Feb. 6, 1951 C. F. DIETHER 2,540,717

WASHING MACHINE

Filed April 15, 1947 7 Sheets-Sheet 1

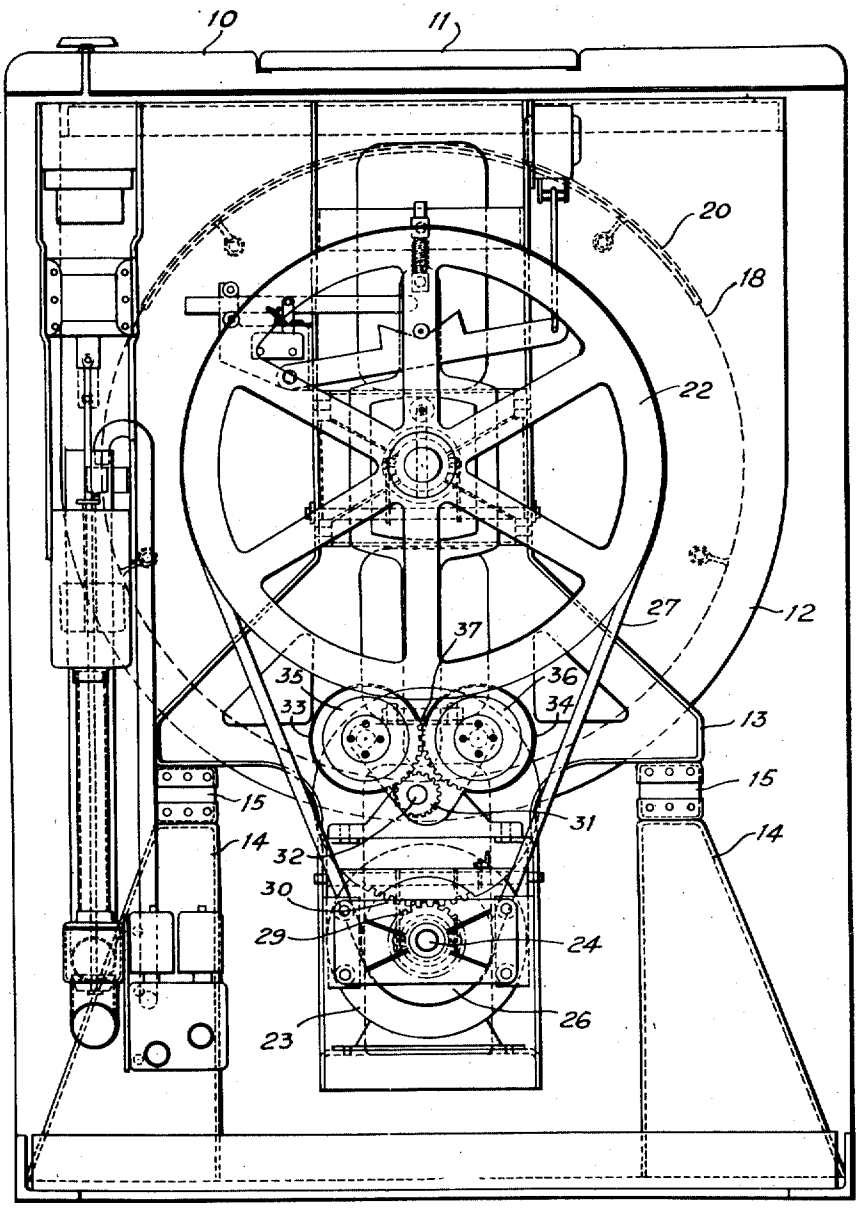

Fig. 1

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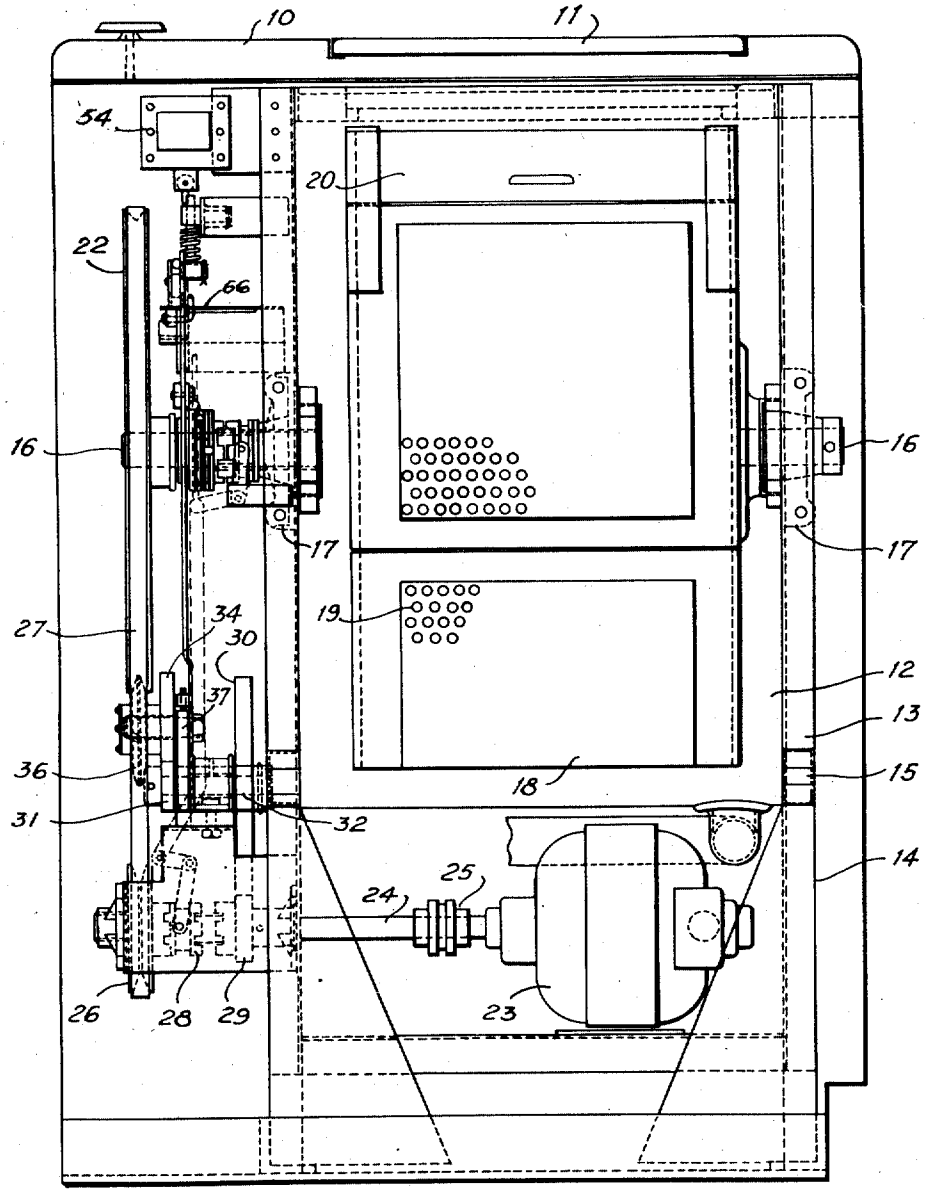

Fig. 2

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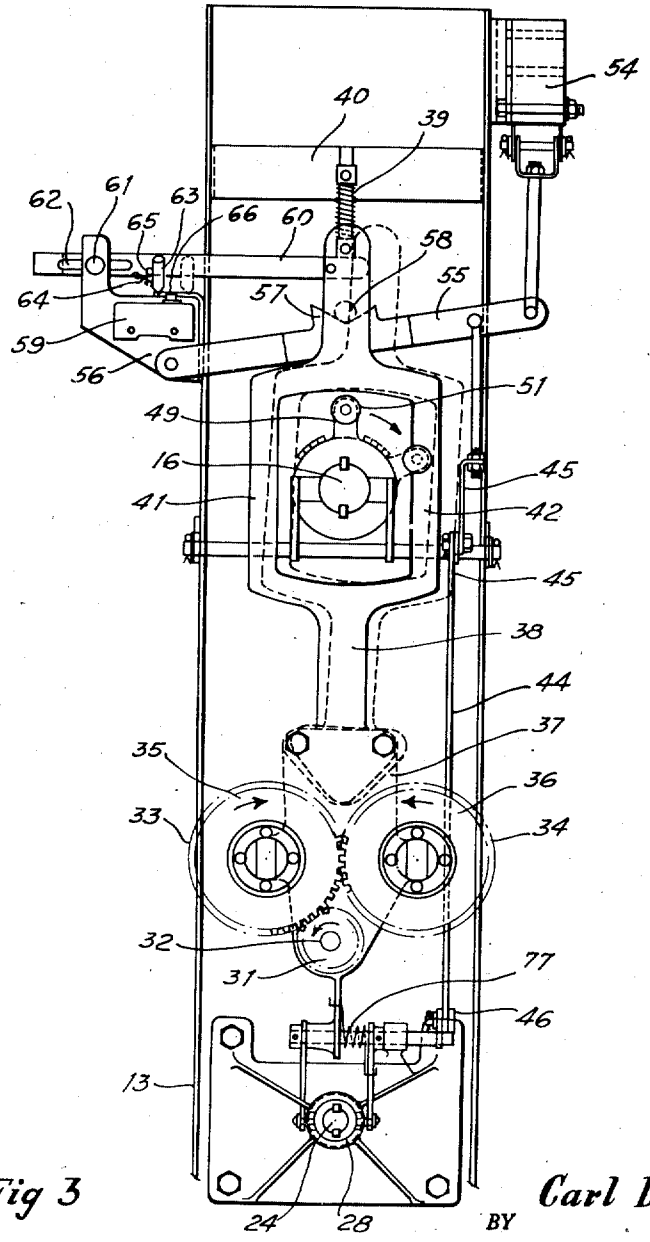

Fig 3

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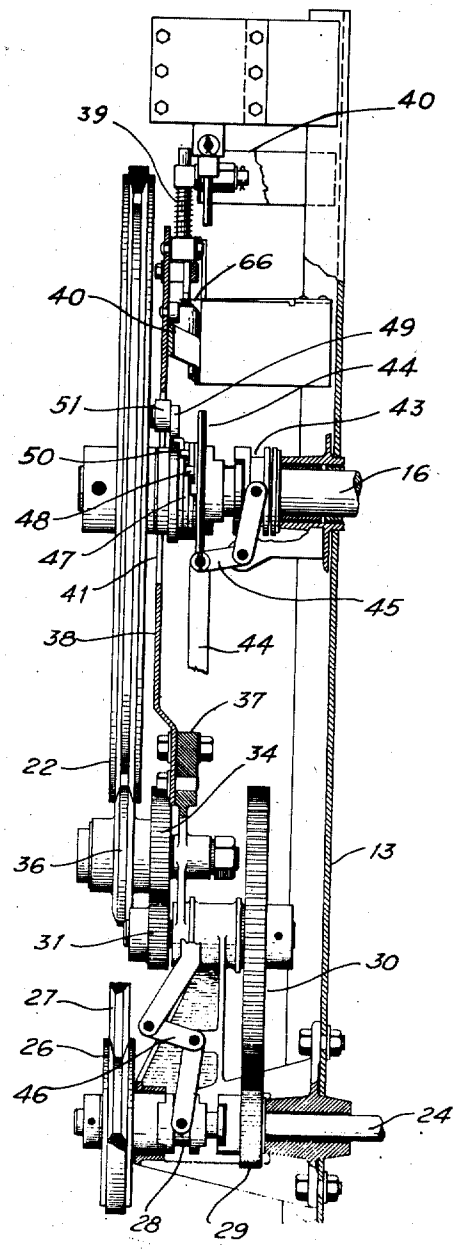

Fig. 4

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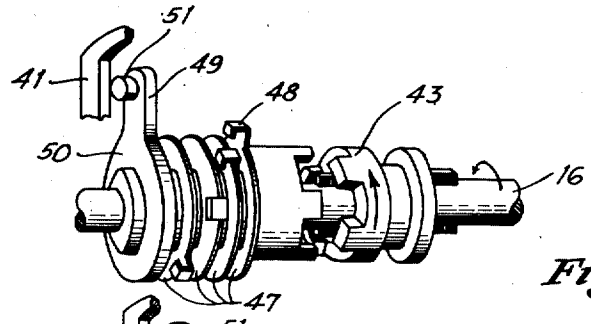

Fig. 5

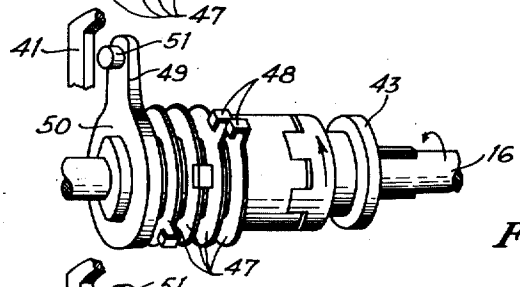

Fig. 5A

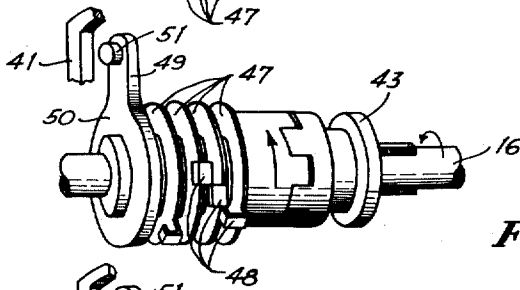

Fig. 5B

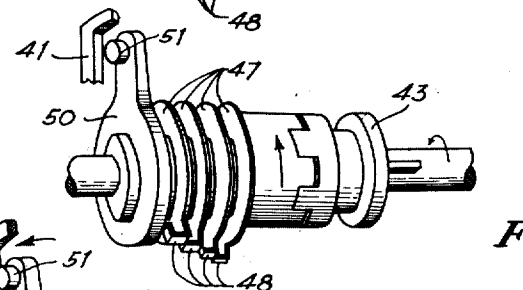

Fig. 5C

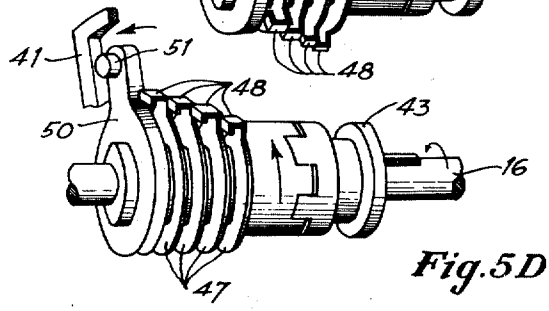

Fig. 5D

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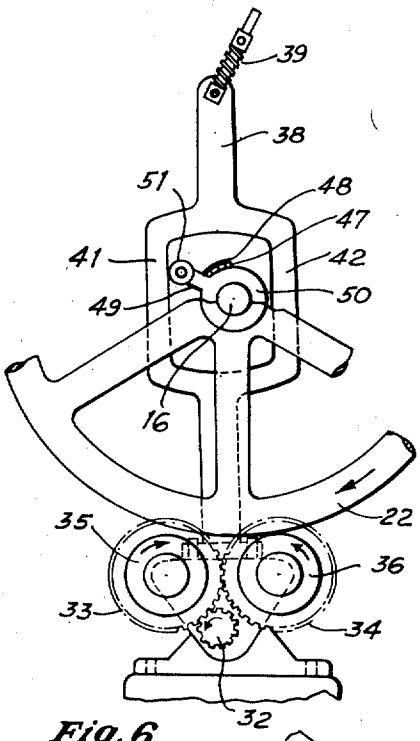

Fig. 6

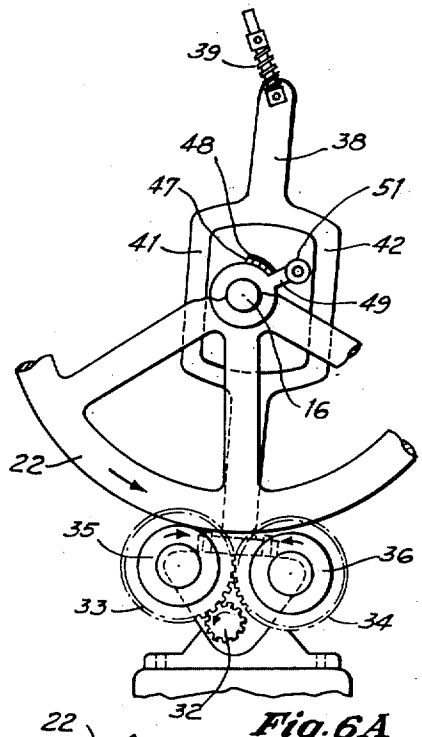

Fig. 6A

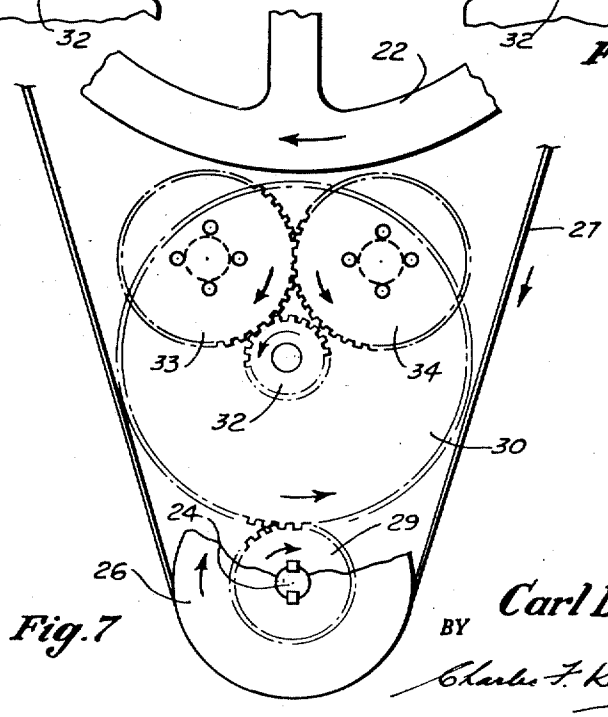

Fig. 7

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WASHING MACHINE

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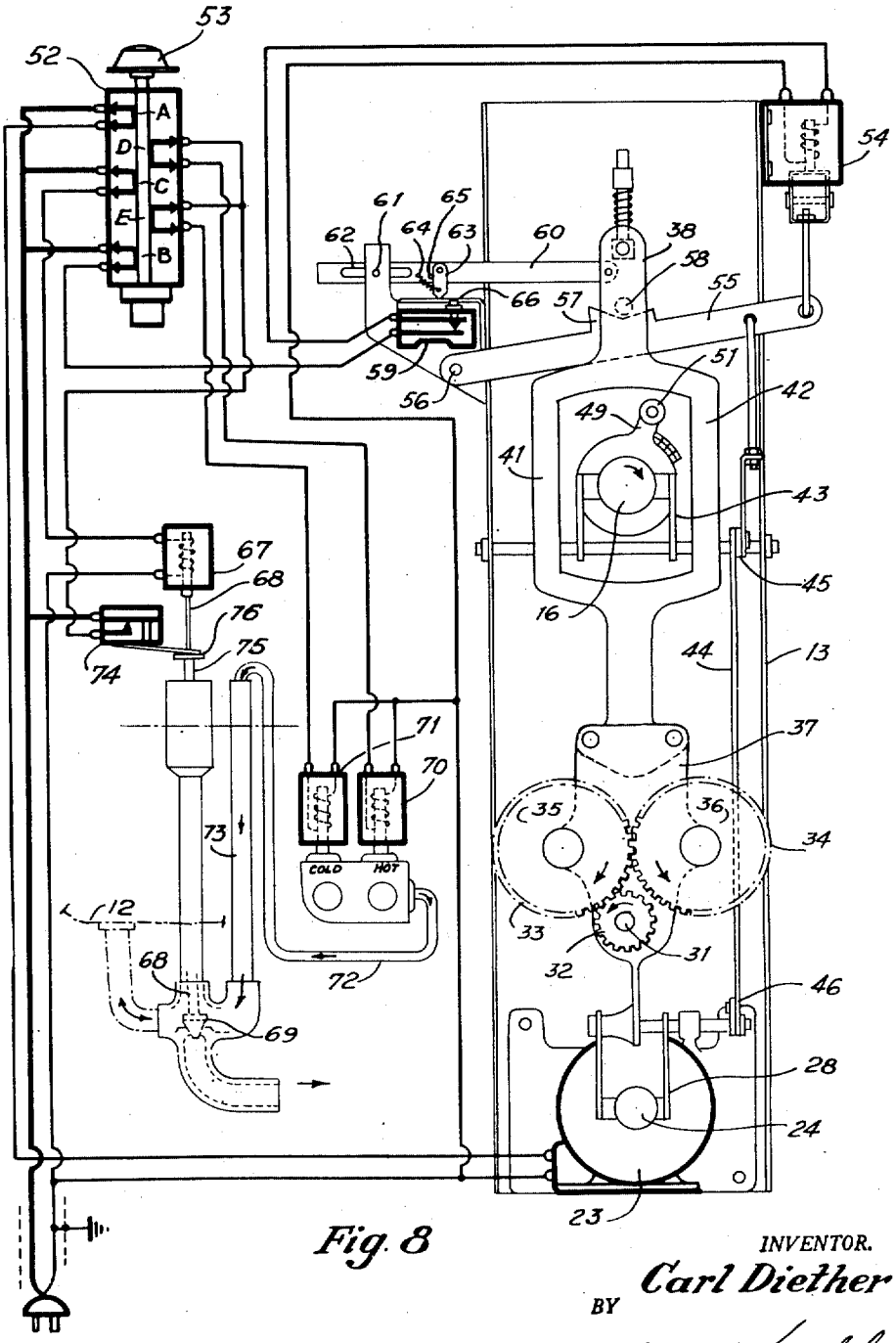

Fig. 8

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Patented Feb. 6, 1951 2,540,717

UNITED STATES PATENT OFFICE

2,540,717

WASHING MACHINE

Carl F. Diether, Shaker Heights, Ohio

Application April 15, 1947, Serial No. 741,547

14 Claims. (Cl. 68—12)

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This invention relates to washing machines It has particular reference to washing machines provided with a horizontally rotatable drum for holding the material to be washed; more especially, the invention relates to such machines in which the horizontal drum is capable of clockwise and counterclockwise rotation as well as constant rotation in one direction.

Among the objects of the present invention are: (*a*) to provide a relatively simple and inexpensive machine capable of performing washing and initial drying without interruption of its operation; (*b*) to provide a washing machine having a horizontally rotatable drum capable of clockwise and counterclockwise rotation as well as constant rotation in one direction; (*c*) to provide automatic means for causing the said horizontal drum to perform a predetermined number of rotations in a clockwise direction, then to reverse and to perform a predetermined number of rotations in a counterclockwise direction; (*d*) to provide automatic means for causing the said horizontal drum to rotate continuously in one direction after a predetermined lapse of time during which it performed a given number of cycles of clockwise and counterclockwise rotation; (*e*) to provide automatic means synchronized with the rotation of the said drum for the admission and drainage of washing and rinsing waters; (*f*) to provide a washing machine capable of performing washing and initial drying operations more efficiently and economically than other washing machines now on the market.

The washing machine and its operation will be described with reference to the annexed drawings in which:

Fig. 1 is an elevation of the machine with a side of the exterior cabinet removed to show a side view of the operation mechanism;

Fig. 2 is a front elevation of the machine with a side of the cabinet removed to show a front view of the operating mechanism;

Fig. 3 is a front view of the mechanism for controlling the rotation of the horizontal drum;

Fig. 4 is a side view of the mechanism shown in Fig. 3;

Figs. 5, 5A, 5B, 5C, and 5D show the mechanism for controlling the clockwise and counterclockwise rotation of the horizontal drum as such mechanism functions during one series of counterclockwise rotations;

Figs. 6 and 6A show the mechanism for driving the rotating drum engaged to cause counterclockwise (Fig. 6) and clockwise (Fig. 6A) rotation;

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Fig. 7 shows the engagement of driving mechanism to produce constant rotation of the horizontal drum in a clockwise direction;

Fig. 8 is a schematic layout of the electrical circuits for controlling the complete drum operation and the admission and drainage of washing and rinsing waters.

A washing machine embodying the features and principles of the present invention is illustrated generally in Figs. 1 and 2 and will preferably be provided with an outer or external cabinet or case 10 provided at the top with lid 11 through which clothes or other material to be washed are introduced into the machine. Positioned inside the cabinet 10 is a tub or vat 12 having a semi-circular bottom supported upon a suitable frame 13. This frame 13 is in turn mounted on lower frame 14 being separated therefrom by anti-vibration pads 15, e. g. rubber blocks. Transfixing the vat 12 is a shaft 16 carried by bearings 17 in the frame 13. Rigidly fixed on this shaft is the horizontal drum 18 adapted to rotate with shaft 16 within the vat 12. The drum 18 is made of some permeable material, preferably sheet metal perforated as at 19; it is preferably made in sections and is provided with a lid 20 and interiorly with a plurality of lifting projections 21. Keyed on the shaft 16 is a V pulley 22 which is the driving means for rotating the shaft 16 and the drum 18.

Power is supplied to the washing machine by any suitable means, preferably, as shown, an electric motor 23 driving a shaft 24 through a flexible coupling 25. A V pulley 26 is mounted on the outer end of the shaft 24. This V pulley 26 is connected by a V belt 27 to the larger V pulley 22. This combination of driving and driven V pulleys and the connecting V belt constituting the high speed or direct belt drive. The ratio of diameters of these two pulleys will be so selected in relation to the speed of the motor as to produce a desired predetermined speed of rotation of the horizontal drum. The V pulley 26 is not keyed to the shaft 24 but is free to rotate thereon. Engagement with the shaft so that the pulley will be driven by the shaft is effected by means of the sliding clutch 28. This clutch 28 is adapted to drive either pulley 26 as aforesaid or gear 29 which also is not keyed to the shaft and hence is driven only when the clutch 28 is in engagement therewith. This gear 29 meshes with the larger gear 30 which carries small gear 31. These two integral gears 30 and 31 rotate freely on a countershaft 32 mounted in frame 13. The

small gear 31 engages one of a pair of intermeshed gears 33 and 34 which carry concentrically two friction wheels 35 and 36. The gears 33 and 34 carrying the wheels 35 and 36 are mounted in tandem on the plate 37 which in turn is pivotally mounted on the shaft 32. The friction wheels 35 and 36 are beveled to engage the V pulley 22; and the plate 37 is positioned in such manner that upon moving back and forth on the shaft, the friction wheels 35 and 36 alternately engage and drive V pulley 22. This combination of gears and friction drive wheels which engage the driven V pulley constitute the slow speed reversing drive.

It will be obvious from the description thus far that when the clutch 28 engages gear 29, the train of gears 29, 30, 31, 33 and 34 and friction wheels 35 and 36 transmits motive power from the motor 23 to the V pulley 22 thence to the shaft 16 and thus to the horizontal drum 18. Due to the intermeshing of the gears 33 and 34, driven by gear 31 enmeshed with gear 33, they turn in opposite directions as do the corresponding friction wheels 35 and 36. Hence, when these wheels alternately engage the V pulley 22 there is imparted to the horizontal drum 18 alternate clockwise and counter-clockwise rotation. When the clutch 28 is out of engagement with gear 29 but engaged with V pulley 26 the aforesaid train of gears is disconnected and the motive power is transmitted through the V pulley 26 to V pulley 22 by means of the V-belt 27 imparting thereby to the horizontal drum a relatively high speed rotation in one direction only.

In the normal operation of a washing machine of the present invention the horizontal drum will perform a predetermined number of rotations in a clockwise direction, then a predetermined number of rotations in a counter-clockwise direction and, after performing this cycle of rotations throughout a desired period of time which constitutes the washing period, will automatically change to relatively high speed rotation in one direction for a desired period of time which constitutes the drying period. The drying period as herein referred to constitutes a period in which excess liquid is separated from the drum contents by centrifugal force, and places the washed materials in condition for the complete or final drying stage. The mechanism for achieving these respective changes in rotation of the horizontal drum will now be described in detail, and will be found more particularly illustrated in Figs. 3, 4, 5, and 6.

The plate 37 on which are mounted gears 33 and 34 is attached to, and its movement is controlled by, actuating bar 38 which is attached to the frame 13 by means of spring toggle 39 and cross bar 40. The actuating bar 38 is divided to form side bar sections 41 and 42 positioned on either side of the shaft 16. Mounted on and rotating with the shaft 16 is a clutch 43 which operates in conjunction with clutch 28 being connected thereto by means of a controlling rod 44 and appropriate levers 45 and 46. Means are provided for automatically shifting the actuating bar so as to cause alternative contact of friction drive wheels 35 and 36 with driver pulley 22. Such means many consist of a plurality of members interlocking or jamming after a predetermined number of revolutions of the drum 18 to cause shifting of the actuating bar 38 and reversal of the direction of rotation. In a preferred and illustrated embodiment, when the clutch 28 is engaged with the gear 29, the clutch 43 engages the first of a series of catch members preferably in the form of washers 47 which fit loosely on shaft 16. As shown in Fig. 5, one element of clutch 43 rotates with the shaft and is longitudinally slidable thereon. The other mating clutch element is fixedly attached to the adjacent washer 47. When the elements of clutch 43 are in engaged position as shown in Fig. 5b the adjacent washer 47 is therefore engaged with and driven by the shaft through clutch 43. Each of these washers is provided with a cleat 48 which overlaps the adjacent washer so that as the shaft 16 rotates the first washer performs a single rotation whereupon cleat thereof abuts against the cleat on the second washer, as will be seen in Fig. 5A, whereupon the second washer is caused to rotate. These two interlocked washers perform a single rotation to contact the cleat on the third washer, as is shown in Fig. 5B, whereupon this third washer is caused to rotate. Then these three interlocked washers in like manner pick up the fourth washer as is shown in Fig. 5C and thereupon after one rotation the cleat on the fourth washer abuts against arm 49 on a fifth washer 50. This arm 49 at its extremity carries roller 51 which is adapted to contact alternatively side bar sections 41 and 42 of the actuating bar 38.

Figs. 5, 5A, 5B, 5C and 5D show the operation of the washer assembly when the horizontal drum 18 and the shaft 16 are rotating in a counter-clockwise direction. When the roller 51 contacts side bar section 41 of the actuating bar 38 the said bar is shifted in the direction of the movement of the roller 51. Thereupon, the plate 37 is caused to pivot bringing friction wheel 36, which is turning in a counter-clockwise direction, into engagement with V-pulley 22 causing it first to stop its rotation in a counter-clockwise direction, reverse and then to rotate in a clockwise direction as shown in Fig. 6. This in turn causes the shaft 16 to rotate in a clockwise direction, the washers 47 unwind and then rewind in a clockwise direction so that the cleats 48 engage as before but on the opposite side until, after a sufficient number of revolutions the cleat on the last washer abuts against the other side of arm 49 rotating it in a clockwise direction and causing roller 51 to contact side bar section 42 of the actuating bar 38 shifting the same in the direction of movement of the roller 51 as shown in Fig. 6A. Thereupon the plate 37 is caused to pivot bringing friction wheel 35 which is turning in a clockwise direction, into engagement with V-pulley 22 causing it to stop its rotation, reverse and then to rotate in a counter-clockwise direction. This washing cycle of clockwise and counter-clockwise rotation is repeated for a period governed by automatic electrical controls hereinafter described in detail.

When the predetermined washing period is over, clutch 43 is automatically disengaged from the nearest washer 47 thereby disengaging the mechanism which controls the alternate clockwise and counter-clockwise rotations of the horizontal drum 18. Simultaneously, clutch 28 is disengaged from gear 29 and engages V-pulley 26 whereupon motive power is transferred from gear train and friction wheels which impart the clockwise and counter-clockwise rotation to the drum to the V-belt drive system 26, 27, and 22 whereupon the horizontal drum is caused to rotate at relatively high speed in one direction continuously, which will be the direction of rotation of

motor shaft 24, viz., clockwise in the embodiment illustrated in the annexed drawings and shown in detail in Fig. 7.

The automatic electrical controls above referred to are illustrated more particularly in Fig. 8 and comprise essentially five circuits governed by a timer 52 having suitable time setting means indicated at 53.

The first and simplest circuit controls the motor and is indicated on Fig. 8 as A.

Circuit B controls the mechanical elements which connect the motor either directly to the high speed pulley, or through the train of gears and the friction drive to revolve the drum at low speed, clockwise and counter-clockwise as previously explained. Circuit B includes solenoid 54, which is connected through mechanical linkage to arm 55, and to the clutch operating system which includes controlling rod 44, and the levers 45 and 46 which operate clutches 28 and 43. Arm 55 is pivoted on the frame at 56 and is provided with a notched portion near the center as at 57. When the solenoid 54 is actuated so as to disconnect the clutches 28 and 54 from the slow speed counterclockwise and clockwise drum rotation system and clutch 28 is engaged with the pulley 26 to drive the drum at high speed, arm 55 is raised by connection with the solenoid as aforementioned and notch 57 engages a pin 58 projecting from actuating bar 38. Engagement of pin 58 in notch 57 maintains the actuating bar 38 in central position so that neither of the friction drive wheels 35 and 36 are in engagement with the pulley 22. Thus when circuit B is operating solenoid 54 and the drum is being driven at high speed during the drying period, all elements of the slow speed clockwise and counter-clockwise system are disconnected. Also in circuit B is direction switch 59 which in operation insures that the solenoid 54 will only operate when the drum is moving in the same direction as the high speed driving pulley 26. This is shown in more detail in Fig. 3 and is accomplished by providing a direction switch assembly and which, in the illustrated embodiment comprises a bar 60 which is pivotally attached at one end to actuating bar 38 as shown and which is supported at the other end by pin 61 extending from the frame and riding in slot 62 in the bar. Dog latch 63 is pivotably suspended from bar 60 and is normally urged into vertical position by the tension means such as spring 64 acting to pull it against stop pin 65. Spring plate 66 engages the operating button of the direction switch 59 and is pressed downwardly to depress this button by the latch 63 which is in vertical position when the bar 60 is moving, as shown in the drawing, from left to right. When the bar 60 is moving from right to left the latch 63 pivots and rides up over spring plate 66 which does not then depress the operating button of direction switch 59. Switch 59 may be arranged to be normally closed and circuit B operating solenoid 54, can be completed only when the arm 60 is moving from right to left or is stationary at the left hand position, this corresponding to the time the drum is rotating in a clockwise direction. When, however, the drum is moving counter-clockwise, the arm will have moved from left to right, the latch 63 will have assumed a vertical position and acting through spring plate 66 depresses the operating button and opening direction switch 59. When the actuating bar 38 swings to the left to reverse the direction of rotation of the drum, the bar 60 swings to the left, latch 63 pivots and releases the pressure on spring plate 66, thus enabling the direction switch 59 to close. Circuit B may then operate as heretofore explained and the drum picks up high speed directly from slow speed rotation in the same direction.

Circuit C operates the drain valve solenoid 67. This is connected by operating rod 68 to drain plug 69. On closing this circuit plug 69 is lifted from its seat and the liquid contents of the drum are drained out through a drain communicating with the bottom of tub 12.

Circuits D and E operate respectively hot water solenoid 70 and cold water solenoid 71. These solenoids control hot and cold water valves which when opened cause water to flow through pipe 72 into fill pipe 73 which communicates with the tub 12. In series with circuits D and E is float switch 74 which is normally closed but is opened when the water in the tub 12 reaches a predetermined level. This is accomplished by arranging float extension 75 to raise lever 76, which is operatively connected to the switch mechanism, when the float (not shown) has reached a predetermined height. It will be obvious that with the float switch 74 open, the solenoids 70 and 71 cannot be operated to cause additional hot or cold water to be added to the tub 12.

As a safety feature in case the electric power should fail when the motor is operating during the high speed initial drying period, a spring 77 may be arranged to exert tension on the lever system 46 as shown most clearly in Fig. 3, to normally urge the clutch 28 in engagement with the slow speed driving gear 29. This spring does not affect the action of the control system until a failure of the power supply occurs, but when this happens, will disconnect the clutch from pulley 29 if it should be in that position, and urge it into engagement with gear 26. Thus on resumption of electric current flow, the motor is called on to carry only the normal low speed load until the automatic controls throw the clutch back into the high speed connection again.

The timer switch 52 is intended to be of conventional design in which the circuits controlled by it may be shut off or turned on after predetermined time intervals. While the operation of the various units may be adjusted as desired a preferred cycle of operation is as follows:

At the start, circuit A is closed operating the motor and the motor continues to operate during the entire cycle. At the same time, the valves controlling the hot and cold water are opened and after flowing for 3 minutes are shut off and the drain valve opened for 1 minute. The drain valve is then closed and the hot water valve is opened and remains open during the washing cycle of 15 minutes, the float control valve controlling the flow meanwhile, so that the desired level is maintained in the washer. Then the hot water valve is shut and the drain valve opened for 1 minute, followed by 3 minutes of hot water, 1 minute drain, 3 minutes of cold water and 1 minute drain and 3 minutes of cold water constituting the rinsing part of the cycle. After the final 3 minutes rinse, in cold water, the drain valve is opened and after 2 minutes, to allow as much water as possible to drain out, the high speed drum rotation system is started. This constitutes the drying period, operating by centrifugal action and continues for 7 minutes after

which the motor shuts off and the cycle is complete.

The speed at which the drum is rotated during the washing and drying periods may be regulated by using gears and pulleys of appropriate relative sizes as will be apparent. It has been found, however, that a speed of from 40 to 50 R. P. M. and preferably about 45 R. P. M. during the washing period (clockwise and counterclockwise) is very effective, since at this speed the clothes are carried to the top of the drum and then dropped and tumbled for best effect. The four revolutions in each direction has been found efficient since under these conditions the reversal untangles any garments which may have started to "knotup" during the previous four revolutions. The reversal action constantly presents different surfaces of the clothes to the suds water thus permitting thorough detergence. Under these conditions a washing period of between about 10 and 20 minutes, preferably about 15 minutes will be found sufficient for effective washing of a batch of clothes. A centrifugal drying speed of 400–450 R. P. M. has been found efficient although this speed may be varied somewhat as may be found advantageous. At a speed of 400 to 450 R. P. M. a period of high speed drum rotation of about 5 to 10 minutes, preferably about 7 minutes will be found to give proper drying action. The speeds of rotation of the drum and the number of revolutions before reversal have been indicated above as being preferred for a home type clothes washer. However, operation of the machine of this invention is not intended to be limited thereto and other speeds and number of revolutions before reversal may be employed to suit particular conditions.

The unique drive and reversal mechanism of the washing machine of this invention makes possible the use of the horizontal type drum washer in a home machine. The mechanism is simple yet positive and capable of long life without adjustment. The friction drive wheels operate effectively and quietly and have the advantage that any play due to wear is automatically taken up by the controlling mechanism and the beveled edges of the drive wheels. The washer assembly for controlling the reversal mechanism operates simply and positively and does not involve the use of cams and worm gears.

The speed at which the cylinder rotates plus the reversing action distributes the clothes nearly equally around the inside of the drum thus reducing out of balance forces to a minimum. This is important during the high speed drying stage, and the inherent balance plus the use of flexible mountings makes bolting of the machine to the floor unnecessary.

It is one of the unique features of this invention that the driven V pulley connected to the drum is adapted to serve as a common driven element for both the high speed and low speed reversing drives. This type of pulley is efficient in transmitting power when actuated either by the V belt or the beveled edges of the friction drive wheels and the combination of these systems provides a simple, rugged and efficient arrangement particularly useful for the purpose described.

The unique mechanism for controlling the starting of the high speed driving system only when the drum is rotating in the proper direction, results in much less starting up load being placed on the motor at this time. Since the drum is already revolving when the high speed drive cuts in, the drum simply picks up additional speed without starting jerk or vibration and without any overload on the motor.

The top loading drum type washer is convenient and safe and operating in conjunction with the novel and unique features according to this invention provides a home washer, which washes efficiently, rinses and partially drys the clothes, all operations being automatically timed and controlled.

While the washing machine of this invention has been described with particular reference to the embodiment illustrated herein, it is not intended to limit this invention thereto but other embodiments and modifications may be used within the scope of the following claims.

I claim:

1. In a washing machine of the class described, having a horizontal rotatable drum and a driving motor therefor, the combination of a driven pulley connected to said drum, a direct belt drive, comprising a driving pulley and a belt connecting said driven and driving pulleys, and a reversing drive comprising oppositely rotating friction drive wheels alternatively engageable with said driven pulley a clutch connecting said driving motor selectively to said driving pulley or said reversing drive and controlling means actuating said clutch to cause periodic selective connection of said direct belt drive or said reversing drive with said driving motor.

2. In a washing machine of the class described having a horizontal rotatable drum and a driving motor therefor, the combination of a driven V pulley connected to said drum, a direct belt drive comprising a driving pulley and a V belt connecting said driven and driving pulleys, a reversing drive comprising oppositely rotating beveled friction drive wheels alternatively engageable with said driven V pulley, means to cause cyclic alternative engagement of the said friction drive wheels with said driven pulley a clutch connecting said driving motor selectively to said driving pulley or said reversing drive, and controlling means actuating said clutch to cause periodic selective connection of said direct belt drive or said reversing drive with said driving motor.

3. In a washing machine of the class described, having a horizontal rotatable drum and a driving motor therefor, the combination of a driven V pulley connected to said drum, a high speed drive comprising a driving pulley and a belt connecting said driving and driven pulleys, a slow speed reversing drive comprising oppositely rotating beveled friction drive wheels, alternatively engageable with said driven V pulley, means actuated by rotation of said driven pulley to cause cyclic alternative engagement of said friction drive wheels with said driven pulley a clutch connecting said driving motor selectively to said driving pulley or said reversing drive, and controlling means actuating said clutch to cause periodic selective connection of said high speed drive or said slow speed reversing drive with said driving motor.

4. In a washing machine of the class described, having a horizontal rotatable drum and a driving motor therefor, a driven V pulley connected with said drum, a high speed drive comprising a driving V pulley and a V belt connecting said driving pulley and said driven pulley, a low speed reversing drive comprising transmission gears, a pair of oppositely rotating friction drive wheels

driven by said gears, a pivotably mounted supporting plate for said friction drive wheels, an actuating bar attached to said plate and means operable by rotation of said driven pulley to cause cyclic shifting of said actuating bar and pivotal movement of said plate thereby to cause cyclic alternative engagement of said friction drive wheels with said driven pulley a clutch connecting said driving motor selectively to said driving pulley or said reversing drive, and electrical control means actuating said clutch to cause periodic selective connection of said high speed drive or said low speed reversing drive with said driving motor.

5. The washing machine of claim 4 in which the means for causing cyclic shifting of the actuating bar comprises a shaft attached to and rotating with said driven pulley, a series of catch members loosely mounted on said shaft adapted on rotation to interlock in turn with each other, one end member of said series being engageable with said shaft, the other end member carrying an extended arm, rotary motion of said first mentioned catch member causing movement of the extended arm on said last mentioned catch member after a number of revolutions dependent on the number of catch members in said series, said extended arm being adapted to contact and shift the actuating bar attached to the plate supporting the friction drive wheels to cause cyclic alternative engagement of said drive wheels with the driven pulley.

6. The washing machine of claim 4 in which the means for causing shifting of said actuating bar comprises a shaft attached to and rotating with said driven pulley, a series of washers loosely mounted on said shaft each washer having a cleat adapted to overlap the adjacent washer and engage with the similar cleat thereon, said series of washers adapted on rotation to interlock in turn with each other, one end washer of said series being engageable with said shaft, the other end washer carrying an extended arm, rotary motion of said first mentioned washer causing movement of the extended arm on said last mentioned washer, after a number of revolutions dependent on the number of washers in said series, said extended arm adapted to contact divided portions of said actuating bar to shift said bar and cause pivotal movement of said friction drive wheel supporting plate to cause cyclic alternative engagement of said friction drive wheels with the driven pulley.

7. In a washing machine of the class described, having a frame, a horizontal rotatable drum and a driving motor therefor, a driven pulley connected with said drum, a high speed drive comprising a driving pulley and a belt connecting said driving and driven pulleys, a low speed reversing drive comprising transmission gears and a pair of oppositely rotating friction drive wheels, a pivotably mounted plate supporting said friction drive wheels, an actuating bar attached to said plate, means to cause periodic shifting of said bar from side to side, each of said side position of said bar causing engagement of one of said friction drive wheels with said driven pulley, spring means to normally urge said bar in either side position, means operable by rotation of said driven pulley to cause cyclic shifting of said actuating bar and pivotable movement of said plate thereby to cause cyclic alternative engagement of said friction drive wheels with said driven pulley a clutch connecting said driving motor selectively to said driving pulley or said reversing drive, and electrical control means actuating said clutch to cause periodic selective engagement of either the high speed drive or the low speed reversing drive with said driving motor.

8. The washing machine of claim 7 in which the spring means for normally urging the actuating bar to a side position comprises a spring toggie connecting one end of said actuating bar with the frame of said washing machine.

9. The washing machine of claim 7 in which the electrical control means include direction control means cooperating with said actuating bar to allow engagement of the high speed drive only when the drum is already moving in the direction of high speed rotation.

10. The washing machine of claim 9 in which the direction control means include an electric switch, and mechanical means operated by movement of said actuating bar to close and open said switch in an appropriate circuit whereby said electrical control means will cause engagement of said high speed drive only when said actuating bar is disposed to cause slow speed rotation of the drum in the same direction as that imparted by the high speed drive.

11. The washing machine of claim 7 in which means are provided to maintain said actuating bar in central position with neither friction drive wheels engaging said driven pulley when said electrical control means are operating to engage said high speed drive in engagement with said driving motor.

12. The washing machine of claim 11 in which the means to maintain said actuating bar in central position comprise, a bar having a central notched portion, one end of said bar being pivotably mounted on the frame of said washing machine, the other end of said bar being operably connected with said electrical control means, a pin projecting from said actuating bar, said pin being so disposed so that mating of said pin with the notch in said bar will maintain said actuating bar in central position.

13. In a washing machine of the class described having a horizontal rotatable drum and a driving motor therefor, a shaft connected with said motor, a clutch mounted on and rotating with said shaft, a V pulley mounted on said shaft, and engageable with said clutch, a gear wheel mounted on said shaft and engageable with said clutch, said V pulley being connected by a belt to a driven V pulley connected to said drum, said gear wheel adapted to drive a pair of oppositely rotating friction drive wheels alternatively engageable with said driven pulley, a solenoid control adapted to operate said clutch and electrical timing means for causing periodic actuation of said solenoid to cause said clutch to selectively connect either said V pulley or said gear wheel with said motor driven shaft.

14. In a washing machine of the type described having a frame and a horizontal drum rotatably mounted therein, a driven V pulley operably connected to said drum, a motor mounted on said frame, a drive shaft connected to said motor, a double clutch operatively connected with and slidably mounted on said shaft, a V pulley loosely mounted on said shaft adapted to engage with said clutch and connected with said driven V pulley by a V belt, a spur gear loosely mounted on said shaft and adapted to engage said clutch when the same is disengaged from said V pulley, a counter shaft mounted on said frame generally parallel to and above said drive shaft and carry-

ing a spur gear meshing with said spur gear on said drive shaft, a plate pivotally mounted on said countershaft, a pair of inter-meshing spur gears mounted on said plate, one of said gears intermeshing with the gear on said countershaft, friction drive wheels being adapted to alternately engage the driven V pulley connected to said drum upon pivotal movement of said plate thereby to cause said drum to rotate alternately clockwise and counter-clockwise, means operatively connected with said plate and actuated by rotation of said drum to cause cyclic pivotal motion of the same, and electrical means responsive to a timing device, to control said clutch whereby said drum is caused to rotate at slow speed alternatively clockwise and counter-clockwise for a predetermined period and subsequently at high speed continuously in one direction for a predetermined period of time.

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