

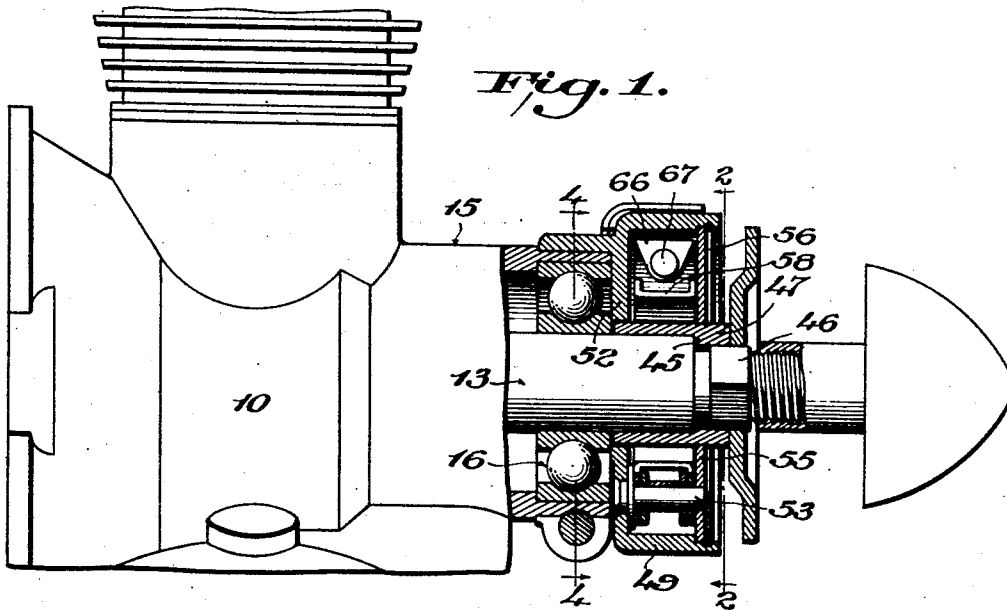
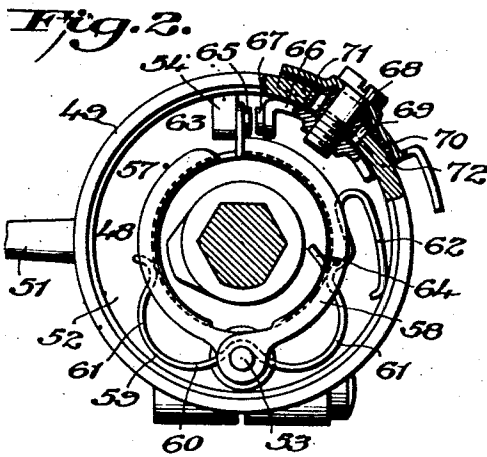
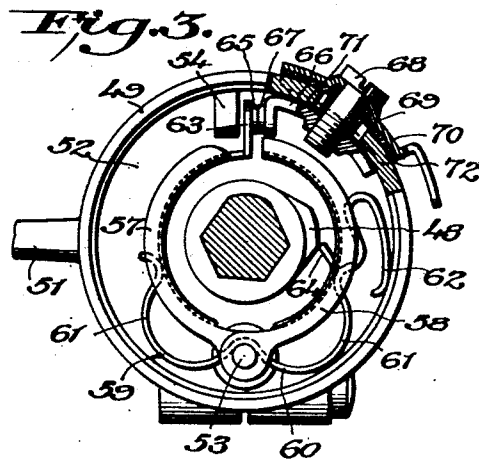
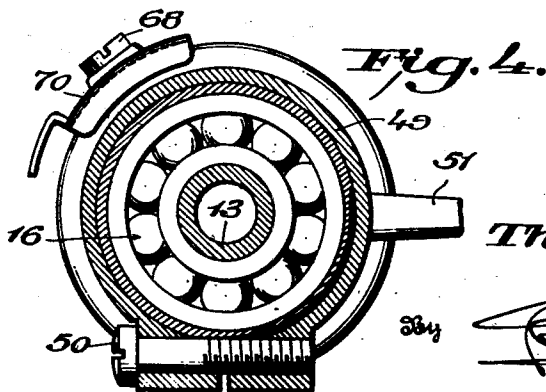
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T. R. ARDEN

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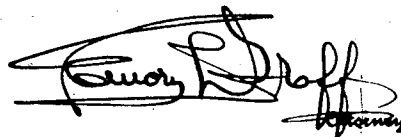
TIMER FOR INTERNAL-COMBUSTION ENGINES

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Inventor

Thomas R. Arden,

By 

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TIMER FOR INTERNAL-COMBUSTION
ENGINES

Thomas R. Arden, Danbury, Conn., assignor to
Bard-Parker Company, Inc., Danbury, Conn., a
corporation of New York

Original application December 10, 1943, Serial
No. 513,752, now Patent No. 2,412,195, dated
December 10, 1946. Divided and this applica-
tion April 23, 1946, Serial No. 664,260

3 Claims. (Cl. 200—30)

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This invention relates to a timer for internal combustion engines, and has particular reference to a timer as illustrated and described in my prior application, Serial No. 513,752, filed December 10, 1943, now Patent No. 2,412,195, December 10, 1946, of which the present application is a division.

The object of the invention is to provide a simple, reliable, highly efficient timer for controlling operation of the spark plug, or plugs, of an engine and which is quickly acting whereby high engine speeds may be attained.

With the foregoing and other objects in view, which will become more fully apparent as the nature of the invention is better understood, the same consists in a timer embodying the novel features of construction, combination and arrangement of parts and in the manner of mounting the same upon an engine, as will be hereinafter more fully described, illustrated in the accompanying drawings and defined in the appended claims.

In the accompanying drawings, wherein like characters of reference denote corresponding parts in the different views:

Figure 1 is a fragmentary side elevation of an engine, partly in section, equipped with a timer in accordance with the invention.

Figure 2 is a transverse section on the line 2—2 of Fig. 1, with the cover plate of the timer removed and showing the timer parts in circuit-open positions.

Figure 3 is a view similar to Fig. 2 showing the timer parts in circuit-closed positions; and

Figure 4 is a transverse section on the line 4—4 of Fig. 1.

The engine illustrated in the drawings is of a well-known type especially designed for use in powering miniature aircraft. It is to be understood, however, that the present time is not limited to use with such engines but may be used on engines of various other specifically different types.

The engine includes a crank case 10 having a forwardly extending cylindrical portion 15 in which the forward end portion of the crank shaft 13 is journaled, preferably through the instrumentality of anti-friction bearings one of which is illustrated and designated as 16.

The crank shaft 13 extends forwardly beyond the front end of the cylindrical portion 15 of the crank case 10 and its front end portion is of reduced diameter, thus providing said shaft with an annular, forwardly facing shoulder 45. On the reduced-diameter portion of said shaft,

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adjacent to the shoulder 45, is a polygonal formation 46, while engaged partly over the larger diameter portion and partly over the smaller diameter portion of said shaft is a sleeve 47 having a rearwardly facing shoulder which engages the shoulder 45 whereby movement thereof rearwardly relative to the shaft 13 is limited. Moreover, the opening in the front end portion of said sleeve is of the same cross-sectional shape as the polygonal formation 46 and accommodates said polygonal formation, thus constraining said sleeve to rotate with said shaft. On the exterior of the sleeve 47 is a lug 48 constituting a cam for actuating the timer of the engine.

The timer mechanism is enclosed in a cylindrical housing 49 which is mounted for rotative adjustment on the forward end of the cylindrical portion 15 of the crank case 10. The rear portion of said housing embraces the crank case portion 15, is longitudinally split, and is provided with a screw 50 whereby it may be clamped sufficiently tight upon said crank case portion 15 so that it will frictionally be held in any position to which it may be rotatably adjusted. For effecting its rotative adjustment, the housing 49 is provided with a suitable handle 51.

Within the housing 49 is a transverse wall 52 which closes the front end of the crank case portion 15 and which has fixed thereto and extending forwardly therefrom a pin 53, while at a point approximately diametrically opposite the pin 53, said housing 49 has fixed thereto and projecting into the same an abutment 54. At its front end, the housing 49 is closed by a removable plate 55 which may be retained in assembly with said housing in any suitable manner as, for example, by means of a split ring 56.

Within the housing 49 is a pair of breaker arms 57 and 58 of substantially semi-circular shape which are pivoted at adjacent ends on the pin 53 for independent rocking movement thereon and which have their other ends free and disposed adjacent to the abutment 54. A suitable spring 59 of the leaf type tends constantly to rotate the arms 57, 58 toward one another about the pin 53, thus to cause their free ends normally to abut one another, and either this same spring or, if desired, another spring, tends to rock both of said arms as a unit in one direction about said pin 53. In the present instance, the one spring 59 performs both of these functions, said spring being bent to shape from a length of suitable spring material and including a substantially U-shaped portion 60 medially engaged with the pin 53 and having its legs 61 embracing the breaker

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arms 57, 58 to perform the first-mentioned function, and further including a reversely bent terminal extension 62 of one of its legs 61 engaged with the inner face of the housing 49 whereby it performs the second-mentioned function.

The leading breaker arm, as regards the direction of unitary rocking movement of the two breaker arms by the spring 59, is provided at its free end with an outwardly extending tongue 63 for engagement with the abutment 54 whereby its rocking movement by said spring 59 is limited. Thus, said leading breaker arm, which is the arm 57 in the present instance, is held by the spring 59 normally in a position with its tongue 63 in engagement with the abutment 54. At the same time, the other or trailing breaker arm, as regards the direction of unitary rocking movement of the two breaker arms by the spring 59 and which is the arm 58 in the present instance, normally is held by said spring 59 with its free end in engagement with the free end of the arm 57.

Extending inwardly from the trailing breaker arm 58 into the path of rotation of the cam lug 48 is a suitable projection 64 which, appropriately, may be in the form of a tongue struck inwardly from said breaker arm 58. In any event, regardless of the form of said projection 64, it is apparent that, once during each complete rotation of the shaft 13 and of the cam sleeve 47 which is carried by and rotatable therewith, said projection 64 will be engaged by the cam lug 48 with the result that the trailing breaker arm 58 will be rocked a limited distance in a direction counter to the direction in which it is urged by the spring 59.

On the tongue 63 is a back contact 65, while carried by the timer housing 49 is a plate 66 which carries a front or fixed contact 67 with which the back contact 65 cooperates, the plate 66 being positioned so that when the tongue 63 is engaged with the abutment 54, the said front contact 67 is spaced from the back contact 65 by an amount less than the amount of rocking movement which is imparted to the free end of the breaker arm 58 by the cam lug 48. Manifestly, therefore, each time the trailing breaker arm 58 is rocked by the cam lug 48, the other or leading breaker arm 57 is rocked therewith by the spring 59 until the back contact 65 engages the front contact 67, whereupon rocking movement of said leading breaker arm is arrested with the result that the free end of the trailing breaker arm is moved into spaced relationship to the free end of said leading breaker arm, as shown in Figure 3. Consequently, when the cam lug 48 passes the projection 64 and thereby suddenly releases both of the breaker arms 57, 58 for return to their normal positions by the spring 59, the free end of the trailing breaker arm 58 is caused to strike the free end of the leading breaker arm 57 a hammer-like blow which effects exceptionally quick separation of the contact 65 from the contact 67.

It will be understood, of course, that the contacts 65, 67 are included in a circuit which also includes the spark plug of the engine, and that due to the quick separation of said contacts 65, 67, sparking of the plug 22 is sharply defined and occurs at the intended instant even at exceptionally high speeds of the cam lug 48, with the result that exceptionally high engine speeds are attainable.

The plate 66 preferably is adjustable so that the distance between the contacts 65, 67 in their

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separated relationship may be varied. To this end, a screw 68 extends through a circumferentially elongated slot 69 in the side wall of the housing 49 and is threaded into a hole in said plate 66 whereby the latter may be shifted to adjust its contact 67 toward and away from the contact 65 and whereby it may be clamped in any adjusted position thereof against the said side wall of said housing. The screw 68 also serves to clamp a terminal plate 70 against the exterior of the housing 49, a sheet of insulation 71 being interposed between the plate 66 and said housing and another sheet of insulation 72 being interposed between the terminal plate 70 and said housing to prevent grounding through said housing of that side of the circuit which includes the contacts 65, 67.

Obviously, the present timer not only is quickly acting in its operation, but is compact and is mounted in a practical manner relative to the engine. Moreover, it is strong and sturdy and embodies a simple construction such that it is unlikely to get out of order, despite long service. Obviously, by rotatably adjusting the housing 49, the time of actuation of the timer may be varied. Obviously, too, the timer may be adapted for use on multiple cylinder engines by providing a plurality of the lugs 48 on the sleeve 47.

From the foregoing description considered in connection with the accompanying drawings it is thought that the improvement contemplated by the present invention will be readily understood without further description and that changes in the form and construction may be resorted to without departing from the scope of the appended claims.

I claim:

1. A timer comprising a rotatable cam, a housing surrounding said cam, a pair of opposed substantially semi-circular breaker arms pivoted at adjacent ends to said housing and having their other ends free, spring means tending constantly to rock said arms to urge their free ends against one another and to swing the two arms as a unit in one direction, an abutment carried by said housing to be engaged by the leading arm as regards the direction of unitary swinging movement of said arms by said spring means thus to limit unitary swinging movement of said arms by said spring means, a back contact carried by said leading breaker arm, a fixed contact carried by said housing, and a projection carried by the trailing breaker arm and engageable by said cam whereby said trailing breaker arm is rockable by said cam in a direction counter to the direction in which it is urged by said spring means, said trailing breaker arm being rockable by said cam a greater amount than is required to permit said spring means to rock the leading breaker arm to engage its contact with said fixed contact, whereby the free end of said trailing arm becomes spaced from the free end of said leading breaker arm to be caused by said spring means to strike the free end of said leading breaker arm a hammer-like blow to cause quick separation of said contacts when the cam releases said trailing breaker arm.

2. A timer comprising a rotatable cam, a housing surrounding said cam, a pair of opposed substantially semi-circular breaker arms pivoted at adjacent ends to said housing and having their other ends free, spring means tending constantly to rock said arms to urge their free ends against one another and to swing the two arms as a unit in one direction, an abutment carried by said

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housing to be engaged by the leading arm as regards the direction of unitary swinging movement of said arms by said spring means thus to limit unitary swinging movement of said arms by said spring means, a back contact carried by said leading breaker arm, a fixed contact carried by said housing, and means whereby said trailing breaker arm is rockable by said cam in a direction counter to the direction in which it is urged by said spring means and in an amount greater than is required to permit said spring means to rock the leading breaker arm to engage its contact with said fixed contact, whereby the free end of said trailing arm becomes spaced from the free end of said leading breaker arm to be caused by said spring means to strike the free end of said leading breaker arm a hammer-like blow to cause

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quick separation of said contacts when the cam releases said trailing breaker arm.

3. A timer as set forth in claim 2 in which a single spring serves to rock the breaker arms to urge their free ends toward one another and also to rock the two breaker arms as a unit in one direction.

THOMAS R. ARDEN.

REFERENCES CITED

The following references are of record in the file of this patent:

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Number	Name	Date
1,665,265	Hosterman	Apr. 10, 1928