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REFRIGERATING APPARATUS

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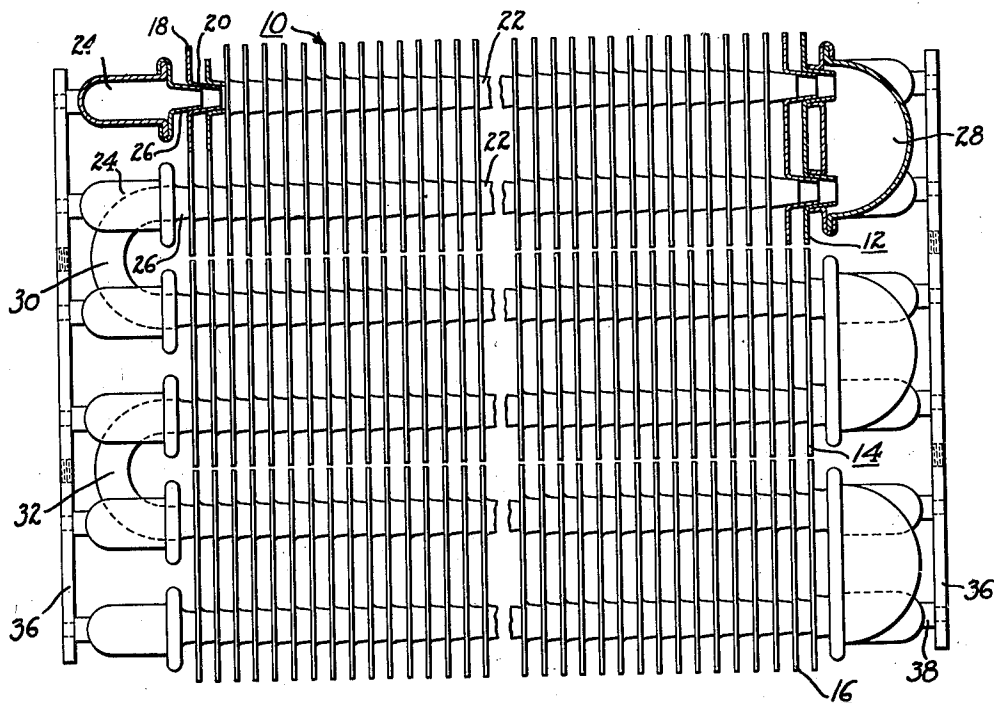


Fig. 1

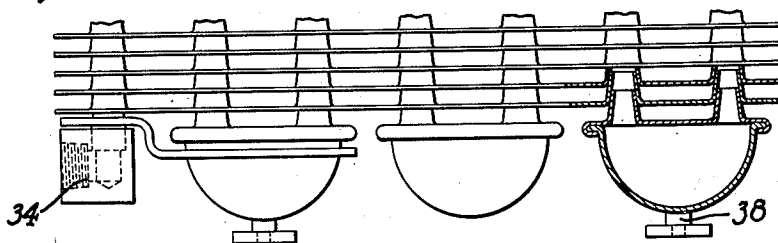


Fig. 2

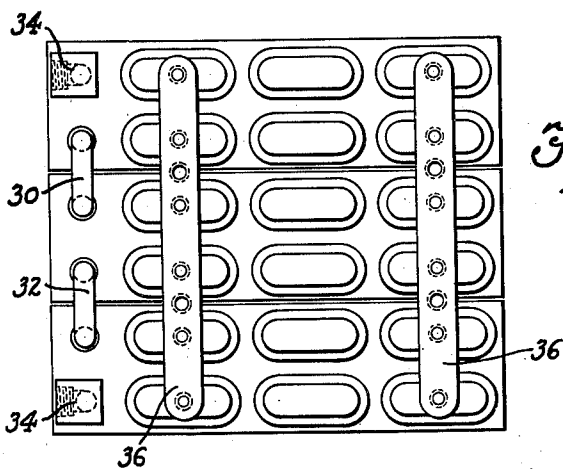


Fig. 3

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REFRIGERATING APPARATUS

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2 Claims. (Cl. 257-255)

This invention relates to refrigerating apparatus and more particularly to a heat exchange structure for use in refrigerating apparatus and for other purposes.

In constructing heat exchangers of large size for use in refrigerating apparatus and for other uses where large and rapid temperature changes occur, and particularly heat exchange devices of the general type illustrated in the patent to Karmazin 1,997,563 issued April 9, 1935, considerable difficulty has been experienced in preventing breakage of the heat exchange core under the stresses induced by unequal expansion between the heat exchange core and the supports therefor. Particularly, in the larger sizes of heat exchangers, the supports must be of rugged construction due to the weight of the heat exchange device and very often are made of material having a different coefficient of expansion from the material of the heat exchange core. In addition, the supporting means being of more concentrated mass than the elements of the heat exchange core is, therefore, slower in responding to the temperature changes of the fluid flowing through the heat exchange device than is the material of the core. These factors produce unequal expansion between the core and the supports which in constructions heretofore devised have often caused failure of the heat exchange core.

It is an object of the present invention to provide a heat exchange device which may be constructed in large sizes and in which the supporting means therefor and the construction of the heat exchange device itself are so correlated as to minimize stresses produced under unequal expansions of the core and the support.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing, wherein a preferred form of the present invention is clearly shown.

In the drawing:

Fig. 1 is a side view of the heat exchange device embodying the present invention;

Fig. 2 is a top view partly in section of the device illustrated in Fig. 1; and

Fig. 3 is an end view of the device illustrated in Fig. 1.

Generally speaking, these objects are accomplished in the present invention by dividing the core into a plurality of sections embracing a small number of rows of parallel tubes. The sections are connected to each other only through a small flexible tubing connection, while the sup-

ports are fastened to the core in a manner to provide a large lever arm through which the expansion forces are transmitted between the support and the core.

In the construction illustrated in the drawing, a heat exchange core 10 is provided which is divided into a plurality of sections, 12, 14 and 16. Each section is formed from a plurality of flat parallel fins 18 having integral tapered tubular projections 20 formed therein. The projections of adjacent tubes are telescoped together to provide a plurality of rows of parallel tubes 22. The tubes of each row are connected for series flow circuit relation by a plurality of header means 24 having tapered tubular projections 26 for engaging with the tubes 22 at the end thereof. The tubes at one end of each row are connected to the tubes of the adjacent row by a similar header means 28 engaging with the tubes 22. One of the end tubes of the lowermost row of tubes in section 12 is connected with the end tube of the top row in section 14 by a return bend 30 which is formed from a bent tube in a manner to provide a slight degree of flexibility. A similar return bend 32 connects one tube of each of the sections 14 and 16. Inlet and outlet connections 34 are provided to connect with one tube of each of the sections 12 and 16 respectively. Thus, a series flow circuit is established through each tube of the entire heat exchange structure.

The supporting means for the heat exchange structure comprises a set of supporting plates 36, two of which are provided at either end of the device. The plates 36 are attached to the heat exchange structure by studs 38 which are secured to the header means 24, as by welding, and which may also be welded to the plates 36.

In operation of the device whenever differences in expansion between the core 10 and the supporting plates 36 occur, the stresses are relieved between each of the sections 12, 14 and 16 by the flexible return bends 30 and 32. The stress transmitted to the core is thereby reduced since the total expansion difference effective on any section of the core is limited to that which may take place in the short section of the plates 36 which connects between the two header means 24 of each section. This limited stress is further reduced by the fact that the header means 24 provide a leverage through which the expansion force must act so that the amount of movement which takes place at the joint between the tubular projections 26 and the fins 18 is very greatly reduced.

While the form of embodiment of the present invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A heat exchange device comprising a plurality of sections, each section including a plurality of rows of parallel tubes and a plurality of transverse fins connecting the tubes and the rows of tubes, header means connecting the ends of adjacent tubes in each row, means forming a connection between adjacent rows of tubes, flexible conduit means between tubes of adjacent sections, and supporting means for joining the sections together, said supporting means being attached to said header means to provide a slightly flexible connection between the header means of a section whereby conditions of unequal expansion are compensated by flexure of the flexible

conduit means between adjacent sections and by flexure of the supporting means between adjacent rows of one section.

2. A heat exchange device comprising a plurality of sections, each section including a plurality of rows of parallel tubes secured in relatively rigid relationship, header means connecting the ends of adjacent tubes in each section, a single flexible conduit between adjacent sections, and supporting means for joining the sections together, said supporting means being attached to said header means to provide a slightly flexible connection between the header means of a section whereby conditions of unequal expansion are compensated by flexure of the flexible conduit between adjacent sections and by flexure of the supporting means between adjacent rows of one section.

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