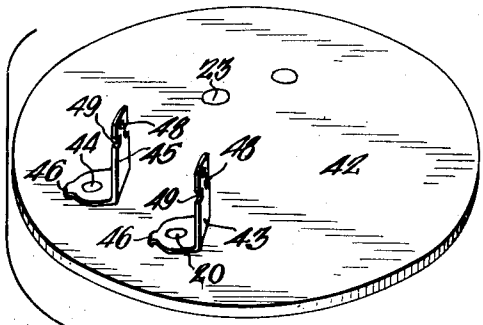
May 23, 1939. A. M. DRAVING ET AL 2,159,369

ELECTRIC SWITCH AND THE LIKE

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Fig. 1.



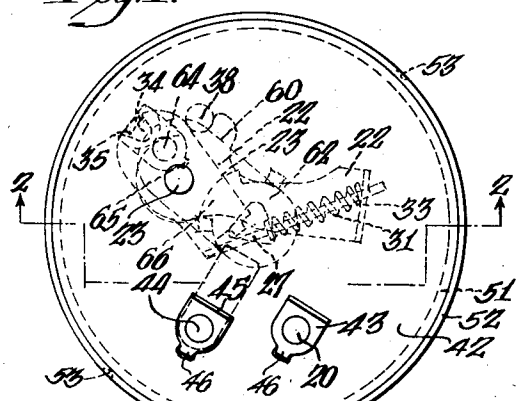


Fig. 3.

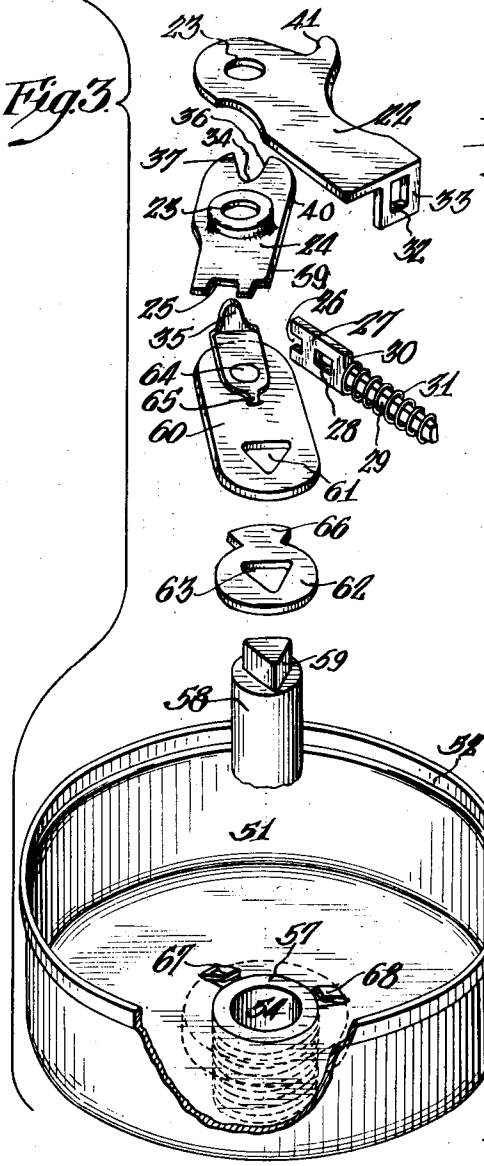


Fig. 2.

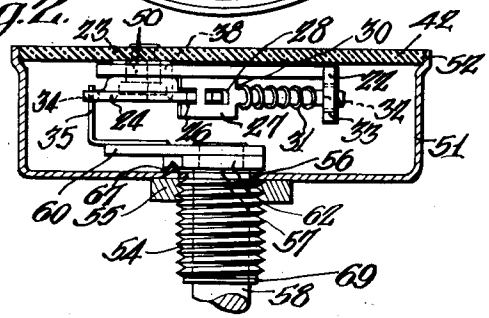
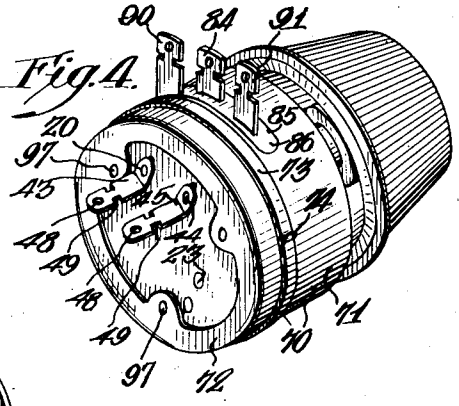


Fig. 4.



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ELECTRIC SWITCH AND THE LIKE

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Fig. 5.

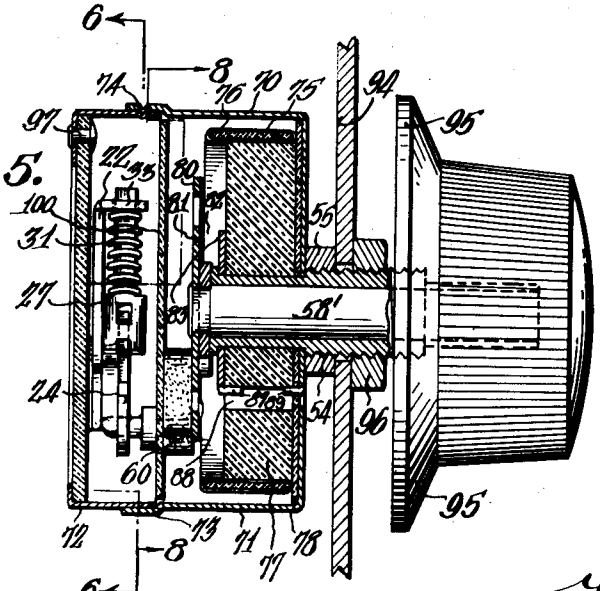


Fig. 6.

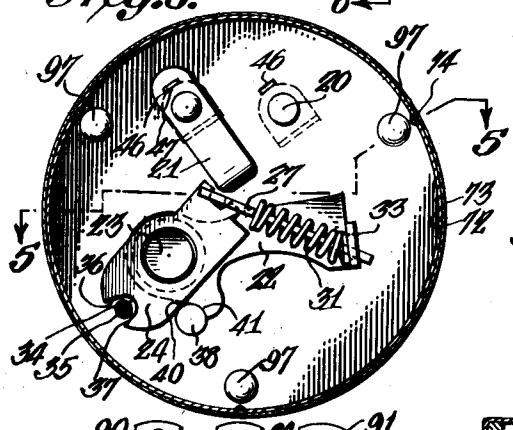


Fig. 7.

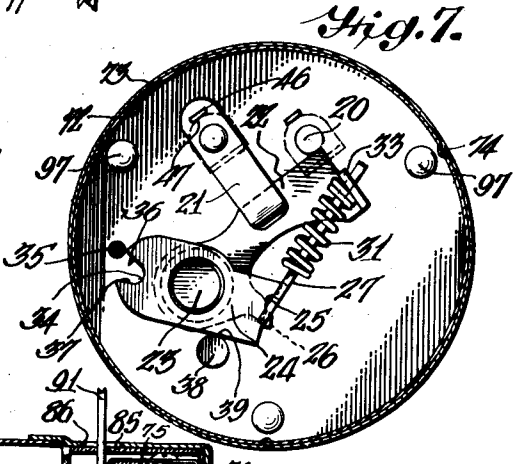


Fig. 8.

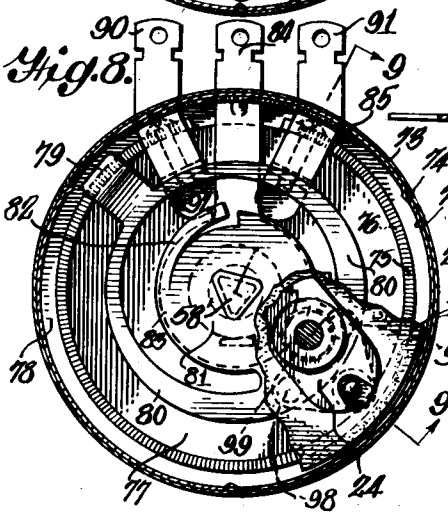
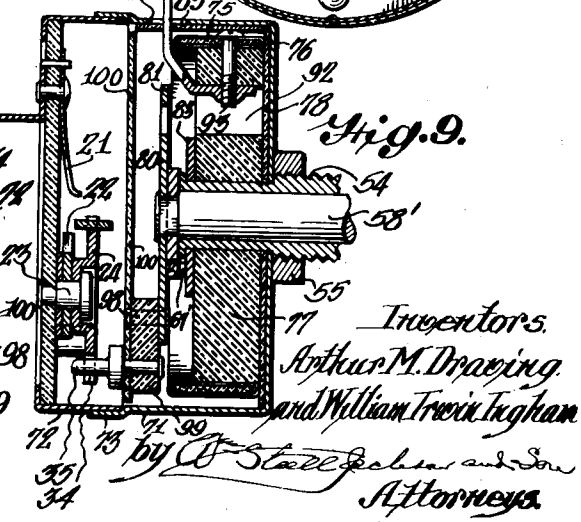


Fig. 9.



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ELECTRIC SWITCH AND THE LIKE

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Fig. 10.

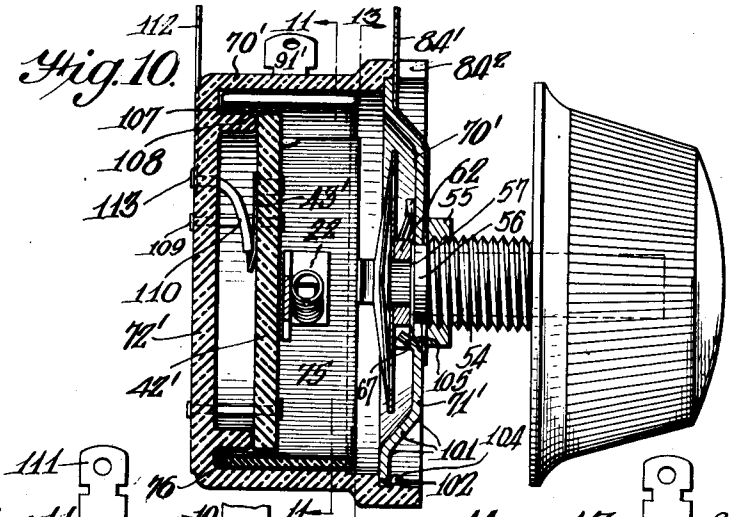


Fig. 11.

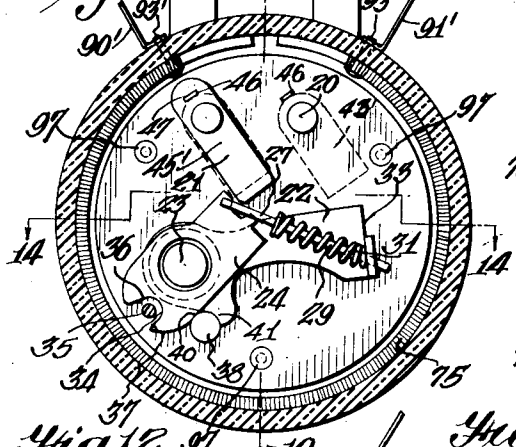


Fig. 12.

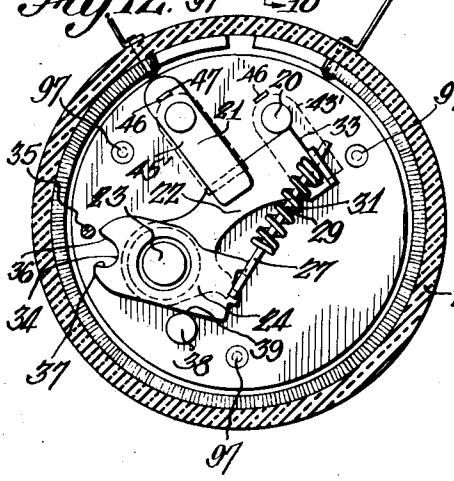


Fig. 13.

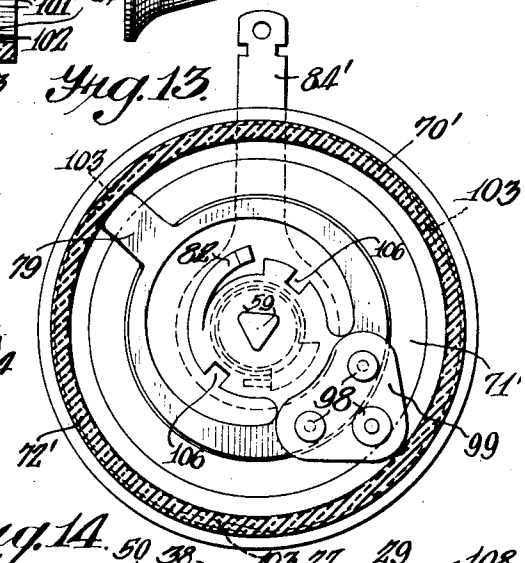
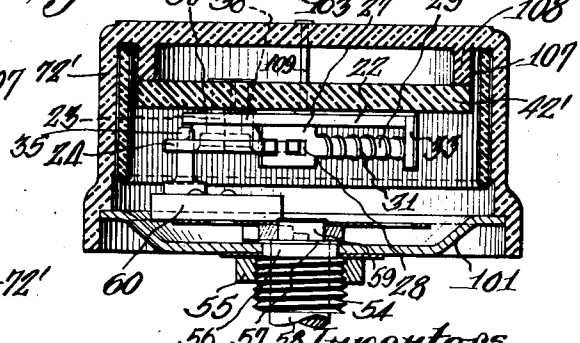


Fig. 14.



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UNITED STATES PATENT OFFICE

2,159,369

ELECTRIC SWITCH AND THE LIKE

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Application February 27, 1931, Serial No. 518,836

4 Claims. (Cl. 201—55)

Our invention relates to electrical switches, either separately or in combination with potentiometers, volume controls, tone controls or resistances.

A purpose of our invention is to throw a switch by means of a tripping lever, preferably pivoted on the switch blade pivot, and to hold the switch blade in open or closed position by pressure from the movable end of the switch blade against the tripping lever in one of its limiting positions.

A further purpose is to provide an extension from a tripping lever, so that the switch may be thrown by engaging the extension.

A further purpose is to shape a tripping lever extension so that a projection moving over a predetermined path can engage the extension in one position, and, after throwing the switch, move free of the extension.

A further purpose is to limit the movement of a tripping lever and of its switch blade by stops, preferably using a single stop to engage the tripping lever in both of its extreme positions and to engage the switch blade in open position.

A further purpose is to mount a switch to be operated by a potentiometer, volume control, tone control or resistance dial within the control or other casing, and to throw the switch by a projection from the movable contact of the device, preferably insulating the projection from the contact.

A further purpose is to place within the casing of a potentiometer, volume control, tone control or other variable resistance, a switch operated by the movable contact, and to open and close the switch in a plane parallel to the plane of movement of the contact.

A further purpose is to trip a full stroke switch by one portion of the movement of a projection from a resistance-varying contact, desirably having the projection move free of the tripping mechanism in other positions.

A further purpose is to locate a switch within the annular space inside a resistance coil and to operate the switch by turning the dial by which the resistance is varied.

Further purposes will appear in the specification and in the claims.

In the drawings we illustrate a few only of the numerous variations in which our invention might be embodied, choosing the forms shown from the standpoints of ease in construction, satisfactory operation and convenient illustration of the principles involved.

Figure 1 is a rear elevation of a switch embodying our invention.

Figure 2 is a section taken upon the line 2—2 of Figure 1.

Figure 3 is a detached perspective view of the principal parts of the switch of Figures 1 and 2.

Figure 4 is a perspective view of a somewhat different form of our invention, in which the switch is located in the same casing as a potentiometer, volume control or tone control and is thrown by moving the dial.

Figure 5 is a section of the form of Figure 4, taken upon the line 5—5 of Figure 6.

Figure 6 is a section upon the line 6—6 of Figure 5.

Figure 7 is a section corresponding to Figure 6, but showing the switch in its opposite position.

Figure 8 is a section upon the line 8—8 of Figure 5.

Figure 9 is a fragmentary section upon the line 9—9 of Figure 8.

Figure 10 shows a variation in a section taken upon the line 10—10 of Figure 11.

Figure 11 is a section of Figure 10 upon the line 11—11.

Figure 12 is a view corresponding to Figure 11, showing the switch in its closed position and omitting some of the contacts extending beyond the casing.

Figure 13 is a section upon the line 13—13 of Figure 10.

Figure 14 is a section of Figure 11 upon the line 14—14.

In the drawings like numerals refer to like parts.

Numerous switches upon the market will operate by motion transmitted through turning a shaft, but relatively few switches may be thrown by substantially translatory movement of a switch operating projection, and of these, even fewer embody the full stroke feature.

In switches intended for opening and closing electric lighting circuits, radio circuits and the like, provided suitable electrical and mechanical characteristics are present, cheapness is the prime essential. The elimination of a single part or the change of a part so that it may be produced by a cheaper process, may make it possible to sell a switch which could not otherwise be placed upon the market.

We have invented a switch which meets the electrical and mechanical demands exceptionally well, and at the same time is extremely simple in construction. Aside from the switch blade and its pivot, only three parts are required in our preferred construction to perform both the tripping and full stroke functions. Of these, one is a

spring and the others are extremely simple stampings.

Essentially this embodiment of our invention involves the use of a tripping lever to throw the switch blade through a toggle of which the tripping lever forms one element.

In the drawings we illustrate our switch separately and also embodied in two slightly variant forms of volume control. We will first describe the construction of the switch proper, as seen in Figures 1, 2, 3, 5, 6, 7, 9, 11, 12 and 14.

The switch contacts comprise a stud **20** and a spring strip **21**, which are connected together by a switch blade **22** when the switch is in closed position as seen in Figures 7 and 12. The switch blade **22** is pivoted at **23**, and moves to open position as shown in Figures 6 and 11.

On a pivot line within the edge of the switch blade and preferably on the switch blade pivot **23** as shown, we place a tripping lever **24**, which is free to turn with respect to the switch blade **22**.

One end of the tripping lever **24** is notched at **25** to engage a cooperating notch **26** in a plunger **27**.

A recess **28** in the plunger **27** permits the plunger to fit firmly into the tripping lever notch **25** without engaging the opposite walls of the notch.

The plunger **27** is reduced in width at **29**, forming shoulders **30** against which a spring **31** surrounding the reduced portion **29** of the plunger, is held. The other end of the plunger passes through an opening **32** in a tab **33** turned out perpendicularly from the movable end of the switch blade **22**. The tab **33** holds the spring, while the plunger is free to move through the tab.

The tripping lever **24** is notched at **34**, opposite to the notch **25**, for engagement of a tripping projection **35**. The edges **36** and **37** of the notch **34** are preferably not symmetrical, so that the tripping projection may move out of the notch on one side.

A single stop **38** serves to limit the movement of the tripping lever **24** in both open and closed positions and of the switch blade **22** in open position. When the switch is closed, the shoulder **39** of the tripping lever engages the stop **38** as seen in Figures 7 and 12. In open position of the switch, the portion **40** of the tripping lever engages the stop, and the portion **41** of the switch blade **22** also engages the stop, but the engagements are upon different portions of the stop as seen in Figures 6 and 11, so that the resultant lateral pressure against the stop is not excessive.

The operation of the switch embodies the full-stroke principle. Considering the switch in closed position as shown in Figures 7 and 12, the switch blade **22** is resiliently pressed against the switch contacts **20** and **21** by the spring **31**. The spring **31** acts at one end against the movable end of the switch blade **22** and at the other end, through the plunger **27**, against the tripping lever **24** and ultimately against the stop **38**.

It will be evident that the plunger **27** and the tripping lever **24** form a toggle, from which the switch blade is resiliently pressed into closed position.

The switch is shown in open position in Figures 6 and 11.

To open the switch, the tripping lever **24** is moved to its opposite limiting position in any suitable manner, as by contact of the tripping projection **35** against the edge **36** of the tripping lever notch **34**. This swings the toggle to the other side of its neutral position, so that the tripping lever portion **40** engages the stop **38**, and the plunger **27** swings about the walls of the opening **32** in the switch blade tab **33** as a pivot, while the walls of the notch **26** in the swinging end of the plunger **27** maintain their engagement with the walls of the notch **25** in the tripping lever **26**.

Shifting of the position of the toggle compresses the spring **31**, so that as soon as the toggle passes its neutral position, the switch blade is snapped to open position under the action of the spring, simultaneously with or even before the arrival of the tripping lever against the stop. The switch blade **22** comes to rest when the portion **41** of the switch blade strikes the stop **38**.

The details of the switch housing and of the means for operating the tripping projection are immaterial to the broad aspects of our invention. However, certain features of the housing and of the operation of the tripping projection cooperate very desirably with the switch of our invention, particularly because the plane of movement of the switch blade in opening and closing is the same as the plane of movement of the tripping projection, so that the switch assembly may be made very compact.

In Figures 1 to 3 we show our switch in a casing intended to hold the switch alone. The parts of the switch proper, as previously described, are mounted upon a base **42** of insulating material. The stud **20** passes through the insulation and is riveted to a contact **43** on the back. The switch spring contact **21** is secured by a rivet **44** to a contact **45**. From both of the contacts, **43** and **45**, ears **46** have been bent down and extended through the insulation to prevent turning of the contacts **43** and **45**. An opening **47** in the spring contact **21** admits the end of an ear **46**, to prevent the contact **21** from turning.

Openings **48** and notches **49** in the contacts **43** and **45** faciltate attachment of wires to the contacts. The stop **38** is the head of a rivet passing through the base **42**. The switch blade pivot **23** is also desirably a rivet, on which a washer **50** is placed to provide a smooth bearing for the switch blade.

The switch is enclosed within a casing **51**, flanged outwardly at **52** to hold the insulating switch base and peened at **53** to prevent removal of the base.

The casing is adapted to be supported from a panel by tightening a nut upon a bushing **54** against a lock nut **55**. The bushing is reduced in diameter at **56** where it passes through an opening in the casing **51**, and turned over at **57** to unite the bushing to the casing.

Through the interior of the bushing passes a spindle **58** which is coined at **59** at one end to receive an arm **60**, desirably of insulating material, having a tringular opening **61**, and a stop **62** having an opening **63**. The arm **60** and the stop **62** are secured to the spindle by riveting the coined end **59**. On the movable end of the arm **60** is secured a switch tripping projection **35** by riveting at **64** and by extending an ear **65** through the arm **60**.

The stop **62** carries a segment **66**, which moves between limiting positions in contact with one or the other of the clips **67** and **68** pressed up from the body of the casing. In the form of Figures 1 to 3, the spindle **58** performs no other function than that of throwing the switch, so that there is no need for having the switch tripping pro-

jection 35 move out of the slot 34 in the tripping lever 24.

To prevent inward slipping of the spindle 58 we provide a suitable collar 69 on the spindle at the outer end of the bushing 54, preferably making the collar a C washer contracted into a slot in the spindle.

In Figures 4 to 14 we illustrate embodiments of our switch in other apparatus to which it is particularly well suited.

The device illustrated might serve in any of the capacities suggested, namely, as a potentiometer, volume control, tone control or other variable resistance.

The greatest prospective utility is in volume controls and tone controls; but all are variable resistances and we have therefore called the device by that name.

In designing radio panels it is highly desirable to have as few knobs and dials as possible. The initial movement of the variable resistance dial commonly carries the contact over an insulating strip before the resistance winding is reached, and therefore is not directly effective in changing the resistance. It has been proposed to connect the variable resistance contact to a switch, desirably the main circuit switch of the set, so that the switch will be closed by this initial variable resistance dial movement, and, when turning the variable resistance dial back to its initial position, so that the switch will be opened.

In this way the extra knob ordinarily necessary for control of a switch is eliminated. The connection in the past has been made from the variable resistance through a system of levers to a separate switch unit usually supported upon the back of the variable resistance casing.

By our invention we are able to mount the switch within the variable resistance casing proper, where the operating connection between the variable resistance contact and the switch may consist simply of a projection from the variable resistance contact. The operating projection is made to engage and throw the switch at one position of the contact and to travel free from the switch in the other positions.

In order to avoid possible short-circuiting of the switch or the variable resistance, we insulate the tripping projection from the variable resistance contact in all positions. In the drawings we intend the illustration of the variable resistance shown by us to be essentially diagrammatic, since our invention is applicable to any variable resistance having a moving contact maker, whether the moving body is the resistor or a contact sliding along the resistor.

In Figures 4 to 9, the casing 70, desirably made of metal, is formed in two parts, consisting of a front 71 and a rear 72 joined by flanging at 73 and peening at 74.

Within the front part 71 of the casing we show a resistance winding 75 upon a form 76 and annularly surrounding an insulating disc 77. To prevent contact between the resistance winding 75 and the casing, an insulating sheet 78 covers the inside of the front casing face.

The movable contact of the variable resistance consists of a spring metal clip 79 supported by annular arms 80 from a central disc 81 secured upon the variable resistance spindle 58'. Cut from the central disc, a brush 82 wipes over the face of a disc 83 integral with a contact 84 extending through an insulating sheet 85 covering an opening 86 in the casing. The disc 83 has an ear 87 turned down and held in an opening 88 in the insulating disc 77. An ear 89 punched up from the casing front 71 also enters the opening 88. The ears assist in centering the respective parts.

Connection is made to the ends of the resistance winding 75 by contacts 90 and 91 bent into recesses 92 in the disc 77 and secured by screws 93. Where the winding is used as an ordinary rheostat, the contact 84 and one only of the contacts 90 and 91 will be employed, but where the winding is used as a potentiometer, the three contacts will all be used.

The construction of the bushing, spindle and stop mechanism is substantially the same as that shown in Figures 1 to 3, except in a few features as noted. The narrow portion 56 of the bushing extends through the insulating disc 77 and the contact disc 83 and is turned down at 57. A clip 67' is bent up from the contact disc 83 to engage the segment 66 of the stop 62 secured to the coined end of the spindle, and limit movement of the movable contact 79. The single clip 67' engages the stop in both limiting positions.

As seen in Figure 5, the spindle 58 extends through a panel 94 and carries a dial 95 which covers a nut 96 holding the variable resistance to the panel.

Thus far we have described what is essentially a conventional variable resistance. On the back casing portion 72 we mount a switch similar to that shown in Figures 1 to 3. Attachment of the switch base 42 to the casing is desirably made by rivets 97 as shown.

On the movable variable resistance contact 81 we secure in any suitable manner, as by rivets 98, an insulating piece 99 to the outer end of which the tripping projection 35 is fastened. As an additional protection against failure of electrical insulation between the variable resistance and the switch, we secure an insulating partition 100 to the base of the tripping projection 35.

When the movable contact 79 is in its limiting position at the end of the resistance winding connected to the contact 90, as shown in Figure 8, the tripping projection 35, opposite to the movable contact 79, is in the position shown in Figure 6, with the switch open. The spindle 58, contact 79 and tripping projection 35 cannot travel further counter-clockwise (as seen from the front) because of the spindle stop 62 and also because of the switch stop 38.

Movement of the spindle 58 clockwise is however possible, and the first part of the clockwise stroke is effective to throw the switch from the open position as shown in Figure 6 to the closed switch position as shown in Figure 7. Further clockwise movement of the spindle 58 disengages the tripping projection 35 from the slot 34 of the tripping lever 24. The tripping projection 35 is seen in Figure 7 just after leaving the slot 34.

Further clockwise travel of the spindle 58 carries the movable contact 79 over the variable resistance winding 75, varying the resistance connected between the respective contacts 90, 84 and 91 in the usual manner.

Reversal of the direction of turning of the spindle first carries the movable contact 79 over the resistance winding 75, and finally causes the tripping projection 35 to engage the tripping lever 24 and open the switch.

Thus the initial and final ranges of movement of the variable resistance are employed to close

and open a switch, which will ordinarily be the main circuit switch in a radio set.

In Figures 10 to 14 we illustrate a somewhat different form of composite variable resistance and switch, in which the switch is located within the annular space inside the variable resistance, thus minimizing the space requirement and permitting closer connection between the variable resistance spindle and the switch.

The variable resistance in this form is essentially the same as that illustrated in Figures 4–9 except for variations in detail. The casing 70' is formed in two parts, of which the front portion 71' is metallic and the rear portion 72' is molded from suitable insulating material. The front portion 71' has been annularly flanged at 101 to fit within an annular depression 102 in the molded rear casing portion 72'. At points 103 part of the outer edge of the metal casing portion 71' has been cut away to allow the casing to clear projections 104 extending from the walls of the depression 102 and to permit the front casing portion 71' to be held in position by turning it with respect to the rear casing portion 72'.

The terminal 84' lies on the outside of the front casing portion 71' and extends through the terminal notch 84^2 in the rear casing portion, 72'. The notch 84^2 prevents turning of the front casing portion 71' with respect to the rear portion 72'. The terminal 84' is united to the casing portion 71' by turning down the end 57 of the bushing 54. A projection 67, punched up from the front casing portion 71', engages the movable stop 62 as in the other forms. An ear 105, turned down from the terminal 84', passes through the opening in the front casing portion 71' formed by punching out the projection 67, to assist in centering the terminal.

The method of attachment of the movable stop 62 and of the movable contact 79 to the spindle 58 is identical with that used in the other forms. In Figure 13 we illustrate notches 106 in the movable contact disc to assist in connecting together a plurality of contacts for operation by a single spindle, where that is desired.

The resistance winding 75 and the form 76 differ somewhat from that shown in Figures 4 to 9, as the winding has been made wider to fit into a depression 107 formed by an annular ridge 108 in the base of the molded casing 70'. Connection to the ends of the resistance winding is provided by contacts 90' and 91' secured to the winding by screws 93', extending through the casing.

The switch has been mounted on a base 42' secured to the casing by rivets 109, and rested on the inner edge of the ridge 108. Leads 110, extend from the switch contacts 43' and 45' to contacts 111 and 112 secured to the rear of the casing 70' by rivets 113.

It will of course be evident that the space between the switch base 42' and the rear of the casing portion 72' may be used as desired, for example to hold a fixed resistor.

The structure just described is particularly desirable because space radially within variable desistance windings which otherwise would not be advantageously used, is employed to hold the switch. This is made possible because the switch opens and closes in a plane parallel to the plane of movement of the movable contact.

It will be evident, that, besides providing a distinctly useful switch, we provide a switch which is particularly well suited for embodiment in a variable resistance, because it may be thrown by a projection from the movable contact during a part only of the movable contact travel.

While we show a form of switch in which both contacts are touched by the switch in closed position only, it will of course be apparent that connection could be made permanently to the switch blade, as for example at its pivot, thus removing the necessity for one of the switch contacts shown. The number of contacts used is not vital to the broad aspects of our invention.

In view of our invention and disclosure variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art, to obtain all or part of the benefits of our invention without copying the structure shown, and we, therefore, claim all such in so far as they fall within the reasonable spirit and scope of our invention.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. In a composite potentiometer, volume control, tone control or rheostat with a switch, a casing, a susbtantially cylindrical resistance strip within the casing, a contact touching the strip and movable with respect to it, a switch within the casing and the strip and connection between the contact and the switch adapted to throw the switch in one position of the contact.

2. In a composite potentiometer, volume control, tone control or rheostat with a switch, a casing, a resistance strip within the casing conforming generally to the inner contour of the casing, a contact touching the strip and movable with respect to it, a projection from the contact, and a full stroke switch within the casing and the strip having tripping mechanism adapted to be engaged and thrown by the projection in one position of the contact.

3. In a composite potentiometer, volume control, tone control or rheostat with a switch, a casing, a resistance within the casing, a contact touching the resistance, means for moving the contact with respect to the resistance, a snap switch within the casing, connection between the contact and the switch adapted to throw the switch in one position of the contact, and a rotatable insulating partition carried by the contact moving means between the contact and the switch and movable with the contact, the edges of said partition extending closely adjacent the inner wall of the casing.

4. In a rheostat and switch unit, a cylindrical shell member, a base mounted in one end thereof, a resistance element on said base, a shaft journalled in said base and extending into said shell, a disc carried by said shaft at its inner end and rotatable therewith, said disc completely closing the shell intermediate its ends, an end member in said shell opposite said base carrying a switch mechanism on its inner face, and means on said disc to actuate said switch mechanism.

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