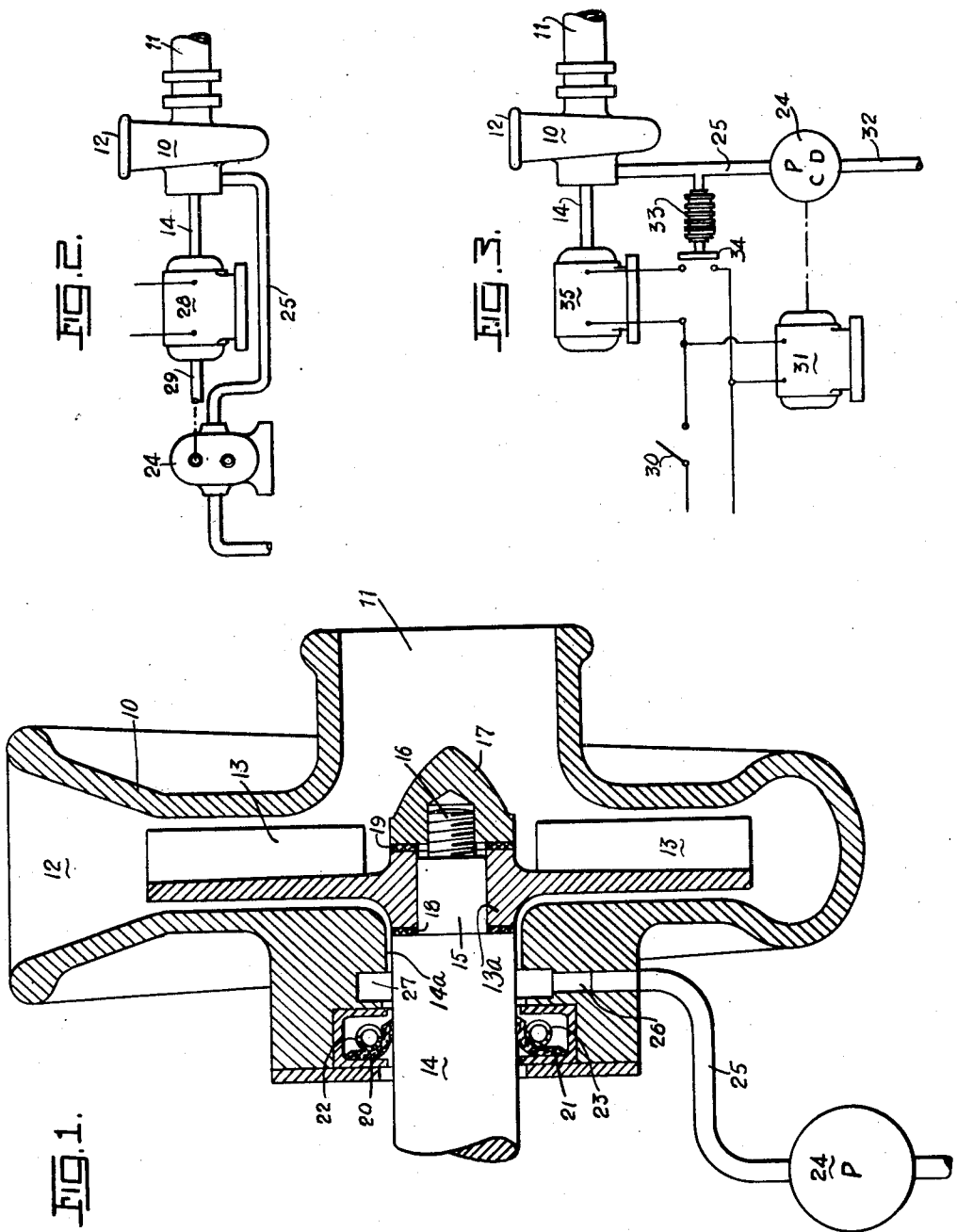


May 18, 1948.

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PUMP FOR CORROSIVE FLUIDS

2,441,708

Filed Feb. 17, 1944



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UNITED STATES PATENT OFFICE

2,441,708

PUMP FOR CORROSIVE FLUIDS

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Application February 17, 1944, Serial No. 522,696

2 Claims. (Cl. 103-103)

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This invention relates to pumps, and more particularly deals with a process for pumping corrosive fluids and a rotary pump therefor.

Rotary pumps made of stainless, non-corrosive steels have been used before for corrosive liquids. However, there always was the drawback that after a short while, the packings lost their tight fit because they had been attacked by the corrosive fluid. Thus the pumping procedure had to be interrupted quite frequently in order to change the packings.

This drawback has been overcome by the present invention, according to which the packings of the pump are continuously bathed in or washed by non-corrosive liquid forming part of the fluid to be pumped and thus protected against the corrosive action of the fluid.

In the usual type centrifugal pump there is a space behind the impeller and into which space the fluid being pumped can pass during operation.

Since the drive shaft for such a pump is most practically manufactured from a corrosive substance such as ordinary steel, it will be apparent that the corrosive fluid can reach the surface of the shaft under ordinary circumstances.

A still further object of this invention is to prevent the corrosive fluid from reaching the shaft by continuously bathing the said shaft when the pump is in operation by a non-corrosive fluid.

The invention will be more fully understood from the following description taken in connection with the accompanying drawings, in which,

Fig. 1 is a cross-sectional view of the pump.

Fig. 2 is a diagrammatic view of an installation showing one way of conjointly operating a main pump and an auxiliary pump for washing the pump packing; and

Fig. 3 is a diagrammatic view of another modification of an installation showing another way of conjointly operating a main pump and an auxiliary pump for washing the pump packing.

Referring particularly to Fig. 1, 10 is the casing of the pump with the inlet 11 and the outlet 12 for the liquid to be pumped. 13 is a rotor which fits the reduced part 15 of the shaft 14. The cover 17, which is screwed on the threaded part 16 of the shaft, holds the rotor in position. 18 and 19 are gaskets, and 20 and 21 are portions of the packing material placed around the shaft 14. The packing 20, 21 is tightly pressed against the walls of the stuffing box and the shaft by a coil spring 22, 23. 24 is a pump which is con-

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nected by pipe 25 and the passage 26 with the annular groove 27.

It will be noted in the drawings that the rotor 13 has a raised boss portion 13a standing up from the back surface thereof which projects into the bore 14a in the casing and through which the shaft 14 extends.

The diameter of the boss 13a is substantially equal to that of the shaft 14 and thus the shaft and boss together and with the bore 14a form a relatively thin passage connecting the groove 27 with the space between the casing and the back of the impeller.

It will be apparent that this passage of relatively small cross section will provide for adequate bathing of the shaft and the boss part of the impeller by fluid forced into the groove 27 under pressure and will accomplish this with an economy of bathing fluid.

Due to the fact that the shaft 14 is necessarily machined to smooth finish and has other machine operations to be performed thereon such as the threading of the end 16 and the forming of the reduced diameter part at 15, it is made of a machinable substance such as steel but which at the same time is subject to attack by corrosive fluids such as might be passed through the pump.

It is very difficult to form a drive shaft of the same material as the pump because in alloying or mixing a metallic substance to make it non-corrosive to as many fluids as possible, the said substance becomes very brittle and difficult to machine and quite unsuitable for use as a drive shaft.

By way of example, the operation of the pump of this invention will be described as applied to the pumping of a mixture of oil and sulfuric acid. The shaft 14 is connected with a motor (not shown in Fig. 1) which rotates the shaft and with it the rotor mounted on the shaft. By the rotation of the rotor, liquid is sucked into the pump through the inlet 11 and continuously discharged through the outlet 12. According to the invention, the pump 24 delivers a non-corrosive substance such as, for example, the same oil as is contained in the mixture to be pumped, through pipe 25 and passage 26 into the annular groove 27. The discharge pressure of this auxiliary pump 24 is slightly greater than that of the main pump 10 in order that only oil free from sulfuric acid fills the annular groove and none of the corrosive mixture contacts the packing 20, 21. By this, the service life of the packing is considerably increased, thus making possible a

more continuous and less costly process, since less interruptions are required for repacking the pump.

Fig. 2 shows, by way of example, how the two pumps may be conjointly operated by a single motor.

In Fig. 2, 10 again is the main pump with inlet 11 and outlet 12, 24 is an auxiliary pump of the constant delivery or positive displacement type, 14 is the shaft of the main pump 10 connected with the motor 28, and 29 the shaft of the auxiliary pump 24 which also is connected with the motor 28. As in Fig. 1, the pipe 25 connects the auxiliary pump with the shaft end of the main pump 10.

Since the auxiliary pump is a constant delivery pump, and the main pump a centrifugal pump which only works at capacity after the rotor has been brought up to a sufficiently high speed, in the beginning of the operation of the motor 28, the pump 24 will immediately pump the non-corrosive liquid and deliver it to the shaft end of the main pump 10 while the pump 10 itself is still in the starting up period. Thus the non-corrosive liquid reaches the main pump before any of the corrosive fluid has a chance to enter the pump and by bathing the packing 20, 21 protects it from the action of the corrosive fluid being pumped.

Fig. 3 illustrates another embodiment of the invention. There again, 10 is the main pump and 14 the pump shaft. 30 is a switch on the main power line, 31 a motor, 24 a constant delivery pump driven by the motor 31, 25 a pipe connecting the pump 24 with the shaft end of the pump 10, and 32 an inlet pipe for the non-corrosive fluid. 33 is a bellows connected with a pressure switch 34, and 35 is the motor having a shaft 14 connected with the pump 10 for driving the pump 10.

The arrangement shown in Fig. 3 operates as follows: On starting the operation, the switch 30 is closed and the circuit of which the motor 31 is a part is energized. Consequently the motor 31 starts to run and drives the constant delivery pump 24, thus causing non-corrosive fluid to flow into the pump 24 through pipe 32 and to be delivered to the shaft end of the main pump 10 through pipe 25. As the pipe 25 is brought under pressure, the bellows 33 is expanded, and thereby the switch 34 is closed. Thus the circuit with the motor 35 is energized and the motor 35 starts to run and drives the main pump 10. Also in this modification the pump 24 delivering the non-corrosive fluid to the shaft end of the main pump 10 for protection of the packing is set to work before the corrosive fluid can enter the main pump 10.

The arrangement illustrated in Fig. 3, particularly the arrangement of the pressure switch 34 operated by the bellows 33 actuated by pressure from the auxiliary pump 24, insures protection of the packing by bathing it with non-corrosive fluid before pumping of the corrosive fluid starts.

Instead of a centrifugal pump as shown at 10, any other kind of pump suitable for handling corrosive fluids may be used.

It is also understood that instead of using a non-corrosive component of the fluid mixture being pumped, any other non-corrosive fluid may be used for bathing and thus protecting the packing according to the invention.

It will be understood that while there have been described certain specific embodiments of this

invention, it is not intended thereby to have this invention limited to or circumscribed by the specific details of procedure, arrangement of parts, materials, proportions or conditions set forth in the specification or illustrated in the drawing, in view of the fact that this invention may be modified according to individual preference and conditions without departing from the spirit of the disclosure and the scope of the appended claims.

We claim:

1. In an apparatus for pumping corrosive fluids, a main centrifugal pump comprising a corrosion resistant casing and a corrosion resistant impeller rotatable therein, an opening in said casing for receiving a drive shaft, a boss on said impeller extending therefrom into said opening, a drive shaft passing through said opening and extending into said boss, said boss and the portion of the drive shaft extending therefrom being of substantially the same diameter, a seal in said casing and around said shaft, an attenuated annular passage around said shaft between said seal and the interior of said casing and consisting in part of said boss and the part of said opening surrounding said boss, an auxiliary pump connected to deliver non-corrosive fluids to said annular passage and therethrough to the interior of said pump casing, means of driving said auxiliary pump to so supply said non-corrosive fluid, and means responsive to a predetermined delivery pressure of said auxiliary pump brought about by the delivery thereby of fluid through said annular passageway to actuate said main pump.

2. In an apparatus for pumping corrosive fluids, a main pump having a corrosion resistant pumping element having a boss extending from the back thereof, a corrosion resistant casing for receiving said element and having an opening in one wall for receiving said boss, a drive shaft extending through said opening and into said boss to drive said pumping element, said boss and the part of said shaft extending from the boss being substantially the same diameter, a packing gland between said casing and shaft, a reduced area annular passage way around said shaft between said packing and the interior of said casing and including the annular passageway between said boss and said opening, an auxiliary pump and a pressure connection between said auxiliary pump and said passageway whereby said auxiliary pump may supply non-corrosive fluid to said passageway, driving means for said main pump, and means controlling the actuation of said driving means whereby said auxiliary pump forces non-corrosive fluid through said passageway prior to the delivery of corrosive fluid by said main pump.

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