

Jan. 22, 1963

F. R. BECK ET AL

3,074,282

TIMER

Filed March 6, 1961

4 Sheets-Sheet 1

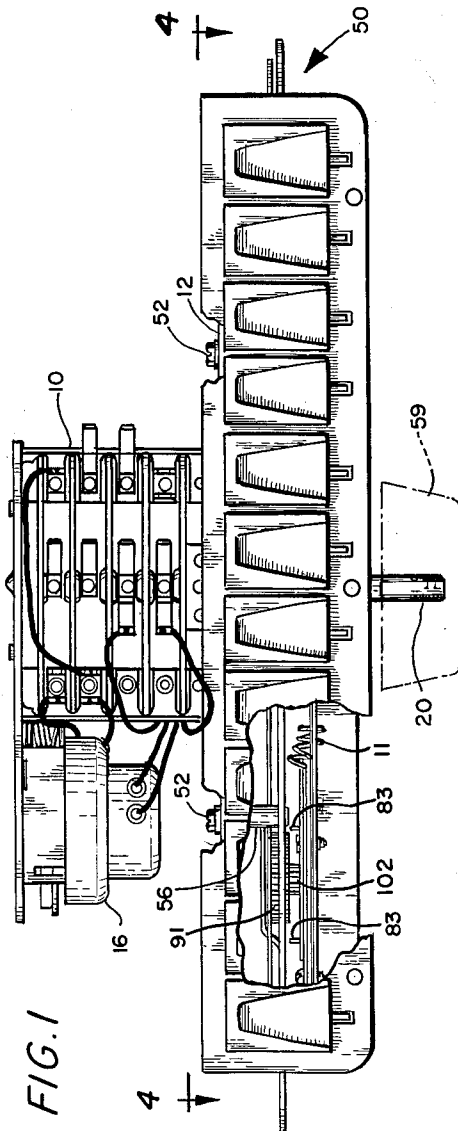


FIG. 1

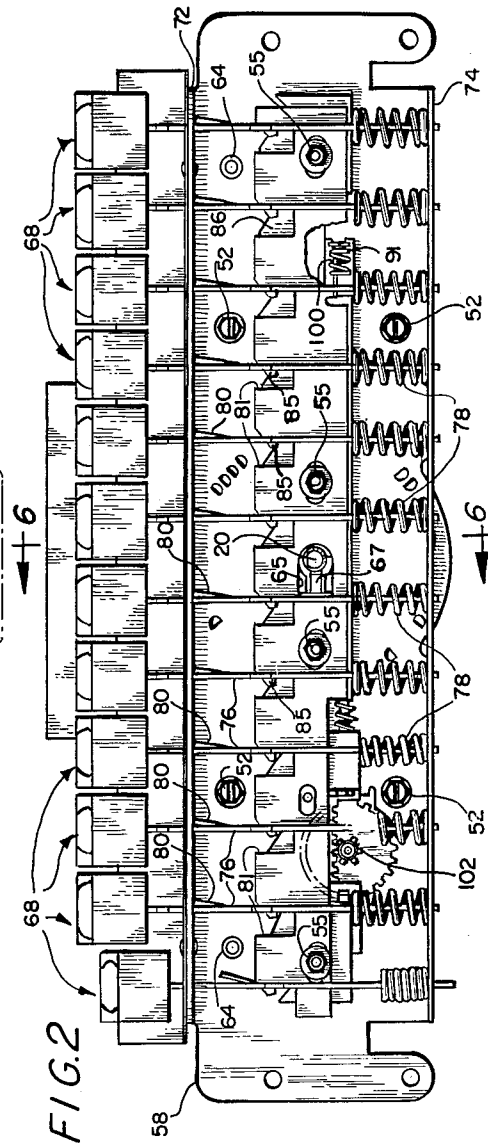


FIG. 2

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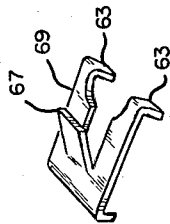
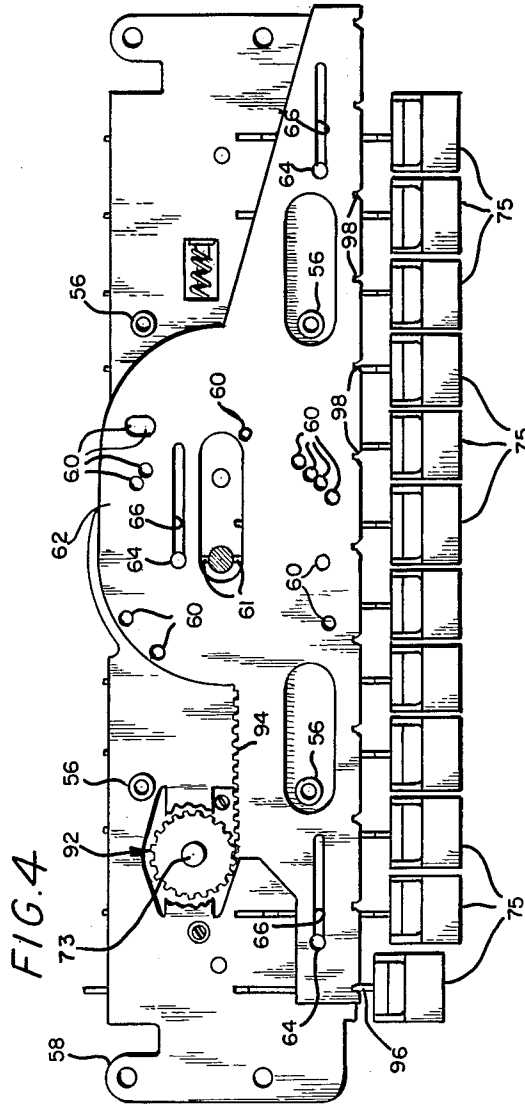
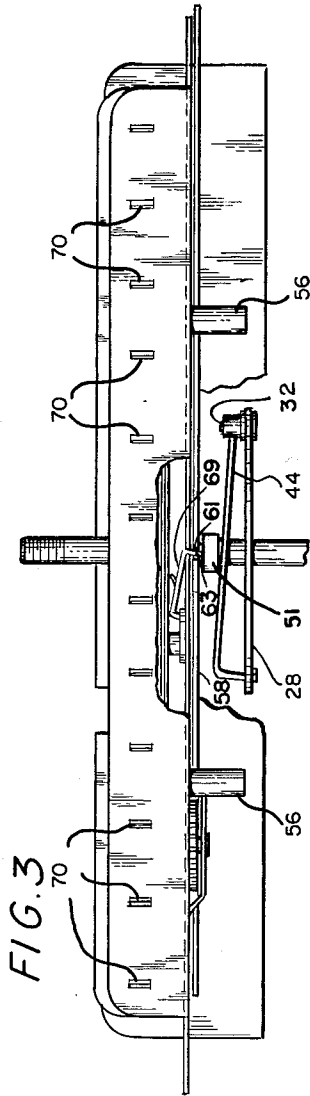
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4 Sheets-Sheet 2



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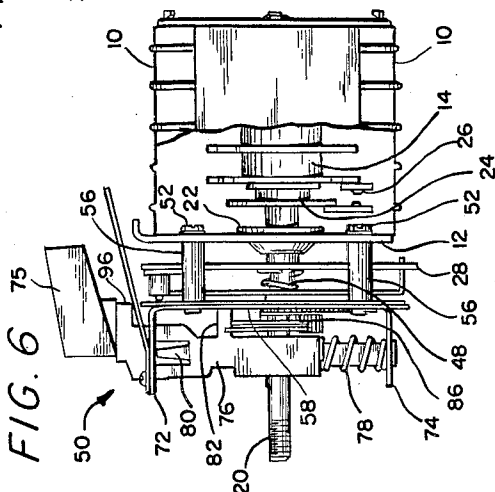
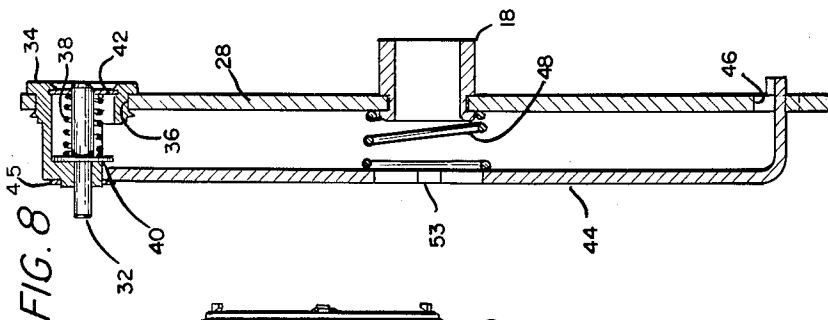
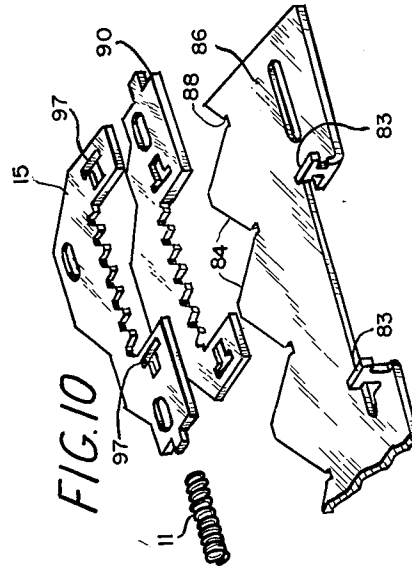
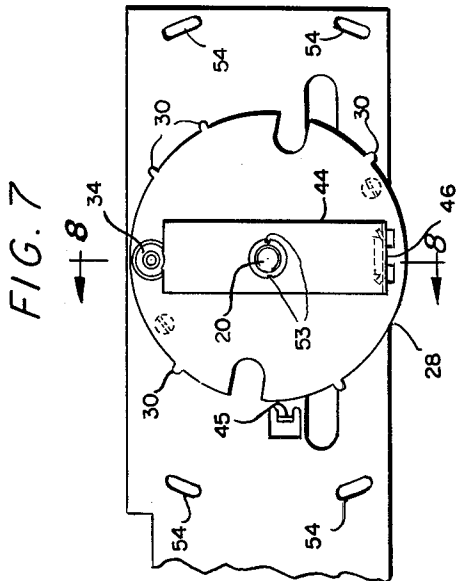
F. R. BECK ETAL

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TIMER

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4 Sheets-Sheet 3



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1

3,074,282

TIMER

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Filed Mar. 6, 1961, Ser. No. 93,654
27 Claims. (Cl. 74—3.52)

This invention relates to timers and more particularly, to an improved means for accurately positioning the timer at a desired starting point.

Sequence timers operating on rotations of a cam drum can be visualized as having 360 degrees of rotation available for containing the desired programs. With the variations in fabrics, soil condition of clothes, etc., it has become necessary to crown an ever increasing number of programs into the 360 degrees of rotation available. The spacing between adjacent programs has been reduced to a point where it has become necessary to provide mechanical means for accurately locating the starting points on the cam drum. This has been done in copending Thornbery application Serial No. 823,972, filed June 30, 1959 (assigned to applicant's assignee), now Patent No. 2,973,672 dated March 7, 1961, where a plate having a number of holes indicating starting points has been secured to shaft for the cam drum and a manually selectable panel for carrying a number of selectively movable pins has been secured to the timer next to the plate. A push button arrangement is used to move one of the pins into position to engage the hole on the plate corresponding to the starting point for the selected program.

The primary object of this invention is to simplify the structure of Thornbery and particularly, to simplify the pin locating structure.

This has been done by mounting a single pin on a disc which is secured to the shaft for the cam drum and positioning a laterally movable pin plate adjacent the disc. The pin plate is provided with a number of holes corresponding to the starting points for the programs on the cam drum, and by moving the plate laterally one or the other of the holes will be moved into the path of the pin on the disc. The disc and cam drum are then rotated until the pin drops into the hole for the starting point of the selected program.

Other objects and advantages will be pointed out in, or be apparent from, the specification and claims, as will obvious modifications of the single embodiment shown in the drawings, in which:

FIG. 1 is a top view of the timer and selector mechanism partly broken away to show the multiplier;

FIG. 2 is a front view of the selector device with the cover plate removed;

FIG. 3 is a view similar to FIG. 1 with the timer and push buttons removed;

FIG. 4 is a view taken on line 4—4 of FIG. 1;

FIG. 5 is a view of the retractor actuated;

FIG. 6 is a view taken on line 6—6 of FIG. 2 partly broken away to show the timer;

FIG. 7 is a view of the stop pin disc;

FIG. 8 is a view taken on line 8—8 of FIG. 7 showing the stop pin arrangement;

FIG. 9 is a projection view partly broken away to show the selector mechanism; and

FIG. 10 is a view of the ratchet gear anti-backlash arrangement.

The timer generally comprises a pair of switch panels 10 secured to a mounting plate 12 on either side of cam drum 14 which is driven by a synchronous motor 16 usually through a stepping drive or a creep drive. A shaft 20, coaxial with the cam drum, is rotatable within bearing 22 on the mounting plate and is splined to engage the cam drum while permitting axial motion. The shaft

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carries a cam 24 to actuate a line switch 26 upon reciprocation of the shaft in the usual manner.

A disc 28 is staked to bushing 18 which is secured to the shaft and has a number of tabs or cam followers 30 on its outer periphery each located one step past the "off" intervals for each program provided on the cam drum. The disc has a single stop pin 32 mounted for reciprocal motion in a housing 34 staked in an aperture 36 on the outer edge of the disc. The pin is biased outwardly by a spring 38 acting against flange 40 on the pin and held in the bushing by a retaining ring 42. A retractor 44 is pivoted in a slot 46 in the disc diametrically opposite the stop pin housing and is biased by a light spring 48 so that its free end engages a washer 45 secured to the end of the stop pin housing. It can be seen that by depressing the retractor the free end of the retractor will engage flange 40 moving the stop pin into the housing against the bias of spring 38.

The timer is secured to a push button mechanism 50 by a number of screws 52 passing through arcuate slots 54 in the timer mounting plate for engagement with studs 56 riveted to a mounting bracket 58. With this arrangement, the relative position of the timer with respect to the push button mechanism can be adjusted to more accurately locate the starting points as described hereinafter. The timer shaft projects through the push button mechanism to provide access for manual rotation and reciprocation of the disc by an indicating knob 59.

The stop pin on the disc is positioned to engage one of a number of holes 60 provided in pin plate 62 secured to the mounting bracket by pins 64. Slots 66 in the pin plate cooperate with pins 64 to allow the pin plate to be moved laterally on the mounting bracket. The holes in the pin plate indicate the starting points for the timer and by moving the pin plate with respect to the disc one of the holes will be positioned in the path of revolution of the stop pin on the disc. The position of the pin plate, therefore, determines the starting point for the timer.

The pin plate is moved by actuating one of a number of push button assemblies 68 reciprocally movable in slots 70 in the flanges 72 and 74 of the mounting bracket. The push button assemblies include indicating buttons 75 mounted on push bars 76 having outwardly bent tabs 80 to retain the push bar between the flanges. Return springs 78 bias the push button assemblies to an inoperative position. A tang 82 is provided on each push bar to engage one of the V-grooves 84 in pin plate actuator 86 when one of the push buttons is depressed. The pin plate actuator is mounted on pins 55 with slots 57 allowing for lateral motion of the actuator with respect to the mounting bracket. Each V-groove is wide enough at its open end to always be aligned with its corresponding push bar tang within the limits of movement of the pin plate actuator. It can be seen that by depressing one of the push button assemblies, the tang on the selected push bar will engage one of the sides of the V-groove camming the pin plate actuator to the right or to the left. The tang will slide down the side of the groove into notch 88 at the end of the groove. The distance between the notches in the grooves on the pin plate actuator are unequal so that the actuator assumes a different position each time a different button is pushed.

The motion of the pin plate actuator is picked up by a small gear 92 on a gear multiplier 92 rotatably mounted on pin 73 on the mounting bracket from an adjustable rack 90 rigidly secured to the pin plate actuator. The rotary motion of the small gear is increased by a large gear 91 and transferred to a rack 94 fixed on the pin plate. The gear multiplier has a gear ratio of approximately four to one so that the motion of the pin plate is increased approximately four times with respect to the motion of the pin plate actuator. This increase in mo-

tion is necessary to prevent the possibility of the stop pin from dropping into more than one hole on the pin plate. An anti-backlash plate 15 having slots 97 is slidably mounted on T-shaped tabs 83 on the pin plate actuator and is biased by spring 11 acting against the actuator. The anti-backlash plate will provide a counter-clockwise bias on the multiplier gear so that the teeth on the small gear always engage the same side of the teeth on rack 90. Simultaneously with the seating of the tang in the notch 88 in the pin plate actuator, a protrusion 96 under the button will be seated within groove 98 in the pin plate to more accurately locate the pin plate with respect to the mounting bracket and correct any misalignment which may have been induced by improper adjustment.

The push button assemblies are locked in the depressed position by latch plate 95 having slots 93 to allow for lateral motion of the plate on pins 55 on the mounting bracket. Return spring 91 is mounted on tab 89 on the mounting bracket and engages tab 100 on the latch plate to bias the latch plate to the left (FIG. 2). When a push button assembly is pushed, tang 82 will engage one of the cam surfaces 87 on latch plate 95 moving the latch plate to the right against the bias of the return spring until the tang slides past toe 85 (FIG. 9). When the tang has been pushed inward far enough to clear the toe, the latch plate will snap to a locking position with the tang locked in one of the notches 88. If another button had been previously locked in one of the notches, the camming action of the newly pressed button assembly will move the latch bar far enough to the right to release the tang from the toe allowing the push button return spring to return the button to a normal position.

Since the stop pin may be in a position where it might drop into one of the holes in the pin plate during the setting of the pin plate, it must be retracted before another push button is depressed. A retractor actuator 69 (FIG. 5) is pivoted on the mounting bracket between the latch plate and the surface of the bracket (FIG. 3) and has a tab 67 bent outward into hole 65 in the latch plate. When the latch plate is moved to the right by the initial motion of the push button assembly, the tab will be pushed rearwardly by the latch plate, pivoting the retractor actuator so that fingers 63 pass through slots 61 in the mounting bracket and engage sleeve 51 slidably positioned on the timer shaft. The sleeve engages tabs 53 on the retractor, pushing the retractor toward the disc. Since the sleeve only engages the tabs, there will be no tendency for the sleeve to bind on the shaft. The retractor will act against flange 40 on the stop pin, pushing the pin into the housing. The pin will then be clear of the pin plate so that it cannot interfere with the motion of the pin plate. On the return motion of the latch plate, the retractor actuator will be returned to its starting position by spring 48. The toe of the latch plate is set so that it will not clear the tang until the tang has moved far enough to enter notch 88. The pin plate actuator and the pin plate will then both be moved to the selector position before the stop pin is released by the return motion of the latch plate.

The shaft is shown with a knob 59 secured thereto for manual setting of the timer to the selected starting point. The shaft is then pushed axially to move the stop pin out of engagement with the pin plate and close the line switch to start the timer. At the end of the selected program, one of the tabs 30 will be aligned with cam 45 on the mounting plate. Any attempt to rotate the timer shaft will cause the tab 30 to ride upon the cam, moving the shaft outward and opening the line switch.

In operation, assuming one of the push button assemblies has been locked by the latch plate and the stop pin, mounted on the disc, is engaged with the corresponding hole in the pin plate, the following action will occur when a different push button assembly is pushed.

During the initial portion of the push bar stroke, the tang on the push bar will contact one of the cam surfaces on the latch plate, camming the latch plate to the right (FIG. 2) to release the previously latched push button assembly. The push bar return spring 78 will return the push button assembly to its normal position. This same initial movement of the latch plate cams the retractor actuator rearward to push sleeve 51 on the shaft against the tabs on the retractors, depressing the retractor against the flange on the spring loaded stop pin to retract the stop pin into its housing. This will move the stop pin to a position where it will not interfere with the setting motion of the pin plate.

Upon further depression of the push bar, the tang contacts the sides of the V-grooves and cams the pin plate actuator to the right or left until the tang engages notch 88. Since the notches in the V-grooves are spaced at unequal intervals and the push bars are spaced at equal intervals, the pin plate will be moved to a different position each time a button is pushed. The motion of the pin plate actuator is increased by the multiplier gear and transferred to the pin plate whereby one hole in the pin plate will be brought into the path of revolution of the stop pin on the disc.

In the final motion of the push bar, the tang seats in the notch and the toe will clear the tang, allowing the latch plate to move to the left locking the push bar in the depressed position. The locking motion of the latch plate will release the retractor actuator, retractor and stop pin so that the stop pin is biased against the face of the pin plate. Holes 25 may be provided in the mounting bracket to provide a clearance behind the pin plate for the stop pin when it drops into the holes in the pin plate. The protrusion on the push bar will enter into the corresponding groove in the edge of the pin plate to more accurately locate the pin plate with respect to the mounting bracket. The unequal spacing of notches 88 in the pin plate actuator makes it impossible to seat more than one tang in the notches at one time. Since the latch cannot lock on the tang until it is seated in the notch, only one push button assembly can be locked at a time. The timer is finally rotated manually until the stop pin drops into the preselected hole in the pin plate. The timer is started by pushing the shaft axially inward to disengage the stop pin from the pin plate and to close the line switch.

Although but a single embodiment of the present invention has been illustrated and described, it will be apparent to those skilled in the art that various changes and modifications may be made therein without departing from the spirit of the invention or from the scope of the appended claims.

We claim:

1. A means for locating a starting point on a timer comprising, a member adapted to be rotated with the timer, a pin supported by the member, a plate movably supported adjacent the member, a number of starting point establishing means on the plate for engaging the pin, means for selectively moving the plate to position one of the establishing means in the path of revolution of the pin to thereby engage the pin and stop the member at the selected starting point.
2. A means for locating a starting point according to claim 1, including means for moving the pin from engagement with the stop means and starting the timer.
3. A means for locating a starting point on a timer comprising, a member adapted to be rotated with the timer, said member being provided with a pin, a plate movably mounted adjacent the member and having a number of holes angularly spaced at varying radial distances from a common axis on said plate, means for selectively moving the plate transverse to the axis of rotation of the member to position one of the holes in the circle of revolution of the pin, means for rotating the member so that the pin drops into the selected hold,

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preventing further rotation of the member and thereby stopping the member at the selected starting point.

4. A means for locating a starting point according to claim 3 including means for moving the pin out of the selected hole to start the timer.

5. A means for locating a starting point on a timer comprising, a disc adapted to be rotated with the timer, a plate mounted for transverse movement with respect to the axis of rotation of the disc, said plate being provided with a number of holes positioned in relative angular and radial spaced relationship on said plate, a pin mounted on the disc, means for biasing the pin into engagement with the plate, means for selecting a program of operation for the timer and moving said plate to position one of said holes in the circle of revolution of the pin, means for rotating the disc relative to the plate so that the pin engages the prepositioned hole in the plate, preventing further rotation of the disc, and means for disengaging the pin from the plate.

6. A device according to claim 5 wherein the selecting means includes a second movable plate having a number of unequally spaced grooves corresponding to the starting points on the timer and a number of equally spaced selector buttons each having engaging means for engaging said grooves, whereby depressing of one of the buttons will cause the plate to move transversely to the button until the engaging means is seated in the groove, and means transferring the motion of the second plate to the first plate.

7. A device according to claim 6 including means interconnecting the buttons so that the depressing of one button disengages any other depressed button from the groove.

8. A device according to claim 7 wherein said interconnecting means is operative to actuate said means for moving the pin out of engagement with the pin plate during the actuation of the selecting means.

9. A means for locating a starting point on a rotary switch comprising, a member adapted to be rotated with the timer, a first supported plate for lateral motion with respect to the member, means on the first plate establishing starting points for the timer, means on the member for engaging the establishing means on the first plate, means for selectively moving the first plate to position one of the starting point establishing means in the path of the engaging means on the member, and means for rotating the member relative to said first plate until the engaging means engages the one selected establishing means.

10. A means for locating a starting point according to claim 9 wherein said selecting means includes a button actuated selector plate and means for operatively connecting the selector plate to the starting point establishing plate, said connecting means increasing the motion of the starting point plate with respect to the motion of the selector plate.

11. A means for locating a starting point according to claim 10 wherein said engaging means on the member comprises a pin biased to operatively engage the first plate and including means for depressing said pin prior to moving the first plate.

12. The combination with a timer of the type having a motor rotating switching means to effect sequential operation of apparatus controlled thereby, of means for locating a starting point on the timer comprising, a disc rotatable with the timer, a plate mounted parallel to the disc and linearly movable relative thereto, a pin secured to the disc and positioned to engage the plate, starting point stop means on the plate for engaging the pin, and means for selectively positioning the plate with respect to the disc so that one of the starting point stop means is positioned in the path of the pin when the disc is rotated.

13. The combination with a timer of the type having a motor rotating switching means to effect sequential operation of apparatus controlled thereby, of means for locat-

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ing a starting point on the timer comprising, a disc rotatable with the timer, a plate having a plurality of holes positioned in relative angular spaced relationship on said plate, a pin mounted on said disc and biased to engage said plate, means for moving said plate to align one of said holes in the path of the pin, means for rotating said disc, said pin engaging the preselected hole, preventing further rotation of the disc, and means for depressing said pin during the time that the plate is being moved to the starting point.

14. The combination with a timer of the type having a motor rotating switching means to effect sequential operation of apparatus controlled thereby, of means for locating a starting point on the timer comprising, a disc rotatable with the timer, said disc being provided with a pin radially spaced from the axis of the disc, a plurality of tabs located on the periphery of the disc, a plate mounted adjacent the disc for lateral motion with respect thereto, said pin being positioned to engage the surface of the plate, a number of starting point establishing means on the surface of the plate, means for selecting a program of operations on the timer and aligning the plate with one of the establishing means in the path of the pin, means for rotating said disc so that said pin engages said one establishing means, means for disengaging the pin from the selected starting point establishing means, and means on the timer for engaging one of the tabs after the selected program of operation has been completed, so that further rotation of the disc will return the pin to the engaging position.

15. The combination according to claim 14 wherein said means for disengaging said pin from the plate is actuated by said selecting means during the selecting operation.

16. The combination according to claim 15 wherein the selecting means includes a plurality of buttons operatively connected to the plate and to each other so that depressing one button will disengage any other depressed button.

17. A means for locating a starting point on a timer comprising, a plate adapted to be moved transversely to the timer, said plate being provided with a plurality of holes positioned in relative angular and radial spaced relationship on said plate, means mounted on the timer for movement through a predetermined path for engaging one of the holes in the plate, a plurality of buttons operatively connected to the plate so that movement of a button will position the plate so that one of the holes is in the path of the engaging means, latching means releasably engaging the buttons so that the pressing of one button will release all other depressed buttons, and means for rotating the engaging means into engagement with the selected hole to prevent further rotation of the engaging means.

18. A push button selector for a rotary switching device comprising, a bracket, a number of spaced selector buttons mounted on the bracket for movement between inoperative and operative positions, a first plate movable on said bracket and having a camming surface corresponding to each selector button, said camming surfaces being spaced so that the plate assumes a different position each time a different button is moved to an operative position, a second plate movably mounted on the bracket and having locating means for each position of the first plate, means mounted on the rotary switching device for seeking a selected one of said locating means on the second plate, and means for transferring the motion of the first plate to the second plate to position the selected locating means in the path of the seeking means.

19. A push button selector according to claim 18 wherein the transferring means multiplies the motion of the second plate with respect to the first plate.

20. A push button selector according to claim 18 including, a third plate movable in response to the actuation of a button to lock the selected button in its operative position after the first plate has been moved to the se-

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lected position, the first acting to prevent the third plate from engaging more than one button at a time.

21. A push button selector according to claim 20 including means actuated by the motion of the third plate for rendering the seeking means inoperative while the second plate is being moved by the first plate.

22. A push button selector according to claim 19 wherein said transferring means includes a gear and means for biasing the gear in one direction thereby eliminating any backlash in the transferring means.

23. A push button selector for a rotary switching device comprising, a bracket, a number of spaced selector buttons mounted on the bracket for movement between inoperative and operative positions, a first plate movable on said bracket and having a camming surface corresponding to each selector button, said camming surfaces being spaced so that the plate assumes a different position each time a different button is moved to an operative position, a second plate movably mounted on the bracket and having starting point locating means for the switching device and second locating means corresponding to each selector button, means on the rotary switching device for engaging the locating means, means for transferring the motion of the first plate to the second plate to position a different one of said locating means in the path of the engaging means for each different position of the first plate, and means on each button for engaging the second locating means on the second plate to positively position the second plate with respect to the bracket after the motion of the first plate has been transferred to the second plate.

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24. A push button selector according to claim 23 wherein said second locating means comprises a number of notches on the second plate.

25. A means for locating a starting point on a timer comprising, in combination, a first rotatable member, a second member supported adjacent said first member for movement transversely of the axis of rotation of said first member, pin means on one of said members, and the other of said members including starting point establishing means for engagement with said pin means and positioned in relative angular and radial spaced relationship about an axis on said other member.

26. A means for locating a starting point on a timer comprising, in combination, a first member adapted to be rotated with the timer, a second member supported adjacent said first member for movement transversely of the axis of rotation of said first member, one of said members including pin means and the other of said members including a plurality of starting point establishing means positioned in relative angular and radial spaced relationship about an axis on said other member.

27. The combination of claim 26 wherein said starting point establishing means comprise a plurality of holes.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,074,282

January 22, 1963

Frederick R. Beck et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 5, line 40, for "a first supported plate" read
-- a first plate supported --.

Signed and sealed this 6th day of August 1963.

(SEAL)

Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents

UNITED STATES PATENT OFFICE
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