

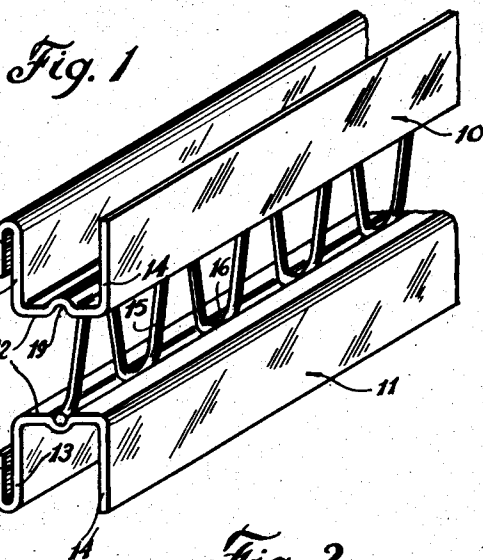
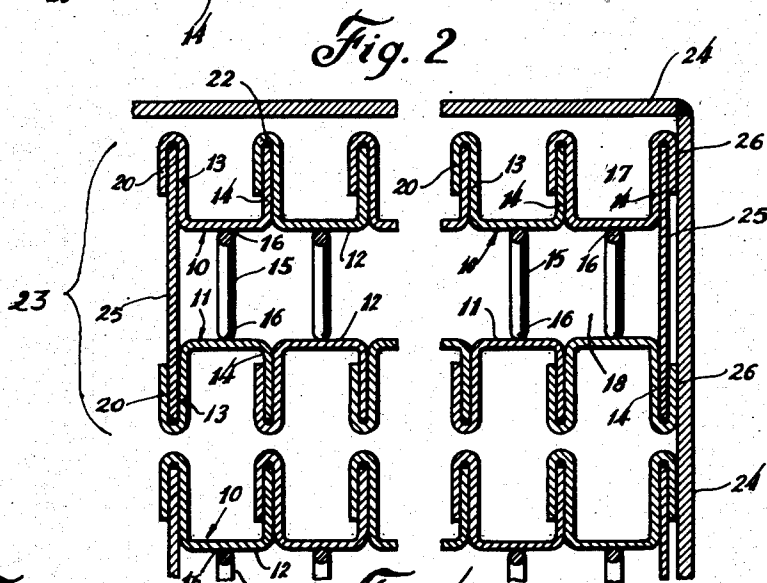
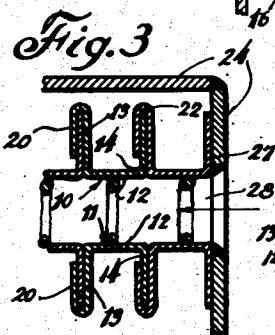
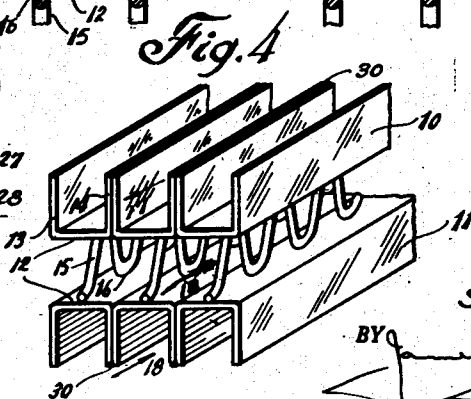
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PLATE TYPE HEAT EXCHANGER

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## PLATE TYPE HEAT EXCHANGER

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1

The present invention relates to heat exchange apparatus and especially to plate type exchangers for the exchange of heat between two confined fluids with particular reference to novel components for building up the heat exchange envelopes usually formed by plates.

In a heat exchanger of the plate type wherein heat is exchanged between one fluid such as a hot gas that flows in alternate passages while other fluid to be heated flows in the intermediate passages, metallic plate members are mounted in spaced relation to create so-called envelopes defining the fluid passages. In some heat exchangers of this type the walls of the gas passages are provided with extended surface in the form of fins for increasing the heat transfer from the gas to and through the wall to the air in the adjoining passages.

The present invention contemplates building up a heat exchange envelope having finned surface in gas passages from a plurality of like components each consisting of a pair of metallic channel members whose bases form parts of the walls of the heat exchange passage with sinusoidally bent wires extending back and forth in upright relation in the passage and secured to the bases of the channel members of the component. A plurality of such components are mounted in side by side relation so that the bases of the channel members form continuous surfaces that constitute the walls bounding the gas passage, for example, and separating it from the air passages at either side into which the flange portions of the channel member extend to constitute continuous extended surface in these passages.

The invention will be best understood upon consideration of the following detailed description of illustrative embodiments thereof when read in conjunction with the accompanying drawings in which:

Figure 1 is a perspective view of part of one of the heat exchange components embodying the present invention.

Figure 2 is a sectional elevational view of part of a heat exchanger in which the envelopes that form the gas and air passages are made up of channel components in accordance with the present invention.

Figure 3 is a view similar to Figure 2 but illustrating the envelopes of the exchanger arranged for transverse flow of the fluids between which heat is exchanged, and

Figure 4 is a fragmentary perspective view of an envelope for heat exchanger embodying an alternate arrangement for securing the channel components together to form an envelope.

2

In Figure 1 the numerals 10 and 11 designate a pair of metallic channels mounted in opposed relation so that the outer faces of their bases 12 face each other with their peripheries registering and the leg or flange portions 13, 14 of the channels extending outwardly with relation to the bases. Mounted between the bases 12 of the channel members 10 and 11 and extending in the direction of their longitudinal axes is a metallic wire bent to sinusoidal form so that the leg portions 15 of the U-shaped loops formed therein extend back and forth in upright relation between the bases 12 of the channels while the intervening stretcher portions 16 of the loops are in contact with the channels and bonded thereto in good heat transfer relation as by welding. The bases 12 of the channels 10, 11 may be formed with grooves or recesses 19 to receive the stretcher portions 16 that intervene between the fin-forming legs 15 of the sinusoidal loops. The leg portions 15 of the loop thus form fins that constitute extended surface for the channel bases 12 that form parts of the walls bounding the air-gas passages 17, 18 of a heat exchanger when a plurality of these components designated as a whole by the reference numeral 19 are joined to form an "envelope" for a heat exchanger as illustrated in Figs. 2, 3 and 4.

As illustrated in Fig. 2 in order to form a heat exchange envelope a number of the components 19 each consisting of a pair of channel members 10, 11 joined by fins 15 are mounted in side by side relation with the bases of all the channels 10 and 11 respectively in transverse alignment or in the same plane and the flange 13 of each channel in contact with the flange 14 of the contiguous channel component. One way of joining the contiguous channels together is illustrated in Figs. 2 and 3 wherein the flanges 13 each have a lip portion 20 formed thereon in re-entrant fashion parallel to this flange 13 and in spaced relation to the latter to provide a groove 21 open on the side facing the base 12 and designed to receive the oppositely positioned flange 14 of the contiguous channel member. When a plurality of components have thus been assembled to form a heat exchange envelope they may be brazed together so that bonds 22 are formed between the abutting portions of the base parts of contiguous channels as well as between the flange parts 13, 20 that form the grooves 21 and the flanges 14 of contiguous channels that are received therein. To form a complete heat exchanger a plurality of envelopes, designated 23 in Fig. 2, are mounted within a casing 24 and supported in any suit-

able manner so the air passages 17 alternate with gas passages 18 with the leg portions 15 of the sinusoidally bent wires constituting fins of the wall surfaces facing the gas passages while the flanges 13, 14 as well as the lips 20 of the former flanges constitute continuous fins extending longitudinally in the air passages. The inlet and outlet ends of the gas and air passages are connected in conventional fashion to distributing boxes or headers. When heat is to be exchanged between the fluids in counterflow relation, plates 25 are mounted in the channels 21 of the two components at the extreme ends of the envelopes 23 and may be integrally bonded to the latter in the brazing step when the envelope is formed. For this purpose the channel component at one end of the envelope has groove forming lips 26 provided on the channel flanges 13 in addition to the lips 20 on the flanges 13. Where the fluids flow transversely of each other, Fig. 3, such plates are not required at the ends of the envelopes but the latter are sealed at 27 to the margins of inlet openings 28 for the heating gas and also corresponding outlet openings.

In Fig. 4 the flanges 13 of the channels are not provided with lips to embrace the channels 14 of contiguous components but these flanges being in abutting relation are joined together by a weld 30 along the outer end edges of the flanges.

What I claim is:

1. A heat exchange envelope made up of a plurality of similar components each consisting of a pair of channel members mounted in opposed relation with their side flanges extending outwardly with relation to the intervening base portions between which are mounted metallic wires bent to sinusoidal form to provide a plurality of U-shaped loops therein with the leg portions extending in upright relation between said channel bases as fins and with the intervening yoke portions that are contiguous along the axis of each wire in contact with and bonded to the base portion of one or the other of said channels with lip portions on one flange of each channel formed in re-entrant fashion parallel to the outer face of said one flange to provide a groove for receiving the opposite flange element of the corresponding channel of the adjacent component for interlocking adjacent components so that the bases of their channels align to form continuous surfaces constituting the walls of a passage in which said fins are located.

2. A heat exchange envelope made up of a plurality of similar components each consisting of a pair of channel members mounted in opposed relation with their side flanges extending outwardly with relation to the intervening base portions between which are mounted metallic wires bent to sinusoidal form to provide a plurality of U-shaped loops therein with the leg portions extending in upright relation between said channel bases as fins and with the intervening yoke portions that are contiguous along the axis of each wire in contact with and bonded to the base portion of one or the other of said channels with the contiguous flanges of the channels of adjacent components in contacting relation so that the bases of adjacent channels form continuous surfaces constituting walls between one fluid passage in which said fins are located and adjacent passages at either side thereof in which the flanges of said channels constitute continuous longitudinal fins extending in the direction of fluid flow; and means

joining the said contiguous flanges of the channels of adjacent components to form a unitary envelope structure thereof.

3. A heat exchange envelope made up of a plurality of similar components each consisting of a pair of channel members mounted in opposed relation with their side flanges extending outwardly with relation to the intervening base portions between which are mounted metallic wires bent to sinusoidal form to provide a plurality of U-shaped loops therein with the leg portions extending in upright relation between said channel bases as fins and with the intervening yoke portions that are contiguous along the axis of each wire in contact with and bonded to the base portion of one or the other of said channels with lip portions on one flange of each channel formed in re-entrant fashion parallel to the outer face of said one flange to provide a groove for receiving the opposite flange element of the corresponding channel of the adjacent component for interlocking adjacent components so that the bases of their channels align to form continuous surfaces constituting the walls of a passage in which said fins are located, the grooves formed by the lips on flanges of the two confronting components that form parts of the opposite walls of the envelope aligning with each other; and a plate member having opposite marginal edge portions received in the aligned grooves of the components at the extreme ends of said passage with the body of said plate bridging the space between the bases of the channels of said components for closing the ends of said passage.

4. A heat exchange envelope made up of a plurality of similar components each consisting of a pair of channel members mounted in opposed relation with their side flanges extending outwardly with relation to the intervening base portions with lip portions on one flange of each channel formed in re-entrant fashion parallel to the outer face of said one flange to provide a groove for receiving the opposite flange element of the corresponding channel of the adjacent component for interlocking adjacent components so that the bases of their channels align to form continuous surfaces constituting the walls of a passage, the grooves formed by the lips on flanges of the two confronting components that form parts of the opposite walls of the envelope aligning with each other; and a plate member having opposite marginal edge portions received in the aligned grooves of the components at the extreme ends of said passage with the body of said plate bridging the space between the bases of the channels of said components for closing the ends of said passage.

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