

Aug. 7, 1951

C. K. SCHWARTZ

2,563,077

TIMER FOR AUTOMATIC WASHING MACHINES

Filed Sept. 8, 1949

4 Sheets-Sheet 1

Fig. 1.

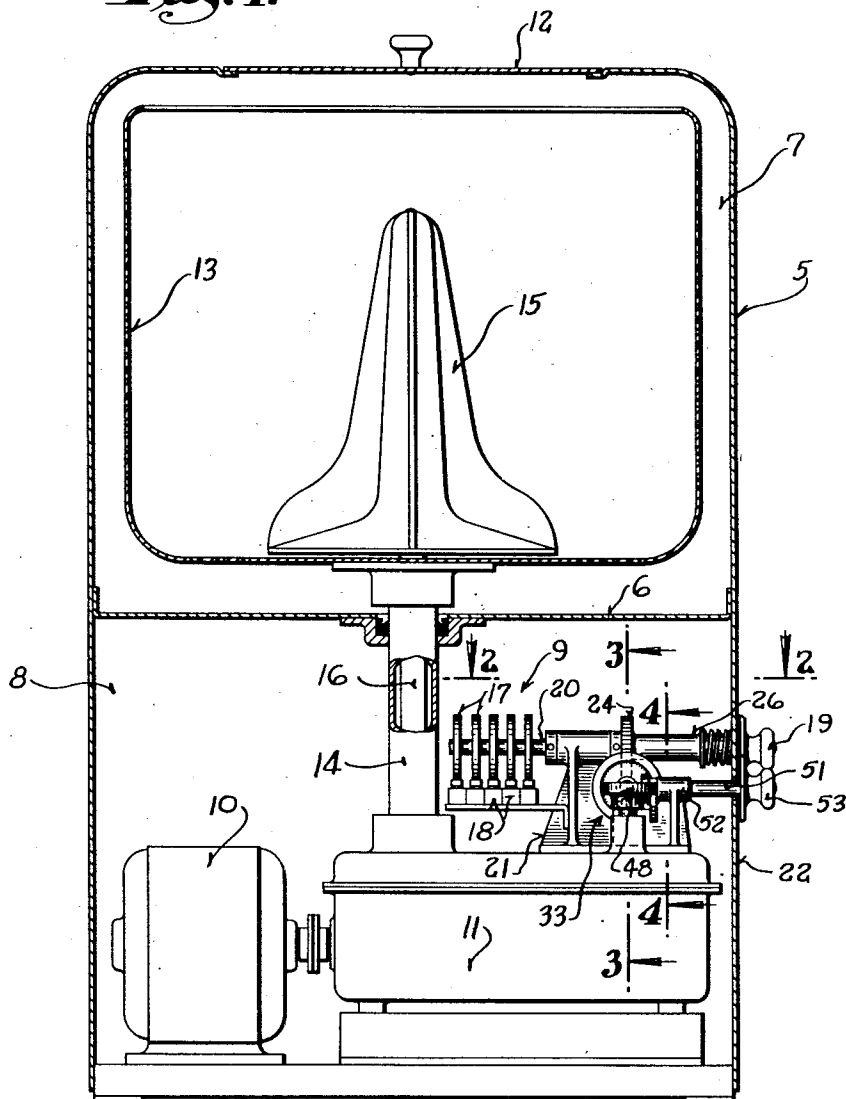
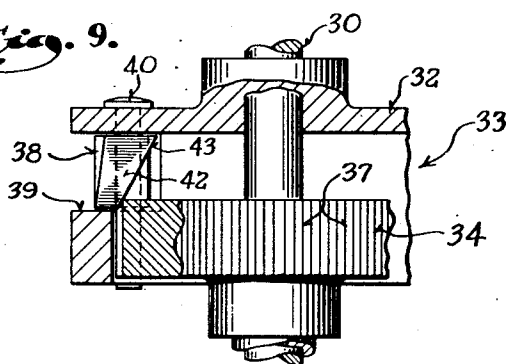


Fig. 9.



Inventor
Carl K. Schwarz
by *Irvington Jones*
attorney

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Fig. 2.

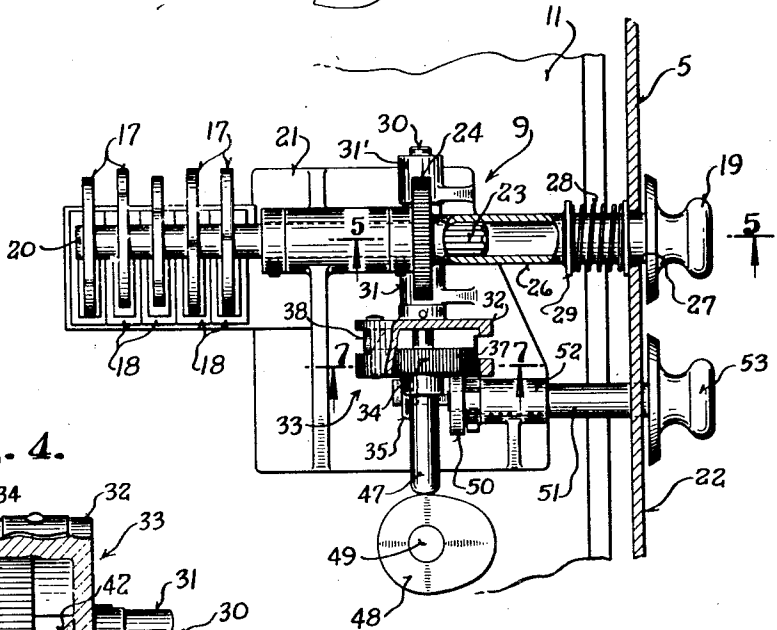


Fig. 4.

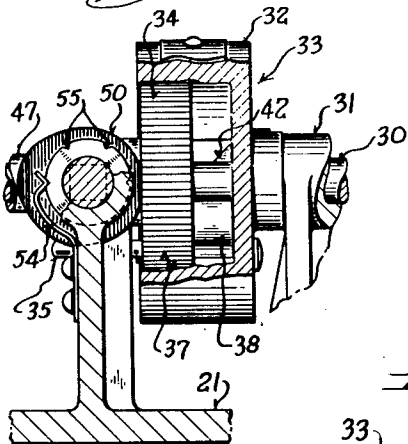
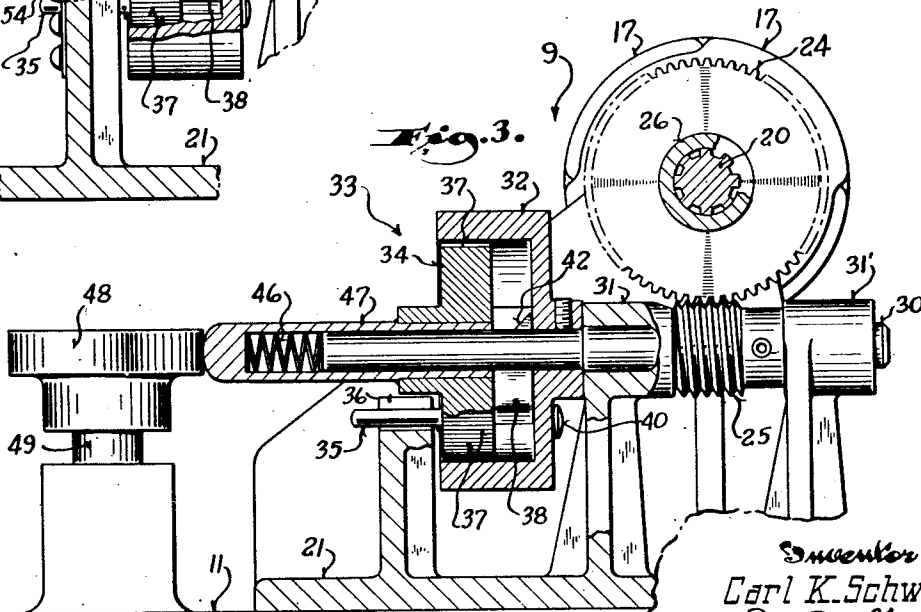


Fig. 3.



Inventor
Carl K. Schwarz
by *Irish Mulligan Jones*
attorney

Aug. 7, 1951

C. K. SCHWARTZ

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Fig. 5.

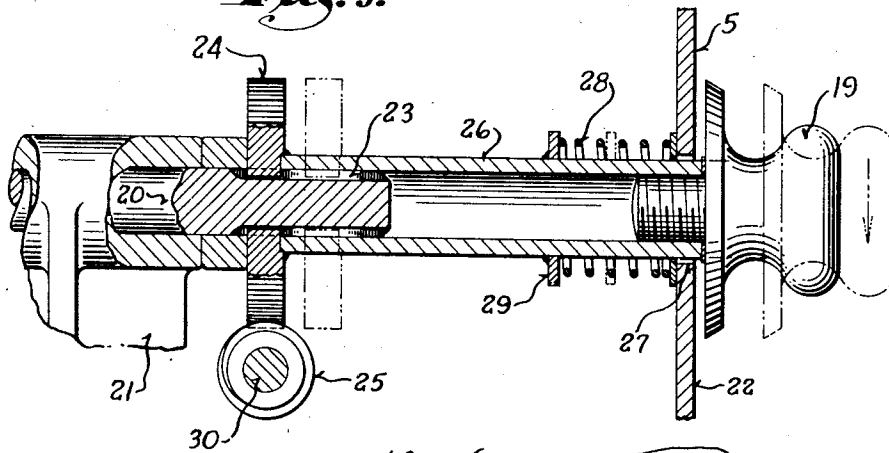


Fig. 6.

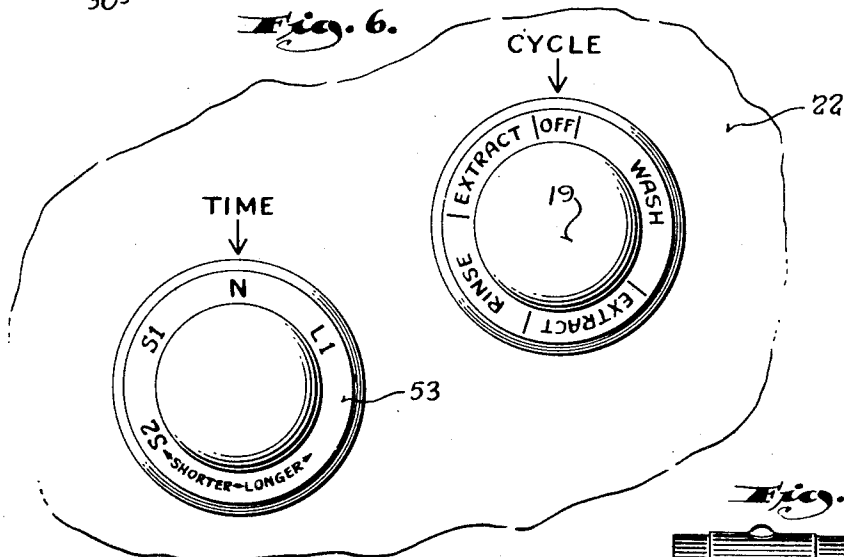
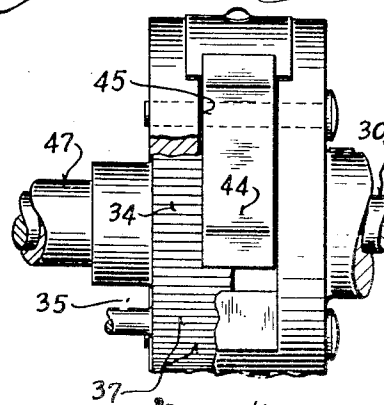
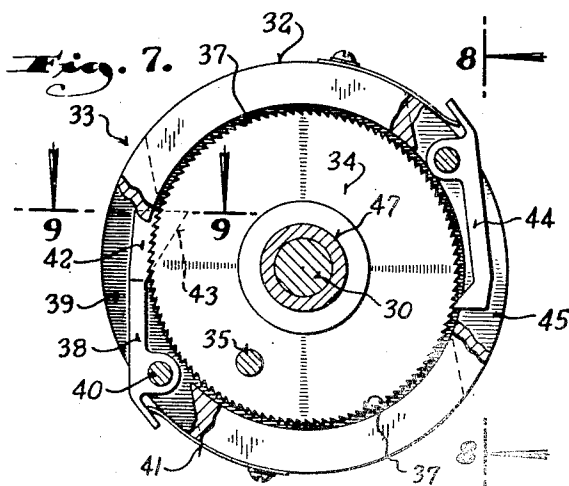


Fig. 8.



Inventor
Carl K. Schwartz
by *Irvington Jones*
attorney

Aug. 7, 1951

C. K. SCHWARTZ

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Fig. 10.

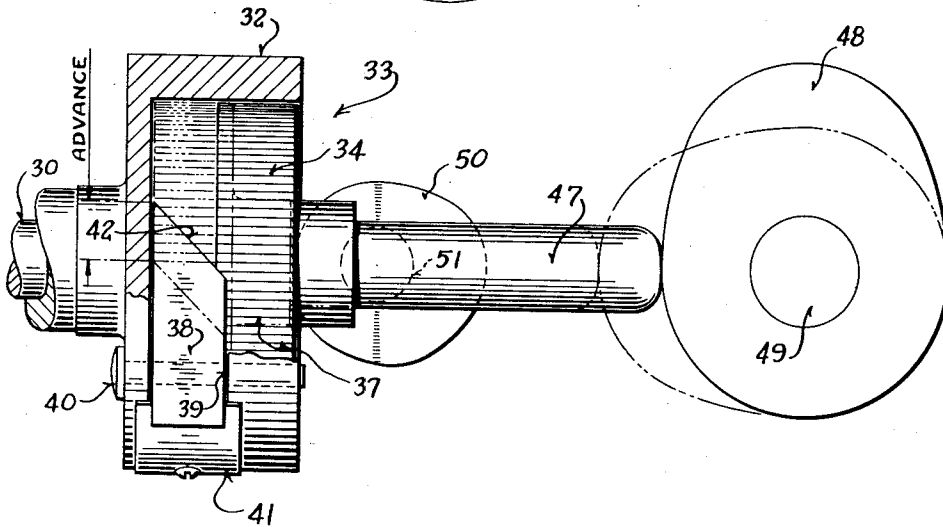
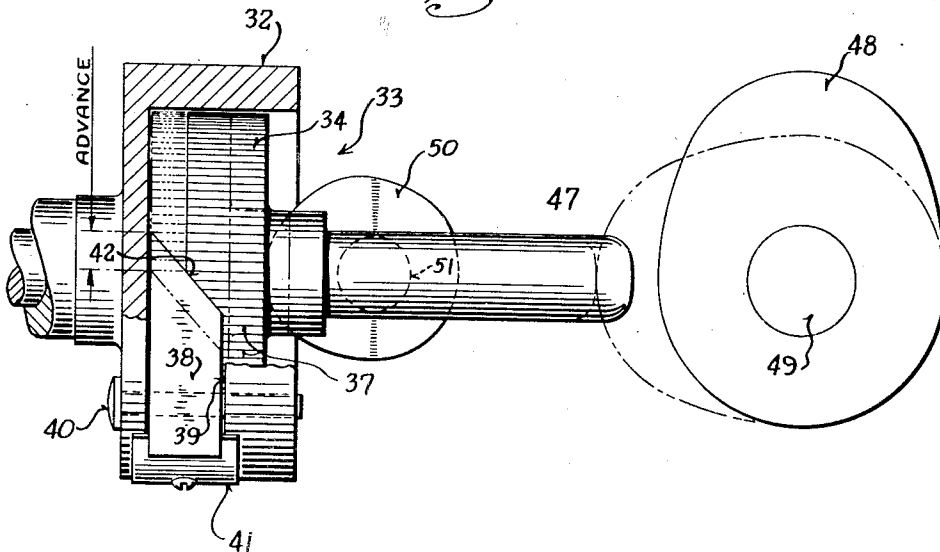


Fig. 11.



Inventor
Carl K. Schwartz
by *Dradutton Jones*
Attorney

UNITED STATES PATENT OFFICE

2,563,077

TIMER FOR AUTOMATIC WASHING
MACHINES

Carl K. Schwartz, Elkhart Lake, Wis., assignor to
Roger Hagen, Plymouth, Wis.; Mildred Hagen
administratrix of said Roger Hagen, deceased

Application September 8, 1949, Serial No. 114,580

4 Claims. (Cl. 161—1)

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This invention relates to automatic washing machines and refers more particularly to such machines designed for domestic use and in which means are provided for automatically performing all the necessary operations to effect washing, rinsing and drying (damp drying) of a batch of clothes loaded into the machine.

These operations are, of course, performed in predetermined sequence and the control thereof of necessity involves the use of some form of timer or timing mechanism by which cams or other devices are actuated to initiate and terminate the several operations which together comprise the machine cycle. Heretofore these timers or timing mechanisms have been driven by a separate electric motor, or as in one or two instances they were built into the transmission of the machine. In the latter case servicing of the timing mechanism and, in fact, its assembly into the machine presents a difficult problem; and where a separate motor is used to drive the timer the cost of the machine is obviously increased.

Another disadvantage of the way in which the timers or timing mechanisms of automatic washing machines were incorporated in machines of the past resides in the fact that the length of the complete automatic cycle was fixed except that selected operations could be shortened or bypassed. For instance, many machines have means for selectively shortening the washing and sometimes other portions of the cycle, and an example of this expedient may be found in Patent No. 2,225,407 issued December 17, 1940 to R. E. Bassett, Jr., but the means heretofore employed for shortening a portion or portions of the cycle necessitated manual attendance at the machine during the cycle, and regardless of how few clothes were being washed the cycle always had to be of the same duration if it were to be entirely automatic.

It is, therefore, one of the objects of this invention to provide an automatic washing machine wherein the timing mechanism is so designed and embodied as to permit the operator to select an automatic cycle of a length best suited for the particular washing job. In other words, if a few slightly soiled clothes are to be washed a shorter cycle may be selected and, conversely, where a larger batch of clothes or dirtier clothes are to be washed, a longer cycle can be selected. In each instance, however, all of the operations of the cycle will be performed automatically without necessitating the attendance of the operator after the machine has been turned on.

Another object of this invention is to provide

an automatic washing machine having a timer which is far simpler and considerably less expensive than the timing mechanisms of washing machines heretofore in use.

With the above and other objects in view which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claims.

The accompanying drawings illustrate one complete example of the physical embodiment of the invention constructed in accordance with the best mode so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a longitudinal sectional view through an automatic washing machine embodying this invention;

Figure 2 is a horizontal sectional view through Figure 1 on the plane of the line 2—2;

Figure 3 is a vertical sectional view taken through Figure 1 on the plane of the line 3—3;

Figure 4 is a detail sectional view taken through Figure 1 on the plane of the line 4—4;

Figure 5 is a detail sectional view through Figure 2 on the plane of the line 5—5;

Figure 6 is a fragmentary elevational view showing the controls for the machine;

Figure 7 is a detail sectional view taken through Figure 2 on the plane of the line 7—7;

Figure 8 is a view partially in side elevation and partially in section taken on the plane of the line 8—8 in Figure 7;

Figure 9 is a detail sectional view taken through Figure 7 on the plane of the line 9—9; and

Figures 10 and 11 are two similar more or less diagrammatic views to illustrate the manner in which the stroke of the indexer is adjusted to enable the selection of the duration of the total automatic cycle of the machine, it being noted that for the sake of clarity the actuator cam is illustrated in these views with its axis parallel to that of the time selector cam whereas actually these cams turn on axes perpendicular to each other.

Referring now particularly to the accompanying drawings in which like numerals indicate like parts throughout the several views, the numeral 5 designates the outer shell or cabinet of the washing machine. This outer shell is divided by a horizontal partition 6 into an upper compartment 7 and a lower compartment 8. The

upper compartment 7 provides a tub into which the cleaning and rinsing fluid is periodically charged and discharged under the control of an automatic timing mechanism 9 located in the lower compartment 8 which also houses the drive motor 10 for the machine and a transmission 11. A door 12 in the top of the cabinet provides access into the tub, and hence to a perforated clothes receptacle 13.

The receptacle 13 is rotatably mounted by a hollow shaft 14 which extends vertically through the bottom of the tub, i. e. the partition wall 6, to have operative connection with the transmission 11 so that at the proper times the receptacle is spun to extract the liquid from the clothes. The washing action is produced by an oscillating agitator 15 mounted within the receptacle on a shaft 16 which extends from the transmission through the hollow shaft 14 to oscillate the agitator during those periods of the cycle requiring agitation.

Inasmuch as the drive mechanism for the receptacle and agitator forms no part of this invention it has not been shown in detail. Also since the valves and other devices by which the introduction of cleaning and rinsing fluid and its discharge from the tub are governed and the electrical circuits through which the timing mechanism controls the various functions of the machine form no part of this invention, they have not been illustrated. It is sufficient to observe that as in all automatic washing machines the timer or timing mechanism 9 includes a series of cams 17 which slowly rotate during the cycle of the machine to actuate switches 18 by which the control circuits (not shown) are opened and closed to effect the various operations of the machine.

Also as in all automatic washing machines heretofore available the washing cycle is started by manually turning a control knob 19 from its off position in which position the knob is illustrated in Figure 6. As will be hereinafter more fully described such actuation of the knob 19 to initiate the operation of the machine entails outward withdrawal of the knob.

Though the various operations performed by automatic washing machines may vary somewhat in their specific nature and perhaps also in their sequence, the basic operations performed by such machines are (1) washing, (2) extracting, (3) rinsing, and (4) final extraction, which is ordinarily referred to as damp drying. The control knob 19 thus has at least these operations designated thereon, and as the machine cycle is performed the knob rotates in unison with the cams 17 to carry its various designations past the cycle indicator shown in Figure 6 so that the operator at all times knows what portion of a cycle is being performed.

The cams 17 of the timer are mounted upon a common cam shaft 20 journaled in and constrained to rotation by a bearing in a bracket 21. This bracket 21 is conveniently mounted upon the top of the transmission housing 11 so that the cam shaft 20 is horizontal with its axis normal to the front wall 22 of the machine cabinet.

The outer end 23 of the cam shaft 20 has a worm wheel 24 slidably splined thereon which normally meshes with a worm 25 to be driven thereby. A tubular extension 26 fixed to the worm wheel projects forwardly through a hole 27 in the cabinet wall 22 and has the control knob 19 mounted thereon. Thus outward with-

drawal of the knob 19 as indicated in dot-dash lines in Figure 5 moves the worm wheel 24 out of mesh with the worm 25 to permit manual rotation of the cam shaft by means of the knob. Preferably, means (not shown) are provided for discontinuing the drive of the machine when the knob 19 is withdrawn. This enables the operator to advance the cams 17 whenever it is desired to manually select any portion of the complete machine cycle.

Return of the knob 19 to its normal position and remeshing of the worm wheel 24 with the worm 25 is effected by a spring 28 confined between the back of the wall 22 and a stop abutment 29 on the shaft extension 26.

The manner in which the cam shaft is slowly rotated to effect the sequential performance of the various operations, now about to be described, differs materially from the ways in which the cam shaft of automatic washing machines has been driven in the past, and is largely responsible for the flexibility of the machine with respect to the duration of the total automatic cycle, and also its mechanical simplicity and low cost.

The worm 25 is fixed on a shaft 30 journaled in bearings 31-31' which form part of the bracket 21. Also fixed on the shaft 30 is a driven member 32 of a novel pawl and ratchet driving connection indicated generally by the numeral 33. The driven member 32 is substantially cup-shaped and receives therein the driving member 34 of the pawl and ratchet connection. The driving member 34 is constrained to reciprocatory motion, being slidable upon the shaft 30 and restrained against rotation by a pin 35 sliding in a slot 36 in an adjacent portion of the bracket 21.

The driving member 34 is essentially a ratchet wheel having a large number of small teeth 37 on its outer periphery which lies closely adjacent to the side wall of the cup-shaped driven member 32; and the driven member has a pawl 38 mounted in a slot 39 in the side wall of the cup-shaped driven member. A pin 40 mounts the pawl and a spring 41 yieldingly urges the same into operative engagement with the teeth of the ratchet wheel.

It is important to observe that the working face 42 of the pawl is inclined with respect to the axis of rotation of the driven member and that the underside 43 thereof is also inclined. Thus, as clearly illustrated in Figures 10 and 11, the working face of the pawl at all times engages the side edge of one of the ratchet teeth, being held in such engagement by the tension of the spring 41.

By virtue of the wedge-shaped formation of the outer or operating end of the pawl (provided by the inclined surfaces 42 and 43) driving engagement between the pawl and ratchet wheel is maintained throughout the full stroke of the ratchet wheel. The angle through which the driven member is turned with each operating stroke of the ratchet wheel depends upon the number of ratchet teeth encompassed by the distance between the tip of the pawl and the point of engagement between the pawl and the engaged tooth; and this distance, which is designated "advance" in Figures 10 and 11, depends upon the length of the operating stroke of the ratchet wheel. As will be hereinafter more fully described the stroke of the ratchet wheel is manually adjustable.

Retrograde rotation of the driven member dur-

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ing retraction of the ratchet wheel is precluded by a holding pawl 44 mounted in a slot 45 in the side wall of the cup-shaped driven member similar to and preferably diametrically opposite the slot 39. The holding pawl, like the main pawl, is yieldingly biased into engagement with the ratchet teeth.

The ratchet wheel 34 is yieldingly retained in retracted position by a spring 46 confined between the outer end of the shaft 30 and the closed end of a hollow shaft 47 which is secured to and extends out from the ratchet wheel. In the specific construction illustrated the hollow shaft is slidably mounted on the worm shaft 30 and is secured to and extends into the ratchet wheel to provide a bushing therefor. Thus the hollow shaft is fixed with respect to the ratchet wheel and since it projects exteriorly of the timing mechanism generally it constitutes an indexer by which the timing mechanism may be indexed to effect the desired slow rotation of the cam shaft.

Any part on the machine which moves in a recurrent path as long as the machine is in operation can be employed periodically to depress the indexer. For instance, this function may be performed by an actuator cam 48 mounted upon a shaft 49 which extends up from the top of the transmission and is continuously rotated thereby while the machine is in operation. Obviously, of course, the actuator cam or any equivalent motion producing device could be mounted on any other continuously moving part of the machine, the important consideration being that the actuator cam or its equivalent be capable of effecting the maximum stroke of the indexer 47. Attention is directed to the fact that in all views of the drawings the actuator cam 48 is shown in its position permitting maximum retraction of the indexer.

As noted hereinbefore the length of the stroke of the driving member (the ratchet 34) determines the angle through which the driven member will be turned with each depression of the indexer, and since the cam 48 has a fixed throw and will always carry the indexer to the same point, it follows that adjustment of the length of the operating stroke is effected by shifting the location of the stop which determines the retracted position of the indexer and hence the driving member. A cam 50 provides this stop. It is mounted on a shaft 51 journaled in a bearing 52 formed as part of the bracket 21. The shaft 51 is parallel to the axis of the knob 19 and extends through the front wall 22 of the machine to mount a selector dial 53 by which the cam 50 may be rotated.

Though the number of operative positions of the cam 50 and, hence, the number of different time settings of the timer is a matter of choice, in the present instance the cam 50 has four positions indicated by the engagement of a detent spring 54 in notches 55 formed in the hub of the cam. Indicia on the face of the dial corresponds with the locations of the detent notches. The setting of the dial 53 thus determines the length of the total automatic cycle.

In its normal position, indicated by the letter N on the dial 53, the stop cam 50 is in its position permitting the indexer to be retracted a distance at which the angle of the working face of the pawl 38 encompasses five ratchet teeth. With the dial 53 set in this position, therefore, each operating stroke of the indexer advances the driven member and consequently the worm wheel

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25, an angular distance five times the pitch of the ratchet teeth.

If the dial 53 is turned counter-clockwise to bring its designation "L1" in line with the adjacent fixed pointer, the stop cam 50 will be in its position holding the indexer retraction to its minimum. This is the position of the parts illustrated in Figure 11, and as there shown with the cam 50 in this position only four ratchet teeth are encompassed by the working face of the pawl so that the angular advance of the driven member with each operating stroke of the indexer is only four times the pitch of the ratchet teeth. This affords a longer cycle.

If on the other hand the dial 53 is rotated in a clockwise direction to either of its positions indicated by the characters "S1" and "S2" the number of teeth encompassed by the working face of the pawl will be correspondingly increased with the result that the length of the total automatic cycle will be correspondingly shorter. Thus with the dial in its position S1 six ratchet teeth are encompassed by the pawl and with the dial in its S2 position seven teeth are encompassed. Figure 10 shows the parts in this latter position.

It will, therefore, be seen that means are provided for enabling the operator to easily and quickly select a machine cycle of a length best suited for the particular washing job. If only a few slightly soiled clothes are to be washed the dial is moved to either of the positions S1 or S2, and where the clothes are heavily soiled the operator uses the longest cycle indicated by the designation "L1."

Assuming that the normal cycle (N on the timing dial 53) is thirty minutes, with the structure illustrated and described wherein five teeth are encompassed for the normal timing, four for longest timing and six and seven for the shorter timing, the length of the automatic cycle at these respective settings is approximately as follows:

L1=37½ minutes

N=30 minutes

S1=25 minutes

S2=21 minutes

From the foregoing description taken in connection with the accompanying drawings it will be readily apparent to those skilled in the art that this invention provides an automatic washing machine which not only enables the operator to select desired portions of the operating cycle as may be done in automatic washing machines now available, but in addition the length of the total automatic cycle may be manually adjusted so that the operator may select the cycle best suited for the particular washing job to be done, and that such selection does not entail the attendance of the operator once the selection has been made and the machine turned on. It will also be readily apparent that this invention provides a timer especially adapted for automatic washing machines which is far simpler and less expensive than mechanisms heretofore in use for this purpose, and that the timer of this invention requires no separate electric motor to drive the same, but instead may be driven or actuated by any recurrently moving part on the machine.

Another very important advantage of the present invention lies in the fact that it permits the entire timer to be assembled in a small compact unit easily installed on the machine.

What I claim as my invention is:

1. A timer for automatic washing machines, comprising: an output shaft constrained to ro-

tation; a spring retracted indexer constrained to reciprocatory motion along a path parallel to the axis of rotation of the output shaft; an adjustable stop defining the retracted position of the indexer; the indexer projecting exteriorly of the timer to be engageable by an actuator driven from any continuously moving part of the machine and by which the indexer is advanced; a pawl and ratchet driving connection between the indexer and the output shaft, one of the engaging surfaces of the pawl and ratchet being inclined to the axis of the output shaft so that advance of the indexer is translated by said pawl and ratchet connection into rotation of the output shaft, the angle through which the output shaft is turned with each advance of the indexer being determined by the location of the adjustable stop defining the retracted position of the indexer; and means for adjusting said stop to thereby enable adjustment of the duration of the total timer cycle.

2. A timer for automatic washing machines, comprising: a cam shaft constrained to rotation; a driver for the cam shaft also constrained to rotation; a driving connection between the cam shaft and its driver; an indexer constrained to reciprocatory motion along a path parallel to the axis of rotation of the cam shaft driver; a spring yieldingly urging the indexer to a retracted position, said indexer projecting exteriorly of the timer to be engageable by an actuator driven from any continuously moving part of the machine and by which the indexer is advanced against the force of the retracting spring; a pawl and ratchet driving connection between the indexer and the cam shaft driver, one of the engaging surfaces of the pawl and ratchet being inclined to the axis of the cam shaft driver so that advance of the indexer is translated by said pawl and ratchet connection into rotation of the cam shaft driver, the angle through which the cam shaft driver is turned with each advance of the indexer being determined by the distance the indexer travels during its advance, which in turn depends upon the location of its retracted position; and an adjustable stop defining the retracted position of the indexer.

3. The timer for automatic washing machines set forth in claim 2 further characterized by the fact that the driving connection between the cam

shaft and its driver comprises meshing gears, the cam shaft gear being slidably splined thereto so as to enable meshing and demeshing of the gears and rotation of the cam shaft independently of its driver; and means for connecting the cam shaft gear with a manually operable control member by which such movements may be imparted to the cam shaft gear.

4. Mechanism for producing a slow rotation of a control shaft, comprising: a driven member constrained to rotation and connectable with the control shaft; a driving member constrained to reciprocatory motion along a path parallel with the axis of rotation of the driven member; a pawl and ratchet connection between said members, the pawl being carried by one of said members and the ratchet teeth being on the other, and the pawl having an inclined working face engageable with the ends of the ratchet teeth to impart rotary motion to the driven member during reciprocation of the driving member, the angle through which the driven member turns with each operating stroke of the driving member being determined by the number of teeth encompassed by the inclined working face of the pawl which in turn depends upon the stroke of the driving member; means for effecting reciprocation of the driving member including a spring at all times tending to move the driving member in one direction, and an indexer connected to the driving member and adapted to be periodically depressed against the force of the spring to impart movement in the opposite direction to the driving member; a multiple position stop against which the driving member is brought to bear by the spring and by which the length of the driving member stroke is set; and means for adjusting the stop and thereby setting the length of a cycle controlled by the control shaft.

CARL K. SCHWARTZ.

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