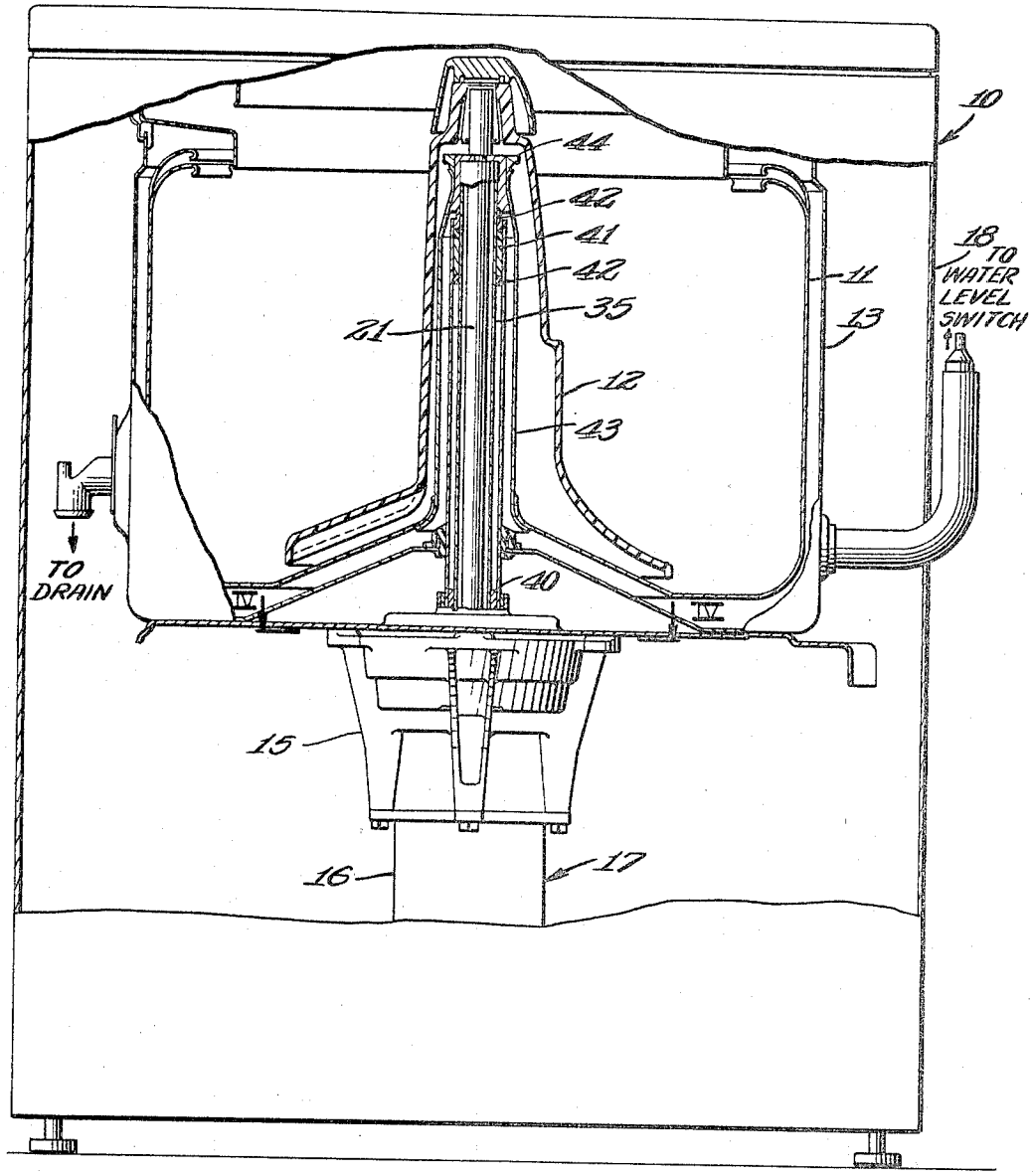
Oct. 18, 1966 G. R. SEVERANCE ETAL 3,279,223

DIRECT DRIVE FOR AUTOMATIC WASHERS WITH MAGNETIC AMPLIFIER CONTROL

Filed July 10, 1964 6 Sheets-Sheet 1

Fig. 1



INVENTORS

Glen R. Severance
Clifton A. Cobb
William F. Robandt

BY Hill, Sherman, Meroni, Gross & Simpson ATTORNEYS

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DIRECT DRIVE FOR AUTOMATIC WASHERS WITH MAGNETIC AMPLIFIER CONTROL

Filed July 10, 1964 6 Sheets-Sheet 2

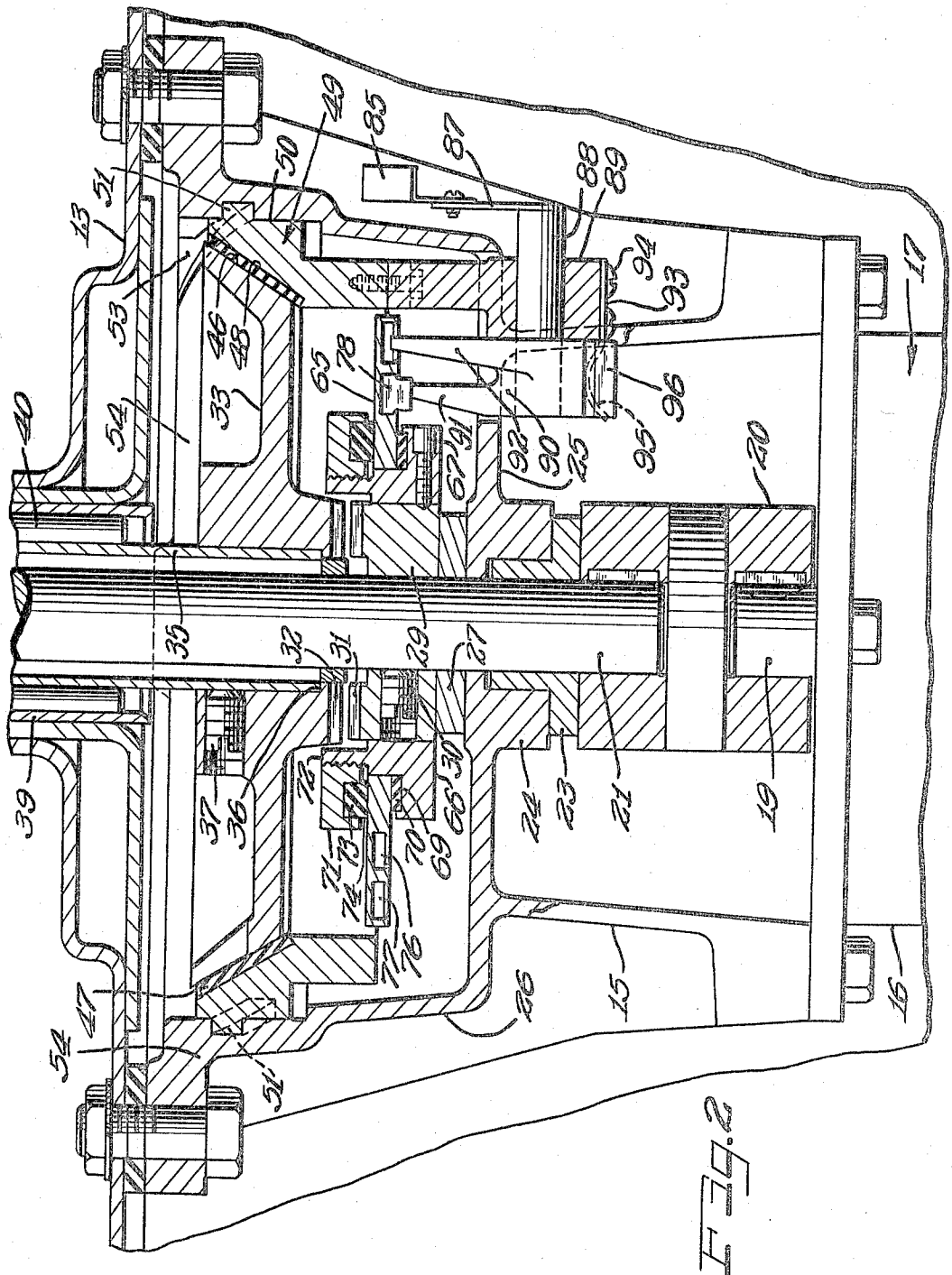


Fig. 2

INVENTORS

Glen R. Severance
Clifton A. Cobb
William F. Robandt

BY Hill Sherman, Meroni, Gross & Simpson ATTORNEYS

Oct. 18, 1966

G. R. SEVERANCE ET AL

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Filed July 10, 1964

6 Sheets-Sheet 3

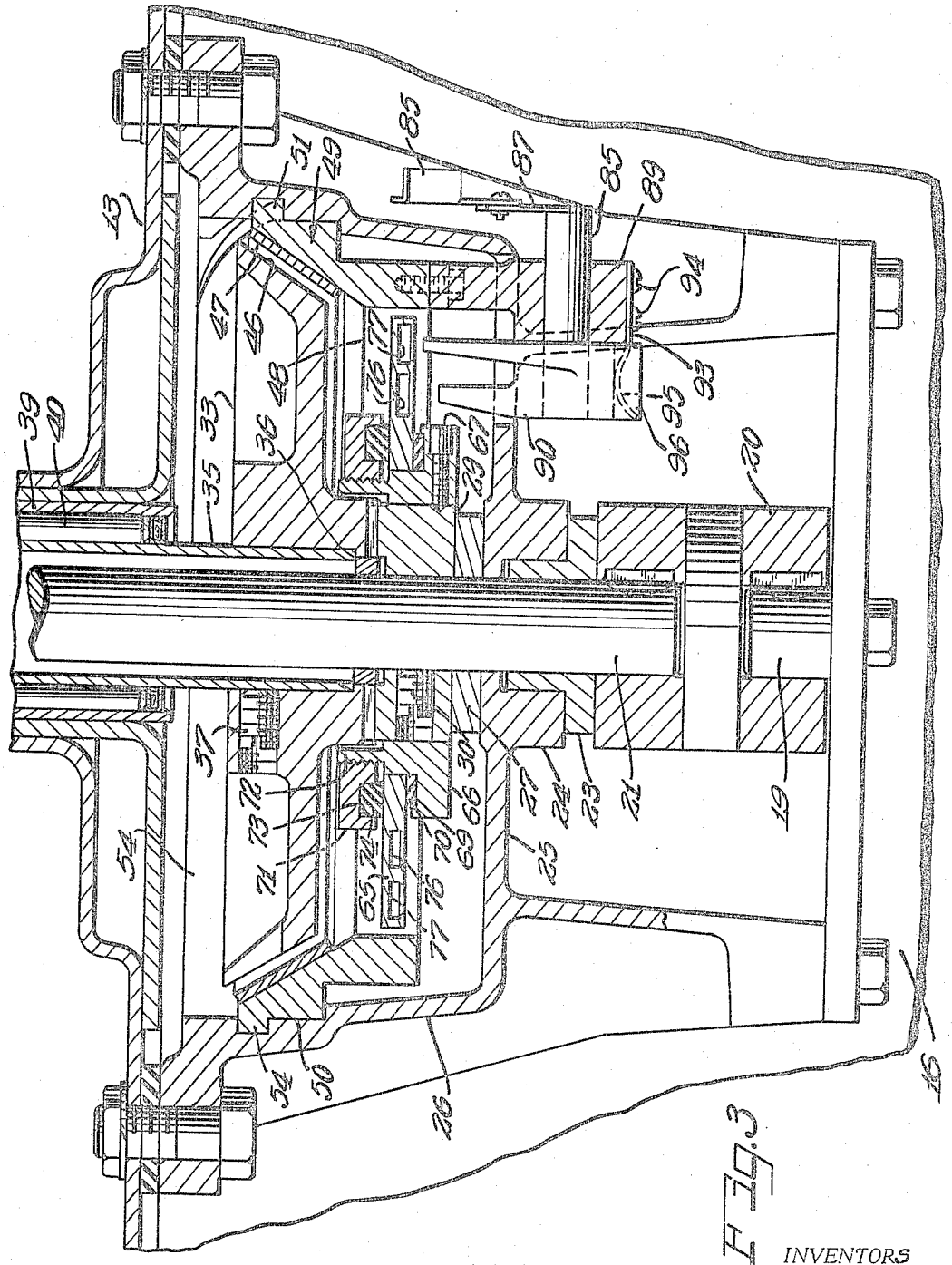


FIG. 3

INVENTORS
Glen R. Severance
Clifton A. Cobb
William F. Robandt

BY Dill, Sherman, Meroni, Gross & Simpson ATTORNEYS

Oct. 18, 1966 G. R. SEVERANCE ETAL 3,279,223

DIRECT DRIVE FOR AUTOMATIC WASHERS WITH MAGNETIC AMPLIFIER CONTROL

Filed July 10, 1964 6 Sheets-Sheet 4

Fig. 4

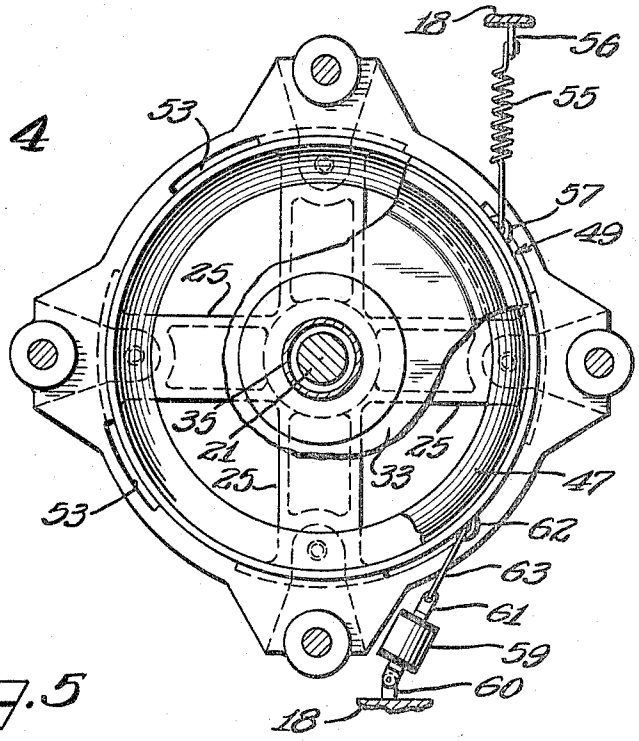
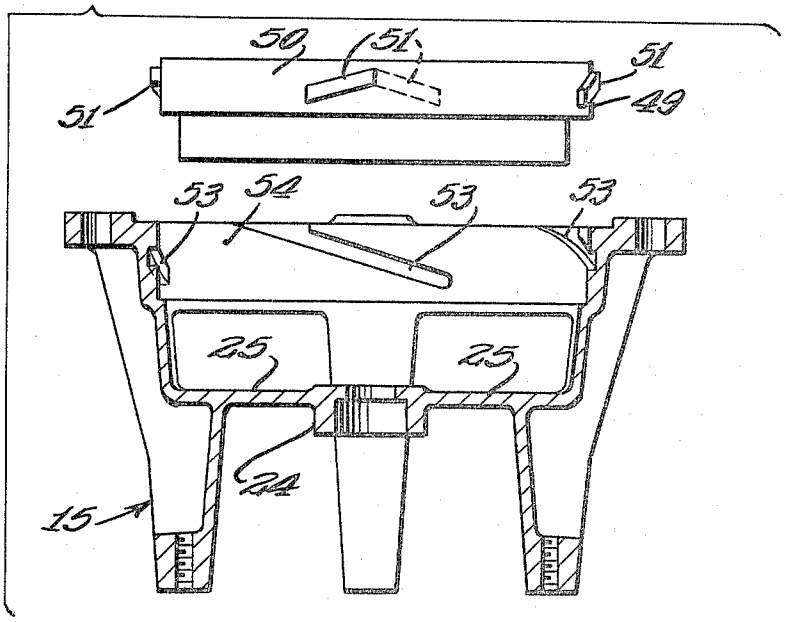


Fig. 5



INVENTORS

Glen R. Severance
Clifton A. Cobb
William F. Robandt

BY Hill, Sherman, Meroni, Gross & Simpson ATTORNEYS

Oct. 18, 1966 G. R. SEVERANCE ETAL 3,279,223
DIRECT DRIVE FOR AUTOMATIC WASHERS
WITH MAGNETIC AMPLIFIER CONTROL

Filed July 10, 1964 6 Sheets-Sheet 5

Fig. 6

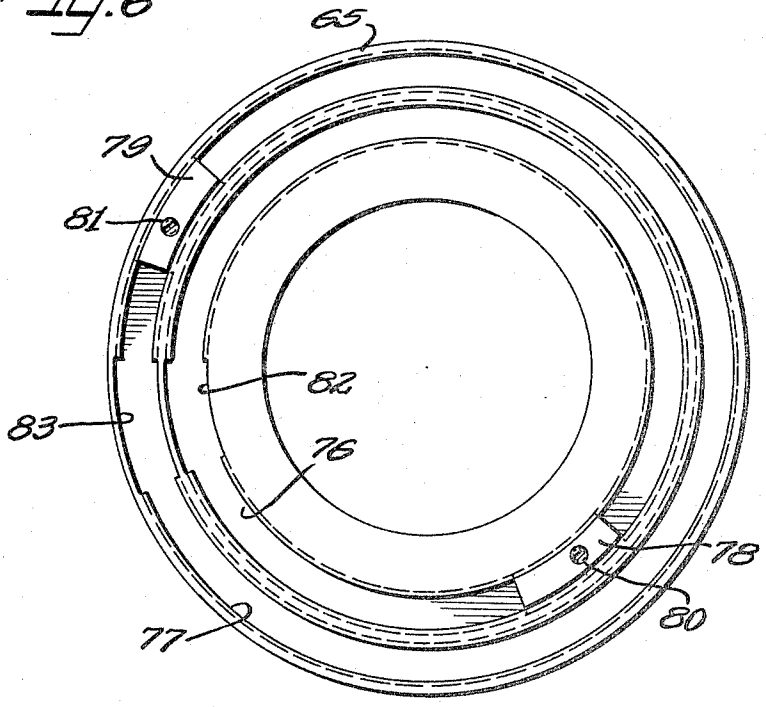
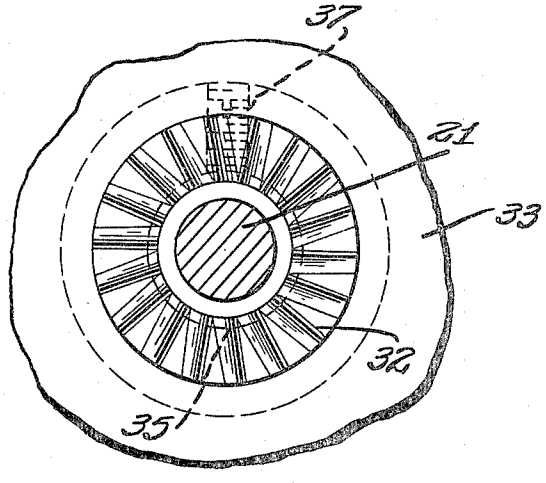


Fig. 7



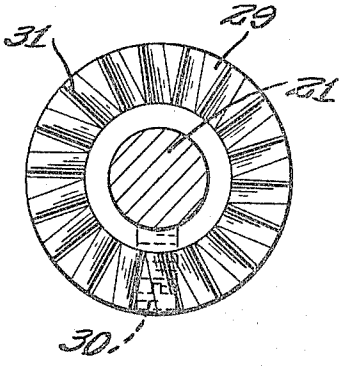


Fig. 8

INVENTORS
Glen R. Severance
Clifton A. Cobb
William F. Robandt

BY Hill Sherman Meroni Gross & Simpson ATTORNEYS

Oct. 18, 1966

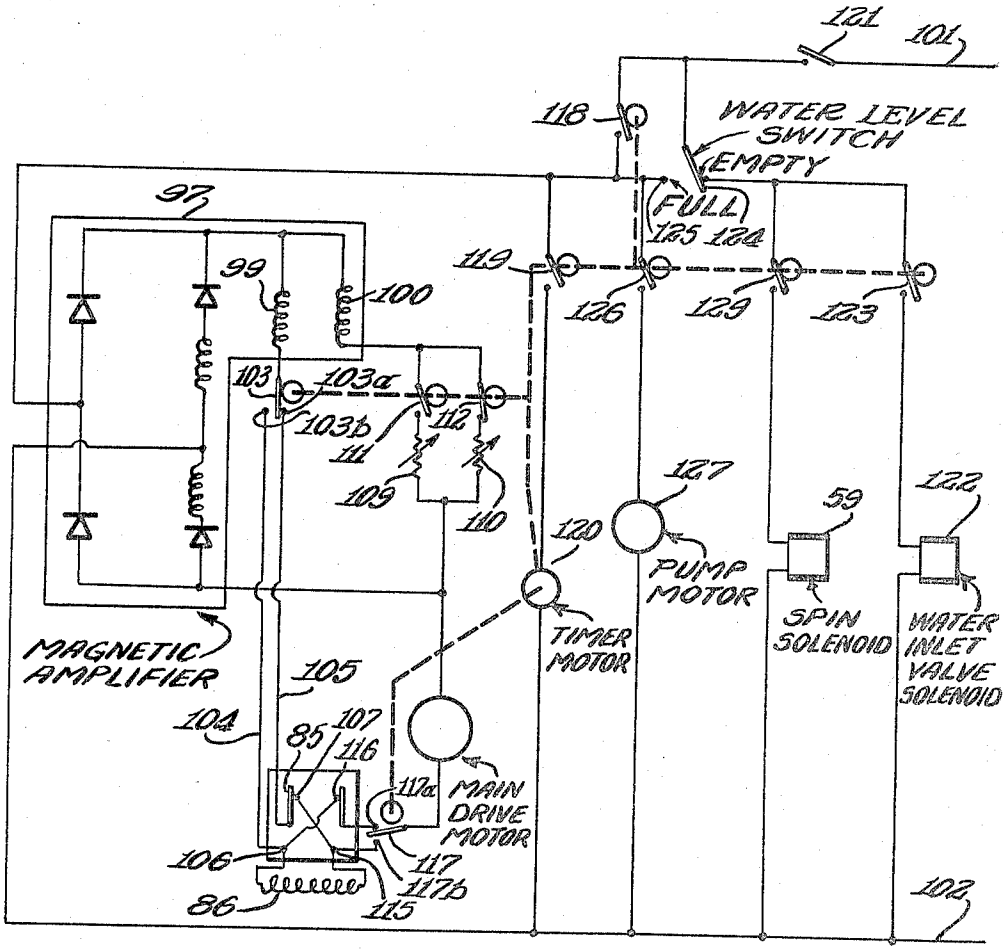
G. R. SEVERANCE ETAL
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3,279,223

Filed July 10, 1964

6 Sheets-Sheet 6

Fig. 9



INVENTORS
Glen R. Severance
Clifton A. Cobb
William F. Robarde

BY Hill, Sherman, Meroni, Gross & Simpson ATTORNEYS

United States Patent Office 3,279,223 Patented Oct. 18, 1966

3,279,223

DIRECT DRIVE FOR AUTOMATIC WASHERS WITH MAGNETIC AMPLIFIER CONTROL

Glen R. Severance, Benton Harbor, and Clifton A. Cobb and William F. Robandt, St. Joseph, Mich., assignors to Whirlpool Corporation, Benton Harbor, Mich., a corporation of Delaware

Filed July 10, 1964, Ser. No. 381,621
21 Claims. (Cl. 68—12)

This invention relates to improvements in laundry machines and more particularly relates to a simplified and improved form of automatic machine for washing and extracting water from clothes in a series of sequential operations.

In the present day laundry machines in which clothes are contained in a clothes container or basket in a laundry tub and washing is effected by oscillatable movement of an agitator within the clothes container, and water is extracted from the clothes by spinning of the clothes container, it has been necessary to provide a relatively complicated oscillatable drive to the agitator together with a clutch connecting the drive to the agitator and disconnecting the drive to the agitator and connecting the drive motor to the clothes container for spinning the clothes container to extract water from the clothes therein.

These drives have been relatively complex and inefficient and have been subject to wear and breakage but due to the fact that household current has been alternating current, it has not been economically feasible or practical to directly drive the agitator from a reversible drive motor.

In carrying out the present invention we are able by a simplified mechanical clutching and braking arrangement to directly connect the agitator shaft to the drive motor for the machine by utilizing a direct current motor connected to an alternating current source of supply through a conventional magnetic amplifier and are able to select the spinning and oscillating speeds through an electrical speed control system connected with the magnetic amplifier by utilizing control currents of low magnitudes to control the voltages applied to the drive motor and thereby control the speed of operation of the motor.

With this system, it is possible to directly connect the agitator drive shaft with the motor shaft and to directly drive the clothes container at a selected extracing speed through a simplified clutching arrangement and to effect oscillatable movement of the agitator by periodically reversing the drive motor therefor.

A principal object of the invention, therefore, is to improve upon the automatic laundry machines heretofore in use by directly connecting the agitator to the drive motor for the machine and by oscillatably driving the agitator by periodically reversing the drive motor therefor.

A further object of the invention is to provide a novel and improved form of automatic laundry machine utilizing a direct current reversible series wound drive motor to directly drive the agitator and by utilizing an alternating current source of power rectified to supply direct current to the motor, in which oscillation of the agitator is attained by periodically reversing the driection of rotation of the motor, and spinning of the clothes container is attained by continuous rotation of the motor in one direction through a simplified form of clutching arrangement between the motor and spinning clothes container.

Still another object of the invention is to provide an improved form of automatic washing and extracting machine having a clothes container rotatably supported

on a drive sleeve therefor and an agitator within the clothes container encircling the drive sleeve and rotatably supported on the drive shaft therefor, in which a reversible direct current drive motor has direct connection with the drive shaft and is reversed by cam means rotating with the drive shaft and wherein the drive sleeve is supported in an elevated position by a combined clutch and brake arrangement during oscillation of the agitator and is lowered into a drive position to effect spinning of the clothes container by the motor by movement of the brake disk downwardly into a disengaged position, automatically rendering the reverse mechanism ineffective to reverse the drive motor when the clothes container drive sleeve is in an extracting position.

These and other objects of the invention will appear from time to time as the following specification proceeds and with reference to the accompanying drawings wherein:

FIGURE 1 is a front elevational view of a laundry machine constructed in accordance with the principles of the present invention with parts of the outer cabinet removed and in section and with certain other parts broken away and in section in order to illustrate certain principles of the present invention;

FIGURE 2 is a fragmentary sectional view taken through the drive mechanism for the clothes container and agitator and showing the mechanism in position to effect an oscillatable drive to the agitator;

FIGURE 3 is a view somewhat similar to FIGURE 2 illustrating the drive connection to the clothes container spinning thereof;

FIGURE 4 is a top detail plan view of the support for the tub taken along line IV—IV of FIGURE 1 and showing the brake member mounted therein, and the mechanism for moving the brake member into its elevated and lowered positions;

FIGURE 5 is an exploded view of the brake member and its support, showing the support in transverse section;

FIGURE 6 is a bottom plan view of the cam disk showing the reversing cam segments mounted therein;

FIGURE 7 is a fragmentary bottom plan view of the brake cone for supporting and driving the clothes container and showing the clutch teeth on the bottom thereof;

FIGURE 8 is a top plan view of the drive lug for the clothes container showing the upwardly facing clutch teeth thereon and showing agitator drive shaft in horizontal section; and

FIGURE 9 is an electrical schematic diagram indicating the wiring connections, electrical components and the sequential control means for the machine.

As shown on the drawings:

In the embodiment of the invention illustrated in the drawings, we have shown in FIGURE 1 an automatic laundry machine **10** of the washing and extracting type operating to wash clothes in a clothes container or basket **11** by oscillatably driving an agitator **12**, and to extract extract water from the clothes contained in the clothes container by spinning the clothes container at an extracting speed. The washing and extracting operations are, therefore, carried out in a conventional manner well known to those skilled in the art. The clothes container **11** is shown as being mounted within a tub **13** supported on a mounting or support frame **15** mounted on the top of a casing **16** for a motor **17** and bolted or otherwise secured thereto. The motor **17** in turn is mounted on the base (not shown) of a cabinet **18** for the machine.

As shown in FIGURES 2 and 3, the motor **17** has a vertical motor shaft **19** keyed or otherwise secured to a

drive coupling **20**, forming a drive coupling for an agitator drive shaft **21** axially aligned with the motor shaft **19**, and keyed or otherwise secured to the lower end portion of said agitator drive shaft. The coupling **20** may be of a conventional form so need not herein be shown or described in detail. The agitator drive shaft **21** extends upwardly of the coupling and forms a drive support for the agitator **12** at its upper end, supporting and oscillatably driving said agitator during a clothes washing operation and spinning said agitator with the clothes container **11** during an extracting operation.

As shown in FIGURE 2, the agitator drive shaft **21** is journalled at its lower end portion, just above the coupling **20** in a flanged bearing **23** extending upwardly within a hollow boss **24** shown as being formed integrally with radial arms **25** of the mounting frame **15** and extending inwardly of an annular side wall **26** of said mounting frame, intermediate the top and bottom ends thereof.

A thrust bearing **27** abuts the top surface of the boss **24** and is abutted by a drive lug **29** for the clothes container **11** and forms a thrust bearing therefor. The drive lug **29** is shown as being secured to the agitator drive shaft **21** as by a set screw **30**, although it may be secured to said agitator drive shaft by any well known form of securing means.

The drive lug **29** is shown as having clutch teeth **31** projecting upwardly therefrom and arranged in an annular row spaced outwardly of the periphery of the agitator drive shaft **21**. The clutch teeth **31** are adapted to be meshed with clutch teeth **32** depending from a brake cone **33** extending about and secured to a support and drive sleeve **35** for the clothes container **11**. As shown in FIGURES 2 and 3, the drive sleeve **35** abuts a shoulder **36** of the brake cone **33** at its lower end and is supported on said brake cone. A set screw **37** is shown as securing the brake cone **33** to the clothes container support and drive sleeve **35**, to effect a driving connection between said drive cone and clothes container support sleeve **35**, when the clutch teeth **32** are in mesh with the clutch teeth **31** and supported on the drive lug **29**.

As shown in FIGURES 1, 2 and 3, the sleeve **35** extends upwardly within a bearing support tube **39** secured to and extending upwardly of the bottom of the tub **13** and forming a support at its lower end portion for bearings **40** for the sleeve **35**, and at its upper end portion for bearings **41** for said clothes container support and drive sleeve. Suitable sealing means indicated generally by reference character **42** are provided on opposite sides of the bearing **41** to seal the tube **39** from the leakage of water downwardly into the bearings. The clothes container **11** is supported on the upper end of the agitator drive tube **35** on a spider **44** suitably secured to the upper end of said tube, to be driven therefrom and forming a support for an upstanding hollow center post **43** of the clothes container. The support for the clothes container on the tube **35**, and the drive to the clothes container from said tube are conventional, so said support and drive need not herein be shown or described in detail.

Referring now to the means for lowering the brake cone **33** and accommodating engagement of the clutch teeth **32** with the clutch teeth **31** to effect a spin drive to the clothes container **11**, the brake cone **33** has an outer downwardly facing frusto-conical brake surface **46**, engaging and supported on a brake shoe or band **47**, extending at the angle of a brake surface **46**, and carried on an inner peripheral frusto-conical surface **48** of a brake member **49**. The brake member **49** is generally annular in form and has a cylindrical peripheral wall portion **50** having a series of generally spiral or helical elongated cam lugs **51** projecting from the periphery thereof. The cam lugs **51** are supported in and engage generally spiral or helical camming grooves **53** formed in an internal cylindrical wall portion **54** of the mounting frame member **15**. The cam lugs **51** and the camming grooves **53** all extend at the same angle so that angular movement of the brake member **49** about the wall **50** in one direction, which in FIGURE 4 is a clockwise direction, will lower the brake member **49**, brake cone **33**, sleeve **35** and clothes container **11** to engage the clutch teeth **32** with the clutch teeth **31** and support the brake cone **33**, drive sleeve **35** and clothes container **11** on the drive lug **29**. Continued clockwise movement of the brake member **49** will then bring the brake shoe **47** out of engagement with the frusto-conical braking surface **46** of the brake cone **43**. A drive connection will thus be provided between the agitator drive shaft **21**, drive lug **29** and clothes container **11** to rotatably drive said clothes container from the motor **17** at an extracting speed.

Angular movement of the brake member **49** in a counterclockwise direction will thus cause the cam lugs **51** to ride upwardly along the camming grooves **53** and bring the brake shoe **47** into engagement with the frusto-conical face **46** of the brake cone **33** and move said brake cone vertically into the position shown in FIGURE 2, disengaging the clutch teeth **32** from the clutch teeth **31** and supporting the brake cone **33** and clothes container through the drive sleeve **35** on the brake shoe **47** and brake member **49**. The brake shoe **47** will also hold the clothes container from rotatable movement during the washing operation, effected by oscillatable movement of the agitator **12**.

A tension spring **55** is shown in FIGURE 4 as being connected at one end to the inside of the cabinet **18** as by a connector **56** and as being connected at its opposite end to an eye **57** extending outwardly of the cylindrical wall **50** of the brake member **49**. The tension spring **55** thus biases the brake member **49** in a counterclockwise direction to effect raising movement of the brake cone **33** and disengagement of the clutch teeth **32** from the clutch teeth **31**.

A solenoid **59** is shown in FIGURE 4 as being connected to the inside of the cabinet **18** at the opposite side of the cabinet from the tension spring **55**, by a connector **60**. The solenoid **59** is shown as having an armature **61** connected to an eye **62** extending radially of the wall **50** as by a link **63**. Energization of the solenoid **59**, therefore, will retract the armature **61** and angularly move the brake member **49** against the tension spring **55** and thereby lower the brake cone **31** to engage the clutch teeth **32** with the clutch teeth **31** and provide a spin drive to the clothes container **11**.

As previously described, a direct drive connection is provided from the motor shaft **19** to the agitator drive shaft **21**, so the agitator is continuously driven during the washing and extracting operation. A means is provided to periodically reverse the direction of rotation of the motor **17** to effect an oscillatable drive to the agitator **12**, which is herein shown as comprising a cam disk **65** mounted on a cam disk drive member **66** extending about the drive lug **29** and secured thereto to be rotated thereby, by a set screw **67**. The cam disk drive member **66** has an upwardly facing annular groove **69** extending thereabout carrying an annular friction disk **70** supporting the undersurface of the cam disk **65**. A nut **71** is threaded on the outside of an annular projection **72**, projecting upwardly of the drive member **66** and spaced radially outwardly of the clutch teeth **32**. The nut **71** has a downwardly opening groove **73** therein, in which is mounted an annular friction disk **74**, engageable with the top surface of the cam disk **65**. Turning of the nut **71** about the annular surface **72** in a tightening direction will thus squeeze the cam disk **65** between the annular friction or clutching surfaces **70** and **74** and provide a friction drive for said cam disk from the drive lug **29**. The friction drive for the cam disk **65** permits the over-travel of the agitator due to its momentum when the cam members **78** and **79** are stopped by arms **91** and **92**.

The cam disk **65** has a plurality of radially spaced downwardly opening annular grooves **76** and **77** extending thereabout. The groove **76** contains a cam member **78**. The groove **77** contains a circumferentially spaced cam member **79** (FIGURE 6). The cam members **78**

and 79 may be secured to their respective grooves as by machine screws 80 and 81 respectively or by any other suitable fastening means. As shown in FIGURE 6 the respective annular grooves 76 and 77 have widened portions 82 and 83 formed therein for receiving the respective cam members 78 and 79 to accommodate said cam members to be inserted in the selected grooves, it being seen from FIGURES 2 and 3 that the cam members have generally dovetail shaped bases fitting into correspondingly shaped grooves.

The cam members 78 and 79 are adapted to alternately operate a reversing switch 85. The reversing switch 85 may be a mercury type of double pole double throw reversing switch for reversing the flow of current through a series field 86 of the drive motor 17 to effect reversal of the drive motor in a conventional manner.

The reversing switch 85 is shown as being mounted on the outer end of an arm 87 secured to the outer end of a rock pin 88 rockingly mounted in a bracket 89 secured to the bottom of the brake member 49 and depending therefrom. The rock pin 88 extends generally radially of the axis of rotation of the agitator shaft 21 and has an actuator 90 secured thereto and projecting upwardly therefrom toward the cam disk 65. The actuator 90 has two upwardly projecting radially spaced actuator arms 91 and 92, the inner arm 91 of which registers with the center of the annular groove 76 and is engaged by the cam disk 78 to rock the actuator 90 and reversing switch 85 in one direction, and the outer arm 92 of which registers with the center of the cam groove 77 to be engaged by the cam member 79 to rock the actuator 90 in an opposite direction. A holding detent in the form of a leaf spring 93 is provided to hold the actuator 90 and the switch 85 in its two operative positions. As shown in FIGURES 2 and 3, the holding spring 93 is secured to the bottom of the bracket 89 as by machine screws 94 and has a downwardly and upwardly curved inner detent portion 95 engaging an under surface 96 of the actuator 90.

It will be understood that the circumferential spacing of the cams 78 and 79 may be varied and that the spacing of said cams determines the length of the agitator stroke.

It may be seen from the foregoing that the spring 55 normally biases the brake member 49 in a counterclockwise direction with respect to the cylindrical wall 54 of the support 15. This disengages the clutch teeth 32 from the clutch teeth 31 and raises the bracket 89 and actuator 90 in position to be alternately rocked in opposite directions by the stop cams 78 and 79. The brake band or shoe 48 supporting the brake cone 33 also holds said brake cone and the clothes container 11 from rotation. The stop cams 78 and 79 alternately engaging the arms 91 and 92 of the actuator will thus alternately rock the switch 85 in opposite directions to periodically reverse the motor 17 in accordance with the positions of the stop cams on the cam disk 65 and thereby effect an oscillatable drive to the agitator 12 continuing for the duration of the washing period.

At the termination of the washing period, the solenoid 59 is energized to angularly move the brake member 49 in a clockwise direction and engage the clutch teeth 32 with the clutch teeth 31 and effect a direct driving connection from the drive lug 29 to the clothes container support and drive sleeve 35, for driving said sleeve and the clothes container 11 at an extracting speed. As the clutch jaws 32 move downwardly into engagement with the clutch jaws 31, the actuator fingers 91 and 92 of the actuator lever 90 will be moved downwardly with the brake member 49 out of operative association with the stop cams 78 and 79 and the brake shoe 47 will move out of engagement with the coned brake surface 46 of the coned brake member 33. The clothes container 11 will then be supported on the drive lug 29 and will be rotatably driven therefrom.

Referring now to FIGURE 9 and the operation of the laundry machine, the motor 17 is shown as being energized through a magnetic amplifier 97 of the full-wave, self-saturating, diode gated, flux-reset type. The magnetic amplifier 97 is connected with an alternating current source of current supply through conductors 101 and 102 and delivers direct current to energize the direct current drive motor 17. The magnetic amplifier 97 may be of any well known commercial form and is like that shown and described in an application Serial No. 348,459 filed March 2, 1964 by Glen R. Severance and entitled "Speed Control for a Laundry Machine," so need not herein be shown or described in detail. The laundry machine is energized through a predetermined sequence of operation by a sequential controller comprised of the timer motor 120 and the associated cam operated switches 103, 111, 112, 117, 118, 119, 123, 126 and 129.

Direct current flows through an impedance winding 99 under the control of a cam operated timer switch 103, through either of two positive lines 104, 105 depending upon whether the operation is a washing or extracting operation, to positive terminals 106, 107 respectively. Terminal 106 is directly connected with the series field 86. Terminal 107 is connected with the series field 86 through the reverse switch 85.

The coil 100 is a control winding and is connected with the negative side of the drive motor 17 through either one of two timer operated switches 111 and 112 respectively. The speed control resistor 109 is connected in series with the coil 100 upon closing of the switch 111, during an extracting operation. The speed control resistor 110 is connected in series with the coil 100 from the negative terminal of the motor 17 upon closing of the switch 112 during the washing period, it being understood that the switches 111 and 112 are alternately operable during the sequential carrying out of the cycles of operation of the machine.

The reversing switch 85 alternately reverses the flow of current through the field coil through the terminals 106 and 107 and to the armature of the motor 17 through the respective terminals 115 and 116, through a timer switch 117. The flow through the field coil 86 is thus reversed to reverse the direction of rotation of the drive motor 17 in a conventional manner.

The machine is conditioned for operation by positioning the timer knob (not shown) at the beginning of the cycle of operation. This will close timer switch 123, timer switch 112, timer switch 119, move switch 103 to contact 103*a* and move switch 117 to contact 117*a*. Timer switch 118 is open during the washing portion of the cycle and the water level switch 124 is in the "empty" position at the initiation of the washing operation as shown in FIGURE 9. The timer knob (not shown) is then pushed in to close the master switch 121 and energize the water inlet valve solenoid 122 through a timer switch 123 and the water level switch 124. When the water reaches a predetermined level, the water level switch 124 moves to the "full" position to deenergize the water inlet valve solenoid 122 and to engage a contact 125 and complete an energizing circuit to the timer motor through timer switch 119 and to the drive motor through timer switches 103, 112, and 117. A circuit will then be completed through timer switch 103 from the impedance coil 99 through the positive conductor 105 to the field 86, while the timer switch 112 will complete a circuit from the negative terminal of the drive motor 17 through the speed control resistor 110. The motor 17 will then be energized and alternately reversed by operation of the double pole double throw reversing switch 85, first completing a circuit through the field coil 86 through the terminals 115 and 106, and then completing a circuit through the field coil 86 through the terminals 116 and 107. The washing operation will then continue for a predetermined time interval determined by the cam profiles of the sequential controller.

At the termination of the washing operation, the timer switch 103 will engage contact 103*b* to complete a circuit

through the positive conductor 104 to the field terminal 106. The timer switch 117 will engage contact 117*b* to complete a circuit from the field terminal 115 to the armature of the motor 17, while the switch 111 will move into position to complete a circuit from the negative terminal of the motor through the speed control resistor 109. The switch 112 will then be open and the circuit through the resistor 110 will be dead. A timer switch 126 will also move into position to complete a circuit through a pump motor 127 to drain water from the tub. Water level bypass switch 118 will be closed to provide a circuit to the components after the water level switch has moved to the empty position. As the water is drained from the tub the water level switch 124 will complete a circuit through a timer switch 129 to energize the spin solenoid 59 and angularly move the brake member 49 to lower said brake member and bring the clutch teeth 32 into mesh with the clutch teeth 31, to effect a drive to the brake cone 33, support sleeve 35 and clothes container 11 at a spinning speed, the speed of which is determined by the speed control resistor 109.

The extraction of water from the clothes will then continue until the timer switch 129 is opened to deenergize the solenoid 59 and accommodate the tension spring 55 to move the brake member 49 in a counterclockwise direction and thereby raise said brake member along the spiral camming grooves 53, and engage the brake shoe or band 48 with the frusto-conical surface 46 of the brake cone 33, and raise the clutch teeth 32 out of clutching engagement with the clutch teeth 31. The clothes container is then held from rotation by the brake shoe 47 and the agitator is conditioned to come into oscillatable operation by alternate reversal in the direction of rotation of the motor 17.

While we have herein shown and described one form in which the invention may be embodied, it may readily be understood that various variations and modifications in the invention may be attained without departing from the spirit and scope of the novel concepts thereof.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In a laundry machine including a tub, a clothes container within said tub mounted fo rrotation at a relatively high extracting speed, an agitator mounted within said clothes container for oscillatable movement with respect thereto,
- a shaft for driving said agitators,
- a reversible motor having driving connection with said shaft,
- a clutch providing a drive connection between said shaft and said clothes container,
- brake means movable in a first direction to disengage said clutch and hold said clothes container from rotation, said brake means movable in the second direction opposite to said first direction to engage said clutch and release said clothes container for rotation with said shaft,
- and means for periodically reversing the direction of rotation of said motor,

whereby said motor forms an oscillatory drive member for said agitator.

2. In a laundry machine including a tub, a clothes container within said tub,
- an agitator in said clothes container,
- a shaft for driving said agitator,
- a reversible motor,
- a sequential controller for controlling said machine through a sequence of operations,
- a driving connection between said motor and said shaft,
- a clutch and brake mounted coaxially of said shaft,
- means operable by said sequential controller of the machine for moving said brake to a first position to engage said clutch and release said brake to effect a drive to said clothes container at a high extracting speed and for moving said brake to a second position to release said clutch and engage said brake to hold said clothes container from rotation,
- and other means rotated by said shaft for periodically reversing the direction of rotation of said motor,

whereby said motor serves as an oscillatory drive member for said agitator.

3. A laundry machine in accordance with claim 2 in which the means for reversing rotation of said motor comprises a rotatable cam disk,
- a reversing switch for reversing the direction of rotation of said motor,
- a reversely movable actuator for said switch,
- and cam means on said cam disk periodically engaging said actuator and moving said actuator in reverse directions to operate said switch to cyclically reverse said motor and effect a reciprocable drive to said shaft and agitator.

4. A laundry machine in accordance with claim 3 wherein the cam disk is rotatably driven by said motor,
- wherein the actuator for the switch is pivoted for rockable movement in reverse direction,
- wherein circumferential spaced cams are provided on said disk for reversely pivoting said actuator,
- and wherein said switch is directly connected with said actuator to be actuated thereby and effect a reversal in the direction of rotation of said motor during each stroke of rocking movement thereof.

5. A laundry machine comprising:
- a tub, a support therefor,
- a clothes container rotatably mounted within said tub,
- a sleeve for supporting and rotatably driving said clothes container,
- an agitator within said tub extending about said sleeve,
- a shaft within said sleeve for supporting and driving said agitator,
- a reversible motor,
- a direct driving connection between said motor and said shaft,
- a clutch selectively connecting said sleeve with said shaft to effect rotation of said sleeve and clothes container,
- a brake holding said clutch in a disengaged position and holding said clothes container from rotation,
- and movable downwardly to effect engagement of said clutch and release of said brake to effect a rotatable drive to said clothes container,
- and reversing means for said motor to effect reversal of said motor and oscillatable movement of said agitator,
- said reversing means being moved by said brake out of position to effect reversal of said motor upon engagement of said clutch and release of said brake.

6. A laundry machine comprising:
- a tub,
- a stationary support for said tub,
- a clothes container within said tub mounted for rotational movement with respect thereto,
- a sleeve for rotatably driving said clothes container,
- an agitator within said tub and extending about said sleeve,
- a shaft within said sleeve for supporting and driving said agitator,
- a reversible motor,
- a direct driving connection between said motor and said shaft,
- a clutch for selectively connecting said sleeve with said shaft,
- a brake movable vertically to disengage said clutch and hold said clothes container from rotation,
- and movable downwardly to effect engagement of said clutch and release of said brake,
- a cam disk rotatably driven by said motor and having cam means thereon,
- a reverse switch for said motor,
- an actuator for said switch mounted for vertical move-

ment with said brake and moved out of operative association with said cam means upon engagement of said clutch and release of said brake,

and movable into operative association with said cam means and operated thereby to move said switch to periodically reverse the direction of rotation of said motor upon movement of said brake to disengage said clutch and engage said brake.

7. A laundry machine in accordance with claim **6** in which the brake includes a vertically movable support, in which said actuator is pivotally supported on said support,

in which the cam means on said disk comprises a pair of circumferentially and radially spaced cams separately engaging said actuator,

depending upon the direction of rotation of said motor to rock said actuator and periodically move said switch to reverse the direction of rotation of said motor.

8. A laundry machine comprising a tub,

a stationary support therefor,

a clothes container within said tub mounted for rotational movement with respect thereto,

a sleeve for rotatably driving said clothes container and supporting said clothes container for rotatably movement,

an agitator within said clothes container extending about said sleeve,

a shaft within said sleeve for supporting and driving said agitator,

a reversible motor,

a direct driving connection between said motor and said shaft,

a clutching connection between said shaft and said sleeve including a clutch member mounted on said sleeve and secured thereto,

said clutch member having radially spaced downwardly facing clutch and brake surfaces,

a brake member having a braking surface having supporting engagement with said brake surface of said clutch member and mounted in said support for vertical and angular movement with respect thereto, a camming supporting connection between said support and said brake member,

means angularly moving said brake member in one direction to effect engagement of said clutch and disengagement of said brake and in an opposite direction to effect disengagement of said clutch and engagement of said brake,

and actuating means vertically movable with said brake member for periodically reversing the direction of rotation of said motor to effect an oscillatable drive to said agitator,

and move by said brake member into an operative position to effect reversal of said motor upon engagement of said brake and disengagement of said clutch.

9. A laundry machine in accordance with claim **8** wherein a cam disk is mounted on said shaft for rotation therewith and has cam means depending therefrom,

and wherein said actuator is pivotally mounted on said brake member beneath the braking surface thereof for pivotal movement about an axis extending radially of said shaft and is moved into and out of operative association with cam means upon movement of said brake member to engage and disengage said clutch.

10. A laundry machine in accordance with claim **9** wherein the motor is a direct current motor having a series field,

wherein a double pole double throw switch is connected in the energizing circuit to said field and is actuated by said actuator to periodically reverse the direction of the flow of current through said field and the direction of rotation of said motor.

11. A laundry machine comprising a tub,

a support for said tub supporting said tub in a vertical position,

a clothes container rotatably mounted within said tub,

a sleeve supporting said clothes container and rotatably driving said clothes container, an agitator within said tub extending about said sleeve,

a shaft within said sleeve for supporting and driving said agitator,

a reversible motor,

a sequential control means for controlling said laundry machine through a predetermined sequence of operation,

a direct driving connection between said motor and said shaft,

a cam disk mounted on said shaft for rotation therewith,

a reverse switch connected with said motor and movable into positions to reverse the direction of rotation thereof,

a rockable actuator for said switch for rocking said switch to effect rotation of said motor alternately in opposite directions,

and cam means on said disk engaging said actuator at the termination of rotation thereof in one direction to operate said actuator to effect operation to said switch to periodically change the direction of rotation of said motor to thereby effect an oscillatable drive to said agitator.

12. A laundry machine in accordance with claim **11** in which a first clutch member is mounted on said shaft for rotation therewith,

a second clutch member is mounted on said sleeve and has driving connection therewith and is engageable with said first clutch member upon downward movement of said sleeve,

wherein said second clutch member has a downwardly facing annular brake surface,

wherein a brake member has supporting engagement with said brake surface and is mounted within said support for vertical and angular movement with respect thereto, wherein a camming supporting connection is provided between said support and said brake member,

wherein means are operatively connected with said brake member for angularly moving said brake member in one direction to effect downward movement thereof and engagement of said clutch and release of said brake member and in an opposite direction to effect release of said clutch and engagement of said brake member,

and wherein said actuator is mounted on said brake member for movement therewith and is moved by said brake member into and out of operative association with the cam means on said disk upon movement of said brake member respectively to engage said brake and disengage said clutch and to disengage said brake and engage said clutch.

13. A control and drive for a laundry machine comprising,

agitator means for mechanically agitating a batch of clothes in a treatment zone during washing and rinsing periods,

a spin basket for centrifuging the clothes during a drying period,

a reversible drive motor having a coupling connection to said agitator means,

a brake for selectively holding said spin basket from rotation, a clutch operated by movement of said brake to a release position for connecting said drive motor to said spin basket,

a brake motor energizable to engage said brake and hold said spin basket from rotation,

and circuit means for controlling the operation of said drive motor and said clutch to drive said agitator

means oscillatorily by intermittently reversing said drive motor and to rotate the spin basket unidirectionally by concurrent energization of said drive motor and said brake motor.

14. In a laundry machine including a tub,
a clothes container within said tub,
an agitator in said clothes container,
a shaft for driving said agitator,
a reversible motor,
a sequential controller for controlling said machine through a sequence of operations,
a direct driving connection between said motor and said shaft,
a clutch and brake mounted coaxially of said shaft,
means operated by said sequential controller to engage said clutch and release said brake to effect a drive to said clothes container at a high extracting speed and to release said clutch and engage said brake to hold said clothes container from rotation,
and other means rotated by said shaft for periodically reversing the direction of rotation of said motor comprising
a cam disk coaxial of said shaft,
a rockable actuator,
a double pole, double throw mercury switch operated by said actuator and connected in the energizing circuit to said motor, to effect reversal of said motor,
and circumferentially spaced cams on said cam disk for reversally pivoting said actuator to operate said switch and effect periodic reversal of said motor.

15. In a laundry machine including a tub,
a clothes container within said tub,
an agitator in said clothes container,
a shaft for driving said agitator,
a reversible motor,
a sequential controller for controlling said machine through a sequence of operations,
a driving connection between said motor and said shaft,
a clutch and brake mounted coaxially of said shaft,
means operable by said sequential controller to engage said clutch and release said brake and effect a drive to said clothes container at a high extracting speed, and to release said clutch and engage said brake and hold said clothes container from rotation,
and other means rotated by said shaft for periodically reversing the direction of rotation of said motor comprising
a cam disk on said agitator shaft and rotatably driven by said motor and having a pair of radially and circumferentially spaced cams,
a rockable actuator having two radially spaced actuator arms, each one of which corresponds to one of said radially and circumferentially spaced cams, and rocked in reverse directions by said cams,
and a double pole, double throw reversing switch moved in one direction upon rocking movement of said actuator in one direction to effect rotation of said motor in one direction and moved in an opposite direction upon a reversal of the direction of rocking movement of said actuator, to effect rotation of said motor in an opposite direction.

16. In a laundry machine including a tub,
a clothes container within said tub,
an agitator in said clothes container,
a shaft for driving said agitator,
a reversible motor,
a sequential control for controlling said machine through a sequence of operations,
a driving connection between said motor and said shaft,
clutch and brake means mounted coaxially of said shaft,
means operable by said sequential controller to engage said clutch means and release said brake means to effect a drive to said clothes container at a high extracting speed, and to release said clutch means and engage said brake means to hold said clothes container from rotation,
and other means rotated by said shaft for periodically reversing the direction of rotation of said motor comprising
a cam disk rotatably driven by said motor,
a reversing switch for reversing the direction of rotation of said motor,
a rockable actuator for said switch,
circumferentially spaced cams on said cam disk for reversely rocking said actuator,
said switch being directly connected with said actuator to be actuated thereby and effect reversal in the direction of rotation of said motor upon reverse rockable movement of said actuator,
and said actuator being mounted on said brake and clutch means and moved out of registry with said cams upon release of said brake means and engagement of said clutch means.

17. In a laundry machine including a tub,
a clothes container with said tub,
an agitator in said clothes container,
a shaft for driving said agitator,
a reversible motor,
a sequential controller for controlling energization of said motor and including
a timer motor,
timer cams driven by said motor,
and timer switches operated by said timer cams,
a drive connection between said motor and said shaft,
a clutch and brake mounted coaxially of said shaft,
means operable under the control of said sequential controller for engaging said clutch and releasing said brake to effect a drive to said clothes container at a high extracting speed and for releasing said clutch and engaging said brake to hold said clothes container from rotation,
other means rockably moved by said shaft for periodically reversing the direction of rotation of said motor,
an energizing circuit to said motor including a magnetic amplifier connected to an alternating current source of supply and delivering direct current to said motor and including
a speed control coil,
separate variable resistors connected between said speed control coil and one side of said motor through certain of said timer switches,
one of said timer switches connecting one resistor to said speed control coil through periodic reverse rotation of said motor and oscillatable movement of said agitator and another timer switch connecting the other resistor in the energizing circuit to said motor during continuous rotatable movement of said motor, whereby the speeds of washing and extracting may be independently varied.

18. A laundry machine comprising a tub,
a support for said tub supporting said tub in a vertical position,
a clothes container rotatably mounted within said tub,
a sleeve supporting said clothes container and rotatably driving said clothes container,
an agitator within said tub extending about said sleeve,
a shaft within said sleeve for supporting and driving said agitator,
a reversible motor,
a sequential control means for controlling said laundry machine through a predetermined sequence of operation,
a driving connection between said motor and said shaft,
a cam disk mounted for rotation with said shaft,
a reverse switch connected with said motor and mov-

able into positions to reverse the direction of rotation thereof,

a rockable actuator for said switch for rocking said switch to effect rotation of said motor alternately in opposite directions,

cam means on said disk engaging said actuator at the termination of rotation thereof in one direction to operate said actuator to effect operation of said switch to periodically change the direction of rotation of said motor to thereby effect an oscillatable drive to said agitator,

a first clutch member mounted on said shaft for rotation therewith,

a second clutch member mounted on said sleeve and having driving connection therewith and engageable with said first clutch member to effect rotation of said sleeve,

said second clutch member having a downwardly facing annular brake surface,

a brake member having supporting engagement with said brake surface and mounted for vertical and angular movement with respect to said support,

a camming supporting connection between said support and said brake member,

means operatively connected with said brake member for angularly moving said brake member in one direction to effect movement thereof along said camming supporting connection and engagement of said clutch and release of said brake member, and for angularly moving said brake member in an opposite direction to effect release of said clutch and engagement of said brake member,

said actuator being rockably mounted on said brake member for movement therewith and being moved by said brake member into and out of operative association with said cam disk upon movement of said brake member respectively to engage said brake and disengage said clutch and to disengage said brake and engage said clutch.

19. A laundry machine in accordance with claim **18**, wherein the means for moving said brake member to engage said clutch is a solenoid energized through said sequential control means for the machine.

20. In a laundry machine,

a tub,

a clothes container within said tub, mounted for rotation at a high extracting speed,

an agitator mounted within said clothes container for rotation therewith and for oscillatable movement with respect thereto,

a shaft for driving said agitator,

a reversible motor having driving connection with said shaft,

clutch and brake means operable to provide a spinning drive connection between said shaft and said clothes container, and to hold said clothes container from rotation during oscillatable movement of said agitator,

and means for operating said clutch and brake means comprising

a cam member retained from movement with respect to said shaft,

a second cam member engageable with said first cam member,

means effecting movement of said second cam member along said first cam member to operate said clutch and brake means to engage the clutch and release the brake, and

other means for effecting movement of said second cam member in an opposite direction to release the clutch and engage the brake.

21. The structure of claim **20**,

wherein the cam members are annular cam members and encircle said shaft,

wherein one of said cam members is fixed from angular movement,

wherein the other cam member is angularly movable with respect to the one cam member,

wherein spring means bias the angularly movable cam member in one direction into one operative position,

and wherein motor means connected to the angularly movable cam member move said cam member in an opposite direction into a second operative position.

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WILLIAM I. PRICE, *Primary Examiner.*