May 27, 1952 A. R. CONSTANTINE 2,598,227

INJECTOR FOR POWDERED MATERIALS

Filed March 12, 1948 6 Sheets-Sheet 1

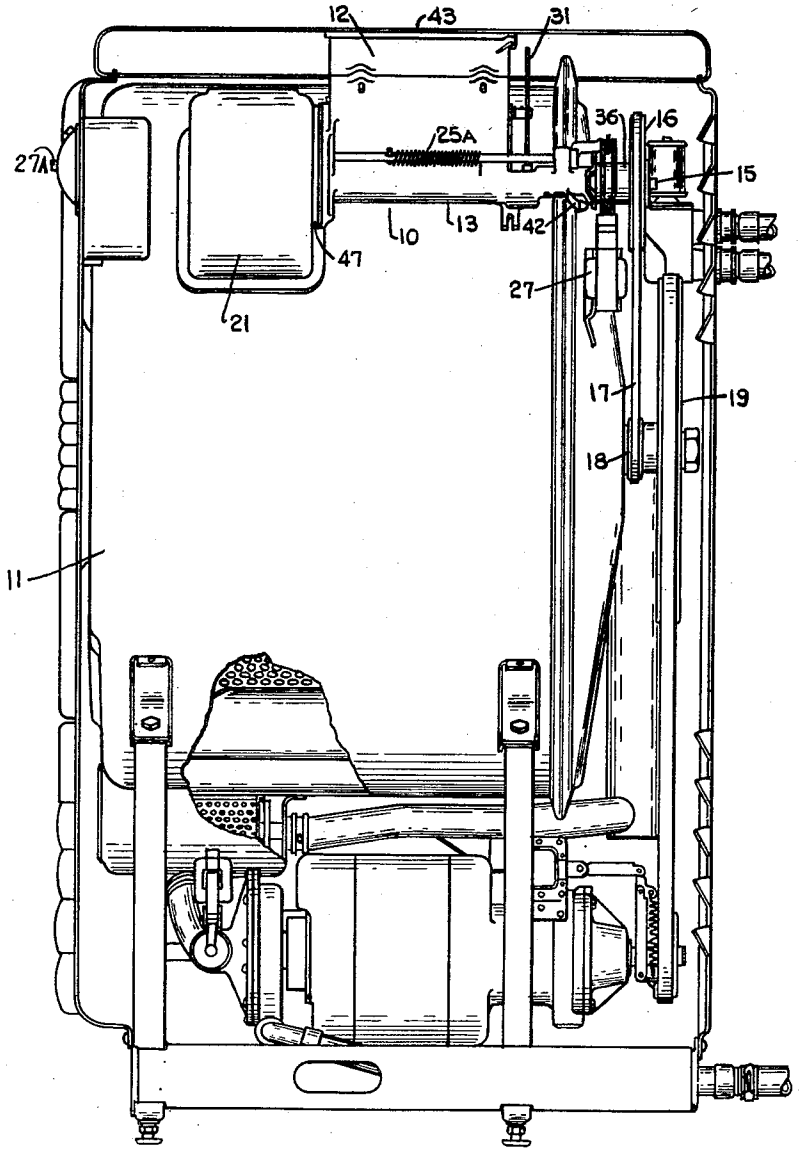



Fig. 1.

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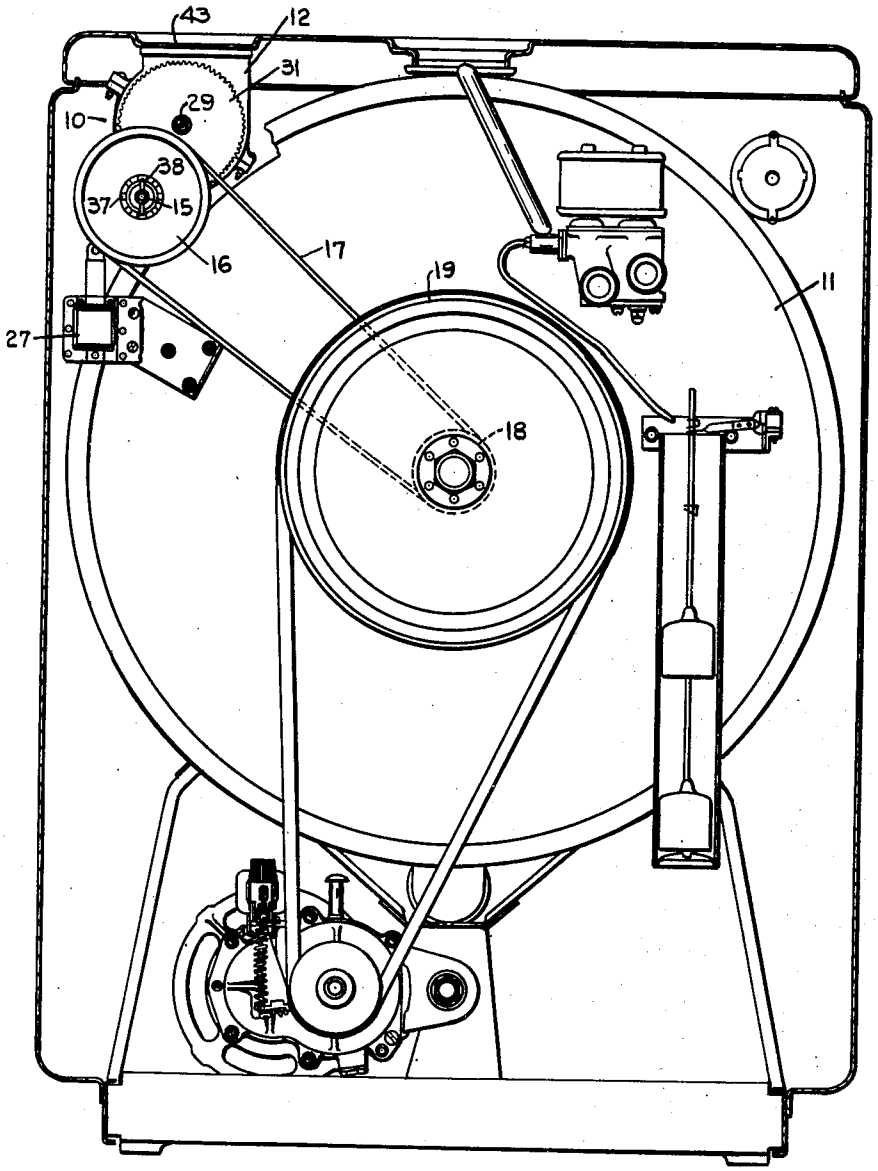



Fig. 2.

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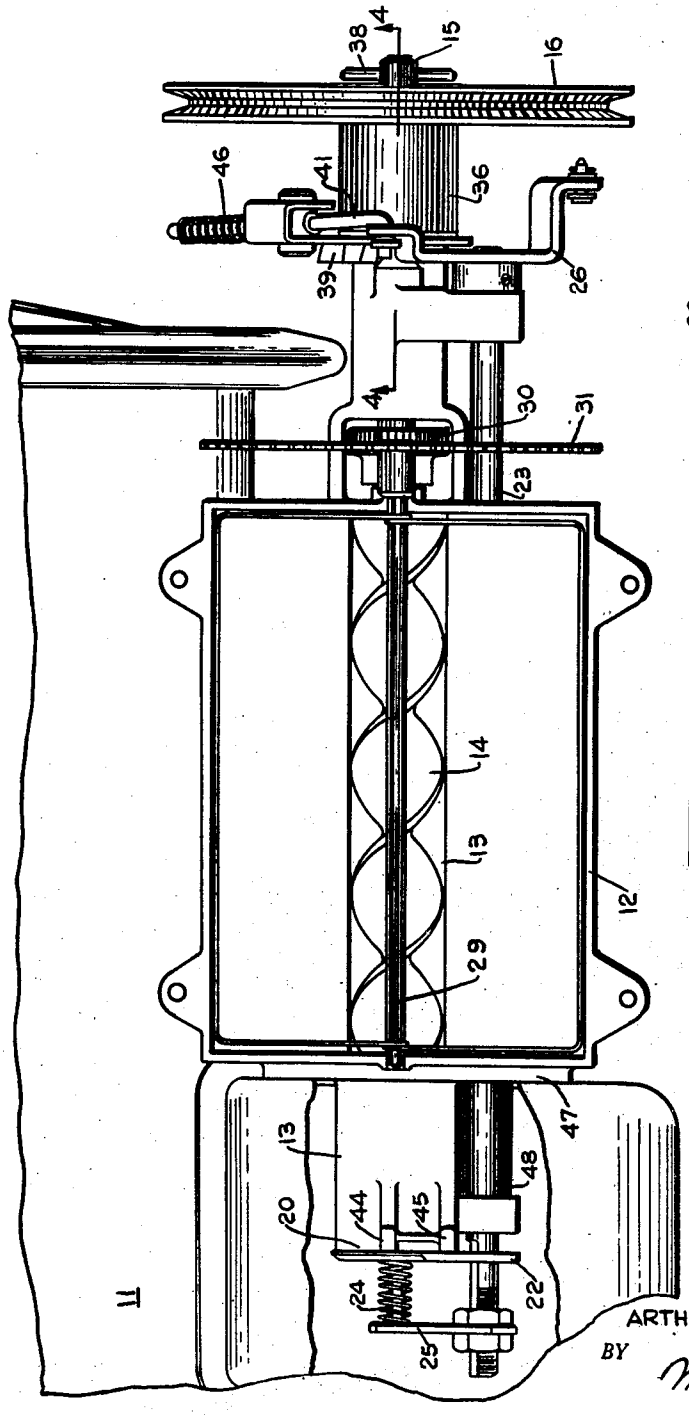



Fig. 3.

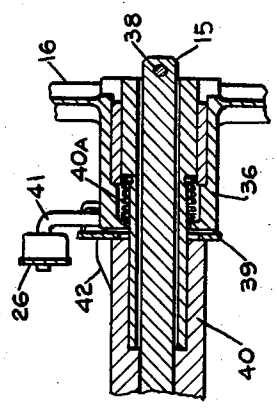



Fig. 4.

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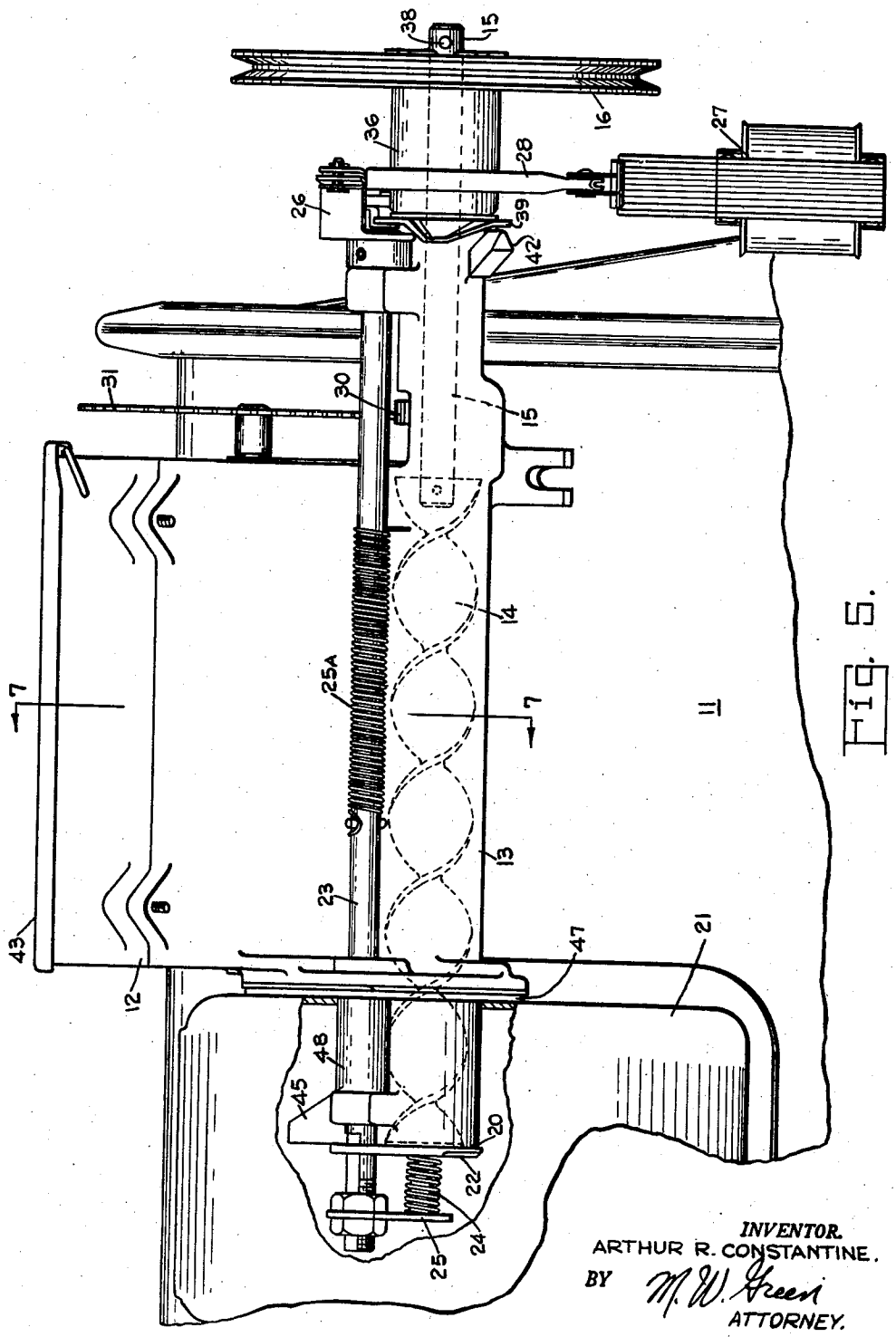



Fig. 5.

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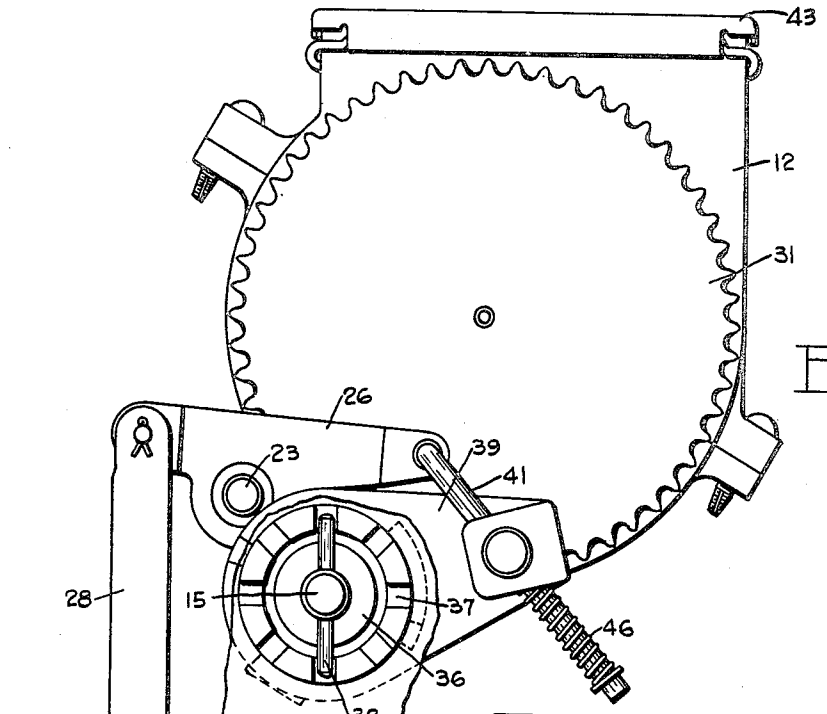



Fig. 6.

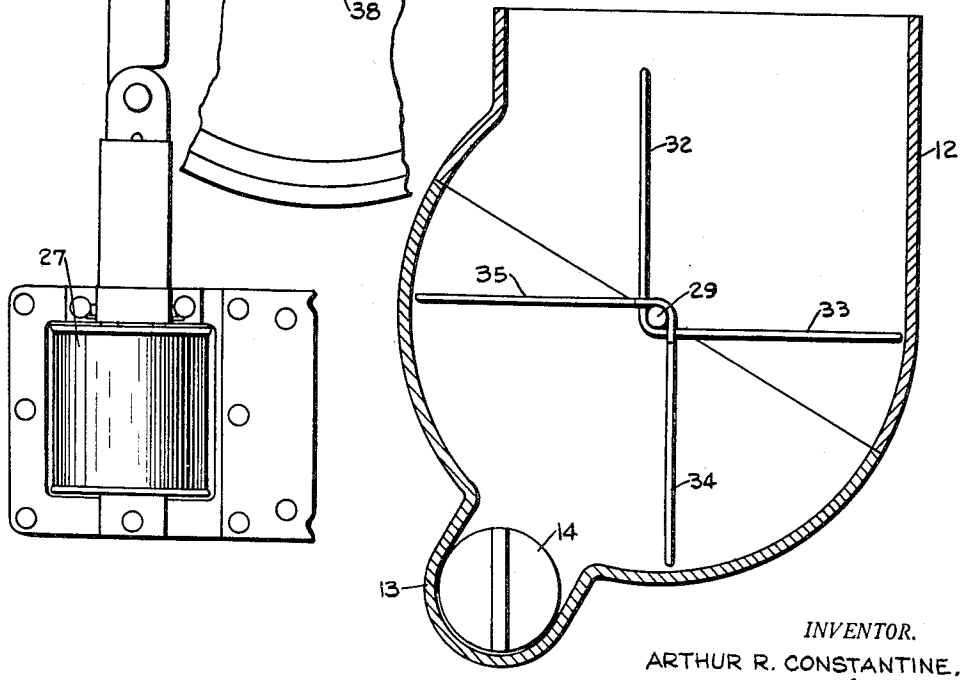



Fig. 7.

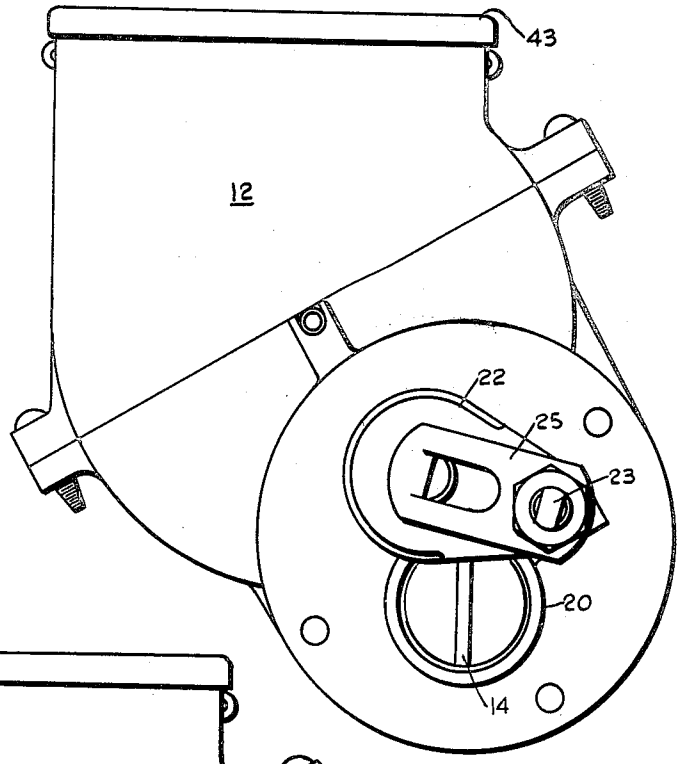
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INJECTOR FOR POWDERED MATERIALS

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Fig. 8.



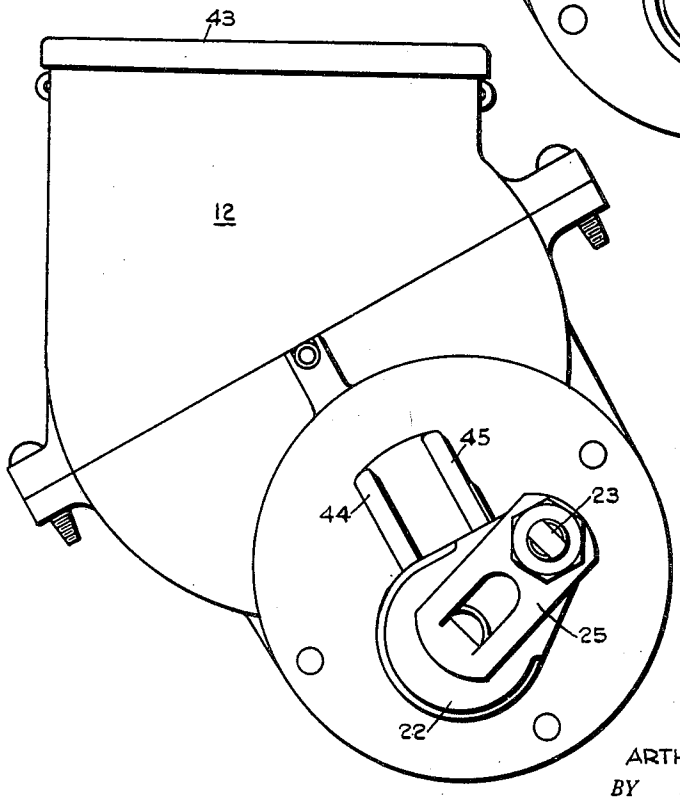




Fig. 9.

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Patented May 27, 1952

2,598,227

# UNITED STATES PATENT OFFICE

2,598,227

## INJECTOR FOR POWDERED MATERIALS

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Application March 12, 1948, Serial No. 14,492

3 Claims. (Cl. 222—413)

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This invention relates to injecting or dispensing devices for powdered or similar material. The mechanism discussed and described herein has been particularly designed for injecting detergent materials such as soap or other similar material into the water and clothes containing drum or tub of a textile washing machine.

In order to accomplish the purpose of injecting a fixed measured quantity of material in a given time into a washing machine tub it is important that a fixed amount of material be carried from a supply hopper to the ejecting end of the mechanism. Furthermore, as the outlet or ejecting end of the unit must necessarily be in communication with the water containing tub it is necessary that the end be closed as soon as material has stopped as otherwise moisture would cause the material to become caked and would in all probability prevent subsequent operation, particularly if the next operation would be at a much later time. It is also important that the hopper containing material be so arranged that a uniform feed of material can be assured into the ejecting mechanism. Experiments with granular, flake and powdered material of the type used in washing machines led to the definite conclusion that there was a problem to be solved as such material had a tendency to form openings or cavities preventing satisfactory feed of the material unless agitation of the material in the hopper was provided. It is also necessary, if a definite measured quantity of material is to be handled in a given time, that the electrical mechanism for placing the ejector in operation shall be positive and can be accomplished without undue complications or delay by merely closing an electrical circuit to the ejector mechanism.

It is therefore the primary object of the invention to provide an injecting device with a positive closure at its outlet combined with positive agitation in the supply hopper.

It is a further object to provide an ejecting mechanism and a drive capable of actuation by an electrically operated solenoid or other suitable means providing positive starting and stopping of the injection at a measured time.

The above and other objects of the invention will appear more fully in the following description and by reference to the accompanying drawings forming a part hereof and wherein:

Figure 1 is a side view of a washing machine partially in section with the detergent injector mechanism mounted thereon.

Figure 2 is the rear view of the washing machine and detergent injector assembly shown in Figure 1.

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Figure 3 is a top view partially in section showing the general arrangement of the injector mechanism including the outlet, the drive pulley, and actuating mechanism.

Figure 4 is a section on the line 4—4 of Figure 3 showing the central portions of the clutch mechanism for starting the injector in operation.

Figure 5 is a side view of the injector mechanism showing a side view of the assembly as is shown in Figure 3.

Figure 6 is an end view of the injector assembly and shows the actuating solenoid and certain portions of the drive mechanism including the gear for the agitator and solenoid actuator.

Figure 7 is a cross section through the supply hopper showing the agitator mounted therein and is a section taken substantially on the line 7—7 of Figure 5.

Figure 8 is an end view showing the outlet of the injector with cut-off blade in the position it would occupy when powdered material is being ejected from the mechanism.

Figure 9 is a view similar to Figure 8 except in this case the outlet is closed by the cut-off blade to prevent moisture from entering the outlet end of the injector.

Referring to the drawings, an injector assembly 10 is shown in Figures 1 and 2 mounted on the outer wall of a tub 11, which tub forms a part of a washing machine of the automatic horizontal axis type. As shown particularly in Figures 3 and 4 a detergent or powdered material containing hopper 12 is so formed at the bottom portion thereof to provide a cylindrical housing 13 for a rotatable feed screw 14, the housing 13 having an open side for communication with hopper 12. The feed screw 14 is secured to and rotated by a shaft 15 from a pulley 16, the pulley 16 being rotated in turn by a belt 17 from a pulley 18 which is concentric with and which is secured to rotate with the washer main driving pulley 19 (Fig. 2).

As shown in Figures 3 and 5, an outlet end 20 of the feed screw housing 13 projects into a housing assembly 21 which opens into the tub 11. In order to close the outlet end 20 of the feed screw housing 13, a cut-off blade 22 is provided. The cut-off blade 22 is secured to and swings with a shaft 23 in a plane perpendicular to the axis of the feed screw 14 and the cut-off blade 22 is normally held firmly against the outlet end 20 of the feed screw housing 13 by the action of a spring 24 which presses against the cut-off blade 22 and which is supported by a bracket 25 also attached to the shaft 23. Such action of the cut-off blade shears off material which may adhere

to the edge of outlet 20 leaving a surface parallel to the blade surface to provide a satisfactory seal. As can be seen from inspection of Figure 3, the shaft 23 is normally urged in a direction to close the cut-off blade 22 over the outlet 20 by the action of a return spring 25A. However, the end of shaft 23 opposite the end to which the cut-off blade 22 is secured is provided with a lever 26 shown in Figure 6 which is connected to the armature of solenoid 27 by means of a solenoid link 28. Actuation of the solenoid 27 by closing of switch 27A will move the lever 26, thereby rotating the shaft 23 and attached cut-off blade 22 to open the otlet end 20 of the feed screw housing 13 as shown in Figure 9. If, for any reason, the current to the solenoid 27 is cut off, the return spring 25A rotates the shaft 23 back to its original position to again close the cut-off blade 22 over the outlet 20 as shown in Figure 8, any excess powdered material being sheared off by the shearing action of cut-off blade 22 on the end of outlet 20 leaving a parallel surface for closure by blade 22.

As shown in Figures 3, 4 and 5 the pulley 16 wnich provides the driving means for the feed screw 14 through the shaft 15 also provides power for rotating an agitator shaft 29 through a small gear 30 carried on the shaft 15 and a large gear 31 secured to the end of the agitator shaft 29. The shaft 29 is mounted inside the hopper 12 and above and parallel to the feed screw 14, and as shown in Figure 7, forms an axis for a plurality of wires 32, 33, 34 and 35 which extend radially from the shaft 29 along the sides of the hopper 12 and which are bent to extend across the width of the hopper 12 and parallel to the feed screw 14, thereby forming agitators for the detergent contained in the hopper 12, the wires swinging close to the feed screw 14 in order that the detergent will be continually kept in a loose condition enabling it to fall into the feed screw 14. This type of mechanism for agitation, although relatively simple in its final arrangement, was found to be very important in connection with the operation of the device as agitation adjacent the feed screw was necessary to insure proper feeding of the material.

As shown in Figure 6 the end of a hub 36 of the pulley 16 is provided with a multiplicity of slots 37 which are designed to receive a pin 38 mounted in a transverse hole based in the end of the shaft 15. As is apparent from inspection of Figures 3, 4, and 5, the pulley 16 will rotate the feed screw 14 and agitator shaft 29 only when the hub 36 of the pulley 16 is pushed up against the pin 38 to enable the pin 38 to fit into one of the slots 37 in the hub 36. Pushing of the hub 36 is accomplished by means of a cam 39 which is positioned between a housing 40 of the feed screw shaft 15 and hub 36. The cam 39 is attached to the lever 26 by means of a connecting rod 41 in such a manner that actuation of the solenoid 27 will rotate the cam 39 on the housing 40. The cam 39 is so formed that when rotated by the lever 26 it will push the hub 36 and the pulley 16 toward the pin 38, thereby causing the pin 38 to fit into one of the slots 37 in the hub 36. A projection 42 on the housing 40 prevents the cam 39 from moving in the opposite direction toward the hopper 12 and acts as a member against which cam 39 reacts. A spring 40A shown in Figure 4 normally urges hub 36 toward the left as viewed in Figure 4.

The top of the hopper 12 is provided with an opening 43 through which the hopper 12 may be



filled with powdered detergent. Assuming that the hopper 12 has been filled, the soap injector will not operate unless the solenoid 27 has been actuated. Upon the actuation of the solenoid 27 by closing of a suitable electrical circuit the solenoid link 28 moves the lever 26 to rotate the shaft 23, thereby causing the attached cut-off blade 22 to move in a clockwise direction as viewed in Figures 8 and 9 to the open position shown in Figure 8. Two guide members 44 and 45 provide a surface upon which the cut-off blade 22 slides and is supported.

Simultaneous with the opening of the cut-off blade 22 there is engagement of the pin 38 with one of the notches 37 in the pulley 36 to cause shaft 15 to rotate with the continuously rotating pulley 16 and hub 36. This is accomplished, as previously described, by means of the lever 26, which, upon actuation of the solenoid 27, moves the cam 39 in a direction to force the hub 36 towards the pin 38. In order to afford resiliency to the connection 41 between the lever 26 and the cam 39, a spring 46 is provided which surrounds the connecting rod 41.

Rotation of the shaft 15 causes the rotation of the agitators 32, 33, 34, and 35 through the gears 30 and 31 and also causes the rotation of the feed screw 14. The rotating feed screw 14 acts to propel the powdered detergent out the outlet end 20 of the feed screw housing, the cut-off blade 22 being open at all times when the feed screw 14 is rotating. Continuous rotation of the agitators 32, 33, 34, and 35 assures that the powdered detergent contained in the hopper 12 will be kept in a loose condition enabling it to fall into the feed screw 14 to replace the powdered material extruded through the outlet end 20 of the feed screw housing 13. After extrusion the powdered detergent falls into the housing assembly 21 which is in communication with the interior of the tub 11 in that water in the tub is permitted to splash into the housing assembly 21 enabling any detergent which might otherwise adhere to the walls of the housing assembly 21 to be washed away. However, this arrangement makes it necessary to seal any openings in the housing 21 in order that water will not escape either outside the injector or come in contact with the powdered detergent contained in the hopper 12. This is accomplished by means of a seal 47 which is provided at the point where the feed screw housing projects into the housing assembly 21 and by the rubber seal or boot 48 which surrounds a portion of the shaft 23 where it projects inside the housing assembly 21.

When sufficient detergent has been added to the water in the tub 11, the operation of the injector is stopped by cutting off the current supply to the solenoid 27 such as by opening switch 27A. When the solenoid 27 is no longer actuated, the lever 26 no longer holds the cam 39 against the hub 36. The spring 40A urges the cam 39 in a direction away from the hub 36, thereby permitting the pin 38 on the shaft 15 to disengage from the slots 37 on the hub 36. Since the hub 36 and pulley 16 are then no longer driving the shaft 15, it is apparent that the attached feed screw 14 and the agitators 32, 33, 34 and 35 will also cease to rotate. Likewise the cut-off blade 22 is returned to the closed position shown in Figure 9 by the action of the return spring 25A and the outlet end 20 is closed, the cut-off blade 22 having sheared off powdered material thereby assuring parallel contact and sealing of the outlet by the cut-off blade.

Although the invention has been described by reference to a specific structure found practical in actual operation it is nevertheless intended that various modifications may be made within the scope of the following claims.

I claim:

1. In an injecting mechanism of the character described, a housing, a feed screw for carrying material in said housing to an outlet positioned at one end thereof said outlet being concentric with the axis of rotation of said feed screw, an agitating member in said housing, a cut off blade slidable in a plane to cover and uncover said outlet of said housing and to move in shearing contact with said outlet, electro-magnetic means operable to cause actuation of said agitating member and to cause rotation of said feed screw, and connections cooperating with said electro-magnetic means to slide said blade to open said outlet at the start of said agitator and feed screw rotation and to slide said blade to close said outlet at the termination of said agitator and said fed screw rotation.

2. In a detergent material injecting device of the character described, a rotatable feed screw, a housing for said feed screw, an agitating member above said feed screw, an outlet at one end of said housing, drive means for said feed screw and said agitating member, a cut off and a sealing blade for said outlet moveable in a plane substantially perpendicular to the axis of rotation of said feed screw, and means cooperating with said drive means operable to actuate said blade on starting and stopping of said drive means thereby to shear off excess powdered material and to provide a positive closure of said outlet and of said housing by said blade.



3. In an injecting mechanism, a hopper for storing material, an agitating member in said hopper, a feed screw housing below said hopper having an open side thereof in communication with said hopper, a feed screw in said housing, driving mechanism for rotating said feed screw, electro-magnetic means operable to cause actuation of said driving means, said feed screw housing having an outlet portion thereof extending from said hopper and being concentric with the axis of rotation of said feed screw, sealing means adjacent said outlet operable to provide an opening of said outlet on the start of rotation of said feed screw and a closing of said outlet on stopping of rotation of said feed screw, and mechanism cooperating with said electro-magnetic means to cause actuation of said sealing means.

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