United States Patent [19]

Gartner

[11] **3,758,734**

[45] **Sept. 11, 1973**

[54] **SEQUENTIAL SWITCH MEANS WITH A LINEARLY MOVABLE AND ROTATABLE ACTUATOR MEANS**

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[22] Filed: **May 24, 1971**

[21] Appl. No.: **146,132**

[52] **U.S. Cl.** ..... **200/5 R,** 200/4, 200/153 T, 267/156

[51] **Int. Cl.** **H01h 9/00**

[58] **Field of Search** ..... 340/365; 200/18, 200/153 T, 5 R, 5 E, 16 R, 16 C, 1 R, 153 K, 166 SD, 153 W, 4; 317/112; 267/156

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[57] **ABSTRACT**

The sequential signal producing means has a housing including a back wall mounting a row of a desired number of individual push button switches, and including a mating, open backed cover with a front longitudinal slot, and with a like number of upper windows; a slider assembly of a knob plate with a rectangular sleeve extending through the slot and secured to an inner plate to be thereby slideably mounted to the housing for movement along the slot; a strip spring coiled at one end, anchored to the housing at the one end, secured to the sleeve of the slider assembly mid-way thereof, and extended along the slot to be collected in a tube adjacent the other end of the slot to bias the slider assembly toward the one end to a ready position, a spring ball in the inner plate for dropping into one of a like number of indentations in the housing to precisely locate the slider assembly in a respective distinct position along the slot; an arm on the inner plate for blocking the window corresponding to the distinct position of the slider assembly; a knob with a shaft extending through the sleeve of the slider assembly to locate an eccentric over the row of switches to depress an aligned push button upon rotation of the knob to an operating position; a shoulder from the inner plate extending into an arcuate slot in the knob to limit rotation thereof; a torsion spring from the shaft to the inner plate to bias the knob to a non-operating position; a spring ball in the knob which drops into an identation in the knob plate to temporarily hold the knob in non-operating position, and a switch on the housing operated by movement of the knob away from a ready position to energize the switches whereby when the knob is located in a respective distinct position and is rotated, a respective switch is operated, upon a patterned movement between distinct positions and upon rotation in these positions, to produce a sequential signal for being sent to a means for discriminately receiving a sequential signal.

3 Claims, 6 Drawing Figures

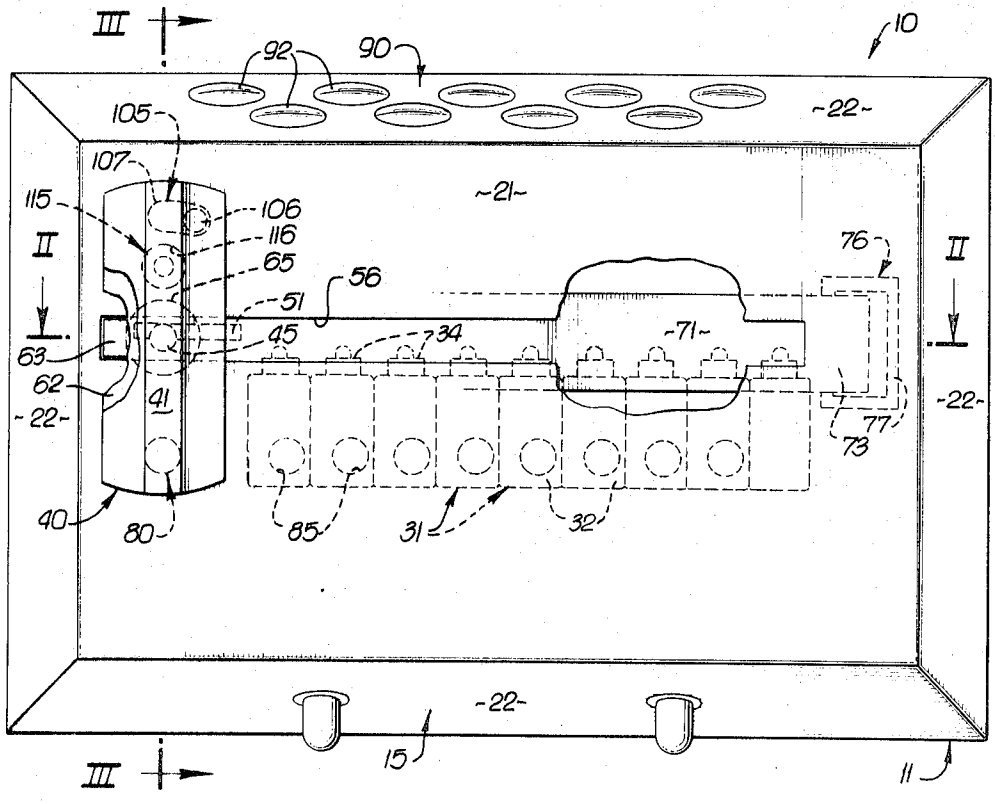


FIG. 1.

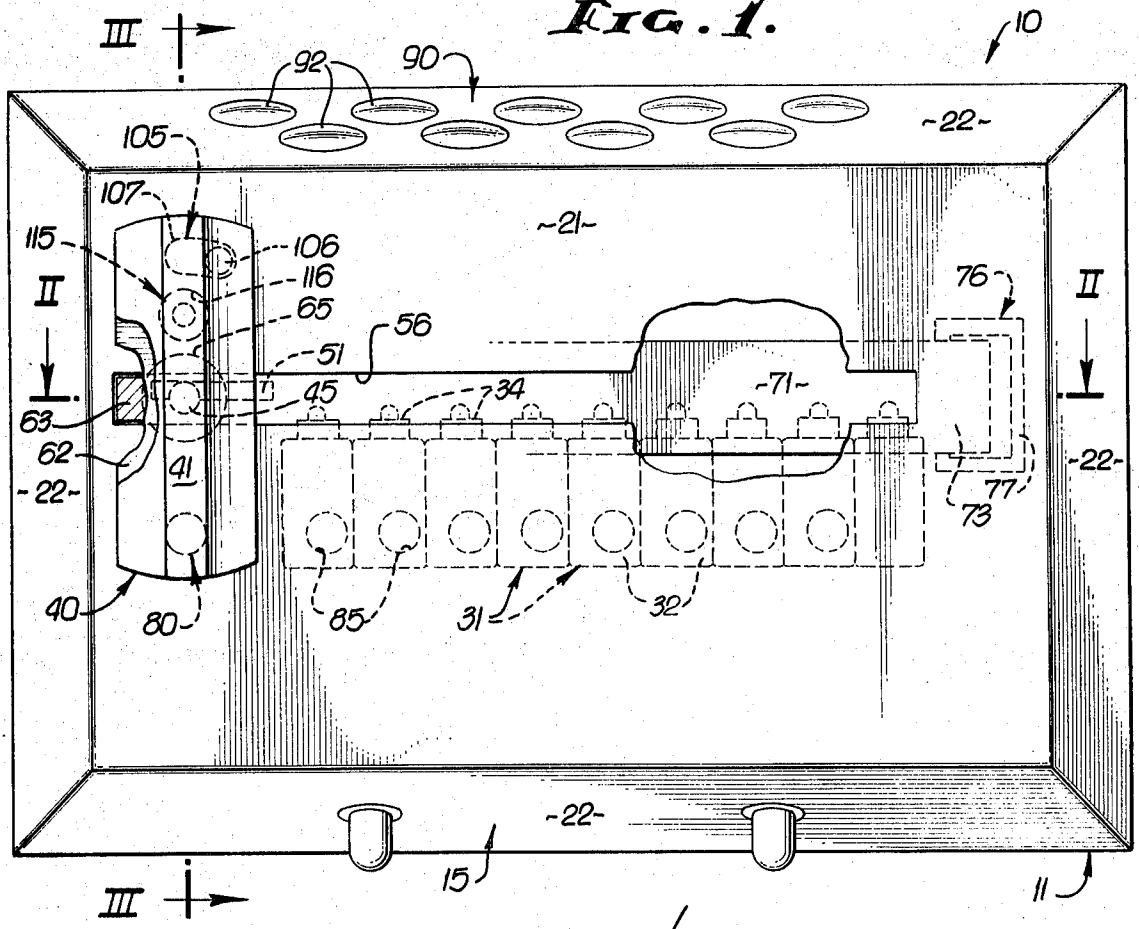
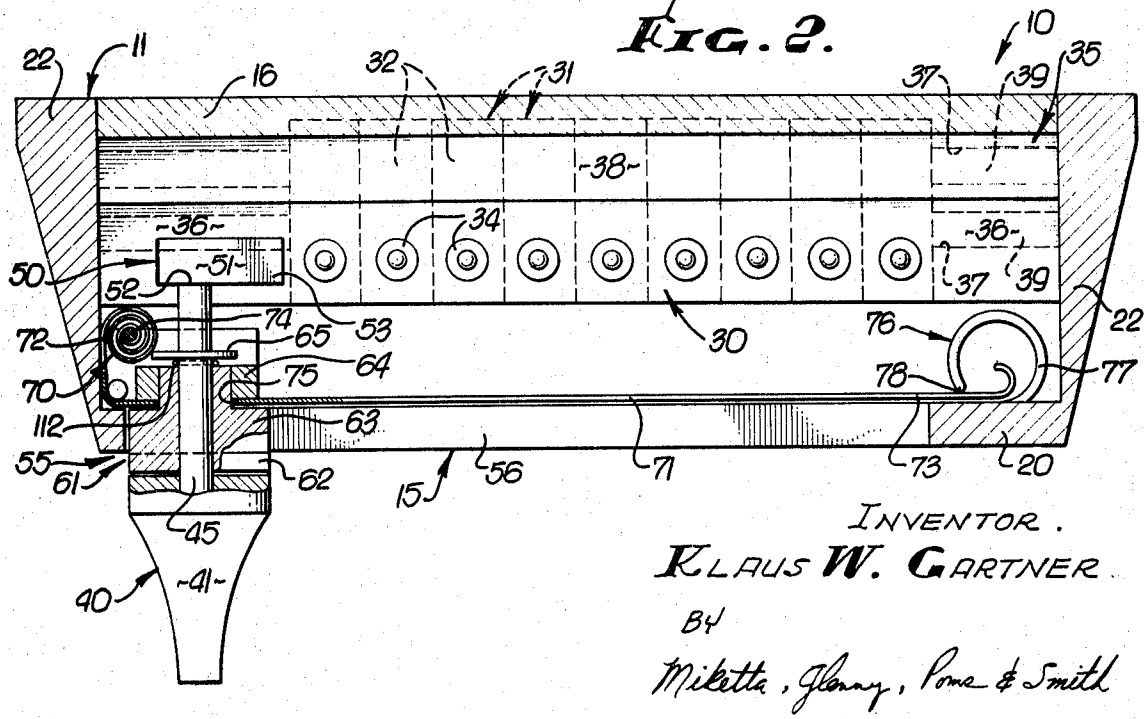


FIG. 2.



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FIG. 3.

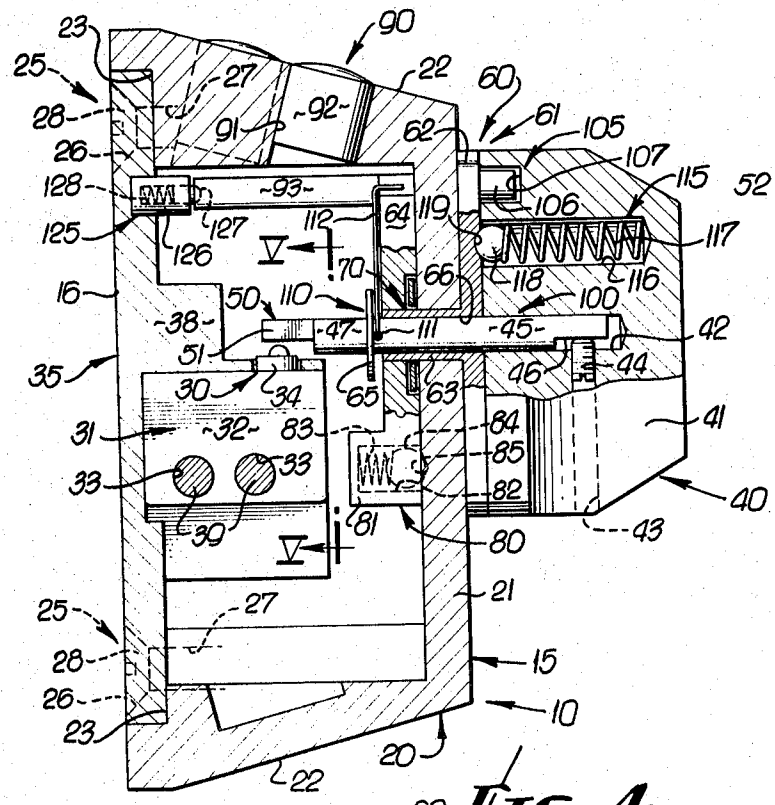


FIG. 5.

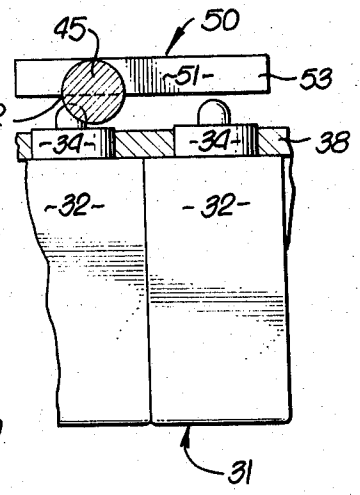


FIG. 4.

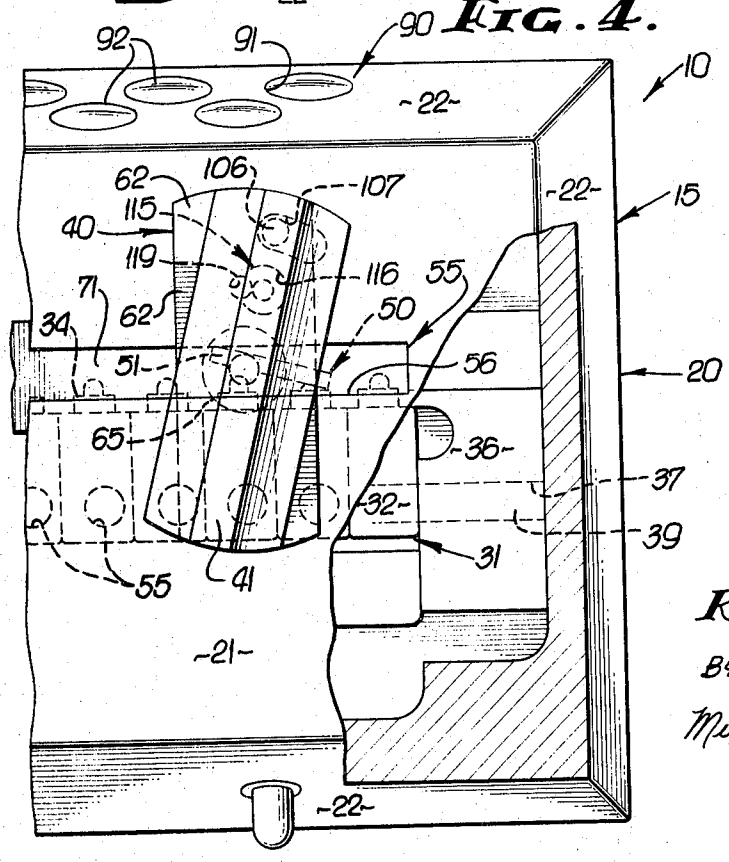
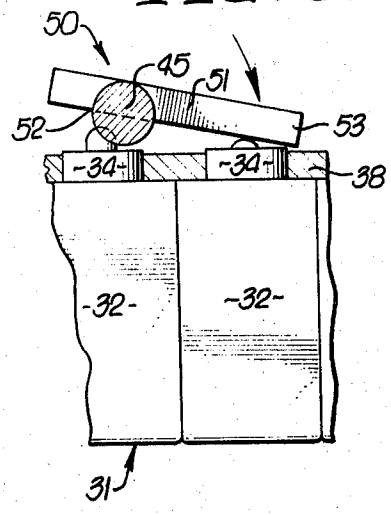


FIG. 6.



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SEQUENTIAL SWITCH MEANS WITH A LINEARLY MOVABLE AND ROTATABLE ACTUATOR MEANS

BACKGROUND OF THE INVENTION

This invention relates to means for producing a sequential signal to open an electrically controlled lock and more particularly to an actuator means therefore which is linearly movable between distinct positions and which is rotatable between operating and non-operating positions in each distinct position.

This invention is related to the invention shown in my co-pending patent application Ser. No. 116,909 filed Feb. 19, 1971 and entitled SEQUENTIAL SIGNAL PRODUCING MEANS.

The means of this invention uses a linear movement as one mode of movement and rotational movement as the other mode of movement to produce the sequential signal. By selecting such modes of movement, the sequential signals producing means provides not only all the advantages of the previous invention but in addition some very new and desirable advantages which will become apparent from a reading of the specification hereafter.

BRIEF DESCRIPTION OF THE INVENTION

Therefore it is the primary object of this invention to provide a sequential signal producing means with linearly movable and rotatable actuator means.

Other and additional objects of this invention are to provide such an actuate means for a sequential signal producing means which is easiy movable between distinct positions, which is automatically energized upon movement from a ready position, which is movable along a slot which is closed to permit foreign objects from entering the means, which permits the use of rows of switches, which simply indicates the distinct positions and the rotative positions, which is biased to the normal positions, which indicates its positions relative a housing and which is economical to manufacturer, inexpensive to assemble, and easy to use to provide a long and useful life of security.

Generally, the improvement in a means for producing a sequential signal to be sent to a means for discriminately receiving a sequential signal includes means for movably mounting an actuator means in a housing in association with a sensing means for linear movement along the housing and for rotation relative the housing, the actuator means moving linearly between distinct positions and rotating between an operating position and a non-operating position to operate the sensing means in a preselected pattern to produce the sequential signal. The sensing means may be switches mounted in the housing in a row. The actuator means may include a knob with shaft having an eccentric. The mounting means may include a knob plate, a sleeve and an inner plate to slideably and rotatably mount the actuator means. Linear biasing means, such as a strip spring, and rotational biasing means, such as a torsion spring, may be provided. Detent means such as spring biased balls and indentations may be provided for temporarily maintaining a position of the actuator means. Indicating means may be provided for indicating the position of the actuator means and energizing means may be provided for energizing the sensing means automatically upon movement of the actuator means from a ready position.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a partially broken away, front elevational view of the sequential signal producing means with a linearly movable and rotatable actuator means, according to this invention, which is shown in a ready position.

FIG. 2 is a cross-sectional view taken along the plane II—II of FIG. 1.

FIG. 3 is a cross-sectional view taken along the plane III—III of FIG. 1.

FIG. 4 is a partially broken away fragmentary, front elevational view similar to FIG. 1 but showing the actuator means in a distinct position and rotated to an operating position.

FIG. 5 is a fragmentary cross-sectional view taken along the plane V—V of FIG. 3 showing the eccentric of the actuator means in the non-operating position over the switch means.

FIG. 6 is a view similar to FIG. 5, but showing the eccentric rotated to an operating position to depress a respective push button of the switch means.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawing and particularly to FIG. 1, the sequential signal producing means according to this invention is generally denoted by the number **10**. The preselected sequential signal produced by the means **10** is to be sent to a means for discriminately receiving a sequential signal (not shown) to perform a desired function such as unlock a door, energize a machine, etc.

Generally the means **10**, according to this invention, includes a hollow housing **15** with a back wall **16**, a mating cover **20** and attaching means **25** securing the two together; a sensing means **30** for generating the signal, an actuator means **40** for linear movement from a ready positions to and between distinct positions and for rotation between non-operating and operating positions to operate the sensing means; mounting means **55** including linear mounting means **60** for mounting the actuator means **40** for linear movement, with linear biasing means **70**, linear detent means **80** and linear indicating means **90** associated therewith and including rotational mounting means **100** for mounting the actuator means **40** for rotational movement, with rotational limit means **105**, rotational biasing means **110**, and rotational detent means **115** associated therewith; and energizing means **125** for selectively energizing the sensing means **30**.

Referring now to FIG. 3, the hollow housing **15** has a back wall **16** of generally rectangular shape with a flat back side for mounting flush with a wall (not shown) of a building, machine, etc. The open-backed cover **20** has a front wall **21** and integral therewith, four sloping sidewalls **22** which together form a rearwardly opening cavity closed by the back wall **16**. The back wall **16** seats on shoulders **23** formed in the sidewalls **22** adjacent the rear edges thereof. The attaching means **25** for attaching the back wall **16** to be cover **20** includes counter sunk holes **26** in the back wall **16** and tapped holes **27** in the sloping sidewalls **22** into which flat head screws **28** extend.

The sensing means **30** for sensing a respective distinct position of the actuator means **40** when the actuator means is in a respective distinct position and is rotated to the operating position includes a source of en-

ergy and a receiver of energy, both of which are included a switch 31 in each of the distinct positions. The switch 31 includes a generally box shaped housing 32 with a pair of holes 33 therethrough and a push button 34 on the upper end thereof. The housings 32, each have wires running thereto and therefrom to carry an electrical signal but these wires have been omitted from the drawings for sake of clarity.

The mounting means 35 for mounting the housing 32 on the back wall 16 includes the provision of a spaced pair of end walls 36 integral with the back wall 16 and having spaced holes 37 therein. An apertured top wall 38 is integrally formed in the back wall 16 and extends between the end walls 36 to form a housing receiving cavity in which the housing 32 are mounted by cross bolts 39 extending through the holes 37 and 33. When the housings 32 are mounted in the cavity as seen in FIGS. 5 and 6, the buttons 34 extend up through the apertures in the top wall 38 ready to be depressed by the actuator means 40.

The actuator means 40 for association with the sensing means 30 is best seen in FIG. 3 and includes a knob 41, a shaft 45 and an eccentric 50. The knob 41 is generally rectangular in cross section with scooped sides to make it easier to grasp. The knob 41 has an inwardly opening central bore 42 which is joined at its inner end to a tapped hole 43 with a set screw 44 therein. The shaft 45 is of a diameter to be snugly received in the central bore 42 with the end inserted therein being flatted at 46 to lockingly receive the set screw 44 while the inner end 47 protrudes from the knob 41. An eccentric 50 is mounted on the inner end 47 of the shaft and as seen in FIGS. 5 and 6 includes a blade 51 with the shaft 45 attached thereto at 52 to provide an actuating end 53 for depressing a respective push button 34 of a switch 31. As seen by compring FIGS. 5 and 6, upon rotation of the knob 41 and shaft 45 thereby from the non-operating position to the operating position while in a respective distinct position, the end 53 depresses a respective push button 34. The knob 41 the shaft 46 and the eccentric 50 are mounted in the housing 15 for movement by mounting means 55.

The mounting means 55 for mounting the actuator means 40 to the housing 15 in association with the sensing means 30 includes the provision of a longitudinal slot 56 formed in the front wall 21. Further, the mounting means 55 can be divided into a portion which provides a linear mode of movement i.e., a linear movement mounting means 60 for mounting the actuator means 40 to the housing 15 for linear movement between the distinct positions and into a portion which provides a rotational mode of movement i.e., a rotational movement mounting means 100 for mounting the actuator means 40 to the housing 15 for rotational movement between the non-operating and operating positions relative the sensing means 30. Both portions necessarily include means which relate to the type of movement provided and these means will be described in conjunction with the description of the mounting means providing the particular type movement to which they relate.

In the preferred embodiment, the linear movement mounting means 60 includes a slider assembly 61 which is slideably mounted on the front wall 21 for movement along the slot 56. The slider assembly 61 has an outer or knob plate 62 of a shape to blend with the knob 41. The plate 62 has a rectangular sleeve 63 extending rearwardly therefrom. The rectangular sleeve 63 is of the proper dimension to be slideably inserted through the slot 56. When the knob plate 62 is adjacent the outside of the front wall 21, the sleeve 63 extends through the slot 56 and through an inner plate 64 on the inside of the front wall 21. The shaft 45 has a disk shaped shoulder 65 which maintains the inner plate 64 on the sleeve 63 while the shaft 45 extends through a central bore 66 in the sleeve 63 to be secured to the knob 41 by the set screw 44. Thus, the actuator means 40 is slidably mounted for linear movement along the slot 56 between the distinct positions.

The actuator means 40, in the preferred embodiment, is biased to the left end of the slot 56 to a ready position by a longitudinal biasing means 70. As best seen in FIG. 2, the longitudinal biasing means 70 of the preferred embodiment includes a strip spring 71 with an initially coiled left end 72 and an initially straight right end 73. The left end 72 is anchored by a pin 74 extending from the cover 20 and extends along the slot 56. The spring 71 has a hole 75 therein through which the sleeve 63 of the slider assembly 61 extends to be mounted thereto. The right end 73 of the spring 71 is located at the right end of the slot 56 for being received in a collector means 76. The illustrative collector means 76 is a cylindrical tube 77 mounted to the cover 20 and having a vertical slot 78 into which the right end 73 extends.

The coiled left end 72 of the spring 71 biases the slider assembly 61 and the actuator means 40 carried thereby to a ready position, as shown in FIG. 2. The knob 41 of the actuator means 40 is manually grasp and slid to the right to a distinct position, such as is shown in FIG. 4, whereupon the coiled left end 72 of the spring 71 unwinds while the right end 73 extends into the tube 77 to be loosely coiled therein. Upon release of the knob 41, the coiled left end 72 returns to its coiled state to return the slider assembly 61 to the ready position and pulling the right portion of the spring 71 from the tube 77. It should be noted that at all times, the strip spring 71 keeps the slot 56 closed to keep foreign material out of the housing 15.

A longitudinal detent means 80 is provided for precisely locating the actuator means 40 in each of the distinct positions. In the preferred embodiment, the longitudinal detent means 80 includes the provision of an enlargement 81 on the lower end of the inner plate 64. The enlargement 81 has an outwardly opening bore 82 into which is received a spring 83 and a ball 84. An indentation 85 is provided on the inside surface of the front wall 21 adjacent the location of the ball 84 when the eccentric 50 of the actuator means 40 is aligned with a corresponding switch 31 of the sensing means 30. As the actuator means 40 is moved longitudinally along the slot 56, the ball 84 will be biased by the spring 83 to drop into each indentation 85 and precisely locate the actuator means at the exact position of each of the distinct positions.

An indicating means 90 is provided for indicating in which of the distinct positions the actuator means 40 is located. In the preferred embodiment, the indicating means 90 includes the provision of a hole 91 in the upper side wall 22 which corresponds to each distinct position of the actuator means 40. As seen in FIG. 1, the holes 91 are staggered in two rows and are filled with clear or translucent plastic to provide windows 92. The housing 15 contains a light (not shown) therein

which emits light rays through the windows 92. An arm 93 is mounted to the inner plate 64 to extend along the inside of upper side wall 22 of the cover 20 and block the window 92 which corresponds to the location of the actuator means 40 and thereby indicate the position of the actuator means 40.

Thus, the actuator means 40 is mounted to the housing 15 by the longitudinal movement mounting means 60 for linear movement between distinct positions whose precise location established by the detent means 80 and which location is indicated by an indicating means 90 while the actuator means 40 is biased to a ready position by the longitudinal biasing means 70. Besides this linear movement, the actuator means 40 also requires rotational movement between non-operating and operating positions to operate the sensing means 30.

The rotational movement mounting means 100 of the mounting means 55 is for mounting the actuator means 40 for rotational movement between non-operating and operating position relative the sensing means 30. In the preferred embodiment, the rotational movement mounting means 100 includes the provision of the shaft 45 which extends through the central bore 66 of the rectangular sleeve 63 to rotate therein.

A rotational limit means 105 is provided for limiting the rotation of the actuator means 40 to movement between the non-operating and operating positions. In the preferred embodiment the limit means 105 includes, as best seen in FIG. 4, the provision of a protruding shoulder 106 on the knob plate 62 which protrudes into an arcuate slot 107 in the knob 41 to limit the rotation of the knob 41.

In order to bias the actuator means 40 to the non-operating position, a rotational biasing means 110 is provided. In the preferred embodiment, the rotational biasing means 110 includes a hole 111 in shaft 45 into which one end of a torsion spring 112 extends while the other end of the spring 112 seats against the arm 93 to exert a counter-clockwise biasing on the shaft 45 and thereby bias the actuator means 40 and the eccentric 50 thereof, to the non-operating position of FIG. 1.

To help the biasing means 110 hold the actuator means 40 in the non-operating position, a rotational detent means 115 is provided which in the preferred embodiment includes an inwardly opening bore 116 in the knob. The bore 116 contains a spring 117 with a ball 118 on the end thereof. An indentation 119 is provided in the knob plate 62, aligned with the ball 118 when the knob 41 is in the non-operating position enabling the ball 118 to be moved by the spring 117 into the indentation 119 and thereby temporarily hold the knob 41 in the non-operating position. Manual rotation of the knob 41 to the operating position against the biasing of spring 113 moves the ball 117 out of the indentation 119 and release of the knob 41 permits the biasing of the spring 113 to return the knob 41 to the non-operating position whereupon the ball 117 drops into the indentation 119.

The means 10 is provided with energizing means 125 for energizing the sensing means 30 to make it ready to sense the position of the actuator means 40. The energizing means 125 could be a manually operated switch but in the preferred embodiment, the energizing means 125 includes a normally closed switch 126 which, as seen in FIG. 3, is mounted to the back wall 16. The normally closed switch 126 includes a push button 127 which is biased by spring 128 outwardly into engagement with the arm 93 to be depressed thereby when the actuator means 40 is located in the ready position. As the actuator means 40 is moved from the ready position, the arm 93 is moved away from the push button 127, permitting the spring 128 to move the button 127 to the normal position to close the switch 126 and energizes the switches 31 of the sensing means 30 and the light of the indicating means 90. When the actuator means 40 is returned to the ready position, the arm 93 depresses the button 127 to deenergize the switches 31 and the light of the indicating means 90.

When the means 10 is assembled, mounted and operably connected to a means (not shown) for discriminately receiving a sequential signal, the operation of the means 10 is very simple. The knob 41 is grasp and moved longitudinally against the biasing of the strip spring 71 from the ready position, as shown in FIGS. 1 and 2, which automatically closes switch 126 to energize the switches 31. The knob 41 is moved to a preselected distinct position, such as shown in FIG. 4, wherein the ball 84 drops into the indentation 85 to precisely locate the knob 41 in that distinct position. The knob 41 is then rotated from the non-operating position, as is shown in 1, 2, 3 and 5 against the biasing of the torsion spring 112, to the operating position, as shown in FIGS. 4 and 6. The rotation of the knob 41 pivots the eccentric 50 from the position of FIG. 5 to the position of FIG. 6 to operate the corresponding respective switch 31 and generate a signal. The knob 41 is then, returned by the spring 112 to the non-operating position wherein the ball 118 drops into indentation 119 to help hold the knob 41 while the knob 41 is moved to another preselected position for rotation to the operating position. The repetition of these steps produces the preselected sequential signal for being sent to the receiving means. After the sequential signal is produced, the knob 41 is returned by the strip spring 71 to the ready position which opens the switch 126 to deenergize the switches 31 until the knob 41 is again moved.

Thus, the means 10 according to this invention provides actuator means which is linearly movable and rotatable to generate a sequential signal for being sent to a means for discriminately receiving this signal.

I claim:

1. In a sequence switch mechanism including a manually movable actuator means for movement between distinct positions associated with a housing having sensing means mounted thereto, the improvement comprising:

first means for mounting the actuator means to the housing for movement linearly along the housing in a non-operating relation to the sensing means, said first means including a longitudinal slot in the housing and means mounting said actuator means for longitudinal movement in said slot including a pair of inner and outer sleeves located on the inner and outer surface of the housing slot; and

second means associated with said first means for mounting said actuator for relative rotation between a non-operating position not operating the sensing means and an operating position operating the sensing means, said second means including means for mounting said actuator means for rotational movement in said slot including the provision of a central bore in the sleeve through which

said actuator means extends to be rotatably mounted in said slot, said actuator means being thereby movable linearly to a preselected distinct position while in the non-operating position and then being rotatable from the non-operating position to the operating position for operating the preselected sensing means.

2. In a sequence switch mechanism including a manually movable actuator means for movement between distinct positions associated with a housing having sensing means mounted thereto, the improvement comprising;

first means for mounting the actuator means to the housing for movement linearly along the housing in non-operating relation to the sensing means associated with said housing, said first means including a longitudinal slot in the housing through which the actuator means extends for longitudinal movement and for relative rotation; and

second means associated with said first means for mounting said actuator means for relative rotation between a non-operating position not operating the sensing means and an operating position operating the sensing means; and

said actuator means including a knob, a shaft mounted to the knob and extending through said slot to the sensing means, and wherein said first mounting means includes a knob plate between said knob and said housing, said knob plate having a sleeve extending through a slot with said shaft passing through said sleeve, and an inner plate on the inner side of the sleeve inside the housing, said plates sliding on the housing to mount the knob and shaft for both linear movement and rotational movement in said slot, said actuator means being thereby movable linearly to a preselected distinct position while in the non-operating position and then being rotated from the non-operating position to the operating position for operating the preselected sensing means.

3. In a sequence switch mechanism including a manually movable actuator means for movement between distinct positions associated with a housing having sensing means mounted thereto, the improvement comprising:

first means for mounting the actuator means to the housing for movement linearly along the housing in non-operating relation to the sensing means, said first means including a longitudinal slot in the housing through which said actuator means extends for longitudinal and rotational movement;

second means associated with said first means for mounting said actuator means for relative rotation between a non-operating position not operating the sensing means and an operating position operating the sensing means;

longitudinal biasing means for biasing said actuator means towards one end of said slot including a strip spring attached to the housing in a coil adjacent one end thereof and extending to the other end of the housing, said actuator means being mounted to the spring such that movement of said actuator means along the slot away from one end unwinds the spring and upon release of said actuator means the spring rewinds to return said actuator means to the one end of said slot, and strip spring collector means provided in said housing adjacent the opposite end of the slot for collecting the end of the spring adjacent thereto as said actuator means is moved along said slot toward the opposite end thereof, whereby said actuator means may be moved against the spring biased linearly to a preselected distinct position while in the non-operating position and then may be rotated to the operating position for operating a preselected sensing means.

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