May 15, 1956 G. R. LONG 2,745,797

ELECTROPLATING PIPE JOINT

Filed Jan. 19, 1953

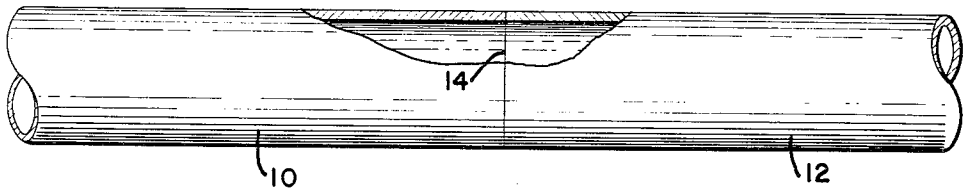

Fig. 1

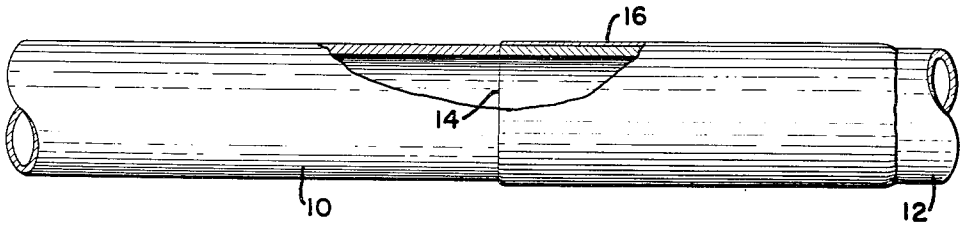

Fig. 2

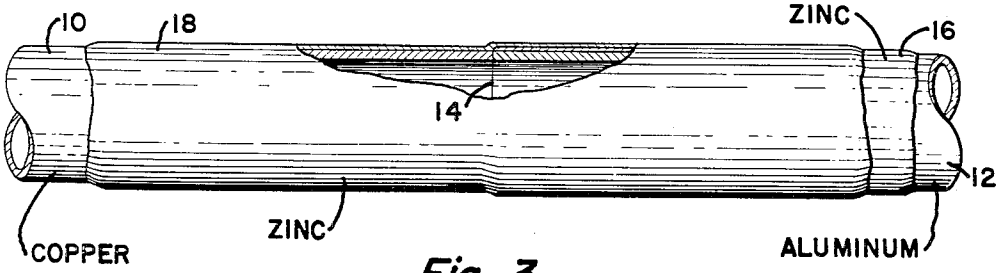

Fig. 3

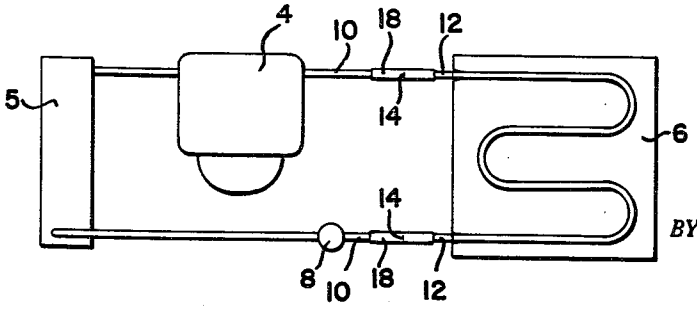

Fig. 4

INVENTOR.
George R. Long
BY Willits, Pardue & Fahr.
Attorneys

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ELECTROPLATING PIPE JOINT

George R. Long, Oakwood, Ohio, assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

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1 Claim. (Cl. 204—16)

This invention relates to refrigerating apparatus and more particularly to a corrosion proof joint between two unlike metals in a conduit for use in refrigerating systems and the like where condensation and other forms of moisture may collect on the joint.

Several advantages result from the use of aluminum heat exchangers in a refrigerating system but such use presents problems due to the fact that it is not practical to make all of the refrigerator parts of aluminum and therefore it becomes necessary to connect aluminum refrigerant lines to copper or steel lines. It has been found that corrosion takes place at the point where the aluminum is joined to the copper or steel due to the electrolytic action which takes place when the strongly electropositive aluminum comes in contact with the other metals. This electrolytic action is aggravated in a refrigerant line due to the condensation of moisture on the cold external surface of the refrigerant line. It is an object of this invention to provide an improved type of galvanic protection on the refrigerant line at the point where the aluminum is joined to the steel or copper so as to prevent injurious electrolytic action.

More particularly it is an object of this invention to coat the region adjacent the joint with a metal such as zinc or cadmium which will afford the necessary galvanic protection.

The coating of a joint with metal such as zinc or cadmium presents a further problem in that it is not practical to deposit a satisfactory coating of any of these metals on a bimetallic joint by previously known methods of coating. It is an object of this invention to provide an improved method of coating a bimetallic joint.

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 form of the present invention is clearly shown.

In the drawings:

Figure 1 is an elevational view with parts broken away showing a bimetallic joint;

Figure 2 is a view similar to Figure 1, but showing a thin coating of a third metal on the one side of the joint;

Figure 3 is a view similar to Figures 1 and 2 showing the joint completely protected against corrosion; and,

Figure 4 is a diagrammatic view showing a refrigerating system embodying the invention.

Referring now to the drawing wherein a preferred embodiment of the invention has been shown, reference numerals **4**, **5** and **6** designate respectively a sealed motor-compressor unit, a condenser and an evaporator. The evaporator **6** is preferably a plate type aluminum evaporator which is connected in the refrigerant circuit by means of either copper or steel refrigerant lines **10**. The individual components of the refrigerant system shown are intended to represent conventional components connected into a conventional refrigerant circuit wherein the flow of refrigerant to the evaporator is controlled by means of an expansion valve **8** in accordance with standard practice. For convenience of description, certain portions of

the refrigerant lines **10** will be referred to as copper lines whereas these may equally well be steel as some of the same problems are involved in connecting steel to aluminum as in connecting copper to aluminum. The reference numeral **12** designates the sections of aluminum line leading from the aluminum evaporator **16** to the copper lines **10** and the reference numeral **14** is used to designate the joint between the line **10** and line **14**.

The joint **14** represents a conventional flash welded joint which serves to connect the aluminum to the copper. A bimetallic joint of this type can easily be welded but the resultant welded joint requires protection on its outside so as to prevent corrosion due to electrolysis. The inside of a bimetallic joint in a refrigeration system requires no protection as the refrigerant and lubricant in the system do not support any electrolytic action. I have discovered that a bimetallic joint can be protected by adding a third metal to the joint in such a manner that any destructive electrolytic action which takes place attacks the third metal rather than destroying the metals forming the main refrigerant conduit. In order to add such a third metal to the joint, the tubing adjacent the joint is first subjected to a solution such as sodium zincate which places an immersion deposit **16** of zinc on the aluminum tube section **12**. This treatment fails to place any deposit of zinc on the copper and only serves to provide a very thin deposit of zinc on the aluminum. The thickness of the zinc deposit **16** would be ineffective in protecting the aluminum against corrosion and therefore it is necessary to increase the thickness of this coating and to also coat the end of the copper tubing adjacent the joint.

A thicker and final coating **18** (shown in Figure 3) can now be applied by electroplating the tubing on both sides of the joint as the immersion deposit coating **16** makes it possible to add additional zinc thereto by the electroplating process whereas it would have been impossible to electroplate the aluminum directly. It will be noted that the metals used for coating are between aluminum and copper in the electromotive force series of elements.

It is recognized that electrolysis in varying degrees will take place wherever two unlike metals are subjected to moisture, dust and the like and that one or the other of the metals will be eaten away. By selecting a coating material which is electropositive and one offering galvanic protection to the metals forming the main tubing, the metals of the main tubing will not corrode. In the coated bimetallic joints illustrated, the zinc coating rather than the copper or the aluminum will be eaten away very gradually but this does not produce any leaks in the refrigerant line so long as any of the zinc remains. The thickness of the zinc coating therefore must be sufficient to protect the joint for the normal lifetime of the refrigerant system.

For convenience in describing the invention, reference has been made to specific materials, whereas certain aspects of the invention are equally applicable to other materials. Thus, it would be possible to substitute cadmium for the zinc and as pointed out hereinabove steel tubing could be used in place of the copper tubing. It is important however in providing a pretective coating to use a coating metal which offers the necessary galvanic protection to the metal forming the main refrigerant line at the point where the two unlike metals are joined.

While the form of embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, as may come within the scope of the claim which follows.

What is claimed is as follows:

The method of coating a joint between sections of copper and aluminum which comprises immersion depositing cadmium on the aluminum adjacent said joint and

then electroplating said immersion deposit and the copper adjacent said joint.

References Cited in the file of this patent

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