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PISTON FOR REFRIGERATION PUMPS

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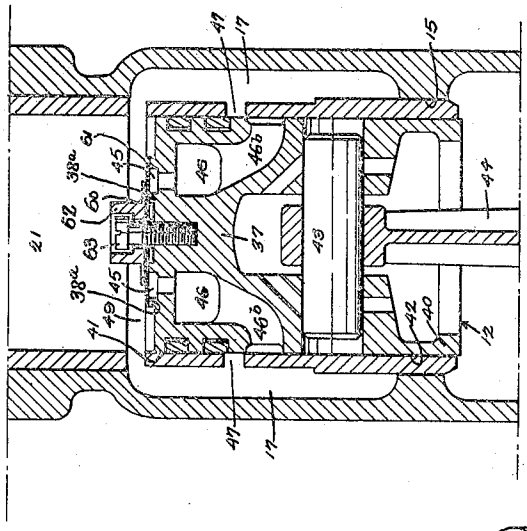


Fig. 2

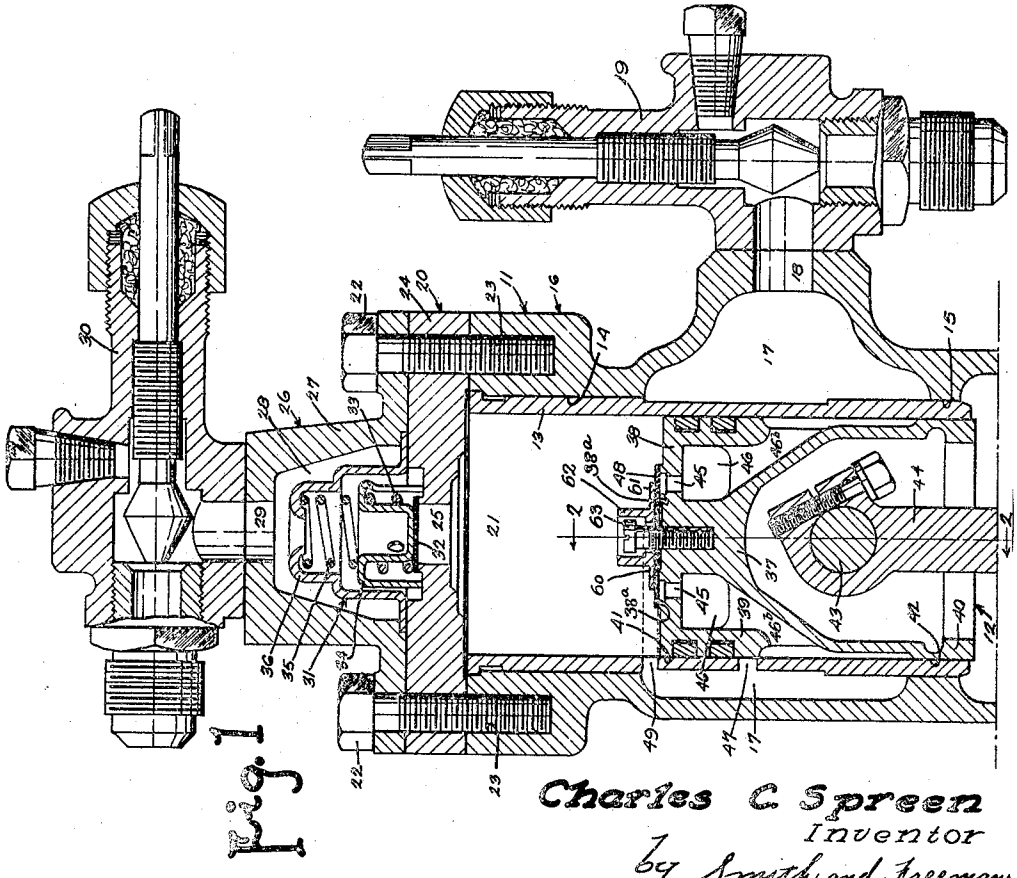


Fig. 1

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UNITED STATES PATENT OFFICE.

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PISTON FOR REFRIGERATION PUMPS.

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My invention relates to mechanical refrigeration, and particularly to compressors for compressing the refrigerant in mechanical refrigeration units, and the particular object of my invention is to provide a new and improved compressor of this type. In the drawings accompanying this specification and forming a part of this application I have shown, for purposes of illustration, one form which my invention may assume. In these drawings:

Figure 1 is a central vertical section through this illustrative embodiment of my invention, while

Figure 2 is a fragmentary vertical section taken on the line 2—2 of Figure 1.

The compressor 11 herein shown comprises a piston 12 operating in a cylinder sleeve 13 received and supported within alined upper and lower annular surfaces 14 and 15 provided upon a compressor casing 16. The casing extends outwardly intermediate the upper and lower annular faces 14 and 15 to provide between itself and the cylinder sleeve 13 a refrigerant intake chamber 17, with which an intake opening 18, controlled by a suitable shut-off valve 19, is associated. A compressor head 20 forming the upper wall of the compression chamber 21, is secured to the compressor casing 16 by means of a plurality of bolts 22 which extend into screw-threaded apertures 23 formed about the upper portion of the compressor casing 16. The compressor head includes a plate 24 directly engaging the upper edge of the compressor casing 16, and the upper edge of the cylinder sleeve 13, and is provided with a central outlet opening 25; and a dome 26 surmounting the plate 24, provided with an upper convexed section 27 providing an outlet chamber 28 in communication with the outlet opening 25 in the plate 24. The dome has an outlet opening 29 for the flow of the compressed refrigerant from the outlet chamber 28 through a suitable shut-off valve 30. Carried within the outlet chamber 28 is a suitable valve unit 31 herein shown as comprising a valve plate 32 yieldably held in position closing the upper end of the outlet opening 25 of the plate 24 by means of a compression spring 33 confined between the upper face of the valve plate 32 and the lower face of the upper end of a yielding abutment 34 itself yieldably held in position by means of a compression spring 35 confined between the upper face of the upper end of the yielding abutment 34 and the lower face of the upper end of a fixed abutment 36 fixedly mounted in position within the compressor head 20, the double valve mechanism being provided to permit abnormal opening of the valve for the passage of an unusual discharge from the compressing chamber 21, such as a slug of oil, or the like.

In the embodiment of my invention herein shown the piston 12 comprises a body 37, a head 38 secured to the upper end of the body 37 and forming the movable wall of the compressing chamber 21, upper and lower skirts 39 and 40 depending respectively from the head 38 and the body 37 and themselves provided with alined upper and lower surfaces 41 and 42 slidably engaging the inner surface of the cylinder sleeve 13, and a bearing pin 43 mounted in the body 37 and receiving the connecting rod 44 by which the piston 12 is reciprocated within the cylinder sleeve 13. The piston head 38 is provided with a pair of annular concentrically arranged projecting seats 38^a and a plurality of apertures 45 communicating with a chamber 46 within the piston 12 in communication with the intake chamber 17 of the compressor casing 16 through radially extending passages 46^b and a port 47 in the cylinder sleeve 13 except when the skirt 39 depending from the piston head 38 covers this port 47 when the piston 12 is in its extreme retracted position. The flow of refrigerant from the intake chamber 17 through the port 47 and piston chamber 46 and apertures 45 into the compressing chamber 21 is controlled by an annular thin metal valve plate 48 overlying the apertures 45 and permitting flow of refrigerant into the compressing chamber 21, but seating against the piston head seats 38^a to prevent flow of refrigerant in the reverse direction through the ports 45 from the compressing chamber 21 back into the intake chamber 17.

The annular valve plate is provided with a central aperture and has associated therewith a follower 60 provided with an annular base portion 61 which is adapted to engage with the valve plate. The follower base is of less diameter than the valve plate and partially overlies the ports 45 which are similarly spaced and extend through the piston end wall intermediate the seats 38ª. An annular flange 62 extends from the base and is adapted to project into the aperture 25 in the compressor head plate when the piston is adjacent thereto, thus with the piston displacing substantially all of the compressed refrigerant in the compression chamber and preventing reexpansion when the piston is retracted. A stud 63 extends within the flange 62 and projects through a central aperture in the follower and the central aperture in the valve plate, and is screwed into the head wall of the piston. The valve plate and follower are both bodily movable relative to the piston to open and close the ports 45, and are retained with the piston by the stud head. Compressed refrigerant passes from the periphery of the valve plate and through the central aperture therein, so that the valve will move substantially bodily from the seats without flexing serious to its operation and life.

The compressor 11 herein shown is provided with a second passageway for the inflow of refrigerant into the compressing chamber 21, comprising a second port 49 formed through the cylinder sleeve 13 directly from the intake chamber 17 into the compressing chamber 21 at a point to be uncovered by the skirt 39 depending from the piston head 38 only when in substantially the extreme retracted position of the piston 12.

From the above description those skilled in the art will understand that with the shut-off valves 19 and 30 in open position, and the pumping apparatus in operation, the refrigerant will flow through the shut-off valve 19 into the intake chamber 17 and the piston chamber 46, and that during retraction of the piston 12 this refrigerant will flow additionally through the apertures 45 into the compressing chamber 21. Upon the beginning of the compression stroke of the piston 12 the valve 48 will close the apertures 45, and the piston 12 will compress the refrigerant within the compression chamber 21 until it raises the valve plate 32 and flows out through the outlet chamber 28 and outlet shut-off valve 30. During the final portion of the retraction stroke of the piston 12 communication between the intake chamber 17 and the piston chamber 46 will be cut off by the skirt 39 depending from the piston head 38, to cut off, at this time, the flow of refrigerant into the compression chamber 21 through the apertures 45, and to cause the valve 48 to seat slightly in advance of the beginning of the compression stroke of the piston 12, and thus insure that the valve 48 is fully seated at the beginning of the compression stroke of the piston 12. The full charge of refrigerant into the compression chamber 21 is still permitted because of the second port 49 formed directly between the intake chamber 17 and the compression chamber 21 and uncovered during the final portion of the retraction stroke of the piston 12, uncovered at the same time that the port 47 is covered to cut off the inflow of the refrigerant through the apertures 45.

Under these circumstances those skilled in the art will realize that I have provided a compressor accomplishing at least the principal object of my invention.

At the same time those skilled in the art will realize that the embodiment of my invention herein shown and described includes advantages other than those specifically referred to herein, and also that this particular embodiment of my invention may be variously changed and modified without departing from the spirit of my invention or sacrificing the advantages thereof, and it will therefore be understood that the disclosure herein is illustrative only, and that my invention is not limited thereto.

I claim:

1. In a compressor, the combination of a piston having ports extending through the end wall, and a valve structure comprising a plate adapted to seat against the end wall of said piston to close the ports therethrough, a follower movable with said valve plate, and a retainer stud secured to the end wall of said piston for said follower and valve plate, said valve plate and follower being reciprocable relative to said stud and piston.

2. In a compressor, the combination of a piston having ports extending through the end wall, and a valve structure comprising a valve plate exterior of the end wall of said piston, a valve plate follower, and means for retaining said valve plate and follower with said piston, said plate and follower being reciprocable relative to said piston.

3. In a compressor, the combination of a piston having ports extending through the end wall thereof; a valve structure reciprocable exteriorly of the end wall of said piston, said structure comprising a thin disc adapted to seat against said piston and wall interiorly and exteriorly of the ports, and a follower of smaller diameter than said disc and means for retaining said valve structure with said piston.

4. In a compressor, the combination of a piston having ports extending through the end wall thereof in annular relation; a valve structure reciprocable exteriorly of the end wall of said piston, said structure including a thin disc adapted to seat against said piston end wall interiorly and exteriorly of said annularly arranged ports, and a follower of

smaller diameter than formed by the exterior of said ports; and means for retaining said valve structure with said piston.

5. In a compressor, the combination of a piston having ports extending through the end wall thereof; a valve structure reciprocable exterior of said piston end wall comprising a disc for covering said ports, and a follower, said follower and disc having apertures therethrough; and a stud secured to said piston, the shank of said stud extending through the apertures in said disc and follower.

In testimony whereof I hereunto affix my signature.

CHARLES C. SPREEN.