

July 28, 1931.

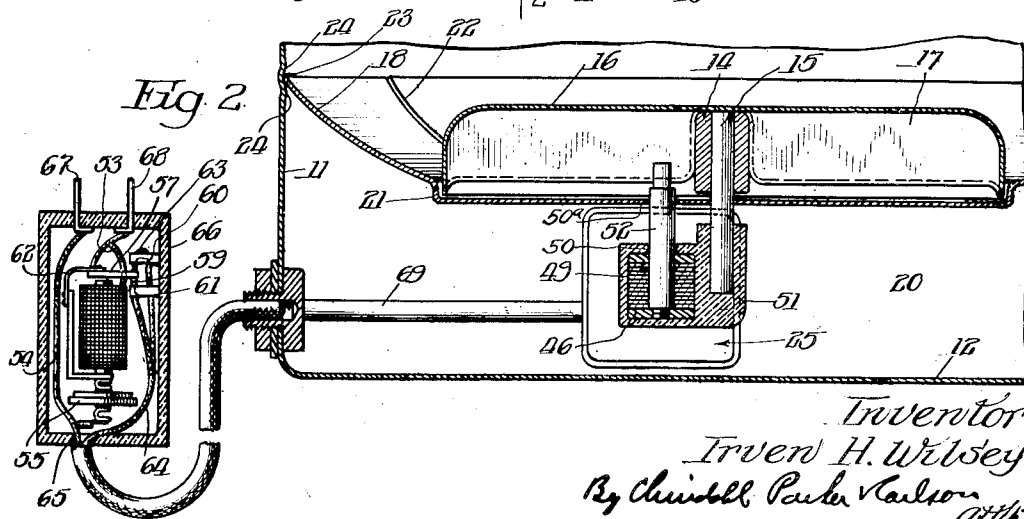
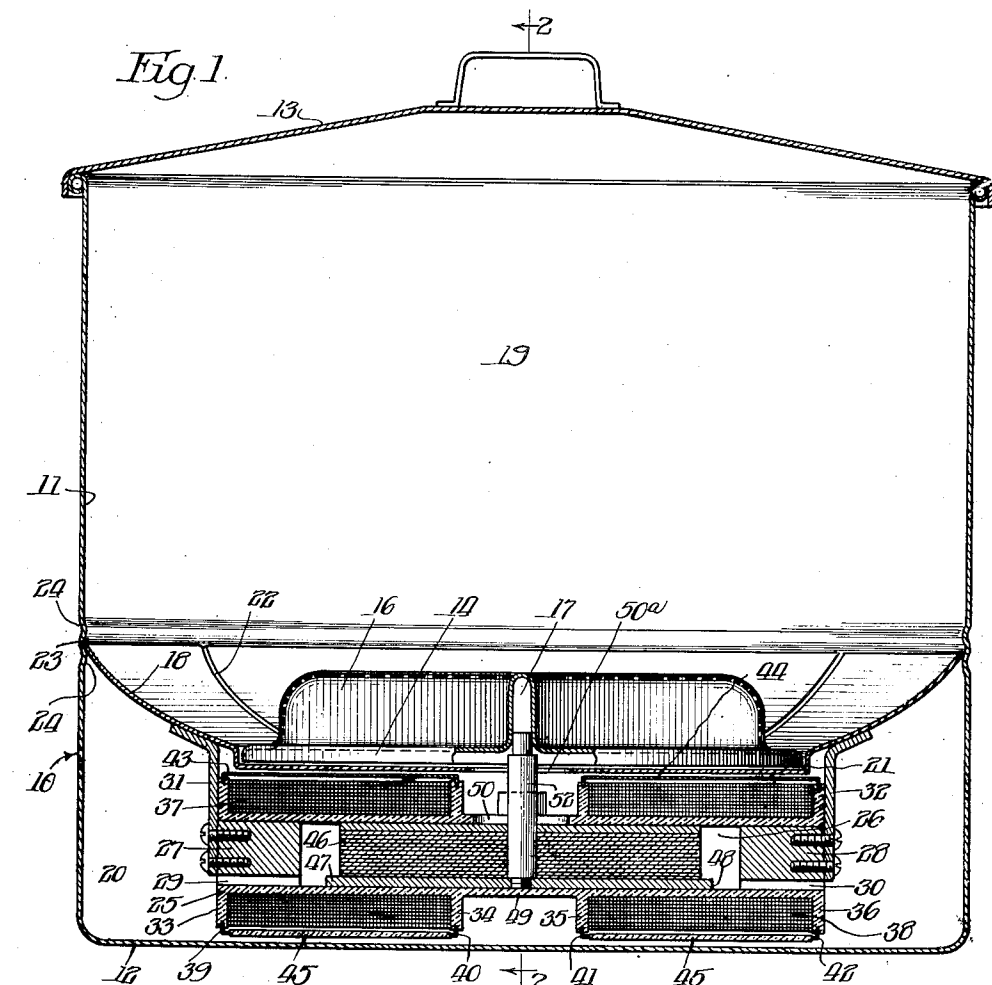
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1,816,033

LAUNDRY MACHINE

Filed June 17, 1929

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

Fig. 3

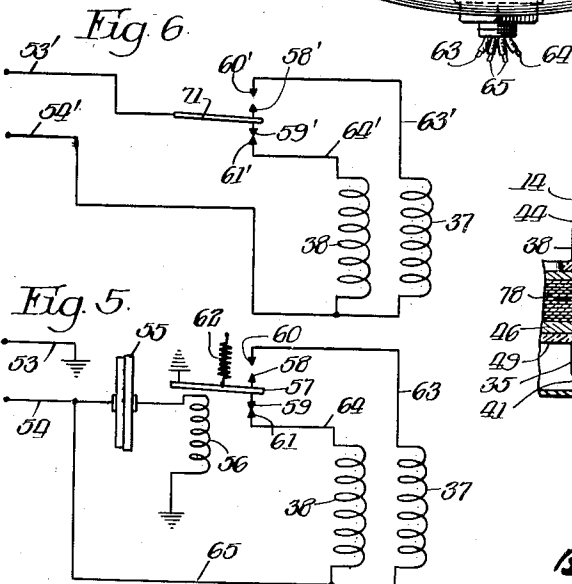
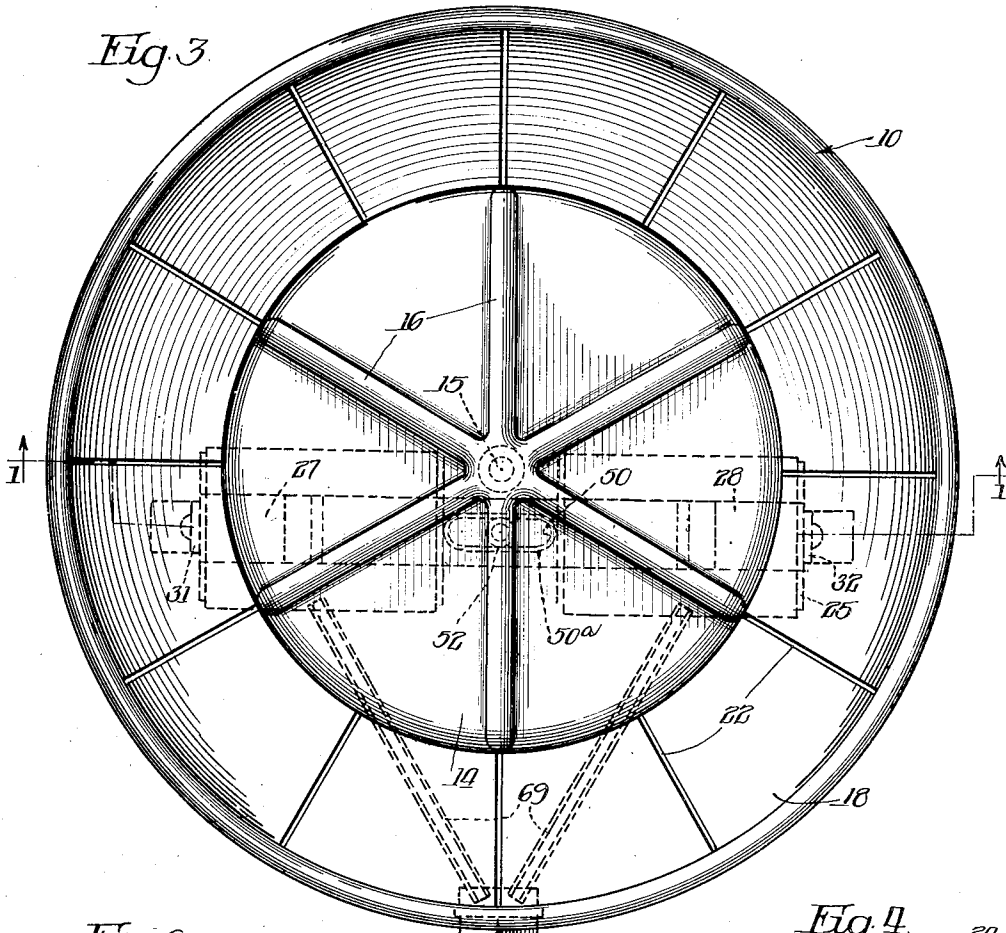
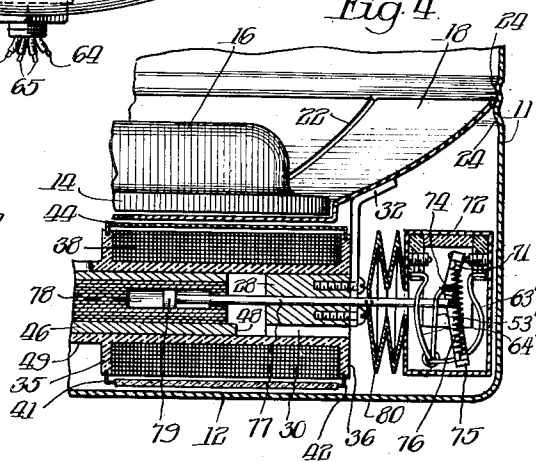


Fig. 4



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3 Sheets-Sheet 3

Fig. 7.

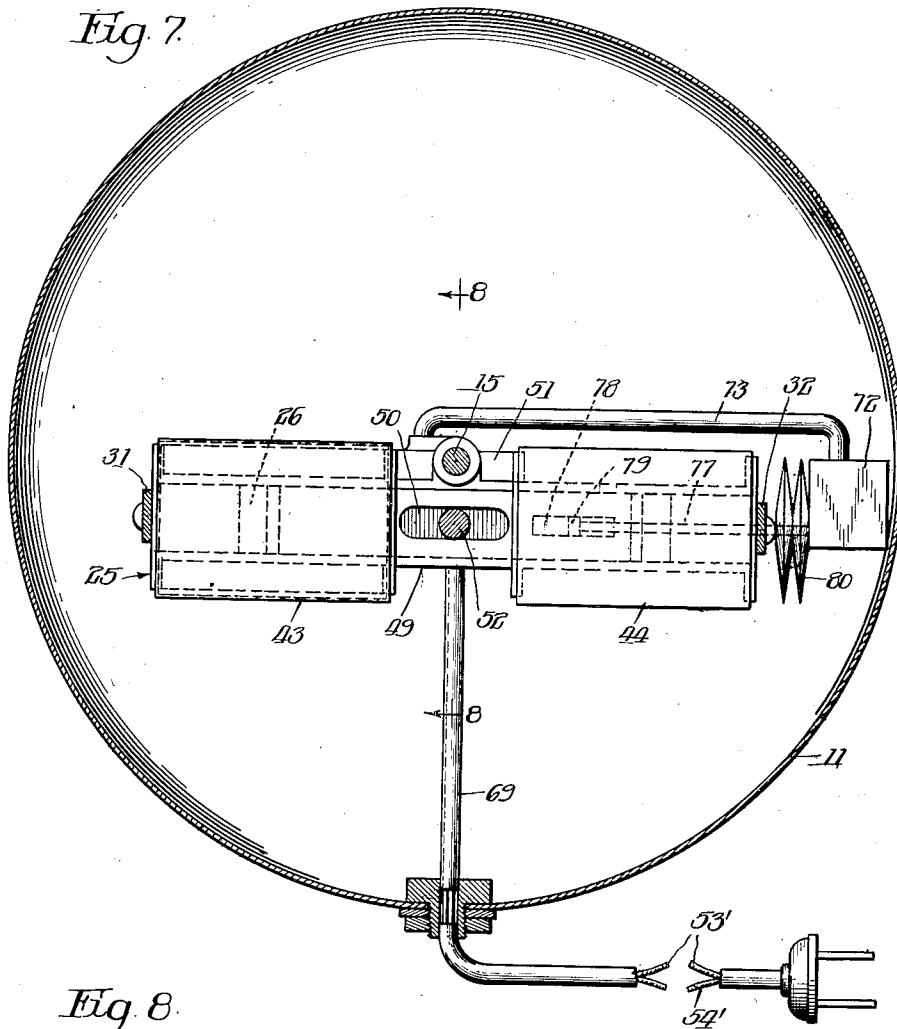
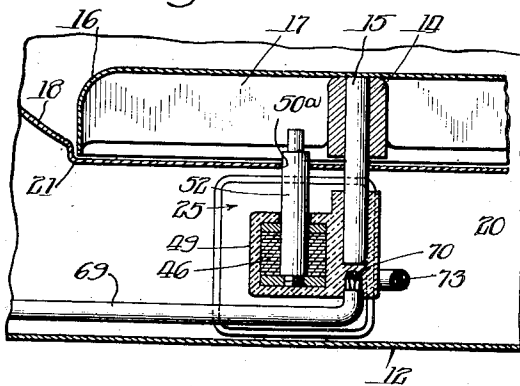


Fig. 8.



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UNITED STATES PATENT OFFICE

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LAUNDRY MACHINE

Application filed June 17, 1929. Serial No. 371,632.

The present invention relates to improvements in laundry machines, and has particular reference to a new and improved washing machine, of the general type disclosed in my copending application Serial No. 276,861 filed May 11, 1928, adapted to be operated by electric power.

Various general objects of the invention reside in the provision of a novel washing machine which is simple, inexpensive, compact, and light in construction, which can be made small in size, which is powerful and quiet in operation and not easily overloaded, and which washes thoroughly, gently and efficiently.

For a high washing efficiency, it is necessary to maintain the water at a suitable temperature. In this connection, many types of washing machines are seriously handicapped because of rapid cooling of the water. An important object of the invention, therefore, resides in mounting the electric operating mechanism in the bottom of the container under and in contact with the water so that substantially all of the heat generated in the mechanism is transmitted to the water, thereby serving the dual function of keeping the mechanism cool and of keeping the water in the container hot.

Another object of the invention resides in the provision of a new and improved washing machine in which the electric operating mechanism for the agitator comprises a double-acting solenoid.

A further object resides in the provision of a new and improved washing machine of the foregoing character in which the coils of the solenoid and the leading wires therefor are hermetically sealed, and in which no packing connection between the mechanism and the agitator is required.

Still another object resides in the provision of novel means for cushioning the end of each stroke of the solenoid core so as to obtain quietness in operation.

A general object of the invention is to provide a washing machine of the foregoing character which may be adapted for the use of alternating current or direct current by a mere change in the coil windings, and in

which magnetic reversals may be effected by the use of either a thermostatic switch or a mechanical switch.

Further objects and advantages will become apparent as the description proceeds.

In the accompanying drawings, Fig. 1 is a vertical sectional view taken along line 1—1 of Fig. 3, and showing a washing machine embodying the features of my invention.

Fig. 2 is a fragmentary sectional view taken along line 2—2 of Fig. 1.

Fig. 3 is a plan view of the washing machine shown in Fig. 1 with the cover removed.

Fig. 4 is a fragmentary sectional view similar to Fig. 1 but of a modified form of the invention.

Fig. 5 is a diagrammatic representation of the electric circuit for the operating mechanism shown in Fig. 1.

Fig. 6 is a diagrammatic representation of the electric circuit for the operating mechanism shown in Fig. 4.

Fig. 7 is a horizontal sectional view of the modified form of Fig. 4, the section being taken directly over the solenoid.

Fig. 8 is a fragmentary transverse sectional view taken along line 8—8 of Fig. 7.

While the invention is susceptible of various modifications and alternative constructions, I have shown in the drawings and will herein describe in detail the preferred embodiment, but it is to be understood that I do not thereby intend to limit the invention to the specific form disclosed, but intend to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

Referring more particularly to the drawings, the washing machine constituting the exemplary embodiment of the invention comprises a container 10 of any suitable construction. The container may be made of any suitable material, such for example as metal or enamelware, and may be of any suitable size, but is particularly adapted for small sizes. The container 10 also may be of any suitable shape, and preferably is a light and rugged pail or can having a cylindrical

vertical wall 11, a flat bottom wall 12, and a removable cover 13.

Suitable means is provided for agitating the clothes and water, and in the present instance, this means comprises a suitable agitator 14 and electrically operated means for actuating the agitator. Both are mounted in the bottom of the container 10 under the normal water level so that the energy input converted into heat is transmitted to the water. As a result, the actuating means is cooled and hence can take a large energy input to provide a powerful action without danger of becoming overheated, and the water is prevented from cooling below a temperature necessary for efficient washing.

The agitator 14 preferably is of the impeller type, comprising a flat circular metal disk mounted for rotation on a central, vertical pin 15. Struck up from the upper face of the disk and terminating slightly short of the peripheral margin thereof are a plurality of hollow radial ribs 16 open on the underside to define a plurality of downwardly opening radial grooves or channels 17.

The impeller 14 is mounted for rotation directly over a false bottom 18 which is removably supported in the lower portion of the container 10, and which defines in the container an upper space 19 adapted to receive the clothes or fabrics to be washed, and a lower space 20 housing the electric actuating means.

The false bottom 18 may be of any suitable form, and in the present instance comprises an upwardly concave or disk-shaped metal wall having a flat, circular, central and downwardly off-set portion 21 in which the impeller 14 is mounted, and formed with a plurality of radial slots 22 extending from the portion 21 to the periphery to permit the free circulation of water from each to the other of the spaces 19 and 20. The periphery of the false bottom 18 engages in a peripheral groove 23 between two peripheral ribs 24 formed on the inside of the wall 11 of the container 10, and is thereby held in position. Obviously, the false bottom 18 can be sprung into or out of the groove 23 to assemble or disassemble the parts.

The electric actuating means preferably comprises a double-acting solenoid of suitable construction located in the space 20. In the present instance, the solenoid comprises an elongated horizontal spool 25 of suitable material, such for example as molded bakelite. The spool 25 is formed with a central longitudinal passage or guideway 26 opening therethrough. Two metal plugs 27 and 28, one for each end, are secured in opposite ends of the passage 26, and, except for two small venting passages 29 and 30 along the lower surfaces of the plugs, substantially close said ends. The plugs 27 and 28 serve to improve the characteristics of the solenoid. A pair of

depending straps 31 and 32 on the false bottom 18 are secured at their lower ends to the outer ends of the plugs 27 and 28 to support the solenoid in spaced relation in the space 20.

Formed on the outer periphery of the spool 25 are four parallel spaced flanges 33, 34, 35 and 36, constituting a set of two on each end. Suitably wound on the spool 25 between the flanges 33 and 34 and the flanges 35 and 36, respectively, are two solenoid coils 37 and 38 constituting the construction in effect a double solenoid. These coils may be wound for either alternating current or direct current. These coils are hermetically sealed by suitable heat conducting material to protect the coils from the water, and yet to transmit heat from the coils to the water. To this end, rings or inserts 39, 40, 41 and 42, of a suitable metal such as brass, are molded respectively in the peripheries of the flanges 33, 34, 35 and 36. The inserts 39 and 40, and 41 and 42 are joined respectively by thin covers 43 and 44, of a suitable metal such as brass, preferably soldered thereto. To prevent a short-circuited turn in the secondary effect, I prefer to insert a longitudinal strip of bakelite 45 in each cover, and extending substantially to the ends thereof.

Slidably disposed in the guideway 26 is a suitable plunger 46 constituting a movable core for the solenoid. Preferably, the plunger 46 is made of a suitable laminated material, with the lower lamination extending beyond the others to form projections 47 and 48 adapted to enter the inner ends of the vent passages 29 and 30 respectively. It will be evident that water is adapted to pass freely to and from the guideway 26 through the passages 29 and 30, and that when either of the projections 47 and 48 enters its vent passage, a small amount of water will be trapped and hence will form an hydraulic cushion for the plunger 46, thereby preventing a sharp impact at the end of the stroke, and hence resulting in practically noiseless operation.

The intermediate connecting portion 49 of the spool is formed in its upper wall with an elongated slot 50, and also is formed on the side adjacent the center of the container 10 with an enlargement or fitting 51 in which the lower end of the pin 15 is anchored. The solenoid thus is positioned at one side of the center of the impeller 14.

Extending vertically through the center of the plunger 46 and anchored in the lower lamination thereof is a connecting or crank pin 52. This pin extends outwardly through the slot 50 and through an aligned slot 50^a in the false bottom 18 for suitable operative eccentric engagement with the impeller 14 to oscillate the latter upon reciprocation of the plunger 46. In the present instance, the upper end is slightly reduced in size, and slidably engages in one of the channels 17.

Any suitable means may be provided for alternately energizing the coils 37 and 38 to effect reciprocation of the plunger 46. In Figs. 2 and 5, I have shown one suitable control circuit, including a relay type flasher switch for this purpose. This circuit comprises two mains 53 and 54 adapted to be plugged into a suitable source of current (not shown). The main 53 is grounded, and the main 54 is connected through a thermostatic flasher switch 55 and a relay coil 56 to the ground. Since thermostatic flasher switches are old and well known, and since the switch 55 per se forms no part of the present invention, the specific construction thereof is not shown. It is sufficient to state that the switch 55 serves to energize the relay coil 56 periodically.

The relay coil 56 controls an armature 57 grounded at one end and carrying opposed contacts 58 and 59 on the other end. The contacts 58 and 59 are arranged respectively to engage alternately with two fixed contacts 60 and 61 upon oscillation of the armature 57. A spring 62 tends to resist the action of the coil 56, and when the latter is de-energized serves to bring the contacts 58 and 60 into engagement. Each time the coil 56 is energized, the armature 57 is actuated against the force of the spring 62 to bring the contacts 59 and 61 into engagement. The contacts 60 and 61 are connected respectively through lines 63 and 64 to the coils 37 and 38, and the latter are connected by a common branch line 65 to the main 54. It will be evident that the oscillatory armature 57 will cause the coils 37 and 38 to be excited alternately, thereby effecting reciprocation of the plunger 46.

Preferably, the switch 55, the coil 56, the armature 57 and the contacts 58 to 61 are housed in a unitary plug 66 external of the container, and having terminals 67 and 68 adapted to be inserted in a suitable socket (not shown). The lines 63, 64 and 65 are directed to the coils 37 and 38 through suitable pipe conduits 69 extending through the space 20.

The advantages of this type of control circuit are that the construction inside the container is simple and never in need of replacement, the plug 66 can be renewed when necessary, and the reversal of the magnetic field is independent of the movement of the plunger 46 so that reversal of movement is not dependent on a full stroke.

In Figs. 4, 7 and 8, I have shown a mechanically controlled switch for the coils 37 and 38. The construction of the washing machine is the same as in the first form, and hence corresponding parts are identified by like reference characters. The primary difference in the control circuits resides in the elimination of the switch 55 and the relay coil 56, and in the substitution for the arma-

ture 57 of a switch contact blade 71 operatively connected to the plunger 46, and hence parts in the modified circuit correspondent to like parts in the first circuit are identified by similar reference characters primed.

In the modified form the contacts 58', 59', 60' and 61', and the blade 71 are enclosed in a suitable housing 72 mounted in the space 20. The lines 53', 63' and 64' extend from the housing 72 through a conduit 73 to the passage 70 from where they are suitably distributed. The end of the blade 71 opposite the contacts is mounted on a suitable pivot pin 74. Also mounted on the latter and extending oppositely to the blade 71 is an arm 75. A coil tension spring 76 connects the remote ends of the blade 71 and arm 75, and serves to throw the former one way or the other upon movement through dead center. The arm 75 is connected to a rod 77 extending through the plug 28 and through the adjacent end of the plunger 46 into an elongated space 78 formed in the latter. An enlargement 79 on the free end of the rod 77 is slidable in the space 78. The latter is slightly less in length than the full stroke of the plunger 46 so that near the end of each stroke one end of the space 78 will engage and move the enlargement 79 to reverse the blade 71. To seal the housing 72, a flexible bellows 80 has a fluid-tight connection with the housing and the rod 77.

It will be evident that I have provided a washing machine that is simple and inexpensive in construction, and quiet and efficient in operation. The moving parts being made of metal conduct heat readily. Water is allowed to permeate all parts of the operating mechanism, excepting the interior of the coils, the lead wire conduits and the switch mechanisms, and hence readily takes up heat generated in the solenoid. Thus, the water is heated to maintain a high washing efficiency, and the solenoid is cooled, and can be operated under a heavy load without overheating.

I claim as my invention:

1. A laundry machine comprising, in combination, a container adapted to contain water and fabrics, an agitator in said container, and an electric driving mechanism operatively connected to said agitator, said driving mechanism being mounted in said container below the normal water level.

2. A laundry machine comprising, in combination, a container, an agitator in said container adapted to contain water and fabrics, an electric driving mechanism for said agitator operatively connected thereto, said driving mechanism being mounted in the lower portion of said container below the normal water level, said mechanism comprising an electric coil and a closure for said coil, said closure being formed of heat conducting material for transmitting heat generated in said coil to the water.

3. A laundry machine comprising, in combination, a container adapted to contain water and fabrics, an agitator in said container, and an electric driving mechanism operatively connected to said agitator, said driving mechanism being mounted in said container below the normal water level, and having parts of heat conducting material for conducting heat therefrom to the water.
4. A laundry machine comprising, in combination, a container, an agitator in said container, and electromagnetic operating means in said container, said means having a movable member operatively connected to said agitator for driving the latter.
5. A laundry machine comprising, in combination, a container, an agitator in said container, a solenoid mounted in the lower portion of said container and having a reciprocatory core, and means operatively connecting said core to said agitator to drive the latter.
6. A laundry machine comprising, in combination, a container, an agitator in said container, a double-acting solenoid in the lower portion of said container, said solenoid having two coils and a reciprocatory core, means operatively connecting said core to said agitator, and means for alternately exciting said coils to effect reciprocation of said core.
7. A laundry machine comprising, in combination, a container, an agitator in said container, a double solenoid in the lower portion of said container, said double solenoid having a reciprocatory core, means operatively connecting said core to said agitator, and means for automatically varying the excitation of said solenoid to effect reciprocation of said core.
8. A laundry machine comprising, in combination, a container, a false bottom in said container, an agitator mounted over said false bottom, two aligned solenoids mounted below said false bottom, a reciprocatory core for said solenoids, means operatively connecting said core to said agitator, and means for varying the relative excitation of said solenoids to effect reciprocation of said core.
9. A laundry machine comprising, in combination, a container, a perforated false bottom in the lower portion of said container, an agitator mounted over said false bottom, a solenoid mounted on the under-side of said false bottom and having a reciprocatory core, means operatively connecting said core and said agitator to drive the latter upon reciprocation of said core, and means for varying the excitation of said solenoid to effect reciprocation of said core.
10. A laundry machine comprising, in combination, a container, a false bottom in said container, an agitator mounted in said container over said false bottom, and unitary operating means for said agitator mounted completely in said container below said false bottom.
11. A laundry machine comprising, in combination, a container, a perforated false bottom in the lower portion of said container, said false bottom being concave upward and having a flat central depressed portion, an agitator mounted for oscillation in said portion, and electromagnetic means mounted on the under-side of said false bottom and having an operative driving connection through said false bottom with said agitator.
12. A laundry machine comprising, in combination, a container, a false bottom in said container, a solenoid horizontally disposed in said container under said false bottom, said solenoid having a horizontal reciprocable core, an oscillatory agitator mounted over said false bottom, and connecting means carried by said core and extending through said false bottom into eccentric driving engagement with said agitator.
13. A laundry machine, comprising, in combination, a container, an agitator mounted for rotation on a vertical axis and having a radial guideway on its under-side, a solenoid mounted in said container below said agitator and at one side of the center of rotation of the latter, said solenoid having a reciprocatory core, a connecting pin on said core, said pin having a sliding engagement in said guideway, and means for varying the excitation of said solenoid to effect reciprocation of said core.
14. A laundry machine comprising, in combination, a container, an agitator in said container, a double-acting solenoid in the lower portion of said container, a core reciprocable in said coils, means for cushioning the movement of said core at each end of its stroke, means operatively connecting said core and said agitator to drive the latter upon reciprocation of said core, and means for varying the excitation of said solenoid to effect reciprocation of said core.
15. A laundry machine comprising, in combination, a container, an agitator in said container, a solenoid disposed in said container, said solenoid having a reciprocatory core, means operatively connecting said core and said agitator for driving the latter upon reciprocation of said core, and means controlled by the reciprocation of said core to automatically vary the excitation of said solenoid.
16. A laundry machine comprising, in combination, a container, an agitator in said container, a double-acting solenoid in the lower portion of said container, said solenoid comprising two horizontally spaced coils, a core reciprocable in said coils, means for providing a hydraulic cushion for said core at each end of its stroke, means operatively connecting said core and said agitator to drive the latter upon reciprocation of said core, and

means for varying the excitation of said solenoid to effect reciprocation of said core.

17. A laundry machine comprising, in combination, a container, an agitator in said container, a solenoid disposed in said container, said solenoid having a reciprocatory core, means operatively connecting said core and said agitator for driving the latter upon reciprocation of said core, and means for automatically varying the excitation of said solenoid, said last mentioned means comprising a multiple point switch having a lost motion connection with said core for actuating said switch at the end of each stroke of said core.

18. A laundry machine comprising, in combination, a container, a solenoid in the lower portion of said container, said solenoid comprising a fixed portion and a movable core, an agitator mounted for rotation on said fixed portion, and an eccentric driving connection between said agitator and said core.

19. A laundry machine comprising, in combination, a vertical container, an agitator in said container, a spool mounted in the lower end of said container, said spool having a central longitudinal passage opening therethrough, two electric coils, one on each end of said spool, said spool being formed with a central longitudinal slot opening to said passage between said coils, a core slidably mounted in said passage, and means projecting from said core through said slot into operative driving engagement with said agitator.

20. A laundry machine comprising, in combination, a vertical container, a false bottom removably mounted in the lower portion of said container, an agitator mounted for oscillation over the central portion of said false bottom, said false bottom being formed with an elongated slot eccentric to the center of said agitator, said agitator being formed with an outwardly extending guideway on its under-side, an elongated spool horizontally disposed in the bottom of said container, and mounted on the under-side of said false bottom, said spool being formed with a longitudinal passage opening therethrough, a pair of coils, one on each end of said spool, a core for said coils slidably mounted in said passage, a slot in said spool in registration with said first mentioned slot and opening to said passage, a pin carried by said core and extending through said slots into sliding engagement with said guideway, a source of electric current, a two-point switch adapted to selectively connect said source to said coils, and means having a lost motion connection with said core for reversing said switch.

21. A laundry machine comprising, in combination, a vertical container, a false bottom in the lower portion of said container, an agitator mounted for oscillation over the central portion of said false bottom, said false bottom being formed with an elongated slot

eccentric to the center of said agitator, an elongated spool horizontally disposed in the bottom of said container and mounted on the under-side of said false bottom, said spool being formed with a longitudinal passage opening therethrough, a pair of coils, one on each end of said spool, a core for said coils, slidably mounted in said passage, a slot in said spool in registration with said first mentioned slot and opening to said passage, a pin carried by said core and extending through said slots into sliding engagement with said agitator, and means for varying the relative excitation of said coils.

22. A laundry machine comprising, in combination, a container, an agitator in said container, a solenoid below the normal water level in said container, said solenoid having a central passage opening therethrough, two closures one for each end of said passage, each closure defining a vent port for permitting water to enter said passage, a reciprocatory core in said passage, projections on the ends of said core in alignment with said ports and adapted to enter said ports alternately at the ends of alternate strokes to cushion said core, means operatively connecting said core to said agitator, and means for automatically varying the excitation of said solenoid.

23. A laundry machine comprising, in combination, a container, a spool mounted in the lower end of said container, said spool having a central longitudinal passage opening therethrough, two electro-magnetic coils, one on each end of said spool, and an agitator in said container, an operative driving connection between said core and said agitator, and heat conducting means hermetically sealing said coils and externally exposed.

24. A laundry machine comprising, in combination, a container, an agitator in said container, a double-acting solenoid, said solenoid having two coils and a reciprocatory core, means operatively connecting said core to said agitator, and means for alternately exciting said coils to effect reciprocation of said core.

25. A laundry machine comprising, in combination, a container, an agitator in said container, a double-acting solenoid, a core reciprocable in said coils, means for cushioning the movement of said core at each end of its stroke, means operatively connecting said core and said agitator to drive the latter upon reciprocation of said core, said means for varying the excitation of said solenoid to effect reciprocation of said core.

26. A laundry machine comprising, in combination, a container, an agitator, a solenoid disposed in said container, said solenoid having a reciprocatory core, means operatively connecting said core and said agitator for driving the latter upon reciprocation of said core, and means for automatically vary-

ing the excitation of said solenoid, said last mentioned means comprising a multiple point switch having a lost motion connection with said core for actuating said switch at the end of each stroke of said core.

27. A laundry machine comprising, in combination, a vertical container, an agitator in said container, a horizontal solenoid having two aligned coils and a core reciprocable in said coils, means operatively connecting said core to said agitator, and means for automatically varying the relative excitation of said coils to effect reciprocation of said core.

In testimony whereof, I have hereunto affixed my signature.

IRVEN H. WILSEY.

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