May 12, 1959 R. E. LARKIN 2,885,905

DETACHABLE LEVER LOCKING DEVICES FOR ELECTRIC SWITCHES

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Fig. 1

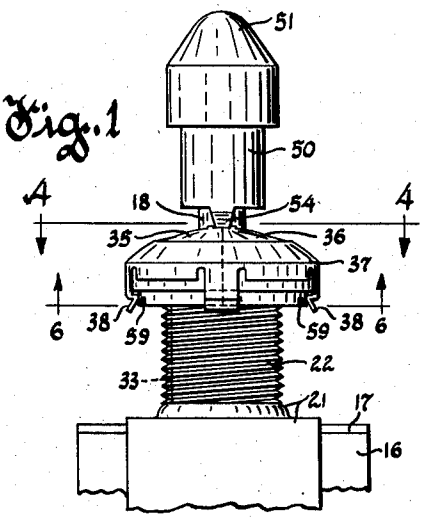


Fig. 2

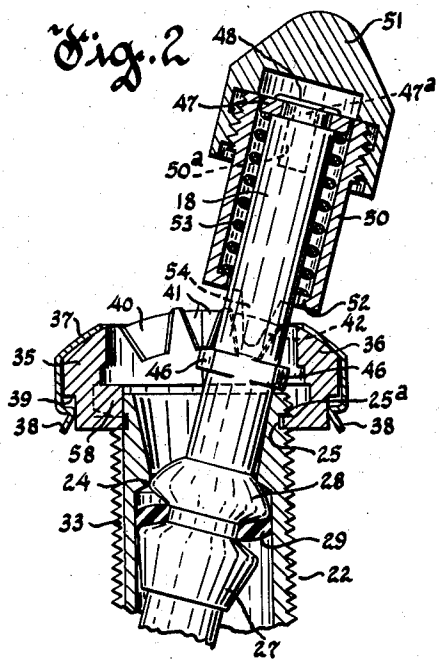


Fig. 3

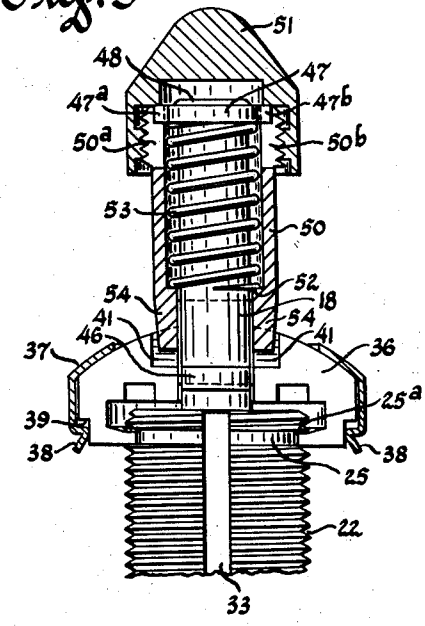


Fig. 4

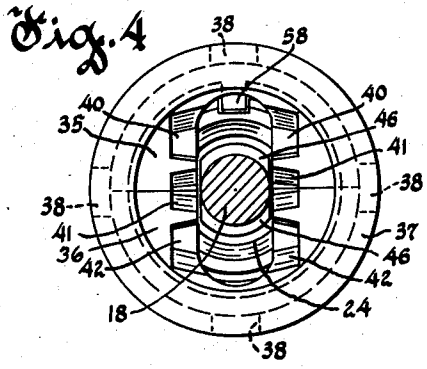
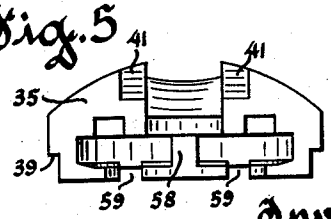


Fig. 5



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Fig.6

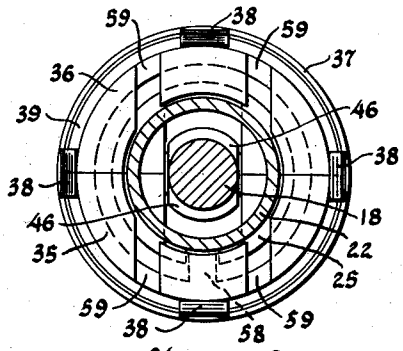


Fig.7

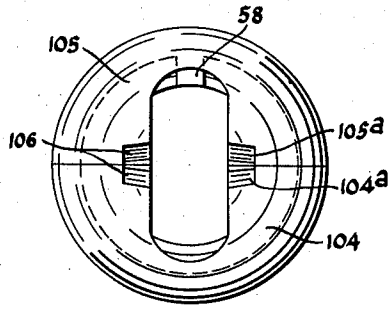


Fig.8

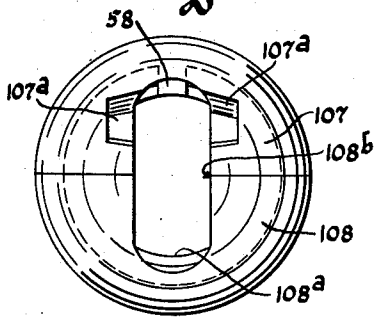


Fig.9

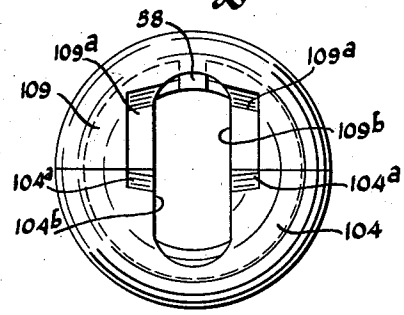


Fig.10

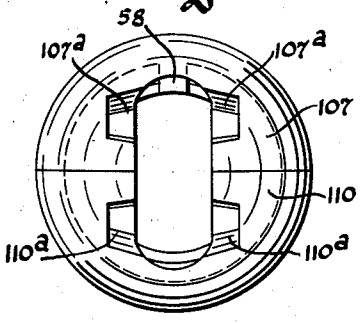
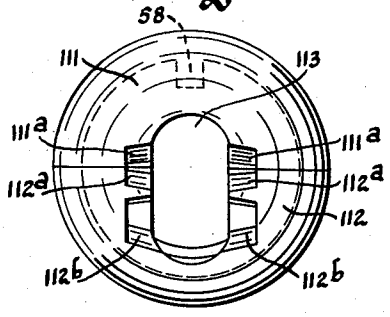


Fig.11



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Fig. 12

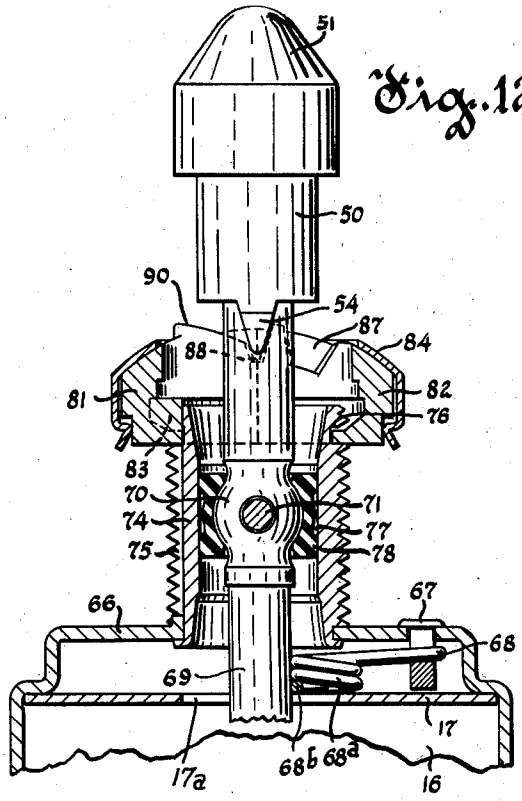


Fig. 13

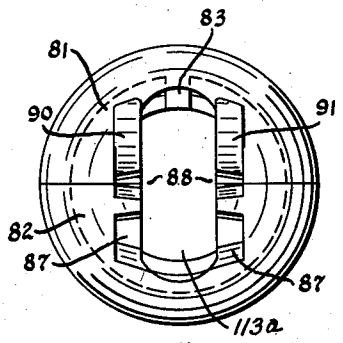


Fig. 14

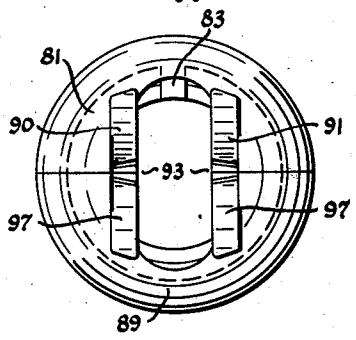
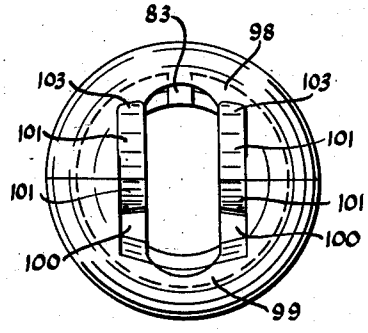


Fig. 15



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2,885,905

DETACHABLE LEVER LOCKING DEVICES FOR ELECTRIC SWITCHES

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Application February 15, 1956, Serial No. 565,648

14 Claims. (Cl. 74—536)

This invention relates to improvements in detachable lever locking devices for electric switches, wherein the lever is to be retained in at least one position thereof until moved or released from such position by the operator; and particularly to locking devices including multiple sets of different cap parts which can be readily changed, and variously combined, for retaining the lever in a number of different combinations of desired positions, without requiring dismounting of the switch itself.

Electrical switches, such as those used on aircraft, are frequently of a multi-position type with a single operating lever to be manually moved to various positions relative to other switch parts and to the panel on which the switch is mounted. The lever positions should be readily changeable by the operator, but also the lever should be restrained against accidental undesired or inadvertent movement, due to shock or vibration or to action of the operator, from a locked position in which it has been placed by the operator. Under other conditions it is desired that the lever automatically return to a given position from one of the other positions and be locked in the "return" position. Where automatic lever movement is desired, it should be limited to only a preselected amount and with reference to a predetermined sequence of positions. In any of the above cases it is desired that the lock be positive and secure against shock and vibration and that the lever be incapable of accidental movement, or inadvertent or thoughtless operation, or an excessive amount of movement, such as overtravel.

It is therefore an object of the present invention to provide novel, improved, and less expensive locking means for a lever operable to a plurality of positions and which positively prevents accidental or inadvertent movement of the lever from a locked position to another position thereof.

Another object of the invention is to provide a locking device for the operating lever of a multi-position switch in which various locking parts are interchangeable and can be assembled for locking the lever in each of the switch positions or in only one or more of such positons.

Another object of the invention is to provide a locking device for multi-position switches, in which the number of parts and the weight of the device are reduced as compared with prior devices for the same purpose.

Another and more specific object of the invention is to increase the size of the operating lever of a multi-position switch of the character aforementioned, while retaining the possibility of mounting the switch in a standard size hole in a panel or other suitable support.

Another object of the invention is to minimize entry of moisture and dust into enclosed parts of such a switch, by providing for drainage of such foreign matter from around the outer end of the passage through the bushing for the lever of the switch, and by sealing the space between the lever and the peripheral wall of such passage.

Another object of the invention is to provide locking devices for the operating levers of multi-position electrical switches of the character aforementioned, which preserves

visibility of the panel on which the switches are mounted and correspondingly conserves space on such panel.

Other objects and advantages of the invention will appear hereinafter, in connection with the accompanying drawings illustrating certain embodiments of the invention and which will now be described, it being understood that the embodiments shown are susceptible of various modifications without departing from the spirit and scope of the appended claims.

In the drawings, Figure 1 is a front elevation of a locking device for a switch operating lever which is adapted for manual oscillatory movement into and out of any one of three predetermined positions, in which it may be locked, for operating an electric switch, a fragmentary portion of which is illustrated; and the lever being shown locked in its intermediate position.

Fig. 2 is a longitudinal sectional view on the center line of a portion of the structure, looking in the same direction as in Fig. 1, on a somewhat larger scale, and with the lever in and locked in its right-hand extreme position.

Fig. 3 is a view partially in longitudinal central section, at right angles to the view of Fig. 2, and partially in elevation, with the lever in the intermediate position shown in Fig. 1.

Fig. 4 is a horizontal sectional view, taken on the line 4—4 of Fig. 1, looking in the direction of the arrows, and showing the means for locking the lever in any one of its three predetermined positions.

Fig. 5 is a side elevational view of the upper section of the cap shown in Fig. 4.

Fig. 6 is a horizontal sectional view, taken substantially on the plane of line 6—6 of Fig. 1, looking in the direction of the arrows.

Fig. 7 is a top plan view of coacting portions of one pair of cap members, which when assembled on a bushing and clipped together are adapted to provide for locking of the lever only in the intermediate one of its three operative positions.

Fig. 8 is a view similar to Fig. 7 providing for locking of the lever only in the upper end position thereof, and leaving the lever unlocked in its intermediate or mid-position and in the lower end position to which it may be moved.

Fig. 9 is a view similar to Fig. 7 providing for locking of the lever against movement from its intermediate position toward its lower end position, but permitting relatively free manual movement of the lever from its intermediate position to its upper end position.

Fig. 10 is a view similar to Fig. 7, but providing for locking of the lever in each of its upper and lower end positions, and leaving the lever unlocked in the intermediate position thereof.

Fig. 11 is a view similar to Fig. 7, but showing means adapted for use with a two-position switch, in which the lever is adapted to be locked in either position.

Fig. 12 is a view, partially in elevation and partially in section on a longitudinal central plane, illustrating a modified form of the present invention in which the lever is automatically returned to an intermediate position from one end position, but locked against automatic return from its other end position.

Fig. 13 is a top plan view of the coacting cap portions of the locking device of Fig. 12 which provides for locking of the lever in the lower end position and in the intermediate position of a multi-position device; to which intermediate position it is automatically returned from its upper end position upon manual release of the switch lever.

Fig. 14 is a view similar to Fig. 13, showing a three-position type of switch, but providing for locking of the lever only in its intermediate position; to which it is

automatically returned from either of its end positions upon manual release of the switch lever; and

Fig. 15 is a view similar to Fig. 13 but providing for locking of the lever only in one of its two operative positions to which locked position it is automatically returned when manually released after movement thereof to its other operative position.

Referring first to Figs. 1 to 6 of the drawings, the numeral **16** designates a fragment of a casing enclosing a multi-position electric switch of a known type. The casing has a metallic cover plate **17** (see Figs. 1 and 12) with an elongated opening **17***a*, Fig. 12, through which the lower portion of lever **18** extends for oscillation to either of two end positions adjacent the ends of the opening, and through an intermediate position, for placing of the switch lever in any one of three positions. A metal member **21** of inverted U- or saddle-shape is attached to the switch housing **16** in a well known manner and has its central portion formed with an apertured boss, as shown, against the lower surface of which the reduced end of the tubular bushing **22** is adapted to be upset, for attachment of said parts to each other.

Bushing **22** is shown in Fig. 2 as being substantially cylindrical, and is initially externally threaded to the upper end thereof for projection outwardly through a panel or other suitable support (not shown) for mounting therein. The bushing **22** has a longitudinal external keyway **33** for receiving suitable means for predetermining the rotary position of the bushing relatively to the metal member **21** and for other purposes. An internal shoulder **24** is formed in bushing **22** toward the end thereof remote from the switch casing **16** and said bushing is externally peripherally grooved at **25** adjacent such end. An external flange **25**[a] is thus formed adjacent the upper end of the bushing and such flange is also externally threaded. The bushing is of such length that washers, seal rings and two nuts can be placed thereon for mounting on the usual panel of up to one-eighth inch thickness. The switch casing **16**, cover plate **17** and bushing **22** may be considered as coacting to form mounting means for the lever **18**.

The lever **18** has an enlarged portion **27** which is within the bushing **22** when the parts are in their assembled relation, such portion being at the lever fulcrum point within the bushing. One surface **28** of the enlarged lever portion **27** is in the form of a segment of a sphere for movement of the upper end of lever portion **27** in bearing engagement with the bushing shoulder **24** when the lever is oscillated in the passage through which it extends into the switch casing. A somewhat wedge-shaped groove is provided in the lever portion **27** to receive an annular member **29**. The member **29** is preferably formed of a resilient rubber or rubber-like material not substantially affected by heat, vapors, etc., which may be present where the switch is to be used; and its inner diameter is of a size to grip the inner periphery of the groove in the lever while its outer diameter is of a size to seat at its outer edge against the inner peripheral surface of the bushing **22**. The resilient member **29** is preferably under slight compression between the lever **18** and the bushing **22** and is of a thickness to permit lateral flexing in the lever groove without bodily shifting as the lever is oscillated. Therefore member **29** forms a seal effectively to prevent passage of moisture or other foreign matter through the bushing into the switch casing **16**.

Generally similar parts **35** and **36** engage and extend about the flange **25**[a] of the bushing and engage in the groove **25** formed therein, to form a cap for the end of the bushing; and such parts **35** and **36** provide an elongated opening therethrough, as shown in Fig. 4, whereby the lever **18** may be oscillated into either of two end positions and through an intermediate position, in respect of a switch of the three-position type. The cap members **35** and **36** are held in place by a one-piece resilient metal clip **37** of a generally inverted cup shape but having a multiplicity of resilient fingers **38** respectively adapted to snap inwardly over a downwardly facing shoulder **39** on the cap members and bearing inwardly against the peripheral portions of the respective cap members beneath such shoulder. The cap parts **35, 36** are shown as formed to jointly provide three downwardly extending notches **40, 41, 42** (see Fig. 4) respectively adjacent the two ends of and centrally of the opening through the cap. Such sets of notches coact for jointly providing the two end positions and an intermediate position of the lever when the parts **35** and **36** are used. The several other cap portions are hereinafter described in further detail.

The lever **18** is formed with a pair of flanges **46, 46** between the enlarged portion **27** thereof and the outer end of the lever; said flanges cooperating with the straight walls of the elongated central opening in the cap to prevent rotation of the lever. A washer **47** is attached to the outer end of the lever **18** as by riveting over an integral extension **48** of lever **18**. Washer **47** extends beyond the cross sectional area of the lever to serve as a downwardly facing flange at said end of the lever. A sleeve **50** is placed about the lever **18** and has external threads at the upper end thereof for cooperatively engaging the threads formed in a nut or knob **51** capping the sleeve and enclosing the end of the lever. Sleeve **50** is provided with a pair of diametrically opposed slots **50**[a] and **50**[b] extending downwardly from the upper end of said sleeve. As shown in Fig. 3 washer **47** is provided with a pair of lugs **47**[a] and **47**[b] which are adapted to fit into said slots **50**[a] and **50**[b]; so that when washer **47** is rigidly attached to the upper end of lever **18** sleeve **50** will be positively held against rotation with respect to said lever. The nut **51** is preferably of substantially greater external diameter than the sleeve **50** to provide surfaces which may be gripped by the operator's fingers for retraction of sleeve **50** from a locked position thereof.

The sleeve **50** is of larger internal diameter than the external diameter of the upper end portion of lever **18** and has an internal flange **52** at the lower end thereof to form a seat for one end of a helical compression spring **53**, which bears at its other end against the lower surface of washer **47**. Sleeve **50** also has a pair of integral downwardly extending substantially triangular projections **54** located at 180 degrees spacing from each other and adapted for engagement in the cap notches (**40, 41** and **42** of Fig. 4, for example) depending upon the position of the lever. The sleeve sub-assembly **50—54** may be considered as a retractable lever member or portion which is external of the mounting means and coacts with the cap assembly for such purposes as will now be described.

Referring particularly to Figs. 3, 4 and 5, the cap parts **35** and **36** are generally similar but the cap portion **35** has an inwardly projecting key portion **58** to enter the bushing keyway **33** for preventing rotation of the entire cap and one-piece clip assembly with respect to the bushing **22**, whereas the cap portion **36** has no such key. For any given combination of lever positions in which it is desired to lock the lever **18**, the cap halves **35, 36** coact to provide notches, as shown at **40, 41, 42** (or one-half of a notch **41** when the division line between the cap parts falls within the notch). Each coacting pair of notch parts in the cap are in alinement so that the sleeve teeth **54** may simultaneously enter into a pair of the notches; the notches extending at a right angle to the direction of movement of the lever **18**. Passages or slots **59** extend through each cap part from the inside to the outside surfaces thereof for drainage of moisture or foreign matter carried thereby, and which would otherwise accumulate in the cap and tend to drain into the inner portion of bushing **22**, and thence into the switch casing **16**.

There is no substantial wear upon the cap parts, and such parts can therefore be made as die castings of relatively soft metal. Unless the operator exerts a pull upon the sleeve unit **50—54** the spring **53** will remain in its expanded condition, with the respective teeth **54** biased

into one of the sets of notches to a sufficient extent to restrain the lever against movement out of a given position pending manual retraction and movement of the lever **18** to another position.

In operation, therefore, the operator must grip the sleeve-cap handle unit **50**, **51** and exert a pull thereon longitudinally of the lever **18** to compress the spring **53** sufficiently to raise the teeth **54** out of the then engaged set of notches. After the teeth have been disengaged from a notch, the lever **18** may be moved to any other position provided for by a locking cap unit, such as members **35**, **36** and clip **37** (in Fig. 1), according to the functions to be afforded by the particular switch.

The cap parts **35**, **36** shown in Figs. 1 through 6 jointly provide three sets of notches whereby the lever may be locked in either of two end positions or in an intermediate position. Such cap construction is accordingly particularly useful where a three-position switch is used and the switch is to be locked in each one of its three positions.

The combinations of pairs of cap parts shown in Figs. 7 to 11, inclusive, are likewise adapted to be assembled with respect to a bushing like the bushing **22** aforedescribed and with respect to the lever **18** as aforementioned, and to be held in assembled relationship by the one-piece resilient metal clip member **37** shown in Figs. 1 to 3, inclusive, and in Fig. 6.

The lower cap part **104** shown in Fig. 7 is identical with the corresponding cap part **104** in Fig. 9; whereas the upper cap part **105** in Fig. 7 is different from all the other cap parts herein illustrated. The cap parts of Fig. 7 are adapted for use with a switch actuating lever like that shown in Figs. 1 to 3; but in which said lever may be locked only in its intermediate, or "off," position, as indicated by the recesses **104ª** and **105ª** forming the intermediate cavity **106**. It is to be understood that in each form of the invention herein disclosed the switch parts themselves (other than the locking means therefor) may be arranged to normally provide for automatic spring return of the operating lever from one extreme position to the intermediate position (as shown in Fig. 12), or from either extreme position to said intermediate position; or from one extreme position to the other in a two-position type of switch; different forms of such momentary types of switch actuators being well known to those skilled in this art.

The upper cap part **107** in Fig. 8 is combined with a lower cap part **108**, for use with a three-position switch having an intermediate "off" position, and an "on" position at each extreme or end position of the lever. The lever (not shown) may be biased in any well known manner to return to its intermediate or "off" position at the mid-length of the slot **108ᵇ**, when the lever is manually released from its extreme position **108ª**, or when said lever is manually released after withdrawal of its locking lugs or ears from the end locking cavity designated by the numeral **107ª**.

The cap parts **104** and **109** in Fig. 9 are respectively recessed as indicated at **104ª**, **104ª** and at **109ª**, **109ª**, for cooperation with the lever lugs, to normally lock the lever against movement from its intermediate position to its lower extreme position in the slot **109ᵇ**, **104ᵇ** pending manual withdrawal of the lever lugs (**54**, **54**, shown in Fig. 3) from engagement with the lower end walls **104ª**, **104ª** of the opposite portions of recess **104ª**, **104ª**. On the contrary the switch lever **18** is relatively freely movable from its intermediate "off" position to its upper extreme position, with reference to Fig. 9, because of the relatively larger size or width of the recess portions **109ª**, **109ª**, the bottoms of which extend entirely to the aforementioned recesses **104ª**, **104ª**.

The cap parts **107** and **110** in Fig. 10 are recessed adjacent opposite end portions of the slot affording clearance for movement of the switch lever; such recesses being designated by the numerals **107ª**, **107ª** and **110ª**, **110ª**. Thus the lever will be locked automatically (when the knob thereof is manually released) after movement of the lever out of one extreme position and movement thereof to its other extreme position.

The cap parts **111** and **112** of Fig. 11 are respectively formed to provide a relatively short clearance slot **113** for the switch lever; it being understood that when the switch lever is adjacent the upper end wall of slot **113** it will be locked in position, preferably the "off" position of the switch mechanism, by engagement of the lever projections **54**, **54** with the walls of the cavities formed at **111ª**, **111ª** and **112ª**, **112ª** formed at the meeting surfaces of the respective cap parts **111** and **112**.

Cap part **112** in Fig. 11 and cap part **82** in Fig. 13 are respectively shown as being identical with the cap part **36** in Fig. 4, and are shown as provided adjacent the lower end of the slots **113** (Fig. 11) and **113ª** (Fig. 13) for the switch lever with a pair of recesses **112ᵇ**, **112ᵇ**, Fig. 11, and **87**, **87**, Fig. 13, which are adapted to receive the projecting lugs on the switch lever to lock the same in its lower extreme position; which may, for example, with respect to Fig. 11, be presumed to be the single "on" position of the switch.

The modified forms of my invention as illustrated in Figs. 12 through 15 in general include the locking device features previously described, together with means for automatically insuring return of the lever to an intermediate position upon manual release thereof from one extreme position (Figs. 12 and 13); or from either extreme position to an intermediate position (Fig. 14); or from one of its extreme positions to the other, in a two-position switch (Fig. 15); the die-cast cap parts being formed so as to facilitate operation of the return means.

A metal support member **66** (Fig. 12) is formed to provide space between the cover member **17** for the insulating switch housing **16** and the metal support member **66** to which a plate **67** or the like is attached. Plate **67** serves as attaching means or as abutments for opposite ends **68** of a spring wire having two spaced helically wound, portions, one of which is shown at **68ª**, said wire having a normally straight portion **68ᵇ**, between the helical portions which continuously bears against the switch lever **69** to tend to return the level to its intermediate position, as illustrated.

The lever **69** is formed with a ball-like enlargement **70** and has a transverse aperture for receiving a pivot pin **71**. A bushing **74** is fixed in the opening in the metal support member **66** and is formed with a keyway **75** and an upper end flange **76** and is externally threaded for mounting upon a supporting panel, as aforedescribed. The interior of the bushing **74** is formed with its opposite end portions of substantially frusto-conical contour, and with an intermediate cylindrical portion **77**. A resilient, elastic, rubber or rubber-like sealing member **78** is formed as a short cylinder with an internal ball-shaped recess; the wall portions of which are adapted to grip the lever portion **70**; and having integral external peripheral flanges at the ends to seat against the inner cylindrical surface **77** of the bushing for thereby sealing the lever in the bushing. The upper end portion of lever **69** carries the sleeve-nut unit **50**—**54** previously described.

Bushing **74** is capped by two generally similar cap parts **81**, **82** which are jointly of generally disk-like shape and coacting to define an elongated opening therethrough for accommodating the upper end portion of lever **69**. Each cap part is formed with an internal flange to engage the bushing **74** under the upper end flange **76** thereof and the cap part **81** has a key **83** engageable in the keyway **75** of the bushing to prevent rotation of the assembled cap parts relatively to the bushing **74**. The cap parts are held in position by a punched and stamped resilient sheet metal clip **84** which is preferably the same as the clip **37** aforedescribed, and which coacts with the present cap parts in the same manner as previously described. The cap parts **81**, **82** are likewise shaped to

be engaged by and to hold sleeve teeth **54**. As shown in Figs. 12 and 13, holding surfaces **87** are formed adjacent the right-hand end (Fig. 12) of the clearance opening through the cap parts and another pair of holding surfaces **88** are formed intermediate the ends of said cap opening. The cap surfaces between the pair of holding surfaces **88** and the left-hand end of the cap opening are smooth curves and are designated **90** and **91** (see Fig. 13). Hence voluntary locking of the lever **69** is possible in the present construction either at the right-hand end position **87** (Fig. 13) or at the intermediate position designated **88** (when moving lever **69** from the end position **87**).

If the handle unit **50, 51** of lever **69** is manually released after movement of said handle to its extreme left-hand position (Fig. 12) the spring **68** acts in an obvious manner to bias lever **69** toward the intermediate position thereof shown in Fig. 12. At the same time the coiled compression spring **53** in handle **50, 51** (see Fig. 2) biases the teeth **54** of sleeve **50** against the downwardly curved cam surfaces **90** and **91** (Figs. 12 and 13) to assist in rapidly returning lever **69** to the intermediate position thereof shown in Fig. 12.

The cap of Fig. 14 comprises an upper part **81** (like the upper part **81** shown in Fig. 13) and a lower part **89**, and has notches **93** only at the intermediate position while the cap surfaces are curved from the outer end positions toward the notches **93** so that the spring **53** within sleeve **50** (see Fig. 2) causes the teeth **54** to act against the pairs of cam surfaces **90, 91** or **97, 97** to automatically return or assist in returning the lever **69** to its intermediate (locked) position from either end position.

With cap parts like those shown in Fig. 14 it is to be understood that the single spring **68** of Fig. 12 might, under proper conditions, be omitted, or an additional spring, like **68**, might be mounted on the left-hand side of lever **69**. The circuits can therefore be closed in the end positions only so long as the lever **69** is held therein by the operator.

The cap parts **98** and **99** shown in Fig. 15 provide holding surfaces or notches **100** at one end of the cap opening only and said cap parts have mated, continuously upwardly curved surfaces **101, 101** joining the locking end position **100** with the other end position **103** for the lever. Therefore the upper end of lever **69** may now be locked only by the cooperating pairs of surfaces designated by the numeral **100**, and will be returned automatically to its extreme right-hand position (with reference to Fig. 12) by the action of spring-pressed teeth **54** (as shown in Fig. 12) against the spaced sets of cam surfaces **101, 101** shown in Fig. 15, unless the upper end of lever **69** is held in the aforementioned extreme left-hand end position by the operator. With a cap like that shown in Fig. 15 a spring like that shown in Fig. 12 may not be required; or, if employed, it should act to automatically throw the lower end portion of the lever **69** to its extreme left-hand position.

I claim:

1. In a detachable locking device of the character described, in combination, an externally threaded tubular metal bushing having an inner end portion of reduced diameter, said bushing having an external keyway formed therein and extending inwardly from the outer end thereof whereby the inner end portion thereof may be rigidly and non-rotatably attached to a switch housing, said bushing also having a peripheral groove formed therein spaced inwardly from the outer end thereof, a lever positioned within said bushing and adapted for pivotal movement relatively thereto, means for positively limiting said lever to pivotal movement in a single plane, said means comprising a cooperating pair of formed metal members, each of said members having an inwardly projecting portion adapted to fit closely within the peripheral groove in said bushing, said formed metal members when jointly assembled on said bushing being adapted to completely surround the same, and a single punched and stamped resilient sheet metal member adapted to be pressed inwardly over said formed metal members jointly, said sheet metal member having a multiplicity of resilient lugs formed thereon for snap engagement with the inner surfaces of said formed metal members jointly, whereby the latter are positively retained in assembled relation to each other and to said bushing by said sheet metal member.

2. The combination according to claim 1, wherein one of said formed metal members is provided with an integral inwardly projecting lug adapted to fit closely within said keyway, whereby said formed metal members are jointly retained in a fixed position relatively to said bushing.

3. The combination according to claim 1, wherein said plurality of formed metal members are die castings of semi-circular contour and are retained in assembled relationship to each other only by said single punched and stamped resilient sheet metal member.

4. The combination according to claim 1, wherein said formed metal members are provided on opposite sides of the plane of pivotal movement of said lever with pairs of integral, transversely aligned, raised and indented portions of like contour, said lever having a retractable handle portion normally spring biased inwardly toward said formed metal members for cooperation therewith to positively retain said handle in at least one of a plurality of different angular positions, but subject to release from such position upon manual outward movement of said handle.

5. The combination according to claim 1, wherein said formed metal members are provided on opposite sides of the plane of pivotal movement of said lever with two matched groups of transversely aligned, alternate raised and indented portions, said lever having a retractable, plural-toothed handle portion normally spring-biased inwardly toward said formed metal members for cooperation therewith to positively retain said handle in at least one position and to insure automatic return of said handle to said one position upon release thereof after manual movement thereof to at least one other alternative position.

6. The combination according to claim 1, wherein said formed metal members are provided on opposite sides of the plane of pivotal movement of said lever with transversely aligned, pairs of raised and indented portions of like contour, said transversely aligned pairs of raised portions being located in alternate relationship to said pairs of indented portions and being formed integrally with the latter, said lever having a retractable handle portion normally biased inwardly toward said formed metal members for cooperation therewith to normally insure automatic return of said handle to its intermediate position upon manual release thereof after manual movement of the same from engagement with said intermediate pair of indented portions.

7. The combination according to claim 1, wherein the cooperating pair of formed metal members are respectively provided with like inwardly extending arcuate surfaces so as to insure automatic return of said handle to one extreme position, upon manual release thereof after movement thereof to its other extreme position.

8. The combination according to claim 1, wherein various individual members of the respective pairs may be combined at will to afford various functionally different switching control characteristics.

9. In a detachable lever locking device for electric switches and the like, in combination, an externally threaded tubular metal bushing, a metal lever supported within said bushing for pivotal movement with respect thereto, a spring-biased retractable hollow handle member attached to said lever at the upper end of the latter, said handle member having a pair of oppositely disposed,

inwardly extending, substantially triangular projections at the lower end portion thereof, for the purpose set forth, means for positively insuring against rotary displacement of said lever relatively to said bushing, and means rigidly attached to said lever and having sliding engagement with said handle member for insuring against rotary displacement of said handle member relatively to said lever.

10. In a detachable lever locking device for electric switches, in combination, an externally threaded hollow metal bushing having a reduced inner end portion which is adapted for rigid, non-rotatable attachment to a cooperatively formed sheet metal casing member, the threaded portion of said bushing having a peripheral groove formed therein in a plane parallel to and offset inwardly from the outer end thereof, said bushing also having a single, straight line, lateral groove formed therein and extending throughout the threaded length thereof in a direction at a right angle to said peripheral groove, and a multiplicity of different lever locking members of outwardly convex, semi-circular peripheral contour adapted for use in pairs selectively, according to the particular controlling functions desired, the respective members of each pair being so formed as to provide for non-rotatable interlocking engagement thereof jointly with said peripheral and straight line lateral grooves upon complete assembly of all parts of the device, and a one-piece punched and stamped resilient sheet metal member having a multiplicity of integral inwardly projecting shouldered lugs formed thereon and insertable simultaneously over said lever locking members jointly with a snap fit to positively retain the latter in assembled position, a manually operable lever positioned within said bushing and supported for pivotal movement with respect thereto, an inwardly spring-biased retractable handle non-rotatably attached to the outer end portion of said lever, and said handle having a pair of transversely spaced, inwardly projecting teeth formed thereon for cooperation jointly with the pair of lever locking members to provide for automatic retention of said lever in at least one of a plurality of different positions thereof at will.

11. A device of the character set forth in claim 10, wherein said one-piece, punched and stamped sheet metal member is provided with a relatively large central opening to afford clearance for said lever, said retractable handle, and said transversely spaced pair of teeth formed on the latter.

12. A device of the character set forth in claim 11, wherein at least one pair of inwardly extending convex cam surfaces are provided upon one or both of said lever locking members, and wherein associated spring means are provided for insuring automatic return of the switch lever to a predetermined normal position thereof upon manual release of the switch handle.

13. A device of the character set forth in claim 12, wherein said means for insuring automatic return of the switch lever to a predetermined normal position thereof includes two laterally spaced parallel pairs of inwardly curved convex cam surfaces respectively formed on each of the particular pair of lever locking members aforementioned.

14. For an electric switch operating lever oscillatable in a mounting member, said lever having an inwardly spring-biased handle portion manually retractable outwardly with respect thereto, said handle portion having a pair of parallel inwardly extending teeth formed thereon at the inner end thereof, a lever lock through which said lever extends comprising a pair of sections of semi-circular contour jointly affording an upper surface of a shallow dome shape, said sections jointly providing an elongated opening therethrough which extends in a direction at right angles to the line of division therebetween, to thereby provide clearance for movement of said handle from at least one operating position thereof to another, at least one of said sections having a pair of recesses formed in the dome shaped upper surface thereof and opening to said elongated opening aforementioned, and said retractable handle portion when withdrawn from locking engagement with the walls of said pair of recesses being movable manually, or automatically under the influence of an associated biasing spring associated therewith, to another predetermined position thereof, for circuit control.

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