J. BIJUR.

ELECTRIC CIRCUIT CHANGING APPARATUS.

APPLICATION FILED AUG. 26, 1911.

1,271,535. Patented July 9, 1918.

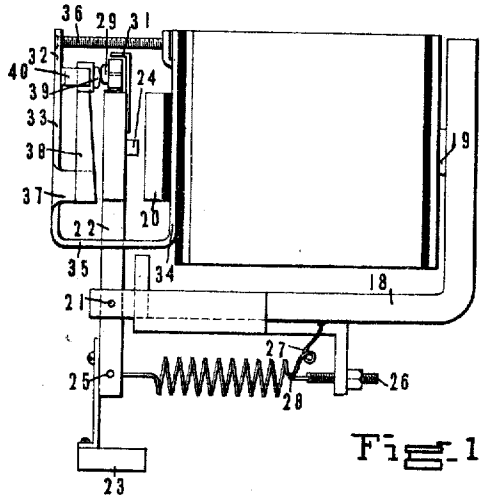


Fig. 1.

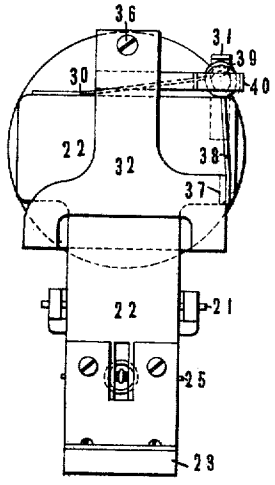


Fig. 2.

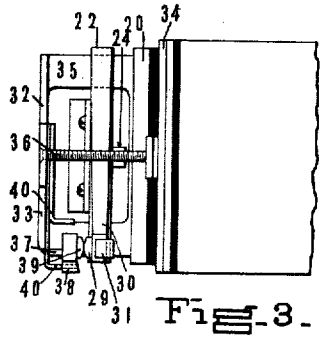


Fig. 3.

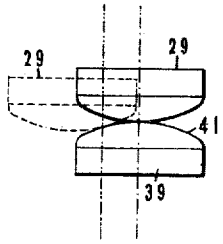


Fig. 4.

WITNESSES

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ELECTRIC-CIRCUIT-CHANGING APPARATUS.

1,271,535. Specification of Letters Patent. **Patented July 9, 1918.**

Application filed August 26, 1911. Serial No. 646,189.

To all whom it may concern:

Be it known that I, JOSEPH BIJUR, a citizen of the United States, residing at New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Electric-Circuit-Changing Apparatus, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to circuit-changing apparatus, and with regard to the more specific features thereof, to contact mechanism for vibrators and the like.

One of the objects thereof is to provide a practical and reliable device for intermittently interrupting an electric circuit. Other objects are to provide a device of the above nature of simple and durable construction and dependable and efficient action. Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements and arrangement of parts which will be exemplified in the construction hereinafter set forth, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings, wherein is shown one of various possible embodiments of this invention,—

Figure 1 is a side elevation of a circuit-interrupting device;

Fig. 2 is an end view thereof;

Fig. 3 is a partial plan of the same;

Fig. 4 is a diagrammatic view showing the action of the contacts.

Similar reference characters refer to similar parts throughout the several views of the drawings.

As shown in Fig. 1, there is provided an iron member 18 which performs the functions of acting as a supporting element for the device and completing the magnetic circuit. Mounted upon this member is a core 19, upon which the coils are wound, and this core is provided with an enlarged head 20. Pivoted to member 18 at 21 is a swinging armature 22 so counter-balanced at 23 as to bring its center of gravity within its pivotal axis. This member is swung inwardly by core 20 to a point limited by the brass pin or stop 24 and is urged outwardly by a suitable spring soldered at 25 to a pin upon armature 22 and stretched to a pin 26 adjustably mounted upon the support 18. A suitable electrical connection 27 is soldered as shown at 28 to this spring and to the support 18.

Armature 22 has mounted thereon a contact member 29 by means of a flat spring 30, shown in dotted lines in Fig. 2 of the drawings. This spring is set edgewise with respect to the direction of vibration of the armature and is of such a thin, sensitive nature as to result in a continuous lateral oscillation or trembling while the device is in action, the amplitude of swing of this trembling movement being limited by the stop 31 and the adjacent side of the armature.

Mounted upon the magnet, but electrically insulated therefrom, is a bracket 32, preferably formed of brass, this bracket being bent to provide the substantially parallel portions 33 and 34 connected by portion 35 and having their free ends joined by the adjusting screw 36. Formed upon bracket 32 is a lug 37, on which is mounted a spring 38 similar to spring 30 and having at its free end a contact member 39. The mounting of this contact member upon the flat spring 38 is such that it tends to oscillate or quiver in a direction substantially at right angles to the direction of the similar movement of the contact 29. A pair of stops 40 are provided to limit the lateral movement of contact 39. Springs 30 and 38 are preferably of a tapering form, as shown, to increase their sensitiveness and guard against deformation.

Referring to Fig. 4 of the drawings, the contacts 29 and 39, which are securely mounted upon their respective springs, are shown upon a larger scale. The adjacent surfaces of these contact members are preferably evenly rounded, as indicated at 41, but any convex formation is advantageous, and it is to be noted that by the term "convex," as used herein, is meant any shape such that cross-sections taken in successive planes transverse to the line of movement of the contact in a direction toward the opposing contact will be of diminishing area.

In the action of this device the vibration,

due to movement of the armature or other cause, gives rise to a constant trembling of the contacts in directions which are transverse with respect one to another, and hence as these contacts come into and out of engagement the point at which they touch continually shifts over their surfaces. The entire surface of each, moreover, is brought into action by the structures above set forth, and hence any tendency of the disruptive discharge or slight sparking to carry metal from one contact to another is not localized, but is continually changing in its point of application. In this manner any deposit of metal or corresponding removal of metal, which action, of course, is of a minute order, is so broadened in its application as to do away with any chance of injury to the device. This effect, moreover, is wholly automatic; that is, the action is caused by the movement of parts which perform another function by such movement, and hence this particular mechanism is self-acting.

The use of contacts or electrodes having a convex surface, and particularly a curved conformation, is in itself decidedly advantageous, as the breaking down of the metal starts in the center of the contact and there is less likelihood of the device being rendered inoperative by the depositing action above referred to. In connection with means for varying the point at which the metal is deposited, however, this convex structure is peculiarly effective. As indicated in Fig. 4 of the drawings, the point of contact is positively varied by the lateral movement, even though one or the other of the surfaces were marred by irregularities due to deposited metal, or other reason. Moreover, this effect is gained without harmfully varying the distance through which the armature swings to bring the members into and out of contact, and this distance is adjusted and fixed by the screw 36, as above described. The convex form, moreover, gives a larger surface for contact with a given lateral movement of the contact members than could be obtained with flat surfaces.

A device of this character is rendered more certain in action by pivoting the vibrating member at its center of gravity or counter-balancing the same in such a manner that the movement of the armature will not be affected by the vibration which causes the trembling of the spring mounted contacts, and hence this vibration may be carried to any degree found desirable for best action. This device, moreover, is peculiarly adapted for use in connection with electrical regulating apparatus, inasmuch as the uniformity of contact gives a substantially uniform resistance to electric current in the circuit which is interrupted, and hence tends to an accurate and uniform action in the regulating apparatus.

A further and highly important feature to be noted in connection with this invention is that the automatic change of surface against which the sparking is directed is accomplished without placing any additional load on the vibrating mechanism. In other words, the energy by which this action is carried on is not taken from the vibrator magnets, and hence the attraction exerted by this magnet upon its armature is not in any way varied or affected by the necessity for performing another function, such as causing lateral movement of the contacts. Moreover, the fact that both contacts are alike and symmetrically disposed permits wholly efficient action of the vibrating mechanism even though the direction of current therethrough be reversed.

It will thus be seen that there is provided apparatus in which the several objects of this invention are accomplished, and that this apparatus is well adapted to meet the requirements of practical use.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

Having described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In combination, an electric circuit comprising a pair of coacting contacts, electromagnetic means adapted to vibrate said contacts into and out of engagement in a direction transverse to their operative faces, and means loosely mounting one of said contacts to permit it to be swung upon contact-making action in a direction transverse to the line of said first movement and about an axis passing outside of the center of gravity of said contact.

2. In combination, a coil, a counter-balanced vibratory member mounted within the effective field of said coil, adjustable means tending to swing said member away from said coil, a pair of coacting contacts, one of which is mounted upon said vibratory member and the other of which is mounted in position to be intermittently engaged by said first contact as said member vibrates, conducting means respectively leading to said contacts, and resilient means adapted to vary irregularly the point of contact surface against which the spark is directed as the circuit is interrupted by the separation of the contacts, said resilient means being formed and mounted to cause movement of the contact with which it

is connected in a path other than that in which it is positively urged by the action of said coil.

3. In combination, an electric circuit comprising a pair of co-acting contacts, electro-magnetic means adapted to vibrate said contacts into and out of engagement in a direction substantially transverse to their active surfaces, and means mounting one of said contacts upon a point eccentric to its center of gravity to permit it to move irregularly about said point transversely with respect to said first movement.

4. In combination, a circuit comprising a pair of co-acting contacts, the co-acting surfaces of which are non-fitting with respect one to another, means mounting said contacts adapted to permit substantially all of the active area of one of said contacts to move into engagement with the other contact, and electro-magnetic means adapted to vibrate said contacts toward and away from one another in a direction substantially transverse to their active surfaces.

5. In combination, an electric circuit comprising a pair of coacting contacts, means adapted to move one of said contacts into and out of engagement with the other thereof, and means mounting said contacts to permit relative movement thereof in two directions transversely with respect to the line of said first movement.

6. In combination, an electric circuit comprising a pair of coacting contacts, means adapted to move one of said contacts into and out of engagement with the other thereof, and resilient means mounting said contacts to permit relative movement thereof in two directions transversely with respect to the line of said first movement.

7. In combination, an electric circuit comprising a pair of coacting contacts, means adapted to move one of said contacts into and out of engagement with the other thereof, and means mounting each of said contacts adapted to permit the respective contacts each to move transversely with respect to the line of said first movement.

8. In combination, an electric circuit comprising a pair of coacting contacts, means adapted to move one of said contacts into and out of engagement with the other thereof, and a flat spring mounting one of said contacts in position and set edgewise with respect to the direction of said movement.

9. In combination, an electric circuit, a pair of coacting contacts, means adapted to move one of said contacts into and out of engagement with the other thereof, and a pair of flat springs respectively mounting said contacts in position and arranged transverse one to another and each set edgewise in the direction of said movement.

10. In combination, an electric circuit comprising a pair of coacting contacts, means adapted to move one of said contacts into and out of engagement with the other thereof, means mounting one of said contacts upon a point eccentric thereto to permit it to move irregularly about said point transversely with respect to said first movement, and means limiting said transverse movement.

11. In combination, an electric circuit comprising a pair of coacting contacts, means adapted to move one of said contacts into and out of engagement with the other thereof, means resiliently mounting one of said contacts to permit it to vibrate transversely with respect to said first movement, and means limiting said transverse movement.

12. In combination, a controlling coil, a vibratory member controlled by said coil, a pair of contacts one of which is moved toward and away from the other by said vibratory member, and means comprising a resilient member mounting said contacts to permit relative movement thereof in two directions transverse to said vibratory movement.

13. In combination, an electric circuit comprising a pair of coacting contacts, means adapted to move one of said contacts into and out of engagement with the other thereof, and means mounting one of said contacts upon a point eccentric thereto to permit it to move irregularly about said point and transversely with respect to said first movement, one of said contacts being formed to provide a convex surface for engagement with the other.

14. In combination, an electric circuit comprising a pair of coacting contacts, means adapted to move one of said contacts into and out of engagement with the other thereof, and means mounting said contacts to permit relative movement thereof in two directions transversely with respect to the line of said first movement, one of said contacts being formed to provide a convex surface for engagement with the other.

15. In combination, an electric circuit comprising a pair of coacting contacts, means adapted to move one of said contacts into and out of engagement with the other thereof, and means mounting each of said contacts adapted to permit the respective contacts each to vibrate freely in a direction transverse with respect to the line of said first movement, one of said contacts being formed to provide a convex surface for engagement with the other.

16. In combination, an electric circuit comprising a pair of coacting contacts, means adapted to move one of said contacts into and out of engagement with the other thereof, and means mounting each of said contacts adapted to permit the respective contacts each to move transversely in dif-

ferent directions with respect to the line of said first movement, each of said contacts being formed to provide rounded surfaces for engagement with the other.

17. In combination, an electric circuit comprising a pair of coacting contacts, means adapted to move one of said contacts into and out of engagement with the other thereof, and a flat spring mounting one of said contacts in position and set edgewise with respect to the direction of said movement, said contact members having their effective surfaces rounded.

18. In combination, a controlling coil, a vibratory member controlled by said coil, a pair of coacting contacts, a flat spring mounting one of said contacts on said vibratory member, a second flat spring set transversely with respect to said first flat spring and mounting the other of said contacts in position to coact with the first contact, said flat springs being set edgewise with respect to the vibratory movement of said vibratory member, and an electric circuit in which said contacts are connected, each of said contacts being formed to provide a rounded surface for engagement with the other.

19. In combination, an electric magnet, a vibratory member magnetically actuated by said magnet, and a pair of coacting contacts one of which is intermittently moved into engagement with the other by said vibratory member, means for loosely mounting one of said contacts to permit it to be swung irregularly by the shock of its engagement with the other and formed to present an inclined contact surface movable in a direction other than that in which the parts move into contact.

20. In combination, an electromagnet, a vibratory member magnetically actuated by said magnet, and a pair of co-acting contacts, one of which is intermittently moved into engagement with the other by said vibratory member, means for loosely mounting one of said contacts to permit irregular movement by the shock of its engagement with the other in a direction at an angle to the line of contact-making movement, and the engaging surface of one of said contacts being rounded.

21. In combination, an electromagnet, a vibratory member magnetically actuated by said magnet, a pair of co-acting contacts one of which is intermittently moved into engagement with the other by said vibratory member, one of said contacts having a rounded engaging surface and the other having a non-fitting surface co-acting therewith, and means mounting said contacts adapted to permit relative movement thereof in two directions laterally with respect to the direction of their vibratory movement.

22. A circuit interrupting device comprising in combination, a coil, a magnetic circuit energized by said coil, and comprising a spring-retracted vibratory armature, a contact carried by said armature and provided with a rounded surface, a second contact into engagement with which said armature intermittently moves the rounded surface of said first contact, the engaging surfaces of said contacts being non-fitting with respect one to another, and means loosely mounting said second contact for freedom of movement in a direction other than that of said first contact.

In testimony whereof I affix my signature, in the presence of a witness.

JOSEPH BIJUR.

Witness:
HELEN M. SEAMANS.

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