R. H. CUNNINGHAM.

CIRCUIT BREAKER FOR MAGNETOS AND THE LIKE.

APPLICATION FILED FEB. 8, 1911.

1,021,506. Patented Mar. 26, 1912.

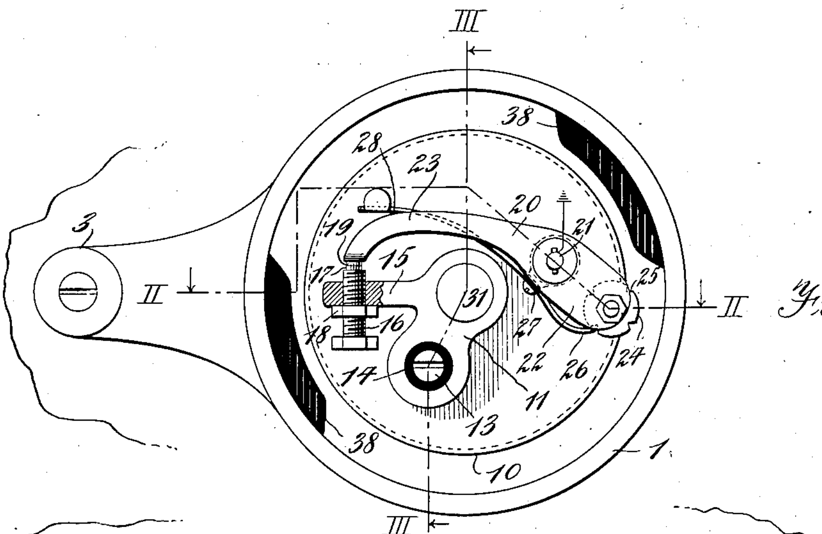

Fig. 1.

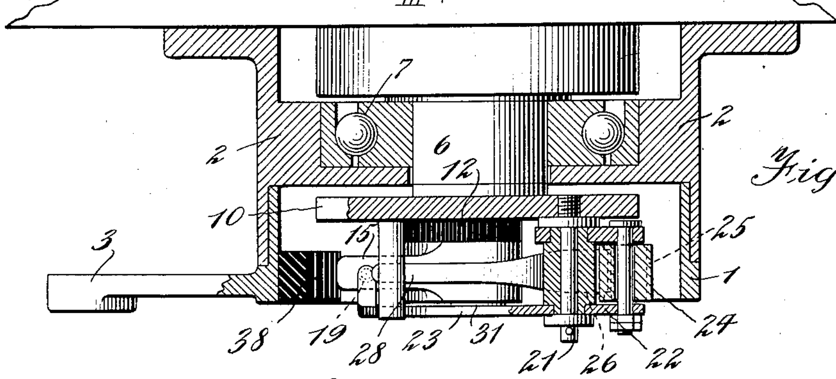

Fig. 2.

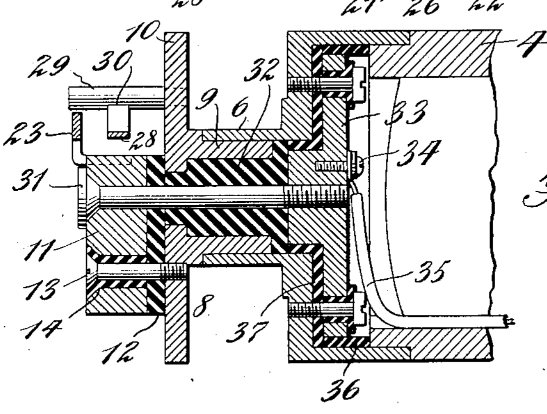

Fig. 3.

Witnesses:

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CIRCUIT-BREAKER FOR MAGNETOS AND THE LIKE.

1,021,506. Specification of Letters Patent. Patented Mar. 26, 1912.

Application filed February 8, 1911. Serial No. 607,269.

To all whom it may concern:

Be it known that I, RICHARD HOOPE CUNNINGHAM, a citizen of the United States, residing at New York city, in the borough of Manhattan and State of New York, have invented certain new and useful Improvements in Circuit-Breakers for Magnetos and the Like, of which the following is a full, clear, and exact description.

This invention relates to electric circuit controlling devices and particularly to breaker boxes for dynamo electric generators or magnetos of the type adapted for use in connection with internal combustion engines, such as are used upon automobiles, motor boats, and the like; and has for its object the provision of a novel circuit breaking mechanism which is adapted to make and interrupt the circuit through the primary of the magneto at proper and regular intervals, no matter what the speed of the engine, or of the armature of the magneto, may be.

In devices of this character as heretofore constructed, it has been customary to depend solely upon a spring or springs as the means of maintaining two contact points or elements normally in opposition; co-acting devices being provided which are intended to break contact between said points at given intervals when the armature shaft, upon which the device is usually mounted, is rotated. The difficulty encountered herein, however, is that the parts involved necessarily have some weight and hence some inertia. Furthermore each spring has a definite periodicity at which it tends to vibrate. Hence, when the said shaft is rotating at very high speed, the spring, even if made quite strong, in order that it may urge the points into contact after they have been separated by the impingement of a moving part against a fixed part or parts, is still unreliable owing to its periodicity, and the use of a powerful spring is further obviously objectionable for many reasons, such for example, as increased friction and wear and tear on the device.

I have devised means whereby the action of centrifugal force may be employed to effect the desired contact between the points in question, and prefer to supplement this action by that of a very light spring so that the contact points or elements will be normally maintained in contacting relationship at all times except when they are forcefully driven apart by devices provided for that purpose. Furthermore, while when the shaft carried parts are being rotated at a relatively low speed, and hence while the light spring aforesaid will be amply strong enough to effect such closure, the centrifugal action will not be very material, and the wear will be correspondingly diminished; but as the speed of rotation of the parts is increased, this centrifugal action becomes more and more pronounced, so that in effect I have provided a variable pressure contact-closing mechanism. These and other objects of my invention will be hereinafter referred to and more particularly pointed out in the appended claims.

In the drawings which form a part hereof, and in which like reference characters designate like parts throughout the several views: Figure 1 is an elevation of a preferred form of my invention. Fig. 2 is a horizontal section of the same taken on the line II—II of Fig. 1. Fig. 3 is a fragmentary vertical transverse section of the same taken on the line III—III of Fig. 1.

Referring to the drawings, a cylindrical frame or ring 1 is mounted upon a suitable casing 2 which is adapted to be secured to the magneto frame in any suitable manner, said cylindrical frame having an extension 3 whereby the same may be oscillated in the usual manner. One extremity of the armature 4 which is centrally disposed with respect to the said casing and ring preferably carries an armature trunnion 6 which may be mounted upon suitable ball bearings 7, in the manner shown in Fig. 2. In so far as the present invention is concerned, however, the manner of supporting the armature is immaterial, so that the same will be but briefly referred to. The trunnion forming element 6 is recessed interiorly for the reception of a circuit breaker support 8, the hub 9 of which fits neatly into the element 6 and is hence carried and rotated thereby; being secured thereto in any suitable manner. The body of this support is preferably a circular disk, and upon this disk are mounted the rotative elements of the circuit breaking mechanism to which this invention relates. Substantially centrally disposed upon the supporting disk is a bracket 11 of bronze or other suitable material which is insulated from the disk by an insulating washer 12, being secured thereto in any suitable manner, as for example by means

of a bolt or screw 13, which is threaded into the disk, said bolt being insulated from the bracket by an insulating bushing 14.

The bracket as viewed in Fig. 1 is preferably somewhat S-shaped and carries a laterally extended lug 15 which is apertured and tapped for the reception of an adjustment screw 16, which may be of any suitable conductive material, and the upper extremity of which preferably carries a contact element or point 17, of platinum or the like. This screw may be provided with the usual lock nut 18 and the contact point 17 is adapted for contact with a similar point or element 19 which is carried by an operating part or lever 20, upon one extremity of such part. This operating part is preferably a lever of the first-class, and is pivoted at 21 to the support or base 10, being in electrical communication therewith. An important feature of my invention is involved in the construction of this lever, the short arm 22 of which is preferably so positioned with respect to the long arm 23 of the lever that a right line passing through the center of gravity of arm 22 and the pivotal axis is angularly disposed with respect to a right line passing through the center of gravity of arm 23 and the said pivotal axis, such short arm being relatively heavier than said long arm, the latter being preferably quite thin. The contact element 19 is secured to the free end of arm 23. At the outer extremity of arm 22 is mounted a normally non-revoluble cylindrical member 24 which is preferably nicked as at 25 at intervals around the peripheral surface thereof, said nicks being adapted for the reception of the extremity of a leaf-spring 26. This spring is secured to the lever in any suitable manner as by means of a screw 27, and has its other extremity 28 adapted for engagement with a pin 29, which projects laterally from the surface of the base 10. I prefer to notch the pin 29 as at 30 for the reception of this spring to prevent lateral displacement of the latter. An axially disposed stud or bolt 31 extends through bracket 11, insulating washer 12 and an insulating sleeve 32 which is positioned within the cap 9; this bolt being threaded into the hub of a disk 33 so that when screwed firmly into position it tends to draw all of the parts in question firmly together. Bolt 31 further serves as means for conducting current from the bracket 11 to the disk 33 and this disk is electrically connected in any suitable manner, as by means of a set screw 34, with a lead 35 which preferably extends in the usual fashion to the primary coil of the magneto. The periphery of the disk 33 may be insulatedly spaced from the wall of the recess in the element 6 by a ring 36 of insulating material, while the outer surface of the said disk is correspondingly insulated from the trunnion forming element 6 by means of an insulating washer 37. It will hence be seen that current may be led into disk 33 from lead 35 and will thence traverse stud 31, bracket 11, screw 16, and the contact elements or points 17 and 19, provided the latter be in contact, and will thence traverse the lever 20, to ground; the lever being grounded at 21 since its pivotal pin is in contact with the conductive support 8, and the latter being in direct electrical communication with the magneto frame via the element 6. The frame 1 preferably carries a plurality of cams 38 which may be formed of fiber or other suitable material, said cams being adapted for engagement with a portion of the roller 24. I find that it is preferable to have a sliding engagement between these parts rather than a rolling contact and have for this reason notched the said roller and adapted it to be held by the spring 26 in the manner above described. As the cam engaging portion of the roller becomes worn, the roller may be shifted around to afford a new engaging surface.

The operation of the device is as follows: When the revoluble part of the magneto, to wit, the armature is rotated, current will be generated in the usual manner in the magneto primary coil. Rotation of the armature will correspondingly rotate the support 10 and thereby cause a surface of the member 24 to successively impinge against cams 38. This action will periodically forcibly separate the contact points 17 and 19 and thereby periodically interrupt the flow of current through the primary. Spring 26 is preferably a very light one so that it normally tends to press contacts 17 and 19 lightly together. By reason, however, of the disposition of the arm 22 and by reason further of the fact that this arm and relatively heavier parts, *i. e.*, the member 24 and its stud, carried thereby, will tend under the influence of centrifugal force to swing outwardly about the pivotal axis of the lever and will thereby normally force the contact points more firmly into engagement with each other. When the member 24 encounters a cam 38 the contact elements will be separated in spite of this combined action of the spring and centrifugal force; but the arrangement in question is a particularly efficacious one in view of the fact that as the speed of rotation is increased the tendency of the contact carrying lever or operating part to move into circuit closing position is increased. To the best of my knowledge, heretofore, in devices of this character springs have been relied upon solely for the purpose of effecting the closure of circuit, but this construction is open to several objections and subject to disadvantages, in that while the spring is able to effect contact fairly uniformly so long as the speed

of rotation is not great, this closing action is seriously interfered with when the speed of rotation of the parts is very high, and since under such conditions the spring, unless a very heavy one be employed, is not powerful enough normally to close the contacts when the same have been forced apart by the impingement of a roller or the like upon one of the operating cams, the said roller encountering a second cam before the lever has had time to move to circuit closing position; or at least before the contact points have been well pressed together to afford a proper closure of circuit. When in order to obviate this difficulty the spring or springs have been made strong, the friction and wear and tear upon the mechanism have been, of course, materially increased. Furthermore, since every spring has a certain periodicity of vibration, when the parts are rotating at great speed, this characteristic of the spring will in turn tend to interfere with the proper closure of the circuit. Obviously, also, closure solely by spring action is not positive; and by devising a mechanism of the character in question in which the action of centrifugal force is utilized to insure a normally closed circuit, much greater regularity of action may be attained. The use of a light spring is desirable since when the parts are rotating at very slow speed, the centrifugal action will necessarily be but slight.

Having thus described my invention, what I claim is:

1. In a circuit breaker, a support rotatable about an axis and adapted to be carried upon the extremity of a shaft, a bracket carried by said support, a contact element adjustably mounted in said bracket, a lever of the first class pivotally connected to said support, said lever having one arm thereof heavier than the other, a part adapted to contact with the fixed element carried by the lighter arm of said lever being adapted to be rotated about its pivoted axis by centrifugal force when the support is rotated, and said contact elements being thereby normally held in contact, and means for separating said elements at determined intervals during the rotation of said support.

2. In a circuit breaker, a support rotatable about an axis and adapted to be carried upon the extremity of a shaft, a bracket carried by said support, a contact element adjustably mounted in said bracket, a lever of the first class pivotally connected to said support, said lever having one arm thereof weighted heavier than the other, a part adapted to contact with the contact element aforesaid, said part being carried by the lighter arm of the lever, said lever being adapted to be rotated about its pivotal axis by centrifugal force when the support is rotated and said contact elements being thereby normally held in contact, means for separating said elements at determined intervals during the rotation of said support, and means for insulating said lever from said bracket.

3. In an electric circuit controlling device, a rotatable support, a lever of the first class pivoted thereupon, contacting means operable by said lever, one of the arms of said lever being weighted heavier than the other, said lever being rotatable about its pivotal axis into its circuit closing position by the action of centrifugal force when said support is rotated, a spring attached to said lever and normally urging said lever into the said circuit closing position, the action of said spring being supplemented by the centrifugal action aforesaid, and means for forcing said lever into open circuit position.

4. In an electric circuit controlling device, a rotatable support, a lever of the first class pivoted thereupon, contacting means operable by said lever, one of the arms of said lever being weighted heavier than the other, said lever being rotatable about its pivotal axis into its circuit closing position by the action of centrifugal force when said support is rotated, a spring attached to said lever normally urging said lever into the said circuit closing position, the action of said spring being supplemented by the centrifugal action aforesaid, and means for forcing said lever into open-circuit position, said means comprising a spring-held notched roller carried by said lever and a cam relatively fixed with respect to said support.

In witness whereof, I subscribe my signature, in the presence of two witnesses.

RICHARD H. CUNNINGHAM.

Witnesses:
WALDO M. CHAPIN,
WILLIAM C. LANG.