July 1, 1952 R. P. L. HYTTE 2,601,974

PLATE HEAT EXCHANGER

Filed Sept. 18, 1947

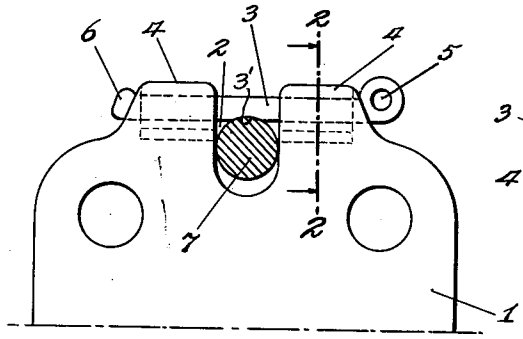


Fig. 1.

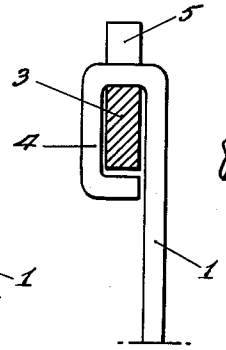


Fig. 2.

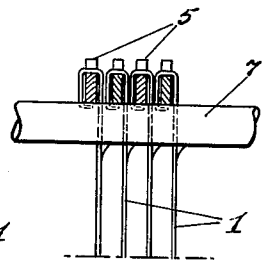


Fig. 3.

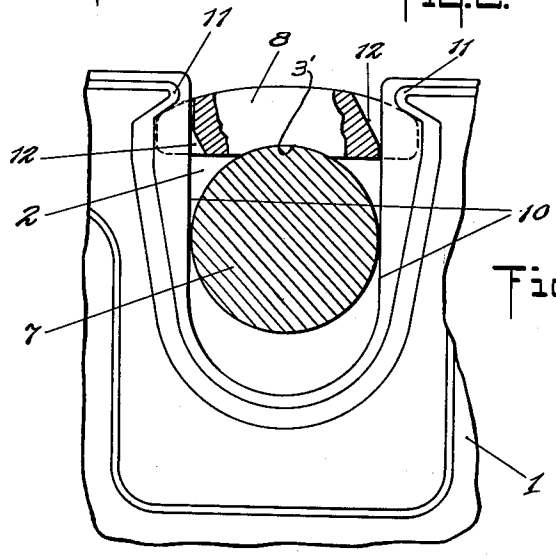


Fig. 4.

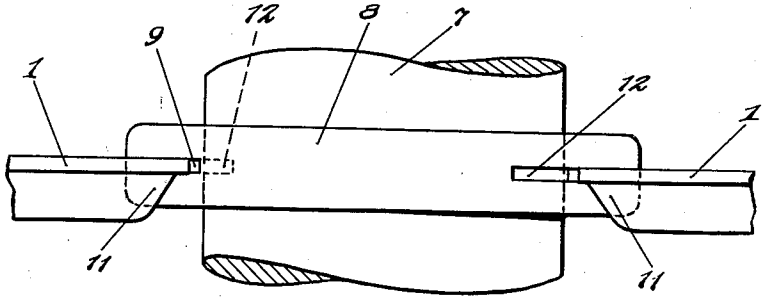


Fig. 5.

INVENTOR.
ROBERT PONTUS LARSSON HYTTE
BY
Davis, Hoxie & Faithfull
Attorneys

Patented July 1, 1952

2,601,974

UNITED STATES PATENT OFFICE

2,601,974

PLATE HEAT EXCHANGER

Robert P. Larsson Hytte, Lund, Sweden, assignor to Aktiebolaget Separator, Stockholm, Sweden, a corporation of Sweden

Application September 18, 1947, Serial No. 774,852
In Sweden December 9, 1939

Section 1, Public Law 690, August 8, 1946
Patent expires December 9, 1959

12 Claims. (Cl. 257—245)

1

This invention relates to heat exchangers of the type in which the exchange of heat is effected through the intermediary of a number of plates arranged side by side and between which channels are formed for the fluids between which the heat exchange is to take place. The plates at present employed often consist of pressed sheet material which is rather thin, for instance of 1 mm. or slightly heavier gauge. A number of such plates are usually assembled to form a set which is fixed between end plates of heavier gauge. The latter, one of which may be in the form of a frame carrying the plates, are screwed together by means of rods which are also used for supporting the plates, one of the rods usually being positioned above the other. At the top of the plates are provided with a hole by means of which they are suspended from the upper rod, and at the lower side is a groove or recess fitting over the lower rod. The plates thus hang on the upper rod and are also properly positioned by the lower rod.

In plate heat exchangers of this type it has been found that a good deal of work is entailed in replacing a damaged plate by a new one, the replacement necessitating disassembly of the whole machine. Moreover, not only the replacement of damaged plates but also the first assembly operation of the apparatus has proved to entail complications owing to the construction referred to above. It has been proposed to provide each individual plate with hooks or other carrier members which enable the plates to rest on one or more rods, and in some types of apparatus this construction has also been introduced in practice. In such a construction the plates can be removed from the apparatus after unscrewing the clamping members and without further disassembly of the apparatus. When plates of thin pressed sheet material, however, are utilized in such a construction, it becomes necessary to provide the plates with hooks or other members made of material considerably thicker than the plate, which entails great expense. Plates of pressed sheet material have therefore, generally speaking, continued to be constructed in practice with a hole in the upper part of the plate by means of which the plate is suspended from a rod.

According to the present invention, the inconveniences referred to are avoided by providing each of the plates with a seat and a bolt or other movable retaining member lodged in or against the seat, the plate being suspended from the rod by means of said bolt or other member. Thus, the bolt or other member rests on the rod and takes the place of the upper rim of the hole through which the rod passes. The bolt may, for example, carry the plate by means of one or two, or possibly more, bent portions of the plate which are supported by the bolt. The bent portions may advantageously be in the form of bows or hooks embracing the bolt.

2

This suspension arrangement easily enables any of the plates to be removed by drawing or moving the bolt or other member out of its position in the plate, the latter thereby being freed so that it can be moved downwardly and out of the set of plates.

Embodiments of the invention will now be more particularly described, by way of example, with reference to the accompanying drawing, in which

Figure 1 is a front elevation of one construction of plate and suspension arrangement according to the invention.

Figure 2 is a vertical section on a larger scale of the top portion of Figure 1, showing the method of suspending the plate from the bolt by which it is suspended from the usual rod.

Figure 3 is a vertical section of the upper portion of a set of four plates suspended in accordance with the invention from a rod from which it is obvious that they are readily removable, and

Figures 4 and 5 are a front elevation and plan, respectively, on a larger scale, of a modified arrangement.

Referring to Figures 1 and 2, at its upper part the plate 1 is provided with a groove or recess 2, forming together with a bolt 3 a suspension arrangement for the plate. The bolt 3 is embraced by two hooks or bows 4, formed by bending tongues at the upper part of the plate as illustrated in Figure 2. The said upper portion of the plate need not, of course, be bent round the bolt 3 as shown in Figure 2 and it is sufficient if any kind of hook, bow or other formation of the plate is provided to form a seat for the bolt by means of which the plate is suspended

from the rod. The bolt may at its one end be provided with a loop 5, into the aperture of which a hook or other tool can be inserted when the bolt is to be drawn out of the hooks or bows 4. As an alternative, the bolt may be provided at its opposite end with a projection 6, which prevents the bolt being extracted from the hooks or bows 4 too easily or by inadvertence. The bolt may, if desired, be threaded at one end. It should rest on the rod 7, and as shown in Fig. 1 it may be provided with a recess 3' fitting against the rod, the surface of the bolt contacting with the rod thereby being considerably larger than if the bolt were provided with a straight lower surface. As an alternative, the rod may be provided with a plane surface on its upper side.

Referring to Figure 3, a set of four plates is shown suspended on the rod 7 and it will be immediately understood that any plate can be removed from the rod 7 by drawing out the bolt 3 of the plate, without having to extract the rod from the plates.

Referring to the modified arrangement shown in Figures 4 and 5, instead of a bolt movable in its longitudinal direction, a locking or retaining member 8 is used which is vertically movable in the groove 2 and can be freed from the plate 1 only after the rod 7 has been pressed some distance into the groove 2. The member 8 is provided with a groove 9 in each of its ends which embraces the edges 10 of the groove or recess 2 which are thereby guided in the groove. At the upper end of the groove or recess a projection 11, consisting of a lug pressed in the material of the plate 1, is provided on each side thereof against which the ends of the member 8 lie. The plate rests on the member 8 by means of the projections 11, the said member in turn being supported by the rod 7.

When the plate 1 is to be removed from the rod, it is first forced upwards, i. e. the rod 7 is pressed inwardly towards the bottom of the groove 2. Then one of the ends of the member 8 can be swung into the groove and disengaged from the edges 10. In order to facilitate this disengagement and make it possible to use a groove 2 of lesser depth, the member 8 is provided with a chamfered edge 12 at the inner end of one or both of the grooves 9.

I claim:

1. In a plate heat exchanger, the combination of a supporting rod, a plurality of heat exchange plates made of thin pressed sheet material and having openings through which the rod extends, each plate having a seat integral with the plate, and a movable retaining member engaging each seat to suspend the plate, each retaining member resting upon said rod and being movable relative to its stationary plate seat in a plane normal to the rod to allow the plate to be removed from the other plates and the rod, each plate and its retaining member having an interlocking connection securing them against relative movement in either direction along the rod.

2. A combination according to claim 1, in which the intermediate portion of each retaining member rests upon the rod, the end portions of each retaining member engaging the plate seat.

3. A combination according to claim 1, in which the movable retaining members are bolts, said seat for each plate being formed by at least one tongue extending from the plate and bent around the bolt, the tongue forming a hook embracing the bolt.

4. A combination according to claim 1, in which the movable retaining members are bolts, each bolt having at one end an aperture adapted to receive a tool for drawing the bolt from its plate seat.

5. A combination according to claim 1, in which the movable retaining members are bolts, each bolt having at one end a loop forming an aperture adapted to receive a tool for drawing the bolt from its plate seat, the loop also forming a shoulder engageable with the plate.

6. A combination according to claim 1, in which the movable retaining members are bolts, each bolt having at one end an enlargement forming a shoulder for preventing accidental movement of the bolt from its plate seat, said enlargement being sufficiently small to be drawn along the plate seat.

7. A combination according to claim 1, in which each retaining member has an arcuate recess adjacent the rod and into which the rod fits.

8. A combination according to claim 1, in which said plate openings for the rod are slots, the side edges of each slot and the ends of the retaining member for the corresponding plate having vertical tongue-and-groove sliding connections in the plane of the plate, the end portions of the retaining member engaging the seat, said sliding connections acting to secure the retaining member against other than vertical movement relative to the plate.

9. A combination according to claim 1, in which said plate openings for the rod are slots, each retaining member having in each end a generally vertical groove receiving one side edge of the slot in the corresponding plate, the grooves acting with said side edges to secure the retaining member against other than vertical movement relative to the plate, the end portions of the retaining member engaging the seat.

10. A combination according to claim 1, in which said plate openings for the rod are slots, each retaining member having in each end a generally vertical groove receiving one side edge of the slot in the corresponding plate, the grooves acting with said side edges to secure the retaining member against other than vertical movement relative to the plate, and projections on each plate adjacent the side edges of the slot, the retaining member engaging said projections to support the plate on the rod.

11. A combination according to claim 1, in which said plate openings for the rod are slots, each retaining member having in each end a generally vertical groove receiving one side edge of the slot in the corresponding plate, the grooves acting with said side edges to secure the retaining member against other than vertical movement relative to the plate, and lugs pressed in the material of each plate adjacent the side edges of the slot, the retaining member engaging said lugs to support the plate on the rod.

12. A combination according to claim 1, in which said plate openings for the rod are slots, each retaining member having in each end a generally vertical groove receiving one side edge of the slot in the corresponding plate, the grooves acting with said side edges to secure the retaining member against other than vertical movement relative to the plate, at least one end of each retaining member having a chamfered edge adjacent the groove therein, for facilitating disengagement of the retaining member from the

plate, the end portions of the retaining member engaging the seat.

ROBERT P. LARSSON HYTTE.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
440,671	Weisel	Nov. 18, 1890
1,142,021	Chambers	June 8, 1915
1,359,162	Genter	Nov. 16, 1920
2,252,916	Crosby	Aug. 19, 1941

FOREIGN PATENTS

Number	Country	Date
528,223	Great Britain	Oct. 24, 1940
800,478	France	July 6, 1936
52,142	Netherlands	Sept. 14, 1936