April 21, 1931. J. L. ARTHUR ET AL 1,801,584

IGNITION DEVICE

Filed Aug. 26, 1929

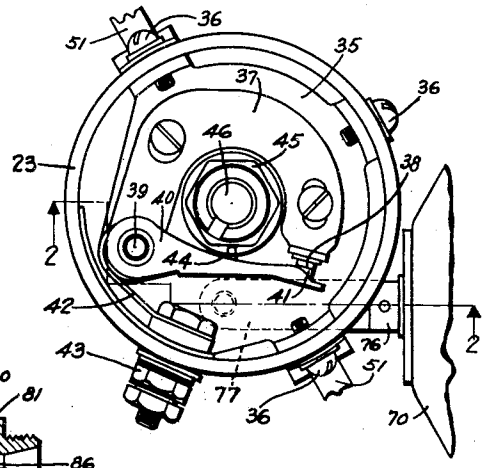


FIG. 1.

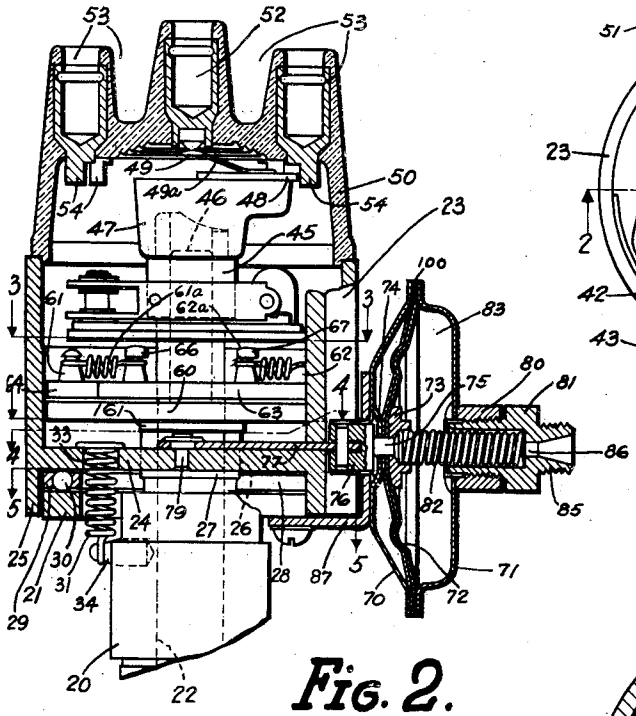


FIG. 2.

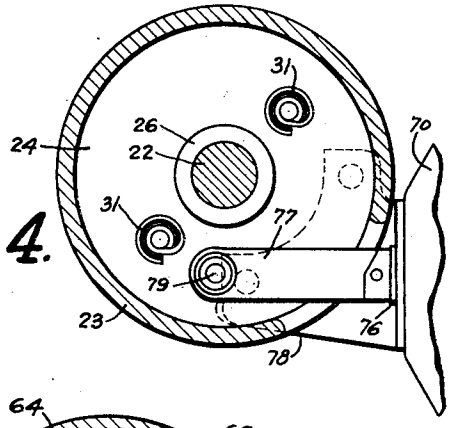


FIG. 4.

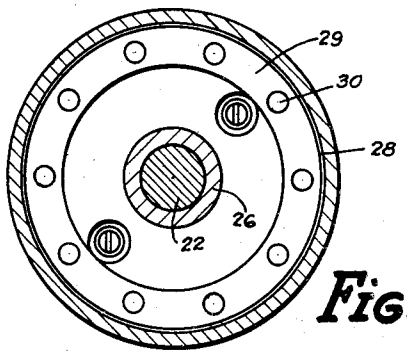


FIG. 5.

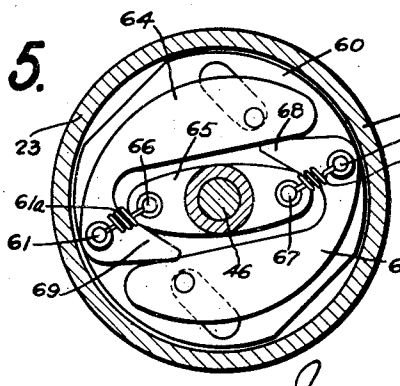


FIG. 3.

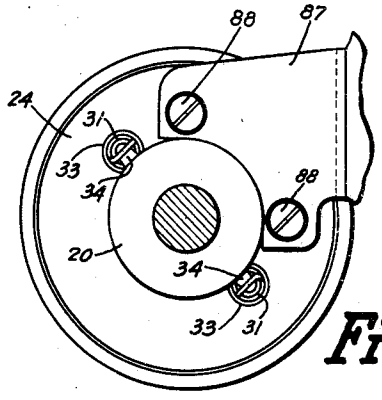


FIG. 6.

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Patented Apr. 21, 1931

1,801,584

UNITED STATES PATENT OFFICE

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IGNITION DEVICE

Application filed August 26, 1929. Serial No. 388,296.

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

It is among the objects of the present invention to provide ignition apparatus for an internal combustion engine of simple structure and design, adapted to be operated automatically to control the time of sparking impulses for the engine in response to both variations in the speed and the engine suction and load conditions.

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 one form of the present invention is clearly shown.

In the drawings:

Fig. 1 is a plan view of the ignition apparatus with the distributor head and rotor removed.

Fig. 2 is a longitudinal sectional view taken along the line 2—2 of Fig. 1.

Fig. 3 is a transverse sectional view taken along the line 3—3 of Fig. 2.

Fig. 4 is a fragmentary sectional view taken along the line 4—4 of Fig. 2.

Fig. 5 is a sectional view taken along the line 5—5 of Fig. 2.

Fig. 6 is an inverted plan view of the ignition unit.

In the drawings no showing is made of the internal combustion engine, however, a mounting member 20 is provided which is adapted to be secured to the engine in any suitable position, said mounting member 20 providing a mounting platform 21 for the ignition timer. Mounting member 20 has a longitudinal passage in which is journalled the drive shaft 22 of the ignition timer.

The ignition timer comprises a housing 23 having a bottom wall 24. An annular flange 25 extends from the bottom wall 24 of the housing. The bottom wall 24 has a central aperture 26 operatively fitting over a reduced portion 27 of the mounting member. A ball bearing 28 is interposed between the platform 21 of the mounting member 20 and the bottom wall 24 of the timer housing, said ball bearing comprising a ball retaining ring 29 having a plurality of balls 30 provided therein. The ball bearing is provided to reduce friction between the mounting platform 21 and the timer housing 23 which is rotatably supported by said platform.

In order to maintain the timer housing 23 upon the ball bearing 28, a series of springs 31 are provided, one end of the springs extending through respective openings 33 in the bottom wall 24 of the housing and having enlarged convolutions at this end which engage the inner surface of the bottom wall 24 and thus prevent removal of the springs from the timer housing. The other end of the springs are anchored to respective posts 34 supported by the mounting member 20.

Within the timer housing 23 there is secured a plate 35 by means of screws 36, said plate supporting a circuit interrupter comprising a bracket 37 carrying a stationary contact 38. A post 39 is supported at the end of the bracket opposite the contact 38, said post pivotally supporting the interrupter arm 40 which carries the movable contact 41 adapted to be moved into engagement with the stationary contact 38 by the blade spring member 42 moving the arm in a counterclockwise direction as regards Fig. 1. The spring 42 also acts as a conductor element for connecting the arm and its contact 41 with the terminal 43 which is insulatingly carried on the timer housing 23. The arm 40 has a rubbing block 44 adapted to be engaged by the lobes of the interrupter operating cam 45. The cam 45 is rotatably supported upon the reduced end portion 46 of the drive shaft 22. Cam 45 has provisions for supporting a rotor 47 which has a terminal plate 48 electrically connected with a contact button 49 carried by a blade spring 49*a*. A distributor head 50 securable to the housing 23 by spring clips 51, portions of which are shown in Fig. 1, is provided with a central high tension terminal 52 in electrical connection with the spring supported clip 49 of the rotor. A plurality of high tension terminals 53 arranged in circular formation about the central terminal 52 have conductor posts 54 extending into the interior of the housing so as to lie in juxtaposition to the circular path of move-

ment of the rotor terminal 48 whereby sparking impulses from the terminal 52 passing through the spring supported contact 49 and the terminal plate 48 may be transmitted or delivered to the respective posts 54 in proper sequence so that the spark plugs, not shown, but connected with the terminals 53 will have the sparking impulses directed to them.

As has been mentioned before, cam 45 is rotatably supported upon the reduced portion 46 of the drive shaft 22. The drive shaft and the cam are operatively connected by a speed responsive device which not only acts to connect these two elements but also to adjust one relative to the other in response to variations in speed of the drive shaft. The speed responsive means comprises a disc member 60 which is attached to the drive shaft 22 so as to rotate therewith, said disc member resting upon an annular flange 161 provided on said drive shaft. This disk member 60 has two posts 61 and 62 supported thereon on diametrically opposite sides of the center. A centrifugal weight member 63 is pivotally supported by the post 62 and a similar member 64 is pivotally carried by the post 61. The cam 45 has the plate 65 secured thereto, this plate having posts 66 and 67 mounted thereon. Plate 65 is rotatable relative to the shaft 22 but the cam 45 and plate 65 will rotate together. The centrifugal weight members have projections 68 and 69 respectively which engage the plate 65 on opposite sides thereof so that as the weights move outwardly in a counterclockwise direction about the supporting posts 61 and 62 the plate 65 will be moved clockwise about the shaft portion 46 resulting in a similar clockwise rotation of the cam 45. Springs 61*a* and 62*a* anchored between posts 61—66 and 62—67 respectively normally maintain the centrifugal weight members 63 and 64 in the neutral position or as shown in Fig. 3.

The drive shaft 22 is connected to the cam 45 through disk 60, posts 61 and 62, portions 68 and 69 of weight members 63 and 64 respectively and plate 65. The cam 45 rotating normally in a clockwise direction will operate the circuit interrupter to produce sparking impulses. In order to advance the time of sparking impulses the cam 45 may be rotated additionally to its normal rotation, the speed responsive means providing such additional rotation by the movements of the weights 63 and 64 outwardly in response to increase in the rotative speed of the drive shaft 22.

The time of sparking impulses may also be set ahead by the rotation of the timer housing 23 in a direction opposite to the rotation of the cam 45 which results in the rotation of the circuit interrupter and consequently the movement of the rubbing block 44 in a direction opposite the rotation of cam 45.

The present invention provides means for so rotating the timer housing. This means comprises a suction operated device including a casing 100 made up of members 70 and 71 substantially cup-shaped, and secured together by the edge of one overlapping the edge of the other. A diaphragm of any suitable material such as airplane fabric or the like and designated by the numeral 72 is provided within the casing, the peripheral edge of said diaphragm being clamped between the two members 70 and 71. At the center of the diaphragm 72 clamping members 73 and 74 are provided, one on one side and one on the other, said members being mounted upon a reduced shank portion 75 of a lug member, one end of which is riveted over the clamping member 73, the other end having a head portion 76 which is engaged by the clamping member 74. The head 76 has one end of a connecting link 77 secured thereto, said link extending through an opening 78 in the timer housing 23 and having its other end anchored to the bottom wall 24 of the housing by a pin 79. The member 71 of the suction control device has a coupling 80 secured thereto, said coupling receives a nipple 81, recessed to receive the spring 82, interposed between said nipple 81 and the clamping member 73. This spring 82 normally urges the diaphragm 72 toward the left of the casing as regards Fig. 2. The chamber 83 provided between the member 71 of the suction operated device and the diaphragm 72 may be connected with any suitable suction portion of the engine such as the intake manifold. To make such a connection nipple 81 has an extension 85 to which any suitable pipe, leading from the intake manifold, may be connected. The extension 85 has a passage 86 which leads to the interior of the chamber 83.

The suction control device is supported upon the platform 21 of the mounting member 20 by a bracket 87 one portion of which is secured to said platform 21 by screws 88, the other portion of said bracket 87 being secured to the member 70 of the suction control device.

Increased suction of the engine creates a vacuum in the chamber 83 which causes diaphragm 72 to move toward the member 71 thus the link 77 connected with said diaphragm through the member 76 will exert a pull tending to rotate the housing 23 in a counterclockwise direction as regards Figs. 1 and 4 whereby the interrupter supported by said housing will be moved counterclockwise relative to the clockwise operation of the cam. This causes the rubbing block to be moved against the operation of the cam and thus the circuit interrupter will be broken earlier in the cycle of engine operation thereby advancing the time of sparking impulses in accordance with the suction conditions of the engine. The variations in the speed of the engine will control the time of sparking im-

pulses through the speed responsive mechanism as described heretofore.

While the form of 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. An ignition device for an internal combustion engine comprising in combination, a mounting platform provided on the engine; a timer housing rotatably supported by said platform; a friction reducing bearing interposed between the timer housing and platform; and resilient members connected between said housing and platform, urging the housing into seating engagement with the bearing.

2. An ignition device for an internal combustion engine comprising in combination, an ignition timer housing rotatably supported upon the engine; a ball bearing interposed between the said housing and the engine; and springs connected at one end to the housing and at the other to the engine, said springs urging and maintaining said housing in proper seating engagement with the ball bearing.

3. An ignition device for an internal combustion engine comprising in combination, a timer housing; a suction operated device; means connecting the said device with the timer housing; and a common member attachable to the engine and having relatively angular portions, one for rotatably carrying the timer housing and the other for rigidly supporting the suction operated device properly spaced from and angularly to the timer housing.

4. An ignition device for an internal combustion engine comprising in combination, a housing; a circuit interrupter supported within said housing; a rotatable cam for operating said interrupter; a drive shaft for operating the cam; a bearing member adapted to be secured to the engine, and in which the drive shaft is journalled, said bearing member providing a mounting platform for the housing; a ball bearing interposed between the housing and platform; springs secured at one end to the housing and at the other end to the bearing member said springs urging the housing upon the ball bearing; and engine controlled means attached to the platform and connected with the housing for rotating the housing relative to the drive shaft.

5. An ignition device for an internal combustion engine having an intake manifold, comprising in combination, a timer housing rotatably supported by the engine; a circuit interrupter carried within the housing and attached thereto; a cam for operating said interrupter; a drive shaft operatively connected with the engine; speed responsive means connecting the cam to the shaft and adapted in response to variations in engine speed to adjust the cam relative to the circuit interrupter; and engine suction controlled means connected with the housing for adjusting the housing and the circuit interrupter supported thereby relative to the cam in accordance with variations in engine suction conditions.

6. An ignition device for an internal combustion engine having an intake manifold, comprising in combination, a timer housing rotatably supported by the engine; a circuit interrupter carried within the housing and attached thereto; a cam for operating said interrupter; a drive shaft operatively connected with the engine; a centrifugal governor connecting the cam to the shaft and adapted in response to variations in engine speed to adjust the cam relative to the circuit interrupter; a suction operated device comprising a casing having a diaphragm therein providing a suction chamber in said casing; means connecting the suction chamber with the engine intake manifold; means secured to the diaphragm and connected with the timer housing for adjusting said housing and the circuit interrupter carried thereby relative to the cam in accordance with variations in suction conditions within the engine intake manifold.

7. An ignition device for an internal combustion engine having an intake manifold, the combination with a timer housing, of a circuit interrupter supported within said housing; a cam for operating said interrupter; a shaft for operating the cam; means operatively connecting the shaft to the cam, said means being adapted to vary the angular relation between said shaft and cam in response to variations in the speed of the shaft; means rotatably supporting the housing upon the engine; a suction device also carried by said last mentioned means and comprising a casing having a diaphragm providing a suction chamber within said casing; means connecting the suction chamber with the engine intake manifold; and means connecting the diaphragm with the timer housing whereby movement of said diaphragm will rotate the said housing to vary the angular relation between the circuit interrupter and cam.

In testimony whereof we hereto affix our signatures.

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