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AUTOMOBILE BREAKER POINT ASSEMBLY

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This invention relates to a breaker assembly used for making and breaking electrical contact in circuits such as automobile ignition systems.

Conventional breaker assemblies used in automobile distributors to supply pulses of electrical current to the ignition system are well known. These units generally include a relatively heavy and rigid arm which is secured at one end to pivot with respect to a frame. A first electrical contact is mounted on the other end of the arm to be adjacent a second electrical contact mounted on the frame. A strong spring urges the two contacts together. An actuator bar is disposed to engage an intermediate portion of the rigid arm so that as the bar is reciprocated, say by a rotatable cam, the contacts are opened and closed.

The prior art breaker assemblies are relatively large, due to the length of the rigid arm, and therefore usually require special mounting configuration. Consequently, many different types of breaker assemblies are made to meet the various special limitations found in different types of internal combustion engines. This creates the problem of high-cost, short-production runs to meet the great variety of replacement needs.

The relatively heavy and rigid contact arm of prior art breaker assemblies requires a strong spring to force it and the actuator bar to follow the cam. This causes high frictional contact between the cam and actuator bar, and extreme pounding between the contacts, which produces an abnormally large temperature buildup and increases contact wear. Moreover, the stiff spring and heavy arm have a relatively large inertia, and cannot follow the cam at high engine speeds.

This invention provides a breaker assembly of compact design so that it is small enough to fit into the distributor of any internal combustion engine. For this reason, it can be mass produced at a cost substantially lower than that of previous breaker assemblies. Even more important, the breaker assembly of this invention has a light mass and low inertia with a relatively weak spring return action so that there is a substantial reduction in frictional wear between the parts and between the electrical contacts because of reduced pounding forces. In addition to its long life and universal application to all types of internal combustion engines, the breaker assembly can operate at substantially higher speeds due to the lower mass and inertia than is possible for the heavier prior art units.

Briefly, the breaker assembly includes a frame and an elongated spring secured to the frame to be movable with respect thereto. A first electrical contact is mounted directly on the spring at a location spaced from where the spring is secured to the frame. A second electrical contact is mounted on the frame adjacent the first contact. An actuator bar is disposed to engage the spring and move the two contacts together and apart as the bar is reciprocated.

Since the contact is mounted directly on the spring, the rigid relatively heavy contact arm of the prior art devices is eliminated. This makes it possible to use a spring which is weaker than those previously used, and which therefore imposes less rubbing friction between the actuator bar and the cam. Moreover, the weaker spring creates less pounding between the electrical contacts, and the spring follows the cam at higher engine

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speeds than previously possible with conventional breaker assemblies.

In the preferred form of the invention, the electrical contact is mounted adjacent a free end of the spring, and the actuator bar is disposed to engage that free end so that the contact is located between the point where the spring is attached to the frame and where the spring is engaged by the actuator bar. This requires less force by the actuator bar to oppose the spring action and change the condition of the contacts.

Preferably, the actuator bar is made of electrical insulator material, such as nylon impregnated with molybdenum di-sulfide, which is sold under the trade name "Nylatron." This material is self-lubricating and has good wear-resistant properties. Moreover, its wear substantially matches that which occurs between the electrical contacts, and therefore reduces the amount of gap needed between the contacts on the initial adjustment. With the conventional prior art device, the gap must be set wider than actually desired because the prior art actuator bars wear faster than the contact points. This undesirable characteristic also requires that the prior art units be replaced or adjusted more frequently than is required by the breaker assembly of this invention.

Preferably, the spring is U-shaped and fits within a U-shaped frame. The rider bar extends through an opening in one leg of the frame, and the spring is insulated from the frame by a grommet or washer made of insulating material.

These and other aspects of the invention will be more fully understood from the following detailed description and the accompanying drawings, in which:

FIG. 1 is a plan sectional view of the presently preferred embodiment of the invention disposed adjacent an operating cam in a conventional distributor;

FIG. 2 is a perspective view of the spring used in the unit shown in FIG. 1;

FIG. 3 is a plan sectional view of an alternate embodiment of the invention; and

FIG. 4 is a perspective view of the spring used in the apparatus shown in FIG. 3.

Referring to FIGS. 1 and 2, a hexagonal cam 10 is mounted on a shaft 11, and engages the outer end of an elongated actuator bar 12 which is secured at its inner end to the free end of a generally U-shaped spring 14. As viewed in FIG. 1, the cam is rotatable by conventional distributor means (not shown) in a counter-clockwise direction. The opposite end of the spring is secured by a rivet 15 to the outside of an insulating grommet 16 disposed over a slot 17 in one leg of a generally U-shaped frame 18. A wire lead 19 is secured to a lug 20 clamped by the rivet against electrically conductive washers 21 which engage the outside surface of the secured end of the spring. The other end of the spring urges the actuator bar 12 through guide opening 22 toward the cam periphery. The opening 22 is in the opposite leg of the U-shaped frame from where the spring is secured. This leg of the frame includes an alternate guide opening 23 which permits the spring to be reversed from the position shown in FIG. 1 for use with cams which rotate clockwise as viewed in FIG. 1. The bottom of the frame includes a longitudinal slot 24 through which extends a locking bolt 25 so the frame can be adjusted toward or away from the cam and securely locked in the required position to a base plate 25A.

A first electrical contact 26 is secured directly to the spring and adjacent the free end of the spring. A second contact 27 is secured to the inside surface of the frame leg adjacent the free end of the spring so the two contacts face each other. The spring urges the first contact toward the left (as viewed in FIG. 1) so that when the cam is rotated approximately 30° from the position

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shown, the actuator bar is allowed to move to the left and the contacts close. As shown best in FIG. 2, the secured end of the spring includes a longitudinal slot 28 which receives the shank of the rivet that holds the spring in place.

The actuator bar may be any suitable material. However, preferably it is a self-lubricating plastic with long wearing properties. I prefer to use nylon impregnated with molybdenum di-sulfide and sold under the trade name "Nylatron." This material wears at substantially the same rate as the contacts, and thereby improves operation of the assembly. The spring may also be constructed of any suitable material such as steel, copper, bronze, or the like. The electrical contacts may be made of any hard, wear-resistant electrically conductive material, but preferably it is made of tungsten or alloy steel.

In operation the frame is set so that the maximum gap between the electrical contacts as the cam is rotated is of the desired value. The frame is then secured firmly to the base plate by tightening the locking bolt. Thereafter, as the cam is rotated, the actuating bar is reciprocated to open and close the contacts, thus making and breaking the electrical circuit as required.

Since the first contact is mounted directly on the spring, there is no rigid, relatively heavy arm to contribute unduly to the mass of the system. Consequently, the relatively light weight spring produces minimum frictional force between the cam and the actuator bar, greatly increasing the life of the bar. Moreover, the location of the bar at the free end of the spring increases the mechanical advantage of the bar in opening the contacts, and further reduces the force between the cam and the bar. If desired, the actuator bar can be located below (as viewed in FIG. 1) the contacts so that it extends through the second guide opening 23. In this case, the actuator bar can travel a shorter distance, but is subjected to a greater frictional force against the cam.

Referring to FIGS. 3 and 4, a U-shaped spring 30 has one end secured to the inside face of a grommet 32 of electrical insulating material mounted in an opening 33 in one leg 34 of a U-shaped frame 35. The spring is held against the grommet by a bolt 36 which extends through an opening 37 in the grommet. The bolt 36 also extends through a slot 37A (FIG. 4) in the secured end of the spring. A first pair of washers 38 are secured by a first nut 39 against the outside face of the grommet, and a second pair of washers 40 are held by a lock nut 41 against the first nut 39. A conventional lug and electrical lead (not shown) can be secured between the washers to put the assembly in any desired circuit. A lock bolt 42 extends down through a longitudinal slot 43 in the bottom of the frame and secures the frame to a base plate 44. An actuator bar 45 is mounted on the free end of the spring, which extends beyond the frame and terminates adjacent cam 10. A first electrical contact button 46 is mounted directly on the spring adjacent the actuator bar. A second electrical contact button 47 is mounted on the leg of the frame adjacent the free end of the spring so the two buttons are engaged when the cam is in the position shown in FIG. 3. As the cam rotates about 30°, the actuator bar is forced to the right, and the contact buttons separate to break the electrical circuit.

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The operation of the apparatus shown in FIGS. 3 and 4 is substantially identical with that described in FIGS. 1 and 2, except that in the latter case the actuator bar is even farther removed from the point where the spring is secured to the frame, thereby further reducing the force required to actuate the breaker assembly.

The advantage of the breaker assembly of this invention is that the movable electrical contact is mounted directly on the spring, thereby eliminating a heavy, rigid breaker arm. This reduces the frictional force between the actuator bar and cam, and also reduces the inertia of the breaker assembly so that it can follow the cam at higher speeds than previously possible. Moreover, the pounding which is between the contact buttons is reduced because of the lower mass of the assembly and the weaker action of the spring. Thus, the breaker assembly of this invention has longer life, and can be used at higher speeds than previous units.

I claim:

1. A breaker assembly comprising a base plate, a frame, means for securing the frame to the plate to be movable with respect to it, an elongated spring secured to the frame at a point spaced from one end of the spring, a first electrical contact mounted directly on the spring at a location spaced from where the spring is secured to the frame, a second electrical contact mounted on the frame adjacent the first contact, the spring mounted first electrical contact being biased against the second electrical contact, and an actuator bar disposed to engage the spring and move the contacts apart as the bar is reciprocated.

2. A breaker assembly comprising a U-shaped frame, an elongated U-shaped spring secured by one leg to one leg of the frame, the other spring leg being disposed adjacent the other leg of the frame, a first electrical contact mounted directly on the said other leg of the spring at a location adjacent the said other leg of the frame, a second electrical contact mounted on the frame adjacent the first contact, the spring mounted first electrical contact being biased against the second electrical contact, and an actuator bar disposed to engage the spring and move the contacts apart as the bar is reciprocated.

3. A breaker assembly comprising a U-shaped frame, an elongated U-shaped spring secured by one leg to one leg of the frame, the other leg of the spring being disposed adjacent the other leg of the frame, a first electrical contact mounted directly on the said other leg of the spring at a location adjacent the said other leg of the frame, the said other leg of the frame having a guide opening through it, a second electrical contact mounted on the frame adjacent the first contact, the spring mounted first electrical contact being biased against the second electrical contact, and an actuator bar disposed through the guide opening to engage the spring and move the contacts apart as the bar is reciprocated.

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