Nov. 11, 1924. 1,515,192

L. DINESEN

ROTARY PUMP

Filed June 23, 1922 2 Sheets-Sheet 1

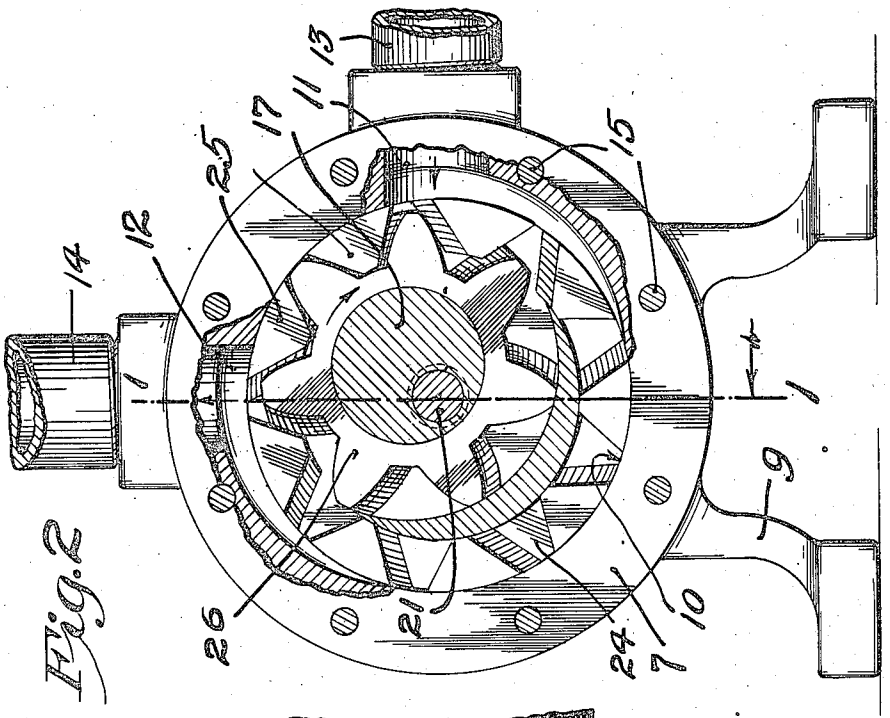


Fig. 2

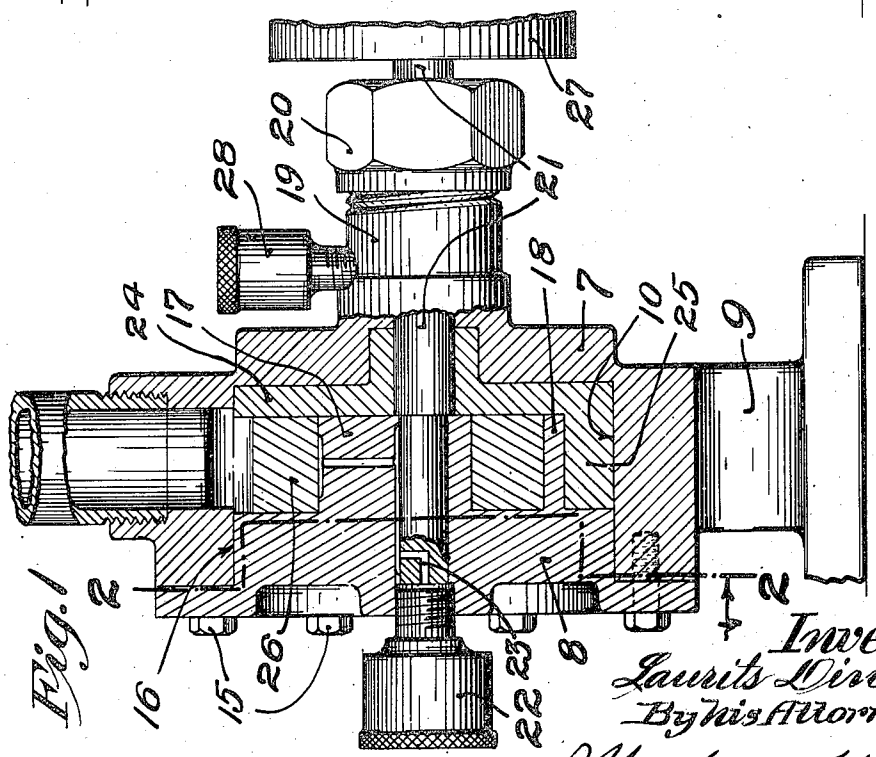


Fig. 1

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Fig. 3

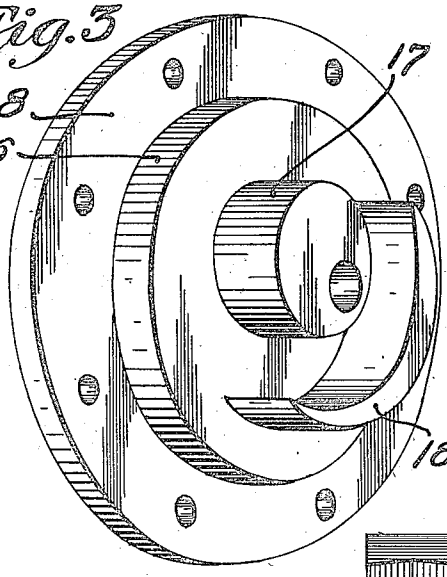


Fig. 4

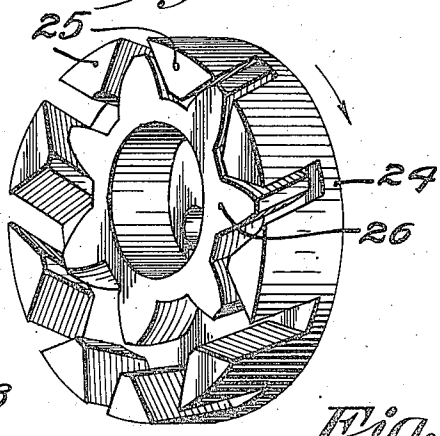


Fig. 8

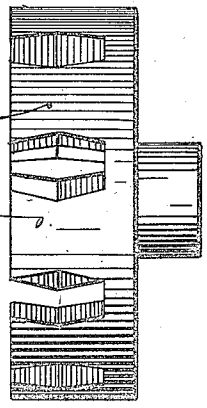


Fig. 7

Fig. 5

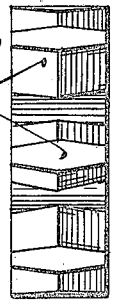
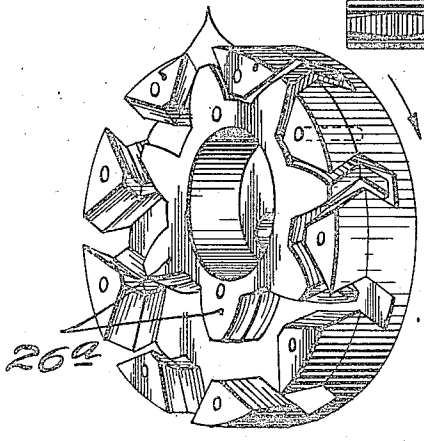
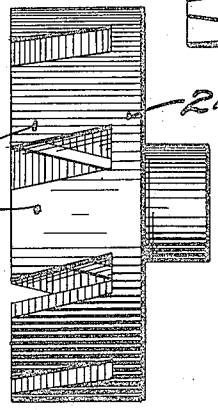


Fig. 6





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UNITED STATES PATENT OFFICE.

LAURITS DINESEN, OF MINNEAPOLIS, MINNESOTA.

ROTARY PUMP.

Application filed June 23, 1922. Serial No. 570,422.

To all whom it may concern:

Be it known that I, LAURITS DINESEN, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Rotary Pumps; 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 that type of rotary pump or motor which involves a casing and, within the casing, cooperative gear-acting rotary piston members, one of which is in the form of an internal gear and the other of which is in the form of an external pinion, and the invention involves certain important novel features whereby a very highly efficient motor or pump is produced.

The improved device is broadly treated as a motor, but is especially intended for use as a rotary pump and more particularly for use as a pump for doing light work, such as pumping of cream or milk in creameries, the circulation of brine in refrigerators, the pumping of liquid in spraying apparatuses and for the circulation of cooling water in automobiles or in connection with other water-cooled engines. Nevertheless, the pump may be designed in any suitable size and may be used for any suitable purpose, or may be used as an engine when driven either by water, air or steam.

In the accompanying drawings, which illustrate the invention, like characters indicate like parts throughout the several views.

Referring to the drawings:

Fig. 1 is a view chiefly in vertical section on the line 1—1 of Fig. 2, but with some parts shown in full and illustrating the construction of the improved motor hereinafter referred to as a pump;

Fig. 2 shows the pump in side elevation with some parts sectioned on the irregular line 2—2 of Fig. 1 and with some parts broken away.

Fig. 3 is a perspective showing one side or section of the pump casing;

Fig. 4 is a perspective showing the two rotary gear-acting piston elements removed from the pump;

Fig. 5 is a plan view of the parts shown in Fig. 4;

Fig. 6 is a view corresponding to Fig. 4 and illustrating a modified construction;

Fig. 7 is a plan view illustrating a modified form of the internal rotary member; and

Fig. 8 is a plan view showing a piston-acting pinion designed for co-operation with the member shown in Fig. 7.

Referring first to the construction illustrated in Figs. 1 to 5, inclusive, the numerals 7 and 8 indicate, respectively, relatively fixed and removable head plates or side members of the pump casing, the former as shown being cast integral with supporting legs 9. The plate 7 is formed with an internal cylindrical surface 10 and with peripheral intake and discharge ports 11 and 12, respectively. Liquid supply and discharge pipes 13 and 14 lead, respectively, to the ports 11 and 12. The ports 11 and 12 are circumferentially extended and preferably are made progressively more narrow until they blend into the cylindrical surface 10. In the preferred construction illustrated, the main portions of the ports 11 and 12 are located about ninety degrees apart and are extended circumferentially in opposite directions through considerably less than ninety degrees, leaving considerably more than ninety degrees between the diminished extremities. The plate 8 is shown as detachably secured to the plate or member 7 by machine screws 15 and it is formed with a cylindrical surface 16 that closely telescopes into the cylindrical surface 10 but terminates outward of the ports 11 and 12. Said plate 8 is formed with a cylindrical hub 17 and with a crescent-shaped partition 18. The hub 17 is eccentric to the axis of the cylindrical surface 10. The outer surface of the crescent partition 18 is concentric to said cylindrical surface 10, while the inner surface of said crescent partition is concentric to the exterior of the hub 17.

The casing plate or member 7 is formed with an axially located outwardly projecting sleeve 19 shown as equipped with a packing gland 20. A driving shaft 21 is extended through and journaled in the bearing sleeve 19 and in the hub and body portion of the plate or member 8. Preferably, the

shaft 21 does not extend completely through the member 8 and the shaft passage of the latter is plugged by a grease cup 22 that supplies oil to an oil duct 23 in the adjacent end of said shaft.

Here it is highly important to note that the shaft 21 is located radially inward of the cylindrical surface of the eccentric hub 17 and that the said hub and the body of the plate 8 afford a long bearing for said shaft. By the arrangement described, the shaft 17 has a bearing on both sides of the pump and, in fact, the said bearing is nearly continuous through the pump, which structure is made possible by the fact that the said shaft is inside of the cylindrical hub.

The said hub 17 and the crescent partition 18 are spaced from the inner face of the plate 7 so as to leave space for a closely fitting rotary disk or wheel 24 that is secured to the driving shaft 21 and has a hub working in a recess of the bearing sleeve 19. This rotary disk 24 constitutes part of the internal rotary gear-acting pump piston and its periphery is concentric to and runs in close contact with the cylindrical surface 10 and, moreover, said disk 24 is provided with laterally projecting circumferentially spaced internal gear teeth 25 that run in close contact with the annular channel formed between the cylindrical surface 10, the outer surface of the crescent partition 18 and the side plates of the pump casing.

Working rotatively on the eccentric hub 17 is a toothed rotary pump piston in the form of an external spur pinion 26, the teeth of which mesh with the spaces between the teeth 25 and are arranged to run in close contact with the inner or concave surface of the crescent partition 18. The sides of this pinion run in close contact with the inner face of the rotary disk 24 and with the inner face of the plate 8.

As an important feature of this invention, the teeth 25 of the rotary disk or piston member 24 and the teeth of the pinion 26 have obliquely cut or formed contacting surfaces. This not only gives a smoother running gear action but, as will presently appear, produces a more efficient pumping action.

The numeral 27 indicates a driving pulley located on one end of the driving shaft 21 and the numeral 28 indicates a grease cup shown as applied to the bearing sleeve 19.

The operation of the device described, as a pump, is as follows:

By power applied to the shaft 21 through a belt, not shown, but which may be run over the pulley 27, said shaft and the two rotors or gear-acting piston members will be caused to rotate in a clockwise direction in respect to Fig. 2 and water or other liquid will be drawn in through the intake port 11 and will be discharged through the discharge port 12. Obviously, as the teeth of the two rotary members separate by downward movement from the intake port 11, they will tend to create a partial vacuum that will draw in the liquid through the pipe 13 and port 11 and this will cause the interdental spaces between the teeth of the said two rotary members to be filled with water. The liquid caged in these interdental spaces will be carried by the teeth 25 through the space between the cylinder 10 and the crescent partition 18, while the water caged between the teeth of the pinion 26 will be carried inward of said partition. After passing the partition in an upper direction, the teeth of the two rotary members again come into mesh and progressively force the water from the interdental spaces radially outward through the passages between the teeth 25.

The diminishing extension of the ports 11 and 12 give the water a chance, in the first instance, to completely fill the interdental spaces and, in the second instance, to be freely discharged therefrom. The spiral or oblique arrangement of the teeth of the rotary piston members not only gives a smoother gear action but causes the water to be taken into the interdental spaces and to be discharged therefrom with a very even and well distributed action. For example, it will be noted that the interdental spaces do not come all at once into registration with the intake port 11 nor all at once leave registration with the discharge port 12 but pass the same obliquely and with a sort of a movement resembling the drawing cut of a knife. This reduces, to a minimum, water shocks and, moreover, reduces, to a minimum, all tendency toward "water lock." It is, of course, important that the interdental spaces between the teeth 25 be opened at the outer peripheral portion of the internal rotary piston member, so that they may freely receive from the port 11 and freely discharge into the port 12.

It will, of course, be understood that when a motive fluid, such as water, steam or air, is delivered to the port 12 through the pipe 14, the device will then act as a rotary engine and the rotary piston members will then be rotated in an anti-clockwise direction in respect to Fig. 2.

The arrangement of bearings on both sides and substantially through the casing for the shaft 21 is highly important and, so far as I am aware, not hitherto accomplished in a pump or motor of the type herein disclosed.

In the modified construction illustrated in Fig. 6, the teeth or propelling lugs 25^a of the internal rotary piston member and the teeth of the pinion 26^a are formed on one

side with reversely beveled salient surfaces and on the opposite sides with reversely beveled reentrant surfaces, the apexes of which surfaces are at the transverse centers of said teeth.

In the construction illustrated in Figs. 7 and 8, the teeth 25^b of the internal rotary piston member and the teeth 26^b of the rotary pinion are formed on both sides with reversely beveled salient surfaces. The toothed surfaces of the said modified constructions, Figs. 6, 7 and 8, have the advantages of being oblique without producing end thrust, in either direction, of the rotary piston members.

What I claim is:

1. A device of the kind described comprising a cylindrical casing having circumferentially spaced intake and discharge ports, an internal toothed piston-acting member concentrically rotatable within said casing, and a piston-acting pinion eccentrically mounted within and intermeshing with said internal toothed member, the latter having interdental spaces that open through the periphery thereof and extend obliquely to planes that radiate from its axis of rotation, so that its teeth cut obliquely across the intake and discharge ports of said casing.

2. The structure defined in claim 1 in which the teeth of said pinion are also oblique to planes that radiate from its axis of rotation.

3. A device of the kind described comprising a cylindrical casing having at its opposite sides head plates, at least one of which is removable and the other of which is provided with a bearing sleeve, said casing having circumferentially spaced intake and discharge ports, an internal toothed piston-acting rotary member concentrically rotatable within said casing, a piston-acting pinion eccentrically mounted within and intermeshing with said internal toothed member, and a shaft journaled in said removable head plate and in the sleeve of the other head plate, said shaft being extended through said pinion and through said internal toothed member and secured to rotate with the latter.

4. The structure defined in claim 3 in which said internal toothed member is arranged to run against the head plate having the bearing sleeve and is provided with a hub seated therein, and the said removable head plate is provided with an eccentric hub through which said shaft is extended and upon which said pinion is journaled.

5. A device of the kind described comprising a cylindrical casing having head plates, at least one of which is removable and is provided with an eccentric hub and with a crescent-shaped partition, the inner surface of which partition is concentric to said eccentric hub and the outer surface of which is concentric to the cylindrical surface of said casing, an internal toothed member comprising a disc with laterally projected teeth, said disc being arranged to run adjacent to the head plate opposite the detachable head plate, a pinion rotatively mounted on said eccentric hub and meshing with the teeth of said internal toothed member, and a shaft extended axially through and secured to rotate with the disc of said internal toothed member and extended into the eccentric hub of said removable head plate.

6. A device of the kind described comprising a cylindrical casing having head plates, at least one of which is removable and the other of which is provided with an axially projecting sleeve, an internal toothed member comprising a disc with laterally projecting teeth, said disc being arranged to run adjacent to the head plate having the axial sleeve and its teeth being arranged to run in close engagement with the cylindrical surface of said casing, a pinion eccentrically mounted within said casing and meshing with the teeth of said internal toothed member, said removable head plate having a crescent-shaped partition filling the clearance space between the teeth of said pinion and internal toothed member, said removable head plate further having an eccentric hub on which said pinion is journaled, and a shaft journaled in said eccentric hub and in said projecting bearing sleeve and secured to rotate with said internal toothed member.

In testimony whereof I affix my signature.

LAURITS DINESEN.