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AIR PUMP

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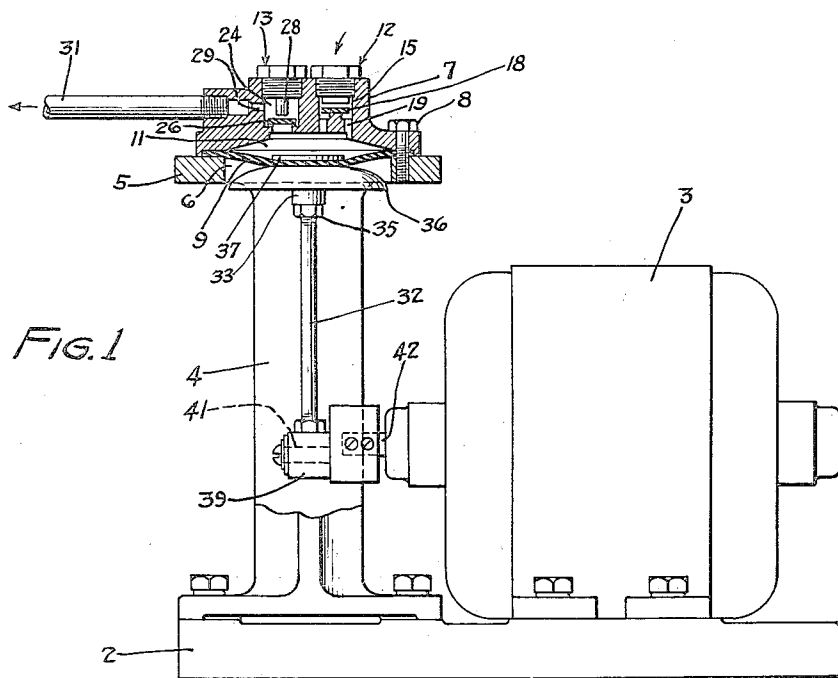


FIG. 1

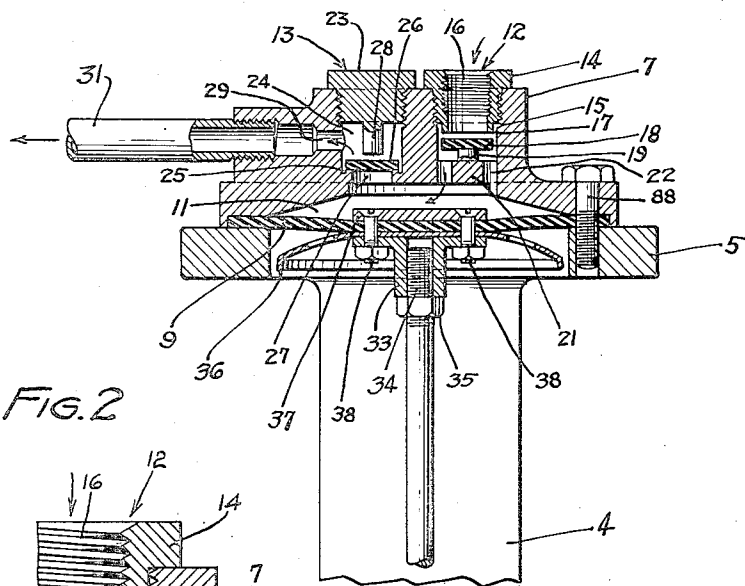


FIG. 2

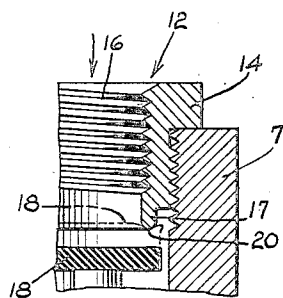


Fig. 3

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AIR PUMP

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3 Claims. (Cl. 230—170)

This invention relates to new and useful im-
provements in air compressor pumps and has as
an object to provide such a pump of simple and
inexpensive construction, and which requires no
lubrication.

A further object is to provide an air pump com-
prising a body having a diaphragm secured there-
to and cooperating with a wall thereof to pro-
vide a chamber, and said chamber having air inlet
and outlet openings provided with check valves,
each of which comprises a relatively light-weight
valve disk, mounted for limited movement within
their respective openings and operating to control
the directional flow of the air through the pump,
when the diaphragm is operated.

Other objects of the invention reside in the
simple and inexpensive construction of the pump,
as a whole, including the air inlet and outlet
valves; in the novel manner of securing the dia-
phragm to its operating member whereby there is
no relative movement between said parts; in the
particular arrangement of the diaphragm and its
operating means, whereby the central portion of
the diaphragm is operated symmetrically about
the medial plane thereof, to thereby relieve it of
unnecessary strains; and in the means embodied
in the construction of the intake valve to permit
a slight leakage of air through said valve, when
the diaphragm is idling at a relatively lower speed
than normal, to thereby relieve the apparatus of
an unnecessary load.

Other objects of the invention will appear from
the following description and accompanying
drawing and will be pointed out in the annexed
claims.

In the accompanying drawing, there has been
disclosed a structure designed to carry out the
various objects of the invention, but it is to be
understood that the invention is not confined
to the exact features shown as various changes
may be made within the scope of the claims
which follow.

In the drawing:

Figure 1 is an elevational view, partially in
section, showing the novel pump operatively con-
nected to a motor;

Figure 2 is an enlarged detail sectional view
showing the interior construction of the pump;
and

Figure 3 is an enlarged detail sectional view
more clearly showing the construction of the seat
of the intake valve.

In the selected embodiment of the invention
here shown, for purposes of disclosure, there is
illustrated in Figure 1, a base member 2 having a

motor 3 suitably secured thereto. A standard 4
is shown mounted at one end of the base and
terminates at its upper end in an annular frame
or annulus 5, having a central opening 6 therein.

An important feature of this invention resides
in the construction of the air compressor or
pump supported upon the annular frame 5 of
the standard 4. This pump comprises a body 7
which forms a housing for a plurality of valves
which will subsequently be described. The hous-
ing 7 is secured to the annular frame 5 by suit-
able bolts 8. A diaphragm 9 is clamped between
the body portion 7 and the annulus 5 in leak-
proof relation. The lower face of the body 7 is
concaved, as shown, and the diaphragm 9 coop-
erates therewith to provide a chamber 11.

Air inlet and outlet valves, generally indicated
by the numerals 12 and 13, respectively, are pro-
vided in the body 7. The inlet valve comprises a
plug 14 received in threaded engagement with a
socket 15 in the housing 7. The plug 14 has an
aperture 16 extending therethrough which prefer-
ably is threaded as shown, whereby a pipe or
other fitting, not shown, may be connected there-
to, if desired. The lower end of the plug 14 ter-
minates in an annular flange 17 adapted to be
engaged by a small, semi-flexible disk 18, nor-
mally seated upon a raised portion 19 provided on
the bottom wall 21 of the socket 15. The bottom
face 20 of the annular flange 17 is rounded, as
shown in Figure 3, so as to present a relatively
small surface to the valve disk 18, when the
latter engages it under light pressure, as when
the diaphragm is idling at a relatively slow speed
under no load, thus relieving the apparatus of
an unnecessary load, when idling. When the
motor attains its normal speed, the valve disk 18
will be thrust against the rounded seat 20 with
sufficient force to cause the seat to become slight-
ly depressed in the disk 18, as indicated by the
dotted lines in Figure 3, whereby leakage is posi-
tively prevented through the valve 12, when the
apparatus is operating at normal speed. Suit-
able passages 22 are provided in the bottom wall
21, as shown, to permit free air circulation there-
through. The lower edge of the flange 17 is
adapted to be engaged by the disk 18 to prevent
the compressed air from discharging through
said valve from the chamber 11, when the dia-
phragm 9 is actuated. In other words, the disk
18 and flange 17 cooperate to provide a check
valve for permitting air flow through the valve
12 in one direction only.

The outlet valve 13 comprises a solid plug 23
received in threaded engagement with a socket

24 which is provided at its lower portion with an annular seat 25, adapted to receive a disk valve 26. The bottom of the socket 24 communicates with the chamber 11 through a suitable opening 27. A reduced extension 28 depends from the lower portion of the plug 23 and has its lower end terminating in spaced relation to the disk 26, thereby to provide means for limiting the movement of said disk. An outlet port 29 connects the socket 24 with a pipe 31, received in threaded engagement with the valve body 7, as clearly illustrated in the drawing. This pipe 31 may lead to a suitable air storage tank or other receiving means.

The means for operating the diaphragm 9 is shown consisting of a connecting rod 32 having its upper end immovably secured to the diaphragm. A flanged head 33 is adjustably secured to the upper end of the connecting rod 32 by suitable threads 34 and an adjusting nut 35. A dish-shaped member 36 is seated upon the flanged head 33, and is directly engaged with the central portion of the diaphragm 9, as best shown in Figure 2. A clamping plate 37 is engaged with the upper face of the diaphragm 9 and is secured to the head 33 by suitable bolts 38, whereby the central portion of the diaphragm will be rigidly clamped between the inverted dish-like member 36 and the clamping plate 37.

The lower end of the connecting rod has a bearing 39 secured thereto which is engaged with a crank pin 41 suitably secured to the shaft 42 of the motor, as will readily be understood by reference to Figure 1. Thus, when the motor is operated, reciprocal movement will be imparted to the connecting rod 32 to thereby actuate the diaphragm. The inverted dish-shaped member 36 below the diaphragm provides a support for the latter when the diaphragm is moved upwardly to discharge the air from the chamber 11 through the pipe 31. The diaphragm is of the double acting type, that is, it operates to circulate the air on both its up and down stroke. When the diaphragm is moved downwardly, air is drawn through the inlet valve 12 which will be open as shown in Figure 2, while the disk 26 of the outlet valve will be closed. Upon the up stroke of the connecting valve, the valve 18 of the inlet valve 12 will engage the seat 17 and interrupt air flow therethrough while the disk 26 of the air outlet valve 13 will move upwardly into engagement with the terminal of the extension 28 of the plug 23, to thereby permit the air to exhaust from the chamber 11 through the outlet valve 13 and into the pipe 31.

An important feature of the invention resides in the specific construction of the air inlet and outlet valves 12 and 13. The disks 18 and 26 of these valves are preferably made of rubber and are very light, whereby the pump is very sensitive in operation and will function with the slightest air pressure. The upper end of the connecting rod being connected in fixed relation to the diaphragm, eliminates wearing surfaces and because of the unique construction of the air inlet and outlet valves, the air pump may be operated indefinitely without a lubricant, whereby the air discharging from the pipe 31 will always be free from oil and other foreign matter, assuming, of course, that the air drawn through the air inlet valve 12 is free from such matter.

The novel air pump or compressor herein disclosed, has been found very useful in connection with beverage dispensing apparatus of the type employing air pressure. In such apparatus, it is

of utmost importance that the air pressure contained on top of the liquid or beverage in the barrel or keg, is maintained substantially constant. Because of the sensitiveness of the pump, it readily lends itself for use in connection with such apparatus, and when used in connection with an ordinary pressure regulating device, a constant predetermined pressure may be maintained in the barrel at all times, regardless of the level of the beverage therein.

The pump is very simple and inexpensive in construction and comprises no wearing surfaces and therefore requires no lubrication. The only movable parts are the valve disks 18 and 26 and the diaphragm 9, and these parts may readily be replaced when necessary. By removing the plugs 14 and 23 of the air inlet and outlet valves, respectively, access may be had to the disks 18 and 26 and, in like manner, by the removal of the valve body 7 from the annulus 5, access may be had to the diaphragm 9.

By mounting the valve body 7 upon the standard 4 and operatively connecting the diaphragm to the motor 3, as hereinbefore described, the entire apparatus may be constructed as a unit, as shown in Figure 1, whereby it may readily be moved about from place to place without interfering with the operation of the mechanism. The pump is also substantially noiseless in operation, which is a very desirable feature in apparatus of this type.

I claim as my invention:

1. In an air pump, a body having a concaved face, an annular seat in said face, a diaphragm fitting in said seat, an annulus engaging the marginal edge of the diaphragm and suitably secured to said body to thereby secure the diaphragm thereto in leak-proof relation, said diaphragm being spaced from the concaved face of said body and cooperating therewith to provide a chamber, means for operating the diaphragm, said body having an air inlet opening communicating with said chamber, said opening having a perforated bottom provided at its center with a raised portion, a valve disk supported on said raised portion, a perforated plug received in threaded engagement with the walls of said opening and having its lower edge normally spaced from said valve disk, said body also having an air outlet opening provided at its bottom with an annular shoulder, a valve disk normally supported on said shoulder, an imperforate plug secured in said air outlet opening and having a depending portion normally spaced from said valve, and an air conduit connected to said air outlet opening between its respective valve disk and said plug, said disks operating as check valves to cause the air to circulate through said air chamber in one direction, when the diaphragm is actuated.

2. In an apparatus of the class described, a motor, a standard positioned adjacent thereto and terminating at its upper end in a ring-like portion open at its top and bottom, a diaphragm seated on said ring-like portion and having one face exposed to the atmosphere, a valve body engaged with said diaphragm, means securing the valve body to the ring-like portion whereby the diaphragm is secured thereto in leak-proof relation, a connecting rod having one end immovably secured to the diaphragm and having its opposite end connected to a crank pin secured to the motor shaft, said valve body having the central portion of its bottom face spaced from the diaphragm to provide a chamber, said chamber having an air outlet and air inlet and outlet valves com-

communicating with said chamber, and adapted to be actuated by operation of the diaphragm to thereby cause air to be drawn into said chamber and discharged therefrom, under pressure, into
5 said air outlet.

3. In an air pump, a body having a concaved face provided with an annular seat, a diaphragm fitting in said seat and secured thereto in leak-proof relation, said diaphragm being spaced from
10 the concaved face of said body and cooperating therewith to provide a chamber, means for operating the diaphragm, said body having an air inlet opening communicating with said chamber, said opening having a perforated bottom provided
15 with a raised central portion, a valve disk normally supported on said raised portion, a valve seat

secured in said opening and spaced from said valve disk and providing means for limiting movement of the disk, said chamber having an air outlet comprising a threaded recess provided at its bottom with an annular seat, a valve disk normally supported on said seat, a plug received in threaded engagement with said recess and having a reduced central portion normally spaced from the valve disk in said recess and forming an abutment to limit movement of said disk, and
80 an air outlet connected with said recess, said disks operating as check valves to cause air to circulate through said chamber and into said air outlet, when the diaphragm is actuated.

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