertical end plates in a flow module, reactor or plate heat exchanger frame are exposed to very big loads when the device is clamped together. It is desired that they are designed without welds and that they have U-shaped cross sections to host spring packs for distributing the forces from the clamping on the flow, reactor or heat exchanger plates. Such a beam structure is disclosed in WO 2008/066447 and in WO 2009/142579. In a structure like the one described in this document the two enforcing beam webs are fastened to the beam flange by screwing bolts. However this sets limitations to the load the construction can carry. Also it is not ideal for the even distribution of forces in the U-shaped beam construction.

SUMMARY OF THE INVENTION

[0003] Accordingly, the present invention provides a solution that reduces the disadvantages of the above mentioned problems, namely the limitation and distribution of the load.

[0004] The present invention is therefore characterized by that the flow module, reactor or heat exchanger plate clamping device comprises two U-section formed end plates, springs, and tensioning rods, wherein at least one end plate comprises, an elongated beam flange and on each side of said beam flange a beam web, where the long sides of the beam webs each has a groove in which the beam flange is fitted, in such a way that an end plate with a U-section is formed.

[0005] In another embodiment of the present invention the edge of the long side of the beam flange (3) is stepped, in such a way that it comprises a tongue which is fitted in the groove of the beam web.

[0006] In yet another embodiment of the present invention the grooves have bridges, which bridges correspond to interruptions in the flanges.

[0007] Other aspects and advantages of the invention will, with reference to the accompanying drawings, be presented in the following detailed description of embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

Fig. 1 discloses a flow module with a clamping device according to the present invention.

Fig. 2 discloses a sectional view of the clamping device according to fig. 1.

Fig. 3 discloses apartly exploded view of an end plate

according to the present invention.

DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

[0009] Fig. 1 discloses a side view of a closed reactor frame 1 holding reactor or flow module plates 6 in place. According to this embodiment of the invention distribution plates 15 and pressure plates 13 are placed on each side of the stack of reactor or flow module plates 6. The stack of reactor or flow module plates 6 are pressed and held together by a pressure applied by two end plates 2, one on each side of the stack 6 outside the distribution plates 15 which the end plates 2 are pressed together by tensioning rods 7 applied in holes in the end plates 2, which rods are tightened evenly to press the stack 6 together into sealing contact with each other.

[0010] To further evenly distribute the pressure over the whole area of the plates in the stack 6 a grid of springs 11 is arranged in one of the end plates 2, which arrangement is disclosed in fig. 2. This is made possible by the U-shape construction of the end plates 2. Each end plate 2 comprises an elongated beam flange 3 and a likewise elongated beam web 4 arranged on each side of said beam flange 3 thus forming a U-shape beam construction. Each beam web 4 has a groove 5 along an edge of its long side 8. The edges of the long side of the beam flanges 3 are fitted in the groove 5. To fix the webs 4 and the flange 3 together bolts 9 are arranged in through holes along the edge of the web 4 fastened in corresponding holes in the flange 3. As can be seen in fig. 3 the edge of the long side of the beam flange 3 may be stepped, i.e. the edge has a tongue 10 of about half the thickness of the edge. In the embodiment according to fig. 2 this tongue 10 is fitted into the groove 5 of the beam webs 4. To further fix the position of the beam webs 4 in relation to the beam flange 3 and strengthen the design, the grooves 5 may have bridges 12 i.e. interruptions in a groove 5 at strategic positions, which bridges 12 correspond to interruptions in the flanges 10 at the same positions.

[0011] As has been previously implied a clamping device according to the present invention may also be used with plate heat exchangers and other flow modules comprising plates.

[0012] The above detailed description is not limited to the mentioned embodiments of the invention but to a person skilled in the art there are several modifications possible within the scope of the claimed invention.

Claims

1. Flow module, reactor or heat exchanger plate clamping device comprising two U-section formed end plates (2), springs (11), and tensioning rods (7), wherein at least one end plate (2) comprises, an elongated beam flange (3) and on each side of said

beam flange (3) a beam web (4), where the long sides (8) of the beam webs (4) each has a groove (5) in which the beam flange (3) is fitted, in such a way that an end plate (2) with a U-section is formed.

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2. Flow module, reactor or heat exchanger plate clamping device according to claim 1, wherein the edge of the long side of the beam flange (3) is stepped, in such a way that it comprises a tongue (10) which is fitted in the groove (5) of the beam web (4).

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3. Flow module, reactor or heat exchanger plate clamping device according to claim 1, the grooves (5) have bridges (12), which bridges (12) correspond to interruptions in the flanges (10).

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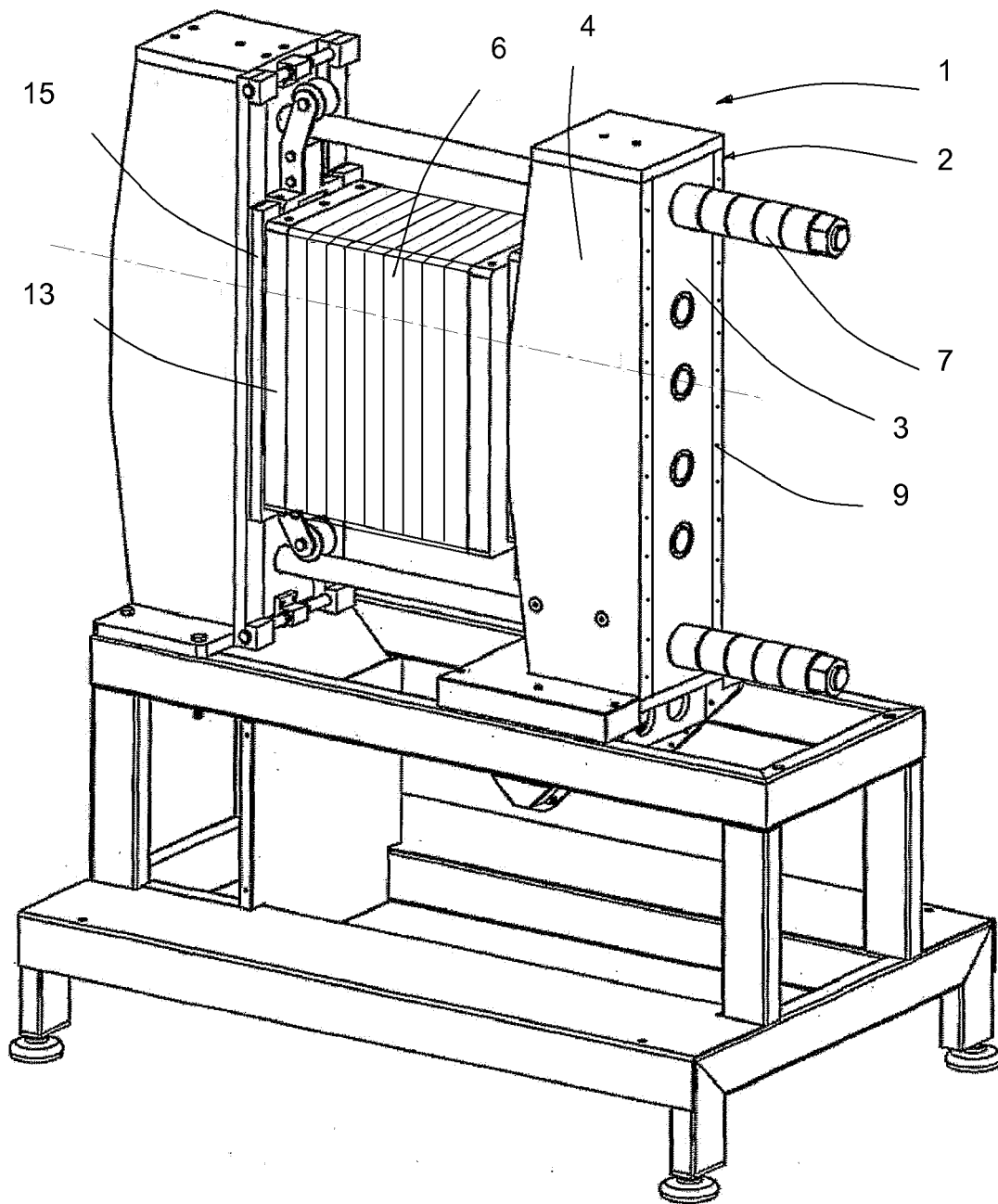


FIG 1

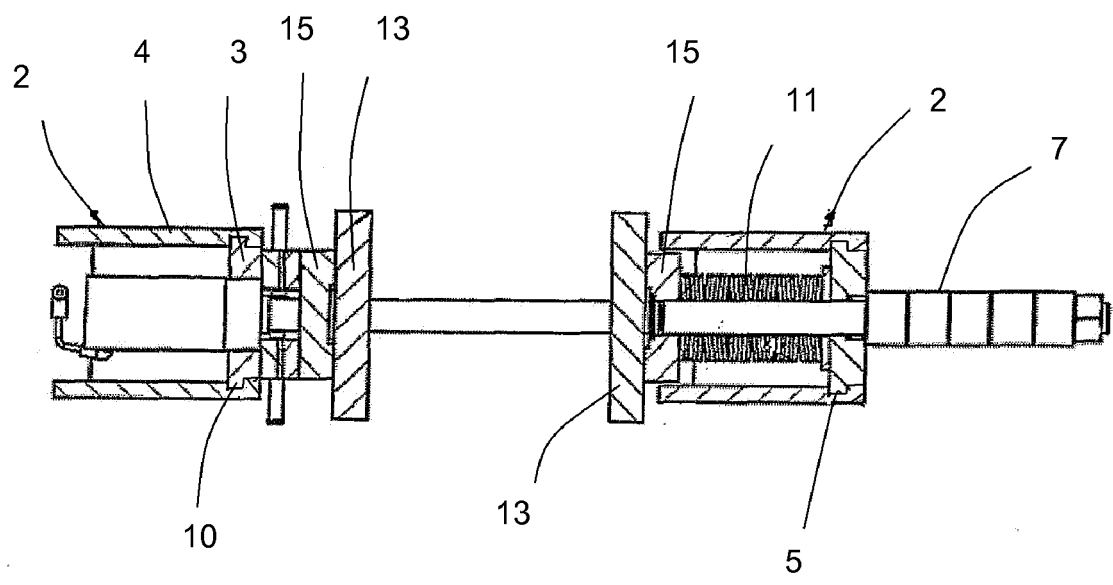


FIG 2

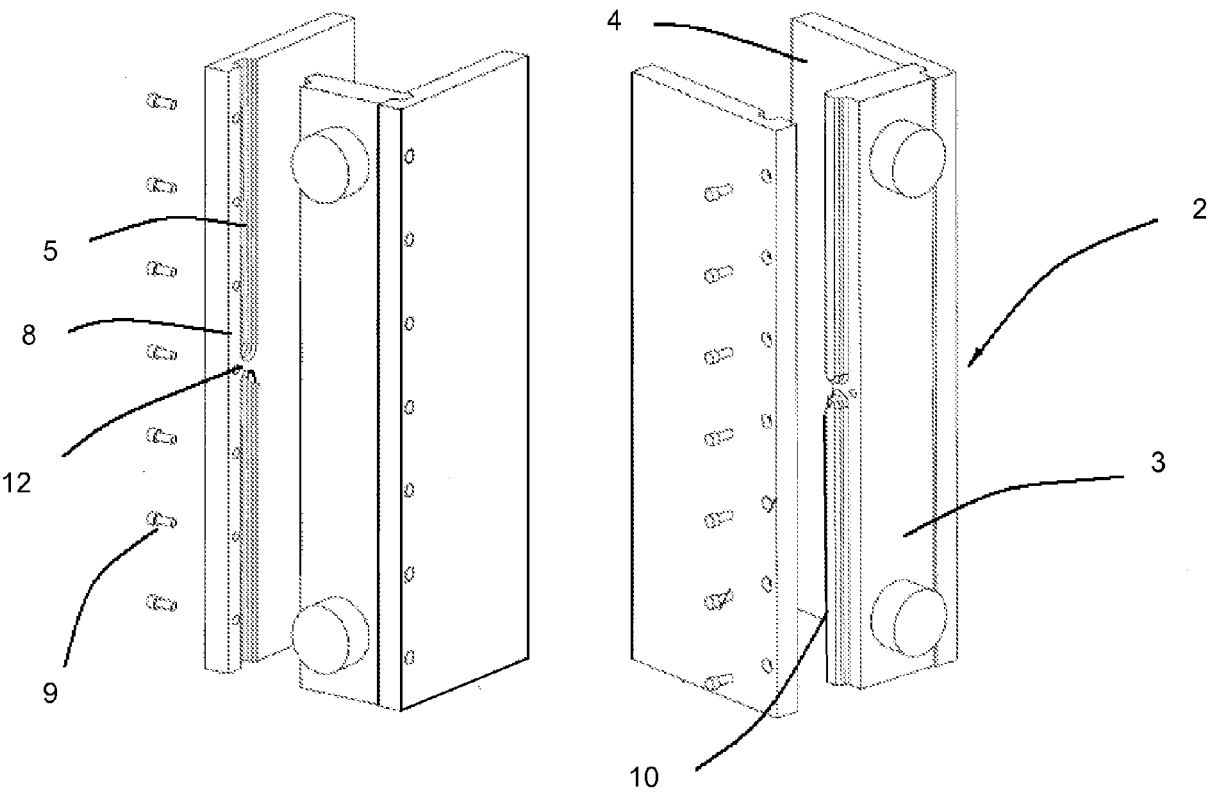


FIG 3



EUROPEAN SEARCH REPORT

Application Number
EP 10 16 8219

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X,D	WO 2009/142579 A1 (ALFA LAVAL CORP AB [SE]; HOEGLUND KASPER [SE]; LINGVALL MAGNUS [SE]; N) 26 November 2009 (2009-11-26) * figures 7,10 *	1-3	INV. F28D9/00 F28F3/08 F28F9/007
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X	EP 0 947 795 A1 (BALCKE DUERR GMBH [DE]) 6 October 1999 (1999-10-06) * figure 2 *	1-3	
			TECHNICAL FIELDS SEARCHED (IPC)
			F28D F28F
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 24 January 2011	Examiner Vassoille, Bruno
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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EPO FORM 1503 03.02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 10 16 8219

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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24-01-2011

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