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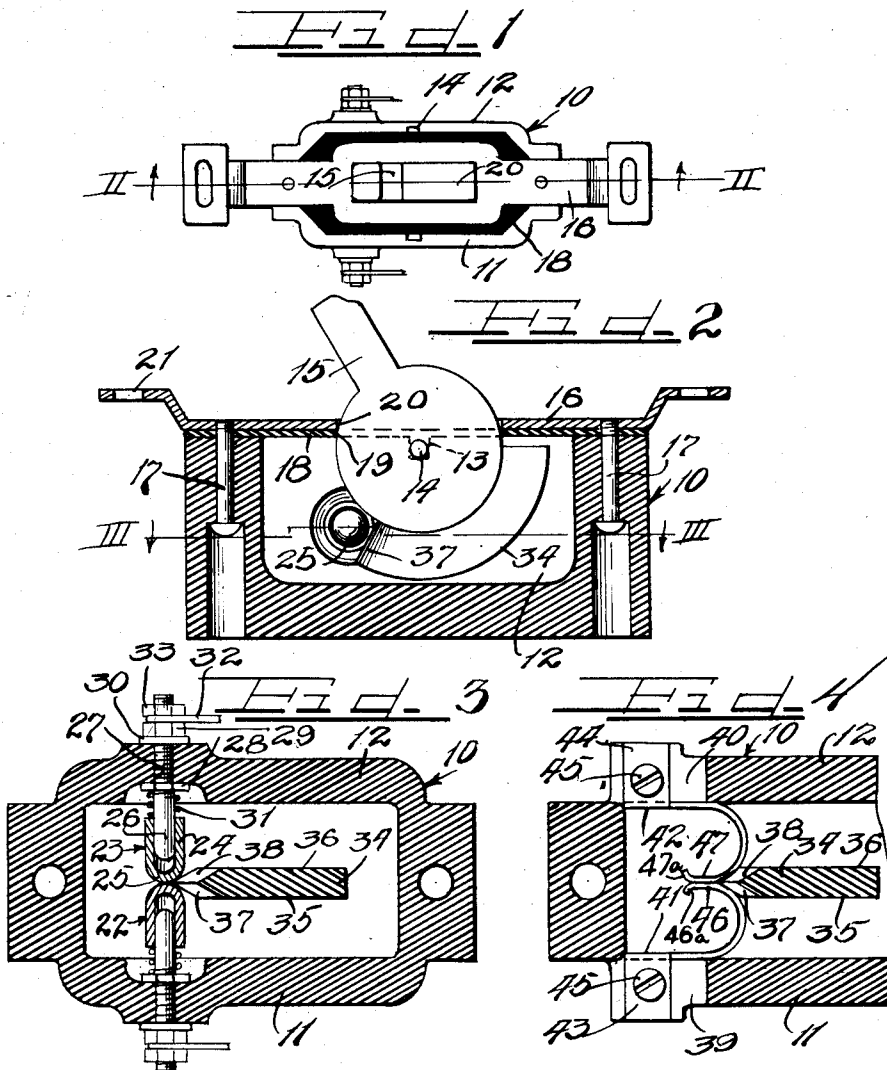
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2,254,347

ELECTRIC SWITCH

Filed April 27, 1938

2 Sheets-Sheet 1



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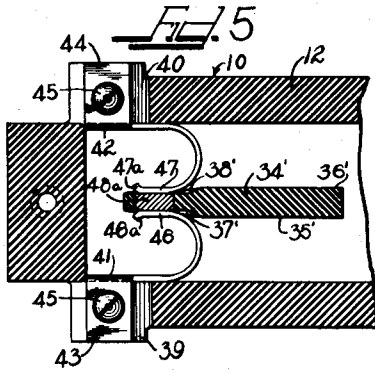
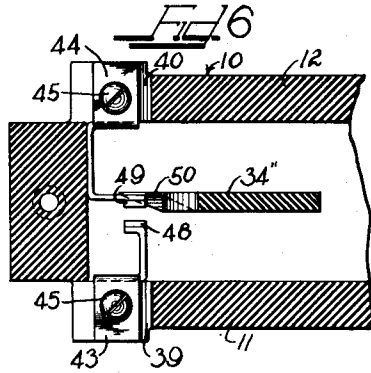
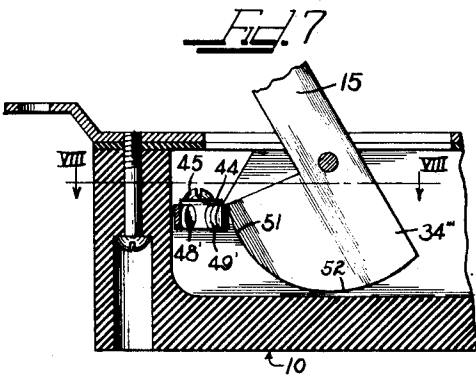
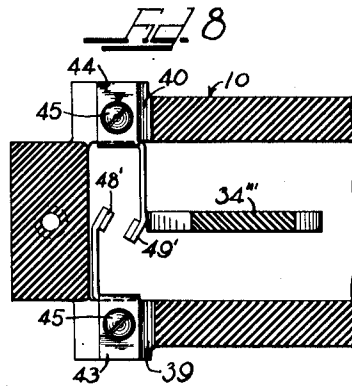
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ELECTRIC SWITCH

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1 Claim. (Cl. 200—165)

The present invention relates in general to electric circuit interrupting means and is more particularly concerned with improvements in a construction of electric switches of the so-called toggle type such as ordinarily used in homes, stores, hotels, and the like for control of domestic electric circuits.

The toggle switches of present construction operate with a snap action and are very noisy in their operation. The resounding click when the switch is turned on or off is especially disturbing to people of nervous temperament and is in general a prime source of annoyance. In fact, the turning on and the turning off of these switches have been known to awaken light sleepers not only where the switch is located in an adjacent room, but also where the switch is located in an adjacent building and the windows are raised.

Realizing the inconvenience and objections to the operating noises emanating from these switches, I have found that these noises are, in the main, caused by the impact of the moving parts on the switch, these parts being movable with high velocity and snap action, with stop means such as the porcelain or Bakelite from which the switch housing is made. Moreover, the striking together of these parts is accentuated, due to the fact that the switch is ordinarily mounted in a metal box opening towards the room in which the switch is located, this box acting as a sounding board to increase the intensity of the operating noises of the switch.

Having in mind the objections to the present types of snap switches, the present invention has for its main object the provision of a control switch incorporating novel means for rendering its operation substantially noiseless.

A further object of the herein described invention, is to provide improved means in a switch for use in homes, hotels and the like, wherein the circuit controlling contacts are actuated to closed and opened positions in a novel manner without setting up impact and other objectionable noises.

A still further object of the invention is to eliminate in switches of the toggle type the usual spring for closing and opening the contacts with a snap action by selectively moving it from one side to the other of a dead center position, whereby the impact noises of the parts acted upon by the spring are likewise eliminated.

It is also an object to provide a switch of the herein described type having improved contact actuating means including a novel arrangement

of parts which tend to keep the switch in the last position to which it has been actuated.

Still another object is to provide in a switch of the herein described type, improved mechanism wherein an insulating barrier is disposed between the switch contacts when they are in open position.

In accordance with the general features of the invention, it is proposed to utilize a different type of contact actuating mechanism than that usually found in the well known types of snap switches. In my improved construction I prefer to provide a pair of contacts in end to end relation, these contacts being actuated by means of suitable springs towards each other so that their adjacent ends will normally be in contact. Adjacent the engaged ends of these contacts and to one side thereof, there is provided a cam member of insulating material which is provided with a bevelled edge arranged to enter between the contacts when the cam is moved towards them. This movement forces the contacts apart and carries them onto the body of the cam where they make pressure engagement with parallel surfaces. In the open position of the contacts, this cam which is made of a suitable insulating material, forms an insulating barrier between the contacts.

It will also be noted that the bevelled edge tends to hold the cam in contact closed position of the switch, but that when the contacts are in engagement with the parallel surfaces of the cam the pressure of the contacts frictionally hold the cam in the open contact position of the switch.

The cam is provided with a digital member which extends to the exterior of the switch housing so that the cam may be manually moved to actuate the switch to on and off positions. This arrangement eliminates the snap action of the ordinary toggle switch, whereby the usual operating noises are also eliminated, and provides a very efficient circuit interrupting device which is substantially noiseless in operation.

Other objects and features of the present invention will more fully appear from the following detailed description taken in connection with the accompanying drawings which illustrate several embodiments thereof and in which:

Figure 1 is a plan view of a switch embodying the features of the present invention;

Figure 2 is an enlarged longitudinal vertical section through the same showing the cooperative relationship of the various parts thereof taken substantially on line II—II of Figure 1;

Figure 3 is a horizontal section of the same,

taken substantially on line III—III of Figure 2;

Figure 4 shows a fragmentary horizontal section similar to that shown in Figure 3 of a slightly modified form of construction;

Figure 5 is a view similar to Figure 4, but showing an alternate construction;

Figure 6 is a similar view of another modification;

Figure 7 is a fragmentary longitudinal vertical section of still another modification of the invention; and

Figure 8 is a fragmentary horizontal section of the same, taken substantially on line VIII—VIII of Figure 7.

As shown on the drawings:

In the illustrated embodiments of the present invention, there is shown in Figure 1 a circuit interrupter or switch embodying the features of the present invention.

The switching mechanism is contained within a hollow shell or casing, as generally indicated at 10, this casing being constructed of porcelain, Bakelite or any other suitable insulating material. This casing or shell is open at its top and has laterally spaced side walls 11 and 12 which are respectively provided at their upper edges with centrally disposed and vertically extending grooves 13 which form seat supports for the ends of a horizontally disposed shaft 14.

For actuating the switch, there is provided an operating lever 15 which is mounted for swinging movement on the shaft.

This shaft is retained against removal from the supporting grooves 13—13 by means of a bar 16 which extends longitudinally of the housing at its top and is secured in position by means of holding down screws 17—17 extending upwardly through appropriate passageways in the housing.

The bar 16 is insulated on its under surface by the usual insulating member 18. Both the bar and insulating member are provided with intermediate openings 19 and 20 which are in registration and enable the operating lever to extend to the outside of the housing. The ends of the bar 16 project beyond the ends of the housing and are provided with the usual apertures 21—21 by means of which the bar and its associated housing may be secured in the usual metallic switch box.

Within the housing I provide a pair of contact assemblies 22 and 23 of similar construction. Each contact assembly comprises a hollow cap member 24 having a rounded closed end 25. This cap is longitudinally supported for axial movement on the end of a cap supporting stud 26 which is supported in a suitable opening 27 in the switch housing wall.

The stud 26 is threaded where it extends through the wall and is provided with nuts 28 and 29 disposed adjacent the inner wall surface and outer wall surface respectively, the nut 29 being tightened against a washer 30.

Disposed between the innermost end of cap 24 and nut 28 is a suitable spring 31 which normally acts to bias the movement of the contact cap away from its associated wall.

Since the supporting stud 26 has its ends respectively disposed within the housing and outside the housing, the outermost end of this stud may be utilized as a terminal to which a suitable electric circuit conductor 32 may be secured by means of an additional nut 33 which clampingly cooperates with the nut 29 to secure the conductor to the stud.

It will be noted that the contact assemblies 22 and 23, as shown in Figure 3 are disposed in axial alignment so that the contact caps associated with each contact assembly will be moved into end-to-end engagement by the action of their respective springs.

In this arrangement of the invention, it is contemplated that an electrical circuit through the contacts will be interrupted by separation of the contact caps. This is accomplished by means of an arcuate cam member 34 which is carried by the operating lever construction 15. This cam member may be separately formed from the operating lever and secured thereto in any appropriate manner. However, it is preferred to form the cam member integrally with the operating lever and construct the lever and cam member of a suitable insulating material such as Bakelite or the like.

The cam member is provided with a body portion having parallel side surfaces 35 and 36 which terminate at the end of the cam, which is adjacent the contact caps, in obliquely disposed converging surfaces 37 and 38 to form a bevelled or wedge shaped edge at the point of engagement of the contact ends.

By relatively moving the cam, as shown at Figure 3, it will be apparent that the bevelled edge of the cam will initially enter between the contacts and spread them apart, the obliquely disposed surfaces 37 and 38 carrying the contacts onto the parallel surfaces 35 and 36 of the cam body.

When the ends of the contacts are in engagement with surfaces 37 and 38, the action of the contact springs, tending to force the contacts towards each other, will set up force components which will tend to oppose movement of the cam to a position between the contacts. Thus the contacts normally tend to hold the cam in circuit closed position of the switch. On the other hand, when the switch operating lever 15 is moved towards the right end of the switch housing, as shown in Figure 2, the cam will be positioned between the contacts, and in this position, the pressure of the contacts against the parallel surfaces 35 and 36 will operate to frictionally retain switch operating lever in switch open position.

With the contacts in open position, the cam forms an insulating barrier between these contacts so that there is no possibility of the circuit becoming accidentally closed for any reason.

Referring to Figure 4, there is disclosed a slightly different construction which operates in the same manner and upon the same principles as the preferred form of construction. This modified arrangement is, however, of simpler construction, and less expensive to manufacture.

In this modification of the invention, the housing walls 11 and 12 are respectively provided with cut-out portions 39 and 40 which define openings through which contact strips 41 and 42 may have their ends 43 and 44 respectively disposed to provide terminal connections, these ends being suitably anchored and provided with terminal screws 45.

These contact strips respectively extend from their anchored ends along the inner associated wall of the housing and are then carried towards the center of the housing to form generally J-shaped contact members. The free ends of these members as shown at 46 and 47 are held in engagement by the natural resiliency of the contact strip material.

As shown at 46a and 47a, the tip ends of the contacts are oppositely deflected at an angle. Such construction causes a quicker breaking of any arc which might develop due to overload or short circuit at the time the contacts are being separated to open circuit therethrough.

The position of the contacts in this form of the invention are controlled by a cam member 34 in the same manner as the previously described arrangement, shown in Figure 3, and the principals of operation are likewise the same.

It will be noted that the arrangements hereinabove described have their contacts normally in engagement or closed circuit position. It will be apparent, however, that the contacts might normally be in spaced apart relation and actuated by the cam into engaged or closed positions. Such arrangements are illustrated in Figures 5 to 8 inclusive.

In general, the arrangement shown in Figure 5 is quite similar to that shown in Figure 4. In this alternate construction, however, instead of the contacts being normally engaged, they are maintained separated by the cam 34' which carries a metal insert 48a adapted to bridge the contacts when the cam is actuated to circuit closing position. Movement of the cam to circuit open position carries the cam surfaces 37' and 38' between the contacts and guides them onto the parallel surfaces 35' and 36'. During this movement of the cam, the contacts are disengaged from the metal insert and are spread further apart. Due to the resiliency of the contacts, they will make pressure engagement with the surfaces 35' and 36' and tend to hold the cam against movement from such position. It will be noted that in the open position of the switch the cam interposes an insulating barrier between the contacts, the same as in the arrangements previously described.

Referring to Figure 6, this modification comprises a pair of spaced contacts 48 and 49 which are respectively connected with the terminals 43 and 44. The contact 48 is rigidly supported, whereas the contact 49 is resiliently supported for movement into and out of engagement with the contact 48. The resilient support for contact 49 normally maintains the contact out of engagement with contact 48, and a cam member 34'' in this case is provided for actuating contact 49 into engagement with the contact 48.

The cam 34'' differs somewhat from the cams previously described in that it has only one beveled face 50, as shown, which extends at an angle from one of the parallel surfaces to the other parallel surface of the cam member. The action of the cam face 50 is to move the contact 49 in a direction axially of the cam member. As in the previously described constructions, the cam is arranged to hold the cam member in the last position to which it has been operated, and when the contacts are in engagement the contact 49 will bear against the adjacent parallel surface of the cam member.

Referring to Figures 7 and 8, these figures disclose a modification which is in general similar to the modification just described and as shown in Figure 6.

It differs, however, in that the cam 34'' acts in a radial direction instead of axially. Accordingly, the cam edge is provided with an eccentric edge portion 51 which connects with a portion 52 spaced at a constant radial distance from the center of rotation or pivot of the cam. The contacts, as shown at 48' and 49', are in this instance displaced substantially ninety degrees from the position shown in Figure 6. This is, of course, to take care of the actuation of the contacts in response to a cam having a radial instead of an axial throw. Otherwise, the operation of the switch is the same as previously described.

From the foregoing description, it will be apparent that the present invention provides an improved circuit interrupter or switch construction embodying novel means for rendering its operation substantially noiseless; which is particularly adapted for homes, hotels and the like where noiseless operating switches are particularly to be desired; which construction eliminates the spring actuating mechanism on the toggle switch and does away with the impact noises of the operative parts of such switches; which includes novel operating means which are so arranged as to tend to keep the switch in the last position to which it has been actuated; and which separates the contacts by an insulating barrier when the contacts are in open position.

It is, of course, to be understood that although I have described in detail several embodiments of my invention, the invention is not to be thus limited, but only insofar as defined by the scope and spirit of the appended claim.

I claim as my invention:

A quiet-operating switch comprising an elongated and hollow casing open at its top and including a pair of spaced opposed longitudinally extending walls each provided with a recess in its upper face, an elongated actuating member of insulating material having pin means thereon entered in the recesses to support the member for rotation on the side walls, removable means on said side walls and overlying the pins to limit vertical movement of the pins, said actuating member having a finger-engageable lever portion above said pins and having an arcuate lower portion within the casing, spring-impelled contact elements on each of said walls and within the casing and providing a pair of opposed contact faces for circuit-closing engagement, said arcuate portion being arranged swingable in one direction to provide surfaces movable forwardly and upwardly between said contact faces to separate them and to then be frictionally held by them while the contacts are in circuit-opening position, and being arranged swingable in the opposite direction from the contact-separating position to permit the contact faces to engage.

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