Jan. 15, 1963 E. H. RUBY 3,072,935

AUTOMATIC MOP AND CLOTH CLEANING MACHINE

Filed Sept. 12, 1961 3 Sheets-Sheet 1

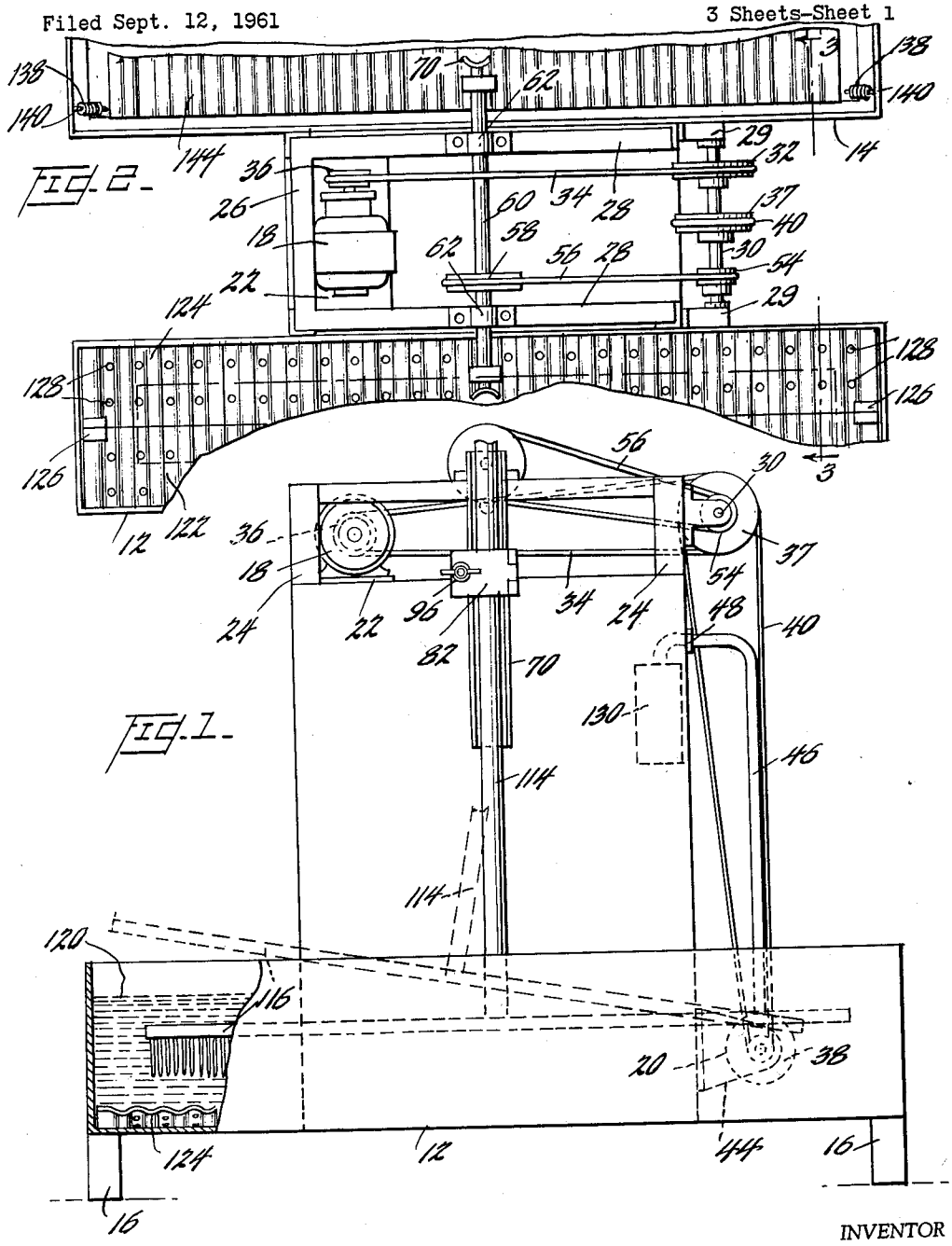

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FIG. 3.

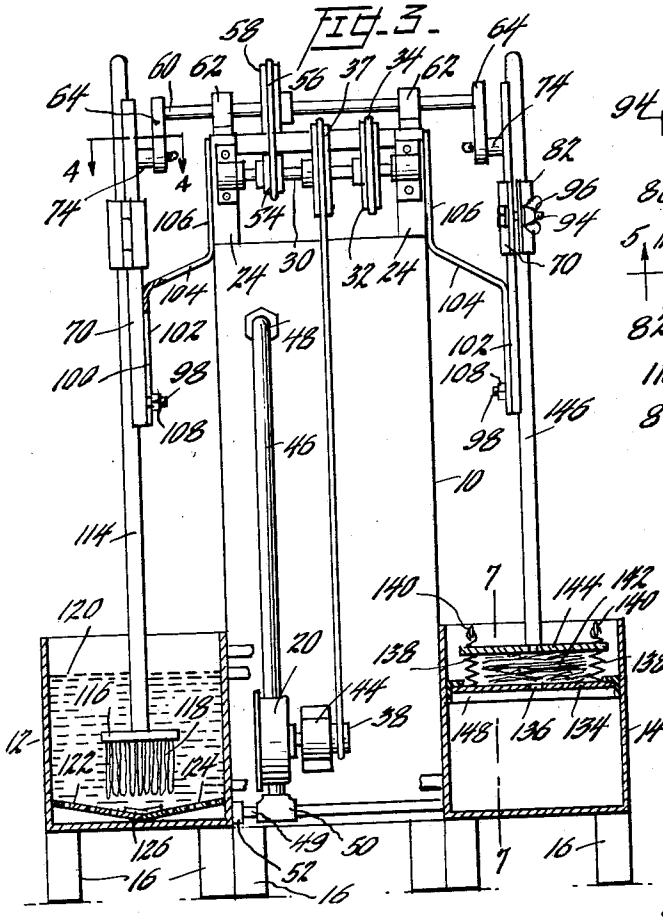


FIG. 4.

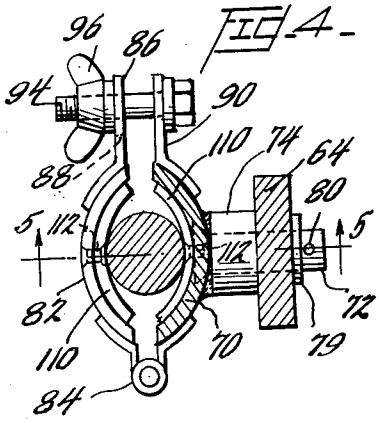


FIG. 5.

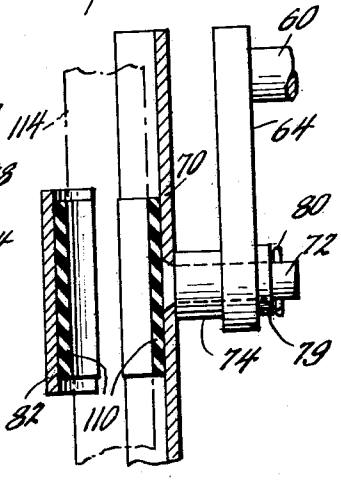
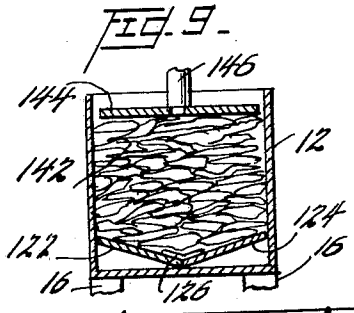


FIG. 9.



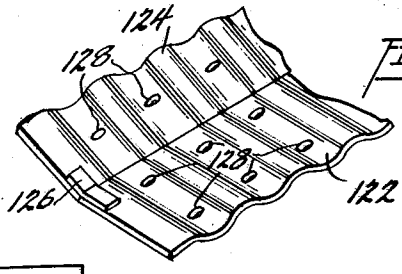


FIG. 6.

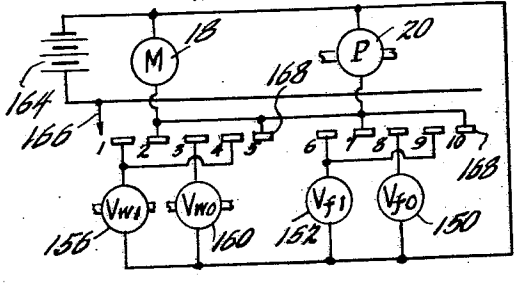


FIG. 10.

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FIG. 7.

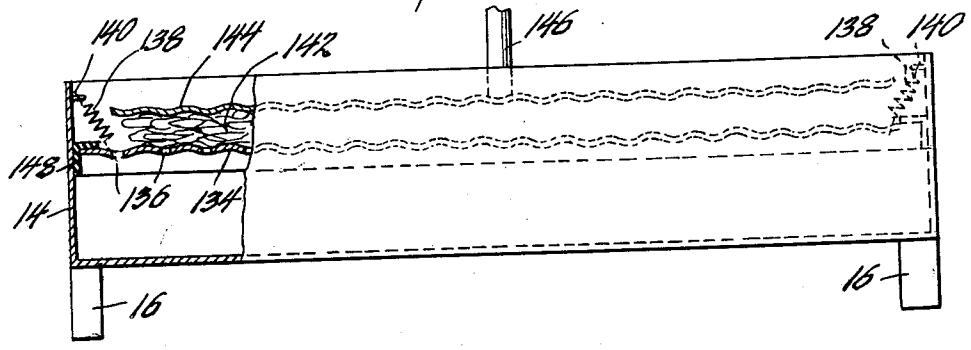
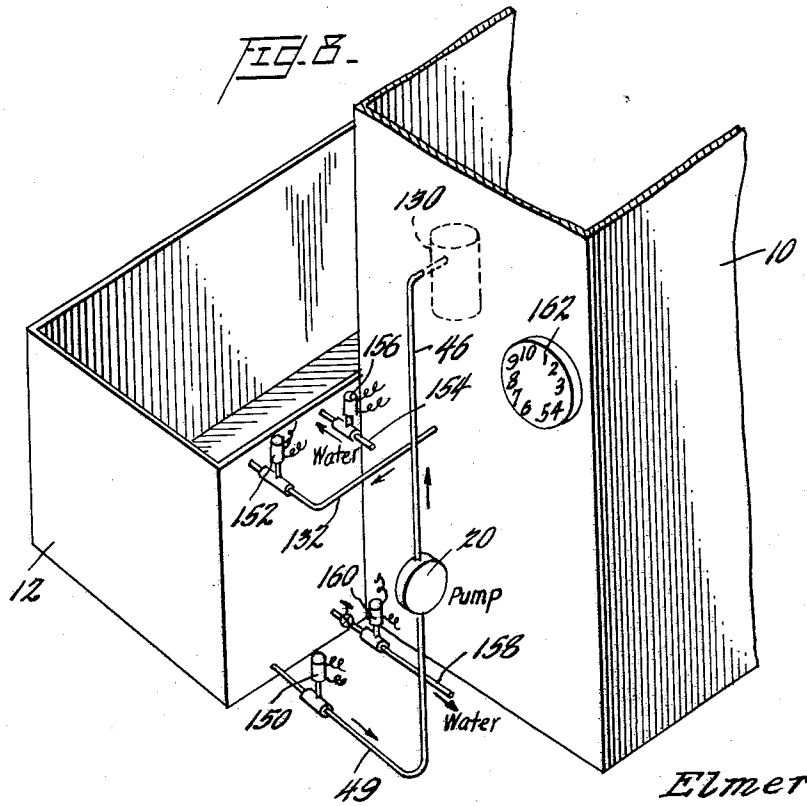


FIG. 8.



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3,072,935

AUTOMATIC MOP AND CLOTH CLEANING MACHINE

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Filed Sept. 12, 1961, Ser. No. 137,603
15 Claims. (Cl. 15—4)

This invention relates to a machine for cleaning mops, scrub rags, dust cloths, and other janitors' implements. Machine cleaning of such items has been proposed, and attempted heretofore, but results have been disappointing for many reasons, among which may be mentioned the fact that it has been necessary to disassemble mops from their handles, and subsequently reassemble them, and in particular, in the case of the common, tasseled or fringed mop, the strings almost invariably become knotted and entangled, requiring adjustment prior to continued use. In addition, these machines have not been noteworthy for thorough removal of dirt or dust.

It is a primary object of the present invention to provide a cleaning machine for mops which does not require dismantling them from their handles.

A further object is to provide a machine which is capable of wet washing, or of scavenging dirt and dust from mops or clothes in the dry state.

More particularly it is an object to effect cleaning through a gyratory movement of the article in an environment which provides fluid currents for efficiently ridding the articles of foreign matter, and in which sedimentation is facilitated.

Other objects include the provision of a device which is simple of construction, easy of manufacture, operation and maintenance, and low in bulk and cost.

These and other ends, which will be readily apparent are attained by the present invention, which may be briefly described as comprising a central, storage tank for fluid, flanked by shallow operating tanks, and a crank drive having a clamp for securing the handle of a mop which is immersed in an operating tank, or for securing the handle of an agitating implement known as a dasher. In cooperation with the moving mop, or the dasher, the operating tanks, for a wet process have a perforated, bottom plate arranged to enhance circulation of fluid as well as trap sediment, and in either a wet or dry process, the tank is provided with a spring-suspended, perforated plate which not only provides an upward jet action, but also positively draws dust or dirt downward, thus materially improving over a mere process of sedimentation.

For a more detailed description of the invention, reference is made to the following specification, as illustrated in the drawings, in which:

FIGURE 1 is a side elevational view of the machine, with the "wet" tank in the foreground, and partly broken away;

FIGURE 2 is a top plan view of the machine of FIGURE 1, with parts of the two side tanks broken away;

FIGURE 3 is a front elevational view of the machine, with the side tanks shown in section along the line 3—3 of FIGURE 2;

FIGURE 4 is a sectional view taken on the line 4—4 of FIGURE 3, showing a detail of the clamp holder for mop handles;

FIGURE 5 is a sectional view taken on the line 5—5 of FIGURE 4;

FIGURE 6 is a perspective view of a fragment of the tide plate, carried in the bottom of the wet tank,

FIGURE 7 is a section through the dry tank, taken on the line 7—7 of FIGURE 3;

FIGURE 8 is a fragmentary view, in perspective of a portion of the fluid-supply tank and the wet tank, showing the piping and controls;

FIGURE 9 is a fragmentary view of a wet tank, such as shown to the left in FIGURE 3, showing cleaning rags in association with a dash plate agitator; and

FIGURE 10 is a schematic diagram showing the wiring associated with the timer.

Referring to the drawings by characters of reference, there is shown a system of three rectangular tanks, comprising a central, high tank **10**, and at its sides, in contacting relationship, two relatively shallow tanks **12**, **14**, somewhat longer than the central tank, and, in the form shown, approximately square in vertical cross section. All three tanks are mounted on legs **16**, of equal height, and the bottoms of the tanks are disposed at a common level, although this is not essential.

In its main function, the middle tank **10**, serves as a reservoir and sedimentation tank, in a system of circulating cleaning fluid, which includes the tank **12**. The middle tank also serves as a support pedestal for the apparatus which imparts mechanical agitation to the tanks, either through a mop handle or the handle of an auxiliary dasher plate. A motor **18**, which actuates the agitating mechanism and the re-circulating pump **20**, is carried on a plate **22**, mounted crosswise on the top of middle tank **10**, near one end thereof, and the pulley system, as well as the agitator, or oscillator, are carried by a framework atop the tank **10**, comprising four vertical corner posts **24**, of angle iron, supporting a platform of angle iron with an end piece **26** and two side pieces **28**. At the open end of the platform, the respective corner posts **24** carry outwardly extending bearing blocks **29**, in which a horizontal countershaft **30** is journalled. Keyed to shaft **30** are three pulleys, one of which, **32**, receives rotation from the motor through a belt **34**, engaging a pulley **36** on the motor shaft. A second pulley **37** on shaft **30** communicates rotation to a pulley **38** on pump **20** through a belt **40**, the pump shaft **42**, holding the pulley, being journalled in a bearing block **44** secured to tank **10**. A vertical pipe **46** leads from the pump to a fitting **48** in tank **10**, and a horizontal pipe **49** leads from a fitting **50** on the pump to a fitting **52** in the wall of the wet tank **12**, near the bottom thereof. A third pulley **54** on shaft **30** communicates rotation to the shaker system through a belt **56**, engaging a pulley **58**, keyed to a horizontal shaft **60**, which is journalled in a pair of bearing blocks **62**, carried on side pieces **28** of the top platform.

The agitators are actuated through crank arms **64**, located at opposite ends of shaft **60**. Since the two agitators are identical in structure ,only one need be described, and the same reference numerals will apply to corresponding parts in each. Crank arm **64** has a bore **66** near one end, which is received on the end of shaft **60**, and the arm is keyed to the shaft by a set screw **68**. A holding plate **70** for mop handles is pivotally attached, near its upper end, to an outer part of crank arm **64**, by means of a pin **72**, which passes through a tubular bearing **74** on plate **70**, and a bore **76** in the crank arm, the pin having a head **78**, and being secured by a washer **79** and a cotter pin **80**. As seen in FIGURE 4, the plate **70** is arcuate in lateral cross section, for efficient gripping of round handles of various diameters. For clamping the handle to the plate, a short length of clamp plate **82**, similar in cross section to plate **70** is connected at one edge to an edge of plate **70** by a hinge **84**, being so mounted that when closed upon plate **70**, the concave sides of the two plates are facing. Hinged plate **82** carries a tab **86** with slot **88** opening in its outer edge and plate **70** has a laterally extending tab **90** adjacent the hinge, and having a central bore **92** adapted to receive a locking bolt **94**. The slot **88** clears the bolt in the swinging movement on closing the clamp, and the clamp is locked in place by a wing nut **96**, engaging bolt **94**.

On rotation of shaft **60**, and consequent full-circle swing

of crank arm **64**, an up-and-down movement is imparted to the handle clamp assembly. In order to also give the mop holder a lateral component of motion, rendering its total action similar to that of a manually operated broom, for instance, the clamp plate **70** fixedly carries a headed pivot pin **98** near its lower end, which is slidably mounted in a slot **100**, opening through the end edge of the lower section **102** of a strap having a diagonal bend **104** at its middle, and an upper, vertical section **106**, secured, as by welding, to one of the side, angle irons **28**, and abutting the tank **10**. The pivot **98** is threaded to receivee a nut **108** in a manner permitting turning of the pivot and the nut. As the upper pivot **72** on the bar oscillates in a circular path, the lower pivot **98** is constrained to a vertical path, which results in an up-and-down movement as well as a side-wise swing of the lower end of a mop or tool carried by the clamp bar. Alternatively, the sliding pivot could be carried by the strap section **102**, and the slot provided in the lower part of clamp plate **70**. To improve the frictional hold of the clamp on handles, both the plate **70** and the swinging plate **82** are provided, on their inner surfaces, with pads **110**, of resilient material, such as rubber, leather, or plastic, secured in any convenient manner, such as by rivets **112**.

The agitator above wet tank **12** is shown as holding the handle **114** of an elongate mop **116** with depending cords **118**, the working head of the mop being within the tank **12**, and near the bottom thereof, substantially immersed in the fluid **120** when at the lowest point of its motion. Supported on the bottom of the wet tank is a tide plate, or surge plate, comprising two corrugated sheets or plates **122**, **124**, butt-connected by a series of riveted, splint plates **126**, bent along the joining line of the plates so that the plates are arranged at an obtuse, dihedral angle. The plates **122**, **124** are each provided with a plurality of perforations **128**, for through passage of fluid and particles of foreign matter, and these perforations may be arranged in an orderly geometric pattern, or at random. The tide plate is loosely fitted in the tank so that fluid may pass over its side and end edges, and this circumstance, in conjunction with the perforations in the plates, brings about a gyratory current movement within the fluid in response to the rise, dip, and lateral movement of the mop head, the currents, in one phase of movement, passing downward through the perforations, and upward around the outer edges of the plates. However, the turbulence below the plate will be much less in degree than that above the plates, so that sedimentation of all but the finest particles is favored, below the plate, and proceeds at an optimum rate. Most of the particles remaining in suspension, being free of the mop, will settle out after cessation of the agitation.

After the cleaning operation, the cleaning fluid is returned to tank **10** through pipes **49** and **46**, by pump **20**, and passes through a filter **130**, located within the tank, and connected to line **46**, whereby the fluid is conditioned for re-use by removal of the sediment. Sedimentation within tank **10** further purifies the fluid. For the rinsing operation, the relatively clean fluid in tank **10** is run by gravity through a pipe line **132** to the tank **12**, and the mop is again subjected to agitation in the clean fluid. These operations are effected automatically, through a conventional timer and associated mechanism as hereinafter described in general terms.

In the embodiment illustrated, the other, side tank **14** is adapted for cleaning or shaking out cloths or mops in the dry state, and therefore no fluid lines are shown connected to this tank. However, it will be understood that both tanks may be arranged for selective use of either a wet or a dry process. As shown, tank **14** has no tide plate, such as **122**, **124**, but carries, in resilient suspension, what may be termed a bellows plate **134**, which has a plurality of perforations **136**, and is suspended from four coiled tension springs **138** near its corners, the latter being anchored on pins **140** carried by the end walls of the tank, near the top edge thereof. The articles to be cleaned, such as dust cloths or scrub rags, indicated by the numeral **142**, are loaded on top of the bellows plate **134**, and a dasher plate **144** is superposed above the rags, its handle **146** being held in clamp **70—82**, and properly located so that the height of the dasher plate is such to allow reasonable movement about in the mass of cloths, at least at certain stages of the agitating movement. The gyratory movement of the dasher plate is, of course, the same as that of a mop, as above described, and in the downward phase of this motion the cloths are squeezed against the bellows plate, which yields in a downward, responsive movement, and at the same time the cloths are rubbed together in a lateral, shearing movement. This produces not only a beating action, but also a scrubbing action, as in the wet washing of clothes or other fabrics. During upward movement of the dasher plate the bellows plate is raised by the springs **138**. A highly important feature of the dry process resides in the fact that the bellows plate provides a valve action, which yields to the downward movement, by virtue of its perforations, and produces a plurality of impinging blasts of air into the cloths, dislodging dust, and which, in the upward movement, sucks the free dust down through the openings. As in the case of the tide plate, the dust which passes downwardly through the plate is substantially trapped, and settling to the bottom is therefore facilitated. It may be mentioned also, that the upward jets of air are effective to carry much of the finer dust upwardly out of the tank, with ultimate disposal apart from the tank.

In order to improve the valve action producing the suction effect, the bellows plate **136** is preferably provided with a depending, peripheral skirt **148**, formed from sheet stock or rubbery material, and secured to the outer edges of the plate with cement or suitable fasteners, such as rivets. This edge sealing confines air passage to the perforations, where it is effective to do work, and seals off the edges, where air currents would be wasted.

FIGURE 9 shows the use of the dasher plate **144** in the wet tank **12**, and in this case it will be readily understood that the cleaning action partakes of both the scrubbing action of the dasher plate in the dry process, and the current-inducing, or surge action of the tide plates **122**, **124**.

The piping and valve layout for the wet tank is shown in skeletonized form in FIGURE 8, wherein the arrows show the direction of fluid flow, and four solenoid valves are indicated. Line **49** to the pump has an outflow valve **150**, and return line **132** from tank **10** has an inlet valve **152**. For the alternative use of water as a cleaning agent, a pipe line **154** from a water supply to tank **12** has an inlet valve **156**, and a pipe line **158** from the tank to waste disposal has an outlet valve **160**.

A timing unit or programmer **162**, with ten stations, is shown mounted on tank **10** in FIGURE 8. The programmer is conventional, as commonly employed in washing machines, and therefore needs no detailed description. Broadly, the system, as applied to the cleaning operation dealt with herein, is shown in its essentials in the schematic layout in FIGURE 10, wherein the ten stages of the timer are indicated by an aligned series of rectangles, numbered consecutively through **9**. The first five stages are for a cycle using water, and the second five for a cycle using cleaning fluid. For simplicity, only one main circuit including th source of E.M.F., **164**, has been shown, but it will be understood that the system will be arranged to provide proper voltages to the motor, the pump, and the solenoid valves. The arrow **166** indicates the wiping contact for the ten commutator segments **168**, and in their actual form these will comprise a radial arm and dial. At the first stage, valve **156** is cut in, permitting water to enter the tank, the subscripts "*wi*" indicating "water inlet." At stage **2** the motor is cut in, causing agitating movement of whatever is clamped on either or both of the plates **70**. At stage **3**, valve **160** is cut in, permitting drainage of water from the tank ("*wo*" indicating "water outlet"). At stage **4**, valve **156** is again cut in, allowing entry of

rinse water. At stage 5, the motor is again cut in to produce the agitation, and after the set interval of rinsing, all motion ceases. After removal of the cleaned object, the timer may be set manually to drain the tank, or the rinse water may be re-used for the next washing operation.

In stages 6 to 10, the sequence is substantially the same, using cleaning fluid instead of water, with filling at stage 6 through valve 152 ("*fi*" meaning "fluid in"), shaking at stage 7, pumping fluid out ("*fo*") through valve 150 by pump 20 at stage 8, refilling at stage 9, rinsing at the last stage, and stopping.

While a certain preferred embodiment has been shown and described herein, modifications will be apparent, in the light of this disclosure, and the invention should not, therefore, be deemed as limited, except insofar as shall appear from the spirit and scope of the appended claims.

I claim:

1. A cleaning device for mops and other cleaning implements, comprising an associated group of tanks, with a central, fluid-supply tank, a first cleaning tank on one side of said supply tank and a second cleaning tank on the other side of said supply tank, a shaft mounted on top of said supply tank, for rotation on a horizontal axis, a crank arm carried at each end of said shaft, mounting means for an elongate handle associated with each crank arm, each said means comprising a clamp element, with a backing plate pivoted, in its upper portion, to an outer part of said crank arm, a clamp plate hingedly connected to said backing plate, means to lock said plates in clamping position, a strap carried at each side of said supply tank, a vertical sliding, pivotal connection between each said backing plate and one of said straps, a perforated plate in the form of a dihedral angle, nested in the bottom of said first tank, a series of coil springs secured in said second tank, a perforated plate suspended on said springs, a depending skirt of rubbery material mounted on the periphery of said suspended plate, a perforated plate adapted to be received in said tanks and having a handle for attachment in the clamp means, fluid conduit means including valves and a pump for circulating fluid between said supply tank and said first tank, power means carried on said supply tank, transmission means connecting said power means with said shaft and said pump, and a timer controlling said power means, pump, and valves.

2. A device as in claim 1, said backing plate and clamp plate being arcuate in cross section, with concave sides facing in the closed position of the clamp.

3. A cleaning device for mops and other cleaning implements, comprising an associated group of tanks, with a central, fluid-supply tank, a first cleaning tank on one side of said supply tank and a second cleaning tank on the other side of said supply tank, a shaft mounted on top of said supply tank, for rotation on a horizontal axis, a crank arm carried at each end of said shaft, mounting means for an elongate handle associated with each crank arm, each said means comprising a clamp element, with a backing plate pivoted, in its upper portion, to an outer part of said crank arm, a clamp plate hingedly connected to said backing plate, means to lock said plates in clamping position, a strap carried at each side of said supply tank, a vertical sliding, pivotal connection between each said backing plate and one of said straps, a perforated plate in the form of a dihedral angle, nested in the bottom of said first tank, a series of coil springs secured in said second tank, a perforated plate suspended on said springs, a depending skirt of rubbery material mounted on the periphery of said suspended plate, a perforated plate adapted to be received in said tanks and having a handle for attachment in the clamp means, fluid conduit means including valves and a pump for circulating fluid between said supply tank and said first tank, power means carried on said supply tank, and transmission means connecting said power means with said shaft and said pump.

4. A cleaning device for mops and other cleaning implements, comprising an associated group of tanks, with a central, fluid-supply tank, a first cleaning tank on one side of said supply tank and a second cleaning tank on the other side of said supply tank, a shaft mounted on top of said supply tank, for rotation on a horizontal axis, a crank arm carried at each end of said shaft, mounting means for an elongate handle associated with each crank arm, each said means comprising a clamp element, with a backing plate pivoted, in its upper portion, to an outer part of said crank arm, a clamp plate hingedly connected to said backing plate, means to lock said plates in clamping position, a strap carried at each side of said supply tank, a vertical, sliding, pivotal connection between each said backing plate and one of said straps, a perforated plate in the form of a dihedral angle, nested in the bottom of said first tank, a series of coil springs secured in said second tank, a perforated plate suspended on said springs, a depending skirt of rubbery material mounted on the periphery of said suspended plate, a perforated plate adapted to be received in said tank, and having a handle for attachment in the clamp means, power means carried on said supply tank, and transmission means connecting said power means with said shaft.

5. A cleaning device for mops and other cleaning implements, comprising an associated group of tanks, with a central, fluid-supply tank, a first cleaning tank on one side of said supply tank and a second cleaning tank on the other side of said supply tank, a shaft mounted on top of said supply tank, for rotation on a horizontal axis, a crank arm carried at each end of said shaft, mounting means for an elongate handle associated with each crank arm, each said means comprising a clamp element, with a backing plate pivoted, in its upper portion, to an outer part of said crank arm, a clamp plate hingedly connected to said backing plate, a strap carried at each side of said supply tank, a vertical sliding, pivotal connection between each said backing plate and one of said straps, a perforated plate in the form of a dihedral angle, nested in the bottom of said first tank, a series of coil springs secured in said second tank, a perforated plate suspended on said springs, a depending skirt of rubbery material mounted on the periphery of said suspended plate, a perforated plate adapted to be received in said tanks, and having a handle for attachment in the clamp means, power means carried on said supply tank, and transmission means connecting said power means with said shaft.

6. A cleaning device for mops and other cleaning implements, comprising an associated group of tanks, with a central, fluid-supply tank, a first cleaning tank on one side of said supply tank and a second cleaning tank on the other side of said supply tank, a shaft mounted on top of said supply tank, for rotation on a horizontal axis, a crank arm carried at each end of said shaft, mounting means for an elongate handle associated with each crank arm, each said means comprising a clamp element, with a backing plate pivoted, in its upper portion, to an outer part of said crank arm, a clamp plate hingedly connected to said backing plate, a strap carried at each side of said supply tank, a vertical, sliding, pivotal connection between each said backing plate and one of said straps, a perforated plate in the form of a dihedral angle, nested in the bottom of said first tank, a series of coil springs secured in said second tank, a perforated plate suspended on said springs, a depending skirt of rubbery material mounted on the periphery of said suspended plate, power means carried on said supply tank, and transmission means connecting said power means with said shaft.

7. A cleaning device for mops and other cleaning implements, comprising an associated group of tanks, with a central, fluid-supply tank, a first cleaning tank on one side of said supply tank and a second cleaning tank on the other side of said supply tank, a shaft mounted on top of said supply tank, for rotation on a horizontal axis, a crank arm carried at each end of said shaft, mounting means for an elongate handle associated with each crank arm, each said means comprising a clamp element,

with a backing plate pivoted, in its upper portion, to an outer part of said crank arm, a clamp plate hingedly connected to said backing plate, a strap carried at each side of said supply tank, a vertical, sliding, pivotal connection between each said backing plate and one of said straps, a perforated plate in the form of a dihedral angle, nested in the bottom of said first tank, a series of coil springs secured in said second tank, a perforated plate suspended on said springs, power means carried on said supply tank, and transmission means connecting said power means with said shaft.

8. A cleaning device for mops and other cleaning implements, comprising a pair of tanks, a standard located between said tanks, a shaft mounted on said standard for rotation on a horizontal axis, a crank arm carried at each end of said shaft, power means to rotate said shaft, mounting means for an elongate handle associated with each crank arm, each said means comprising a clamp element, with a backing plate pivoted in its upper portion to said crank arm, a clamp plate hingedly connected to said backing plate, the lower portion of said backing plate having a pivotal connection with said standard, arranged for sliding movement vertically, a perforated plate in the form of a dihedral angle carried in the bottom of one of said tanks, a series of coil springs secured in the other of said tanks, and a perforated plate suspended on said springs.

9. In a device as in claim 8, a perforated plate adapted to be received in said tanks, and having a handle adapted to be received in said clamp element.

10. A cleaning device for mops and other cleaning implements, comprising a tank, a shaft mounted adjacent said tank for rotation on a horizontal axis, a crank arm carried by said shaft, mounting means for an elongate handle comprising a backing plate pivoted to said crank

arm and having a sliding pivotal connection apart from said crank arm, a clamp plate arranged in cooperative relation to said backing plate, and a perforated plate in the form of a dihedral angle carried in the bottom of said tank.

11. A cleaning device for mops and other cleaning implements, comprising a tank, a shaft mounted adjacent said tank for rotation on a horizontal axis, a crank arm carried by said shaft, mounting means for an elongate handle comprising a backing plate pivoted to said crank arm and having a sliding pivotal connection apart from said crank arm, a clamp plate arranged in cooperative relation to said backing plate, and a perforated plate in said tank, with outer edges higher above the tank bottom than its mid portion.

12. A cleaning device for mops and other cleaning implements, comprising a tank, a shaft mounted adjacent said tank for rotation on a horizontal axis, a crank arm carried by said shaft, mounting means for an elongate handle comprising a backing plate pivoted to said crank arm and having a sliding pivotal connection apart from said crank arm, a clamp plate arranged in cooperative relation to said backing plate, and a perforated plate suspended from springs in said tank.

13. A device as in claim 12, said plate having a depending, peripheral skirt of rubbery material.

14. In a device as in claim 10, a reservoir tank with fluid connections to the first-mentioned tank, including a pump, a valve and a filter.

15. A device as in claim 10, said shaft being mounted on a fluid tank, and fluid connections including a pump, valve and filter between said tanks.

No references cited.