July 2, 1935. P. E. MACK 2,006,959

CIRCUIT BREAKER

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Fig. 1.

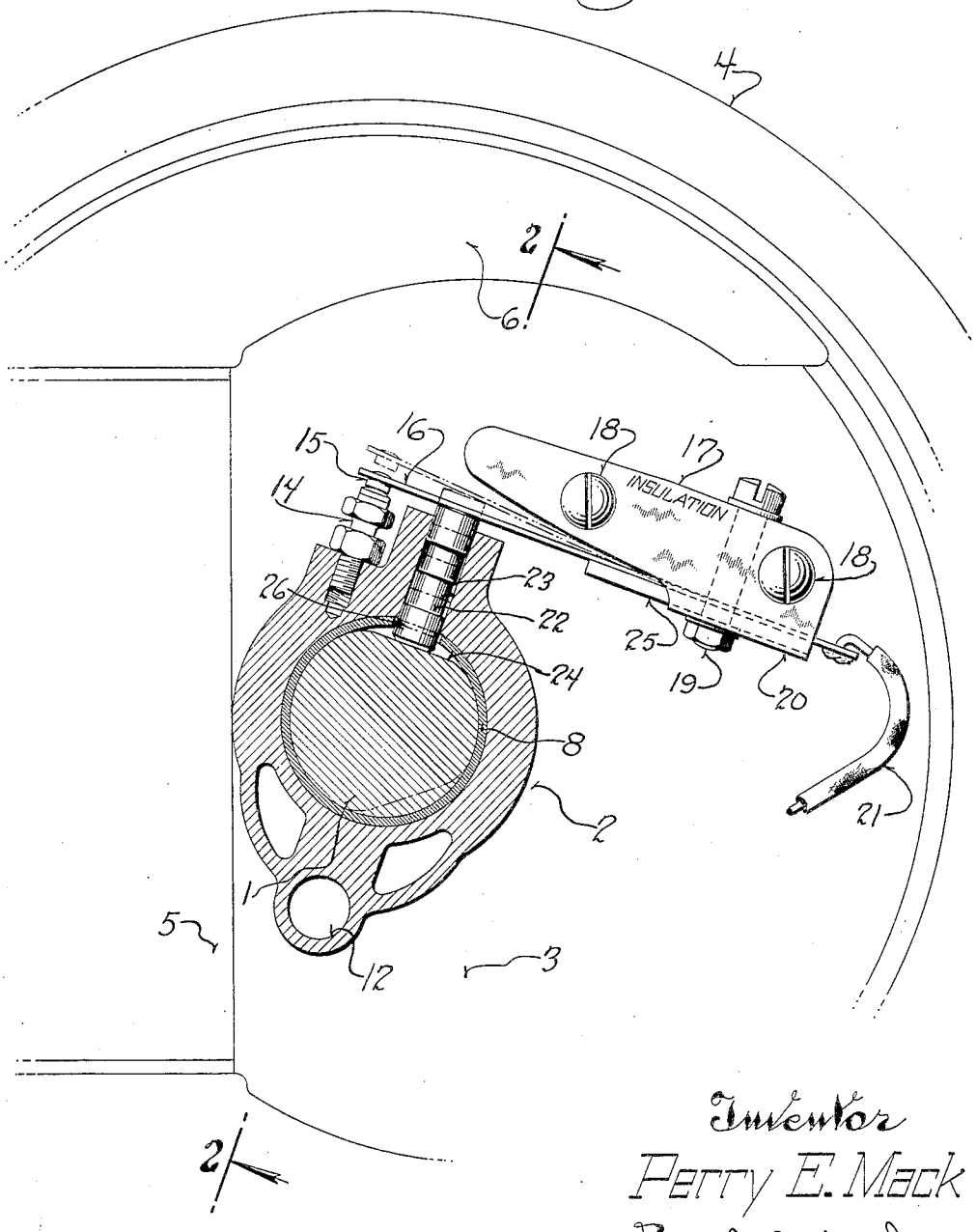

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Fig. 2.

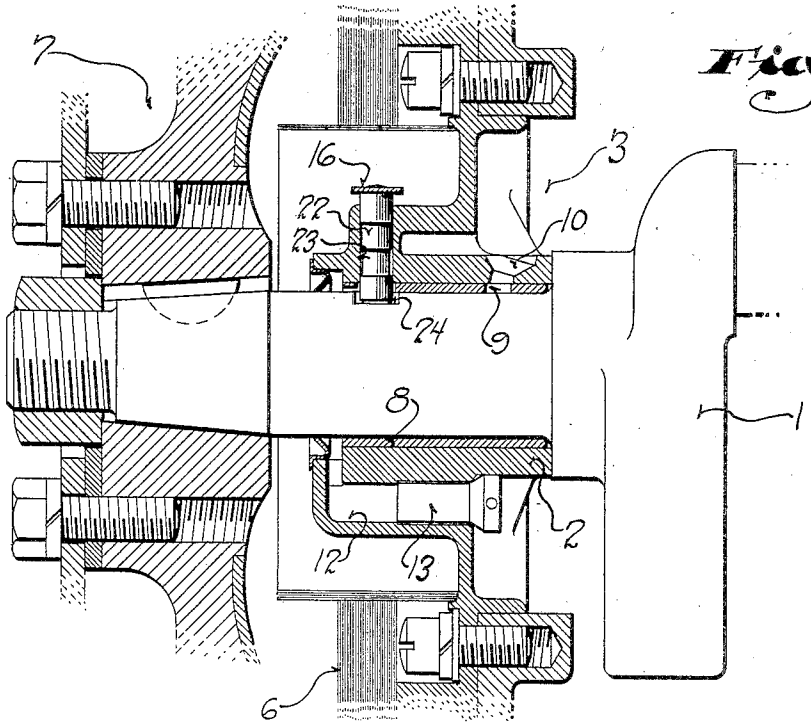


Fig. 3.

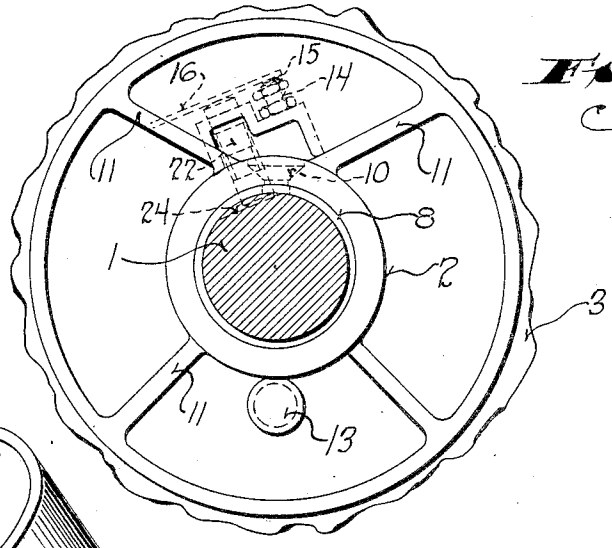
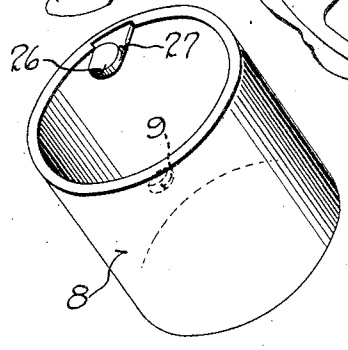


Fig. 4.



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2,006,959

UNITED STATES PATENT OFFICE

2,006,959

CIRCUIT BREAKER

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Application July 13, 1933, Serial No. 680,209

7 Claims. (Cl. 200—30)

This invention relates to improvements in circuit breakers for use in ignition systems of internal combustion engines and refers more particularly to a magneto circuit breaker for use in conjunction with small gasoline engines.

Heretofore, in magneto circuit breakers of this general type, the movable breaker point was carried by a pivotally mounted lever held in its closed contact making position by a tension spring. This construction was objectionable as at high speeds the lever arm began to flutter or chatter. Also the spring was very apt to break or elongate the holes into which its ends were hooked.

This invention has as a general object the provision of a circuit breaker particularly adapted to small gasoline engines, in which the aforementioned objectionable features are entirely overcome.

It is also an object of this invention to simplify the construction of circuit breakers and eliminate wearing connections by mounting the movable breaker point on the free end of a spring blade, the resiliency of which holds the contacts closed.

It is a further object of this invention to provide means operating in oil for actuating the circuit breaker.

In this connection, it is a feature of this invention to provide novel means for conducting oil to the cam follower which actuates the circuit breaker and for draining excess oil therefrom.

With the above and other objects in view which will appear as the description proceeds, my invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the herein disclosed invention may be made as come within the scope of the claims.

In the accompanying drawings, I have illustrated one complete example of the physical embodiment of my invention constructed according to the best mode I have so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a section view through one end of the crank shaft of a conventional gasoline engine illustrating part of the magneto assembly and the application of this invention thereto;

Figure 2 is a section view through one bearing for the crank shaft, said view being taken on the plane of the line 2—2 in Figure 1;

Figure 3 is a detail section view through Figure 2 on the plane of the line 3—3; and

Figure 4 is a perspective view of the bearing bushing showing the oil drain for the cam follower.

Referring now more particularly to the accompanying drawings, the numeral 1 represents the crank shaft of an internal combustion engine, one end of which is journalled in a bearing 2 carried by a stationary hub 3. The hub 3 forms one wall of the crank case and provides support for a magneto assembly indicated generally by the numeral 4. This assembly comprises an armature coil 5 wound on a laminated metal U-shaped frame 6 as is customary. Inasmuch as the specific construction of the magneto assembly forms no part of this invention, it has not been shown in detail and further description thereof is unnecessary.

The outer extremity of the crank shaft end shown mounts a fly-wheel 7, which overlies the magneto assembly.

The bearing 2 is lined with a bushing 8 having an oil inlet opening 9 which aligns with an oil passage 10 in the top portion of the bearing inner end. As best shown in Figure 3 the inner wall of the hub 3 above the bearing has two inclined ribs 11, which define a pocket or recess in which oil splashed upwardly by the revolving crank collects to flow through the passage 10 and the opening 9 into the bushing. The outer end of the bushing communicates with a drain passage 12, which leads back to the crank case, there being an automatic valve 13 in said passage.

The circuit breaker per se comprises a stationary contact 14 adjustably mounted on the bearing 2 to be engaged by a movable contactor 15 mounted on the free end of a spring blade 16. The blade 16 is anchored to a block 17 of insulating material secured by screws 18 to the adjacent wall of the hub 3, the spring blade 16 being secured to the block by a bolt 19. The blade is held against turning about the bolt by flanges 20 formed on the block and projecting down over the side edges of the blade.

The extreme end of the blade opposite the contactor projects beyond the block 17 to provide a terminal to which a conductor wire 21 is attached to connect the same in the electrical circuit in the customary manner.

The undersurface of the block 17 against which the spring blade 16 engages is curved away from the blade from a point approximately in line with the bolt 19 to afford a support against which the blade progressively rests as it is flexed during movement to open position. Such movement of the blade is effected by a push pin or cam follower 22 formed of insulating material and slidable in a radial bore 23 in the bearing 2 with its inner end aligned with a flat spot 24 forming a cam on the shaft. Obviously, upon each revolution of the shaft, and

the consequent alignment of the flat spot 24 with the push pin, the breaker points are permitted to contact.

The progressive engagement of the blade 16 with the curved surface of the supporting block causes the fulcrum point to move outwardly along the support and consequently, shortens the free end portion of the spring. This changing of the effective length of the spring alters its period of vibration and effectively quenches all harmonic vibrations that tend to cause chattering at the contact points. Overstraining of the spring blade is also prevented by this construction.

A rebound guard 25, which consists of a strip of stiff metal is fixed to the support over the spring blade and extends a substantial distance out over the free end portion of the spring to limit outward swinging of the spring and cooperate with the supporting block 17 to prevent chattering.

It will be noted that the inner end of the push pin or cam follower passes through an opening 26 in the bushing sleeve 8. This opening, which obviously aligns with the radial bore 19 in the bearing, is sufficiently large to permit oil to flow up into the bore 19. The push pin consequently "floats" in oil.

To preclude the pumping of oil out through the radial bore 19 by the push pin 18, a diagonal drain slot 27 leads from the hole 26 to the adjacent drained end of the bushing, the capacity of the slot being such that only the excess oil is carried away from the push pin.

From the foregoing description taken in connection with the accompanying drawings it will be readily apparent to those skilled in the art, that this invention materially simplifies the construction of magneto circuit breakers and eliminates wear from all active parts of its assembly. It is also apparent that by this construction, objectionable chattering and heretofore unsatisfactory operation at high speeds is entirely overcome.

What I claim as my invention is:

1. A circuit breaker comprising a stationary contact, a movable contactor engageable therewith, a spring blade carrying the movable contactor, means mounting the spring blade comprising a support to which the spring blade is attached with one flat side of the spring blade in engagement with one surface of the support, and means to flex the spring blade toward the support to disengage the contactor from the contact, the surface of the support with which the spring engages being curved so as to automatically shift the fulcrum about which the blade bends outwardly along the blade to shorten its effective length as the spring blade is flexed.

2. In a circuit breaker, a pair of separable contacts, a spring blade mounting one of the contacts, a support to which one end portion of the spring blade is secured, said support having a portion provided with a curved wall with which the spring blade engages progressively at greater distances from its point of attachment to the support upon flexing of the blade toward the support, and means to flex the blade.

3. In a circuit breaker of the character described, a pair of contacts, a spring blade carrying one of the contacts, a supporting block for the spring blade, means to attach the spring blade to the supporting block so that the resiliency of the spring blade holds its contact in engagement with the other contact, said supporting block having a portion projecting from the point of attachment of the blade thereto toward the free end of the spring blade with which the blade is progressively engaged as it is flexed to disengage its contact from the other contact, and means to periodically flex the blade toward the support.

4. In a circuit breaker of the character described, a fixed contact, and a movable contactor engageable therewith, a spring blade carrying the movable contactor at one end portion, a supporting member for the blade having a curved surface, means to secure the blade to said supporting member so that upon flexing of the blade to disengage the contactor from the contact the blade progressively engages portions of the curved surface at lesser distances from the fixed contact to shorten the effective length of the free end portion of the spring blade, and means to periodically flex the spring blade to disengage the contactor from the contact.

5. In a circuit breaker of the character described, a fixed contact, a movable contactor engageable therewith, a spring blade carrying the movable contactor, a supporting member for the spring blade having a curved surface, means to attach the spring blade to the supporting member at a distance from the contactor with the curved surface of the supporting member disposed between said attaching means and the fixed contact so that upon outward flexing of the spring blade to disengage the contactor from the contact the curved surface is progressively engaged by the spring blade, means to periodically flex the spring blade to disengage the contactor from the contact, and a member overlying the mounted end portion of the spring blade to provide a rebound guard and cooperate with the curved surface of the supporting member to preclude chattering between the contactor and the contact.

6. In a circuit breaker of the character described, a stationary member having a shaft bearing and a wall substantially perpendicular to the axis of the bearing, a fixed contact carried by the bearing, a movable contactor, a spring arm carrying the movable contactor, a supporting block mounted on said wall, means to attach the spring arm to said supporting block at a distance from the movable contactor, said supporting block having a surface with which the spring arm progressively engages as it is flexed to disengage the movable contactor from the fixed contact, a push pin mounted in a radial bore in the bearing, and a shaft mounted to turn in said bearing and having means to periodically actuate the push pin to flex the spring arm and periodically disengage the movable contactor from the fixed contact.

7. In a relay, a movable member, a resilient element arranged to bias said member, and a cam mounted in contact with said resilient element, said cam having a contour departing slightly from that of said resilient element and being arranged to change the effective free length of said resilient element upon movement of said member.

PERRY E. MACK.