Aug. 1, 1950 R. T. TIEDJE 2,517,145

SEALED UNITARY COMPRESSOR

Filed Jan. 8, 1949

Fig. 1.

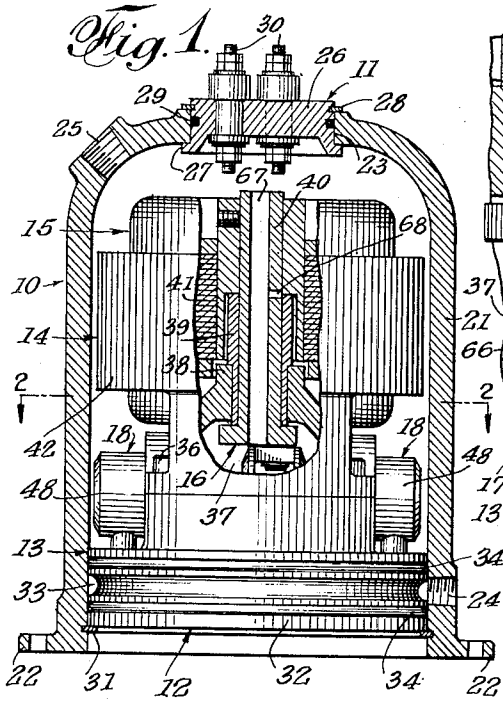


Fig. 3.

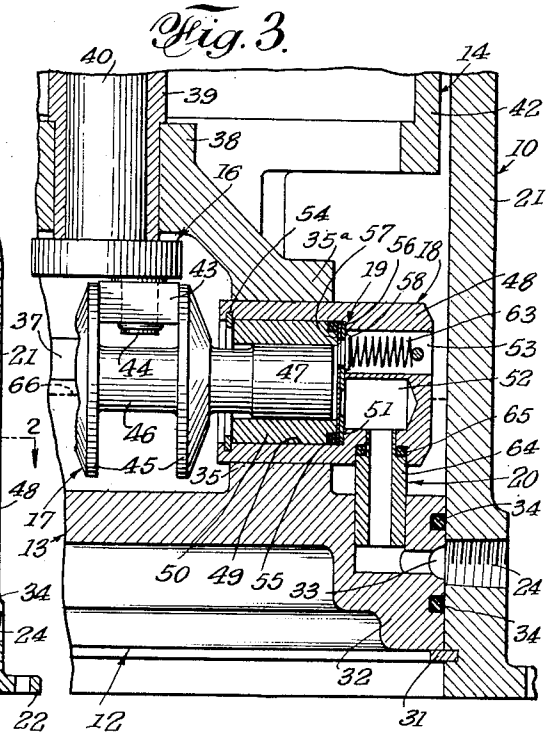


Fig. 2.

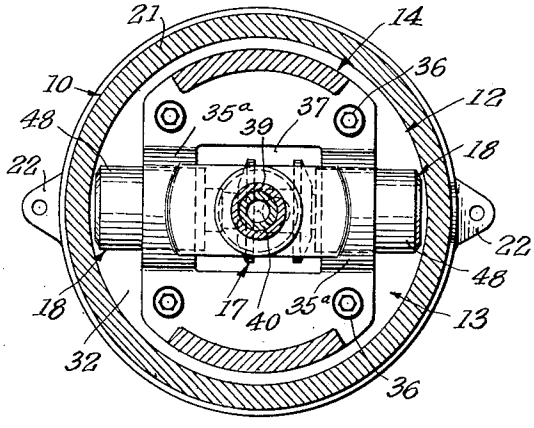


Fig. 4.

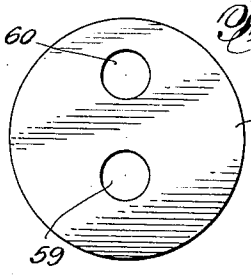


Fig. 5.

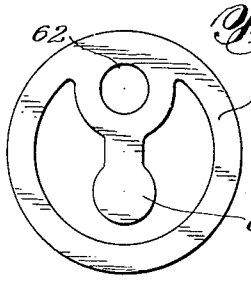
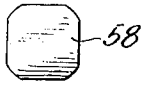


Fig. 6.



Inventor

RICHARD T. TIEDJE

By C. G. Stratton

Attorney

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SEALED UNITARY COMPRESSOR

Richard T. Tiedje, Los Angeles, Calif., assignor to Joseph Schilling, Los Angeles, Calif.

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5 Claims. (Cl. 230—58)

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This invention relates to an hermetically sealed unit that combines therein a compressor and an electric motor to drive the compressor and is particularly adapted for use in refrigeration.

An object of the present invention is to provide a unit of the character indicated that, while hermetically sealed to retain lubrication and exclude contaminating foreign matter, is readily disassembled for repair and other service.

Another object of the invention is to provide, in a unit of the character indicated, a novel compressor construction that is long-wearing and has a high output efficiency.

More specifically, the invention contemplates the provision of a novel opposed piston double-acting air compressor that is housed in a frame that also comprises the support for an electric motor, an enclosure for the compressor and motor, and separable sealing means between said frame and enclosure.

The invention also has for its objects to provide such means that are positive in operations, convenient in use, easily installed in a working position and easily disconnected therefrom, economical of manufacture, relatively simple, and of general superiority and serviceability.

The invention also comprises novel details of construction and novel combinations and arrangements of parts, which will more fully appear in the course of the following description. However, the drawings merely show and the following description merely describes one embodiment of the present invention, which is given by way of illustration or example only.

In the drawings, like reference characters designate similar parts in the several views.

Fig. 1 is an elevational view, partly in central section of a combined compressor and motor unit according to the present invention, the housing for said unit being shown in vertical section.

Fig. 2 is a plan sectional view thereof as taken substantially on the plane of line 2—2 of Fig. 1.

Fig. 3 is an enlarged fragmentary vertical sectional view showing the details of one of the two air compressing means of the present device.

Figs. 4, 5 and 6 are further enlarged face views, respectively, of a valve seat, a flapper air inlet valve, and an air outlet valve washer employed in the present invention.

The unitary device herein contemplated and, as illustrated, comprises, generally, a dome-like housing 10 that has an open bottom and is provided with a terminal mount plug 11, a support frame 12 removably held within housing 10 and

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comprising a lower section 13 and an upper section 14, an electric motor 15 carried by said upper section, an operating crank 16 driven by said motor, a dual piston unit 17 reciprocated by said crank, opposed cylinders 18 carried by the frame and clamped between the sections 13 and 14 thereof within which said piston unit operates, valve means 19 operable by the pistons, and passage means 20 for conducting air or gas to the cylinders and past the valve means to be displaced into and subsequently outward of the housing 10.

The housing 10 preferably has a cylindrical wall 21 which, at its bottom end, is provided with suitable lugs 22 whereby the same is adapted to be fastened to a support. The top of the housing is domed and provided with a central opening 23. An inlet 24, near the bottom of the housing and an outlet 25 near or at its top, are provided.

The terminal mount plug 11 comprises a plate 26 that fits opening 23, the same having a flange 27 limiting the outward position of said plug. A snap ring 28 removably holds the plug in its opening. Leakage around the plug is obviated by an O-ring 29 carried by the plug and sealing the opening. Depending on whether the motor 15 requires two or three electrical conductors, said plug 11 carries two or three terminals 30, said terminals comprising conventional devices that receive electrical conductors from a current source and transmit the current by means of conductors connected to said motor.

The frame 12 fits within housing 10 and is held therein by a snap ring 31. The lower section 13 of the frame is provided with a cylindrical base 32 that has a snug sliding fit in the cylindrical wall 21 of the housing. An annular groove 33 is formed in said base, the same being in communication with inlet 24, and O-rings 34, carried by said base, seal against the housing wall 21 on each side of groove 33.

The lower section 13 is provided with symmetrically arranged bearing halves 35 and the upper section 14 is provided with mating bearing halves 35—a that cooperate to clamp the opposed cylinders 18. Bolts 36 connect the frame sections and can be reached only when the frame is removed from the housing. Between the clamping bearings there is provided a space 37 in which crank 16 and piston unit 17 operate.

The upper frame section is provided with a vertical bearing 38 in which is fixed an upwardly extending bushing 39. The shaft 40 of motor 15 rotates in said bushing, the lower end of said shaft carrying the crank 16. In the usual way,

the motor armature 41 is fixed to shaft 40 to rotate the latter and the motor field is carried by a cylindrical upper extension 42 of the upper section 14.

Crank 16 comprises a block 43 on an eccentric pin 44 extending from the lower end of shaft 40.

The dual piston unit 17 comprises an integral cylindrical element formed with a central spool portion consisting of a pair of discs 45 connected by bar 46. Discs 45 are spaced to accommodate block 43 therebetween and it will be evident that rotation of shaft 40 will result in reciprocation of the piston unit. At each end, said unit is provided with a piston 47, the same operating in the opposed cylinders 18.

The construction of cylinders 18 is best seen in Fig. 3. Each cylinder comprises an outer cylinder part 48 in which is formed an end bore 49 for a bushing 50 in which piston 47 operates. Said bore 49 terminates in a shoulder 51. Entering bore 49 there is provided a smaller blind bore 52 and, thereabove, a smaller through bore 53. Bushing 50 is held in the cylinder part 48 by a snap ring 54 and the bore 49 is sealed by an O-ring 55.

The valve means 19 comprises a valve seat 56 (Fig. 4) located against shoulder 51, a flapper valve 57 (Fig. 5) behind the valve seat, and a discharge valve disc 58 (Fig. 6) in front of the valve seat and in bore 53.

The valve seat, preferably of synthetic rubber, has a port 59 aligned with bore 52 and a port 60 aligned with bore 53. The flapper valve comprises an element formed of spring material and has most of its middle part removed to provide a resilient tongue 61 that normally lies against the valve seat 56 to close the port 59 thereof. A port 62 in the flapper valve aligns with port 60 of the valve seat. The valve disc 58 is held by a spring 63 against port 60 to close the same.

It will be evident from the above that movement of piston 47 outward of its bore will unseat tongue 61 and draw air or gas from bore 52 through port 59 into the bore of bushing 50, and that reverse movement of the piston will displace the air or gas through ports 62 and 60 into and past valve disc 58 into bore 53. The air or gas escaping from bores 53 of the opposite cylinders 18, alternately, will fill the interior of the housing and will find egress through outlet 25. With a motor operating at 1750 R. P. M., there will be 3500 ejections of air or gas into the housing to provide a relatively large output regardless of the small size of the ports controlling the flow.

The passage means 20 comprises the mentioned groove 33 and a tubular connector 64 communicating said groove and the bore 52 of each cylinder. Said connectors are tightly fitted in the base part 32 and are sealed by O-rings 65 where they connect with the cylinders. Said connectors also serve both as locating and non-rotating means for the cylinders.

Lubrication of the device is quite simply accomplished. Oil is introduced to a level indicated by line 66 and reciprocating piston unit 17 will agitate said oil to provide effective lubrication for the pistons 47. Much of said oil will lubricate shaft 40 by passing up through a hollow 67 therein and through a communicating port 68 in said shaft, the oil being thus directed to the top of bushing 39.

While the invention that has been illustrated and described is now regarded as the preferred embodiment, the construction is, of course, subject to modifications without departing from the spirit and scope of the invention. It is therefore not desired to restrict the invention to the particular form of construction illustrated and described, but to cover all modifications that may fall within the scope of the appended claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A compressor unit having a bottom-open housing in which a fluid inlet and outlet are provided, a two-part frame fitting into said housing and removably held therein, sealing means between the housing and frame to enclose the interior of the housing, a pair of opposed cylinders clamped between the frame parts, flapper valve means in each cylinder, passage means for conducting fluid from the inlet to said valve means of each cylinder, a piston unit having a piston at each end and each piston being operatively engaged in each respective cylinder, said unit having a flanged spool portion at the middle thereof, a crank engaged with said spool portion, and an electric motor carried by one of the frame parts for rotating the crank and thereby reciprocating the pistons to draw fluid from the inlet into the interior of the housing and thence outward of the outlet.

2. In a compressor unit, a two-part frame formed with spaced pairs of mating bearing portions, a cylinder clamped between each pair of said portions, a flapper valve at the end of the cylinder bore of each cylinder, an inlet and an outlet passage in each cylinder opposite to the bore thereof, a piston unit having a piston at each end and each piston being operatively engaged in each respective cylinder, said unit having a flanged spool portion at the middle thereof and between the mating bearing portions, a crank engaged with said spool portion, and an electric motor carried by one frame part for rotating the crank and thereby reciprocating the pistons to pump fluid alternately from each inlet passage past each respective flapper valve into each outlet passage.

3. In a compressor unit, a pair of opposed cylinders, each cylinder having an end bore terminating at a shoulder and a blind inlet bore and a through outlet bore opening on the end bore, a valve seat positioned against said shoulder and having inlet and outlet ports aligned with the inlet and outlet bores, a flapper valve having a port also aligned with the outlet bore and formed with a resilient tongue aligned with an controlling the inlet bore, said flapper valve being positioned against and on the end bore side of the valve seat, a displaceable valve disc controlling the outlet ports, and a cylinder bushing in the end bore of the cylinder and tightly fitted thereinto to clamp the valve seat and flapper valve in place.

4. In a compressor unit, a pair of opposed cylinders, each cylinder having an end bore terminating at a shoulder and a blind inlet bore and a through outlet bore opening on the end bore, a valve seat positioned against said shoulder and having inlet and outlet ports aligned with the inlet and outlet bores, a flapper valve having a port also aligned with the outlet bore and formed with a resilient tongue aligned with and controlling the inlet bore, said flapper valve being positioned against and on the end bore side of the valve seat, a displaceable valve disc controlling the outlet ports, a cylinder bushing in the end bore of the cylinder and tightly fitted thereinto to clamp the valve seat and flapper valve in place,

and an O-ring seal between said bushing and the cylinder end bore.

5. In a compressor unit, an open-ended housing having inlet and outlet ports, a pair of opposed fluid-pumping cylinders within the housing, a two-part support clamping said cylinders in spaced relation with each other, one of said parts closing the open end of the housing and having a fluid-conducting groove in communication with the inlet port, and a tubular connector extending between each cylinder and the part having the groove to communicate said groove and the inlet port with said cylinders, said cylinders discharging fluid into the housing and thence through the outlet port.

RICHARD T. TIEDJE.

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