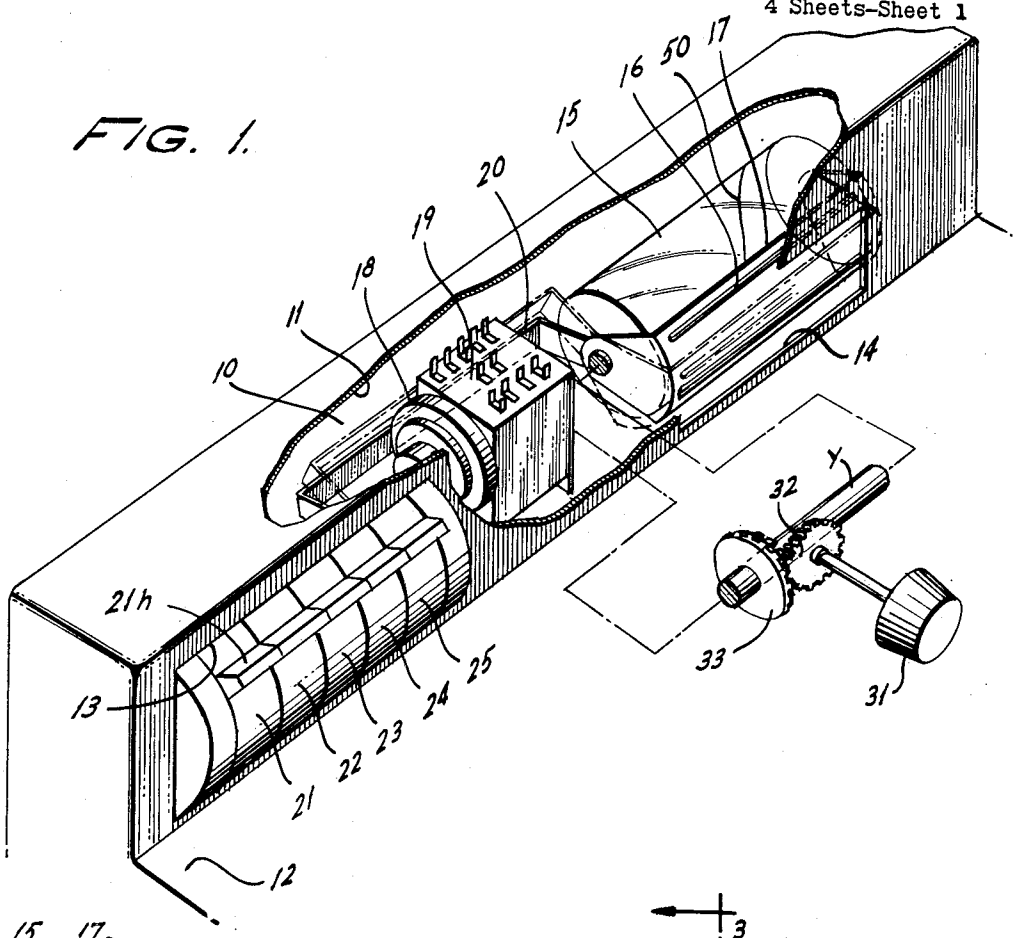
May 16, 1961 L. ANASTASIA ET AL 2,984,755

CONTROL MECHANISM

Filed April 14, 1959

4 Sheets-Sheet 1

FIG. 1.



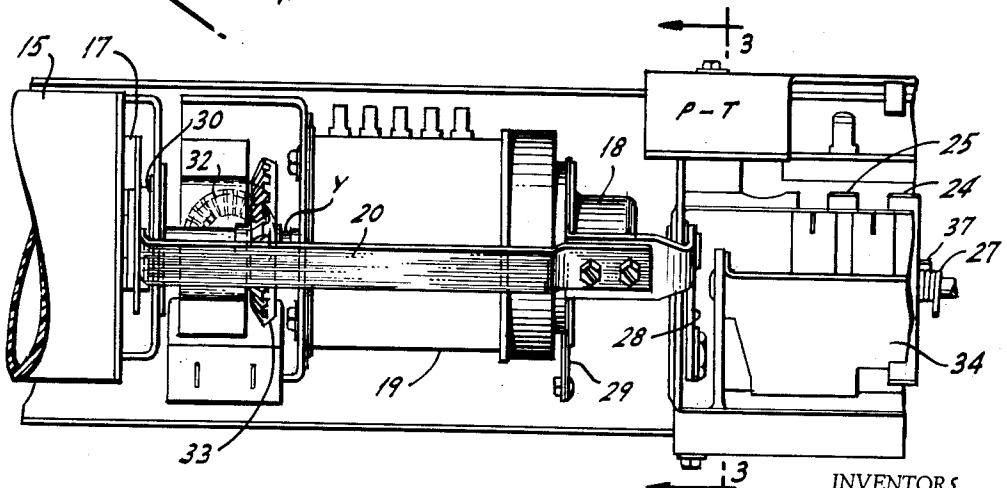


FIG. 2.

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CONTROL MECHANISM

Filed April 14, 1959 4 Sheets-Sheet 2

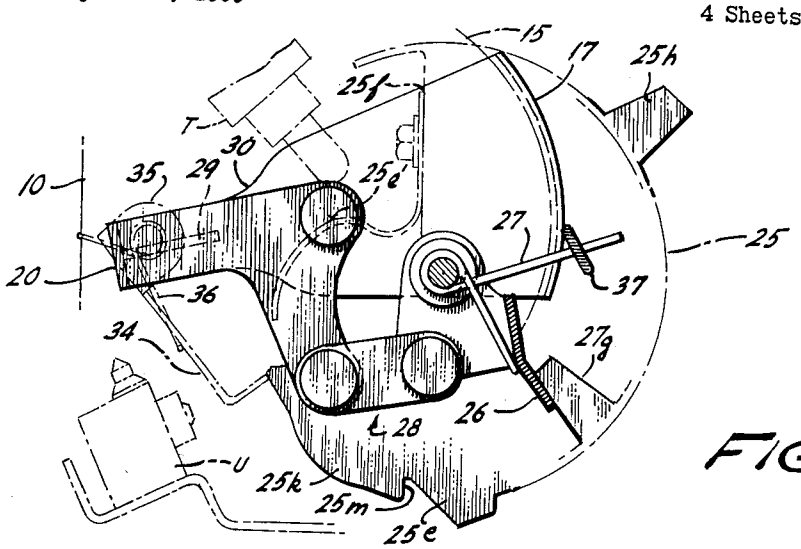

FIG. 3.

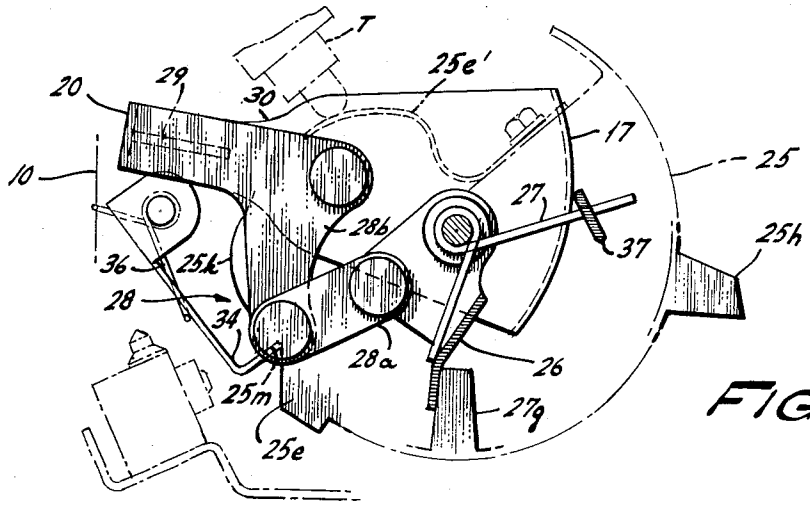

FIG. 4.

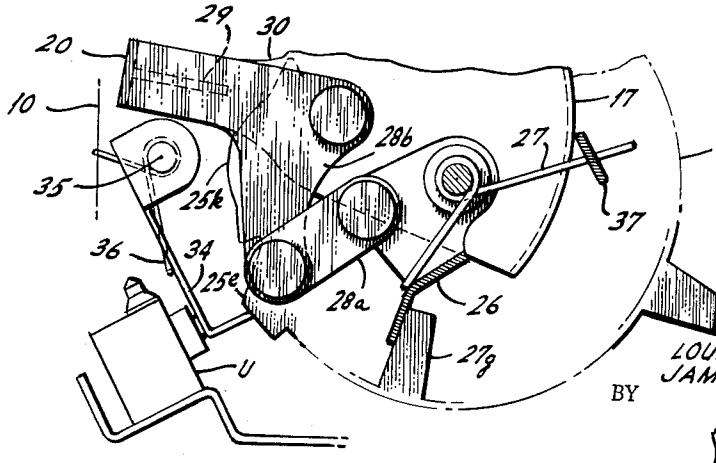

FIG. 5.

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CONTROL MECHANISM

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4 Sheets-Sheet 3

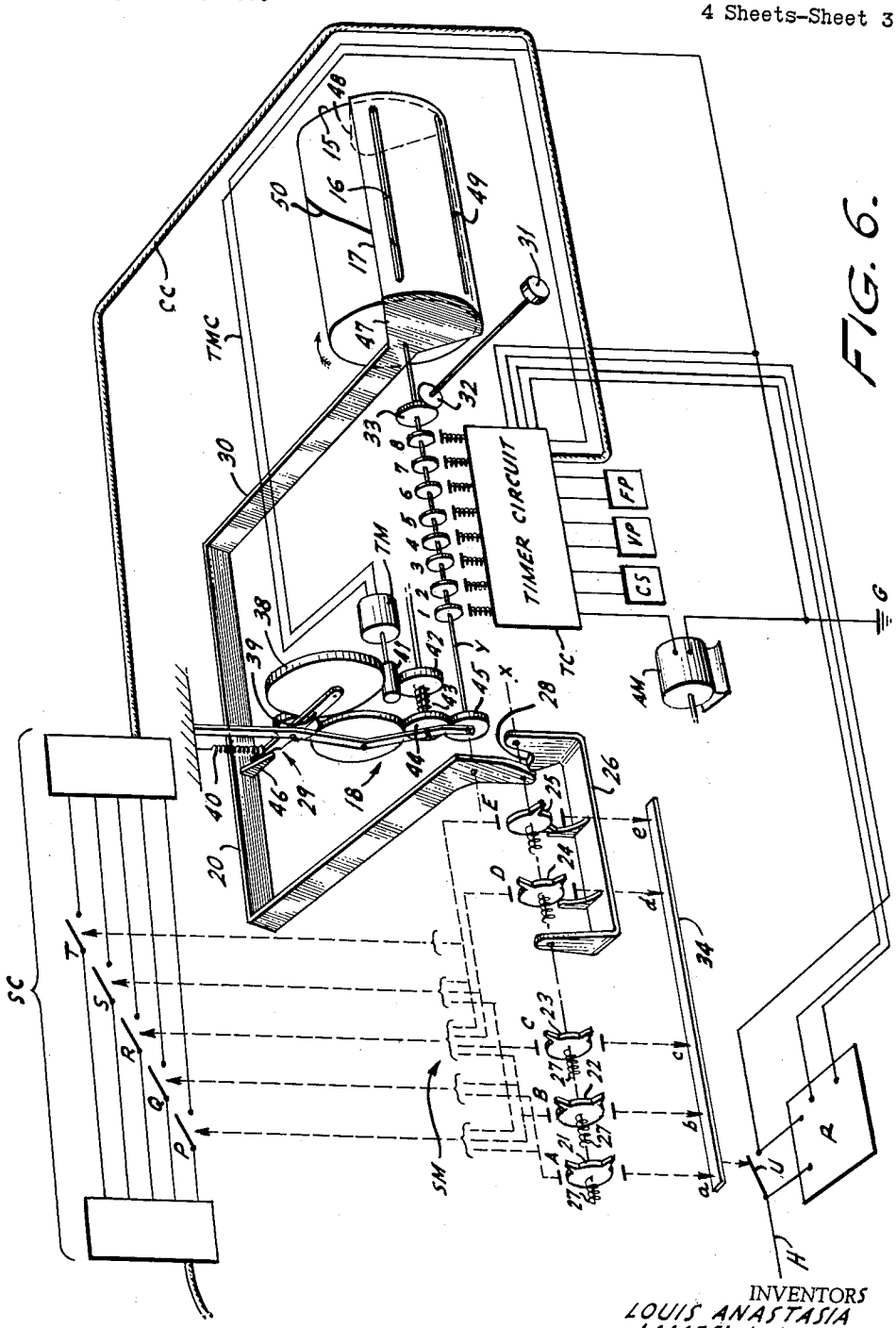

FIG. 6.

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CONTROL MECHANISM

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4 Sheets-Sheet 4

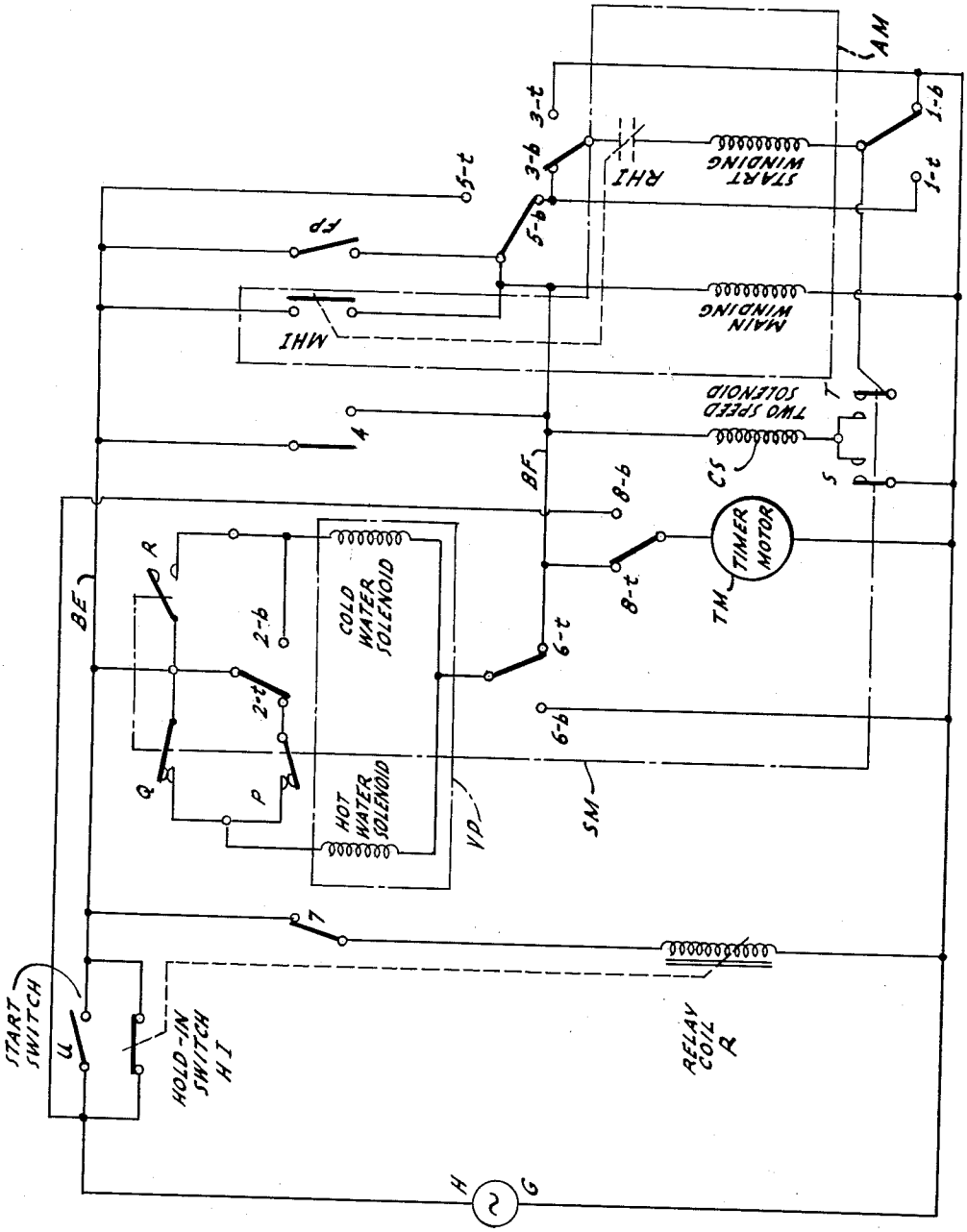

FIG. 7.

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United States Patent Office 2,984,755 Patented May 16, 1961

2,984,755

CONTROL MECHANISM

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Filed Apr. 14, 1959, Ser. No. 806,256

3 Claims. (Cl. 307—141.4)

This invention relates to control mechanism for automatic washing machines, particularly of the home laundry type.

A great variety of goods, used by the members of a household, is usually laundered in such a machine. For instance, wool, cotton, silk, synthetic fabrics, and so on are usually represented, any of which may either be white or colorfast or treated with more or less delicate dyes. Many fabrics have individual requirements, for instance as to allowable water temperatures, speed of agitating and/or spinning operations, and duration of such operations. A washing machine can be made versatile in such respects, and the machine is then able, on proper selection and control, to provide automatic performance of different laundering cycles, one in accordance with each of the different needs as outlined.

On the other hand, a household washing machine should also be simple, compact, and rugged; and this applies particularly to such controls as must be set, selected, adjusted or started by the householder. The invention is particularly concerned with this latter problem, involving the supervision and selective setting of control devices at the start of automatic operation of a washing machine.

It has been a primary object of this invention to achieve the greatest possible simplicity of manual setting, selecting and starting operations, while providing required versatility of operating cycles. A mechanism has therefore been provided, in accordance with the invention, wherein a single manual operation suffices to select any one of several possible cycles, to set, simultaneously, all required indicating and controlling parts so as to suit the selected cycle, and at the same time to start the automatic operation. It has been a further object to make such mechanism physically compact, mechanically simple, and generally efficient, as well as economical.

All this has been achieved by a control system which is characterized by novel, relatively simple yoke and linkage members, combined with suitable selector timer and indicator means. One of the new yoke and linkage members is advantageously associated with a limited portion or segment of a selector switch subassembly, while another one of said members is associated with certain parts of a time switch and indicator subassembly; the two yokes or linkage systems being interconnected, one for actuation by the other. More specific characteristics and feature of the invention will appear from the detailed description of a preferred embodiment, which follows.

In the drawing Figure 1 is a perspective view of the new mechanism, shown with certain parts broken away and other parts "exploded" in order to disclose certain details. Figure 2 is a fragmentary rear view of the same mechanism, drawn on a somewhat larger scale.

Figures 3, 4 and 5 are side views, taken along line 3—3 in Figure 2, showing certain parts of the mechanism in three different operative positions, and drawn on a scale somewhat larger than that of Figure 2.

Figure 6 is a highly schematic motion diagram of the selector, linkage, and timer-indicator system of the machine, oriented in the approximate way of Figure 1; and Figure 7 is a wiring diagram, showing details of selector and timer circuits and associated parts of Figure 6.

Referring first, and for general orientation, to Figure 1: control mechanism 10 is housed in splashguard enclosure 11, forming part of washing machine 12, said enclosure having a first elongate aperture 13 for a system of selector actuators, and a second elongate aperture 14 for inspection of an indicator drum 15. Part of said drum is visible in aperture 14, through one of several slots 16 in a shield 17, said shield being movable by selector actuator means, located at 13, to index one of said slots 16 with indicator aperture 14, and each slot having a distinctive legend (not shown), suitably formed on shield 17.

In order to move shield 17, and simultaneously to effect coordinated control over the drive mechanism 18 of a timer 19, the invention provides a transfer yoke 20. This yoke is moved by some, and only by some, of the several selector switch actuators which are provided in aperture 13, and which are identified by numerals 21, 22, 23, 24, 25. More specifically, and as best shown in Figure 6, the last two of said actuators, numbered 24, 25 are adapted to move yoke 20. They do so by means of a second yoke 26 which is specifically connected to these actuators, while the principal yoke 20 is specifically connected to other machine elements, as will be explained presently.

In connection with a complete laundering cycle, the user has to perform only one simple operation, that is: to depress handle 21*h* or the corresponding handle of any one of the several actuators 22 to 25. This single, manual operation not only selects one of several standard laundering programs or cycles (subject to further change, as will be described), it also adjusts timer drive 18 and indicator shield 17 to the selected cycle, and it simultaneously starts performance of such cycle; all this by means of simple linkage, including said yokes 20, 26.

As will be apparent, from Figure 1 in conjunction with Figure 2, actuators 21 to 25 have the form of disc elements installed side by side, below a switching device P–T for cycle selection. Each actuator has a spring 27 connected therewith, this spring being provided for automatically returning the actuator, when its handle has been released, toward a normal position. Additionally, as more fully shown in Figures 3 to 6, such release of actuator disc 24 or 25 shifts a yoke member 26, and thereby the main yoke 20, to a normal position. These two yokes are interconnected by linkage system 28, while connection from principal yoke 20 to timer-indicator unit 15—19 is effected by further linkage 29, 30. Member 29 is connected to timer drive 18, and member 30 is connected to moving shield 17. Thus it will be seen that each selector actuator controls cycle selecting and cycle starting circuitry, and several of them move special control means for cycle timing and indicating mechanism.

Different operating positions of linkage 20, 28, 29 and 30 and of directly associated parts are shown in Figures 3, 4 and 5; the first of these figures being drawn to indicate the positions of these parts as established normally or prior to operation of the machine, while Figure 4 shows one of the operative positions established upon the manual setting of the machine, and Figure 5 shows still another condition, momentarily existing during a certain phase of a manual control operation. In each of these three figures, only one of the last two selector

actuators, 25 has been shown; and it has only been shown in part and has otherwise been broken off and indicated only by broken lines, in order to show, as clearly as is possible in these views, the forms, positions and relative arrangements of linkages 29 and 30.

Inspection of Figures 3 and 4 shows that the two positions of handle 25*h*, shown in these figures, correspond respectively to two positions of the said linkages 20, 28, 29 and 30. Figure 5 shows that the position of linkage 29, 29 and 30, illustrated in Figure 4, exists also in the further condition, represented by this Figure 5, subject to slightly different positioning of the actuator. The three positions can be identified as non-operating (Figure 3), operating (Figure 4) and starting operation (Figure 5).

Reference will now be made to Figure 6, and particularly to the left hand portion thereof, wherein two special, or link-actuating selectors 24 and 25, with their interconnecting yoke 26, are shown in schematically simplified forms. All of the selector actuators, including selector discs 21 to 23 as well as the special selectors 24 and 25, are additionally associated with certain other mechanisms, indicated in this figure by broken lines which are identified by letters A to E and *a* to *e*. These added mechanisms are substantially in the nature of push button means, each element A to E being an individual selector push button and *a* to *e* being actuators for a single starting push button U.

Each actuator 21 etc. is individually journalled about an axis X, which also serves as axis for rocking motion of yoke 26. The principal yoke 20, by contrast, is pivoted about a separate although adjacent and parallel axis Y, coincident with the axis of the timer 18 and indicator 15 and also furnishing a journal for indicator shield 17.

It will further be noted, in Figures 1 and 6, that a knob 31 is connected to timer shaft Y by a bevel pinion 32 and bevel gear 33 (also see Figure 2). This device serves to make it possible for the user, after selection of any one of several standard laundering programs, corresponding to selectors 21 to 25, to modify such program by prolonging, shortening or skipping some phases thereof, as may sometimes be desired.

An actual form of one of the push button members, schematically indicated in the left part of Figure 6, is shown in Figure 3. Provision is made for actuating push button starting switch U by a raised cam lobe or hump 25*e* on the circumference of selector actuator disc element 25, whereas another push button means T is actuated by a raised portion 25*e'* of said element. Portion 25*e'* is provided by an actuator member 25*f* separately attached to selector disc element 25; this member 25*f* being preferably of resilient material, while disc 25 is rigid. (Also see Figures 4 and 5.)

For purposes of interconnection, mutual release and starting of electrical operation, each start switch actuating lobe, such as 25*e*, operates start switch U through the intermediary of still another linkage member or yoke, for instance a bar 34 pivoted to cabinet 10 at a suitable point 35 and resiliently returned by a spring 36 to a position remote from starting switch U. By means of this bar 34 any one of selectors 21 to 25 can operate said starting switch. Additionally, as is evident from Figures 3 and 4, bar 34 is adapted to engage another cam lobe on each moving actuator, for instance lobe 25*k*, for the purpose of automatically returning a previously operated actuator to normal position, incident to operation of any further actuator.

In other words, only one actuator can be active, at each time, to select a cycle. For this purpose each actuator has a notch—shown at 25*m* for actuator 25, Figure 3—which is engaged by said bar 34 when the corresponding actuator handle 25*h* has been depressed (Figure 5) and then released (Figure 4). Return spring 27, having one end secured at 37 and another bearing against yoke 26 and thereby against dog 27*g* and the corresponding disc element, moves the said disc element toward the normal (raised) position thereof, but is not allowed to complete such motion (Figure 3) unless and until bar 34 has been disengaged from the notch 25*m* which it has once engaged. Such disengagement is achieved by the latch-engaging effect of any other cam lobe, similar to 25*k*. Thus it will be seen that by depressing the handle of any other one of actuators 21, 22, etc., the user automatically releases a previously used actuator, causing it to return to raised position.

The connection of each right-hand selector disc element 24, 25 to yoke 26 (Figure 6) is effected (Figure 3) by a dog 27*g*, disposed on the inside of the periphery of each disc element 24, 25. Linkage elements 28*a*, 28*b* (Figure 4) are movable by and with this yoke 26, thereby providing linkage 28 for moving transfer yoke 20 (Figures 4, 6).

As further shown in Figure 6, a starting and selecting circuit SC is provided and is interconnected with a timer circuit TC by a suitable connector cable CC. The timer circuit in turn is connected with timer motor TM, washing machine agitator motor AM, speed changing clutch solenoid CS, and valve and/or pump means VP, as well as the usual float or pressure switch FP, by suitable conductors. This arrangement of agitator means etc. of course is subject to a variety of modifications, as is well known to the art. For the present invention, such modifications are of secondary significance and it is more important to refer particularly to timer motor TM and the mechanical arrangement thereof.

In this connection it is further shown in Figure 6 that linkage 29, provided for the control of timer drive mechanism 18, comprises a gear 38 rotatably mounted on a rocking arm 39, which arm is normally held in such position, by a spring 40, as to keep said gear 38 out of connection with drive pinion 41 of timer motor TM. Said pinion is permanently in mesh with a further gear 42, driving a clutch 43 and thereby driving an intermediate gear 44, which in turn is in mesh with drive gear 45 of timer shaft Y. It is possible, however, by means of selector 24 or 25 to move yoke 26, linkage 28 and yoke 20 so that the latter yoke, by means of a finger 46 forming part of mechanism 29, moves arm 39 against spring 40, thus engaging gear 38 with timer pinion 41 and thereby causing rotation to be transmitted from said pinion through gear 38 to a gear smaller than gear 42, and thereby to gear 44 at a rate faster than the direct transmission from 41 to 44, so that clutch 43 then overruns and timer drive gear 45 and shaft Y are more rapidly rotated. Conversely, of course, the arrangement could be constructed so that actuation of leverage connected with any one or more of selectors 21 to 25 would cause slower than normal rotation of the timer shaft, or more than two speeds could be provided.

Simple mechanism is sufficient to provide the linkage 30 between transfer yoke 20 and indicator shield 17. This linkage comprises a plain bar, rigid with yoke 20 and also rigid with one of two side members 47, 48 of shield 17, so that manual operation of selector 24 or 25 moves linkage 26, 28 backwards, yoke 20 upwards and shield 17 downwards. Normally, a lower slot 49 in shield 17 is registered with slot 14 of cabinet 11 (Figure 1), but depression of the handle of either selector 24 or 25 exposes, instead, the upper slot 16 in shield 17.

The surface of drum 15 has a spiral marker 50 thereon, which extends by way of a single turn over the entire length of the drum. In any one position of the drum and marker, one portion of said marker is visible, if the lower slot 49 and the corresponding legend of shield 17 is indexed with cabinet aperture 14 and visible in cabinet opening 14. However, if in the same position of drum 15 and marker 50, the handle of either actuator 24 or actuator 25 of the selector system is depressed, depressing shield 17 by means of yoke 20, the upper shield slot

16, together with the legend thereof, replaces the lower slot 49 and becomes visible in the cabinet front aperture 14, in accordance with the different cycling speed or timer shaft velocity obtained by the yoke and transfer mechanism 20, 29. Thus it will be seen that, dependent on operation or non-operation of special selector 24 or 25, different cycling and different cycle indications are obtained by the yoke, drum and shield mechanism 20, 30, 15, 17.

Reference will now be made, once more, to the left part of Figure 6 where selector push buttons A to E are shown as being combined with selector switch contactors P to T, by selector mechanism SM, so as to provide a predetermined correlation of said contactors with said push buttons. For instance, as shown, mechanism SM enables push buttons A, B and C to operate contactor P; push buttons A and B to operate contactor Q; push buttons B, C, D and E to operate contactor R; push buttons C, D and E to operate contactor S; and push button E to operate contactor T. A variety of such mechanisms are known and available, wherein five or some other number of push buttons actuate some suitable number, not necessarily the same number, of switch contactors. It is therefore believed that no details of this switch mechanism, beyond those shown in Figure 6, need be explained herein, the invention being directed to the novel interconnection of the basically known switch circuit and switch mechanism SC, SM with the timer and indicator unit TC, 15, 16, 17, etc., by the interconnecting yoke linkage 20, 26, supplemented further by the actuator return and control transfer linkage 34 which as shown is combined with the actuating system *a* to *e* for start switch U.

In order to start operation, the user will generally consult suitable legends or indicia, not shown herein but which can readily be provided in suitable form, on or adjacent each selector disc 21 to 25. It may be assumed for instance that selector disc 21 is provided, and suitably labeled, for the selection of a laundering cycle as generally used for regular cottons and linens and more particularly for white or colorfast goods of this type, which cycle desirably provides for hot washing, warm rinsing, high speed agitation during the washing and rinsing, and high speed spinning thereafter; the duration of the washing and rinsing agitation being relatively long. Such a cycle is selected and at the same time the performance thereof started by momentarily depressing handle 21*h* (Figure 1).

Figure 7 shows the condition of the wiring system which exists when handle 21*h* has been depressed as has just been noted. This operation has established a position of the principal control elements which can best be characterized by the following Chart I, the upper line of which indicates the selector and timer switches, such as switches P, Q, R, etc., 1, 2, 3, etc., the timer speed selector element 45 and the indicator positioning element 17. In the lower line of the chart letter symbols are used as follows: *c* for closed; *o* for open; *b* for being at position –*b*, for instance, in case of switch 1, at position 1–*b*; and *t* for being, similarly, at position –*t*.

Chart I

Cycle	P	Q	R	S	T	1	2	3	4	5	6	7	8	FP	45	17
21	*c*	*c*	*o*	*o*	*o*	*b*	*t*	*b*	*o*	*b*	*t*	*c*	*t*	*o*	slow	up

It is believed to be unnecessary to describe the complete operation of each circuit element P, Q, R, 1, 2, 3, etc. but it may be mentioned at this point that timer switch 7 has been left in the closed position shown in Figure 7, at the end of a previous cycle, and that consequently, momentary closure of start switch U has energized relay coil R which now holds hold-in switch HI closed.

It will also be noted from the description, given above, and mainly from consideration of Figure 7, that closing of selector switch Q, in series with parallel circuits including motors TM and AM, results in energization of the hot water solenoid in unit VP and thus in the provision of hot water for the washing cycle, whereas subsequent operation of timer switch 2 (see Chart I–A, hereinafter) results in the use of warm water for rinsing. Also, while the motors TM and AM are in series with VP, as they initially are, insufficient voltage is available for operating these motors, but they start operating when, due to admission of the hot or warm water, switch FP closes and brings full voltage from source H and bus wire BE to intermediate bus wire BF, short-circuiting unit VP. The agitating motor is additionally controlled by centrifugal and reversing switches MHI, RHI, as is well known to the art in general. High speed performance of agitating and spinning operations is obtained, as selector switches S and T have been left open, which has prevented energization of the speed-lowering clutch solenoid CS. Relatively long duration of the agitating cycle is provided, by the feature that element 45 has been set for slow operation. A complete résumé of all timed functions is as follows.

Chart I–A

Cycle Function	1 (AM)	2 (VP)	3 (AM)	4 (CS)	5 (AM)	6 (VP)	7 (R)	8 (TM)	FP
Start	*b*	*t*	*b*	*o*	*b*	*t*	*c*	*b, t*	*o*
Fill & Wash	*b*	*t*	*b*	*o*	*b*	*t*	*c*	*t*	*o, c*
Spray Rinse and Extract	*t*	*b*	*t*	*c*	*t, b*	*b*	*c*	*t*	*o*
Deep Rinse	*b*	*b*	*b*	*o*	*b*	*t, b*	*c*	*t*	*o, c*
Extract	*t*	*b*	*t*	*c*	*t, b*	*o*	*c*	*t*	*o*
Reset, Part 1	*t*	*t*	*t*	*c*	*b*	*o*	*o, c*	*t, b*	*o*
Reset, Part 2	*b*	*t*	*b*	*o*	*b*	*o*	*c*	*b, t*	*o*

This chart can of course be modified in many ways, for instance by the interposition of pause periods between operations, use of added or modified operations, etc.

In the event that other types of fabrics are to be laundered, other basic types of operation can be performed by the new apparatus, one which is started by operating selector 22 and characterized by the following Chart II.

Chart II

Cycle	P	Q	R	S	T	1	2	3	4	5	6	7	8	FP	45	17
22	*c*	*c*	*c*	*o*	*o*	*b*	*t*	*b*	*o*	*b*	*t*	*c*	*t*	*o*	slow	up

This second type of operation will generally be chosen when such cottons and linens must be laundered as are not colorfast and when, accordingly, the temperature of washing water, as well as that of rinsing water, should only be warm. It will be seen that the initial setting of the selector elements differs from that in Chart I by closure of switch R; and consideration of Figure 7 and Chart I–A will make it clear, without extended description, that the above-mentioned modification, as to water temperatures, is thus obtained.

A third type of operation is required when so-called wash-and-wear synthetics are to be laundered. These again may be white or colorfast, and in such case selector **23** is desirably used, resulting in a cycle the initial position of which is as follows:

Chart III

Cycle	P	Q	R	S	T	1	2	3	4	5	6	7	8	FP	45	17
23	*c*	*o*	*c*	*c*	*o*	*b*	*t*	*b*	*o*	*b*	*t*	*c*	*t*	*o*	slow	up

Consideration of Figure 7 and Chart I–A will show that in this case wash water temperature is warm; rinse water temperature is cold; agitating and spinning velocities are low, due to operation of clutch CS, connected at S; and duration of agitation again is relatively long.

In the event that synthetics or blends are involved which are colored, or of particularly fine fabric, it is preferable to use selector **24**, resulting in the following, additionally modified, initial position.

Chart IV

Cycle	P	Q	R	S	T	1	2	3	4	5	6	7	8	FP	45	17
24	*o*	*c*	*c*	*c*	*o*	*b*	*t*	*b*	*o*	*b*	*t*	*c*	*t*	*o*	fast	down

This further selection involves the use of cold water washing, as well as cold water rinsing (Chart I–A); and it further involves the use of a relatively short agitating cycle, by virtue of operation of yokes **26** and **20** and the consequent resetting of speed selector element **45**. Corresponding resetting of indicator element **17** is provided at the same time. The speed of agitating and spinning motions again is low, due to closure of selector switch S.

Assuming, finally, that the articles to be laundered are substantially of the nature of woolens and/or silk, selector **25** should be depressed, resulting in the following still further initial position.

Chart V

Cycle	P	Q	R	S	T	1	2	3	4	5	6	7	8	FP	45	17
25	*o*	*o*	*c*	*o*	*c*	*b*	*t*	*b*	*o*	*b*	*t*	*c*	*t*	*o*	fast	down

Operations in this cycle are generally the same as under Chart IV, but the spinning velocity is relatively high, as is required for adequate damp drying of such fabrics. This is achieved by disabling clutch solenoid CS, through closed selector switch T, at the start of the extraction operation (Chart I–A, above).

While the settings of timer speed element **45**, and the corresponding durations of time cycles and particularly of agitation periods, are different in the various cycles of Charts I to V, the sequence of positions of time switches 1 to 8 can remain the same, or in other words, a single timer instrument **19** (Figure 1) and timer sequence (Chart I–A) can be used and different cycles of Charts I to V can nevertheless be obtained, as briefly indicated above. This has been achieved by the feature that the timer switch circuits are interlaced with selector switch circuits, as indicated by Figures 6 and 7.

It will thus be seen that the operation of the new machine is highly versatile, while combined selection and

starting of any one cycle, from the group of available operations, is most simply performed by operation of a single selector element. The householder, by merely depressing one of five selectors **21** to **25**, selects one of the several, complex types of cyclic operation which are possible, and at the same time starts the selected operation; and the same manipulation also selects a suitably adapted timer speed, corresponding duration of laundering operations, and corresponding setting of timing indication means. No further manual operation is required, during any of the so-selected cycles, although further variation is available, if desired, by means of the manual control knob which can be used to prolong, shorten or repeat any of the desired, cyclic functions of the machine.

While only a single embodiment of the invention has been described, it should be understood that the details thereof are not to be construed as limitative of the invention, except insofar as is consistent with the scope of the following claims.

We claim:

1. A control system for an electrical unit such as the motor and solenoid means of a washing machine, comprising: a group of program selector devices constructed and arranged for individual manual momentary operation substantially in the manner of a bank of push buttons, said group having control linkage connected with certain but not all of said program selector devices to enforce movement of the linkage into different positions by any one so connected program selector device; a system of selector switches, selectively controlled by such program selector devices, and a system of timer switches, in circuit with said selector switches, both systems being in circuit with said electrical unit of the machine, for the control of the machine; a timer mechanism adapted to be started by operation of any one of said program selector switches, for operation of said timer switches in predetermined sequence; and timer speed control means controlled by said linkage and adapted to control the timer mechanism to selectively enforce rapid and slow succession of the operations of the timer switches in accordance with said positions of said linkage enforced by said certain program selector devices.

2. A control system as described and claimed in claim 1 including a gear type speed reducer which forms part of the timer mechanism, and a variable gear clutch the gears of which form part of said speed reducer, said clutch comprising gear support means which form part of said control linkage.

3. A program selector and indicator system comprising a timer; a group of individually, manually, momentarily operable program selectors each adapted to start said timer and being individually adapted to start it for different types, such as different speeds, of operation thereof; a rotatable drum connected to and driven by the

timer to provide indications of the operation of the timer pursuant to such start; an apertured shield tiltably supported coaxially with said drum to select one of said indications; and linkage connecting said apertured shield with certain but not all of said program selectors for tilting said shield, so as to expose different areas of said drum through the apertured shield, dependent on the

type of operation of the timer, started by different program selectors.

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