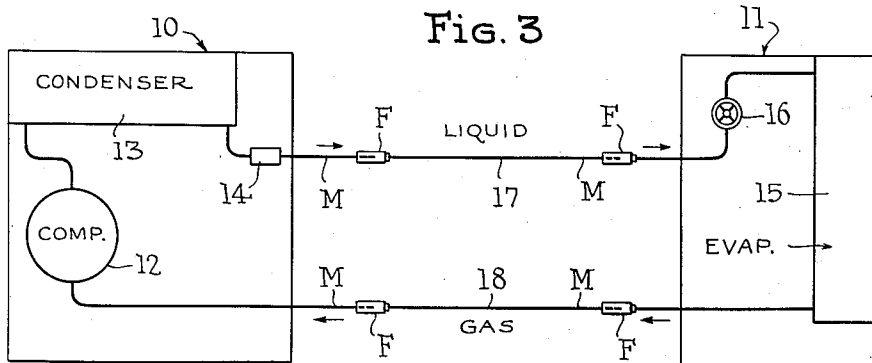
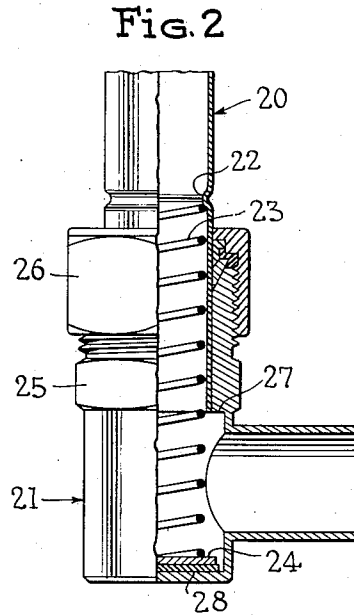
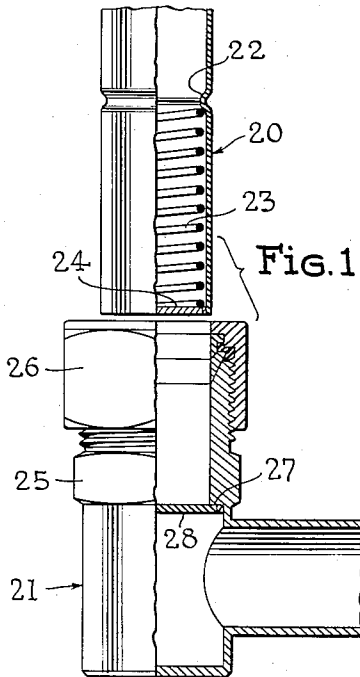


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REFRIGERATION PIPING CONNECTOR

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## REFRIGERATION PIPING CONNECTOR

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This invention relates to pipe joints and more particularly to a special fitting for field connection of pre-charged remote air-conditioning units.

Commercial and domestic air-conditioning systems are currently manufactured in the self-contained or remote unit types. In the self-contained type, the compressor, condenser and evaporator components are all housed together. In the remote type of unit, however, the compressor and condenser units are housed separately from the evaporator. Quite frequently installation requirements dictate a fairly wide separation of the two units. Conventionally the compressor-condenser may be outside and the evaporator inside the building. This immediately gives rise to the question of whether or not to pre-charge the units before they are shipped. If they are not pre-charged, then a highly skilled refrigeration technician must make the necessary connections and then charge the units. Before they can be charged, however, they must first be evacuated and the equipment necessary for proper evacuation represents a considerable capital investment. Since the average mechanic cannot afford such apparatus it is highly desirable to pre-charge the units so that all that is necessary is to assemble them in the field.

The interconnection of pre-charged units requires the design of a fitting which enables the interconnection to be effected without admitting air to the system, which would impair the operating thermal efficiency. Prior art attempts along these lines have not enjoyed substantial success.

Accordingly, it is the principal object of the present invention to provide a fitting for the interconnection of pre-charged remote air-conditioning units in the field. Other objects include the following:

(1) The provision of a fitting for the interconnection of refrigeration units in the field, which fitting can be assembled using only ordinary wrenches and a small heating torch.

(2) The provision of a fitting for use as outlined above which permits factory pre-charging of remote air-conditioning units.

(3) The provision of a fitting in which substantially the full cross-sectional area of the tubing employed is available for refrigerant flow.

Other objects will be apparent from the following description when read in conjunction with the attached sheet of drawings in which:

Figure 1 is a side elevational view, partly in section, showing a preferred embodiment of a fitting, in accordance with the present invention, in its unassembled form;

Figure 2 is a view similar to Figure 1, but showing the fitting in its final assembled state; and

Figure 3 shows, schematically, a remote type air-conditioning unit with the interconnecting lines and further indicates, schematically, the point of attachment of the fittings of this invention.

Referring first to Figure 3, a pair of units 10 and 11

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are shown which, when interconnected, comprise a complete air-conditioning system. The first unit 10, which appears at the left-hand side of the drawing, includes a compressor 12, a condenser 13, and a liquid receiver 14.

5 The right-hand unit 11 includes an evaporator 15 and an expansion valve 16 for controlling the admission of liquid refrigerant thereto. The two units are interconnected by a pair of lines 17 and 18, the upper of which, 17, is the liquid line and the lower of which, 18, is the gas line.

10 The liquid line, 17, conducts liquid refrigerant from the liquid receiver to the evaporator and the lower line, 18, connects the other side of the evaporator to the compressor inlet. The points of connection and type of fittings have been indicated on the drawing by the letters M and F, standing for male and female, respectively.

15 Referring now to Figure 1, which shows the fitting in its unassembled form, the male unit 20 appears at the top of the figure and the female unit 21 at the bottom. The male half of the fitting is constructed in the end of the usual thin-wall copper conduit used for refrigerant carrying purposes. An inwardly extending annular shoulder 22 is formed adjacent one end and provides a shoulder against which one end of a helical coiled spring 23 may react. The spring is compressed and held in place by means of a circular disc 24 which is soft-soldered into the end of the conduit. This effectively forms a gas-tight seal at the end of the male fitting.

20 The female fitting 21 is in the form of a "T" or elbow, and includes a hex body portion 25 which enables the fitting to be held with one of a pair of wrenches. The upper end of this fitting includes a compression type seal which can be tightened or loosened by means of a hex nut 26. Internally, and immediately below the hex portion of the fitting, there is formed an internal shoulder 27. A second circular disc 28 is soft-soldered against this shoulder to effectively seal the female fitting.

25 To assemble the two halves of the fitting, the male portion 20 is first inserted into the female portion 21 until the two discs 24 and 28 are in contact with each other. A first wrench is then applied to the hex portion 25 of the fitting and a second wrench is used to tighten the hex nut 26 to form a gas-tight compression seal between the exterior of the male fitting and the interior of the female fitting. The exact details of this compression fitting are unimportant insofar as the present invention is concerned. Suffice to say, there are numerous types available and they may be purchased on the open market. Once the gas-tight seal has been effected, a heating torch, such as a propane burner, is then applied to the exterior surface of the fitting at the area opposite the position occupied by the two discs. The heat of the torch melts the soft-solder, releasing the two discs, and the spring 23 then forces both discs to the bottom of the female fitting. The final position of these parts is shown in Figure 2.

30 It will be apparent from an inspection of Figure 2, that substantially the full cross-sectional area of the tubing employed is available for refrigerant flow. Prior art devices of the type which employ a piercing member to establish flow through a disc seal, are deficient in this respect, because there is a definite throttling of refrigerant flow.

35 Referring again to Figure 3, which shows a preferred connection and assembly of the components of an air-conditioning system and the fittings of the present invention, it will be seen that each of the two lines 17 and 18 has a male fitting on one end and a female fitting on the opposite end. When assembled at the factory, the fittings are first secured to opposite ends of the lines and the lines are then evacuated. For evacuation purposes, a small tag line may be connected at any point intermediate the two ends. After the lines have been evacuated, they are then preferably charged with refrigerant gas

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under a pressure of approximately 30 pounds per square inch. The condenser unit carries the bulk of the refrigerant charge in a precharged system. The refrigerant is charged through the compressor and into the condenser and liquid receiver, the latter units holding substantially the entire charge for the system. The compressor conventionally includes a valve which prevents backflow of the refrigerant from the high to the low side. The evaporator unit is treated in much the same way as are the two interconnecting lines; that is to say; it is first evacuated and then charged with refrigerant gas to a pressure preferably of the order of 30 pounds per square inch. It will be understood that the suction and liquid lines of the compressor unit terminate at the unit in a male fitting of the type shown in Figure 1 and that the corresponding lines of the evaporator unit terminate at the unit in a female fitting of the type shown in Figure 1.

In order to interconnect the two units in the field, the assembly of each of the four fittings must be effected as hereinbefore described. The order of assembly becomes important at this stage, however, due to different refrigerant pressures existing in the several components of the system, prior to the application of heat to unseat the discs of the fittings and establish interconnection of the two units. The first fitting to be fired is the one on the suction side of the compressor. At this point it is well to note that here is a valid reason for having the male half of the fitting on the suction side of the compressor and the female half of the fitting on the end of the gas line 18 which connects thereto. The compressor-condenser unit (in the case, for example, of a two-ton system) is pre-charged with approximately six and one-half pounds of Freon. While the pressure will depend upon ambient temperature, normal ambients result in pressures ranging between approximately 120 and 145 pounds per square inch. When heat is applied to this particular fitting, therefore, the pressure relationship between the line and the compressor unit is such that there is substantially higher pressure in the compressor unit than in the line. Accordingly, this pressure must act in a direction to assist rather than oppose the action of the spring in seating the two discs on the base of the female fitting. This same pressure condition governs the placing of the male and female fittings throughout the system. The second fitting to be fired is the one connecting the liquid receiver to the liquid line. The third connection to be fired is the one between the gas line and the output or suction side of the evaporator. The last connection is the one between the liquid line and the evaporator.

While the air-conditioning system shown and described herein includes an expansion valve, it is worth noting that the fittings of this invention adapt themselves admirably to the use of units which employ, in place of a thermal

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expansion valve, a capillary line. As is well known in the art, the use of a capillary line renders the refrigerant charge in the system substantially more critical than in the case of a thermal valve. In view of the equipment and technical know-how necessary to effect a critical charge in the field, it is a decided advantage to be able to pre-charge the units as hereinbefore described.

From the foregoing, it will be apparent to those skilled in the art that there is herein shown and described a new and useful refrigerant piping connection which can be manufactured at low cost and which can be assembled in the field by persons not necessarily skilled in the refrigeration or air-conditioning art. Thus, it is possible to ship pre-charged units from the factory for installation in domestic or commercial establishments at remote places, and the installation requires the services of only an ordinary mechanic and the utilization of a minimum of tools.

While a preferred embodiment of the invention has herein been shown and described, applicant claims the benefit of a full range of equivalents within the scope of the appended claims.

I claim:

1. A coupling for field connection of pre-charged remote refrigerating or air-conditioning units comprising: a male fitting; means sealing the end of the male fitting, including a member heat-releasably joined thereto; spring means biasing said member outwardly of said male fitting; a female fitting, including an inlet portion for receiving the male fitting, an outlet portion, a heat-releasable member sealing said female fitting at a point intermediate the inlet and outlet, and a closed portion for ultimately housing the heat-releasable members, said closed portion being positioned beyond the outlet and in line with the inlet portion; and means carried by said female fitting for holding said male fitting in gas-tight relationship therewithin with said heat-releasable members in contact with each other; whereby when said fittings have been assembled, application of heat to the exterior thereof releases said members, which are then forced by said spring past the outlet of the female fitting and into the closed portion thereof to provide a permanently open path of fluid flow through the fittings.

2. A coupling as defined by claim 1, in which the female fitting is substantially in the form of a T, the stem of the T being the outlet, one end of the cross being the inlet and the opposite end of the cross being closed.

#### References Cited in the file of this patent

##### UNITED STATES PATENTS

|           |              |               |
|-----------|--------------|---------------|
| 2,493,644 | Rider        | Jan. 3, 1950  |
| 2,667,760 | Curtis       | Feb. 2, 1954  |
| 2,702,993 | Harris       | Mar. 1, 1955  |
| 2,782,496 | Augustauskas | Feb. 26, 1957 |