July 11, 1950 H. HORNSCHUCH 2,514,865

PUMPING UNIT

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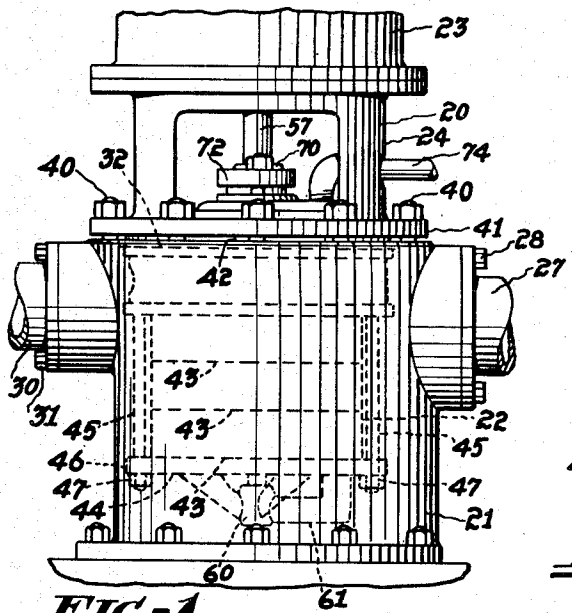


FIG.-1.

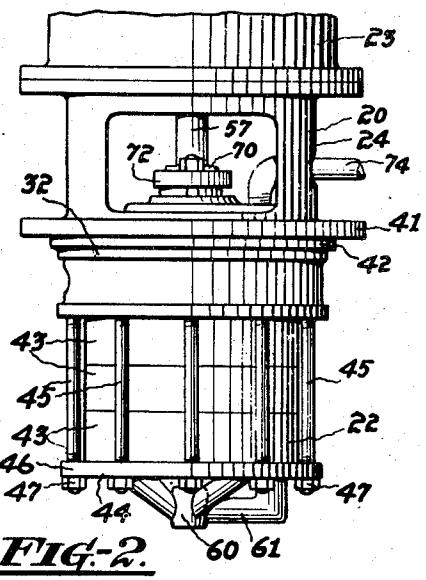


FIG.-2.

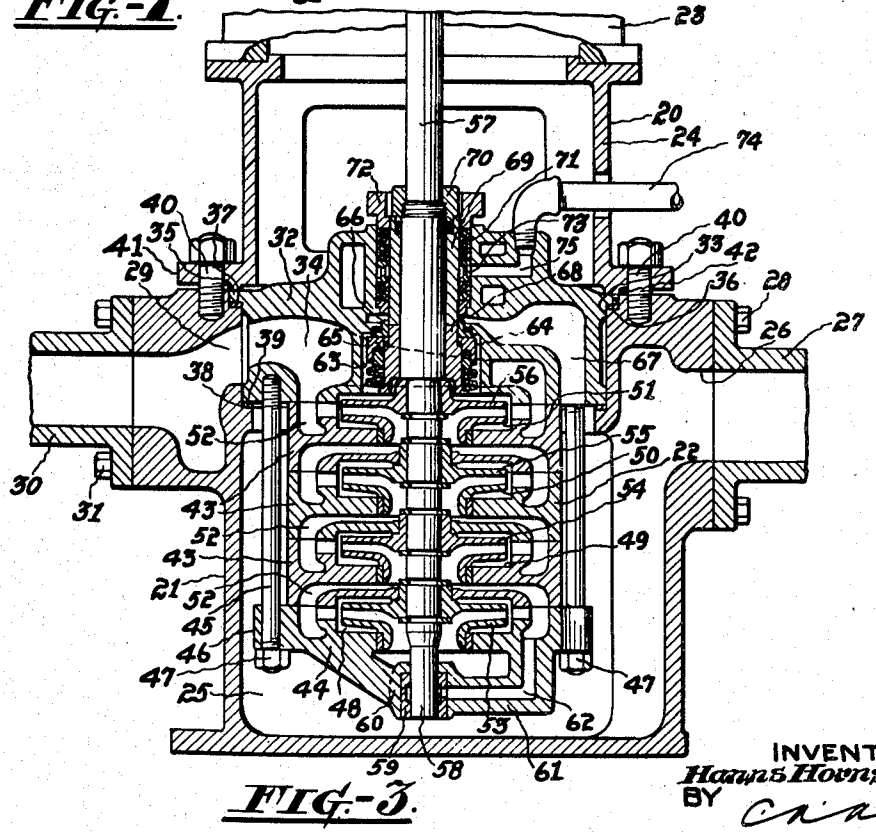


FIG.-3.

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PUMPING UNIT

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2 Claims. (Cl. 103—96)

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This invention relates to pumps, and more particularly to a pumping unit of the centrifugal, multi-stage type.

One object of the invention is to render all parts of the pumping unit readily accessible for the purpose of making inspections and repairs.

Another object is to simplify the construction of the parts comprising the pumping unit and thereby maintain the cost of construction to a minimum.

Other objects will be in part obvious and in part pointed out hereinafter.

In the drawings accompanying this specification and in which similar reference numerals refer to similar parts,

Figure 1 is a side elevation of the pumping unit,

Figure 2 is a similar view of the centrifugal pump and a portion of the motor serving to drive it, and

Figure 3 is an elevation, partly in section, of the pumping unit.

Referring more particularly to the drawings, the pumping unit, designated in general by 20, comprises a vertical outer, cup-shaped casing 21, a centrifugal pump 22 within the casing 21, and a motor 23 positioned above the pump for driving it. Only the lower end portion of the casing of the motor 23 is shown and said casing is seated upon a distance piece 24 supported by the casing 21.

The casing 21 is of cylindrical shape and its interior constitutes a supply chamber 25 for liquid. In the side of the casing, near the upper end thereof, is an inlet port 26 through which the liquid enters the supply chamber. The liquid is delivered to the port 26 by a supply conduit 27 secured to the casing 21 by bolts 28. The casing 21 also has a discharge port 29 near its upper end for the passage of liquid discharged by the pump 22 to a conduit 30 secured to the casing by bolts 31.

The centrifugal pump 22 is of the multi-stage type and is held suspended in a vertical position within the supply chamber 25 by a head 32 lying within an opening 33 at the upper end of the casing 21 and forming the sole support for the pump 22. The head 32 serves as a cover for the opening and is of a depth to overlie the discharge port 29 and has a passage 34 to convey the liquid from the pump to the port 29. An annular flange 35 at the upper end of the head lies within a depression 36 in the casing 21, and a sealing member 37 is interposed between the flange and the bottom of the depression 36 to prevent the

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leakage of liquid through the opening 33 to the exterior of the casing 21. A sealing member 38 is also interposed between the bottom of the head and a shoulder 39 in the opening 33 to prevent the leakage of discharge liquid from the passage 34 back into the supply chamber 25.

The sealing members 37 and 38 are compressed between the head 32 and the shoulders by bolts 40 threaded into the casing 21 and extending through a flange 41 on the distance piece 24, said distance piece being provided with an annular rib 42 that seats upon the flange 35.

The portion of maximum diameter of the centrifugal pump 22 is sufficiently smaller than the diameter of the opening 33 to enable the pump, as assembled on the head 32, to pass readily through the opening. In addition to the head 32 it comprises, as casing parts, a plurality of channel rings 43 and a head 44 at the lowermost end of the pump. The channel rings 43 are clamped between the heads 32 and 44 by bolts 45 extending along the exterior of the channel rings and threaded at one end into the underside of the head 32. The opposite ends of the bolts extend through lugs 46 on the periphery of the head 44, and nuts 47 threaded on the ends of the bolts seat against the lugs to press the casing parts against each other.

The channel rings 43 are identical. Their opposed surfaces and the surfaces of the heads 32 and 44 opposing the end channel rings are recessed to define pumping chambers 48, 49, 50 and 51 and channels 52 for conveying liquid from one pumping chamber to the other and from the final stage pumping chamber 51 into the passage 34. The pumping chambers 48, 49, 50 and 51 contain, respectively, impellers 53, 54, 55 and 56 for pumping the liquid from the supply chamber 25 to the discharge line of the pump.

The impellers are arranged upon and may be interlockingly secured, in any well known manner, to a vertical shaft 57 that extends through the head 32 and the distance piece 24 for connection with the shaft of the motor 23. The lower end 58 of the shaft is journaled in a bearing 59 arranged in a hub 60 that lies below the head 44 to permit the free flow of liquid from the chamber 25 to the first stage impeller 53 and is supported by arms 61 shown as being formed integrally with the head and the hub 60.

To the end that the surfaces of the bearing and the shaft end 58 may be lubricated by a portion of the liquid being pumped, one of the arms is provided with a passage 62 that leads from the

discharge passage 52 of the first stage pumping chamber 48 into the bore of the bearing 56.

Inasmuch as the eyes of all the impellers are located on the lower sides of the impellers it is essential that means be provided for counterbalancing the downward thrust on the rotor. To this end the head 32 is provided with a bore 63 that opens into the upper end of the final stage pumping chamber 51, and a mechanical seal 64 in the bore 63 serves to reduce the pressure of the liquid acting upon the upper side of the impeller 56 in suitable degree to balance the upward thrust of the suction pressure. The sealing device 64 may be of a known type and comprises the usual rotary and stationary members 65 and 66, respectively, that cooperate with their opposed surfaces to valve liquid from the bore 63 to a zone of lower pressure, in the present instance, into a passage 67, in the head 32, opening into the supply chamber 25.

The stationary component of the sealing device is arranged in the head, and the rotary component is disposed upon a wearing sleeve 68 on the shaft 57. The wearing sleeve seats against the adjacent end of the impeller 56 and is held thereagainst by a second sleeve 69 that encircles the shaft and is pressed against the sleeve 68 by a nut 70 threadedly connected to the shaft.

In order to preclude the leakage of liquid from the passage 67 through the bore 63 to the exterior of the head 32, packing material 71 is disposed about the sleeve 69 and compressed by a gland 72. A lantern gland 73 is preferably arranged intermediate the ends of the packing material 71 and liquid is supplied thereto by a conduit 74 threaded into an end of a passage 75 opening into the lantern gland.

From the foregoing description it will be readily seen that a pumping unit thus constructed and arranged requires only a minimum number of parts, all of which may be of simplified design and may, therefore, be easily cast and manufactured of special alloy metals. The centrifugal pump may, moreover, be readily removed from the assembly for the purpose of making inspections and repairs without requiring the disconnection of the inlet and discharge conduits and hence the breaking of the seals between the conduits and the casing.

I claim:

1. In a pumping unit, a vertical outer casing having a supply chamber and an opening at the upper end thereof, inlet and discharge ports in the side of the casing adjacent the opening, a vertical centrifugal pump in the supply chamber in spaced relation with the casing to pump liquid from the supply chamber to the discharge port, a head for the pump to form a closure for the opening and to form the sole support for the pump and having a passage to convey the discharge liquid from the pump to the discharge port.

2. In a pumping unit, a vertical outer casing having a supply chamber and an opening in the upper end thereof, a port at the upper end of the casing for the admission of liquid into the supply chamber, said casing having a discharge port, a cover for the opening extending into the casing across the discharge port and having a passage to communicate with the discharge port, sealing members in the opening above and below the point of communication of the passage with the discharge port to prevent leakage of discharge liquid through the opening to the exterior of the outer casing and into the supply chamber, a vertical inner casing in the supply chamber of smaller diameter than the supply chamber and the opening and having an inlet opening at the lower end thereof, bolts for securing the inner casing to the underside of the cover, pumping chambers in the casing, impellers in the pumping chambers for pumping liquid from the supply chamber to the discharge port, a shaft for the impellers, a bearing on the inner casing for the shaft, and a passage in the inner casing for conveying liquid from one of the pumping chambers to the bearing for lubricating said bearing.

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