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2,063,728

COMPRESSOR

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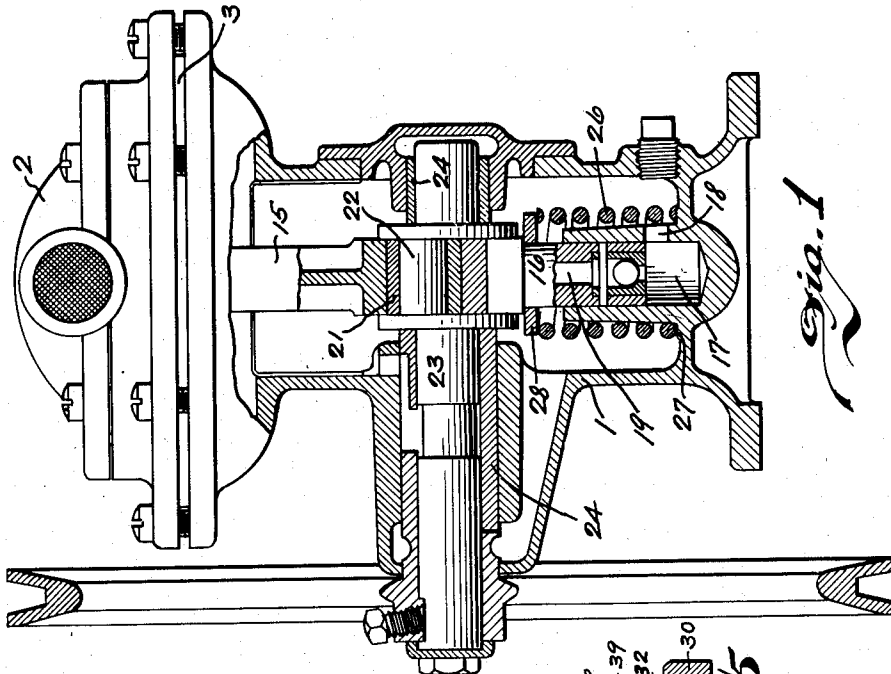


Fig. 1

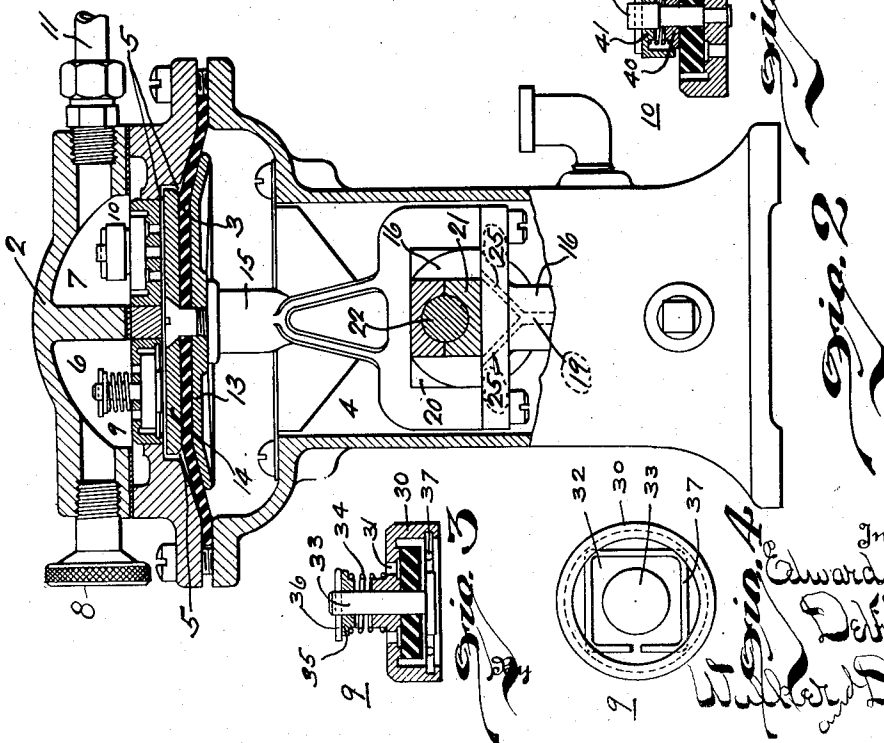


Fig. 2

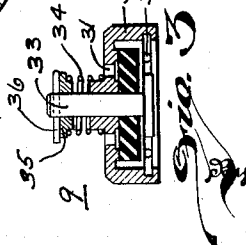


Fig. 3

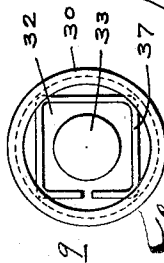


Fig. 4

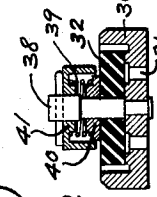


Fig. 5

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UNITED STATES PATENT OFFICE

2,063,728

COMPRESSOR

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mesne assignments, to The Creamery Package
Mfg. Company

Application November 18, 1933, Serial No. 698,634

3 Claims. (Cl. 230—170)

This invention pertains to fluid pressure pumps, and more particularly to an air or gas compressor of the diaphragm type.

The present device is especially adapted for
5 compressing air for beer dispensing apparatus or other analogous purposes wherein it is desirable that the compressed fluid be protected from contamination by oil and oil odors arising from the compressor mechanism. The range of deflection of the compressor diaphragm being quite
10 limited, the effective compression occurs through only approximately forty-five degrees or less of the cycle of operation, which tends to give the device a "shock" load or bumpy action. This
15 has been obviated in the present construction by providing a counter balancing spring which not only equalizes the load but advantage is taken of the spring reaction during the active period of compression. To vibrate the diaphragm a
20 "Scotch yoke" type of actuator is employed, which is provided with a force feed lubrication means, by which an oil cushion is provided in the slide bearing, and the use of the usual objectionable splash system of lubrication is avoided, thereby protecting the rubber diaphragm
25 from the deteriorating effect of oil and insuring uniform lubrication regardless of the level of the oil supply.

The object of the invention is to improve the construction as well as the means and mode of
30 operation of diaphragm type compressors whereby they may not only be economically manufactured, but will be more efficient in use, uniform in operation, easily operated and unlikely to get out
35 of repair.

A further object of the invention is to provide equalizing means by which the operating load is distributed and the power of the retractive stroke stored for use during the compression period.

A further object of the invention is to provide
40 an improved form of actuator for the vibratory diaphragm.

A further object of the invention is to provide improved lubricating means.

A further object of the invention is to provide
45 means for maintaining uniform oil distribution regardless of the oil level of the supply reservoir.

A further object of the invention is to provide
50 a fluid compressor having the herein mentioned desirable characteristics and features of construction.

With the above primary and other incidental
55 objects in view, as will more fully appear in the specification, the invention consists of the features of construction, the parts and combina-

tions thereof, and the mode of operation, or their equivalents, as hereinafter described and set forth in the claims.

In the drawing wherein is shown the preferred, but not necessarily the only form of embodiment of the invention, Fig. 1 is a side elevation partly in section of a compressor embodying the present invention. Fig. 2 is a side elevation partly in section viewed at right angle to that shown in Fig. 1. Figs. 3, 4 and 5 are detail views
10 of the intake and discharge valves.

Like parts are indicated by similar characters of reference in the several views.

In the drawing illustrating the preferred embodiment, 1 is a housing having a chambered
15 head 2 between which is clamped a flexible diaphragm or piston 3 dividing the housing into a power chamber 4 and a compression chamber with which the valved intake and outlet chambers 6 and 7 in the head 2 communicate. The
20 intake chamber 6 is provided with an air intake 8 and a suction valve 9 while the outlet chamber is provided with a discharge valve 10 and a fluid pressure supply conduit 11 leading from the chamber 7. The diaphragm 3 may be of any
25 suitable type, that shown comprising a reinforced flexible rubber disc having on opposite sides reinforcement pressure plates 13 and 14 to which is connected a reciprocatory actuator
15 within the power chamber 4. At its upper end the actuator is connected with the flexible diaphragm or piston 3. The lower portion 16
30 of the actuator is of cylindrical form and projects for reciprocation within a cylinder 17 arising from the bottom of the power compartment 4. The cylinder 17 has an inlet port 18 communicat-
35 ing with the power compartment in elevated relation above the bottom of the cylinder and uncovered by the retraction of the actuator. Lubricant is admitted through the port 18 from
40 the power chamber 4, the lower portion of which forms a supply reservoir. Upon descent of the cylindrical actuator portion 16 the charge of lubricant trapped within the cylinder 17 is subjected to pressure and is discharged upwardly
45 through the valved passage 19 in the actuator. To reciprocate the actuator there is provided a Scotch crosshead construction comprising a transverse slot 20 in the actuator in which is
50 mounted a slide block 21 receiving the wrist pin 22 of a crank shaft 23 mounted in suitable bearings 24 projecting from the side of the housing 1. The lubricant conduit 19 in the actuator is divided into branch conduits 25 discharging into the transverse slot 20 in the path of the slide
55

block. The outlets of the branch conduits 25 are so spaced that they are closed and opened alternately by the movement of the slide block in the slot, but both conduits are never closed simultaneously. Lubricant is thus supplied under pressure to provide an oil film or cushion between the relatively moving surfaces and to automatically compensate for play or looseness and thus overcome the prevailing objection to the use of a Scotch crosshead for a driving connection.

The range of vibratory motion of the diaphragm piston 3 being quite limited, the crank and actuator have relatively short strokes and the effective compression of the charge in the compression chamber occurs in forty-five degrees or less of the cycle. Hence the load resistance is intermittent resulting in a "bumpy" action or "shock" load. To equalize the load on the operating mechanism a helical compensating spring 26 is provided about the lower end 16 of the actuator and exteriorly of the lubricant compression cylinder 17. The spring 26 engages a seat 27 at one end and an abutment collar 28 upon the actuator at its opposite end. The compensating spring 26 is compressed by the movement of the actuator in alternation with the charge in the compression chamber. Upon its up-stroke the actuator deflects the diaphragm piston to compress the charge within the compression chamber and upon its return it compresses the spring 26. The subsequent reaction of the spring augments the power of the driving mechanism applied to the diaphragm. Thus the power developed upon the idle stroke of the actuator and crank is stored in the spring for use during the effective stroke of the apparatus and also equalizing the load to insure uniform operation.

The present construction avoids the objections of the usual splash system of lubrication, and regardless of the oil level in the power chamber, the oil pressure upon the crosshead will be uniformly maintained so long as there is sufficient supply to flow into the cylinder 17 upon the uncovering of the port 18. The construction affords complete separation of the oil and compressed fluid and prevents the odor of the oil or entrained particles thereof being carried from the compressor in the discharged fluid under pressure.

The intake and discharge valves 9 and 10 each includes a cup shaped seat 30 having perforations 31 in its bottom, and a valve disc 32 seated interiorly of the cup 30. The cup shaped seats of the respective valves are disposed in reverse relation. The intake valve 9 includes a stem 33 projecting through and beyond the perforated side of the seat 30. The stem is movable with the valve disc 32 against the tension of a retracting spring 34 surrounding the stem and bearing at one end upon the seat 30 and at its opposite end upon a collar 35 secured to the stem by a cotter pin 36.

To limit the unseating movement of the valve disc 32 and thereby prevent fluttering or vibration of the valve, there is provided beneath the valve disc at the open side of the seat cup a stop member 37 which may be of any suitable form but which in the present instance comprises a resilient rectangular loop of wire the angles of which are seated in a groove interiorly of the valve cup and the sides of which extend across the face of the disc in the relation of chords to the periphery thereof. This stop member 37 not only limits the unseating motion of the valve disc, but supports the valve disc when unseated, in parallel rela-

tion with its seat, and so insures instant and effective response.

The discharge disc 10 includes a fixed stem 38 secured in the valve cup 30 and projecting beyond the open side thereof. The valve disc 32 is mounted for to and fro sliding motion upon the stem 38 against the tension of a retracting spring 39 interposed between two collars 40 and 41 upon the stem 38. The collar 40 bears directly upon the valve disc, while the collar 41 is retained by a cotter pin through the extremity of the stem. The latter collar 41 is recessed on the side toward the disc. The rim of the recessed collar 41 overhangs the inner collar 40 and forms a limiting stop for the disc in its unseating movement. The collar 41 is of sufficient diameter and engages the disc sufficient distance from its center to maintain the valve disc in parallel relation with its seat when it is unseated.

From the above description it will be apparent that there is thus provided a device of the character described possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions, detail construction and arrangement of parts without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute, the invention has been described in language more or less specific as to structural features, it is to be understood that the invention is not limited to the specific features shown, but that the means and construction herein disclosed comprise the preferred form of several modes of putting the invention into effect, and the invention is therefore claimed in any of its forms or modifications within the legitimate and valid scope of the appended claims.

Having thus described my invention, I claim:

1. The combination with a compressor including a housing provided with intake and discharge chambers, a piston and actuating means therefor, of intake and discharge valves associated with said chambers, at least one of said valves being characterized by a cup-shaped valve seat, the seat having perforations in its side, a valve disc located within the cup shaped seat, a valve stem therefor, a retracting spring for the disc and a stop member positioned in spaced relation with the disc and engaging the disc medially of different radii to thereby support the valve disc in substantially balanced parallel relation with its seat when it is in unseated position.

2. The combination with a compressor including a housing provided with intake and discharge chambers, a piston and actuating means therefor, of intake and discharge valves associated with said chambers, at least one of said valves being characterized by a cup-shaped valve seat, the seat having perforations in its side, a valve disc located within the cup-shaped seat, a valve stem therefor, a retracting spring for the disc and a polygonal wire loop resiliently engaging within the open side of the seat cup in a plane spaced away from the normal position of the valve disc and parallel with its seat, the sides of which engage the disc medially of different radii in chord relation to the periphery thereof to thereby support the valve disc in substantially balanced parallel relation with its seat when it is in unseated position.

3. The combination with a compressor including a housing provided with intake and discharge chambers, a piston and actuating means therefor, of intake and discharge valves associated with said chambers, at least one of said valves being characterized by a cup shaped valve seat, said seat having perforations in its side, a valve disc located within the cup shaped seat, a valve stem therefor, a retracting spring for the disc and a cup shaped collar located upon the valve stem in spaced relation with the valve disc and with its open side directed toward the valve disc, the rim of which concentrically engages the disc intermediate the center and periphery thereof, in different radial positions to thereby support the valve disc in parallel relation with its seat when it is in unseated position. 5

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