March 12, 1940. C. F. ROSENBLAD 2,193,345

HEAT EXCHANGE APPARATUS

Filed May 13, 1936

FIG. 1

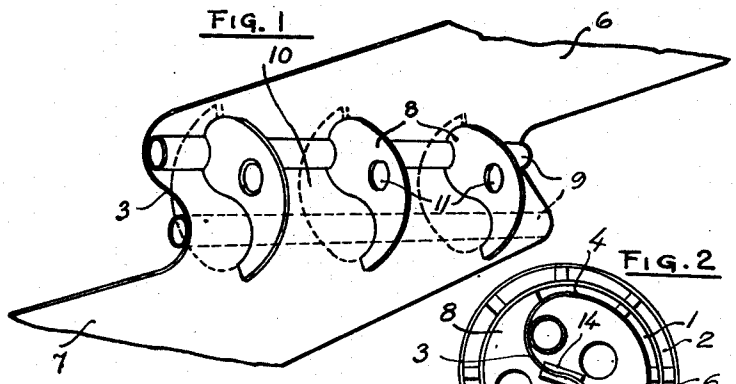


FIG. 2

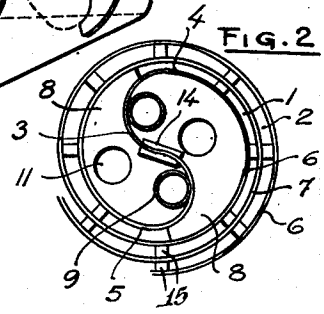
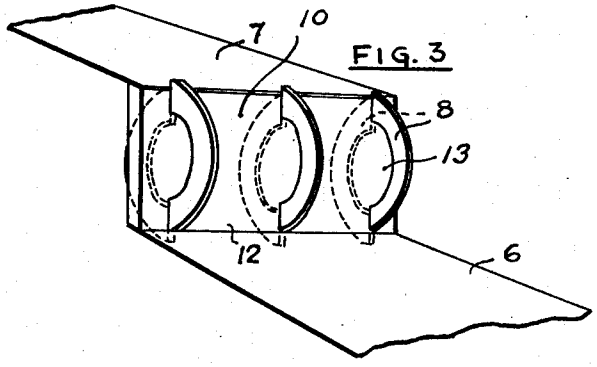


FIG. 3



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HEAT EXCHANGE APPARATUS

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12 Claims. (Cl. 257—245)

This invention relates to heat exchange apparatus, and more particularly to such apparatus having convolute walls for transmission of heat between fluids flowing in channels formed by said walls.

One of the objects of my invention is to provide a central portion constituting a core around which plates or the like may be so shaped as to form the desired convolute walls, the core serving to support the walls evenly along their longitudinal extent during and after the shaping thereof.

Another object of my invention is to provide simple and efficient means adapted for correctly rolling up plates into convolute shape when manufacturing the apparatus and forming part of the apparatus after the latter has been finished.

Still another object of the invention is to provide such apparatus with a central part, for the purpose referred to, which is simple in construction and obviates the use of thick central drums hitherto employed.

Still another object of my invention is to provide simple means permitting the correct manufacture of apparatus of the kind referred to, said means including a central S-shaped partition between two convolute channels, said partition being formed by bending part of a plate forming the channel walls into such S-shape, thereby removing difficulties that have hitherto prevented commercial manufacture of such simple apparatus.

In the accompanying drawing, which forms a part of this specification and in which like characters of reference indicate the same or like parts, Fig. 1 is a perspective view of an embodiment of the central part of the apparatus about which the plates 6 and 7 are wound; Fig. 2 is an end view of the central portion of a heat exchanger; and Fig. 3 is a perspective view showing another embodiment of the invention.

Referring first to Figs. 1 and 2 the convolute channels 1 and 2 are separated from one another at the center of the apparatus by an S-shaped partition 3 which may be attached by welding or otherwise at its longitudinal edges 4 and 5 to the plates 6 and 7, respectively, or said partition may be an integral part of a single metal sheet bent into S-shape and forming the walls 6 and 7. To shape and support the innermost parts of the plates 6 and 7, frame plates 8 are arranged at both sides of the partition 3, from which they extend laterally. The plates 8 have curved, for instance circular, outer edges to support the plates 6 and 7. As shown in Fig. 1, a tube 9 with, for instance, three plates 8 attached thereto is placed on each side of the S-shaped partition 3 and on rolling up the wall plates 6 and 7 around the frame plates 8, the S-shaped partition 3 is clamped between the plates 8 by virtue of the force exerted on plates 8 by the wall plates 6 and 7. Between the plates 8 there are formed chambers 10 which are in communication with one another by means of openings 11 in plates 8.

When rolling up the plates into convolute shape (Fig. 2) rods (not shown) rotating the plates 8 and partition 3 are introduced into the tubes 9 and, obviously, the turning force will be transmitted through the plates 8 to the plates 6 and 7 over the entire width of the latter so that the innermost windings of the channel walls will take the same shape as the outer contour of the plates 8. As the outer edges of the plates 8 are semi-circular and their inner edges S-shaped the coiled plate will have a maximum resistance to breaking strains. For the purpose of reinforcing the flattest part of the S-shaped partition 3, ribs 14 may be applied thereto. On continued rolling up of the plates they are in known manner held apart by distance members 15 or any other suitable means.

As shown in Fig. 3 the partition consists of a thick plate or flat iron bar 12. This construction is deemed to be most suitable when the convolute walls are relatively thick. The plates 6 and 7 are attached each to one of the longitudinal edges of the bar 12. Though the plates 6 and 7 are shown to be secured each to one edge of the bar 12 they may possibly be attached both to the same edge.

The frame plates 8 which are in this case shaped somewhat otherwise than according to Figs. 1 and 2 are by welding or in any other suitable manner attached to opposite sides of the bar 12. The plates 8 embrace openings 13 for a bar or tool (not shown), having semi-circular cross section which may be introduced into said openings and by which the plate or flat bar 12 may be rotated. The wall plates 6 and 7 may be rolled up by turning the central body formed by the bar 12 and plates 8 and in such case the introduced tools act as drivers and transmit the turning force through the plates 8 to the plates 6 and 7 uniformly over their entire width. The openings 13 also serve to effect communication between the different chambers 10 between the plates 8 which are obtained by applying the wall plates to the plates 8.

Though there have been shown a plurality of

frames 8 arranged at opposite sides of the bar it might in very small apparatus be sufficient to arrange a single frame at each side of the bar. Though the frames are conveniently shaped as plates they may possibly consist of curved ribs made, for instance, of shapes such as angle-iron.

I claim:

1. In a heat exchange apparatus having convolute heat transmission walls, means for spacing said walls apart, a central body comprising a partition which coincides substantially with the longitudinal axis of the apparatus and from which extend said walls, and plates having an outer contour which determines the inner contour of said walls, a plurality of said plates projecting laterally from each side of said partition and each of said plates having an aperture into which a bar may be inserted longitudinally of the apparatus for turning said body.

2. In a heat exchange apparatus having convolute heat transmission walls, means for spacing said walls apart, a central body comprising a partition which coincides substantially with the longitudinal axis of the apparatus and from which extend said walls, a plurality of wall supporting members projecting laterally from each side of said partition and having an outer contour which determines the inner contour of said walls, and a longitudinally extending member on each side of said partition, each of the wall supporting members on the same side of said partition being attached in spaced relationship to said member.

3. In a heat exchange apparatus having convolute heat transmission walls, means for spacing said walls apart, a central body comprising a partition which coincides substantially with the longitudinal axis of the apparatus and from which extend said walls, a plurality of wall supporting members projecting laterally from each side of said partition and having an outer contour which determines the inner contour of said walls, and a tube extending longitudinally of the apparatus on each side of said partition, each of the wall supporting members on the same side of said partition being attached in spaced relationship to the respective tube.

4. In a heat exchange apparatus having convolute heat transmission walls, means for spacing said walls apart, a central substantially flat and rigid body forming a partition which coincides substantially with the longitudinal axis of the apparatus, said walls being attached to said body, and wall supporting members having an outer contour which determines the inner contour of said walls, said supporting members projecting laterally from both sides of said partition.

5. In a heat exchange apparatus having convolute heat transmission walls, means for spacing said walls apart, a central body comprising a flat bar forming a partition which coincides substantially with the longitudinal axis of the apparatus and has longitudinal edges to which said walls are attached, and substantially semicircular ring segments attached to said bar and having an outer contour which determines the inner contour of said walls, said ring segments projecting laterally from both sides of said bar.

6. In a heat exchange apparatus having convolute heat transmission walls, means for spacing said walls apart, a central body comprising a partition which coincides substantially with the longitudinal axis of the apparatus and from which extend said walls, and plates having an outer contour which determines the inner contour of said walls, a plurality of said plates projecting laterally from each side of said partition and each of the plates adjacent ends of the apparatus having apertures into which bars may be inserted longitudinally of the apparatus for turning said body.

7. In a heat exchange apparatus having convolute heat transmission walls, means for spacing said walls apart, a central body comprising a partition which coincides substantially with the longitudinal axis of the apparatus and from which extend said walls, a wall supporting member projecting laterally from each side of said partition and having an inner contour which determines the shape of said partition and an outer contour which determines the inner contour of said walls, said wall supporting members each forming an additional partition between two chambers which are enclosed between one of said walls and the first mentioned partition.

8. In a heat exchange apparatus having convolute heat transmission walls, means for spacing said walls apart, a central body comprising a partition which coincides substantially with the longitudinal axis of the apparatus and from which extend said walls, a wall supporting member projecting laterally from each side of said partition and having an inner contour which determines the shape of said partition and an outer contour which determines the inner contour of said walls, said wall supporting members each forming an additional partition between two chambers which are enclosed between one of said walls and the first mentioned partitions, said additional partition being formed with apertures for flow of fluid therethrough.

9. In a heat exchange apparatus having convolute heat transmission walls, means for spacing said walls apart, a central body comprising a partition which coincides substantially with the longitudinal axis of the apparatus and from which extend said walls, a plate projecting laterally from each side of said partition and having an inner contour which determines the shape of said partition and an outer contour which determines the inner contour of said walls, said plates each forming another partition between two chambers which are enclosed between one of said walls and the first mentioned partition.

10. In a heat exchange apparatus having convolute heat transmission walls, means for spacing said walls apart, a central body comprising a partition which coincides substantially with the longitudinal axis of the apparatus and from which extend said walls, a plurality of plates projecting laterally from each side of said partition and having an inner contour which determines the shape of said partition and an outer contour which determines the inner contour of said walls, one of said plates on each side of the first mentioned partition forming another partition between two chambers which are enclosed between one of said walls and said first mentioned partition, each of said plates having an aperture, said apertures being all arranged to admit a bar to be inserted therethrough longitudinally of the apparatus.

11. In a heat exchange apparatus having convolute heat transmission walls, means for spacing said walls apart, a central body comprising a partition which coincides substantially with the longitudinal axis of the apparatus and from which extend said walls, a plurality of wall supporting members projecting laterally from each side of

said partition and having an inner contour which determines the shape of said partition and an outer contour which determines the inner contour of said walls, and a longitudinally extending member on each side of said partition, each of the wall supporting members on the same side of said partition being attached in spaced relationship to said longitudinally extending member, one of said wall supporting members on each side of said partition forming another partition between two chambers which are enclosed between one of said walls and the first mentioned partition.

12. In a heat exchange apparatus having convolute heat transmission walls, means for spacing said walls apart, a central body comprising a partition which coincides substantially with the longitudinal axis of the apparatus and from which extend said walls, a plurality of wall supporting members projecting laterally from each side of said partition and having an inner contour which determines the shape of said partition and an outer contour which determines the inner contour of said walls, and a tube extending longitudinally of the apparatus on each side of said partition, each of the wall supporting members of the same side of said partition being attached in spaced relationship to the respective tube, one of said wall supporting members on each side of said partition forming another partition between two chambers which are enclosed between one of said walls and the first mentioned partition.

CURT FREDRIK ROSENBLAD.