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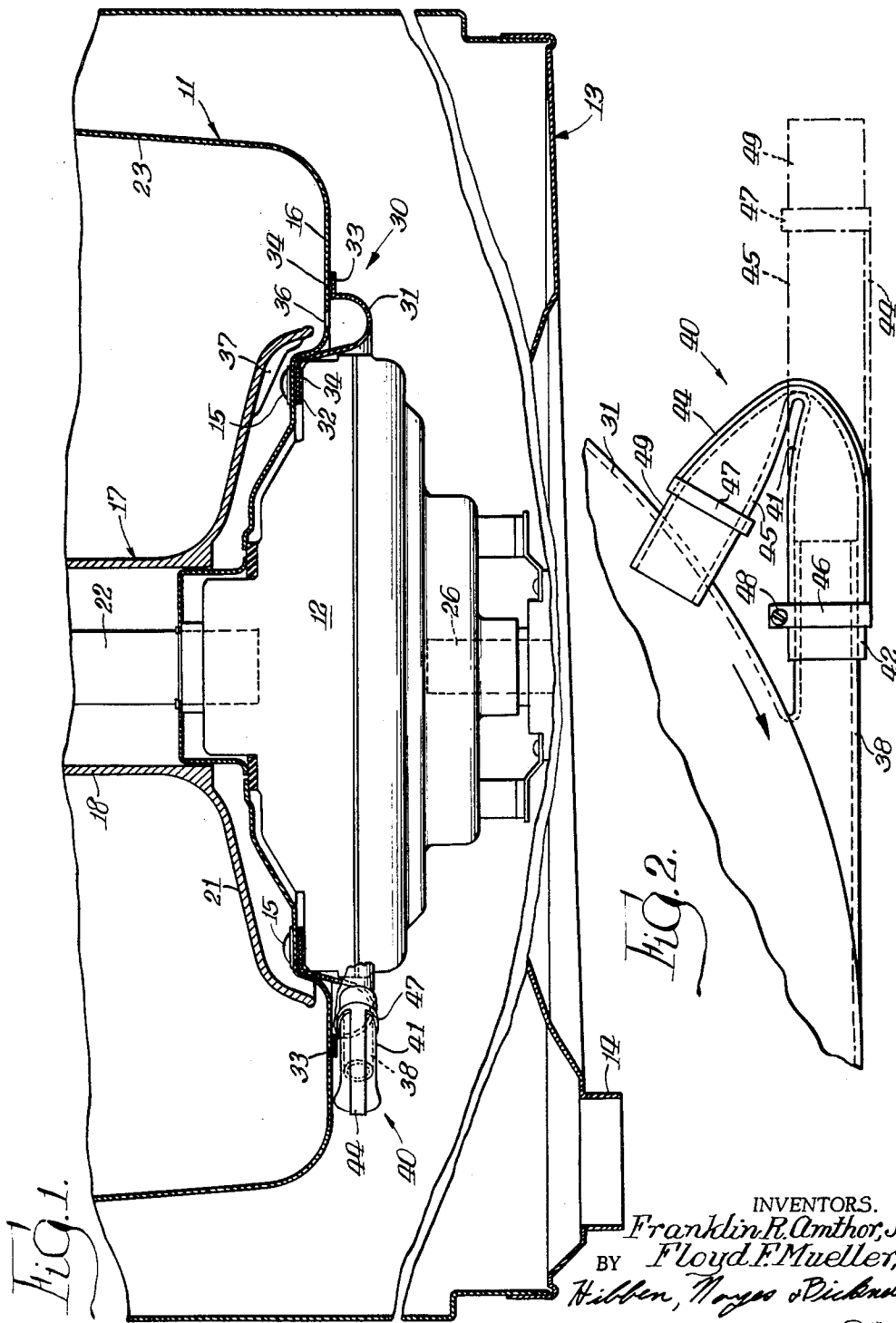
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SOIL REMOVER FOR A WASHING MACHINE

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2 Sheets-Sheet 1



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2 Sheets-Sheet 2

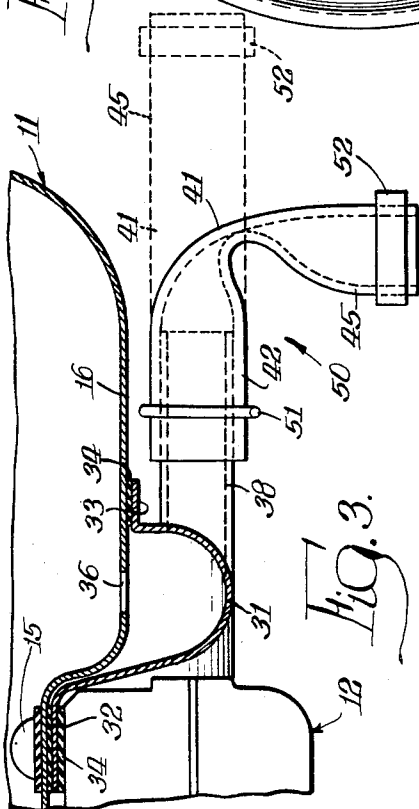
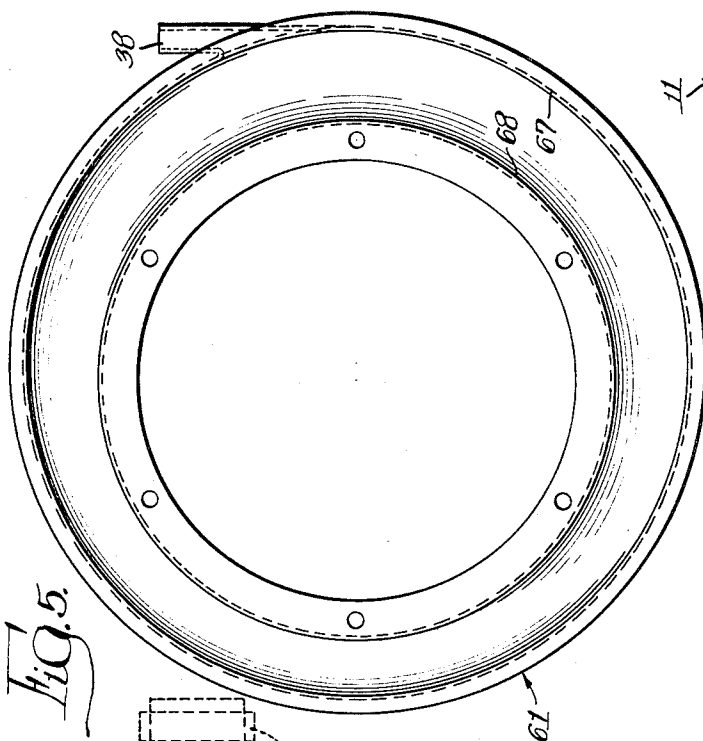
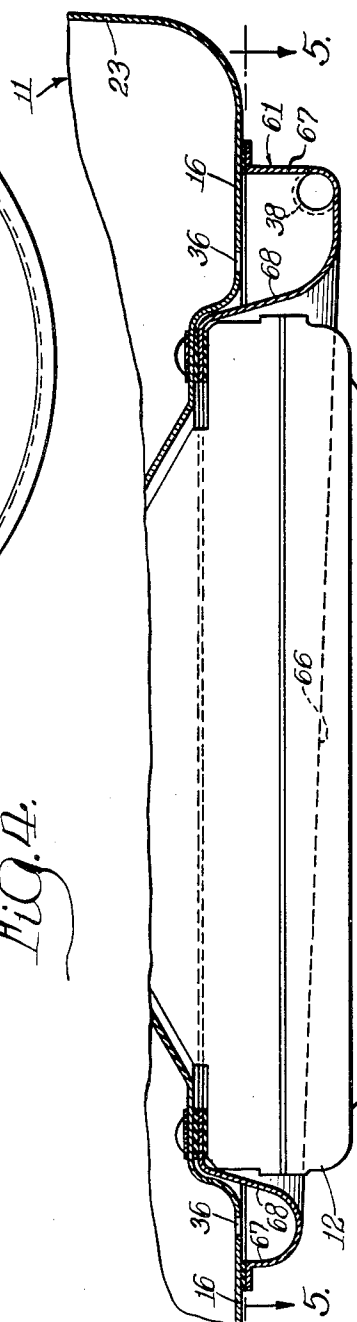


Fig. 4.



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SOIL REMOVER FOR A WASHING MACHINE

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9 Claims. (Cl. 68—23)

This invention relates to washing machines, and more particularly to a soil or sediment remover for a washing machine.

The general object of the present invention is to provide a novel sediment remover for a washing machine having a spin cycle, which assures ejection of heavy sediment or soil particles from the tub of the machine during the spin cycle.

Another object is to provide a sediment remover of the foregoing character which employs a novel speed responsive valve means for controlling the operation thereof.

A more particular object is to provide a novel sediment remover for use in a washing machine having a spin cycle, wherein the combined forces of gravity, inertia and suction are utilized to initiate and augment ejection of heavy sediment particles from the tub during the spin cycle.

Other objects and advantages will be apparent from the following description and accompanying sheets of drawings, in which:

FIG. 1 is a fragmentary vertical sectional view, with some parts in elevation, of a portion of an automatic washing machine employing a sediment remover embodying the features of the present invention;

FIG. 2 is a fragmentary bottom plan view of the valve portion of the sediment remover illustrated in FIG. 1;

FIG. 3 is a fragmentary vertical sectional view of an alternate valve construction for the sediment remover illustrated in FIG. 1;

FIG. 4 is a fragmentary vertical sectional view showing an alternate construction of a portion of the soil remover; and

FIG. 5 is a sectional view taken along the line 5—5 of FIG. 4.

Briefly described, the present invention contemplates a novel soil or sediment remover for use in a washing machine such as an automatic washer having a tub and which employs a spin cycle for removing wash and rinse water from the tub. The present sediment remover is mounted on the bottom wall of the tub and comprises an annular trough underlying a plurality of annularly arranged openings in the bottom wall of the tub, through which heavy sediment and soil particles pass during the washing operation where they are retained until the washer begins a spin cycle.

The trough is provided with an outlet and a novel speed responsive or centrifugal valve means is provided for closing the outlet during the washing operation and for opening the outlet when the tub reaches a predetermined speed of rotation during a spin cycle. As will be described in detail hereinafter, two constructions of the speed responsive valve means are contemplated, each of which comprises a flexible tubular member secured at one end to the trough outlet, and means for holding the tubular member in a bent or crimped position to thus normally close the outlet. Such means, which in one instance comprises a spring and in another instance comprises a weight, are responsive to the speed of rotation of the tub to permit or cause the tubular member to straighten out when the tub reaches a predetermined speed of rotation. Heavy sediment is thus positively ejected from the trough for discharge through the outlet and tubular member.

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A modified construction of the trough is also contemplated, which contributes to complete scavenging thereof during a spin cycle. In this form of the invention, the bottom wall of the trough is sloped toward the outlet and the annular outer wall of the trough is eccentric with respect to the axis of rotation of the tub, with the trough outlet located at the point of greatest radial spacing from the axis of rotation of the tub. Sediment particles in the trough are thereby urged toward the outlet due to both gravitational and centrifugal forces.

In FIG. 1 of the drawings, a portion of an automatic washing machine is illustrated, which in this instance is shown as comprising an inner tub 11 mounted on a transmission 12, and an outer tub or tank 13 having an outlet 14 in its bottom wall and enclosing the tub 11. The tub 11 is shown as being secured to the transmission 12 by a ring of bolts 15 extending through the bottom wall, indicated at 16, of the tub. An agitator 17 having a vertically extending tubular portion 18 and a skirt 21 is mounted in the tub 11 and connected to a post 22 extending centrally upwardly from the upper end of the transmission 12.

The tub 11 has a generally cylindrical sidewall 23 which tapers outwardly from the bottom wall 16 toward its upper end, and a plurality of openings (not shown) are provided around the upper end of the tub 11 to permit wash and rinse water to be centrifuged out of the tub during the various spin cycles for discharge through the tank outlet 14.

The transmission 12 may be of the type that is adapted to receive power from a reversible motor (not shown). The transmission 12, when driven in one direction by the motor, is effective to hold the tub 11 stationary and cause the agitator 17 to oscillate, and when driven in the opposite direction is effective to rotate the tub 11 at a speed sufficient to discharge liquid from the tub and effect drying of the clothes. Preferably, the tub is rotated at a low speed spin intermediate the washing and rinsing cycles, and at a high speed spin for final drying.

With the foregoing construction, during a normal washing operation, heavy soil or sediment particles, such as sand, string, and the like, gravitate toward the bottom wall 16 of the tub 11 and, because of their weight, may not be removed from the tub during the centrifuging operation. With a soil remover embodying the features of the invention, such heavy sediment and soil particles are eliminated from the tub 11 and collected during a washing operation, and are positively ejected during the centrifuging or spin cycle.

Thus, as illustrated in FIG. 1, the soil remover of the invention is indicated generally at 30 and is mounted on the underside of the bottom wall 16. The soil remover 30 comprises sediment collecting means in the form of an annular trough 31 having an inwardly extending flange 32 around its inner periphery and an outwardly extending flange 33 around its outer periphery. The flange 32 extends between the bottom wall 16 of the tub and the transmission 12 and is clamped therebetween by the bolts 15 which secure the tub 11 to the transmission 12. Suitable gaskets 34 are of course interposed between the flange 32 and transmission 12, and between the flange 32 and underside of the bottom wall 16. The outer flange 33 is held against the bottom of the tub by the stiffness of the trough 31.

In order to permit dislodged sediment or soil particles to gravitate into the trough 31, the bottom wall 16 is provided with a ring of openings 36 over the center of the trough 31. The openings 36, in this instance, are disposed beyond the outer periphery of the skirt 21 of the agitator so that heavy sediment particles gravitating downwardly and outwardly across of the upper surface of the skirt will be deposited in the vicinity of the openings

36 for the movement into the trough 31. Dislodged sediment or soil particles deposited on the bottom wall 16 are directed into the openings 36 by currents in the wash water due to the action of the agitator 17.

To prevent accumulation of sediment under the agitator and to assist in directing sediment to the openings 36, the under surface of the agitator skirt 21 may be provided with vanes or fins 37. In the present instance, three circumferentially spaced fins 37 are provided, only one of which is shown in FIG. 1.

To dispose of the sediment collected in the trough 31, the soil remover 30 includes an outlet in the form of a pipe 38 which extends tangentially from the trough 31 and in a direction opposite to the direction of rotation of the tub 11, during the spin cycle as indicated in FIG. 2. The disposition of the pipe 38 outwardly of the outer wall of the trough 31 causes sediment to shift toward and into the pipe 38 for ejection therefrom.

Opening and closing of the pipe 38 is controlled by a novel speed responsive or centrifugal valve means 40. Thus, as shown in FIG. 2, the valve means 40 comprises a flexible tubular member 41 in the form of a length of hose, secured at one end 42 to pipe 38. Means in the form of a spring 44 is provided for normally maintaining the outer portion, indicated at 45, of the hose 41 in a bent or crimped position, as illustrated in full lines in FIGS. 1 and 2, to thereby close the pipe 38. The spring 44 may be of any desired type, but in the drawing is shown as an elongated flat band or leaf having integrally formed collars 46 and 47 at each end thereof for connecting the spring to the hose 41. The spring 44 is initially formed with a set to maintain the hose 41 bent against its natural resiliency. The inner collar 46 is provided with screw 48 for securing the spring 44 to the hose and for maintaining the hose 41 connected to the outlet pipe 38. The hose 41 is preferably made of Neoprene or plastic material such as Delrin, Nylon or Teflon so as to withstand temperature and frequent flexing.

The spring 44 is sufficiently strong so as to maintain the outlet pipe 38 crimped or bent and hence closed throughout the washing cycle of the machine. However, the spring 44 will yield under the centrifugal force of the bent portion 45 of the hose to permit the hose to straighten when the tub 11 reaches a predetermined speed of rotation. Thus, as the tub 11 begins to spin, the hose begins to straighten until, at a predetermined rotational speed such as about 40 to 80 r.p.m. less than the low speed spin and about 260 r.p.m. less than the high speed spin, the portion 45 of the hose becomes substantially aligned with the outlet pipe 38.

Such position is indicated in dotted lines in FIG. 2. The hose 41 is thus completely unobstructed and a rapid flow of water is obtained therethrough which carries the trapped sediment and soil particles out of the trough 31 and pipe 38 and into the tank 13 for discharge through the outlet 14.

As previously noted, the outlet pipe 38 and hence the hose 41 extend in a tangential direction opposite to that of the direction of rotation of the tub 11. The foregoing relationship of the pipe 38 and hose 41 is advantageous to complete flushing of the trough 31 in that a suction force is developed at the outer end of the hose due to the aspirating effect of the air stream moving past the straightened remote open end of the hose when the tub 11 is rotating at high speed. The combination of the centrifugal and suction forces thus results in a rapid and complete flushing of the trough 31 and any sediment trapped therein.

In FIG. 3 an alternate speed responsive or centrifugal valve means 50 is illustrated for effecting opening of the trough outlet pipe 38 when the tub 11 reaches a predetermined speed of rotation. The valve means 50 is like the valve means 40 in that it comprises a flexible tubular member 41 in the form of a length of hose se-

cured at its inner end 42 by a clamp ring 51 to the trough outlet pipe 38. The valve means 50 differs from valve means 40 in the manner in which the outer portion 45 of the hose 41 is maintained in a bent or crimped position before centrifuging.

Thus, instead of a spring, the valve means 50 includes a weight in the form of a collar 52 secured to the remote outer end of the portion 45 of the hose so as to cause the latter to be bent downwardly to the full line position illustrated in FIG. 3 and thus close the outlet pipe 38. The weight of the collar 52 is also such that, when the tub 11 is in a spin cycle, the centrifugal force acting on the collar will cause it to move to its dotted line position, thereby straightening the hose 41 and opening the outlet pipe 38. Water and heavy sediment will thus be ejected through the hose 41 in the manner of the valve means 40. The suction force at the open end of the hose 41 also assists in ejection of sediment in the same manner as in the valve means 40.

It will thus be appreciated that by utilizing a speed responsive valve means, such as the valve means 40 or 50, in conjunction with the sediment collecting trough 31 for controlling the opening of the tangential outlet pipe 38 thereof, an efficient and positive system is obtained for assuring rapid scavenging of the trough and any sediment or soil particles therein.

While the flow of liquid in the trough 31 when the outlet pipe 38 is open may be sufficient to carry away all sediment collected in the trough, it may be desirable to so form the trough that complete evacuation of the trough 31 of all sediment or soil particles is assured. To this end, a modified trough construction 61, illustrated in FIGS. 4 and 5, may be employed. The trough 61 is similar to the trough 31 in that it is annular in form and is secured to the tub in the same manner as the trough 31.

The trough 61 differs from the trough 31 in that its bottom wall 66 slopes downwardly toward the outlet pipe 38 in the manner illustrated in FIG. 4. Such an arrangement will cause heavy sediment or soil particles entering the trough through the various openings 36 in the tub 11 to gravitate toward the outlet pipe 38 and remain in the vicinity of the outlet for ejection from the trough when the outlet is opened. The sloping bottom wall 66 thus contributes to the overall efficiency of the soil remover.

To further contribute to a complete scavenging of the trough 61, the latter also employs an eccentric arrangement of its outer wall 67 with respect to its inner wall 68 and the axis of rotation of the trough. Thus, as will be apparent from FIG. 5, the outlet pipe 38 is located in the outer wall 67 so that the point in the trough which opens into the outlet pipe 38 is radially farther from the axis of rotation of the tub 11 than any other point in the trough 61. Such form of trough further contributes to movement of sediment or soil particles toward the outlet pipe 38 due to the increased centrifugal force acting on the liquid in the trough and the particles therein.

It will be understood that either the valve means 40 or the valve means 50 may be used with either the trough 31 or the trough 61, and that a trough employing either a sloping bottom wall 66 or eccentric sidewall 67 or both, as in the case of the trough 61, could be utilized with either valve means.

We claim:

1. In a washing machine including a rotatable tub having a bottom wall and an opening therein, a sediment remover comprising collecting means disposed below the bottom wall of said tub with a portion thereof underlying said opening, said collecting means having an outlet for discharging sediment therefrom, a flexible tubular member extending from said outlet, and means for holding said tubular member in a bent position and preventing fluid flow therethrough, said holding means being effective to permit said tubular member to straighten when said tub reaches a predetermined speed of rotation whereby accumulated sediment from said collecting

means will be ejected through said outlet and said tubular member.

2. A sediment remover according to claim 1, in which said tub has an annular series of openings in its bottom wall, and said collecting means comprises a trough underlying said openings.

3. A sediment remover according to claim 2, in which said trough includes a pipe extending generally tangentially outwardly from said trough outlet in a direction opposite to the direction of rotation of said drum, said tubular member being secured at said one end to said pipe.

4. A sediment remover according to claim 3, in which said tubular member when straightened is substantially aligned with said pipe whereby a suction force is developed at the end of said tubular member during rotation of said tub.

5. A sediment remover according to claim 4, in which said flexible tubular member comprises a length of hose.

6. In a washing machine including a rotatable tub having a bottom wall and an annular series of openings therein, a sediment remover comprising a trough disposed below the bottom wall of said tub and underlying said openings, said trough having a pipe extending outwardly therefrom and defining an outlet for discharging sediment therefrom, a flexible tubular member secured to said pipe, and a spring secured to said tubular member for holding the latter in a bent position to prevent fluid flow therethrough, said spring being adapted to permit

said tubular member to straighten when said tub reaches a predetermined speed of rotation whereby accumulated sediment will be ejected from said trough.

7. A sediment remover according to claim 6, in which said tubular member and spring are arranged for movement in a plane perpendicular to the axis of rotation of said tub.

8. A sediment remover according to claim 6, in which said spring is provided with a collar at each end to connect said spring to said tubular member, one of said collars clamping said spring and tubular member to said pipe.

9. A sediment remover according to claim 1, in which said means for holding said tubular member in a bent position comprises a weight secured to the outer end of the tubular member for bending said tubular member downwardly.

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