

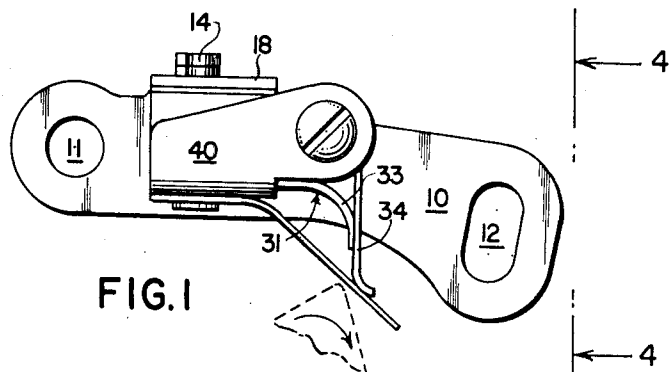
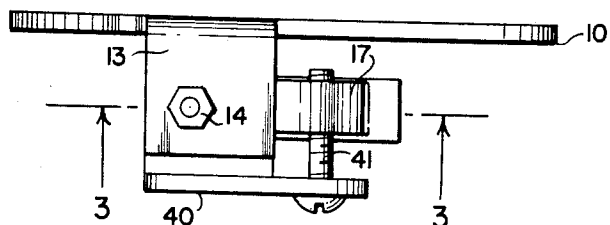
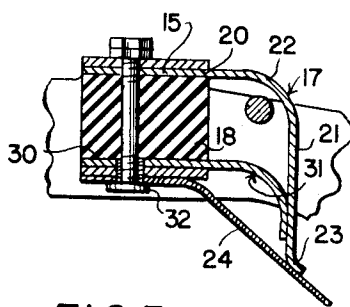
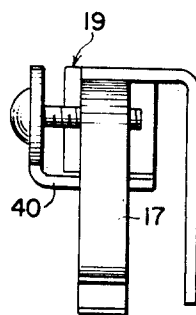
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IGNITION BREAKER

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IGNITION BREAKER

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9 Claims. (Cl. 200—30)

This invention relates to periodic circuit breakers, particularly circuit breakers used by ignition timers for internal combustion engines.

It is a prime consideration in timer systems to develop improved construction of ignition breaker assemblies for internal combustion engines; the constructions providing operational characteristics giving superior performance over prior devices.

It is desirable, therefore, that if superior performance is to be obtained that a construction should be evolved such as to give less moving masses and which will eliminate undesirable harmonics. This then would provide good bounce characteristics, lower amplitude of vibration, give less response to external and harmonic vibration and result in reducing energy losses at the contacts. The breaker must also provide good wiping action in order to provide rapid breakdown of insulating films, to decrease the formation of localized transfer, and to improve cleaning action for removal of contaminants. In addition, the simpler the breaker can be made, the fewer conducting joints will be present, thus decreasing the I²R losses. These factors aided by higher contact forces so as to provide lower contact resistance afford improved efficiency to the circuit breaker.

The many desirable characteristics of an ignition breaker, as related above, have been obtained by the construction of the present invention. As will be hereinafter described, the construction makes use of a flexing spring instead of a pivoted spring member. This factor decreases the amount of mass in the moving member. The spring has a curved configuration which improves its operation by substantially absorbing stress by changing radius rather than flexing as a beam is less sensitive to external vibration which might induce bounce between the contact arm of the device. In the operation of the breaker arm, the cam which is utilized therewith applies its force to the spring at its end. The point where the electrical contact is made is between the fixed end and the point where the cam applies pressure. This feature of the breaker, in addition to that of having the spring arm curved, tends to give "bounce free" operation. It is further apparent that the reduced mass of the moving spring member substantially lessens the impact forces during high velocity operation and provides for better cam follow-through. The effect of the lower cam force necessary to give a desired contact force also makes for less rubbing block wear. In addition, an important aspect of the construction resides in the fact that the flexing of the springs produces considerable wiping action at the contacts so that a more efficient contact relationship is obtained whereby arcing is prevented and rapid breakdown of insulating films is occasioned. Thus, the present invention provides a considerable improvement over prior art structures.

It is therefore an object of the present invention to provide an improved ignition contact breaker providing a construction giving superior operational characteristics while at the same time providing economy in assembly and fabrication.

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Another object of the present invention is to provide an improved ignition breaker for use in automotive internal combustion engines, said breaker being made of fewer parts but which increases the efficiency of such devices over previous types of ignition breakers.

Another object of the present invention is to improve the structural design and physical characteristics of an ignition breaker so as to provide for more efficient operation at high speeds.

It is an object of the present invention to provide a circuit breaker having flexing spring arms of substantially thin construction for attaining a decrease in the mass of the moving parts and to more efficiently obtain a breakdown in insulation film created between contacts during the operation of the breaker.

Still another object of the invention is to provide an ignition breaker having flexing contact spring arms and being arcuately configured so as to obviate a condition of "bounce" or vibration and to improve contact make and break.

Other objects of the invention and the nature thereof will become apparent from the following description considered in connection with the accompanying figures of the drawing and wherein like reference characters describe elements of similar function therein and wherein the scope of the invention is determined rather from the dependent claims.

Referring now to the drawing,

Fig. 1 is a side view of an embodiment of the present ignition breaker of the subject invention useful in showing the component relationship and flexing construction of the curved contact arm springs giving improved operational characteristics therefor;

Fig. 2 is a top plan view of the invention as shown in Fig. 1,

Fig. 3 is a vertical cross sectional view of the ignition breaker of Figs. 1 and 2 and as taken along line 3—3 of Fig. 2, and

Fig. 4 is a frontal view of the ignition breaker of the herein described invention as taken along line 4—4 of Fig. 1.

Generally speaking, the present ignition breaker is of a "flexing" construction incorporating means for simplifying the parts usual therein, while at the same time creating improvements which considerably advance the efficiency of such device. The improved breaker includes a curved flexing spring arm which mates with another spring arm in a manner to obviate needless bounce of the contacting elements. The curved construction of the contact arms, and the placement of these arms with respect to each other and an associated cam follower strip, gives superior contacting characteristics of long wear because insulation films are continually broken down by the intimate relationship of the arms and the inherent wiping characteristics thereof. The fewer parts and reduced mass of the flexing spring reduces the impact forces in high velocity operation and provides longer life and better follow through to the follower strip. There results, therefore, an exceedingly superior construction which affords considerable economy in the cost of parts and fabrication.

With reference to the drawings, the circuit breaker includes a support or bracket 10 which is usually adjustably mounted to a base plate having a shaft extending therethrough and which has suitably secured thereto a circuit breaker operating cam. Although the plate and shaft are here not illustrated, the shaft is rotated in timed relationship with the engine's crankshaft through suitable operating connections with a crankshaft driven part, as for example, the engine camshaft.

The bracket 10 of the ignition breaker is adjustably fixed to the base plate as by screws insertable within

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apertures or slots 11, 12. One end of the bracket is provided with an upstanding flange 13 or lug extension to which there is secured as by means of a rivet 14, one end 15 of a contact spring 17 fabricated of tungsten or other such conducting spring material. The spring, as held on the flange overlies and is supported on an insulation block 18 which also has the screw passing therethrough. The insulation block has a lip 19 which provides a stop shoulder for the flange and is adapted to maintain a determined pressure on the spring lying thereunder so as to substantially fixedly retain the spring against lateral movement.

Spring 17 is formed to have a predetermined curvature. The spring essentially comprises a horizontal section 20 fixed to the flange, a second section 21 integrally connected thereto by an arc 22 substantially at right angles thereto and a third finger or hook like portion 23 integrally connected to said latter portion and which will be adapted to meet against an angulated rubbing strip 24. The spring 17, as later described, will be flexed when the cam moves the insulation strip.

At the lower end 30 of the insulation block, a second spring arm 31 is placed. This spring arm 31 is smaller in extent than the first arm 17. It has a larger portion 32 which extends in a horizontal plane, and is curved to form a finger contact portion which has an arcuate section 33, a tip portion 34 adapted to tangentially meet larger spring 17 at a point away from hooked portion 23 thereof. Thus the free ends of both springs are substantially discretely spaced away from each other with the free end of the large spring adapted to be moved by the cam and insulation strip to flex the spring and move it away from its associated mating spring arm. The contact portion of the larger spring arm is therefore adjacent to the free tip portion of the smaller spring at a point along the vertical portion of the large spring arm.

A terminal bracket 40 comprising a unitarily formed flat dependency and a somewhat tapered vertical extension in which a screw terminal 41 is inserted underlies smaller spring arm 31 and has a flat insulation strip 24 placed therebeneath. This flat strip has a configuration such that one end is larger than the other and takes on an angle adapted to have the larger portion thereof meet with the hook portion of the larger spring arm 17. As the cam rotates it will move the flat insulator strip and also cause the spring arm to be flexed and move away from contact spring arm 31. This will cause the contacts to move apart at a frequency determined by the rotation of the cam.

The flexing action of the spring contact arm with its low mass characteristics, as described previously, will afford an improved efficiency in operation and provide an economical and less costly ignition breaker. It is apparent, too, that if desired, contacts may be placed on the spring arms at the mating points by brazing, welding, riveting, or other means without departing from the essential features of the present invention.

What is claimed is:

1. In a cam actuated circuit breaker for ignition systems for internal combustion engines comprising an adjustable bracket adapted to be mounted to a support plate, said bracket having an integrally mounted flange horizontally disposed thereto, a plurality of contact spring arms, one of said arms being larger than the other, an insulative block separating said spring arms, an individual end of each said respective arms being fixedly retained thereagainst to said flange, the opposite ends of said arms being free and adapted to meet with each other, a terminal bracket also fixedly carried by said flange, and a flat insulative strip placed therebeneath to extend horizontally therefrom, said strip being placed above a cam actuator, said cam adapted to move thereagainst, the movement of said cam pushing said strip against one of said springs to move it away from the other spring so as to break the electrical circuit.

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2. In a cam actuated circuit breaker for ignition systems for internal combustion engines comprising an adjustable bracket adapted to be mounted to a support plate, said bracket having an integrally mounted flange horizontally disposed thereto, a plurality of contact spring arms, an insulative block separating said spring arms, said spring arms having a curved configuration, an individual end of each of said respective arms being fixedly retained thereagainst with the other end being free, said other free ends of said arms adapted to mate with each other, a terminal bracket also fixedly carried by said flange, and a flat, thin insulative strip placed therebeneath and extending horizontally therefrom, said strip having an angulated portion placed above a cam actuator, said cam adapted to move thereagainst, the movement of said cam flexing one of said springs via said insulative strip to move it away from the other spring so as to break the electrical circuit.

3. In a cam actuated circuit breaker for ignition systems for internal combustion engines comprising an adjustable bracket adapted to be mounted to a support plate, said bracket having an integrally mounted flange horizontally disposed thereto, a plurality of contact spring arms, said arms being curved and each having a free end portion forming a hook, an insulative block separating said spring arms, an individual end of said respective arms being fixedly retained to said flange, said other ends of said arms adapted to meet with each other, the hook portions being discretely spaced from each other, a terminal bracket also fixedly carried by said flange, and a flat angulated insulative strip placed therebeneath and extending horizontally therefrom, said strip being placed above a cam actuator, said cam adapted to move thereagainst, the movement of said cam flexing the tip of one of said springs via said insulative strip to move it away from the other spring so as to break the electrical circuit.

4. In a cam actuated circuit breaker for ignition systems for internal combustion engines comprising an adjustable bracket adapted to be mounted to a support plate, said bracket having an integrally mounted flange horizontally disposed thereto, a plurality of contact making spring arms, said arms being curved and each having a free finger portion, an insulative block separating said spring arms, an individual end of said respective arms being fixedly retained to said flange and said block through retention means passing therethrough, said other ends of said arms adapted to meet with each other, the finger portions being discretely spaced from each other with one finger portion making contact with the other above said other finger portion, a terminal bracket also fixedly carried by said flange, and a flat angulated insulative strip placed therebeneath and extending horizontally therefrom, said strip being placed above a cam actuator, said cam adapted to move thereagainst, the movement of said cam flexing the tip of one of said springs through the use of said insulative strip to move it away from the other spring so as to break the electrical circuit.

5. In a cam actuated circuit breaker for ignition systems for internal combustion engines comprising an adjustable bracket adapted to be mounted to a support plate, said bracket having an integrally mounted flange horizontally disposed thereto, a plurality of contact making spring arms, said arms having portions parallel with said flange and a portion substantially at right angles thereto and having the tips thereof free, said latter portions adapted to make contact with each other, an insulative block separating said spring arms, an individual end of said respective arms being fixedly retained to said flange, the tips of said arm being discretely spaced from each other, a terminal bracket also fixedly carried by said flange, and a flat angulated insulative strip having a free tip placed therebeneath and extending horizontally therefrom, said strip being placed above a cam actuator, said cam adapted to move thereagainst, the movement of said cam flexing the tip of one of said springs through

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the use of said insulative strip to move said flexed spring away from the other substantially stationary spring so as to break the electrical circuit.

6. In a cam actuated circuit breaker for ignition systems for internal combustion engines comprising an adjustable bracket adapted to be mounted to a support plate, said bracket having an integrally mounted flange horizontally disposed thereto, a plurality of contact bearing spring arms, said arms being curved and each having a free tip portion, an insulative block separating said spring arms, an individual end of said respective arms being fixedly retained to said flange by means of a retention means, said other ends of said arms adapted to have portions meet with each other, the tip portions being discretely spaced from each other, one of said springs being larger than the other, a terminal bracket also fixedly carried by said flange, and a flat, thin angulated insulative strip placed therebeneath and extending horizontally therefrom, a portion of said strip being placed above a cam moving said strip and flexing the tip of one of said springs to move it away from the other spring so as to break the electrical circuit.

7. In a cam actuated circuit breaker for ignition systems for internal combustion engines comprising an adjustable bracket adapted to be mounted to a support plate, said bracket having an integrally mounted flange horizontally disposed thereto, a plurality of contact bearing spring arms, each of said arms having a curved section substantially vertically extending from a first horizontal section, said spring arms being of different extents, and each of said arms having a tip portion, an insulative block separating said horizontal portions of said spring arms, said individual horizontal section of said respective arms being fixedly retained to said flange, said other individual curved ends of said arms adapted to meet with each other, the tip portions being spaced from each other, a terminal bracket also fixedly carried by said flange, and a flat angulated insulative strip placed therebeneath and extending horizontally therefrom, said strip being placed above a cam actuator, said cam adapted to move thereagainst, the movement of said cam flexing the tip of one of said springs through the use of said insulative strip to move it away from the other spring so as to break the electrical circuit.

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8. A circuit breaker comprising an adjustable bracket adapted to be mounted to a support plate, said bracket having an integrally mounted flange horizontally disposed thereto, a plurality of contact spring arms, said arms being curved and each having a free end portion forming a hook, an insulative block separating said spring arms, an individual end of said respective arms being fixedly retained to said flange, said other ends of said arms adapted to meet with each other, the hook portions being discretely spaced from each other, a terminal bracket also fixedly carried by said flange, and a flat angulated insulative strip placed therebeneath and extending horizontally therefrom, said strip being placed above an actuator, said actuator adapted to move thereagainst, the movement of said actuator flexing the tip of one of said springs via said insulative strip to move it away from the other spring so as to break the electrical circuit.

9. A cam actuated circuit breaker comprising a bracket adapted to be mounted to a support plate, said bracket having a flange extending therefrom, a plurality of contact spring arms, one of said arms being larger than the other, an insulative block separating said spring arms, an individual end of each of said respective arms being fixedly retained to said flange, the opposite ends of said springs being free and curved and adapted to meet with each other, a terminal bracket also carried by said flange, and a flat insulative strip placed therebeneath to extend horizontally therefrom, said strip being placed beneath one of said curved arms and above a cam actuator, said cam actuator adapted to move thereagainst, the movement of said cam pushing said strip and said one curved spring to move it away from the other spring so as to open a connected electrical circuit.

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