Aug. 9, 1949. G. M. GIBSON 2,478,188

METHOD OF AND APPARATUS FOR WASHING FABRICS

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Fig. 1.

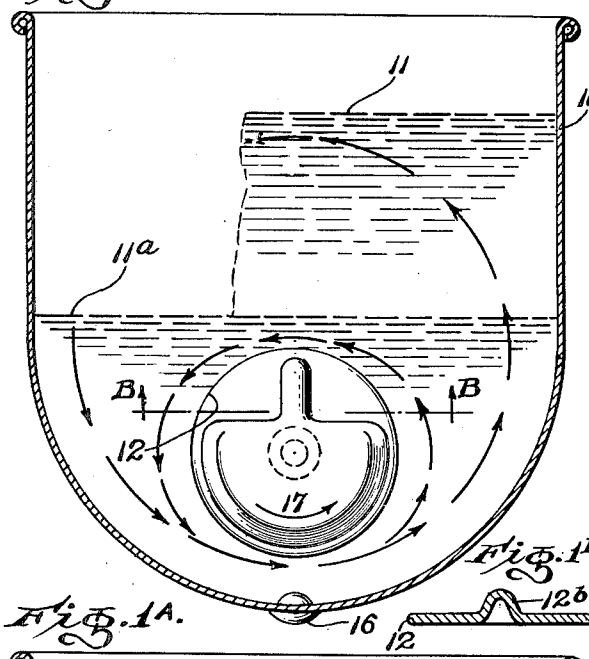


Fig. 1A.

Fig. 1B.

Fig. 2.

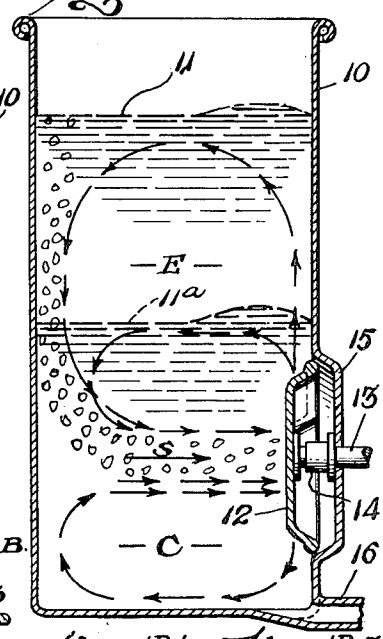


Fig. 1D1.

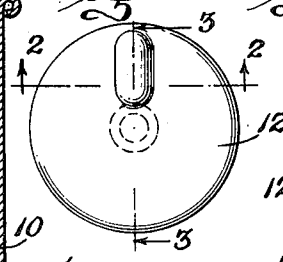


Fig. 1D-3.

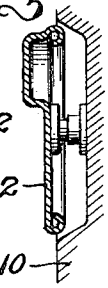


Fig. 1D-2.



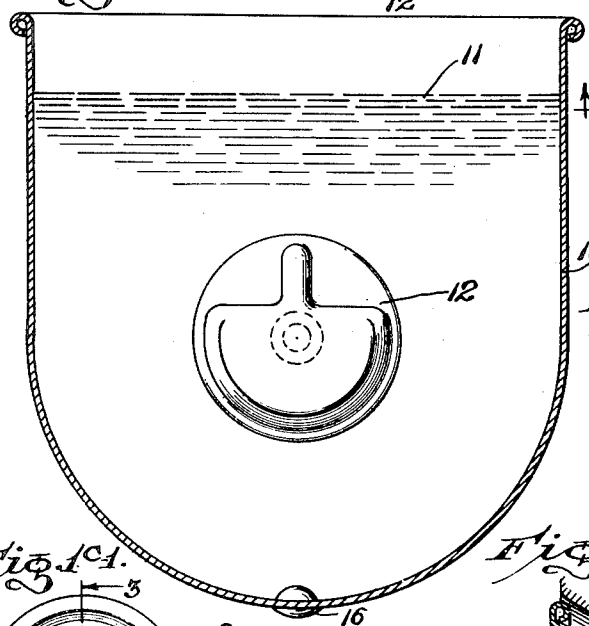


Fig. 1C1.

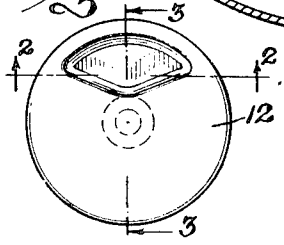


Fig. 1C-2.

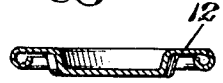
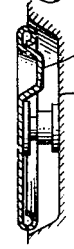


Fig. 1C-3.



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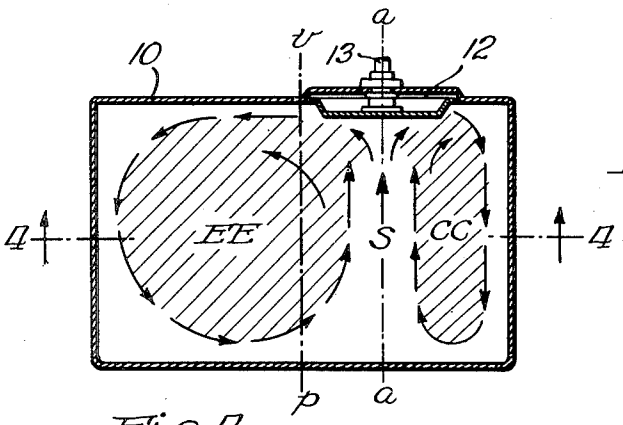


Fig. 3.

Fig. 4.

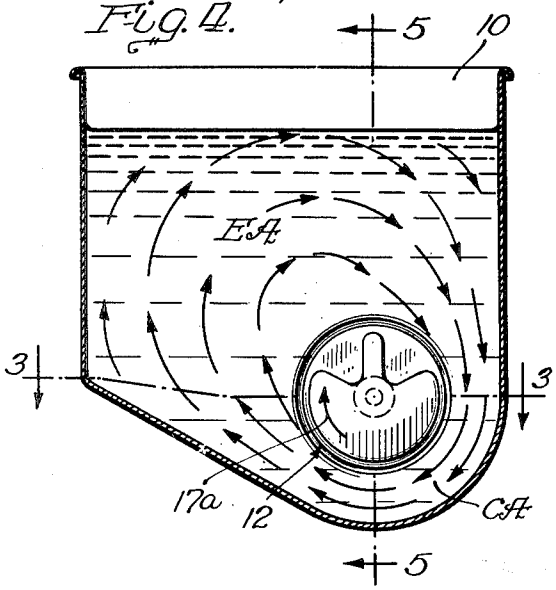
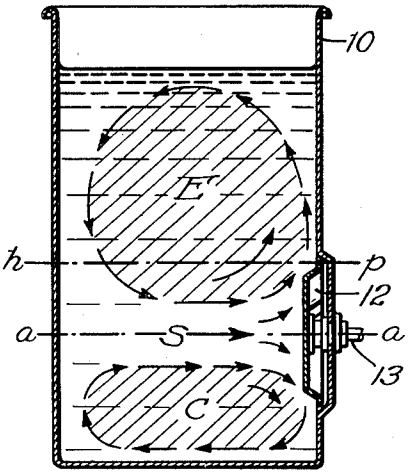


Fig. 5.



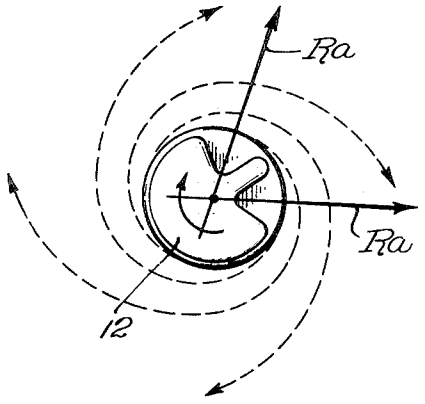


Fig. 6.

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Fig. 7.

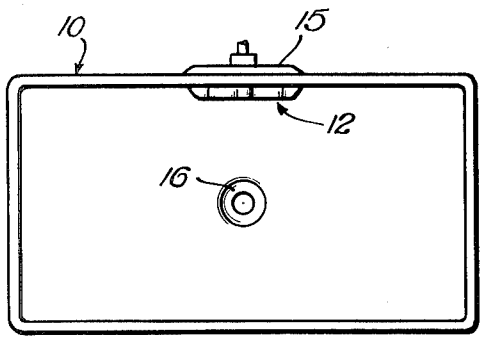


Fig. 8.

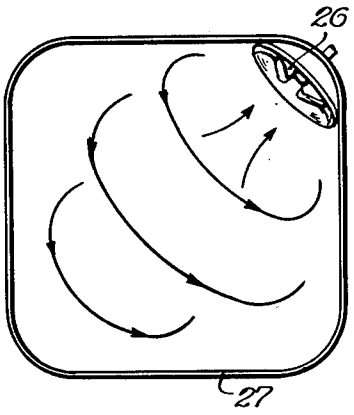


Fig. 9.

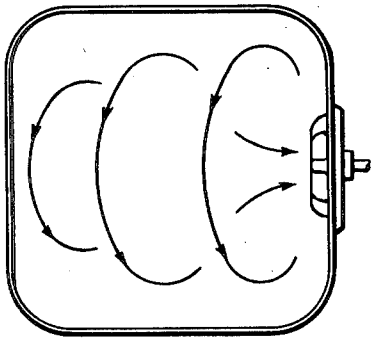


Fig. 10.

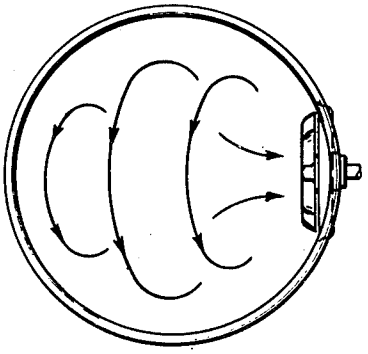


Fig. 11.

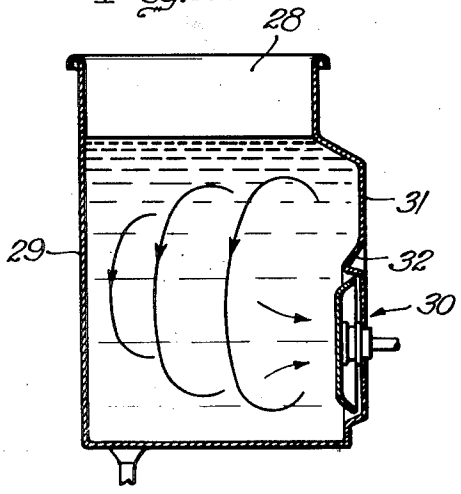
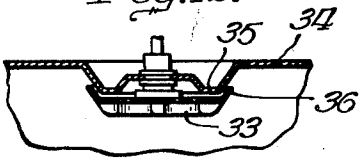


Fig. 12.



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Fig. 13.

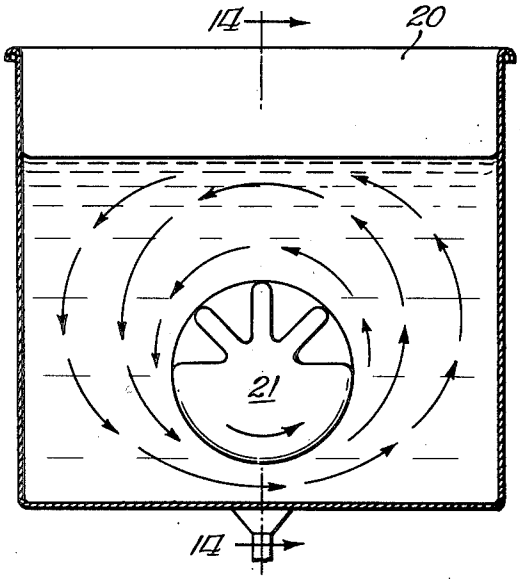


Fig. 14.

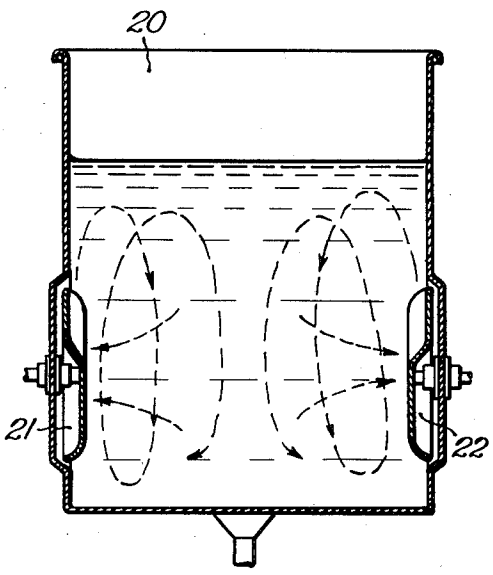


Fig. 15.

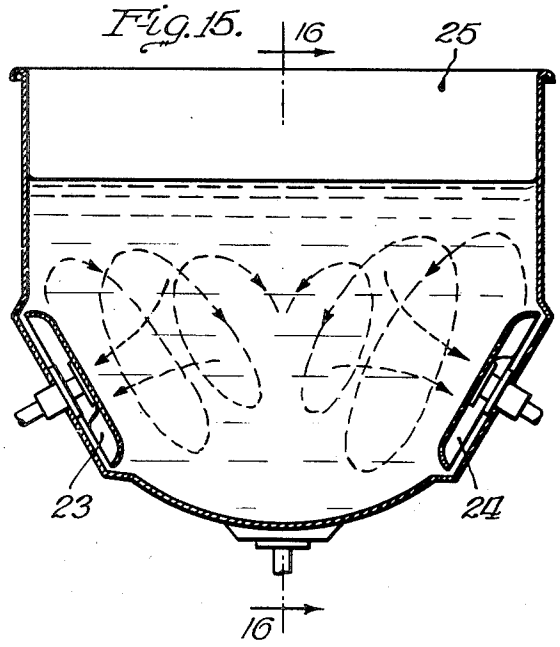
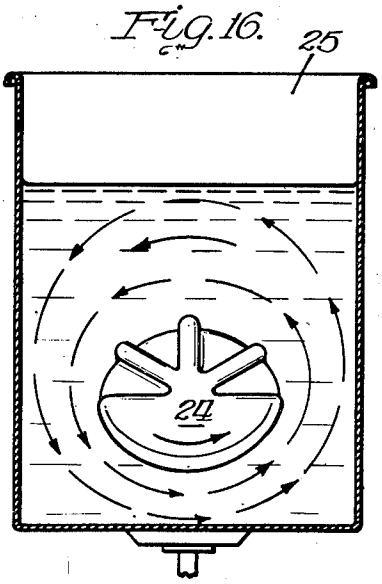


Fig. 16.



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UNITED STATES PATENT OFFICE

2,478,188

METHOD OF AND APPARATUS FOR WASHING FABRICS

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Application July 29, 1948, Serial No. 41,382

9 Claims. (Cl. 8—159)

1

This invention relates to the method of washing ordinary household clothes or fabrics with a washing machine mechanism arranged and adapted for carrying out this method. It will be described as applied to a conventional domestic washing machine, although it obviously has application to commercial washing machines. The invention is an improvement over my invention described in Patent No. 2,071,622, issued February 23, 1937. It is a continuation-in part of my application Serial No. 598,237, filed June 8, 1945, now abandoned.

This invention relates to the method of washing household fabrics adapted for carrying out such method by hand in domestic washing machine units.

The particular object of the present invention is to provide an improved method for preferably unidirectionally rotating machines that will increase washing action and the speed without substantial increase in clothes wear. This arrangement permits added space in the tub for clothes circulation since the tub space is not occupied by baffles or other obstructions: and the clothes are more readily accessible for removal from the tub.

Another object is to provide a novel washing method of efficiently washing clothes and fabrics in a tub that is clear of all obstructing baffles or the like, such a tub facilitating complete draining and ease of cleaning together with a minimum wear action on the fabrics during the washing process of the machine.

The tub and agitator combination of this invention are such to provide an increase in washing speed without corresponding damaging wearing action on the clothes. This can be done with only slight added power input and without damaging impedance from agitator contact.

With this exemplary construction of washing machine to carry out this method of washing clothes and fabrics, it has been found that the power factor is substantially the same with water in the tub and when clothes are added, so the power input remains fairly constant. The clothes do not ride the agitator and thus the power input is only slightly affected by the addition of clothes.

It is, therefore, one of the principal objects of the present invention to establish a method of washing fabrics by creating spirally directed current pulsation in a column or body of cleansing fluid which contains the fabrics, and by establishing such spirally directed current pulsations so as to issue the latter from an axis disposed laterally with respect to the water column or

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body, and by directing such diverging current pulsations toward and away from the surface level of the fluid column or body. To further enhance the washing action above described, it is another object of the present washing method to provide preferably unidirectional means of a character which will simultaneously throw off through frictional contact current pulsations which issue spirally from the peripheral portion of the unidirectional means, and the latter spiral currents expand away from the same general generic axis from which the pulsating currents have emanated. This produces a very effective combined washing action which effectively cleanses fabrics in a relatively short space of time.

It is a further important object of the present invention to teach a washing method wherein an agitator is utilized which rotates upon a generic axis disposed substantially parallel to the surface level of the water column or body and wherein such agitator may be mounted in unbalanced relationship with respect to the median plane of the water column or body extending in parallel relationship with respect to the generic axis of the agitator. This refers to the normal high water level in the tub which is used for maximum clothes loading of the machine. When smaller batches of clothes are washed, lower water levels may be used, depending on the clothes load, down to the normal low water level. In the latter cases, the following descriptions will not accurately apply although good washing of small loads is possible. With this arrangement, at least two revolving currents are obtained which are redirected toward the generic axis of the agitator. One of the revolving water currents may be disposed in a relatively small area due to the offset arrangement of the agitator or constrictions due to tub walls, while the larger or open top area of the revolving water currents contains slower water motion and forms an expanding or clothes overturning zone.

The unidirectional means comprising such agitator is located in a vertical zone closely adjacent the side portion of the water column of the washing machine so as to create the pulsating and spiral currents within such zone and traveling toward and away from the surface level of the water at one side of the tub, leaving the entire tub substantially free for clothes or fabric circulation together with the commingling water and air currents created by the particular type of disc agitator herein shown and described.

The present machine, to carry out this process, also contemplates the preferred use of a unidi-

rectional agitator operating on an axis substantially parallel to the surface level of the water column and wherein such agitator may be placed relatively close to the bottom wall of the tub which may be formed to partially encircle such agitator, this action creating a general current flow including a pressure or compression zone and an expanding slower moving current zone. This arrangement is preferred for a normal high water line level with near maximum clothes loads but is not necessary for light loads and normal low water lines. Further, effective results may be obtained with the agitator in a central position, although it is preferred to have the agitator more submerged. When the fabrics pass into the compression zone they are carried adjacent the wall nearest the agitator which frictionally slows down the movement of the clothes, but the water or fluid at this point is moving at a higher rate of speed through the pressure area so that this water penetrates or flows through the clothing while the latter is restricted in its movement by the adjacent frictional wall surface. When the clothes again get into the greater or expanded current zone they are slowly turned over and mixed and intermingled by the combined slower currents which move in this greater expanded area of the washing machine tub.

Therefore, by the combination of the pulsating radially directed currents together with the spiral currents automatically slinging from the frictional outer peripheral surface of the agitator, such currents all produce a definite washing method that is highly efficient and effective to quickly clean the fabrics within the particular column of water into which such currents issue. The foregoing in connection with the eccentrically disposed generic axis of origin of such currents provides the ultimate washing action sought by the present construction.

Other objects and benefits will be disclosed in the following descriptions and drawings in which:

Fig. 1 is a longitudinal sectional view of a washing machine to carry out my method and showing in broken combination the normal high water level and the normal low water level in the tub;

Fig. 1A is a longitudinal sectional view of my washing machine to carry out my method but mounting the dasher approximately centrally of the tub;

Fig. 1B is a cross sectional view of the dasher shown in Fig. 1 as it would appear on the lines B—B of Fig. 1 to better show the form of the dasher employed;

Figs. 1C–1, 1C–2 and 1C–3 are plan and transverse sectional views of an optional form of dasher employing a single depression of smooth contours as will be clearly understood from the drawings;

Figs. 1D–1, 1D–2 and 1D–3 are plan and section views of an optional form of dasher employing a flat disc with a single smooth vane-like protuberance as clearly shown by the drawings;

Fig. 2 is a transverse sectional view of the washer shown in Fig. 1 as it would appear on the medial cross section lines 1M—1M of Fig. 1 and showing the lower water level in dotted outline;

Fig. 3 is a horizontal cross sectional view of a washing machine portraying a modified arrangement and combination of tub and agitator producing certain definite washing action of meritorious results;

Fig. 4 is a longitudinal vertical cross sectional view through the machine substantially as viewed along the line 4—4 in Fig. 3;

Fig. 5 is a transverse vertical cross sectional view taken substantially along the line 5—5 in Fig. 4 to further illustrate the arrangement of tub and agitator;

Fig. 6 is a diagrammatic face view of a unidirectional agitator to illustrate certain washing current actions as are obtained from a disc agitator of this type;

Fig. 7 is a plan view of a tub and machine of the general type such as illustrated in Figs. 1 and 2 to show the general proportions thereof;

Fig. 8 is a plan view of a modified arrangement wherein the agitator is mounted cornerwise in a substantially square tub;

Fig. 9 is another variation of a tub of the kind illustrated in Fig. 8 wherein the agitator is mounted on a median plane of the tub;

Fig. 10 illustrates a circular tub with an agitator mounted for rotation upon a horizontal axis;

Fig. 11 is a central cross sectional view through another tub illustrating the use of a flush wall arrangement which permits the mounting of the agitator entirely within the outer wall surfaces of a washing machine tub;

Fig. 12 is a fragmentary horizontal cross sectional view of another agitator and mounting arrangement for the protection of fabrics being washed;

Fig. 13 is a vertical longitudinal cross sectional view through a modified construction of machine showing a multiblade pulsating agitator;

Fig. 14 is a transverse vertical cross sectional view taken along the line 14—14 in Fig. 13 illustrating the use of two or more agitators;

Fig. 15 is another vertical longitudinal cross sectional view through a modified construction of the tub having agitators angularly disposed with respect to the side walls thereof; and

Fig. 16 is a cross sectional view taken substantially along the line 16—16 in Fig. 15.

The direction of the washing water flow is indicated by arrows and the various washing zones are cross-hatched in some of the figures as will later be explained.

Now referring to the drawings, a generally narrow rectangular tub 10 having a concave bottom and a normal water line 11 mounts a unidirectional rotating agitator 12 which may be of various forms as will later be explained, in an embossed section 19 in one side wall of the tub 10. An agitator 12 is shown that is similar to that disclosed in my aforementioned patent and provides an effective agitator having advantageous characteristics particularly well adapted for this washing method providing as it does a generally smooth face having rounded rib-like protrusions. However, other types of agitators may be used. The agitator 12 is mounted on a shaft 13 operating in a water seal bearing 14 and may be driven by any type of power means such as an electric motor connected with shaft 13. For the sake of illustration it will be assumed that the agitator is rotating in the direction of the arrow 17 shown on the agitator 12 in Fig. 1. The balance of the tub structure may be conventional except where otherwise disclosed and described and a conventional drain such as 16 may be mounted in the bottom of the tub 10 as shown in Figs. 1 and 2.

Now referring to Fig. 1B, I show a cross section of the agitator 12 as it appears on lines B—B of Fig. 1 which clearly shows that the enclosed convex radial rib 12b therein is formed to provide a relatively smooth clothes contacting surface that will prevent riding of the clothes on

the agitator while at the same time effecting an easy slipping over the clothes and the desirable pulsating and rubbing and by its alternate pressure and suction action with the spiral water currents for flexing and rinsing the clothes.

The agitator may take many forms, including equivalent acting depressions, as long as the basic slipping, rubbing, pulsating and impeller functions are maintained. For example, the agitator may be formed with one or more depressed sectors as clearly shown in Figs. 1C–1, 1C–2 and 1C–3 wherein instead of a convex rib, as previously described, the almost opposite arrangement of a depressed sector is used. The sections are clearly indicated on the drawings with section lines referring to Figs. 1C–2 and 1C–3.

In addition to the multi-ribbed agitator as clearly shown in Figs. 13 and 16, an effective agitator may be formed as shown in Figs. 1D–1, 1D–2 and 1D–3 where a substantially flat disc is provided with one or more protrusions in the generally flat face of the agitator. This construction is clearly indicated in the drawing sections.

It will be noted that I have mounted my unidirectional rotating agitator 12 on the lower side of the generally narrow rectangular curved bottom tub 10. When the agitator 12 is continuously rotated as indicated by the arrow 17, Fig. 1, the wash water and clothes are sucked toward the agitator as indicated by the arrow S, Fig. 2, and then impelled radially outward toward and away from the fluid surface level as indicated by the flow arrows in Fig. 2. At the same time, due to the continuous unidirectional rotation of the agitator 12, the mass of wash water enclosed is rotated as indicated by the flow arrows in Fig. 1. The construction of the agitator 12 with one or more radially directed fingers or equivalent structures at the surface thereof, causes the clothes to flow over the surfaces of the agitator while applying axial pulsations thereto due to the flexing of the fabrics by the alternate suction and pressure created by the finger or fingers or equivalent elements on the agitator. The fast moving agitator will create a suction on one side of the finger and a pressure on the other, or within the depression in the surface thereof, as the fabrics move over the surface, causing the pulsating and rubbing action on the fabrics.

The construction of the agitator or dasher 12 with one or more protrusions or ribs on the surface thereof and flanked by depressions causes the clothes to contact the convex outer surface of the agitator or dasher, toward the interior of the tub, while applying axial pulsations thereto due to the flexing of the fabrics by the alternate suction and pressure created by the ribs or protrusions on the agitator or dasher. The one or more ribs or depressions are smoothly curved at their peripheries so as to merge gradually and smoothly into the fabrics contacting surface of the agitator or dasher. The briskly rotating agitator will create a suction on one side of the protrusion or rib and a pressure on the other side at the adjacent depression as the fabrics move over the surface, causing a pulsating and rubbing action on the fabric.

This construction is an improvement over my aforementioned issued Patent #2,071,622 for the following reasons: It will first be noted that the suction line S of the agitator is parallel to the water line 11 instead of vertical as in my issued patent. This permits greater agitator speed and greater suction without objectionable direct vertical air injection and clothes rotation because of the resistance to vertical open vortex action extending in a straight line direction to the water line. This permits considerable variation in the head of the water line 11 over the agitator and increases the ability of the machine to wash under heavy and light loading with normally high and low water lines.

In unidirectional agitators that are mounted for rotation upon a vertical axis as shown in my issued patent, the usual objectionable form of open vortex is created because of the centrifugal action of the continuous spinning agitator. The water and fabrics take up the spinning action of the agitator tending to produce an open vortex leading from the agitator to the fluid level and interfering with the washing efficiency of such a unit. The clothes return to the agitator through the fluid is impeded and the production of relative motion between the water and fabrics is slight because of the vortex motion tending to carry both the water and fabrics at the same speed of rotation. This action may be remedied somewhat by the introduction of baffles in the manner shown in my issued Patent #2,071,622. This introduced other objectionable characteristics that were unavoidable and increased the wear on the fabrics being washed.

All of the above noted faults and undesirable correlated deficiencies were remedied by the new arrangement of agitator and tub comprising, fundamentally, the disposition of a preferably unidirectional pulsating agitator of the general kind used in my earlier patent upon an axis of rotation substantially parallel to the fluid level in the tub. This feature supplemented by a relatively narrow zone flanking a peripheral vertical portion of the fluid body produced an ultimate combination that operates to washing perfection. No undesirable entrainment of air results and the entire water space in the tub is free from obstructions and may be devoted entirely to the fabrics to be washed. The agitator is smooth and disc shaped but may be subject to variations. It nests against the tub wall side permitting freedom of action between the fluid and fabrics and offering no resistance to the motion of the fabrics being washed.

Now again referring to Fig. 2, I illustrate how the side mounting of the agitator 12 changes the objectionable open straight vertical vortex action to a closed angular advantageous air induction action that increases washing effectiveness. The suction action of the agitator 12 is vertical to its rotating plane. Thus, inducted air must take the longer angular path as clearly indicated by the line of bubbles that are indicated at the left hand side of the tub which naturally is the lowest pressure side of the tub as clearly indicated by the angular water line which is effected by the impeller action of the agitator. These air bubbles follow the line of least resistance downward adjacent the left side of the tub when the suction of the impeller 12 carries the bubbles horizontally into the impeller where the air bubbles are broken up in fine dispersed form into the water stream from the impeller. Thus, inducted air is dispersed in fine small bubble form throughout the wash water where it effectively aids in the washing action by an aeration action that assists the detergents in loosening dirt from the clothes. This aeration action is not seriously affected by changes in the level of the water line. It appears that the hydrostatic level compensates for the shortening of the air travel and optimum air in-

duction is maintained for the various water levels.

Now considering the outflow arrows in the Fig. 2 construction, it will be apparent that the flow toward the bottom of the tub is constrained both by the friction of the bottom and the natural tendency of the clothes to float, while the upper flow is relatively unobstructed toward the water line. Naturally, that portion of the clothes in the cross-hatched flow area C will be compressed while the clothes in the flow area E will be expanded. As the clothes rotate around the flow line S in Fig. 1, the clothes will be alternately compressed and expanded while being subjected to variable intensities of water currents which are flowing at various rates with respect to the clothes because of the impedance to flow in the compression area C as contrasted with the free flow in the expansion area E.

While the clothes are subjected to these various conditions of flow, there will be continuous interchange of positions in the same due to variations in the weight and size of the garment and the variations in the speed of flow in the pulsating spiral water currents deflected from the agitator. It will be obvious that this new construction and arrangement of parts accomplishes these results in a much more effective manner than in my older construction wherein there is no variation within the water head and the flow of clothes is upwardly and circular about a vertical axis. This change gives better washing results by effectively increasing the relative water flow through the clothes fabric, and the interchange of clothes positions. Thus I have better provided the essentials of effective washing by:

A. Variations in the relative flow between clothes and wash water.

B. Continued change in the inter-relationship of the clothes with each other.

It should be pointed out that while draining the water in my older construction the same must be done from the sump under the agitator, while in the new construction a free open drain is possible at the lowermost part of the tub which is lower than the agitator structure and mounting and naturally drains the entire agitator unit clean and free of residue.

Now again referring to Figs. 1 and 2, it will be observed that I show in broken section a normal high water level **11** and a normal low water level **11***a*. The high water level is more adaptable to small batches for greater convenience and economy. The positioning of the agitator **12** adjacent the bottom of the tub permits the use of the low water level small batch operation by keeping the agitator **12** submerged.

Now referring to Fig. 1A, I show the agitator about centrally located in the tub and I desire to explain that for normal loading of the washer this arrangement is entirely satisfactory. It has been observed that the combination of friction on the bottom walls of the tub and the buoyancy of the clothes effectively cooperate to create the compression and expansion zones heretofore discussed as applied to Figs. 1 and 2. This central location of the agitator is not as convenient and economical for small batches of clothes.

Referring now more particularly to Figs. 3, 4 and 5, a similar agitator **12** is utilized within the tube **10** and rotated through suitable drive means connected with the horizontally disposed shaft **13** to continuously drive the agitator in the direction of the arrow **17***a* indicated in Fig. 4.

In Fig. 3, it is to be noted that the axis *a*—*a* of the agitator **12** is disposed in offset relation

with respect to a vertical median plane indicated by the letters *v*—*p*. Likewise, in Fig. 5, the rotational axis *a*—*a* of the agitator **12** is disposed in offset relationship with respect to the horizontal median plane indicated by the line *h*—*p* in this figure. This locates the generic center of rotation of the agitator in unbalanced relationship with respect to the column of water within the tub **10** for the purpose of producing unbalanced flow conditions along the horizontal and vertical planes coincident with the axis of rotation of the agitator somewhat as indicated in Figs. 3 and 5.

As seen in Fig. 3, the agitator **12** is positioned for rotation adjacent one wall of the tub and near the bottom of the latter and the wall surrounding the agitator is generally curved concentrically with respect to the agitator axis and slopes upwardly toward the far wall of the tub **10**. The rotation of the agitator will cause a general movement of the clothes and water somewhat as indicated by the arrows in Fig. 4, producing also, in this longitudinally extending vertical plane through the water column in the tub, a constrained or compression area CA establishing a higher velocity zone for the water, and an expansion area EA providing a zone wherein the movement of the water currents is slower and which permits an overturning of the fabrics and re-arrangement therebetween while passing through this expansion area. When the fabrics pass into the area between the agitator and the concentrically curved wall of the tub, which defines the compression area CA space or zone, the resulting movement between the fabrics and the water definitely becomes a relative movement. This is caused due to the frictional contact of the clothes or fabrics with the tube walls within the compression area of the tub. The result is that the water which is at a greater velocity at this point is driven through the clothing which is frictionally retained.

The construction of washing machine illustrated in Figs. 3, 4 and 5 produces a combination of currents for washing fabrics which are directed as shown and as previously explained. In Fig. 5 it will be seen that the same zones of motion prevail as illustrated in Fig. 2, such conditions being duplicated in the horizontal sectional view in Fig. 3 wherein the letters CC illustrate the compression area in this particular plane of operation and the letters EE further illustrate the expansion area in the same plane of operation. In all cases the suction zone is indicated by the letter S which lies along the generic rotational axis of the agitator **12** and is an area or zone into which all of the fabrics or clothes are redirected during the washing operation.

Fig. 6 has been added to show diagrammatically the action of the agitator herein utilized as the general apparatus for creating the current impulses utilized and controlled by the disposition of the agitator within a definitely shaped or predetermined column of fluid for washing fabrics. It will be seen that the radially directed impulses will generally take the diverging paths of the lines R*a*—R*a* leading outwardly from the indentations in the agitator **12** while the dotted spiral lines indicate the expanding spiral current movements coming off of or being produced by the slinging spinner action of the agitator because of the frictional contact with the adjacent fluid which comes into the vicinity of the agitator. Therefore, the pulsating radially directed current movements are simultaneously supplemented with the spiral current movements, all of which take place

in a zone relatively narrow and in the general plane of the spinning agitator and such currents are directed toward and away from the surface level of the column of water within which the spinning agitator operates.

There are other combinations of tubs and agitators that can be obtained by changing the shape of the tub and the location of the agitator or agitators which can function to bring about the described washing operation. Figs. 13 and 14 illustrate a tub 20 shaped somewhat as in the construction illustrated in Figs. 1 and 2 but having a flat bottom. However, in the Figs. 13 and 14 construction I use multiblade pulsating agitators 21 and 22 which are mounted on opposite walls of the tub 20 in opposing relation to each other.

The construction of washing machine tubs and agitators illustrated in Figs. 15 and 16 illustrate the use of multiblade agitators such as 23 and 24 mounted angularly on the side walls of the tub 25 and also in opposite relation with respect to each other.

Figs. 7, 8, 9 and 10 illustrate plan views of differently shaped tubs showing proposed variations in the combination herein presented for carrying out the principles set forth by the present invention. The modified construction in Fig. 8 illustrates a design wherein the agitator is angularly mounted with respect to a side tub wall and is disposed in one of the corners of a substantially square tub. Such an agitator as indicated at 26 may also be mounted on a horizontal shaft in the tub 27, or two such agitators may be mounted on two or more corners of the tub.

The construction illustrated in Fig. 11 has another form of tub with a restricted clothes opening portion 28 extending upwardly from any particular shaped tube 29 having a horizontally mounted agitator 30. In this particular case, the rear tub wall 31 is provided with inwardly extending recess means comprising an annular ridge 32 within which the agitator 30 is nested, such construction providing means to obtain a flush wall adjacent the agitator side of the washing machine tube 29.

Fig. 12 shows another form of guard means utilized to prevent clothes from catching under the rotating agitator 33. The tub wall 34 is dished to form an annular step 35 while the agitator 33 is made with a connected shroud 36 shaped to overlap to step 35. This is another way in which to protect the clothes and insure free operation of the working parts of the washing machine. With the rotatable agitator of the present invention all clothes riding upon the agitator is eliminated, presenting a free smooth passage of all fabrics across the outer face of the rotatable agitator regardless of the direction of approach.

All other variations and modifications of the present design of wash machine and the variations disclosed in carrying out the washing method illustrated shall be governed by the breadth and scope of the appended claims directed thereto.

What I claim is:

1. A method of washing fabrics in a body of liquid in a stationary tub, comprising continuously rotating liquid and fabrics in an upright plane at an active area at one side of the tub and relatively close to the bottom wall thereof, at a sufficient speed to centrifugally discharge the fabrics and liquid from said area in a spiral path and to suck the fabrics and liquid perpendicularly to said plane and toward the center of said active area, and pulsating and rubbing the fabrics as they pass through the active area.

2. A method of washing fabrics in a body of liquid in a stationary tub, comprising continuously rotating liquid and fabrics in an upright plane at an active area at one side of the tub and relatively close to the bottom wall thereof, at a sufficient speed to centrifugally discharge the fabrics and liquid from said area in a spiral path and to vortically suck the fabrics and liquid with entrained air perpendicularly to said plane and toward the center of said active area, and pulsating and rubbing the fabrics as they pass through the active area.

3. A method of washing fabrics in a body of liquid in a statibnary tub, comprising continuously rotating liquid and fabrics in an upright plane at an active area at one side of the tub at a sufficient speed to centrifugally discharge the fabrics and liquid from said area in a spiral path and to suck the fabrics and liquid perpendicularly to said plane and toward the center of said active area, and pulsating and rubbing the fabrics as they pass through the active area.

4. A method of washing fabrics in a body of liquid including air in a stationary tub, comprising continuously rotating liquid and fabrics in an upright plane at an active area at one side of the tub at a sufficient speed to centrifugally discharge the fabrics and liquid from said area in a spiral path and to vortically suck the fabrics and liquid with entrained air induced into the liquid perpendicularly to said plane and toward the center of said active area, and pulsating and rubbing the fabrics as they pass through the active area.

5. A clothes washing machine comprising a tub adapted to contain a body of washing liquid for washing fabrics therein, a dasher having a relatively smooth fabric contacting surface over the face thereof which faces toward the interior of the tub with means on the dasher for causing a suction action on the fabrics toward said surface and a peripheral discharge of the fabrics and liquid therefrom, means mounting the dasher in a submerged position at one side of the tub for rotating movement about an axis at a susbtantial angle to a vertical plane, and means operatively connected with the dasher for operating the dasher.

6. A clothes washing machine comprising a tub adapted to contain a body of washing liquid for washing fabrics therein, a dasher having a relatively smooth fabrics contacting surface over the face thereof which faces toward the interior of the tub, with means on the dasher for causing a suction action on the fabrics toward said surface and a peripheral discharge of the fabrics and liquid therefrom, said means on the dasher comprising one or more smooth depressions merging smoothly into said fabrics contacting surface of the dasher, means mounting the dasher in a submerged position at one side of the tub for rotating movement about an axis at a substantial angle to a vertical plane, and means operatively connected with the dasher for operating the dasher.

7. A clothes washing machine comprising a tub adapted to contain a body of liquid therein for washing of fabrics, a dasher having a disc-shaped body with a substantially smooth fabric contacting surface with one or more smooth convex protrusions thereon, having relatively smoothly curved peripheries, means mounting the dasher

in a submerged position at one side of the tub for rotating movement about a substantially horizontal axis, and means for rotating the dasher, whereby the fabrics are drawn toward the center of the dasher and projected centrifugally and spirally therefrom by the rotation of the dasher and are subjected to pulsating flexing action while in proximity to the dasher.

8. A clothes washing machine comprising a tub adapted to contain a body of liquid therein for washing fabrics, an agitator including a disc-shaped body projecting within the tub having a susbtantially smooth outer fabric contacting surface which faces toward the interior of the tub and provided with a smooth convex rib thereon having a relatively smoothly curved periphery, means mounting the agitator at one side of the tub for rotating movement about an axis at a substantial angle to a vertical plane, and means for rotating the agitator, whereby the fabrics are drawn against the contacting surface of the agitator and are projected centrifugally therefrom by the rotation of the agitator while a pulsating and rubbing action is applied thereto by the convex rib, said rib and the surface speed of the agitator coacting to prevent substantial riding of the clothes on the agitator but providing for relative movement of the agitator on the clothes while creating toroidal water currents that flow outwardly and then return the clothes to the pulsating rubbing action of the agitator.

9. In a washing machine, a tub having elongated opposite side walls connected together by shorter sides substantially in rectangular cross section, an agitator mounted on one of the elongated side walls of said tub and rotatable about an axis to circulate water and clothes between the shorter sides of the tub, the axis of said agitator being disposed in offset relation from the center of the vertical height of said tub and also displaced in offset relation laterally with respect to the center of the elongated sides of said tub.

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