Jan. 21, 1964 R. C. ZOPPOTH 3,118,981

CONSTANT SPEED ROTARY FACE-CAM TIMER

Filed April 20, 1960 2 Sheets-Sheet 1

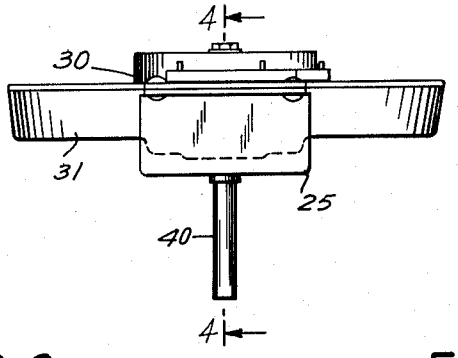


FIG. 1

FIG. 2

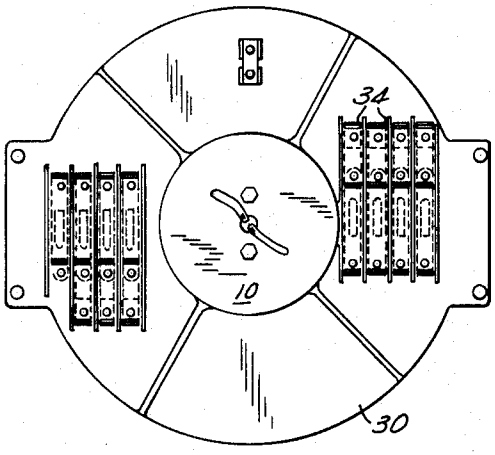


FIG. 3

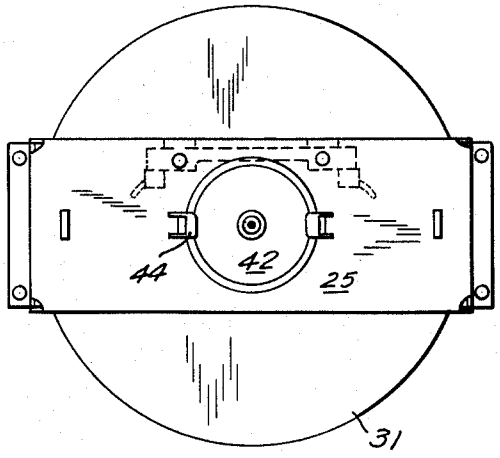
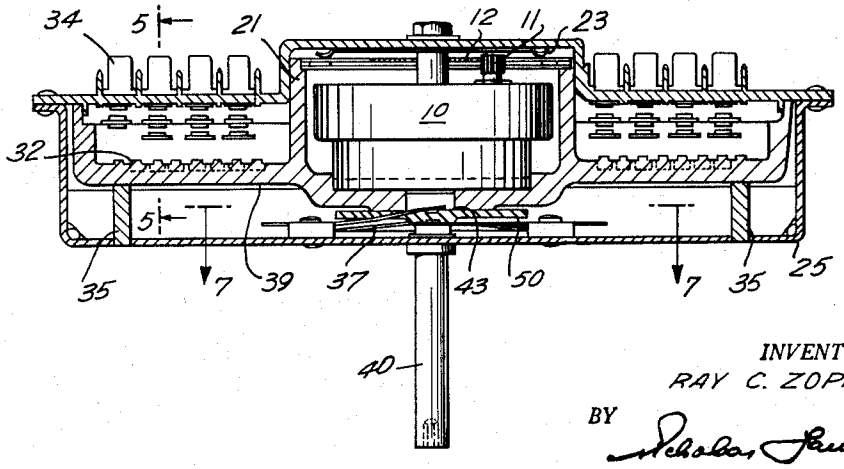


FIG. 4



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CONSTANT SPEED ROTARY FACE-CAM TIMER

Filed April 20, 1960 2 Sheets-Sheet 2

FIG. 5

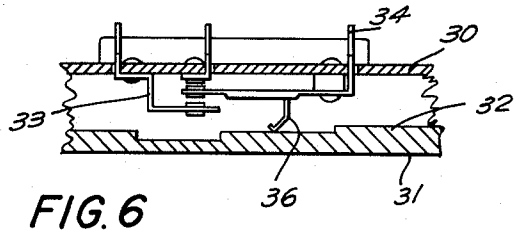


FIG. 6

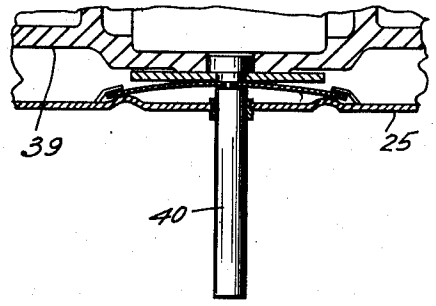


FIG. 7

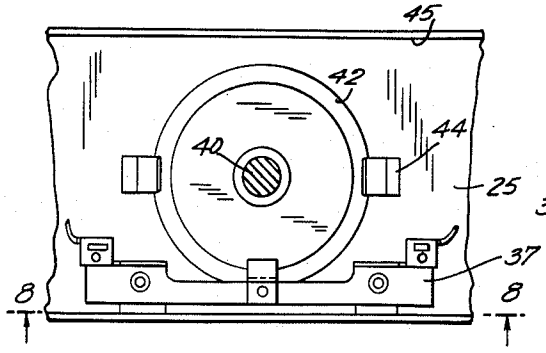


FIG. 8

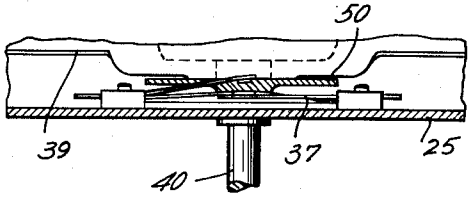
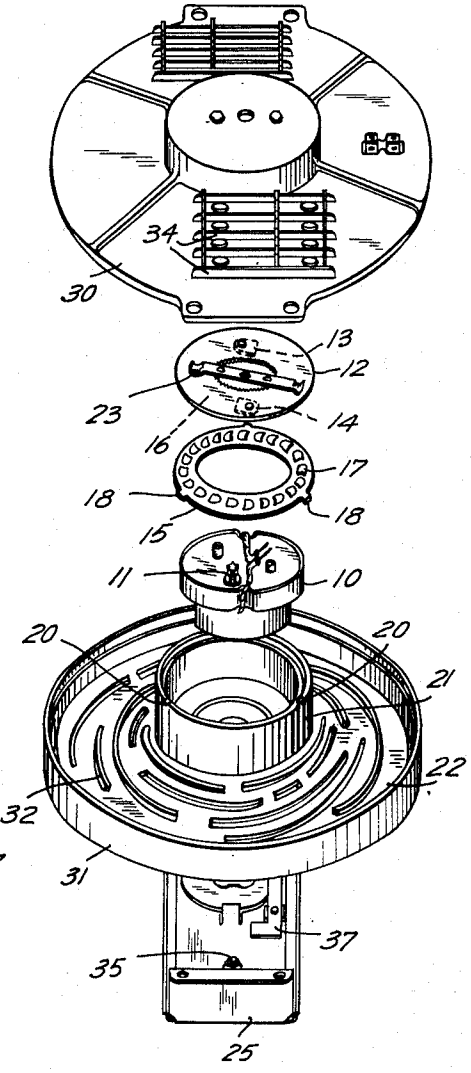


FIG. 9



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CONSTANT SPEED ROTARY FACE-CAM TIMER

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2 Claims. (Cl. 200—38)

This invention relates to control devices for sequentially opening and closing a series of electrical circuits at predetermined points in a cycle for definite durations therein, and is particularly pertinent to the sequential control circuit actuating means in automatic washing means which determine the automatic performance of a series of washing operations.

Automatic washing machines have been used for years in which a series of controlled operations is made possible by the actuation in sequence of mechanisms providing a series of cyclic movements or effects. The operation of these machines, for the most part, are controlled by means of a timing mechanism comprising a series of cams arranged one behind the other on a common rotatable shaft; each of said cams being shaped so that on the rotation of the shaft, associated circuits are activated in accordance with the setting of each cam. The over-all dimension of such a switch is therefore determined by the number of operating cams, becoming somewhat cumbersome as the number of cams are increased. In addition, thereto, the aforesaid type of timer switch normally necessitates the use of an escapement mechanism to give a step by step advancement of the timer cams through the use of a ratchet and pawl mechanism in intermittently moving a ratchet wheel coupled to the rotating cam shaft.

The present novel invention of a sequence timer switch overcomes the necessity of providing a multiplicity of cams along a shaft. This makes the switch adaptable for shallow, close limit environments. The timer also accomplishes the same functions of other timers in a more economical fashion by eliminating the escapement mechanism. It further includes a unique snap action mechanism for actuating a line switch for turning the timer on and off.

The present timer switch comprises a synchronous motor mounted and sunk within a circular shaped molded terminal board. Arranged about the motor, and driven by it, there is revolved a circular molded cam containing a multiplicity of concentric cam rings on its face. By means of the aforesaid individual, molded cam rings, each of which varies in height from an upper position to a neutral position and then to a lower position, a multiplicity of fixedly mounted cam followers are made to activate switches having upper and lower contacts mounted on the terminal board. The action of the switches energizes and de-energizes the washing machine circuits in a desired sequence. In this particular construction, there are seven single-pole double throw switches (SPDT) and one single pole, single throw switch (SPST), plus the line switch controlling the electric current input to the timer.

Therefore, an object of the present invention is to provide a timing mechanism for the control of a series of electric circuits in a sequential pattern lasting for predetermined times and operating at predetermined points therein.

Still another object of the present invention is to provide a radially moving sequential control device for actuating a series of electric circuits in a predetermined time fashion.

Another object of the present invention is to provide a timer for controlling a multiplicity of circuits to be actuated intermittently and so arranged in sequence to provide the usual wash, rinse and spin cycles etc. in a predetermined order and duration.

Another object of the present invention is to provide an economical, sequential timing control mechanism having a minimum of parts.

Another object of the present invention is to provide a simple, flexible and economical program timer mechanism.

Still another object of the present invention is to provide a program timer usable in shallow depth locations.

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

The accompanying drawings illustrate an embodiment of the invention constructed in accordance with the best mode for the practical application of the principles thereof, and in which FIG. 1 is a side view of the timer mechanism illustrating the shallow compactness thereof; FIG. 2 is a plan view of the terminal board of the invention of the present low cost timer invention wherein the concentric arrangement of the motor and terminal plate is shown as illustrating the compact arrangement of the timer.

FIG. 3 is a plan view of the bottom of the timer mechanism showing the mounting strap and line switch construction thereof.

FIG. 4 is a cross sectional view of the embodiment of the invention of the low cost sequential timer mechanism wherein the parts are assembled in relation to each other and as illustrating the constructional arrangement of the parts so as to give an extremely compact mechanism and as taken along line 4—4 of FIG. 1.

FIG. 5 is a cross sectional broken away view as taken along line 5—5 of FIG. 4 of a typical switch used in the timer in which the cam follower finger is actuated by the contour of the cam thereof.

FIG. 6 is a cross sectional view with portions broken away, of the snap action spring mechanism which actuates the line switch for turning the timer on and off.

FIG. 7 is a face view of the snap action line switch of the timing mechanism taken along line 7—7 of FIG. 4.

FIG. 8 is a cross sectional view of the line switch of the present embodiment of the invention as taken along line 8—8 of FIG. 7; and FIG. 9 is an exploded view of the timer mechanism as adapted to illustrate the cooperative arrangement of the components.

Generally speaking, the present invention comprises means and methods of making and breaking one or more pairs of contacts in a controlled sequence cycle for an automatic washing machine and wherein each pair of contacts is activated for a prescribed period and in a controlled sequence.

In the invention, the contact means for activating the electrical circuits is supplied by a series of switches which are radially and concentrically disposed with reference to a motor which turns a multiple face molded cam into juxtaposition with the molded terminal board carrying the switches.

Referring now to the figures of the drawings of the constant speed mechanism consists of a fractional horsepower synchronous motor 10 (FIGS. 4 and 9) mounting a pinion gear 11 which engages a free floating internally toothed ring gear 12. The internal ring gear 12 in turn mounts two pawls 13, 14 on its face 16 which engage a stamped uni-directional ratchet wheel 15 having raised struck-out teeth 17 thereon. By means of three extended keys 18 said ratchet wheel 15 is keyed via keyways 20 to a centrally molded collar 21 integrally joined to and vertically extended up from the face of cam 22 causing

said cam to revolve at constant speed about the motor. Transmitting the pinion and ring gear drive through the uni-directional ratchet wheel is necessary to prevent the operator from manually rotating the timer in a counter-clockwise direction which would damage the U-shaped formed cam follower fingers 23. Ratchet 15 is necessary, on the other hand, to allow the operator to manually advance the timer in clockwise direction to any desired setting.

A formed and channeled sheet metal strap 25 serves to tightly couple the molded terminal board 30 and molded cam 31 in juxtaposition with each other. As seen, the terminal board contains the fixed multipositioned switches 33 and terminals 34. These switches are activated by the followers 36 on face tracks 32 of the rotating cam 31. Cam 31 is rotated on nylon bearings points 35 having the form of cones and which support face 39 of the cam which is rotated by the motor during the ratchet mechanism comprising the pinion 11, internal ratchet 12, pawl 13, ratchet 15, keys 18 and keyways 20. Within the channeled strap is the line switch 37 which is actuated by axial movement of the timer shaft 40.

The axial movement of the timer shaft 40 is to accomplish "on and off" position of the switch 41 governing current input to the timer. In the present invention, the switch 37 provides an improved and simplified construction. It comprises a thin, round spring steel washer 42 fabricated with a spherical radius. This construction has a resilient snap action much in the manner of a snapping diaphragm when pressure is applied thereto. The snap action washer 42 is retained within a groove 43 on the timer shaft while its periphery is contained by stamped ears 44 and a depressed annular groove 45 on the strap. Thus, the desired snap action axial movement of the shaft is obtained by pushing and pulling the washing machine control means. By means of a molded ring 50 on the shaft, the line switch 37 is opened or closed.

The function of the usual escapement mechanism in a sequential timer is to provide an intermittent drive to the cams which provides a quick "make and break" of the contact points of the switches connected thereto. In the constant speed timer describe herein the contact points "make" and "break" slowly and provision has been made to minimize the arcing, welding and erosion which might occur. It has been determined through tests that the worst condition for contact wear occurs when a heavy motor load "makes" slowly and "breaks" fast. It is to be noted that in the present switch the construction of

each follower in relation to the cam track allows the make of the contact to be "fast" while the break is made at a slower rate. This prevents flash over or arcing during the operation of the switches.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed is:

1. A control device for sequentially opening and closing a series of electrical circuits comprising a fixed terminal board having a central circular opening therethrough, a motor being placed in said opening, said opening being substantially the same diameter of said motor, switches on said terminal board having cam followers, said switches placed on both sides of said motor, a cam having a collar for including said motor therewithin, said cam being coupled to and rotatable about said motor by a ratchet mechanism, said mechanism including a pinion driven by said motor, an internal ring gear driven by said pinion having a double pawl mounted thereon, and a ratchet ring upon which said pawl moves to move said ratchet ring, said ring having ears coupled to said collar of said cam whereby said cam is rotated, said cam having varying heights of cam tracks on its face, said switches being activated by said followers responding to the heights of said tracks to activate said circuits in a determined time pattern.

2. A control device as in claim 1 including a mounting strap therefor, said strap carrying nylon bearings upon which said cam rotates.

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