

Sept. 27, 1932.

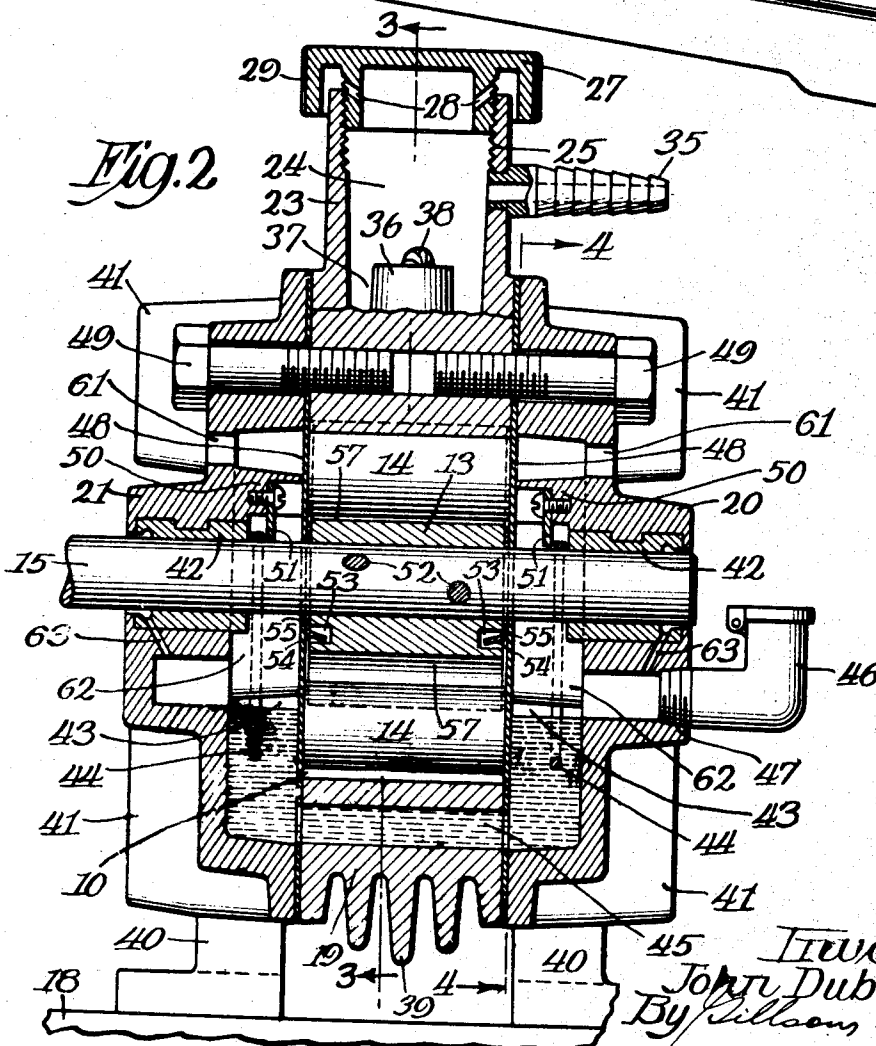
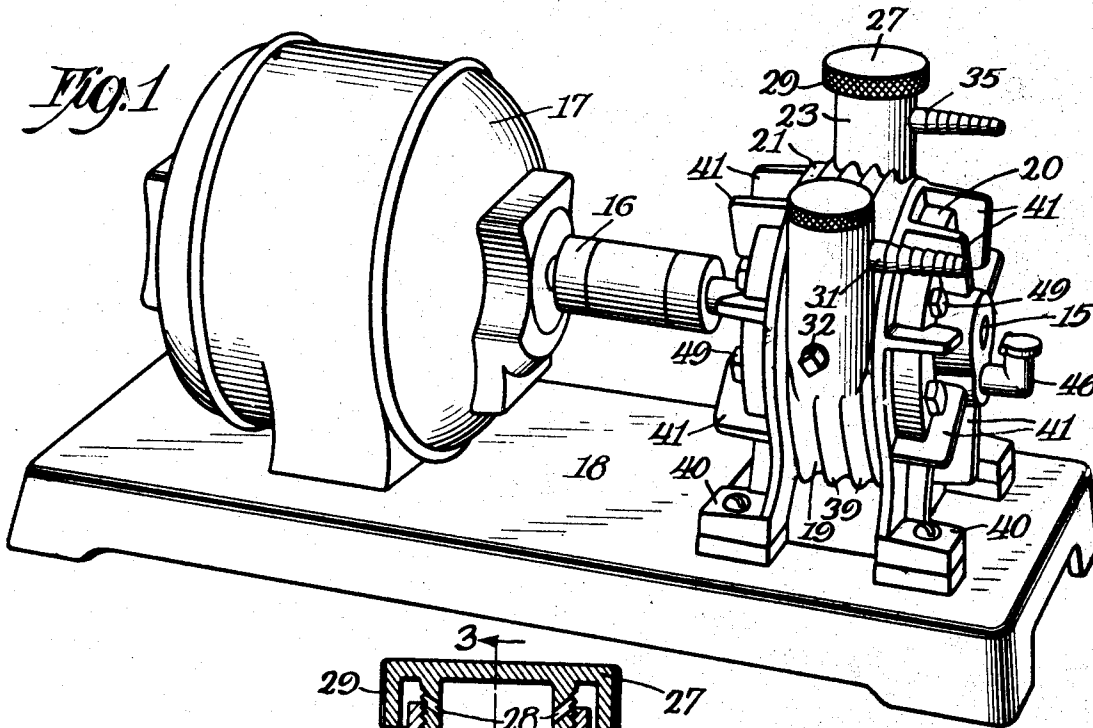
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BLOWER AND VACUUM PUMP

Filed Dec. 16, 1929

2 Sheets-Sheet 1



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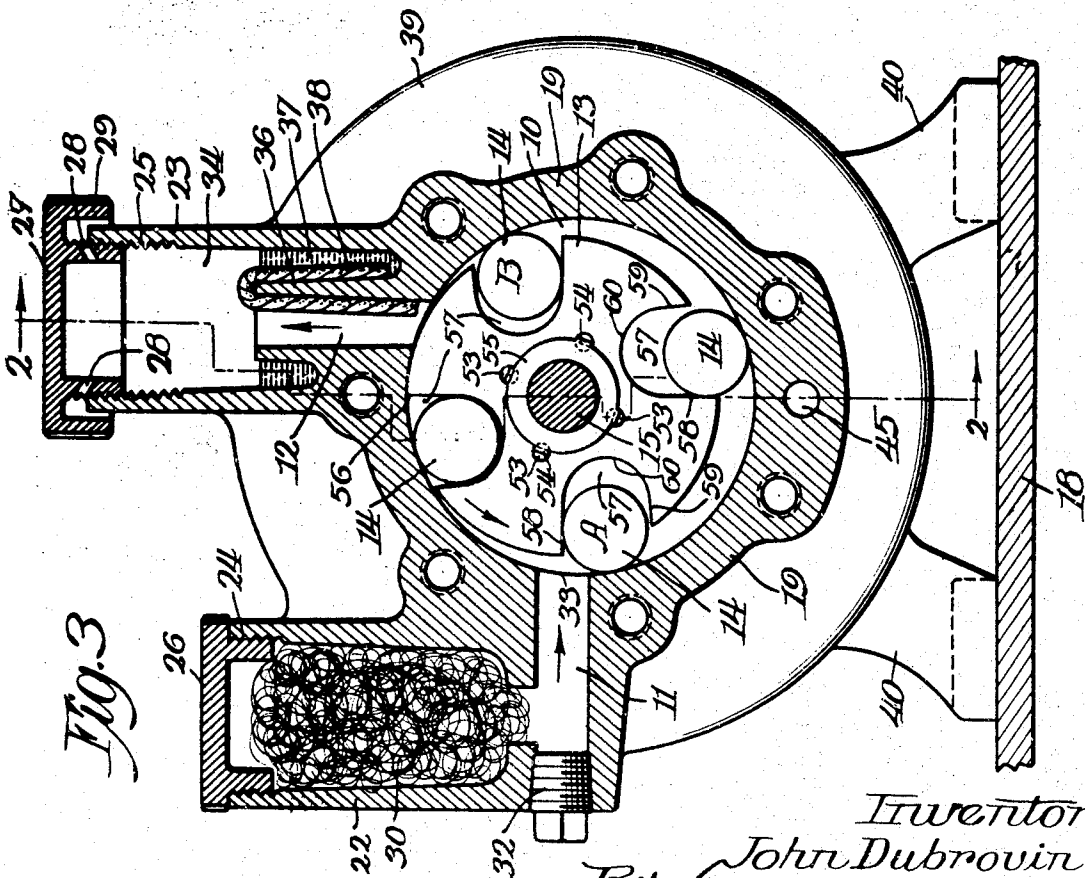
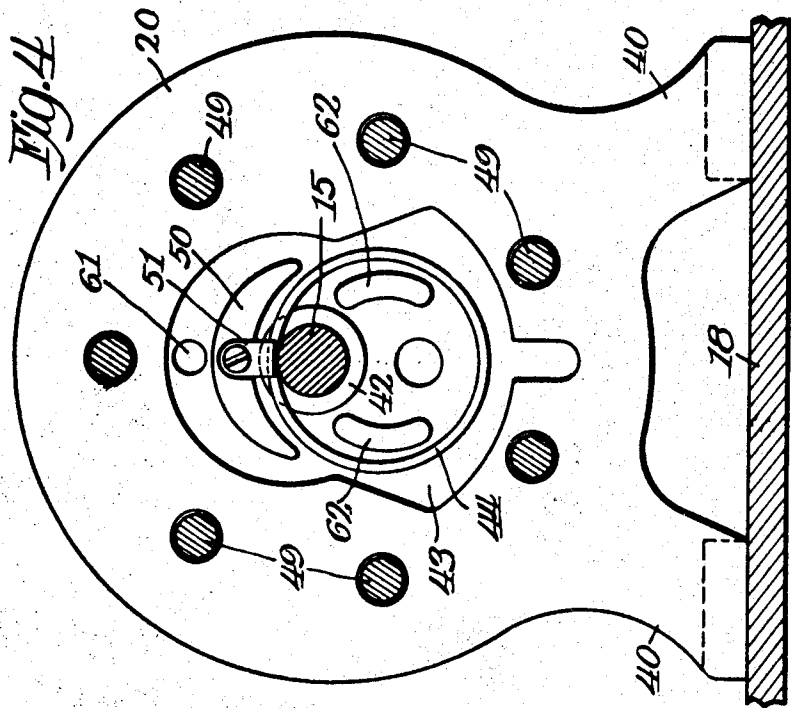
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BLOWER AND VACUUM PUMP

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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BLOWER AND VACUUM PUMP

Application filed December 16, 1929. Serial No. 414,275.

This invention relates to blowers and vacuum pumps for use with laboratory apparatus requiring moderate air pressure or vacuum. Such pumps in common use develop so much heat as to require water cooling with all its objections, and they include so many moving parts, and otherwise are so constructed that the production and maintenance are objectionable, difficult and expensive.

Primarily the object of this invention is to eliminate or reduce these and other objectionable features of the near past practice, and particularly to reduce the heat developed to an amount that can be satisfactorily dissipated by "air cooling", thus relieving the devices from the water supply and the connections, to reduce the friction and binding with the consequent wear and generation of heat, to reduce noise in operation, to increase the capacity to provide greater and more convenient control of the flow of air, all without increasing the cost of production and with reduced care and maintenance in service.

More particular objects and advantages of the invention will become apparent as the disclosure proceeds and the description is read in connection with the accompanying drawings illustrating the preferred embodiment of the invention, and in which

Fig. 1 is a perspective view illustrating the unit including a blower and vacuum pump and a driving motor on a suitable base;

Fig. 2 is a longitudinal vertical section taken on the line 2—2 of Fig. 3;

Fig. 3 is a vertical transverse section taken on the line 3—3 of Fig. 2; and

Fig. 4 is a similar section taken on the line 4—4 of Fig. 2.

This specific illustration, however, and the correspondingly specific description are used for the purpose of fully disclosing the form and construction now deemed most desirable, but the substance of the invention can be readily embodied in other forms, including other materials, and it is intended that all such forms shall be included within the scope of the protection granted.

In its general organization the device includes a casing providing a cylindrical pump chamber 10, having an inlet port 11 and an

exhaust 12, an eccentric rotor 13 mounted in the chamber and equipped with a plurality of cylindrical vanes 14, which cooperate with the periphery of the chamber 10 to do the actual pumping, or blowing. The rotor 13 is driven by and mounted upon a shaft 15, which is directly connected with the shaft 16 of a suitable electric motor 17, mounted on the same base 18 as the pump and blower.

The casing includes a central casting 19, for convenience designated a cylinder block, and two almost identical side castings 20 and 21, designated for convenience as head blocks, all composed of "aluminum" die castings.

The cylinder block is of a general ring-like form, having two upwardly directed hollow bosses 22 and 23, having interior threads 24 and 25, to cooperate with caps, or closures 26 and 27, the latter of which is provided with a series of perforations 28, shielded by a knurled skirt 29. The hollow 30 of the boss 22 forms an enlargement of the intake passage 11 which begins with the laterally directed hose nipple 31, which enlargement is packed with oily fiber, such as wool, natural or mineral, to act as a strainer and cleaner for entering air.

The bottom of the hollow 30 opens into a substantially radial bore, closed at its outer end by a block 32 and opening at its inner end 33 through the periphery of the cylindrical pump chamber.

The hollow 34 of the boss 23 forms an enlargement in the exhaust passage, which terminates in the laterally directed hose nipple 35, and this hollow has a tubular protuberance 36 which, together with the outer wall of the hollow, forms an oil chamber 37, from which a wick 38 conducts oil into the pump chamber.

The outer periphery of the cylinder block is provided with ample cooling ribs 39 to increase the rapid dissipation of heat by contact with the atmosphere.

The head blocks, or disk-like castings, are provided with feet 40 to rest on the base 18, and a plurality of cooling ribs 41 on their outer sides. A little off the center, each head block has a transverse bore in which is mounted a suitable soft metal bearing 42 for the shaft

15. On the inner side, each block is provided with a recess 43 for the storage of lubricant and the accommodation of ring oilers 44, which continuously supply the bearings 42.
 5 These recesses communicate through a transverse bore 45 in the bottom of the cylinder block by virtue of which the recess on the left in Fig. 2 is supplied with oil put into the casing through the filling tube 46 inserted in the
 10 threaded bore 47, which forms the only difference between the two head blocks. Excess oil on the bearings is returned to the oil reservoir by the small bores 63.

Atmospheric openings 61 through the
 15 blocks adjacent the top of the oil recesses serve to maintain an equalized pressure on the oil at all times.

A pair of hardened steel disks 48 are clamped, one between each head block and the
 20 corresponding face of the cylinder block, and are there secured together by the studs 49. The sheet metal from which clock springs are ordinarily made is the most suitable found so far having the proper wearing qualities
 25 and being of high resiliency.

Each of the head blocks is provided on the inner side with crescent shaped lugs 50 and 62 which bear against the outer side of the corresponding disk 48 and give support there-
 30 to against outward thrusts. The lower portion of the lugs 50 are slightly recessed and provided with clamps 51, which confine the ring oilers 44 to the immediate neighborhood of the bearing 42.

The rotor 13 is also preferably an aluminum die casting cast upon the shaft 15 which is provided with pins 52 to insure a lasting driving connection between the rotor and the shaft. The end faces of the rotor are pro-
 40 vided with small depressions 53, which receive overturned ears 54 on ring-like shims 55 of hardened steel or two or three thousandths of an inch in thickness.

The rotor has a zone of contact with the
 45 periphery of the cylinder, the center of which at 56 (Fig. 3) is directly above the axis of the shaft 15 and slightly to the left of the beginning of the exhaust port 12. Hence, the wick 38 supplies lubricant to the
 50 rotor adjacent to and in advance of its contact with the periphery of the cylinder.

The periphery of the rotor is provided with four grooves 57 equally spaced and extending lengthwise through the rotor to receive the cylindrical vanes 14 of bakelite,
 55 hard rubber, artificial bone, and like tough substances. The driving face 58 of each groove 57 lies on a diameter of the rotor, while the opposite face 59 is at a slight angle to the face 58, whereby the grooves are slightly flaring as they extend outwardly from the cylindrical bottoms 60, where they are substantially the complement of the vanes 14.

In operation the rotor is driven constantly
 65 ly in the direction of the arrow in Fig. 3.

As each vane 14 approaches the position A it severs the intake side of the pump from the exhaust and becomes the propelling element by which air in the crescent shaped lower portion of the pump chamber is forced to
 70 travel counter clockwise towards the entrance to the exhaust passage 12, through which it is forced as the vane approaches the position B.

Since the pump vanes actually roll upon the inner surface of the cylinder wall, there is a minimum amount of friction and wear between the moving parts. Two vanes will give almost the same capacity as four, but the latter number gives a somewhat better seal, and permits greater latitude in locating the intake port.

It will be obvious from a mere inspection of the drawings that the number of moving parts and the friction between the relative moving surfaces has been reduced to a minimum, thereby correspondingly reducing wear, generation of heat, and consumption of power. Proper lubrication is constantly and automatically supplied to the most important bearing surfaces. A further advantage of the internal arrangement of the pump is found in the cooling action of the oil in the main reservoir on the resilient disks 48 and the bottom portion of the cylinder wall. The sheet metal plates 48 are particularly helpful in dissipating heat generated during the operation of the pump because of their relatively high heat conductivity.

The disks 48 provide appropriate flat and durable end surfaces for the pump chamber and eliminate the necessity for accurate machining of surfaces in the castings. The shims 55 provide and maintain very slight clearance between the ends of the driving motor and the inner surfaces of the disks 48. One modification that will readily suggest itself is that when the rotor is made of hard material, such as cast iron and steel, the shims may be eliminated and the proper clearance provided by leaving a slight boss at each end in a corresponding position.

The flow of air through the exhaust nipple 35 may be regulated by adjusting the position of the cap 27 without altering the speed of the motor.

Throughout this description, the term "aluminum" has been used in its generic sense and is meant to include that group of alloys often referred to as "white metals" but more often as "aluminum," these alloys being characterized particularly by their ability to be die cast and by their high thermal conductive properties.

I claim as my invention:

1. In a pump of the class described, a casing providing a pump chamber with inlet and exhaust passages and including a hollow boss for the latter passage, a connection in the side of the boss for delivering the ex- 130

haust gas, and an adjustable closure for the end of the boss comprising a threaded cap having side perforations adapted to be uncovered as the cap is moved out from its seated position.

2. In a pump of the class described, a casing providing a pump chamber and comprising a cylinder block having a cylindrical bore with inlet and exhaust passages communicating with the bore, two head blocks, two sheet metal disks each clamped between a head block and the corresponding face of the cylinder block, a shaft extending through the pump chamber, a rotor eccentric to the pump chamber keyed to the shaft and having a zone of contact with the cylindrical bore, a hollow boss on the casing above the rotor for receiving the exhaust gases and having a central protuberance forming an annular reservoir for oil, and means for lubricating the rotor periphery from the reservoir.

3. In a pump of the class described, a casing providing a pump chamber with inlet and exhaust ports, an eccentric rotor in the chamber having longitudinal grooves, a cylindrical vane for each groove, a shaft for the rotor journaled in the casing, an oil reservoir in the upper portion of the casing for lubricating the rotor periphery, and a second oil reservoir in the base of the casing providing lubricant for the shaft bearings.

4. In a pump casing of the class described, a cylindrical block having a cylindrical bore, two head blocks having their inner faces cored out to provide an oil reservoir, two sheet metal disks each clamped between a head block and the corresponding face of the cylindrical block to form a pump chamber, and lugs carried by the head blocks for resisting outward thrusts on the metal disks.

5. In a pump of the class described, a cylindrical block having a cylindrical bore, two head blocks, a pair of sheet metal disks each of which is clamped between a head block and the corresponding inner face of the cylindrical block to form a pump chamber, a shaft extending through the chamber and journaled in the head blocks, an eccentric rotor mounted on the shaft and having pockets in its end walls, and seal-forming shims adapted to fit over the shaft between the rotor and the metal disks and having locking ears engageable in the pockets.

6. In a pump of the class described, a casing providing a pump chamber with inlet and exhaust passages, the latter having two branches, means for controlling the output of one of the branches including a threaded cap for the other branch, the cap having peripheral perforations adapted to be gradually opened by the unseating of the cap, and a skirt for the cap.

7. In a blower and vacuum pump, the combination of a cylinder block having a pump chamber therein, a rotor in the pump cham-

ber, a pair of head blocks clamped to the ends of the cylinder block and having opposite the peripheral margin of the rotor interior recesses in communication with the atmosphere, and thin resilient metal plates clamped between the cylinder block and the head blocks, said plates separating the pump chamber from the recesses and yielding slightly outwardly so as to reduce friction when the pump is acting as a blower.

8. In a pump casing of the class described, a cylinder block having a cylindrical bore, two head blocks each having its inner face cored out to provide an oil reservoir in the lower portion thereof and a recess in the upper portion thereof open to the atmosphere, a sheet metal disk clamped between each head block and the adjacent face of the cylinder block to form a pump chamber, an eccentric driving rotor in the chamber having longitudinal grooves opening outwardly, and a cylindrical vane in each of said grooves.

9. In a blower and vacuum pump, a cylinder block having a pump chamber therein, a rotor in the chamber, a pair of head blocks having interior recesses opposite the peripheral margin of the rotor clamped to the ends of the cylinder block, and thin resilient metal plates clamped between the cylinder block and the head blocks, said plates constituting the end closures of the pump chamber and, by their resilience, automatically compensating for wear occasioned by frictional contact with the rotor.

In testimony whereof I affix my signature.
JOHN DUBROVIN.

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