J. K. LUX.

CONTROLLING MEANS FOR ELECTRIC CIRCUITS.

APPLICATION FILED SEPT. 2, 1909.

964,037. **Patented July 12, 1910.**

Fig. 1.

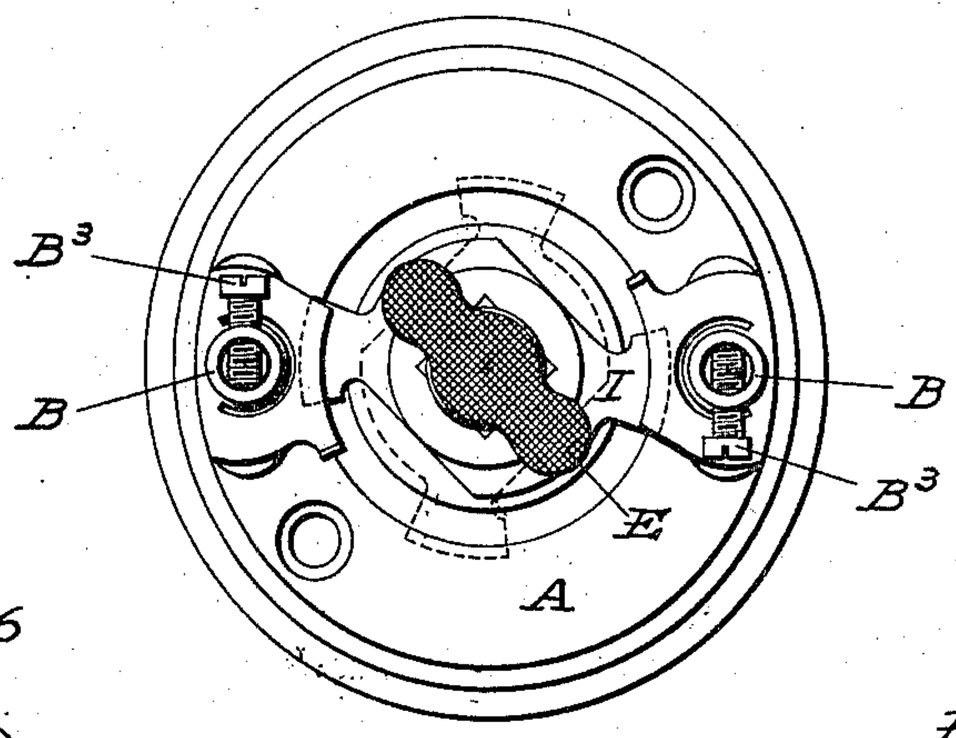


Fig. 6

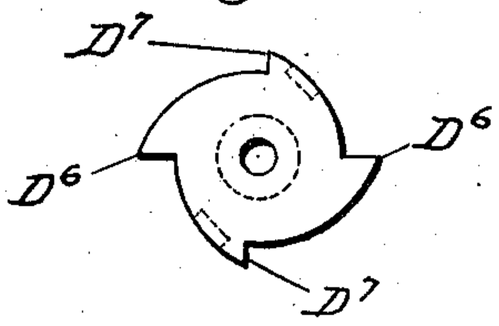


Fig. 2

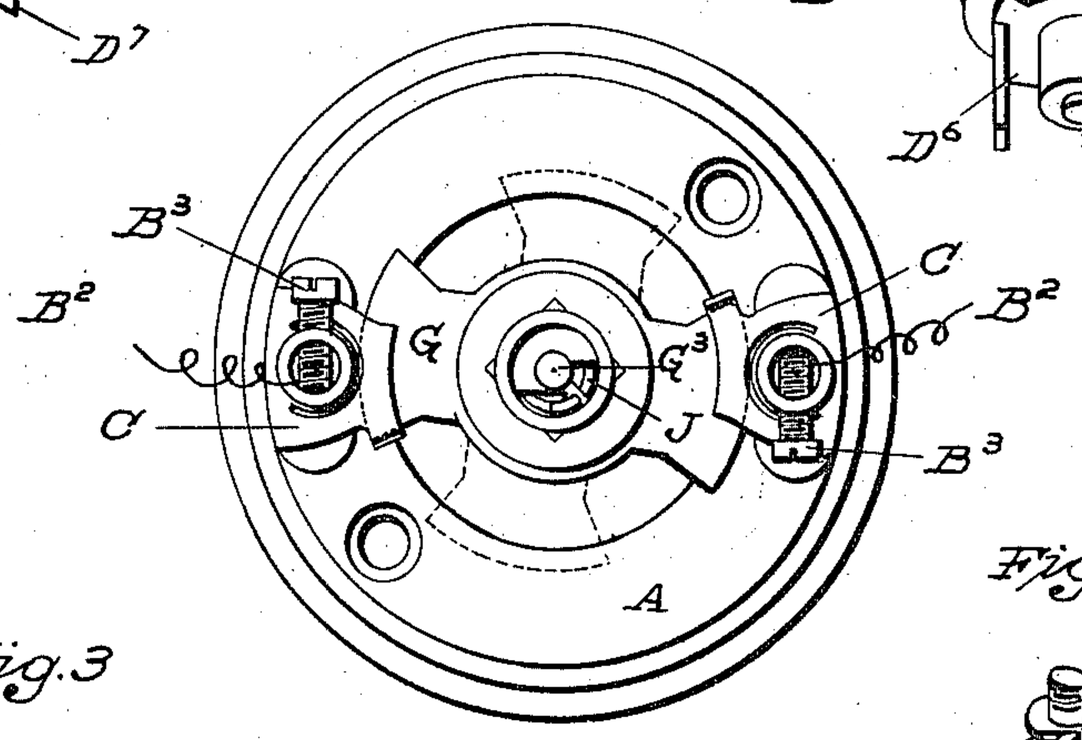


Fig. 7

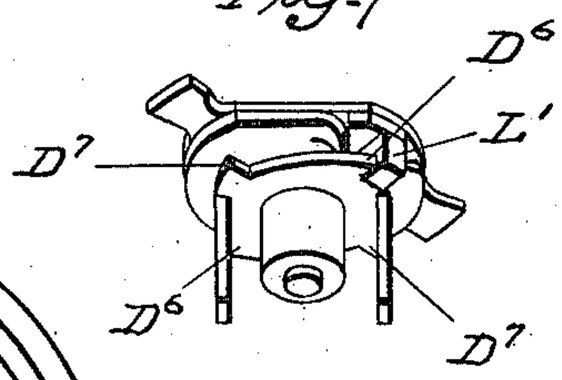


Fig. 3

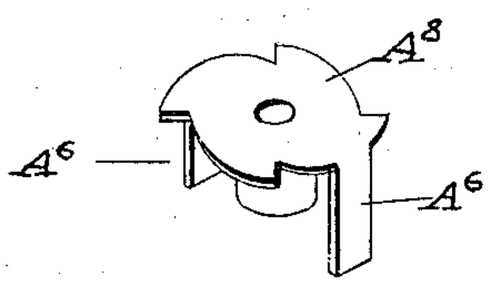


Fig. 4

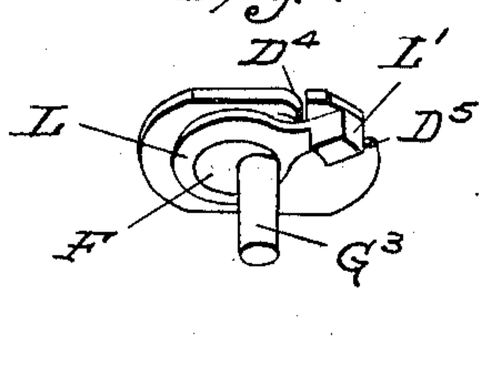
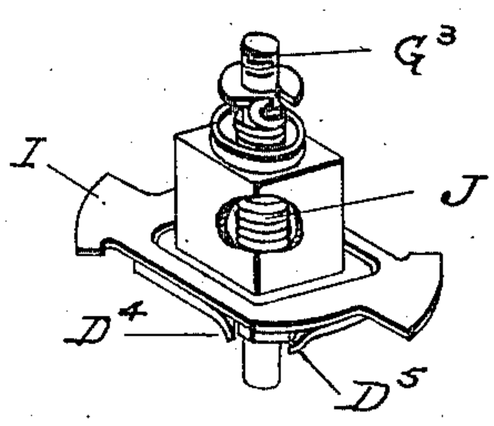


Fig. 5



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CONTROLLING MEANS FOR ELECTRIC CIRCUITS.

964,037. Specification of Letters Patent. Patented July 12, 1910.

Application filed September 2, 1909. Serial No. 515,932.

To all whom it may concern:

Be it known that I, JULIUS K. LUX, a citizen of the United States, residing at Jersey City, in the State of New Jersey, have invented certain new and useful Improvements in Controlling Means for Electric Circuits.

The principles of my invention are embodied in the form of a single pole snap switch, of which the following is a specification.

The subject matter of this application appeared in my application Serial No. 143139 Feb. 12, 1903 and Serial No. 152092 April 10, 1903.

Figure 1 is a plan view of a switch embodying my improvements and showing the hereinafter described impact absorbing addenda integral with the fixed contact brushes. Fig. 2 is a view analogous to Fig. 1, but with the addenda integral with the movable contact. Fig. 3 is a view of the detaining means which is fixed to the base by means of the portions A^6. Fig. 4 is an under view of turning parts of the device enlarged and showing the spindle, the eccentric on the spindle, and the movable detaining means or bolt which is operated by the said eccentric. Fig. 5 is a side view of the movable contact partly broken away at the top central portion, and showing the spindle and actuating spring partly withdrawn from the said central portion of the movable contact. Fig. 6 is a top plan view of the part shown in Fig. 3 and showing the ratchet teeth of unequal lengths and unequally spaced. Fig. 7 is an under view of the coöperative detaining means and the movable contact.

Referring to the drawings in detail A indicates the porcelain base.

A^8 indicates a bearing piece for the moving parts of the mechanism. The said bearing is formed with a downwardly projecting hub at the central portion to afford a long bearing for the hereinafter described spindle G^3.

A^6, A^6 indicate fingers by means of which the bearing piece is secured to the base.

D^6, D^6 and D^7, D^7 indicate detents formed as unequally spaced ratchet teeth of unequal lengths on the edge of the bearing piece A^8. The said detents coöperate with the moving parts of the device so as to detain the said moving parts during the initial movements of the hereinafter described energizing means, and until predetermined amounts of energy are stored in the hereinafter described yielding actuating means or spring. The said detents also act as stops to limit the successive movements of the device.

1 indicates the movable contact which is revolubly mounted in position to come into rubbing or sliding engagement with the hereinafter described fixed contacts. The said movable contact has a projection D^5 on its under surface which projection normally engages the hereinafter described coöperative detaining means or bolt L. It secures the said bolt as against rotation relatively to the movable contact 1 and permits the required reciprocal movement of the said bolt L. D^4 is another projection similar to D^5 and it limits the movement of the bolt L when the hereinafter described handle E is being unscrewed from the spindle G^3. The said movable contact is formed with a perpendicular central portion which central portion incloses the yielding actuating spring J, and in which central portion one end of the said spring is secured or engaged so as to operate the movable contact. The spindle G^3 extends through the central portion of the movable contact, and at its upper part is provided with a projection to suitably engage one end of the spring J. At its upper extremity the said spindle is provided with a screw thread to fasten the handle E. The lower part of the said spindle is journaled in the bearing piece A^8.

Fixed to the spindle G^3 at a point between the movable contact and the bearing piece is the eccentric F; one side of the said eccentric bears on the under surface of the movable contact, and the other side of the eccentric bears on the bearing piece A^8. The eccentric F moves the bolt L into and out of engagement with the detents D^6 and D^7. When the device is assembled, the handle E, the spindle G^3 and the eccentric F operate as one piece.

L indicates a coöperative detaining means or detent. It is formed as an eccentrically operated bolt and the eccentric F causes it to reciprocate to and from the center of the device to respectively detain and release the movable contact. The upper surface of the part L bears against the under surface of the

movable contact. The major lower surface of the part L bears against the top of the bearing piece A^8.

L^1 indicates a projection on the under surface of the part L; which projection extends below the upper surface of the bearing piece A^8 and comes into engagement with the edge of the latter and with the faces of the detents, so as to form a movable detaining means to coöperate with the fixed detaining means or detents. In other words the projection L^1 engages the sides and the bottoms of the ratchet teeth.

B, B indicate fixed contacts disposed at opposite sides of the axis and having binding screws B^3, B^3 by means of which the conductors B^2, B^2 are secured in position. When the parts are at rest in either open or closed positions the actuating spring is under moderate stress and the part L^1 bears against the face and the bottom of the detent tooth. The said engagement with the face of the detent will hold the movable contact as against rotation, and the said engagement of L^1 with the bottom of the detent tooth prevents further relaxation of the said moderate spring stress.

To operate the device that end of the actuating spring J which is secured to the spindle G^3 is by means of the handle E turned in a clock-wise direction, thereby placing the spring J under increased stress. The eccentric moves the part L^1 away from the spindle G^3 and when a predetermined amount of energy is stored in the actuating spring the part L^1 is caused by the eccentric to pass beyond the extremity of the detent, and the energy previously stored in the yielding actuating means or spring carries the movable contact and the part L^1 to the next position. The eccentric not being turned with the same celerity as the part L^1 causes the latter part to move toward the axis of the spindle and to engage the next detent. Successive movements of the device are effected in like manner.

In spring closing switches it has been usual to use no less spring power in the opening than in the closing movement. In the closing movement of the device the fixed contacts act as a cushion or buffer by reason of the sliding or rubbing contact, but in the opening movement, the movable contact opens with a hammer-like blow on the stop or other parts that limit the said movement, and that (increased) power which is desirable in the closing movement, is objectionable and detrimental in the opening movement of the device. When the opening and closing powers are alike each of the said two powers and their mean or average are the same (given) quantity. My improved arrangement subtracts from the said quantity in the opening movement and adds to the said given quantity in the closing movement of the device. The said arrangement develops more power in the closing and less power in the opening of the device than the mean or average power of the combined opening and closing movements.

I desire to call special attention to the arrangement, the proportioning and the functions of the said detents. The arrangement of the detents D^6, D^6 relatively to the contacts causes the movable contact to turn less than has been usual to effect (a complete) engagement of the movable with the fixed contacts.

For convenience in description the closing movement will be divided into four periods. 1 maximum spring stress. 2 spring stress at beginning of rubbing connection (of cooperative contacts.) 3 spring stress at the moment of full engagement of said contacts. And 4 spring stress at conclusion of closing movement.

The arrangement of the detents D^6, D^6 with reference to the fixed contacts is such that the movable contact turns but little to begin the rubbing connection with its cooperative fixed contacts; this assures spring power near the maximum stress. The spring power is also greater with relation to the maximum stress than is usual when the full engagement of the coöperative contacts is effected. And the spring stress which subsists at the time of full engagement of the contacts subsides during the remainder of the closing movement; and in addition it is partly absorbed by the extra rubbing connection which continues from the time of full engagement until the movement is stopped by the coöperating detents D^7 and L^1. The said extra rubbing connection and the continued unwinding of the spring reduces the shock to the parts at the conclusion of the opening movement. This arrangement taken with a given maximum stress contributes to a more powerful closing action and less powerful impact on the detents than has been usual.

In the closing movement the energizing means or handle turns farther than has been usual before the movable contact is freed from the detent. By this means the actuating spring is brought under greater stress, so as to increase the closing power of a given actuating spring without increasing the opening power thereof.

In the opening movement of the device the handle turns less than has been usual to free the movable contact from the detent. By this means an actuating spring of a given strength is brought under less stress in the said movement, so as to decrease the opening power of the said spring without decreasing the closing power thereof. In other words, the shorter detents decrease the opening power. The longer detents increase the closing power, and the herein described dispo-

sition of the contacting surfaces relatively to the detents D^6, D^6 further increases the circuit closing power of any given spring stress.

In my improved switch, the preferred form of detaining means for the movable contact are of the ratchet tooth form, and with the reciprocal coöperative detaining means shown. I desire it understood, however, that the principles of my invention may be applied to all intermissively rotary circuit controlling devices wherein yielding actuating means effects a snap opening and closing of the circuit or device. By reason of the increased closing power the coöperating contacts may be made stiffer and with greater contacting and carrying capacity.

The power of the yielding actuating means is so related to the impact absorbing capacity of the fixed contacts that the detents should be protected from excessive shock in closing the device. In practice however, this adjustment is difficult to maintain. I have therefore devised other means for reducing the shock of impact on the detaining means in the closing movement. Usually in the closed position of switches of this type, the fixed contacts have contacting surfaces equal in area to those of the coöperating movable contacts. When there has been any overlapping it has been equal at each side of the smaller member.

The major addenda or overlapping portion or portions of the respective contacts are disposed at one side of that area of actual engagement or contact which obtains when the device is closed and without diminishing the contact making stress or pressure between the coöperating contacts. The said addenda may be affixed to the movable contact as shown in Fig. 2, or to the fixed contact as shown in Fig. 1, or to both of these coöperating contacts.

I will not seek to herein broadly claim a snap switch for closing a circuit with more yielding power than is used to open it as that subject matter appears in Reissue Patent #12,490 of May 29, 1906.

I claim—

1. In a snap switch, an electrical contact, a coöperative movable contact, a torsional spring for yieldingly urging the said movable contact, means for energizing the said spring, means for detaining the said movable contact and means for releasing the said movable contact when a prearranged power is stored in the said torsional spring, said releasing means having movement, for releasing the said movable contact to close the circuit after more yielding power is stored than is used to open the circuit.

2. In a rotary snap switch having coöperative contact members, means for yieldingly actuating a rotary part, means for energizing the said yielding means, means coacting to successively detain and release the said rotary part and for releasing the said rotary part to close the circuit after more yielding power is stored than is used to open the circuit.

3. In a rotary snap switch having coöperative contact members, means for yieldingly actuating a rotary part, means for energizing the said yielding means, means coacting to successively detain and release the said rotary part and for releasing the said rotary part to close the circuit after more yielding power is stored than is used to open the circuit, said coacting means including a cam for moving one of the said coacting parts with reference to the other one.

4. In a rotary snap switch having coöperative contact members, means for yieldingly actuating a rotary part, means for energizing the said yielding means, means for detaining the said rotary part and means for releasing the said rotary part when a prearranged power is stored in said yielding means, said detaining and releasing means having movement with relation to each other for releasing the said rotary part to close the circuit after more yielding power is stored than is used to open the circuit.

5. In a rotary snap switch having coöperative contact members, means for yieldingly actuating a rotary part, means for energizing the said yielding means, means coacting to successively detain and release the said rotary part and to release the said rotary part after a greater movement of the said energizing means to close the circuit than is used to open it.

6. In a circuit controlling device, a suitable support, an electrical contact carried thereby, a rotary contact to coöperate with said first contact, yielding means for opening and closing said contacts with snap actions, means for energizing said yielding means, means for detaining the action of said yielding means during the energizing thereof, and means for releasing said yielding means from said detaining means for more than a quarter revolution in its closing movements, said contacts being located to engage in closing before the completion of the quarter revolution and to maintain engagement during the remainder of the closing movement.

7. In a circuit controlling device, a suitable support, an electrical contact carried thereby, a rotary contact to coöperate with said first contact, yielding means for opening and closing said contacts with snap action, means for energizing said yielding means, means for detaining the action of said yielding means during the energizing thereof, and means for releasing said yielding means from said detaining means for a greater movement of the rotary contact in closing than in opening the circuit.

8. In a circuit controlling device, a suitable support, an electrical contact carried thereby, a rotary contact to coöperate with the said first contact, yielding means for opening and closing said contacts with snap actions, means for energizing said yielding means, detents for detaining the action of said yielding means, said detents being alternately larger and smaller for placing said yielding means under greater stress to close the circuit than is used to open the same.

Jersey City N. J. Sept. 1—.09.

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