

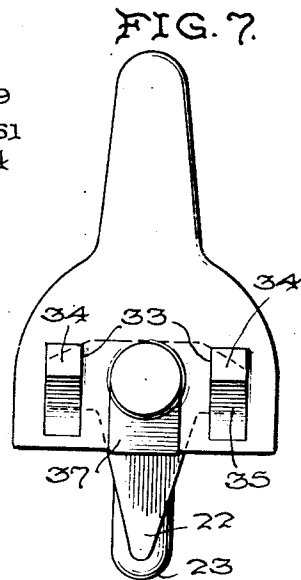
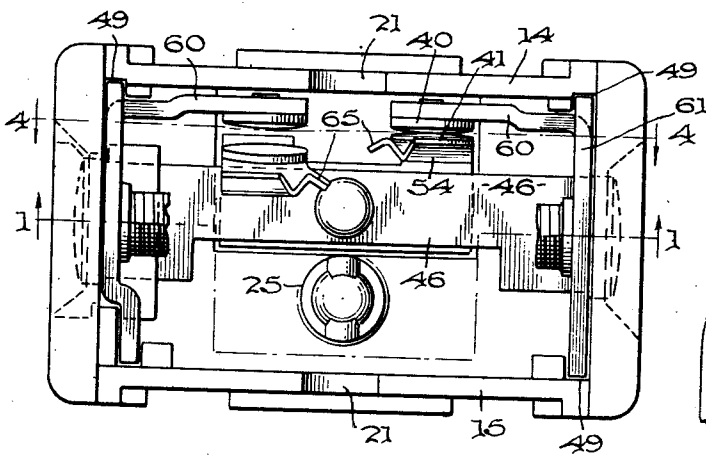
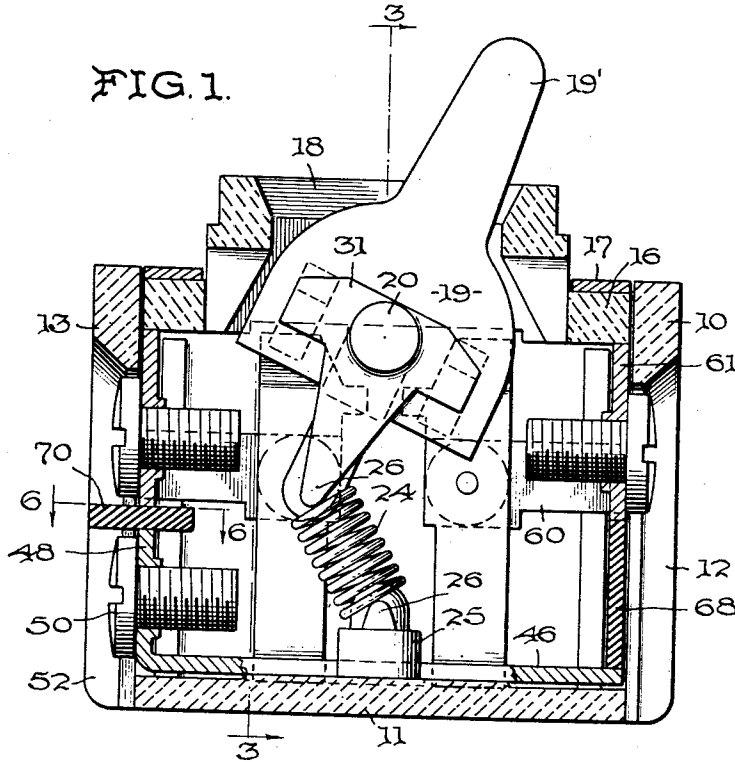
Feb. 16, 1954

V. R. DESPARD
SWITCH

2,669,613

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2 Sheets-Sheet 1



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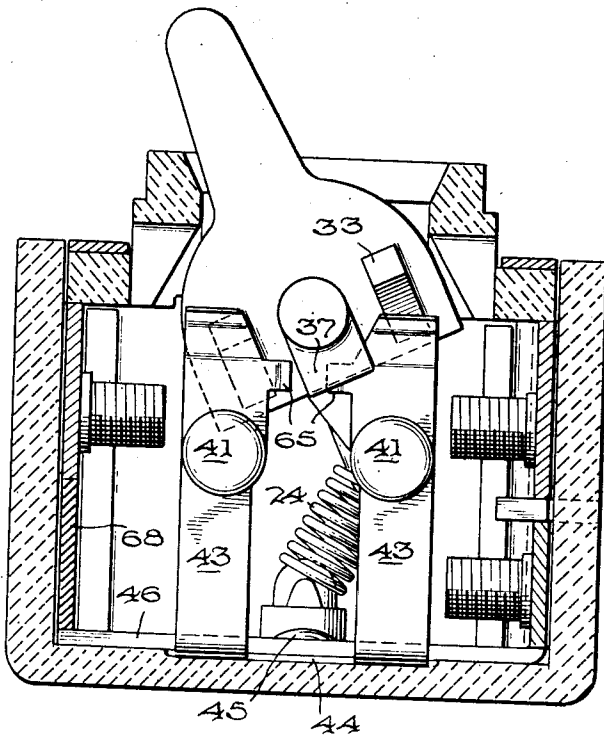
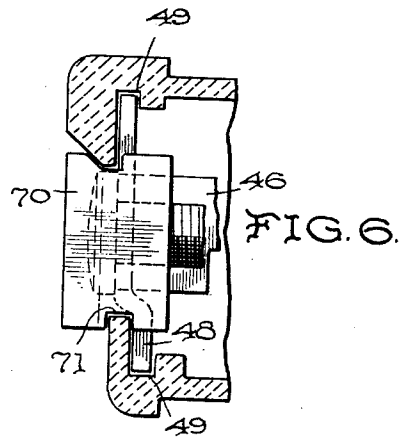
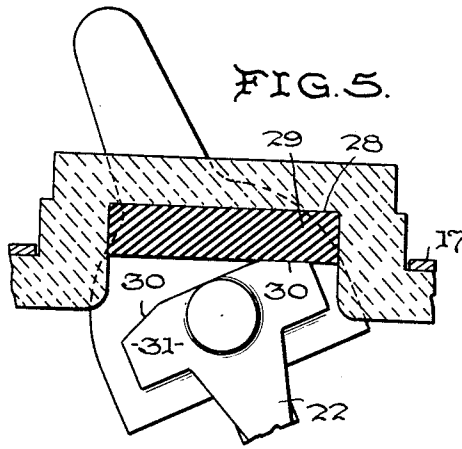
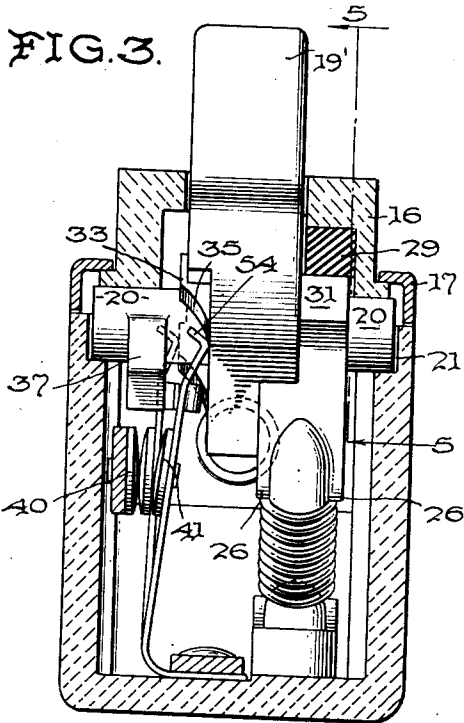


FIG. 4.
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UNITED STATES PATENT OFFICE

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CAM SWITCH

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6 Claims. (Cl. 200-6)

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This invention relates to switches and more particularly to wall switches of the lever operated alternating current type.

It is a general object of the present invention to provide a novel and improved switch of the lever actuated alternating current type wherein a contact mounted intermediate the ends of a cantilever leaf spring is cammed toward and from a stationary contact.

More particularly it is an object of the present invention to provide in a switch of the type described a novel operating mechanism for a contact carrying leaf spring comprising an operating lever mounted to oscillate in a plane substantially parallel to that of the spring leaf and fitted with a face cam to engage the free end of the spring and flex it in contact closing direction.

An important object of the present invention resides in the provision of means on the cam carrying operating lever for applying a positive release pressure on the spring for disengaging the contacts.

Another important object of the invention resides in the side-by-side assembly of two sets of operating contacts arranged for alternate opening and closing by cams on the single operating lever.

A further important object of the invention comprises quieting means for limiting and cushioning the movements of the operating lever which acts under the direction of an over-center spring.

An important feature of the invention resides in the unique assembly of the fixed and movable parts of the switch construction in the enclosing housing.

Other and further objects and features of the invention will be more apparent to those skilled in the art upon a consideration of the accompanying drawings and following specification wherein is disclosed a single exemplary embodiment, with the understanding that such changes and modifications may be made therein as fall within the scope of the appended claims without departing from the spirit of the invention.

In said drawings:

Fig. 1 is a longitudinal central section, through a switch constructed in accordance with the present invention, taken on broken line 1-1 of Fig. 2;

Fig. 2 is a top plan view thereof with the cover and operating lever removed and showing the contact assembly and construction;

Fig. 3 is a transverse section taken on broken line 3-3 of Fig. 1;

Fig. 4 is a longitudinal section through the

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meeting plane of the contacts taken on line 4-4 of Fig. 2;

Fig. 5 is a fragmentary section taken on line 5-5 of Fig. 3 and illustrating the operating lever buffer;

Fig. 6 is a fragmentary section taken on line 6-6 of Fig. 1 showing the mounting of the terminal separating insulator; and

Fig. 7 is a side elevation of the operating lever illustrating the contact-spring actuating cams.

The switch of the present invention is preferably fully encased for use in switch and wall boxes and the like, and for this purpose a one-piece molded insulation housing 10 includes the enclosed bottom 11, slotted end walls 12 and 13, solid side walls 14 and 15 and an open top. A cover 16 serves to close the opening in the housing and is positioned and secured by a metal collar 17 forming no part of the present invention.

The cover 16 is provided with an elongated opening 18 for the passage of handle 19' from operating lever 19, which handle extends outside the housing for manual manipulation. This lever is preferably molded integrally from suitable insulating material and includes laterally projecting trunnions 20 received in complementary shaped half notches 21 (see Figs. 2 and 3) in the side walls of the housing and cooperating half notches in the cover whereby it is journaled for oscillation in the manner of the usual toggle switch lever. A depending arm 22 on the lever is fitted with a semi-spherical lower end 23 adapted to bear on a helical compression spring 24 whose opposite end rests on the semi-spherical end of a stud 25 projecting up from the bottom of the housing. Both this stud and the arm depending from the lever have fulcrum wings 26 thereon to support the spring. The arrangement just described provides a lever with an over-center spring, which insures it moving to either of two extreme positions when turned beyond the center.

To provide limit stops for the operating lever a recess 28 in the extended neck portion of the cover receives a block of suitable resilient material 29 having a flat under face which cooperates with the clipped corners 30 of a lateral protuberance 31 on the operating lever adjacent one of the trunnions 20. The stopping engagement between a corner 30 and the cushion member serves to silence the operation and limit the movement of the lever in either direction.

The face of the lever opposite that fitted with the cushion engaging portion is provided with a pair of cams 33 spaced on either side of the corresponding trunnion, as best seen in Fig. 7.

These are shown as rectangular in elevation and each includes a relatively square flat dwell portion 34 and a concave surface 35 which substantially merges with the side face of the lever unit. The trunnion on the same side of the lever as the cams is provided with a depending rectangular arm 37 having a flat radial inner face, seen best in Figs. 3 and 4, and well spaced outward from the cams.

The switch is of the A. C. type, that is, it is intended to open and close alternating current circuits only. Here, after an initial minute opening between relatively large contacts, the arc is quenched as current passes through zero, and does not restrike. This type of switch is preferably equipped with a pair of silver contacts for each circuit to be opened and they are of substantial diameter and preferably convex on the meeting faces to insure good engagement in the event of inaccurate confrontation. Two pairs of such contacts is arranged for alternating actuation by the cams, in the switch shown, in order to provide what is commonly termed a three-way or lazy man's switch but more properly termed a single pole double throw switch. One contact 40 of each pair is stationary, while the other, shown at 41, is movable and carried at such an intermediate position between the ends of a cantilever leaf spring 42 that it is situated at a nodal point resulting from flexure of the spring. This provides for minimum vibration and chattering on closing the circuit.

These leaf springs are preferably formed integral with and bent up from the sides of a connecting element 44 which is received in a shallow recess in the bottom wall and is riveted at 45 to a heavy transverse strap 46 which extends the full length of the bottom wall and has formed integral with one end thereof an upturned terminal plate 48 which extends laterally into the vertical slots 49 in the corners of the housing, as seen in Fig. 6. The opposite end of the strap is widened to provide a pair of prongs received in similar slots in the opposite corners of the housing. A terminal screw 50 is threaded into the terminal plate, after assembly, and its head is available in slot 52 in end wall 13 of the housing.

One edge of the strap 46 is offset to clear the stud 25 and the contact carrying springs extend upwardly from the opposite edge, as seen in Fig. 2, into proximity to the paths of the cams 23. The extreme upper end of each spring is sharply bent toward the cam and then reversed, as seen at 54 in Fig. 3, to provide a transverse ridge bearing on the surface of the corresponding cam resulting from the initial set and shape of the spring. This ridge bears on the cam from the open circuit position shown at the right in Fig. 4 to the closed circuit position shown at the left therein. In the open circuit position, the ridge on the free end of the spring is at the lowermost portion of the concave section of the cam and during movement of the lever the cam moves beneath the ridge until it finally rests on the dwell section 33 and holds the circuit closed with considerable flexure of the spring to insure against chatter.

Each contact carried by one of the springs is adapted to cooperate with one of the stationary contacts 40. These are supported from opposite ends of the housing by similar but reversely formed arms 60 which are bent up at right angles from terminal plates 61, and whose ends extend into the corner slots 49 for support against movement. Where each arm 60 springs from its terminal plate 61 suitable slits are provided so that

the arm is free from the side wall of the housing. The contact 40 is shown as riveted to the end of the arm, which is suitably widened for the purpose. The contacts of a pair normally confront each other, as seen in Fig. 3, with the spring tending to move them toward open circuit position, but only one circuit can be opened at a time because of the manner of cooperation of the cams with the ends of the springs.

To insure positive openings of the contacts in the event that there should be some tendency to stick from arcing or heating, the positive kick-off lever 37, depending from the trunnion as previously described, is arranged to selectively cooperate with lateral tongues 65 near the upper ends of the springs. These tongues project toward each other, as shown, and their ends are formed to provide ridges in the same manner as the ends which engage the cams. The ridges however are vertical and face to the opposite sides of the springs. Thus when a cam moves from beneath the end of a spring the lever 37 moves over the tongue 65 thereof, as seen in the right of Fig. 4, to positively retract the upper end of the contact carrying spring and thus separate the contacts under all conditions.

The end of the spring carrying strap 46 remote from its terminal plate is positioned and held down by a sheet of insulation 63 slid vertically into grooves 49 as seen in Figs. 1 and 4. The terminal plate 61 for one of the stationary contact arms rests on the upper edge of this sheet and the whole is clamped by the housing cover 14 as shown. At the opposite end of the housing the stacked terminal plates 43 and 61 are similarly clamped. They are insulated from each other by a sheet of insulation 70, Figs. 1 and 6, horizontally positioned and notched at 71 to engage the walls of slit 52 in the end of the housing. The outward extension of sheet 70 serves as a barrier between terminal plates and screws.

It will be clear that a single pole switch will be formed if one set of contacts is omitted and that double pole and four-way switches only require the duplication of the two sets of contacts which can be placed on the opposite side of the operating lever and appropriately connected in a manner well understood.

The above-described switch is simple in construction, has few parts, is quiet and effective in operation and capable of handling substantial currents with a minimum of destructive arcing.

I claim:

1. In a switch of the type described, in combination, a stationary contact, a movable contact, a leaf spring cantilevered at one end and having a free end, said movable contact being mounted intermediate the ends of and urged to open circuit position by said spring, an operating lever mounted for limited oscillation in a plane adjacent and substantially parallel to that of the spring, a face cam on said lever positioned to engage one face of the free end of the spring and flex it into contact engaging position when the lever is at one end of its stroke, and means on said lever to engage the opposite face of said free end as the lever approaches the other end of its stroke to flex the spring toward contact separating position.

2. In a switch of the type described, in combination, a pair of laterally spaced cantilever leaf springs each having a fixed and a free end, a contact intermediate the ends of and on the same face of each spring, a stationary contact normally spaced from each fixed contact, an operating lever

journalled for limited oscillation in a plane substantially parallel to that of said springs, cam surfaces on said lever for cooperation with the free end of each spring, said surfaces being so shaped and positioned that one engages the back face of and closes one set of fixed and movable contacts while the other releases the back face of the second set and vice-versa, and a separate oppositely facing surface movable with said lever to engage the front face of the spring whose contacts are being released to insure contact opening.

3. The switch of claim 2 in which said operating lever is equipped with an over-center spring to hold it at either limit of movement, and resilient buffer means positioned to determine said limits.

4. The switch of claim 2 in which the separate surface on said lever is flat and each spring is provided with a laterally extending tilted tab for engagement thereby, whereby the contacts are relatively rocked for said release actuation.

5. An A. C. switch having in combination a box-like open top housing having closed side walls and bottom and slotted end walls, a metal strap extending along said bottom and having a terminal exposed through one of said end walls, a pair of flat cantilever springs symmetrically extending from the strap toward the top of said housing, a cover for said housing, a lever having a handle portion extending through said cover and trunnions journalled between the centers of the upper edges of the side walls and said cover, an open coil spring, an inward extension on said lever compressing the spring against said bottom wall to provide an over-the-center action for the lever, a contact on each spring intermediate its ends and facing the nearer side wall, a stationary contact facing each spring mounted contact, a rigid strap mounting each stationary contact, supported by the housing and having a terminal exposed through one of said end walls, said lever having a radial face confronting said last men-

tioned side wall, two cam surfaces on said face positioned to alternatively flex said springs to engage the corresponding contacts, said springs normally biasing the contacts open, and means carried by one of said trunnions to engage the rear face of the spring released by a cam surface to positively separate its contacts.

6. In a switch of the single pole, double throw type, in combination, a housing, an operating lever assembly trunnioned for limited oscillation therein, an over-center spring adjacent one side of and associated with said lever-assembly to hold it in definite "off" and "on" positions, a pair of face cams on the other side of said assembly oppositely disposed about the axis of trunnioning, a pair of stationary contacts supported by said housing, mating movable contacts one for each stationary contact, a leaf spring cantilevered from the housing for each movable contact and supporting the same intermediate the spring ends and urged toward open circuit position, each spring being in a plane substantially parallel to the plane of movement of said cams and with its free end positioned to be engaged by one of said cams at one of its limits of movement to flex the spring into contact engaging position, and means connecting the contacts of one pair together and forming a terminal for the same.

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