April 11, 1933. C. E. ANDERSON 1,903,606

ROTARY PUMP

Filed June 6, 1928 3 Sheets-Sheet 1

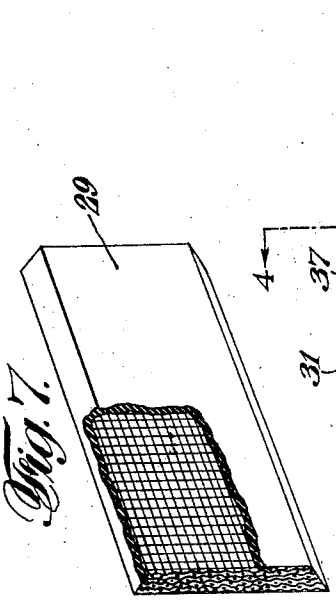


Fig. 7.

Fig. 1.

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INVENTOR

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ROTARY PUMP

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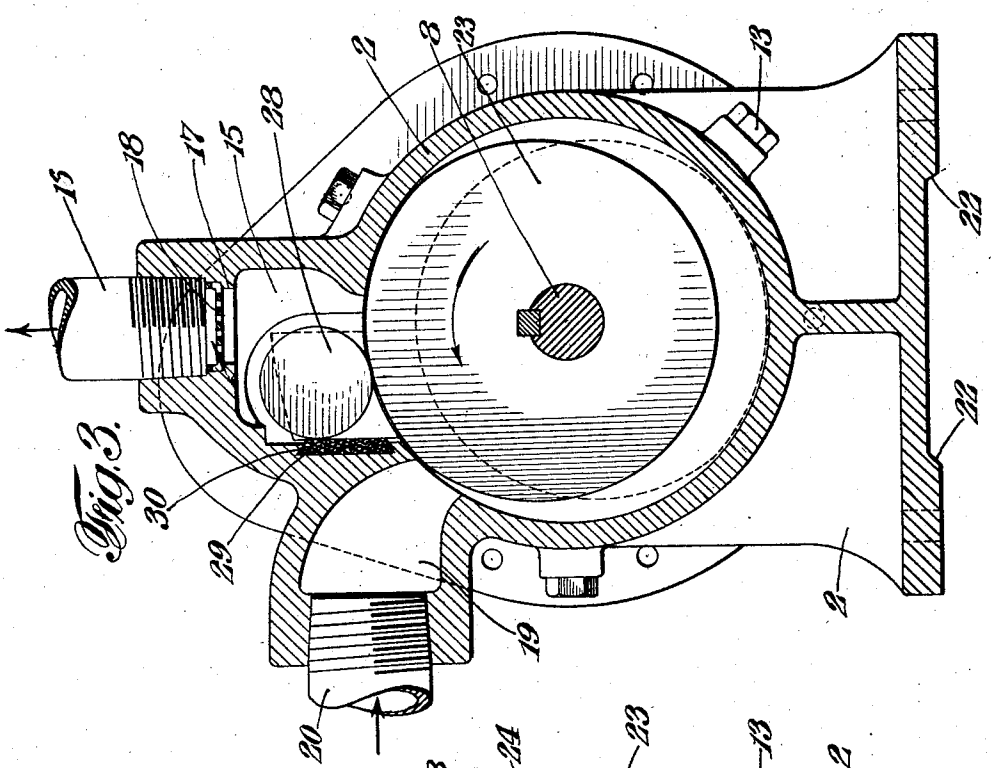


Fig. 3.

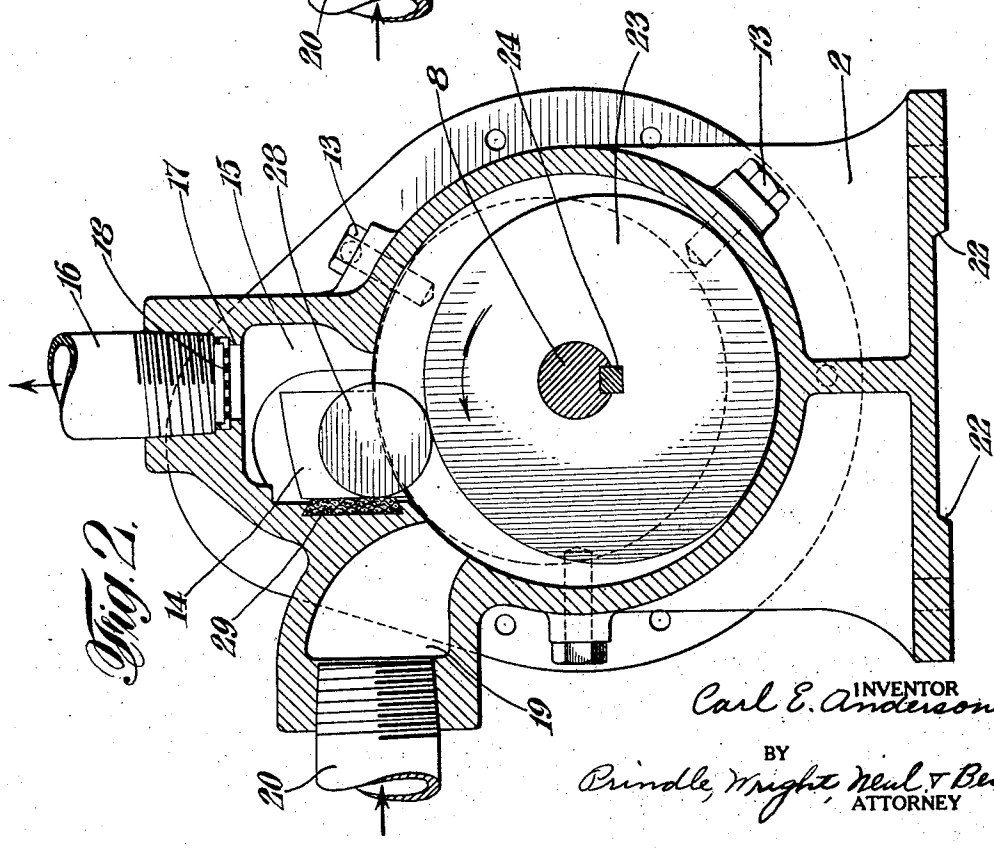


Fig. 2.

Carl E. Anderson INVENTOR

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ROTARY PUMP

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Fig. 6.

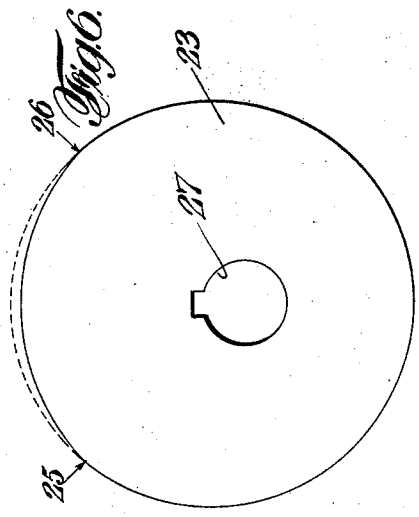


Fig. 5.

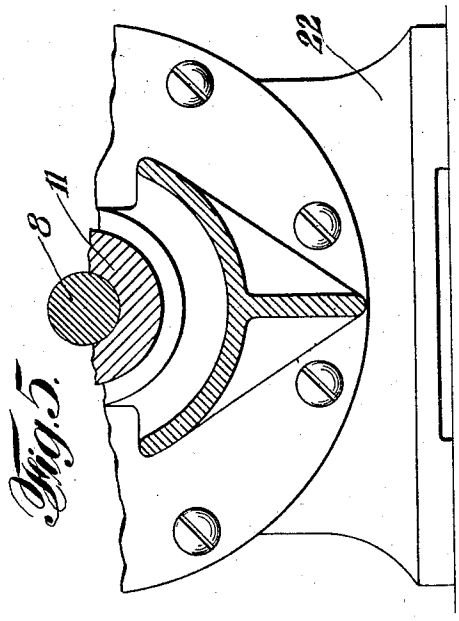
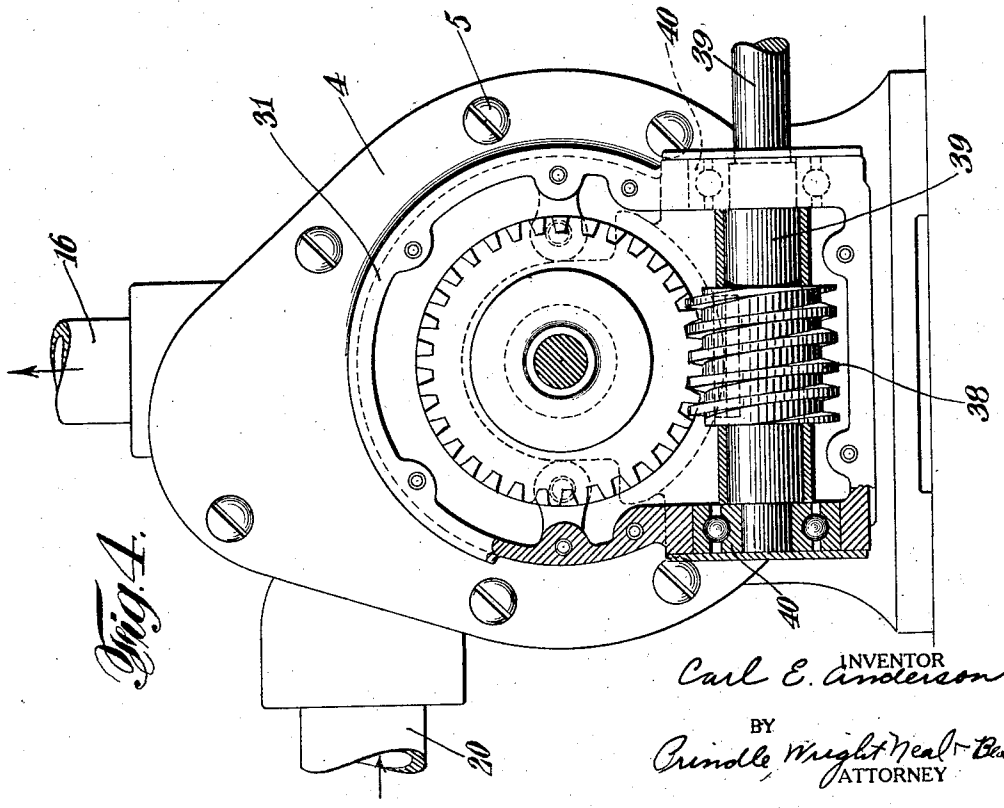


Fig. 4.



Carl E. Anderson INVENTOR

BY Cronolle, Wright, Neal & Blan

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Patented Apr. 11, 1933

1,903,606

UNITED STATES PATENT OFFICE

CARL E. ANDERSON, OF BROOKLYN, NEW YORK

ROTARY PUMP

Application filed June 6, 1928. Serial No. 283,150.

This invention relates to improvements in rotary pumps, and the principal object thereof is the provision of a pump which is simple in construction, composed of few parts, having high efficiency in operation, and capable of various and extended uses, in a wide range of installations.

A further object of the invention is the elimination of springs and other similar movable parts which deteriorate and break in use, and limiting the structure to the utilization of a few parts of substantial construction capable of extended usage without deterioration and wear, and which however, may be readily replaced in the event that becomes necessary.

A further object of this invention is the provision of a rotary pump having a plurality of pump chambers, in each of which is mounted a rotor or rotary element, each rotary element being mounted eccentrically and the rotary elements in the adjacent compartments being in opposition to each other as far as the eccentric mounting is concerned; an abutment roller having rotary contact with each of said rotors, the partition separating the pump compartments or chambers being extended sufficiently to separate the abutment rollers from each other.

A further object of this invention is the provision in connection with the abutment rollers previously referred to, of a bearing surface element of long life and which may be readily replaced in the event it becomes worn through abnormal or very extended usage.

A further object of this invention is the provision in combination with the pump casing, of a discharge outlet having a screen element positioned therein which acts as a screen and also as means to restrict the discharge flow so as to build up pressure upon the abutment rollers to assist in retaining them in engagement with the rotating surfaces of the rotors.

Further objects of this invention include improvements in details of construction and arrangement, whereby a rotary pump of simple construction is provided, which is readily adaptable to mass production and which has a high efficiency, and operates quietly.

To the accomplishment of the foregoing and such other objects as may hereinafter appear, this invention consists in the construction, combination and arrangement of parts hereinafter described, and then sought to be defined in the appended claims, reference being had to the accompanying drawings forming a part hereof, and which show merely for the purpose of illustrative disclosure, a preferred embodiment of my invention, it being expressly understood however, that various changes may be made in practice within the scope of the claims without digressing from my inventive idea.

In the drawings:

Fig. 1 represents a longitudinal vertical cross sectional view of one form of pump constructed to embody my invention.

Fig. 2 represents a vertical transverse cross section taken through one of the pump chambers or compartments thereof.

Fig. 3 is a view similar to Fig. 2 with the rotor and other parts shown in the position assumed after a rotation of approximately 180°.

Fig. 4 is an end view taken substantially on line 4—4 of Fig. 1, parts being shown in section to facilitate the disclosure.

Fig. 5 is a vertical transverse cross section taken substantially on line 5—5 of Fig. 1.

Fig. 6 is a side elevation of one of the rotors.

Fig. 7 is a perspective view of one of the bearing surface elements removed, part being broken away to illustrate the interior construction thereof.

Referring now to the drawings, the numeral 1, designates the pump casing, as a whole. This is preferably formed of the body part, 2, and the end plates or members 3 and 4 adapted to be secured to each side of the body 2 by means of bolts 5.

The end plate 3 is formed with the hollow boss or projection 6, adapted to receive the bushing or bearing 7 to form the end bearing for the driving shaft 8, which also has a bearing in the bushing or bearing 9 positioned in the extension 10 from the other end plate

4. A suitable packing gland 11 is provided in this end to insure a fluid-tight connection.

The body member 2 has a partition member 12 permanently secured thereto, as by means of screws, 13, so as to divide the casing into a plurality of pump chambers or compartments and this partition is provided with an extension element 14 offset on the upper side thereof and which is of sufficient length to extend into the discharge compartment 15 which communicates with the outlet 16 formed in the upper part of the body member 2. This outlet 16 has a comparatively restricted opening 17 in which is mounted a screen element 18 which operates to further restrict the discharge flow and therefore build up pressure within the discharge compartment 15. The screen also serves to keep foreign materials out of the pump. This body member 2 is also provided with an inlet compartment 19 which communicates with the inlet connection 20 and provides a source of fluid supply for the pump.

As shown in the drawings the extension element 14 is preferably a separate element and is preferably secured in position on top of the partition 12 by means of the screw or bolt 21. It is to be expressly understood that while I have illustrated only one partition and extension 14, that the same construction may be utilized to provide a multiplicity of pump chambers or compartments within the pump casing 1; also that only one pump chamber or compartment may be used. Furthermore, attention is directed to the fact that the body 2 of the pump casing is formed so as to provide the extended base or foot construction 22.

The rotors 23 are of course preferably similar in conformation and dimension, and are keyed, as at 24, to the shaft 8. These rotors are of general circular construction, on a radius or diameter less than that of the internal diameter of the pump chamber or compartment. However, a substantial portion of the edge or periphery of each rotor 23 is formed on the same radius and diameter as the inner surface of the pump chamber or compartment, this being indicated in Fig. 6 of the drawings between the reference characters 25 and 26. There is a slight clearance between this surface 25, 26, and the inner surface of the cylinder, which is exaggerated in the drawings for purposes of disclosure. The rotors 23 are bored eccentrically as at 27 to receive the shaft 8 and they are mounted upon the shaft in opposition to each other, as far as their eccentricity is concerned.

I provide, in each pump chamber or compartment, the rotary abutment member 28, which is positioned in the space between the partition 12 and its extension element 14 on the one hand, and the sides 3 or 4 of the pump casing on the other hand as the case may be, or, in the multiple construction, between the various partitions in the case of the intermediate pump chambers or compartments. Each rotary abutment 28 is mounted in an off center position or rather, to one side of the vertical center line of the cylinder bore, and has a lower point of contact with the rotating surfaces of its rotor 23, and also has a side point of contact in the discharge chamber. At this point of contact, I provide a bearing surface element 29, which is preferably securely fitted into the beveled or undercut opening 30, formed in the wall of the discharge compartment in the body 2 of the casing. This bearing surface element is formed of material having a long life and I have found for example that a bakelite or phenol condensation product is suitable for the purpose. In one form, this bearing surface 29 is built up of such material and a plurality of plies of strong fabric. As the contact of the rotary abutment 28 therewith is movable, it is seen that the life of such a bearing surface element must be very extensive. As the pump is operated, the rotary abutment member 28 has, beside its relatively high speed of rotation, a vertical sliding motion relative to the bearing surface 29. In order to prevent the abutment member from becoming scored or pitted or unevenly worn due to the vertical sliding contact with surface 29, it is necessary that the bearing surface be formed of a relatively tough substance having a low coefficient of friction. When the abutment member is made of metallic material, the bearing surface 29 is preferably formed of a non-metallic substance such as a phenolic condensation product, lignum-vitæ, fibre, leather or the like. At this point I desire to call attention to the fact that the rotary abutment may be characterized as free rolling and positively acting. Furthermore, it is subject to a minimum amount of wear and friction, and may be operated at standard speeds and also at much higher speeds. The total weight of the rotary abutment is supported on the rotor. The bearing surface element 29 is preferably arranged vertically in the casing and in such a position as to eliminate friction which might be caused by the weight of the roller acting directly against it. The function of this element 29 is to eliminate the wear of the roller and also to reduce friction. It does not support the roller, and it prevents the wearing of the roller due to the peculiar characteristics of its composition.

In order to provide for a convenient drive for this pump, I form the side member 4 of the casing with an integral gear housing and a gear construction therein. This housing is connected to the end of the extension 10 and includes the housing 31 having the integral side member 32 and the separable end or side

member 33. The side member 32 is bored to receive the driving shaft 8 and the packing 34 and the end member 33 is provided with a hollow projection 35 and a bushing or bearing 36 to afford an end bearing for the shaft. The lower portion of this end member 33 is formed as an extended foot or base 33′ in parallelism or in the same plane with the extended foot or base 22 of the pump casing or body.

Worm gear 37 is keyed to the shaft 8 within the housing 31 and is in mesh with the worm 38 keyed to the driving shaft 39 which extends through the lower portion of the housing at right angles to the driving shaft 8 and has suitable journals or bearings 40 thereon. This driving shaft 39 is directly connected to a motor so that the pump has a direct drive.

In operation, rotation of the shaft 8 will result in rotation of the rotors 23 in the direction of the arrow, and during this rotation each rotor will act to carry a charge of water from the inlet compartment 19 to the discharge chamber or compartment 15. When the part of the rotor which is formed on the larger diameter indicated at 25 and 26, and which may be called a "lobe", is at the top or upper part of the pump casing; both the inlet and discharge ports or chambers are closed so as to eliminate any possibility of back pressure. Furthermore, the discharge port or chamber is closed before the inlet port or chamber is opened. As the rotor moves to the left or in the direction of the arrow, see Fig. 2, the space in the pump chamber which receives the incoming fluid, increases in capacity until the cut-off surface or lobe cuts off the inlet port. As the rotor moves further, this space opens into or communicates with, the discharge chamber or compartment 15 and the water is gradually forced thereinto and out through the discharge outlet due to the convergence of the surface of the rotor and the inner surface of the pump casing. Of course the rotary abutment 28 is always in contact with the upper surface of the rotor 23 between the inlet port and the opening into the discharge chamber compartment and insures the discharge of the fluid under pressure. This rotary abutment is held in position by the force of gravity and by the pressure in the discharge chamber or compartment 15. This completes the description of a cycle of operation.

Of course, it is understood that I may utilize in this pump construction a single rotor, and, also, instead of having a single lobe or cut-off surface 25, 26, I may have two or more for each rotor. Furthermore, it is to be understood, that the screen element may be omitted, if desired. It is however, desirable to use it in some high speed installations.

It is to be particularly noted that there are no springs or other parts liable to quick deterioration, and that the rotary abutment has a rolling contact at two points only, resulting in a minimum wear of all the parts and also resulting in uniformity at whatever wear eventuates so that long use of this construction will result in no decrease in efficiency.

Furthermore, attention is also directed to the self-contained driving and pump construction embodied in a single unitary construction, which lends itself to mass production and to use for small installations as well as large ones.

This construction may be used as a vacuum pump, compressor and for handling a light and heavy liquid and also as an air or liquid motor as well as a meter.

What I claim is:

1. An apparatus of the character described, including, in combination, a casing having a circular pump chamber and a common abutment and outlet chamber therein, a partition dividing said chambers into a plurality of compartments to provide a duplex pump, said partition being inserted and fixedly secured in said casing, a shaft journaled in said casing, a rotor mounted eccentrically on said shaft in each of said compartments, each rotor having an extended cut-off surface, said casing having an inlet and an outlet adapted to communicate with said compartments, said partition having an extension fixedly secured thereto extending into said outlet chamber, a cylindrical rotary abutment member for each compartment positioned between said inlet and outlet and bearing upon the upper surface of its rotor, said rotary abutments being separated by said extension and also having a side and end bearing or contact with part of the casing.

2. An apparatus of the character described comprising a casing having a circular pump chamber and a common abutment and outlet chamber therein, a circular partition plate fixedly secured in said casing for axially dividing said pump chamber into a plurality of pumping compartments, a shaft journalled in said casing, a rotor mounted eccentrically on said shaft in each of said compartments, said casing having common inlet and outlet openings for said compartments, said partition plate having an extension plate secured thereto, said extension plate being positioned in said outlet chamber, a cylindrical rotary abutment member positioned in each abutment chamber between said inlet and outlet openings, resting freely on the surface of the rotor and having continuous rolling contact therewith, a bearing member fixed in one wall of said abutment chamber in vertical offset relation to the vertical axis of said casing, said abutment members hav-

ing rolling and sliding contacts with said bearing member, said bearing member consisting of a tough, non-metallic substance having a low co-efficient of friction.

In testimony that I claim the foregoing, I have hereunto set my hand this 26th day of May, 1928.

CARL E. ANDERSON.