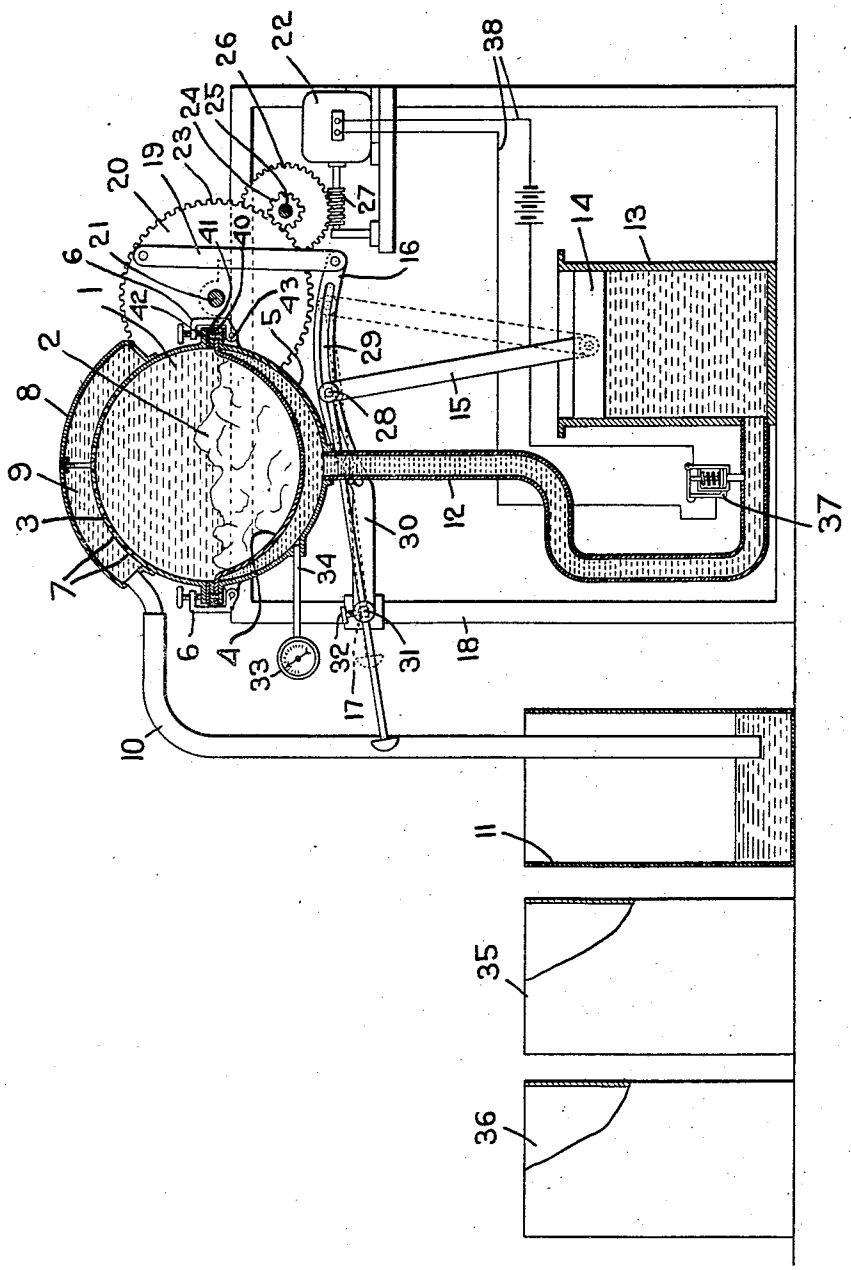
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WASHING MACHINE

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WASHING MACHINE.

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To all whom it may concern:

Be it known that I, GEORGE C. GRAHAM, a citizen of the United States, residing at Watertown, county of Middlesex, State of Massachusetts, have invented an Improvement in Washing Machines, of which the following description, in connection with the accompanying drawing, is a specification, like characters on the drawing representing like parts.

This invention relates to washing machines of that class which comprise a container for containing the clothes to be washed and means for repeatedly and alternately forcing suds or other cleansing fluid into the container and then expelling it therefrom, the clothes or other articles to be washed becoming saturated with the suds or cleansing fluid as it is forced into the chamber and said suds or cleansing fluid being forced out of and through the clothes or other articles when it is expelled from the chamber.

One form of washing machine of this type is constructed so that the chamber which contains the clothes to be washed is expansible and contractible and is connected to a tank or receptacle containing suds or other cleansing fluid. In a washing machine of this type the expanding action of the clothes-receiving chamber will create suction therein which will draw the suds or cleansing fluid from the tank or receptacle into the chamber, the clothes or other articles becoming saturated with the cleansing fluid during this operation, and the contracting action of the chamber will subject the clothes to sufficient pressure to force or squeeze the suds or other cleansing fluid through and out from the clothes.

In order to effectively perform the washing operation by this alternate suction and pressure method it is only necessary to use sufficient suction to draw the cleansing fluid into the chamber with an easy movement and sufficient pressure to squeeze the suds out of the clothes. A relatively light pressure will be sufficient for this purpose. If, however, the clothes are subjected to a relatively heavy pressure or, in other words, if the chamber is contracted under a relatively heavy pressure the clothes will be squeezed or pressed to such an extent as to reduce them to a semi-dried condition.

My improved machine is constructed so that it can be operated to produce the alternate suction and pressure in the clothes-receiving chamber thereby to perform the washing operation, during which operation the pressure developed is relatively light, or it may be operated so as to subject the clothes in the clothes-receiving chamber to a relatively heavy pressure thereby to express all the water therefrom and bring them to the semi-dried condition.

My invention, therefore, provides a combined washing and wringing machine by which the clothes may not only be washed but may be also squeezed or pressed practically dry. These operations of washing and drying are performed successively on the clothes while they are in the clothes-receiving chamber and without the necessity of removing them therefrom, which is a very decided advantage as it eliminates the labor involved in lifting wet clothes from one container to another.

In order to give an understanding of my invention I have illustrated in the drawings a selected embodiment thereof which will now be described after which the novel features will be pointed out in the appended claims.

The drawings show in section a machine embodying my present invention.

The chamber in which the clothes are placed for the washing operation is indicated generally at 1 and the clothes therein are indicated at 2. This chamber 1 is an expansible and contractible chamber and while it is possible to provide a suitable expansible and contractible chamber by means of a variety of different constructions I have, for the sake of illustration, shown a chamber which has a fixed wall 3 and an opposed movable wall 4. The fixed wall 3 is shown as convex in shape, although it may have any shape without departing from the invention and it is formed by a part of a divided container, the other part of which is indicated at 5. These two parts are separable from each other but are clamped together by means of suitable clamps 6. The movable wall 4 is shown as a flexible sheet or diaphragm which has its edges clamped between the two sections 3 and 5, this being done in such a way as to make a water tight joint.

The container section 5 is shown as having a peripheral flange 40 to which the edge of the diaphragm 4 is secured by means of a clamping ring 41, the latter being screwed

to the flange 40. The container section 3 is also provided with a flange 42 which fits on the clamping ring 41. The clamps 6 which are shown as pivoted to the container section 5 at 43 are adapted to engage the flange 42 and clamp the latter firmly against the clamping ring, a suitable gasket being provided between the flange 42 and the clamping ring to make a water tight joint. The container section 3 is thus removably secured to the fixed section 5, the removability of the section 3 providing for placing the clothes 2 to be washed in the chamber 1 or removing them therefrom.

The wall 3 is perforated as shown at 7 and the perforated portion is covered by a hood 8 which forms with the exterior of the wall a chamber 9 that communicates with the clothes-receiving chamber 1 through the perforations 7. This chamber 9 has a pipe connection 10 communicating therewith which extends to a tank or receptacle 11 adapted to contain the suds or other cleansing fluid. The pipe connection 10 will preferably be a flexible one for reasons presently to be described and it may be connected to the tank 11 by simply having its end immersed in liquid therein.

The contracting and expanding of the chamber 1 is secured by moving the diaphragm or movable wall 4 up and down and this is preferably accomplished by hydraulic means.

The section 5 of the container is connected by a pipe 12 to a cylinder 13 in which operates a piston 14. The space beneath the diaphragm 4, the pipe and the cylinder are filled with water or some other relatively non-compressible fluid so that when the piston 14 moves downwardly the water will be forced out of the cylinder 13 into the shell section 5 thereby raising the diaphragm 4 while when the piston 14 moves upwardly the water will be withdrawn from the shell section 5 thus pulling the diaphragm 4 downwardly.

Assuming that there are clothes to be washed in the chamber 2 and that the pipe connection 10 leads into a tank 11 containing suds or other cleansing fluid it will be seen that during the upward movement of the piston 14 the chamber 2 will be expanded and the suds or cleansing fluid will be drawn into the chamber and the clothes will become saturated therewith, while during the downward movement of the piston 14 the chamber 2 will be contracted thus forcing the suds or cleansing fluid out of said chamber and back into the tank 11 again and the clothes will be subjected to sufficient pressure to squeeze the suds out of them. The up and down movement of the diaphragm 4, therefore, will cause the clothes to be alternately saturated with the suds and then squeezed to press the suds out of them, this repeated operation resulting in effectively washing the clothes.

The best results may be secured by expanding and contracting the clothes-receiving chamber relatively slowly and as stated above it is sufficient to contract the chamber under a moderate pressure only.

My machine is constructed so that the piston 14 may be operated to produce the moderate pressure for the washing operation or may be operated to develop a relatively high degree of pressure against the diaphragm 4 which will subject the clothes to the same high degree of pressure thereby expressing therefrom the water therein and bringing them to a semi-dried condition.

So far as the invention is concerned various devices for producing either of these two working pressures may be employed. I have, however, for illustrative purposes shown a simple and practical device for this purpose. The piston 14 is connected by a connecting rod 15 to a lever 16 which in turn is pivoted at 17 to the frame 18 that supports the container. This lever 16 is in turn connected by a link 19 to a crank disk 20 that is mounted on a shaft 21 journalled in the frame 18. The crank disk may be operated at the proper speed by a suitable mechanism. That herein shown comprises a motor 22 which is operatively connected to the crank disk 20 through suitable reduction gear. The crank disk 20 is shown as having gear teeth 23 on its periphery which mesh with a pinion 24 on a shaft 25, the latter shaft having fast thereon a worm gear 26 which meshes with and is driven by a worm 27 on the shaft or motor 22.

The connecting rod 15 is adjustably connected to the lever 16, said link having a pin 28 at its upper end operating in a slot 29 formed in the lever 16. The connecting rod 15 also has a link or rod 30 connected thereto by which it may be adjusted longitudinally of the slot 29, said rod extending through and being guided by a guiding support 31 which carries a set screw 32 by which the rod may be clamped in adjusted position.

The length of the stroke of the piston 14 and consequently the degree of pressure to which the clothes are subjected can be thus varied by means of the adjustable connection between the connecting rod 15 and the lever 16. When the parts are in the full line position the piston will have a shorter stroke than when the connecting rod is adjusted into the dotted line position.

During the washing of the clothes the connecting rod 15 will be adjusted at the proper point to give the desired pressure for expelling the water from the chamber 2, the precise point at which it is adjusted being dependent upon the amount of clothes

in said chamber. If the chamber 2 is well filled with clothes then a smaller vibrating movement of the diaphragm 4 and a shorter length of stroke of the piston 14 will be required than if the chamber 2 is only partially filled with clothes.

In order to assist the operator in making a proper adjustment I have illustrated the pressure gauge 33 which is connected to the section 5 by a pipe 34. Assuming that for the washing operation an upward pressure of five pounds on the diaphragm 4 is sufficient then when the operator comes to start the machine he will watch the gauge 33 during the down stroke of the piston 14 and will so adjust the connecting rod 15 as to secure the desired five pounds pressure when the piston 14 is at the bottom of its stroke. The repeated up and down movement of the piston 14 and the consequent expanding and contracting action of the chamber 1 results in washing the clothes as above described.

After the clothes have been washed for a sufficient length of time then they may be dried or partially dried by developing a relatively high pressure beneath the diaphragm 4 so that the clothes will be highly compressed between the diaphragm and the fixed wall 3. This increased pressure will express the water or fluid from the clothes and will leave them in a semi-dried condition. Said increased pressure can be secured by shifting the connecting rod 15 toward the right hand end of the slot 29 so that the piston will have a longer stroke, and a greater quantity of water will be forced into the container beneath the diaphragm 4.

My invention, therefore, provides a machine by which a moderate suction and pressure may be alternately produced in the clothes-receiving compartment during the operation of washing the clothes and when the clothes are washed said compartment or chamber may be contracted under a high degree of pressure thereby expressing the water from the clothes and leaving them in a semi-dried condition.

I have herein shown additional tanks 35 and 36, one of which may contain rinsing water and the other of which may contain blueing water and with any one of which the pipe connection 10 may have communication.

In using the apparatus the pipe connection 10 will first be connected to the tank 11 containing the suds or cleansing fluid and when the washing has been carried on for a sufficient length of time an adjustment may be made to subject the clothes to the high pressure so as to express the sudsy water from them as far as possible, and then the pipe 10 may be connected to the tank 35 containing the rinsing water and the device again operated under the moderate pressure conditions. After the rinsing has been properly attended to then the pipe connection 10 may be transferred to the tank 36 containing the blueing water and the blueing water may be forced into and out of the container thus blueing the clothes.

If desired, the clothes may be subjected to the high pressure to partially dry them after both the rinsing operation and the blueing operation. With the machine herein shown, therefore, it is possible to wash, rinse, blue and wring the clothes without removing them from the container and without the necessity of the operator handling them in any way.

It will be understood that when the clothes are being subjected to the high pressure for drying them the motor 22 may be stopped with the piston 14 at the bottom of its stroke and this high pressure may thus be maintained for any desired length of time. When the clothes are to be removed from the container the pressure will be relieved somewhat, the clamps 6 loosened and the container section 3 removed thus giving access to the clothes.

37 indicates a safety or relief device of ordinary construction which is adapted to open automatically the circuit 38 of the motor 22 in case an abnormal or dangerous pressure is developed by the downward movement of the piston 14.

I claim.

1. In a washing machine, the combination with an expansible and contractible clothes-receiving chamber to receive the clothes to be washed, of a receptacle separate from said chamber and containing cleansing fluid, a conduit connecting said chamber and said receptacle, power-driven means for alternately expanding the chamber and drawing cleansing fluid thereinto from the tank through the conduit and contracting the chamber to expel fluid therefrom back into the receptacle through said conduit, and adjustable means by which the maximum pressure with which the chamber is contracted by said power-driven means can be varied.

2. In a washing machine, the combination with a chamber to contain the clothes to be washed, said chamber having a movable wall by the movement of which the chamber is expanded and contracted, of a receptacle containing cleansing fluid, said receptacle being separate and independent from the chamber, a conduit connecting said chamber with said receptacle, power-driven means to move the movable wall thereby to expand and contract the chamber and alternately draw cleansing fluid into said chamber from the receptacle through the conduit and expel it from said chamber back into the receptacle also through said conduit, and adjustable means to limit the maximum pres-

sure to which said wall is subjected during the contracting movement.

3. In a washing machine, the combination with an expansible and contractible clothes-receiving chamber to receive the clothes to be washed, of a receptacle containing cleansing fluid with which the chamber communicates, hydraulic means operating to alternately expand and contract said chamber whereby cleansing fluid is alternately drawn into the chamber and expelled therefrom, and means to vary the degree of pressure with which the chamber is contracted.

4. In a washing machine, the combination with an expansible and contractible clothes-receiving chamber to receive the clothes to be washed, of a receptacle containing cleansing fluid with which the chamber communicates, means for alternately expanding and contracting said chamber, said means including a cylinder having a piston therein by movement of which the chamber is expanded or contracted, means for reciprocating the piston, and means to vary the length of the stroke thereof, whereby the degree of pressure with which the chamber is contracted may be varied.

5. In a washing machine, the combination with a chamber to contain the clothes to be washed, said chamber having a movable wall by movement of which the chamber is expanded and contracted, of a receptacle containing cleansing fluid with which said chamber communicates, means to move the movable wall thereby to expand and contract the chamber and alternately draw cleansing fluid into the chamber and expel it therefrom, said means including a cylinder and a piston therein, means to reciprocate the piston, and means to vary the length of the stroke of the piston.

6. In a washing machine, the combination with a shell, of a flexible diaphragm extending across the latter and dividing it into two compartments, one of which constitutes a clothes-receiving chamber, a receptacle containing suds or cleansing fluid communicating with said clothes-receiving compartment, a cylinder containing relatively incompressible fluid communicating with the other compartment, a piston operating in said cylinder, means to actuate the piston thereby to move the diaphragm and alternately expand and contract the clothes-receiving compartment, and means to vary the length of the stroke of the piston.

7. In a washing machine, the combination with an expansible and contractible clothes-receiving chamber to receive the clothes to be washed, of a tank containing cleansing fluid with which the chamber communicates, means to expand and contract the said chamber, said means including a cylinder, a piston operating in the cylinder and connections between the cylinder and said chamber whereby movement of the piston in one direction expands the chamber and movement in the opposite direction contracts the chamber, and means to vary the degree of pressure with which the chamber is contracted.

8. In a washing machine, the combination with a container, of a flexible partition dividing said container into two compartments, one of which constitutes a clothes-receiving compartment, a receptacle for cleansing fluid with which said clothes-receiving compartment communicates, a pump device to pump fluid into the other compartment under pressure and withdraw said fluid therefrom, whereby the clothes-receiving compartment is alternately contracted and expanded, and adjustable means by which the pressure produced in said other compartment by said pump when the clothes-receiving compartment is contracted may be varied.

9. In a washing machine, the combination with a container, of a movable partition dividing said container into two compartments, one of which constitutes a clothes-receiving compartment, a receptacle for cleansing fluid with which said clothes-receiving compartment communicates, a pump device to pump fluid into the other compartment under pressure and withdraw said fluid therefrom, whereby the clothes-receiving compartment is alternately contracted and expanded, and means to vary the degree of pressure with which the clothes-receiving chamber is contracted.

In testimony whereof, I have signed my name to this specification.

GEORGE C. GRAHAM.