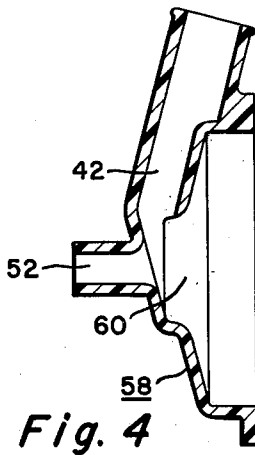
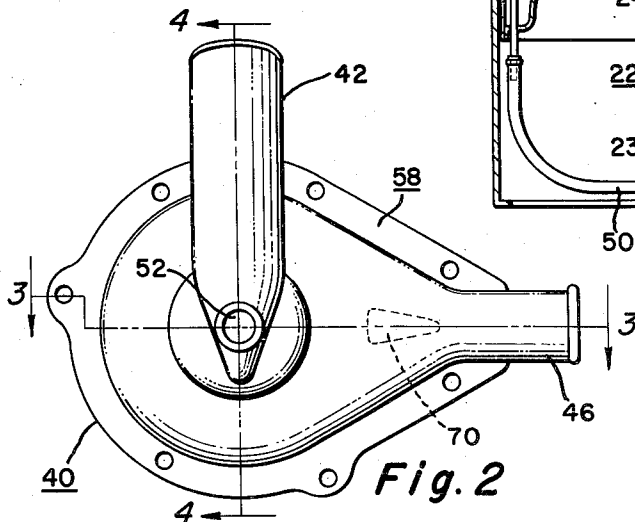
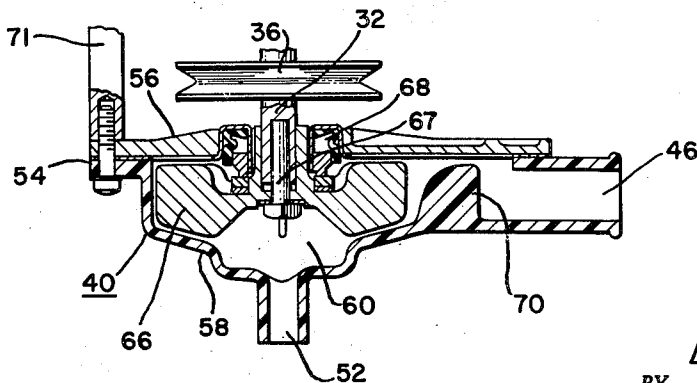
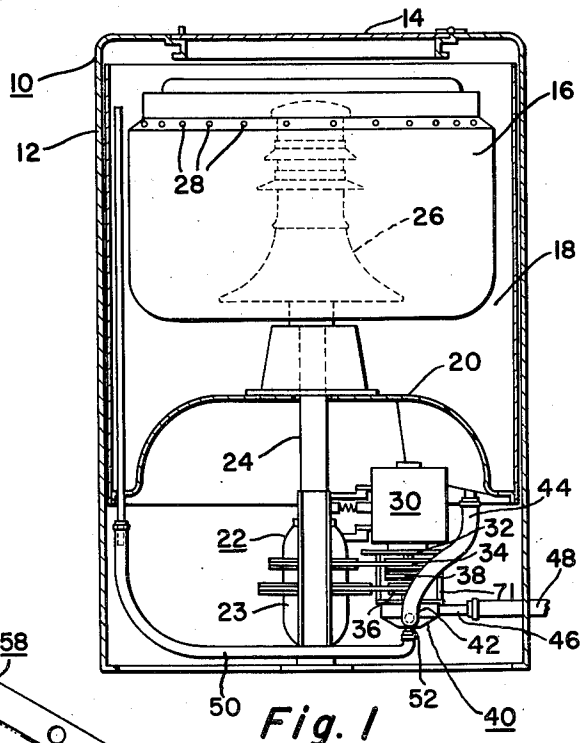


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 WASHING MACHINE WITH DRAIN PUMP HAVING MEANS
 TO REDUCE THE POWER REQUIREMENTS OF THE PUMP
 WHEN OPERATING AT HIGH SPEED
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1

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This invention is directed to a domestic appliance and more particularly to an improved centrifugal pump.

Current trends in clothes washing machines have lead to the development of different speeds for different washing operations. For instance, it is now desirable to provide multiple speed agitation as well as multiple speed spinning or centrifuging in order to effect the most suitable operation for a particular fabric. Thus, it becomes necessary to provide these clothes washing machines with a multiple speed prime mover or motor. Many of these clothes washers also include a centrifugal pump connected to the motor for removing soiled wash and rinse water from the washing apparatus. But the amount of water to be removed from the clothes washer remains relatively constant regardless of whether the pump is being driven fast or slow. The problem is thus to find a pump which will deliver liquid at substantially the same rate when operated at a plurality of speeds. Stated another way, it is desired to provide a pump which will not unduly overload the agitate and spin drive motor when the motor is operating at high speed. It is to the solution of these and other problems in the pump art that this invention is directed.

Accordingly, it is an object of this invention to provide a pump for pumping a substantially constant quantity of liquid when operated at a plurality of speeds.

It is also an object of this invention to provide an improved centrifugal pump having an impeller and an air vent connected to the eye of said impeller, thereby to diminish the suction head of the pump when operated at high speed.

Broadly, it is an object of this invention to provide a pump with means to reduce the power requirements of the pump when operating at high speeds.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein preferred embodiments of the present invention are clearly shown.

In the drawings:

FIGURE 1 is a schematic sectional view of a clothes washing machine suitable for use with this invention;

FIGURE 2 is a bottom elevational view of the pump of this invention;

FIGURE 3 is a sectional view taken along line 3—3 of FIGURE 2; and

FIGURE 4 is a sectional view taken along line 4—4 of FIGURE 2 with parts broken away.

In accordance with this invention and with reference to FIGURE 1, a clothes washing machine 10 is illustrated. The clothes washer 10 is comprised of an outer casing 12 having a top access door 14 in axial alignment with the opening in a rotatably mounted cylindrical spin tub 16. A cylindrical water container 18 circumscribes the spin tub 16 and includes a bottom bulkhead 20 interposed to form a moisture barrier between the spin tub 16 and an agitate and spinning mechanism shown generally at 22. Generally speaking, the agitating and spinning mechanism 22 is connected through concentric shaft means 24 into driving engagement with a vertically reciprocable agitator 26 within the spin tub 16 and with the bottom of the spin

2

tub. Thus, when a housing 23 of the agitate and spin mechanism 22 is rotated in one direction, the agitator 26 is vertically reciprocated. A reverse rotation of the mechanism housing 23 will serve to rotate the spin tub 16.

Since the spin tub is provided with a plurality of out-flow ports 28, any water within the tub 16 will be spun from the tub into the water container 18 during such reverse rotation through the agitate and spin mechanism. For further details on the agitate and spinning mechanism 22, reference may be had to the patent to Sisson, 2,758,685, issued August 14, 1956.

A multiple speed clothes washer has been effected by providing a two-speed reversible motor 30 as the prime mover for the agitate and spin mechanism 22. Depending from the motor 30 is a motor shaft 32 on which are relatively rotatably mounted a high speed spin pulley 34 and a low speed spin and high and low speed agitate pulley 36. One or the other of pulleys 34 and 36 are selected by the manipulation of a shifter clutch 38. For further details of the multiple speed clothes washer and more particularly the operation of the clutch 38 and drive pulleys 34 and 36, reference may be had to copending applications Serial No. 738,330, filed May 28, 1958, now Patent No. 2,974,542, and Serial No. 822,877, filed June 25, 1959. Suffice it for this invention to recognize that the rotation of the mechanism housing 23 in one direction will produce a high or low speed vertical reciprocation of the agitator 26 simply by selecting the desired running speed for motor 30. On the other hand, tub spin is accomplished by reversing the motor 30—the positioning of the clutch 38 and the particular energization of the two speed motor 30 determining the desired speed.

Regardless of whether it is sought to agitate at high or low speeds or spin the tub 16 at high or low speeds, there remains, for a given load of clothes, a generally fixed quantity of water from the various wash or rinse fills which must be removed from the water container 18. This water enters the water container 18 above the bulkhead 20 when the tub 16 is rotated to centrifuge the water from the tub by way of the out-flow ports 28. It is this quantity of water which must be removed by means of a pump shown generally at 40 and having an impeller 66 drivingly connected to the lower end of the motor shaft 32. The pump has a water inlet 42 which is connected by way of a conduit 44 through the bulkhead 20 to the water container 18. A pump outlet 46 is connected to a drain line 48 which leads to any sanitary sewer line.

In the prior art clothes washers it was possible to provide a pump such as 40 which was driven by a single speed prime mover to expel water from the washer. However, when the washing art started using multiple speed motors 30, the directly driven pumps 40 were operated at multiple speed also, since it is not economical to disconnect the pump from the motor each time motor speed is changed. Even though water is pumped faster at high speed than it is at low speed, the efficiency of the pump decreases when the pump is designed for low speed operation. Not only does the efficiency of the pump 40 diminish but, more importantly, a drag on the motor 30 is produced which necessitates the use of a heavier duty motor than would otherwise be necessary. It is thus proposed to provide a means for admitting air to the pump 40 which will come in with the water entering the pump through the water inlet 42. Such action will reduce the suction head and the power requirements of the pump 40 when operated at high speed.

Referring generally to FIGURE 1, an air vent line 50 is connected to an air inlet or stub connection 52 in the pump 40 and extends to a point above the highest possible

water level in the water container 18. The size of the air intake 52 is such that air will not be sucked through the vent line 50 into the pump 40 when the pump is operated at its rated speed, i.e., low motor speed. However, when the motor 30 is energized for high speed operation, air will be sucked through the air vent 50 into the pump housing where it will combine with the water entering the pump from the water container 18—the resultant mixture of water and air being discharged through the pump outlet 46. A reduced suction head resulting from the combination of water and air will lessen the pump load on the motor 30.

With reference now to FIGURES 2, 3 and 4, a more complete understanding of the novel pump of this invention will be set forth. The pump 40 is comprised of a pump housing 54 which includes a top cover plate 56 and a formed bottom molding 58 of plastic or other suitable material. The assembly of the support plate 56 and the bottom molding 58 forms a pump chamber 60 therebetween to which the pump water inlet 42, the pump water outlet 46 and the vent air inlet 52 connect. Within the chamber 60 a rotatably mounted impeller 66 is connected in any suitable manner by a shaft stub 67 to the lower end of the motor shaft 32. A conventional shaft seal arrangement 68 circumscribes the impeller shaft to prevent egress of water from the pump chamber 60. Since the impeller 66 is adapted for rotation in either direction, the water entering the pump chamber 60 beneath the impeller through inlet 42 is directed selectively on either side of a divider or vane 70 and out from the pump casing by way of the outlet 46. The entire pump assembly may be supported by columns 71 beneath the motor 30.

In operation flow is determined by an energy gradient between the discharge head being pumped against (determined by the resistance of the drain line 48) and the sum of the developed pressure and suction heads. The suction head and, hence, the flow can be controlled by admitting air to the pump suction line or inlet 42. Since most appliance pumps are gravity feed, as is the pump 40, there is no danger of losing prime or interrupting flow by admitting air. When the motor 30 is operating on four poles or at low speed, the suction at the eye of the impeller is near atmospheric pressure. Consequently, there is little intake of air through the vent 50 and little change from normal or rated pump flow, head or power requirement. At two-pole motor speed or high speed, the pump suction normally would increase, but with the eye open to atmosphere through the vent 50, the pump merely sucks in air. The suction head can be controlled by the size of the air intake opening 52. The maximum reduction in pump flow and power requirements occurs when the suction head is reduced to atmospheric pressure. As aforesaid, a static condition of water in the pump chamber 60 requires the opening 52 beneath the impeller eye to be connected to a vent conduit 50 which extends above the maximum water level possible in the water container 18.

As described, the improved pump design is particularly advantageous in multiple speed washing machines where it is desired to eliminate as much of the power requirement for pumping water as is possible. This is particularly so at high speed machine operation. It should be noted, however, that the pump of this invention is not limited to the domestic appliance art only and is capable of general application.

While the embodiments of the present invention as herein disclosed, constitute preferred forms, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. In combination, a washing machine having a spin tub adapted to contain water and a water container surrounding said tub and adapted to receive water from said spin tub when said spin tub is spun, means for selectively agitating said water or spinning said tub, a two-pole, four-pole, reversible motor for driving said agitating or spinning means, a pump comprising a casing having an air inlet,

a water inlet and an outlet, and an impeller having a shaft extending into direct driven engagement with said motor, said water inlet connected to said water container and said outlet connected to a drain, said air inlet positioned on the opposite side of said casing from said impeller shaft and in axial alignment with said shaft, and a conduit having one end connected to said air inlet and the other end connected to the atmosphere above the maximum water level in said water container, thereby to draw air into said casing only when said impeller is driven by said motor in two pole operation.

2. In combination, a washing machine having a spin tub adapted to contain water and a water container surrounding said tub and adapted to receive water from said spin tub when said spin tub is spun, means for selectively agitating said water or spinning said tub, a power shaft for driving said agitating or spinning means at high or low speeds, a pump comprising a casing having an air inlet, a water inlet and an outlet, and an impeller extending into direct driven engagement with said power shaft, said water inlet connected to said water container, said air inlet positioned on the opposite side of said casing from said power shaft and in axial alignment with said impeller, and a conduit having one end connected to said air inlet and the other end connected to the atmosphere above the maximum water level in said water container, thereby to draw air into said casing only when said impeller is driven by said power shaft at high speed.

3. In combination, a washing machine having a water container and a power shaft operable selectively at high and low speeds to produce a high or low speed washing action, a pump comprising a casing having an air inlet, a water inlet and an outlet, and an impeller extending into direct driven engagement with said power shaft, said water inlet connected to said water container, said air inlet positioned on the opposite side of said casing from said power shaft and in axial alignment with said impeller, and a conduit having one end connected to said air inlet and the other end connected to the atmosphere above the maximum water level in said water container, thereby to draw air into said casing when said impeller is driven by said power shaft at high speed.

4. In combination, a washing machine having a water container and a power shaft operable selectively at high and low speeds to produce a washing action, a pump for pumping water from said container at substantially the same rate irrespective of the speed at which the power shaft is operating and comprising a casing having an air inlet sized to admit air to said casing only when said power shaft is operating at high speed, a water inlet and an outlet, and an impeller permanently connected in driven engagement with said power shaft, said water inlet connected to said water container, and a conduit having one end connected to said air inlet and the other end connected in permanently open relationship to the atmosphere above the maximum water level in said water container, thereby to draw air into said casing only when said impeller is driven by said power shaft at high speed.

5. A pump comprising, means forming a pump chamber, a rotatably mounted impeller in said chamber adapted for high and low speed rotation, an outlet conduit connected to said chamber, a water inlet conduit connected to the bottom of said chamber beneath said impeller, and an air inlet conduit connected to said water inlet conduit in axial alignment with said impeller for conveying air to said chamber only when said impeller is rotated at high speed.

6. A pump comprising, means forming a chamber having a water inlet and a water outlet, means in said chamber for impelling water from said water inlet to said water outlet and adapted for high and low speeds, and means for admitting air to said chamber only when said impelling means is operating at high speed.

7. A pump comprising, means forming a chamber hav-

5

ing a water inlet and a water outlet, means in said chamber for impelling water from said water inlet to said water outlet and adapted for high and low speeds, and means responsive to the high speed only of said impelling means for admitting air to said chamber.

8. A pump comprising, means forming a chamber having a water inlet and a water outlet, means in said chamber for impelling water from said water inlet to said water outlet, prime mover means for said impelling means adapted for high and low speeds, and means responsive to the high speed only of said impelling means for admitting air to said chamber, thereby to reduce the pump load requirements on said prime mover means.

9. A material pump comprising, means forming a chamber having a material inlet and a material outlet, means in said chamber for impelling said material from said inlet to said outlet, means for driving said impelling means adapted for high and low speeds, and means for reducing the power requirements of said impelling means on said driving means during said high speed only.

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10. In combination with a washing machine having a liquid containing tub and prime mover means for spinning said tub at high and low speeds, a pump for removing liquid from said machine and comprising, means forming a chamber having a liquid inlet communicating with said tub and a liquid outlet, means in said chamber drivably connected to said prime mover means for impelling liquid from said liquid inlet to said liquid outlet, and means for reducing the power requirements of said pump on said prime mover means during high speed spin.

References Cited in the file of this patent

UNITED STATES PATENTS

2,336,127	Rocke -----	Dec. 7, 1943
2,770,121	Kuntz -----	Nov. 13, 1956
2,791,182	Scheidl -----	May 7, 1957
2,841,003	Conlee -----	July 1, 1958

FOREIGN PATENTS

522,592	Germany -----	Apr. 11, 1931
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