

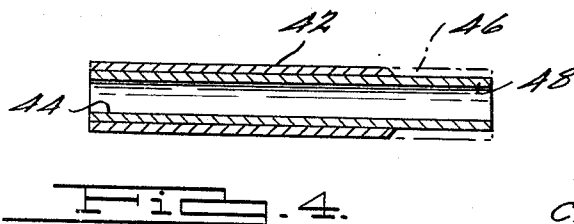
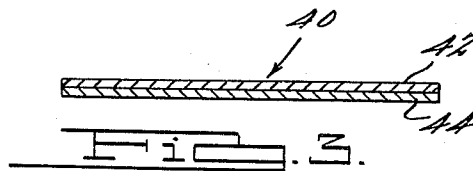
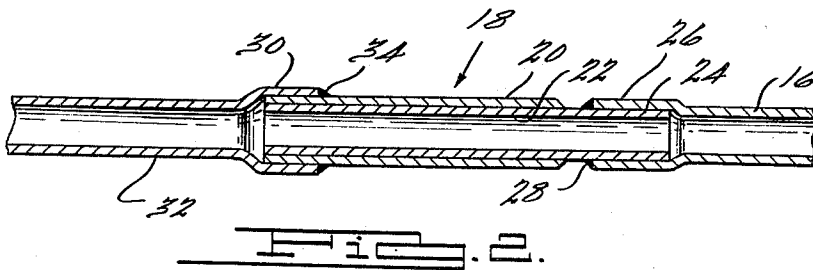
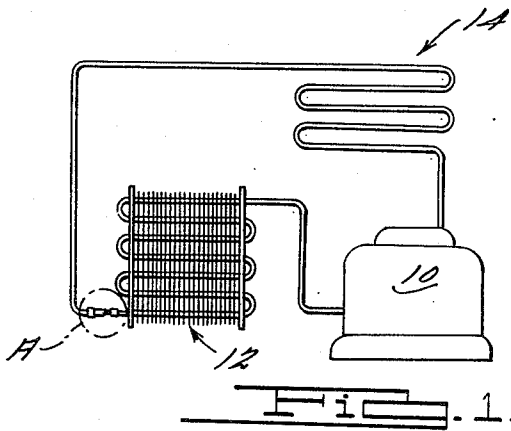
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REFRIGERATING SYSTEM AND METHOD OF MAKING THE SAME

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REFRIGERATING SYSTEM AND METHOD OF MAKING THE SAME

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6 Claims. (Cl. 285—173)

This invention relates to refrigerating systems of the kind wherein a part of the system is formed of a metal which is difficult to solder or join, such for example as aluminum tubing, and other parts of the system are formed of a readily solderable metal, such for example as copper tubing.

Since aluminum tubing has gone into extensive use in refrigerating systems, considerable difficulty and expense have been encountered in providing a satisfactory pressure-tight joint between the aluminum tubing and other parts of the system formed of readily solderable metals due to the difficulty of soldering or joining aluminum to such other metals. Generally it has been the practice to use for this purpose a transition piece in the connection between the aluminum tubing and the other metal. Such a transition piece usually consists of a short length of copper tubing and a short length of aluminum tubing butt welded together in series flow relationship. During the assembly of the system the aluminum tubing of the transition piece is arc welded to the aluminum tubing of the system while the copper tubing of the transition piece is hard soldered to the readily solderable metal, which may consist of copper coated steel tubing or some other metal which is readily solderable, such for example as copper or brass. It is difficult and expensive to make satisfactory pressure-tight joints between the aluminum and the copper tubing of such transition pieces, and this difficulty has in some cases retarded the more extensive use of aluminum in refrigerating systems.

We have devised a refrigerating system which eliminates the difficulties hereinabove referred to. According to our invention, we employ a tubular transition piece consisting of a layer of aluminum and a layer of a readily solderable metal clad or bonded to one face of the layer of aluminum. The readily solderable metal may be of any of the readily solderable metals which can be bonded to or clad on aluminum, such for example as copper. The aluminum of the transition piece is then integrally united to the aluminum tubing of the system, while the other metal of the transition piece is integrally united, such for example as by hard soldering, to the other metal of the system.

A principal object of the invention, therefore, is to provide a new and improved refrigerating system.

Other and further objects of the invention will be apparent from the following description and claims and may be understood by reference to the accompanying drawings, of which there is one sheet, which by way of illustration show a preferred embodiment of the invention and what we now consider to be the best mode in which we have contemplated applying the principles of our invention. Other embodiments of the invention may be used without departing from the scope of the present invention as set forth in the appended claims.

In the drawings:

Fig. 1 is a schematic diagram of a refrigerating system of a compression-condenser-evaporator type embodying the invention;

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Fig. 2 is an enlarged view of the connection between the outlet from the condenser and the inlet to the evaporator, indicated by the circle A in Fig. 1;

Fig. 3 is a sectional view of a blank used to form the transition piece of the system; and

Fig. 4 is a sectional view of the transition piece in an intermediate stage of manufacture.

As illustrated in Fig. 1, the refrigerating system includes a compressor 10, a condenser 12, and an evaporator 14 operatively connected in series flow relationship. The condenser 12 usually is formed of copper coated steel tubing or copper tubing. Since extruded aluminum tubing of the desired specifications became commercially available at attractive prices, it has gone into general use for the low side or the evaporator of refrigerating systems.

In Fig. 2 the outlet tube or terminal 16 from the condenser 12 is hard soldered to one end of the transition piece indicated generally at 18. The transition piece consists of a tubular piece formed of bimetal consisting of a layer of aluminum 20 and a layer of a readily solderable metal 22, such as copper, bonded to the inner face of the layer of aluminum. In this case the aluminum 20 surrounds the copper 22, but the transition piece could have the copper 22 surrounding the aluminum 20 if desired. The copper tubing 22 projects beyond the aluminum tubing 20.

The projecting end 24 of the copper tubing 22 is disposed within the enlarged end 26 of the terminal 16 and hard soldered thereto as indicated at 28. At its other end the transition piece is fitted within the enlarged end 30 of the aluminum tubing 32 leading to the evaporator 14. A metering device (not shown) for metering the flow of liquid refrigerant from the high side to the low side may be incorporated at any appropriate place within the system. The enlarged end 30 of the tubing 32 is arc welded by any conventional process to the aluminum tubing 20 of the transition piece, as indicated at 34. The weld 34 is the same type of weld which is now employed for integrally uniting the aluminum tube end of conventional transition pieces to the aluminum tubing leading to the low side of the system.

The transition piece 18 may be made from a blank 40 of composite metal consisting of a layer of aluminum 42 on which a layer 44 of electrolytic copper is clad on one side. Metals 42 and 44 are inseparably bonded together by a solid phase bonding process without the use of any brazing alloy or other intermediate material. This method assures the absence of objectionable voids, oxides, and compound inclusions at the interface and provides a continuous bond between the two metals with a strength as great as that of aluminum. The copper layer 44 has the same structure and properties as solid wrought copper while the aluminum 42 retains all of its original aluminum properties.

Bimetal blanks of the character referred to may at the present time be obtained commercially from the General Plate Division of Metals & Controls Corporation, of Attleboro, Massachusetts, which markets the bimetal under the trade name "Alcuplate."

The blank 40 is subjected to a series of conventional drawing steps to form a bimetal tube as illustrated in Fig. 4, with the aluminum 42 on the outside and the copper 44 on the inside, or vice versa. Thereafter, the aluminum is stripped from one end of the piece, as indicated at 46, to leave a projecting end 48 of copper tubing.

While we have illustrated a bimetal transition piece only between the condenser and evaporator, we contemplate that such a piece may be employed anywhere in the system where a joint between aluminum tubing and

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tubing of a readily solderable metal is required. Thus, if the condenser is made of aluminum, such a transition piece would be used between the condenser and the outlet of the compressor. Similarly, such a transition piece would be employed in the system illustrated between the evaporator and the inlet to the condenser.

While we have illustrated and described a preferred embodiment of our invention, it is understood that this is capable of modification, and we therefore do not wish to be limited to the precise details set forth but desire to avail ourselves of such changes and alterations as fall within the purview of the following claims.

We claim:

1. In a refrigeration system, a fluid conducting part formed of aluminum tubing and another fluid conducting part formed of tubing of a metal that can readily be soldered, a tubular fluid conducting transition piece connecting said tubing in fluid flow relationship and formed of a tubular layer of aluminum and a tubular layer of a readily solderable metal, a pressure tight joint integrally uniting the readily solderable tubular metal part of the transition piece and the tubing of the readily solderable metal, and a pressure tight joint integrally uniting the tubular aluminum of said transition piece and said aluminum tubing, said transition piece being formed of dissimilar wrought metals, metallurgically bonded together at their interface.

2. A system according to claim 1 wherein said readily solderable metal of said transition piece is copper.

3. A system according to claim 1 wherein said layer of aluminum is disposed on the outside.

4. A refrigeration system including a fluid conducting part formed of aluminum tubing and another fluid conducting part formed of tubing of a metal that can readily be soldered, a tubular fluid conducting transition piece connecting said tubing in fluid flow relationship and formed of bimetal consisting of a tubular layer of aluminum and a tubular layer of copper bonded to one face

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of said layer of aluminum, a soldered pressure tight joint integrally uniting the copper of said transition piece and said other part, and a welded pressure tight joint between the aluminum of said transition piece and said aluminum tubing, each of said layers of said transition piece being of sufficient wall thickness to contain the internal pressure to which the fluid of the system is subjected within said transition piece.

5. Apparatus according to claim 4 wherein said layer of aluminum surrounds said layer of copper at one end of said transition piece and wherein the copper tube projects from the aluminum tube at the other end thereof.

6. In the art of manufacturing refrigerating systems wherein a fluid conducting part is aluminum tubing and another part is tubing of a readily solderable metal, that method of forming a fluid pressure tight fluid flow connection between said tubing which consists of forming a bimetal tube consisting of a tubular layer of aluminum and a tubular layer of a readily solderable metal and wherein each of said layers is of sufficient wall thickness to contain the internal pressure to which the fluid of said system is subjected within said bimetal tube, integrally uniting said layer of aluminum to said aluminum tubing and integrally uniting said layer of readily solderable metal to the tubing formed of readily solderable metal, said bimetal tubing being formed of dissimilar wrought metals metallurgically bonded together at their interface.

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