May 26, 1953 C. F. ABRESCH 2,639,600

DOMESTIC APPLIANCE

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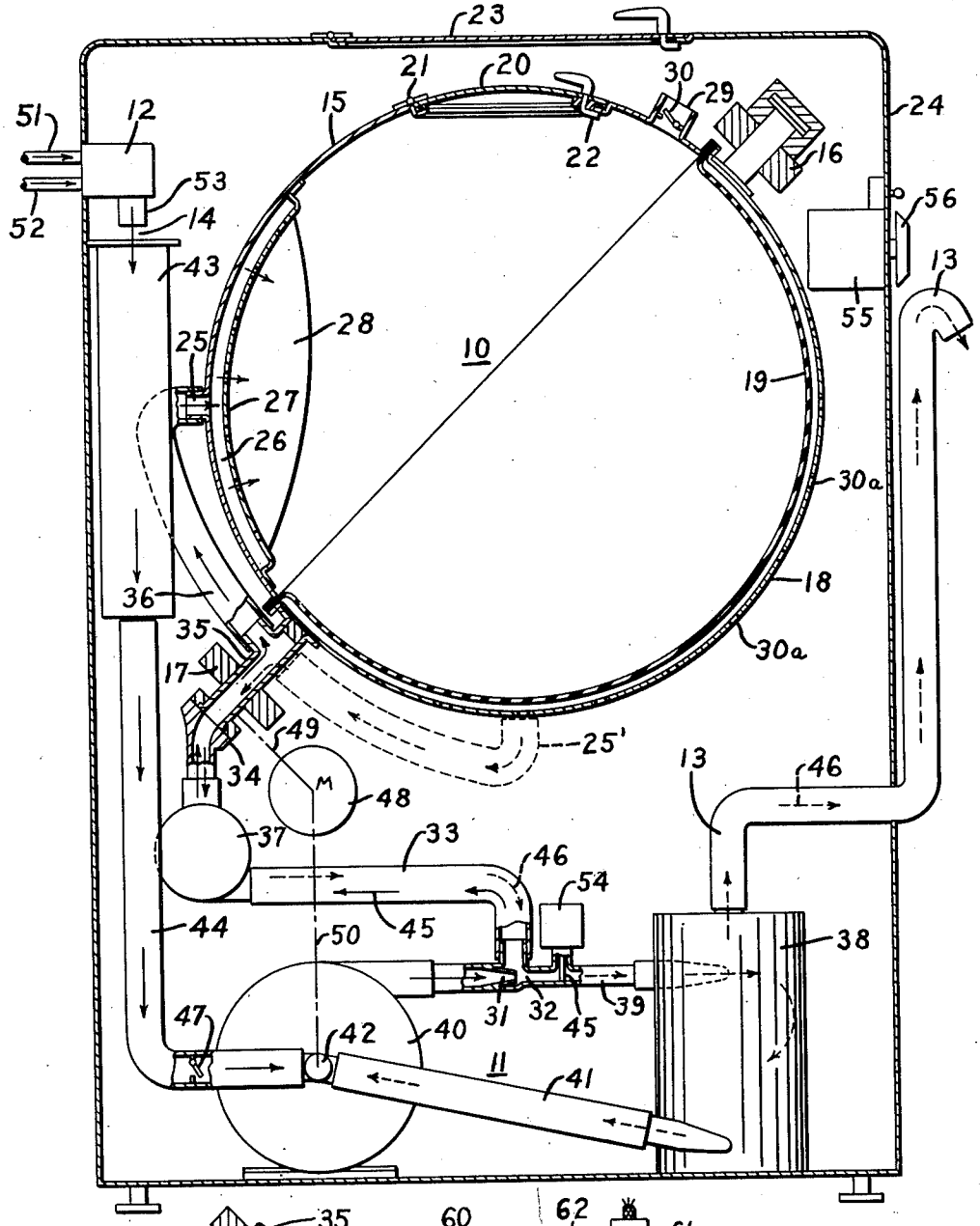


FIG. 1

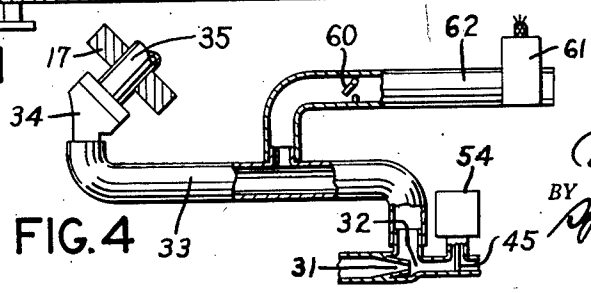


FIG. 4

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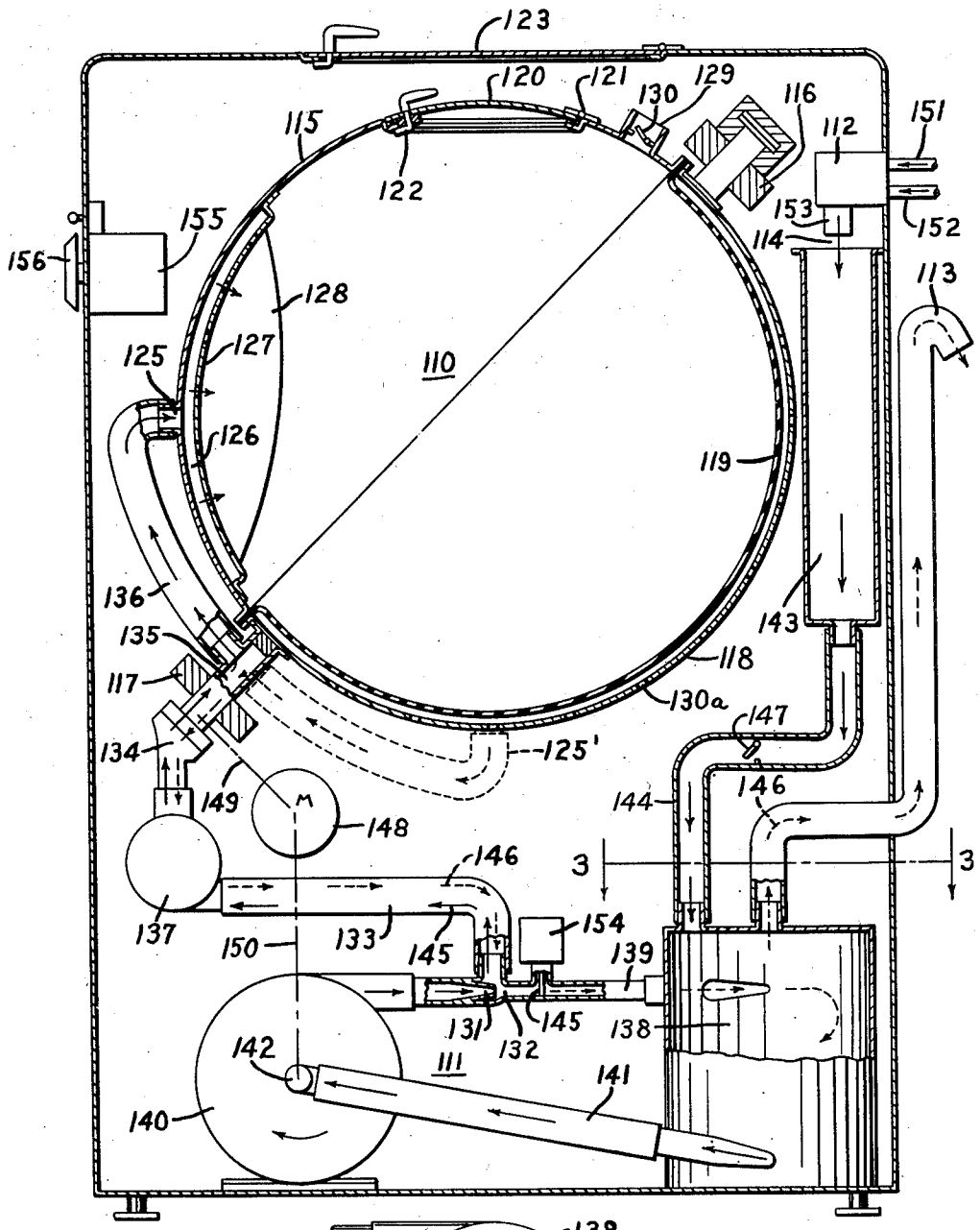


FIG. 2

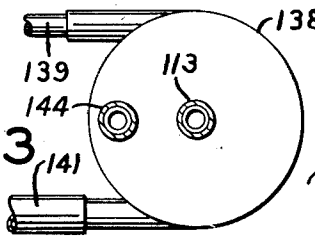


FIG. 3

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DOMESTIC APPLIANCE

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Application November 8, 1949, Serial No. 126,159

7 Claims. (Cl. 68—21)

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This invention relates to domestic appliances and more particularly to washing machines.

This application is a continuation in part of my copending application S. N. 118,316 filed September 28, 1949, issued February 26, 1952 as Patent No. 2,587,080.

An object of this invention is to provide a pumping system connected to a washing machine which system is capable of introducing water from the water supply system into the washing machine and is capable of removing water and/or air from the washing machine in order to wring the clothes.

Another object of this invention is to provide a washing machine with a pumping system capable of introducing water for washing and rinsing purposes, and of withdrawing air and water from said washing machine and to produce a vacuum therein for wringing purposes.

Another object of this invention is to provide a washing machine with a pumping system capable of receiving water from a water supply and of introducing it into the washing machine without danger of allowing the water to flow back into the water supply system.

Reference is made to the following applications owned by the same assignee: S. N. 16,790 filed March 24, 1948, Carel F. Abresch, applicant; S. N. 34,038 filed June 19, 1948, Carel F. Abresch, applicant; S. N. 79,226 filed March 2, 1949, Carel F. Abresch, applicant.

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

In the drawings:

Figure 1 is a vertical cross section, somewhat diagrammatic, of a washing machine embodying features of my invention.

Figure 2 is a view similar to Figure 1, but showing a modification.

Figure 3 is a horizontal cross section taken along the line of 3—3 of Figure 2.

Figure 4 is a vertical cross sectional view of a vacuum breaker, which may be applied to either of the modifications shown in Figures 1 and 2.

My invention embodies a washing machine having a washing enclosure 10, which is to be filled with and emptied of water and air. This enclosure is connected to a pumping system 11 which is capable of introducing water into the enclosure 10 from the water supply controlled by valve 12. The pumping system 11 also is capable of emptying the water from the enclosure 10, together with any air present therein, and of directing it through the drain hose 13.

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The pumping system 11 is so connected to the water supply valve 12, that no water can back up into the water supply, should a temporary vacuum be produced in the supply. Preferably this is accomplished by providing an air gap 14 between the valve 12 and the pumping system 11, which prevents any backward flow of water into the valve 12.

This invention may be used with many types of washing machines. Merely by way of example, the washing machine disclosed in my copending application Serial No. 34,038, filed June 19, 1948, may be used. Briefly stated, this washing machine includes a rotatable sphere-like member surrounding enclosure 10, and rotating about the bearings 16 and 17. This spherical member includes a substantially imperforate semi-sphere 15, and a perforate semi-sphere 18. A flexible bag 19 is placed in the enclosure 10 in such a manner that it may extend into the semi-sphere 15 during wringing operations, and into the semi-sphere 18 during the washing operations.

Clothes are introduced into the enclosure 10 through a swinging cover 20 hinged at 21 and latched at 22, and if desired, also through a cover 23 in the outer casing 24.

Water and/or air are introduced into the enclosure 10 through an opening 25, which is connected to the space 26 formed by a perforated false bottom 27. A radial baffle 28 is provided to agitate the clothes, as the washing machine rotates. An air discharge opening 29 is provided with a spring pressed check valve 30, which allows air to leave the enclosure 10 during the filling operation; but prevents entrance of air into the enclosure when a vacuum is imposed thereon.

The washing machine illustrated is rotated at about 40 R. P. M., after water, detergent and clothes have been introduced into the enclosure 10. This tumbles the clothes in the water and washes them. Thereafter, a suction action is produced on the opening 25 which removes water from the enclosure while the opening passes its lower positions, as indicated by the dotted line 25'. It also removes air from the enclosure during and after the water has been removed and eventually a sufficient vacuum is created in the enclosure 10 to cause the bag 19 to be pressed into the semi-sphere 15 by the atmospheric air entering the perforations 39a in the semi-sphere 18. This wrings the clothes. They may be thereafter removed from the enclosure, or else subjected to a rinsing action.

The pumping system 11 comprises a jet pump 31 having a low pressure jet pump chamber 32 connected to the enclosure 10 through the medium of pipes 33, 34, 35 and 36. If desired, a receiver 37 may also be included in the connection, which would prevent any small amount of water remaining in the system from entering into the enclosure 10 after the water had been removed therefrom, and when the vacuum was being broken.

The jet pump 31 is connected to a drainage separator 38 through the medium of the pipe 39 discharging tangentially into the separator 38. The separator 38 is connected with a mechanical pump 40 by pipe 41, also tangentially connected to the separator 38. Preferably the mechanical pump 40 is a centrifugal pump having an inlet 42. The pumping system 11 is constructed to recirculate a pumping fluid (water) continuously from the pump 40 through the jet pump 31 to the separator 38 and then back into the pump 40. Any excess water and air is adapted to be separated at 38 and to be discharged through the axially connected pipe 13 to the atmosphere and to the drain.

To introduce liquid from the water supply valve 12 to the enclosure 10, a well 43 is placed below the valve 12 with the gap 14 being effective to prevent backward flow of water into the valve 12. The well 43 is connected by a pipe 44 with the inlet 42 of the pump 40. A valve 45, which may be a throttling valve, if desired, is placed in the pipe 39, and is adapted to be closed when the water supply valve 12 is open, thus causing the pump 40 to introduce the water into the enclosure 10 as indicated by the full line arrows. When it is desired to empty the water from the enclosure 10, together with air, the valve 45 is opened, thus causing the jet pump 31 to remove the water and air, as indicated by the dotted line arrows 46. The dotted line arrows also indicate the recirculating fluid or water which is continuously recirculated through the jet pump 31, separator 38 and centrifugal pump 40. A check valve 47 is placed in the pipe 44 to prevent backward flow of water into the well 43.

The washing machine is adapted to be automatically controlled. For this purpose an electric motor 48 is connected by transmissions 49 and 50 with the washing machine and the pump 40 respectively and is adapted to rotate them at the proper speeds. The water supply valve 12 may include hot and cold water pipes 51 and 52, which are controlled by a thermostatic mixing valve which is solenoid operated and is well known in the art, and which discharges through the faucet 53. Preferably the valve 12 is of the type which directs a constant volume of water regardless of the varying pressures in the pipes 51 and 52, this type of valve being well known at present. The valve 45 also may be solenoid operated by the solenoid 54. A timer 55, controlled by the handle 56, is adapted to send electrical power to the solenoids and to the motor 48 in such a manner as first to fill the enclosure 10 with water to the desired level from the supply valve 12 by opening the valve 12 for the correct period of time. Thereafter the timer interrupts the supply of water but continues the rotation of the enclosure 10 to wash the clothes. The filling operation and the washing operation are accomplished by having the timer 55 maintain the valve 45 closed or in throttling position, which causes the water from supply 12 to be introduced into the casing 10 and prevents any

suction action in the opening 25 during the washing operation. Thereafter the valve 45 is opened by the timer 55, which produces a suction action at 25, to remove the water and air from the enclosure 10 and to wring the clothes. Thereafter this sequence of operations may be repeated one or more times in order to rinse the clothes.

In order to break the vacuum in the enclosure 10 after a wringing operation, a vacuum breaker, as shown in Figure 4, may be added to the pipe 33 or at any other desired point. This vacuum breaker includes an inwardly directed check valve 60 and a solenoid valve 61 connected by pipe 62 with the pipe 33. During the wringing operation, when a vacuum is being created in the enclosure 10, the solenoid valve 61 is closed by the timer. After the wringing operation, the timer opens the valve 61, which then allows atmospheric air to enter the pipe 62 and flow past the check valve 60 into the enclosure 10 to cause the bag 19 to move from the semi-sphere 15 into the semi-sphere 18.

In the modification shown in Figure 2, the corresponding parts have been numbered with the same numbers; but with 100 added, these parts are intended to have identical construction and operation with Figure 1, insofar as it is possible to have them so constructed and operated. The water supply 112 in this case is connected to the intake 142 of the pump 140 through the medium of separator 138. The water from supply 112 flows through the well 143 and pipe 144 into the separator 138 and from thence to the pipe 141 into the pump 140. Otherwise the operation of various parts in Figure 2 and their construction may be substantially identical with those of Figure 1.

Figure 3 shows the construction of the separator 138; but it may also be taken as representative of the separator 38, in which case the pipe 144. and its opening are omitted.

In the operation of the machine shown in Figure 1, the covers 20 and 23 are opened, and clothes and suitable detergent are introduced into the enclosure 10. Thereafter the covers are closed, and the timer 55 is set by the knob 56 to the start position, which causes the supply valve 12 to be opened, the motor 48 to be energized and the valve 45 to be closed or throttled. This causes water to flow from valve 12 to well 43, pipe 44 into pump 40, from thence it is discharged into the jet pump 32, and is caused to back up by the closed valve 45 into the pipe 33, 34, 35, 36 and into the opening 25 and past the perforated false bottom 27 into the enclosure 10. As the sphere is being rotated by the motor 48 at this time the clothes, detergent and water are tumbled in the enclosure 10 to wash the clothes. After a suitable length of time, the valve 12 is closed. The length of time is such as to introduce the proper amount of water in the enclosure 10. Thereafter the clothes are tumbled during a suitable washing period of time. Thereafter the valve 45 is opened by the timer 55, thus imposing a suction action in the opening 25, to withdraw water and air from the enclosure eventually to collapse the bag 19 into the semi-sphere 15 to wring the clothes. As the opening 25 continues to rotate down to its lowest position 25', all free-running water is removed from the enclosure and clothes during the wringing operation. After the wringing operation has been completed, the timer 55 repeats the filling, tumbling and vacuum pro-

ducing operations one or more times to rinse the clothes.

After each wringing operation the vacuum in enclosure 10 is broken by admitting air thereto. In Figure 1 this is accomplished by stopping motor 48 and allowing valve 45 to remain open. Air then finds its way into enclosure 10 from well 43 and drain hose 13, the air bubbling through the water in the pumping system 111. Any water which otherwise might be swept into enclosure 10 is trapped in receiver 37.

The clothes may be removed after the final wringing operation and after the vacuum has been broken.

If Figure 1 is modified by the addition of the vacuum breaker shown in Figure 4, the timer stops motor 48 and opens valve 61 after each wringing operation a sufficient length of time to allow air to enter enclosure 10 and to cause bag 19 to move from 15 to 18. With this modification the receiver 37 may be omitted as there is no danger of water entering the space 16 while the vacuum is being broken. The check valve 60 insures that, during the filling operation, no water will flow into pipe 62 and out valve 61. The valve 61 is adapted to be closed at all times except while the vacuum is being broken.

The operation of the modification shown in Figure 2 is identical with that of Figure 1, just described, except that the water from supply valve 112 first flows into separator 138 and thence into pump 140, instead of, as in Figure 1, flowing directly into pump 40.

The pump 140 is of sufficient capacity to withdraw all water from separator 138 which is introduced by valve 112, and thus prevents such water from being discharged through drain hose 113.

The parts of the pumping systems 11 and 111 have been shown relatively larger than they need be, in order to show greater detail. In actual construction they should be made as small as possible to prevent them from retaining any large quantities of water. The separators 38 and 138 should be large enough to retain only the small amount of liquid necessary for the operation of the jet pump.

While the form of embodiment of the invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, as may come within the scope of the claims which follow.

What is claimed is as follows:

1. In combination an enclosure to be filled with and emptied of water; a jet pump having a low pressure jet chamber connected to said enclosure; a mechanical pump discharging into said jet pump; a liquid and gas separator connected to the discharge of said jet pump and intake of said mechanical pump to form a working fluid recirculating cycle; a valve controlling the flow between said jet pump and separator selectively to fill or empty said enclosure conduit means connecting the interior of said enclosure with the atmosphere outside said enclosure to admit air, and a vacuum breaker valve for completely closing said conduit means.

2. In a washing and extracting machine, an enclosed clothes washing container having a flexible wall portion of large area and a clothes washing chamber for receiving the clothes to be washed, a fluid connection adapted to connect to that lowermost portion of the clothes washing chamber of said container opposite the flexible wall portion, a valved vent for connecting with the upper portion of the clothes washing chamber of the container to control the venting of said chamber, a jet pump having a nozzle and a discharge outlet and a suction chamber, a closed separating container for separating gas from liquid having its inlet connected to said discharge outlet, a mechanical pump having its outlet connected to the nozzle of said jet pump and its inlet connected to the separating container, said connections of said jet and mechanical pumps and said separating container forming a loop circuit having a low pressure portion extending from said suction chamber through said separating container to the inlet of said mechanical pump, said fluid connection being connected to said suction chamber of said jet jump, means for feeding a liquid to the low pressure portion of said loop circuit, a discharge conduit extending from the upper portion of said separating container, means for throttling the connection between the discharge outlet and said separating container for pumping liquid from said loop circuit into said enclosed chamber having the flexible wall portion and for opening said connection between the discharge outlet and said separating container to evacuate said enclosed clothes washing container to cause the flexible wall portion to collapse and reduce the volume of the clothes washing chamber of this enclosed clothes washing container to a minimum, means for agitating the clothes and liquid in said clothes washing chamber.

3. In a washing and extracting machine, an enclosed clothes washing container having a flexible wall portion of large area and a clothes washing chamber for receiving the clothes to be washed, a fluid connection adapted to connect to that lowermost portion of the clothes washing chamber of said container opposite the flexible wall portion, a valved vent for connecting with the upper portion of the clothes washing chamber of the container to control the venting of said chamber, a jet jump having a nozzle and a discharge outlet and a suction chamber, a closed separating container for separating gas from liquid having its inlet connected to said discharge outlet, a mechanical pump having its outlet connected to the nozzle of said jet pump and its inlet connected to the separating container, said connections of said jet and mechanical pumps and said separating container forming a loop circuit having a low pressure portion extending from said suction chamber through said separating container to the inlet of said mechanical pump, said fluid connection being connected to said suction chamber of said jet pump, means for feeding a liquid to the low pressure portion of said loop circuit, a discharge conduit extending from the upper portion of said separating container, means for throttling the connection between the discharge outlet and said separating container for pumping liquid from said loop circuit into said enclosed chamber having the flexible wall portion and for opening said connection between the discharge outlet and said separating container to evacuate said enclosed clothes washing container to cause the flexible wall portion to collapse and reduce the volume of the clothes washing chamber of this enclosed clothes washing container to a minimum, means for agitating the clothes and liquid in said clothes washing chamber, and means for releasing the vacuum in said container.

4. In a washing and extracting machine, an enclosed clothes washing container having a flex-

ible wall portion of large area and a clothes washing chamber for receiving the clothes to be washed, a fluid connection adapted to connect to that lowermost portion of the clothes washing chamber of said container opposite the flexible wall portion, a valved vent for connecting with the upper portion of the clothes washing chamber of the container to control the venting of said chamber, a jet pump having a nozzle and a discharge outlet and a suction chamber, a closed separating container for separating gas from liquid having its inlet connected to said discharge outlet, a mechanical pump having its outlet connected to the nozzle of said jet pump and its inlet connected to the separating container, said connections of said jet and mechanical pumps and said separating container forming a loop circuit having a low pressure portion extending from said suction chamber through said separating container to the inlet of said mechanical pump, said fluid connection being connected to said suction chamber of said jet pump, means for feeding a liquid to the low pressure portion of said loop circuit, a discharge conduit extending from the upper portion of said separating container, means for throttling the connection between the discharge outlet and said separating container for pumping liquid from said loop circuit into said enclosed chamber having the flexible wall portion and for opening said connection between the discharge outlet and said separating container to evacuate said enclosed clothes washing container to cause the flexible wall portion to collapse and reduce the volume of the clothes washing chamber of this enclosed clothes washing container to a minimum, means for agitating the clothes and liquid in said clothes washing chamber, said means for feeding a liquid including an open well having an outlet connected to the low pressure portion of said loop circuit, said well extending up above the lowermost portion of said clothes washing container.

5. In a washing and extracting machine, a rotatably mounted enclosed clothes washing container having a flexible wall portion of large area and a clothes washing chamber for receiving the clothes to be washed, a fluid connection connecting with the lower portion of the clothes washing chamber of said container, a valved vent for the clothes washing chamber of said container to control the venting of said chamber, a jet pump having a nozzle and a discharge outlet and a suction chamber connecting into said fluid connection, a closed separating container for separating gas from liquid having its inlet connected to said discharge outlet, a mechanical pump having its outlet connected to the nozzle of said jet pump and its inlet connecting to the separating container, said connections of said jet and mechanical pumps and said separating container forming a loop circuit having a low pressure portion extending from said suction chamber through said separating container to the inlet of said mechanical pump, an overflow discharge conduit extending from the upper portion of said separating container, means for feeding a liquid to the low pressure portion of said loop circuit, a common driving means for rotating said clothes washing container to agitate any liquid and clothes therein and for simultaneously driving said mechanical pump, means for throttling the connection between said discharge outlet and said separating container for pumping liquid from said loop circuit through said fluid connection into said clothes washing container

while said clothes washing container rotates and the mechanical pump operates to apply liquid to the clothes and for opening the connection between the discharge outlet and said separating container to evacuate said clothes washing container to cause the flexible wall portion to collapse and contract the clothes washing container to assist in the evacuation of liquid while said clothes washing container rotates and the mechanical pump operates.

6. In a washing and extracting machine, a rotatably mounted enclosed clothes washing container having a flexible wall portion of large area and a clothes washing chamber for receiving the clothes to be washed, a fluid connection connecting with the lower portion of the clothes washing chamber of said container, a valved vent for the clothes washing chamber of said container to control the venting of said chamber, a jet pump having a nozzle and a discharge outlet and a suction chamber connecting into said fluid connection, a closed separating container for separating gas from liquid having its inlet connected to said discharge outlet, a mechanical pump having its outlet connected to the nozzle of said jet pump and its inlet connecting to the separating container, said connections of said jet and mechanical pumps and said separating container forming a loop circuit having a low pressure portion extending from said suction chamber through said separating container to the inlet of said mechanical pump, an overflow discharge conduit extending from the upper portion of said separating container, means for feeding a liquid to the low pressure portion of said loop circuit, a common driving means for rotating said clothes washing container to agitate any liquid and clothes therein and for simultaneously driving said mechanical pump, means for throttling the connection between said discharge outlet and said separating container for pumping liquid from said loop circuit through said fluid connection into said clothes washing container while said clothes washing container rotates and the mechanical pump operates to apply liquid to the clothes and for opening the connection between the discharge outlet and said separating container to evacuate said clothes washing container to cause the flexible wall portion to collapse and contract the clothes washing container to assist in the evacuation of liquid while said clothes washing container rotates and the mechanical pump operates, and means for releasing the vacuum in said clothes washing container.

7. In a washing and extracting machine, a rotatably mounted enclosed clothes washing container having a flexible wall portion of large area and a clothes washing chamber for receiving the clothes to be washed, a fluid connection connecting with the lower portion of the clothes washing chamber of said container, a valved vent for the clothes washing chamber of said container to control the venting of said chamber, a jet pump having a nozzle and a discharge outlet and a suction chamber connecting into said fluid connection, a closed separating container for separating gas from liquid having its inlet connected to said discharge outlet, a mechanical pump having its outlet connected to the nozzle of said jet pump and its inlet connecting to the separating container, said connections of said jet and mechanical pumps and said separating container forming a loop circuit having a low pressure portion extending from said suction

chamber through said separating container to the inlet of said mechanical pump, an overflow discharge conduit extending from the upper portion of said separating container, means for feeding a liquid to the low pressure portion of said loop circuit, a common driving means for rotating said clothes washing container to agitate any liquid and clothes therein and for simultaneously driving said mechanical pump, means for throttling the connection between said discharge outlet and said separating container for pumping liquid from said loop circuit through said fluid connection into said clothes washing container while said clothes washing container rotates and the mechanical pump operates to apply liquid to the clothes and for opening the connection between the discharge outlet and said separating container to evacuate said clothes washing container to cause the flexible wall portion to collapse and contract the clothes washing container to assist in the evacuation of liquid while said clothes washing container rotates and the mechanical pump operates said means for feeding a liquid including an open well having

an outlet connected to the low pressure portion of said loop circuit for feeding liquid to said circuit, said well extending up above the lowermost portion of said clothes washing container.

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