March 29, 1932. C. H. DAVIS, JR., ET AL 1,851,567

CIRCUIT BREAKER

Filed Jan. 16, 1930

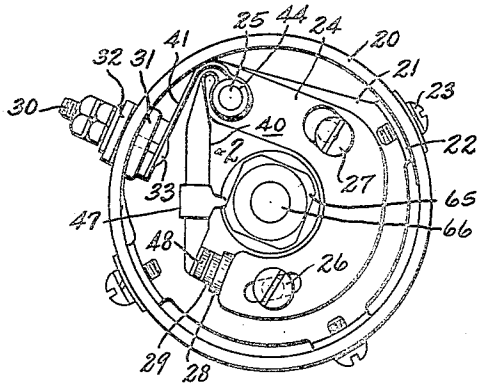


Fig. 1

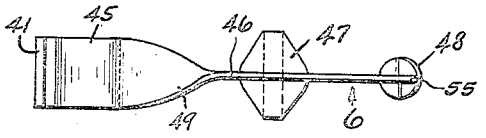


Fig. 5

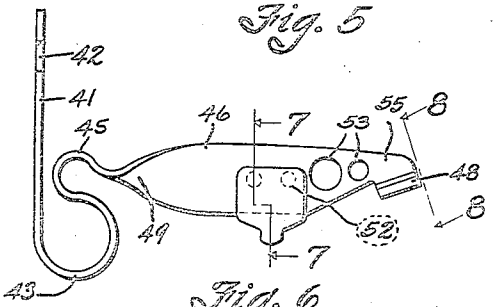


Fig. 6

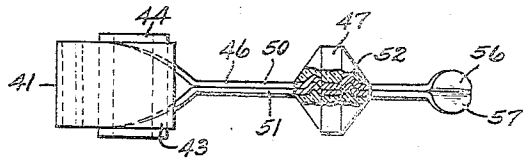


Fig. 2

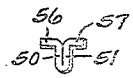


Fig. 4

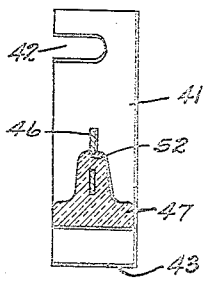


Fig. 7

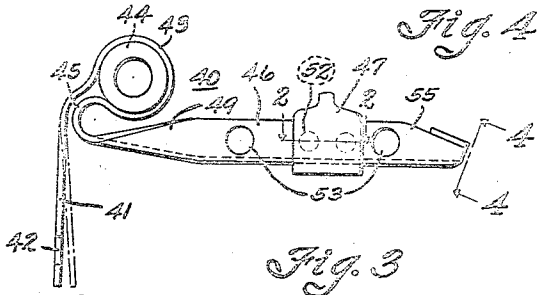


Fig. 3

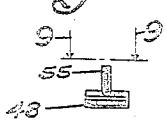


Fig. 8

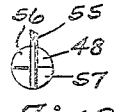


Fig. 9

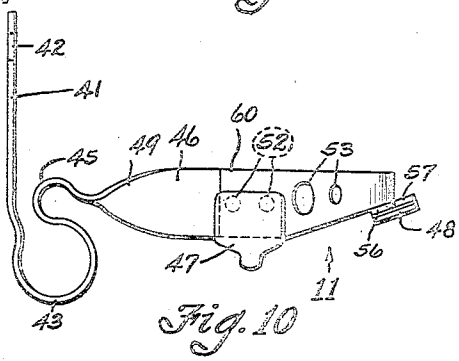


Fig. 10

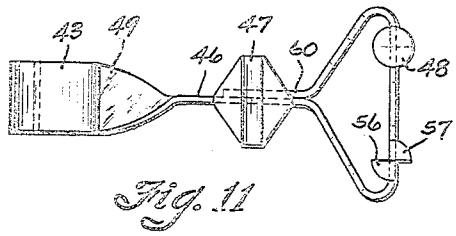


Fig. 11

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# UNITED STATES PATENT OFFICE

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## CIRCUIT BREAKER

Application filed January 16, 1930. Serial No. 421,202.

This invention relates to periodic circuit closures and particularly to timers for ignition apparatus.

Among the objects of the invention is the provision of an ignition timer and circuit breaker mechanism which is novel in construction and that may be produced at a relatively low cost.

A further object of the invention is to provide a contact breaker assembly that will provide an arm of simple construction and efficient in operation, yet of the least practical mass.

A further object of the invention is to provide a circuit breaker assembly that will be efficient at high speed operation.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of one form of the present invention is clearly shown.

In the drawings:

Fig. 1 is a plan view of a timer embodying the present invention.

Fig. 2 is an enlarged view of a circuit breaker lever assembly as indicated by the arrow 2 of Fig. 1, illustrating a fragmentary section thereof, as appears along the line 2—2 of Fig. 3.

Fig. 3 is an enlarged plan view of the circuit breaker lever assembly as appears in Fig. 1.

Fig. 4 is an end view of the contact anchoring means, substantially as indicated by the line and arrows 4—4 of Fig. 3.

Fig. 5 is an elevational view of a modified form.

Fig. 6 is a plan view of the same, as indicated by the arrow 6 in Fig. 5.

Fig. 7 is a sectional view substantially as indicated by the line and arrows 7—7 of Fig. 6.

Figs. 8 and 9 are detailed views of a means for securing a contact point to the lever, substantially as indicated by the line and arrows 8—8 of Fig. 7, and 9—9 of Fig. 8 respectively.

Figs. 10 and 11 are plan and elevational views of a second modification, Fig. 11 being that substantially indicated by the arrow 11 of Fig. 10.

In the present day of high speed automotive engineering, it has been found desirable to provide circuit breaker mechanism that will be sufficiently responsive to the high speed operation of automotive engines, and that will provide a long life of efficiency without material failure in operation. The circuit breaker structures of ordinary design, that have been developed for slower speed automotive engines, functions poorly or fail to operate at all, when they are driven at the higher speeds demanded by present day engineering. Some of these failures are due to sluggishness in the operation of the circuit breaker lever, while some others are due to rupture or breaking of the lever itself. After considerable experimentation, the instant form of circuit breaker lever assembly has been resorted to, since it has been found to operate efficiently over a long period of time without the least indication of failure, and to function properly at both low and high speeds of operation.

With particular reference to the drawings, 20 indicates a timer cup supporting a breaker plate 21 by means of ears 22 attached to the wall 20 by screws 23. The breaker plate 21 supports a contact breaker assembly bracket 24, which is pivoted to a post 25 secured in the plate 21, the plate 24 being adjustable about the pivot post 25 through the agency of a clamping screw 26 and eccentric 27. The bracket 24 provides an upstanding lug 28 to which is fixed a contact point 29. A terminal post 30 is insulatingly mounted in the wall of the cup 20 as by bushing 31 and washer 32, the stud 30 terminating within the cup in a head 33.

The circuit breaker lever assembly 40 of the instant invention is illustrated in the preferred form by Figs. 1 to 4 inclusive, and is formed of a single strip of spring steel bent into formation to provide the structure illustrated. The assembly includes a spring portion 41 providing a terminating notch 42 which is adapted to be secured beneath the head 33 of the terminal stud just described. Joining the spring portion 41 is a large loop

43 adapted to embrace a dielectric bushing or sleeve 44, and thence a reentrant curve or bend 45 is formed, from which extends a rigid portion 46 forming the circuit breaker lever to which is attached a rubbing block 47 and a contact point 48, for cooperation with the fixed contact 29 supported by the bracket 24. The formation of the loop 43 being the intermediate portion between the rigid member 46 and the spring portion 41 is sufficiently smaller in diameter than the bushing 44, that the bushing will be firmly retained therein while the assembly is in the free position as illustrated in Fig. 3.

In this figure the dotted line position is the actual free position of the formed assembly prior to insertion of the bushing 44, as illustrated in full line position. The reentrant bend 45 resolves into the main flexing portion of the assembly since most of the flexing of the lever assembly is manifest at this point during operation. This in effect forms a flexing shank for the contact supporting arm.

The rigid portion 46 of the lever may be formed in various ways, as by twisting the blank at the juncture of the loop 45 so that the arm will lie in a plane perpendicular to the plane that the body of the blank would normally assume, or the blank may be doubly twisted and folded together as illustrated in Figs. 1 to 4 inclusive. That is, the body of the blank may be folded inwardly as at 49 and doubled along the medial line to form the parallelly extending portions 50 and 51.

The rigid portion 46 of the member may be provided with deformations 52 forming an anchorage for the rubbing block 47, and also may include the deformations 53 which operate to reduce the mass of the member 46. In the various forms illustrated, the deformations for securing the rubbing block 47 have been illustrated differently, but either style of deformation operates successfully in either instance for anchorage of the rubbing block. In the form illustrated in Figs. 2 and 3 the deformations 52 constitute indentations in the body of the arm 46, while in the form illustrated in Figs. 6 and 7 the deformations constitute apertures through the body of the lever, but in both events form means to which the rubbing block 47 may be molded securing it to the lever member. However, a machined rubbing block could readily be employed and attached to the arm with rivets, screws or other suitable means. In the present instance, we propose to mold the block about the arm or a portion thereof as indicated in Figs. 2, 3, 6 and 7.

The extreme free end 55 of the arm 46 provides means for supporting the contact point 48, as has been earlier stated, and it has been found desirable to bend portions of the member into the oppositely extending ears or lugs 56 and 57 which provide a base to which the contact 48 may be welded. In the form illustrated in Figs. 2 to 4 inclusive, these ears are substantially semi-circular in form, while in the style of lever illustrated in Figs. 5 to 11 inclusive, the lugs conform to the shape of quadrants of circles, but it is obvious that the same form of lug or ear or even different forms as square or triangular may be used equally well with respect to either form of the breaker lever assemblies illustrated. It has been found that the form illustrated in Figs. 8 and 9 is particularly well adapted for firmly securing the contact point in place.

The form of breaker lever assembly illustrated in Figs. 10 and 11, is that adapted to the double point ignition, that is, in which the circuit breaker lever is designed to support a pair of contact points 48 in cooperative engagement with as many fixed contacts 28. This form is accomplished by using a longer blank so that the lever portion 46 may be looped into the form illustrated in Fig. 11, with the extreme end 60 being bent upon itself as illustrated, to overlie the main portion of the lever at the juncture of the rubbing block, both portions of the overlapped lever being provided with the deformations 52 by which the rubbing block 47 is anchored thereto.

In either form of the circuit breaker lever assembly adopted, the deformations 53 may be provided, or omitted, or if provided may be disposed relative to the contact points and rubbing block so as to accomplish the results desired. That is, the deformations may be placed on one side or the other of the rubbing block 47, or they may be placed on both sides, or they may be omitted entirely. Whether or not they are adopted, and if so adopted where they are to be placed, will be determined by the individual characteristics of the lever portion 4 after formation into the assembly.

Applicants have found that for the weight of spring material, size of the blank, mass of contact point, and rubbing block that they have used, that the apertures or deformations 53 are preferably to be placed as has been illustrated. By so positioning these deformations the inertia of the lever 46 is so little that the lever is readily responsive to the influence of the spring portion 41 when mounted within the timer mechanism as illustrated, and yet the lever is of sufficient rigidity, and the inertia of the contact supporting portion 55 is not so great as to cause breaking of the contact points or of the arm, or even whipping of the lever 46 when the same is operated at high speed.

The contact breaker lever assembly is readily adapted for quick insertion and removal from the timer housing 20, and contributes to rapid change upon desire to repair the contact points. When in the correctly assembled relation with respect to the timer as

illustrated in Fig. 1, the contact point will be urged into engagement with the fixed contact 29 by the spring 41 through its reentrant loops 44 and 45 intermediate the spring portion 41 and the rigid portion 46 which keeps the rubbing block 47 in cooperable engagement with a timer cam 65, provided by a shaft 66 at the axis of the timer housing 20. Electrical communication is made between the contact point 48 and the terminal post 30 by the lever and spring, the latter of which is secured beneath the screw head 33, the dielectric bushing 44 of course insulatingly supporting the assembly on the post 25 as is the usual practice.

While the form of embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A circuit breaker lever and spring assembly comprising, in combination, a strip of spring steel providing a spring leaf and being bent to form a bearing adapted to be mounted on a pivot post, thence provided with a reentrant bend and being twisted to form a rigid arm, a contact point and rubbing block each secured to said rigid arm.

2. A breaker lever for an ignition timer comprising, in combination, a spring portion adapted to have its one end secured to a support, a rigid portion formed integral with the other end of the flexible portion, a rubbing block secured to the rigid portion, means formed between the spring and the rigid portions for pivotally supporting said lever and spring portion, the spring portion extending from the point of support to the pivot portion, and a contact supported by said rigid portion and biased into cooperative engagement with a fixed contact by said spring portion.

3. A circuit breaker lever for an ignition timer comprising, in combination, a spring portion adapted to have its one end secured to a support, a rigid portion formed integral with the other end of the spring portion, said integral formation including a clamping portion adapted to engage a dielectric bushing secured in said clamping portion, and a flexing portion, said rigid portion supporting a contact point and a rubbing block, and being urged into actuating engagement with the timer structure through said flexing portion.

4. A breaker lever for an ignition timer comprising, in combination, a spring portion adapted to have its one end secured to a support, and its other end wrapped about a pivot post and doubled over to form a rigid portion, said rigid portion supporting a contact point and a rubbing block.

5. An integrally formed circuit breaker lever and spring comprising a flexible portion adapted to be secured to a support and having a part adapted to be placed around a pivot post, and being thence twisted to form a rigid arm, said rigid arm supporting a contact point and a rubbing block.

6. An integrally formed circuit breaker lever and a spring comprising a flexible portion adapted to be secured to a support and having a part adapted to be placed around a pivot post, and being thence twisted to form a rigid arm, said rigid arm being provided with deformations, and a rubbing block of nonconducting material molded upon said arm about said deformations.

7. A circuit breaker lever and spring assembly formed from an integral blank comprising, in combination, a spring portion adapted to have its one end secured to a support, an intermediate portion bent into reentrant loops and adapted to engage a pivot bushing, and a rigid portion joining said intermediate portion and adapted to support a contact point and a rubbing block, said rigid portion being formed by twisting a portion of the blank into a plane transverse to the flexible portion.

8. A circuit breaker lever and spring assembly formed from an integral blank comprising, in combination, a spring portion adapted to have its one end secured to a support, an intermediate portion bent into reentrant loops and adapted to engage a pivot bushing, and a rigid portion joining said intermediate portion, and adapted to support a contact point and a rubbing block, said rigid portion being formed by twisting and folding portions of said blank into a plane substantially perpendicular to a plane of said spring portion.

9. A circuit breaker lever and spring assembly formed from an integral blank comprising, in combination, a spring portion adapted to have its one end secured to a support, an intermediate portion bent into reentrant loops and adapted to engage a pivot bushing, and a rigid portion joining said intermediate portion and adapted to support a contact point and a rubbing block, said rigid portion being formed by doubling a portion of the blank along the medial axis thereof.

10. A circuit breaker lever and spring assembly formed from an integral blank comprising, in combination a spring portion adapted to have its one end secured to a support, an intermediate portion bent into reentrant loops and adapted to engage a pivot bushing, and a rigid portion joining said intermediate portion and adapted to support a contact point and a rubbing block, said rigid portion being provided with deformations and having the rubbing block moldably secured thereabout.

11. A circuit breaker lever assembly of spring steel wrapped about a pivot post to

provide a flexing shank and terminating in a spring portion secured to a terminal post, a portion of said steel being folded over the longer axis to form a rigid member, portions of said folded portion providing ears and a contact point secured to said ears.

12. In a timer the combination comprising, a circuit breaker lever and a rubbing block of dielectric material moldably secured thereto.

13. In a timer the combination comprising, a circuit breaker lever and a rubbing block of dielectric material, said lever providing deformations, and said rubbing block being molded on said lever to embrace said deformations.

14. In a timer, the combination comprising, a circuit breaker lever providing deformations, some of which tend to reduce the mass of said breaker lever, a rubbing block of dielectric material molded upon said lever to embrace others of said deformations, and a contact point supported by said lever.

15. A breaker lever and spring assembly for an ignition timer comprising, a strip of resilient metal bent to form a spring portion adapted to have its one end secured to a support and bent to form a rigid portion supporting a contact point and a rubbing block and bent to form an intermediate portion embracing a pivot post for said rigid portion, and a flexing shank for said rigid portion.

16. A circuit breaker lever comprising a bearing portion, a bar portion extending from the bearing portion and providing two ears extending oppositely from the bar, a contact disc secured to both said ears, and a rubbing block attached to the bar.

17. A circuit breaker lever comprising a bearing portion, a bar portion including two juxtaposed plates extending from the bearing portion, each plate terminating in an ear, the two ears extending oppositely from the bar, a contact disc secured to both said ears, and a rubbing block attached to the bar.

18. A circuit breaker lever comprising a bearing portion, a bar portion including two juxtaposed plates extending from the bearing portion, each plate terminating in an ear, the two ears extending oppositely from the bar, a contact disc secured to both said ears, and a rubbing block attached to both plates of the bar.

In testimony whereof we hereto affix our signatures.

CHARLES HALL DAVIS, JR.
ARNOLD E. RIGGS.