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J. T. FITZSIMMONS ET AL

2,471,318

IGNITION TIMER

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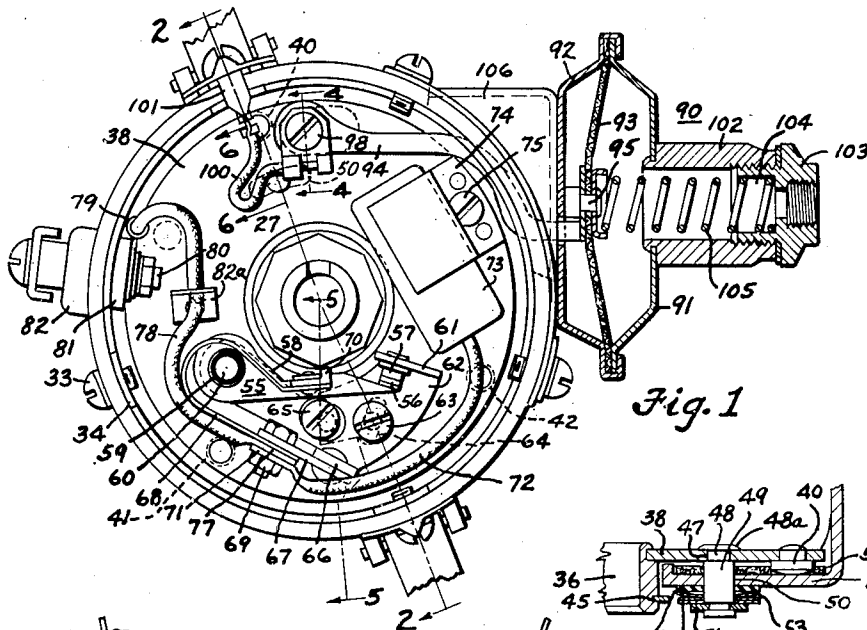


Fig. 1

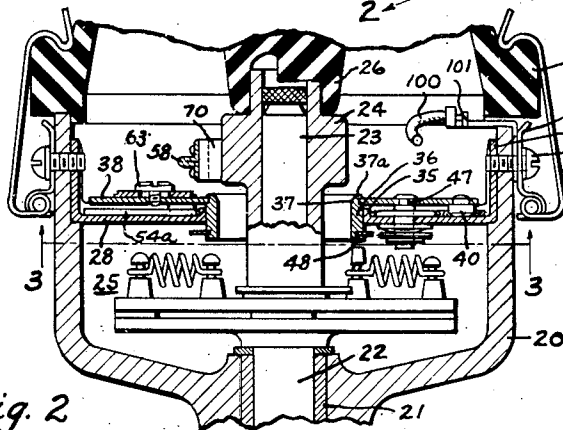


Fig. 2

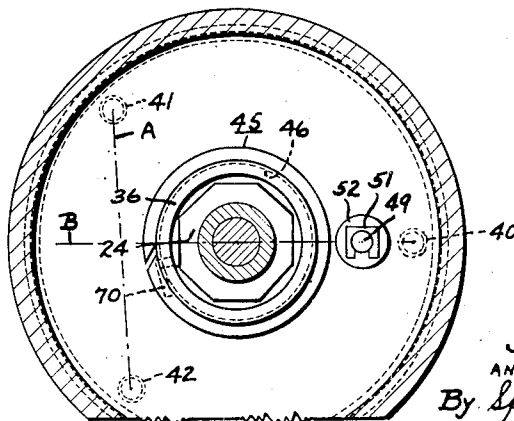


Fig. 3

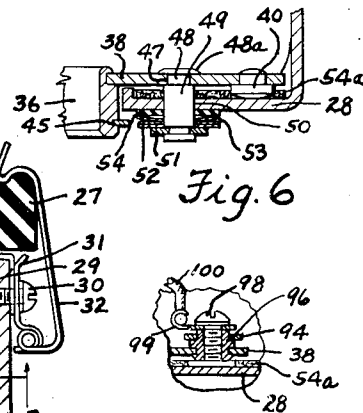


Fig. 4

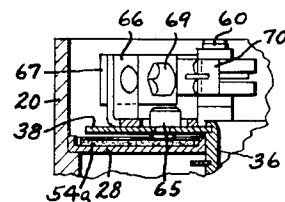


Fig. 5

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IGNITION TIMER

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9 Claims. (Cl. 200—30)

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This invention relates to improvements in ignition devices for internal combustion engines.

It is among the objects of the present invention to provide an ignition device with a three point bearing support for a movable plate which carries the circuit breaker mechanism and which will prevent the reaction of the cam upon the rubbing block tilting the movable part. This object is accomplished by having the rubbing block of the circuit breaker lever located mid-way between two of the bearing supports and having spring means located approximately 180° from the location of the point where rubbing block engages the cam. The spring means operates to prevent the movable plate from tilting due to the reaction of the rubbing block upon the cam which is above the plane of the bearing supports.

Another object of the present invention is to provide a circuit breaker mechanism of an ignition system whereby a movable plate which carries the circuit breaker mechanism is maintained in a plane at right angles to the axis of a cam that operates the breaker mechanism at all times.

Another object of the present invention is to provide a circuit breaker mechanism wherein a movable plate which carries the circuit breaker mechanism is held in assembled relation with a stationary plate with sufficient force to prevent chatter of the movable plate upon the stationary plate and at the same time provide freedom of movement when the movable plate is adjusted to vary the time of sparking impulses in the engine.

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 top plan view of a circuit breaker and showing in section the vacuum actuated means which automatically moves the concentrically mounted plate that carries the circuit breaker.

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

Fig. 3 is a cross sectional view taken on the line 3—3 of Fig. 2.

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 1.

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 1.

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Fig. 6 is a sectional view on an enlarged scale, taken on line 6—6 of Fig. 1.

Referring to the drawings 20 designates a timer housing having a bearing 21 to support a shaft 22 driven by the engine. A shaft extension 23 supports a cam 24 which is drivingly connected with the shaft 22 by a speed responsive device 25 which varies the relation between the cam 24 and the engine driven shaft 22 in response to the variations in engine speed. The cam supports and drives a rotor 26 carrying a conducting member (not shown) for distributing sparking impulses to terminals (not shown) supported by a distributor cap or cover 27.

The timer housing 20 supports therein a lower stationary plate or platform 28 at three points, two of which are diametrically opposite each other. The plate 28 is provided with ears 29 having threaded apertures to receive the free ends of screws 30 which secure the plate 28 to the housing 20. The screws also attach brackets 31 on the outside of the housing 20 which have openings through which the screw 30 projects. These brackets hingedly support clamps 32 which secure the distributor cover or cap 27 firmly upon the top of the housing 20. The plate 28 is also secured at a third point within the housing 20 by a screw 33 extending through the housing and having screw threaded engagement with an ear 34 on the plate 28.

The lower stationary plate or platform 28 is provided with a central opening defined by a flange 35 having a bearing surface concentric with the bearing 21. The flange 35 forms a bearing for a rotary sleeve 36 having a reduced portion 37 to form a shoulder against which an upper plate 38 rests. This upper plate is secured to the sleeve 36 by spinning over the reduced portion 37 to form a shoulder against which an upper plate 38 rests. This upper plate is secured to the sleeve 36 by spinning over the reduced portion against the plate 38 as at 37a. The upper plate 38 is spaced from the lower plate at three points by buttons or bearing members 40, 41 and 42. The bearing members are carried by the upper plate 38 and are located near its periphery. It is to be understood that the bearing members could be carried by the lower plate, but for the best results it is preferable that these bearings be carried by the upper plate in order that their positions with respect to a breaker mechanism 55, to be described, remains the same as the upper plate 38 is rotated or oscillated by a vacuum control responsive device 90.

In the present instance the bearing members or buttons 40, 41, and 42 are preferably formed from a rod of hard insulating material, such as "Bakelite." Each bearing has a convex head provided with a shank portion to provide a shoulder with each shank extending into a suitable opening provided by the plate 38. When plate 38 and the bearings are assembled with the plate 28 the plate will rest on the shoulders of the bearings and the weight of the plate will cause the convex heads to make point contact with the lower plate 28. By this arrangement friction resistance between the buttons and the plate 28 is reduced to a minimum. It is to be understood that the bearings or buttons may be made of metal, or a body of insulating material may be molded about a metal stud. The upper plate is assembled with the lower plate by passing the sleeve 36 through the bearing 35. The upper plate 38 is held in assembled relation with the lower plate by a removable hold down spring washer 45 fitting into an annular groove 46 provided by the sleeve 37. The hold down spring washer 45 is of the split type to permit easy assembly thereof with the sleeve 36.

In the plate 38 there is an aperture 47 the axis of which is on the same radial line which extends from the axis of the shaft 23 to the axis of the opening which receives the shank of the button 40, see Fig. 1. The aperture 47 receives a reduced portion 48 of a stud 49. The stud is fixed to the plate 38 by riveting over the reduced portion as at 48a. The stud 49 passes through an elongated arcuate opening 50 in the lower or stationary plate 28, the lower end of the stud is provided with a groove to receive a washer 51. Disposed between the washer 51 and the bottom face of plate 28 are shims 52, a curved spring 53, and a bearing washer 54. An annular felt member 54a is provided on the upper face of the plate 28 which is saturated with a suitable lubricant to lubricate the surfaces upon which the buttons slide, see Fig. 6, and also the center bearing 35.

The circuit breaker 55 is mounted upon the upper plate 38 and comprises a movable contact 56 engageable with a stationary contact 57. The movable contact 56 is fixed to the free end of a lever 58 having an insulating hub 59 mounted on a pivoted stud 60 fixed to the plate 38. The stationary contact is attached to an ear 61 of a bracket 62 which is pivoted on the stud 60 and is secured to the plate 38 by a screw 63 extending through an arcuate slot 64 provided in the bracket 62. The screw 63 has threaded engagement with a tapped hole in the plate 38. The bracket 62 may be turned about its pivot by an eccentric 65 the shank of which is pivotally mounted in the plate 38. The bracket 62 has an ear 66 upon which is secured an insulating block 67 to which the free end of the spring 68 is secured by a screw and nut device 69. The other end of the spring 68 together with a rubbing block 70 are attached to ears on the lever which is urged toward the cam 24 by the spring.

The screw and nut device 69 also secures to the block 68 a terminal clip 71 attached to a wire 72 which is electrically connected with one of the foils of a condenser 73. The condenser 73 is attached to the plate 38 by a bracket which is secured to the plate 38 by a screw 75. Another foil of the condenser is grounded to the plate 38 through the condenser casing 73, bracket 75 to the plate 38.

A terminal clip 77 is also attached to the block 67 by the nut and bolt device 69. A wire 78 has

one end electrically connected to the clip 77 and the other end is attached to a clip 79 electrically connected to a terminal 80. The terminal 80 is insulatingly supported from the housing 20 by suitable insulating bushings 81 and 82. In order that the plate 38 may be turned relative to the housing without hindrance by reason of electric connections wire 78 connected with spring 68 and terminal 80 is provided with a certain amount of slack and is supported intermediate its ends by a bracket 82a attached to plate 38 by a rivet.

In order to prevent the plate 38 from chattering on the plate 28 and at the same time maintain concentricity for the plate with respect to the cam 24 the bearings 40, 41 and 42 are arranged in the manner shown in Figs. 1 and 3. In this instance the bearings are fixed to the upper plate 38. Thus, when the upper plate is rotated or oscillated by the vacuum responsive device 90 the positions of the three bearings with respect to the breaker mechanism will not change. The bearings 40, 41 and 42 are assembled with the plate 38 near its periphery and are so arranged that the bearings 41 and 42 are outside the point, as indicated by dot-and-dash line A, at which the cam 24 strikes the rubbing block 70 of the breaker mechanism. The bearing 40 is approximately 180° from the breaker mechanism, as indicated by the dot-and-dash line B which is a line extending through the center of the bearing 40 and passing through the center of the distributor and intersects the line A, see Fig. 3.

When the plate 38 is assembled with the plate 28 the bearings 40, 41 and 42 support the plate in a plane at right angles to the axis of the shaft 23. The circuit breaker 55 which is supported on the plate 38 is arranged so that the rubbing block 70 is approximately midway between the buttons 41 and 42. In order to prevent the plate from tilting when the cam lobes engage the rubbing block the spring 54 on the stud 49 is located approximately 180° from the location of the rubbing block. The spring 54 prevents the reaction of the cam upon the rubbing block to tilt the plate. It has been found that when the rubbing block 70 strikes the lobes of the cam 24 the force is such that the plate 38 will rock on the bearings 41 and 42, and lift the bearing 40 from contact with the plate 28. This is prevented by the tension of spring 53. The tension in the springs 53 is sufficient to hold bearing 40 in contact with the plate 28, thus chattering between the plates 38 and 28 is prevented and angularity of the plate relative to the cam 24 is maintained.

The plate 38 is rotated by a suction device 90 comprising a housing made of shells 91 and 92 having the peripheries clamped together and against a diaphragm 93. The diaphragm is connected with one end of a link 94 by a rivet 95. The other end of the link is attached to a bearing 96 which is non-rotatably attached to the plate 38 in Fig. 4. A screw 98 secures a terminal clip 99 to the bearing 96. The clip 99 is electrically connected to a wire 100. The wire is also connected to a clip 101 which passes through a locating slot provided by housing 20 and fastened under the spring clip 31 shown in Fig. 2 forming a ground connection between the plate 38 and the housing 20.

The shell 91 supports a sleeve 102 carrying a bushing 103 having a recess 104 to receive a compression spring 105 disposed between the bushing 103 and the rivet 95. The spring 105 urges the diaphragm 93 to the left to move the link 94 in the position as shown in Fig. 1. The bushing 103

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is adapted to receive one end of a conduit, not shown, which is connected to the intake, not shown, of the engine. The shell 92 of the vacuum responsive device 90 is secured to a bracket 106 attached to the housing 20.

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 device for an internal combustion engine having a housing, a cam rotatably supported by the housing, a stationary plate; a circuit breaker having a rubbing block operated by the cam, and a movable plate for supporting the circuit breaker, the combination with said plate, of a plurality of bearing means carried by the movable plate for laterally supporting the plate near its periphery on the stationary plate; means rotatably supporting the plate at its central portion; means carried by the central rotating means for loosely holding the plates in assembled relation; and yieldable means carried by the movable plate and cooperating with the stationary plate to prevent the movable plate from tilting relative to the stationary plate when the rubbing block of the circuit breaker is actuated by the cam.

2. An ignition device for an internal combustion engine comprising in combination, a housing, a cam rotatably supported by the housing; a circuit breaker having a rubbing block operated by the cam, a movable plate for supporting the circuit breaker; a stationary plate; a plurality of bosses carried by the movable plate for laterally supporting the movable plate near its periphery on the stationary plate; means rotatably supporting the movable plate at its central portion; and resilient means carried by the movable plate and disposed between one of the bosses and the central supporting means resiliently urging the bosses carried by the movable plate against the stationary plate, said resilient means operating to prevent tilting of the movable plate when the cam engages the rubbing block of the circuit breaker.

3. In an ignition device for an internal combustion engine having a housing, a cam rotatably supported by the housing, a circuit breaker having a rubbing block operated by the cam, and a support assembly for the circuit breaker, the combination with said support assembly a pair of plates one of which is fixed to the housing, means for supporting the other plate centrally of the fixed plate and permitting angular movement; a plurality of bearing members carried by the movable plate and engageable with the fixed plate substantially at its periphery, said bearing members being so arranged that the rubbing block is located approximately midway between two of the bearing members; means about the central supporting means for holding the movable plate in its central supporting means; and resilient means supported from the movable plate and cooperating with the stationary plate to prevent tilting of the movable plate when the cam engages the rubbing block, said resilient means being located substantially 180° from the location of the rubbing block.

4. In an ignition device for an internal combustion engine having a housing, a cam rotatably supported by the housing, a circuit breaker having a rubbing block operated by the cam, and a movable plate for supporting the circuit break-

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er, the combination with said plate, of a stationary plate supported by the housing; bearing members carried by the movable plate and engaging the stationary plate to support laterally the movable plate near its periphery; a central flange carried by the stationary plate; a bearing sleeve carried by the movable plate extending through the flange of the stationary plate, said bearing having an annular groove below the stationary plate; a removable washer located within the groove to prevent separation of the plates; and spring means carried by the movable plate and engaging the under side of the stationary plate for urging the plate in a direction causing the bearing members to engage the upper side of the stationary plate to prevent the reaction of the cam upon the rubbing block tilting the movable plate.

5. In an ignition device for an internal combustion engine having a housing, a cam rotatably supported by the housing, a circuit breaker having a rubbing block operated by the cam; a stationary plate carried by the housing and a movable plate for supporting the circuit breaker, the combination with said movable plate, of a plurality of bosses carried by the movable plate for engaging the stationary plate near its periphery; a bearing sleeve attached to the movable plate extending through a bearing provided by the stationary plate; retaining means supported by the bearing sleeve for maintaining the movable plate in assembled relation with the stationary plate; and a resilient member carried by the movable plate and engaging the stationary plate near one of the bosses, said resilient means operating to prevent wobbling of the movable plate due to the reaction of the rubbing block upon the cam.

6. In an ignition device for an internal combustion engine having a housing, a cam rotatably supported by the housing, a circuit breaker having a rubbing block operated by the cam and a rotatable plate for supporting the circuit breaker, the combination with said rotatable plate, of a stationary plate supported by the housing having a journal coaxial with the cam; bearing members carried by the rotatable plate and adapted to engage the stationary plate near its periphery; a bearing sleeve carried by the rotatable plate and extending through and rotatable on the journal; means carried by the bearing sleeve to prevent axial separation of the plates; a stud carried by the rotatable plate and passing through an elongated slot in the stationary plate to permit angular movement of the rotatable plate; a bowed spring member having an aperture for receiving the stud below the underside of the stationary plate; and means for retaining the bowed member on the stud and causing the bowed member to flatten against the underside of the stationary plate, said spring member operating to prevent wobbling of the rotatable plate when the cam strikes the rubbing block.

7. In an ignition device for an internal combustion engine having a housing, a cam rotatably supported by the housing, a circuit breaker having a rubbing block operated by the cam and a rotatable plate for supporting the circuit breaker, the combination with said rotatable plate, of a stationary plate supported by the housing having a journal coaxial with the cam; bearing members carried by the rotatable plate and adapted to engage the stationary plate near its periphery; a bearing sleeve carried by the rotatable plate and extending through and rotatable on the journal; means carried by the bearing sleeve to prevent

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axial separation of the plates; a stud carried by the rotatable plate and located substantially 180° from the point where the cam strikes the rubbing block, said stud extending through an elongated arcuate opening provided by the stationary plate; and a spring member carried by the stud engaging the underside of the stationary plate for preventing the rotatable plate from tilting when the cam strikes the rubbing block.

8. In an ignition device for an internal combustion engine having a housing, a cam rotatably supported by the housing, a circuit breaker having a rubbing block operated by the cam and a rotatable plate for supporting the circuit breaker, the combination with said rotatable plate, of a stationary plate supported by the housing having a bearing flange coaxial with the cam and having an elongated arcuate opening located between the flange and the outer periphery of said plate; said opening being substantially 180° from the location where the cam strikes the rubbing block; bearing members carried by the rotatable plate and adapted to engage the stationary plate beyond the confines of the opening; a bearing sleeve carried by the rotatable plate and passing through the bearing flange; removable means associated with the sleeve to prevent axial separation of the plates; a stud extending through the opening and connected at one end with rotatable plate and carrying at the other end a bowed spring member which bears against the underside of the stationary plate and

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prevents the rotatable plate from tilting when the cam strikes the rubbing block.

9. In an ignition device for an internal combustion engine having a housing, a cam rotatably supported by the housing, a circuit breaker having a rubbing block operated by the cam and a rotatable plate for supporting the circuit breaker, the combination with said rotatable plate, of a stationary plate supported by the housing having a bearing flange coaxial with the cam and having an elongated arcuate opening located between the flange and the outer periphery of said plate; said opening being substantially 180° from the location where the cam strikes the rubbing block; bearing members carried by one of the plates for engaging the other plate near its periphery whereby the rotatable plate will move in a plane parallel with the plane of the stationary plate; a bearing sleeve carried by the rotatable plate and passing through the bearing flange; means carried by the sleeve and cooperating with the stationary plate to prevent axial separation of the plates; and a stud extending through the opening and connected at one end with the rotatable plate and carrying at the other end a dished spring washer which bears against the underside of the stationary plate and holds the rotatable plate against tilting when the cam strikes the rubbing block.

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No references cited.