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WILLIAM C. BRINTON, JR., OF KENNETT SQUARE, PENNSYLVANIA, ASSIGNOR TO  
PHILBRIN CORPORATION, OF KENNETT SQUARE, PENNSYLVANIA, A CORPORATION OF DELAWARE.

## CONTACT MAKER AND INTERRUPTER.

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This invention relates to an improvement in interrupters for making and breaking the circuit of ignition systems for gas-driven automobiles.

5 The object of my invention is to provide a simple device of this character which is highly efficient and very sensitive, and which will not be affected by the vibrations of the return spring so that the device will function  
10 properly at a high speed.

Another object of my invention is to provide such a device in which the different element forming members are secured to each other by means of rivets and are so arranged  
15 that the different elements are maintained in connection with each other by spring means, so that the various elements which are movable relative to each other can readily be assembled.

20 A further object of my invention is to provide a device of this kind which will be actuated to make and break the circuit when the engine is rotated in one direction, but which will not affect the circuit when the engine  
25 is moved in the other direction.

The precise nature of my invention will be best understood by reference to the accompanying drawings, which will now be described, it being premised, however, that various changes may be made in the details of  
30 construction of the device without departing from the spirit and scope of my invention as defined in the appended claims.

Fig. 1 is a front view of one form of device made in accordance with my invention.

Fig. 2 is a detail sectional view on the line 2-2 of Fig. 1.

Fig. 3 is a perspective view of the actuating lever.

40 Fig. 4 is a perspective view of one end of the supporting spring for one of the contacts; and

Fig. 5 is a detail sectional view through the spring and the contact carried thereby.

45 In these drawings, the reference character 10 designates a supporting base of conducting material which may be connected in any desired manner to the engine support, in

proper relation to a cam shaft 11 and an actuating cam 12 thereon.

The cam 12 has four projections thereon, which are arranged to make and break the circuit, as hereinafter described, while the shaft 11 is connected to the crank shaft of the engine in such a manner that the inter-  
55 rupter will be actuated in timed relation to pistons.

Secured to supporting base 10 by means of rivets 14 is a block of insulating material 13, to which is riveted a bracket having a base  
60 member 15 and a vertical arm 16, the arrangement being such that the bracket is insulated from the base 10.

Threaded in the arm 16 of the bracket is a screw 17 which constitutes one pole of the  
65 device, the other side of the device being grounded in the usual manner through the base, and 18 is an adjustable fixed contact threaded in the arm 16.

19 is a movable contact connected to a flat  
70 or leaf spring 20 and a conductor member 21, which are provided with loops at their ends adapted to clamp around the posts 22 and 23 riveted to the base 10.

The loops on the spring are provided with  
75 detents 24 which engage the walls of recesses in the posts 22 and 23 to retain the springs against movement, while the loops on the ends of the spring 20 retain the parts in position on the posts and also assure a good  
80 contact between the conductor 21 and the posts.

By forming a laminated support for the movable contact 19, I am enabled to greatly  
85 increase the conductivity of the contact support as well as prevent the deterioration of the flexible quality of the spring.

Pivotally mounted on the post 23 is a vibrating lever for the movable contact 19 which is formed of a blank cut from sheet  
90 metal and bent to form the various members thereof. This lever comprises arms 25 having slotted openings therein which pivotally engage the post 23 and straddle the supporting spring 20. The other ends of the lever arms  
95 25 are connected to each other by a bridge

or body portion 26, which is engaged by the projections of the cam 12. 27 is a tongue integral with the rear of the bridge piece and which extends forwardly between the arms beyond the bridge piece.

28 is an elliptical spring secured to the laminated support for the contact 19, which is arranged to be compressed to take up further movement of the vibrating lever after the contacts 18 and 19 have engaged each other, and 29 is a stop pin for the vibrating lever.

30 is a helical spring connected to the post 22 and one of the lever arms 25, and which is arranged to retain the outer edges of the slots in said arms against the post 23, and also assist in retaining the lever against the stop pin 29.

The various members are blanked, punched and formed, and the bracket is secured to the block of insulating material by rivets which pass through the base 15 of the bracket and the block. The spring 20, after the loops on the ends have been formed and the body between the loops has been cambered, is assembled with the conductor member 21 and the elliptical spring 28, and the three members are then secured to each other by the movable contact, the one end of which passes through said members and is riveted to fix- edly secure the various members to each other.

The movable contact element is then inserted between the lever arms 25, and the vibrating lever together with the movable contact element are then placed in position by forcing the loop ends of the spring 20 over the posts 22 and 23. As the inner diameters of the loops (before positioning) are somewhat less than the diameters of the posts, the element will be held in its proper position relative to said posts by the grip of the loops and the detents 24, and the ends of member 21 will be held in electrical contact with the posts.

The detents 24 on the spring loops, which are seated in the recesses in the posts, will prevent movement of the element along or around the posts.

The spring 30 is then connected to the post 22 and the lever, which, together with spring 28, will retain the vibrating lever in position.

The fixed contact 18 is then adjusted with relation to the movable contact 19 to provide the proper gap between the contacts when the circuit is broken.

In operation, the bridge piece 26 of the vibrating lever is engaged by the projections of the cam 12 during the rotation of the cam in the direction of the arrow, shown on Fig. 1, which will close and then break the circuit each time the lever is engaged by a projection. When the lever is depressed, the members 20 and 21 will be straightened somewhat until the contacts 18 and 19 engage each

other, and any further movement of the lever will be taken up by the spring 28. As soon as the projections pass off the bridge piece, the contacts will be abruptly separated by the springs and the lever elevated against its stop.

If the shaft 11 should be turned backward for any reason, the vibrating lever will be moved rearwardly over the post 23 against the action of the spring 30 without closing the circuit through the contacts and without affecting the mechanism; and as soon as the projections clear the lever, the spring 30 will return the lever to its normal position.

The advantages of my invention result from the provision of a device of this character which is cheap of construction, as most of the parts can be blanked from sheet or ribbon stock, punched and shaped in forming dies. The various members of the different elements are then fixedly riveted to each other, after which the different elements can readily be assembled in proper relation to each other. By so constructing the device that the various element forming members are riveted to each other, I am not only enabled to greatly reduce the cost of making and assembling the parts, but am also enabled to produce more uniform structures, as well as structures which will not become disarranged by loose connections. Furthermore, I am enabled to provide a device which cannot be disarranged by the tinkering novice.

A further advantage results from the provision of an adjustable fixed stop, together with a vibrating stop supported on a leaf spring supported at both ends, which will prevent the spring from vibrating falsely under high speed, so that the device will function properly under all speeds. By cambering the spring and providing post-engaging loops on the ends thereof with positioning detents, I am enabled to make a light and sensitive spring support for the movable contact, which is easy of action and therefore noiseless, as well as a spring which will not be subjected to the fatigue to which a spring secured at one end is subjected, and therefore produce a device which has a very much longer life.

A still further advantage results from the provision of a laminated spring contact support, one portion of which is formed of conducting material while another portion thereof is formed of spring stock, which enables me to reduce the cross-sectional area of the spring below that required if the spring were used as a conductor, and as the current passes through the conducting material, the danger of destroying the spring by passing current therethrough is avoided.

A still further advantage results from the provision of spring clamping means on the ends of the spring contact support, which not only permits the spring to shift slightly

under flexure, but also provides means for making a perfect contact between the supporting posts and the contact support, as well as a structure which is readily assembled.

7 A still further advantage results from the provision of an elliptical spring connected to the contact spring, which is arranged to be compressed by the vibrating lever after the contacts have been moved into engage-  
10 ment with each other, as well as from the provision of a vibrating lever which is held in position on its pivot pin by the contact supporting spring.

Another advantage results from the pro-  
15 vision of a vibrating lever which is so mounted that it will be shifted and not move the movable contact when the lever actuating mechanism is actuated in the wrong direc-  
20 tion, together with a return spring for the lever which will slightly assist the contact supporting spring in retaining the vibrating lever in its returned position.

Having now fully described my invention, what I claim and desire to protect by Let-  
25 ters Patent is:—

1. A make and break device for electrical circuits comprising a support, a fixed contact, a leaf spring connected at both ends to the support, a movable contact connected to the  
30 spring between its ends, and auxiliary spring means for vibrating said spring.

2. A make and break device for electrical circuits comprising a fixed contact point, a leaf spring having a connecting loop formed  
35 at each end, two supporting pins adapted for engagement by the loops formed at the ends of said spring, stops on said pins and loops adapted to coact to stop movement of the loops about the pins, a contact point connect-  
40 ed to the spring between its ends and means adapted to act on the spring intermittently between its ends to vibrate it.

3. A make and break device for ignition circuits comprising a fixed contact, a spring-  
45 supported movable contact, vibrating means, and a vibrator interposed between the movable contact and the vibrating means arranged to vibrate the vibrator when moved in one direction and to be shifted without operating  
50 the vibrator when said means is moved in the reverse direction.

4. A make and break device for electrical circuits comprising a support, a fixed contact, a leaf spring connected at both ends to the  
55 support, a movable contact connected to the spring between its ends, a floating vibrating lever, an actuating spring between the leaf spring and the lever, and means for vibrating said lever.

5. A movable contact for a make and break device comprising a cambered leaf spring  
60 having a spring loop at each end, a conducting member on the convex side thereof having curved ends within the loops on the spring, an elliptic spring mounted on the conducting

member, and means for securing the contact, spring and conducting member to each other.

6. A make and break device for ignition circuits comprising a supporting base, a fixed  
70 contact mounted thereon but insulated therefrom, pins on said base, a cambered leaf spring connected to said pins, a contact connected to said spring intermediate said pins, a vibrating lever for the spring pivotally  
75 mounted on one of the pins and having arms straddling said spring, a second spring between the cambered spring and the lever, and means for vibrating said lever.

7. A make and break device for ignition circuits comprising a supporting base, a fixed  
80 contact mounted thereon but insulated therefrom, pins on said base, a cambered leaf spring having spring loops on the ends thereof frictionally engaging said pins, means on the pins for retaining the loops  
85 against endwise movement thereon, an elliptical spring mounted on the convex side of the leaf spring, a contact connected to the concave side of said leaf spring, a vibrating lever having arms straddling one loop of the  
90 leaf spring pivotally engaging one of said pins, said lever being in engagement with the elliptical spring, a stop for said lever, and means to vibrate said lever.

8. A make and break device for ignition  
95 circuits comprising a supporting base, a fixed contact mounted thereon but insulated therefrom, pins on said base, a cambered leaf spring having spring loops on the ends there-  
100 of frictionally engaging said pins, means on the pins for retaining the loops against endwise movement thereon, an elliptical spring mounted on the convex side of the leaf spring, a contact connected to the concave side of said  
105 leaf spring, a floating vibrating lever having arms straddling one loop of the leaf spring pivotally engaging one of said pins, said lever being in engagement with the elliptical spring, a stop for said lever, and means to vibrate said lever, said lever being arranged  
110 to be vibrated when said last mentioned means is moved in one direction and to be shifted endwise when said means is moved in the reverse direction.

9. A make and break device for electrical  
115 circuits comprising a pair of rigid supports, a fixed contact point, a leaf spring fixedly connected at separated points to said supports respectively, a contact point carried by  
120 said spring between its points of connection to said supports and means including an elliptical spring in engagement with said leaf spring at a point adapted to act on said leaf spring with said supports between its points  
125 of connection to vibrate it and and make and break contact between said points.

10. A make and break device for electrical circuits comprising a pair of rigid supports,  
130 a fixed contact point, a resilient member connected at its opposite ends to said supports

respectively, a contact point carried by said resilient member intermediate its ends, a second resilient member bearing on said first mentioned resilient member at a point adjacent to the contact point carried thereby and means operative on said second resilient member at a point opposite to its point of bearing on said first mentioned resilient member and adapted through the medium of said second resilient member to cause said first resilient member to make and break contact between said contact points. 10

In testimony of which invention, I have hereunto set my hand, at Philada., Penna, on this 29th day of November, 1920.

WILLIAM C. BRINTON, JR.