July 27, 1937. O. STEINBERG ET AL 2,088,391

HEAT EXCHANGE ELEMENT

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FIG. 1.

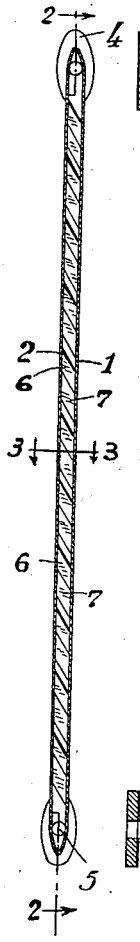

FIG. 2.

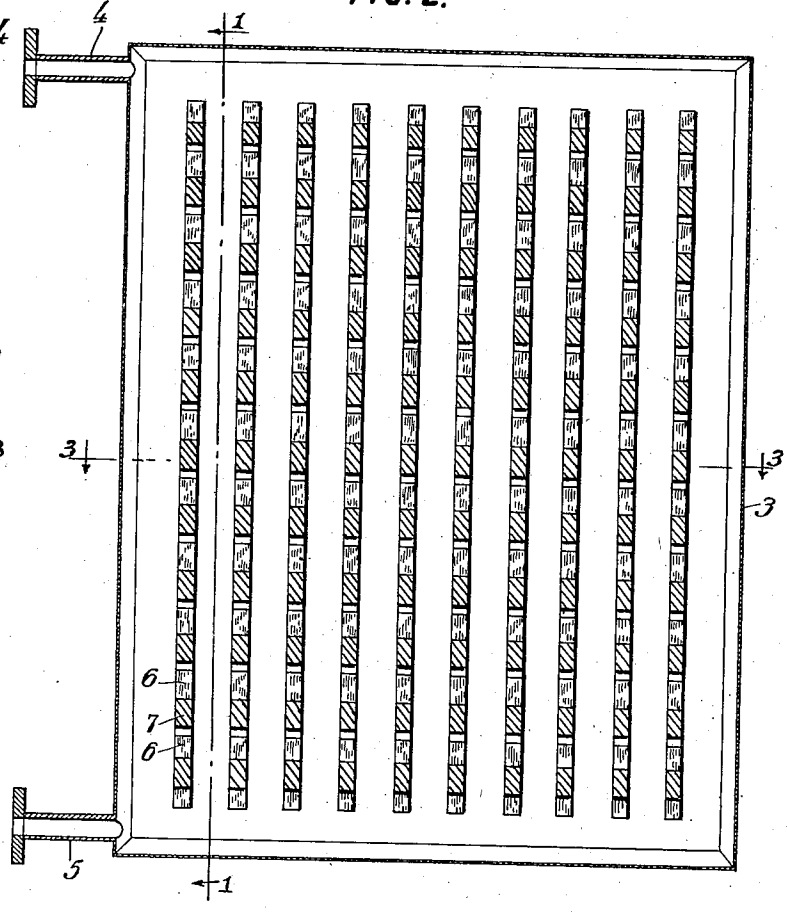

FIG. 3.

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FIG. 4.

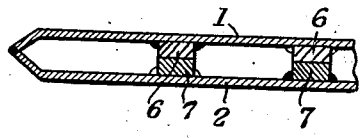
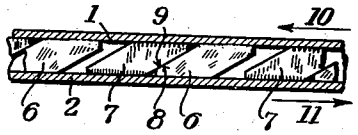


FIG. 5.



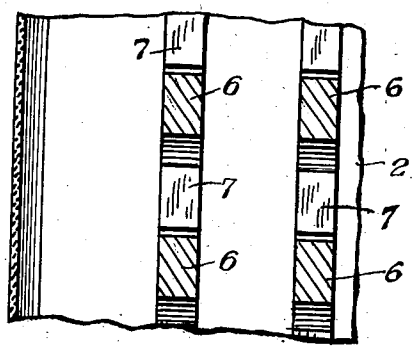


FIG. 6.

FIG. 7.

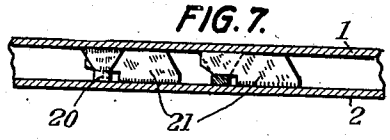
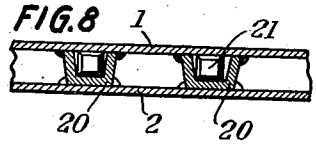


FIG. 8



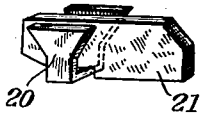


FIG. 9

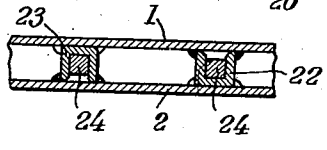


FIG. 10

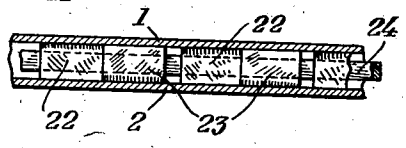


FIG. 11

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HEAT EXCHANGE ELEMENT

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Application February 18, 1936, Serial No. 64,586
In Germany February 21, 1935

7 Claims. (Cl. 257—256)

This invention relates to a heat-exchange apparatus in the form of a flat pocket, which is adapted to resist internal pressure and is designed for example, although not exclusively, for use in cooling systems in which the cooling agent produced by the evaporation of suitable liquids circulates in the interior of the flat-pocket exchanger and exerts its cooling action through the medium of the flat walls of the exchanger on the agent flowing about the outer faces of these walls.

It is an object of the present invention to ensure that the flat walls of the exchanger are relatively anchored to a sufficient extent to resist the internal pressure occurring, without the necessity for boring or perforating the said walls.

A further object is to provide a heat-exchange element of the character described, which possesses an equal strength throughout.

A still further object is to provide a heat-exchange element aforesaid, which is light in weight, compact in form and economical in use.

In the accomplishment of these and other objects and advantages which will become apparent as the description proceeds the two walls of the heat-exchange element, which are welded together at their edges, are furnished on their inner faces with blocks or abutments the bases of which are welded to the walls and which engage with each other in pairs.

In this way it is accomplished that the two welding seams of each block or abutment are subjected to an even strain. The free space in the interior of the exchanger is not unduly restricted, inasmuch as the blocks or abutments themselves are not subjected to any appreciable bending strain and accordingly do not call for a reinforced cross-section.

The invention will now be described more fully with reference to the accompanying drawings, in which

Fig. 1 is a sectional view of an embodiment of the apparatus, taken along the line 1—1 of Fig. 2,

Fig. 2 is a section taken on the line 2—2 of Fig. 1,

Fig. 3 is a sectional view taken along the line 3—3 of Figs. 1 and 2.

Fig. 4 is a fragmental portion of Fig. 3 showing on enlarged scale the arrangement of the blocks,

Fig. 5 is a view likewise on enlarged scale of a fragment of Fig. 1, and

Fig. 6 is an enlarged fragment of Fig. 2.

Figs. 7 to 9 illustrate a modified form of embodiment of the heat-exchange element with direct engagement of the blocks or abutments.

Figs. 10 and 11 illustrate an example of the use of a special locking member.

The flat-pocket exchanger shown in Figs. 1 to 3 comprises two smooth parallel walls 1 and 2, which are composed of sheet metal and are drawn inwards at the edges as at 3. These walls are welded together about the periphery. The sockets for the supply and discharge of the cooling agent are designated 4 and 5.

Separate anchoring abutments 6 and 7 are welded to the inner faces of the walls 1 and 2 in vertical rows, these abutments engaging with each other along inclined surfaces, as shown in detail in Figs. 4 to 6. The blocks or abutments 6, which are approximately rhombic in cross-section, are welded to the sheet 1 in suitable spacial disposal to each other, and similar blocks or abutments 7 situated in the gaps between the abutments 6 are welded to the sheet or wall 2. The faces 8 of the abutments 6 and the faces 9 of the abutments 7, i. e., the oppositely disposed faces of the two sets of blocks, are caused to bear against each other when the walls are fitted together. Any internal pressure within the exchange element acting vertically against the two walls is then taken over equally by the two sets of blocks through the medium of their inclined faces 8 and 9 and accordingly distributed over the entire surface of the walls. In the case of internal pressure in the exchange element the rhombic abutments take up over the entire surface of the wall through the medium of the inclined faces 8 and 9 the forces which are directed vertically against the walls, in this way ensuring an even distribution of the forces.

The assembly of the exchange element may conveniently be performed in such fashion that the two walls furnished with the abutments are first placed loosely one against the other with the blocks on the one wall disposed between the blocks on the opposite wall, whereupon the desired spacial disposal of the two walls may be regulated by the degree of pressure exerted in the direction of the arrows 10. Whilst the walls are thus held in position the peripheral edges 3 are welded together, so that after release of the pressure the welding seams take over the strains directed parallel to the walls and emanating from the wedge surfaces.

In place of the arrangement of the blocks as shown in Fig. 2 these blocks may also be staggered in relation to one another in adjacent rows of each wall, so that the blocks in any one row will then be opposite to the gaps between the blocks

in an adjacent row on the same wall, so as to compensate bending strains on the walls.

In the form of embodiment according to Figs. 7 to 9 there are welded to the wall 1 U-shaped members 20, which are engaged by pawl-like members 21 welded to the wall 2.

Figs. 10 and 11 show an embodiment in which U-shaped members 22 and 23, which are disposed end to end in the assembled position of the exchanger, are welded at their open sides to the two walls 1 and 2, rods or bolts 24 then being passed through the same in order that internal pressures may not force the walls apart.

What we claim as new and desire to secure by Letters Patent is:

1. A heat-exchange device comprising two outer walls welded together about their periphery to form a flat container, and single abutments distributed over and welded to the inner faces of each of the said walls, the abutments on either wall each engaging underneath an abutment on the opposite wall for the purpose of anchoring the said walls in relation to one another against internal pressure within said container.

2. A heat-exchange device comprising two outer walls welded together about their periphery to form a flat container, and single abutments distributed over and welded to the inner faces of each of the said walls, the abutments on either wall each engaging underneath an abutment on the opposite wall and the welding seams of each pair of cooperating abutments being disposed parallel to the direction of engagement of the said abutments.

3. A heat-exchange device comprising two outer walls welded together about their periphery to form a flat container, and single abutments distributed over and welded alternately to the inner faces of each of said walls to form straight rows of abutments on either wall, each abutment on the one wall engaging underneath a corresponding abutment on the opposite wall for the purpose of anchoring the said walls in relation to one another against internal pressure within said container.

4. A heat-exchange device comprising two outer walls welded together about their periphery to form a flat container, and single abutments distributed over and welded alternately to the inner faces of each of said walls to form straight rows of abutments, the abutments in the single rows on each wall being staggered in relation to the abutments in adjacent rows, and the abutments on the one wall engaging underneath the abutments on the opposite wall for the purpose of anchoring the said walls in relation to one another against internal pressure within said container.

5. A heat-exchange device comprising two outer walls welded together about their periphery to form a flat container, single U-shaped abutments welded to one wall, and single pawl-like abutments welded to the opposite wall and engaging with the said U-shaped abutments for the purpose of anchoring the said walls in relation to each other against internal pressure within said container.

6. A heat-exchange device comprising, two outer walls welded together about their periphery to form a flat container, and substantially rhombic abutments welded to the inner faces of the said walls and interengaging with their overlapping faces for the purpose of anchoring the said walls in relation to each other against internal pressure within said container.

7. A heat-exchange device comprising two outer walls welded together about their periphery to form a flat container, and U-shaped abutments placed end to end in rows between the walls, the open ends of alternate abutments being welded to one wall and the open ends of the other abutments being welded to the other wall, and bolts passed through the abutments for the purpose of anchoring the said walls in relation to one another against internal pressure within said container.

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