Aug. 16, 1966 J. W. JACOBS 3,266,128

METHOD OF MAKING A HEAT EXCHANGER

Original Filed May 16, 1961

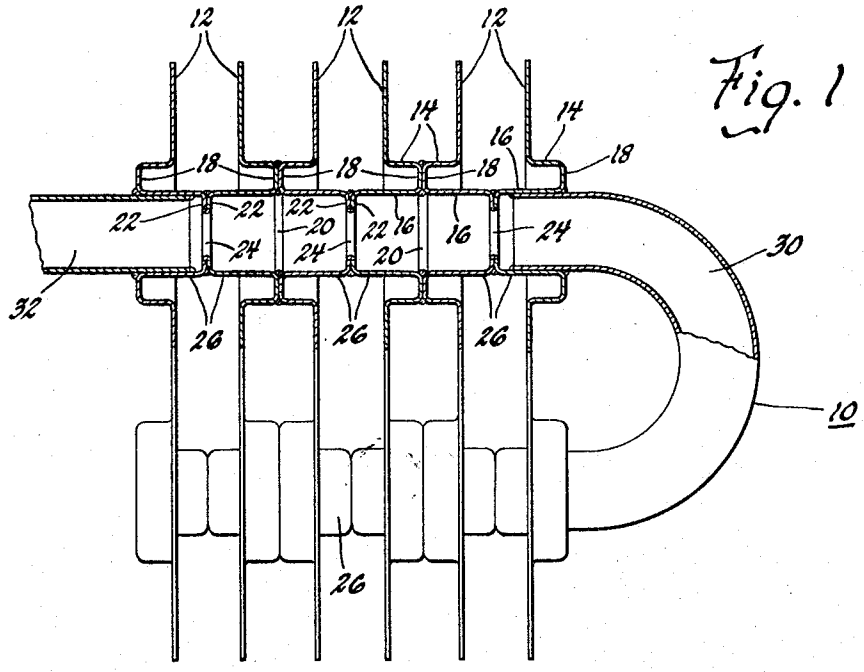



Fig. 1

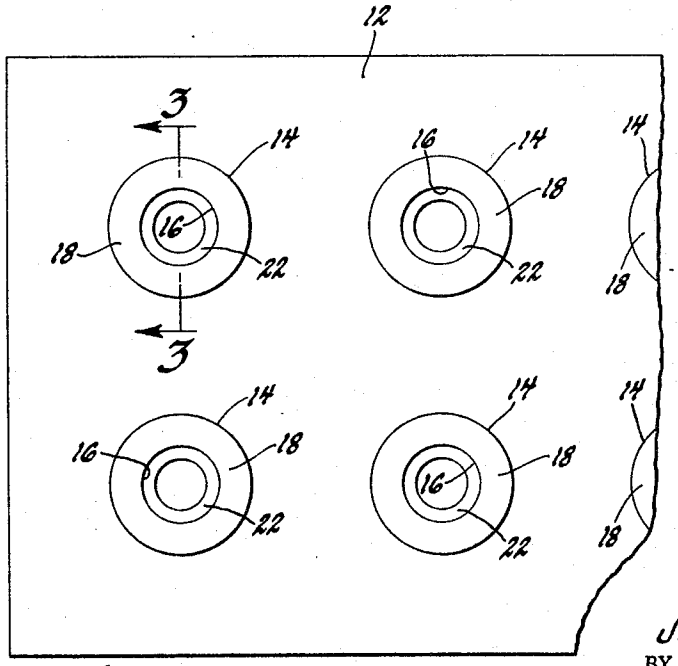



Fig. 2

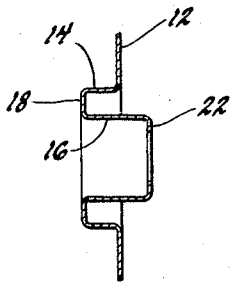



Fig. 3

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# METHOD OF MAKING A HEAT EXCHANGER

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Original application May 16, 1961, Ser. No. 110,397, now Patent No. 3,202,211. Divided and this application Feb. 18, 1965, Ser. No. 433,748

1 Claim. (Cl. 29—157.3)

This application is a division of application Serial No. 110,397, filed May 16, 1961, now United States Patent Number 3,202,211.

This invention relates to refrigerating apparatus and more particularly to a heat exchanger and to the method of manufacturing heat exchangers for use in refrigerating systems and the like.

It is an object of this invention to provide a heat exchanger having fluid conduits and integrally formed fins made from relatively flat sheet stock.

It is another object of this invention to form flanged tubular projections on relatively flat sheets, which projections abut and are bonded to complementary projections on adjacent flat sheets to form fluid conduits.

More specifically, it is an object of this invention to reduce the amount of metal drawing necessary to join the fin structures together to form a gas-tight fluid passageway.

These and further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

In the drawing:

FIGURE 1 is a fragmentary side elevational view with parts broken away showing a heat exchanger embodying my invention;

FIGURE 2 is an elevational view showing one of the sheets used in making the heat exchanger shown in FIGURE 1; and

FIGURE 3 is a fragmentary sectional view taken substantially on line 3—3 of FIGURE 2.

Referring now to the drawing wherein a preferred embodiment of the invention has been shown, a heat exchange unit, generally designated by the reference numeral **10**, is formed from a plurality of flat sheets **12** which not only form the heat radiating fins but also form fluid passages.

As shown in the drawings, each of the flat sheets **12** is provided with a plurality of relatively large diameter tubular projections **14** which are integral with the sheet and extend in one direction from the sheet. Each of the relatively large tubular projections is provided with a relatively small diameter internal projection **16** which is joined to the relatively large diameter tubular projection **14** by means of a relatively flat surface **18**. The relatively flat surfaces **18** on adjacent pairs of sheets **12** are bonded to one anoter as shown so as to form bonded joints **20** between adjacent sheets. The terminal ends of the relatively small diameter tubular projection **16** are provided with internal flanges **22** which are bonded together as shown to form bonded joints **24**. By virtue of the above-described arrangement, a plurality of parallel fluid passages are formed which, in effect, have integrally formed heat radiating fins. The necessary number of return bend elements, such as the element **30**, are provided for connecting the ends of adjacent fluid passages **26**. Suitable inlet and outlet connectors, such as the connector **32**, may be provided as shown. The elements **30** and **32** telescope into the fluid passages **26** as shown.



By virtue of the above-described construction, it will be obvious that the draw necessary to form the tubular portions **14** and the re-entrant portions **16** is not greater than the distance between two adjacent sheets. This is an important feature in the manufacture of heat exchangers as it greatly reduces the number of leaks resulting from tears in the metal due to excessively long draws.

The sheets are preferably made of basic aluminum to which is bonded on each side thereof a lower melting temperature aluminum brazing or bonding material. The entire assembly is clamped together and dipped brazed in the presence of flux whereby all joints are simultaneously brazed in accordance with well known brazing procedures.

While the embodiment of the present invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

A method for manufacturing a heat exchanger having a plurality of separate fin elements each having integral tube forming portions, comprising the steps of, reversely drawing an interior portion of a first flat sheet to form a first large tubular projection extending from one side of the first sheet and to form a relatively smaller open-ended tubular projection integral with the first projection and arranged interiorly and concentrically of the first projection to extend past the opposite side of the first sheet, reversely drawing an interior portion of a second flat sheet to form a second large tubular projection extending from one side of the second sheet and to form a relatively smaller open-ended tubular projection integral with the second large tubular projection and arranged interiorly and concentrically of the second large tubular projection to extend past the opposite side of the second sheet, maintaining a continuous spaced relationship between the undeformed portions of the first and second sheets by aligning and bonding the first and second large tubular projections with one another in abutting relationship, and aligning and bonding the smaller tubular projections of said first and second sheets in abutting relationship with the smaller tubular projections of additional sheets of a configuration similar to said first and second sheets whereby a conduit is formed through said spaced apart sheets.

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