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IGNITION DEVICE

Filed March 8, 1929

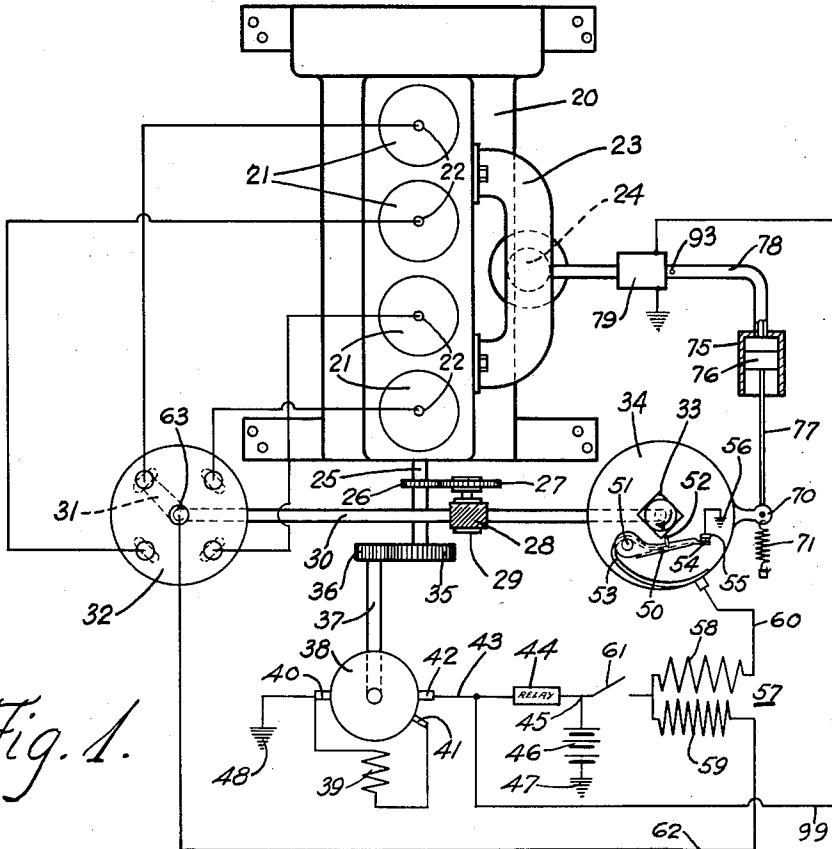


Fig. 1.

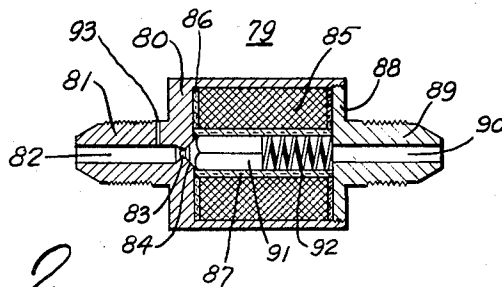


Fig. 2.

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IGNITION DEVICE

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This invention relates to a device for automatically varying the time of sparking impulses for internal combustion engines.

Automatic ignition controllers which adjust the timing of the sparking impulses by the vacuum in the intake pipe of the engine are well known. In such a device, when the throttle is open, so that a large quantity of fuel mixture is supplied, the vacuum is but slight, and thus the ignition controller is slightly operated. When the throttle is substantially closed, however, the suction of the engine produces a comparatively greater vacuum and thus the ignition controller is actuated to a much greater degree, thereby advancing the time of sparking impulses to a considerable extent.

In practical operation it is frequently necessary to run the engine idle, that is, substantially or entirely without load. This is preferably done at as low a speed as possible for purposes of minimizing fuel consumption and wear on the engine. At idle the throttle of the engine is substantially closed, which is termed the "no load" position of the throttle. Under these conditions the time of sparking impulses should be late, or "retarded", for, if said time of sparking impulse is advanced, the engine will not operate slowly.

From the foregoing it may be seen that if the suction actuated device which operates the timer or ignition controller is directly connected with the engine intake manifold, there being no other control provided, during the "no load" position of the throttle, or during the idling of the engine, at which a high suction is produced in the intake manifold, the time of sparking impulse will be substantially fully advanced, at which time on the contrary the time of sparking impulse should be substantially retarded.

One object of the present invention is to provide an engine with an ignition timer, adjusted to "retard" or "advance" position by a suction actuated device.

A further object of the present invention is to control the suction actuated timer adjusting device so that the timer will be adjusted to retard the time of sparking impulse

when the engine is idling and the throttle is substantially at its "no load" position.

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 illustrates in diagrammatic form an internal combustion engine with the invention applied thereto.

Fig. 2 is a detail sectional view of the solenoid plunger valve.

Referring to the drawings, the numeral 20 designates the internal combustion engine having cylinders 21 each of which being provided with a spark plug 22. The engine 20 has an intake manifold 23 in which a throttle valve 24 is provided. The crank shaft 25 of the engine has a gear 26 attached thereto which is in driving connection with the gear 27 carried on a shaft which also carries the spiral gear 28. The spiral gear 28 meshes with another gear 29 secured to shaft 30. Shaft 30 drives the rotor 31 of the distributor 32 and the cam 33 of the circuit interrupter or timer 34.

Another gear 35 is attached to the crank shaft 25, said gear meshing with and driving a pinion 36 attached to the armature shaft 37 of the dynamo or generator 38. The generator is shown diagrammatically, and comprises a field winding 39 connected with brushes 40 and 41 respectively, the brush 41 being a third or regulating brush. Brush 42 of the generator is one of the main brushes and has the wire 43 attached thereto, said wire being connected also with the cutout relay 44. The cutout relay 44 is of the standard type and is adapted to permit the current to flow therethrough in one direction only and in this instance the relay permits the current to flow from the generator brush 42, wire 43 through the relay, wire 45 into the storage battery 46, the other side of the storage battery being grounded as at 47. Brush 40 of the generator is grounded as at 48.

The timer 34 or the ignition circuit interrupter as it is sometimes called, comprises a

contact arm 50 pivotally supported on pin 51 and having a rubbing block 52 engageable with the cam 33, a spring 53 urging the arm 50 toward the block 33. A contact 54 is carried at the free end of the arm and is adapted to cooperate with the stationary contact 55, which is grounded as at 56. The ignition coil 57 includes windings 58 and 59. The primary winding 58 has its one end connected with the spring 53 of the circuit interrupter arm 50 through wire 60, the other end of said primary winding being connectable through a switch 61 with the wire 45 which, during operation of the engine is connected to the generator 38 or the storage battery 46. One end of the secondary winding 59 is connected with one end of the primary winding, the other end of the secondary being connected through the wire 62 with the high tension terminal 63 of the distributor 32, said high tension terminal being connectable in proper sequence by the rotor 31 with the various terminals leading to the spark plugs of the engine.

The circuit interrupter or timer 34 may be rotated to vary the angular relation of the rubbing block 52 relative to the cam 33 whereby the time of sparking impulse is retarded or advanced. The cam 33 operates in the direction of the arrow shown thereon. If the ignition timer 34 is operated in the same direction as the arrow, or clockwise, then the time of sparking impulse will be retarded. Rotating the timer 34 counter-clockwise, or in a direction opposite the arrow, will advance the time of sparking impulse. The timer housing has an arm 70 extending therefrom to which is secured a spring 71 properly anchored, said spring normally urging the timer 34 clockwise or toward the retarded position.

The suction actuated timer-adjusting-device is shown in the present instance as comprising a cylinder 75 having a piston 76 therein which is connected with the arm 70 through a link 77. The suction chamber of the cylinder 75 is connected with the intake manifold by a conduit 78. In this conduit there is provided a valve 79 which is detailedly illustrated in Fig. 2.

Valve 79 comprises a cup-shaped housing 80 having a nipple 81 which has a passage 82 leading into the interior of the housing. On the inside end of passage 82, or, at the end thereof adjacent the interior of the housing 80, a restriction 83 is provided and also a valve-seat 84. Housing 80 receives the solenoid magnet coil 85 insulated at one end by the insulating disc 86 and having a non-magnetic, tubular core 87. A cover plate 88 is screw-threaded into the open end of the housing 80 to hold the electromagnet winding 85 properly housed therein, said cover 88 having a nipple 89 provided with a longitudinal passage 90 which leads into the tubular core 87 of the electromagnet winding. Within

this core there is provided a valve 91 having flat angularly arranged sides so as to provide space between it and the inner wall of the tubular core 87. One end of the valve 91 is tapered and normally held in engagement with the valve seat 84 by a spring 92 interposed between the end cover member 88 and the valve 91. When in normal position valve 91 shuts off communication between the passage 82 and the passage 90. Passage 82, when the valve is connected in the conduit 78, leads directly to the engine manifold 23, while passage 90 leads to the suction chamber of the cylinder 75.

The opening 93 in the nipple 81 provides a bleeder which permits pressures within the cylinder 75 to return to atmospheric pressure when valve 91 closes the passage 83.

When the engine is not operating, the circuit interrupter or ignition timer 34 will be maintained in full spark retarding position by the spring 71. When the engine starts, it will drive the generator 38, said generator providing charging current for the battery 46. Valve 79 will remain closed and thus prevent suction from being exerted upon the piston 76 of the suction actuated device until the voltage of the generator 38 has attained a predetermined or proper value, at which time current from the generator flowing through the wire 43 and through the wire 99 which connects with the electromagnet coil 85 of switch 79 will cause said electromagnet to become energized and to move the valve 91 against the effect of spring 92 away from the seat 84 and thus the manifold of the engine communicates with the suction chamber of the cylinder 75. The piston 76 will now be drawn into the cylinder exerting a pull upon the link 77 and thus rotating the timer or circuit interrupter housing 34 counterclockwise, thereby advancing the time of sparking impulse. If the engine is idling, that is, if the throttle 24 is at its "no load" position, a comparatively high vacuum is provided in the manifold 23 which would operate piston 76 to fully advance the timer 34 if no valve 79 were provided. However, providing valve 79 keeps conduit 78 closed while the engine is idling, for during such idling the engine is not operating the generator 38 sufficiently fast to build up enough voltage to open valve 79. In using this device the timer 34 cannot be adjusted into its advanced position until the engine has reached a sufficient speed at which the generator will be driven sufficiently fast to provide voltage to energize electromagnet 83 and thus open the valve 79 to establish suction upon the timer adjusting member.

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 system for an internal combustion engine comprising, in combination, an ignition timer for the engine; a dynamo driven by the engine; means controlled by the suction of the engine for adjusting the timer; and dynamo controlled means for controlling the action of the timer adjusting means. 70
2. An ignition system for an internal combustion engine comprising, in combination, an ignition timer for the engine; a dynamo driven by the engine; means controlled by the vacuum produced in the engine intake for adjusting the timer; means normally shutting off said vacuum; and means controlled by the dynamo for rendering the last mentioned means ineffective. 75
3. An ignition system for an internal combustion engine having an intake manifold comprising, in combination, a dynamo driven by the engine; an ignition timer; a suction actuated device for adjusting said timer; a conduit connecting said device with the intake manifold; and a valve in said conduit for controlling the suction therethrough in accordance with the voltage of the dynamo. 80
4. An ignition system for an internal combustion engine having an intake manifold comprising, in combination, a dynamo driven by the engine; an ignition timer; a suction actuated device for adjusting said timer; a conduit connecting said device with the intake manifold; and a magnetically operated valve in said conduit for controlling the suction therethrough in accordance with the voltage of the dynamo. 85
5. An ignition system for an internal combustion engine having an intake manifold comprising, in combination, a dynamo driven by the engine; an ignition timer; a suction actuated device for adjusting said timer; a conduit connecting said device with the intake manifold; and a normally closed valve in said conduit adapted to be opened when the voltage of the dynamo reaches a proper value. 90
6. An ignition system for an internal combustion engine having an intake manifold comprising, in combination, a dynamo driven by the engine; an ignition timer; a suction actuated device for adjusting said timer; a conduit connecting said device with the intake manifold; a normally closed valve in the conduit; and magnetic means under the control of the dynamo, adapted to open said valve when the voltage of said dynamo has attained a proper value. 95
7. An ignition system for an internal combustion engine having an intake manifold comprising, in combination, a dynamo driven by the engine; an ignition timer; a suction actuated device for adjusting said timer; a conduit connecting said device with the intake manifold; and a solenoid, plunger-valve in said conduit for controlling the suction therethrough in accordance with the voltage of the dynamo. 100
8. An ignition system for an internal combustion engine having an intake manifold comprising, in combination, a dynamo driven by the engine; an ignition timer; a suction actuated device for adjusting said timer; a conduit connecting said device with the intake manifold; and a solenoid plunger valve in the conduit, normally cutting off the suction through said conduit, but adapted to open said conduit when the voltage of the dynamo has reached a proper value. 105
9. An ignition system for an internal combustion engine having an intake manifold comprising, in combination, a dynamo driven by the engine; a storage battery; a circuit connection between the dynamo and storage battery; a cut-out relay in said circuit; an ignition coil; a circuit interrupter for said coil; a suction actuated device for adjusting the circuit interrupter; and a magnetically operated valve for controlling the operation of said device, said valve being connected in the circuit between the dynamo and cut-out relay whereby the valve is operated in accordance with the voltage of the dynamo. 110

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