Dec. 10, 1929. H. H. HAIGHT 1,739,139

PUMP

Filed May 18, 1925

Fig. 1.

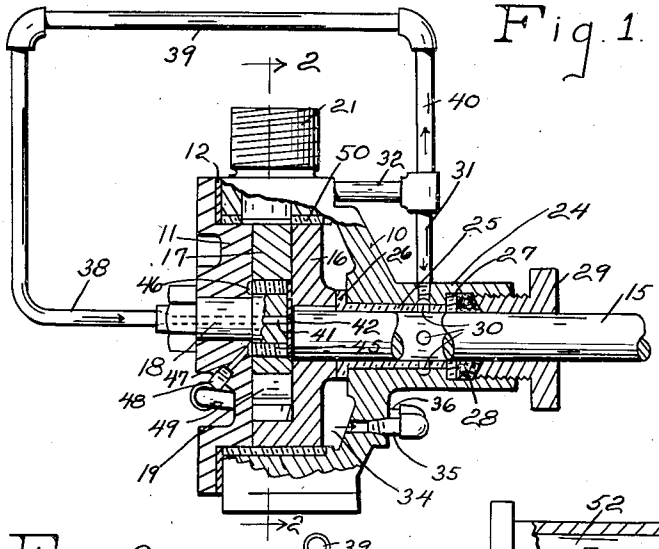


Fig. 2.

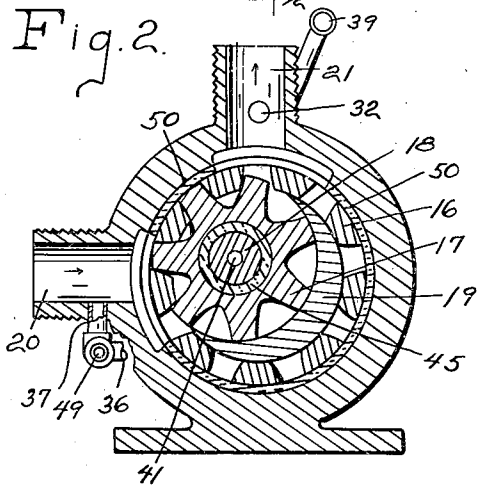


Fig. 3.

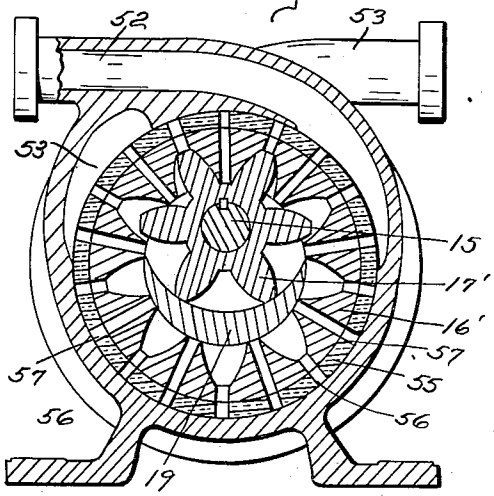
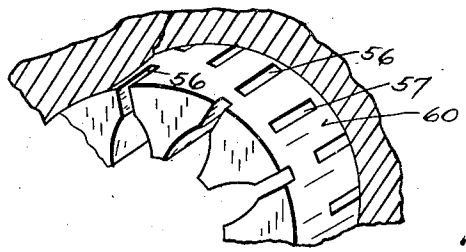


Fig. 4.



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UNITED STATES PATENT OFFICE

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PUMP

Application filed May 18, 1925. Serial No. 30,952.

This invention relates to improvements in pumps.

It is one of the principal objects of the invention to provide a pump having bearings adapted to be lubricated by the material pumped and adapted to be self-cleansing, whereby to prevent accumulations of foreign matter in the bearings.

It is a further object of the invention to provide a pump which is adapted to act upon electrolytes without being subject to electrolytic decomposition which might affect the material of which the pump is constructed. This last feature is of great importance for the reason that ordinary sea water and many other less common substances have the property of establishing an electrical current between differing metals in a pump, whereby such metals are eaten away or caused to unite with other substances. The electrolytic action is comparatively weak in the case of sea water and yet the life of a pump used for sea water may be materially shortened by such action. It is one of the objects of the present invention as aforesaid to do away with electrolytic action, this being preferably accomplished by the use of a suitable non-metallic bearing material which is preferably also free from attack by acids, and which therefore is peculiarly adapted for use in bearings which are lubricated by the electrolyte or other material which is being pumped.

In the drawings:

Figure 1 shows a view largely in vertical axial section through a pump embodying this invention.

Figure 2 is a view taken on line 2—2 of Figure 1.

Figure 3 is a view similar to Figure 2, showing on a slightly enlarged scale a modification of the invention.

Figure 4 is a detail view in perspective, showing a further modification of certain of the parts of the pump.

Like parts are identified by the same reference characters throughout the several views.

The pump casing includes a body portion 10 and a cover portion 11 which is adapted to be clamped to the body portion about the interposed gasket 12. The pump mounted within the above described casing will preferably be of the type which includes a ring or lantern gear and a pinion, either of which, for the purposes of the present invention, may be primarily driven and the other of which will run idle.

In the Figure 1 construction the driving shaft 15 has the lantern or ring gear 16 keyed to its end whereby to be primarily driven therefrom. The pinion 17 meshes upon one side of the pump casing with the ring gear 16 and is driven therefrom about the axis of a stub shaft 18 which is slightly eccentric with reference to the axis of the driving shaft 15. A crescent-shaped baffle 19 is interposed between the pinion 17 and gear 16 at that side of the casing where the pinion and gear are not in mesh. The mesh between the pinion and gear results in a displacement of the fluid acted on by the pump so that such fluid is drawn into the pump casing through the intake manifold 20 and is expelled from the casing through the outlet manifold 21. The action of pumps of this character being well known no further explanation is deemed to be necessary.

It has heretofore been thought desirable to use bushings or bearing sleeves of some comparatively soft metal between the several rotatable parts of the pump and the adjacent stationary parts of the pump case. For example, the pump casing and movable parts of the pump have frequently been constructed of some such metal as iron or steel and bearing sleeves of bronze or brass have been interposed between the moving and stationary parts of the pump. Salt water, however, and various other substances have the property of acting upon certain metals in the presence of other metals to set up a flow of electrical current betwen such metals. Thus, salt water will act as an electrolyte in the presence of brass and iron or steel. A similar action occurs when salt water is in the presence of brass and some other still softer metal, such as Babbitt or the like.

In order to overcome this electrolytic action, I have resorted to the use of a single metal for all metallic parts of the pump

which are exposed to the action of the electrolyte which is being acted upon by the pump, together with a non-metallic bearing liner which may be mounted either upon the rotary part or upon the adjacent stationary part, or may be allowed to float between said parts disconnected from both. It is broadly immaterial what particular metal is used throughout the metallic parts of the pump which are exposed to the electrolyte. The metals, above mentioned, are most commonly used in pumps, but it will be obvious that the choice of a particular metal will depend to a large degree upon the resistance offered by such metal to the purely chemical action of the material handled by the pump, while physical strength must also be given consideration. Among the various nonmetallic materials, such as fiber or the like, which might be used in carrying out this invention, I have found that molded rubber is best suited for my purpose, since rubber provides an excellent bearing for metallic rotors such as the shafts 15 and 18 and the gears 16 and 17.

Accordingly, I place within the bearing sleeve portion 24 of the pump case body 10 a rubber bushing 25 which may have a flanged head 26, if desired. The rubber not only acts as an insulating medium to keep shaft 15 out of contact with casing portion 10 but also serves as an excellent bearing material to permit the rotation with very little friction of the metallic shaft 15 therewithin. The flange 26 serves conveniently as an end thrust bearing member for the purpose of positioning the gear 16 properly within the casing.

The end of sleeve portion 24 of the casing is preferably counter-bored and threaded to comprise a packing gland in which a rubber ring 27 may be seated to receive the pressure of the packing 28 forced thereagainst by the packing nut 29.

In order to provide for the self lubrication of the bearing of shaft 15 within the rubber sleeve or bushing 25, I provide in the said sleeve and immediately adjacent the packing gland just referred to an aperture or series of apertures 30. Pipes 31 and 32 afford communication between apertures 30 and the outlet manifold 21 of the pump casing. The chamber 34 within the pump casing immediately surrounding the end of the rubber bushing 25 is in communication through pipes 35, 36, and 37 with the inlet manifold 20 of the pump. Thus, the outside end of the bearing is subject to such high pressures as exist at the pump outlet and which are communicated to the bearing through openings 30, whereas the inside end of the bearing is in communication through chamber 34 with such reduced pressures as exist at the pump inlet. Thereby there tends to be produced a flow of liquid through the bearing and preferably from the outside of the pump toward the inside thereof. Such a flow of liquid acted upon by the pump not only lubricates the bearing between rubber bushing 25 and shaft 15 but also performs the additional function of washing the bearing. This is particularly important when the pump is handling such materials as paper stock and the like, in which the pulp has a tendency in the ordinary pump to work into the bearings and to escape through the bearings to the exterior of the pump. In such an event, however, it may be preferable to connect the pipe 40 to some independent source of liquid under pressure in order that clean lubricant may always be available for bearing flushing purposes. In the present device the outside portion of the bearing is subject to as high pressures as exist within the pump or the system of which the pump is a part, whereas there is a low pressure zone established in chamber 34 at the inside end of the bearing. Consequently, there will be no tendency for foreign matter carried in suspension by the fluid acted upon by the pump to work into the bearing, and the bearing being clean will be more easily lubricated and will be subject to far less wear than would otherwise be the case.

In the present embodiment of the invention the stub shaft 18 is stationary and is made hollow to receive connection with a supply system including pipes 38, 39, 40 and the pipe 32 which communicates with the pump outlet 21. The central bore 41 through shaft 18 opens to the end of the shaft against a disk 42 which directs into the bearing hereinafter to be described the liquid which issues under pressure from the duct 41. The bearing between the rotor or pinion 17 and the relatively stationary shaft 18 is provided by means of a rubber bushing or sleeve 45 which may be fixed either to the stationary or the movable parts adjacent thereto or may be floated between such parts. A low pressure chamber 46 is formed, if desired, in the cover portion 11 of the pump casing and may communicate through return duct 47 and pipes 48 and 49 with the pipe 37 which leads to the intake manifold 20 of the pump. As a result of this arrangement the bearing upon which the pinion 17 is rotatable is also lubricated and cleansed just as is the bearing in which shaft 15 turns.

In addition to the use of rubber for bearing purposes at the points above indicated I may also line the pump casing with rubber at 50. Such a lining furnishes a smooth non-metallic bearing surface between the gear 16 and the body of the casing. Due to the fact that the liner 50 is at all times subject to the action of the liquid being pumped no special passages for its lubrication are necessary.

In the Figure 3 construction I have illustrated a pump similar to that disclosed in my co-pending application, Serial No. 14,636, filed March 11, 1925, in which a tangential

inlet manifold 52 and a tangential outlet manifold 53 are provided. In this device the drive shaft 15, instead of being connected with the ring gear 16, is keyed to the pinion 17'. The ring gear 16' is driven by the pinion and finds a bearing within the pump casing. In accordance with the purposes of this invention, the ring gear rotor 16' is provided with a rubber facing 55 provided with openings at 56 and 57 communicating respectively with the interdental spaces of the ring gear and with the tips of the teeth thereof. The driving of the pinion 17' rather than the ring gear renders unnecessary the use of a stub shaft 18 and the bearing thereupon. Shaft 15, however, will preferably be provided with a bearing formed exactly in accordance with the disclosure in Figure 1. It is, of course, immaterial to this invention whether the pinion or the gear is primarily driven, and the disclosure of Figure 3 is introduced for the purpose of showing that it is also immaterial whether the bearing surface of rubber is formed upon the rotor as in Figure 3 or upon the stationary parts adjacent thereto, as is the case in Figure 2, where the liner 50 is represented as being a part of the pump casing. In either event the rubber or other non-metallic material takes the wear and co-operates with the metal to provide an excellent bearing surface without requiring the use of different metals for that purpose.

In Figure 4 I have illustrated a construction in which the entire rotor is molded from rubber. The rotor 60 is intended to represent a rubber rotor, and it will be obvious that under such circumstances no special liner 50 or facing 55 is necessary. In order to provide adequately for the wiping of the interior of the pump casing I prefer to break up the continuity of the rubber surfaces by staggering the inlet and outlet ducts 56 and 57 in the manner clearly shown. Certain of these ducts may comprise slots disposed centrally with reference to the side faces of the rubber rotor 60. Others of these ducts may comprise notches of greater or less axial extent, as indicated. As a result of this staggered arrangement of the ducts, it will be obvious that at short intervals about the periphery of the rotor there will always be a sharp edge adapted to wipe the interior surface of the pump casing, whereby to keep such surface free of foreign matter.

It must be obvious from the foregoing that the objects of the present invention are wholly satisfied by the structure disclosed, and that I have provided not only a self cleaning and self lubricating bearing but also a construction such that regardless of the material which is acted on by the pump there will be no electrolytic action occurring between the material of the pump proper and the material of which the bearings are made. This latter result is assured not only by reason of the fact that the metal parts of the pump may be made of one metal throughout, but also because of the fact that the rubber which is preferably used as a bearing material is not only adapted to present an excellent bearing surface but is resistant to attack by acids and other electrolytes and comprises an insulating medium.

I claim:

1. In a pump, the combination with a casing part and a part movable therein in bearing contact therewith and exposed to material acted upon by the pump, of dielectric bearing material disposed between said parts; all metallic parts of said pump which are exposed to the material acted on thereby being of the same metal to prevent electrolytic action in said pump.

2. In a pump, the combination with a casing, a shaft mounted therein, and a rotary pump member mounted on said shaft within said casing, of a rubber di-electric bushing forming a bearing for said shaft, all metallic parts of said pump which are exposed to the material being pumped, being of the same metal to prevent electrolytic action in said pump.

3. The combination with a pump casing, pumping mechanism therein including a gear element and a pinion element, and a shaft operatively connected with one of said elements for driving the same, of a non-metallic di-electric bushing interposed between said shaft and a portion of said casing, all parts of said casing, said elements and said shaft which are exposed to the material pumped, being made of the same metal to prevent electrolytic action in the pump.

4. In a pump, the combination with a pump casing, pumping mechanism therein including a ring gear element, and a pinion element, and a shaft operatively connected to drive one of said elements and extending through said casing, of a rubber bushing for said shaft adapted to provide a bearing therefor in said casing, and a rubber facing for said ring gear element adapted to provide a like bearing for said elements in said casing; all metallic parts of said pump which are exposed to the material pumped being made of the same metal to prevent electrolytic action in said pump.

5. In a pump, the combination with a pump casing having inlet and outlet ports, and a fluid displacing device, of a rotor interposed between said device and said ports within said casing and provided with apertures for liquid displaced, said apertures being variously positioned and so distributed in the periphery of said rotor between the sides thereof that substantially all portions of the interior periphery of said casing will be traversed by such an aperture during rotation of said rotor.

6. The combination with a ported casing, of a rotor having bearing contact with the interior thereof and provided with apertures so distributed across its bearing surface that the margins thereof will wipe substantially the entire inner periphery bearing surface of the casing.

7. The combination with a casing having an interior bearing surface and a port opening therethrough, of a rotor having a bearing in said surface and provided with offset apertures extending respectively substantially to one side or the other of said rotor and adapted successively to register with said port and provided with margins adapted to traverse substantially all of said surface, whereby to cleanse said surface of solids and to be cleared by fluid traversing said port.

8. The combination with a casing having an interior bearing surface and a port opening therethrough, of a rotor provided with a complementary bearing surface and apertures through said complementary surface so distributed as to traverse substantially all of said casing bearing surface and to register successively with said port, and means for circulating fluid through said port and apertures registering therewith.

9. The combination with a casing having an interior bearing surface and a port opening therethrough, of a rotor provided with a complementary bearing surface and apertures through said complementary surface so distributed as to traverse substantially all of said casing bearing surface and to register successively with said port, and means for circulating fluid through said port and apertures registering therewith, said means comprising a displacement device within said rotor.

10. The combination with a casing having an interior bearing surface and a port opening therethrough, of a rotor provided with a complementary bearing surface and apertures through said complementary surface so distributed as to traverse substantially all of said casing bearing surface and to register successively with said port, and means for circulating fluid through said port and apertures registering therewith, said rotor being internally toothed and provided with at least one of said apertures for each interdental space, and said means comprising a pinion eccentrically mounted within said rotor in mesh with the teeth at one side thereof.

11. The combination with a ported casing having an interior bearing surface, of an internal pump gear bearing in said surface and provided with apertures opening toward said surface from its interdental spaces in offset positions, some of which open to one side or the other of said gear, whereby to traverse substantialy all of said surface.

12. The combination with a ported casing having an interior bearing surface, of an internal pump gear bearing in said surface and provided with apertures opening toward said surface from its interdental spaces in offset positions, some of which open to one side or the other of said gear, whereby to traverse substantially all of said surface, said apertures being successively offset whereby the unapertured portion of said gear is substantially helical in form.

HIRAM H. HAIGHT.