This invention relates to washer-dryer apparatus of the vacuum extraction type and more particularly to improved fluid pump means for removing liquid from the apparatus.

In such an apparatus there is provided vacuum circuit means comprising a container, fluid conduit means therefrom, vacuum creating means in the conduit means and fluid separating means in the conduit means.

One of the features of this invention is to provide an improved fluid pump means of simple design for drawing fluid from the vacuum circuitry of a washer-dryer apparatus in combination with an air lock preventing fluid vent means between the interior of the pump means and the fluid separating means.

Other features and advantages of the invention will be apparent from the following description of one embodiment thereof taken in conjunction with the accompanying drawings. Of the drawings:

FIGURE 1 is a diagrammatic view of a washer-dryer laundry device including a pump means embodying the invention.

FIGURE 2 is a side elevational view of one side of the pump housing containing the inlet and the outlet of the pump.

FIGURE 3 is a sectional view taken substantially along line 3-3 of FIGURE 2.

FIGURE 4 is a side elevational view of the pump impeller.

FIGURE 5 is a transverse sectional view taken on a diameter of the impeller of FIGURE 4.

FIGURE 6 is a side elevational view showing the other side of the pump housing which is constructed to function as a back-up plate for the impeller.

FIGURE 7 is a sectional view taken substantially along line 7-7 of FIGURE 6.

FIGURE 8 is a diametrical sectional view of the pump assembly of the invention.

FIGURE 1 illustrates a washer-dryer laundry device including the pump means of this invention which is ideally suited for operation in such a device.

The schematic view of FIGURE 1 shows a combination washer-dryer embodying the invention. The structure shown in this view comprises a rotatable drum 10 having a perforated metal periphery 11. The drum is rotated by an electric motor 12 having a shaft 13 projecting from each end thereof. The shaft at one end drives a belt system 14 which rotates the drum 10 and the shaft at the other end drives a turbine pump 15. The pump is provided with an inlet 16 and an outlet 17 leading to a drain.

The drum is rotated in a counterclockwise direction as indicated by the arrow 18. The drum is contained within a housing or tank 19. The apparatus is supplied with water through an inlet mixing valve 20 provided with a hot water line 21 and a cold water line 22. Leading from the valve 20 is a water line 23 that empties into a detergent dispenser 24. Leading from the dispenser 24 is a liquid line 25 emptying into the tank 19 at 26. There is also provided a rinse conditioner dispenser 27 and a bleach dispenser 28. These are connected to the tank 19 by lines 29 and 30, respectively.

At the bottom of the tank 19 at the lowest point there-
to be energized and condenser water continues to be introduced to condenser 39.

As is shown in the pump parts views of FIGURES 2–7 and the pump assembly of FIGURE 8, the pump is of simple design yet because of the improved means for preventing air locks the pump functions efficiently even when constructed to loose tolerances.

As is shown in FIGURES 2, 3 and 8 the pump 15 has a housing 47 with one side 48 of the housing containing both the pump inlet 49 and the pump outlet 50. The interior of the pump at this side is provided with an accurate pump chamber 51 that extends from the inlet 49 to the outlet 50 through an arc of approximately 180°. About the first one-half 52 of this arc is at a substantially constant radius about the center point 53. The remainder 54 of the chamber is of progressively decreasing radius to the outlet 50. Thus the annular pump chamber 51 has an exit portion 55 that is closest to the center 53 communicating directly with the outlet 50.

Located radially inwardly of this exit portion 55 is a vent connection 56 that will be described in greater detail hereinafter.

The impeller 57 for the pump 15 is shown in FIGURES 4, 5 and 8. This impeller is provided with a circular skirt 58 and a series of spaced curved blades 59. If desired, the skirt 58 can be omitted without impairing the functioning of the pump.

The other side 60 of the pump housing is shown in FIGURES 6, 7 and 8. As is shown in FIGURE 8, this other side functions as a back-up plate for the impeller 57. This side of the housing is provided with three threaded mounting bosses 61 which may be used to mount the pump on a motor 12.

As is shown in FIGURES 1 and 8, the vent connection 56 is connected to the vent line 45 which leads to the separator 37 at a point above the normal liquid level therein.

The pump 15 is a turbine pump and operates throughout the cycle of machine operation. The inlet 49 of the pump is connected to the line 16 which leads to the separator 37 and which also communicates with the sump 31 by way of the trap 33. The outlet 50 of the pump 15 is connected to the drain conduit 17.

The air bleed line 45 previously described communicates with the interior of the pump 15 in order to prevent air locks. Thus any air or suds entrapped within the the pump interior are immediately drawn from the interior of the pump through the bleed line 45 and into the separator 37 because of the suction therein provided by the suction blower 35 during extraction and drying portions of the machine cycle.

The inlet 49 to the pump 15 as shown in FIGURE 1 is substantially at the lowest point in the pump and is at the lowest point in the fluid circuit. Thus the liquid and suds drain into the pump entrance by gravity to nullify any air lock problem during washing and rinsing operations.

However, air lock is somewhat greater problem during extraction and drying portions of the cycle. Because during these portions of the cycle the pump is required to operate against an almost continuous vacuum in the separator 37, the liquid including water and suds cannot drain by gravity to the pump entrance. Under these conditions a close tolerance pump would normally be required. However, because any tendency toward air lock is relieved by the air bleed line 45, there are like-wise no air lock problems even during these conditions. Thus, again, a pump with very close tolerances is not re-quired and the tolerances can be quite loose. Any air or suds trapped in the arcuate pump chamber is immediately drawn from the chamber by the vacuum in the separator 37 with this air being drawn by way of the air bleed line 45.

The apparatus of this invention is particularly adapted to solving the problem of pumping liquid against varying head conditions within a vacuum extraction combination washer-dryer. The vent means for the pump is so arranged that regardless of the head against which the pump must act, if liquid is present to be pumped, the pump will be effective to accomplish the desired result.

Having described our invention as related to the embodiment disclosed in the accompanying drawings, it is our intention that the invention be not limited by any of the details of description, unless otherwise specified, but rather be construed broadly within its spirit and scope as set out in the accompanying claims.

The embodiment of the invention in which an exclusive property or privilege is claimed is defined as follows:

We claim:

1. In a washer-dryer: a rotatable container for receiving wet fabrics; suction conduit means communicating with the interior of said container; fluid separator means connected to said suction conduit means for separating liquid from air passing through said suction conduit means; suction means in said suction conduit means for causing air and liquid to flow through said separator means from fabrics within said container; pump means including an outlet for discharging liquid from said fluid separator means; and vent means interconnecting the interior of said pump means and said fluid separator means for venting fluid from said pump interior to said fluid separator to preclude air locking of said pump means.

2. The apparatus of claim 1 wherein said vent means communicates with said pump interior at an area thereof adjacent said outlet.

3. The apparatus of claim 1 wherein said pump means comprises a turbine pump with said vent means communicating with said pump interior at an area thereof adjacent and radially inwardly of said outlet.

4. In a vacuum extraction washer operable through a liquid extracting operation, a suction nozzle for withdrawing liquid from fabrics during said extracting operation, a suction unit for applying subatmospheric suction to said suction nozzle during said extracting operation, a suction conduit interconnecting said suction nozzle and said suction unit, a fluid conduit in communication with said suction conduit, a centrifugal pump in said fluid conduit for removing liquid entering said fluid conduit during said extracting operation, and gas bleed means interconnecting said suction conduit and said centrifugal pump to provide a subatmospheric vent for withdrawing gas from said centrifugal pump during said extracting operation to thereby preclude air-locking of said centrifugal pump.

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