Aug. 4, 1953 S. M. SCHWELLER 2,647,683

COMPRESSOR

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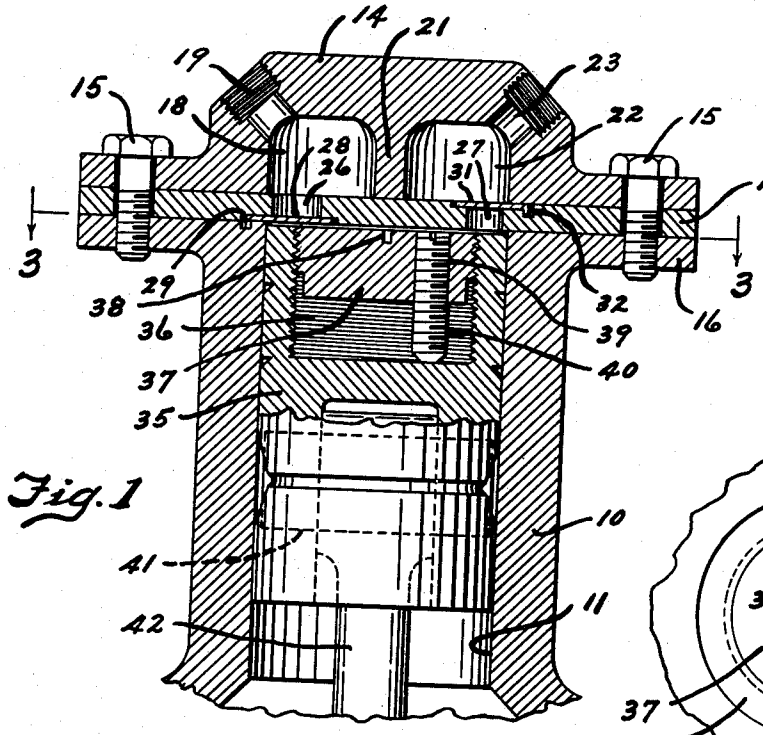

Fig. 1

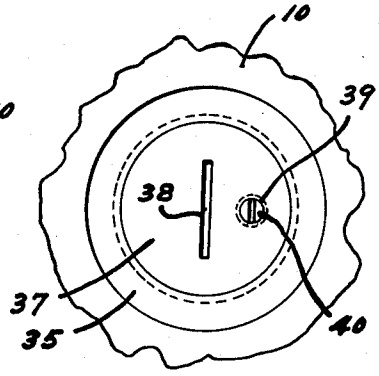

Fig. 3

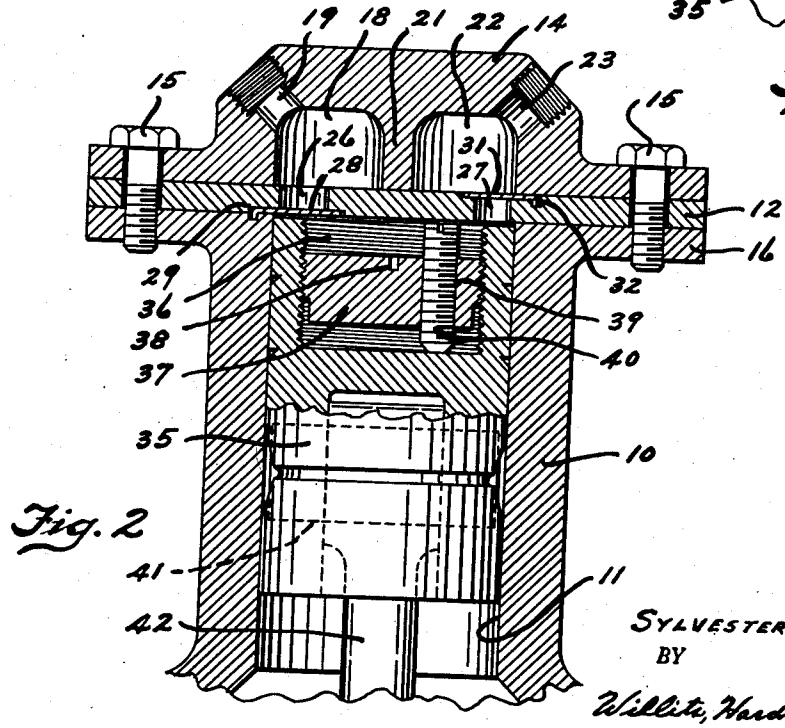

Fig. 2

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COMPRESSOR

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2 Claims. (Cl. 230—21)

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This invention relates to compressors and particularly to compressors for use in refrigerating systems.

An object of my invention is to provide an improved, simple and inexpensive means or device for adjustably setting the cylinder clearance within a compressor.

Another object of my invention is to provide a compressor piston with an element carried thereby and adjustable relative to the length thereof for increasing and decreasing the cylinder clearance in the cylinder within which the piston reciprocates.

In carrying out the foregoing objects it is still a further object of my invention to provide a compressor piston with a plug threaded into a bore therein which plug is adjustable relative to the piston to increase or decrease the volume of the compression space in the cylinder within which the piston reciprocates and to provide means for locking the plug in any one of its adjusted positions.

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 fragmentary sectional view of a portion of a compressor showing my improved device set in a position to provide the compressor with a minimum cylinder clearance;

Fig. 2 is a view similar to Fig. 1 showing my device set in a position providing the compressor with increased cylinder clearance; and

Fig. 3 is a fragmentary view taken on the line 3—3 of Fig. 1 showing the top portion of parts of my adjustable cylinder clearance device.

Referring to the drawings, for illustrating the present invention, I have shown in Fig. 1 thereof the working portion of a compressor such, for example, as a conventional compressor of a refrigerating system. This portion of the compressor comprises a housing or casing 10 provided with a bore 11 forming the cylinder of the compressor. A valve plate 12 is located on top of housing 10 to substantially close the upper end of the cylinder 11. A head 14 is located on top of plate 12 and suitable bolts 15 extend through holes in a flange provided on head 14 and through holes provided in plate 12 and these bolts are threaded into tapped holes provided in a flange 16 on housing 10 as is conventional in the art so as to firmly secure plate 12 and head 14 to the housing 10. Gaskets may, if desired, be

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placed between housing 10 and plate 12 and between plate 12 and head 14. The head 14 is provided with a fluid inlet chamber 18 having an inlet port 19 adapted to be connected to the suction conduit or pipe of a closed refrigerating system (not shown). A web 21 on head 14 separates the inlet chamber 18 from a fluid outlet chamber 22 having discharge port 23 adapted to be connected by a pipe to the condenser of the closed refrigerating system. Plate 12 is provided with an opening 26 adapted to permit fluid to enter the cylinder 11 and with another opening 27 adapted to permit fluid to escape from the cylinder. These openings 26 and 27 are normally closed by any well known or conventional inlet and outlet valves. In the present disclosure I show a flat spring type inlet valve 28 secured in any suitable or desirable manner, between housing 10 and plate 12, within a recess 29 provided in the lower face of valve plate 12 for normally closing the inlet opening 26. I show a flat spring type discharge valve 31 secured in any suitable and desirable manner, between the plate 12 and head 14, within a recess 32 provided in the upper face of valve plate 12 for normally closing the outlet opening 27. It is to be understood that while the valves 28 and 31 are herein shown more or less diagrammatically they may be of any conventional present day type or design.

A piston 35 having suitable oil grooves thereabout and located in the cylinder 11 is provided with a threaded counterbore or round cavity 36 in its upper closed end into which a disk-like plug or element 37 is threaded for a purpose to be hereinafter described. This plug or element 37 is of less thickness than the depth of the counterbore or cavity 36 so as to permit the same to be threaded upwardly or downwardly within the cavity or longitudinally relative to the length of piston 35. The threaded plug or element 37 is provided with a screw driver receiving groove 38 or the like and with a tapped hole 39 which hole receives a set or lock screw 40 (see Fig. 3). The piston 35 is provided with bearings which receive a wrist pin 41 to which is connected a pitman or connecting rod 42 in the usual and conventional manner. The lower end of rod 42 is adapted to be connected to an eccentric portion of a shaft of the compressor, which may be rotated by an electric motor, for causing reciprocation of the rod 42 and consequently reciprocation of piston 35 within cylinder 11 as is well-known and conventional in the art.

In compressors of the type herein illustrated

the cylinder clearance is usually referred to as being the space within cylinder 11 intermediate the top of piston 35 and valve plate 12 when the piston is at the uppermost portion of its stroke. By holding this cylinder clearance space to a minimum volume the compressor capacity is at or near its maximum and by increasing this space the compressor capacity is reduced. Stated in another way, if the compressor is designed to have a rather great volumetric cylinder clearance and is driven by an electric motor of predetermined capacity the cylinder clearance of the compressor may be reduced to increase the capacity and efficiency of the compressor, within predetermined limits without overloading and damaging the electric driving motor. Thus to adjustably set the cylinder clearance of the compressor is desirable in order to render the same or similar compressors capable of being installed in different refrigerating systems of like charge, equal evaporator size and driving motor capacity wherein the evaporator of one system may be desired to be maintained at a lower temperature than the evaporator temperature of another system. The adjustable set clearance device incorporated in the compressor herein disclosed permits accomplishment of the desideratum explained and avoids the necessity of manufacturing a great number of compressor sizes for refrigerating systems of different capacities at least within a predetermined capacity range.

After assemblying the piston 36 into the cylinder 11 of the present compressor the plug 37 is rotated about the threads on the side wall of cavity 36 to adjust the plug or element 37 longitudinally relative to the length of piston 35 to provide a predetermined cylinder clearance within the compressor. The set-screw 40 is thereafter rotated about the threads of the tapped hole 39 in plug 37 to cause the same to tightly engage the inner or bottom wall of cavity 36 to thereby lock the plug 37 in its adjusted position against rotation relative to the piston. The valve plate 12 and head 14 are then secured to the cylinder housing 10. The adjusted or set position of the adjustable cylinder clearance device may be indicated on an exterior part of the compressor by stamping a numeral or the like insignia thereon. In order to obtain maximum capacity from the compressor the cylinder clearance device is adjusted to and set in the position thereof disclosed in Fig. 1 of the drawing. In this position of the plug 37 very little if any of the compressed fluid remains in the cylinder after the upward or compression stroke of the piston and this permits the piston, during its suction or down stroke to draw into the cylinder, through valve 26, a maximum amount of gaseous refrigerant from chamber 18 and consequently the suction or low pressure side of the refrigerating system. However if less than the full capacity of the compressor is desired the plug 37 of the cylinder clearance device is adjusted, longitudinally relative to the length of the piston, and set at a point below the top surface thereof such, for example, as is disclosed in Fig. 2 of the drawing. In this position of plug 37 a small amount of refrigerant fluid, compressed by a preceding upward or compression stroke of the piston, remains trapped in the cylinder thereby preventing the piston from sucking a great amount of gaseous refrigerant, which it otherwise would be capable of withdrawing, from the suction or low pressure side of the refrigerating system. Thus it should be obvious that adjustment of plug 37 of the

cylinder clearance device herein disclosed will permit the compressor to meet the requirement of maintaining an evaporator of a refrigerating system between predetermined temperature limits within a range as is desired. A stock of compressors with the different cylinder clearance therein indicated thereon as described will suffice to provide a compressor of the proper capacity for certain refrigerating system installations and which compressors may be driven by a given size or capacity electric motor without fear of overloading or damaging the motor.

The adjustable cylinder clearance setting device may also be changed by a serviceman after installation of the refrigerating system to compensate for certain requirements made of the system. The serviceman may remove the compressor head 14 and valve plate 12 together with valves 28 and 31, to gain access to the upper end of the piston 35, and may then loosen the lock screw 40 to permit rotation or adjustment of plug 37 longitudinally of the piston to thereby increase and/or decrease the cylinder clearance within the compressor as desired. The serviceman will of course lock the plug 37 in its readjusted position by the lock screw 40 before reassemblying the valve plate 12, valves 28 and 31 and the head 14 upon the compressor.

In view of the foregoing it should be apparent that I have provided an improved cylinder clearance adjusting device for a compressor by employing a minimum of parts and incorporating the same directly in the compressor piston. The manner in which I lock the plug of the cylinder clearance device insures that the plug will not become loose during reciprocation of the compressor piston. The cylinder clearance device is located in a position within the compressor normally occupied by a portion of the piston and therefore eliminates the necessity of employing auxilliary equipment adjacent to and outside the compressor while also eliminating the provision of added chambers and the like within the working end of a compressor.

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

What is claimed is as follows:

1. In combination, a compressor having a cylinder, a piston therein, and a discharge valve for said cylinder, said piston having an end portion exposed to the interior of said cylinder, a closed end threaded bore in the exposed portion of said piston, a plug threaded into said bore, the outer surface of said plug being normally disposed flush with the exposed end portion of said piston to provide a minimum cylinder clearance within said compressor, said plug being rotatable into the piston to position its said outer surface inwardly of the exposed end portion of said piston for increasing the cylinder clearance within said compressor, and a screw threaded through said plug and engaging the closed end of said bore for locking the plug in any one of its adjusted positions against rotation relative to said piston.

2. In combination, a compressor having a cylinder, a piston therein and a discharge valve for said cylinder, said piston having an end portion exposed to the interior of said cylinder, a closed end threaded bore in the exposed portion of said piston, a plug threaded into said bore, said plug being rotatable within said bore for varying the

cylinder clearance within said compressor, and means threaded through said plug into engagement with the closed end of said bore for locking the plug against rotation relative to said piston.

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