

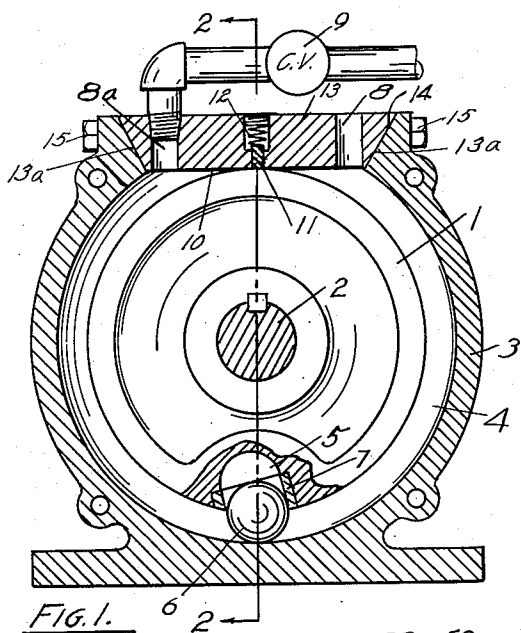
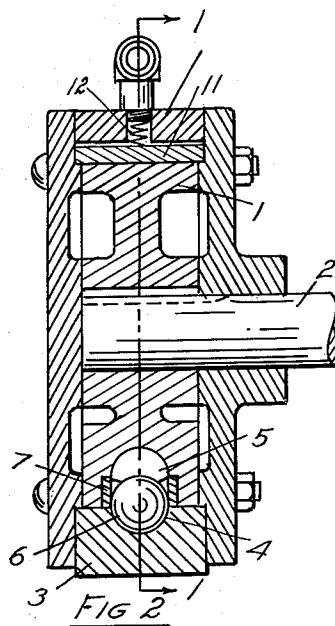
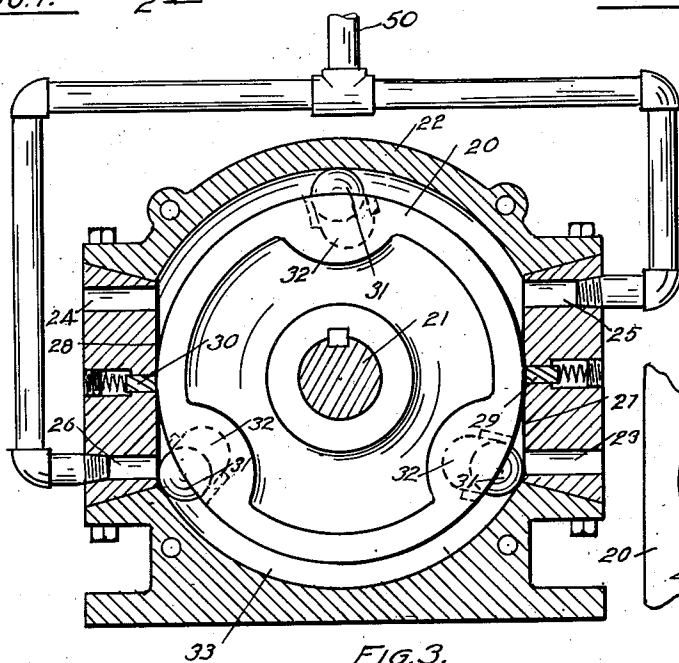
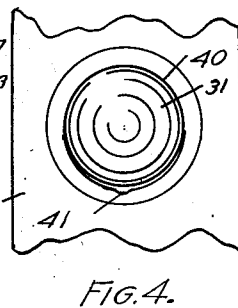
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2,241,607

MACHINE FOR EVACUATING AND EXERTING PRESSURE ON FLUIDS

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MACHINE FOR EVACUATING AND EXERTING
PRESSURE ON FLUIDS

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7 Claims. (CL 103—135)

This invention relates generally to evacuating or pressure creating machines and more particularly to a machine which may be used as a pump, compressor or the like. This application is a continuation in part of application, Serial No. 198,210.

Machines of this character, made according to the teachings of the prior art and with which I am familiar, have not been practical because they have been unable to hold a seal. The capacity of the prior machines have also been very limited because of the use of an eccentric rotor. Spring pressed reciprocating blades have been used with the eccentric rotors, but it has been found that there is excessive wear due to friction. Much leakage passed the blades and these machines therefore were of small capacity. Cylindrical pipe members and the like have been used in rotary compressors, but no seal is obtainable because of the leakage around the ends of the cylinder.

It is accordingly an object of my invention to overcome the above and other defects in present types of compressors and it is more particularly an object of my invention to provide a machine for evacuating fluid or for creating fluid pressure which is simple and rigid in design, economical in initial cost and operation, efficient, and capable of operating at high speed without excessive friction or wear.

Another object of my invention is to provide a machine for evacuating fluid or for creating fluid pressure which requires little attention or repair and provides a maximum of serviceable life.

Another object of my invention is to provide a machine of the class described which may be disposed in a vertical, horizontal, or any other suitable position.

Another object of my invention is to provide a machine of the class described which employs certain forces set up in the machine to assist in the more efficient functioning of the machine.

Another object of my invention is to provide a machine of the class described which has a minimum amount of torque to overcome.

Another object of my invention is to provide a machine of the class described which utilizes a minimum amount of space, which has a maximum output in proportion to the space required.

Another object of my invention is to provide a machine for evacuating a fluid or for creating fluid pressure which furnishes a continuous flow of fluid at uniform pressure, or which evacuates continuously.

Another object of my invention is to provide a machine of the class described for evacuating fluid or for creating fluid pressure which provides a construction wherein a perfect seal is maintained by a member on the periphery of the inner rotor of the machine.

Other objects of my invention will become evident from the following detailed description taken in conjunction with the accompanying drawing in which:

Fig. 1 is a side elevational view in cross section, along a central longitudinal line shown by line 1—1 of Fig. 2.

Fig. 2 is a view taken on the line 2—2 of Fig. 1.

Fig. 3 is a side elevational view in cross section on a central longitudinal plane, showing the use of more than one ball in my novel evacuating or pressure creating machine, arranged to create an even flow of fluid at uniform pressure.

Fig. 4 is a fragmentary top plan view of the aperture in the rotor of my machine showing a small vent for the escape of fluid from the bottom portion of the aperture.

Referring to the drawing, Fig. 1 shows one embodiment of my novel evacuating or pressure creating machine comprising a rotor 1, keyed on a driving shaft 2 and an outer casing 3, having a semi-circular groove 4 on the internal periphery thereof. An aperture 5 is disposed in the outer periphery of the rotor 1 for retaining a ball 6. The aperture 5 is inclined in order that the surface of the ball 6 contacting the side of the aperture 5 will be at a point below the periphery of the rotor 1. The outer surface of the ball 6 contacts the side of the aperture 5 at a predetermined point below the periphery of the rotor 1. The groove 4 is of such depth as to cause the ball 6 to contact the side of the aperture 5 at a predetermined point below the periphery of the rotor 1. A complete seal is provided upon full contact between the outer side of the ball 6 and groove 4 which is permitted when the surface of the ball 6, contacting the sidewall of aperture 5, is at a point below the periphery of the rotor 1. The outer surface of the ball 6, contacting the side of the aperture 5 is in a plane normal to the inclined side of the aperture and passing through the center of the ball 6. The plane normal to the inclined side of the aperture 5 is parallel to a line tangent to the ball 6 at a point where a line drawn parallel to sides of the inclined aperture 5 and through the center of the ball 6 projects through the periphery thereof. A replaceable insert 7 is provided in the aperture 5 which may be hardened and

therefore provide a surface which will give long wear. The insert 7 may be made of any suitable materials. The outer casing 3 has an inlet port 8 and an outlet port 8a for the fluid. A check valve 9 is disposed adjacent the outlet port 8a to prevent the return to the casing 3 of the fluid under pressure passing therethrough. A raised portion 10 on the inner periphery of the casing 3 is disposed between the inlet port 8 and outlet port 8a and has a sealing member 11 urged inwardly by spring 12 to prevent the incoming fluid from mixing with the fluid being compressed by the ball 6 moving in the groove 4 in the casing 3. It will be evident that any form of sealing means may be provided to perform the same function as the spring urged sealing member 11. The raised portion 10 provides for an automatic release of pressure in front of the ball 6, rotating and moving in the groove 4, in that the ball 6 moves up the raised portion and permits the fluid to pass, thereby releasing any pressure set up. If the pressure set up by the ball 6 were not released there would be such a high resistance to the movement of the ball 6 that it would greatly decrease the efficiency of the machine. The outlet port 8a is preferably disposed at a point immediately preceding the rise in the raised portion 10 to permit better release of pressure and less wear on the port 8. The rotor 1 of my machine may be disposed in a vertical or horizontal plane.

In order that my machine may be easily machined, I have provided a removable member 13 wherein the inlet and outlet ports 8 and 8a are disposed. The removable member 13 has tapered surfaces 13a which engage corresponding tapered surfaces 14 in the casing 3 to provide a sealed engaging surface. A bolt 15 secures the removable member 13 in position.

In operation, when the rotor 1 is rotated at a predetermined speed, the ball 6 is thrown outwardly by centrifugal force into engagement with the groove 4 in the casing 3 and it is held in engagement with the groove 4 by centrifugal force. The ball 6 moves into a tightly fitted position in the groove 4 and rotates therein. The ball 6 in the groove 4 of the casing 3 compresses any fluid in its path and forces the fluid out of the casing 3 through the outlet port 8a. When the ball 6 reaches the outlet port 8a it is gradually raised out of the groove 4 by the raised portion 10. At this time any pressure set up between the ball 6 and the sealing member 11 is released by the ball 6 into the port 8a. After the ball 6 passes over the sealing member 11 it again reengages the groove 4. The passage of the ball 6 around the enclosed casing 3 in the groove 4 thereof creates a partial vacuum, thereby filling the space in the casing 3 with fluid from the inlet port 8, which fluid is placed under pressure by the ball 6 after it passes over the raised portion 10 and engages the groove 4 at the inlet port 8. It is evident that any form of fluid may be used in my machine such as liquid, gas, air and vapor. It is evident that a plurality of balls and ports could be used as well as one in this embodiment of my invention.

Fig. 3 is another embodiment of my invention in which a rotor 20 is keyed on the driving shaft 21 and partially encased in an outer casing 22. The outer casing 22 has two inlet ports 23 and 24, and two outlet ports 25 and 26. Two raised portions 27 and 28 are disposed between the inlets 23 and 24 and outlets 25 and 26, respectively. Sealing members 29 and 30 are provided on the

raised portions 27 and 28 to prevent passage of fluid thereby. Three balls 31 disposed in inclined apertures 32 on the outer periphery of the rotor 20 move outwardly by centrifugal force created by rotation of the rotor 20 and engage the groove 33 on the internal periphery of the casing 22. It will be evident that even and continuous flow results from this machine because of the even number of ports and the odd number of balls, although it will be evident the same results could be obtained by an even number of balls and an odd number of ports. The balls 31 are so disposed that when one ball leaves the inlet port 24 the ball immediately forward thereof approaches the outlet port 25 thereby providing a continuous flow of fluid at a uniform pressure. The inlet ports 23 and 24 have a common source and the outlet ports 25 and 26 have a common outlet 50.

This form of my invention operates on the same principle as my previously described machine, the only difference being the use of an even number of ports with an odd number of balls in order to obtain a constant flow of fluid and even pressure in the outlet ports 25 and 26 and a constant evacuation from the inlet ports 23 and 24. My invention, shown in Fig. 3, shows the balls 31 disposed equally distant from each other around the periphery of the rotor 20. This form of my invention requires a concentric groove to create even evacuation and to create a constant flow of fluid at a uniform pressure.

Fig. 4 shows an aperture 40 wherein a small passage 41 is provided for any fluid which may be forced into the bottom of the aperture 40. This small passage 41 is not necessary for the successful operation of my machine and is, therefore, not shown in the drawing in Figs. 2 and 3.

It will be apparent from the foregoing description that radially extending apertures in the rotor could not be used because of the leakage around the ball members when in operation. The apertures must be inclined to such a degree that a perfect seal is obtained on at least the rear portion of the ball members when they are in operation. The best inclination found is from 13 to 15 degrees although the applicant does not wish to be limited to any particular angle of inclination for the apertures.

It will be evident that I have provided a machine for evacuating and for exerting the pressure on fluids, which is simple in construction, low in cost, easy to maintain, maximum in capacity, efficient in operation, and which may be operated at high speed without excessive friction or wear.

Various changes may be made in the specific embodiment of the present invention without departing from the spirit thereof or from the scope of the appended claims.

What I claim is:

1. A machine of the class described having, in combination, a circular rotating member having an aperture inclined inwardly forward in the direction of rotation in the peripheral surface thereof, a ball member disposed in said aperture movable outwardly upon rotation of said rotating member, a casing surrounding and supporting said rotating member having an inlet and an outlet, and a grooved surface concentric with respect to said rotating member in communication with said inlet and said outlet and in alignment with said aperture in contact with which grooved surface said ball member moves upon rotation of said rotating member to exert a pressure on fluid in said casing, said groove being of a prede-

terminated depth wherein the outer surface of said ball member contacts the side of said inclined aperture which is rearward with respect to the direction of rotation of the rotating member at a point radially inwardly of the periphery of said rotating member in a vertical plane, passing through the center of the ball and normal to the side of said inclined aperture throughout the period of contact of said ball member with the wall of said grooved surface.

2. A claim as set forth in claim 1 wherein a sealing member is disposed between said inlet and said outlet.

3. A machine of the class described having, in combination, a circular rotating member having a plurality of apertures inclined inwardly forward in the direction of rotation in the peripheral surface thereof, ball members disposed in said apertures movable outwardly upon rotation of said rotating member and a casing surrounding and supporting said rotating member having an inlet and an outlet, and a grooved surface concentric with respect to said rotating member in communication with said inlet and said outlet and in alignment with said apertures in contact with which grooved surface said ball members move upon rotation of said rotating member to exert a pressure on fluid in said casing, said groove being of such depth as to move said ball members in contact with a side of said apertures at a point below the outer surface of the rotating member in a plane normal to the side of the apertures and passing through the center of the ball members throughout the period of contact of said ball members with the wall of said grooved surface.

4. A machine as set forth in claim 2 wherein a sealing member is disposed between said inlet and said outlet.

5. A machine of the class described having, in combination, a circular rotating member having a plurality of apertures inclined inwardly forward in the direction of the rotation in the peripheral surface thereof spaced equally distant apart, ball members disposed in said apertures movable outwardly upon rotation of said rotating member, the outer surfaces of said ball members contacting a side of said apertures at a point below the outer periphery of the rotating member in a plane normal to the side of the apertures and passing through the center of the balls, and a casing surrounding and supporting said rotating member having oppositely disposed

inlets and outlets wherein two ball members engage an inlet and an outlet respectively, at the same time, said casing having a grooved surface concentric with respect to said rotor in communication with said inlets and said outlets and in alignment with said apertures in contact with which grooved surface said ball members move upon rotation of said rotating member to exert a pressure on fluid in said casing, said grooved surface being of such depth as to move said ball members in contact with the side of said inclined apertures which is rearward with respect to the direction of rotation of the rotating member at a point below the periphery thereof throughout the period of contact of said ball members with the wall of said grooved surface, and means for releasing the pressure set up by said ball members.

6. A machine as set forth in claim 5 wherein said means for releasing the pressure set up by said ball members comprises a portion of said casing raised inwardly toward the peripheral surface of said rotating member between said inlets and outlets.

7. In a machine of the class described, in combination, a circular rotating member having apertures inclined inwardly forward in the direction of rotation in the peripheral surface thereof, ball members disposed in said apertures movable outwardly upon rotation of said rotating member, a casing surrounding and supporting said rotating member having a plurality of inlets and outlets and a grooved surface concentric with respect to said rotor in communication with said inlets and said outlets and in alignment with said apertures in contact with which grooved surface said ball members move upon rotation of said rotating member to exert a pressure on fluid in said casing, the depth of said groove being such as to move said ball members in contact with the side of said inclined apertures which is rearward with respect to the direction of the rotation of the rotating member at a point below the outer peripheral surface of said rotating member in a plane normal to the side of the apertures and passing through the center of the ball members throughout the period of contact of said ball members with the wall of said grooved surface, and a common conduit engaging said outlets for maintaining equal pressures in said machine.

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