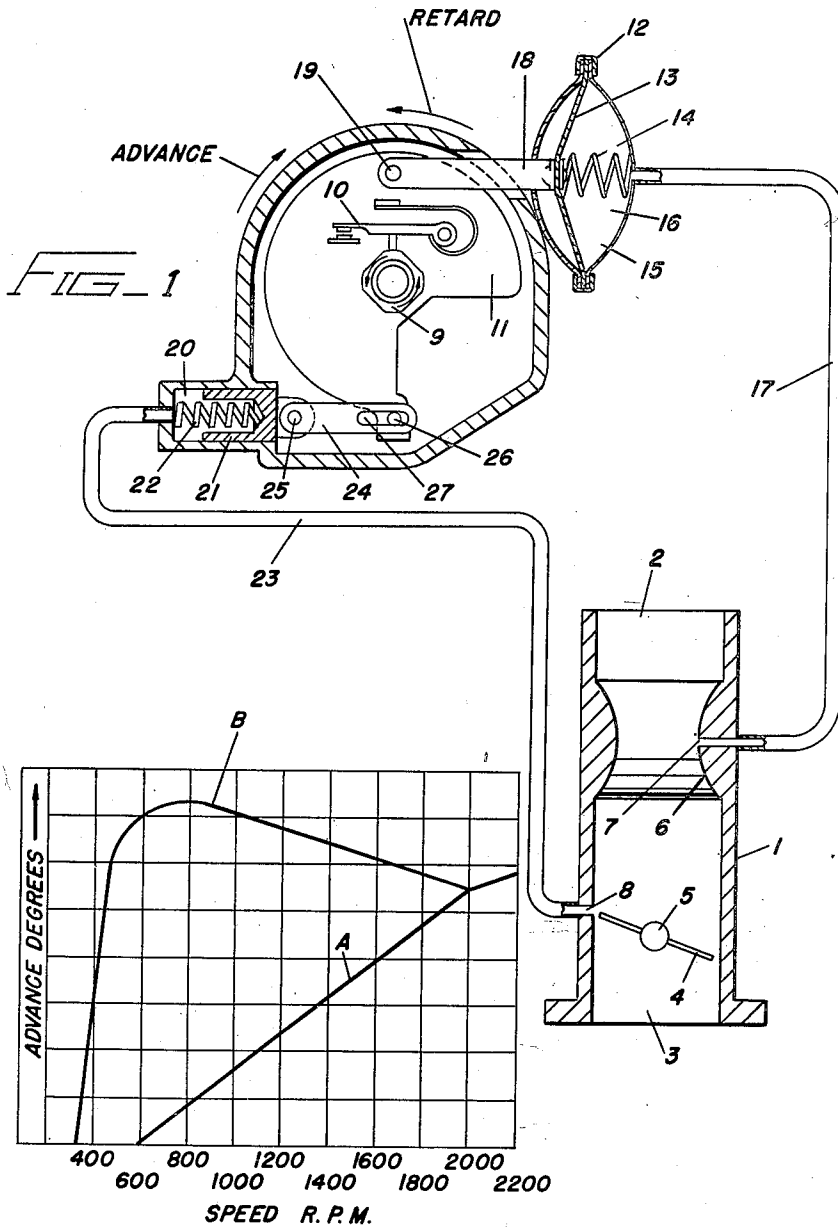


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IGNITION TIMING CONTROL MEANS FOR
INTERNAL-COMBUSTION ENGINES
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IGNITION TIMING CONTROL MEANS FOR
INTERNAL-COMBUSTION ENGINES

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5 Claims. (Cl. 123-117.1)

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This invention relates to ignition timing control means for an internal combustion engine.

This invention contemplates an ignition system which is controlled by the pressures obtaining in the intake passageway of the engine so that the spark will be retarded when the engine is idling, will advance in direct relation to the engine speed when the throttle is wide open, and will advance ahead of the load curve at intermediate positions of the throttle.

Fig. 1 is a sectional view showing the mechanism of my ignition timing control means for an internal combustion engine.

Fig. 2 is a graph showing one curve for the part throttle spark advance and another curve for the full throttle spark advance.

Referring more particularly to the drawings there is shown a carburetor 1 having an atmospheric air inlet 2, an outlet 3 to the engine intake manifold, a throttle valve 4 of the butterfly type mounted on the usual shaft 5 journaled in the carburetor housing, a venturi 6 having an orifice 7. Another orifice 8 is located in the intake passageway adjacent to, but on the atmosphere side of, throttle valve 4 when in idle position.

The timing mechanism is conventional and, as shown, consists of the usual rotatable cam 9 which operates the electrical circuit breaker 10. The circuit breaker 10 is mounted on plate 11 which can be rotated clockwise to advance the spark and counterclockwise to retard the spark.

Two suction devices are utilized for advancing and retarding the spark. One suction device 12 comprises a flexible diaphragm 13 backed up by compression spring 14. Diaphragm 13 is mounted in housing 15, the suction chamber 16 of which is connected by conduit 17 with orifice 7. Diaphragm 13 is connected to plate 11 by connecting rod 18, one end of which is pivotally connected to plate 11 as at 19 and the other end of which is fixed to the diaphragm.

The other suction device, for purposes of illustration, is shown as comprising cylinder 20, piston 21, compression spring 22 which urges piston 21 toward the right, and conduit 23 which connects cylinder 20 with orifice 8. A connecting rod 24 has a fixed pivotal connection as at 25 with piston 21 and has a lost motion connection with plate 11 in the form of pin 26 on plate 11 which interengages connecting rod 24 in elongate slot 27.

The operation of my device is as follows: When the throttle valve 4 is wide open the spark advance is in direct relation to the engine speed and this spark advance is illustrated by curve A in Fig. 2. The spark advance at idle engine speed

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and part throttle is illustrated by curve B, Fig. 2.

In Fig. 1 I have shown the throttle at idle position and the spark is retarded because the pressure at orifices 7 and 8 will be substantially atmospheric and the pressure in suction chamber 16 and within cylinder 20 will also be atmospheric at such throttle position.

When throttle 4 is wide open the venturi suction created at orifice 7 by the velocity of the air flowing through venturi 6 will establish itself in suction chamber 16 and advance the spark in direct relation to the engine speed, as illustrated by curve A. It should be noted that as plate 11 is rotated clockwise by suction device 12 to advance the spark that this advance is not resisted by spring 22 because pin 26 simply moves freely or idles in elongate slot 27 and when the spark is fully advanced pin 26 will be short of the left hand end of slot 27.

If the throttle is moved from idle position toward open position, orifice 8 will be placed upon the engine side of the throttle valve and the full manifold vacuum will be applied through orifice 8, conduit 23 upon piston 21, thereby drawing the same toward the left against the pressure of spring 22. As piston 21 is drawn toward the left, link 24 contacts pin 26 and controls the spark advance, per curve B, Fig. 2. It should be noted that the advance of the spark is very abrupt as orifice 8 passes on to the engine side of valve 4 because the full manifold vacuum will be established in piston 21. Spring 22 is a strong spring but the vacuum is so high when throttle 4 is only partly open that the spark will advance far ahead of the load curve (that is, the curve which exemplifies the degree of opening of throttle valve 4). However, due to the fact that the spring 22 is a relatively strong spring, the spark will immediately retard if the throttle 4 is opened very far toward open position, but never further than permitted by venturi suction at orifice 7 acting through suction device 12.

I claim:

1. In an internal combustion engine having an intake passageway with a venturi and a throttle valve positioned on the engine side of said venturi for controlling fluid flow through said passageway, an ignition timer, a suction device connected into the venturi, a connection between the aforesaid suction device and ignition timer, a second suction device connected into the intake passageway adjacent to and on the atmosphere side of the throttle valve when in idle position, a connection between said second suction device and the ignition timer whereby when the throttle

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valve is wide open the first mentioned suction device responds to venturi suction and controls the position of said ignition timer and when the throttle is partly open the second suction device responds to the suction on the engine side of the throttle valve and controls the position of said ignition timer, the said connection between the second suction device and the ignition timer being a lost motion connection whereby when the throttle valve is wide open the first suction device can actuate said ignition timer independently of said second suction device.

2. In an internal combustion engine having an intake passageway, a throttle valve in the intake passageway, a venturi in the intake passageway on the atmosphere side of the throttle valve, an orifice in the venturi, a second orifice in the intake passageway adjacent to and on the venturi side of said throttle valve when in idle position whereby the throttle valve moves between the two orifices as it moves toward an open position from idle thereby subjecting the second orifice to the suction obtaining on the engine side of the throttle valve, a suction responsive device connected into the first orifice and a second suction responsive device connected into the second orifice, an ignition timer, connections between each of the suction responsive devices and the ignition timer whereby when the throttle valve is wide open the first suction responsive device responds to venturi suction and controls the ignition spark advance substantially in direct relation to the engine speed and when the throttle valve is partly open the second suction device responds to the suction on the engine side of the throttle valve and controls the ignition spark advance in accordance with said last mentioned suction, resilient means for moving the ignition timer to retard the spark whenever the suction falls in the first suction device, the connection between the second suction device and the ignition timer being a lost motion connection so that the second suction device positively moves said ignition timer to advance the spark in response to an increase in suction and is ineffective to move the ignition timer to retard the spark.

3. The combination as set forth in claim 2 wherein the connection between the second suction device and the ignition timer takes the form of a pin and elongate slot.

4. In an internal combustion engine having an intake passageway provided with a throttle valve for controlling the flow of motive fluid to the engine, a venturi in said intake passageway on the atmosphere side of said throttle valve, an ignition timer, an orifice in said venturi, means connected into said orifice and actuated through changes in the venturi suction obtaining at said orifice for imparting movement to said ignition timer, a second orifice in the intake passageway positioned adjacent to and on the atmosphere side of said throttle valve when in idle position and passing on to the engine side of said throttle valve as it is opened from idle position, a second means connected to said second orifice and actuated through changes in pressure in the intake passageway obtaining at said second orifice for imparting movement to said ignition timer

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whereby when the throttle valve is wide open the first pressure actuated means responds to venturi suction and controls the ignition spark advance substantially in direct relation to the engine speed and when the throttle valve is partly open the second pressure actuated means responds to the suction on the engine side of the throttle valve and controls the ignition spark advance in accordance with said last mentioned suction, a connection between the first pressure actuated means and the ignition timer whereby movement of the pressure actuated means imparts movement to the ignition timer, and a lost motion connection between the second pressure actuated means and the ignition timer whereby movement of the second pressure actuated means in a spark advance direction only moves said ignition timer.

5. In an internal combustion engine having an intake passageway provided with a throttle valve for controlling the flow of motive fluid to the engine, a venturi in said intake passageway on the atmosphere side of said throttle valve, an ignition timer, an orifice in said venturi, means connected into said orifice and actuated through changes in the venturi suction obtaining at said orifice for imparting movement to said ignition timer, a second orifice in the intake passageway positioned adjacent to and on the atmosphere side of said throttle valve when in idle position and passing on to the engine side of said throttle valve as it is opened from idle position, a second means connected to said second orifice and actuated through changes in pressure in the intake passageway obtaining at said second orifice for imparting movement to said ignition timer whereby when the throttle valve is wide open the first pressure actuated means responds to venturi suction and controls the ignition spark advance substantially in direct relation to the engine speed and when the throttle valve is partly open the second pressure actuated means responds to the suction on the engine side of the throttle valve and controls the ignition spark advance in accordance with said last mentioned suction, and resilient means tending at all times to move said ignition timer to retard the spark whereby when the throttle is at idle position substantially atmospheric pressure obtains in both of said pressure actuated means and the spark is fully retarded, said second means including a one way driving connection with said ignition timer whereby said second means is effective to actuate said ignition timer to advance the spark when the throttle valve is partly open and the suction at the said second orifice increases but is ineffective to actuate said ignition timer to retard the spark when said suction decreases.

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