May 5, 1959 J. D. HUGHES 2,884,776

PUMPING APPARATUS FOR LAUNDRY EQUIPMENT

Filed Feb. 20, 1956 2 Sheets-Sheet 1

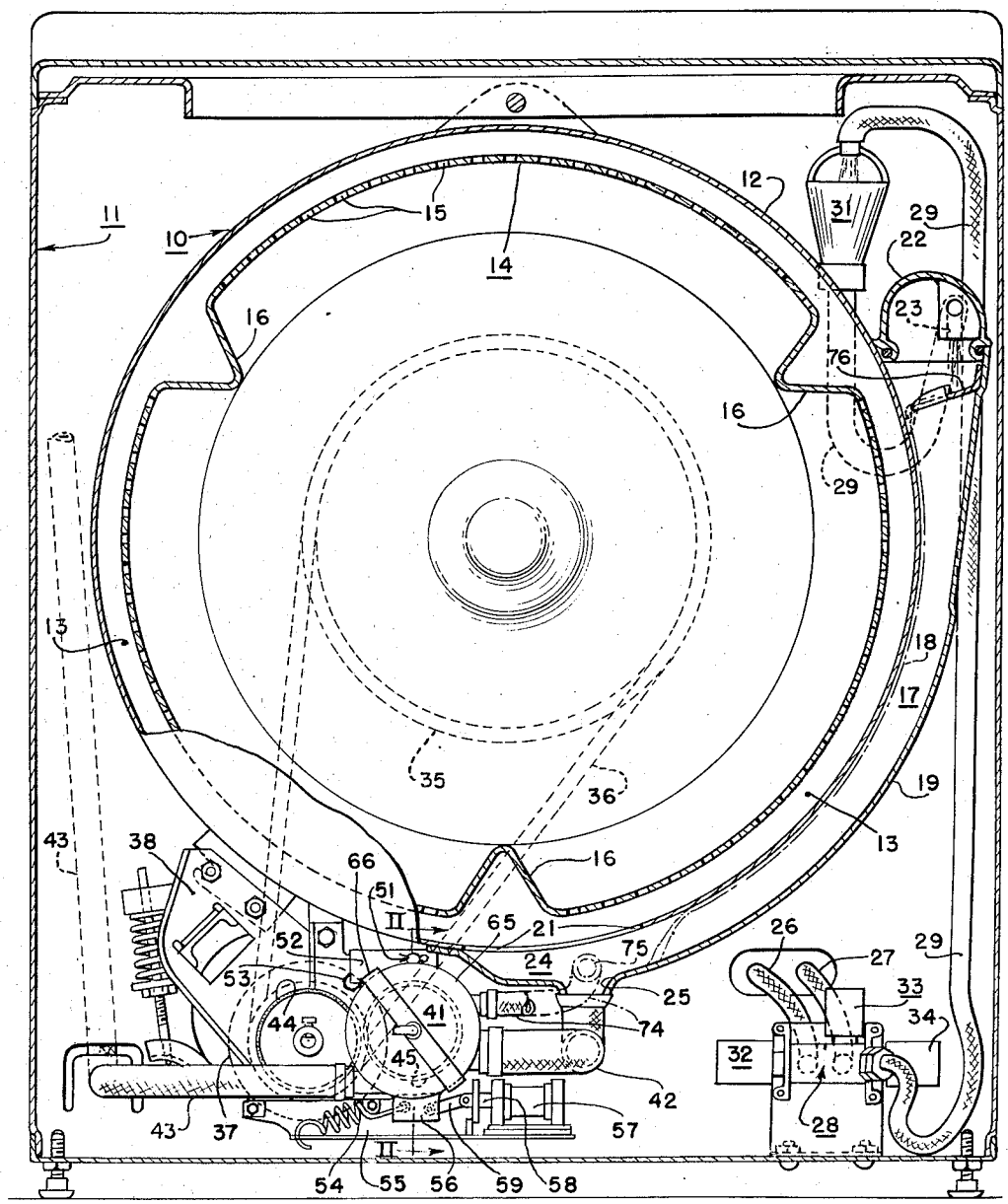


FIG. 1.

INVENTOR
JOHN D. HUGHES
BY Raymond & Cooper
ATTORNEY

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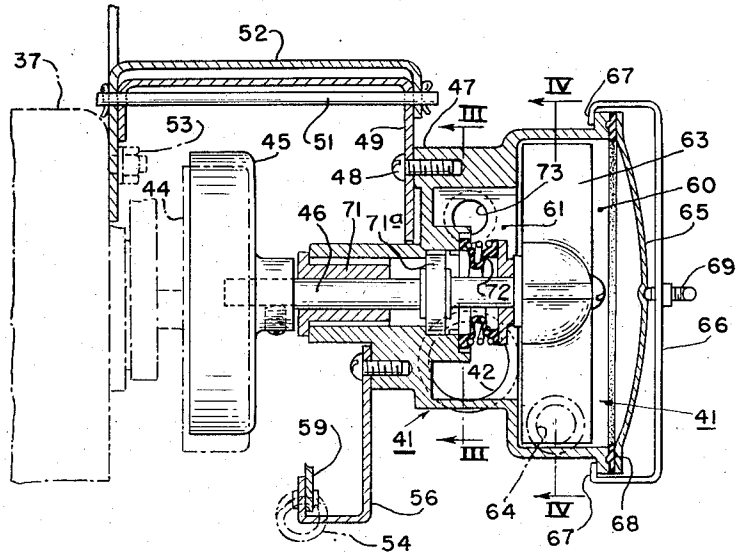


FIG. 2.

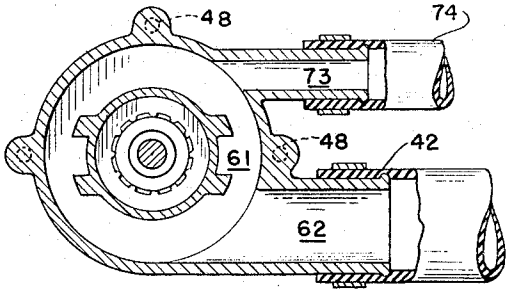


FIG. 3.

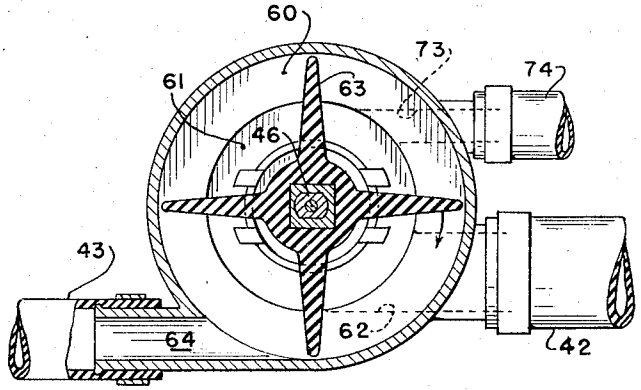


FIG. 4.

INVENTOR
JOHN D. HUGHES
BY Raymond J. Ritzo
ATTORNEY

United States Patent Office 2,884,776 Patented May 5, 1959

2,884,776

PUMPING APPARATUS FOR LAUNDRY EQUIPMENT

John D. Hughes, Loudonville, Ohio, assignor to Westinghouse Electric Corporation, East Pittsburgh, Pa., a corporation of Pennsylvania

Application February 20, 1956, Serial No. 566,583

4 Claims. (Cl. 68—20)

This invention relates to centrifugal liquid translating pumps and more particularly to a pump of this kind employed for the translation of liquid at relatively high and low rates. An object of the invention is to provide an improved pump of this kind.

A further object of the invention is to prevent air locks in a pump of the type set forth, particularly during periods when the pump operates to translate liquid at a low rate.

While it may have general application, a pump of the type set forth is particularly applicable to domestic clothes washing and drying machines wherein the drying apparatus includes a water cooled condenser. During washing and rinsing periods, the body of water employed must be removed at a relatively high rate by the pump at the conclusion of these operations but, during drying periods, the pump operates at a low delivery rate as the flow of water to the pump from the condenser is relatively small. When removing the bodies of washing fluid, the inlet of the pump is subjected to a head of fluid throughout, it being understood that the fluid flows by gravity from the tub to the pump. During this operation, there is a substantial flow to the pump, so that there is little possibility of air collecting in the pump chamber and forming an air lock. However, during drying, the flow of cooling water is low and the inlet passage to the pump is not submerged so that air may readily enter the passage and collect in the pump chamber. When sufficient air collects, the pump becomes air locked and ceases to pump as is understood.

In accordance with the present invention, an additional passage from the upper region of the pump chamber to the sump in the tub is provided. This passage terminates at a higher elevation in the sump than that of the main inlet to the pump chamber. Accordingly, during the removal of the body of washing fluid from the tub, fluid enters both the main inlet and said additional inlet of the pump chamber for translation by the pump. During low pumping loads, any air which may enter the main inlet of the pump and find its way to the pump chamber is vented through the additional passage back to the tub. Accordingly, air locks are prevented at this time.

These and other objects are effected by the invention as will be apparent from the following description and claims taken in connection with the accompanying drawing, forming a part of this application, in which:

Fig. 1 is a view in transverse section taken through a domestic clothes washing and drying machine having a pump structure constructed and arranged in accordance with the invention applied thereto;

Fig. 2 is an enlarged section taken along the line II—II of Fig. 1; and

Figs. 3 and 4 are sections taken, respectively, along the lines III—III and IV—IV of Fig. 2.

Referring to the drawings, the invention is disclosed applied to a domestic clothes washing and drying machine of the type having a water cooled condenser for condensing vapor in the air circulated over the fabrics during a drying operation. Only so much of this machine is

shown and described as is necessary for an understanding of the invention. It will be understood that the invention has various applications and the specific application described is by way of example.

The washing and drying machine is of the type disclosed in the application of William A. Johnston, Serial No. 511,675 filed May 27, 1955, now Patent No. 2,813,414, and includes a tub structure **10** suitably supported within a housing **11**. The tub **10** includes a sidewall **12** enclosing a chamber **13** in which the fabrics are washed and subsequently dried by the circulation of heated air. The fabrics are contained in a conventional basket **14** having a perforate side wall **15** and the usual vanes **16** extending radially inwardly from the side wall for tumbling the fabrics as the basket **14** is rotated. The tub structure also includes a condensing space **17**, generally arcuate as shown and defined by an arcuate portion **18** of the tub sidewall **12** and an outer wall **19**. The spaces **17** and **13** are communicating, a passage **21** being provided in the arcuate wall portion **18** at the lower end thereof. The upper end of the condenser space **17** is closed by a head **22** having a water inlet nozzle **23** formed therein. The lowermost portion of the space **17** defines a sump **24** and a water outlet **25** is formed in the wall **19** for the drainage of water from the sump **24**.

Washing water and cooling water for the condenser are admitted to the tub **10** in any suitable manner. As shown, conduits **26** and **27** lead to sources of hot and cold water and to a water mixing valve structure **28** of conventional construction. The latter delivers water to a conduit **29** leading to the nozzle **23**, preferably through an air gap, vacuum breaker **31** of suitable form. The mixing valve structure **28** includes three solenoids **32**, **33** and **34** which when energized open respective valves, not shown, for delivering water at various temperatures to the nozzle **23**. It will be assumed that, when the valve solenoid **32** is energized, hot water only from conduit **26** is passed directly to the conduit **29** for washing operations. Warm water washing and rinsing operations are carried out with lower temperature water provided by mixing the hot and cold water. This mixture of hot and cold water is passed to conduit **29** when solenoid **34** is energized. As set forth hereinafter, the condenser **17** is active during drying operations and at this time cold water is delivered thereto by conduit **29** upon energization of solenoid **33**. As the construction and operation of water mixing fill valves of the type shown at **28** are well understood, further description is deemed unnecessary.

The basket **14** is suitably journalled in the tub structure **10** and is rotated by a sheave **35** fixed to the basket **14** and belted, as shown at **36**, to a driving mechanism including an electric motor **37**. The latter is carried by a bracket **38** bolted to the underside of the tub structure **10**. It will be understood that, if centrifuging of the fabrics is to be carried out, any suitable adjustable two speed mechanism may be interposed between the motor **37** and the driven sheave **35**, for providing the relatively low and high basket speeds necessary for the washing and centrifuging operations.

Vitiated water is translated from the sump **24** to a point of discharge by means of a pump **41** constructed and arranged in accordance with the invention and described in detail hereinafter. The primary water inlet for the pump includes the conduit **42** which extends to the outlet **25** of the sump **24**. The discharge conduit of the pump **41** is shown at **43**, a portion of which extends above the highest level of water maintained in the tub. The reason for this arrangement is that no drain valve is employed and, therefore, when a body of water is maintained in the tub **10**, the conduit **42**, pump **41** and the portion of the conduit **43** below the level of water in the tub are flooded. Of course, at this time, the pump **41** is inactive,

Discharge of water from the tub is initiated by starting operation of the pump.

The pump 41 may be driven in any suitable manner. As shown, the main motor 37 is provided with a friction wheel 44 engageable with a second friction wheel 45 fixed to the shaft 46 of the pump 41. The pump 41 has a body 47 secured by screws 48 to a hanger 49 (see Fig. 2). The latter is pivotally suspended from a pin 51 suitably secured in a fixed channel iron 52 which may be secured to the frame of the motor 37 as shown at 53. The pump 41 is biased clockwise about the pivot 51 by a tension spring 54, one end of which is attached to a fixed bracket 55 and the other end of which is attached to an arm 56 extending downwardly from the pump body 47. Accordingly, the friction wheels 44 and 45 are engaged for the driving of the pump. Disengagement of the wheels 44—45 and stopping of the pump are affected by magnet 57 carried by bracket 55, the movable armature 58 of the magnet being linked to the arm 56 as shown at 59. Energization of the magnet 57 effects movement of armature to the right as viewed in Fig. 1 and counter-clockwise movement of pump 41 about its pivot 51, whereby the wheels 44—45 are disengaged and operation of the pump 41 is terminated.

The construction of the pump 41 is shown in detail in Figs. 2 to 4, inclusive, to which reference will now be had. As shown, the pump body 47 encloses a generally cylindrical pumping chamber 60 having an extension 61. Water discharged by the conduit 42 enters an inlet passage 62 and then the extension 61 of the pumping chamber. A pump impeller 63 preferably of rubber or some resilient material is suitably secured to the shaft 46 and rotated thereby for centrifugally projecting water through an outlet passage 64 into the discharge conduit 43. The open end of the pump body 47 is closed by a suitable gasketed cover 65 held in position by a clamp 66. The latter is hooked at its ends, as shown at 67, over a flange 68 formed on the body 47 and its center is provided with a threaded thumb screw 69 for pressing the cover 65 into position. The shaft 46 is journalled in suitable bearings 71 and 71*a* carried by the body 47 and a conventional water seal 72 may be provided for retarding leakage along the shaft.

In accordance with the present invention, there is provided a second passage 73 communicating with an upper region of the pump chamber 60 through its extension 61, which passage 73 is connected by means of a conduit 74 with an opening 75 in a portion of the sump 24 elevated with respect to the outlet 25. The purpose of the passage 73 and its connection to the sump is to vent the pump chamber and prevent air locks, particularly during drying periods when a small quantity of cooling water is admitted to the condenser for immediate discharge by the pump as fast as it is admitted. Before discussing this operation, a brief description of the operation of the washer-dryer may be helpful.

In initiating a cycle of operation of the washer-dryer, water at the proper temperature for the fabrics being treated is admitted by energizing the proper solenoid 32 or 34. At this time, the pump magnet 57 is energized for inactivating the pump so that a body of washing water collects in the tub 10. When the proper amount of water has been admitted, a suitable water level responsive device (not shown) deenergizes the water valve solenoid 32 or 34. Washing is carried out by tumbling the fabrics in the body of water by means of the rotating basket. At the conclusion of the washing step, the magnet 57 is deenergized so that the pump operates to discharge the vitiated washing water. A rinsing step substantially as described above may next be carried out. Preferably, a centrifuging step is next carried out in order to remove a substantial portion of the water contained in the fabrics. This is done, of course, by increasing the speed of rotation of the basket by any means, such as, by the adjustable two speed mechanism referred to heretofore.

Following the final step in the washing and centrifuging program, the drying step is initiated. At this time, the basket rotates to tumble the damp fabrics and heated air is circulated through the basket for vaporizing water from the fabrics. The air heating and circulating mechanism has not been shown for the sake of brevity and because it forms no part of this invention. Briefly stated, this mechanism translates heated air into the basket for contact with the clothes. The air abstracts moisture from the clothes and passes downwardly through the passage 21 into the condenser. At this time, the cold water valve solenoid 33 is energized and cold water at a relatively low rate of about ½ gallon per minute in a domestic machine is admitted to the condenser through nozzle 23. This cold water as it is discharged by the nozzle 23 is directed by a baffle, indicated at 76, toward the arcuate wall portion 18 and passes downwardly thereover as a thin film, the latter presenting a relatively large cooling surface for the humid air passing upwardly through the space 17 at this time. This manner of passing cooling water through a condenser of the type shown is disclosed and claimed in the application of Jerome G. Jacobsen, Serial No. 559,251 filed January 16, 1956, and assigned to the assignee of the present application. The air passing upwardly in the condensing space 17 is cooled by the water film below its dew point temperature so that vapor is condensed and precipitated from the air. This precipitated condensate and the cooling water descend to the pump for removal by the pump. The cooled and dried air passes upwardly through suitable large openings in the baffle 76 and into the head 22 from which it passes to the air translating apparatus to be again heated and returned to the basket.

From the foregoing description, it will be apparent that the pump 41 operates at high and low rates of delivery during a cycle of operation. In removing the bodies of washing water, the pump operates at a rate of about 12 gallons per minute and, during a drying cycle, at a low rate of ½ gallon per minute, which is the amount of cooling water utilized at this time. During the removal of the washing water, the pump and its connection to the tub are flooded and under a head of water and there is little possibility at this time of air locking. However, during drying steps, water at the low rate trickles into the inlet conduit of the pump which is open to the atmosphere so that air may readily enter the pump and collect in the pumping chamber. In a conventional pump or one without the passage 73, the pump may operate at the low rate as long as air may leak back through the pump inlet 62 to atmosphere. However, if water builds up in the inlet passage 62 for any reason, closing the pump chamber 60 to the atmosphere, the accumulated air in the chamber 60 prevents the admission of water to the chamber 60 and, therefore, pumping ceases due to an air lock.

In accordance with the present invention, air locks during drying periods are prevented as air is vented from the chamber 60 through the passage 73 and conduit 74 and, therefore, is ineffective to block the admission of water through the primary inlet 62 regardless of whether or not the latter is filled with water. During removal of bodies of washing water from the tub, both passages 62 and 73 are submerged and receive water from the sump through the respective openings 25 and 75. It has been found that the added passage 73 does not materially affect the functioning of the pump, when compared to a similar pump without this passage, during operation at high rate of delivery with the pump flooded and under a head of water.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various other changes and modifications without departing from the spirit thereof.

What I claim is:

1. In a pump construction for discharging liquid from a reservoir, the combination of a pump body having a pumping chamber formed therein, conduit means defining a primary liquid inlet for the pump and connecting said pumping chamber and the lowermost region of the reservoir, means defining an outlet for the pumping chamber, an impeller within the pumping chamber for discharging liquid through said outlet, means for rotating the impeller, and a second conduit means connected to a region of the pumping chamber elevated with respect to said primary liquid inlet thereto, said second conduit means also being connected to a portion of the reservoir elevated with respect to said lowermost region thereof.

2. In a centrifugal pump construction arranged for discharging liquid from a reservoir, the combination of a pump body having a pumping chamber therein and including a primary liquid inlet and an outlet for the chamber, an impeller in the chamber rotatable for centrifugally discharging liquid through said outlet, conduit means for conveying liquid by gravity from the lowermost region of the reservoir to said primary liquid inlet and a second conduit means providing communication between a region of the pumping chamber above the primary inlet thereof and a portion of said reservoir elevated with respect to said lowermost region thereof; said second conduit means defining a liquid inlet for the pump when liquid in said reservoir submerges said elevated portion of the reservoir and defining an air vent for the pumping chamber when the level of the liquid in the reservoir is below said elevated portion of the reservoir.

3. In a centrifugal pump for discharging liquid from a sump having a drain opening in the bottom portion thereof, the combination of a pump body enclosing a pumping chamber and having liquid inlet and outlet passages therein, an impeller within the chamber for translating liquid through said passages, conduit means connecting said inlet passage and the drain opening in the

sump and means defining an auxiliary passage connecting an upper portion of the pumping chamber and a region of the sump elevated with respect to the drain opening therein; said auxiliary passage defining a supplementary liquid inlet for the pump when said elevated region of the sump is submerged and defining a vent for relieving the pumping chamber of air when the level of liquid in the sump is below said elevated region thereof.

4. In a centrifugal pump construction for a clothes washing and drying machine having a tub adapted during washing operations to contain a head of washing water and, during drying operation, to receive cold water for condensing vapor in the tub, said pump construction including a pump body having a pumping chamber formed therein, said body including a primary liquid inlet passage and a liquid discharge passage communicating with the pumping chamber, an impeller within the chamber rotatable for centrifugally discharging liquid through the liquid discharge passage, conduit means providing communication between the lowermost region of said tub and said primary inlet passage for the flow of liquid by gravity to the latter, and a second conduit means connecting a portion of the pumping chamber elevated with respect to said primary inlet passage and a region of the tub above said lowermost region thereof, said second conduit means being flooded during washing operations when the tub contains said head of water but open to the atmosphere in the tub when said cold water is admitted to the tub during drying operations for discharge by the pump.

References Cited in the file of this patent

UNITED STATES PATENTS

1,578,236	La Bour	Mar. 23, 1926
2,607,209	Constantine	Aug. 19, 1952
2,739,538	Witchger	Mar. 27, 1956