Jan. 24, 1950 E. RAWSON 2,495,601

PUMP OILING MEANS

Filed Aug. 31, 1945

FIG. 1

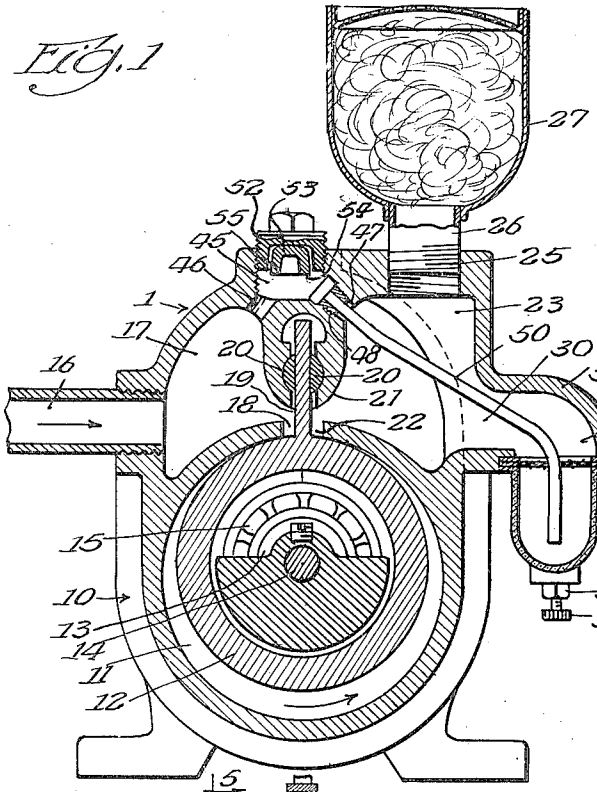


FIG. 2

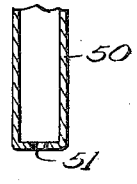


FIG. 3

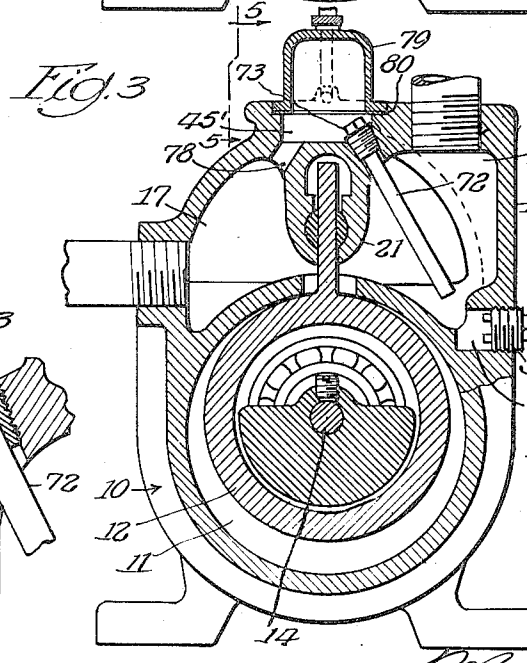


FIG. 4

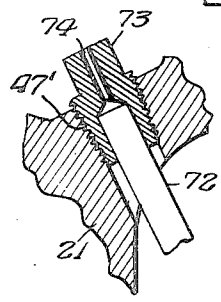
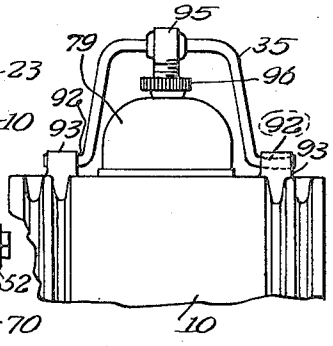


FIG. 5



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PUMP OILING MEANS

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15 Claims. (Cl. 230—207)

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This invention relates to pumps and more particularly to the oiling means for air pumps such as, for instance, a vacuum pump.

In certain types of vacuum pumps there is a tendency for the pump lubricant to follow the air currents outwardly of the pump and be dissipated by discharge into the atmosphere. This not only necessitates frequent replenishment of the oil supply but also tends to produce disagreeable oil odors in the region of the pump and to befoul objects close by.

It is one of the objects of the present invention to provide an improved vacuum pump or pump casing wherein the above mentioned difficulties are obviated by providing means entirely within the pump for recirculating the oil that is initially carried off with the air stream. It is a further object of the present invention to provide a simple structure wherein the tube or tubes for recirculating the oil may be easily and quickly assembled, and disassembled if necessary for cleaning.

It is a further object of the present invention to provide an improved oiling system wherein provision is made for a visual indication of whether or not the circulating oil system is functioning.

It is a still further object of the present invention to provide an oil recirculating system with means for filtering or removing foreign matter that may be carried off by the oil stream.

It is a still further object of the present invention to provide an oiling system of the above mentioned character which is substantially entirely contained within the pump casing.

The attainment of the above and further objects of the present invention will be apparent from the following specification taken in conjunction with the accompanying drawing forming a part thereof.

In the drawing:

Figure 1 is a transverse sectional view of a rotary pump embodying the present invention;

Figure 2 is a transverse sectional view through the bottom of the oil by-pass pipe;

Figure 3 is a sectional view illustrating a modified construction;

Figure 4 is an enlarged sectional view through the top of the oil by-pass pipe; and

Figure 5 is a view taken along the line 5—5 of Figure 2.

In the drawings like reference numerals designate like parts throughout.

The pump to which the present invention is applied is a rotary air pump. As shown it is a vacuum pump, although the invention is equally applicable to the same pump when used as an air compressor pump. The pump is indicated at 1 and comprises an integral casing within which the rotor of the pump is mounted. The rotary portion of the pump is of the same construction as illustrated in the patent to McArthur et al., No. 2,313,387, issued March 9, 1943, to which reference may be had. The pump comprises a casing 10 in which is located a drum-shaped chamber 11 which houses a drum-shaped rotor 12 of smaller diameter than the diameter of the chamber 11. The rotor 12 is actuated by an eccentric 13 carried by a shaft 14. The eccentric operates within a ball race 15 so that as the shaft is rotated the line of contact of the rotor 12 will progressively follow around the inner cylindrical wall of the casing 11, thus progressively driving ahead the air from the point of inflow to the point of discharge, in the manner well understood in the operation of pumps. As shown the air is drawn in through an inlet opening pipe 16, into a vacuum air inlet chamber 17 which communicates with the interior of the chamber 11 through a port 18 on the inlet side of a fin 19 which is integral with the rotor 12 and is slidably mounted within a bearing block 20 carried by a depending partition 21 which is part of the casing 1.

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The fin 19 projects upwardly from the periphery of the rotor. The top of the wall of the chamber 11 is divided to form a gap through which the fin 19 projects and which gap is divided by the fin into the inlet and outlet ports 18 and 22. The depending partition 21 and the fin 19 divide the upper portion of the casing 10 into two chambers, one of which constitutes the inlet or vacuum chamber 17 and the other constitutes the outlet or discharge chamber 23. The discharge chamber 23 has an outlet opening 25 at the top thereof in which is threaded a rather large diameter pipe 26 constituting the outlet pipe. In the case of a vacuum pump the outlet pipe is part of an exhaust muffler 27.

Adjacent the bottom of the discharge chamber 23 the casing 10 has an opening 30, the portion of the casing above the opening 30 extending sideways, as indicated at 31, to provide the casing with a downwardly directed opening 32. A transparent cup 34, which constitutes an oil well, closes the opening 32. The cup is held in place by a U-shaped yoke 35 that embraces the cup 34, the opposite arms of the yoke 35 being swiveled to the casing, and the bight portion of the yoke 35 having a thumb screw 38 threaded through an opening in the yoke, which thumb screw bears against the cup 34 and supports it in place. A

suitable rubber gasket 40 provides a sealing fit between the cup 34 and the casing.

Above the partition 21 there is a small chamber or compartment 45, which has an opening 46 leading to the chamber 17. The compartment 45 also has a tapped opening 47 leading to the discharge chamber 23, said opening having an externally threaded sleeve 48 threaded therein through which sleeve there is extended an oil tube 50. The top of the tube opens into the compartment 45 and the bottom extends into the oil cup 34. The bottom of the tube 50 is inwardly flanged to restrict the opening of the tube so that the bottom opening of the tube 50 constitutes a fine choke 51. The top of the compartment 45 is closed by a plug 52 that includes a permanent magnet 53, the opposite poles of which are indicated at 54—55. The opening 47 is directed at an angle towards the oil well to facilitate assembly of the tube 50 in the casing 10. When the shaft 14 rotates in a counter-clockwise direction the rotor will follow the wall of the surrounding chamber 11 in a counter-clockwise direction thereby drawing air in through the pipe 16, chamber 17 and port 18 and forcing it around the periphery of the rotor and out through the port 22 into the discharge chamber 23. The air then flows through the muffler to the atmosphere. There is a tendency for the rotor lubricating oil to follow the air current and be forced out of the rotor chamber 11. Some of the oil precipitates within the chamber 23 and the rest of the oil is caught in the muffler 27 and flows downwardly through the pipe 26 into the discharge chamber 23. The oil thus tends to accumulate in the cup 34 which is part of the discharge chamber 23. Due to the fact that the air pressure within the chamber 17 is below that of the air pressure within the chamber 23 oil flows through a passageway from the cup 34, through the choke 51 into the tube 50 to the chamber 45, thence through the opening 46 into the inlet chamber 17. The oil entering the chamber 45 is directed into the region of the permanent magnet 52 which attracts and holds any fine particles of iron or iron filings that may have been carried along by the flowing air. The oil leaving the opening 46 drops into the path of the air flowing through the chamber 17 and is carried thereby to the inlet port 18 and maintains the cooperating surfaces of the chamber 11 and the rotor 12 lubricated.

The cup 34 provides a visual indication of the presence or absence of lubricating oil and of the amount of smudge or dirt that may have accumulated. The oil supply for the pump can be replenished by merely unscrewing the plug 52 and then pouring the oil into the casing.

In Figures 3 and 5 there is shown an alternate construction which differs essentially from that of Figure 1 in that the position of the cup 34 and the plug 52 of Figure 1 have been reversed. The pumping system of the pump of Figure 2 is the same as that of Figure 1. In this instance the side wall of the pump casing 10 is provided with an opening 70 at the bottom of the air discharge chamber, which opening is closed by a threaded magnetic drain plug 52, of the same construction as that of Figure 1. The bottommost part of the discharge chamber 23 constitutes an oil well. A straight oil tube 72 is secured to a metallic plug 73 that has a choke 74 therethrough and which plug is threaded through a tapped opening 47' in the top of the casing 10 at the partition 21 so that the tube 72 and the choke 74 constitutes an oil passageway from the bottom of the discharge

chamber 23 to the oil chamber 45' formed at the top of the partition 21. The oil chamber 45' is open at its top and communicates with the pump intake chamber 17 by means of a port 78. A sight glass, in the form of an inverted transparent cup 79, is positioned over the open top of the chamber 45' and makes a sealing fit as by a synthetic rubber gasket 80.

A yoke 35 in the form of a stiff spring wire bent to a U shape is swiveled to the casing 10 as by having the ends of the yoke bent in alignment to constitute both arms 92—92 pivots that extend into aligned openings in lugs 93 constituting a part of the pump casing 10. A screw 95 having a threaded shank on which is threaded a thumb screw 96 is secured on the under side of the bail portion of the yoke 35. The thumb screw 95 bears against the cup 79 and thus holds the cup in place.

During operation of the pump the chamber 45' is at the same pressure as that of the intake side of the pump. Oil will thus flow from the bottom of the discharge chamber 23 through the oil tube 72 and the choke 74 where it is discharged as a continuous jet against the inner surface of the sight glass 79 and then drops down into the chamber 45' and through the opening 78 into the path of flow of the incoming air.

During operation of the pump there is a violent agitation of the air flowing through the discharge chamber 23, which air carries with it a large amount of oil. Oil globules are scattered in the chamber 23, there being a general current or spray of oil flowing downwardly from the muffler and another current or spray of oil being carried upwardly by the moving air. A large number of oil globules are continuously striking the outside of the tube 72 which stops their movement in the air stream and they then move downwardly along the outer surface of the tube. When they reach the bottom of the tube 72 they come into the path of a current of air and oil that is being drawn up into the tube. Thus any oil that strikes the outer surface of the tube and flows down the tube never drops off of the bottom of the tube but is drawn up into the tube and discharges through the choke 74. I have found that in many instances the amount of oil that thus strikes the outside of the tube 72 and flows down the outside of the tube and then into the tube is sufficient for lubricating purposes and therefore the tube 72 may be so short as not quite to reach the oil level in the oil well at the bottom of the air discharge chamber 23.

In compliance with the requirements of the patent statutes I have here shown and described a few preferred embodiments of my invention. It is, however, to be understood that the invention is not limited to the precise constructions here shown, the same being merely illustrative of the principles of the invention. What is considered new and desired to be secured by Letters Patent is:

1. An air flow device comprising a casing having a top, means including a partition extending downwardly from the top of the casing and dividing the casing into an air inlet chamber and a discharge chamber, means for drawing air from the inlet chamber and discharging that air into the discharge chamber, the top of the casing having a pair of communicating openings therethrough on opposite sides of the partition and communicating with the respective chambers, an oil well at the lower part of the discharge chamber, a tube extending from the oil well through

one of said openings, means forming a sealing cover over the portion of the top of the casing where the two openings are located whereby the preponderance of pressure in the discharge chamber over that in the inlet chamber causes oil to flow from the oil well through the tube thence through the opening that leads to the inlet chamber.

2. An air flow device comprising a casing having a top, means including a partition extending downwardly from the top of the casing and dividing the casing into an air inlet chamber and a discharge chamber, means for drawing air from the inlet chamber and discharging that air into the discharge chamber, the top of the casing having a pair of communicating openings therethrough on opposite sides of the partition and communicating with the respective chambers, an oil well at the lower part of the discharge chamber, a tube extending from the oil well through one of said openings, the opening leading to the discharge chamber being at an angle directed towards the oil well to facilitate insertion of the tube in the casing through the last mentioned opening, means forming a sealing cover over the portion of the top of the casing where the two openings are located whereby the preponderance of pressure in the discharge chamber over that in the inlet chamber causes oil to flow from the oil well through the tube thence through the opening that leads to the inlet chamber.

3. An air pump comprising a casing having an air inlet chamber, an air discharge chamber, and an operating chamber, means in said last mentioned chamber for drawing air from the inlet chamber and discharging that air into the discharge chamber, an oil well at the lower part of the discharge chamber, the top of the casing wall having an opening therethrough leading into the discharge chamber, a tube extending through the opening towards the oil well, said opening being at an angle directed towards the oil well so that the tube can be put into position by insertion through said opening, a second opening in the casing wall adjacent the first opening and leading into the inlet chamber, means including a sight glass on the outside of the casing establishing communication between said two openings.

4. An air pump comprising a casing having an air inlet chamber, an air discharge chamber, and an operating chamber between the inlet and the discharge chambers, means in said last mentioned chamber for drawing air from the inlet chamber and discharging that air into the discharge chamber, an oil well at the lower part of the discharge chamber, the top of the casing wall having an opening therethrough leading into the discharge chamber, a tube extending through the opening, said opening being at an angle directed towards the oil well so that the tube can be put into position by insertion through said opening, a second opening in the casing wall adjacent the first opening and leading into the inlet chamber, means including a sight glass establishing communication between said two openings, said tube and said sight glass and said second mentioned opening forming parts of an oil flow passageway from the discharge chamber to the inlet chamber, whereby the preponderance of pressure in the discharge chamber over the pressure in the inlet chamber causes oil to flow from the discharge chamber through said tube and across the sight glass and thence

through said second opening into the inlet chamber, said passageway having a choke therein for restricting the rate of oil flow therethrough.

5. An air pump comprising a casing having from the inlet chamber to the discharge chamber, and an operating chamber between the inlet and the discharge chambers, means in said last mentioned chamber for drawing air from the inlet chamber and discharging that air into the discharge chamber, an oil well at the lower part of the discharge chamber, the top of the casing wall having an opening therethrough leading into the discharge chamber, a tube extending through the opening towards the oil well, said opening being at an angle directed towards the oil well so that the tube can be put into position by insertion through said opening, a second opening in the casing wall adjacent the first opening and leading into the inlet chamber, means including a part of the casing forming a compartment through which both openings are in communication, said last named means including a releasable closure closing said compartment from the atmosphere, said tube and said compartment and said second mentioned opening forming parts of an oil flow passageway from the discharge chamber to the inlet chamber, whereby the preponderance of pressure in the discharge chamber over the pressure in the inlet chamber causes oil to flow from said well through said tube into said compartment thence through said second opening into the inlet chamber, means forming a choke in said oil flow passageway for restricting the rate of oil flow therethrough, there being a sight glass member and a plug member in the path of the oil flow in said oil flow passageway, both members being secured to the casing and exposed on the outside of the casing and one of said members constituting the above mentioned releasable closure.

6. A rotary air pump comprising a casing having an air inlet chamber, an air discharge chamber, and an operating chamber between the inlet and the discharge chamber, rotary pump mechanism in said last mentioned chamber for drawing air from the inlet chamber and discharging it into the discharge chamber, an oil well at the lower part of the discharge chamber, the top of the casing wall having an opening therethrough leading into the discharge chamber, a tube extending through the opening towards the oil well, said opening being at an angle directed towards the oil well so that the tube can be put into position by insertion through said opening, a second opening in the casing wall adjacent the first opening and leading into the inlet chamber, means including a part of the casing forming a compartment through which both openings are in communication, said last named means including a releasable closure closing said compartment from the atmosphere, said tube and said compartment and said second mentioned opening forming parts of an oil flow passageway from the discharge chamber to the inlet chamber, whereby the preponderance of pressure in the discharge chamber over the pressure in the inlet chamber causes oil to flow from said well through said tube into said compartment thence through said second opening into the inlet chamber, said second opening discharging oil into the path of air flow in the inlet chamber, means forming a choke in said oil flow passageway for restricting the rate of oil flow therethrough, there being a sight glass member and a magnetic plug member in

the path of the oil flow in said oil flow passageway, both members being secured to the casing and exposed on the outside of the casing and one of said members constituting the above mentioned releasable closure.

7. An air flow device comprising a casing provided with an air inlet chamber and an air discharge chamber, means for drawing air from the inlet chamber and discharging air into the discharge chamber, an oil well at the lower part of the discharge chamber, means forming an oil passageway within the casing and extending from the oil well to and opening into the air inlet chamber in the path of air flow therein, said oil passageway having a choke therein for restricting the rate of flow of oil therethrough, said casing having an opening at the top thereof communicating with said passageway and a releasable closure for said opening.

8. An air flow device comprising a casing provided with an air inlet chamber, and an air discharge chamber, means for drawing air from the inlet chamber and discharging air into the discharge chamber, an oil well at the lower part of the discharge chamber, means forming an oil passageway within the casing and extending from the oil well to and opening into the air inlet chamber in the path of air flow therein, said oil passageway having a choke therein for restricting the rate of flow of oil therethrough, said casing having an opening communicating with said passageway and a releasable closure plug for said opening, said closure plug having a magnetic member in the path of oil flowing through said passageway for removing iron particles from said flowing oil.

9. An air flow device comprising a casing having a top, means including a partition extending downwardly from the top of the casing and dividing the casing into an air inlet chamber and a discharge chamber, means for drawing air from the inlet chamber and discharging that air into the discharge chamber, the top of the casing having a pair of openings formed therethrough on opposite sides of the partition and communicating with the respective chambers, a tube extending into the discharge chamber from one of said openings, means forming a cover overlying the portion of the top of the casing where the two openings are located and together with a portion of the casing forming a compartment into which both openings lead whereby the preponderance of pressure in the discharge chamber over that in the inlet chamber causes oil at the bottom of the tube to flow into the compartment through the tube thence through the opening that leads to the inlet chamber.

10. An air flow device comprising a casing having a top, means including a partition extending downwardly from the top of the casing and dividing the casing into an air inlet chamber and an air discharge chamber, means for forcing air from the inlet chamber to the discharge chamber, a pair of ports opening into the respective chambers, the top of the casing having an opening through which the ports are in communication with each other, a tube extending into the discharge chamber from one of said ports and discharging into said opening, and means forming a releasable sealing cover for said opening in the top of the casing, whereby the discharge flowing from said tube into said opening then flows into the inlet chamber through the port leading thereto from said opening.

11. An air flow device comprising a casing having a top, means including a partition extending downwardly from the top of the casing and dividing the casing into an air inlet chamber and an air discharge chamber, means for forcing air from the inlet chamber to the discharge chamber, a pair of ports opening into the respective chambers, the top of the casing having an opening through which the ports are in communication with each other, a tube extending into the discharge chamber from one of said ports and discharging into said opening, means forming a releasable sealing cover for said opening in the top of the casing, whereby the discharge flowing from said tube into said opening then flows into the inlet chamber through the port leading thereto from said opening, said cover comprising a sight glass.

12. An air flow device comprising a casing having a top, means including a partition extending downwardly from the top of the casing and dividing the casing into an air inlet chamber and an air discharge chamber, means for forcing air from the inlet chamber to the discharge chamber, a pair of ports opening into the respective chambers, the top of the casing having an opening through which the ports are in communication with each other, a tube extending into the discharge chamber from one of said ports and discharging into said opening, means forming a releasable sealing cover for said opening in the top of the casing, whereby the discharge flowing from said tube into said opening then flows into the inlet chamber through the port leading thereto from said opening, said cover comprising a magnet in the path of fluid flowing through said opening.

13. An air flow device comprising a casing having therein means dividing the same into an air inlet chamber and an air discharge chamber and means for forcing air from the inlet to the discharge chamber, a fluid flow passageway at the outer surface of the casing and ports leading from the respective chambers to said passageway and communicating with one another through said fluid flow passageway, and a releasable closure for the portion of the outer surface of the casing that constitutes said passageway, the port leading to the discharge chamber being a straight port having a longitudinal axis which intersects the releasable closure.

14. An air flow device comprising a casing having therein means dividing the same into an air inlet chamber and an air discharge chamber and means for forcing air from the inlet to the discharge chamber, a fluid flow passageway at the outer surface of the casing and ports leading from the respective chambers to said passageway and communicating with one another through said fluid flow passageway, and a releasable closure for the portion of the outer surface of the casing that constitutes said passageway, said releasable closure including a sight glass.

15. An air flow device comprising a casing having therein means dividing the same into an air inlet chamber and an air discharge chamber and means for forcing air from the inlet to the discharge chamber, a fluid flow passageway at the outer surface of the casing and ports leading from the respective chambers to said passageway and communicating with one another through said fluid flow passageway, and a releasable closure for the portion of the outer surface of the casing that constitutes said passageway, said re-

leasable closure including a magnet in the path of fluid flow through said passageway.

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