

950,305.

2 SHEETS—SHEET 1.



Fig. 1.

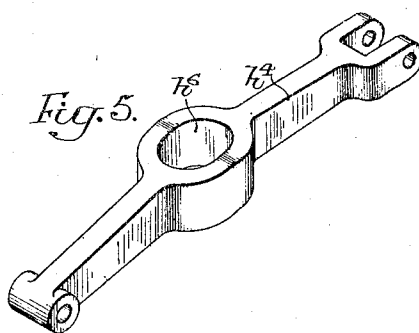
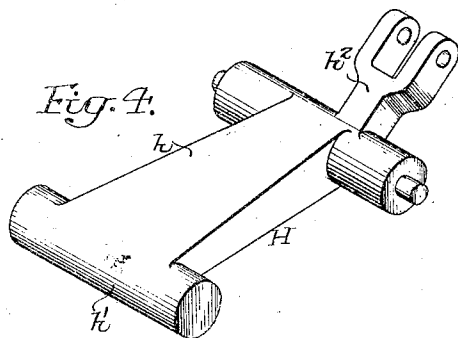
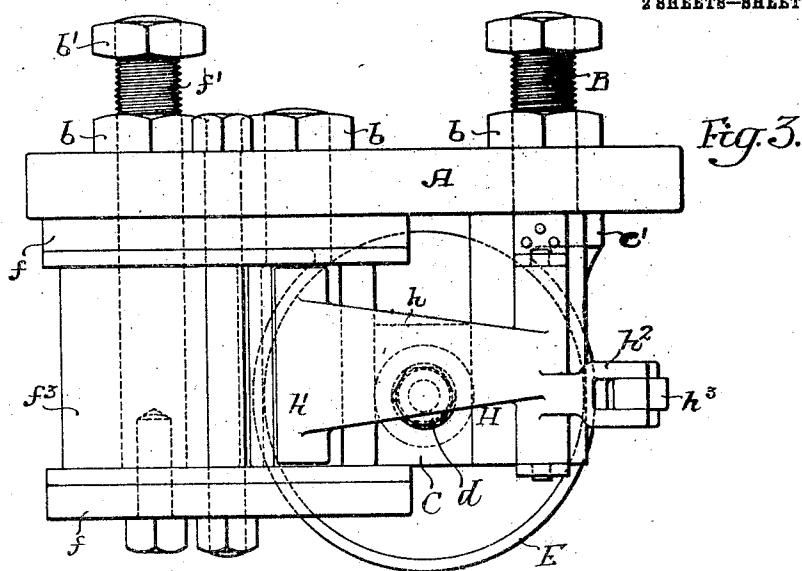
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H. C. ROBINSON.
ELECTRIC SWITCH.
APPLICATION FILED APR. 21, 1909

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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

HARRY C. ROBINSON, OF COATESVILLE, PENNSYLVANIA.

ELECTRIC SWITCH.

950,305.

Specification of Letters Patent.

Patented Feb. 22, 1910.

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To all whom it may concern:

Be it known that I, HARRY C. ROBINSON, a citizen of the United States, residing in Coatesville, Pennsylvania, have invented certain Improvements in Electric Switches, of which the following is a specification.

One object of my invention is to provide a switch of the electro-magnetically actuated type which shall possess but relatively few parts and have those of a substantial construction; the arrangement being such that the switch is not likely to get out of order or require any but a minimum of attention and repairs.

A further object of the invention is to provide an electro-magnetic switch particularly designed for use in motor controlling systems, which shall have its parts so constructed as to permit of its being opened and closed while under load without injury; there being provided a novel form of arc breaking attachment so constructed as to be reliable and efficient in operation.

It is also desired to provide a switch having an arrangement and construction of engaging members particularly designed to insure a relatively perfect contact when the switch is closed.

These objects and other advantageous ends I secure as hereinafter set forth, reference being had to the accompanying drawings, in which:—

Figure 1, is a front elevation, partly in section, illustrating the preferred form of a single pole switch constructed according to my invention; Figs. 2 and 3 are respectively a side elevation and a plan of the switch shown in Fig. 1; Figs. 4 and 5, are perspective views of portions of the arc breaking attachment of the switch.

In the above drawings, A represents a supporting structure of some electrical insulating material such as slate or marble, and on this are mounted the two main contacts B and B' of the switch. Said contacts in this instance are formed as triangular prisms each having a threaded stud projecting through the supporting structure A, whereby it may be held in position by means of nuts b. In the case of the contact B, the stud is somewhat prolonged for the reception of cable terminals or conducting bars whereby it may be connected in circuit, and in view of connections hereafter described, the stud B' is, in the present instance, just long enough to properly receive its retaining nut.

The two contacts are so mounted that their two contact faces lie in planes at an angle of 90° to each other, although it is obvious that this angle between the faces may be varied considerably without departing from my invention.

The movable contact of the switch is illustrated at C and preferably consists of a laminated structure having the form of a truncated wedge. That is to say, its engaging faces lie in planes bearing the same angular relation to each other as do the planes of the engaging faces of the two contacts B and B'. The laminations of this movable contact are so formed and arranged that their ends are capable of respectively engaging the two contacts B and B', and they are clamped together by a nut d threaded on one end of a bar D, passing through them at right angles to their length. Said bar at its opposite end is attached to a cylindrical armature or core d' operative within a solenoid E, which is provided with a winding of any suitable size and is preferably inclosed by a protective casing e held to the supporting structure A by bolts e' passing through suitable lugs as shown.

For breaking the arc formed when the switch is opened, I provide a blow out magnet F which consists of a pair of pole pieces f suitably mounted on the supporting structure A, and connected together by two bolts f' and f'. The first of these bolts f' is larger than the other and has an elongated threaded extension projecting through the structure A for the reception of a holding nut b and any desired number of clamping nuts b'. Wound on this stud as a core and electrically connected to it is a current conductor, in the present instance having the form of a flat copper ribbon f², whose convolutions are insulated from each other in any suitable manner, and whose outer end is connected to the main contact B'. The magnet thus formed is so arranged that the upper portion of the main contact B' lies within its magnetic field and from Fig. 1 it will be seen that on the top face of said contact there is removably mounted a carbon block g. This block is held in an undercut recess, and one of the edges of the contact, as b², is removable from the body thereof, in order to permit of the block being replaced when burned or worn.

Mounted upon and electrically connected to the main contact B is a lever H, one arm h of which has at its end a cylindrical portion

h' so formed that its cylindrical face lies parallel to and is capable of engagement with the top surface of the carbon block g . The second arm h^2 of this lever is connected by a link h^3 , of fiber or other suitable insulating material, with a second lever h^4 pivoted to a stud h^5 carried by the supporting structure. This latter lever is provided with an opening h^6 for the passage of the armature bolt D , and the various parts are so proportioned and arranged that the weight of the arm h and its end portion h' is sufficient to normally maintain this latter portion in engagement with the carbon block g as long as the switch is closed. When, however, the switch is opened, the upper end of the armature bolt or the laminated contact C engages the lever h^4 and turns it downwardly, so that through the link h^3 , the lever H is turned on its pivot and the cylindrical end portion h' is moved out of engagement with the carbon block g .

The energization of the solenoid E draws the core d' into its hollow interior and thereby forces upwardly the laminated movable contact C , so that the inclined ends of this latter respectively engage and electrically connect the two main contacts B and B' . Before, however, this movable contact can thus engage the two main contacts, the lever h^4 is permitted to move upwardly to its fullest extent, under the action of gravity upon the lever arm h and the cylindrical end h' , with the result that said end comes into electrical contact with the carbon block g and completes the circuit between the two main contacts.

As a consequence, any flashing or arcing which might be produced upon closing the circuit, necessarily occurs between the carbon block g and the cylindrical end h' .

When the solenoid E is deenergized, the combined weight of the movable contact C , the armature bolt D and the core itself, is sufficient to cause immediate separation of said movable contact from the main contacts B and B' , and it will be noted that the break between these contacts is between one-quarter and one-half inch or more before the movable contact engages the lever h^4 . In the meantime, however, the circuit remains closed through main contact B , the lever arm h , cylindrical end h' and carbon block g to the main contact B' , and it is finally broken by the separation of the end h' from the block g , due to the movement of the lever h^4 under the action of the movable contact C and its connected parts. Since, however, the circuit through the switch includes the winding f^3 of the blow magnet, the arc finally drawn between the block g and the end h' is immediately blown out by the action of the magnetic field existing between the pole pieces f of the blow magnet.

It will be noted that the arms of the lever

H are so proportioned that a relatively long break occurs between the carbon block and the end h' of the lever, and the rupture of the arc is hastened and most effectively accomplished by reason of the fact that the levers are so proportioned as to cause a relatively quick movement of the end of the lever arm h .

By reason of the peculiar disposal of the inclined fixed contact faces relatively to the inclined and laminated ends of the movable contact, I am enabled to secure a very perfect electrical engagement of the several parts so that the liability of their heating owing to bad contact is reduced to a minimum.

While I preferably so construct the fixed contacts of my switches that their engaging faces lie in planes at an angle of about 90° to each other, it is obvious that this single may be materially varied on both sides of a right angle without departing from my invention. Since the end desired, namely the provision of a wedge-shaped recess for the reception of a laminated movable contact of similar form, is attained in any case.

I claim:—

1. An electric switch, having two fixed main contacts; a movable main contact capable of engaging said two fixed contacts; an auxiliary contact pivoted to one of the fixed main contacts so as to be capable of engaging the other; means operatively connecting the auxiliary contact with the main movable contact while leaving said auxiliary contact free to move into engagement with a fixed main contact under the action of gravity; with means for forcibly maintaining the movable contact in engagement with the fixed contacts.

2. The combination in a switch of two fixed contacts; a movable main contact capable of connecting said fixed contacts; an auxiliary contact pivoted on one of the fixed contacts so as to be capable of engaging the other; means for forcibly holding said movable main contact in engagement with the fixed contacts; and means for operatively connecting the auxiliary contact with said holding means for the movable main contact so as to cause said contacts to move in opposite directions under operative conditions.

3. The combination in a switch, of two fixed contacts; a movable contact capable of engaging the same; means for holding said movable contact in engagement with the fixed contacts; an auxiliary contact member mounted on one of the fixed contacts and capable of engaging the other fixed contact; with means controlled by the contact holding means for moving said auxiliary contact member out of engagement with said other fixed contact after the main movable contact breaks connection with the fixed con-

tacts; said auxiliary contact member being free to move under the action of gravity into engagement with its fixed contact when the main movable contact moves to engage the fixed contacts.

4. The combination in a switch, of two fixed main contacts; a main movable contact, means for maintaining said movable contact in engagement with the fixed contacts against the action of gravity; an auxiliary contact member mounted on one of the main fixed contacts and capable of engaging the other fixed contact; and means connecting said movable main contact with the auxiliary contact member for causing said two contacts to move in opposite directions.

5. The combination in a switch, of two main fixed contacts; a main movable contact; means for maintaining said movable contact in engagement with the fixed contacts; an auxiliary contact member mounted on one of the fixed main contacts and capable of engaging the other fixed contact; and means actuated by the main movable contact for causing it and said auxiliary contact member to be simultaneously moved in opposite directions away from one of the fixed main contacts after said movable main contact has disengaged the fixed main contacts.

6. The combination in a switch, of a supporting structure, an electro-magnetic operating means including a bar and means for actuating the same, a movable switch contact carried by said bar, a lever capable of being actuated by said movable elements, two main contacts placed to be electrically connected by said movable contact, an auxiliary contact member mounted on one of said main contacts and capable of engaging the other, means for connecting said auxiliary contact member and said lever, and means for extinguishing the arc formed between the auxiliary contact member and the one of said main contacts engaged thereby.

7. The combination in a switch, of two fixed contact members; a carbon contact piece mounted on one of said contacts; an auxiliary contact member mounted on the other contact and capable of engaging the carbon contact piece; a main movable contact capable of electrically connecting said two fixed contacts; means connecting the main movable contact and the auxiliary con-

tact to cause them to move in opposite directions away from the fixed contacts, means for extinguishing the arc formed between the auxiliary contact member and the carbon contact piece; and means for actuating the movable contact member.

8. The combination of a supporting structure; a solenoid mounted thereon; two main fixed contacts carried by the supporting structure above the solenoid; a movable main contact connected to the core of the solenoid and free to fall away from said fixed contacts under the action of gravity; a lever forming an auxiliary contact and fulcrumed on the top of one of the fixed main contacts so as to be capable of engaging the other; with means connected to the lever and also to the main movable contact for causing said lever to be turned on its pivot under predetermined conditions.

9. The combination of a supporting structure; a solenoid mounted thereon; two fixed main contacts projecting from the structure above the solenoid; a main movable contact connected to the core of the solenoid and placed to be free to drop away from said main contacts under the action of gravity when the solenoid is deenergized; a bell crank lever pivoted to the top of one of the fixed contacts; a head carried by one arm of said lever and capable of engaging the second fixed contact; a lever pivoted to the supporting structure and placed to be acted on by the main contact and its connected parts when the solenoid is deenergized, with a link connecting said two levers.

10. An electric switch consisting of two main fixed contacts, a wedge shaped movable contact, an electro-magnetic device capable of forcing the movable contact into engagement with said two fixed contacts, a lever pivoted to one fixed contact and capable of engaging the second fixed contact, and means for operating said lever from the other movable parts of the switch to cause it to break contact with one of the fixed contacts after the movable contact has disengaged said fixed contacts.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

HARRY C. ROBINSON.

Witnesses:

WILLIAM E. BRADLEY,
WM. A. BARR.