June 2, 1964 M. E. ANDERSON 3,135,429

GRANULAR DETERGENT DISPENSER

Filed Nov. 7, 1960 2 Sheets-Sheet 1

FIG. 1

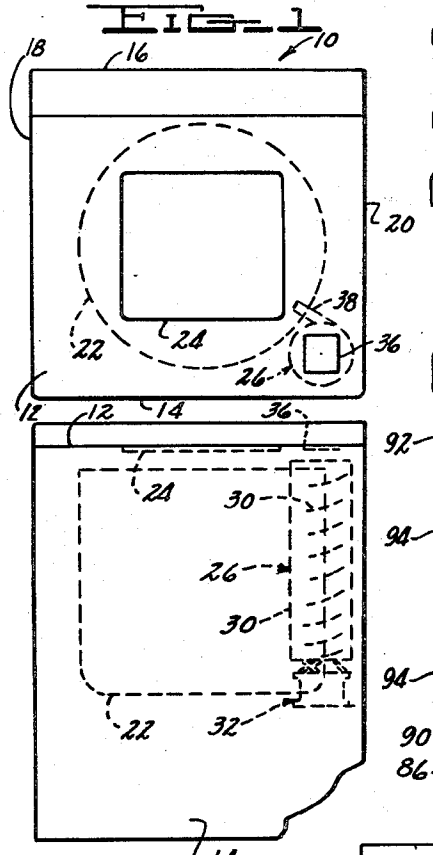


FIG. 2

FIG. 3

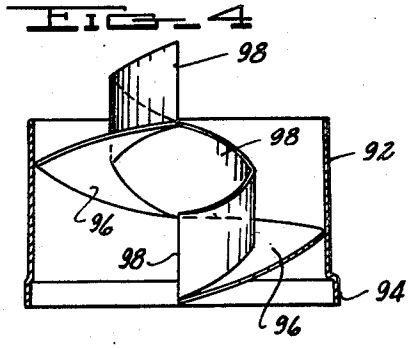


FIG. 4

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June 2, 1964 M. E. ANDERSON 3,135,429

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Filed Nov. 7, 1960 2 Sheets-Sheet 2

FIG. 6

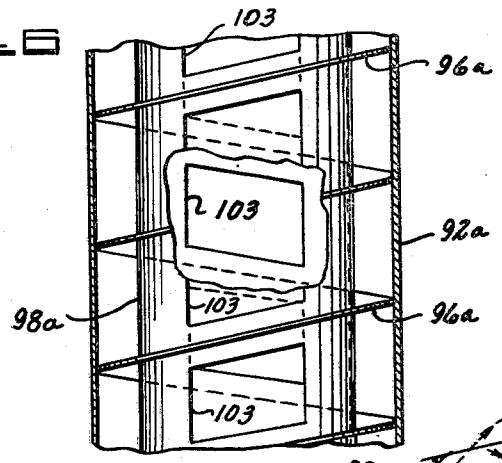


FIG. 7

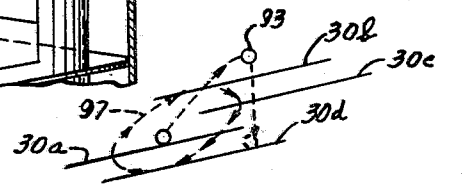


FIG. 5

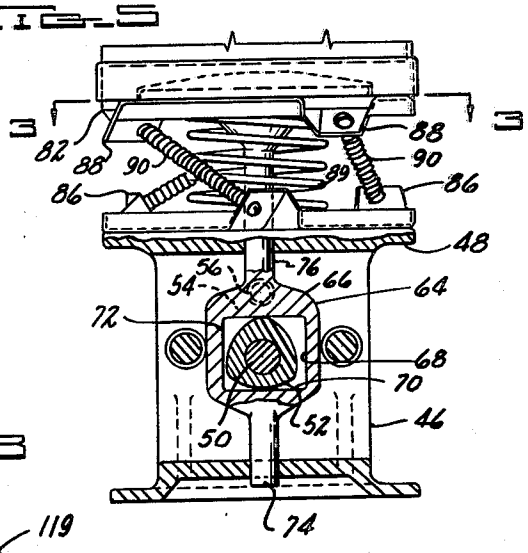
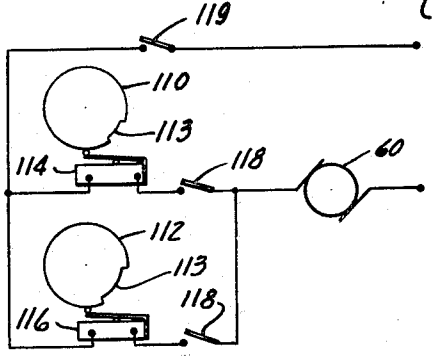


FIG. 8



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GRANULAR DETERGENT DISPENSER

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3 Claims. (Cl. 222—161)

This invention relates to granular material dispensers, as for example dispensers for discharging granular detergent in domestic automatic clothes washing machines. Within the broader aspects of the invention the dispensers of this invention can be utilized for dispensing various different granular materials. This application is a continuation-inpart of copending application, Serial No. 739,824 filed June 4, 1958, now abandoned.

In the automatic dispensing of granular detergents within washing machines, under conventional practice some difficulties have been encountered due to the fact that the discharged granules tend to clog the conventional apparatus so as to form accumulations on the dispenser casing surfaces and seriously limit the service life of the dispenser.

One object of the present invention is to provide a granular material dispenser so designed as to have a lessened tendency to clog the dispenser parts.

Another object is to provide a dispenser which can be operated to discharge accurately regulated quantities of granular materials.

A further object is to provide a granular material dispenser having a relatively long service life.

A further object of the invention is to provide an automatic washing machine with a novel detergent dispenser construction and arrangement.

An additional object is to provide a washing machine with a novel detergent dispenser arrangement having a relatively large detergent capacity.

Another object of the invention is to provide a dispenser which has a vibratory action for conveying the granular material upwardly on an inclined ramp, the dispenser construction being characterized in that vibrations of the dispenser parts are isolated from the washing machine parts so as to minimize noise.

An additional object of the invention is to provide a granular material dispenser which can be manufactured at relatively low cost, thereby permitting it to be utilized in domestic clothes washing machines without materially adding to the cost of the machine.

A still further object of the invention is to provide a washing machine and detergent dispenser wherein the housewife can very easily load the dispenser at periodic intervals.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

In the drawings:

FIG. 1 is a top plan view of a washing machine having a dispenser of the present invention installed therein,

FIG. 2 is a front elevational view of the FIG. 1 mechanism,

FIG. 3 is an enlarged elevational view of the FIG. 1 dispenser, with parts thereof shown in section of illustrative purposes,

FIG. 4 is a sectional view of a component utilized in the FIG. 3 dispenser,

FIG. 5 is a sectional view on line 5—5 in FIG. 4,

FIG. 6 is a fragmentary view illustrating the construction of a dispenser container which can be employed as an alternate to the container shown in FIG. 3,

FIG. 7 is a diagrammatic illustration of a path of motion which can be utilized to operate the FIG. 3 dispenser, and

FIG. 8 is a diagram of an electric circuit which can be employed to program the FIG. 3 dispenser.

Before explaining the present invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practised or carried out in various ways. Also, it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

Referring to the drawings, and particularly FIGS. 1 and 2, there is shown therein a clothes washing machine **10** having a top wall **12**, front wall **14**, back wall **16**, and two sidewalls **18** and **20**. Centrally disposed within the washing machine casings is a conventional tub **22** adapted to receive the wash load through an opening normally closed by hinged closure **24**.

In the corner defined by walls **14** and **20** there is disposed a granular detergent dispenser **26**, which comprises an upright tubular container **28** having a spiral ramp **30** disposed therein. In the dispensing periods the container and ramp are oscillated by a subjacent power means **32** to cause the granular detergent particles to advance upwardly on the ramp and thence into the washing machine tube **22**.

The dispenser container **28** is disposed immediately beneath an access opening in the machine top wall **12** which is normally closed by a hinged closure **36**. By this arrangement the housewise can easily load the dispenser at periodic intervals merely by opening the access closure **36** and pouring the granular material into container **28**.

The illustrated dispenser is preferably programmed automatically to dispense various preselected quantities of detergent into the washing machine tub in accordance with the character of the wash load. Various electrical control circuits and devies can be utilized to provide for the automatic programming of the dispenser. The main components of one suitable type of control circuit are diagrammatically shown in FIG. 8. In general the control may be set for operation by manual actuation of various push button switches at the beginning of the wash cycle. With the illustrated arrangement each of the push button switches is in a circuit which is controlled by a timer-driven cam so that the circuit becomes energized at a predetermined time and for a predetermined time period. The various push button circuits are connected in parallel to a motor which forms part of the power means **32** so that the power means can be operated for predetermined time periods to cause a dispensing of various predetermined amounts of detergent from container **28**. As shown in FIG. 1, the container is provided with a discharge spout **38** for discharging the detergent granules into the washing machine tub **22**.

Refrring now to FIGS. 3 and 5, the dispenser con-

struction there shown comprises a fixed base 40 having a foot section 42, two parallel upstanding walls 44 and 46, and a generally horizontal top wall 48. Rotatably disposed between walls 44 and 46 is a shaft 50 having a cam 52 rigidly secured thereon, as by means of a set-screw (not shown). As best shown in FIG. 3, the cam is defined with the gear-forming extension 54, the teeth of which mesh with the teeth of the pinion gear 56 carried on the shaft 58 of an electrically-energized drive unit 60. Within the broader aspects of the invention the speed of shaft 58 may be set at various different values; however best operation appears to result when the shaft speed is set below 800 r.p.m. It will be understood that by the provision of unit 60 and gear 56, the cam 52 is driven at a predetermined rotary speed.

Encircling the cam 52 is a cam follower 64 having the four internal surfaces 66, 68, 70 and 72 formed thereon. The illustrated cam is a three lobed cam, with all of the lobes spaced the same distance from the axis of the mounting shaft 50 so that each rotation of shaft 50 is effective to move the cam follower 64 through three complete reciprocations.

The space between faces 66 and 70 is substantially the same as the diametrical distance across the cam so that the cam follower is prevented from leaving the cam surface at any time during cam rotation, even when the cam drive unit is set to operate the cam at relatively high speeds. The cam-follower contact is further maintained by means of a compression spring 89.

The spacing between follower surfaces 68 and 72 is somewhat greater than the diametrical distance across the cam for the purpose of permitting the follower to enjoy a bodily twisting or rotary motion around the vertical axis defined by the two shaft portions 74 and 76. This vertical twisting or rotary motion is of advantage in effecting a desired movement of the granule particles within dispenser container 28 as will be explained hereinafter. The shaft portions 74 and 76 of course serve to guide the cam follower and container 28 in their vertical movements.

The dispenser container 28 is in the FIG. 3 embodiment formed to include a bottom wall 78 suitably secured to the afore-mentioned follower 64, as by means of the rivets 80 and wall-carried bracket 82. Fixedly disposed on the top wall 48 of base 40 is a second bracket 84 having three upstanding lugs or tabs 86 formed integrally therewith. As shown in FIG. 5 the superjacent bracket 82 is formed with three tabs 88 which are offset circumferentially with respect to the tabs 86. Circumferentially extending links 90 in the form of wire coils are trained between adjacent ones of tabs 86 and 88 so as to take positions at about forty-five degree angles with respect to the horizontal. The links 90, although in appearance are similar to coil springs, are not springs and do not stretch along their longitudinal axes. If desired the wire coil type links could be replaced by rigid bars since the links 90 do not extend and retract during operation of dispenser. The advantage in using wire coil constructions for members 90 is that I thus avoid expensive connections between members 90 and the brackets 82 and 84. Thus, in the FIG. 3 embodiment the members 90 can be connected with the bracket tabs by merely extending screws through the tabs and into locking engagement with end portions of the wire coils. During operation of the dispenser the wire coil links are free to arc or bend slightly in longitudinal directions (but without stretching axially).

The manner of formation of the dispenser container 28 may be varied, but as shown in FIG. 3 the container may be formed by a series of identical stacked-together subassemblies 92, a representative one of which is shown in FIG. 4. Each sub assembly comprises a tubular outer side wall 92 having an enlarged cylindrical lower end portion 94, a spiral-like ramp wall 96, and an inner arcuate upstanding wall 98 extending upwardly from wall 96. Each ramp wall 96 spirals around within the tubular wall 92 for a circumferential distance of three hundred sixty degrees, and each upstanding wall 98 is co-extensive in length with the corresponding ramp wall so that when the various sub-assemblies 92 are stacked on one another there is formed a continuous spiral ramp 30 and a continuous upstanding rim (at 98) along the ramp inner edge. Each wall 98 is of lesser vertical extent than the vertical distance between the various ramp walls 96 so that a free space 103 is formed above each ramp wall 98. By this arrangement the ramps are continuously supplied with granular material irrespective of the extent of filling of container 28.

It will be understood that in the manufacture of the FIG. 3 container the various sub-assemblies 92 may be stacked on one another to any desired extent so as to provide a container 28 of desired height and capacity for a particular installation. The containers must of course be orientated with respect to one another so that the ramp sections align together in the desired manner to thus form a continuous ramp surface. Each of the sub-assemblies 92 can be formed economically as a single plastic molding to reduce construction costs. The various sub-assemblies can be secured together by various means, as for example vertical tie rods, clamps, clips, or the like.

The upper end of container 28 may be equipped with a discharge spout 38, which in the illustrated embodiment takes the form of an arcuate wall 100 conforming to the shape of wall 92 and having a spout-forming extension 102 formed thereon. As shown in FIG. 3, the spout-forming extension is provided with a bottom wall 104 which extends through an opening suitably formed in the upper one of walls 92 and underneath the upper terminus of ramp 30. Bands 107 can be used to economically mount the spout-forming member onto the dispenser container.

By the described arrangement the spout may receive the granular material and convey same into the washing machine tub. In the illustrated embodiment the discharge spout feeds directly to the washing machine tub, although it will be understood that the spout could feed into a funnel or the like, with wash water being pumped into the funnel to mix with the granules prior to their introduction into the tub. In such case the funnel would be provided with a tube for feeding the detergent solution into the tub.

It will be noted the upper end of container 28 is provided with a central opening within walls 98 which registers with the opening normally closed by closure 36. By this arrangement the housewife may load the dispenser with granular detergent through the central opening so as to fill container 28, either fully or partially. During the filling operation the granular material overflows from the central column at 98 out through the openings 103 onto ramp walls 96 so that the entire container volume may be supplied with granular material.

Preferably the speed of oscillation of the unit is such as to provide a very rapid discharge of granular material from container 28, and thus the operation of the dispenser is not materially affected by partial loading of container 28. Thus, if the dispenser is partially loaded with granules the dispenser drive unit 60 may be operated from a manual switch on the washing machine casing for a short length of time, as for example one minute, to bring the granules up to the discharge spout 38. When the upper portions of the ramp are coated with granules the dispenser may be operated automatically by the washing machine since the design of the dispenser is such that granules are conveyed from the container bottom to the container top.

During operation of the dispenser, unit 60 is energized to drive cam 52 with a rotary motion around the axis of shaft 50. As the cam proceeds through its rotary path the various lobes thereon engage surface 66 of the follower 64 so that the follower is driven upwardly. By this motion the container 28 is given an upward component of motion as well as a rotary component of motion. In this connection, as the cam follower 64 is driven up-

wardly the links **90** are required to change their angular positions with respect to the horizontal. Thus, as the bracket **82** is powered upwardly its point of connection with each link **90** travels upwardly, but because the link arms are of a fixed length the connection point must rotate to a certain extent in order to maintain a fixed distance between the various tabs **86** and **88**. The action is such as to give the container **28** a combined vertical and rotary motion.

As the cam lobe moves downwardly away from follower surface **66** another one of the cam lobes moves into engagement with cam follower surface **70** so that the cam follower is drawn downwardly by cam action. During this downward movement the links **90** return to their original positions so that the container **28** is rotated in a reverse direction back to its initial position. Thus it will be seen that during cam rotation the container **28** is given an oscillation, both vertically and rotationally.

The vertical-rotational oscillation of container **28** causes the granular particles on ramp **96** to be advanced upwardly along the ramp **30**, the action being best visualized by reference to schematic FIG. 7. In FIG. 7 the various positions of the ramp are indicated by the four numerals **30***a*, **30***b*, **30***c*, and **30***d*, and the direction of oscillation of the ramp by numeral **97**. As the ramp is moved from position **30***a* to position **30***b* an illustrative granule **93** is bumped upwardly off of the ramp surface so that when the ramp moves downwardly toward the position **30***d* a different portion thereof will register with the granule. As the granule then drops onto the ramp surface it is displaced forwardly relative to its initial position. In this manner the oscillating movement of the ramp causes the granules to be advanced upwardly along the ramp surfaces.

Referring again to FIG. 3 when the granules are initially loaded into the dispenser the lower portion of the dispenser will of course be completely filled with granules. The upper portion may or may not be completely filled. As the dispenser is operated the upper ramp sections will tend to have a predetermined maximum amount of granules disposed thereon due to the action of spaces **103** (above the various walls **98**). In this connection, excess material from the ramp **30** tends to be driven or fall into the central space within walls **98** so as to be precluded from being discharged from spout **38**. Thus, the openings **103** serve two functions, namely as openings for distributing the granules onto portions of the ramps during the loading operation, and as overflow devices for limiting the quantities of granules discharged through the spout **38**. The exact quantity of granules discharged in each cycle is of course determined by the length of time of energization of unit **60**. With respect to the quantity of granules being dispensed it will be noted that the quantity is substantially uneffected by the amount of material at any one time contained within container **28** since the openings **103** set an upper limit on the amount of material which can be discharged per unit time.

FIGS. 3 and 4 show one way in which the dispenser container can be formed. Another manner of forming the container is shown in illustrative FIG. 6. As there shown, the dispenser container can be formed by an outer tube **92***a*, an inner tube **98***a*, and an inclined ramp **96***a*. In this case the inner tube and outer tube may be formed separately from one another, and the spiral ramp **96***a* formed integrally with one or the other of the tubes or separately therefrom. The various components can be suitably secured to one another after their formation.

As will be seen from FIG. 6 the previously discussed overflow-charging openings need not be formed as a continuous opening **103**. Thus, the overflow-charging function can be provided by a series of separate individual openings **103***a*. They function in the same manner as the space **103** previously described. The FIG. 6 container construction can be powered by the same devices as are shown in FIG. 3.

Control or programming of the dispenser may be affected by any suitable control circuitry. However, as shown in illustrative FIG. 8 the control may include two timer-driven cams **110** and **112** having different length operational surfaces **113** thereon registering with the trip arms of separate electrical switches **114** and **116**. These switches may be connected in parallel with one another and in series with manual push-button switches **118** suitably mounted on the console portion of the washing machine. These switches are suitably connected to the dispenser motor unit **60** so that when the machine is started by actuation of a switch **119** a selected one of the timer-driven cams will cause the dispenser motor to be operated at a predetermined time and to remain in operation for a predetermined length of time (depending on which of the electric switches **114** or **116** is energized). The length of operation of motor **60** determines the amount of material dispensed into the washing machine tub.

From the above description it will be seen that the illustrated mechanisms are operative to accomplish the objects previous set forth. It will be understood that various modifications and rearrangements could be resorted to without departing from the spirit of the invention as set forth in the appended claims.

I claim:

1. A vibratory dispenser for storing, conveying and metering granular material comprising a base; a vessel for storing granular material mounted on the base for vertical and pivotal movement; an upwardly inclined spiral ramp within the vessel to carry granular material stored therein; drive means to impart vertical and pivotal movement to the vessel comprising a cam follower secured to the vessel and pivotally mounted in the base; a power driven multi-lobe cam separately mounted and operatively engaged with the follower to drive the follower vertically while permitting limiting pivoting of the follower and vessel; said cam follower having a pair of cam engaging surfaces; one of said cam engaging surfaces being positioned above the cam and the other of said cam engaging surfaces being positioned below the cam; each of said cam engaging surface being in contact with the cam at all times whereby to prevent cam chatter; said cam lobes alternately engaging the upper cam engaging surface and the lower cam engaging surface to drive the cam follower and attached vessel alternately upwardly and downwardly; and connecting means between the base and vessel causing pivoting of the vessel upon vertical movement thereof; said vertical and pivotal movement of the vessel sequentially moving the ramp in a diagonally upward and forward direction and a diagonally downward and rearward direction whereby granular material carried on the ramp will be conveyed upwardly on the ramp towards the upper end of the vessel; and an outlet opening in the upper end of the vessel adjacent the upper end of the ramp to dispense granular material from the vessel.

2. A vibratory dispenser for storing, conveying and metering granular material comprising a base; a vessel for storing granular material mounted on the base for vertical and pivotal movement; an upwardly inclined spiral ramp within the vessel to carry granular material stored therein; drive means to impart vertical and pivotal movement to the vessel comprising a cam follower secured to the vessel and pivotally mounted in the base; a power driven cam separately mounted and operatively engaged with the follower to drive the follower vertically while permitting limited pivoting of the follower and vessel; resilient means interposed between the base and the vessel for resiliently supporting the vessel; and connecting means between the base and vessel causing pivoting of the vessel upon vertical movement thereof; said vertical and pivotal movement of the vessel sequentially moving the ramp in a diagonally upward and forward direction and a diagonally downward and rearward direction

whereby granular material carried on the ramp will be conveyed upwardly on the ramp towards the upper end of the vessel; and an outlet opening in the upper end of the vessel adjacent the upper end of the ramp to dispense granular material from the vessel.

3. A device as claimed in claim 2 and further characterized in that said connecting means comprises a series of links extending between the base and vessel at angles to the horizontal; said links being pivotally connected to the base and to the vessel and being relatively rigid in the direction of their longitudinal axes.

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