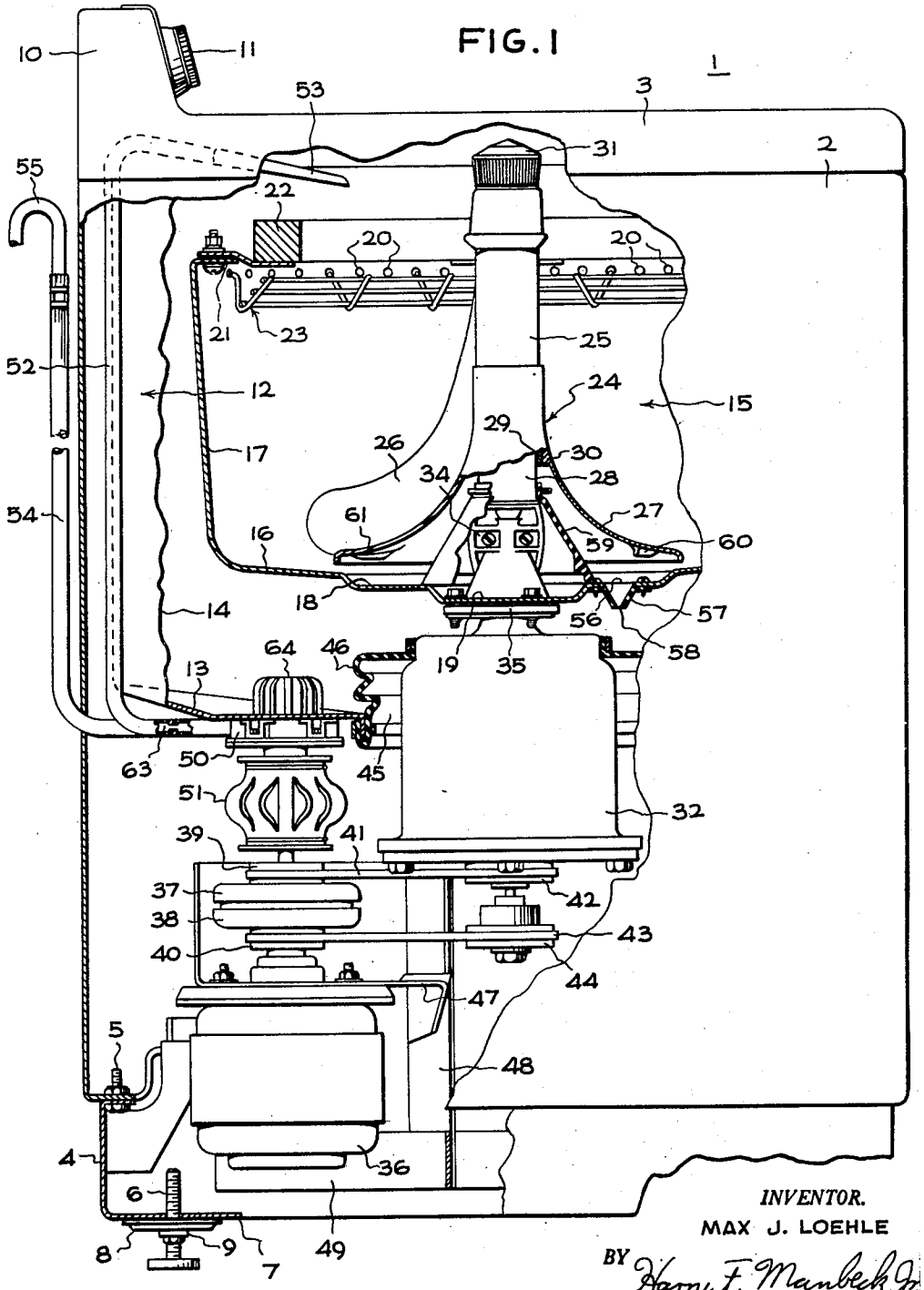
Feb. 18, 1958 M. J. LOEHLE 2,823,534

CLOTHES WASHING MACHINE

Filed Oct. 7, 1955 2 Sheets-Sheet 1

FIG. 1



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CLOTHES WASHING MACHINE

Filed Oct. 7, 1955 2 Sheets-Sheet 2

FIG. 3

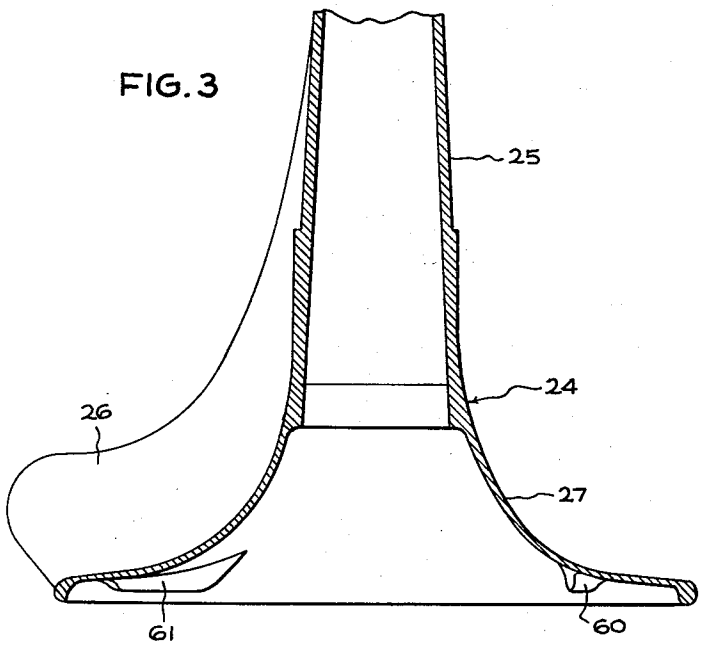


FIG. 2

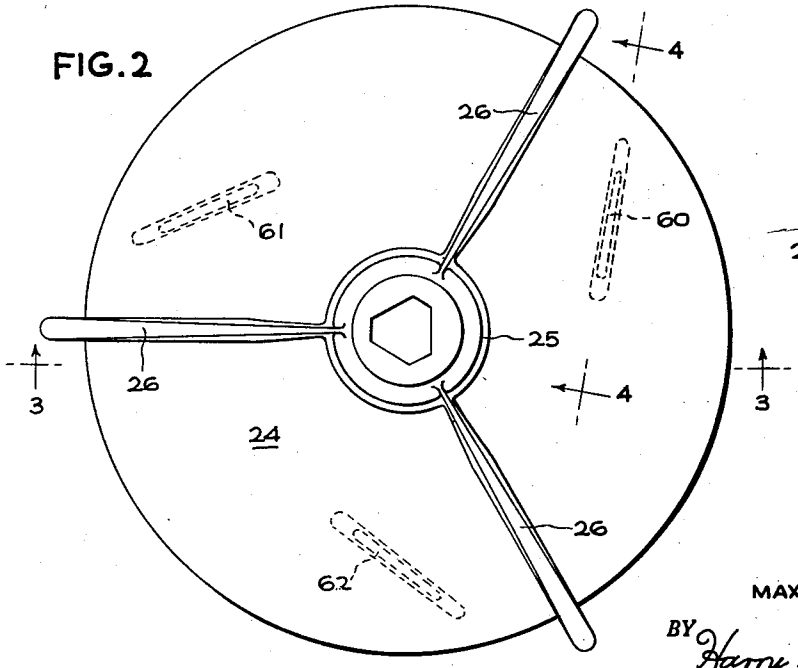
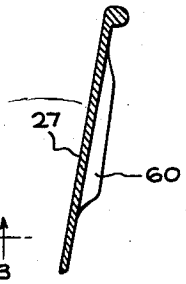


FIG. 4



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United States Patent Office 2,823,534 Patented Feb. 18, 1958

2,823,534

CLOTHES WASHING MACHINE

Max J. Loehle, Louisville, Ky., assignor to General Electric Company, a corporation of New York

Application October 7, 1955, Serial No. 539,216

7 Claims. (Cl. 68—23)

My invention relates to clothes washing machines for domestic use and more particularly to such machines of the type having a vertical axis agitator operating within a clothes basket.

In clothes washers having a vertical axis agitator, the agitator is commonly oscillated about its axis in order to produce the washing action. By moving back and forth the agitator creates high turbulence in the wash water contained in the clothes basket, and this turbulence is effective to wash the clothes. In order to extract the wash water from the clothes after they have been washed the clothes basket is mounted for rotatable movement, and a drive mechanism is provided which rapidly rotates the basket upon the conclusion of the washing operation. The rotation of the basket centrifugally extracts the washing liquid contained in the clothes as well as removing the water within the basket. The side walls of the basket are commonly inclined outwardly in the upward direction in order to facilitate the removal of the water from the basket by centrifugal action. While the rotation of the basket effectively removes the water, it is found that heavy insoluble particles removed from the clothes during the washing operation, for example sand, silt or the like, tend to remain in the basket even after centrifugal extraction. Thus, when the machine is again filled with water, for example for the rinsing operation, these insoluble particles may be re-deposited on the clothes; or upon the conclusion of the entire washing operation, deposit of sand or like particles may be left in the bottom of the machine. This of course necessitates a manual cleaning operation.

In order to obviate these difficulties it is desirable that the clothes washer be self-cleaning, that is, automatically remove heavy soil and dispose of it to the drain during the washing operation. A clothes washer which accomplishes this self cleaning action is shown and described in the copending application of William R. Molnar, S. N. 468,459, filed November 12, 1954, now Patent No. 2,807,949, and assigned to the same assignee as the present invention. The Molnar clothes washing machine includes a vertical axis agitator which has an outwardly flared skirt extending over a substantial area of the bottom of the clothes basket. The area under the agitator skirt accumulates the insoluble soil particles during the oscillation of the agitator because very limited turbulence is created beneath the agitator skirt compared with that in the main washing zone of the basket. In this soil collection area beneath the agitator skirt there is provided an orifice or nozzle extending through the bottom wall of the basket. This orifice or nozzle discharges into the outer tub of the clothes washer and removes the soil particles from the basket in the flow of liquid passing therethrough. By the use of suitable recirculation means the liquid which carries the soil particles into the tub is returned to the basket for further use in the washing operation. The insoluble soil particles, however, settle out of the liquid and remain in

the outer tub for subsequent disposal upon the conclusion of agitation.

The present invention is directed to clothes washing machines including a soil removal system of this type, and it has as its principal object the provision of improved means for effecting the discharge of the soil particles from the area beneath the agitator skirt into the tub of the machine.

The invention has as a more specific object the provision of flow creating means which set up a net circular flow of water under the agitator skirt during the oscillation of the agitator, thereby to sweep the heavy soil particles over and into the discharge means leading into the tub or other container.

In carrying out my invntion I provide a plurality of fins or blades beneath the agitator skirt. The fins are so arranged that they set up a greater movement of water when moved in one direction than when moved in the other direction, whereby a net circular flow of water is created beneath the agitator skirt as the agitator oscillates. This circular flow of water is effective to carry any soil particles collecting under the agitator skirt over and into the discharge means leading to the tub, no matter where the soil particles first move under the agitator skirt relative to the discharge means. As a result soil does not collect at any point under the agitator skirt but rather is all discharged outwardly into the tub.

The features of my invention which I believe to be novel are set forth with particularity in the appended claims. My invention itself, however, both as to its organization and method of operation, together with further objects and advantages thereof, may be best understood by reference to the following description taken in conjunction with the accompanying drawings in which:

Fig. 1 is a side elevational view of a clothes washing machine embodying my invention, with certain surfaces broken away and partially sectionalized to illustrate detail;

Fig. 2 is a plan view of the vertical axis agitator included in the machine of Fig. 1;

Fig. 3 is a fragmentary sectional view taken on the line 3—3 of Fig. 2; and

Fig. 4 is a fragmentary sectional view taken on the line 4—4 of Fig. 2.

Referring now to Fig. 1 I have shown therein a domestic clothes washing machine 1 embodying my invention in one preferred form thereof. The machine 1 includes an outer enclosing cabinet structure 2 which is provided with a separate top 3. The cabinet structure 2 is mounted on a base or supporting assembly 4 by means of a plurality of bolts 5. For leveling the machine the base assembly 4 is provided with appropriate threaded adjustment feet 6 which extend through flanges 7 of the assembly at points strengthened by reinforcing plates 8. A lock nut 9 is threaded on each adjustment foot in order to secure it in the desired position once the machine has been installed and leveled.

The top 3 of the machine includes a backsplash panel 10 suitable for the mounting of various operator controls. These operator controls in the well known manner provide for the adjusting and controlling of the desired sequence of machine operations. Although the operator controls form no part of the present invention, a suitable control knob 11 is shown by way of example in Fig. 1.

Rigidly secured within the outer cabinet structure is a water tight tub 12 having a bottom wall 13 and a generally round side wall 14. Within the tub 12 there is rotatably mounted an imperforate clothes basket 15. The basket 15 includes a bottom wall 16 and a generally round side wall 17. The bottom wall 16 has a slight downward slope and is provided with one or more downwardly

stepped areas such as indicated at **18** and **19**. The side wall **17** of the basket is inclined slightly outwardly to reach a maximum diameter adjacent the upper edge thereof. At the maximum diameter, a plurality of apertures **20** are provided through which wash water or other liquid may escape for example during centrifugal extraction. The uppermost edge of the basket is rolled inwardly to form a flange **21** and on this flange there is mounted a suitable balance ring **22**. A clothes retainer **23** is attached to the basket near the flange to prevent flotation or projection of clothes from the basket into the outer tub during the operation of the machine.

Operatively positioned and preferably centrally located within the basket **15** is an agitator **24**. The agitator **24** includes a hollow center post **25** having a generally vertical axis and a plurality of vanes or liquid impelling means **26** which extend radially outward from the center post. The vanes **26** are joined to an outwardly and downwardly flared skirt **27** which extends to a position in proximity to the bottom wall **16** of the basket and covers a substantial area thereof. The agitator **24** is independently rotatable with respect to the basket and specifically is mounted at its top by means of a drive shaft (not shown) extending up through the hollow center post **25**. The agitator is further held in alignment by means of a hub **28** secured to the center portion of the basket. This hub **28** provides a journal for an internal bearing **29** mounted in the agitator at **30**. The agitator is removably secured in the desired position by means of a threaded cap **31** at the upper end of the center post, which is screwed on the agitator drive shaft.

The basket **15** and the agitator **24** are independently driven from a drive mechanism (not shown) which is mounted within an enclosing casing **32**. In the usual manner, the basket drive is provided through an outer shaft or spin tube (not shown) connected to the basket hub **28** through a clamping means **34**. The basket rests on a mounting flange **35** formed on the basket hub **28** and is bolted thereto so that it is driven upon the rotation of the hub. The agitator **24** is driven by the above mentioned shaft which extends coaxially through the spin tube and the center post of the agitator and is secured to the agitator by the threaded cap **31**.

Insofar as this invention is concerned, any suitable drive mechanism may be employed which selectively provides a drive for oscillating agitator **24** or for rotating both the agitator and the basket **15** at high speed for centrifugal extraction. In the illustrated machine both the basket and the agitator are driven by means of an electric motor **36** and the selection between agitate or wash action and centrifugal extraction is provided by controlling the direction of rotation of the motor **36**.

The motor **36** operates a bi-directional clutch including clutch halves **37** and **38** which drive respectively pulleys **39** and **40**. Pulley **39** is connected by a flexible belt **41** to an input pulley **42** of the transmission mounted within the casing **32**. This input pulley **42** provides the drive for high speed rotation of the basket **15**. Similarly, the other drive pulley **40** of the bi-directional clutch assembly is connected by a flexible belt **43** to a second transmission input pulley **44**. The pulley **44** provides the drive for oscillating the agitator **24**. Upon one direction of rotation, the bi-directional clutch is effective to provide a drive only to transmission input pulley **44** thereby to drive the agitator **24**; whereas upon the reverse direction of rotation, the bi-directional clutch is effective to provide a drive to input pulley **42**, thereby to rotate the basket **17** at a high speed for extraction. While I have not shown the details of the construction in this application, since the precise drive mechanism does not form a part of this invention, reference is made to Patents 2,639,618 and 2,639,794 to J. W. McNairy both issued May 26, 1953 and both assigned to the General Electric Company, assignee of the present invention. These patents disclose in detail the structural characteristics of the drive mechanism including the bi-directional clutch and the transmission assembly.

During normal operation conditions of static and dynamic unbalance within basket **15** must be expected. Therefore, during centrifugal extraction appreciable gyratory motion of the basket occurs. To permit such motion, bottom wall **13** of the outer tub **12**, which remains rigid with the outer cabinet, is provided with an enlarged aperture **45** of appreciably larger diameter than that of the transmission casing **32**. The upper end of the transmission casing extends through this aperture **45** and a water tight seal is provided between the bottom wall of the tub and the casing by means of a flexible boot **46** having a plurality of corrugations to increase its flexibility. The lower end of the boot **46** is secured to the edge of the aperture **45** by means of a compression ring as shown, and the upper end of the boot is compressed against transmission casing **32** by means of a suitable clamping ring. Thus, the basket and agitator assembly along with the transmission are sealed to the tub but yet are free to move relative to it.

It is also preferred to mount the motor and clutch assembly in the moving system. For this purpose the motor is secured to a bracket **47** which in turn is secured to one or more of the upright members **48** which mount the transmission casing **32** and thus the basket and the agitator. The upright members **48** are secured to a spider or frame work **49** which is resiliently supported from the base of the machine by resilient means (not shown). For example a suspension and vibration damping system may be employed along the lines illustrated by Patent 2,454,112 issued November 16, 1948 to T. T. Woodson and assigned to the General Electric Company, assignee of the present invention.

Liquid discharged into the outer tub **12** from basket **15** is disposed of by means of a pump **50** having an outer casing rigidly secured to the bottom wall **13** of the tub. The bottom wall of the tub is provided, of course, with an appropriate aperture defining an inlet into the pump chamber. A flexible driving connection **51** between the motor shaft and the pump shaft permits relative motion between motor and the pump during operation of the machine.

While I have not shown the details of the pump herein, it is of the type discharging into one of two outlets depending upon the direction of pump rotation. For example, a directional pump of the type disclosed by the copending application of John Bochan S. N. 468,460 filed November 12, 1954 and assigned to the General Electric Company, may be used. One of the two outlets of the pump is connected to a recirculation hose or conduit **52** for returning liquid to basket **17** through a discharge nozzle **53**. The outer pump outlet is connected to a hose **54** which is adapted to be connected or disposed for discharge to a stationary tub or waste line. For this purpose the drain hose **54** may conveniently include a goose neck **55** on the end thereof. The pump is so arranged that upon one direction of motor rotation corresponding to the driving of agitator **24** the pump output is discharged through conduit **52** for return to basket **15**; whereas upon rotation of the motor in the reverse direction for spinning basket **15**, liquid is pumped through conduit **54** to the drain. It will be understood, however, that a conventional pump with suitable solenoid operated valve means may be used in place of the directional pump to effect this result, and that my invention is not limited to a machine having a directional pump.

For washing of clothes the basket **15** is filled to the overflow level defined by the apertures **20** and a quantity of liquid is preferably overflowed into the outer tub through the apertures. A suitable soap or detergent compound is then added. The agitator is oscillated to produce a churning motion of the liquid and a tumbling motion of the articles of clothing contained within the

basket. A certain amount of rubbing action between the layers of clothes and between the clothes and the vanes of the agitator also results. The combined result is to extract the dirt or soil from the clothes. The detergent or soap suspends a substantial amount of such soil in the washing liquid, but it is not uncommon for the clothes to contain a substantial amount of relatively heavy and insoluble soil particles which will not remain in suspension in the washing liquid.

During agitator operation, the heavy soil particles naturally tend to sink and collect at the bottom of the basket, and while there is a tendency for them to remain in motion with the liquid, within a relatively short time most of the heavy soil particles pass into the region of relatively limited turbulence occurring between the skirt 27 of the agitator and the portion of the bottom wall of the basket beneath it. Although the action of the vanes 26 is to create considerable turbulence throughout most of the basket, the skirt 27 acts as more or less of a shield whereby very little turbulence is set up under beneath it. Having once entered this region of limited turbulence due to their random motion within the wash water, the heavy soil particles then tend to remain therein.

In order to remove the heavy soil particles from beneath the agitator skirt an aperture 56 is provided in the bottom wall of the basket. This aperture 56 discharges into a nozzle member 57 of inverted conical shape whose outer wall converges into a relatively small outlet aperture or orifice 58 discharging into the outer tub. This particular shape of discharge nozzle 57 is of value in providing a completely self cleaning structure while limiting the discharge rate of the detergent and liquid from the basket. Since aperture 56 and nozzle 57 are located in the area of limited turbulence under the agitator skirt, the insoluble soil particles collected under the agitator are carried with the flow of liquid through the aperture and the nozzle into the outer tub.

In practice it has been found that there is practically no turbulence whatsoever in the area under the skirt of the agitator adjacent hub 28 of the basket. To prevent soil particles from entering this more or less stagnant area and remaining therein despite the action of nozzle 57, a boot 59 is employed extending from the hub 28 of the basket downwardly and outwardly to the bottom wall 16 of the basket. While a liquid tight seal is not essential, it is preferred that this boot fit snugly with the hub 28 of the basket and the bottom wall of the basket to prevent entry of dirt or soil particles into the region enclosed by it.

As thus far described, the machine 1 is not my invention but rather is described and claimed in the aforesaid application of W. R. Molnar S. N. 468,459, now Patent No. 2,807,949. By my invention, however, improved means are provided whereby it is insured that the soil particles do not collect beneath the agitator skirt but rather are swept over and into the aperture 56 and the drain nozzle 57. In order that the soil particles collecting beneath the agitator be discharged out of the nozzle 57, it is desirable that a flow exist underneath the agitator which will carry them to the nozzle. My invention contemplates the provision of a net circular flow of liquid beneath the agitator skirt to accomplish this result.

To produce this circular flow of liquid beneath the agitator skirt I have provided a plurality of vanes or fins 60, 61 and 62 on the bottom side of the agitator skirt 27. These vanes are preferably formed integrally with the agitator skirt as shown, but it will be understood that they may comprise separate pieces which are screwed or otherwise attached to the agitator skirt. Vanes 60, 61 and 62 are so arranged that they create a net circular flow of water beneath the agitator as it oscillates to wash the clothes. In order to create the circular flow these vanes or fins are disposed at an angle relative to the radii of the center post 27 of the agitator. Specifically, in the illustrated embodiment, the vanes are so arranged that when the agitator is moving in a counterclockwise direction, they push the water under the skirt ahead of them. However, when the agitator reverses and moves in the clockwise direction, the vanes tend to push the water outwardly and in fact present a smaller surface for moving it at all. In other words they are not as effective to move water clockwise around the agitator post as they are to move water counterclockwise. As a result a net circular flow of water is sent up beneath the agitator skirt in the counterclockwise direction. It will be noted that in my preferred embodiment the vanes 60, 61 and 62 are spaced apart equidistant and that they are each disposed at the same angle, about sixty-six degrees, to the respective radii of the center post through their inner ends. The radii of the center post through their respective ends are, of course, a hundred and twenty degrees apart.

Due to the net circular flow created by the vanes or fins during the oscillation of the oscillator, any soil particles passing under the agitator skirt are positively carried to the aperture 56 and the discharge nozzle 57. As a result there is little or no tendency for the soil particles to collect at any point beneath the agitator skirt. Rather no matter where they first enter beneath the skirt they are soon carried to the discharge nozzle and discharged outwardly into the tub.

For the system to be effective, the insoluble soil particles must be separated from the wash water before it is returned to the basket 15 through hose 52 and nozzle 53. While the liquid and soil separation means might take a number of different forms it is found quite practical to use the outer tub 12 as a settling chamber. In fact this is the preferable way of doing it. In order to use the tub most effectively as a settling chamber it is desirable that the machine be supplied with sufficient liquid not only to fill the basket 15 but also to provide a pool of water in the outer tub. For example in a size of the illustrated machines suitable for domestic use, after the basket has been filled with approximately fifteen gallons of water, from four to six gallons of water are overflowed into the outer tub. In this washer it is contemplated that liquid will flow through the soil discharge nozzle 57 at a rate from 1 to 3 gallons per minute. The rate of flow through the recirculation hose 52 is however about 6 gallons per minute, the recirculation flow rate being held at this figure by a suitable flow restrictor 63. The excess water recirculated into basket 15 beyond the amount which is discharged from the basket through nozzle 57 overflows through the apertures 20 at the top of the basket. With this arrangement two to four inches of water is present in the outer tub at all times during the washing. With this level of water in the tub the water discharged through the nozzle 57 remains in the tub long enough before it enters the pump for the heavy soil particles to settle to the bottom of the tub. In fact, when this level of water is maintained in the tub, the liquid is substantially freed of soil particles before it enters the pump. The soil particles remain in the tub until a later time when all of the liquid is pumped from the machine during an extraction stage.

A suitable strainer 64 preferably is provided for the pump inlet. While many types of such strainers are available I have shown here a device of the type having a plurality of outwardly extending fins between which are defined inlet openings. This device prevents the entry of any large pieces of laundry into the pump, while permitting soil particles, lint and the like to pass into the pump chamber during the extraction stage.

During the centrifugal extraction stage when basket 15 is rotated at a high speed, the liquid contents of the basket are very rapidly discharged into the outer tub resulting in a high degree of turbulence which washes the soil particles collected during the agitation stage into the pump for discharge through hose 54 to the drain,

Therefore, any serious or undesirable collection of insoluble soil within the tub is prevented. Furthermore, as the centrifugal extraction period continues, all of the water is pumped from the outer tub carrying with it the soil particles which have not settled out of the water. In any event, insoluble soil particles are substantially removed from the outer tub during each centrifugal extraction period.

To summarize the operation of the illustrated machine, the laundry to be washed and an appropriate quantity of detergent and washing liquids such as water are placed within the wash basket **15**. The drive mechanism is then operated to oscillate the agitator while the basket is retained in a substantially stationary position. This produces a washing action within the basket. The soil which is emulsified or suspended in the washing solution is removed from the laundry and eventually discharged from the basket during centrifugal extraction. The relatively heavy particles which remain insoluble and tend to settle out of the washing solution accumulate under the skirt **27** of the agitator, this motion being assisted by the downward inclination of the bottom wall **16** of the basket. The insoluble particles tend to remain underneath the agitator skirt in view of the limited turbulence in that area. Due to the net circular flow of water set up beneath the agitator skirt by the vanes or fins **60**, **61** and **62**, the soil particles are positively carried over and into the nozzle **57**. As a result the soil particles are carried out of the basket by the flow of liquid discharged through nozzle **57**. The net circular flow of water created by the fins insures that all the soil particles will reach the nozzle rather than collecting at some point beneath the agitator skirt. The insoluble soil particles then settle out of the water in the outer tub before the water is returned to the basket through the recirculation conduit **52**. As a result relatively clean water is returned to the basket from the tub.

It is to be noted that the flow rate through nozzle **57** must be at a sufficiently low value to prevent suction of articles of laundry under the agitator. In other words, flow rates in the main washing zones of the basket must be considerably higher than the flow rate into the area beneath the agitator skirt resulting from the discharge through nozzle **57**.

Upon conclusion of the washing operation i. e. the oscillation of the agitator **24**, during which time substantially all of the insoluble soil particles have been discharged through nozzle **57** into the outer tub, the basket is driven at a relatively high speed to extract the soapy water from the clothes and to discharge it through apertures **20** in the basket into the tub. During this extraction period the pump discharges the water entering the tub through hose **54** into an appropriate drain. As mentioned above, due to the high turbulence created in the tub during this period the soil particles collected in the tub during the washing operation are flushed out of the tub and down the drain.

In the usual manner one or more rinsing operations may be employed followed by a final centrifugal extraction. Since the insoluble particles are substantially all removed during the centrifugal extraction stage following the first washing operation, there is substantially no redepositing of the particles on the clothes. Furthermore, if any soil should remain in the tub after the first extraction, it is flushed from the outer tub during the final rinse and extraction period, thus leaving the machine in a relatively clean and sanitary condition for the next operation.

As pointed out above, my vanes or fins on the underside of the agitator skirt are particularly useful in a soil removal system which includes recirculation means for returning liquid from the tub to the basket. It will be obvious, however, that my invention is not necessarily limited to such a system. For example, the vanes or fins could be advantageously used in a system wherein the soil settles by gravity into a small closed container disposed beneath the basket without there being any liquid discharged into the tub. Here also, the vanes or fins are advantageous to sweep the soil particles over the aperture in the basket bottom so that they may settle through it.

In accordance with the patent statutes I have described what at present is considered to be the preferred embodiment of my invention. However, since it will be obvious to those skilled in the art that various changes and modifications may be made therein without actually departing from the invention, it is, therefore, aimed in the appended claims to cover all such equivalent variations as come within the true spirit and scope of my invention.

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

1. In a clothes washer, a wash basket, an agitator disposed in said basket having a center post and an outwardly flared skirt on said post, said skirt being disposed adjacent to the bottom wall of said basket and covering a portion thereof, means supporting and driving said agitator with an oscillatory motion on the axis of said center post thereby to wash clothes in said basket, said oscillatory motion creating only limited turbulence under said agitator skirt whereby insoluble soil particles collect thereunder, liquid discharge means in the bottom of said basket under said skirt and displaced from axis of said center post for discharging said particles out of said basket in a flow of liquid, a plurality of fins on the underside of said agitator skirt for creating a net circular movement of liquid under said skirt during the oscillatory motion of said agitator, thereby to sweep said soil particles over and into said discharge means, said fins protruding downwardly from said skirt, each said fin having a substantial part thereof disposed at an acute angle to a radius drawn thereto from the axis of said center post, and means for returning the liquid discharged through said discharge means to said basket.

2. The combination of claim 1 wherein said fins are spaced equidistant apart and are each disposed at an angle of at least 60° to a radius drawn thereto from the axis of said center post thereby to create a greater flow of liquid when the agitator is rotated in one direction than when it is rotated in the other direction, resulting in said net circular movement of liquid beneath said agitator skirt during the oscillation of said agitator.

3. In a clothes washer, a wash basket, an agitator disposed in said basket having a vertically extending center post and a downwardly and outwardly flared skirt on said post, said skirt being disposed adjacent to the bottom wall of said basket and covering a portion thereof, means supporting and driving said agitator with an oscillatory motion on the axis of said center post thereby to wash clothes in said basket, said oscillatory motion creating only limited turbulence under said agitator skirt whereby insoluble soil particles collect thereunder, liquid discharge means in the bottom of said basket under the skirt of said agitator and displaced from said center post for discharging said soil particles out of said basket in a flow of liquid, a plurality of fins on the underside of said agitator skirt for creating a net circular movement of liquid under said skirt during the oscillatory motion of said agitator, thereby to sweep said soil particles over and into said discharge means, said fins protruding downwardly from said skirt, each said fin having a substantial part thereof disposed at an acute angle to a radius drawn thereto from the axis of said center post, a settling chamber for collecting the liquid discharged from said discharge means to allow said soil particles to settle out of said liquid, and means for returning the relatively soil free liquid to said basket.

4. In a clothes washer, a substantially imperforate wash basket including liquid overflow means adjacent the upper end thereof, an imperforate tub surrounding said basket, an agitator disposed within said basket having a vertically extending center post and a downwardly and outwardly

flared skirt on said post, said skirt being disposed adjacent to the bottom wall of said basket and covering a portion thereof, means supporting and driving said agitator with an oscillatory motion about the vertical axis, thereby to wash clothes in said basket, a region of limited turbulence occurring under said agitator skirt during said oscillatory motion whereby insoluble soil particles collect thereunder, nozzle means in the bottom of said basket under the skirt of said agitator and displaced from the axis thereof for discharging said soil particles out of said basket in a flow of liquid, a plurality of fins on the underside of said agitator skirt and protruding downwardly therefrom for creating a net circular movement of water under said skirt during the oscillatory motion of said agitator thereby to sweep said soil particles over and into said nozzle means, a substantial part of each said fin extending at an acute angle relative to a radius extending outwardly thereto from the axis of said agitator, said tub collecting the liquid discharged from said nozzle to allow said soil particles to settle out of said liquid, and means for returning the relatively soil free liquid from said tub to said basket.

5. In a clothes washer, an imperforate tub, a substantially imperforate wash basket disposed within said tub and rotatable about a vertical axis, said basket including liquid overflow means adjacent the upper end thereof, an agitator disposed in said basket having a vertically extending center post and a downwardly and outwardly flared skirt on said post, said skirt being disposed adjacent to the bottom wall of said basket and covering a portion thereof, means supporting and driving said agitator with an oscillatory motion on the axis of said center post, thereby to wash clothes in said basket, an area of limited turbulence occurring under said agitator skirt during said oscillatory motion whereby insoluble soil particles collect thereunder, liquid discharge means in the bottom of said basket under the skirt of said agitator and displaced from the axis of said center post for discharging said soil particles out of said basket in a flow of liquid, a plurality of fins on the underside of said agitator skirt for creating a net circular movement of liquid under said skirt during the oscillatory motion of said agitator, thereby to sweep said soil particles over and into said discharge means, said fins protruding downwardly from said skirt, each said fin having a substantial part thereof disposed at an acute angle to a radius drawn thereto from the axis of said center post, said tub collecting the liquid discharged from said nozzle to allow said soil particles to settle out of said liquid, means for returning the relatively soil free liquid from said tub to said basket during the oscillation of said agitator, means for rotating said basket at a speed suitable for centrifugal extraction, and drain means for pumping the liquid out of said tub during the centrifugal extraction period whereby said soil particles are removed from said tub.

6. In a clothes washer, a wash basket, an agitator disposed in said basket having a center post and an outwardly flared skirt on said post, said skirt being disposed adjacent the bottom wall of said basket and covering a portion thereof, means supporting and driving said agitator with an oscillatory motion on the axis of said center post whereby to wash clothes in said basket, said oscillatory motion creating only limited turbulence under said agitator skirt whereby insoluble soil particles collect thereunder, at least one aperture in the bottom of said basket under said skirt and displaced from the axis of said center post for the escape of said particles from said basket, and a plurality of fins on the underside of said agitator skirt for creating a net circular flow of liquid under said skirt during the oscillatory motion of said agitator, thereby to sweep said soil particles over and into said aperture, said fins protruding downwardly from said skirt each said fin having a substantial part thereof disposed at an acute angle to a radius drawn thereto from the axis of said center post.

7. In a clothes washer, a wash basket, an agitator disposed in said basket having a vertically extending center post and a downwardly and outwardly flared skirt on said post, said skirt being disposed adjacent to the bottom wall of said basket and covering a portion thereof, means supporting and driving said agitator with an oscillatory motion on the axis of said center post thereby to wash clothes in said basket, said oscillatory motion creating only limited turbulence under said agitator skirt whereby insoluble soil particles collect thereunder, liquid discharge means in the bottom of said basket under the skirt of said agitator and displaced from said center post for discharging said soil particles out of said basket in a flow of liquid, at least one fin on the underside of said agitator skirt for creating a net circular movement of liquid under said skirt during the oscillatory motion of said agitator, thereby to sweep said soil particles over and into said discharge means, said fin protruding downwardly from said skirt and having a substantial part thereof disposed at an acute angle relative to a radius drawn thereto from the axis of said center post, a settling chamber for collecting the liquid discharged from said discharge means to allow said soil particles to settle out of said liquid, and means for returning the relatively soil free liquid to said basket.

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