Nov. 6, 1934. H. F. McLOUGHLIN ET AL 1,979,277

ELECTRIC SWITCH

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Fig. 1.

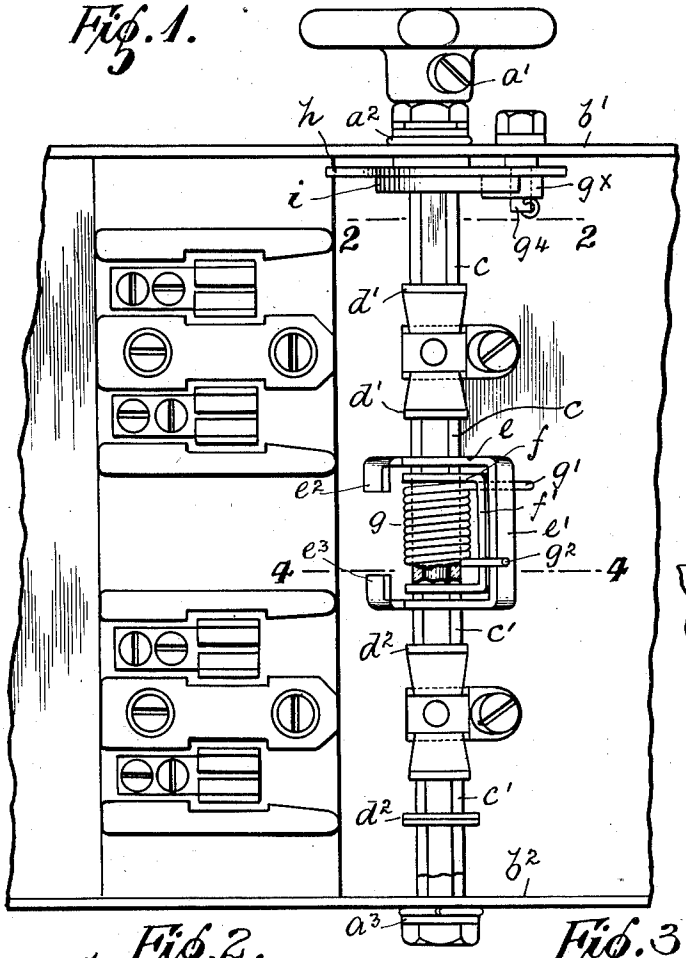


Fig. 4.

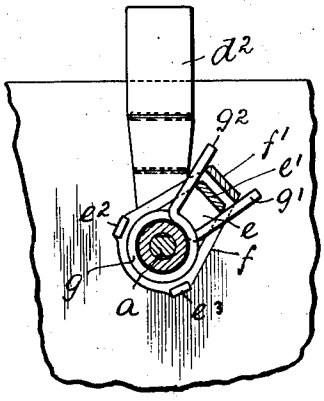


Fig. 2.

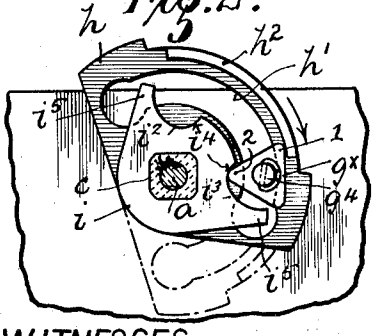
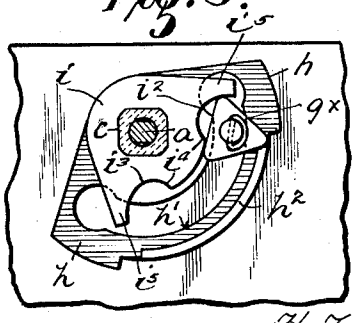


Fig. 3.



WITNESSES

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Fig. 5.

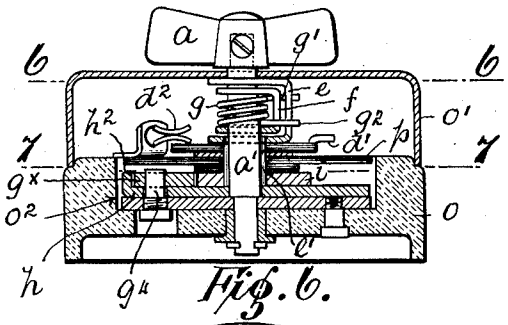


Fig. 6.

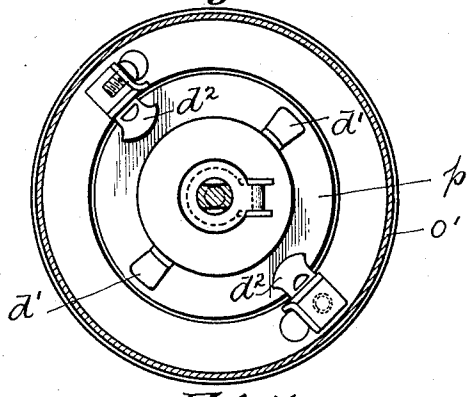
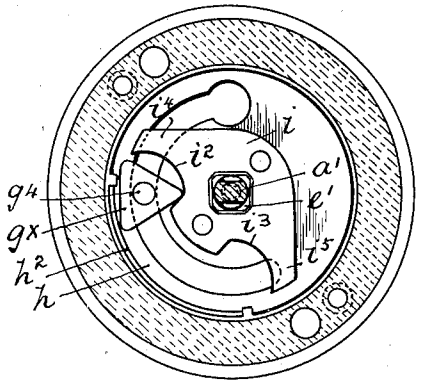


Fig. 7.



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ELECTRIC SWITCH

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Application August 1, 1929, Serial No. 382,712
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3 Claims. (Cl. 200—70)

This invention has reference to quick-make and quick-break electric switches, wherein there is interposed between the moving contact-blade member and an "operating" handle, a snap-action spring mechanism so arranged that when the operating member is actuated, it first tensions or stresses the spring and then, when the spring is sufficiently tensioned allows the said contact-blade member to be tripped or displaced by spring action relatively to the operating member.

To enable this tensioning of the snap-spring by the operating handle, means are embodied in the mechanism for detaining the moving contact member during the initial or spring-tensioning displacement of the said handle and for releasing the said contact handle when the spring is tensioned sufficiently to impart the "make" or "break" movement to the contact blade member, and the principal object of the present invention is to provide for such detention and release of the contact-member by a simple and compact, but durable and efficient, mechanism such as can readily be applied to or embodied in switches and switch-fuse combinations of various types.

This object is realized according to the present invention by a mechanism in which there is interposed between a controlling element connected to and moving with the operating member, and a controlled element connected to and moving with the contact-member, a pawl or detention device which, on commencement of each operation of the handle in either the "make" or "break" direction, is positively displaced into detaining connection or engagement with the controlled element and is held or retained in such engagement by the controlling element, but is released by the said controlling element and disengages the controlled element at the appropriate time for enabling the contact-member to be actuated by the tensioned spring.

The disengagement of the pawl or detention device from the controlled element preferably is effected (on the said pawl being released from the restraint imposed by the controlling element) by movement transmitted to the pawl through the controlled element from the snap action spring, and on being so disengaged, the pawl may be used as a stop for arresting or stopping the parts of the switch that are displaced during the movement of the contact-blade assembly into its "on" or "off" position.

An application of the invention to a double pole switch adapted for mounting in an enclosing box is shown in the accompanying drawings, in which

Figure 1 is a plan showing the lay-out of the switch, with the contact-blade assembly in its "off" position.

Figure 2 is a section taken on the line 2—2, Figure 1, showing the detention and release mechanism which is interposed between the spindle of the "operating" handle and the sleeve that carries the moving contact blades, and said mechanism is rotatably supported on the said spindle. This view shows the parts in the normal or neutral positions they assume at the commencement of an operation of the switch in the opening direction.

Figure 3 is a view similar to Figure 2 but shows the parts in the positions they assume on completion of the opening of the switch and prior to the return of the controlling element and the operating handle to their normal or neutral position.

Figure 4 is a section on the line 4—4, Figure 1, showing the connection between the snap-action spring and the driving stirrups that are fixed respectively to the "operating" lever spindle and to the carrier-sleeve of the moving contact blade assembly.

Figure 5 is a transverse vertical section of the complete switch.

Figure 6 is a horizontal section on the line 6—6 showing the rotary contact member (in the "off" position), and also the fixed contacts of the device.

Figure 7 is a horizontal section on the line 7—7 showing the element of the detention mechanism.

The same letters of reference indicate corresponding parts in the said Figures 1 to 4 of the drawings.

In the "ironclad" switch shown, the spindle a of the operating handle a' is journalled in bearings a^2, a^3 fixed in the opposite side-walls b^1, b^2, of the enclosing box or casing. This spindle supports two sleeves c, c^1, that are free to turn about the said spindle and respectively carry the insulated contact blades d^1, d^2, these sleeves being coupled as a unit by a spring-abutment stirrup e, whilst a similar but smaller abutment-stirrup f is fixed to the spindle and is adapted to move angularly within and relatively to the stirrup e. A coiled spring g having levering arms g^1, g^2, is so mounted on the spindle, between the sides of the spindle stirrup f, that its arms g^1, g^2, are opposed to opposite sides of the transverse portions or bridge-bars e^1, f^1, of the two stirrups. Also the contact-member stirrup e carries on its opposite sides, pairs of inwardly-projecting ears or horns e^2 e^3 with one or other of which the stir-

rup *f* is adapted to engage for positive driving or starting the make or break movement of the contact-blade assembly after the snap-action spring has been wound up or tensioned.

This arrangement of spring and abutment stirrups renders both arms of the spring available for use in tensioning the said spring, since whether the operating spindle and its stirrup *f* are turned in the opening or closing direction the bridge-bar f^1 of the stirrup *f* levers against one of the spring arms, meanwhile the other spring-arm remains in abutment with the bridge-bar e^1 of the stirrup *e* (which for the time being is locked by the contact-blade detention mechanism hereafter to be described) and thus enables the winding-up of the spring. Further, when the stirrup *f* has completed its spring-tensioning displacement, its bridge-bar may come into contact with a pair of horns e^2 or e^3 on the stirrup *e* for giving a positive starting drive to the contact-blades at a moment which synchronizes with, or slightly follows, the release of the contact-blade assembly from the detention mechanism.

The detention mechanism is arranged inside the box adjacent to one of the bearings of the operating spindle, and comprises three elements, viz:—a pawl or detention "star" g^x, a controlling element *h* and a controlled element *i*. The device g^x, in the particular construction illustrated, has the form of an equilateral triangle presenting three equidistant points or noses. g^x is journalled on a stud g^4, fixed in the side wall *b*, of the box in appropriate relation to the centre of the operating spindle. The pawl-controlling element consists of a quadrant or sector plate which is keyed or otherwise secured to the spindle *a* and is located against the box wall b^1, outwards of the pawl. This plate has a curved slot or clearance hole h^1 which accepts the pawl-carrier stud g^4 and it is also formed with an inwardly-projecting flange h^2 having an angular measurement slightly greater than the angular distance through which the operating spindle has to be turned for effecting the tensioning of the snap-spring. The pawl-controlled element or flyer *i*, which is a fixture to one of the sleeves of the contact-blade assembly, is constituted by another and smaller quadrant or sector plate, having in the periphery which is concentric with the flange h^2 of the pawl-controlling quadrant *h*, two counterpart recesses i^2, i^3 which are disposed on opposite sides of the spindle center, in positions respectively corresponding to the "off" and "on" positions of the contact blades. Each recess presents, on its inner side, a shoulder i^4, with which the pawl engages when locking the flyer, whilst outwards of each recess is a stop heel i^5 adapted to co-act with the pawl for stopping the spring-actuated parts on completion of the "make" or "break" movement. As will be seen from Figures 2 and 3, the flange h^2 occupies only the middle sector of the periphery of the quadrant *h* and is substantially smaller in angular dimensions than is the clearance slot h^1.

In the construction illustrated, and after each spring-actuation of the contact member and during the subsequent return of the operating member and the controlling element *h* to their normal or neutral positions, the pawl *g* is positively moved by the said element *h* into detaining engagement with the flyer and is locked in that engagement (as shown in Figure 2) by the overhanging flange h^2. This lock is maintained, during the next spring-stressing movement of the operating member, by the said flange h^2 riding over the said pawl, but when the flange clears the pawl on completion of the stressing of the snap-action spring, the said pawl is tripped, by the spring reaction transmitted to it through the flyer, so that it releases the said flyer to permit of the spring actuation of the contact-member assembly and then assumes a position (as shown in Figure 3) wherein a nose thereof lies in the path of one of the stop-wheels i^5 of the flyer. This enables the pawl to serve as a stop for the spring-driven parts, and during the subsequent return of the operating member *a* and controlling element *h* to their neutral or normal position, the end of the flange h^2 acts upon the pawl to positively re-set the same into detaining engagement with the flyer, whilst on completion of the said return movement, the said flange is engaged over the said pawl to lock the same in the said engagement ready for the next operation of the switch.

Mechanism as above described, Figures 5, 6 and 7 of the drawings, show an application of the invention to a rotary non-ironclad surface switch.

In the switch shown in these figures, the parts are designed and arranged to enable their mounting on a circular insulating base *o* of relatively small dimensions and their enclosure within a cover o^1, and the moving contact-assembly is adapted to oscillate in a plane parallel to the base for taking the contact blades d^1 thereof into and out of connection with the fixed contacts d^2. The moving contact member is suitably insulated from its operating spindle, and an insulating partition *p* is located between the current carrying parts and a chamber o^2 in the switch-base wherein the detention mechanism is located.

The base end of the operating spindle a^1 (to which the external handle or turn-button *a* is attached) is surrounded by a sleeve e^1 that forms part of the moving contact-member assembly and the spindle and sleeve respectively carry stirrups *e* and *f* which are associated with a double-armed spring *g*, g^1, g^2, and are arranged to provide for the tensioning of the spring and for the transmission of the spring-drive to the moving contact-member assembly substantially in the same manner as already described with reference to Figures 1 to 4.

As regards the detention mechanism, this comprises a three-pointed detention pawl g^x mounted to oscillate about a fixed stud g^4, a flanged controlling plate *h*, h^2 fixed to the operating spindle, and a pawl-controlled flyer *i*, i^2, i^3, i^4, i^5, fixed to the sleeve of the moving contact assembly, and except that the controlling element *h* is made in the form of a circular plate instead of as a quadrant, the mechanism is substantially the same in construction and arrangement as that already described with reference to Figures 1 to 4, and is adapted to operate in substantially the same manner.

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

1. A switch of the class described, comprising a support, fixed contacts on the support, a spindle having sleeves thereon and supported by said support, contacts carried by the sleeve, stirrups supported respectively by the spindle and by the sleeves, a quadrant member on the spindle, a control member on the sleeve, a pawl journaled on the support for interlocking the quadrant member with the control member, a coil spring supported by the sleeves and having terminals engaging both stirrups, whereby the spring may be placed under tension during the movement of a stirrup.

2. A switch of the class described, comprising a

casing having fixed contacts thereon, a spindle journaled in the casing, a sleeve rotatable on the spindle and carrying a contact, two stirrups, one carried by the spindle and the other by a sleeve, a coil spring surrounding the sleeve and having terminals bearing against both stirrups to place the spring under tension during the movement of a stirrup, a star shaped pawl journaled in the casing, a quadrant shaped controlling member on the spindle, a flier on the sleeve adjacent the controlling member and having recesses therein and projections thereon and engaging with the pawl to lock the flier to the controlling member.

3. A switch of the class described, comprising a casing having fixed contacts thereon, a spindle journaled in the casing, a pair of stirrups on the spindle, a coil spring surrounding the spindle and having terminals engaging both stirrups, a quadrant shaped controlling member on the spindle, said member having an arcuate slot therein, a post carried by the casing and operable in said slot, a pawl on the post, a flier having recesses therein and projections thereon engageable with the pawl to control the tension of the spring and a flange on the controlling member engageable with the pawl to hold the same in locked engagement with the flyer.

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