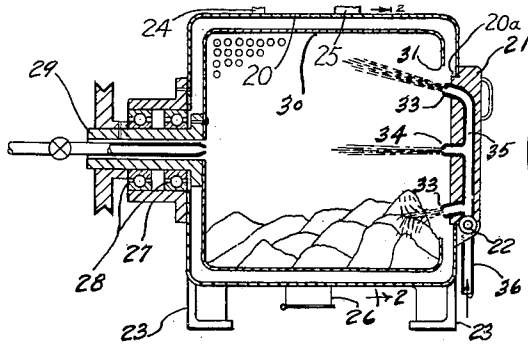
March 11, 1952 L. M. KAHN 2,588,535

WASHING AND THE EXTRACTION OF WASH WATER

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Fig. 1.



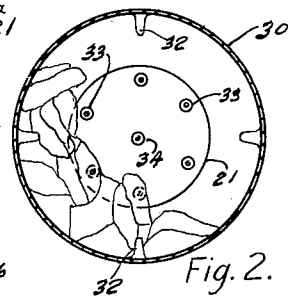


Fig. 2.

Fig. 3

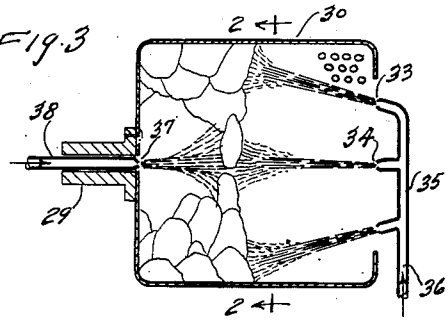


Fig. 4

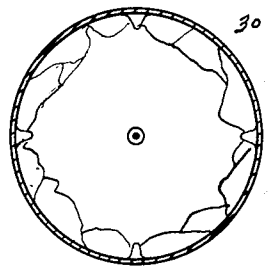


Fig. 5

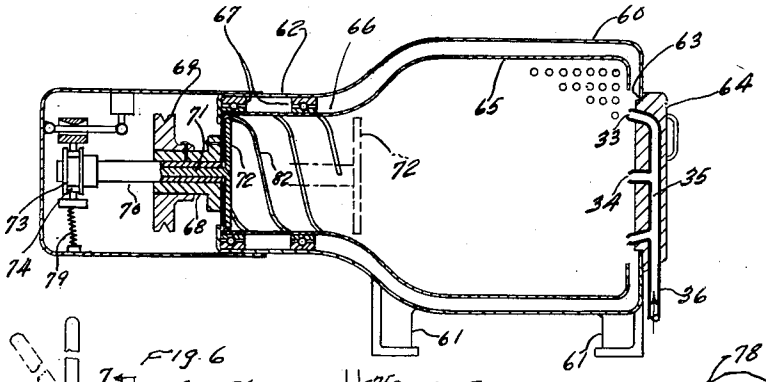


Fig. 6

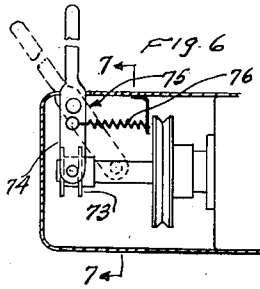


Fig. 7

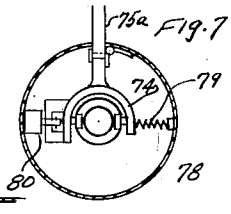
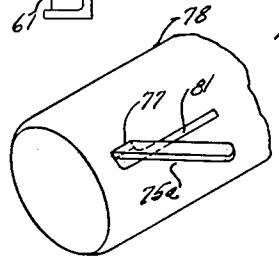


Fig. 8



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Fig. 9

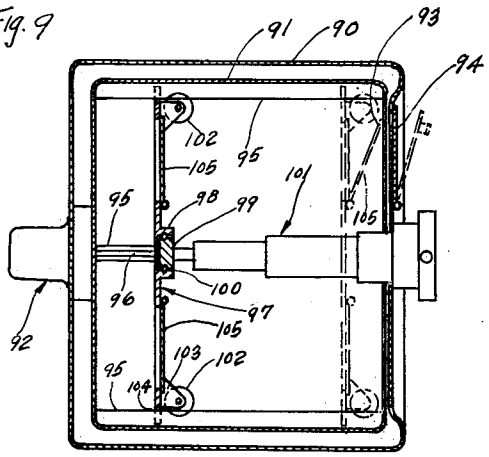
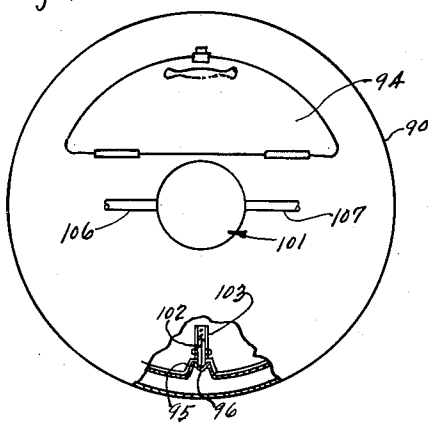


Fig. 10



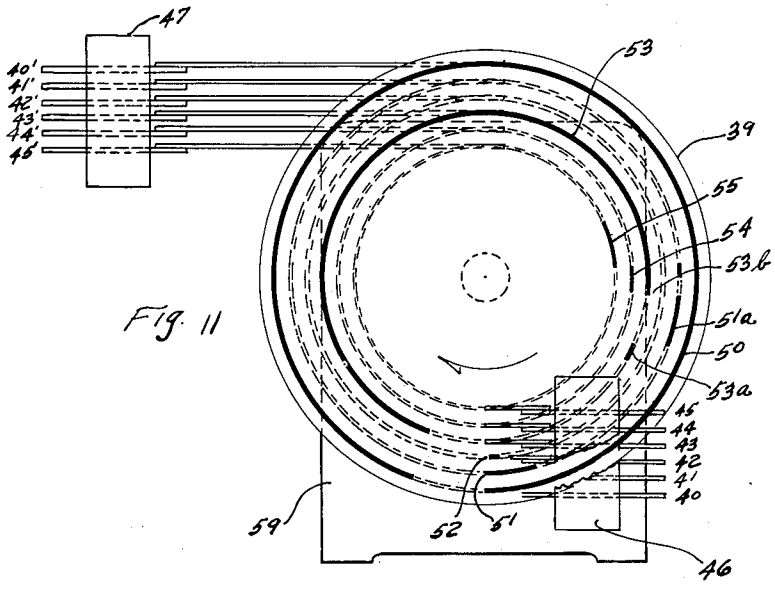
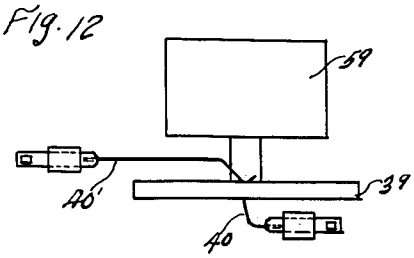


Fig. 11

Fig. 12



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WASHING AND THE EXTRACTION OF WASH WATER

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Fig. 13

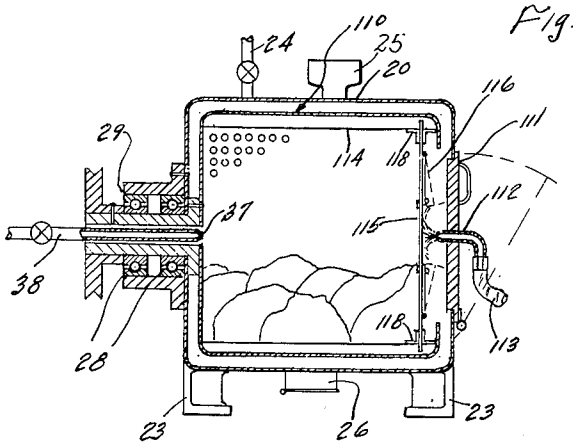


Fig. 14

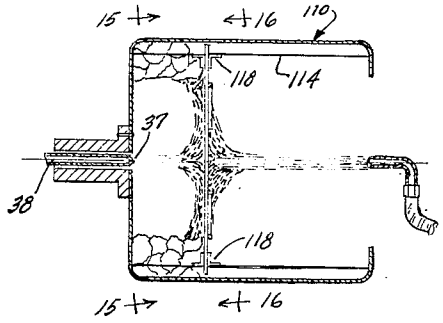
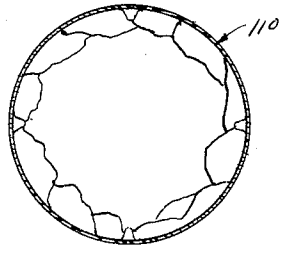


Fig. 15



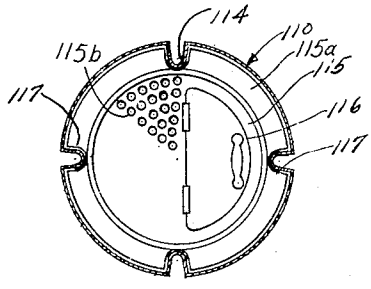


Fig. 16

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UNITED STATES PATENT OFFICE

2,588,535

WASHING AND THE EXTRACTION OF WASH WATER

Leo M. Kahn, Island Park, N. Y.

Application December 23, 1944, Serial No. 569,609

3 Claims. (Cl. 8—147)

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This invention relates to laundry apparatus, and more particularly to an automatic washing machine for domestic use.

There have been commercially available for a number of years domestic or small capacity washing machines capable of sequential operation for washing, rinsing and extracting. Some types of machines are characterized by drums operating about a vertical axis, others utilize drums having a horizontal axis and still others have drums whose axes are diagonal. While these machines wash and rinse in a reasonably efficient manner, each type if somewhat less than satisfactory in respect of the extracting operation, for several reasons. Water is usually extracted from the wet wash in these machines by spinning the drum at high enough speed to force the water out by centrifugal force. However, unless the wet wash is substantially uniformly distributed about the periphery of the drum, the drum is out of balance and accordingly vibrates badly when spun at high speed. In the vertical axis type of drum, and to a certain extent in the diagonal axis type, it is possible to manually distribute the wet wash uniformly about the drum, but this, of course, necessitates stopping and opening the drum which interrupts the timed sequence of operations which is desirable in domestic washers, and also precludes completely automatic operation through the entire cycle. In the horizontal type drum it is, of course, impossible to manually distribute the wash.

Thus it follows that regardless of the type of machine, each has an inherent incapacity in relation to the extracting operation which results in unsatisfactory operating conditions and occasionally substantial damage to the machine.

It is accordingly among the objects of this invention to provide a simple, sturdy and inexpensive washing machine which, in addition to washing and rinsing, is capable of extracting water from the wet wash in a thoroughly satisfactory and efficient manner. Other objects will be in part apparent and in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements and arrangements of parts, as will be exemplified in the structure to be hereinafter described, and the scope of the application of which will be indicated in the following claims.

In the drawing, wherein I have shown several embodiments of my invention,

Figure 1 is a schematic sectional elevation of the washer showing the distribution of the wash during or at the end of the rinsing operation;

Figure 2 is a schematic section taken along the line 2—2 of Figure 1;

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Figure 3 is a schematic sectional elevation of the drum illustrating the action of the pressure device as the wash is being forced into extracting position;

Figure 4 is a schematic section of the drum taken transversely of its axis and showing the distribution of the wash for extraction after the operation of the pressure device;

Figure 5 is a schematic elevation, partly in section, of a modified form of my washer;

Figure 6 is a schematic fragmentary sectional elevation of a portion of the control mechanism of the washer shown in Figure 5;

Figure 7 is a section taken along the line 7—7 of Figure 6;

Figure 8 is a fragmentary perspective view of the mechanism shown in Figure 6;

Figure 9 is a schematic fragmentary sectional view of another form of my washer;

Figure 10 is an elevation of the right-hand end of the washer shown in Figure 9;

Figure 11 is a schematic view of a timing mechanism for controlling the sequence of operations of my washer;

Figure 12 is a reduced top plan view of the timer shown in Figure 11;

Figure 13 is a sectional elevation of another form of my washer;

Figure 14 is a schematic sectional elevation of the washer drum illustrating an operative condition of the drum;

Figure 15 is a schematic elevation taken along the line 15—15 of Figure 14, showing the distribution of the articles being washed, with the drum in the operative condition of Figure 14; and,

Figure 16 is a section taken along the line 16—16 of Figure 14.

This application is a continuation in part of my copending application filed December 23, 1943, Serial No. 515,356, now Patent No. 2,533,888.

In accordance with one form of my invention, I mount a perforated drum for rotation about a horizontal axis, the drum being open at one end, for example, to provide access to its interior, and mounted at the other end on a heavy antifriction bearing for oscillation or rotation, or both. The laundry may be placed in the drum through the open end thereof, and this open end also provides an aperture through which pressure may be exerted against the contents of the drum. Illustratively, the washer casing or tank within which the drum operates may have an opening which is juxtaposed to the drum opening and which may be provided with a water-tight door, the door being suitably formed to carry pressure jets so arranged as to direct a fluid under pressure toward the bearing end of the drum and somewhat outwardly of the axis of rotation against the con-

tents of the drum. Thus if the drum is rotated at a suitable rate during the flow of high pressure fluid, the center of mass of the wet wash is displaced toward the bearing end of the machine and at the same time is relocated adjacent the axis of the drum, the wash articles being uniformly distributed about the periphery of the drum. With the articles so concentrated and distributed, the flow of fluid may be stopped and rotation of the drum continued at high speed to extract the water from the articles.

As shown in Figure 1, a stationary tank **20** is provided with a door **21** hinged as at **22** to one end thereof, and is supported by legs or standards **23**. The tank also has a water inlet **24**, a soap reservoir **25**, and a dump valve **26** (Fig. 13). Each of these elements is of conventional nature, and each is under the control of equipment (not shown) such as solenoids, in turn under the control of the timing device shown in Figure 11, and and described hereinbelow.

To the left-hand end of tank **20** (as viewed in Figure 1) is secured a relatively heavy tube **27** which carries antifriction bearings **28**, which in turn rotatably support a hollow shaft **29**, to the inner or right-hand end of which is secured one side or end of a perforated drum **30**. Drum **30** is provided at its right-hand end with an opening **31** which registers with the opening **20***a* in tank **20**, into which door **21** is swingable. As shown in Figure 2, drum **30** is preferably provided with suitably spaced longitudinal ribs **32** which, as the drum rotates, carries the articles upwardly until the angle of respose thereof is exceeded, whereupon the articles tumble back toward the bottom of the drum, so as to become washed.

Door **21** carries a plurality of air or water pressure jets **33** which are arranged in a circle about a central jet **34**, all of the jets being intercommunicating by way of suitable piping **35** (Figure 1) which piping is in turn connected to an inlet pipe **36** leading from a source of pressure fluid, preferably water, such as a water main or a high pressure pump (not shown), if necesary. Jets **33** are arranged to direct the fluid outwardly of the axis of drum **30** so that as the drum rotates, the pressure fluid flowing from jets **33** impinges against the articles in the drum and forces them to the left-hand end of the drum, as shown in Figure 3. The articles in the drum **30** are thus concentrated at that end of the drum nearest the bearing, and as the speed of rotation of the drum is increased, the articles in the drum tend to become evenly distributed thereabout, as shown in Figure 4, where they are held by the centrifugal force exerted thereby during high speed rotation of the drum.

I have found that under certain circumstances the distributing action of the streams of pressure fluid may be facilitated by counterpressure acting axially of drums **30**. To this end, jet **34** is provided, a counterjet **37** being provided at the opposite end of drum **30** and forming the end of a pipe or nozzle **38** suitably disposed within hollow shaft **29**. Thus the streams of pressure fluid emerging from jets **34** and **37** impinge causing the fluid to spread radially of the drum, and accordingly exert a radial pressure against the articles in the drum, tending to urge the articles against the periphery of tank **30**.

After the articles to be washed have been concentrated at the left-hand end of the drum, as shown in Figure 3, i. e. adjacent the bearing end thereof, and after the articles have been distributed with more or less uniformity about the periphery of the drum, as shown in Figure 4, the flow of pressure fluid from the several jets is stopped while the drum rotates during the moisture extracting operation. When the pressure fluid is water, it is sometimes desirable to continue its flow for a short time during the extracting portion of the cycle to obtain additional rinsing.

It will now appear that the fluid under pressure in concentrating the articles at the bearing end of the drum, and in effecting the uniform distribution thereof around the periphery of the drum, substantially balances the drum, accordingly substantially reducing vibration during high speed rotation for the extraction operation. Such residual vibration as exists is readily absorbed by the bearing structure at the left-hand end of the drum, as viewed in Figure 1, as the center of mass of the drum and its contents is a relatively short distance from the center of support of the rotating drum, resulting in a moment arm of minimum length.

The sequence and character of the operations of drum **30** through what might be termed a laundering cycle, will be described in connection with the timing mechanism shown in Figures 11 and 12. In Figure 11, a timing drum or disc has its opposite sides engaged by brushes **40**, **41**, **42**, **43**, **44** and **45**, on one side, and **40'**, **41'**, **42'**, **43'**, **44'**, and **45'** on the other side, these groups of brushes being mounted respectively in brush holders **46** and **47**. The free inner ends of these brushes are adapted to engage contact strips **50**, **51**, **52**, **53**, **54** and **55**, carried by disc **39**. Thus the brushes and strips are engageable as follows: brushes **40** and **40'** with strip **50**, brushes **41** and **41'** with strip **51**, etc. Accordingly, as disc **39** rotates, the disc being mounted for rotation at a uniform rate on a suitable driving device **60**, the contact strips thereon are engaged by the brushes to close circuits which effect the following operations. With rotation of disc **39** starting at position A, and proceeding in a clockwise direction, as viewed in Figure 12, strips **50** and **51** are engaged by their respective brushes, closing circuits as follows: strip **50** closes the circuit to the driving motor (not shown) which causes rotation of the washing drum. Strip **51** which, as may be seen, is broken into several segments, closes a circuit to the element (not shown) which controls inlet **24**, causing this element to open the inlet to permit wash water to flow into tank **20** for a predetermined amount of time. Shortly after disc **39** (Figure 11) starts to rotate, contact strip **52** is engaged by its respective brushes **42** and **42'** which closes a circuit to the controlling element (not shown) which controls soap reservoir or container **25** (Figure 1) causing soap to be dumped into tank **20**. Continued rotation of disc **39** (Figure 11) carries the first portion of contact strip **51** away from its brushes, as well as contact **52** away from its brushes, contact strip **50**, however, maintaining the circuit to the drive motor, the motor accordingly continuing to rotate drum **30** (Figure 1) at a slow or washing speed.

The rotation of drum **30** at washing speed continues for a desired amount of time, after which the first portion **53***a* (Figure 11) of contact strip **53** engages its brushes **43** and **43'**. This closes a circuit to the controlling element (not shown) for dump valve **26** (Figure 1), causing the dump valve to open to dump the dirty soapy water out of the tank. The dump valve is illustrative only as a pump may be used if desired. The dump valve is held open for the length of time that contact

strip segment 53a (Figure 11) is in engagement with brushes 43 and 43', after which the dump valve is closed in any suitable manner. Immediately upon closing of the dump valve, the next sector 51a of contact strip 51 engages brushes 41 and 41', causing rinse water to flow into the tank through inlet 24 (Figure 1). This rinse water continues to flow into the tank for a predetermined time, at the end of which the inlet 24 is automatically closed by reason of the circuit under the control of contact strip segment 51a being broken.

Immediately upon cessation of rinse water flow, segment 53b of contact strip 53 engages its brushes 43 and 43' to effect a reopening of dump valve 26 (Figure 1) to release the rinsing water from the tank, the dump valve then remaining open for the remainder of the complete cycle. After a sufficient time has elapsed for the rinse water to be discharged, contact strip 54 engages its brushes 44 and 44' to complete a circuit which controls the flow of pressure fluid through inlet 36, as well as the flow of fluid through nozzle 38. This effects the concentration and uniform distribution of the clothes within drum 30, as viewed in Figures 3 and 4, and as described hereinabove, and at the same time gives the clothes an additional rinsing treatment. After a sufficient time has elapsed for this concentration and distribution of the articles to be effected, contact strip 54 (Figure 11) passes by its brushes 44 and 44', causing the pressure fluid to stop flowing from jets 33, 34 and 37 (Figure 3).

Shortly before contact strip 54 leaves its brushes 44 and 44', brushes 45 and 45' engage their contact strip 55, which establishes a circuit to a suitable speed changing device (not shown) associated with the driving motor of the washing machine, which causes more rapid rotation of drum 30 for the extracting operation which forcibly extracts all of the rinse water from the clothes. It should be noted that the concentrating and distributing tendencies of the pressure fluid are thus being exerted as the washer drum speeds up, so that as the drum approaches or attains its extracting speed, the substantially uniform distribution of the articles therewithin is effected. The drum is permitted to spin at extracting speed for as long as desired, after which strip 55 leaves its contacts 45 and 45', permitting the speed changing device to shift into slow speed, wherein the washing drum 30 continues to rotate at its normal slow speed for as long a period as desired for tumbling or fluff drying the clothes, if tumbling is required. In any event, when the timing disc 39 is rotated to the point where strip 50 leaves its contacts 40 and 40', the complete cycle is concluded.

While I have neither shown nor described in detail the valves and their controls, by which water is let into and let out of the washer tank, the control element which effects delivery of soap into the tank and the speed changing device and its control, it will be understood that all of these elements and mechanisms may be of a purely conventional and well-known type and applied in any suitable and conventional manner wherein the sequence of operations as described is effected under the dictates of the timing mechanism shown in Figure 11. A more detailed disclosure of such a system is made in my above-noted application.

In Figure 5, wherein there is shown another form of my washer, a tank 60 is supported on suitable legs 61, and includes a reduced portion or neck 62. The other end of tank 60 has an opening 63 formed therein adapted to be sealed shut by a removable door 64 carrying piping and jets 33, 34, 35 and 36, as described hereinabove in connection with Figure 1. A perforated and suitably ribbed drum 65 is rotatably disposed within tank 60, this drum having a reduced neck 66 or the like, which is supported in tank neck 62 in any suitable manner, as by antifriction bearings 67. Preferably the necks of tank 60 and drum 65 are of sufficient length as to permit substantial spacing of the bearing elements 67, thus to effect a strong rotatable support for the drum, as well as to provide the neck portion 66 of the drum with substantial capacity for holding articles, for a purpose to be described.

To the left-hand end of drum 65 is fastened a hub 68 on which a driving pulley 69 is mounted, the driving pulley being connected in conventional manner to a driving motor (not shown). Fastened within hub 68 is a hollow shaft 70 which reciprocably carries a plunger 71, to the right-hand end of which is fixed a disc 72, the diameter of this disc being somewhat less than the diameter of neck portion 66 of drum 65. To the left-hand edge of plunger 71 is fastened a flanged collar 73, which is slidably mounted on shaft 70 where it receives the bifurcated end of a yoke 74 comprising part of a lever system generally indicated at 75 in Figure 6. A spring 76 exerts a constant bias on the lever system, tending to slide collar 73 to the right, as viewed in Figures 5 or 6, which movement, of course, causes movement of disc 72 (Figure 5) from its solid to the dotted line position shown. The disc and lever system are preferably manually returned to the solid line position of Figure 6, being maintained in such position by reason of the handle 75a (Figure 8) of the lever system engaging in a notch 77 formed in the covering 78 which extends from the left-hand end of tank 60 (Figure 5). Handle 75a of the lever system (see Figure 7) is held in its Figure 8 position by a spring 79 (Figure 7) having its opposite ends fastened to cover 78 and yoke 74, respectively, a solenoid 80 being provided to swing lever 75a out of notch 77 at the proper time so that it may ride along a slot 81 formed in cover 78 under the pull of spring 76 (Figure 6) to move disc 72 (Figure 5) to its dotted line position.

Tank 60 is, of course, provided with a conventional water inlet, soap inlet and dump valve or pump, as described hereinabove in connection with the washer shown in Figures 1–4, the Figure 5 form also having the usual automatic controls which may be actuated by a timing mechanism similar to that shown in Figure 11. Thus, in operation, the washer shown in Figure 5 may go through a cycle substantially the same as that described hereinabove in connection with the Figure 1 form. This sequence is substantially as follows:

1. Rotation of drum 65 at slow or washing speed is initiated and washing water is introduced into tank 60.

2. After sufficient wash water is in tank 60, soap is dumped therein as heretofore described.

3. Washing continues for a predetermined, desirable time, after which the soiled water is dumped from tank 60.

4. The dump valve is closed and rinse water is introduced into the tank, the tank, of course, continuing to rotate at slow speed.

5. After rinsing a sufficient time, the dump

valve again opens and stays open for the rest of the complete cycle of operation.

6. Shortly after the dump valve reopens, fluid under pressure flows into drum 65 from jets 33 and 34, forcing the articles in the tank to the left-hand end thereof where they are picked up by helical vanes 82 in the neck of the drum, which concentrate the articles in the neck.

7. As the articles are concentrated in tank neck 66, the rotational speed of the tank increases to effect an even distribution of the articles about the periphery of the tank neck. As the rotational speed approaches or arrives at extraction speed, flow of pressure fluid through jets 33 and 34 is stopped and extraction continues.

8. After the water has been extracted from the articles, solenoid 80 (Figure 7) is energized, swinging hand lever 75a (Figure 8) out of notch 77, permitting spring 76 (Figure 6) to force plunger disc 72 (Figure 5) to the dotted line position shown. At the same time that solenoid 80 is energized, the speed change mechanism of the drum drive is shifted to low speed so that plunger disc 72 may gradually force the articles out of drum neck 66 into the main body of the drum, where the articles may be tumbled or not, as desired.

It will now appear that in the form of washer shown in Figure 5, the bulk of the articles being laundered is concentrated in the immediate vicinity of the drum bearings wherein they are substantially evenly distributed about the periphery of the drum, and accordingly vibration of the drum during high speed extraction rotation is reduced to a minimum.

In Figure 9, I have shown a modified form of my washing machine. This form of the washer embodies certain of the basic principles disclosed in my above-mentioned copending application. Thus, in general, there is provided a partition within the washer drum which is movable toward and away from one end of the drum by a fluid operated mechanism, for the purpose of concentrating and effecting a uniform distribution of the articles of wash at one end of the drum.

Referring to Figure 9, this preferred form of my washer includes a stationary tank 90 within which a perforated drum 91 is rotatably mounted as by bearing means, generally indicated at 92, at one end of the tank and drum, it being understood that rotation of the drum is effected and controlled in a conventional manner. Tank 90 is preferably a water-tight unit provided with an opening 93 which may be closed by a door 94, this opening providing access to the interior of the tank.

Washer drum 91 is provided with a plurality of angularly displaced ribs 95 which are preferably evenly spaced about the inner periphery of the drum and act to lift and drop the articles being washed in a manner described hereinabove with respect to ribs 32 (Figure 2). Each of ribs 95 (Figure 9) includes a channel 96 which, as will be described hereinbelow, acts as a guide for a partition generally indicated at 97.

Partition 97 is provided at its central portion with an annular flange 98 which is rotatably mounted on a plunger head 99 as by anti-friction balls 100, the plunger head, balls and flange accordingly comprising a thrust bearing. Plunger head 99 is secured to the outer end of a fluid operated mechanism generally indicated at 101 which preferably takes the form of a hydraulic piston of the telescopic type. Thus when fluid under pressure is introduced into hydraulic piston 101, the elements thereof expand, forcing partition 97 to the left, as viewed in Figure 9. It, of course, follows that when fluid is withdrawn from the device 101, its elements collapse or telescope into one another, thus drawing partition 97 to the right. If desired suitable spring means (not shown) may be provided to facilitate collapse of the telescoping elements. This movement of the partition is facilitated by rollers 102 mounted thereon as by brackets 103. These rollers ride respectively in the grooves or channels 96 of ribs 95, and the partition is cut away as at 104 adjacent each rib, so as freely to ride therealong.

Partition 97 is also provided with one or more doors 105, the uppermost of which registers with door 94 when partition 97 is in its extreme right-hand position, i. e. the dotted line position shown in Figure 9. When so positioned, doors 105 and 94 may be opened to provide access to the interior of drum 91 for the insertion or removal of articles of wash with respect thereto. Hydraulic device 101 (Figure 10) is provided with fluid inlet and outlet pipes 106 and 107, these pipes being connected into a conventional hydraulic system (not shown) for example, including a suitable pump and valves capable of automatic control from a timing device such as that shown in Figure 11.

In operation, wash water and soap are introduced into tank 90 in a conventional manner and drum 91 is rotated at slow or washing speed. This continues for a desired amount of time, it being understood that the entire sequence of operations, comprising a complete washing cycle, is under the control of timing mechanism such as, for example, that shown in Figure 11 and described hereinabove. At the end of the washing operation, the soiled water in tank 90 is dumped or pumped therefrom, and rinse water is introduced. As the rinse water is dumped or pumped from the tank, the speed of rotation of drum 91 may be increased. At this time pressure fluid is introduced into the hydraulic device 101, causing partition 97 to move to the left, as viewed in Figure 9, so as to concentrate the articles of wash in the left-hand end of the drum, and at the same time assist in effecting their uniform distribution about the left-hand portion of the periphery of the drum, thereby to balance the drum and avoid excessive vibration during the high speed water extracting operation. Thus it may be seen that the center of mass of the drum and contained articles, considered as a unit, is moved close to the center of support, i. e. close to bearing 92, so that a minimum moment arm results; thereby a minimum amount of whipping of the drum results from residual vibration.

As the speed of drum 91 builds up to maximum, and preferably, or if desired, before the drum attains maximum speed, the pressure of the fluid in hydraulic device 101 is cut off and the fluid bled therefrom so as to retract partition 97 from the solid line position shown in Figure 9 to the dotted line position, thus to remove the pressure on thrust bearing 98—100 during high speed extracting operation.

At the end of the extracting operation, rotation of drum 91 may be continued at a slower rate, if desired, in order to fluff dry the articles of wash, or the drum may be stopped and the articles removed therefrom, this marking the end of a complete cycle of operation.

In Figures 13 to 16, I have shown another modification of my washer, which incorporates certain of the features characterizing the forms shown in Figures 1 and 9. Thus as shown in Figure 13, this form of the washer includes tank **20** and bearings **28**, by which a drum generally indicated at **110** is rotatably supported within the tank. The right-hand end of tank **20**, as viewed in Figure 13, is provided with a door **111**, this door centrally supporting a pressure fluid nozzle **112** which is adapted to be connected as by a flexible tube **113** to any suitable source of fluid, e. g. water under pressure.

Drum **110** is provided with a suitable number of inwardly extending ribs **114** (see also Figures 14 and 16) by which the articles of wash are caused to be tumbled as the drum rotates. Disposed within drum **110** is a movable partition **115**, provided with suitable doors **116** which, when open, permit access through the partition to the interior of drum **110**. As is better shown in Figure 16, partition **115** has a radius which is preferably slightly less than the radial distance between the axis of drum **110** and the inner edge of a rib **114**, and to the periphery of the partition is attached a leather or heavy felt apron or washer **115***a*, provided with cutouts **117** into which ribs **114** extend, the ribs accordingly serving as guides for travel of the partition axially of the drum, and the aprons **115***a* acting to force the articles in the drum axially thereof as the partition moves, as will be described. As is better shown in Figure 16, partition **115** is provided with cutouts **117** into which ribs **114** extend, the ribs accordingly serving as guides for travel of the partition axially of the drum. Cutouts **117** are somewhat larger than ribs **114** to preclude the partition's jamming as it moves within the drum, and, if desired, the partition may also carry guides **118** (Figures 13 and 14) which are adapted to maintain the plane of the partition normal to the axis of the drum. It may now be seen that when fluid under pressure is introduced into tank **20** against partition **115**, pressure is exerted at the central portion of the partition and axially of the drum **20**, causing the partition to move axially of the drum toward the left-hand or bearing end thereof, as viewed in Figure 14, thus to concentrate the articles of wash at one end of the drum.

Thus it follows that the extent of partition travel is a function of the amount of articles in the drum and varies inversely therewith. As the partition moves toward the bearing end of the drum to concentrate the articles of wash at such end, the effective cubic content of the drum is reduced thus to increase the tendency of the articles in the drum to assume uniform distribution about the drum axis. Obviously, if the drum were completely filled with articles, they would be uniformly distributed within the drum. Hence by decreasing the volume of the drum when a lesser number of articles are in it, the tendency is toward attaining the same effect.

As shown in Figure 14, a counter-pressure may be delivered axially of the drum by nozzle **38**, as described above in connection with Figures 1 and 3.

It should also be noted that in connection with various nozzles shown in Figures 1, 5 and 14, the jets of water delivered thereby perform an important function in addition to that of effecting axial movement and radial distribution of the articles in the drum, i. e. the water so delivered as a supplementary rinsing action which effects a more thorough rinsing than might otherwise be obtained in the conventional rinsing operation. In the form of washer shown in Figures 14 and 16, it may, under certain circumstances, be preferable to provide perforations **115***b* of suitable sizes and number in partition **115** to implement this additional function of the water jet.

The sequence of operations may be substantially the same as described hereinabove, control being automatically obtained by suitable timing mechanism, such as that shown in Figure 11.

It may now be seen that I have provided a washing machine which attains the several objects set forth hereinabove in a thoroughly practical and efficient manner.

As many possible embodiments may be made of the above invention, and as many changes might be made in the embodiment above set forth, it is to be understood that all matter hereinbefore set forth, or shown in the accompanying drawing, is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. The herein described art which includes the steps of, rotating a washing machine drum at relatively low speed about a horizontal axis to launder articles disposed therein, rotating said drum at a substantially higher speed to extract water from the articles therein, and effecting a displacement of the center of mass of said articles axially of said drum from its normal position during slow speed operation of the drum to a position closely adjacent to the axis of the drum during a portion of both the low and high speed rotation of the drum.

2. The herein described art which includes the steps of, rotating a washing machine drum at relatively low speed about a horizontal axis to launder articles disposed therein, rotating said drum at a substantially higher speed to extract water from the articles therein, and effecting a displacement of the center of mass of said articles axially of said drum from its normal position during slow speed operation of the drum to a position near one end of the drum and closely adjacent to the axis of the drum during a portion of both the low and high speed rotation of the drum.

3. The herein described art which includes the steps of, rotating a cylindrical washing machine drum about a horizontal axis at relatively low speed to launder articles disposed therein, exerting a force on the articles in said drum axially thereof while the drum is rotating at low speed to concentrate said articles in an evenly distributed mass at one end of the drum, and then rotating said drum at a substantially higher speed to extract water from the articles therein.

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