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(72) Inventor: Benettolo, Ugo  
35133 Padova (IT)

(74) Representative: De Gregori, Antonella  
Ing. Barzano & Zanardo Milano S.p.A.  
Via Borgonuovo 10  
20121 Milano (IT)

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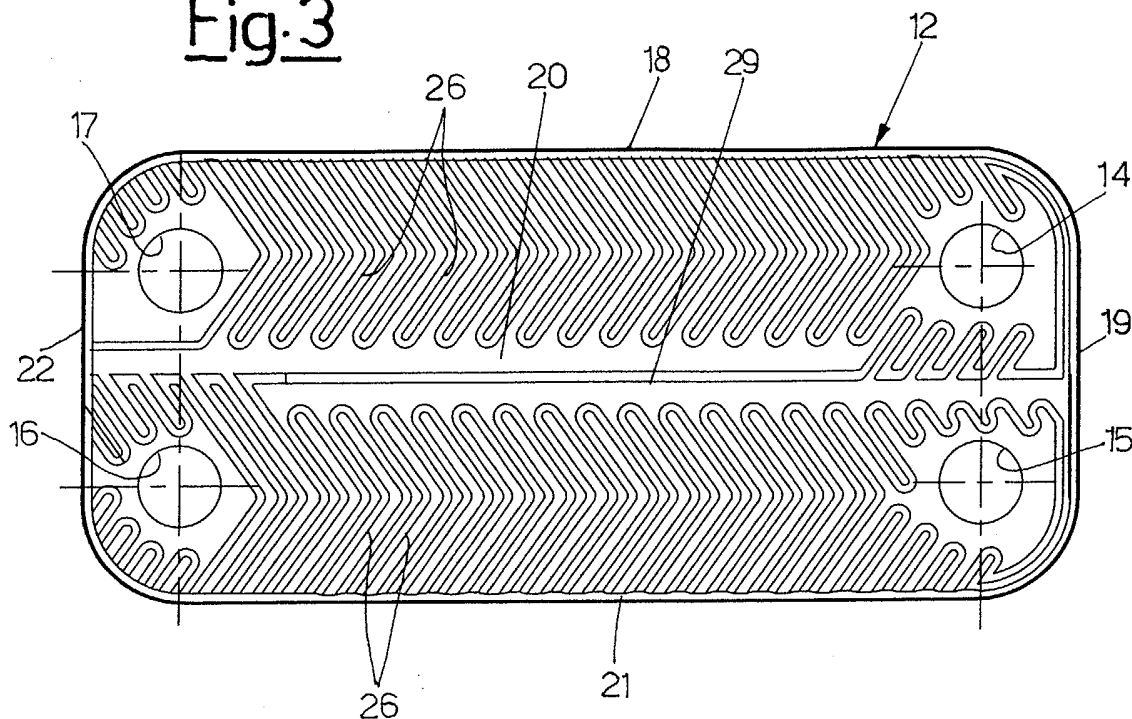
(71) Applicant: Zilmet S.p.A.  
35010 Limena (Padova) (IT)

(54) Easy-to-install plate heat exchanger

(57) An easy-to-install plate heat exchanger of the type comprising a number of substantially rectangular-shaped plates (12, 13) positioned one on top of the other and joined together to form a series of distribution chambers (20, 23) for a primary fluid and a secondary fluid alternatively, where said plates (12, 13) are each provided with at least four corresponding through apertures (14-17), said through apertures (14-17) providing a connection between the distribution chambers (20) of the

primary fluid and between the distribution chambers (23) of the secondary fluid, and furthermore said apertures at one end of the exchanger forming inlets (14, 16 or 15, 17) and outlets (15, 17 and 14, 16) for the primary fluid and for the secondary fluid, in which exchanger an inlet (14, 16 or 15, 17) and an outlet (15, 17 and 14, 16) of both the primary fluid and the secondary fluid are provided along short sides (19, 22) of the exchanger with substantially rectangular-shaped plates (12, 13).

Fig.3



## Description

[0001] The present invention refers to an easy-to-install plate heat exchanger.

[0002] The use of heat exchangers is known where a contribution or release of heat is required for many different applications.

[0003] Of the various types of exchanger where energy is transferred between at least one pair of fluids, without mixing of them, plate heat exchangers are used in particular.

[0004] The arrangement of the plates, positioned one above the other to form a series of interconnected chambers, has the advantage of limiting the external dimensions while exchanging the same amount of heat.

[0005] In these heat exchangers, in which the series of distribution chambers permits circulation of the two fluids, the dimensions and number of the chambers are chosen according to the type of exchange process required.

[0006] It should be noted that these distribution chambers are produced by superimposing a series of plates at a certain distance in order to create a series of chambers arranged on top of each other and intercommunicating in succession.

[0007] For example in an arrangement with two types of fluid, the chambers are alternated so that a first group of chambers provides a path for the primary fluid, while the second group provides the path for flow of the secondary fluid.

[0008] Naturally the distribution chambers of each group are interconnected to obtain said circulation.

[0009] It should also be noted that in general on each plate there are at least four apertures, provided peripherally with collars that extend in a substantially perpendicular direction to the plate itself.

[0010] More precisely, in a plate heat exchanger, there are two types of plates. A first plate is provided with a first pair of collars extending in one direction and a second pair extending in the opposite direction. A second plate, having the four apertures in the same dimensions as those corresponding to the first plate, is provided with a first pair of collars extending in a direction opposite to that of the first pair of collars of the first plate, and a second pair of collars extending in the opposite direction to that of the second pair of collars of the first plate.

[0011] Juxtaposing alternatively plates of the above two types and joining, for example by brazing or welding, the respective collars extending one against the other, we obtain the series of the two groups of distribution chambers that interact in the thermal exchange.

[0012] This generally occurs with inlet and outlet for the same primary or secondary fluid arranged on the same longer side of the superimposed rectangular plates.

[0013] The aim of the present invention is therefore to improve the plate heat exchangers previously men-

tioned and in particular to produce a plate heat exchanger with greater efficiency.

[0014] A further aim of the present invention is to produce a plate heat exchanger that can be manufactured simply, with a minimum number of parts, while at the same time being particularly functional.

[0015] These and further aims according to the present invention are achieved by producing an easy-to-install plate heat exchanger as described in claim 1.

[0016] Further characteristics are illustrated in the subsequent claims.

[0017] The characteristics and advantages of an easy-to-install plate heat exchanger according to the present invention will become clearer from the following description, which is a non-restrictive example, referring to the attached drawings in which:

figure 1 is a side elevation view of an easy-to-install plate heat exchanger according to the present invention;

figure 2 shows an overhead view of the exchanger of figure 1;

figure 3 is an overhead view of a first type of plate used in the exchanger of figure 1;

figure 4 shows an overhead view of a second type of plate used in the exchanger of figure 1.

[0018] With reference to the figures, an easy-to-install plate heat exchanger is shown, indicated overall by number 11, which in the example illustrated, according to the present invention, is produced by superimposing a number of plates 12 and 13, of different type, alternating them.

[0019] Figure 3 shows a first type of plate 12: it is substantially rectangular-shaped, with rounded corners, and has four through apertures 14, 15, 16 and 17.

[0020] More precisely, a first aperture 14 is provided near a corner between a longer side 18 and a shorter side 19 of the rectangle. Said first aperture 14 constitutes an inlet for a first fluid, for example the primary fluid, and a second aperture 15, provided beside the first aperture 14, provides, according to the present invention, an outlet for said fluid, once the same has passed through distribution chambers 20 on the sides of the exchanger between superimposed plates 12 and 13.

[0021] It should be noted that according to the present invention, the inlet and outlet of the first fluid, for example the primary fluid, are located along a short side of the exchanger, in this case the short side 19.

[0022] In a practically equivalent fashion, the exchanger provides a third aperture 16, also located near a corner between a second long side 21 and a short side 22 of the rectangle. Said third aperture 16 provides an inlet for a second fluid, for example the secondary fluid, and a fourth aperture 17, located beside the third aperture 16, provides, according to the present invention, an outlet for said second fluid. Also in this case, said outlet is used once said second fluid has passed through dis-

tribution chambers 23 on sides of the exchanger between superimposed plates 12 and 13.

**[0023]** It should be noted that according to the present invention also the inlet and outlet of the second fluid, for example the secondary fluid, are located along a short side of the exchanger, in this case the short side 22.

**[0024]** Also in this case, it should furthermore be noted that since at least four apertures are provided on each plate, each aperture is provided peripherally with collars that extend in a direction substantially perpendicular to the plate. Moreover, more precisely, as already mentioned, there are two types of plates 12 and 13. The first plate 12 is provided with a first pair of collars that extends in one direction and a second pair of collars that extends in the opposite direction. The second plate, which has apertures with the same dimensions as those of the first plate, is provided with a first pair of collars, extending in a direction opposite to that of the first pair of collars of the first plate, and a second pair of collars, extending in a direction opposite to that of the second pair of collars of the first plate.

**[0025]** Thanks to said arrangement, alternatively juxtaposing plates of the first and second type and joining, for example by brazing or welding, the respective collars to the plates in the position in which they extend one against the other, we obtain the entire series of the two groups of distribution chambers 20 and 23 mentioned above, interacting in the thermal exchange.

**[0026]** In the example shown in the figures, the apertures in general are provided near corners of the rectangular shape of the plates, but they could also be arranged in a different position, on condition that their extension and connection collars can be aligned.

**[0027]** The plates are shaped for example by the provision of a series of ribs 26 and 28, generally obtained by drawing, on the plates 12 and 13; said ribs 26 and 28 have a suitable depth for obtaining a labyrinth path for the circulation of the two fluids of the exchanger.

**[0028]** The ribs 26 and 28 can be straight or in a heringbone pattern and in general the arrangement of the ribs 26 of the primary circuit plate 12 is different from that of the ribs 28 of the secondary circuit plate 13.

**[0029]** Furthermore, the primary circuit plate 12 and the secondary circuit plate 13 are provided with central profiles 29 and 30 which separate the distribution chambers 20 and 23 between the plates.

**[0030]** Naturally in an exchanger according to the invention the inlets and outlets can be arranged in various ways; for example the inlets 14, 16 can be moved to the position of the apertures 15', 17. In this way, naturally, the outlets which were previously located in the apertures 15, 17 are now located in 14, 16.

**[0031]** Operation of the easy-to-install plate heat exchanger 11 according to the invention is clear from the above description with reference to the figures and does not require any particular explanation.

**[0032]** After joining the plates 12 and 13, from what has been said above, it is clear that between adjacent

plates 12 and 13 there is a certain distance thanks to the presence of the collars (not shown), thus creating the parallel superimposed distribution chambers referred to.

**[0033]** The flow of the primary and secondary liquids is obvious but it is equally clear that the present invention also refers to cases in which the path of the primary and secondary fluids is opposite to the one described and shown.

**[0034]** It is helpful to remember that, at the bottom of the plate heat exchanger 11 there is a plate without apertures which closes the first two distribution chambers of the exchanger. A similar configuration applies to the upper plate, which must only permit passage of the final inlet and outlet of both the primary fluid, from a first short side, and of the secondary fluid from the other short side.

**[0035]** The inlet and outlet apertures for the two primary and secondary fluids that exchange heat are connected, generally by threaded couplings, or even without, to respective primary (heating) circuit and secondary (sanitary) circuit.

**[0036]** From the description provided, the characteristics of the easy-to-install plate heat exchanger subject of the present invention are clear, and likewise the related advantages, including simple and dependable use of the same and a reduction in construction costs of the primary and secondary circuit plates due, above all, to the fact that the two types of plates 12 and 13 can be obtained by simply reversing the arrangement of a single plate constructed in this way. Simple installation derives also from the fact that the two plates 12 and 13 can be obtained from one single plate, the position of which is rotated alternatively by 180°.

**[0037]** Lastly, it is clear that the easy-to-install plate heat exchanger thus conceived can be modified and varied in numerous ways, all falling within the invention; furthermore all the details can be replaced with technically equivalent elements. In practice any materials and any forms and dimensions can be used according to technical requirements.

**[0038]** The protective scope of the invention is therefore defined by the attached claims.

## Claims

1. Easy-to-install plate heat exchanger of the type comprising a number of substantially rectangular-shaped plates (12, 13) positioned one on top of the other and joined together to form a series of distribution chambers (20, 23) for a primary fluid and a secondary fluid alternatively, where said plates (12, 13) are each provided with at least four corresponding through apertures (14-17), said through apertures (14-17) providing a connection between the distribution chambers (20) of the primary fluid and between the distribution chambers (23) of the secondary fluid, and furthermore said apertures at one

end of the exchanger forming inlets (14, 16 or 15, 17) and outlets (15, 17 and 14, 16) for the primary fluid and for the secondary fluid, **characterised in that** an inlet (14, 16 or 15, 17) and an outlet (15, 17 and 14, 16) of both said primary fluid and said secondary fluid are provided along short sides (19, 22) of said exchanger with substantially rectangular-shaped plates (12, 13). 5

2. Heat exchanger (11) according to claim 1, **characterised in that** said plates (12, 13) have rounded corners. 10
3. Heat exchanger (11) according to claim 1 or 2, **characterised in that** said plates (12, 13) are of one single type which is rotated alternatively by 180° during positioning of said plates one above the other in the exchanger (11) to provide alternatively said distribution chambers (20) of the primary fluid and said distribution chambers (23) of the secondary fluid. 15 20
4. Heat exchanger (11) according to claim 1 or 2, **characterised in that** said plates (12, 13) are of two types and are alternately juxtaposed in the exchanger (11) to create alternatively said distribution chambers (20) of the primary fluid and said distribution chambers (23) of the secondary fluid. 25
5. Heat exchanger (11) according to any one of the preceding claims, **characterised in that** said plates of the primary circuit (12) and secondary circuit (13) are provided with a series of ribs (26, 28). 30
6. Heat exchanger (11) according to claim 5, **characterised in that** said ribs (26, 28) are arranged in a straight or herringbone pattern. 35
7. Heat exchanger (11) according to claim 6, **characterised in that** the direction of said ribs (26) of the primary circuit plate is different from that of said ribs (28) of the secondary circuit plate. 40
8. Heat exchanger (11) according to claim 1, **characterised in that** the bottom of said heat exchanger (11) is provided with a plate without apertures which closes distribution chambers (20, 23) of said exchanger (11). 45
9. Heat exchanger (11) according to any one of the preceding claims, **characterised in that** said plates (12, 13) are joined by welding or brazing. 50

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Fig.1

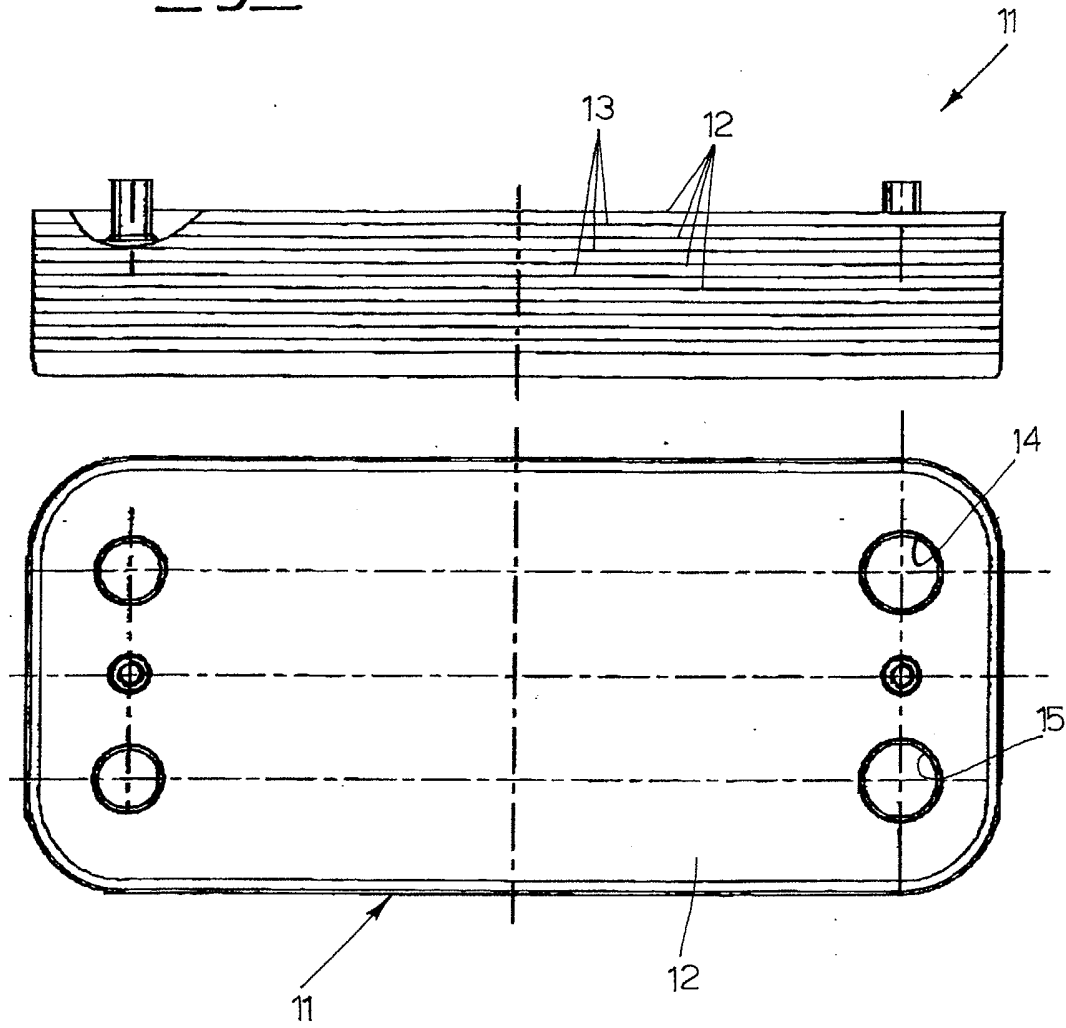


Fig.2

Fig.3

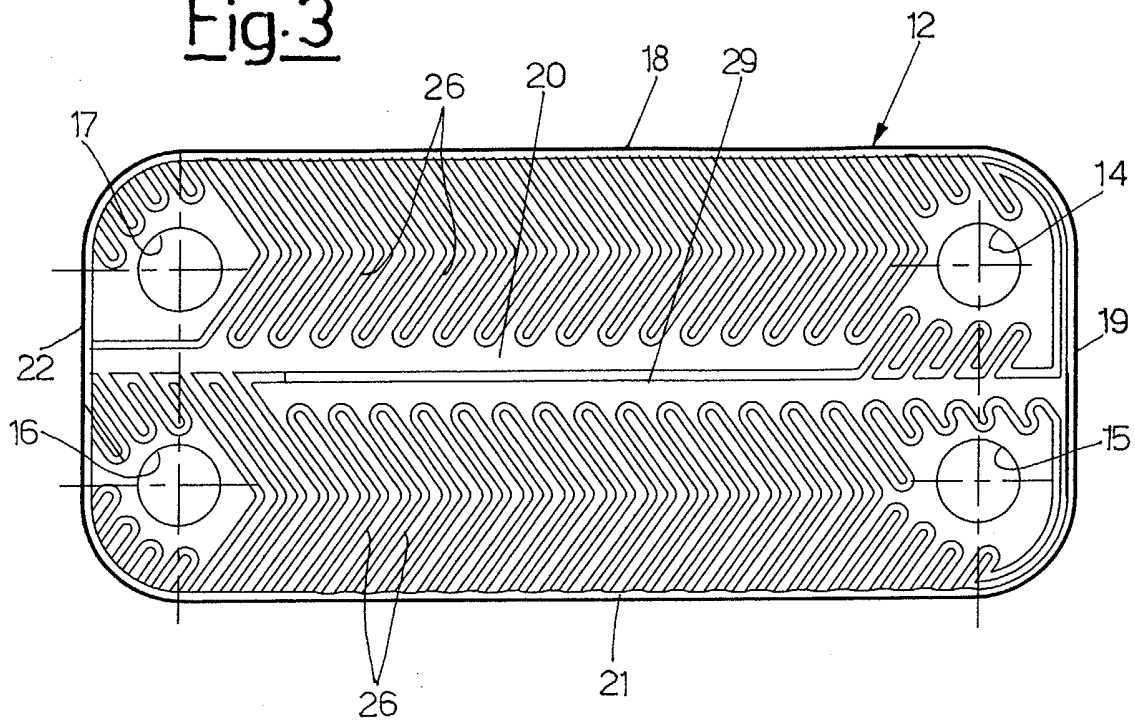


Fig.4

