Sept. 9, 1952 J. T. FITZSIMMONS 2,610,264

IGNITION APPARATUS

Filed March 15, 1949

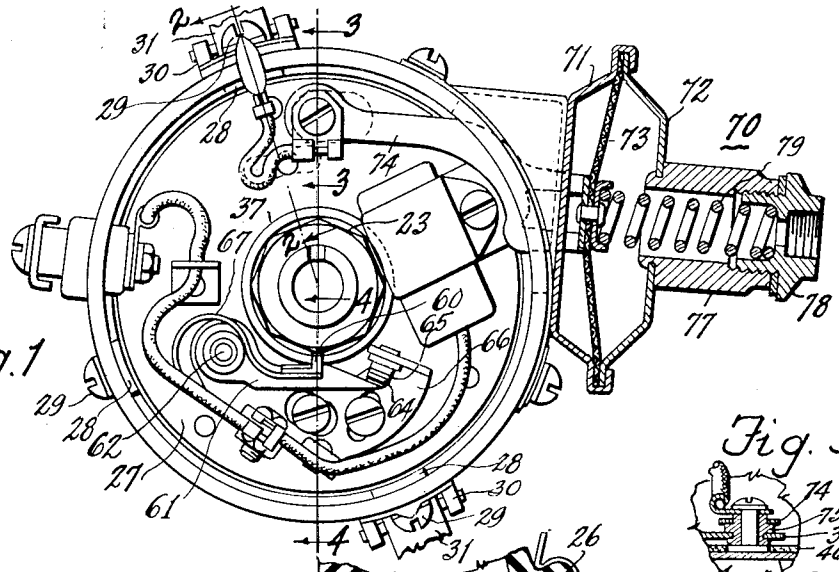


Fig. 1

Fig. 3

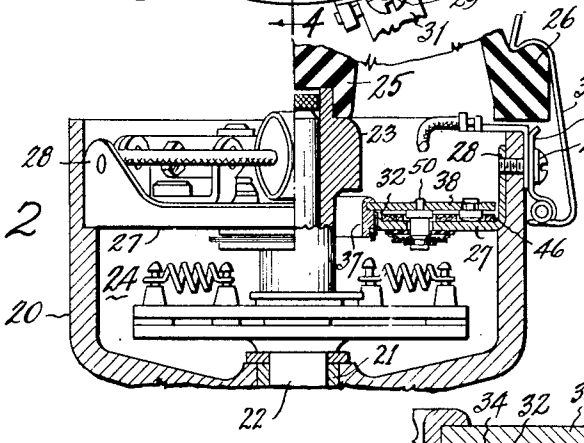


Fig. 2

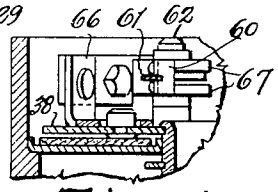


Fig. 4

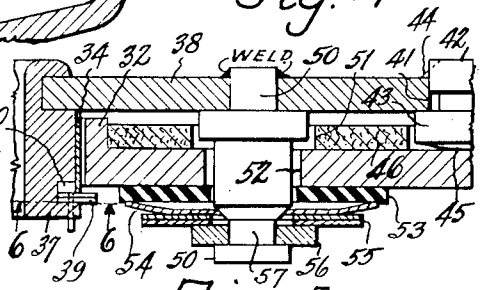


Fig. 5

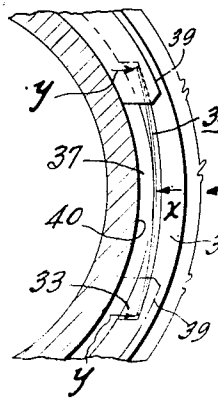


Fig. 6

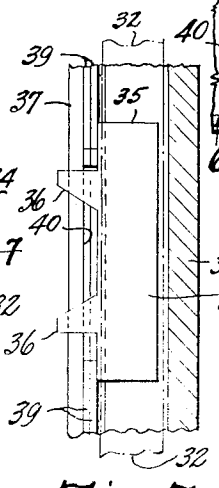


Fig. 7

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IGNITION APPARATUS

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Application March 15, 1949, Serial No. 81,433

4 Claims. (Cl. 200—31)

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This invention relates to improvements in bearing structures for an ignition timer for internal combustion engines, and more particularly to bearing structures for the type of timer having automatic means responsive to engine intake suction for varying the timing of the ignition. An ignition timer of this type is generally provided with a rotatable circuit breaker supporting plate which is adjustable by engine suction responsive means about an axis concentric with the axis of rotation of the ignition timer cam. The rotatable plate is provided with a hub or bearing sleeve member which has a running fit within a bearing provided by a stationary plate. Since a running fit is required, there is a slight clearance between the bearing surfaces. The rotatable plate carries a circuit breaker device including a lever having a rubbing block which is actuated by a cam during rotation thereof. When the rubbing block is struck by the cam, the rotatable plate is urged to one side each time the cam strikes the rubbing block. Consequently, there is chattering between the bearings and the timing of the ignition may be erroneous.

An object of the present invention is to eliminate chattering without appreciably reducing freedom of rotative movement of the circuit breaker plate. This object is accomplished by a spring interposed directly between the bearing members provided by the fixed and rotary plates and so located relative to the circuit breaker that the bearing member of the circuit breaker plate is urged against the bearing member of the fixed plate in a direction which is the same as that in which the circuit breaker plate is urged when the lobes of the cam strike the rubbing block of the circuit breaker lever. By locating the spring directly between the bearing members, cocking of the movable bearing relative to the fixed bearing is prevented and interference with freedom of rotary movement of the circuit breaker plate is minimized.

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

In the drawings:

Fig. 1 is a plan view of an ignition timer which includes an embodiment of the present invention.

Fig. 2 is a side view partly in section on line 2—2 of Fig. 1.

Figs. 3 and 4 are sectional views taken respectively on lines 3—3 and 4—4 of Fig. 1.

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Fig. 5 is an enlargement of a portion of Fig. 2.

Fig. 6 is a fragmentary sectional view on line 6—6 of Fig. 5.

Fig. 7 is a view in the direction of arrow 7 of Fig. 6.

Referring to Figs. 1 and 2, 20 designates a timer housing having a bearing 21 which supports for rotation an engine driven shaft 22 upon which is mounted a timer cam 23 which is drivingly connected with the shaft 22 by a device 24 which, in response to speed, changes the angular relation between the cam 23 and the engine driven shaft 22. The cam 23 supports and drives a rotor 25 carrying a conducting member (not shown) which sweeps past and distributes spark impulses to terminals (not shown) supported by a distributor cap or cover 26.

A stationary plate 27, supported within the housing 20, has three ears 28 each of which has a threaded aperture to receive the threaded end of a screw 29 which secure the plate 27 in position within the housing. Two of the screws 29 secure to the housing 20 brackets 30 each hingedly supporting a clamp spring 31 which secures the cap 25 upon the housing 20.

The stationary plate 27 is provided with a central opening defined by an annular flange 32 having an internal, cylindrical bearing surface concentric with the bearing 21. This flange 32 has an arcuate recess 33 (Fig. 6) extending inwardly from the bearing surface of flange 32 and receiving a leaf spring 34 having a main portion 35 and a pair of spaced tongues 36 on one side edge thereof. The spring 34 is initially flat, but when it is placed in the recess 33 and between the hub 37 of a circuit breaker plate 38 and the flange 32, its mid-portion presses in the direction of arrow x (Fig. 6) against the hub 37 and its end portions press in the direction of arrows y against the flange 32 thus urging the hub 37 always to the left in Fig. 6 for a purpose to be described. Hub 37 is retained within the bearing flange 32 by one or more resilient metal C-washers 39 received by a groove 40 in hub 37. The tongues 36 extend downwardly between the ends of C-washers 39 and the main portion 35 of the spring 34 may gravitate into contact with the uppermost C-washer as shown in Figs. 5 and 7. The plate 38 is provided with a plurality of apertures 41 (Fig. 5) adjacent its periphery which receive the shanks 42 of bearing buttons 43 which are attached to the plate 38 by staking the shanks slightly in a plurality of places as shown at 44 in Fig. 5. The lower ends of the

buttons are provided with convex surfaces 45 which contact with the upper face of the stationary plate 27. By this arrangement friction between the buttons and the lower plate is reduced to a minimum. The lower ends of the buttons extend through apertures provided by a felt washer 46 saturated with lubricant which lubricates the upper face of the stationary plate 27.

To the movable plate 38 there is attached a stud 50 received by a hole 51 in felt washer 46 and an arcuate slot 52 in plate 27. After assembling the plate 38 with the plate 27, a nonmetallic bearing washer 53, a cupped spring washer 54 and one or more flat spring washers 55 are placed around the stud 50 and a C-washer 56 is placed in a groove 57 of the stud 50 and it is deformed in a manner such as to prevent accidental removal. The spring washers cause the buttons 43 to press against the plate 27 thus fixing the location of the plate 38 relative to the housing 20. The arcuate slot 52 limits the degree of angular movement of the upper plate 38 relative to the lower plate 27.

As stated before, the spring 35 urges the hub 37 of plate 38 left in Figs. 5 and 6. This direction is vertically down as viewed in Fig. 1. Therefore the hub 37 engages the flange 32 in the immediate vicinity of the circuit breaker rubbing block 60 attached to circuit breaker lever 61. Therefore, when the lobes of cam 23 strike the rubbing block 60, and tends to urge the plate 38 left in Fig. 2 or down in Fig. 1, there is no shifting of the plate 38 since all bearing clearance has been taken up in said direction. In other words, the movable plate 38 is always being urged by spring 34 in that direction which is the same as the direction in which the movable plate is urged when the lobes of the cam 23 strike the rubbing block. Because the spring 34 is located directly between the bearing hub 37 of plate 38 and the bearing flange 32 of plate 27 and is substantially coextensive vertically with these bearing members, there is no tendency to cock the bearing hub 37 relative to the bearing flange 32. The shanks of bearing buttons 43 are staked lightly against the plate 38 as indicated at 44 in Fig. 5 and the shank of stud 50 is welded to plate 38 thereby avoiding riveting operations which might cause such distortion of the plate 38 that, when its three buttons 43 are drawn against the plate 27 by spring washer 54, plate 38 would be non-parallel to plate 27 and the bearing hub 37 would be cocked or located obliquely relative to the bearing flange 32. Therefore interference with freedom of rotation of plate 38 has been minimized.

The circuit breaker lever 61 is pivotally mounted on a stud 62 attached to the movable plate 38 and carries a contact 64 engageable with a stationary contact 65 attached to a bracket 66. The lever is pressed toward contact closing position by a leaf spring 67. As will be understood the contacts are connected in the usual ignition circuit, not shown, so that the circuit is periodically broken at the contacts by the cam 23 as the shaft 21 rotates.

The movable or upper plate 38 is rotated relative to the stationary plate by a device 70 responsive to engine intake suction. The device 70 comprises a housing including shells 71 and 72. These shells have their peripheries clamped together with a flexible diaphragm 73 therebetween. One end of a link 74 is attached to the diaphragm 73 while the other end of the link passes through openings in the shell 71 and housing 20 and is connected to a bearing 75 (Fig. 3) attached to the movable plate 38. The shell 72 supports a sleeve 77 carrying a bushing 78. A compression spring 79 is disposed between a shoulder provided by the bushing and a cup-shaped washer 80 attached to the diaphragm. Bushing 78 is connectible with a pipe (not shown) connected with the engine intake.

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, an engine driven rotary cam supported by the housing, a fixed plate attached to the housing and providing a bearing concentric with the axis of the cam, a rotatable plate supported laterally by the fixed plate and having a bearing received by the fixed plate bearing, a circuit breaker attached to the rotatable plate and including fixed and movable contacts and a movable member carrying the movable contact, a spring urging the movable member into contact closing position and a rubbing block carried by the movable member engageable with the cam on one side thereof, and a leaf spring disposed in a recess in one of the bearings on a radial line through said rubbing block and interposed between the fixed and movable bearings, said leaf spring being of a length greater than the circumferential length of the recess for causing the spring to bulge outwardly of the recess for causing the leaf spring to act as a cushion between the fixed and movable bearings to take up impulses created by the cam striking the rubbing block.

2. An ignition timer comprising a housing, an engine driven rotary cam supported by the housing, a fixed plate attached to the housing and providing a central bearing concentric with the axis of the cam, a rotatable plate supported laterally by the fixed plate and having a centrally located bearing journalled within the fixed plate bearing, a circuit breaker attached to the rotatable plate and including fixed and movable contacts and a movable member carrying the movable contact and a spring urging the movable member into contact closing position and a rubbing block carried by the movable member and engageable with the cam on one side thereof; and a spring located in a recess provided by the fixed plate bearing and located adjacent to that side of the cam opposite to that side of the cam which strikes the rubbing block and operable to urge the rotatable plate bearing against the fixed plate bearing transversely of the bearing axes in substantially the same direction as that which occurs when a lobe of the cam strikes the rubbing block.

3. An ignition timer comprising a housing, an engine driven rotary cam supported by the housing, a fixed plate attached to the housing and providing a central bearing concentric with the axis of the cam, a rotatable plate supported laterally by the fixed plate and having a centrally located bearing journalled within the fixed plate bearing, a circuit breaker attached to the rotatable plate and including fixed and movable contacts and a movable member carrying the movable contact and a spring urging the movable member into contact closing position and a rubbing block carried by the movable member and engageable with the cam on one side thereof, and a bowed leaf spring located in an arcuate recess provided by the fixed plate bearing and located

between the fixed and movable bearing and adjacent to that side of the cam opposite to that side of the cam which strikes the rubbing block, said spring having its ends engaging the fixed plate bearing and its mid-portion engaging the rotatable plate bearing and operable to urge the rotatable plate bearing against the fixed plate bearing transversely of the bearing axes in substantially the same direction as that which occurs when a lobe of the cam strikes the rubbing block.

4. An ignition timer according to claim 3 in which an arcuate recess provided by the fixed plate bearing extends through it, in which the rotatable plate bearing extends from the rotatable plate through the fixed plate bearing and beyond it, in which there is a member attached to that portion of the rotatable plate bearing extending beyond the fixed plate bearing and in

which the leaf spring is confined edgewise between the rotatable plate and the member attached to the rotatable plate bearing.

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