Oct. 30, 1928. 1,689,495

F. McELROY

ELECTRIC SWITCH

Filed Aug. 9, 1926

Fig. 1.

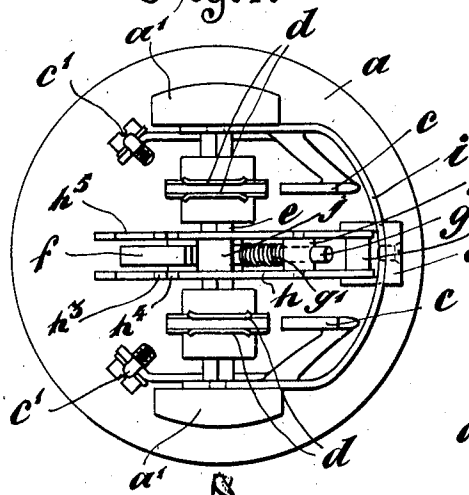


Fig. 3.

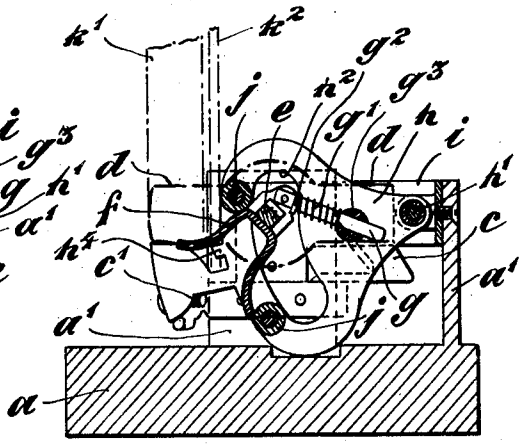


Fig. 2.

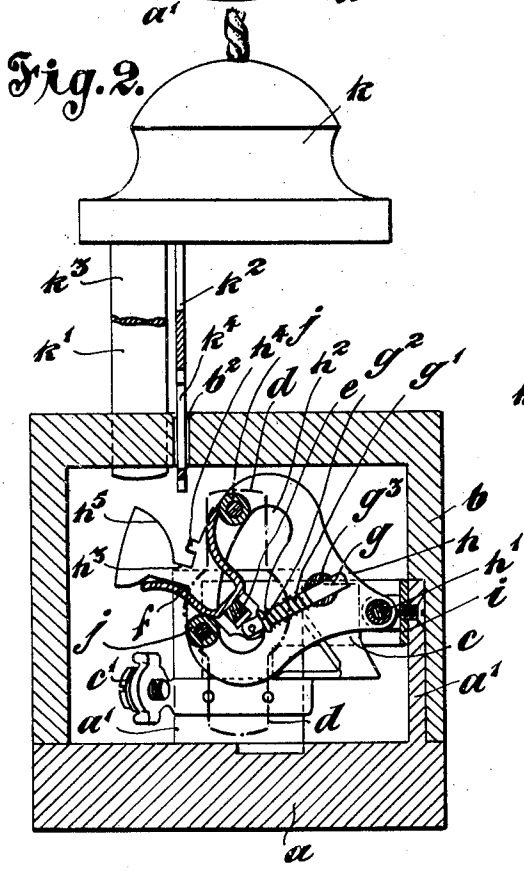
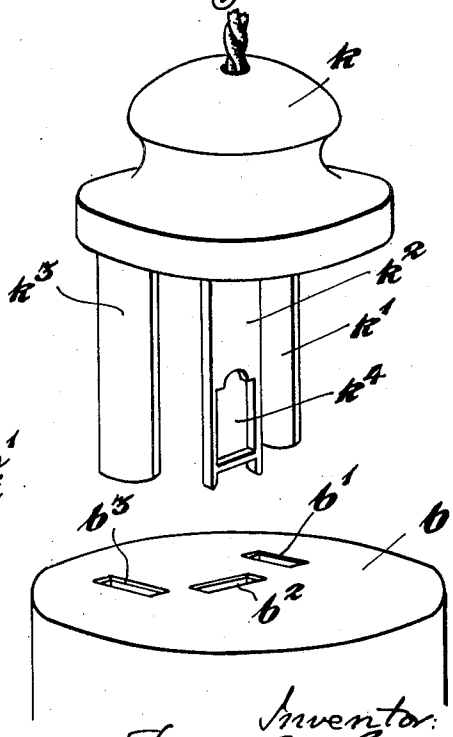


Fig. 4.



Inventor:
Frank McElroy,
By Alfred Hunt
Atty

Patented Oct. 30, 1928. 1,689,495

UNITED STATES PATENT OFFICE.

FRANK McELROY, OF MANCHESTER, ENGLAND, ASSIGNOR TO J. H. TUCKER & COMPANY, LIMITED, OF BIRMINGHAM, ENGLAND.

ELECTRIC SWITCH.

Application filed August 9, 1926, Serial No. 128,307, and in Great Britain November 3, 1925.

This invention has reference to improvements in electric switches of the type which are known as "plug switches", that is, a switch and socket combined on one base and associated with an appropriate plug, which members may be interlocked or operated by the plug.

The invention has among its objects the construction of a double-pole plug switch which shall be completely efficient in its operation, will avoid arcing, and cannot be operated or tampered with by an unauthorized person, the mechanism being so arranged that the switch cannot be put out of operation or made ineffective through misuse, as obtains in connection with certain known forms of plug switch, a feature of the invention residing in so constructing and arranging the mechanism that the apertures in the plug socket or base do not give direct access to the contact arms or any normally live part of the switch when the switch is in the "off" position, so as to avoid the possibility of a misuse or tampering with the switch mechanism. A further feature of the invention resides in the provision of an automatic spring-controlled quick make-and-break operation of the switch mechanism which is set in operation by the insertion or withdrawal of the plug of the switch irrespective of the speed at which the plug is inserted or withdrawn from the socket or base, so that an effective break of the circuit is ensured even without effecting a complete withdrawal of the plug to avoid the possibility of any arcing.

It should be appreciated that a switch of this type may be combined with means for independently operating the switch, distinct from the plug, that is, a switch control may be introduced in the form of a tumbler or dolly-operated mechanism which can be employed to effect an independent control of the switch circuit additional or alternative to that effected by means of the plug.

This invention consists of an electric switch of the plug type hereinbefore referred to, wherein the plug pins constitute removable contacts of the switch, the switch mechanism being so arranged that the withdrawal of the plug removes the circuit completing members of the switch from the path of the plug pins. The invention further resides in mounting on the plug means whereby withdrawal of the plug effects a positive break (as distinct from a spring-effected break) between the contact arms and the fixed contacts of a multi-pole switch. Further, the mechanism is so arranged that the moving switch arm or arms make contact on the one hand with fixed terminals, and on the other hand with terminals constituted by the removable plug pins, the switch arms being so mounted and arranged that they are removed from the path of the plug pins on the withdrawal of the plug. Further, the mechanism is so arranged and constructed that in the event of the spring failing to act to effect the quick make-and-break operation the switch circuit can be positively made and broken by the insertion or withdrawal of the plug.

In order that this invention may be clearly understood and readily carried into practice, reference may be had to the appended explanatory sheet of drawings, upon which:—

Figure 1 is a plan view of switch mechanism constructed according to the present invention.

Figure 2 is a sectional elevation of the complete switch mechanism including the plug pins and its contacts.

Figure 3 is a sectional elevation of the switch mechanism alone in a secondary position to that shown in the Figure 2.

Figure 4 illustrates in perspective more particularly a plug and its plug pins or contacts and slotted casing for the switch mechnism.

Describing now, broadly, one means of carrying the present invention into effect as embodied in a plug switch which has not provision for independent operation, the base part of the switch is constructed in the form of a disc a with projections a^1, upon which disc the switch mechanism proper is mounted. The cover b of this box is of cylindrical or inverted cup formation and is formed with three small rectangular apertures b^1 b^2 b^3 therethrough whereby the blades or arms k^1 k^2 k^3 which are secured to the plug k can be inserted into the box b and make contact with the switch mechanism contained therein, the said blades or arms being mounted on an insulated cap or head in known manner.

The switch mechanism upon the base a comprises a pair of fixed contacts c secured to the projections a^1 and having terminals

c^1, which contacts are adapted to be engaged by a pair of switch contact arms d when the switch mechanism is in the circuit-closing position. The contact arms are mounted upon, but insulated from, a spindle e supported by the projections a^1, and secured to this spindle is a jawed member f which serves to ensure by its co-operation with the arm k^2 of the plug the rotation of the said spindle e. Pivotally connected to this jawed member f is the spindle g of the spring-controlled toggle-operating mechanism for effecting the quick make-and-break action of the switch, the spindle being surrounded by a coiled spring g^1 functioning in compression, the said spring abutting at the one end against a collar or shoulder g^2 formed on the said spindle, and at the other end against a roller g^3 which is freely mounted on a pin which in turn is mounted on a pivotally mounted segment h which will be hereinafter described, the said roller having a passage therethrough for the free end of the said spindle g, whereby the desired compression and extension of the coil spring g^1 may be effected in known manner. The pivotally mounted segment h to which reference has just been made is mounted on a pin h^1 carried by a U-shaped bracket i, and is slotted at h^2 to permit of the free passage therethrough of the main spindle e of the switch on which the contact arms d are fixed, the segment being extended by means of projections h^3 h^4 which co-operate with the arm k^2 of the plug for the purpose of effecting the operation of the switch on the insertion or withdrawal of the plug, as will be hereinafter more particularly described, the projections h^3 taking the form of a pair of lugs extending from the periphery of the segment having a pair of cam surfaces h^5 also extending from the periphery of the segment and adapted for use in co-operation with the lugs hereinbefore referred to. Mounted on the said segment are a pair of rollers j adapted to co-operate with the jawed member f hereinbefore referred to for the purpose of ensuring that only a correct operation or functioning of the switch mechanism can obtain, that is, tampering or unauthorized operation of the switch mechanism is prevented, the said pair of rollers j also providing a lost motion connection between the segment h and the spindle e on which the contact arms d are mounted.

The plug of the switch comprises an insulated cap or head k from which project the three arms or blades k^1 k^2 k^3 two of the said arms or blades k^1 k^3 constituting removable contact of the switch, and the other arm or blade, which is slotted at k^4 and shaped as illustrated, forming the member by which the plug is connected with the switch mechanism within the box and constituting the positive operating element of the switch and earthing pin of the plug. The slot k^4 in the arm or blade k^2 is shaped to admit, firstly, of the engagement of the slotted arm with the cam surfaces h^5, the cam surfaces directing the slotted arm of the plug of the switch after insertion within the socket or base into engagement with the lugs h^3 also extending from the periphery of the segment. The further insertion of the plug into the box constituting the base of the switch causes the slotted arm or blade to depress the segment h and rotate it about its pivot h^1 until the compression spring mechanism g^1 is moved across the dead centre when the spring functions to effect a quick "make" action of the contact arms of the switch. In effecting this operation, the lower of the two jaws of the member f hereinbefore referred to is borne upon by the inner end of the slotted arm k^2 and the other jaw of the said member passes through the slot k^4 in this arm and serves to retain the plug in position within the socket or base of the switch while the switch is closed. A withdrawal of the plug k first of all effects an engagement of the slotted arm k^2 with the lugs h^4 on the periphery of the pivoted segment h, and subsequently with the upper jaw of the member f mounted on the spindle e carrying the contact arms d, whereby the segment is returned to its initial position, the coil spring g^1 again operating after it has passed the dead centre position to effect a quick "break", in that it removes the contact arms d rapidly from the fixed contacts c irrespective of the speed at which the plug k is withdrawn from the base.

The two rollers j which co-operate respectively with the two jaws of the jawed member f form the means of connection between the pivoted segment h and the spindle e on which the contact arms d are mounted, and permit of a lost motion obtaining between the said segment and the said spindle.

The contact arms d mounted on the said spindle e are preferably as shown each in the form of double blades adapted to engage on either side of the fixed contacts c, and of the plug contact arms or blades k^1 k^3 which form the removable contacts of the switch, thereby ensuring an effective and complete circuit through the four terminals of the switch, two of the terminals associated with k^1 k^3 being removable with the plug, and the other two c^1 being associated with the fixed contacts c mounted on the base of the switch.

The jawed member f which co-operates with the slotted arm k^2 of the plug, in addition to constituting part of the lost motion mechanism of the switch, also serves to prevent misuse or tampering with the switch mechanism in that the insertion of a solid blade in place of the slotted arm would not effect an operation of the switch mechanism,

as it would be fouled by the jaw of the said member subsequent to insertion and thereby prevent a complete insertion, and so prevent the switch circuit from being closed accidentally or by an unauthorized person.

As hereinbefore mentioned, an independent switch circuit control may be embodied in the switch whereby even assuming the plug to be inserted the circuit may be broken.

What I claim as my invention and desire to secure by Letters Patent is:—

1. In an electric switch of the plug type, plug pins constituting removable contacts of the switch, circuit completing means comprising members movable into and out of the path of movement of the plug pins, and means whereby withdrawal of the plug removes the circuit completing means of the switch from the path of the plug pins.

2. In the structure of claim 1, said circuit completing means including a multiple switch comprising movable contact arms and fixed contacts, and mechanism whereby withdrawal of the plug pins effects a positive break between the contact arms and the fixed contacts of the multi-pole switch.

3. In an electric switch of the plug type, a removable plug, plug pins, switch mechanism comprising an arm adapted to make contact on the one side with a fixed terminal and on the other side with a terminal constituted by a pin on the removable plug, said switch arm being removable from the path of the plug pin and the fixed terminal and means whereby removal of the plug removes the switch arm from the path of the plug pin and from the fixed terminal.

4. An electric switch according to claim 3, wherein the switch arm comprises spring means for affecting a quick make-and-break operation and means whereby the switch arm or arms is positively actuated by the insertion or withdrawal of the plug on failure of the spring means.

5. In an electric switch, switch mechanism provided with two fixed contacts, two pivotal contact arms, means for rotating said contact arms into and out of engagement with said contacts comprising a movable device having a projection, a plug provided with three blades, one of which co-operates with the projection for the rotating of the contact arms and the remaining two directly engage the said contact arms, for the purpose set forth.

6. In an electric switch, switch mechanism comprising a base, a horizontal spindle, two contact arms, rotatably mounted thereon, a jawed member secured to the spindle, a pivotally mounted segmental member having projections co-operating with said jawed member, an arcuate slot adapted to receive the spindle, a spring-controlled toggle linkage between the spindle and the segmental member, projections upon said segmental member, fixed contacts adapted to be engaged by the contact arms, and a plug member comprising an arm having a slot adapted to co-operate with the projections on the segmental member and also with the jawed member, and two arms adapted to co-operate with the contact arms.

In witness whereof I have hereunto set my hand.

FRANK McELROY.