H. F. KRANTZ.

ELECTRIC SWITCH.

APPLICATION FILED MAR. 13, 1915.

1,306,340.

Patented June 10, 1919.

3 SHEETS—SHEET 1.

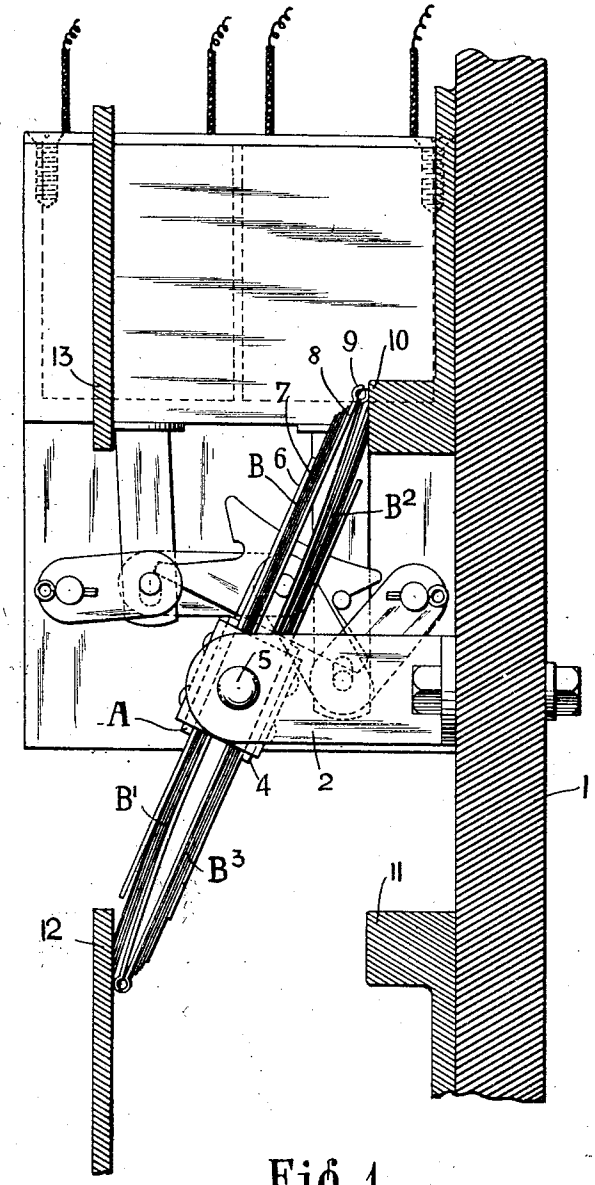


Fig. 1.

Witnesses:
Fred Rogers.
A. P. Brunjes.

Inventor
Hubert F. Krantz

By Attorney
Blair & Nathan

H. F. KRANTZ.

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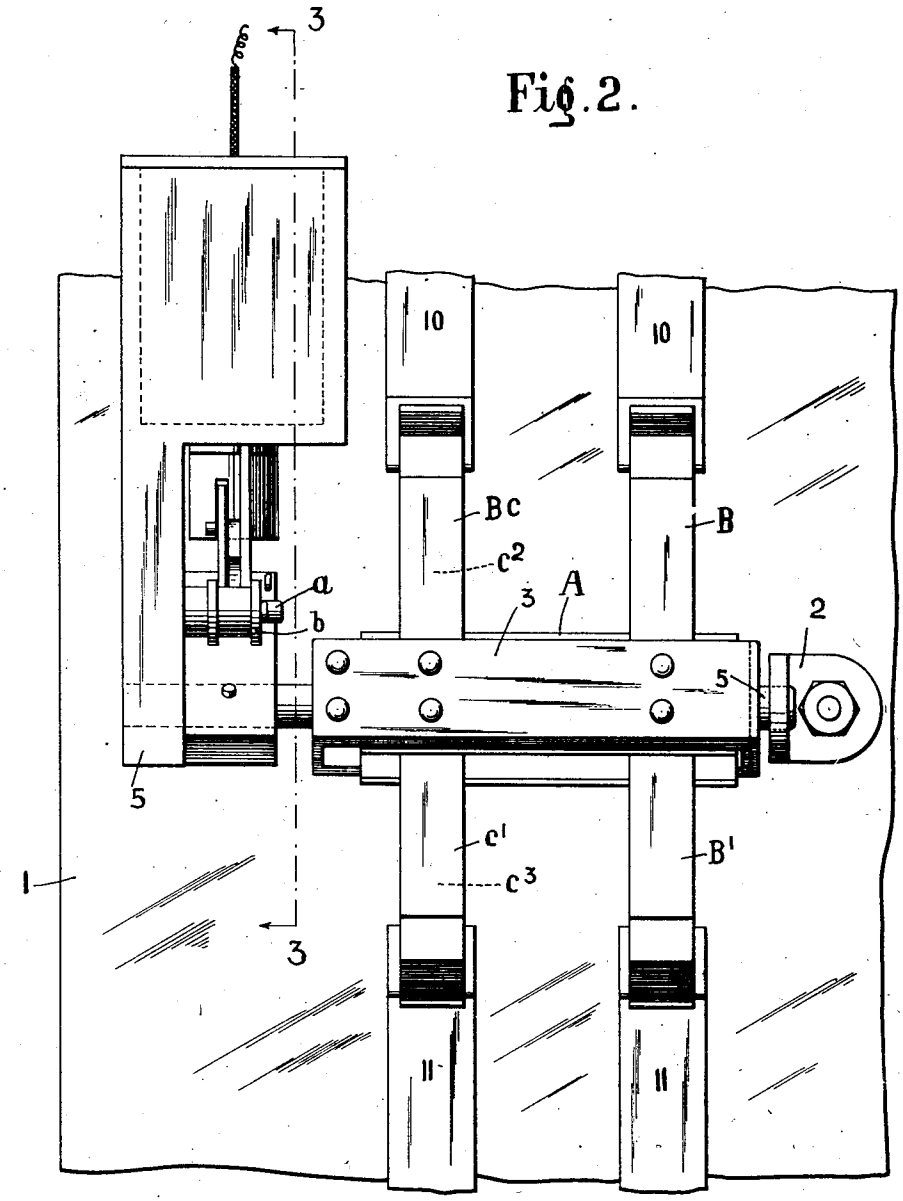
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3 SHEETS—SHEET 2.

Fig. 2.



Witnesses:

Fred. Roger.

H. J. Bruyer

Inventor

Hubert F. Krantz

By Attorney

Blair & Nathan

H. F. KRANTZ.

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3 SHEETS—SHEET 3.

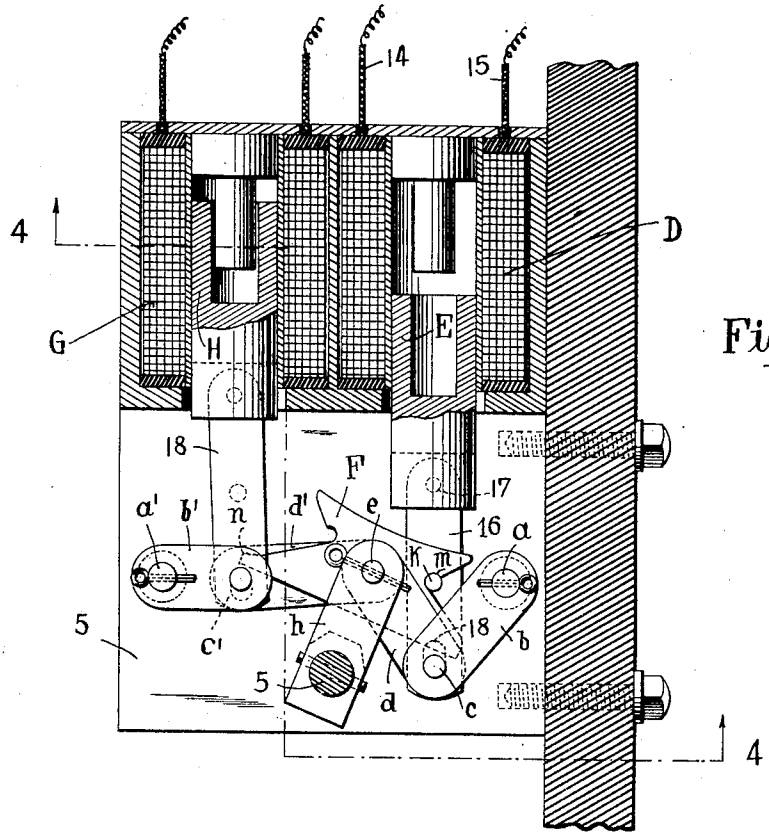


Fig. 3.

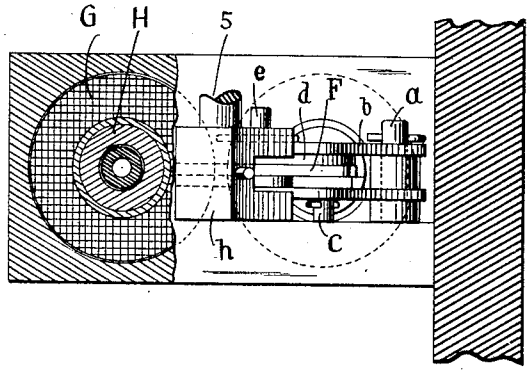


Fig. 4.

Witnesses:
Fred. Rorgen
H. J. Brumley

Inventor
Hubert F. Krantz

By Attorney Blair & Nathan

UNITED STATES PATENT OFFICE.

HUBERT F. KRANTZ, OF BROOKLYN, NEW YORK, ASSIGNOR TO KRANTZ MANUFACTURING COMPANY, INC., OF BROOKLYN, NEW YORK, A CORPORATION OF NEW YORK.

ELECTRIC SWITCH.

1,306,340. Specification of Letters Patent. Patented June 10, 1919.

Application filed March 13, 1915. Serial No. 14,131.

To all whom it may concern:

Be it known that I, HUBERT F. KRANTZ, a citizen of the United States, and residing at Brooklyn, in the county of Kings and State of New York, have invented a new and Improved Electric Switch, of which the following specification is a full disclosure.

This invention deals with an improved electrical switch of the "quick-break" type and it proposes a quick-acting operating mechanism which may be actuated manually and which is peculiarly well constituted to be combined with coöperative automatic means to create a self-contained quick-break switch of the automatic type.

A primary purpose of this invention is to render available a switch mechanism characterized by an increased simplicity and a greater ruggedness, by a pronounced celerity and a wide range of travel in its contact-breaking movement, by the firmness with which the contact elements are maintained together, by its positive avoidance of any incomplete or partial separation of the contacts, and by the smooth action and ease with which the mechanism may be operated, either manually or automatically. It also contemplates a double throw arrangement such that the switch-blade may be shifted abruptly from a locked firm bearing against one contact into a similarly locked firm bearing against another contact.

This invention, from a more specific aspect, seeks to create an automatic quick-breaking switch characterized by certainty in all of its movements, by the use of means for effecting a quick-break and by the use of electrical force for closing the contacts and for inaugurating the application of said means.

Other objects will be in part obvious from the annexed drawings and in part indicated in connection therewith by the following analysis of this invention.

This invention accordingly consist in the features of construction, combinations of parts, and in the unique relations of the members and in the relative proportionings and disposition thereof; all as more completely outlined herein.

To enable others skilled in the art so fully to comprehend the underlying features thereof that they may embody the same by the numerous modifications in structure and relation contemplated by this invention, drawings depicting a preferred form have been annexed as a part of this disclosure, and in such drawings, like characters of reference denote corresponding parts throughout all the views of which:

Figure 1 is a side elevation partially in section showing a duplex automatic magnetic switch mechanism embodying this invention. Fig. 2 is a front elevation thereof. Fig. 3 is a section through line 3—3 of Fig. 2. Fig. 4 is a section through line 4—4 of Fig. 3.

Referring to the drawings, 1 indicates a base or board on which the apparatus is mounted and 2 indicates a standard or bracket, which in this instance is a stationary part, on which is movably mounted the member supporting the switch blade. In the illustrated embodiment, this movable mounting is of the pivoted type. Specifically, this member is made up of clamping plates 3 and 4 which are secured to a rock shaft 5 pivoted to the standard 2 at one end and to a part 5 at its other end. This rocking member in turn carries one or more brushes or connecting blades; in this instance eight blades, B, B′, B^2, B^3, C, C′, C^2, C^3 are positioned on the rocking member A so as to be moved thereby. Preferably, these blades are of laminated construction, being formed of an outer comparatively stiff strip of copper 6, an intervening series of thin copper sheets 7, and another outer stiff strip 8 which preferably is somewhat elongated and terminates in an enlargement or bead 9 adapted to resist the arc produced at the instant of separation. These brushes are resilient and are arranged to have their ends beveled, as shown by Fig. 1, so that they may establish contact endwise with terminals 10, 11, 12 and 13, forming contact pieces for any desired electric circuit or circuits.

The position of the member A will determine the electrical effect of the brushes and this position is in turn controlled by an instrumentality embodying toggle mechanism, as will now be described.

A fixed or stationary pivot *a* is provided by the support 5 and to this pivot or stud *a* is secured the link *b* of a toggle, preferably of the first order. This link or leg has at its free end a pivot pin *c* which constitutes what may be termed the floating pivot of the toggle. The other link of the toggle is indicated by *d* and this is what may be termed the

floating link of the toggle. This link *d* in turn carries a pivot pin *e* which determines the position of the brushes. That is to say, by suitable mechanical connections, the movement of the pivot pin *e* produces corresponding movements in the brushes, and in this instance this is readily obtained by extending the arm *h* from the rock shaft 5 so as to locate the axis of the pivot *e* in offset relation to the axis of the rock shaft 5. These respective pivots are preferably located about as indicated by Fig. 3 so that when the toggle is broken, as shown, the parts are in position such that the leg *h* may swing over to the other side of its center line when the toggle *b d* is closed. Now, if this toggle be straightened until the pivots *a*, *c* and *e* are in the same straight line, then will the brushes B and B^3 be moved against the contacts 13 and 11 respectively to such an extent that they will be slightly bent, thereby obtaining a very positive electrical contact throughout a relatively extensive area of contact. To avoid any likelihood of collapsing the toggle by the back-pressure of these brushes, the parts will be so arranged that the axis of the pivot *c* will be located a short distance at one side of the line between the pivots *a* and *e*, but will be prevented from extending through by providing suitable limiting stops. This very slight overthrow of the toggle will not give sufficient relaxation to the brushes to enable them instantly to break contact and it has the further pronounced advantage that the more strongly the brushes tend to spring contact, the more tightly will the toggle be held against collapsing. The reaction of the brushes thus has the two-fold purpose of establishing a thorough electrical connection and of holding the toggle or a part connected therewith against the stop portion that prevents its overthrow.

The means for closing or straightening the above mentioned toggle will now be described. This means in this instance is of the automatically acting type and it embodies a solenoid D having wires 14 and 15 by which it may be energized so that its armature E may be drawn upward forcibly. The lower end of this armature is connected with the pivot pin *c* by means of a link 16 which is pivoted to the armature E by the pin 17 and has a slot 18 receiving the pivot pin *c*. Now, when the magnet D is energized, the link 16 is uplifted and the pin *c* is impacted by the lower end of the slot 18 and (when the opposite toggle is first released as will be described) the floating pivot *c* of the toggle is drawn upwardly very rapidly by reason of the strong pull of the solenoid, (although it may go slowly in a single acting switch) until it passes the centerline of the toggle and takes its position somewhat at one side thereof so as to press and flex the brushes against their respective contacts and maintain them in that position. The manner in which the toggle is broken will, perhaps, be best understood by again referring to Fig. 3, taking special notice of the right-hand side of the apparatus showing the second toggle. This toggle need not be more fully described since it is in all respects a duplicate of that already discussed, similar parts being referred to by characters *a'*, *b'*, *c'*, and *d'*. It will be obvious that when the one toggle is closed and the other is broken it will be necessary to break the first before the second can be closed. This is accomplished by a toggle breaker F which here is in the nature of a rocker pivoted to the pin 2 and symmetrically constructed so as to be capable of alternately coming into action to break first the one and then the other toggle. This rocker is actuated by the link 16 before the lower end of the slot 18 therein becomes effective against the pivot pin *c*. This is done by providing the link 16 with a pin *k*, which during the uprise of the link 16 may impact against the abutment *m* provided by the rocker F and tilt it slightly before the lower end of the slot 18 impacts the pin *c*.

Now, this rocker F also provides a foot or extension *n* which normally overlies the floating pivot *c'* of the other toggle so that the effect of this initial swinging of the rocker F under the impulse of the pin *k* is to cause the foot *n* to impact the pin *c'* and break the toggle. Shortly after the toggle is thus broken by the impact of the foot *n*, the link 16 becomes effective on the pin *c* and it now acts to straighten the first toggle. By reason of the fact that the other toggle has been broken, it is absolutely ineffective to resist the swing of the arm *h* and consequently the movements will take place with all the celerity of a spring action by reason of the instantaneous and maintained exertion of the magnet D. The action is very abrupt and strong and when the switch blades are thrown either to one side or the other, they are definitely locked in their contacting positions by a locking action of the toggle.

The closing of the other toggle is effected by means of a second solenoid G acting on the armature H and positioning the link 18 in a manner similar to that above described. This invention thus creates a duplex automatic switch mechanism adapted to establish an electrical connection first between one set of terminals and then between another set of terminals. It is obvious that these terminals may be arranged in any relation and may be used to control other electrical instrumentalities, depending upon the use to which it is desired to put the switch. The energizing or exciting current first actuates one and then the other of the solenoids.

Without further analysis, the foregoing will so fully reveal the gist of this invention that others can by applying current knowledge readily adapt it for various applications without omitting certain features that, from the standpoint of the prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention, and therefore such adaptations should and are intended to be comprehended within the meaning and range of equivalency of the following claims.

Having thus revealed this invention, I claim as new and desire to secure the following combinations of elements, or equivalents thereof, by Letters Patent of the United States:—

1. An electric switch combining a switch; two alternately acting electro-magnetic devices; and a toggle system intervening between said switch and said devices for enabling the same to act alternately in shifting the position of said switch to close first one circuit and then another, the switch being pivotally mounted, and the toggle system including two toggles arranged one at each side of the pivotal axis of the switch and being connected with the switch in opposing relation.

2. An electric switch combining a contact device; electromagnetic means for actuating said device to cause it to open an electric circuit; two pivoted links constituting a toggle adapted in unbroken position to oppose said electromagnetic means to hold said device in its closed-circuit position; and means for breaking said toggle.

3. An electric switch combining a part pivoted about a given axis; a contact element movable by said part; two pivoted links constituting a toggle having one leg bearing on said part at one side of said axis; electro-magnetic means for making said toggle; a member blocking a movement of said toggle materially beyond one side of its centerline so as to determine the "made" position of the toggle, and means whereby said member may be caused to break the toggle.

4. An electric switch combining a contact; a movable part; a blade movable by said part and adapted in an advanced position thereof to close a circuit through said contact; electro-magnetic means, connections between said part and said electro-magnetic means for urging said part into a retracted position; and two pivoted links constituting a toggle coacting when unbroken to maintain said part in its advanced position, said toggle being adapted to collapse when broken in a given direction to permit said electro-magnetic means to move said part abruptly into a retracted position.

5. An electric switch combining two contacts; a conducting blade; a part movable into an advanced position to cause said blade to establish a connection between said contacts; two pivoted links constituting a toggle adapted when unbroken to maintain said part in its advanced position; and electro-magnetic means, connections between said part and said electro-magnetic means whereby to render said electro-magnetic means effective at the breaking of said toggle for abruptly causing said blade to be disconnected simultaneously from each of said contacts.

6. An electric switch combining a rotary part; a switch blade radiating from said part; a first and a second contact; a toggle operatively connected with said part at one side of the axis thereof and adapted when unbroken to maintain said blade against said first contact; means for breaking said toggle; and electro-magnetic means for collapsing said broken toggle and turning said part to separate the said blade from said first contact and close it on said second contact.

7. An electric switch combining a pivoted part; two contacts arranged in opposition at the opposite sides of the axis of said part; a resilient switch blade extending transversely to said axis and adapted to bear at its opposite ends against said contacts; a toggle connected with said part, said toggle being of a character movable from a "made" or "dead-center" position to a "broken" position and being adapted when made to hold said blade tightly pressed against said contacts; and electro-magnetic means for urging said part against said toggle whereby upon breaking said toggle it may collapse and enable said electro-magnetic means to swing said part to withdraw said blade from said contacts.

8. An electric switch combining a contact; a switch blade movable thereagainst; a toggle adapted when unbroken to maintain said blade against said contact; counteracting electro-magnetic means; and a member associated with said electro-magnetic means providing a finger adapted automatically to break said toggle upon operation of said electro-magnetic means.

9. An electric switch mechanism combining a pair of toggles; contact mechanism positioned thereby; a toggle operating means, and means automatically operable to "break" one toggle coincident with the "making" of the other.

10. An electric switch combining a blade pivotally mounted to swing into "on" and "off" positions, a pair of toggles arranged in opposing relation and being connected with the blade at a point removed from the pivotal axis of the blade, a first electro-magnet for operating one toggle, and a second electro-magnet for operating the second toggle.

11. An electric switch combining a first

and a second contact, a switch blade movable to make engagement with said contacts selectively at will, a pair of toggles arranged in opposing relation at opposite sides of said switch blade, means to "make" one of said toggles and thereby to cause the switch blade to engage one contact, and means to "break" the first toggle and "make" the second toggle to thereby cause the switch blade to engage the second contact.

12. An electric switch combining a pair of contacts spaced apart, a switch blade movable to close electric engagement with said contacts selectively at will, and means for actuating said switch blade comprising a pair of toggles connected with the switch blade in opposing relation, said toggles each being of a character to be "made" and "broken" and being connected with the switch blade so that the "making" of one necessitates the "breaking" of the other, and means to control the "making" and "breaking" of said toggles.

13. An electric switch combining a pair of contacts spaced apart, a switch blade removable to close electric engagement with said contacts selectively at will, and means for actuating said switch blade comprising a pair of toggles connected with the switch blade in opposing relation, said toggles each being of a character to be "made" and "broken" and being connected with the switch blade so that the "making" of one necessitates the "breaking" of the other, independent means to operate said toggles, and a member extending between said toggles effective to insure the "breaking" of one coincident with the "making" of the other.

14. A switch mechanism comprising a contact, a switch blade movable into and out of engagement with said contact, the switch blade being flexible, a toggle connected with said switch blade, said toggle being movable into "made" and "broken" positions and being adapted when in "made" position to flex the switch blade against said contact and to thereby store energy in the switch blade tending to move the switch blade in a direction away from the contact, a second toggle having means operable to supplement said stored energy for moving the switch blade away from said contact, and connections whereby an operation of the second toggle will break the first toggle.

15. A switch mechanism comprising a switch blade, a contact into and out of engagement with which the switch blade is adapted to move, and means for actuating the switch blade, said means comprising a pair of toggles connected with the switch blade in opposing relation, said toggles each being of a character to be "made" and "broken" and being connected with the switch blade so that the "making" of one necessitates the "breaking" of the other to permit the first to hold the switch blade against said contact and so that the "making" of the second necessitates the "breaking" of the first to enable the second to hold the switch blade away from said contact, and operating means for said toggles.

In witness whereof I hereunto subscribe my name as attested by the two subscribing witnesses.

HUBERT F. KRANTZ.

Witnesses:
J. A. NEWTON,
J. L. KOLB.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."