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REFRIGERATING APPARATUS

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2 Sheets-Sheet 1

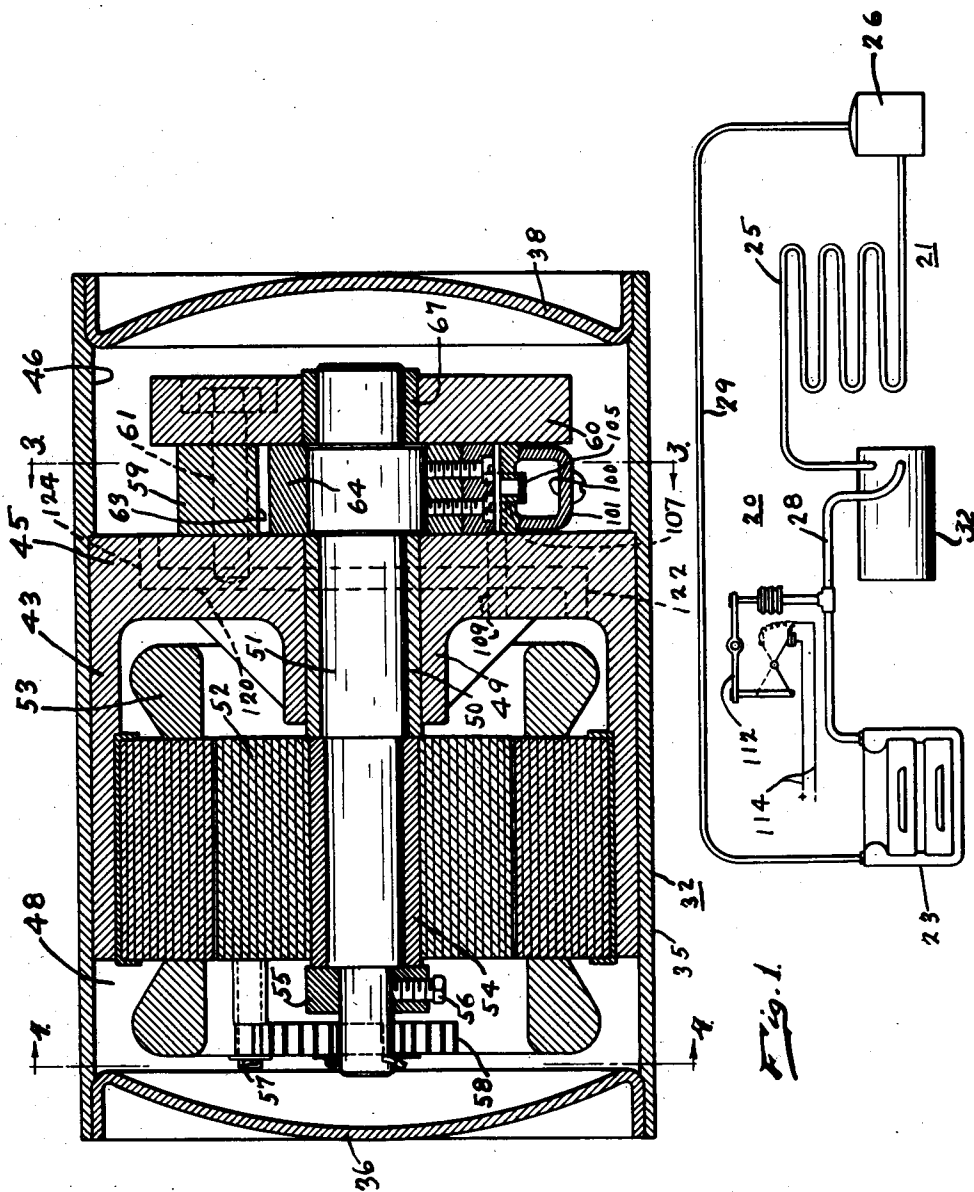


Fig. 2

Fig. 1

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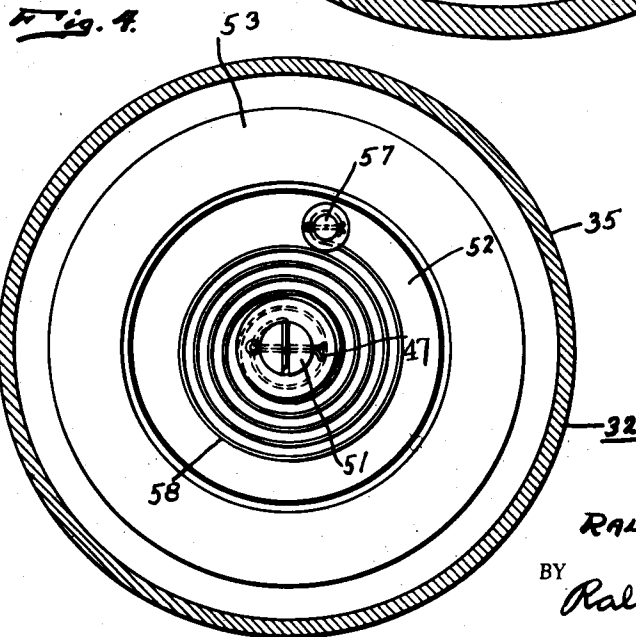
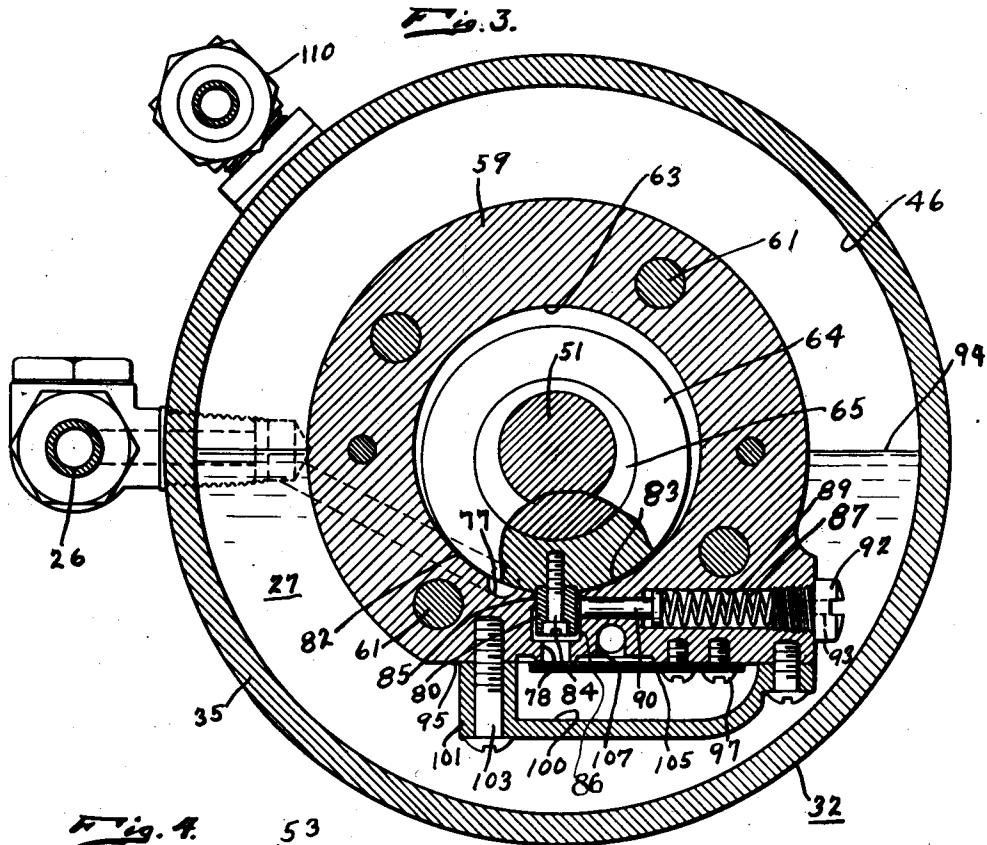
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REFRIGERATING APPARATUS

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2 Claims. (Cl. 230—147)

This invention relates to refrigerating apparatus and more particularly to fluid compressors for use with such apparatus.

One of the objects of the invention is to provide a new and highly efficient fluid compressor for refrigerating apparatus.

Another object of the invention is to provide a durable and simplified type of fluid compressor having a minimum number of working parts which are economical to manufacture and which are easily assembled.

Another object of the invention is to provide a fluid compressor driven by an electric motor and to arrange for operably connecting the compressor to the motor and in a manner whereby the motor is permitted to gain momentum before assuming the working load of the compressor to prevent the possible destruction of the motor due to large starting load.

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:

Fig. 1 is a diagrammatic representation of a refrigerating apparatus embodying features of my invention;

Fig. 2 is a side view in cross section of a motor-compressor unit embodying features of my invention;

Fig. 3 is a view taken along line 3—3 of Fig. 2; and

Fig. 4 is a view taken in the direction of the arrows 4—4 of Fig. 2.

Referring to the drawings, and particularly to Fig. 1, the numeral 20 designates in general a refrigerating system diagrammatically represented as including a refrigerant condensing element 21 and a refrigerant evaporator 23. The evaporator 23, as shown in this instance, is of the flooded type, although other types may be used. The condensing element 21 comprises in general a condenser 25, a high side float mechanism 26, and a fluid compressor 27 which compressor is to be hereafter more fully described.

Liquid refrigerant is supplied to the evaporator 23 from the float mechanism 26 through a liquid supply conduit 29, and evaporated refrigerant is withdrawn from the evaporator through a vapor conduit 28 by means of the compressor 27. The compressor 27 compresses the refrigerant vapor and delivers it to the condenser 25 wherein it is liquefied and from which it is delivered to the float 26 and the cycle repeated.

Referring more in detail to the drawings, and particularly to Figs. 2, 3 and 4, the compressor 27, as shown, is preferably enclosed in a hermetically sealed casing 32. The casing 32 is preferably constructed of a sleeve 35 formed such as by casting, and closure members 36 and 38 for closing the ends of the sleeve 35. The closure members 36 and 38 are formed to be press-fitted within the ends of the sleeve to form a fluid tight casing. The closures are also secured to the sleeve, preferably by welding.

Another casting 43 is tightly press-fitted within the sleeve 35 and includes a vertically extending wall 45 disposed between the end closure members 36 and 38, thus dividing the interior of the casing into two separate compartments 46 and 48. The vertically extending wall 45 is formed with a boss 49 within which is provided a bearing 50, preferably integral therewith. A shaft 51 is journaled to rotate within the bearing 50. The fluid compressor 27 is disposed within the compartment 46 and is operated by the rotation of shaft 51. Shaft 51 is in turn driven by means of an electric motor, which is also preferably enclosed within the casing 32 and within the compartment 48 thereof. The electric motor comprises in general a rotor 52 and a stator 53. The rotor 52 is provided with a bearing 54 and is mounted to rotate freely on the shaft 51. A collar 55 is provided to act as a thrust bearing for maintaining the rotor in position and is fastened to the shaft by means of a set screw 56. The stator 53, as shown, may be secured and held in position by the casting 43.

In motor-compressor units, in which an electric motor having a relatively low starting torque is employed for operating the compressor, some means must be provided for permitting the motor to come up to a certain speed before assuming the working load. I propose to employ a relatively small split phase electric motor for driving the compressor 27, by means of a yieldable or resilient driving connection which permits the rotor to gain momentum before assuming the load of the compressor, thus preventing the possibility of destruction to the motor.

The yieldable connection comprises a resilient coiled member 58, preferably made of spring steel, having one end suitably secured to the shaft 51, such as by a pin 47, and the other end secured to a pin 57, which pin is secured to the rotor 52 adjacent the periphery thereof. Thus it will be seen that the force of the rotor is not applied to rotate the shaft 51 until the coiled spring steel member 58 is wound around the shaft

51, thus locking it to the rotor, during which time, the rotor having made several revolutions, the magnitude of the torque tending to produce rotary motion of the shaft is increased sufficiently to overcome the opposing torque of the compressor. Consequently, by means of this driving connection, an electric motor having the above characteristics may be employed to drive a refrigerant compressor.

10 The compressor 27 is of the so-called rotary type and includes a cylinder block 59 clamped between the vertically extending wall 45 and an outer plate member 60 by means of screws 61. Within the cylinder block 59 there is provided a chamber 63 for refrigerant to be compressed and within the chamber 63 there is disposed a piston 64. The piston 64 is arranged for movement about the cylindrical wall of the chamber 63 by means of an eccentric 65 carried by the drive shaft 51. The shaft 51 extends through the compression chamber 63 and is journaled in a bearing 67 carried by the plate 60.

As shown in Fig. 3, I have disposed the refrigerant inlet port 77 and the outlet port 78 in close proximity to obtain efficient compression of the refrigerant. In order to prevent the refrigerant, entering the inlet port 77, from passing to the outlet port 78 before being compressed, and to also provide a durable compressor having a minimum number of working parts, I provide the piston 64 with a projecting portion or blade 80 which is arranged to project into the outlet port 78, thus dividing the compression chamber 63 into an inlet side 82 and an outlet side 83. The blade 80 may be suitably secured to the piston, as shown, by counter-sunk screws 84. The wall defining the outlet port 78, adjacent the compression chamber 63 and the inlet port 77, constitutes a bearing surface 85 over which the blade 80 slides or reciprocates in a rocking motion during the travel of the piston about the compression chamber.

In Fig. 3 it will be seen that the center of rotation of the eccentric 65 is only a small distance from the center of rotation of the shaft 51 so that the rocking motion of the blade 80 is correspondingly small. The width of the opening or outlet port 78 is made sufficient to allow for the rocking of the blade 80 plus a small passage 86 for exhausting the compressed refrigerant between the blade 80 and the right side of the port 78, as viewed in Fig. 3, which opening is always in open communication with the compression chamber 63. The compressor is designed so that the piston 64 moves in a clockwise direction as viewed in Fig. 3 and as the piston travels about the compression chamber 63 it opens and closes the inlet port 77.

To insure that none of the refrigerant entering the inlet port 77 may escape between the bearing surface 85 and the blade 80, I have provided for resiliently maintaining the blade 80 in contact with the bearing surface 85 by means of a spring 87. An opening 89 is drilled through to the outlet port 78 and substantially at right angles thereto, and the spring 87 is arranged in the opening 89 to urge a contact member 90 against the blade 80, which in turn is urged against the bearing surface 85. The tension of the spring 87 is also made adjustable by means of an adjusting screw 92. Preferably, the adjusting screw 92 is provided with an axially extending bore 93, the purpose of which is to allow lubricating oil contained in compartment 46, the level of which I have in-

dictated at 94, to pass in and out of the opening 89. Without this arrangement there is the possibility of oil leaking into the opening 89 and causing a hydraulic lock therein.

In order to avoid passing the compressed refrigerant through the oil contained in compartment 46, I provide a closed chamber 100 in communication with the outlet port 78 and arranged to deliver the refrigerant from chamber 100 to compartment 48 wherein little or no oil is contained. Preferably, the lower exterior portion of the cylinder block 59 is formed with a flat surface 95 and a casting member 101 is secured thereto by screws 103 and formed to cooperate with the flat surface 95 to provide the chamber 100. Within the chamber 100 there is provided a reed valve 105 for controlling the refrigerant passing from the outlet port thereto and for preventing back pressure in the compression chamber 63 of the higher compressed refrigerant in chamber 100. The reed valve 105, as shown, may be secured by one end to the flat surface 95 of the cylinder block by screws 97. A passageway 107 in communication with the chamber 100 is provided in the cylinder block, and horizontally disposed passageway 109 in communication with passageway 107 (see Fig. 2) is provided in the vertical extending wall 45 of the casting 43 in communication with compartment 48. Thus, after the gaseous refrigerant is compressed it passes through the outlet port 78 to the chamber 100 and from the chamber through passageway 109 to the compartment 48, after which it passes through the outlet fitting 110 and is delivered under pressure to the condenser 25.

Preferably, the outlet fitting is located in the compartment 46. In order to deliver the high pressure gas from the compartment 48 to compartment 46 so that it may enter the fitting 110, I have provided a passage 120 in the vertical wall 45. By this arrangement the compressed gas in compartment 48 enters the inlet end 122 of passage 120 and is discharged into compartment 46 at the outlet end 124 of passage 120. Also, by this arrangement, any oil which may be delivered to the compartment 48 is returned to compartment 46 through passage 120, the highest level to which oil in compartment 48 could rise, being the inlet end 122 of passage 120. This oil is returned by the pressure of refrigerant in compartment 48 on the oil therein.

Preferably, the system is intermittently operated in response to changes in pressures within conduit 28. The evaporator 23 is of the flooded type in which the pressure of the refrigerant bears a direct relation to the temperature of the evaporator. Consequently, the operation of the system will be controlled in response to changes in temperature within the evaporator 23. In order to control the operation of the motor-compressor unit in response to changes in pressure within the conduit 23, I have provided an automatic switch 112, which is adapted to connect and disconnect the motor to and from the power mains 114 at predetermined pressures.

From the foregoing, it will be apparent that I have provided an improved refrigerating system in which a refrigerant compressor and an electric motor for driving the compressor are operably connected by a novel driving connection which permits the motor to operate for a period of time before the load of the compressor is assumed. This arrangement is particularly advantageous in that an inexpensive motor may be utilized to drive a refrigerant compressor without danger of the

motor burning itself out. Moreover, I have provided a compressor which is more efficient in operation and which is durably constructed of a minimum number of moving parts.

5 What I claim as my invention is:

1. Pumping mechanism comprising a cylinder block provided with a compression cylinder and a recess adjacent said compression cylinder, a stationary protruding bearing surface formed on one side and extending inwardly into said recess, a piston mounted for operation in said compression cylinder, a blade rigidly attached to the piston to provide a partition between the high and low pressure sides of the cylinder, said blade extending into and being of lesser width than said recess and operating with a sliding and rocking contact with said stationary protruding bearing surface, said cylinder block also being provided with an outlet passage for discharge of high pressure fluid, and means for maintaining engagement between said blade and bearing surface to seal said high and low pressure sides of said compression cylinder and to maintain a clearance space in said recess on the side opposite said bearing surface to permit said high pressure fluid to pass to said outlet passage, said means including a push rod positioned substantially at right angle to said blade and slidable in said

cylinder wall and a compression spring carried by said cylinder wall and tending to urge said push rod against said blade.

2. Pumping mechanism comprising a cylinder block provided with a compression cylinder and a recess adjacent said compression cylinder, a protruding bearing surface extending inwardly into said recess, a piston mounted for operation in said compression cylinder, a blade rigidly attached to the piston to provide a partition between the high and low pressure sides of the cylinder, said blade extending into and being of lesser width than said recess and operating with a sliding contact with said protruding bearing surface, said cylinder block also being provided with an outlet passage for discharge of high pressure fluid adjacent said bearing, and means for maintaining engagement between said blade and bearing surface to seal said high and low pressure sides of said compression cylinder and to maintain a clearance space in said recess on the side opposite said bearing surface, said means including a push rod positioned substantially at right angle to said blade and slidable in said cylinder wall and a compression spring carried by said cylinder wall and tending to urge said push rod against said blade.

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