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CIRCUIT BREAKERS HAVING SELF-CLEANING AND SELF-ADJUSTING
CONTACTS WHICH ARE VERY EASILY REPLACEABLE
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3,249,730

FIG. 1

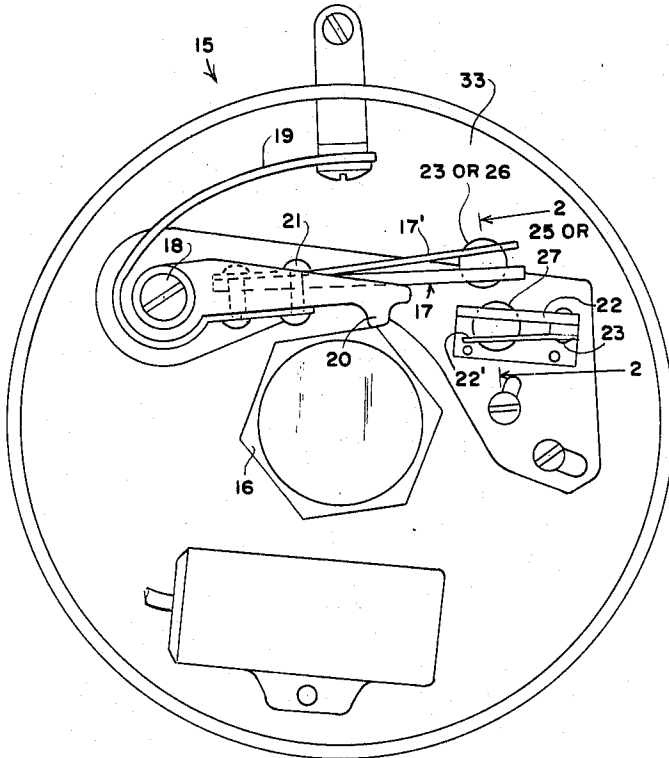


FIG. 2

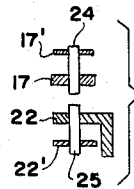


FIG. 3

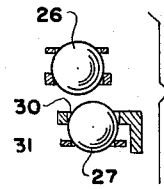


FIG. 4

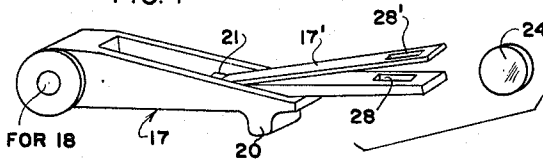


FIG. 5

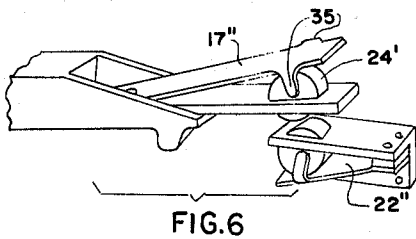
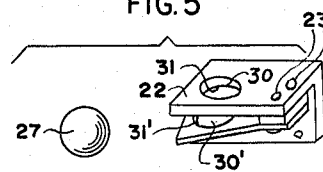


FIG. 6

FIG. 7

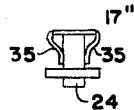
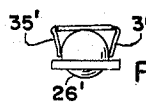


FIG. 8



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CIRCUIT BREAKERS HAVING SELF-CLEANING AND SELF-ADJUSTING CONTACTS WHICH ARE VERY EASILY REPLACEABLE

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20 Claims. (Cl. 200—166)

This is a continuation-in-part of application Serial No. 349,100, filed March 3, 1964, which application is now discontinued.

The present invention relates to circuit breakers for off-and-on electrical circuits generally and in particular to the type which is adaptable to be operated by a rotating cam for use in ignition systems of internal combustion engines.

The principal object of this invention is to provide a novel and improved circuit breaker affording a constant maximum gap between contact elements, constant ignition time, a constant change of points of contact on the contact elements, automatic cleaning and burnishing of the contact elements and a minimization of the effects of pitting of the contact elements.

Another object of this invention is to provide a novel and improved circuit breaker of the character described, in which the contact elements are very easily replaceable, the construction of which device is simple, reasonable in cost to manufacture and which is efficient and long-lasting in carrying out the purposes for which it is designed.

Other objects and advantages will become apparent as this disclosure proceeds.

For one practice of this invention, the contact elements are preferably discs or spherical balls, each rotatably held by the jaws of an easily openable clamp respectively. Said contact elements are seated in holes in the jaws, which holes have their edges in rubbing or scraping contact with said contact elements; the latter being so positioned that upon each impact thereof, each such element will turn slightly. The clamp structures as herein illustrated in a preferred embodiment, may be in the manner of biased-to-close tweezers comprising a rigid blade member having a cantilever blade spring therealong. Preferably, the rigid blade members are intermediate the blade springs. The rigid member of one of the clamps is fixed and that of the other is swingably mounted and spring-biased to serve as the follower against a rotatable polygonal cam which causes said swingable member to oscillate and hence the contact elements held by the clamps will repeatedly hit one or the other. Such impacts are off dead center and hence each contact element will cause the other to turn a bit. At each shift of a contact element in its clamp, the seating edges of the holes in which the contact elements are placed, will clean, burnish and smooth such element.

In the accompanying drawing forming part of this specification, similar characters of reference indicate corresponding parts in all the views.

FIG. 1 is a top plan view of a distributor of an internal combustion engine employing a preferred embodiment of this invention, showing the circuit breaker in open condition.

FIG. 2 is a section taken at line 2—2 in FIG. 1, showing the contact elements seated in holes through the clamping jaws. Here, the contact elements are discs and the holes they set in having sharp edges contacting such discs.

FIG. 3 is a section taken as FIG. 2, but here, the contact elements are spherical.

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FIG. 4 is an exploded perspective view showing the swingable clamp and a disc contact element which is to be associated therewith.

FIG. 5 is an exploded perspective view of the stationary clamp to hold a spherical contact element, and such element is also shown.

FIG. 6 is a perspective view showing associated clamps of a modified construction, holding their contact elements which as shown, are discs.

FIG. 7 is an end view of the swingable clamp of FIG. 6.

FIG. 8 is a view like FIG. 7, except that here, the contact element is spherical.

In the drawing, the numeral 15 designates generally a distributor of an internal combustion engine. Its usual rotatable polygonal cam 16 is adapted to oscillate the arm 17 which is swingably mounted on the axis 18 and spring-biased by the blade spring 19, so the lateral lug 20 shall bear against the cam's periphery to serve as a follower. Said arm 17 has a cantilever blade spring 17' therealong which is secured thereto near axis region by the rivets 21. Said arm 17 and its companion blade spring 17', are the jaws of a normally closed tweezer-like clamp to hold a contact element for rotation between them. There is a stationary arm which may be the leaf 22 of a fixed angle piece. This arm 22 has a cantilever blade spring 22' therealong and fixed at one end thereto by the rivets 23. Said arm 22 and its companion blade spring 22' are the jaws of a tweezer-like clamp to hold a second contact element for rotation between them. These contact elements which may be of tungsten for example, might be discs as 24, 25, or they may be spherical balls as shown at 26, 27. If they are discs, the jaw blades which hold them are provided with holes 28, 28', each of which is rectangular, have sharp edges to contact the disc and of a size which is less than the diametric cross section of the disc they hold between them. When the contact elements are balls, the jaw blades which hold them are provided with round holes 30, 30' having the sharp edges 31, 31' to contact the ball and of a size which is less than the diametric cross section of such ball. Contact element positions are opposite each other and so spaced that they strike each other upon rotation of the cam 16. The axis 18 is parallel to the general planes of all said holes. The holes 28' and 30' may be sockets, but it is best to have them holes to get more scraping action and burnishing of the contact elements and of course the contact elements should extend through the holes 28, 30 so that associated contact elements can come into contact with each other.

When the contact elements are discs or spheres, they are so positioned in the device so that upon impact, their line of centers shall make an acute angle with the plane of the hole in that clamp member which is farthest from oscillated clamp. Such hole in FIG. 5 would be 30'. This avoids a dead center impact and thus when the contact elements hit each other, each will cause the other to turn a bit thereby assuring constantly changing contact points, scraping of the contact elements by the sharp edges of the holes and the burnishing of said elements. When the contact elements are spherical, such angular relation may be in two planes, once as in FIG. 1 and again as in FIG. 3. This causes the spherical contact elements to have a random movement and hence all points thereon serve as contact points.

The automatic shifting of the contact points resulting in their being cleaned and burnished, keeps them

smooth, maintains a constant maximum gap between them thus assuring a constant ignition time and minimizes the effect of pitting besides compelling a change of contact points.

The clamps are insulated from each other and serve as the terminals of a make and break switch. The numeral 33 may be deemed to designate the frame on which the arms 17 and 22 are mounted.

It is to be noted that to get good burnishing action to maintain the cleanliness, smoothness and shape of the contact elements, rubbing action is sufficient, as would be afforded by having the holes countersunk or the hole edges even blunt or rounded. Scraping action as afforded by the sharp edges 31, 31', is not mandatory for operation of this apparatus. Scraping includes rubbing.

In the modified embodiment shown in FIGS. 6-8, the contact elements whether discs or spheres may merely be in rubbing contact with the springy jaws 17'' and 22'' and with springy fingers 35 or 35' which are illustrative examples; such fingers being opposite each other and bent from the blade spring from which they extend as integral parts thereof, to pinch or hug the contact element around axis region; the distal ends of such fingers being spaced from the jaw which is a companion for the blade spring they extend from. Such pinching action offered by said fingers to a disc as 24' or to a sphere as 26' between them, assures that the contact element between them is constantly maintained in good electrical contact with its clamp and avoids a variance in the quality of such connection.

For optimum results, the associated contact elements are chosen of the same diameter. Though pitting will occur, the rubbing action will maintain the circular shape and smooth and clean the surfaces of these elements, hence the point gap will remain nearly precisely constant; the away-from-true being so minute, as to be negligible. It may be desirable that said elements be interchanged so one should be where the other had been, in order that the one that gained metal will now give it back to the other which lost it. Seldom if ever is there a need for new contact elements. Also for best results, the rigid arms 17 and 22 are positioned intermediate the blade springs 17' and 22'.

This invention is capable of numerous forms and various applications without departing from the essential features herein disclosed. It is therefore intended and desired that the embodiments shown herein shall be deemed merely illustrative and not restrictive and that the patent shall cover all patentable novelty herein set forth, reference being had to the following claims rather than to the specific description and showings herein to indicate the scope of this invention.

I claim:

1. In a circuit breaker of the character described, two electrically conductive members insulated from each other and carried on a frame for relative movement towards and away from each other, two contact elements, each having a circular cross-section, means on each of said members holding one of said contact elements for rotation about the axis of its circular section; said elements being so positioned that upon relative movement of said members towards each other, said contact elements will hit each other off dead center; each of said members presenting at least one edge in at least rubbing contact with the circular periphery of the contact element thereon whereby upon impact of said contact elements, each will rotate the other a fraction of a turn whereupon each of said elements will be cleaned and burnished by the rubbing edge it is in contact with.

2. A circuit breaker as defined in claim 1, including spring means on each of said members, biasing said contact elements to remain against the rubbing edges they are against respectively.

3. A circuit breaker as defined in claim 1, wherein each of said contact elements is a disc.

4. A circuit breaker as defined in claim 1, wherein each of said contact elements is of spherical form.

5. A circuit breaker as defined in claim 4, wherein each of said means includes a hole in which the associated contact element is seated; the line of centers of said spherical contact elements being in angular relation to the plane of the hole it is seated in, in more than two directions, upon impact, whereby said spheres will have a random movement when they hit each other; said angular relationships being an acute angle respectively.

6. A circuit breaker as defined in claim 1, wherein each of said members and their related means, constitute a clamp which is biased to close; said contact elements being rotatably supported in said clamps respectively; each of said members being one of the jaws and each of said means being the other of the jaws of the respective clamps they comprise.

7. A circuit breaker as defined in claim 6, wherein each jaw of each clamp has a hole therethrough; each contact element being seated in both holes of the clamp holding it and free to rotate therein; each clamp being openable whereupon the contact element associated therewith is freed for withdrawal therefrom.

8. A circuit breaker as defined in claim 7, wherein said holes are rectangular and the contact elements are each a disc.

9. A circuit breaker as defined in claim 7, wherein said holes are circular and the contact elements are each of spherical form.

10. A circuit breaker as defined in claim 7, wherein the edges of said holes constitute the rubbing edges.

11. A circuit breaker as defined in claim 1, wherein each of said means includes a hole in which the associated contact element is seated; the edge of such hole offering said rubbing edge.

12. A circuit breaker as defined in claim 1, wherein the contact elements are of the same diameter.

13. In a circuit breaker of the character described, a frame, a swingable arm on said frame, a second arm positioned on the frame opposite said first arm, two elongated cantilever blade springs mounted fixed on one end to said arms respectively and extending along them respectively; each arm and its associated blade spring forming a biased-to-close clamp; in each of said clamps, the arms thereof being one jaw and the associated blade spring being the other jaw; each of said clamps holding a contact element having a circular section whereby it is rotatable between the jaws of its associated clamp and releasable therefrom upon separating said jaws; one jaw of each clamp being intermediate the other jaws of said clamps; at least each of said intermediate jaws having an opening presenting an edge which contacts the associated contact element and is in rubbing relation therewith; each of said contact elements being seated in the opening in the clamp holding it and extending therethrough so that upon movement of said swingable arm, said contact elements will hit each other; the line of centers of said contact elements upon their impact, being away from dead center whereby on impact of said contact elements, each will rotate the other a fraction of a turn whereupon each of said elements will be cleaned and burnished by the rubbing edge it is in contact with.

14. A circuit breaker as defined in claim 13, wherein each of said contact elements is a disc.

15. A circuit breaker as defined in claim 13, wherein each of said contact elements is of spherical form.

16. A circuit breaker as defined in claim 15, wherein the line of centers of said spherical elements upon impact, is in angular relation in two directions to the plane of the opening in the jaw having the second arm, whereby said spheres will have a random movement when they repeatedly hit each other; each of said angular relationships being an acute angle.

17. A circuit breaker as defined in claim 13, wherein the contact elements are of the same diameter.

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18. A circuit breaker as defined in claim 13, wherein the intermediate jaws are said arms.

19. A circuit breaker as defined in claim 18, wherein each blade spring has a pair of spaced, opposite springy fingers extending laterally therefrom and pinching the associated contact element between them at the axis region of said element; said element being in rubbing contact with its associated blade spring.

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20. A circuit breaker as defined in claim 19, wherein only each of said arms has an opening.

No references cited.

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