March 9, 1954 M. G. BALES 2,671,829

IGNITION TIMER

Filed April 9, 1949 2 Sheets-Sheet 1

OLD CONSTRUCTION

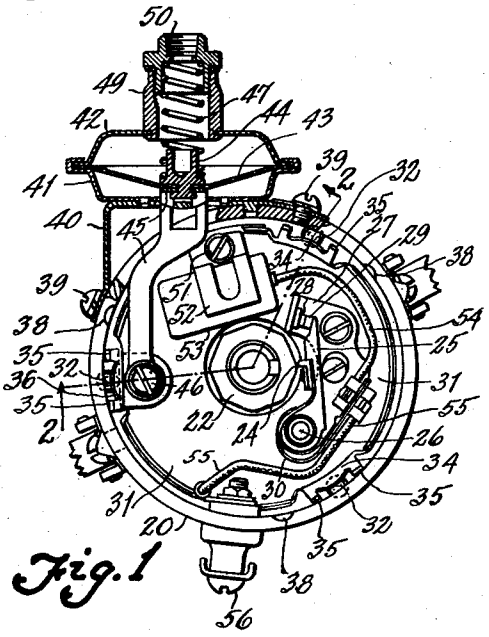

Fig. 1

NEW CONSTRUCTION

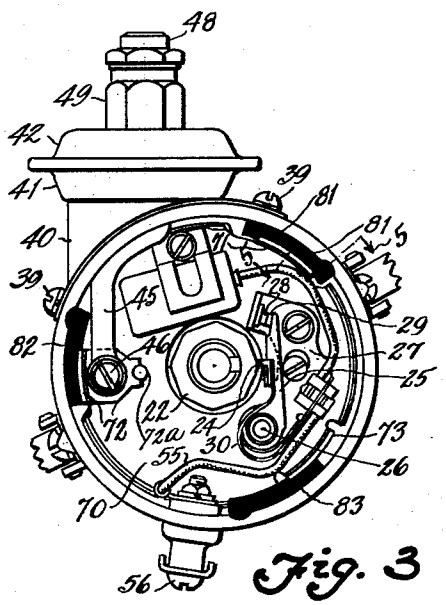

Fig. 3

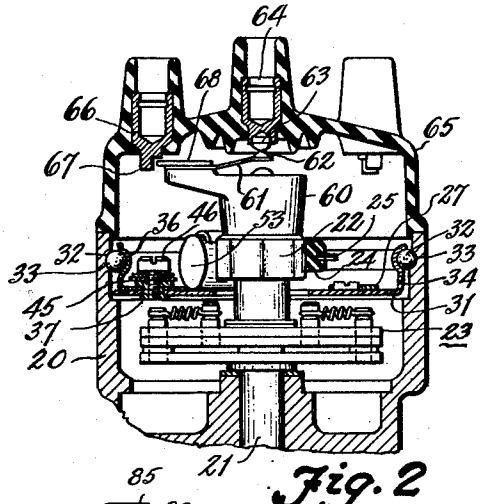

Fig. 2

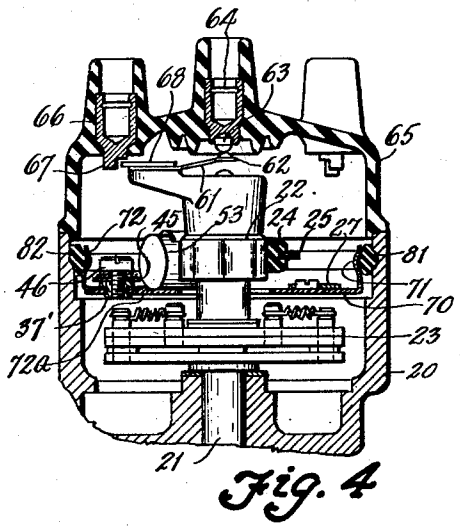

Fig. 4

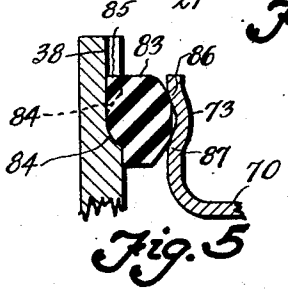

Fig. 5

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IGNITION TIMER

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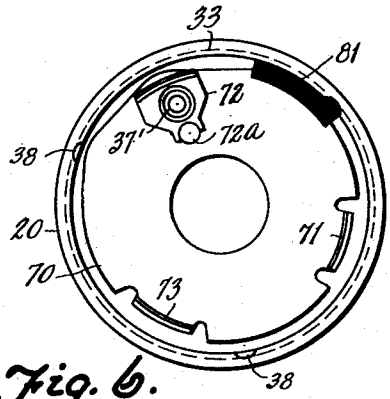

Fig. 6.

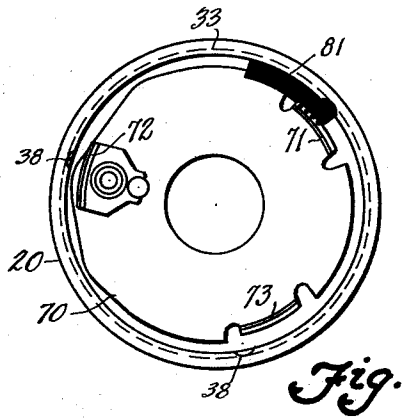

Fig. 7.

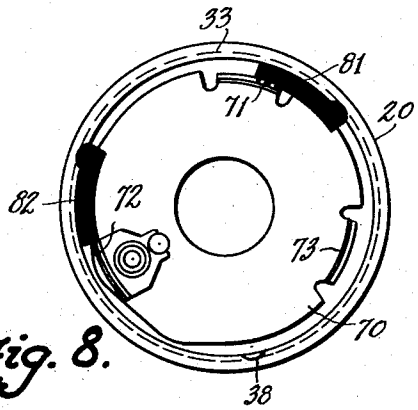

Fig. 8.

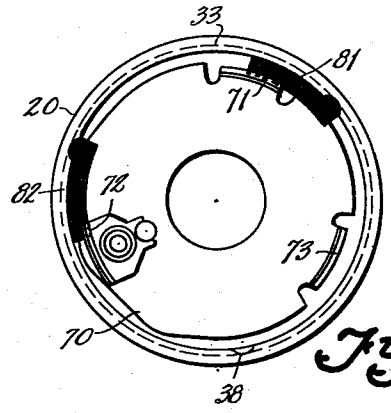

Fig. 9

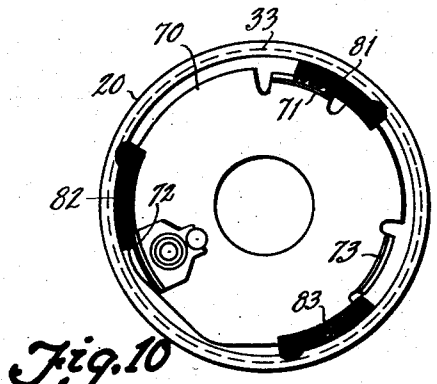

Fig. 10

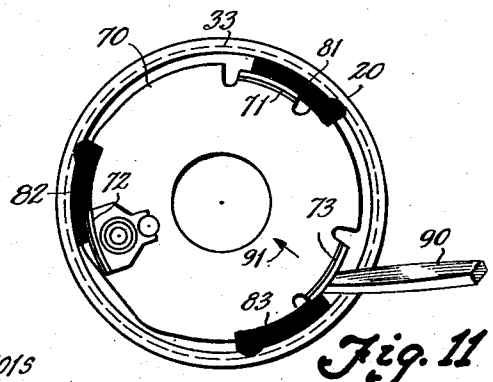

Fig. 11

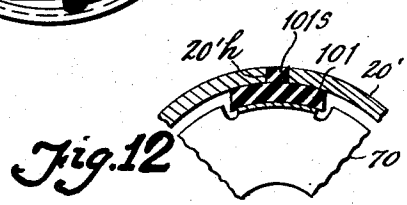

Fig. 12

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UNITED STATES PATENT OFFICE

2,671,829

IGNITION TIMER

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Application April 9, 1949, Serial No. 86,422

9 Claims. (Cl. 200—31)

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This invention relates to ignition timers comprising a cam operated circuit breaker attached to a plate transverse to the cam axis and rotatably supported directly by the timer housing in a manner such that the axis of rotation of the plate will coincide with the axis of rotation of the cam. The patent to J. L. Arthur, No. 2,125,368, issued August 2, 1938, discloses an ignition timer of this type. The housing of the timer has an annular groove providing a ball race which receives balls also received by ears or inner race members connected with the movable circuit breaker plate. It has been found that after continual operation of the timer over a long period, the outer ball race, which is provided by the cast iron housing, becomes indented so that the balls do not roll as freely as they did originally. This interferes with freedom of rotation of the breaker plate and with the proper functioning of a device responsive to engine intake suction for rotating the breaker plate.

An object of the invention is to provide for the servicing of timers of the type shown in the Arthur patent. This is accomplished by a replacement breaker plate and three bearing members preferably made of molded plastic and adapted to be retained in fixed positions by the housing and adapted to be engaged by ears connected with the breaker plate.

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 the present invention is clearly shown.

In the drawings:

Fig. 1 is a plan view of an ignition timer of the type disclosed in the Arthur patent referred to, the part of Fig. 1 in section being a longitudinal section of the device responsive to engine suction for moving the rotatable breaker plate.

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

Figs. 3 and 4 are views similar to Figs. 1 and 2 respectively and show the timer of the Arthur type equipped with replacement parts constructed in accordance with the present invention.

Fig. 5 is an enlarged fragmentary sectional view taken on the line 5—5 of Fig. 3.

Figs. 6 to 11 are diagrams showing the steps of assembling the replacement bearing members.

Fig. 12 is a fragmentary sectional view showing how bearing members similar to those shown in Figs. 3 to 11 can be used as parts of new ignition timers.

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Referring to Figs. 1 and 2, which show the old construction, a housing 20 supports an engine driven shaft 21 which drives a timer cam 22 through a device 23 which, in response to change in engine speed, varies the angular relation between the cam 22 and the shaft 21. Cam 22 (Fig. 1) engages a rubbing block 24 carried by a lever 25 pivoted on a stud 26 attached to a bracket 27 attached to a circuit breaker plate 31 and carrying a fixed contact 28 engageable with a movable contact 29 carried by lever 25. A leaf spring 30 urges the lever 25 in a counterclockwise direction to cause the contacts to be normally engaged and to resist separation thereof when a lobe of the cam 22 engages the rubbing block 24. Plate 31 is supported for rotation coaxially with the axis of the cam 22 by three balls 32 which are received by an annular groove 33 provided by the housing 20 coaxial with the axis of the cam 22 and received by ball races provided respectively by two relatively rigid ears 34 integral with the plate 31 and by a relatively resilient ear 36 attached to plate 31 by a tubular rivet 37. Each ear has two lugs 35 between which the balls 32 are located. The resilient ear 36 urges its ball 32 toward the housing and causes the ears 34 to press their retained balls toward the housing. The housing 20 is provided with grooves 38 extending from the top face of the housing down through the groove 33. When the plate 31 is so located that the ears 34 are adjacent the grooves 38, the balls 32 can be inserted.

Screws 39 attach to housing 20 a bracket 40 supporting a suction device comprising shells 41 and 42 which are secured together at their peripheries with the edge of a diaphragm 43 between. A rivet 44 connects the central portion of the diaphragm 43 with an arm 45 which a screw 46 pivotally connects with the rivet 37 attached to plate 31, as shown in Fig. 2. The rivet 44 receives one end of a compression spring 47, the other end of which bears against a pipe coupling 48 threaded into a bushing 49 attached to the shell 42. The threaded opening 50 in the coupling 48 provides for connection with a pipe connected with the engine intake manifold. Obviously, increase of engine suction will effect clockwise rotation of the ignition timer to effect spark advance, it being understood that the cam 22 rotates counterclockwise.

A screw 51 attaches to the plate 31 a bracket 52 attached to the metal case of a condenser 53, one foil of which is grounded on the case and the other of which is connected by a wire 54 with the fixed end of the spring 30 and with a wire 55

connected with a terminal 56 insulatingly supported by the housing 20.

The cam 22 is connected with a distributor rotor 60 having a spring blade 61 carrying a central contact 62 engaging a button 63 supported by a metal terminal socket 64 anchored centrally in a distributor cap 65 of molded insulating material which provides a cover for the housing 20 on which it is retained in the conventional manner. Cap 65 provides a circular row of terminal sockets 66, each adapted to make connection with a spark plug cable and each having a post 67 past which there rotates a metal segment 68 supported by the rotor 60 and connected with the spring blade 61.

To service a timer of the type shown in Figs. 1 and 2, the cap 65 is removed from the housing 20, the wire 55 disconnected from the terminal 56 and the lever 45 is freed from connection with the plate 31 by removing the screw 46. Terminal 56 is removed to permit removal of plate 31. Then by turning the plate 31 so that the balls 32 can be located adjacent the grooves 33, the balls and the plate 31 can be removed. The old plate 31 is replaced by a new plate 70 (Figs. 3 and 4) supporting similar circuit breaker and condenser parts and wires and having two relatively rigid ears 71 and 73 integral therewith and a relatively resilient ear 72 connected to plate 70 by a tubular rivet 37'. The notched base of ear 72 straddles a small circular boss 72*a* extruded from plate 70. Boss 72*a* and the rivet 37' fix the location of the ear 72 relative to the plate 70. The ear 73 is shown in Fig. 5; and ear 71 is like ear 73. The resilient ear 72 is similar to ears 71 and 73 but is thinner. The ears 71, 72 and 73 engage, respectively, three bearing members 81, 82 and 83 shown in solid black in Fig. 3. Each of the bearing members, for example 83 in Fig. 5, has an arcuate boss 84 of torical cross sectional contour adapted to be received by the groove 33 of the timer housing and has at right angles to the boss 84, a boss 85 adapted to be received by a groove 36. The boss 85 fixes the bearing member in a definite position along the groove 33. The inner face of each bearing member is shaped as shown best in Fig. 5, so that it will be engaged by an ear of the plate 70 at two places marked 86 and 87. The resilient ear 72, by pressing against the adjacent bearing member 82, urges the ears 71 and 73 against the bearing members 81 and 83 respectively. These bearing members present very smooth surfaces in contact with the ears of the breaker plate; and these surfaces are all coaxial with the axis of the timer cam. When these surfaces are greased, the frictional resistance between the bearings and the ears of the breaker plate is so low that there is practically no interference with the operation of the suction device to effect ignition timing in accordance with the load on the engine. Obviously, when these replacement bearings have become worn, they can be replaced by new ones.

Figs. 6–11 illustrate the procedure of assembling the bearing members. Bearing 81 is assembled as shown in Fig. 6. Plate 70 is rotated counterclockwise to cause its ear 71 to engage the bearing 81, as shown in Figs. 7 and 8. Bearing 82 is assembled as shown in Fig. 8 and plate 70 is rotated clockwise to cause ear 72 to engage bearing 82 as shown in Fig. 9. Bearing 83 is assembled as shown in Fig. 10. While prying the plate 70 in about the direction indicated by arrow 91 in Fig. 11 by means of a screwdriver blade 90 inserted between the housing 20 and the ear 73 in order to cause that ear to clear the bearing 83, the plate 70 is rotated clockwise to cause the ear 73 to overlap the bearing 83 and the blade 90 is removed. The prying of the plate 70 in this manner is permitted by the resilient ear 72. All three ears are now in engagement with the respective bearings which are retained in their respective positions along the groove 33 of the housing 20. Lever 45 is pivotally connected with the new plate 70 by screw 46 received by a tapped hole in rivet 37'. The old terminal 56 is reassembled with the housing 20 and the new wire 55 is connected with said terminal. Thus the timer is serviced by a new circuit breaker and plate assembly and three new bearings.

The present invention is not limited in its application merely to the servicing of ignition timers in use but may be applied to new equipment. The timer housing, a fragment of which is shown at 20' in Fig. 12, is provided with three radially extending holes 20'*h*, the center lines of which are in a plane at right angles to the axis of rotation of the timer cam. Each hole 20'*h* receives the shank 101*s* of a bearing member 101 of suitable material, there being three of these bearing members shaped as shown in Fig. 5, except for the omission of bosses 84 and 85. When bearings 101 become worn, they are easily replaced by new ones.

From the foregoing description, it is apparent that the present invention contemplates the combination with a housing 20 or 20' having an inner cylindrical wall coaxial with the timer cam of three bearing members 81, 82, 83 (Figs. 3–11) or three members 101 (Fig. 12) of suitable bearing material having concentric inner and outer surfaces, the outer surfaces conforming to the inner cylindrical surface of the housing when retained in assembly therewith by the ears of the circuit breaker plate 70, and the inner surfaces being coaxial with respect to the housing inner wall and to the cam. Recesses provided by the housing, such as annular groove 33 and straight grooves 38 (Figs. 3–11) receive boss parts 84, 85 of bearing members 81, 82, 83 and holes or cylindrical recesses 20'*h* in housing 20' (Fig. 12) receive cylindrical parts or shanks 101*s* of bearing members 101, for the purpose of fixing these bearing members longitudinally and circumferentially with respect to the inner cylindrical wall of housings 20 or 20'. The shanks 101*s* of bearing members 101 cannot rotate in holes 20'*h* because the outer cylindrical surfaces of the members 101 are pressed against the inner cylindrical wall of the housing.

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.

What is claimed is as follows:

1. An ignition timer comprising a housing having a cylindrical inner wall, a timer cam supported by the housing coaxially with the wall, three arcuate shaped non-metallic bearing members having concentric concave inner and convex outer surfaces, the outer surfaces fashioned to bear against inner cylindrical surface of the housing walls when the bearing members are assembled with the housing and the inner surfaces being coaxial with respect to the cam, recesses provided by the housing and parts provided by the bearing members for reception by the recesses whereby the members are fixed longitudinally and circumferentially relative to the housing wall, a plate having ears provided with surfaces concentric with the housing walls and shaped to

ride on the inner surfaces of the bearing members, at least one of the ears being relatively resilient so that when the plate is in operative position with the said bearing member that the bearing members are held in place solely by the pressure of the ears thereon, said ears locating the plate in a plane at right angles to the cam axis and cooperating with the bearing members to provide for facile rotation of the plate relative to the housing, and a circuit breaker supported by the plate for operation by the cam.

2. An ignition timer according to claim 1 in which the housing has an annular groove within its cylindrical wall in a plane at right angles to the cam axis and three recesses extending from an end surface of the housing across the cylindrical wall to the groove and in which each bearing member has an annular boss part received by the groove and another boss part received by a recess of the housing wall.

3. An ignition timer according to claim 1 in which the housing has three cylindrical recesses extending from the housing wall and radially from the axis of the housing wall, the center line of the recesses being in a plane at right angles to the housing wall axis, and in which each bearing member has a cylindrical part received by a cylindrical recess in the housing wall, said recesses and parts cooperating to fix the bearing longitudinally and circumferentially relative to the housing wall and said housing inner wall and the outer surfaces of the bearing members cooperating to prevent rotation of the members axially of the cylindrical recesses of the housing.

4. A distributor assembly comprising in combination, a body having a circumferential groove thereabout and a plurality of vertically disposed equally spaced slots intersecting said groove; a plurality of arcuate shaped bearing members, one of which is provided for each slot, each of said bearing members including a bearing surface on the concave side thereof and an arcuate bulge on the convex side thereof fashioned to fit within said groove and hold the member against vertical movement in said body, each member also including a vertically disposed bulge at the convex side thereof adapted to fit with said slot for holding the member against rotational movement in said body; a breaker plate; a plurality of shoes equal in number to said members associated with said plate and shaped to slide on the bearing surfaces of said members, at least one of said shoes having a degree of springiness so that when the plate is in operative position with said members the bearing members are held in place solely by the pressure of the shoes thereon.

5. A distributor comprising in combination, two members rotatable relative to one another consisting of a body and a breaker plate positioned therein, a plurality of antifriction bearings disposed between said members, each of said bearings having a portion detachably anchored to one of said members for preventing relative movement in the said one member; and a bearing groove for said bearings, said groove being carried by the other of said members, whereby the breaker plate is freely rotatable relative to the body on said bearings.

6. A distributor comprising in combination, a housing; a plurality of circumferentially spaced elongated non-metallic antifriction bearing elements each of said elements having a portion anchored to the housing to prevent relative movement in the said housing; a circuit breaker plate mounted within the housing; a plurality of spaced ears associated with the plate, each of said ears having a groove formed to at least partially fit around the elements whereby the plate is freely rotatable with respect to the housing without wobble.

7. A distributor comprising in combination, two members rotatable relative to one another consisting of a housing and a breaker plate positioned therein; a plurality of circumferentially spaced elongated non-metallic antifriction surfaces having a curvature similar to the curvature of said housing, each of said bearings having a boss thereon and engaging an axially extending groove in one of said members; and a bearing groove for said bearings, said groove being carried by the other of said members, whereby the breaker plate is rotatable relative to the body on said bearings.

8. A distributor comprising in combination, a housing; a plurality of spaced non-metallic antifriction bearing elements, each of said elements having a boss thereon fitting a vertically disposed groove in said housing to form an anchor for said element; a circuit breaker plate mounted with the housing; a plurality of spaced ears carried by the plate, each of said ears having a groove formed to slide on the bearing elements, whereby the circuit breaker plate is freely rotatable with respect to the housing.

9. A distributor comprising in combination; a housing having a plurality of arcuate-shaped non-metallic bearing members, each of said elements having anchoring engagement with said housing to prevent axial and rotational movements in said housing; a circuit breaker plate mounted in said housing; a plurality of spaced ears, each of said ears having formations for engaging the bearing members to slide on the bearing members whereby the circuit breaker plate is rotatable relative to the housing on said bearing members.

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