Nov. 8, 1966 J. O. ROESER 3,283,596

SNAP ACTION SWITCH MECHANISM

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Fig. 1.

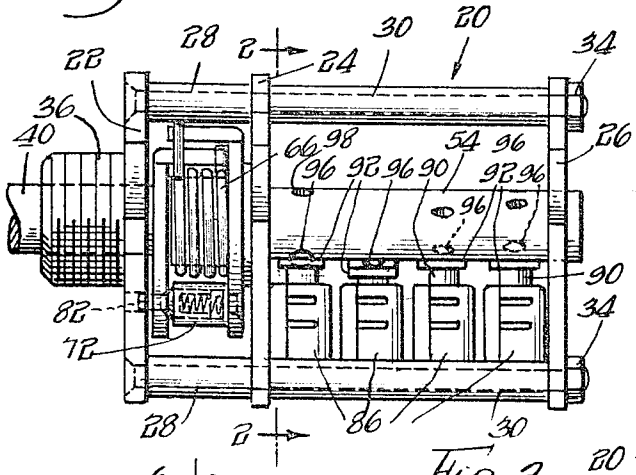


Fig. 2.

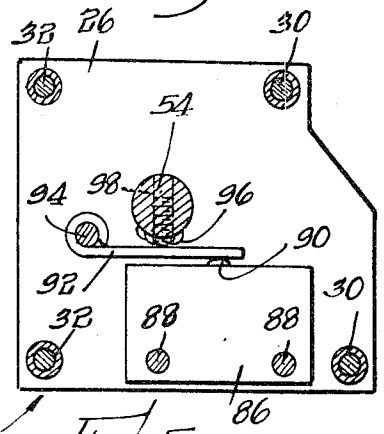


Fig. 3.

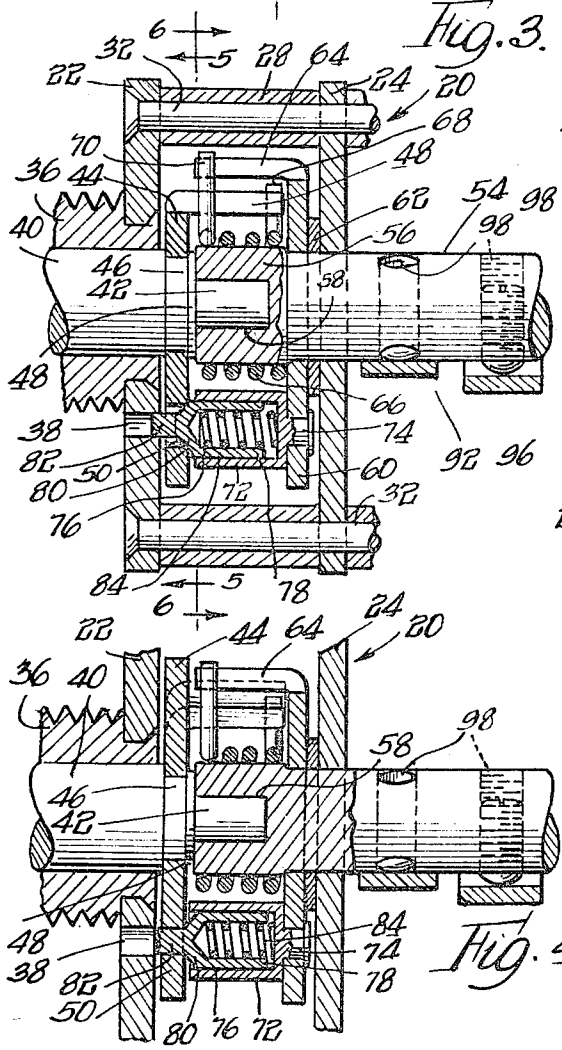


Fig. 5.

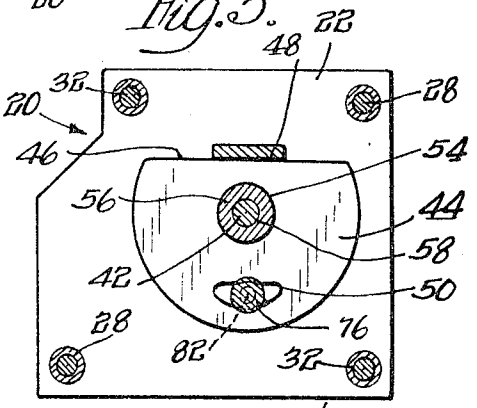


Fig. 6.

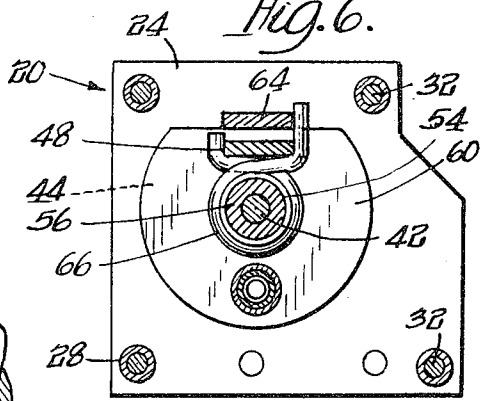


Fig. 4.

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Fig. 9.

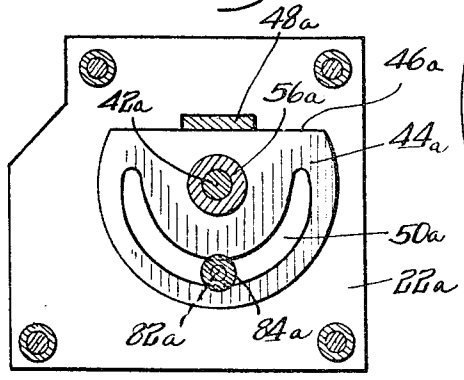


Fig. 11.

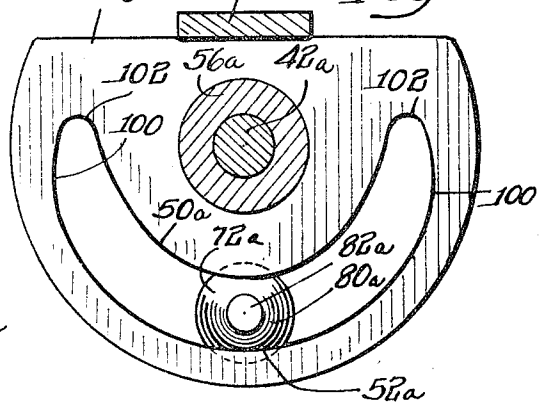


Fig. 10.

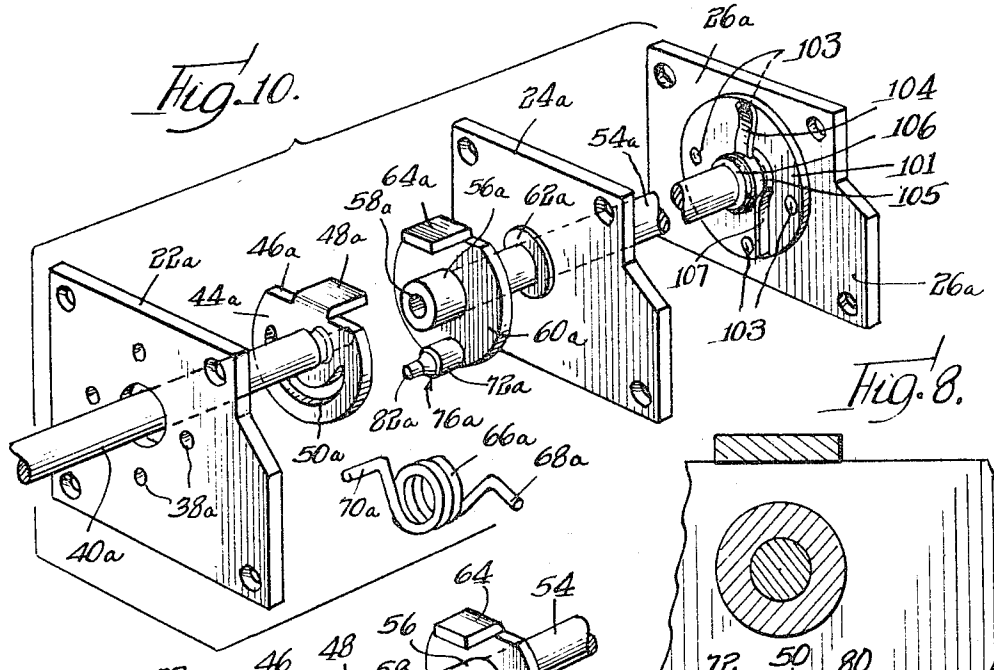


Fig. 8.

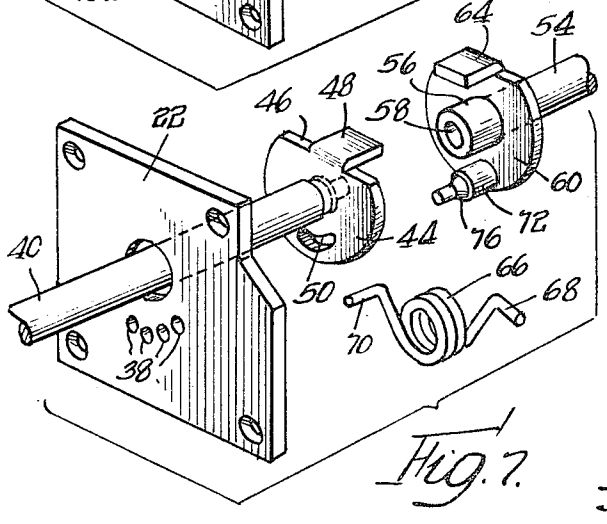


Fig. 7.

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SNAP ACTION SWITCH MECHANISM

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Fig. 14.

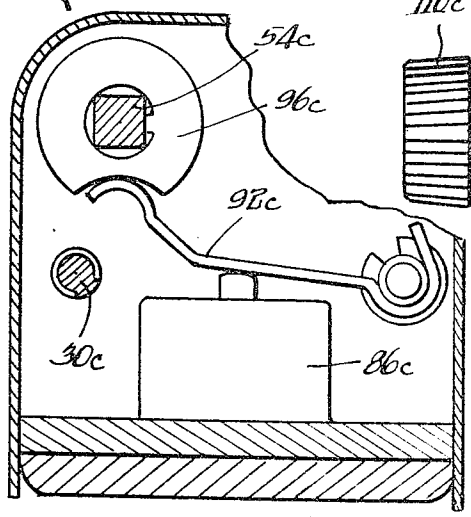


Fig. 13.

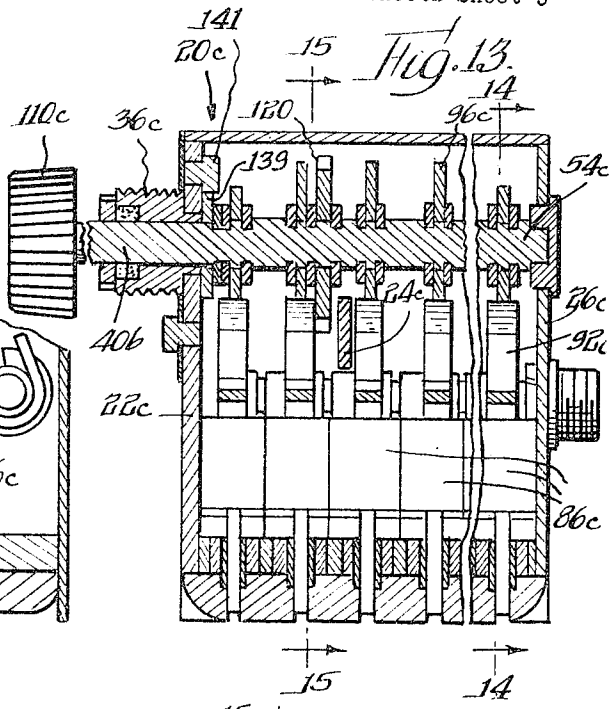


Fig. 15.

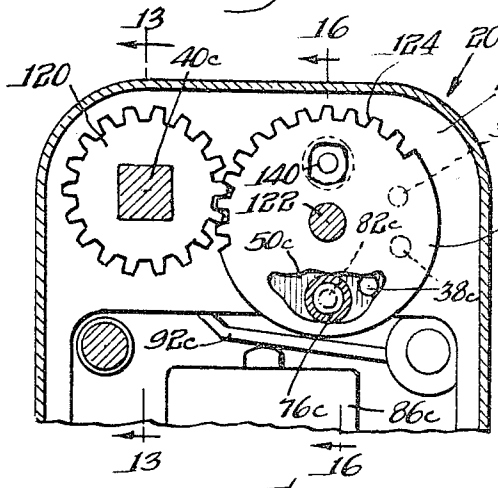


Fig. 16.

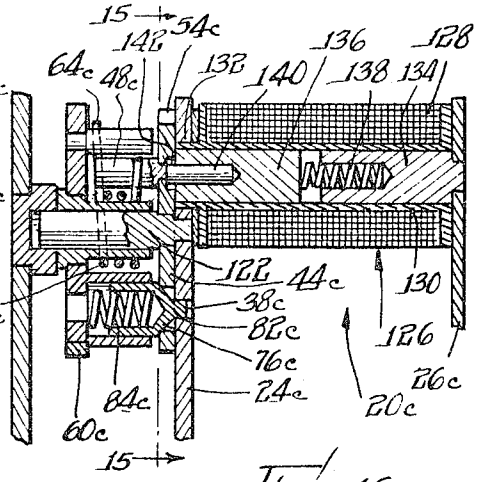
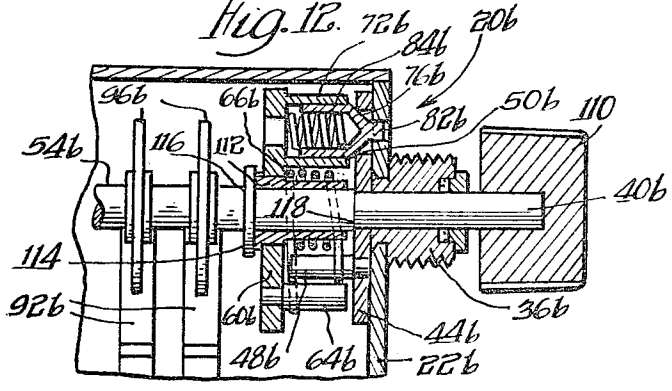


Fig. 12.



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Fig. 17.

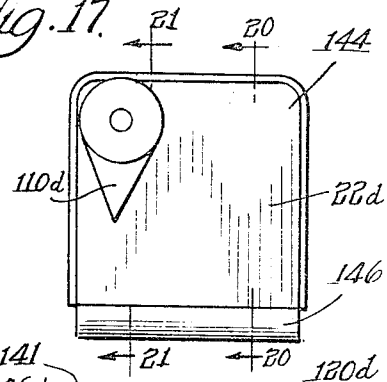


Fig. 18.

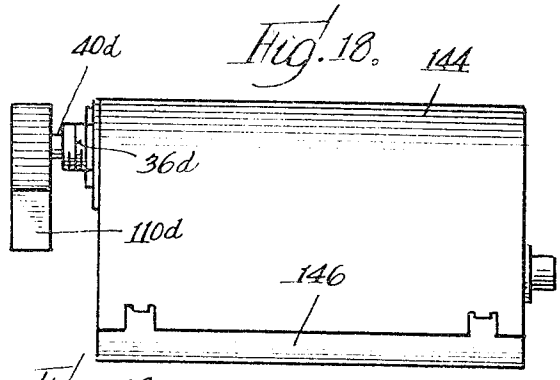
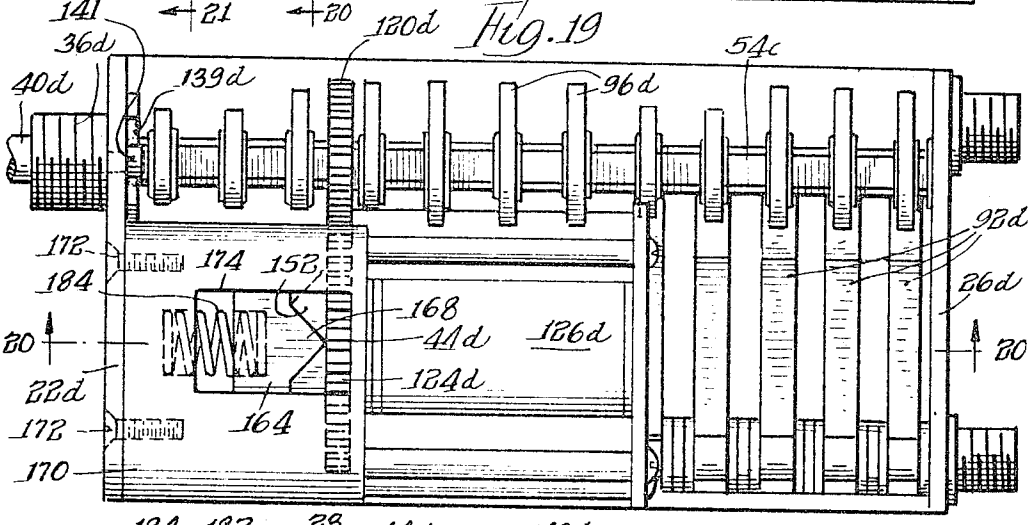


Fig. 19



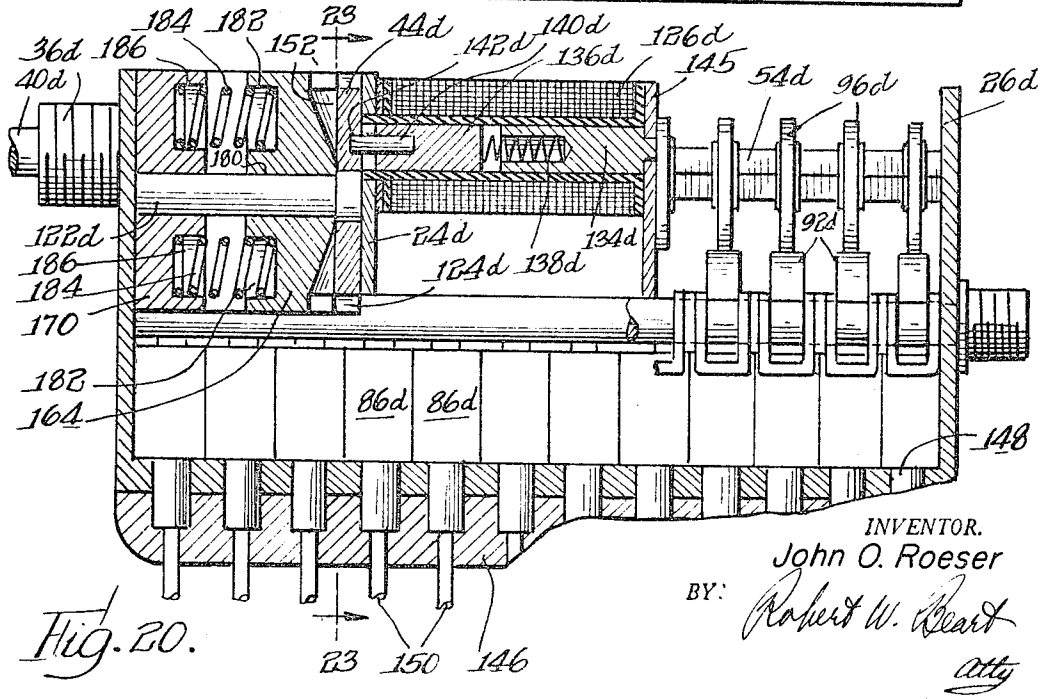


Fig. 20.

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Fig. 21

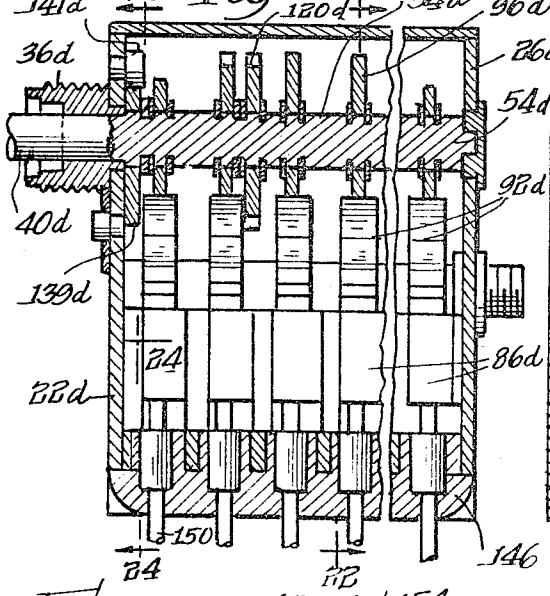


Fig. 22

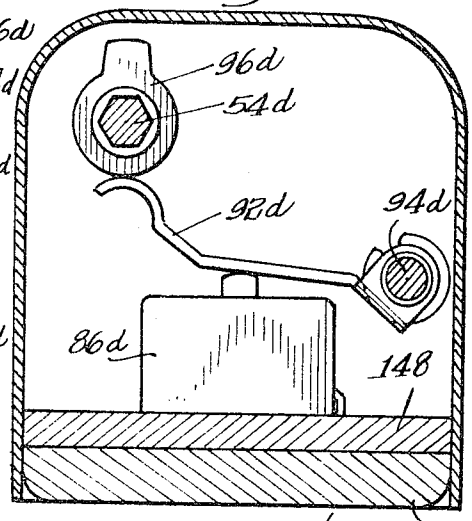


Fig. 23

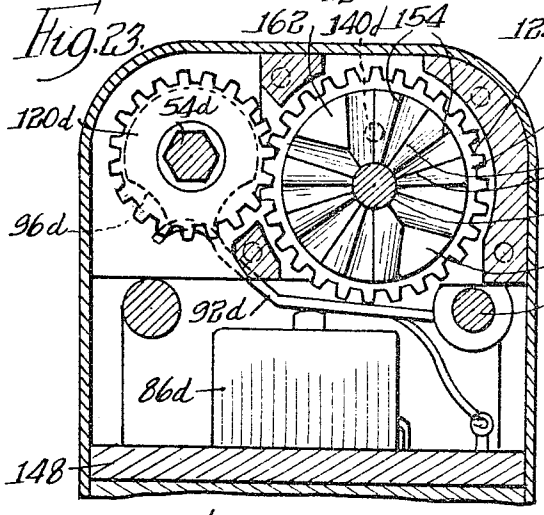


Fig. 25.

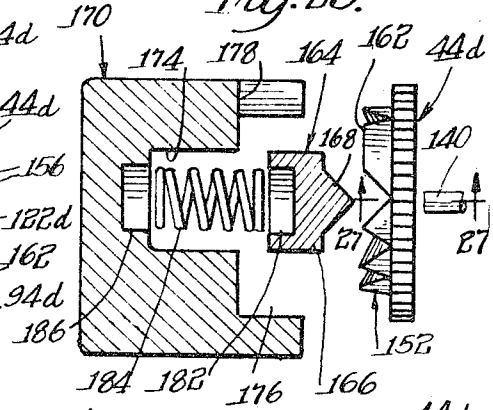


Fig. 24.

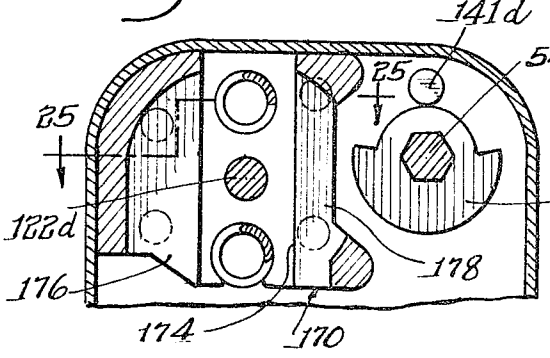


Fig. 26.

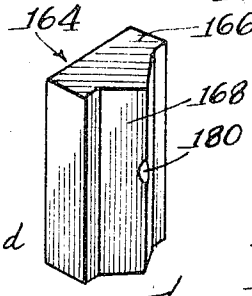
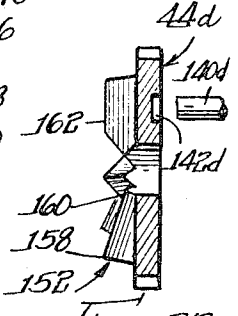


Fig. 27.



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United States Patent Office

3,283,596
Patented Nov. 8, 1966

3,283,596

SNAP ACTION SWITCH MECHANISM

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Filed Aug. 21, 1964, Ser. No. 391,088
6 Claims. (Cl. 74—54)

This invention is concerned with the art of electric switches, and more particularly with a detent locking mechanism and cooperating spring drive for insuring a snap movement from one position to another.

It is well known that it is undesirable to have switches open and close their contacts slowly, as this causes arcing with resultant burning of the contacts and sometimes damage to related devices. Various types of snap switch mechanisms have been developed to insure rapid opening and closing of the switch contacts. This invention relates to a switch of the snap switch type, and more particularly to improved operating parts therefor.

It is an object of this invention to provide a superior snap switch mechanism.

It is another object of this invention to provide a snap switch mechanism which is compact and yet rugged.

A further object of this invention is to provide a snap switch mechanism operable over a great number of switch positions.

It is a further object of this invention to provide a rotary snap switch mechanism.

A still further object of this invention is to provide a snap switch mechanism converting rotary motion to reciprocating motion for operating switches of the low travel or push button type.

Other and further objects and advantages of the present invention will be apparent from the following description when taken in connection with the accompanying drawings, wherein:

FIG. 1 is an elevational view of a preferred embodiment of the invention;

FIG. 2 is a cross sectional view thereof as taken substantially along the line **2**—**2** in FIG. 1;

FIG. 3 is a longitudinal sectional view on an enlarged scale through the operating mechanism, and corresponding to part of FIG. 1;

FIG. 4 is a view similar to FIG. 3 showing the parts in a different position of operation;

FIG. 5 is a cross sectional view taken along the line **5**—**5** in FIG. 3;

FIG. 6 is a cross sectional view along the line **6**—**6** in FIG. 3;

FIG. 7 is an exploded perspective view of the detent operating mechanism of the snap switch;

FIG. 8 is a fragmentary detail view showing the cam of the driver or driving plate;

FIG. 9 is a view similar to FIG. 5 showing a modification of the invention;

FIG. 10 is an exploded perspective view corresponding to FIG. 7 and showing the modification of FIG. 9;

FIG. 11 is a plan view of the driver or driving plate of the modification;

FIG. 12 is a fragmentary longitudinal view through a modified form of the invention;

FIG. 13 is a longitudinal sectional view through another modification of the invention as taken substantially along the line **13**—**13** in FIG. 15;

FIG. 14 is a cross sectional view taken along the line **14**—**14** in FIG. 13;

FIG. 15 is a fragmentary cross sectional view taken substantially along the line **15**—**15** in FIG. 13;

FIG. 16 is a fragmentary longitudinal sectional view taken substantially along the line **16**—**16** in FIG. 15;

FIG. 17 is a front view of an encased modified switch unit;

FIG. 18 is a side view thereof;

FIG. 19 is a top view with the case or housing removed;

FIG. 20 is a vertical sectional view taken substantially along the line **20**—**20** in FIG. 19;

FIG. 21 is a vertical longitudinal sectional view along the line **21**—**21** in FIG. 17;

FIG. 22 is a vertical cross sectional view along the line **22**—**22** in FIG. 21;

FIG. 23 is a vertical cross sectional view along the line **23**—**23** in FIG. 20;

FIG. 24 is a vertical cross sectional view looking toward the front of the switch unit substantially along the line **24**—**24** in FIG. 21;

FIG. 25 is an exploded horizontal sectional view along the line **25**—**25** in FIG. 24;

FIG. 26 is a perspective view of the locking element of FIGS. 19–25; and

FIG. 27 is an axial sectional view of the gear-locking member taken along the line **27**—**27** in FIG. 25.

Referring now in greater particularity to the drawings, and first to FIGS. 1–8, there will be seen a rotary snap switch identified generally by the numeral **20**. The switch comprises a front or detent plate **22**, an intermediate plate or bulkhead **24**, and a back plate **26**. The detent plate **22** is spaced forwardly of the bulkhead **24** by four relatively short spacers **28**, and the back plate **26** is spaced a greater distance behind the bulkhead by four relatively long spacers **30** aligned with the spacers **28**. Through bolts **32** extend through the detent plate, the spacers **28**, the bulkhead **24**, the spacers **30**, and the back plate **26**, the heads of the bolts being recessed or countersunk in the detent plate **22**. Nuts **34** are threaded on the ends of the bolts.

The detent plate **22** is provided with a threaded bushing **36** which may be secured in place by conventional means such as brazing, or expanding or peening in position. The detent plate further is provided with a plurality of small holes **38** spaced along an arc concentric with the bushing **36**. In the illustrative embodiment now under consideration, there are four such holes spaced at twenty degrees apart. The holes **38** comprise locking holes, as will be brought out hereinafter.

A driving shaft **40** extends rotatably through the bushing **36** and to the rear of the detent plate **22**. The driving shaft **40** may be rotated by any suitable or desirable means, including the usual manually engageable knob (not shown). The driving shaft is provided at its end with a reduced diameter tip **42**. A driving plate or driver **44** is fixed adjacent the end of the driving shaft on a section **46** of intermediate diameter, and preferably is held in place by brazing at **48**.

The driver **44**, as may be seen in FIGS. 5, 7, and 8, comprises a segment of a circular plate somewhat greater than a semicircle. The segment is cut off or defined by a terminating chord **46**, and a driver finger or lug **48** extends rearwardly from the center of this edge in an axial direction. Diametrically opposite to the finger **48** the driving

plate or driver **44** is provided with a cam slot **50**. This slot tapers from a maximum width radially of the driver at the center of the slot, as at **52**, to a minimum dimension at the opposite ends thereof. The ends are formed as circular arcs. The slot extends twenty degrees in either direction from the center thereof, in accordance with the twenty degrees spacing of the locking holes **38**.

The switch further includes a driven shaft **54** journaled in the bulkhead **24** and back plate **26** coaxial with the driving shaft **40**. The forward end of the driven shaft **54** is slightly enlarged at **56** and is provided with a counterbore **58**. The counterbore receives the reduced extending end **42** of the driving shaft **40**. A latch plate **60** is mounted immediately adjacent the enlarged section **56**, and is secured to the driven shaft **54**, preferably by brazing. The latch plate is spaced from the bulkhead by a washer **62**. The latch plate **60** is a circular segment of somewhat greater extent than the driver **44**, and has a forwardly extending driven finger **64** overlying the driving finger **48** on the driver.

A torsion spring **66** encircles the enlargement **56** of the driven shaft **54**, and the opposite ends thereof at **68** and **70** respectively, project past the sides of the driving finger **48** and the driven finger **64**, whereby normally to hold these two fingers resiliently in radial alignment. As will be appreciated, when the driving shaft **40** is turned, it causes the driver **44** to turn, and this acts through the torsion spring **66** to tend to drive the latch plate **60**, and hence the driven shaft **54**.

A cup **72** is mounted on the latch plate **60** diametrically opposite to the driven finger **64** by means of an integral stem **74** projecting through an aperture in the latch plate, and peened over. A plunger **76** is received in the cup **72**, and comprises a hollow body **78** having a tapered or frusto-conical nose **80** with a cylindrical tip **82** extending therefrom, and of proper size to be received in any of the locking holes **38**. A coil spring **84** is housed within the hollow body **78**, and biases the plunger outwardly of the cup **72**. Thus, the tip **82** is received in one of the locking holes **38**, while the frusto-conical or tapered nose **80** is urged into the cam slot **50** of the driver **44**.

Since the tip **82** is in one of the holes **38**, then the latch plate and driven shaft cannot rotate immediately upon rotation of the driving shaft **40**. However, when the driving shaft has been rotated a certain degree, the narrowing or tapering radial dimension of the cam slot **50** cams against the frusto-conical nose **80** of the plunger to force the plunger back against its biasing spring **84**, thereby retracting the tip **82** from the locking hole **38** in which it has been located. As will be understood, the rotation of several degrees of the driver relative to the latch plate has caused further tension to be placed on the torsion spring **66**. Hence, as soon as the tip **38** has been withdrawn from the associated locking hole, the torsion spring **66** snaps the locking plate back into rotational alignment with the driver, and the driven shaft **54** is rotated. The initial offset of the driver relative to the latch plate, and the subsequent rotation of the driven shaft **54** amount to twenty degrees, the spacing between locking holes **38**, and the extent of the cam slot **50** on either side of the center thereof.

As may be seen in FIGS. 1 and 2, there is a plurality of identical switches **86** spaced along a pair of supports **88** extending between the bulkhead **24** and the back plate **26**. These switches are of the type having push buttons **90** for operation of the switches. A like plurality of levers **92** is pivoted on a pin or shaft **94** substantially on a level with the driven shaft **54**. The levers extend out across the switches **86** and lie on top of the push buttons **90**. A plurality of set screws **96** is threaded through suitable tapped apertures **98** in the driven shaft **54**. The set screws are aligned with the levers **92**, from the front to the back of the switch, and each set screw is offset twenty degrees relative to the adjacent set screw. As is shown particularly in FIG. 1, the second set screw from the front is engaging the corresponding lever **92** to close the associated switch **86**. The front set screw **96** is in the foreground, and it will be understood that this set screw will engage its corresponding lever **92** if the driving shaft **40** is turned in a clockwise direction, as viewed from the front of the switch. Similarly, the third and fourth set screws are in the background, spaced respectively twenty degrees, and will engage the corresponding levers **92** if the driving shaft is turned twenty degrees or forty degrees in a counterclockwise direction.

Thus, it will be apparent that as the driven shaft moves with a snap action, in the manner heretofore described, the various switches **86** are opened or closed with a snap action.

Reference now should be had to FIGS. 9, 10 and 11, wherein a modification of the invention is illustrated. Most of the modification is similar to the previously disclosed embodiment. Similar numerals are utilized with the addition of the suffix *a*. Accordingly, repetition of the description of such parts is believed to be unnecessary. The differences reside in the type of switch contact arrangement, and in the degree of rotation. Thus, there are four locking holes **38***a* in the detent plate **22***a*, these holes being spaced at ninety degrees, and being concentric with the driving shaft **40***a*. Correspondingly, the cam slot **50***a* in the driver **44***a* is 180° in arcuate extent. At the center thereof, as indicated at **52***a*, the cam slot is of maximum width. The width remains constant throughout most of the extent of the cam slot, but adjacent the opposite ends, as indicated at **100**, the slot tapers to a minimum dimension at the ends **102**, such dimension being just sufficient to receive the tip **82***a* of the plunger **76***a*.

On the back plate **26***a*, there is provided an insulating plate **101** having four fixed contacts **103** thereon spaced arcuately at ninety degrees. The movable switch arm **104** is carried by an insulating fitting **106** on the end of the driven shaft **54***a*, and is engageable with any of the fixed contacts **103**. A slip ring **105** is mounted on the insulating fitting **106** and is connected to or formed integral with the arm **104**. A brush **107** rides against the slip ring **105** to form electrical contact with the switch arms **104**. As will be understood, the ninety degree extent of the driver allows the driving shaft to move substantially ninety degrees before the cam slot **50***a* unlocks the plunger **76***a* from one of the locking holes **38***a*. Accordingly, the switch arm **104** moves ninety degrees within a snap action, quickly breaking away from one contact, and engaging the next, whereby to prevent burning or arcing.

From the foregoing it will be seen that there has been herein presented an improved snap switch mechanism of a rotary type, but adapted for controlling either a rotary switch or one or more switches of the push button type. The snap action mechanism of the switch insures rapid opening and closing of switch contacts, thereby largely eliminating arcing and burning of the contacts. Since the latch plate and the driven shaft are locked in position until such time as the driving shaft and driver have rotated substantially the distance through which the latch plate and driven shaft are to be rotated, it will be apparent that upon unlocking of the latter parts, they will immediately snap from one position to the next. Thus, there is not the slightest possibility of "teasing" the switch contacts by jiggling the driving shaft back and forth. Such jiggling will have absolutely no effect on the driven parts until such time as the arcuate movement necessary for unlocking has taken place, and the driven parts immediately move to the subsequent station and are locked at that station.

In the embodiments of the invention as heretofore shown and described, there has been a resilient spring drive between the shaft **40** and the shaft **54**. The detent mechanism in each instance insures locking of the driven shaft **54** in position until after the driving shaft **40** has been turned a predetermined angular distance. However,

the detent principles of the invention have been found equally applicable to a snap switch in which the shaft is directly driven. As another way of looking at it, the driven shaft may be formed integral with the driving shaft. Other than the exceptions noted, the embodiment of FIG. 12 is similar to those previously described, and similar parts are used to identify similar numerals with the addition of the suffix *b*.

Thus, the driving shaft **40***b* is integral with the driven shaft **54***b*. The switch operators or levers **92***b* are in this instance driven by cams **96***b*. A knob **110** is fixed on the extending end of the shaft **40***b*.

A bushing **112** is rotatable on the shaft, being positioned by a washer **114** against a shoulder **116** of the shaft. The driven or latch plate **60***b* is secured to the bushing, as by brazing. The driving or driver plate **44***b* is fixed on the shaft **40***b* adjacent a shoulder **118** thereon, and against the back of the front wall **22***b*.

In operation, the knob **110** is turned to turn the shaft **40***b*, **54***b*, whereby the cams **96***b* operate the levers **92***b* to vary the condition of actuation of the various switches (not shown). Since the driven or latch plate **60***b* is at first secured against movement by the tip **82***b* of the plunger **76***b* fitting in one of the series of holes **38***b*, the spring **66***b* tends resiliently to hold the driver plate **44***b*, and hence the shaft **40***b*, **54***b* in its initial position. Thus, the shaft is turned against a spring force until it has turned far enough for the cam slot **50***b* to retract the plunger **76***b* against its internal spring **84***b*. The spring retarding force thus is removed, and the shaft moves to the next switch position, the tip **82***b* subsequently snapping into the next successive hole **38***b*. As will be apparent, the fact that the shaft is initially turned against a spring resistance tends to preclude accidental turning of the shaft, as by physical shocks, or inadvertent manual engagement of the knob. Furthermore, the shaft cannot come to rest in an intermediate position, or any other position off of a proper switch position, since the driven or latch plates will stop in position only at one of the holes **38***b*, and the shaft will be automatically aligned with the driven plate by virtue of the spring **66***b* acting between the driver plate **44***b* and the driven plate **60***b*.

A further embodiment of the invention is shown in FIGS. 13–16. This embodiment is substantially the same as that shown in FIG. 12, but is used alternatively thereto in accordance with different requirements, such as space requirements for the switch unit. Again, similar numerals are utilized to identify similar parts, the suffix *c* being applied in this instance.

One essential distinguishing feature of this embodiment relative to the embodiment of FIG. 12, is that driving and latching mechanisms are not mounted on the shaft. Instead, a gear **120** (FIGS. 13 and 15) is fixed on the shaft forwardly of an intermediate supporting wall or web **24***c*. The driving and latching mechanisms are radially offset therefrom, being mounted on a shaft **122** (FIGS. 15 and 16). The driver **44***c* is provided over a portion of its periphery with gear teeth **124** meshing with the teeth of the gear **120**. Accordingly, the driver **44***c* is turned exactly in accordance with turning of the shaft **40***c*, **54***c*, but without being mounted on this shaft. Operation of the switch **20***c* of FIGS. 13–15 is similar to that of the embodiment of FIG. 12, except for the offsetting of the driving and latching mechanisms, as previously noted.

There is a further variation in connection with the last embodiment of the invention, as shown in FIG. 16. Thus, there is a solenoid **126** having a winding **128** on a coil form **130**. The front portion of the coil form projects through the web **54***c* as at **132**. The solenoid **126** further has a fixed core portion **134**, by means of which it is mounted on the back wall **26***c*. The solenoid also has a movable core portion or armature or slug **136** resiliently urged away from the fixed core portion by a spring **138** mounted in a recess in the front part of the fixed core portion **134**. The armature or slug **136** carries a pin **140** which projects into a recess **142** on the back side of the driver plate **44***c*. In accordance with one practical embodiment of the invention, there is only one such recess **142**. Hence, the pin **140** of the solenoid **126** tends to hold the switch in one particular predetermined position. The solenoid may be energized from some external source (not shown) whereby to unlock the switch from the predetermined position. Once the switch has been so unlocked, it may be moved from one to another of several positions of switch actuation, and will be locked by the solenoid pin only when returned to the aforesaid predetermined position. The extent of rotation of shaft **40***c* is limited by a disc **139** (FIG. 13) fixed on the shaft and having a relieved section cooperable with a stop pin **141** fixed on the front wall **22***c*.

Reference now should be had to FIGS. 17–27 in connection with an improved form of the invention. The invention in this series of drawings includes a case or housing **144** having a molded-on bottom **146** of plastic material or the like. This material underlies a floor **148** in the casing which supports the individual switches **86***d*. Lead wires **150** from the individual switches project through the floor **148** and through the molded bottom **150**. As will be understood, the molded bottom hermetically seals the case.

The embodiments of FIGS. 17–27 is in many respects quite similar to that in FIGS. 14–16, and also partakes of features of the previous embodiments of the invention. Thus, in order to avoid prolixity of description, similar numerals have been utilized with the addition of the suffix *d*. The driving shaft **40***d* and driven shaft **54***d* again are integral, and a knob **110***d* of more or less teardrop shape is shown on the end of the driving shaft for turning the same. The driven shaft **54***d* again is provided with cams **96***d* for operating the pivoted levers **92***d* for converting the rotary motion of the shaft **54***d* to reciprocating or oscillating motion for operating the pushbutton type switches **86***d*. Rotation of the driving shaft **40***d* again is limited by means of a disc **139***d* (see particularly FIG. 24) having a cut out section therein receiving a fixed stop pin **141***d* mounted in the front wall **22***d*. A driving gear **120***d* is fixed on the driven shaft **54***d*, as in the last previous embodiment of the invention.

In the present instance, the driver **44***d* is provided with teeth **124***d* entirely around its periphery. The driver again is provided in its rear face with a recess **142***d* receiving a pin **140***d* extending from the slug or reciprocated member **136***d* of a solenoid **126***d* mounted on the intermediate wall **24***d* and on an intermediate wall or web **125** spaced rearwardly thereof.

The solenoid **126***d* serves to latch the driver **44***d* at a predetermined rest or "zero" position. Hence, the switch unit cannot be switched or moved from this position until after the solenoid **126***d* has been energized. As will be apparent, a series of apertures **142***d* could be provided, whereby the solenoid would latch the driver in any predetermined position.

The present form of the invention is distinguished from the prior embodiment in the form of the latch mechanism. More particularly, the driver **44***d* is provided on its face with radially disposed, arcuately spaced teeth **152** (see particularly FIGS. 23, 25, and 27). The teeth are arranged to present alternate crests **154** and valleys or roots **156**. The teeth are higher at their radially outer ends as indicated at **158** in FIG. 27, and tapered to a minimum height at their radially inner ends as indicated at **160**. The shape and size of the teeth are such as to result in two diametrically opposite plateaus **162**. The presence of these plateaus does not interfere with the movement of the driver member since the degree of rotation thereof is limited by the disc **139***d* and pin **141***d* which limit the rotation of the shaft **40***d*, **54***d*.

Confronting the teeth **152** is a locking detent **164**. The detent **164** comprises a rectangular block **166** (see

particularly FIG. 26) disposed diametrically of the driver 44*d*. The detent 164 is provided on the front face of the block 166 with a wedge shaped tooth 168 running from end to end thereof. The tooth is configured to fit between adjacent teeth 152 on the face of the driver member 44*d*.

The detent 164 is mounted in a slide block 170 (see particularly FIG. 25) held on the back side of the face 22*d* by means such as screws 172 extending through the face and threaded into the slide block. The slide block is provided with a channel 174 receiving the base or block 166 of the detent 164, and is further recessed at 176 and 178 for receiving the driver member 44*d* and the face teeth 152 thereon. The stub shaft 122*d* receiving the driver 44*d* extends through the slide block 170, and through a central aperture 180 in the detent.

The detent 164 is provided on the back face thereof with a pair of recesses 182 spaced on opposite sides of the shaft opening 180. These recesses receive the front ends of a pair of helical springs 184, the rear ends of which are seated in complementary recesses 186 in the detent block 170.

The cooperation of the detent slide box, the detent plunger, the face teeth on the driver, and the locking pin for the driver is shown in somewhat exploded nature in FIG. 25. Normally, the parts are related as shown in FIGS. 19 and 20, and the various switches 86*d* are held in predetermined conditions of open or closed. When the solenoid 126*d* is energized to retract the pin 140*d*, the parts are capable of being moved. Turning of the knob 110*d* tends to rotate the driving shaft 40*d* and the integral driven shaft 54*d*. This tends to cause the gear 120*d* to rotate the gear toothed driver 44*d*. However, such rotation is resisted by the spring pressure of the tooth 168 of the detent plunger. However, sufficient pressure on the knob 110*d* will cam the tooth 168 out of the valley between adjacent teeth, and over the intervening crest. As soon as the detent or detent plunger has passed such crest (it will be understood that it simultaneously passes a pair of crests on diametrically opposite sides of the driver) the springs force the detent tooth into the next succeeding valley, whereby to snap the driver from one rotational position to the next, the driven shaft 54*d* simultaneously being snapped to the next succeeding position through the gear teeth 124*d* and the gear 120*d*. The cams 96*d* and levers 92*d* thus change the conditions of the individual switches in accordance with the shape of the cam, some of the switches being changed, and others remaining as before. In any event, the action is a snap action, which is highly desirable from a standpoint of switch contact life, and from a point of precisely controlling the operation of the devices which may be connected to the individual switches 86*d*.

The particular detent mechanism just described has the virtue of impossibility of dead centering. Thus, the driver cannot dead center relative to the detent plunger, and hence the driving and driven shafts cannot be left in such position that the switches are anything but fully opened or fully closed. Accordingly, incorrect combinations of circuits cannot be made. The detent mechanism just described has the further desirable characteristsic of being able to develop rather heavy torque through the cam action of the detent tooth, as forced by the springs 184. This allows the switch unit to operate satisfactorily even though rather substantial friction might be developed in the moving parts, as through corrosion or extreme temperature or pressure variations.

Additionally, the switch unit has rather high inherent frictional resistance to movement. The various lever arms have a certain amount of friction about their mounting shaft, the bearings of the driving and driven shaft present a certain amount of friction, the cams and follower levers present friction (as well as the force necessary to close the switches 86*d*), and a certain amount of friction is introduced by the detent mechanism itself. All of this friction and resistance to rotation readily is overcome by a substantial margin through the use of the detent mechanism of FIGS. 17–27. Even if the operator were deliberately to try to place the operating knob in a middle position, the detent mechanism would positively shift the driven shaft in one way or the other to a definite switch position. Furthermore, as will be obvious, there is no chance for one switch position to be skipped inadvertently, since the detent mechanism tends to lock rather positively in any given position.

As will be apparent, the crests of the face teeth on the driver, and also the crest of the detent tooth 168 are quite sharp. As a result, full torque is developed immediately upon passing of a dead center position of the detent tooth and the driver face teeth.

Various changes in structure will no doubt occur to those skilled in the art, and will be understood as forming a part of this invention insofar as they fall within the spirit and scope of the appended claims.

I claim:

1. A snap action switch unit comprising base means, a plurality of push button type switches mounted on said base means in side by side linear array, a shaft, means rotatably supporting said shaft from said base means extending past all of said switches, a plurality of levers pivotally carried by said base means and each having a portion engaging a push button of a respective switch and having another part adjacent said shaft, a plurality of cam means axially spaced on said shaft and each engaging one of said levers, said cam means acting through said levers to determine the respective open and closed position of said switches, a rotary member rotatably carried from said base means and rotatable with said shaft, said rotary member having a plurality of face-type teeth of uniform height thereon, and a detent member spring pressed against said teeth axially of said rotary member and cammed axially away from said rotary member by said teeth in succession, said detent member resisting rotation of said rotary member, and imparting a snap action thereto upon passing of a tooth crest.

2. A snap action switch unit as set forth in claim 1 wherein the detent member spans said rotary member and engages substantially diametrically opposite teeth.

3. A snap action switch unit as set forth in claim 2 wherein the detent member has a wedge shaped configuration confronting said rotary member and engaging the teeth thereof.

4. A snap action switch unit comprising base means, a plurality of push button type switches mounted on said base means in side by side linear array, a shaft, means rotatably supporting said shaft from said base means extending past all of said switches, a plurality of levers pivotally carried by said base means and each having a portion engaging a push button of a respective switch and having another part adjacent said shaft, a plurality of cam means axially spaced on said shaft and each engaging one of said levers, said cam means acting through said levers to determine the respective open and closed position of said switches, a gear on said shaft, a member rotatably mounted from said base means, said member having peripheral gear teeth meshing with the teeth of said gear whereby said member is rotated in timed relation with said shaft, said member further having deep uniform face type teeth extending in an axial direction, and a spring urged detent member engaging said face type teeth, said face type teeth camming past said detent member, whereby said detent member resists rotation of said rotary member and hence of said shaft, and imparts a snap action thereto as said face type teeth pass said detent member.

5. A snap action switch unit as set forth in claim 4 wherein the detent member spans said rotary member and is provided with a wedge configuration engaging said face type teeth on diametrically opposite sides of said rotary member.

6. A snap action switch unit as set forth in claim 1 wherein the back side of the rotary member is provided with a recess, and further including a solenoid carried on said base means, a plunger in said solenoid, and a latch pin carried on said solenoid plunger and normally received in said recess to lock said rotary member, said pin being retracted from said recess upon energization of said solenoid.

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