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A. L. RIKER

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CIRCUIT BREAKER FOR IGNITION SYSTEMS

Filed April 8, 1921

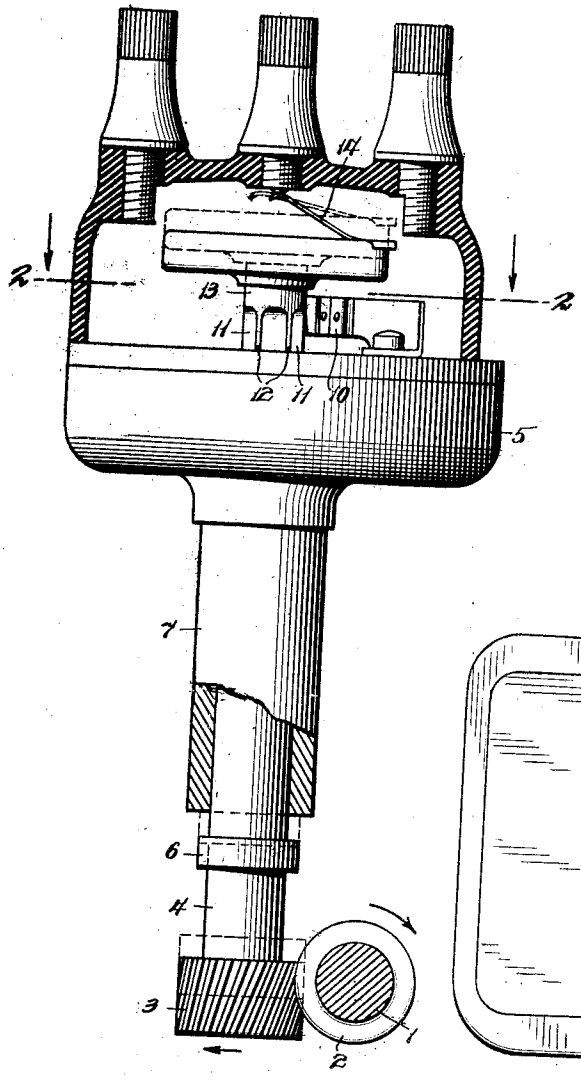


Fig. 1.

Fig. 3.

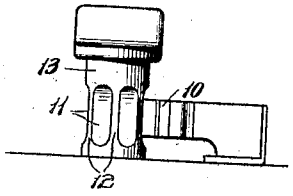
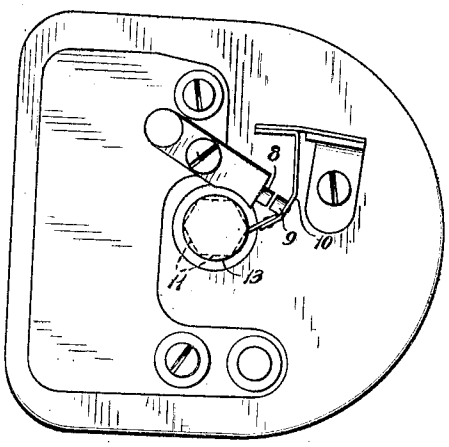


Fig. 2.



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UNITED STATES PATENT OFFICE.

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CIRCUIT BREAKER FOR IGNITION SYSTEMS.

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To all whom it may concern:

Be it known that I, ANDREW L. RIKER, a citizen of the United States, residing at Fairfield, in the county of Fairfield and State of Connecticut, have invented a new and useful Circuit Breaker for Ignition Systems, of which the following is a specification.

This invention relates to the type of circuit-breaker ordinarily employed in battery ignition-systems, as in firing an internal-combustion engine of an automobile. As is well known, in such devices the circuit comprises an interrupter consisting of a rotary cam-device having a plurality of circumferentially-arranged high-points or cams (one for each of the spark-plugs) separated by intervening reduced portions, in combination with a contact-carrying member forced against said cam-device by spring-pressure, the parts being so arranged that when a high-point of the rotary member passes under said spring-pressed member the contact carried thereby is separated from its co-operating fixed contact, thus breaking the circuit, which is restored by said spring-pressure when such contact-carrying member has ridden over the high point to a reduced portion. When the engine is stopped, said rotary member may or may not come to rest with one of its said high-points engaging said spring-pressed member to hold the circuit open; but more frequently the rotary member will come to rest with one of its reduced faces engaging the spring-pressed member, thereby leaving the circuit closed and tending to exhaust the battery. The object of the present invention is to ensure that the stopping of the engine will certainly and positively break the circuit and maintain it open until the engine is again started.

Broadly, the invention comprises a construction and arrangement of parts whereby the ignition-circuit can be operated, by makes-and-breaks, only while the engine is in operation, and the stopping of the engine will automatically break the circuit and maintain it open until the engine is again started up.

More specifically, the invention comprises providing sufficient longitudinal play of the aforesaid rotary cam-member, with means such as spiral-gearing for imparting a longitudinal shift thereto while rotating it, locating the circumferential cams and the alternating reduced portions normally just out of the zone of the spring-pressed member aforesaid, and providing the adjacent part of said rotary member (normally in the same zone with said spring-member) with an unreduced or full cylindrical surface of a diameter not less than that of the high-points of said cams, and providing also a diagonal or inclined surface leading gently from each reduced portion to said unreduced cylindrical portion. So long as the engine is not running, the above-named unreduced cylindrical portion engages the spring-pressed member aforesaid, and thereby maintains the interruption of the circuit; but when the engine is started up, and while it is running, the aforesaid rotary and shifting means (such as spiral-gearing) shifts the rotary member longitudinally a sufficient distance to bring the cam-portions thereof and the intermediate reduced portions into engagement with said spring-member, and thereafter maintain said engagement, whereupon the device will operate, so long as the engine is running, to make-and-break the circuit in the usual well-known manner. But when the engine stops running, some other force, such as gravity (which may be assisted by a spring), forces said rotary member back into its first-named position, bringing said full cylindrical portion into contact with said spring-member, and permanently opening the circuit.

The invention will be best understood by reference to the accompanying drawings which illustrate a preferred embodiment thereof, and in which:

Fig. 1 is a side view, partly broken away, of a well-known form of commercial circuit-breaker shown as equipped with a preferred embodiment of the present invention;

Fig. 2 is a top view of the same, with the cover and adjacent parts and a portion of the head removed; and

Fig. 3 is a side view of the cam and spring-pressed member, detached.

In these drawings, 1 represents a shaft, here indicated as horizontal, rotated from the engine in the usual or any desired manner. This shaft carries a spiral gear 2. 3 is a somewhat elongated spiral gear in mesh with gear 2 and carried at the lower end of the cam-carrying member 4, here shown as a vertical shaft. This shaft is mounted, in the manner usual with these devices, in the ignition-head 5; and, as here employed, it is

shown as provided with a limiting-collar 6 which is spaced a short distance away from the end of the tube or sleeve 7 which usually depends from said head 5. Rotation of said driving-shaft 1 (in the direction indicated by the arrow) tends not only to rotate said cam-carrying shaft 4 (in the direction indicated by its arrow), but likewise imparts a longitudinal action to said shaft 4, moving the shaft until said collar 6 abuts against said sleeve 7. On the upper face of ignition-head 5 is the usual stationary contact 8, and also the usual movable contact 9 mounted intermediately of the spring 10, with the end of the spring projecting beyond said terminal for engagement with the rotary cams upon said shaft 4.

Near the upper portion of said shaft 4 is provided the usual plurality of circumferentially-arranged reduced portions or faces 11 (here shown as six in number), separated by high-points or cams 12, above which is a full unreduced cylindrical surface 13, of a diameter not less than (and preferably the same as) the diameter of said high-points 12. Fig. 1 represents the relative positions of the parts while the engine is not running, the end of spring 10 being engaged by the unreduced or full cylindrical portion 13, and the circuit being thereby maintained open. But when the engine starts running, the lifting-action of the spiral-gearing 2—3 lifts said shaft 4 (to the extent permitted by collar 6) and thereby raises the cams and reduced portions 11 into the zone of the spring 10, whereupon the usual makes-and-breaks occur. When the engine is again stopped, the weight of the shaft 4 and its parts (which may be aided by a stiff commutator-spring 14) shifts said shaft back into the position of rest indicated in Fig. 1, the absence of any abrupt shoulder (where the reduced faces 11 run into the unreduced or full cylinder 13) preventing any tendency of said spring 10 from holding the shaft in its elevated position.

In the particular illustration shown, the invention can be readily applied to structures now in use by merely reducing the length of the depending sleeve (7), and by taking a full cylindrical member (4) and grinding off the six flat faces 11 with gently-inclined shoulders at their upper ends, and adding the limiting collar 6 if desired. But it is obvious that there may be more (or less) than six faces, which need not be flat, and the new device could be constructed in some other manner.

The invention has thus been described as applied to one particular type of circuit, breaker, and with considerable detail, but only for the sake of clearness. The invention is not limited to the precise structure shown, nor to the precise arrangement shown; but may be embodied in various forms, and arranged in a different manner.

The invention having thus been described, what is claimed is:

1. A circuit-breaker for an ignition-system, comprising a vertical shaft having a plurality of circumferentially-disposed reduced faces separated by cam-portions and mounted to have vertical play, spiral-gearing for imparting thereto a lift as well as rotation, said shaft presenting an unreduced or full cylindrical surface just above said reduced surfaces, and a spring carrying the movable contact-member and engaged by said unreduced cylindrical portion while resting in its lowered position but engaged by said cam portions while rotating in the lifted position.

2. In a circuit-breaker for an ignition-system, a vertical shaft having longitudinal play, means operated by the engine for lifting as well as rotating said shaft, a reduced cam-surface upon the upper portion of said shaft and a full unreduced cylindrical surface higher up on the same, and two contact-members normally held in contact by a spring, said full cylindrical portion engaging said spring and maintaining the circuit broken while the shaft rests in its lower position, and said cam-surface adapted to engage said spring when said shaft is rotated in its lifted position.

3. In a circuit-breaker for an ignition-system, a rotary member having circumferentially-arranged reduced portions separated by higher cam-portions and having adjacent said reduced portions and cam-portions and unreduced cylindrical surface of the full diameter of said higher cam-portions, and a spring carrying the movable member of the circuit to be broken, said spring engaging said cam-portions or said cylindrical surface according to whether said member is rotating in one position or is at rest in its other position.

4. In a circuit-breaker for an ignition-system, a rotary member mounted to have longitudinal play, circumferentially-arranged reduced portions thereon separated by higher cam-portions, an unreduced full cylindrical surface adjacent said cam-surfaces and of the full diameter of said higher cam-portions, and means actuated solely by the running of the engine for shifting said member longitudinally.

5. In a circuit-breaker for an ignition-system, a rotary member mounted to have longitudinal play, circumferentially-disposed reduced portions thereon separated by higher cam-portions, an unreduced full cylindrical surface adjacent said portions, a yielding member arranged to ride in engagement with said cam-portions and said unreduced cylindrical surface alternatively,

and a gentle inclination leading outwardly from each reduced portion to said unreduced portion, whereby the longitudinal movement of said rotary member shifts the engagement of said yielding member.

6. In a circuit-breaker for an ignition-system, the combination with the usual plurality of rotary cams and alternate reduced portions for co-operating with the movable member of the circuit to be broken, of means actuated by the running of the engine to move said cams to permit the usual make-and-break of said circuit but maintaining the circuit broken so long as the engine remains at rest.

ANDREW L. RIKER.