May 23, 1950 M. J. BERLYN ET AL 2,508,486

CIRCUIT BREAKER

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Fig. 1.

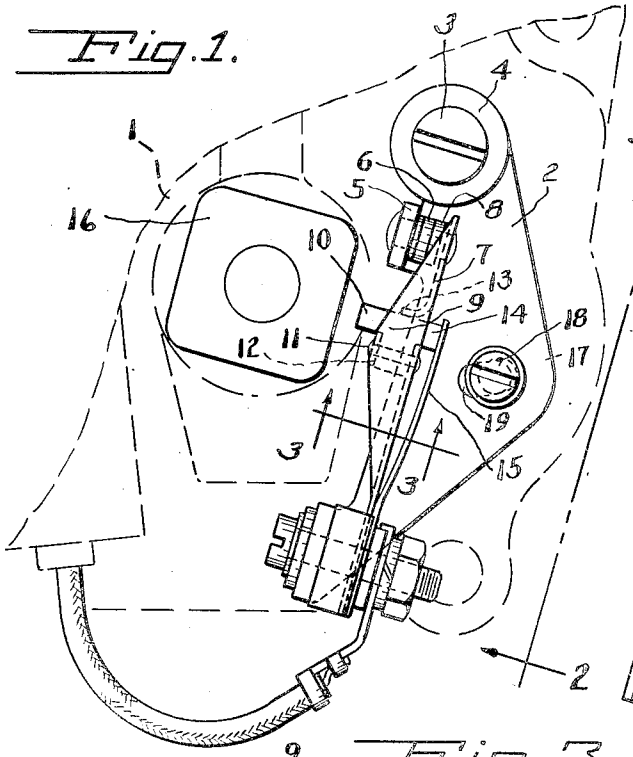


Fig. 2.

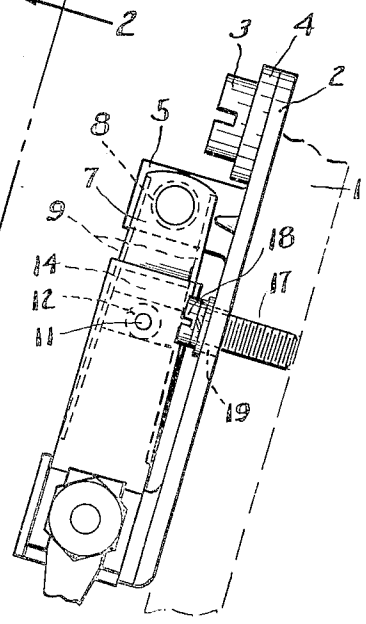


Fig. 3.

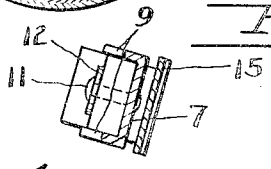


Fig. 4.

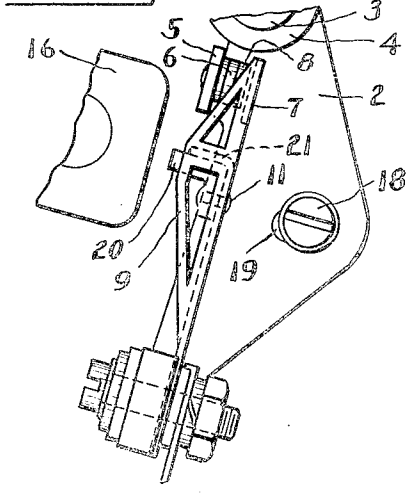
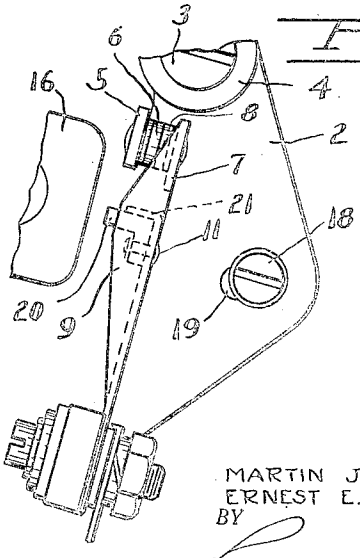


Fig. 5.



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Fig. 6.

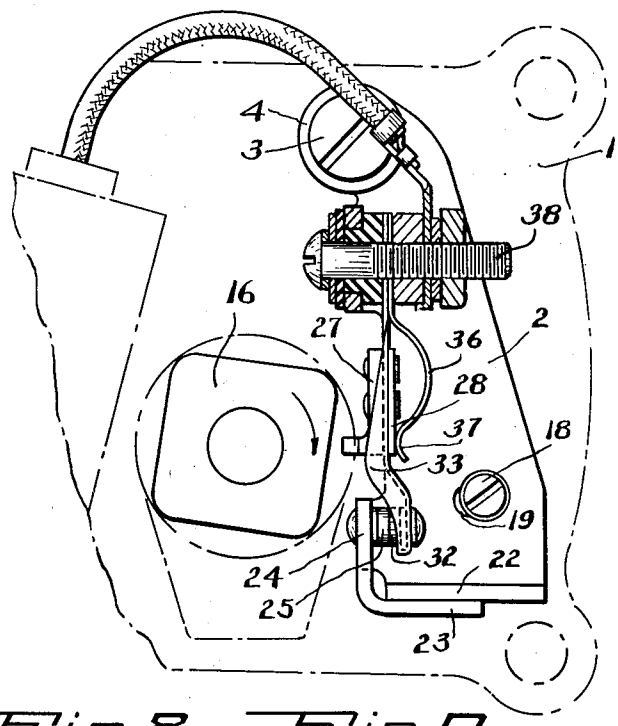


Fig. 7.

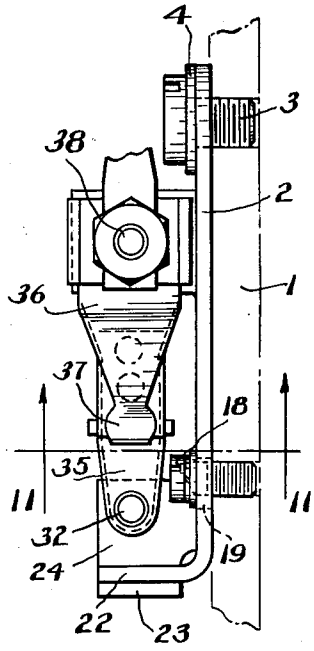


Fig. 8.

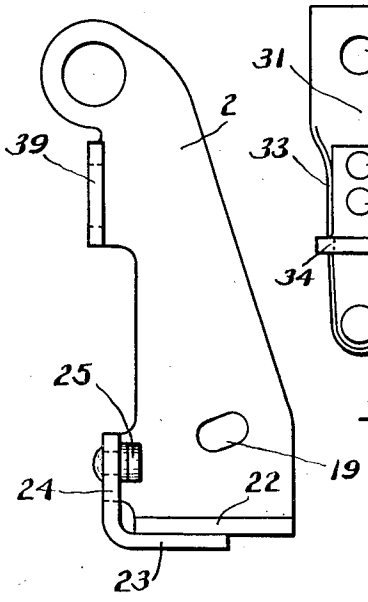


Fig. 9.

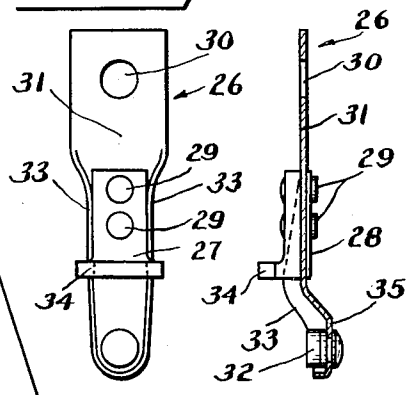


Fig. 10.

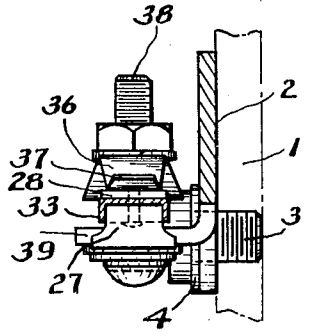


Fig. 11.

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UNITED STATES PATENT OFFICE

2,508,486

CIRCUIT BREAKER

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Application December 4, 1946, Serial No. 713,984

7 Claims. (Cl. 200—30)

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This invention relates to improvements in circuit interrupters or breakers adapted for making and breaking an electric circuit in the ignition system of an internal combustion engine and more particularly to a new and improved interrupter or breaker of the pivotless type.

An object of the invention is to provide a breaker having a light weight, exceedingly rigid contact lever.

Another object of the invention is to provide a breaker of the type set forth in which the maximum stiffness or strength is at the portion thereof of maximum stress.

Another object of the invention is to provide a breaker wherein the contact carrying lever is constructed primarily as a light but rigid structure for the contact and is not depended upon to act as a spring and wherein a separate spring is provided for actuating said contact carrying lever, thus allowing the forming of the contact carrying lever of a material or a gauge of material which is ideal structurally and the resilient arm of material or a gauge of material ideal for the spring function.

Another object is to provide a breaker of the type set forth wherein any relative motion or sliding friction between the cam follower and actuating spring is reduced to a minimum and therefore requires minimum lubrication and also wherein such point of lubrication is remote from and shielded from the contact breaker points thereby preventing interference with the contact points by the lubrication.

Another object is to provide a breaker construction having a light, one piece, relatively inexpensive contact carrying lever.

Another object is to provide a breaker construction which is capable of operating at high speeds without substantial contact bounce.

Another object is to provide an improved contact support for a breaker mechanism.

Another object of the invention is to provide a breaker construction of the type set forth which is mounted on a bracket or support which is pivotally mounted and which has a solid fastening substantially in line with the point of greatest stress.

Other objects and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawings. It will be understood that many changes may be made in the details of construction and arrangement of parts shown and described, as the preferred forms have been shown by way of illustration only.

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Referring to the drawings:

Fig. 1 is a top or plan view of a breaker mechanism embodying one form of the invention;

Fig. 2 is a side view of the construction shown in Fig. 1, and taken along line 2—2 of Fig. 1, looking in the direction of the arrows;

Fig. 3 is a sectional view taken on line 3—3 of Fig. 1 looking in the direction of the arrows;

Fig. 4 is a view similar to Fig. 1 but showing another form of the invention; and

Fig. 5 is also a view similar to Fig. 1 but showing a still further form of the invention;

Fig. 6 is a top or plan view of the preferred form of the invention;

Fig. 7 is a side view of the construction shown in Fig. 6;

Fig. 8 is a top or plan view of the breaker supporting bracket;

Fig. 9 is a plan view of the contact supporting arm or lever;

Fig. 10 is an edge view of the contact supporting arm or lever shown in Fig. 9; and

Fig. 11 is a sectional view taken on line 11—11 of Fig. 7 looking in the direction of the arrows.

Referring more particularly to the drawings wherein similar reference characters designate corresponding parts throughout the several views, the forms of the invention shown in Figs. 1 to 5 inclusive comprise the base or supporting member 1 on which is pivotally mounted the breaker supporting bracket or support 2 by the screw or other suitable member 3 which extends through the pivot 4 and is secured to the base 1.

In the form of the invention shown in Figs. 1 to 3 inclusive, the bracket 2 has the flange 5 carrying one of the breaker contacts 6 and adjacent the opposite end of the bracket 2 is mounted the flexible cantilever 7 which carries the second breaker contact 8 in permanent alignment with the contact 6.

The cantilever 7, as shown, is a relatively light weight, inexpensive construction formed of sheet material by punching and bending and is provided along its longitudinal edges with marginal flanges 9 for added strength and reinforcement. As shown in the drawings, these flanges 9 preferably have their greatest width and, therefore, greatest strength substantially at the point where greatest strength is required, that is, at the point where the cam follower block 10 of insulating material is secured to the cantilever 7 by the rivet 11, and washer 12, and said flanges taper in both directions from this point. The cantilever 7 has the tongue 13 which is displaced to allow the follower block 10 to extend therethrough and said tongue

13 is preferably in engagement with a side wall of the block 10 as shown to shield the contact points 6 and 8 from lubrication, if any, employed to reduce sliding friction between the projecting end 14 of the follower block 10 and the leaf spring 15 which is secured to the bracket 2 in adjacent relation with the cantilever 7 so that they are capable of being deflected about a substantially common fixed point.

The principal function of the cantilever 7 is to carry the contact point 8 and be a good electrical conductor whereas the principal function of the leaf spring 15 is to provide resiliency and normally retain the contacts 6 and 8 in contact and also urge the follower block 10 toward the cam 16 and as it engages the follower block 10 which is of insulating material, it is insulated from the cantilever 7 at this point and, therefore, does not conduct current to the contact 8. In view of their respective functions and as it is difficult, if possible, to get a material which is ideal both as a spring and as an electrical conductor, it is possible with the construction of this invention that the cantilever 7 be formed of beryllium copper or other material which is a good electrical conducting material and which will also withstand the necessary flexing, yet is not ideal for springs, and then form the leaf spring 15 of spring steel which is ideal for a spring and yet not a good electrical conductor.

It is pointed out that due to the fact that the breaker supporting bracket 2 is fastened to the base 1 by a solid fastening or screw 17 with head 18 and which screw is positioned substantially in alignment with the point of contact of the cam follower block 10 and cam 16, that this arrangement tends to provide an improved construction without contact bounce on closure of the contacts. Also by loosening the screw 17 having the slotted head 18 and which screw 17 extends through a slot 19 in the bracket 2, it is possible to adjust the bracket 2 and thereby adjust the breaker mechanism relative to the cam 16 after which the screw is tightened to securely retain the parts in adjusted relation.

It is further pointed out that because of the mounting of the cantilever 7 and leaf spring 15 on an effective common fixed point that any relative sliding motion between the spring 15 and adjacent end 14 of the follower block 10 will be reduced to a minimum thus requiring minimum lubrication and at a point shielded from and remote from the contacts 6 and 8.

The forms of the invention shown in Figs. 4 and 5 do not employ the leaf spring 15 and, therefore, the cantilever 7 must be formed of such material that it can act both as an electrical conductor and spring.

In these forms the bent tongue 21 pressed from the body of the cantilever 7 acts as a locating lug and angle support for the cam follower block 20 which is riveted to the cantilever 7 as in the construction of Figs. 1 to 3.

In the construction shown in Figs. 4 and 5, the cantilever 7 has the marginal flanges or reinforcements 9 for added strength as previously described and in the construction of Fig. 4 these flanges 9 have punched out portions for light weight with the structural framework remaining for added strength and support of the cantilever and thereby providing a one piece, inexpensive, light weight, strongly reinforced structure.

The construction shown in Figs. 6 to 11 inclusive, which is the preferred form of the invention, and which is similar to the form shown in

Figs. 1 to 5 inclusive, except as hereinafter described, comprises the supporting bracket 2 formed with the integral turned lip 22 which is secured by spot welding or the like to the extension 23 on the contact carrying lip 24 supporting the contact 25. This construction tends to eliminate any bounce of the contact 25 and supporting lip 24 particularly when the breaker is operated at high speeds.

The contact carrying lever 26 has the cam follower support 27 of insulating material and a plate 28, on the side of the lever 26 opposite the cam follower support 27 secured thereto by the rivets or the like 29 which extend through the members 28 and 27 and also holes in the lever 26.

The lever 26 has the opening 30 for securing the lever in operative position on the bracket 2, and said lever 26 has a relatively wide portion 31, which is the portion of said lever which is deflected or bent during operation of the contact, and thus the lever is provided with maximum strength at the portion of maximum stress to eliminate breaking.

From the portion 31, the lever 26 is reduced in width to form a light weight lever carrying the contact 32 and having the marginal flange 33 with the greatest width or strength at a point opposite the striking block 34 on the cam follower support 27.

The contact carrying lever is provided with the offset contact carrying portion 35 which is offset from the plane of the lever arm proper and which allows the forming of a relatively short striking block 34 to facilitate high speed operation of the breaker without contact bounce.

The lever 26 may be formed of beryllium copper or of a spring steel of such gauge as to withstand continued deflecting or flexing without breakage as it is not required that such lever have superior spring qualities as the curved spring blade 36 of spring steel and tapering in width is provided to provide such resilience as is necessary to urge said contacts 25 and 32 in engagement and the cam follower striking block 34 against the cam 16.

This blade 36 has its curved end 37 engaging the block 28 of insulating material which eliminates friction and reduces lubrication to a minimum and also any lubrication will be on the side of the lever 26 away from the contact points. The cupped or curved central portion of the spring blade 36 adds to the resilience obtainable with a light weight blade construction.

The blade 36 has an opening similar to the opening 30 in the lever 26 to enable the blade 36 and lever 26 to be secured in operable position by the retaining screw 38 which is secured to the lip 39 on the bracket 2. The blade 36 and lever 26 thus pivot about a substantially common center.

While the cam 16 may be operated in either direction and the breaker will operate satisfactorily regardless of the direction of rotation of the cam, if the cam is rotated in the direction indicated by the arrow in Fig. 6, the contact points will tend to open in a direction away from the pivot of the contact lever 26 which will facilitate the operation of the device.

From the foregoing it will be seen that we have provided relatively simple, efficient and economical means for obtaining all of the objects and advantages of the invention.

Having described our invention, we claim:

1. In an electric circuit breaker mechanism, a pair of make and break contacts, a cantilever

supporting one of said contacts for movement relative to the other of said contacts, a support for said cantilever, a cam follower secured to said cantilever and adapted to engage a cam to separate said contacts, said cantilever having marginal reinforcing or strengthening means of varying dimension with the area of greatest reinforcement of said marginal reinforcing means being located adjacent the point of engagement of said cam follower and cam.

2. In an electric circuit breaker mechanism, a pair of make and break contacts, a cantilever supporting one of said contacts for movement relative to the other of said contacts, a support for said cantilever, a cam follower adapted to engage said cantilever to separate said contacts, and said cantilever having marginal reinforcing or strengthening means of varying dimension with the area of greatest reinforcement being located adjacent the point of engagement of said cam follower and cantilever and said reinforcing means tapering therefrom and a leaf spring secured to said support and having a portion engaging said cantilever for normally urging said contacts into engagement, said cantilever and leaf spring being mounted at a substantially common point on said support whereby relative sliding motion between the free end of said leaf spring and the adjacent portion of said cantilever will be reduced to a minimum.

3. In an electric circuit breaker mechanism, a pair of make and break contacts, a cantilever supporting one of said contacts for movement relative to the other of said contacts, a support for said cantilever, a cam follower adapted to engage said cantilever to separate said contacts, and said cantilever having marginal reinforcing or strengthening means of varying strength or reinforcement with the area of greatest reinforcement being located adjacent the point of engagement of said cam follower and cantilever and said reinforcing means tapering therefrom in both directions and a leaf spring secured adjacent one end to said support and engaging said cantilever adjacent its free end, said cantilever and leaf spring being mounted at a substantially common point on said support whereby relative sliding motion between the free end of said leaf spring and the adjacent portion of said cantilever will be reduced to a minimum.

4. In an electric circuit breaker mechanism, a pair of make and break contacts, a cantilever supporting one of said contacts for movement relative to the other of said contacts, a support for said cantilever, a cam follower secured to said cantilever and having a portion extending therethrough and a separate leaf spring secured to said support and located on the side of said cantilever opposite the cam and engaging said portion of said cam follower extending through said cantilever and adapted to urge said contacts into engagement with each other, said cantilever and leaf spring being mounted at a substantially common point on said support whereby relative sliding motion between the free end of said leaf spring and the adjacent portion of said cantilever will be reduced to a minimum.

5. In an electric circuit breaker mechanism, a pair of make and break contacts, a cantilever supporting one of said contacts for movement relative to the other of said contacts, a support for said cantilever, said cantilever having marginal flange reinforcing means of varying size with the area of greatest reinforcement adjacent the point of engagement of the cam follower and cam and said reinforcing means having cut out portions to reduce the weight thereof while substantially retaining its reinforcing strength and a leaf spring secured to said support and having a portion adjacent its free end engaging said cantilever.

6. In an electric circuit breaker mechanism, a pair of make and break contacts, a cantilever supporting one of said contacts for movement relative to the other of said contacts, a support for said cantilever, said cantilever having marginal flange reinforcing means of varying size with the area of greatest reinforcement adjacent the point of engagement of the cam follower and cam and said reinforcing means having cut out portions to reduce the weight thereof while substantially retaining its reinforcing strength, a cam follower secured to said cantilever and adapted to engage a cam to separate said contacts and a separate leaf spring secured to said support and having a portion engaging said cantilever on the side thereof opposite said cam follower to urge said contacts into engagement, said cantilever and leaf spring being mounted at a substantially common point on said support whereby relative sliding motion between the free end of said leaf spring and the adjacent portion of said cantilever will be reduced to a minimum.

7. In an electric circuit breaker mechanism, a pair of make and break contacts, a cantilever supporting one of said contacts for movement relative to the other of said contacts, a cam follower secured to said cantilever, said cantilever having marginal flange reinforcing means of varying size with the area of greatest reinforcement adjacent the point of engagement of the cam follower and cam and said reinforcing means having cut out portions to reduce the weight thereof while substantially retaining its reinforcing strength and a tongue on said cantilever engaging said cam follower with the point of greatest reinforcement of said marginal flange being adjacent said cam follower.

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