Sept. 3, 1940. C. F. NYSTROM 2,213,325

REFRIGERATING APPARATUS

Filed Jan. 31, 1939 2 Sheets-Sheet 1

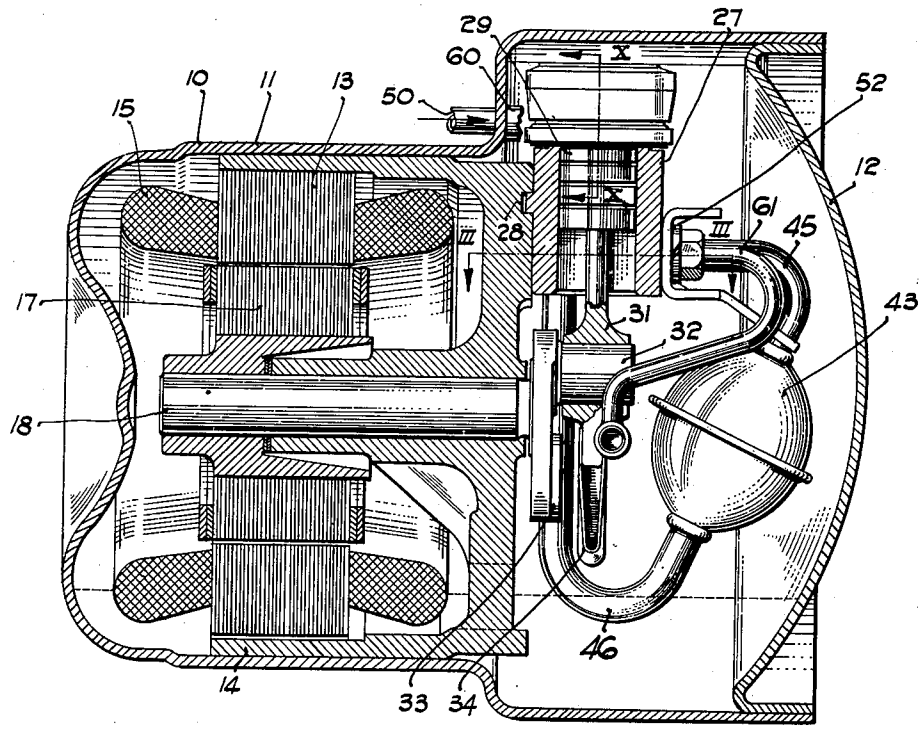


FIG. 1.

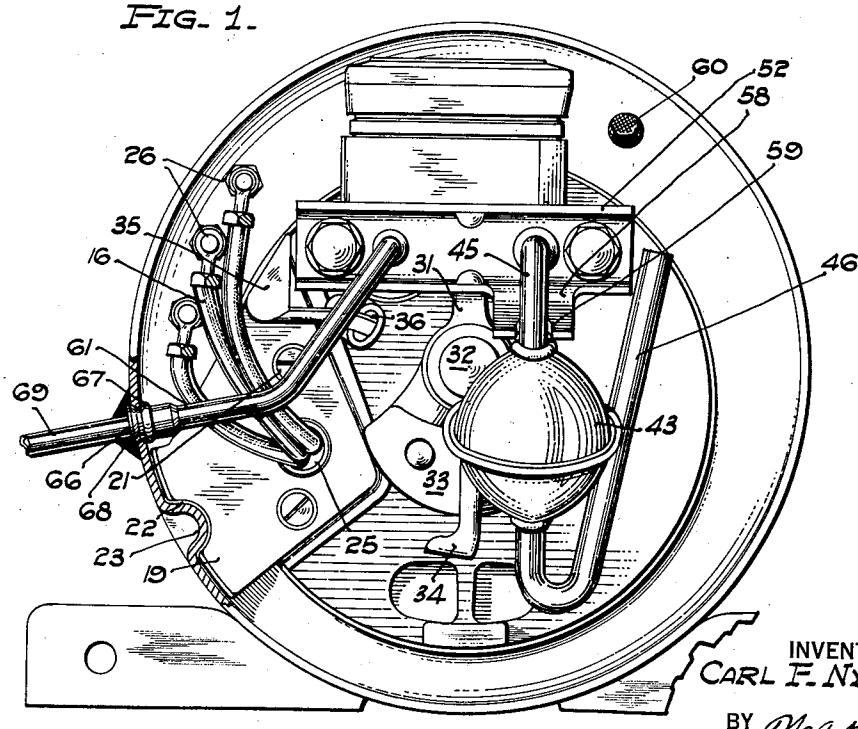


FIG. 2.

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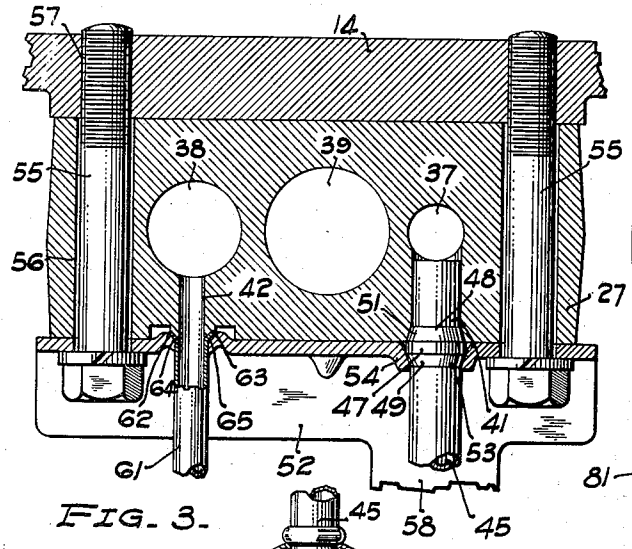


FIG. 3.

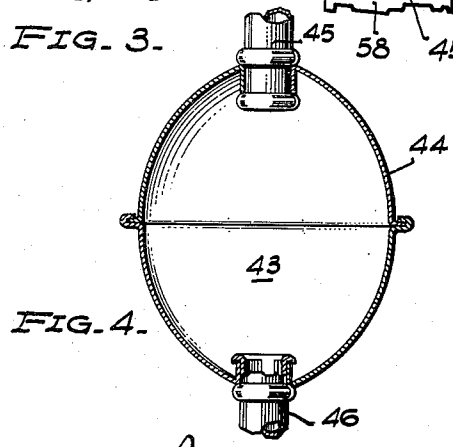


FIG. 4.

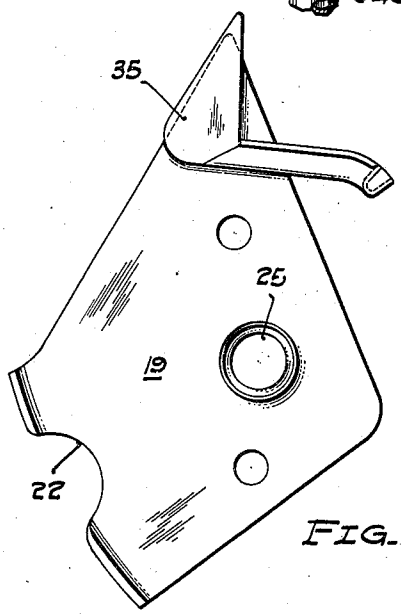


FIG. 5.

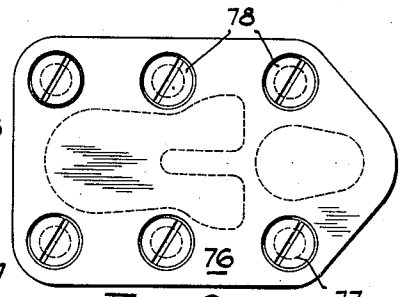


FIG. 6.

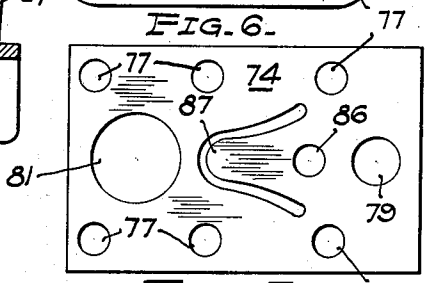


FIG. 7.

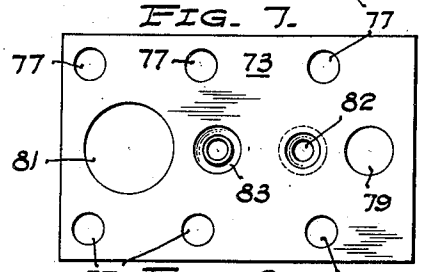


FIG. 8.

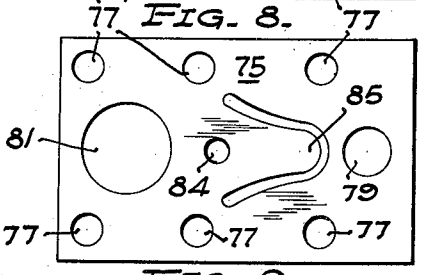


FIG. 9.

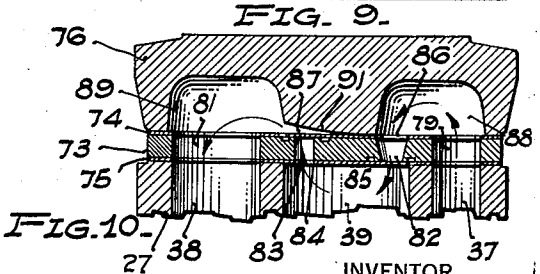


FIG. 10.

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UNITED STATES PATENT OFFICE

2,213,325

REFRIGERATING APPARATUS

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Application January 31, 1939, Serial No. 253,725

8 Claims. (Cl. 230—58)

This invention relates to refrigerant compressors and more especially to a means for connecting the refrigerant carrying tubing to the compressor.

The former practice was to braze the tubing to the compressor. This method has the disadvantage that fluxes are required in the brazing operation. The fluxing material is difficult to remove and unless completely removed tends to clog the flow restricting devices in the refrigerating system. This clogging is most noticeable in refrigerating systems embodying constantly open flow restricting devices such as capillary tubes or fixed orifices and especially in encased units where the refrigerant contacts both sides of the joint. The fluxing material may form the clogging material by itself or may combine with other compounds in the system to form the clogging material.

One object of this invention is, therefore, to provide a joint between the refrigerant compressor and refrigerant tubing which does not require soldering or brazing.

Another object is to provide a leak-proof joint between the refrigerant compressor and the refrigerant tubing which is readily assembled.

Another object is to provide a means for securing the refrigerant tubing on the refrigerant compressor which means also secures the refrigerant compressor to the casing of the motor which drives the compressor.

These and other objects are effected by my invention as will be apparent from the following description and claims taken in accordance with the accompanying drawings, forming a part of this application, in which:

Fig. 1 is a vertical section of a motor-driven refrigerant compressor embodying the invention;

Fig. 2 is an end view of the compressor of Fig. 1, with the cover removed and a portion of the casing broken away;

Fig. 3 is a section on the line III—III of Fig. 1;

Fig. 4 is a section of the muffler;

Fig. 5 is an elevation of a holding plate on the motor;

Fig. 6 is a plan view of the cylinder head with the attachment screws in place;

Fig. 7 is a plan view of the upper flexible valve member;

Fig. 8 is a plan view of the rigid valve plate;

Fig. 9 is a plan view of the lower flexible valve member; and,

Fig. 10 is a section on the line X—X of Fig. 1.

Referring now to the drawings for a detailed description of the invention, the reference numeral 10 represents a casing comprising a cup-shaped container 11 and a cover 12 welded at its edges to the edges of the container 11. A motor 13 comprising a frame 14, a stator 15, leads 16, a rotor 17, and a shaft 18, is pressed into the cup-shaped container 11 and a plate 19 is secured to the motor frame 14 by screws 21. The plate 19 is provided with a detent 22 which registers with a second detent 23 pressed into the side of the cup-shaped container 11 to prevent the motor frame 14 from moving in the container 11. The leads 16 of the motor 13 pass through an opening 25 in the plate 19 and are connected to bushings 26 sealed in the container wall. These bushings 26 conduct the electric current for the motor 13 through the wall of the container 11.

A cylinder block 27 is secured by a tongue and groove element 28 and by other means, subsequently to be described, to the upper portion of the motor frame 14. A piston 29, in the cylinder block 27, is actuated by a connecting rod 31 and a crank pin 32 on the motor shaft 18. A counterweight 33 is secured to an extension on the shaft 18 and is located oppositely to the crankpin 32. The lower portion of the casing 10 contains lubricating oil, and the connecting rod 31 is provided with a scoop 34 which scoops up the oil in the casing and sprays it over the working elements of the unit. Portions of the oil thus sprayed are caught by an oil collector 35 secured to the plate 19 from which collector 35 the oil flows into an oil hole 36 which delivers it to the bearing of the shaft 18 in the motor frame 14.

The cylinder block 27 contains a refrigerant inlet chamber 37, a muffler chamber 38, and a cylinder chamber 39, which chambers are parallel to one another. Two horizontal ducts 41 and 42 are provided in the cylinder block 27, one of which communicates with the bottom of the inlet chamber 37 and the other with the bottom of the muffler chamber 38.

A muffler element 43 communicates with the horizontal duct 41 and comprises a somewhat spherically shaped shell 44 having an inlet tube 46 connected to one side thereof and an outlet tube 45 connected to the opposite side. The duct 41 has a beveled opening 51 and the tube projects into the duct 41 of the cylinder block 27 and is provided with a soft metal sleeve 47 having beveled edges 48 and 49, one of which edges lies adjacent the bevel 51 formed in the horizontal duct 41. A channel member or yoke 52 is provided with a hole 53 having a formed beveled edge

54 registering with the beveled edge 49 of the sleeve 47. The beveled edges 51 and 54 of the duct 41 and of the channel member 52 clamp and shrink the sleeve 47 on the tube 45 thus securing the tube 45 in place. The channel member 52 is adapted to be forced into position by two tap screws 55 which pass through openings in the web of the channel member 52, through registering passages 56 in the cylinder block 27, and engage the threads of threaded holes 57 in the motor frame 14. The tap screws 55 thus hold both the channel member 52 and the cylinder block 27 in place. The channel member 52 is made of relatively thin gauge material and is, therefore, slightly elastic. Thus, even though the bolts 55 are drawn down tightly, the force on the flange 64 of the tube 61 and on the sleeve 47 of the tube 45 is resilient to permit of temperature expansion and contraction of the various elements.

The tube 46 of the muffler element is open to the interior of the casing 10 and also communicating therewith is the inlet tube 50, the opening of which is provided with a screen 60. An extension 58 on the channel member or yoke 52 is provided with a slot 59 which engages the tube 45 of the muffler element 43 and prevents the muffler element 43 from rotating on the sleeve 47. It will be observed that the vapor pressure in the inlet chamber 37 is substantially the same as that in the casing 10 so that there is little tendency for the joint between the tube 45 and the cylinder block 27 to leak.

The channel member 52 also constitutes a holding element for a tube 61 which conducts the compressed refrigerant vapor from the muffling chamber 38 in the cylinder block 27 to the exterior of the casing 10. The edges 62 of the entrance of the duct 42 are undercut to form a projecting conical nipple 63. The end of the tube 61 is provided with conical flanges 64 to fit the conical surfaces of the nipple 63 and are clamped thereon by the channel member 52. The channel member 52 has a hole with formed conical edges 65 which engage the outer surfaces of the flanges 64 formed on the tube 61 and presses the flanges 64 against the nipple 63. This construction is best shown in Fig. 3.

It will be noted that the connections between the tubes 45 and 61 and the cylinder block 27 of the compressor do not require soldering or brazing so that the use of solder or brazing fluxes is avoided.

The other end 66 of the tube 61 is expanded and provided with a bead 67 spaced from the edge of the tube 61. The end portion of the tube 61 is passed through a hole 68 in the casing 10 and the edges of the tube 61 projecting through the hole 68 are crimped over to secure the end 66 of the tube 61 in the casing 10. A refrigerant conducting tube 69 leading to an evaporator (not shown) is inserted in the expanded portion of the tube 61 and is brazed thereto and to the casing 10.

The valve mechanism of the pump comprises a rigid valve plate 73, an upper flexible valve member 74, a lower flexible valve member 75, and a cylinder head 76. These various elements are shown in Figs. 6 to 9 in their natural sequence and are shown in an assembled position in Fig. 10. The cylinder head 76, the two flexible valve elements 74 and 75, and the valve plate 73 are each provided with six registering holes 77 through which six tap screws 78 pass and engage with screw threaded holes (not shown) in the cylinder block 27 to hold the valve assemblage and the cylinder head 76 in place. The valve plate 73 and the two flexible valve members 74 and 75 are provided with holes 79 and 81 commensurate with and registering respectively with the upper ends of the inlet chamber 37 and of the muffler chamber 38. The rigid plate 73 is further provided with two spaced openings 82 and 83 communicating with the cylinder chamber 39. The lower valve member 75 has an opening 84 registering with the opening 83 in the valve plate 73 and further has a flexible tongue 85 formed in the valve member 75 which closes the opening 82 of the valve plate 73. The upper flexible valve member 74 has a hole 86 commensurate with and registering with the hole 82 of the rigid valve plate 73 and has a flexible tongue 87 formed in the member 74 which closes the opening 83 of the valve plate 73. The edges of the openings 82 and 83 of the rigid valve plate 73 which contact the flexible tongues 85 and 87 are undercut around the edges to concentrate the pressure of the tongues 85 and 87 on the edges of the holes 82 and 83.

The cylinder head 76 is formed with two cavities 88 and 89, one of which communicates with the openings 79 and 86 in the upper flexible valve member and the other of which communicates with the hole 81 and the tongue 87 in the upper valve member 74. The cylinder head 76 also has an arcuate valve tongue stop 91 which overlies the flexible tongue 87 and restricts the movement thereof. The purpose of this arcuate valve tongue stop 91 is to prevent the breaking of the flexible tongue 87.

It will be apparent that on the downward stroke of the piston 29 a suction is effected above the piston 29 which draws down the flexible tongue 85 of the lower flexible member 75 and permits refrigerant to be drawn through the muffler 43, through the inlet chamber 37 in the cylinder block 27 and through the cavity 89 in the cylinder head 76. On the upward stroke of the piston 29, the flexible tongue 85 closes and the refrigerant is forced out through the hole 83, the pressure of the refrigerant raising the flexible tongue 87 in the upper valve member 74 so that the refrigerant passes out through the cavity 89, through the holes 81, through the muffling chamber 38 and through the tube 61.

From the above description it will be apparent that I have provided connections in a hermetically sealed refrigerating unit between a pump element and two tubes, which connections do not require soldering or brazing. I have further provided a securing element which secures the tubes to the pump element and the pump element to the motor frame. It will also be apparent that the pump element and the tubes can be secured in place with a minimum of labor.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited but is susceptible of various changes and modifications without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claims.

What I claim is:

1. In a refrigerant compressor, the combination of a motor, a frame therefor, a pump supported by said frame, said pump comprising a cylinder block having a cylindrical bore, a piston in said bore, and a cylinder head on said block, said cylinder block having an opening therein

communicating with said bore, a refrigerant-conveying tube communicating with said opening, said tube having a circumferential enlargement adjacent the end which communicates with said opening, a holding member adapted to engage and force said circumferential enlargement against the cylinder block, and a screw passing through the holding member and through the cylinder block and engaging said frame for securing said cylinder block on said frame and said holding member on said cylinder block.

2. In a refrigerant compressor, the combination of a motor, a frame therefor, a pump supported on said frame, said pump including a cylinder block and a cylinder head on said cylinder block, said cylinder block having a bore adapted to cooperate with a piston and an opening adjacent and communicating with said bore, a tube communicating with said opening, said tube having a flange, a holding member for engaging and forcing the flange of said tube against the cylinder block, and a screw engaging said holding member and said frame to secure said cylinder block on said frame and said holding member on said cylinder block.

3. A refrigerant compressor according to claim 2 in which the holding member is slightly elastic to afford an elastic pressure on the flanges of the tube.

4. In a refrigerant compressor, the combination of a motor, a frame therefor, a pump supported on said frame, said pump including a cylinder block, a cylinder head on said cylinder block, said cylinder block having a bore adapted to cooperate with a piston, an opening adjacent and communicating with said bore, a tongue and groove connection between the frame and said cylinder block, a tube communicating with said opening, said tube having a flange, a holding member for engaging and forcing the flange of said tube against the cylinder block, and a fastening means engaging said holding member and said frame to secure said cylinder block on said frame and said holding member on said cylinder block.

5. In a refrigerant compressor, the combination of a motor, a frame therefor, a pump supported on said frame, said pump including a cylinder block, a cylinder head on said cylinder block, said cylinder block having a bore adapted to cooperate with a piston and an opening adjacent and communicating with said bore, a conical nipple formed on said cylinder block and communicating with said opening, a refrigerant-carrying tube communicating with said nipple, said tube having a conical flange thereon, a yoke for pressing said conical flange against the conical nipple, and means for securing the yoke to the cylinder block and the cylinder block to the frame.

6. In a refrigerant compressor, the combination of a motor, a frame therefor, a pump supported on said frame, said pump including a cylinder block, a cylinder head on said cylinder block, said cylinder block having a bore adapted to cooperate with a piston and an opening adjacent and communicating with said bore, said opening having a conical edge portion, a tube communicating with said opening, said tube having a soft metal ring adjacent one end thereof, said ring lying adjacent the conical edge portion of said opening, a yoke having a conical opening engaging said ring, and means for forcing said yoke against said cylinder block to clamp said ring therebetween, said means also securing said cylinder block to said frame.

7. In a refrigerant compressor, the combination of a motor, a frame therefor, a pump supported on said frame, said pump including a cylinder block, a cylinder head on said cylinder block, a gas-tight casing enclosing said motor and compressor, said cylinder block having a bore adapted to cooperate with a piston and an opening adjacent and communicating with said bore, a conical nipple formed on said cylinder block and communicating with said opening, a refrigerant-carrying tube communicating with said nipple, said tube having a conical flange thereon, a yoke for pressing said conical flange against the conical nipple, and means for securing the yoke to the cylinder block and the cylinder block to the frame.

8. In a refrigerant compressor, the combination of a motor, a frame therefor, a pump supported on said frame, said pump including a cylinder block, a cylinder head on said cylinder block, said cylinder block having a bore adapted to cooperate with a piston and an opening adjacent and communicating with said bore, a tube communicating with said opening, said tube having a flange, a slightly elastic member engaging said flange, and screws engaging said member at points remote from its engagement with said flange, whereby said member forces said flange against the cylinder block, said screws also engaging said motor frame to secure said cylinder block thereon.

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