Nov. 10, 1931. A. L. HART ET AL 1,831,243

ROTARY FLUID OPERATED AND OPERATING DEVICE

Filed Aug. 20, 1928 2 Sheets-Sheet 1

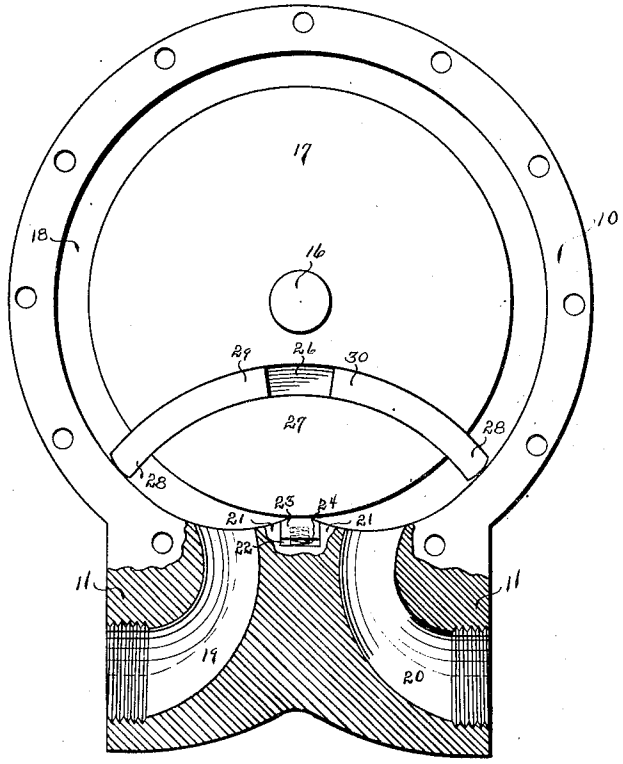


Fig. 1.

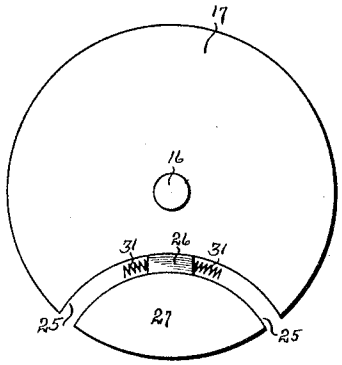


Fig. 2.

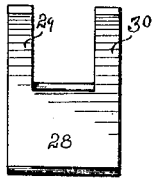


Fig. 3.

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ROTARY FLUID OPERATED AND OPERATING DEVICE

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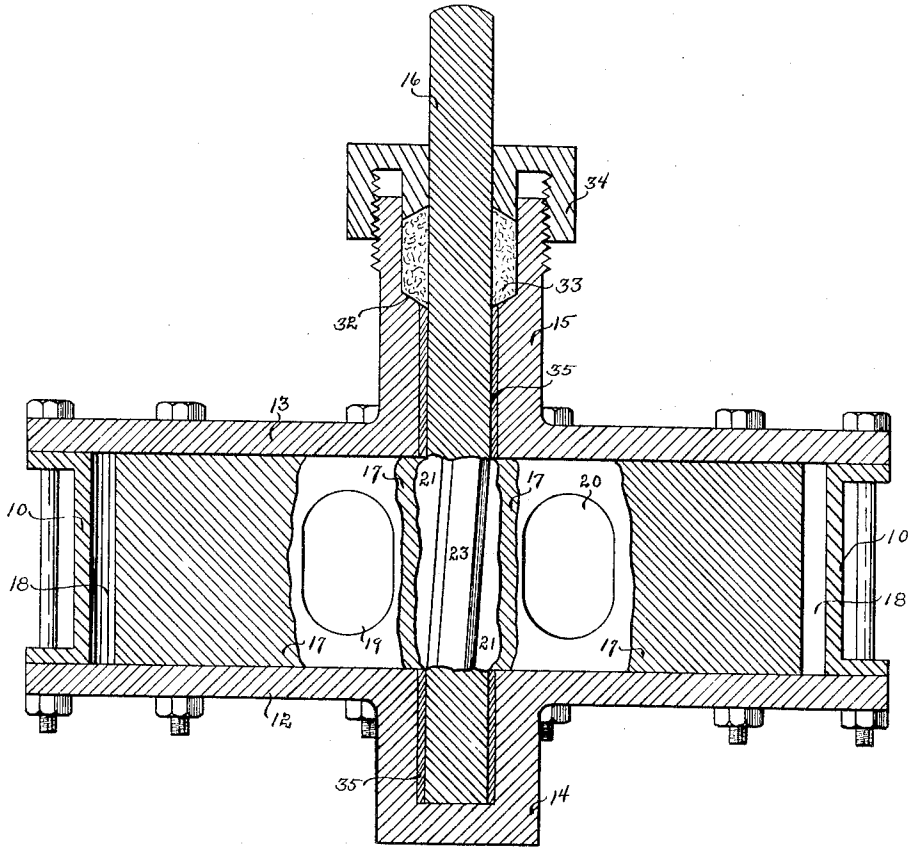


Fig. 4.

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UNITED STATES PATENT OFFICE

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ROTARY FLUID OPERATED AND OPERATING DEVICE

Application filed August 20, 1928. Serial No. 300,760.

The principal object of our invention is to provide a device that may be used as a rotary muffler or rotary motor when its rotatable element is actuated by a fluid as the operating medium and used equally as well as a rotary pump or the like when the rotatable element is rotated by a prime mover and in its rotation impels the fluid.

A further object of our invention is to provide a device capable of being successfully used either as a motor or pump that is high in efficiency.

A still further object of our invention is to provide a rotary fluid operated and operating device that has very few moving parts to wear out.

A still further object of our invention is to provide a rotary fluid operated and operating device that is quiet in operation.

A still further object of our invention is to provide a rotary fluid operated and operating device that is so constructed that counter balance weights are unnecessary.

A still further object of our invention is to provide a rotary fluid operated and operating device that will rotate as efficiently and readily in one direction as it will in the other direction without any change whatsoever in the construction of the invention.

A still further object of our invention is to provide a rotary motor or pump that is economical in manufacture and durable in use.

These and other objects will be apparent to those skilled in the art.

Our invention consists in the construction, arrangement and combination of the various parts of the device, whereby the objects contemplated are attained as hereinafter more fully set forth, pointed out in our claims and illustrated in the accompanying drawings, in which:

Fig. 1 is a side view of our invention with the lower portion in section and the side heads removed.

Fig. 2 is a side view of the rotatable portion of the device with the two sliding pistons or blades removed.

Fig. 3 is a front view of one of the curved sliding pistons or blades.

Fig. 4 is a top plan sectional view of our complete invention and more fully illustrates its interior construction.

The disadvantages of machines in this art now being offered to the general public are their complicated construction of moving parts, impossibility of reversement and their inability to be used either as a positive rotary pump or motor. We have overcome these disadvantages as will be appreciated by those familiar with the art.

We have used the numeral 10 to designate the cylinder portion of our device having integrally formed thereon the block portion 11. Detachably secured by suitable means on each end of the cylinder 10 are the side head plates 12 and 13, as shown in Fig. 4, thereby forming the rotary fluid operated and operating device housing.

Integrally formed on the head 12 is a boss 14 designed to act as a bearing member while integrally formed on the head plate 13 is the elongated bearing member 15. Having one end rotatably mounted in the boss or bearing member 14 and its other end passing through and rotatably mounted in the bearing member 15 is the shaft 16. Rigidly secured on the shaft 16 and inside the housing is the wheel 17 having a diameter less than the inside diameter of the cylinder 10, thereby providing the annular chamber 18. By this construction, if the wheel 17 is rotated the shaft 16 will be rotated and if the shaft 16 is rotated the wheel 17 will be rotated. The numerals 19 and 20 designate two passageways in the block 11 each having one end communicating with the inside of the housing and its other end communicating with the outside atmosphere, as shown in Fig. 1. Between these two passageways is the abutment 21 having both sides sloping toward each other and the wheel

17 until it terminates in a groove 22. This groove 22 has its longitudinal length in a plane at a slight angle to the longitudinal axis of the wheel 17, as shown in Fig. 4. Slidably mounted in this groove 22 is the bar valve 23 having its inner face extending from each side in an angle toward the wheel 17 until it terminates in a longitudinal ridge adjacent the full length of the periphery of the wheel 17. The numeral 24 designates small coil springs for yieldingly holding the bar valve 23 in contact engagement with the wheel 17. The numeral 25 designates the curved channel or groove in the wheel 17 constructed upon the arc of a circle and having both ends terminating at the periphery of that wheel. Near the center of the length of this channel 25 and having a thickness less than the thickness of the wheel 17 is the rectangular connecting member 26, thereby permanently securing the segment 27 of the wheel 17 to the same.

Slidably mounted in each end of this channel or groove 25 are the pistons or blades 28 each having two fingers 29 and 30 formed on its rear end and extending on each side of the rectangular connecting member 26. By this arrangement, each of these pistons or blades 28, which are of arc-shaped plate construction having concavo-convex sides to correspond with the curvature of the groove 25, are prevented from lateral movement but are free to move longitudinally in and out in the groove 25. On each end of the connecting member 26 is a coil spring 31 having one end engaging the connecting member 26 and its other end engaging the rear end of one of the piston members 28 thereby holding the forward end of each of the piston members adjacent and in contact with the inside of the cylinder 10. By this arrangement the annular chamber 18 will be closed at three places, as shown in Fig. 1, by the two pistons or blades 28 and the bar valve 23. Formed in the bearing member 15 is a packing compartment 32 having the ordinary packing 33 therein and embracing the shaft 16. Embracing the shaft 16, threaded on to the free end of the bearing member 15 and extending into the compartment 32 is the ordinary packing gland nut 34. The numerals 35 and 36 designate ordinary bronze bushings for the shaft 16. Inlet and outlet pipes, not shown, may be threaded into the passageways 19 and 20 respectively.

By the foregoing described construction if fluid is forced into the passageway 19 it will pass into the annular chamber 18 and engage one of the pistons or blades 28 and will force that member around with the wheel 17 until it has passed the passageway 20, thereby allowing that amount of fluid to pass out of the annular chamber 18 through the passageway 20 but, however, by this time the other piston or blade 28 is being engaged by the fluid under pressure which will rotate it with the wheel 17 until it also has cleared or passed the passageway 20.

In other words, when fluid is being forced into and through the passageway 19 there will be a constant power exerted for rotating the shaft 16. One reason for this is due to the fact that the two forward ends of the pistons or blades 28 are further apart than the distance between the two points where the two passageways 19 and 20 communicate with the inside of the housing thereby providing no dead center during the rotation of the device. To reverse the rotation of the shaft 16 it is merely necessary to force liquid into and through the device through the passageway 20 instead of the passageway 19. The purpose of the bar valve 23 is to prevent the fluid under pressure from passing directly from one passageway to the other without going around the wheel 17. As the pistons or blades 28 pass between the two passageways they are forced back into the channel or groove 25 by the abutment 21 and the bar valve 23. By the faces of the abutment 21 and the bar valve 23 being sloped to a common point the pistons 28 will yield in their bearings without undue noise or resistance. This action is also facilitated by the bar valve 23 having its longitudinal axis at a slight angle to the longitudinal axis of the wheel 17. For the smoothness of operation of the device the forward ends of the pistons or blades 28 should be rounded, as shown in Fig. 1 and Fig. 3. By such a construction the only wearing parts of the invention will be the two pistons 28 and the bar valve 23 but due to their dimensions and arrangement great wear would be necessary before their efficiency would be destroyed. If after long usage they have become worn to such an extent as to necessitate new parts they are instantly replaced by merely removing either the head 12 or 13.

To increase the life of the invention it is recommended that the pistons or blades 28 and the bar valve 23 be made of different material than the material of the wheel 17 and the cylinder 10.

When the invention is to be used as a positive rotary pump a prime mover is secured in operative engagement with the shaft 16 and one of the passageways is placed in communication with the fluid to be pumped. If it is desired to pump the fluid in the opposite direction it is merely necessary to reverse the rotation of the shaft 16. This is very advantageous where it is desired to first pump the fluid into a tank and then pump it back out again. As there is no dead center during the operating of the device a continual stream of the fluid will be thrown out of one of the passageways. It will be found that the wheel 17 carrying the pistons 28 will be equally balanced, thereby requiring no counter balance

weights and eliminating undesirable vibration. By the bearing member 14 being enclosed, the use of only one packing gland is necessary, thereby greatly increasing the efficiency of the invention. If there is any leakage of the fluid between the shaft 16 and the gland nut 34 it is merely necessary to rotate the latter further on to the bearing member 35, thereby forcing the packing 33 more firmly around the shaft 16. After the wheel 17 has reached a certain number of rotations per minute the springs 31 will be aided in their function by centrifugal force acting on the pistons 28 and yieldingly holding them adjacent the inner side of the cylinder 10. By the groove or channel 25 and the pistons 28 being of a curved construction instead of extending radially from the center of the wheel 17, binding action of the pistons during their sliding movement is eliminated.

The invention produces an intensive even suction and if the fluid to be pumped is reasonably close to the device priming is unnecessary. As soon as the device picks up speed a steady unintermittent flow of fluid will be realized. The invention may also be used to advantage as a meter or measuring device.

It will readily be seen that we have produced a rotary fluid operated and operating device that is efficient in use and refined in appearance.

Some changes may be made in the construction and arrangement of our improved rotary fluid operated and operating device without departing from the real spirit and purpose of our invention and it is our intention to cover by our claims any modified forms of structure or use of mechanical equivalents which may be reasonably included within their scope.

We claim:

1. In a device of the class described, a cylinder, a head secured to each end of said cylinder for enclosing the same, a boss formed on one of said heads, a bearing member formed on the other head, a shaft rotatably mounted in said boss and said bearing member and passing through said bearing member, a wheel secured against relative movement on said shaft and inside said housing, an arc-shaped groove in said wheel and having its two ends terminating at the periphery of said wheel, arc-shaped pistons or blades slidably mounted in said groove each capable of engaging the inner walls of said cylinder, a valve bar slidably mounted in said cylinder for yieldingly closing the space between said wheel and said cylinder and extending at an angle to the longitudinal axis of said wheel, and inlet and outlet ports in said cylinder.

2. In a device of the class described, a cylindrical housing having inlet and outlet ports, a wheel rotatably mounted in said housing having a diameter less than the inside diameter of said housing, a means for yieldingly closing the gap between the inside wall of said housing and the periphery of said wheel, an arc-shaped groove formed in said wheel, a projecting member in said groove having a thickness less than the thickness of said wheel, an arc-shaped piston slidably mounted in said groove and having its forward end capable of engaging the inside of said housing, two projections formed on the rear end of said piston extending on each side of said projecting member, a spring for yieldingly holding said piston adjacent the inside face of said housing, a bar slidably mounted in said cylinder for closing the space between said wheel and said cylinder and extending at an angle to the longitudinal axis of said wheel, and a spring for yieldingly holding said bar adjacent the periphery of said wheel.

3. In a device of the class described, a cylindrical housing having inlet and outlets ports, a wheel rotatably mounted in said housing, a valve for closing the space between said housing and the periphery of said wheel, an arc-shaped groove formed in said wheel and having its two ends terminating at the periphery of said wheel, a connecting member near the center of the length of said groove for holding the two segments of the wheel together and having a thickness less than the thickness of said wheel, a piston slidably mounted in each end of said groove, two projections formed on each of said pistons designed to engage each side of said connecting member, a coil spring between each piston and said connnecting member for yieldingly holding said pistons adjacent the inner wall of said housing, a bar slidably mounted in said cylinder for closing the space between said wheel and said cylinder and extending at an angle to the longitudinal axis of said wheel, and a spring for yieldingly holding said bar adjacent the periphery of said wheel.

4. In a device of the class described, a cylindrical housing, a base member formed on said housing, two passageways in said base member having one of their ends communicating with the inside of said housing, a wheel rotatably mounted in said housing, a sliding piston or blade secured to said wheel, an abutment between said passageways having its two sides sloping toward each other and inwardly, a groove in the top of said abutment extending at an angle to the longitudinal axis of said wheel, a bar slidably mounted in said groove having its inner face extending in two inclines and a means for yieldingly holding said bar adjacent the periphery of said wheel.

5. In a device of the class described, a cylindrical housing, two passageways in said housing, each having one of their ends communicating with the inside of said housing, a wheel rotatably mounted in said housing, a

slidably mounted piston or blade secured to said wheel, an abutment between said passageways having its two sides sloping inwardly and toward each other, a groove in the top of said abutment extending at an angle to the longitudinal axis of said wheel, a bar slidably mounted in said groove having its inner face extending in two inclines and a means for yieldingly holding said bar adjacent the periphery of said wheel.

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