April 29, 1947 F. MIESS 2,419,905

CENTRIFUGAL PUMP

Original Filed Aug. 27, 1940

FIG. 1.

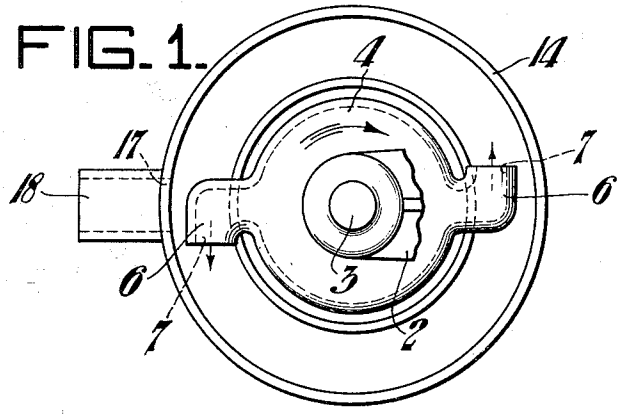



FIG. 2.

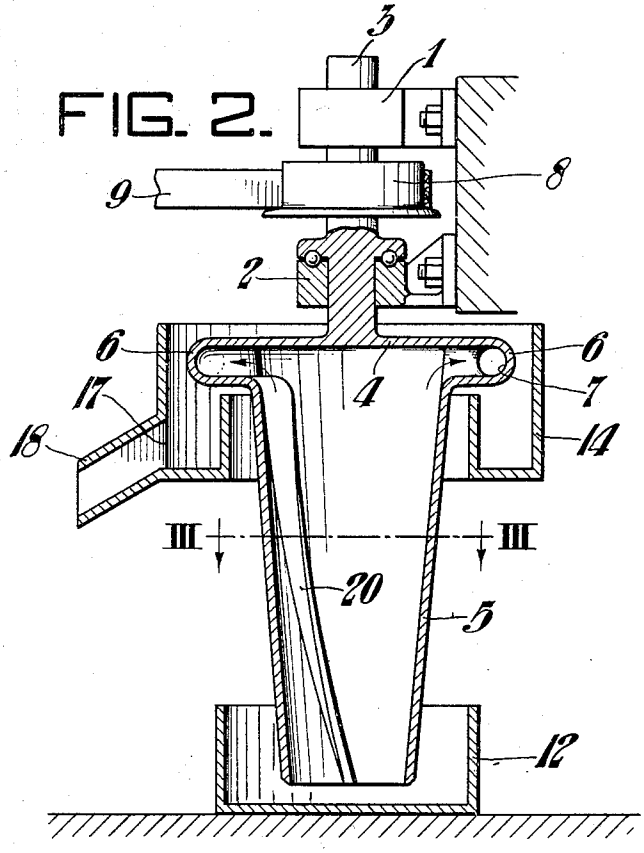
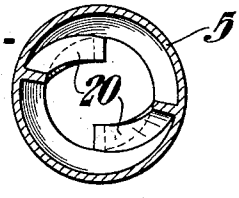



FIG. 3.




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# UNITED STATES PATENT OFFICE

2,419,905

## CENTRIFUGAL PUMP

Fred Miess, Gary, Ind.

Original application August 27, 1940, Serial No. 354,432. Divided and this application June 6, 1944, Serial No. 538,906

2 Claims. (Cl. 103—103)

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This invention relates to centrifugal pumps and more particularly to one which may be used for handling and distributing mercury in an electrical ignition apparatus, although not limited thereto.

Centrifugal pumps of conventional design comprise a stationary casing, a rotary impeller within the casing, a shaft for supporting and motivating the impeller, packing glands around the shaft where it passes through the casing, and bearing means for supporting the shaft for rotation. Such centrifugal pumps are subject to rapid wear and consequent loss of efficiency when handling gritty or other destructive liquids, and this is particularly true of the rotary impeller and the packing glands. Another difficulty with such pumps is that unless they are submerged, priming is required, and this is easily lost by a slight leakage in the packing glands or "foot" valves of the pumps.

It is among the objects of the present invention to provide a centrifugal pump which overcomes the shortcomings of prior art devices in that it eliminates the necessity of packing glands, is self-priming, and requires no "foot" valve.

Another object is the provision of a centrifugal pump which is of extremely simple and inexpensive design, consisting fundamentally of a rotating element which serves as both the casing and the rotary impeller.

The foregoing and other objects will become apparent after referring to the drawings.

In said drawings:

Figure 1 is a plan of the top of the pump of the present invention;

Figure 2 is a vertical elevation showing part of the pump in section; and

Figure 3 is a sectional view on the line III—III of Figure 2.

Referring more particularly to the drawings, the numerals 1 and 2 designate a pair of spaced bearings, the shaft-receiving apertures of which are in vertical alignment and are adapted to receive a shaft 3 which depends therefrom and has integrally formed at the lower end thereof a right angular flange 4 from which there depends a tubular housing 5 which takes the shape of an inverted frusto-cone. Immediately below the flange 4, the upper, and therefore largest, portion of the casing 5 is provided with a pair of radially opposite tubular extensions 6, the side faces of which are provided with reversely disposed apertures 7, whereby the said apertures may face a given direction of rotation of the casing 5. Between the bearings 1 and 2 the shaft 3 has se-

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cured thereto a pulley 8 to which there is connected a belt 9, the latter deriving energy from any suitable source (not shown). Disposed immediately beneath the lower portion of the casing 5 is a sump 12 which is adapted to receive the liquid to be pumped. Beneath, and closely adjacent, the upper portion of the casing 5, and accordingly the flange 4 which is integrally formed on the bottom of the shaft 3, is a stationary annular trough 14. This annular trough 14 provides an outer wall which extends upwardly beyond the horizontal plane of the upper surface of the annular flange 4 and a concentric inner wall which is closely adjacent the outer surface of the upper portion of the casing 5 and terminates immediately below the tubular extensions 6. The lower portion of the outer wall of the annular trough 14 is provided with an aperture 17 with which there is connected a spout 18. This spout 18 is connected (not shown) with the instrumentality to which the liquid is to be pumped; and a return pipe (like not shown), is connected to the sump 12, thus providing a circuit.

According to the manner of operation of the device of the present invention, it will be found that when the sump 12 is continuously provided with sufficient liquid to rise upwardly into the lower portion of the casing 5, rotation of the latter at sufficient speed will cause the liquid to acquire the motion of the rotating casing and tend to cause it to rise along the side walls thereof. Centrifugal force will cause it to flow outwardly through the apertures 7 in the tubular extensions 6 in the direction of the arrows of Figures 1 and 2. The liquid is made to flow in the manner described as long as liquid continues to enter the bottom of the casing 5 from the sump 12. One essential is that the liquid must enter the casing 5 nearer its axis of rotation than the point at which it leaves the upper portion of the said casing. The shape of the said casing is to a large extent immaterial so far as its ability to function is concerned. However, the inverted frusto-cone is preferable from the standpoint of efficiency, and principally to enable the entering liquid to more readily attain the rotary motion of the casing. In addition, the inner surface of the casing is preferably provided with opposed helical vanes 20 which enhance the attainment of the rotary motion of the liquid.

This application is a division of my copending application, Serial No. 355,432, filed August 27, 1940.

I claim:

1. A centrifugal pump adapted to lift liquid from a sump containing the liquid being pumped, which pump comprises a substantially vertically disposed rotatable tubular casing having an inverted frusto-conical shape, having its upper end extended into an enlarged head having oppositely directed tubular extensions and having an open lower end forming a liquid intake opening, the said tubular extensions communicating with oppositely disposed fluid passage ports, the said ports being located in end portions of the tubular extensions and being disposed in a horizontal plane, the said ports projecting in a direction tangential to the rotation of the casing, helical lifting vanes in the casing starting at the open lower end of the casing and terminating at the enlarged head at the upper end of the frusto-conical casing, the helical vanes having a pitch substantially longer than the height of the frusto-conical casing for producing a gradual and uniformly accelerated lifting of the fluid from a point of zero speed of rotation to a point of maximum speed of rotation in the frusto-conical casing, at which maximum speed of rotation with maximum centrifugal force the fluid is projected horizontally from the frusto-conical casing into the enlarged head from which it is projected horizontally through the said passage ports in the end portions of the head, at still further increased centrifugal force, a chamber for receiving the fluid passed through the ports, the fluid receiving chamber being positioned exteriorly of the enlarged head, means for rotating the casing with its head, and a fluid discharge opening in the said chamber.

2. A centrifugal pump adapted to lift liquid from a sump containing the liquid to be pumped, which pump comprises a substantially vertically disposed rotatable tubular casing of an inverted frusto-conical shape having oppositely directed tubular extensions and having an open lower end forming a liquid intake opening, the said tubular extensions communicating with oppositely disposed liquid passage ports, the said ports being located in the end portions of the tubular extensions and being disposed in a horizontal plane, the said ports projecting in a direction



tangential to the rotation of the casing, helical lifting vanes in the casing starting at the open lower end of the casing and terminating at the upper end of the frutso-conical casing, the helical vanes having a pitch substantially longer than the height of the frusto-conical casing for producing a gradual and uniformly accelerated lifting of the liquid from a point of zero speed of rotation to a point of maximum speed of rotation in the frusto-conical casing, at which maximum speed of rotation centrifugal force acts upon the liquid pressing it against the outwardly inclined inner surface of the casing with sufficient pressure to cause the liquid to flow upward in the casing and out through the tubular extensions and tangentially disposed ports discharging the liquid in a direction opposite to the direction of rotation of the casing and at a velocity approximately equal to the velocity of rotation of the ports thus utilizing the reaction of the liquid issuing from the ports to assist in driving the pump and also reducing the actual velocity of the discharged liquid to nearly a zero value, a chamber for receiving the liquid passed through the ports, the liquid receiving chamber being positioned exteriorly of the upper end of the casing, means for rotating the casing, and a liquid discharge opening in the said chamber.

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