

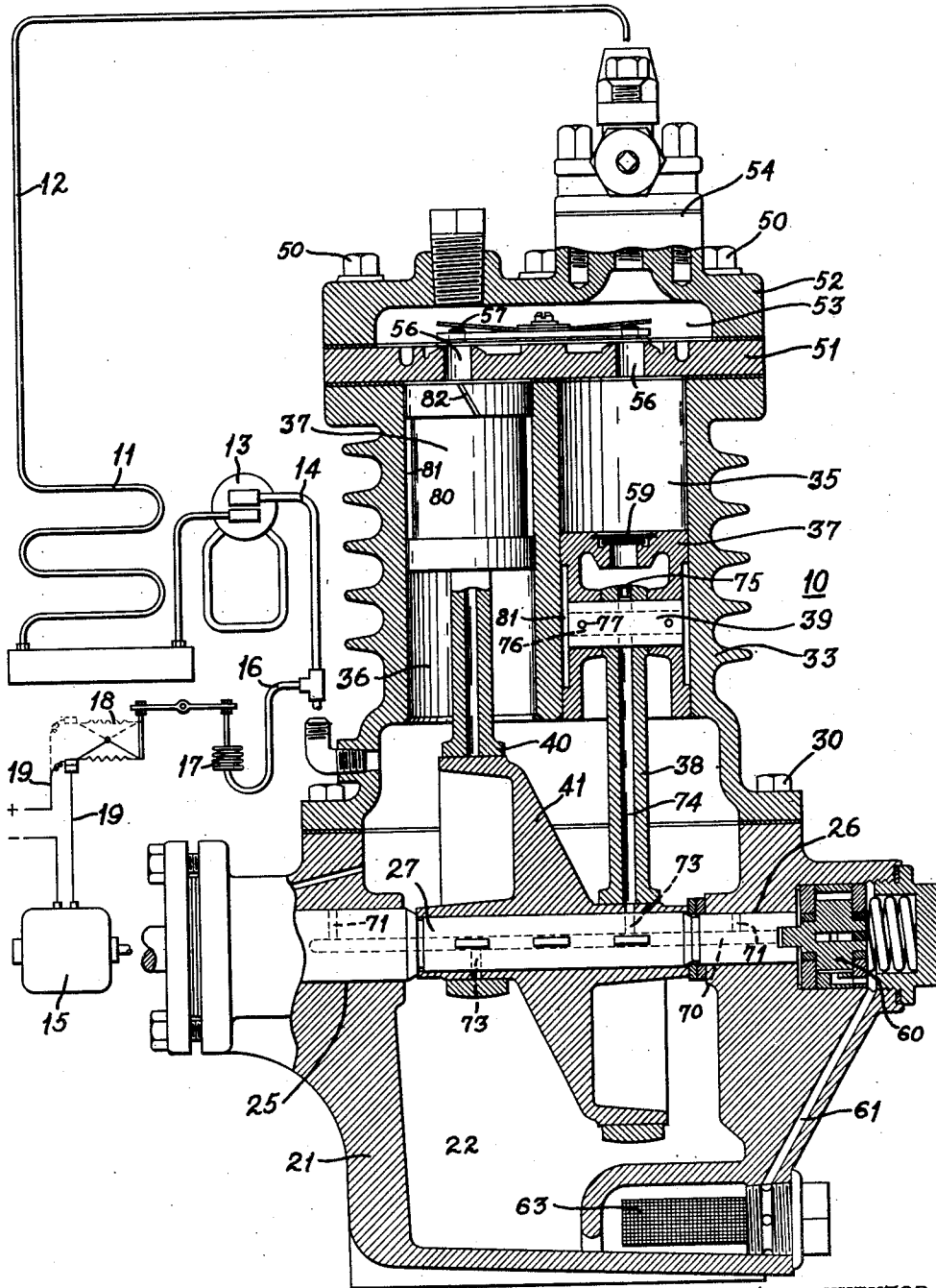
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PUMP FOR REFRIGERATING APPARATUS

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PUMP FOR REFRIGERATING APPARATUS

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This invention relates to refrigerating apparatus and more particularly to motor-compressor units for use with refrigerating apparatus.

Refrigerating apparatus of the compression type generally includes, among other elements, a compressor having its discharge side connected to a condenser and its suction side connected to an evaporator, the evaporator being in turn connected to the condenser through some sort of pressure reducing means. Refrigeration is produced by evaporating a liquid refrigerant under reduced pressure in the evaporator, the vapors being compressed into and condensed in a condenser under a considerable higher pressure. In order to maintain the evaporator, or the refrigerator cabinet within which the evaporator is generally located, at a substantially constant or even temperature, it is customary to operate the compressor intermittently. That is, to say, it is customary to start the compressor when the temperature within the evaporator or refrigerator cabinet reaches a definite high temperature, and to stop the compressor when the temperature is reduced to a predetermined low temperature.

Since the discharge side of the compressor is under condenser pressure, and since the suction side is at evaporator pressure, it is obvious that the compressor must start against a heavy load and the motor must have a high starting torque, unless some means is provided for relieving the compressor of the load until the motor drives the compressor at a substantially normal speed.

It is to such means that my invention relates, having for one of its objects improved means for loading and unloading a compressor, whereby when the compressor has been brought up to speed by its driving member, it is automatically loaded, and whereby, when the speed of the compressor drops below a predetermined limit, it is automatically unloaded. More specifically it is an object of my invention to provide loading and unloading means for the compressor dependent for its loading operation upon the presence of lubricant in the crankcase of the compres-

sor, whereby a deficiency of lubricant will result in an unloading of the compressor.

A further object of this invention is to provide an unloading means for a compressor including a passage, which passage is without valves or other moving parts and which is adapted to be sealed by a fluid, for instance, oil, when the compressor has reached a predetermined speed to thereby load the compressor and which is adapted to be unsealed when the compressor falls below a predetermined speed to thereby unload the compressor.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the drawing, wherein a preferred form of the present invention is clearly shown.

In the drawing:

The figure is a diagrammatic showing of a refrigerating system with the compressor shown partly in section and partly in elevation.

In order to illustrate my invention I have disclosed a compressor embodying features of my invention, which compressor is shown as connected into and forming a part of a compression refrigerating system. This refrigerating system includes, or comprises the compressor 10 which is connected to a condenser 11 through the conduit 12, the condenser 11 being in turn connected to a flooded evaporator of the float control type indicated at 13. The suction side of the compressor 10 is connected through a conduit 14 to the evaporator. A motor is connected to drive the compressor 10 and is adapted to be automatically controlled, to maintain the evaporator between predetermined temperature limits. To this end, a conduit 16 is connected into the suction line 14 of the compressor and is adapted to communicate with a bellows 17, which bellows 17 operates a snap switch 18 located in the electrical lines 19 leading to the motor.

Referring to the compressor 10, it comprises a casting 21 forming a crankcase 22, adapted to contain a body of lubricating oil, the casting 21 being provided with opposite aligned bearing surfaces 25 and 26 for the

drive shaft 27. Above, and secured to the casting 21 by means of the bolts or screws 30, is a second casting 33, having formed therein two cylinders 35 and 36, each cylinder containing a reciprocating piston 37, and each piston being secured to a connecting rod 38, by means of a wrist pin 39. Each connecting rod has its lower end formed into a sleeve 40 enveloping the eccentric 41 formed on the shaft 27. Above the casting 33, and secured thereto by means of bolts 50, are a valve plate 51, and a cylinder head 52, the cylinder head being provided with cut-away portion 53 and with a fitting 54 for connecting the conduit 12 to the chamber 53. The valve plate 51 is provided with passages 56, which passages are controlled by the outlet valves 57.

In order to provide means for lubricating the compressor, there is provided an oil pump 60, herein shown as of the vane type, which pump is located on the end of the driving shaft 27 and is driven thereby. The oil pump has its intake side communicating with a passage 61, which passage has its intake end at the lower end of the crankcase 22 below the body of lubricating oil therein, the intake end of channel 61 being provided with an oil strainer 63. The oil pump 60 discharges oil under pressure into the passage 70 formed in the driving shaft 27, the driving shaft being also provided with lateral passages 71, communicating with the passage 70 for conducting oil to the bearings 25 and 26. The drive shaft 27 is also provided with passageways 73 communicating with passages 74 within the connecting rods 38 which passages are open thru a restriction at their upper ends to the interior of the crankcase as shown at 75. The wrist pins 39 are provided with longitudinal passages 76 communicating with the passages 74 and with lateral passages 77 communicating with the passages 76 and adapted to conduct oil to the bearing surfaces of the wrist pins.

Thus it will be seen that when the compressor is operating the various parts of the compressor are lubricated by oil forced under pressure by the pump 60 through the various passages formed in the driving shaft connecting rods and wrist pins. In addition, the sides of the cylinder walls may be lubricated by the splashing of the lubricating oil upwardly thereon by the eccentrics 41 dipping down into the lubricant.

In order to provide means for loading the compressor when it is driven at a predetermined speed by the motor, each piston is provided with a cut-away portion 80 forming a jacket 81 extending substantially throughout the length of the piston, which jacket is adapted to communicate, and to receive oil from the passage 76 in the wrist pin 39. Groove 82 is formed in the piston head, which groove connects the upper or

pressure side of the piston with the jacket 81 surrounding the piston. During the inoperative period of the compressor, the groove 82 is unsealed, providing an open passageway between the high pressure side of the piston and the low pressure crankcase. When the compressor is operating, however, the oil pressure generated by the oil pump 60 and exerted on the oil within the jacket 81 is sufficient to seal the groove 82 with lubricating oil thereby preventing the passage of pumped fluid from above the piston through the groove to the crankcase.

The operation of my improved construction is as follows. As stated above, during the idle or shut down periods, during which time the compressor is not operating, the groove 82 will be open and will provide a passage from above the piston to the crankcase. When temperature within the evaporator increases to the predetermined high limit, the bellows 17 will snap the switch 18 to the "on" position whereby the motor 15 will start to drive the compressor 10. During the first few strokes of the pistons 37, compression will not be effected for the reason that the gas in the cylinder 35 above the piston 37 will not pass through the valve 57 but will pass downwardly through the groove 82 into the jacket 81 and thence back to the low pressure crankcase 22. As the motor speeds up, however, the speed of the oil pump 60 will increase, and will finally reach the point where it is delivering oil under considerable pressure through the passages 70, 74, 75, 76 and into the jacket 81. The oil within the jacket 81 will be forced upwardly into the groove 82, thereby sealing the latter. Compression will thereafter be effected, the gas being forced outwardly through the passages 56 past valves 57 into the discharge chamber 53, from where it will pass through the conduit 12 into the condenser 11. Here the compressed refrigerant will liquefy and, collecting in the receiver, will finally pass in liquid form to the evaporator 13. Herein the liquid refrigerant will evaporate, the vapors passing through the conduit 14 into the crankcase 22 and thence upwardly through the intake valve in the piston head into the cylinder to be recompressed.

Should the speed of the motor decrease, for example, when the motor is stopping due to the fact that the temperature in the evaporator has been reduced to the predetermined minimum or, due to an overloading condition of any kind, the pressure of the oil within the groove 82 will be insufficient to seal the groove, thereby allowing the compressor to operate in an unloaded condition. Further should the lubricating oil become depleted, the oil pump 60 will not pump sufficient oil to seal the groove 82, thereby allowing the compressor to run in an unloaded condition

and indicating to the operator that some abnormal condition exists within the apparatus.

municating with the space above said piston and with said oil jacket, a connecting rod having a longitudinal passage and a wrist pin connecting said piston to said rod and provided with a passage communicating with said oil jacket and with the passage in said rod, and means for forcing oil through said rod, wrist pin and jacket into said groove to seal the said groove to thereby load the compressor when it is driven at a predetermined speed.

In testimony whereof I hereto affix my signature.

ALEX A. McCORMACK.

Thus it will be seen that I have provided a loading and unloading device for a compressor, operating automatically, substantially without moving parts, and depending for its successful operation upon the presence of lubricating oil within the compressor.

While the form of embodiment of the present invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows.

1. In a compressing unit, a compressor comprising a cylinder, a reciprocating piston in said cylinder, said piston dividing said cylinder into a pressure portion and a suction portion, said piston having a normally open passage connecting said suction and pressure portions and means adapted to fluid-seal said passage against the passage of compressed fluid from the pressure portion to the suction portion when the compressor is driven at a predetermined speed.

2. In a compressing unit, a compressor comprising a cylinder, a reciprocating piston in said cylinder, said piston dividing said cylinder into a pressure portion and a suction portion, said piston having a normally open passage connecting said suction and pressure portions and means adapted to fluid-seal said passage against passage of compressed fluid from the pressure portion to the suction portion when the compressor is driven at a predetermined speed, said last named means also permitting the unsealing of said passage when the speed of the compressor is reduced to a predetermined minimum.

3. A compressing unit including a crankcase provided with a suction port, a cylinder mounted on said crankcase, a reciprocating piston in said cylinder, a drive shaft and means connecting the driving shaft to the piston, said piston including a head portion and a body portion provided with a cutaway section forming a jacket for oil, said piston head having a passage communicating at its upper end with the space above the piston and at its lower end with the said oil jacket, an oil pump driven from said shaft, said pump being connected to said jacket on its discharge side and to the crankcase on its intake side, whereby when the compressor is driven at a predetermined speed, the passage in said piston head will be sealed with lubricating oil.

4. A compressing unit including a crankcase, a cylinder mounted on said crankcase, a reciprocating piston in said cylinder, said piston having a head portion and a body portion, said body portion having a cut-away portion providing a jacket for oil and said head portion having a groove therein com-

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