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VACUUM IGNITION CONTROL

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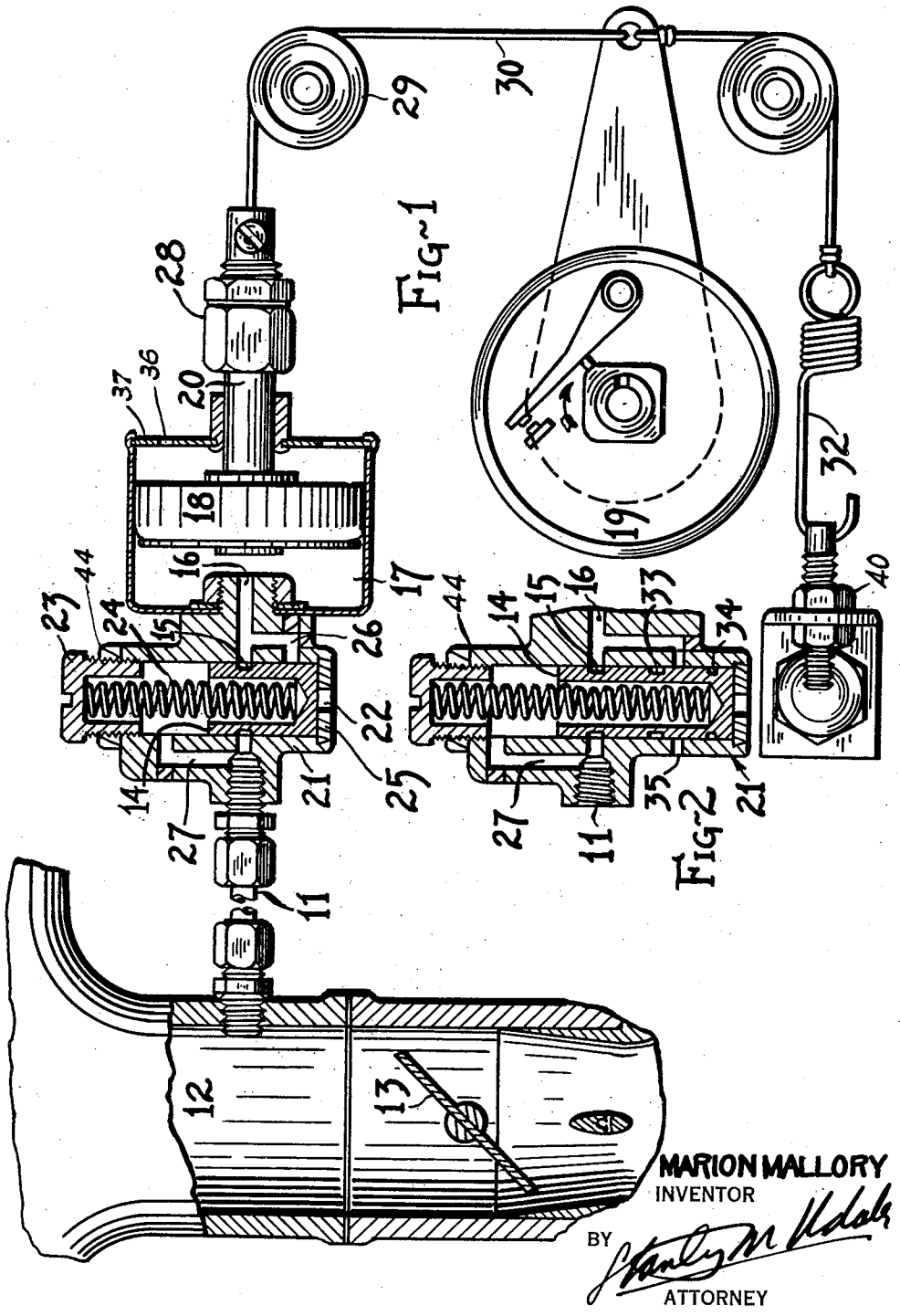


FIG-1

FIG-2

MARION MALLORY
INVENTOR

BY Stanley M. Hodak
ATTORNEY

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VACUUM IGNITION CONTROL

Marion Mallory, Detroit, Mich., assignor to The Mallory Research Company, Toledo, Ohio, a corporation of Delaware

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4 Claims. (Cl. 123—117)

The object of this invention is to improve the automatic control of the ignition of an internal combustion engine. See Nickerson, #1,139,707 issued May 18, 1915.

The specific objects are:—

(a) To positively and instantaneously retard the spark when the engine is idling.

(b) To prevent the engine, to which the device is attached, from hunting. Hunting is due to the delay in the action of a governor or any other automatic controlling device so that when the controlling device comes into action, the conditions calling it into action have already been acting long enough so that it is too late for the control mechanism to prevent the engine either racing or slowing down beyond the desired degree. This, of course, causes a surge in the speed.

(c) To minimize any air leakage, which is usually associated with the devices of the type shown in the Nickerson patent, in which a vacuum controlled piston moves the circuit breaker of the ignition system. This leakage is from the atmosphere to the inlet manifold of the engine with which the ignition control device of the Nickerson type is associated.

In the figures:—

Fig. 1 shows diagrammatically the installation of the preferred form of my invention in combination with an existing timer, which may or may not be centrifugally controlled.

Fig. 2 shows a modification of my invention.

In Fig. 1, 11 is the vacuum pipe connecting the inlet manifold 12 of the internal combustion engine (not shown) with the automatic ignition device.

The pipe 11 enters the inlet manifold 12 above the throttle 13 so that the device is subjected to the vacuum on the engine side of the throttle. 44 is the control device, which is used to modify the action of the well-known Nickerson device referred to above. In 44, a cylindrical valve 14 is provided with an annular groove 15, which acts as a passage connecting the pipe 11 with the passage 16. This passage 16 communicates the vacuum from the inlet manifold 12 to the Nickerson ignition control device, which consists of:—

A cylinder 17, a piston 18, a cylinder cover 37 open to the atmosphere at 36, a piston rod 20, a stop 28, a pulley 29, a wire 30 anchored at 40 to some part of the car or engine. A spring 32 opposes the movement of the piston 18 under the influence of the suction in 12. A circuit breaker 19 is shown controlled by the wire 30.

This circuit breaker 19 may be associated with any of the well known centrifugal devices, such as that shown in the patent of Kent #1,192,788, which was issued July 25, 1916.

When the piston 18 moves over to the left, it restricts the leakage of air into the inlet manifold 12, as the end of 18 restricts the flow of air through 16.

Considering the novel feature of the control device 44 more in detail, the valve 14 is located in the cylinder 21, which is in open communication with the atmosphere through an opening 22. At the other end, it is closed by an adjustable stop 23, which is the means provided for controlling the action of the piston 14. The spring 24 engages at one end with this adjustable stop 23, and at the other end with the piston 14. The spring has sufficient length so that the valve 14 responds promptly to the critical changes of vacuum, which occur under certain conditions of speed and load.

A seat 25 limits the travel of the piston 14.

26 is an atmospheric by-pass, which admits air from the port 22 to the cylinder 17 through the passage 16, when the vacuum 11 is high enough to draw the piston or valve 14 so as to uncover the passage 26, and at the same time cut off the communication from 11 to 16 through the annular groove 15. The operating vacuum, which causes the piston 14 to move, is communicated to the opposite side of the valve 14 through the vacuum by-pass 27, which communicates with the passage 11 and the interior of the cylinder 21.

In Fig. 2, two extra grooves 33 and 34 are provided in the piston 14. The lower groove 34 is so located that, when raised during the "idling" of the engine, a passage 35 in the wall of the cylinder 21 is put in communication with the passage 16.

The upper groove 33 is so located that, when raised by a vacuum exceeding the idling vacuum, the vacuum is readmitted into the cylinder 17 and the ignition is once more advanced by reason of the action of the vacuum. When the vacuum is readmitted, the adjustment 23 is adjusted so that the valve 14 does not rise far enough to uncover the port 26, and to admit air so as to neutralize the vacuum readmitted to 17 through the annular port 33.

Operation

When the engine is idling, the vacuum is admitted from 12 to the passage 27, which acts on the piston 14, which rises against the compression of the spring 24; the vacuum in 27 being aided by the atmospheric pressure acting through 22.

The raising of the piston 14 with the annular passage 15 cuts off communication between 11 and 16. It also opens the passage 26 to the atmosphere which enters at 22. Atmospheric air then rushes into the cylinder 17 and pushes the piston 18 over to the right, and thereby retards the spark without the slightest delay, which delay causes an unpleasant sensation and unsteady running of the engine.

As shown in Fig. 2, when the engine is idling, the piston 14 is raised only far enough for the groove 34 to open communication between the atmospheric port 35 and the lower branch of the passage 16, thereby allowing the piston 18 to move to the right so that the spark is retarded. When the car is coasting at high speed, however, with the clutch in and the engine revolving at high speed, an excessive vacuum is created and the piston 14 is raised higher, until the port 35 is closed and the groove 33 opens communication between the pipe 11 and the upper branch of the passage 16, thus again moving the piston 18 to the left and again advancing the spark. A high vacuum leads to slow flame propagation. Hence, if the high vacuum is associated with high speed and a retarded ignition, very irregular ignition will result, accompanied by backfiring and muffler explosions.

Again, when the car is coasting at high speed on the level and the car is driving the engine, if the spark is retarded, the engine will act as a brake on the car, which will lead to excessive fuel consumption. In any event, it is desirable to advance the ignition at all times with a high vacuum except when idling. The further one coasts, the less fuel is used, as every time the throttle is opened, the carburetor accelerating pump discharges its accelerating fuel charge.

By "idling" is meant the running of the engine with throttle closed and no load on the engine.

What I claim is:

1. Ignition control means for an internal combustion engine, having a fuel inlet manifold and a throttle valve therein, comprising a fuel inlet vacuum responsive device, an ignition timing device connected therewith and adapted to be advanced thereby when the vacuum increases, a piston valve for controlling the admission of vacuum to said device, a cylinder having a closed end in which said valve reciprocates, one end of said cylinder being open to the atmosphere, a passage connecting the closed end with the inlet vacuum, spring means engaging with said piston in opposition to said vacuum, a port in the wall of said cylinder communicating with said device and controlled by said piston so as to be closed when the vacuum overcomes the spring and to be opened to admit the vacuum from the inlet manifold to said device at other times, a second port in the wall of said cylinder communicating with the atmosphere and with said device, said port being controlled by said piston so as to be opened to admit atmospheric air to said device when the first port is closed.

2. A device as claimed in claim 1 with, an additional port in said piston adapted to engage with the first port in said cylinder to readmit the vacuum to said device, an extension in said piston to close the second port in said cylinder when the vacuum is readmitted through the additional port in said cylinder.

3. In an ignition control device of the type in which the engine suction advances the ignition, an automatic suction control valve comprising a cylinder, a piston reciprocating therein, means for admitting suction to one end of the cylinder, means for admitting atmospheric pressure to the other, spring means for opposing the movement of the piston due to the difference in pressure, a passage admitting suction to said ignition control device, said piston forming a movable obstruction in said passage, a passage admitting atmospheric air to said ignition control device, said piston also forming a movable obstruction in said passage, whereby the suction is automatically disconnected from said ignition control device and the atmospheric pressure is suddenly admitted when the suction reaches a predetermined value corresponding to idling suction.

4. In an internal combustion engine, having an air inlet manifold and a throttle admitting air thereto, the combination with an ignition timing mechanism of a vacuum responsive controlling means therefor mechanically connected thereto and a valve controlling the admission of vacuum to said means from the inlet manifold on the engine side of the throttle, said valve being also controlled from the vacuum between the throttle and the engine, yielding means for opposing said valve, a passage for admitting atmospheric air to said vacuum responsive means and also controlled by said valve, whereby the vacuum is cut off and atmospheric pressure is admitted when the vacuum in the inlet manifold reaches a predetermined value.

MARION MALLORY.