Aug. 29, 1950 O. H. BUSCHMANN 2,520,674

COMPRESSOR UNLOADER

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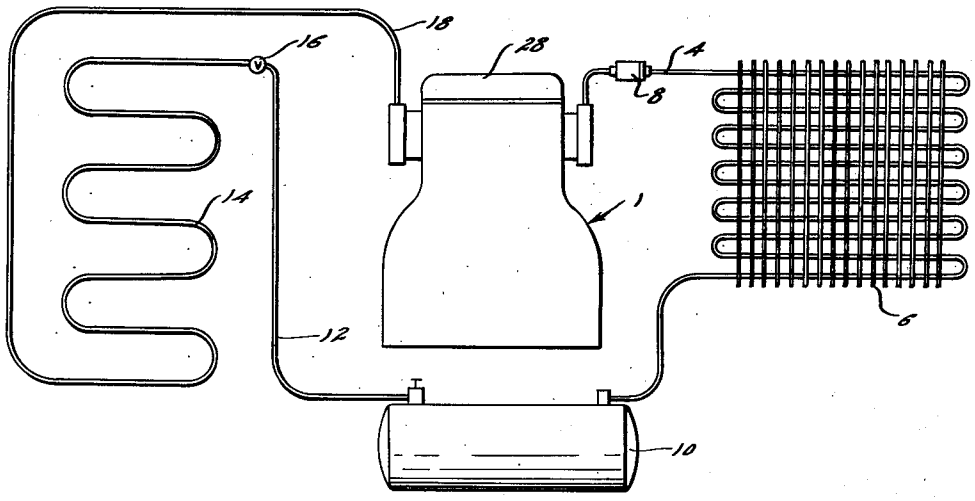


Fig. 1.

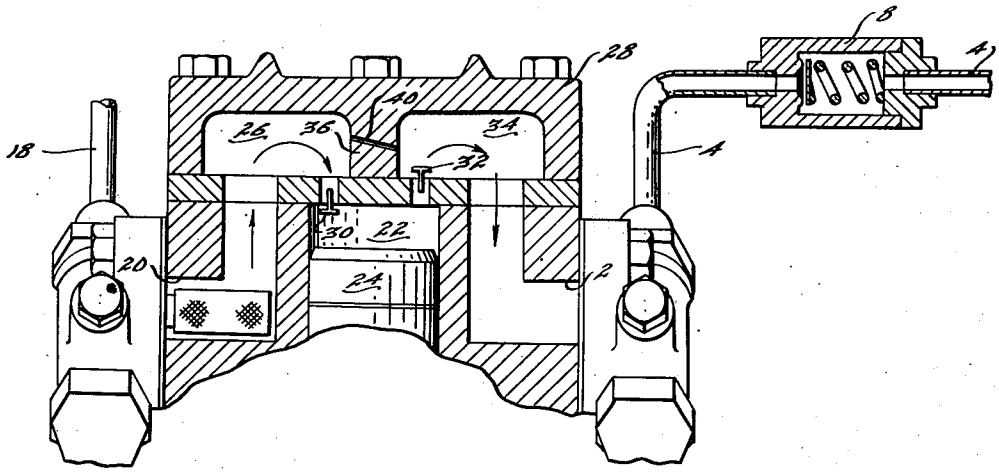


Fig. 2.

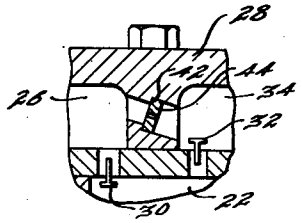


Fig. 3.

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COMPRESSOR UNLOADER

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This invention relates generally to compressor unloaders and more specifically to an unloader for a refrigeration compressor.

The primary object of this invention is to provide a simple, efficient, and economical unloader for a cycling refrigerator compressor. Other objects are to provide such an unloader which has no moving parts, to provide an unloader which requires no complicated control mechanism for actuating the same, to provide such an unloader which is trouble-free in operation, and generally to improve unloaders of the character described.

In the drawing which is to be taken as a part of this specification and in which figures, like parts are designated with like reference characters,

Fig. 1 is a schematic view of a refrigeration system embodying the invention;

Fig. 2 is a diagrammatc sectional view of a compressor showing the unloader; and,

Fig. 3 is a partial view of the compressor showing a modified form of the invention.

Referring to the drawing by characters of reference, the numeral 1 indicates generally a compressor adapted to be driven by any convenient source of power and having a discharge outlet port 2 connected by means of a conduit 4 to a condenser 6. Interposed in the conduit 4 is a check valve 8 for preventing flow of high-pressure refrigerant from the condenser 6 back to the compressor 1. The discharge outlet of the condenser 6 is connected to the inlet of a liquid receiver 10 whose outlet is connected by means of a conduit 12 to the inlet of the evaporator 14. A suitable refrigerant controlling mechanism such as an automatic expansion valve 16 is inserted in the conduit 12 adjacent the evaporator 14 for controlling flow of refrigerant thereto. The outlet of the evaporator 14 is connected by means of a conduit 18 to the inlet or suction port 20 of the compressor 1.

Referring more specifically to Fig. 2, the compressor 1 comprises a piston chamber 22 in which is reciprocated a piston member 24 by means of the usual crank shaft (not shown). As the piston 24 moves downwardly, the volume of the chamber 22 increases, allowing vaporous refrigerant to flow from the evaporator 14 through the conduit 18, suction port 20, into the inlet chamber 26 of the head 28 of the compressor 1, from whence it flows through suction valve 30 into the piston chamber 22. As the piston 24 moves upwardly in the chamber 22, the valve 30 closes and the discharge valve 32 opens, allowing the compressed refrigerant to flow from the chamber

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22 past the discharge valve 32 and into the discharge chamber 34 for flow through the outlet port 2 and conduit 4 to the condenser 6 wherein the heat is removed and the vapor changes to a liquid. The head 28 has a common dividing wall 36 separating the chambers 26 and 34. A small diameter passageway 40 extends through the common wall 36 and communicatively connects the discharge chamber 34 with the suction chamber 26.

During normal operation of the compressor 1, when it is pumping fluid from the evaporator 14 to the condenser 6, fluid will flow through the passageway 40 from the discharge chamber 34 to the suction chamber 26. Such flow, however, is of such a low magnitude that the pumping efficiency of the compressor 1 is not seriously impaired. During periods in which the compressor 1 is not pumping, however, fluid will pass from the chamber 34 through the passageway 40 to the chamber 26 until such time as the pressures in the two chambers are equalized, whereby the compressor 1 may be started with less torque applied to the crank shaft (not shown). The volume of the high pressure fluid which must pass through the passageway 40 is of relatively small magnitude, since the volume thereof is only that contained in the discharge chamber 34 and the passageway connecting this chamber 34 to the check valve 8 so that the diameter will readily equalize the pressures in these chambers in a short period of time.

In the modification shown in Fig. 3, a larger diameter passageway connects the chambers 34 and 26, and this passageway has a shoulder 42 facing the chamber 34 for positioning an orifice member 44 having a very small orifice extending therethrough. Since the length of this orifice is decidedly less than the length of the small bore passageway 40, it must be of correspondingly smaller diameter so that during normal pumping operation of the compressor 1 only an inconsequential proportion of the pumped fluid returns through the orifice member 44 from the discharge chamber 34 to the section chamber 26, thereby maintaining the pumping efficiency of the compressor 1 substantially unimpaired.

It will be obvious to those skilled in the art that such an unloading device is simple of manufacture, it being necessary merely to drill a hole through the common wall 36, and that it will be relatively trouble-free in operation, since the length thereof is generally sufficient to provide a slow rate of fluid flow therethrough with nor-

mal differentials in pressure and the bore diameter will be sufficiently great to prevent clogging.

What is claimed and is desired to be secured by United States Letters Patent is as follows:

1. In a fluid pump adapted to be cycled, a head structure having an inlet compartment and an outlet compartment, a dividing wall separating said compartments and having a bleed passageway therethrough continuously communicatively connecting said compartments.

2. In a fluid pump adapted to be cycled, a head structure having an inlet compartment and an outlet compartment, a dividing wall separating said compartments, said wall having a constantly open passageway communicatively connecting said compartments, said passageway flow capacity being such that with said pump being operated to maintain said compartments at design pressures the fluid passed by said passageway from said outlet compartment to said inlet compartment is a minor fraction of the pumping capacity of the pump.

3. In a fluid pump adapted to be cycled, means providing an inlet chamber and an outlet chamber for the pump and having a common dividing wall, said wall having a passageway extending therethrough and constantly communicatively connecting said chambers, said passageway including a small bore orifice member for controlling flow of fluid between said chambers.

4. In a refrigerating system having a compressor and a condenser; said compressor having an inlet passageway and an outlet passageway communicatively connected to said condenser; means providing a constantly open fluid flow passageway connecting said inlet and outlet passageways; said constantly open passageway having a flow capacity such that, with said compressor being operated to maintain said inlet and outlet passageways at design pressures, the fluid passed by said constantly open passageway is a minor fraction of the pumping capacity of said compressor; and valve means operable to prevent fluid flow from said condenser to said compressor.

5. A compressor head comprising a member having a pair of chambers separated by a common wall, said wall having a small diameter passageway communicatively connecting said chambers, said diameter being sufficiently small relative to the length of said passageway as to permit no more than a minor fraction of the fluid pumped by said pump to flow therethrough.

6. In a refrigerating system having a compressor and a condenser, said compressor having an inlet passageway and an outlet passageway communicatively connected to said condenser, said compressor having a predetermined displacement capacity per unit of time, means providing a constantly open small bore fluid flow passageway connecting said inlet and said outlet passageways, said small bore passageway having a fluid flow capacity per unit of time with said compressor being operated to maintain said inlet and outlet passageways at design pressures such that the fluid passed by said small bore passageway is a minor fraction of said compressor capacity, and fluid flow controlling means in said outlet passageway between said condenser and the opening of said small bore passageway and operable to restrain flow of fluid from said condenser to said compressor.

7. In a fluid pump adapted to be cycled, a body member having a piston chamber, a piston in said chamber, means for reciprocating said piston, an inlet passageway opening into said chamber and adapted to be supplied with fluid from a source, a unidirectional inlet valve permitting fluid flow solely toward said chamber, an outlet passageway leading from said chamber for transmitting the fluid pumped by said pump to a desired location, a unidirectional outlet valve in said outlet passageway permitting fluid flow solely in a direction away from said chamber, means providing a small bore passageway, said small bore passageway opening into a portion of said inlet passageway which is separated from said chamber by said inlet valve and opening into a portion of said outlet passageway which is separated from said chamber by said outlet valve, the flow capacity of said small bore passageway being such that with said pump being operated to maintain said inlet and outlet passageways at design pressures the fluid passed by said small bore passageway is a minor fraction of the pumping capacity of said pump, and a second unidirectional outlet valve permitting fluid flow in a direction solely away from said chamber, said second outlet valve being intermediate the opening of said small bore passageway into said outlet passageway and said desired location.

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