

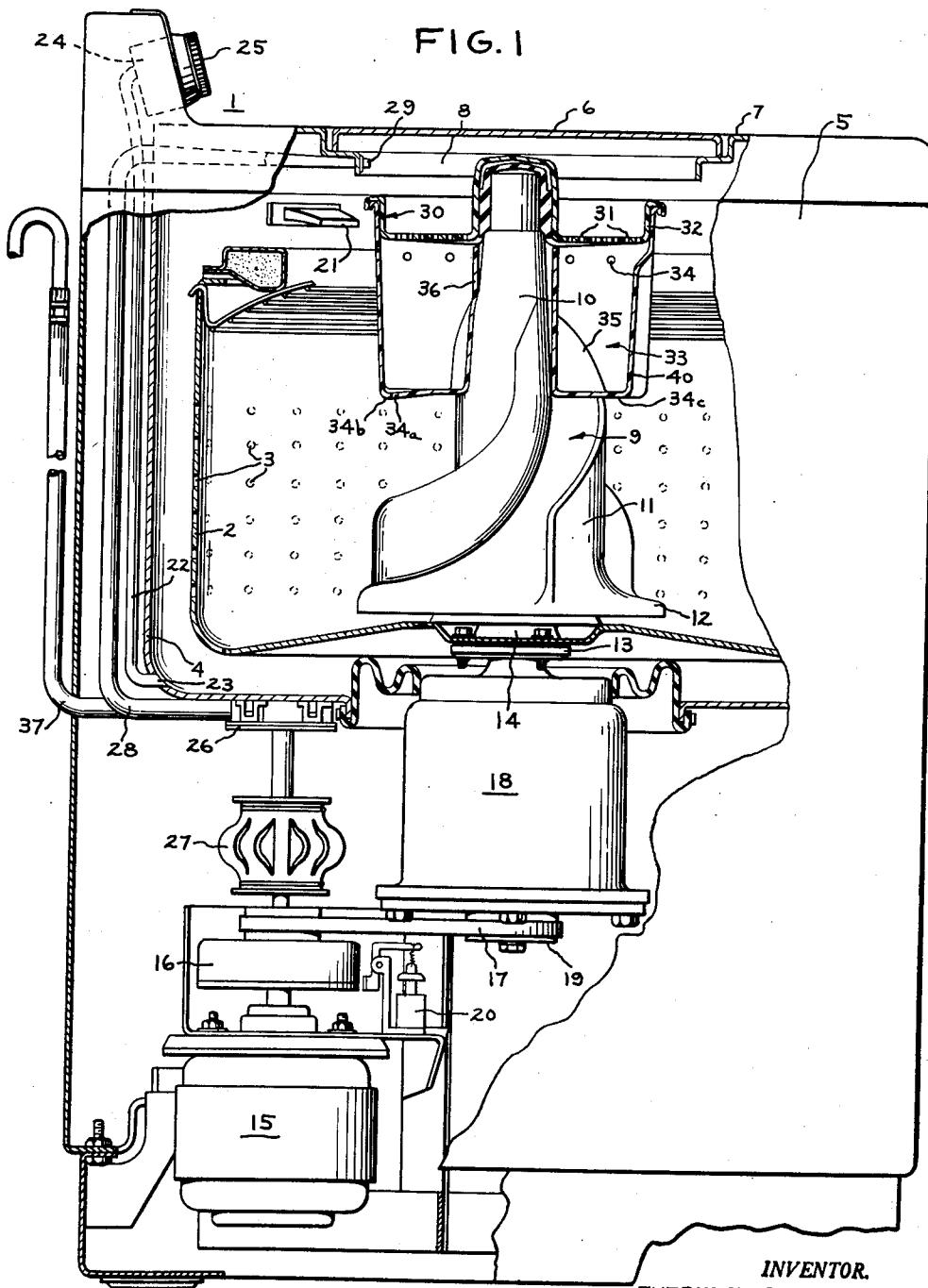
April 17, 1962

E. D. MOREY
VANED WASH BASKET

3,029,623

Filed Sept. 15, 1960

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

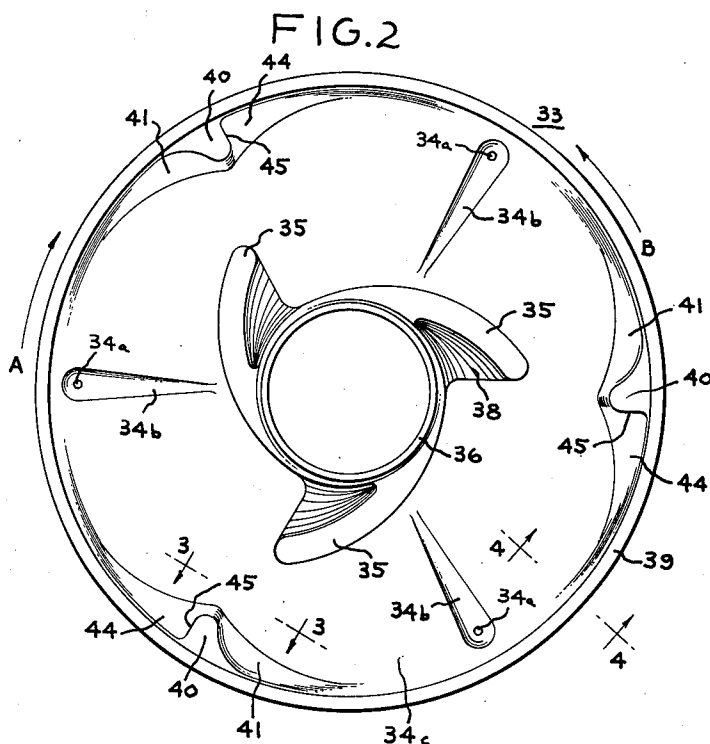


FIG. 4

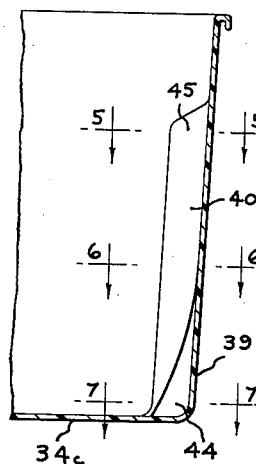
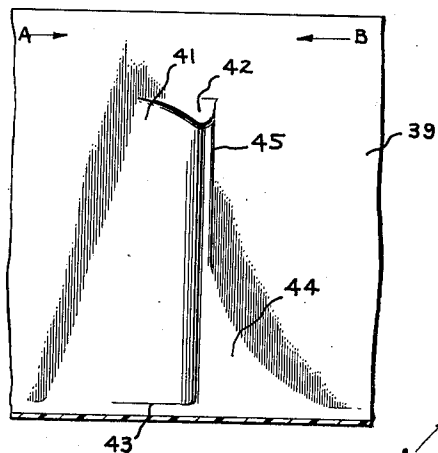


FIG. 3

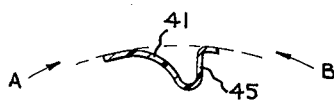


FIG. 5

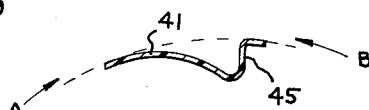


FIG. 6

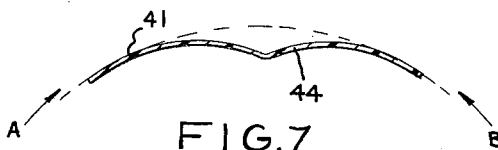


FIG. 7

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VANED WASH BASKET

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Filed Sept. 15, 1960, Ser. No. 56,145
2 Claims. (Cl. 68—4)

This invention relates to automatic clothes washing machines and more particularly to an improved vaned clothes-containing basket formed to be secured on the agitator of a vertical axis washing machine for effecting the washing of very small loads of clothing.

Conventionally, vertical axis washing machines include a clothes-containing basket with an agitator extending upwardly therein, the basket being large enough to accept several pounds of clothing (generally in the range of 8-10 pounds) so that a satisfactory washing effect can be obtained on a sizable quantity of clothes. In order to wash very small quantities of clothing without the use of unduly large amounts of water and detergent, it has been proposed, in copending application (now forfeited) Serial No. 6,037, filed February 1, 1960, by John Bochan, and assigned to General Electric Company, the assignee of the present invention, to effect the desired result by providing a small imperforate basket secured on the top of a moving agitator so that the agitator will impart a washing motion to the basket thereby to cause clothes therein to be washed. The Bochan application further contemplates the provision of a continuous supply of detergent-containing liquid into the small basket, with the overflow then passing into the larger basket and being pumped back into the small basket so that the liquid is continually circulated in this manner.

It will be recognized that in most washing machines of the type having an agitator extending up on a substantially vertical axis into a wash basket, the agitator is of the type which oscillates on its axis. It is further a well known fact that the optimum washing effect for clothes contained in a basket is generally obtained when the liquid in the basket is caused to circulate in a substantially toroidal path.

Accordingly, it is a prime object of my invention to provide, in the type of structure set forth in the Bochan application and for use on an oscillating agitator, an annular basket formed to provide therein the desired toroidal circulation of water.

It is a further more specific object of my invention to provide two sets of vanes, one on the inner wall of the annular basket and one on the outer wall of the annular basket, which vanes will cooperate so as to provide the desired toroidal circulatory path of liquid in the basket.

A further specific object of my invention is to achieve this desired goal by forming the inner vanes so that they direct liquid centrifugally outwardly upon oscillation of the basket (as a result of its being secured to an oscillating agitator) and to form the outer vanes so that they then take this liquid moving outwardly and direct it upwardly along the outer wall of the basket thereby to effect the desired toroidal path.

In one aspect of my invention, I provide my improved basket which, as stated, is for use in a vertical axis clothes washing machine of the type which has a relatively large liquid receptacle with a movably mounted agitator extending upwardly therein, the machine further being provided with means for effecting an oscillatory motion of the agitator on its axis. The basket is relatively small compared to the liquid receptacle, and has substantially imperforate inner, outer, and bottom walls formed so as to provide the basket with an annular shape. A first plurality of vanes extends into the basket from the inner wall adjacent the bottom wall, and is formed so as to direct liquid contained in the basket in a generally radially out-

ward path by centrifugal force during oscillation of the basket. A second plurality of vanes extends into the basket from the outer wall, and is formed so as to direct liquid moving outwardly theretoward in an upward direction along the outer wall. In this manner a toroidal path for the liquid is provided when the basket oscillates.

The subject matter which I regard as my invention is particularly pointed out and distinctly claimed in the concluding portion of this specification. The invention itself, however, both as to its organization and method of operation, may be best understood by reference to the following description taken in conjunction with the accompanying drawings.

In the drawings,

FIGURE 1 is a side elevational view of a clothes washing machine including my invention, the view being partially broken away and partially in section to illustrate details;

FIGURE 2 is a plan view of the washing basket of my invention;

FIGURE 3 is an enlarged view along line 3—3 in FIGURE 2;

FIGURE 4 is a view along line 4—4 in FIGURE 2;

FIGURE 5 is a view along line 5—5 in FIGURE 4;

FIGURE 6 is a view along line 6—6 in FIGURE 4; and

FIGURE 7 is a view along line 7—7 in FIGURE 4.

Referring now to FIGURE 1 for a description of the general type of washing machine in which my invention may be provided, I have shown therein an agitator type clothes washing machine, generally indicated by the numeral 1, having a conventional basket or clothes receiving receptacle 2 perforated over its side and bottom walls with perforations 3 and disposed within an outer imperforate receptacle or tub 4. Tub 4 is mounted within an appearance cabinet 5 which includes a cover 6 hingedly mounted in the top portion 7 of the cabinet providing access through an opening 8 to the basket 2. At the center of the basket 2 there is positioned a vertical axis agitator 9 which includes a center post 10 and a plurality of curved water circulating vanes 11 joined at their lower ends by an outwardly flared skirt 12. Both the clothes basket 2 and the agitator 9 are rotatably mounted. The basket is mounted on a flange 13 of a rotatable hub 14, and the agitator 9 is mounted on a shaft (not shown) which extends upwardly through the hub 14 and through the center post 10 and is secured to the agitator so as to drive it.

During the cycle of operation of the machine 1, the agitator is first oscillated back and forth on its axis, that is, in a horizontal plane, within the basket to wash the clothes therein. While the frequency and amplitude of the oscillation may be varied, one typical type of oscillating stroke which may be used is a stroke of 160° at a frequency of 100 cycles per minute. After a predetermined period of this washing action, the basket 2 is rotated at high speed to extract centrifugally the washing liquid from the clothes and discharge it to drain as will be explained. Following this extraction operation a supply of clean liquid is introduced into the basket for rinsing the clothes and the agitator is again oscillated. Finally, the basket is once more rotated at high speed to extract the rinse water.

The basket 2 and agitator 9 may be driven by any suitable means, and by way of example I have shown them as driven from a reversible motor 15. Motor 15 drives the basket and the agitator through a drive including a clutch 16 mounted on the motor shaft. The clutch allows the motor to start without a load and then to accept the load as it comes up to speed. A suitable belt 17 transmits power to a transmission assembly 18 through a pulley 19. Thus, depending upon the direction of motor rotation, pulley 19 of transmission 18 is driven in opposite directions. Preferably, as will be more fully explained herebelow, transmission clutch 16 is also a two-speed clutch,

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and a solenoid member 20 is provided in order to achieve the two-speed operation.

Specifically, in the illustrated machine, when solenoid 20 is de-energized clutch 16 provides a direct drive between motor 15 and pulley 19, and when solenoid 20 is energized clutch 16 provides a reduced speed drive to pulley 19. A two-speed clutch of this type, particularly suited for use in the illustrated machine, is described in detail and claimed in Patent 2,869,699 issued to John Bochan on January 20, 1959, and assigned to General Electric Company, assignee of the present invention.

The transmission 18 is so arranged that it supports and drives both the agitator drive shaft and the basket mounting hub 14. When motor 14 is rotated in one direction the transmission causes the agitator 9 to oscillate in a substantially horizontal plane within the basket 2. Conversely, when the motor 15 is driven in the opposite direction, the transmission rotates the wash basket 2 and agitator 9 together at high speed for centrifugal extraction. While the drive mechanism forms no part of the invention, reference is made to Patent 2,844,255 issued to James R. Hubbard et al. on July 22, 1958, and owned by the General Electric Company, assignee of the present invention. That patent discloses in detail the structural characteristics of a transmission assembly suitable for use in the illustrated machine.

In order to introduce fresh water to the machine, a suitable conduit 21 is provided having an outlet opening into the tub 4 so that suitable washing and rinsing liquid (normally water) may be introduced in the desired quantities into the tub 4 and basket 2. It will, at this point, be noted that, in the preferred construction shown, the perforations 3 of basket 2 cause the interior of the basket to be in full communication with the part of the tub which is exterior to the basket 2 so that the liquid level in both the basket 2 and the tub 4 is the same; thus, as the water rises in one it will also rise in the other. With this type of structure, suitable means may thus be provided in the tub to determine when the appropriate water level in the basket has been reached.

In the present case, this structure is provided in a conventional manner by means of a tube 22 which extends from an opening 23 adjacent the bottom of tub 4 up to a pressure sensitive water level control 24 which may be of the conventional type used extensively in commercially available laundry machines at the present time. In effect, in this type of water level control an electric switch is included in device 24, and the switch is operated in response to an increase of the air pressure within conduit 22, the increase in the air pressure coming as a result of compression of the air by a rise in the level of the water in tub 4. A further conventional and commercially available embodiment of level control 24 is the provision of means for varying the points at which the switch is closed by the air pressure so that any one of several different air pressures may be selected for the closing of the switch. In this manner, different levels within tub 4 may be selected by movement of dial 25 to different positions. For purposes which are fully described herebelow, I prefer to use a four-position control 24: one position provides a level which substantially fills the basket 3; a second setting provides about 2/3 of a full basket; a third setting shuts off the incoming water when it reaches about half the height of basket 3; and the fourth level, which will be more fully discussed herebelow shuts off the incoming water when it reaches a very low level in the tub which may well not even rise to the bottom of the basket.

In the direction of rotation which is provided for washing operations, the motor 15 drives a pump 26 through a flexible coupling 27 in the appropriate direction to discharge liquid from the bottom of the tub 4 into a conduit 28 which leads to a nozzle 29. Nozzle 29 is positioned relative to a filtering member 30 secured on the top of agitator 9 so as to be movable therewith so that liquid

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is recirculated by the pump 26 up to conduit 28 and out of nozzle 29 into the oscillating filter pan 30. It will be observed that the filter pan has a substantial number of small openings 31 formed therein so that the water coming from nozzle 29 passes down through the openings. The filter pan 30 with its many small openings 31 and its upstanding side wall 32 causes the lint which is separated from the clothes during the washing operation to be filtered out of the water and thus prevents it from being redeposited on the clothes. This type of structure is more fully described and claimed in Patent 2,481,979 issued to Russell H. Colley on September 13, 1949, and assigned to General Electric Company, owner of the present invention.

Also secured on the agitator 9 so as to move therewith is a clothes containing basket 33 which is small relative to basket 2 and tub 4. Except for overflow openings 34 adjacent the top thereof and one or more conventional very small openings 34a which may be provided in depressions 34b at the bottom 34c thereof for removal of heavy soil, basket 33 is imperforate. The basket is formed, as shown at 35, with vanes which extend outwardly from the inner wall 36, the vanes serving a washing purpose which will be explained herebelow and also preferably being hollow so as to accommodate the tops of the vanes 11 of the agitator; this positions the basket securely on the agitator so that there is no relative rotation of the two.

The basket 33 is positioned below filter pan 30 so that water which is poured into the filter pan from nozzle 29 passes through the openings 31 in the filter pan down into the basket 33. Thus, in effect the filter pan effects a filtering action on the water prior to its entry into the basket 33 and, in addition, forms a clothes retaining lid for the basket. Filter pan 30 and basket 33 are, preferably, removably positioned on agitator 9 so that they may be removed when so desired (for instance, for the insertion of clothes into basket 2) and readily replaced on the agitator secured thereto so as to move therewith. It will, however, be obvious that, depending upon the size of the opening into the basket 2 around the pan 30 and basket 33, it may not be necessary to make the basket and pan removable.

Completing the description of machine 1, when enough washing has been provided and it is intended to remove the washing liquid from the clothes, the direction of rotation of motor 15 is reversed. As described above, this causes the basket 2 and agitator 9 to rotate together at a relatively high speed so as to centrifuge the washing liquid out through openings 3. The washing liquid thus removed is caused by pump 26, rotating in the reverse direction to the previous direction thereof, to discharge into a conduit 37. Conduit 37 is adapted for discharge to a stationary tub or drain line (not shown) so that the pump is effective to drain tub 4. While any suitable pump may be used for draining purposes, the one generally described hereabove is representative and is described in detail in Patent 2,883,843, issued to John Bochan on April 28, 1959, and assigned to General Electric Company, assignee of the present invention.

It will be understood that the machine 1 is provided with a suitable electrical sequence control arrangement which causes the machine to pass through an appropriate cycle of operations, first washing the clothes, next extracting the water from them, then rinsing the clothes in clean water, and finally extracting the rinse water from the clothes. While many suitable arrangements are well known in the art, one typical system which may be used is that described and illustrated in the aforementioned Bochan application Serial No. 6,037.

In view of the complete description of the operation of a machine of this type provided in the aforementioned Bochan application Serial No. 6,037, it is believed sufficient to give a brief description of the operation of the machine prior to describing in detail my invention, which

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lies in the particular form of the basket 33. As stated, the control member 25 may be used to provide four different water levels in tub 4, three of them being operative to provide water within basket 2 and one of them being at such low level within tub 4 that there is insufficient water in basket 2 to provide any washing action. This low water level is provided when it is desired to use the small basket 33 to wash a very small load. This generally occurs when delicate garments, of the type which constitute a small minority of all clothes worn, must be washed and there is an insufficient quantity to justify the use of the large basket 2. When such a load is to be washed, the small basket 33 is placed on the agitator mechanism as shown, and the filter pan 30 is then placed over the small basket so as to close the top thereof without preventing the provision of water thereto through perforations 31 in the filter pan.

When the low level selected is reached, water ceases to enter through outlet 21 and the motor 15 starts operation in the direction suitable for moving the agitator mechanism. As described, this also causes pump 26 to operate in the direction to pump water up through conduit 28 and out from nozzle 29 into the filter pan 30, the water then passing through the openings 31 in the filter pan and down into the basket 33. Because basket 33 is substantially imperforate the water quickly rises therein regardless of the fact that the basket 2 does not have any water or virtually no water in it. The water continues to rise in the basket 33 until it reaches substantially the level of overflow outlets 34. Then, both because the water level is near the outlets 34 and because of the substantial amount of movement of small basket 33 (since it is secured to the moving agitator), water flows and splashes out of the openings 34. This water then passes down into the large basket 2 and, because of the perforated nature of the large basket 2, back to the bottom of tub 4 where the pump 26 again recirculates the water into the small basket 33.

Referring now to FIGURES 2-7, and more particularly initially to FIGURE 2, the formation of my improved basket 33 will be described in detail. It will be recalled that the basket is formed so that the vanes 35 extend outwardly from the inner wall 36. While these vanes may take any appropriate shape (for instance extending directly radially outward from the axis on which the basket rotates), I prefer to form them as shown in a spiral shape which provides, in effect, a pocket 38 between each two adjacent vanes 35. With this shape of the vanes 35, a counterclockwise direction of rotation of the basket 33, as shown by arrow B in FIGURE 2, will cause the spiral vanes 35 to push water in a generally radially outward direction relative to the axis of rotation to the basket; because the vanes 35 are located near bottom 34c, this outward push occurs primarily along the bottom 34c of the basket. Rotation in the opposite or clockwise direction, as shown by arrow A, does not have this effect; in fact, there is a small tendency as a result of the formation of the pockets 38 for water to be moved vertically upwardly adjacent the inner wall 36 of the basket. However, this tendency is very slight, and as will be explained herebelow is counteracted by appropriate means on the outer wall 39 of the basket.

On the outer wall 39 I provide a number of vanes 40 which preferably, although not essentially, are the same in number as the vanes 35. The particular configuration of each vane 40 can best be understood by reference to FIGURES 3 through 7 in conjunction with FIGURE 2. Each vane 40 includes a face 41 which is formed so that it slants radially inward from the top 42 of the vane to the bottom 43 of the vane. This will further be understood by particular reference to FIGURES 5, 6, and 7. FIGURE 5, which is a view through the vane 40 near the top thereof, shows that at that height the face 41 is formed so that it is relatively small and curves rapidly back toward the outer wall 39. However, about the middle of the vane, as shown in FIGURE 6, the curva-

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ture back toward the outer wall has been decreased, so that the vane extends radially inward to a greater extent than is the case in FIGURE 5. At the bottom of the vane, as shown in FIGURE 7, the face 41 extends forward even more.

In addition, the vane preferably also slants radially inwardly relative to a clockwise direction of rotation as shown by the arrow A in FIGURE 3, i.e., the slant of face 41 is convergent with the spiral of the closest inner vane 35. This is clearly shown both in FIGURE 2 and all three FIGURES 5, 6, and 7, wherein it is shown that, relative to a circular outer wall and moving in the direction of arrow A, the face 41 slants inwardly at an acute angle to the wall over its entire length.

Each vane 40 is also preferably provided with a face 44 which, relative to the opposite direction of rotation as shown by the arrow B, is slanted in the same manner that face 41 was slanted relative to the direction of arrow A. In other words, face 44 slants radially inwardly from its top to its bottom and radially inwardly relative to the direction of rotation B. Face 44 preferably is not as large as face 41, which extends the entire height of the vane; rather, as can be seen in FIGURES 2 and 4, face 44 extends upwardly only a small part of the vertical distance of the vane and then merges into the outer wall 39.

Also facing toward the arrow B is a face 45 which preferably extends upwardly so as to be substantially at a right angle to the outer wall. While this face may have a curvature relative to a vertical axis, in the preferred form and for ease of manufacturing where the basket 33 is a molded article, I prefer to have the face 45 formed substantially straight up and down as shown in the figures.

Each of the three faces 41, 44, and 45 of each vane 40 has a specific function to perform in cooperation with the action of the vanes 35. It will be recalled that the vanes 35 have been described as providing for an outward flow of water in at least one direction which, in the preferred embodiment shown, is during counterclockwise rotation in the direction of arrow B. This water then moves outwardly and, as stated, this occurs primarily at the bottom of the basket. When this water reaches the outer wall 39 of the basket, it meets the bottom of the slanting surface of face 41. Because this surface slants both radially outward going in an upward direction, and has a slant causing it to extend into the basket, face 41 catches the water being expelled outwardly and causes it to change its direction of movement from outward to substantially upward adjacent the wall 39. This action is enhanced by the preferred relatively concave formation of face 41 which has the effect of gently but forcefully changing the direction.

With the water thus directed outwardly by the vanes 35 and upwardly along the outer wall 39 by the face 41 of each vane 40, it follows that the water is thus provided with a generally toroidal path, since to replace the water thus being moved outwardly and upwardly the water at the top must move inwardly and then downwardly along the vanes 35. Thus, the desired toroidal motion, which has been found to provide a highly effective washing action, is achieved within the basket 33. This action continues as long as the rotation of the basket is in counterclockwise direction indicated by the arrow B.

However, it will be recalled that the movement of the agitator 9 is an oscillating one, and that therefore after the full stroke of 160° the direction of rotation will be reversed and the agitator and basket will move in the direction of arrow A. When the direction of rotation is thus reversed, the vanes 35 cease to move the water outwardly as they did in the previous direction of rotation. In fact, there is a slight unwanted effect from the pocket 38 tending to push water upwardly along the inner wall 36 which in effect would oppose the toroidal circulation obtained during the previous direction of rotation. This effect is offset by the vanes 44 which, in the same manner as vanes 41, tend to push water upwardly along

the outer wall 39 during clockwise rotation. It has been found that vanes 44 tend to offset the slight push of the pockets 38 so that there is no substantial amount of toroidal push provided in any direction during rotation in the direction of arrow A.

There is a further effect obtained in the direction of rotation A, provided by faces 45 of the vanes 40, which is considered of importance to the washing action as a whole. Because these faces 45 are substantially at right angles to the outer wall 39, during rotation in the direction A they will tend to push the water in a circumferential direction. To phrase it differently, there is a tendency to ratchet both the liquid in the basket and the clothes in the basket around in a circumferential direction during rotation in the direction A. This tendency is furthered by the formation of cups by vanes 35. As stated, the toroidal movement of the clothes is the most important one for providing the desired washing result. However, it has further been found that, in a clothes container as small as the basket 33, there may be a tendency with some types of garments for tangling to occur if the motion is purely toroidal. It has further been found that the ratcheting action provided by the faces 45 of vanes 40 tends to inhibit this tangling thereby enhancing further the total washing effectiveness of the operation.

Thus, to summarize, the vanes 35 and faces 41 cooperate to cause the water to move outwardly adjacent the bottom 34c of the basket and then upwardly along the outer wall 39 so as to provide a toroidal circulation of water during rotation in the direction B. During rotation in the direction A, the vanes 44 offset any undesired effect of the pockets 38 to reverse this toroidal motion. Also during rotation in the direction A, the faces 45 cooperate with pockets 38 to provide a ratcheting action to cause the clothes to move not only in a toroidal path but also in a circumferential path during washing action.

It will be understood that the formation of the vanes to provide a toroidal action is of primary importance in this invention. However, also of importance is the provision of the surfaces 45 to provide the ratcheting action, and an added minor but desirable benefit is obtained by the action of the faces 44.

It will be seen from the foregoing that my invention provides a simple structure in which a highly desirable circulation of the water and clothes in the basket 33 is obtained. It will further be understood that while the precise form of the vanes as illustrated is preferred, other forms may also be provided so long as they effect the same result. For instance, the inner vanes 35 may be formed extending radially outwardly so as to provide a centrifugal and ratcheting action on the water in either direction; in such a case it might well be desirable to make faces 41 and 44 of the same size and possibly forego the face 45.

Thus, while in accordance with the patent statutes I have described what at present is considered to be the preferred embodiment of my invention, it will be obvious to those skilled in the art that various changes and modifications, such as, for instance (but not exclusively), that suggested above, may be made therein without departing from the invention, and I therefore aim in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. For use in a vertical axis clothes washing machine having a relatively large liquid receptacle, a movably mounted agitator extending upwardly into said receptacle, and means for effecting an oscillatory motion of said agitator on its axis: a relatively small substantially im-

perforate basket adapted to be secured on said agitator, said basket being substantially annular with an inner wall, an outer wall, and a bottom wall, said outer wall having an overflow opening formed therein adjacent the top thereof, a first plurality of vanes extending into said basket from said inner wall adjacent the bottom thereof, each of said first plurality of vanes being formed in a substantially spiralling form whereby said vanes direct water outward in a generally radial direction by centrifugal force during rotation in a direction opposite to the direction of said spiral, and a second plurality of vanes extending into said basket from said outer wall, each said outer vane having a face slanting radially inwardly from its top toward its bottom and slanting radially inwardly from said outer wall, each of said inner and other vanes being positioned so that the spiral of an inner vane and the slanting face of an outer vane are convergent, each said outer vane further having a second face joined to said slanting face at its radially innermost edge, each said second face extending upwardly substantially at a right angle to said outer wall so as to extend into the path of liquid during rotation in the direction of said spiral thereby to provide a circumferential movement to liquid in said basket.

2. For use in a vertical axis clothes washing machine having a relatively large liquid receptacle, a movably mounted agitator extending upwardly into said receptacle, and means for effecting an oscillatory motion of said agitator on its axis: a relatively small substantially imperforate basket adapted to be secured on said agitator, said basket being substantially annular with an inner wall, an outer wall, and a bottom wall, said outer wall having overflow openings formed therein adjacent the top thereof, a first plurality of vanes extending into said basket from said inner wall adjacent the bottom thereof, each of said first plurality of vanes being formed in a substantially spiralling form whereby said vanes direct liquid contained in said basket in a radially outward path by centrifugal force during rotation in a direction opposite to the direction of said spiral, and a second plurality of vanes extending into said basket from said outer wall, each said outer vane having a first face slanting radially inwardly from its top toward its bottom and slanting radially inwardly from said outer wall so as to extend into the path of liquid in at least one direction of rotation, each said outer vane further having a second face joining said first face at its innermost point, and said second face being formed so as to extend upwardly substantially at right angle to said outer wall and facing the other direction of rotation, each of said inner and outer vanes being positioned so that the spiral of an inner vane and the slanting face of an outer vane are convergent, each said outer vane having a third face slanting radially inwardly from its top toward its bottom and radially inwardly from said outer wall so as to extend into the path of liquid in the other direction of rotation, said third face being substantially smaller and therefore less effective than said first face.

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