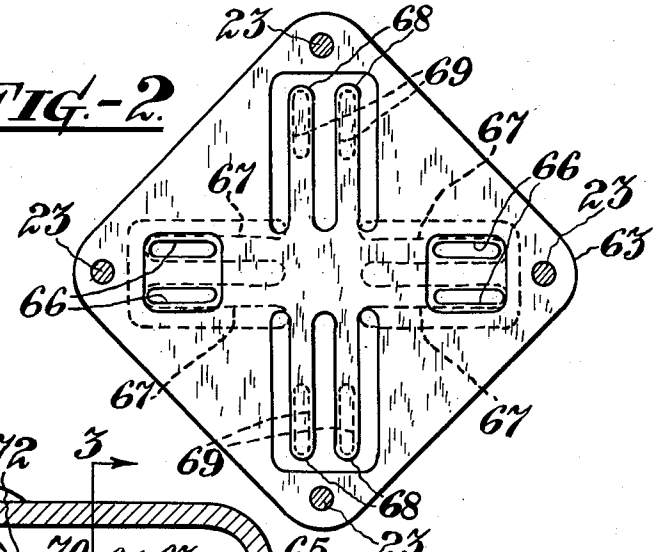
March 1, 1938. J. LE VALLEY 2,109,541

COMPRESSOR

Filed Aug. 4, 1936

FIG.-2.



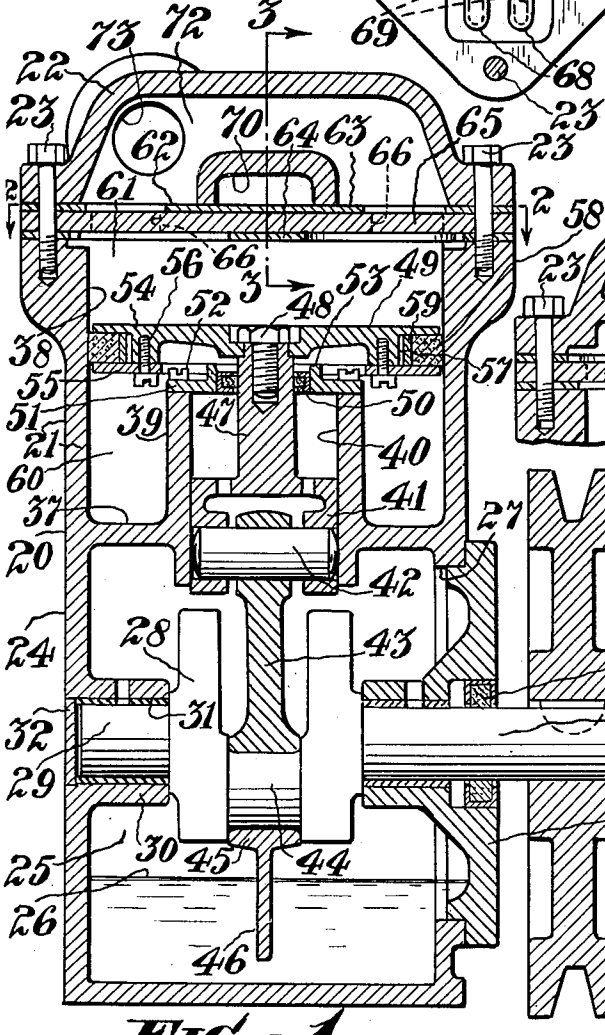


FIG.-1.

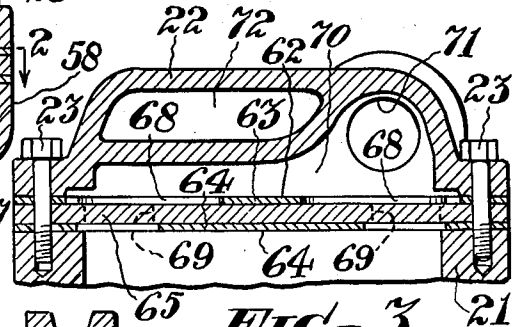


FIG.-3.

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COMPRESSOR

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Application August 4, 1936, Serial No. 94,147

3 Claims. (Cl. 230—172)

This invention relates to compressors, and more particularly to a single acting compressor in which compression takes place on one stroke per cycle of operation.

More specifically, the invention relates to compressors employed for compressing fluid intended for use in processing food-stuffs or beverages or for effecting ventilation in enclosures containing material or substances which may become damaged by oil vapor.

It is accordingly an object of the invention to assure against the admixtion of lubricant with the medium being pumped while at the same time minimizing friction between the cooperating movable and stationary elements of the compressor.

Other objects will be in part obvious and in part pointed out hereinafter.

In the drawing accompanying this specification and in which similar reference numerals refer to similar parts,

Figure 1 is an elevation, in section, of a compressor constructed in accordance with the practice of the invention,

Figure 2 is a transverse view through Figure 1 on the line 2—2, and

Figure 3 is an elevation, in section, taken through Figure 1 on the line 3—3.

Referring more particularly to the drawing, the compressor, designated in general by 20, comprises a cylinder 21 and a head 22 for the cylinder and secured thereto by bolts 23. The cylinder 21 is supported by a crank casing 24 the interior 25 of which serves as a chamber for lubricant 26. In one side of the crank casing 24 is an opening 27 of suitable proportions to permit of the insertion of a crank shaft 28 into the chamber 25. One end 29 of the crank shaft is journaled in a boss 30 on the inner surface of the wall of the crank casing and the outer end of the bore 31 containing the end 29 of the crank shaft is adequately sealed by a plate 32 which may be secured in fixed position in any suitable manner. The opposite end 33 of the crank shaft 24 is journaled in a cover plate 34 forming a closure for the opening 27. The end 33 extends exteriorly of the cover plate 34 and carries a pulley 35 which may be connected, as by a belt (not shown), to a prime mover for rotating the crank shaft 28.

With the exception of the apertures mentioned specifically the walls defining the chamber 25 are imperforate, and all openings associated with the chamber 25 are sealed. The cover plate 34 and the portions of the casing 24 against which it seats are accordingly so constructed as to form a seal for the opening 29, and in the cover plate 34 is a sealing element 36 to prevent leakage of fluid and oil vapor from the chamber 25 along the shaft end 33 to the atmosphere.

In accordance with the practice of the invention, the cylinder 21 is provided with an internal imperforate flange 37 which forms an innermost bounding surface for the bore 38 in the cylinder and carries a guide member 39 arranged concentrically with the cylinder and extending, in the present instance, into the bore 38. The guide member 39 may be of annular shape. Its walls, like the flange 37, are also imperforate.

The interior surface 40 of the guide member 39 serves as a bearing surface for a crosshead 41 carrying a wrist pin 42 which extends through a connecting rod 43 of which the other end is connected to the pin 44 of the crank shaft. The connecting rod 43 or, more specifically, its cap 45, carries a finger 46 adapted to dip into the oil 26 and to fling oil throughout the chamber 25 in order to lubricate the bearing surface of the movable parts in the crank casing and the guide member 39. The crosshead 41 carries a rod 47 which is connected, as by a screw 48, to a piston 49 reciprocable in the bore 38.

In order to prevent the passage of oil vapor from the interior of the guide member 39 into the bore 38 a sealing member 50 is disposed about the rod 47 and supported in that position by a ring plate 51 seated upon the end of the guide member 39 and secured thereto by screws 52. On the portion of the ring plate 51 surrounding the sealing member 50 and on the outer or upper surface of the ring plate is a flange 53 which may serve as a trap or container for such slight amount of oil as may pass with the rod 47 through the sealing member 50.

The piston 49 is preferably of the assembled type comprising an upper plate 54 and a lower plate 55, the latter being secured to the plate 54 by screws 56. In the periphery of the upper plate is an annular groove 57 for which the plate 55 forms a side surface. The groove 57 serves as a container for a sealing ring 58 urged against the wall of the bore 38 by an extension ring 59. The sealing ring 58 preferably consists of graphitic carbon and may be formed in segments in a well known manner. Thus, during the operation of the compressor, particles of the outer surface of the sealing ring are deposited upon the cylinder wall and compressed into its pores and burnished. In this way the entire surface of the cylinder wall exposed to the sealing ring will

become covered with a coating of graphitic material upon which the sealing ring slides with an extremely low coefficient of friction, thereby eliminating the need of introducing oil lubricant into the bore 38.

The guide member 39, preferably extends to a point approximately midway between the ends of the bore 38 and cooperates with the wall of the cylinder to define a chamber 60 beneath the piston 49. The portion of the bore lying above the piston 49 constitutes the compression chamber 61 wherein the fluid acted upon by the piston 49 is compressed. The admission and discharge of such fluid to and from the compression chamber 61 is controlled by suitable valve mechanism designated in general by 62.

The valve mechanism illustrated comprises a pair of plates 63 and 64 seating against the confronting surface of the head 22 and the cylinder 21, respectively. In outline the plates 63 and 64 conform substantially to those of the adjacent portions of the head 22 and the cylinder, and interposed between said plates is a valve seat 65 which, together with the plates 63 and 64 is clamped securely in position by the bolts 23.

The valve seat 65 is provided with a series of inlet ports 66 which are controlled by flexible fingers 67 formed as integral portions of the plate 64. In like manner, the plate 63 is provided with integral flexible fingers 68 to control discharge ports 69 in the valve seat 65 and opening into a discharge chamber 70 in the head 22. The discharge chamber 70 is defined by a U-shaped wall and has an outlet opening 71 through which the compressed fluid may pass from the compressor. The space within the head 22 lying outside of the U-shaped wall constitutes an inlet chamber 72 which is in direct communication with the ports 66 and has an inlet opening 73 to admit fluid to the compressor.

In operation, the fluid entering the inlet chamber 72 passes through the ports 66 into the compression chamber 61 where it is compressed by the piston 49 and discharged through the ports 69 into the discharge chamber 70, whence it may pass to a point of utilization. During the compression of the fluid portions thereof will leak past the sealing ring into the chamber 60 to a pressure value in excess of that existing within the guide member 39 and, therefore, the chamber 25. The ultimate pressure value of the fluid thus accumulating and entrapped in the chamber 60 need not necessarily be a close approach to the value of the final discharge pressure of the compressor, it being sufficient that it predominate over that in the chamber 25 and the usual extent of leakage past the sealing ring assures this advantageous pressure differential. Thus, the course of whatever fluid may flow along the rod 47 during the operation of the compressor will be from the chamber 60 to the chamber 25 and no oil vapor will, therefore, find its way into the chambers 60 and 61.

In practice it has been further found that, after a prolonged period of operation of a compressor constructed in accordance with the practice of the invention, the fluid discharged from the compression chamber 61 is entirely devoid of even the slightest trace of oil lubricant and that the surfaces of the chamber 60 are also free of any perceptible signs of oil.

As will be readily apparent to those skilled in the art, all the parts of the compressor which may be lubricated adequately only by oil are amply supplied with that material and at the same time the chambers exposed to oil lubricant are thoroughly isolated from those in which oil lubricant in even the most minute quantities would be objectionable.

I claim:

1. A single-acting compressor comprising a cylinder of which one end is unvented, a reciprocatory piston in the cylinder, valve means for controlling the admission and discharge of fluid into and from the other end of the cylinder, a crosshead for the piston, a rod connecting the crosshead to the piston, a guide for the crosshead extending into the cylinder and cooperating with the cylinder to define an annular chamber in the unvented end of the cylinder, a wall for an end of the annular chamber integral with the cylinder and the guide, and sealing means encircling the rod to prevent communication between the annular chamber and the interior of the guide.

2. A single-acting compressor comprising a cylinder having an imperforate wall, an imperforate end wall for the cylinder integral with the cylinder, a hollow guide member integral with the end wall consisting of an imperforate wall extending into the cylinder and cooperating therewith and with the first said wall to define an annular chamber in one end of the cylinder, a piston in the cylinder, a rod for the piston extending through the last mentioned wall, means for effecting a seal between the chamber and the interior of the guide member, and valve means for controlling the admission and discharge of fluid into and from the other end of the cylinder.

3. A single-acting compressor comprising a cylinder having an unvented annular chamber in one end and a compression chamber in the other end, a hollow guide member integral with the cylinder extending into the cylinder and constituting an inner bounding surface for the annular chamber, a piston reciprocable in the compression chamber forming a bounding surface for the annular chamber, a rod for the piston extending into the guide member, a sealing device on the guide member encircling the rod, and valve means for controlling the admission and discharge of fluid into and from the compression chamber.

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