Sept. 2, 1924. 1,506,893

F. EGERSDÖRFER

PUMP, COMPRESSOR, OR BLOWER

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Fig. 2.

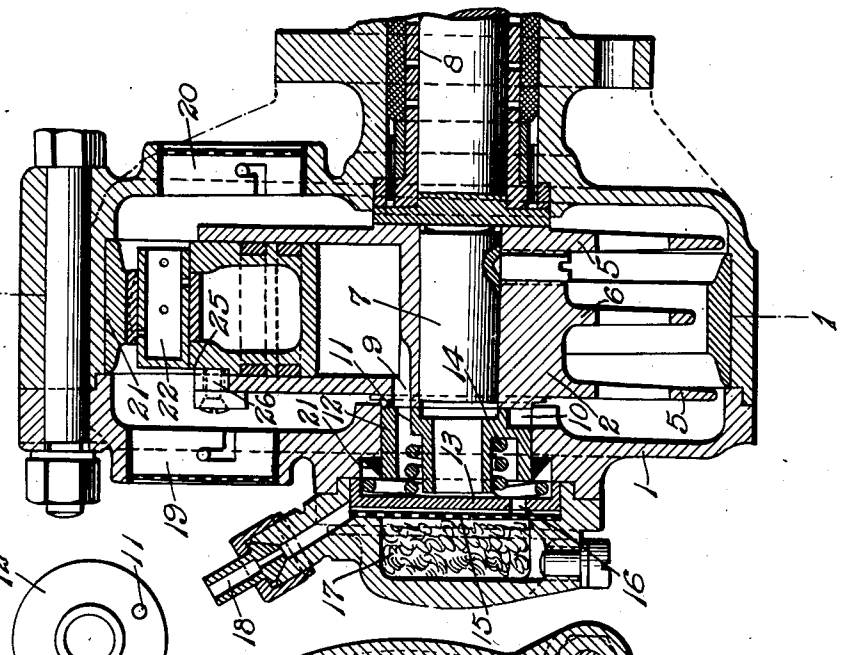

Fig. 3.

Fig. 1.

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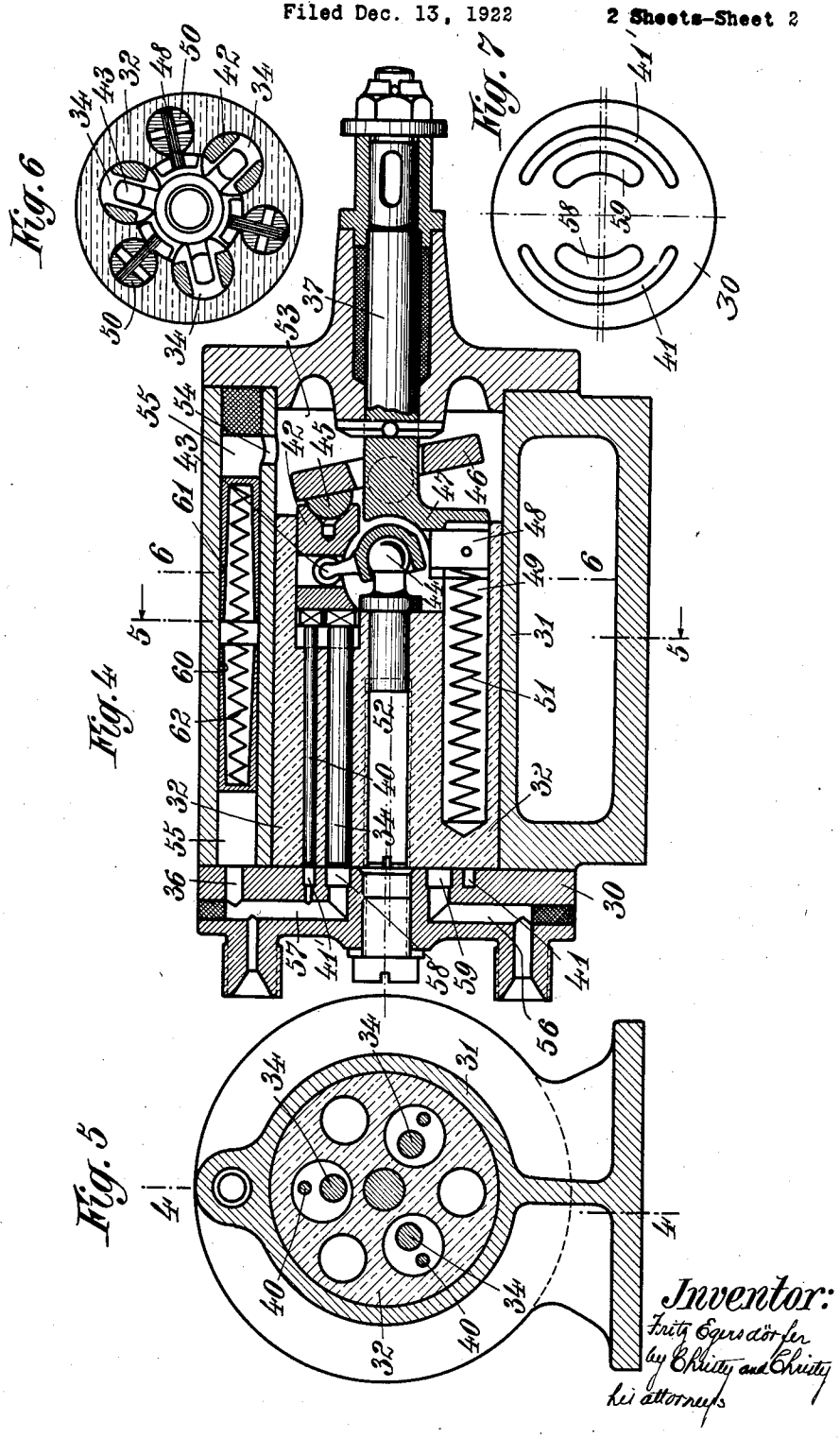

Inventor:
Fritz Egersdörfer
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his attorneys

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UNITED STATES PATENT OFFICE.

FRITZ EGERSDÖRFER, OF CHARLOTTENBURG, GERMANY.

PUMP, COMPRESSOR, OR BLOWER.

Application filed December 13, 1922. Serial No. 606,704.

To all whom it may concern:

Be it known that I, FRITZ EGERSDÖRFER, a citizen of Germany, residing at Charlottenburg, in the State of Prussia, Germany, have invented certain new and useful Improvements in Pumps, Compressors, or Blowers (for which I have filed an application in Germany); and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in pumps, compressors, or blowers having revolving plungers or pistons, and consists more particularly in means for tightening the members containing the ports which in operation come intermittently into registry and in so doing control the supply and discharge of the fluid. As is known in the art it is difficult to provide a tight fitting between the surfaces of these members, which, subject to wear, are forced apart by pressure of fluid getting between the same. Practically it is impossible in most cases by the provision of extraneous means to hold the said members in tightening engagement with each other, for the reason that the power required for forcing the parts together cannot be rendered variable to accord with the varying separating tendency. The invention consists in holding the said members together by the pressure of the fluid compressed by the pump acting on one of the said members which for this purpose is yieldingly mounted relatively to the other member. In case the pistons or plungers are mounted in pockets or cylindrical bores formed in a drum rotary within a casing (one of the members containing the controlling ports), the pressure fluid is made to act on the remote face of the drum. In any case the same fluid pressure which, effective between the parts, tends to separate them, is made effective upon them in such manner also that, tending oppositely, it cancels the tendency first mentioned. The compensating tendency therefore is automatically adapted to varying conditions and a tight fitting is insured even in case of high pressure. To provide a tight contact between the members when starting the pump and before the compensating fluid pressure can become effective a comparatively weak spring is provided, so that the total pressure on the controlling members even at this time exceeds the fluid pressure tending to separate the controlling surfaces.

For the purpose of explaining the invention two examples embodying the same have been shown in the accompanying drawings. in which—

Fig. 1, is a cross-section of an air compressor having a rotary drum provided with radially reciprocating plungers, the section being taken on the line 1—1 of Fig. 2,

Fig 2, is a longitudinal section taken on the line 2—2 of Fig. 1,

Fig. 3, is a detail view showing one of the controlling members and the ports thereof,

Fig. 4, is a longitudinal section of a liquid pump taken on the line 4—4 of Fig. 5,

Fig. 5, is a cross-section taken on the line 5—5 of Fig. 4,

Fig. 6, is a detail sectional view taken on the line 6—6 of Fig. 4, and

Fig. 7, is a detail view showing one of the controlling members and its ports.

In the example shown in Figs. 1 to 3, within a casing 1, a drum 2 is located, which is keyed or otherwise secured to a shaft 7 rotatably mounted in a bearing 8 provided in one of the end walls of the casing 1. The drum 2 is formed with three radial cylinders 3 having pistons or plungers 4 reciprocating therein, and the cylinders are connected by outer flanges 5 and an inner flange 6. One of the end walls of the drum is constructed for providing one of the controlling surfaces, and it is traversed by the cylinder ports 9. The said controlling surface is engaged by a block 12. In block 12 ports 10 and 11 are formed. Block 12 is mounted in casing 1, it is secure against rotation, but it is capable of sliding in the direction of the axis of drum rotation. The block is at all times subject to the tension of a spring 14 which, supported from behind by a plate 13, tends always to hold the block in close engagement, surface to surface, with drum 2. The plate 13 is carried by casing 1, and is perforate, as at 16. Rearwardly of plate 13 the casing contains a chamber 17 which, faced with a sieve 15, may be filled with a loose filtering medium, such as cotton or the like. This chamber 17 opens to the pressure passage 18 for fluid from the pump.

The shaft 7 is eccentrically mounted with-

in the casing 1, and when the same is in rotation the reciprocating plungers 4 are thrown by centrifugal force against the inner face of the cylindrical part of the casing, which casing is disposed eccentrically of the axis of the drum 2. This eccentrically disposed inner wall of casing 1 therefore permits outward centrifugal movement of the plungers during one half of the rotation of the drum for performing the suction stroke, and during the other half of the rotation forces the plungers inwards for performing the pressure stroke. During such rotation the surface of drum 2 upon which block 12 bears, slides upon the face of block 12, and the cylinder ports 9 come into alternate and successive registry with the suction and pressure ports 10 and 11 of the controlling slide 12. The segmental suction port 10 in block 12 extends through a large part of a circle, while the pressure port 11 through which the air compressed within the cylinder is delivered, is in the form of a small circular bore. Consequently the plungers are not during the larger part of the pressure stroke subject to the pressure of the air which has before been compressed.

The spaces beyond port 11 and between port 11 and the pressure passage 18 constitute a chamber formed within the frame and closed by the slide 12, and this chamber is constantly under the pressure of the compressed air. The block 12 consequently is constantly subject to that pressure and impelled by the said pressure from its rear face to its engagement upon the corresponding surface of the drum, so that a tight joint is produced between the contacting surfaces by the pressure of the compressed air. To this pressure the tension of the spring 14 is added, so that any air which might get from the ports 9 between the contacting surfaces can in no case unseat the block 12.

The suction port 10 is in communication with the inner parts of the casing 1, so that the plungers take the air from the said casing. The air is admitted through apertures 19 and 20 made in the end walls of the casing and covered by sieves. Therefore the inner parts of the pump are cooled by the fresh air supply. By the sieve 15 and the filtering medium confined within the chamber 17 the compressed air is cleaned from oil and other impurities. The block 12 is tightened in its sliding engagement with the walls of the pump casing by packing 21.

In the modification shown in Figs. 4 to 7 the plungers 34 reciprocate in axial direction within bores or pockets made in a drum 32 rotatably mounted within a cylindrical casing 31. As shown three plungers 34 are provided which are connected to cylindrical slide blocks 42, as is best shown in Fig. 4, which slide blocks are engaged by arms 43 of a star shaped rocker having universal connection with the drum 32 by means of a spherical journal 44. The blocks 42 are formed at their ends with spherical cavities engaged by semi-spherical slide shoes 45 engaging an inclined disk 46 adapted to be set in different angular positions relatively to the axes of the plungers 34 for varying the stroke of the plungers, as is known in the art.

The driving shaft 37 carries a coupling member 47 formed with three arms each engaging a leaf spring 48 secured to cylindrical rockers 50 mounted in longitudinal bores 49 of the drum 32. Within the said bores coiled springs 51 are located which tend to force the rockers 50 outwards and into contact with the coupling member 47. By reason of this clutch mechanism the drum 32 which is rotatably mounted on a shaft 52 is slightly yielding in circumferential and longitudinal direction relatively to the driving shaft 37.

The chamber 53 enclosing the driving mechanism is made air tight by the pump casing 31 and the drum 32, and it is in communication through a duct 54 with a cylindrical chamber 55. The side of the casing which is opposite to the chamber 53 is closed by a controlling disk or head 30 secured to the casing 31 and formed with segmental suction and pressure ports 59 and 58 and suction and pressure passages 56 and 57. In case the pump is designed for supplying liquid, the said ports extend through a comparatively large part of the circle, as is shown in Fig. 7. A duct 36 connects the passage 57 with the chamber 55. If the said chambers and passages are filled with the compressed liquid the pressure of the liquid is transmitted to the rear face of the drum 32, the pressure on the rear face of the drum corresponding to the pressure of the liquid acting on the front face formed with the controlling ports and holding the drum in contact with the controlling disk or head 30.

As shown in Fig. 4, within the chamber 55 a plunger is mounted, which has the function to take up the pulsations imparted, as the pump operates, to the liquid within the column of passage 57, so that such pulsations are not transmitted to the chamber 53. This is effected either by the inertia of the plunger or by providing a plunger yielding by elasticity without transmitting the shocks from the pressure side to the chamber 53. In the example shown in Fig. 4 the plunger is made in two sections 60 and 61 having a spring 62 disposed between the same. If a pulsation is imparted to the liquid within the passage 57, such pulsation is transmitted

through the duct 36 to the liquid confined within the left hand part of the chamber 55 and to the section 60 of the plunger bounding the same. This section 60 is thereby shifted, compressing the spring 62. Upon the passing of the pulsation the spring 62 returns the section 60 into initial position. If however the increased pressure endures the spring 62 advances the section 61 so as to transmit the increased pressure to the chamber 53. While the apparatus is under pressure the spring 62 is always under tension. Therefore the plunger 60, 61 has the function of a power-storing member adapted to absorb pressure when the pump is delivering liquid through the passage 57. This function is important for example in case the pump is in use as a fuel feed pump for an internal combustion engine, for throwing measured amounts of fuel into the cylinders of the engine. In such case short repeated pulsations of pressure are imposed on the liquid, which blows are taken up by the plunger 60, 61. Furthermore by reason of the power storing capacity the plungers assist the discharge of the individual fuel charges.

In the example shown in Figs. 4 to 7, in addition to the pressure producing plungers 34, plungers 40 are provided. These also are connected with the blocks 42. These plungers 40 are smaller in diameter than the plungers 34. They cooperate with controlling ports 41 and 41′. The object of these subsidiary plungers is to supply a second liquid under pressure, which is discharged independently of the main liquid discharge or admixed thereto, in which case the pressure port 41′ is in communication with the pressure passage 57, as is shown in Fig. 4. Therefore the plungers 34 can be used for supplying fuel to an internal combustion engine, while the plungers 40 are used for supplying a certain amount of water to the said fuel.

In both examples the segmental controlling ports of the stationary disk 30 (12) may be arranged with slight eccentricity of the axis with respect to the rotary drum, so that the cooperating ports of the controlling members 32 and 30 (2 and 12) may come gradually to position for full cooperation.

While in describing the invention reference has been made to particular examples embodying the same I wish it to be understood that my invention is not limited to the constructions shown in the drawings, and that various changes may be made in the general arrangement of the apparatus and the construction of its parts without departing from the invention.

I claim:

1. In a pump, compressor, or blower, the combination, with a frame, a member formed with a cylindrical pocket, a piston within said pocket, means to control the reciprocating movement of the piston within said pocket, a member formed with suction and pressure ducts adapted to be alternately thrown into and out of communication with said pocket, means to impart relative rotary movement to said member and frame, said frame forming with said member a chamber communicating with said pressure duct and in position to enable the fluid pressure admitted from the pressure duct to said chamber to force said member and frame into engagement for tightening said ducts, and pressure-balancing means intermediate said pressure duct and chamber.

2. In a pump, compressor, or blower, the combination, with a frame, a member formed with a cylindrical pocket, a piston within said pocket, means to control the reciprocating movement of the piston within said pocket, a member formed with suction and pressure ducts adapted to be alternately thrown into communication with said pocket, and means to impart relative rotary movement to said member and frame, said frame forming with said member a chamber communicating with said pressure duct and in position to enable the fluid pressure admitted from the pressure duct to said chamber to force said member and frame into engagement for tightening said ducts, of elastic means acting in the direction of the fluid pressure within said chamber and forcing said member and frame into tightening engagement, and pressure balancing means intermediate said pressure duct and chamber.

3. In a pump, compressor, or blower, the combination, with a frame, a member formed with a cylindrical pocket, a piston within said pocket, means to control the reciprocating movement of the piston within said pocket, a member formed with suction and pressure ducts adapted to be alternately thrown into communication with said pocket, and means to impart relative rotary movement to said member and frame, said frame forming with said member a chamber communicating with said pressure duct and in position to enable the fluid pressure admitted from the pressure duct to said chamber to force said member and frame into engagement for tightening said ducts, and pressure-absorbing means arranged in the line of communication between said pressure duct and chamber.

4. In a pump, compressor, or blower, the combination, with a frame, a member formed with a cylindrical pocket, a piston within said pocket, means to control the reciprocating movement of the piston within said pocket, a member formed with suction and pressure ducts adapted to be alter-

nately thrown into communication with said pocket, and means to impart relative rotary movement to said member and frame, said frame forming with said member a chamber communicating with said pressure duct through a cylindrical passage and in position to enable the fluid pressure admitted from the pressure duct to said chamber to force said member and frame into engagement for tightening said ducts, a pair of plungers movable within said cylindrical passage, and elastic means tending to push said plungers apart.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

FRITZ EGERSDÖRFER.

Witnesses:

E. HOLTZERMAN,

R. T. AUSPAER.