

Sept. 8, 1959

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2,902,851

CLOTHES WASHING MACHINE HAVING A WOBBLE-TYPE AGITATOR

Filed Dec. 12, 1957

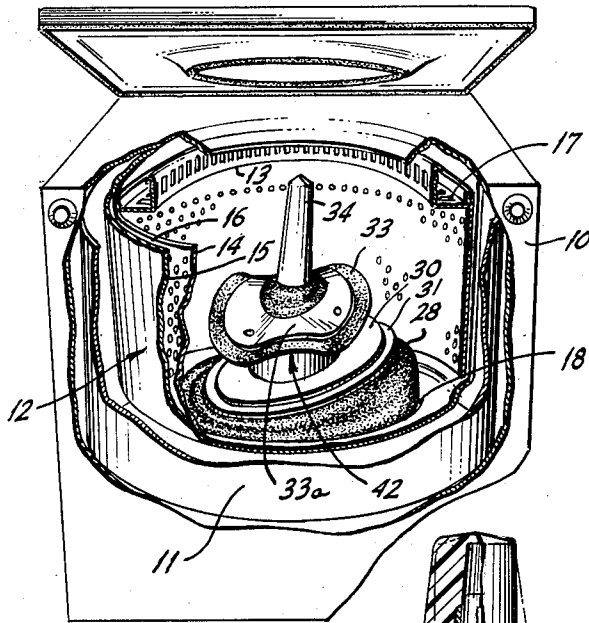


FIG. 1.

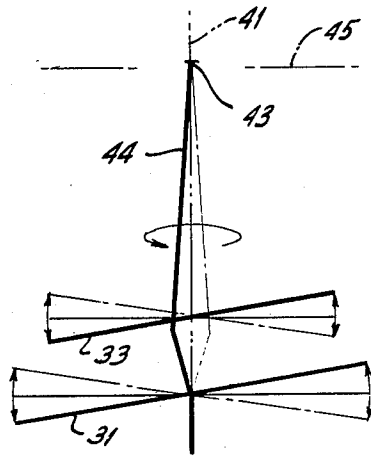


FIG. 3.

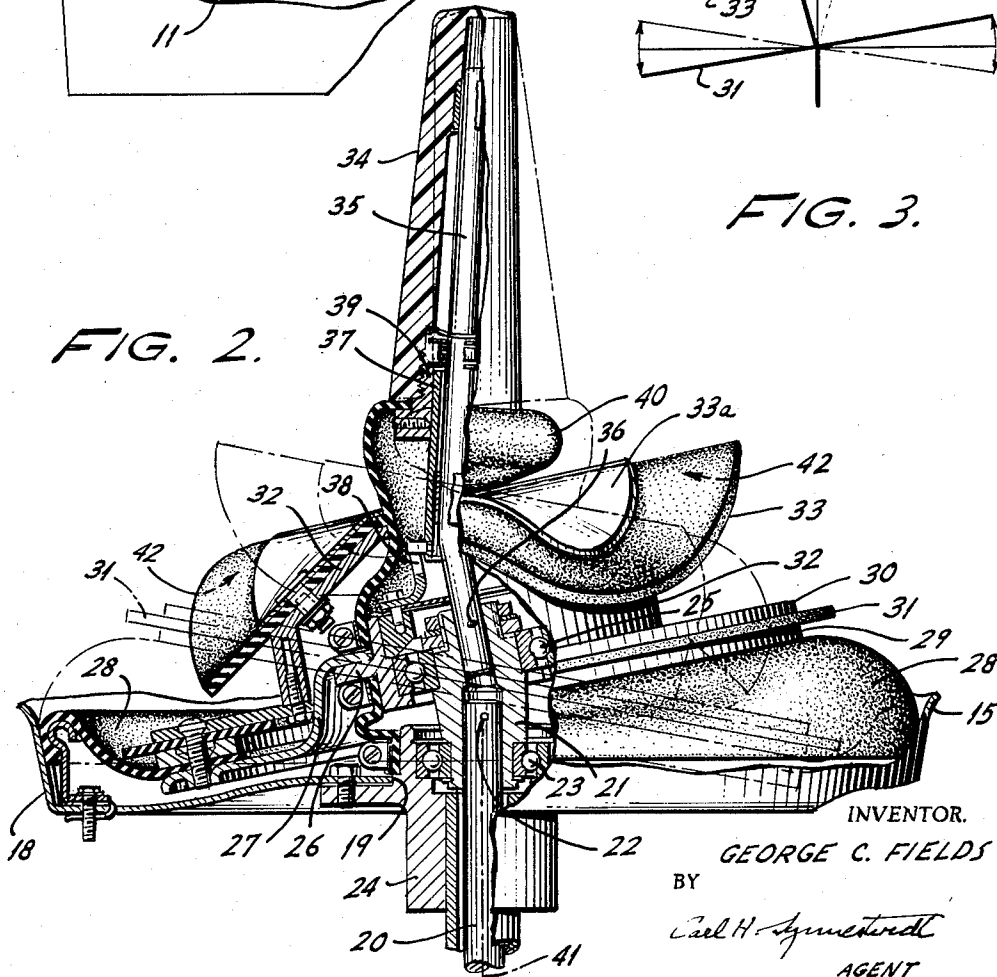


FIG. 2.

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1

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**CLOTHES WASHING MACHINE HAVING A
WOBBLE-TYPE AGITATOR**

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Application December 12, 1957, Serial No. 702,362

6 Claims. (Cl. 68—131)

This invention relates to domestic appliances and more particularly to improvements in wobble type washing machines.

In washing machines generally, it is necessary, in order to accomplish effective washing, to impart vigorous laundering movements to the clothes being washed, a requirement which may result, in the case of conventional wobble type washers, in covering of the agitator by the clothes being washed and consequent smothering of the washing action. In the case of wobble type machines, the washing action is accomplished by freely journalling an agitator of suitable configuration, on an obliquely disposed member, such as an inclined bearing, coupled to a rotatable drive shaft, the agitator being held in fixed, fluid-tight relation with the tub by a flexible interconnecting boot.

Continuous unidirectional rotation of the drive shaft, acting through this eccentric, imparts a tilting or wobbling motion to the agitator, producing circulation of the washing fluid and causing articles being washed to be brought into intimate contact with the turbulent streams of water generated by the moving members.

Washers of the above mentioned type offer a number of advantages over more conventional machines in that the need for a complex and expensive transmission is eliminated, making for a less expensive and more easily maintained unit. Moreover, this type of washing action results in uniform loading of the drive motor since the load does not vary cyclically, as in the more conventional type machines. However, notwithstanding the advantages potentially accruing through the use of such machines their use to date has been minimal.

One reason for this is that normal operation, as mentioned above, results in smothering of the agitator action by the articles being washed, this being brought about by envelopment or covering of the agitating means by the clothes, a condition which is particularly severe when washing articles of substantial size, such as shirts, towels, and the like. Moreover, once agitating action is suppressed, those clothes in direct contact with the agitator undergo excessive mechanical wear, often resulting in substantial damage to the articles being washed.

These enumerated deficiencies more than offset the advantages potentially attainable, and have minimized commercial acceptance of wobble type washing machines.

Accordingly, it is a general object of this invention to provide a wobble type washing machine having an improved agitator mechanism which eliminates the shortcomings of prior art devices.

Another and more particular object of the present invention is to provide mechanism for use in wobble type washers insuring adequate tumbling and mixing of the clothes load, and one which prevents smothering of the agitating action by the articles being washed.

It is a still further object of this invention to provide for improved agitating action wherein compacting, knotting, and entanglement of clothes during washing are substantially eliminated.

The above mentioned and other objects within con-

2

templation will be more readily understood by reference to the accompanying detailed description and drawings in which:

Figure 1 is a cut-away perspective view showing a wobble plate type washing machine embodying the present invention;

Figure 2 is a sectionalized elevation of the agitator mechanism shown in Figure 1; and

Figure 3 is a graphic representation of the agitator action.

Referring to the drawing, Figure 1 shows a wobble type washing machine including an outer casing or cabinet 10 housing a fixed tub 11, this latter member forming an enclosure for the dual walled rotatable cylinder or wash tub 12 which member is of cylindrical shape with inclined walls expanding to increased cross-sectional area at the top and having an inwardly extending peripheral wall portion 13 preventing escape of clothing over the top edge of the wash tub. The clothes cylinder 12 is comprised of a foraminous inner porcelain shell 14 backed by a spaced imperforate casing 15, the perforate shell 14 permitting sediment heavier than water to pass behind the clothes and through the space 16 between members. This arrangement permits sediment to drain from the top edge of the cylinder without redepositing on the articles during the extraction operation. The series of elongated slots 17 located around the inwardly extending wall portion 13 permit the incoming water to overflow the clothes cylinder and provide escape means for the extracted water.

Referring to Figure 2, the clothes cylinder 12 conveniently, although not necessarily, contains a depressed bottom portion 18 provided with a centrally disposed aperture 19 through which the drive shaft 20 extends. This shaft terminates in an obliquely mounted crank 21 to which it is rigidly secured in driving relation by pin 22. The crank 21 is rotatably journalled on the inner race of bearing 23 seated within drive hub 24 which member is securely mounted to the casing 15 as by the cap screws shown.

To provide the characteristic wobble action, a ball bearing 25 is interposed between the crank 21 and the agitator support 26, forming a mount for the entire agitator assembly. This arrangement, on rotation of shaft 20, produces oscillatory or gyrating rotation of the crank 21 which in turn imparts a progressive, substantially non-rotative seesaw or wobbling motion to the agitator assembly mounted on support 26.

Rigidly secured to this support by conventional means not shown, is the agitator base plate 27, this member being maintained in fluid tight relation with the casing 15, as by means of the interconnecting flexible diaphragm 28, which also serves to prevent relative rotation between tub and agitator. Sandwiched between spacer plate 29 and the retaining plate 30 is the flexible flipper 31, this entire subassembly being secured to the agitator base plate 27 for wobbling movement therewith. Mounted to the retaining plate 30 and completing the agitator assembly is the pedestal 32 which has clamped to its convoluted upper surface the flexible agitator disc 33. This disc may be pre-formed or may be simply a flat, flexible annulus which is made to conform to the configuration of the surface to which it is mounted by means of an appropriately shaped retaining cap 33a, the unique convoluted configuration of the disc functioning in a manner to be described.

To insure effective operation of the agitator assembly, it is necessary to provide means preventing smothering of the agitating action by the clothes being washed. This is desirably accomplished, as shown in the illustrated embodiment, by providing a generally vertically disposed, upwardly extending column 34, which physically prevents clothes from covering the agitator assembly. To prevent

interference with normal agitator action, it is necessary that the motion of this column be distinct from that of the agitator assembly, it being found that movement of a column rigidly mounted to the agitator tends to set up currents counter to that produced by the agitator assembly, the gyratory movements of such a column producing circulating currents lying in planes transverse the path of normal clothes circulation which currents act to nullify the main washing action materially impairing washing efficiency.

The unique arrangement shown in Figure 2, constituting a preferred embodiment of the present invention, provides a solution to the above problem and comprises effectively extending the drive shaft 20, by means of shaft 35, through a centrally located aperture in the agitator assembly, one end of the shaft 35 being seated within the crank 21 and rigidly secured thereto by pin 36.

To prevent knotting and entanglement of the wash clothes by the rotating shaft 35, a condition which interferes with effective washing, a casing or hollow column 34 is freely journaled on shaft 35, this being preferably accomplished by slipping a sleeve 37 over shaft 35, the lower end of the sleeve being retained within the collar 38, the arrangement forming a universal coupling rigidly secured to the agitator assembly. Fixedly positioned on the opposite end of the sleeve 37 is the externally threaded collar 39. Screwed to this collar and freely journaled on agitator shaft 35 for substantially frictionless engagement therewith is the column 34, the seal or boot 40 serving flexibly to anchor the column 34 in fluid tight relation to the agitator assembly and to prevent substantial rotation of its surface relative to the agitator, due to frictional drag of the rotating shaft 35.

The column 34 is preferably inclined to the vertical, in the manner illustrated, in order to minimize flexure of seal 40 during movement of the agitator and to provide for increasing gyration of the lower portions of the column 34 about the vertical axis 41 in order to urge clothes tending to accumulate in this zone into the main stream of circulating clothes.

The preferred arrangement is to bring the center of the top of column 34 into coincidence with the axis 41 about which the wash tub 12 rotates thereby eliminating, for all practical purposes, any perceptible wobbling of the upper portion of the column during rotation of shaft 35, and thereby preventing any stirring action from being set up by the upper portion of column 34 which would tend to nullify normal clothes circulation. The height of the column is chosen to prevent covering of the agitator by the clothes, effective performance under all condition of operation being insured by positioning the top of column 34 in a plane substantially coincident with the surface level of the wash water.

As stated above, operation of conventional wobble type washers inherently results in clothes entanglement, the substantially continuous, uniform washing action of the agitator serving to roll the clothes up into tightly compacted braids, an occurrence commonly referred to as "doughnutting." To overcome this particular difficulty the flipper 33 is corrugated so as to provide a series of pockets 42, the embodiment shown conveniently employing three such pockets, the specific configuration being merely illustrative of this aspect of the invention and in no way limitative thereof. This unique configuration serves to break up the continuous uniform washing action characteristic of conventional type washers producing a washing action comprised of a sequence of discrete spaced pulsations, the pockets 42 producing non-continuous, progressive localized disturbance of the wash water, effectively preventing roll up of the clothes. The amount of water displaced during each pulsation and the number of pulsations per cycle is readily varied by simply modifying the number and shape of the corrugations. This technique tends to confine the washing action to discrete zones providing effective clothes agitation while mate-

rially minimizing clothes entanglement. To augment clothes circulation, the rubber flipper 31 is provided, this member serving to urge the clothes and water disposed in the bottom of the tub up into the continuously circulating main stream of clothes and water.

Briefly reviewed, operation of the agitator is initiated by rotation of shaft 20. This shaft, acting through the crank 21 and shaft 35 causes portions of the agitator and column to execute, the movements (graphically shown in Figure 3) in rotary progression, the line representations shown in this figure being numbered in accordance with the members represented, with the exception of line 44 which represents the longitudinal axis of column 34. Extreme positions of the members are also shown in phantom in Figure 2. Each point of the agitator progressively undergoes an oscillating undulatory motion, while simultaneously and in predetermined synchronism therewith column 34, impelled by movement of shaft 35, gyrates about the nodal point 43, the point at which the longitudinal axis 44 of the column 34 intersects the principal axis of rotation 41, the axis of column 34 generating an imaginary cone having its apex at 43. This preferred arrangement permits the column and agitator to be individually driven by common drive means, a technique insuring proper correlative functioning. The height of column 34, relative to the level of the wash water is shown generally by line 45, this being its desired elevation for most effective operation.

Apparatus of the kind described above, has proven highly effective in achieving the advantages inherent in wobble type machines, while yet entirely eliminating the difficulty and disadvantages heretofore encountered. While the optimum construction of such a machine, and the manner in which its benefits may be achieved, will be well understood by the preceding description, a complete understanding of the invention facilitated by additional brief consideration of the pattern of circulatory movement defined by the clothes and washing liquid, and with particular respect to elimination of smothering of the agitator.

Although I do not wish to limit the invention by any particular theory of operation, it is in order to point out that the construction and relative arrangement of the agitator and column are preferably arranged to produce the following cyclic movements. Considering any vertical plane passing through the axis, defined generally by the shafts 20 and 35, it will be seen that maximum lateral excursion of the lower portions of column 34 (to one side of said axis) takes place when the wobble plate assembly achieves its lowermost position in substantially the same vertical plane and to the same side of the axis. The coordinated movements of the column and agitator assembly take place progressively, and the plane of reference is displaced angularly from the position originally considered, and in cyclic fashion. The result is that when the water and entrained clothes receive their maximum impulse in a downward direction, that is, when a given section of the agitator assembly reaches its lowermost position, the column has reached its maximum gyratory excursion in the same plane of reference urging clothes outwardly of the post and into the main circulating stream, thereby still further insuring effective washing, and eliminating smothering of the agitator action.

While a specific embodiment illustrative of the present invention has been depicted and described, modifications may be made therein without departing from the spirit and scope of the present invention. It will be understood, therefore, that such changes and modifications are contemplated as come within the scope of the appended claims.

I claim:

1. In a washing machine, the combination comprising: a clothes tub having an apertured bottom; a wobble type agitator mounted within said tub; columnar means articulately linked to said agitator and extending in a generally

vertical direction and preventing covering of said agitator by clothes being washed, said columnar means having an upper portion centered on the tub axis and lower portions disposed eccentrically thereto; and rotatable drive means extending through said aperture and adapted concurrently to produce distinct but cyclically related gyratory motion of said columnar means about said axis and wobbling movement of said agitator between planes transverse said axis.

2. In a washing machine, the combination comprising: a clothes receiving tub; a wobble type agitator mounted in said tub; flexible means sealing said agitator to said tub and preventing relative rotative movements therebetween; means including a drive shaft extending into said tub for imparting wobbling movements to said agitator; columnar means articulately connected to said agitator to accommodate individual and distinct movements of said agitator and columnar means; and means for imparting gyratory, substantially non-rotative movement to said columnar means in such manner that lower portions thereof describe an arc about said axis and an upper portion thereof lies substantially on said axis which movement is distinct from but cyclically related to the movement of said agitator means.

3. A combination in accordance with claim 2, and in which said columnar means has an elevation within said tub substantially equal to the normal level of wash water.

4. In a washing machine, a clothes-receiving tub, a wobble type agitator mounted within said tub, flexible sealing means connecting said agitator and tub in fluid tight relation, drive means for imparting wobbling movement to said agitator, columnar means extending from said agitator in a generally vertical direction and substantially preventing envelopment of said agitator by articles being washed, said columnar means being articulately linked to said agitator and mounted for substantially non-rotative gyratory movement distinct from but cyclically related to the wobbling movement of said agitator, and means for imparting such gyratory movement to said columnar means.

5. A washing machine, comprising: a clothes-receiving basket; drive means mounted concentrically with respect to said basket and having one end thereof extending into the lower portion of said basket, said end being provided with a crank portion inclined with respect to the vertical; agitator means journaled on said crank portion and fastened and sealed to said basket through the agency of a flexible member preventing rotative movement of said agitator relative to said basket while accommodating wobbling motion thereof relative to said basket, means for rotating said drive means to effect driving movement of said crank portion and consequent wobbling of said agitator; columnar means articulately linked to said agitator and extending upwardly therefrom in a direction generally coinciding with the axis of said tub; and means for imparting gyratory, substantially non-rotative movement to said upwardly extending means distinct from but cyclically related to the wobbling motion imparted to said agitator means.

6. In a washing machine, the combination comprising: a vertical axis clothes tub having an apertured bottom; a wobble type agitator mounted within said tub; columnar means associated with said agitator, extending thereabove, and preventing covering of said agitator by clothes being washed; and rotatable drive means extending through said aperture and adapted concurrently to produce gyratory motion of said columnar means about a nodal point lying on said axis and adjacent upper end portions of said columnar means, and wobbling movement of said agitator about said axis.

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