May 28, 1940. J. L. ARTHUR 2,202,077

IGNITION TIMER

Filed June 19, 1939

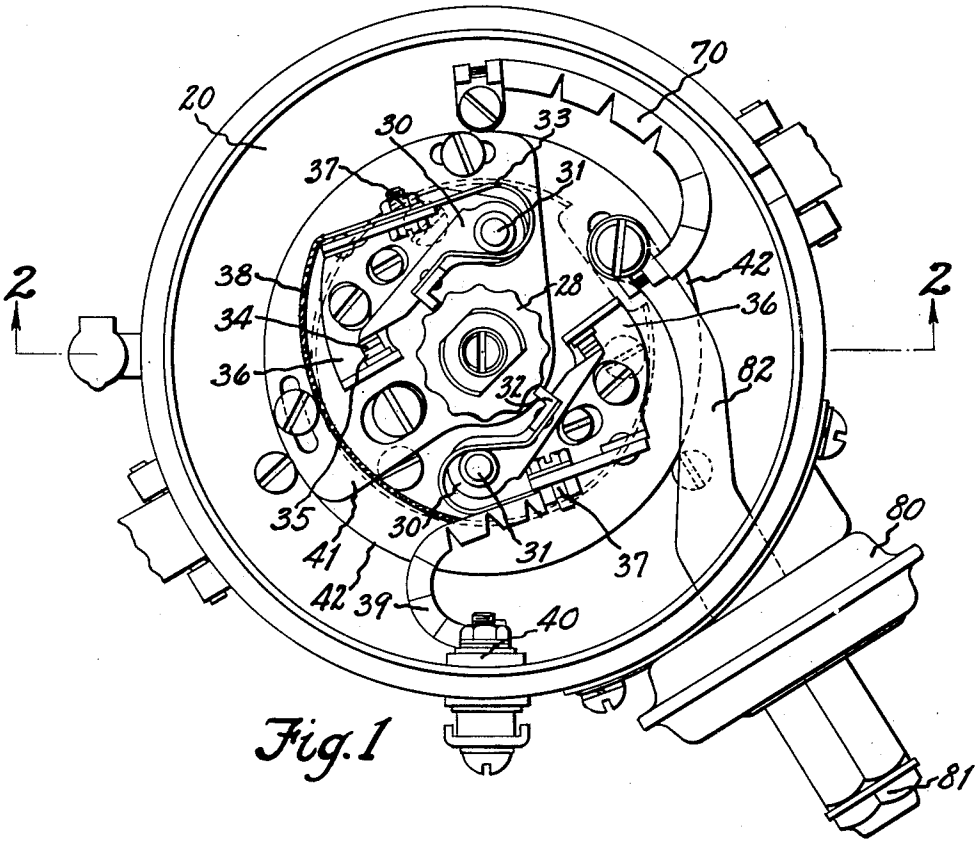


Fig. 1

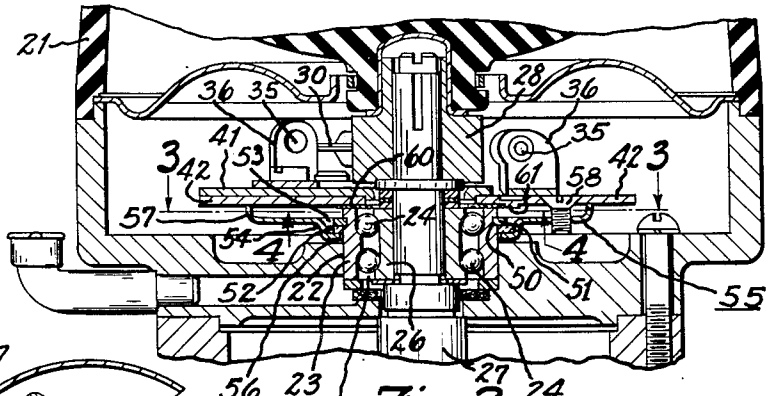


Fig. 2

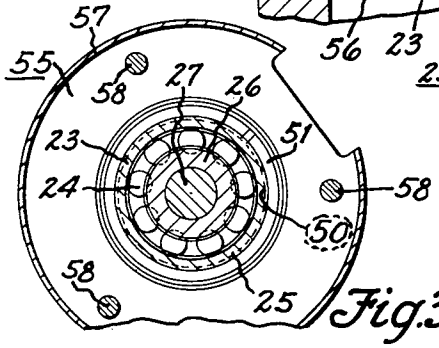


Fig. 3

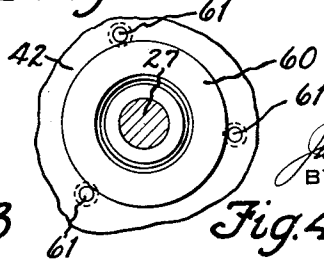


Fig. 4

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UNITED STATES PATENT OFFICE

2,202,077

IGNITION TIMER

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3 Claims. (Cl. 200—31)

This invention relates to ignition timers for internal combustion ignition apparatus and more particularly to the type of apparatus in which the circuit breaker of the ignition timer is mounted upon a plate, called the circuit breaker plate which is adjustable rotatively about the axis of the cam which operates the circuit breaker in order to vary the timing of the ignition.

One form of the particular circuit breaker referred to is disclosed in my Patent No. 2,187,070, granted Jan. 16, 1940. My said application discloses the mounting of the circuit breaker plate upon the outer race of the ball bearing, the inner race of which is pressed over a shaft which supports the ignition timer cam. The timer housing provides a bearing for the outer race of the ball bearing. This construction provides for the mounting of the circuit breaker plate accurately so that the axis of the plate coincides precisely with the axis of rotation of the timer cam. This construction provides for rotation of the circuit breaker plate with very little frictional resistance so that the plate may readily be adjusted automatically by devices responsive to variations in pressure in the engine fuel intake pipe.

Automotive ignition apparatus is usually of the one wire type, the return to the current source being thru a ground connection provided by the automobile frame to which the storage battery is connected, the engine frame on which the metal ignition timer housing is mounted and by means of a flexible wire connecting the movable circuit breaker plate with the ignition timer housing. This flexible lead from the circuit breaker plate to the timer housing is adequate for carrying the direct current supplied by the current source to the ignition system. There are certain high frequency currents of relatively short duration which pass thru the ignition timer concurrently with the discharge of the secondary circuit of the system to provide ignition sparks. These high frequency transient currents are not conducted readily by the flexible lead which provides the ground connection between the circuit breaker plate and the timer housing, because this lead, when of a length sufficient to provide substantially no hindrance to rotation of the circuit breaker plate, offers appreciable resistance to the flow of the high frequency transient currents. Therefore these transient currents of high frequency seek a path to ground thru the ball bearing which supports the circuit breaker plate coaxially with respect to the timer cam. In time the balls of the ball bearing will be pitted by the high frequency transient currents. It is necessary therefore to insulate the ball bearings from ground.

The object of the present invention is to provide for insulatingly mounting the circuit breaker plate upon the outer race of the ball bearing.

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

In the drawing:

Fig. 1 is a plan view of an ignition timer unit embodying the present invention, the distributor rotor and distributor cap being removed.

Fig. 2 is a sectional view taken substantially on the line 2—2 of Fig. 1.

Figs. 3 and 4 are sectional views taken on the line and reading in the direction of the arrows 3—3 and 4—4 respectively of Fig. 2.

The ignition timer housing includes a cup 20 enclosed by distributor cap 21 a fragment of which is shown in Fig. 2. The cup 20 provides a bearing 22 in which the outer race 23 of a ball bearing 25 is rotatively supported, said bearing 22 providing a clearance of about .001". Balls 24 support the outer race 23 upon the inner race 26 which is press fitted over a shaft 27 to which timer cam 28 is fixed. Cam 28 operates one or more circuit breakers each comprising a lever 30 insulatingly mounted on a pivot stud 31 and provided with a non-conducting rubbing block 32 engaged by the lobes of the cam 28. A leaf spring 33 urges the rubbing block 32 toward the cam 28 and a contact 34 carried by the lever 30 toward a stationary contact 35 carried by a bracket 36. One end of the spring 33 is attached to the lever 30 and the other end of the terminal 37 which is insulatingly supported by the bracket 36. The insulated terminals 37 of the two circuit breakers shown are wired together by a flexible lead 38 and are connected by flexible lead 39 with a main terminal 40. One of the circuit breakers is mounted upon an upper plate 41 which is adjustably mounted upon the circuit breaker plate 42 upon which the other circuit breaker is directly mounted.

The outer race 23 of the ball bearing 25 is provided with an annular groove 50 which receives a resilient split washer 51 which provides a shoulder against which is positioned a non-conducting washer 52 having an inside diameter such as to snugly fit the bearing race 23 and having an outside diameter such as to snugly fit within a cylindrical recess 53 provided by an annular flange 54 provided by plate 55. The annular flange 54

merges with a flat circular flange 56 bearing against the under side of the non-conducting washer 52. The outer periphery of the plate 55 is shaped to provide an annular flange 57 which bears against the under side of the circuit breaker plate 42. The plate 42 is located with respect to the plate 55 by three screws 58 the heads of which accurately fit into the countersunk holes of plate 42 and the threads of which are threaded into tapped holes in the plate 55. Between the upper end face of the ball bearing race 23 and the lower side of the plate 42 is located a non-conducting washer 60 which is maintained concentrically with the axis of the shaft 27 by three small bosses 61 formed by extruding portions of the plate 42. When the screws 58 are tightened the washer 60 is confined between the bearing race 23 and the bearing 42 and the non-conducting washer 52 is confined between the split washer or ring 51 and the flange 56 of the plate 55. The inside diameter of the plate 55 is substantially greater than the outside diameter of the bearing race 23 so that there is no metal contact. The spacing between the metal parts such as 56 and 23 need not be very great because the high frequency transient currents are capable of jumping only very minute gaps. While the insulating washers 52 and 60 are relatively thin and the spacing between the flange 56 of the plate 55 and adjacent the metallic parts is relatively small, the insulation is sufficient to raise the resistance to the flow of high frequency transient current to a value in excess of the resistance afforded by the ground lead 70 which connects the breaker plate 42 with the ignition timer cup 20.

The timing of the ignition may be varied by rotating the circuit breaker plate 42 either manually or by some automatic device such as a device which is responsive to variations in pressure in the engine intake pipe. Fig. 1 shows a form of such device. This device comprises a suction chamber 80 connected by fitting 81 with the engine intake manifold and housing a diaphragm not shown connected by link 82 with the circuit breaker plate 42.

While the 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. In an ignition timer, the combination of a circuit breaker, a plate supporting the circuit breaker, a cam for operating the circuit breaker, a shaft carrying the cam, an anti-friction bearing having inner and outer races, the inner race being mounted on said shaft, and means for insulatingly supporting the circuit breaker plate upon the outer race.

2. In an ignition timer the combination of a circuit breaker, a plate supporting the circuit breaker, a cam for operating the circuit breaker, a shaft carrying the cam, an anti-friction bearing having inner and outer races, the inner race being mounted on said shaft, a shoulder provided by the outer race, a non-conducting washer fitted around the outer race and bearing against said shoulder, insulating means spacing the circuit breaker plate from an end of the outer race, and means for clamping the plate against said insulating means and said washer against said shoulder and for maintaining said plate concentric with said washer.

3. In an ignition timer, the combination of a circuit breaker, a plate supporting the circuit breaker, a cam for operating the circuit breaker, a shaft carrying the cam, an anti-friction bearing having inner and outer races, the inner race being mounted on said shaft, a shoulder provided by the outer race, a non-conducting washer fitted around the outer race and bearing against said shoulder, insulating means spacing the circuit breaker plate from an end of the outer race, a clamping plate providing a recess receiving the washer and a flange engaging the side of the washer remote from said shoulder, and means for attaching the circuit breaker plate to the clamping plate, and cooperating therewith to cause the circuit breaker plate to be forced against said insulating means and said washer against said shoulder.

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