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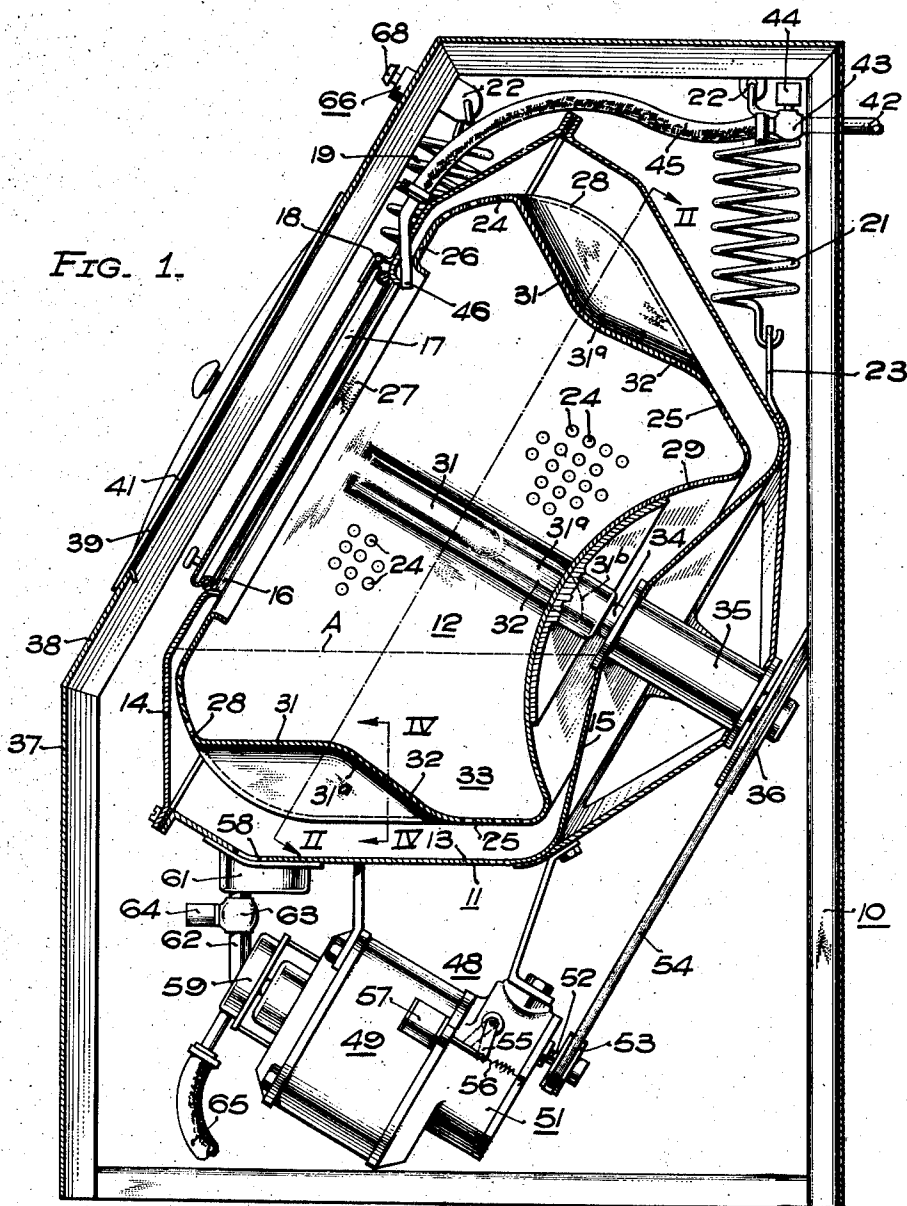
S. R. BAIRD

2,296,267

LAUNDRY APPARATUS

Filed April 15, 1939

2 Sheets-Sheet 1



WITNESSES:

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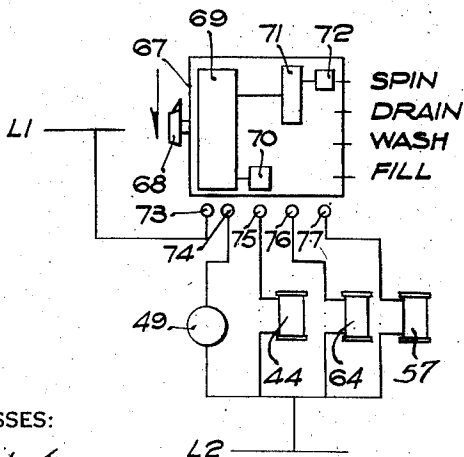
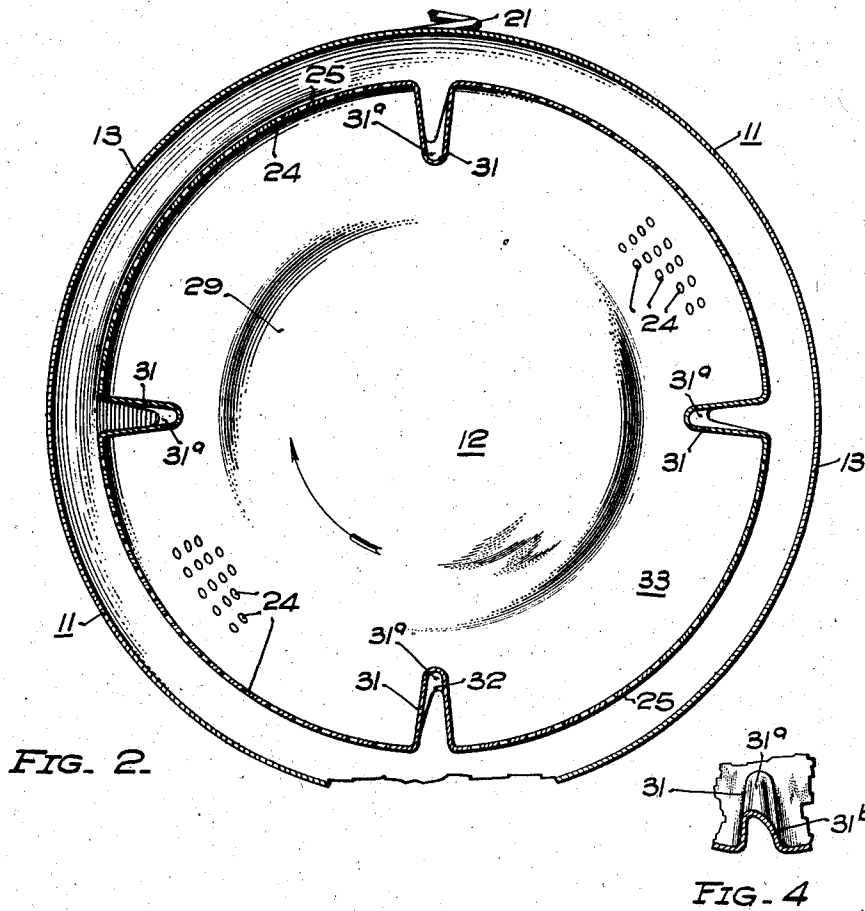
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LAUNDRY APPARATUS

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2 Sheets-Sheet 2



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2,296,267

LAUNDRY APPARATUS

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pany, East Pittsburgh, Pa., a corporation of
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Application April 15, 1939, Serial No. 268,103

8 Claims. (Cl. 68—23)

My invention relates to laundry apparatus and has for one of its objects to provide improved apparatus of this kind.

A further object of my invention is to reduce the load on the driving motor of a washing machine, during periods of acceleration of the clothes containing basket.

It is a further object of the invention to provide improved means for tumbling clothes and centrifuging fluid therefrom, wherein an efficient washing action is effected and the fabrics then so distributed in the basket that vibration of the basket and the load on the motor during acceleration of the basket are maintained at low values.

It is a still further object of the invention to provide an improved washing and spinning machine having the axis of rotation of its clothes container disposed at an acute angle to the vertical.

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

Fig. 1 is a vertical sectional view of a laundry machine constructed and arranged in accordance with my invention;

Fig. 2 is a sectional view taken along the line II—II of Fig. 1;

Fig. 3 is a diagram of the electrical connections of a control for the machine; and,

Fig. 4 is a sectional view of a detail shown in Figs. 1 and 2 and is taken along the line IV—IV of Fig. 1.

Reference will now be had to the drawings wherein I have disclosed my invention applied to a laundry machine of the domestic type and including a casing 10, a tub or container 11 for washing fluid disposed within the casing 10 and a perforate basket 12 rotatably supported by the tub so that its axis of rotation is inclined. The present invention defines an improvement of the machine of the inclined axis type disclosed and claimed in the copending application of Frank Breckenridge, Serial No. 203,804, filed April 23, 1938, and assigned to the assignee of the present application, in that improved means for agitating and distributing the fabrics within the basket 12 is provided.

The tub structure 11 is generally of frusto-conical configuration, as shown, and includes side walls 13 and end walls 14 and 15 at its large and small ends, respectively. The end wall 14 is provided with an access opening 16 which is closed

by a suitable gasketed door 17 hinged at 18 to the tub structure.

Support for the tub structure 11 is effected in any suitable manner. As shown, however, the tub structure 11 is resiliently carried within the casing 10 by means of a plurality of springs, two of which are shown at 19 and 21. The springs 19 and 21 are connected at their upper ends by suitable brackets 22 carried by an upper portion of the casing 10, the lower ends of the springs carrying brackets 23 which are fixedly secured to the tub structure 11. As the specific method of supporting the tub structure 11 forms no part of the present invention, further reference to the support of the tub 11 is deemed unnecessary. A suitable form of flexible mounting for a tub of the type shown at 11 is disclosed and claimed in the copending application of Frank Breckenridge, Serial No. 226,853, filed August 26, 1938, and assigned to the assignee of the present application.

The basket 12 which is also generally of frusto-conical configuration is rotatably disposed within the tub 11 and closely follows the lines of the tub so that a substantial portion of the water contained in the tub lies within the basket. It will be understood that the basket 12 is perforate throughout substantially its extent; a number of perforations being indicated by the reference numeral 24. The basket 12 includes a side wall 25 and an end wall 26 at the end of the basket of major diameter, said end wall 26 having an access opening 27 formed therein and aligned with the access opening 16. The side wall 25 is well rounded where it joins the end wall 26, as shown at 28, so that the fabrics as they are tumbled in the basket 12 are subjected only to surfaces which are well rounded and free from sharp corners. The opposite end of the basket 12 or the end of small diameter is closed by an end wall which is curved inwardly of the basket so as to define a dome 29.

In accordance with my invention, a plurality of protuberances, such as, for example, vanes 31 are circumferentially spaced within the basket and extend from adjacent the end wall 26 toward the dome 29 but terminate in spaced relation with the latter, as shown at 32. Accordingly, an annular zone indicated by the numeral 33 is defined within the basket adjacent the dome 29; the portion of the side wall 25 defining the zone 33 being continuous or uninterrupted by any portion of the vane structure 31. The vanes 31 may be formed in any well understood manner and, preferably, are embossed in the basket structure as best shown in Fig. 2.

The vanes 31 extend inwardly from the basket side wall and are of maximum height adjacent the portion of the basket of major diameter.

The vanes include a tapered portion 31a which becomes progressively reduced in height toward the zone 33. The leading edge of the tapered portion of the vane may be cut away and well-rounded as shown at 31b in Fig. 4. Accordingly, the innermost edges of the vanes are relatively wide adjacent the end wall 26 and become progressively thinner along the vane portion 31a and toward the zone 33. The shape of the vane, as shown at 31b, determines the amount of travel of the clothes upwardly in the basket as they are elevated by the vane. Further reference to this operation is made hereinafter.

Support for the basket 12 is provided by a shaft 34 which is secured within the dome 29 and which is journaled in a bearing 35 carried by the end wall 15 of the tub structure. The outer end of the shaft 34 is provided with a driving pulley 36. The vanes 31 in cooperation with the dome 29 provide an improved washing action and also effect distribution of the fabrics in the region or zone 33 prior to centrifuging fluid from the fabrics as will be described more in detail hereinafter.

The casing structure 10 includes a front wall 37, a portion 38 of which is inclined in a plane normal to the axis of the basket and provided with an opening 39 registering with the openings 16 and 27. A pan or cover 41 is provided for closing the opening 39 during periods when the machine is inactive, the cover 41 being removed when operation of the machine is to be effected.

The supply of water to the tub 11 is effected in any well understood manner. As shown, a conduit 42 is provided for conveying water at a suitable temperature from a source (not shown). The conduit 42 is provided with an electrically-operated control valve 43 which may include an operating solenoid 44. As the construction and operation of the solenoid-operated valves are well understood in the art, further reference to the construction and operation thereof is deemed unnecessary, other than to state that, when the solenoid 44 is energized, the valve is open and, when the solenoid 44 is deenergized, the valve is closed. The conduit 42 is connected by means of a flexible conduit structure 45 to a nozzle 46, said nozzle being directed toward the center of the basket 12 as shown. The level of the water in the tub when properly filled is indicated by the broken line A.

Rotation of the basket 12 in a single direction at relatively low speed during washing periods and at relatively high speed during spinning or fluid extracting periods is provided by a drive mechanism 48 carried by the tub structure 11. The drive mechanism 48 includes an electric motor 49 and rotates the shaft 34 of the basket through a speed-reducing mechanism generally indicated at 51, the latter including a driven shaft 52 and a pulley 53 which is belted as shown at 54 to the pulley 36. As the specific form of speed-reducing mechanism that is employed forms no part of the present invention, it has not been shown in detail for the sake of brevity and clearness. The mechanism includes suitable gearing, not shown, between the motor 49 and the driven shaft 52 so that the latter may be rotated at relatively high and low speeds. Adjustment of the mechanism 51 may be effected by an arm 55 for selecting the speed at which the shaft 52 operates. It will be assumed that

the shaft 52 is rotated at relatively low speed for washing when the arm 55 is in the position shown solid in the drawing and that the shaft 52 rotates at high speed when the arm 55 is adjusted to the position shown in broken lines. The arm 55 is biased to the position shown in the drawing by means of a spring 56 and is actuated to its high speed position by a magnet 57 when energized. Accordingly, when the magnet 57 is deenergized, the arm 55 is maintained in its slow speed position by the spring 56.

Discharge of vitiated water from the tub 12 through an opening 58 is effected by a pump 59 driven by the motor 49. The discharge opening 58 communicates with a pan 61 that defines a sump at the bottom of the tub 11 and which may house a removable screen, not shown, said screen preventing the passage of solid objects from the tub 11 to the pump 59. A conduit 62 conveys the vitiated water from the sump pan 61 to the inlet of the pump 59 and is provided with an electrically operated valve 63 having an operating solenoid 64. The construction of the valve 63 is similar to that of the valve 43 in that the valve 63 is opened when the solenoid 64 is energized and, conversely, the valve 63 is closed when the solenoid 64 is deenergized. The water discharged from the pump 59 is conveyed by a flexible conduit, such as, for example, a length of rubber hose 65, to drain.

Control of the various electrically-operated instrumentalities may be effected manually or automatically by a suitable master control switch. As shown, the washer is manually-operated, the control system including a master drum switch generally indicated by the numeral 66 and carried by the sloping front wall 38 where it is convenient to the operator. The electrical connections between the various electrically-operated devices and the master switch 66 is shown in Fig. 3. The master switch 66 includes a drum 67 which is rotated by a knob or handle 68. The drum 67 is shown in development, and moves in the direction of the arrow when actuated by the knob 68. The drum 67 carries a plurality of electrically-connected contact segments 69 to 72, inclusive, which cooperate with stationary contact fingers 73 to 77, inclusive. The source of power of the apparatus is indicated by line conductors L₁ and L₂, the former of which is connected to the contact finger 73 and the latter of which is connected, respectively, to terminals of the motor 49, the solenoids 44 and 64 and the magnet 57. The opposite terminals of the motor 49, solenoids 44 and 64 and the magnet 57 are, respectively, connected to the contact fingers 74, 75, 76 and 77.

Operation

The cycle of operation of my improved laundry machine will now be described. The cover 41 is removed from the casing and hinged door 17 swung to its open position. Fabrics to be washed and a detergent are then deposited in the basket 12 and the door 17 moved to its closed position. The operator then adjusts the master switch 66 to its "fill" position whereupon the contact segments 69 and 70 engage the contact fingers 73, 74 and 75. Accordingly, the motor 49 and the inlet valve solenoid 44 are energized. Water is admitted to the tub until the level is approximately at the broken line A, whereupon the master switch 66 is adjusted to its "wash" position. It will be understood at this time that, as the magnet 57 is deenergized, the two-speed mechanism 51 is in a slow speed position.

The basket 12 is now rotated at the relatively low speed of approximately 55 R. P. M. during which the vanes 31 as they move upwardly out of the body of water carry a portion of the fabrics thereon. The vanes 31 become more and more inclined as they move toward an upper region of the tub wherein the fabrics slide off the inclined vanes and are directed toward and fall upon the dome 29.

The amount of travel of the fabrics upwardly upon the vanes 31 is determined to a large extent upon the shape of the vane's leading edge, as will be apparent. The fabrics move along the vane toward the dome 29 as the vane becomes more inclined and, when a predetermined elevated zone is reached, they glide over the leading edge of the tapered portion of the vane and drop upon the dome. The distance the fabrics are elevated may be varied by changing the shape of the leading edge of the vane. The fabrics then glide downwardly upon the dome 29 and move forwardly of the basket or towards the end of large diameter as they launch in the water. Subsequently the clothes are again elevated by the vanes 31 to an upper region of the basket and again drop on the dome 29. Agitation of the fabrics in the body of water and the scrubbing action produced as they glide downwardly over the dome 29 provides the washing action.

A rolling action is imparted to the fabrics as they move along the vane prior to dropping therefrom, and an unrolling action is imparted thereto as they move downwardly over the dome prior to launching in the body of washing fluid. These movements of the fabrics prevent "balling" of the fabrics, as the rolling action is counteracted by the unrolling action. Accordingly, the respective effective lengths of the vanes and the dome are such that a substantially equal amount of rolling and unrolling is imparted to the fabrics.

When the washing of the fabrics is completed, the operator moves the master switch 66 to its "drain" position in which the contact segments 71 engage the fingers 76 so that the drain valve 63 is opened. Discharge of the vitiated water from the tub is effected by the pump 59. The course of the fabrics as they are tumbled in the basket in the absence of water is different than the course described heretofore during the washing action. The fabrics are elevated to an upper region of the basket by the vanes and dropped upon the dome 29 as described. As the fabrics are in a saturated condition they tend to cling to the dome as they glide downwardly thereover. At this time their descent is not interrupted by the body of water so that they are not directed forwardly of the basket. Accordingly, the saturated fabrics cling to the dome and gather in the annular zone 33 around the dome 29. As the zone 33 is located in the portion of the basket of minimum diameter, the load on the motor during the acceleration, which follows, is substantially reduced. In other words, the moment of inertia of the fabrics about the axis of the basket is substantially less in this location than in a region of the basket of larger diameter. Furthermore, vibration of the basket due to unbalance of the load is reduced as the unbalanced load is in the portion of the basket of minimum diameter. Acceleration of the basket is effected when the master switch 66 is adjusted to its "spin" position.

In the "spin" position, the segment 72 engages the contact fingers 77 so that the magnet 57 is energized and the two-speed mechanism 51 ad-

justed to its high speed position. At this time, the segment 71 is also in engagement with the contact finger 76 so that the drain valve 63 is maintained open for the discharge of water spun from the clothes.

As the basket 12 is accelerated, the fabrics move outwardly therein and distribute themselves over the side wall 25 of the basket, a substantial portion of the fabrics moving toward the front of the basket or the portion of maximum diameter. In this position, they may be readily reached and removed by the operator. The foregoing description refers to the washing operation and rinsing of the clothes is effected in the same manner as described except, of course, that a detergent is not employed.

The described method of washing the fabrics, collecting the same in a region of the basket of relatively small diameter and then moving the fabrics to a region of the basket of relatively large diameter for centrifuging is disclosed and claimed in the copending application of Frank Breckenridge Serial No. 339,841, filed June 11, 1940, and assigned to the assignee of the present application.

In the copending application of Frank Breckenridge, Serial No. 232,511, filed September 30, 1938, there is disclosed and claimed a laundry machine of the inclined-axis type in which the inclination of the axis is less during washing periods than during extracting periods. I have found that a basket constructed in accordance with the present invention lends itself well to a machine operating in this manner. This operation may be effected in the machine disclosed herein by properly relating the constants of the springs 19 supporting the front of the tub structure to the spring 21 supporting the rear thereof. In other words, as the weight of the suspended unit increases due to the admission of water to the tub, extension of the front springs 19 effects a movement of the axis downwardly and, as the weight of the suspended unit is decreased due to the discharge of water from the tub, contraction of the springs 19 moves the axis upwardly. It has been found that by shifting the axis in this manner improved washing action and distribution of the fabrics in the basket prior to acceleration are obtained.

From the foregoing, it will be apparent that I have provided a novel basket structure for a laundry machine which effects an improved washing action and distribution of the fabrics in the basket prior to acceleration thereof. Accordingly, the load on the motor and vibration of the basket are maintained at a low value during acceleration of the basket.

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 changes and modifications without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are specifically set forth in the appended claims.

What I claim is:

1. In a cleaning machine, the combination of a container for cleaning fluid and the fabrics to be treated, said container having spaced front and rear end walls and a side wall connected thereto, said side wall diverging from the end walls and defining a region of the container of relatively large diameter intermediate the end walls, means for rotatably supporting the container about an axis inclined substantially from

both the horizontal and the vertical so that the region of the container of large diameter is elevated with respect to the rear end wall, a plurality of circumferentially-spaced, inwardly-extending, protuberances disposed within the container and extending generally from the region of the container of large diameter toward the rear end wall, said protuberances terminating in spaced relation with the rear end wall for defluing a substantially unobstructed annular region within the container adjacent the rear end wall and means for actuating the container at relatively low and high frequencies about said axis for respectively cleaning the fabrics and for centrifugally extracting cleaning fluid therefrom.

2. The combination as claimed in claim 1 wherein said protuberances are relatively high adjacent the region of the container of large diameter and are relatively low at their other ends.

3. In laundry apparatus, the combination of a generally cylindrical container for washing fluid and the fabrics to be washed, said container having front and rear end walls and having an intermediate portion of greater diameter than its rear end wall, said container also having its axis of rotation so inclined at an acute angle from the vertical and horizontal that the portion of the container of greater diameter is disposed upwardly of the rear end of the container, and a plurality of circumferentially-spaced vanes provided on the inner side of the container for agitating the fabrics contained therein, said vanes being of greater depth at a larger and upper diameter of the container and of smaller depth at a lower and smaller diameter of the container.

4. In laundry apparatus the combination of a container for washing fluid, a perforate basket generally of frusto-conical formation including side and end walls, said basket being disposed within the container for enclosing the fabrics to be washed and having its axis so disposed at an acute angle from the vertical that the portion of the basket of larger diameter is disposed upwardly of the end of the basket of minor diameter, means for rotating the basket about its axis and a plurality of protuberances provided on the inner surface of the basket, said protuberances extending from adjacent the portion of the basket of major diameter toward the end wall of minor diameter and terminating in spaced relation from the latter, said protuberances being relatively deep near the portion of the basket of major diameter and relatively shallow at the other ends thereof.

5. In apparatus for washing fabrics and for spinning fluid therefrom, the combination of a container for washing fluid, a perforate basket of substantially frusto-conical configuration disposed therein and having its axis of rotation inclined from both the horizontal and the vertical at all times so that the major diameter of the basket is uppermost, a dome closing the end of the basket of minor diameter and extending inwardly of the basket, a plurality of vanes circumferentially spaced in the basket and extending from adjacent the portion of the basket of major diameter toward the dome and terminat-

ing in spaced relation with the latter, and means for rotating the basket at low and high speeds about said axis during periods of the washing and spinning, respectively.

6. In apparatus for washing fabrics and for spinning fluid therefrom, the combination of a container for washing fluid, a perforate basket rotatably carried therein, said basket being circular in cross section and so constructed that its diameter is smaller at one end than a portion thereof adjacent its other end, said basket being so disposed within the container that its axis of rotation is inclined from both the horizontal and the vertical whereby the portion of the basket of large diameter is elevated with respect to the end of the basket of minor diameter, a plurality of protuberances circumferentially spaced within the basket and extending from adjacent the portion of the basket of large diameter toward the small end thereof and terminating in spaced relation with the small end, and means for rotating the basket at low and high speeds about said inclined axis during periods of washing and spinning, respectively.

7. In apparatus for cleaning fabrics and for centrifuging fluid therefrom, the combination of a container for cleaning fluid and the fabrics to be treated, said container being of substantially frusto-conical configuration and having its axis of rotation so inclined at an acute angle from the vertical that the portion of the container of major diameter is disposed upwardly of the end wall of the container of minor diameter, a plurality of circumferentially-spaced, inwardly-extending protuberances disposed within the container and extending in a direction from the portion of the container of major diameter toward its end wall of minor diameter and terminating in spaced relation with the latter end wall, and means for actuating the container about its axis at relatively low and high speeds for effecting the cleaning and damp-drying of the fabrics, respectively.

8. In apparatus for cleaning fabrics and for centrifuging fluid therefrom, the combination of a basket for containing cleaning fluid and the fabrics to be treated, said basket being of substantially frusto-conical configuration and having its axis of rotation so inclined at an acute angle from the vertical that its end wall of major diameter is uppermost, a dome carried by the end wall of the basket of minor diameter and extending inwardly of the basket, a plurality of circumferentially spaced, inwardly-extending protuberances disposed within the basket and extending from the portion of the basket of major diameter toward its end wall of minor diameter, said protuberances being relatively high adjacent the portion of the basket of major diameter and relatively low at their other ends, said protuberances terminating in spaced relation with the end wall of minor diameter so that a substantially uninterrupted annular region is defined peripherally of said dome, and means for actuating the basket about its axis at relatively low and high speeds for respectively cleaning the fabrics and for centrifugally extracting cleaning fluid therefrom.

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