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DISTRIBUTOR

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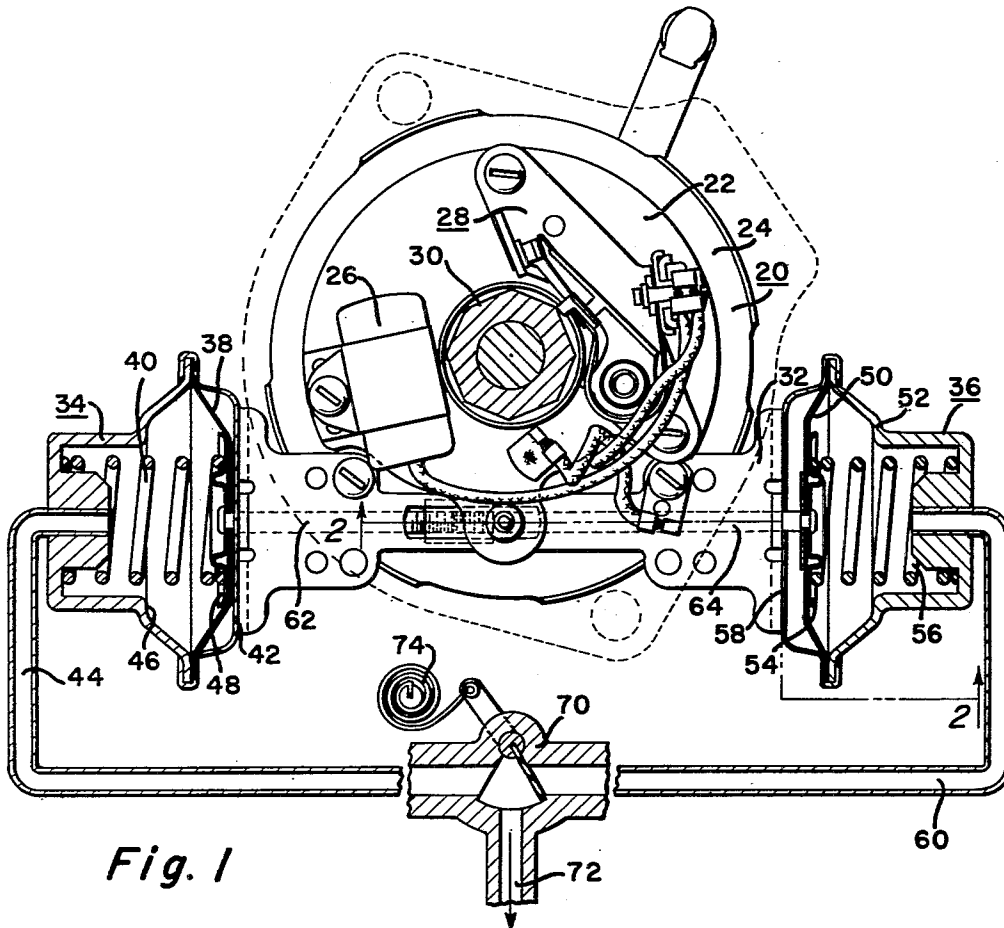


Fig. 1

TO INTAKE MANIFOLD

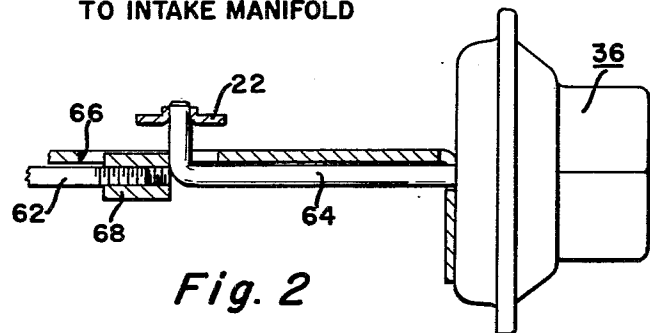


Fig. 2

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Application June 27, 1956, Serial No. 594,303

4 Claims. (Cl. 123-117)

This invention relates to ignition timing control for internal combustion engines and more particularly to an apparatus for retarding the ignition timing of the engine when the engine is below a predetermined temperature.

It has been determined that a faster engine warm up can be accomplished if the ignition timing is retarded for a short period when the engine is initially operated. An arrangement for accomplishing this result is set forth in application Serial Number 594,292, which has been assigned to the assignee of the present invention and is concurrently filed herewith.

The control means according to my invention comprehends an arrangement whereby the vacuum motor which moves the timer advance mechanism of an ignition system for an internal combustion engine is controlled by a second vacuum motor. As will become hereinafter apparent, while the control means according to my invention may be used with any suitable distributor, a distributor which is particularly adapted for use with the control means, which will be hereinafter set forth, is described and shown in application Serial Number 400,024, filed December 23, 1953, now Patent No. 2,769,047, issued October 30, 1956. This application also has been assigned to the assignee of the present invention.

In carrying out the above it is an object of the present invention to provide an ignition timer with a control means which will cause the timer to be retarded when the engine is cold.

A further object of the present invention is to increase the limits of movement of certain parts of an ignition timer so the timing of an internal combustion engine will be abnormally retarded when the engine is cold.

Another object of the present invention is to abnormally retard the timing of an internal combustion engine during periods when the engine is cold. This object is accomplished selectively controlling the energization of a pair of vacuum motors with a temperature responsive valve and arranging the vacuum motors on the engine timer so one of the vacuum motors will move a limit stop for the other motor and permit the other motor to move the ignition timer to an abnormally retarded position.

A still further object of the present invention is to mount a pair of vacuum motors on the opposite ends of a bracket on an ignition timer and to face the motors so their movements are in opposition. When this arrangement is employed and the motors are connected through a suitable temperature responsive valve with the intake suction passage for an internal combustion engine, one of the motors connected to the breaker plate of the ignition timer will rotate the plate in response to fluctuations in engine suction when the valve means is above a predetermined temperature and the other motor will move a limit stop to permit the first motor to rotate the plate to an abnormally retarded position when the valve means is below said temperature so the second motor is energized and the first motor is de-energized.

Further objects and advantages of the present invention will be apparent from the following description, refer-

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ence being had to the accompanying drawings, wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

Fig. 1 diagrammatically shows a mechanism according to the present invention for controlling an ignition timer.

Fig. 2 is a view partly in section along line 2-2 in Fig. 1.

In the drawings the numeral 20 designates an engine distributor. This distributor has a breaker plate 22 which is rotatable in the casing 24 of the distributor. Mounted on the plate is a condenser 26 and a breaker point assembly 28 which is actuated by the distributor cam 30. The distributor cam 30 receives its rotation from the distributor shaft, not shown, through a centrifugal mechanism which is also not shown and which is described in the application supra. The leads from the condenser and the breaker point assembly are connected as shown in the conventional manner.

Mounted or carried on the casing 24 is a bracket 32. Positioned on the opposite ends of the bracket 32 are fluid motors 34 and 36. These motors are carried on bracket 32 so that they are oppositely faced to one another. The motor 34 has a diaphragm or movable wall 38 which is normally urged to the right by a coil spring 40. The diaphragm 38 is ultimately limited in its movement to the right by a wall 42 of the fluid motor. The diaphragm 38 is moved to the left by the suction within conduit 44. The movement to the left of diaphragm 38 is ultimately limited by the wall 46 when it is engaged by the annular spring seat 48.

The fluid motor 36 has a movable diaphragm or wall 50. This diaphragm is also ultimately limited in its movement to the right by the wall 52 when the wall 52 is engaged by the annular seat 54. The spring 56 constantly urges the diaphragm 50 to the left. The movement of diaphragm 50 to the left is limited by a means which will be hereinafter described, but in this connection it is to be noted that the furthest movement to the left of diaphragm 50 is limited by the wall 58. When the fluid motor 36 is energized by the suction in conduit 60, diaphragm 50 will move to the right against the force of spring 56.

The actuating rods or movable elements 62 and 64 are suitably connected to the diaphragms of the fluid motors 34 and 36 respectively. These rods are moved as the diaphragms 38 and 50 respectively respond to variations in the fluid pressures on conduits 44 and 60. The support bracket 32 is provided with an opening 66. The rod 64 is bent upwardly to extend from beneath the bracket through opening 66 where it engages the breaker plate 22. Thus, as the fluid pressure in conduit 60 is varied, the rod 64 reciprocates and the breaker plate 22 will be rotated. The rod 62 has a stop 68 on its free end. The stop 68 preferably extends partially into opening 66 and may be longitudinally adjusted on rod 62 when the stop 68 is rotated on the threads on the end of rod 62. The rod 64 also is limited in its movement to the right by the walls of opening 66. In this instance the wall 52 will not limit the movement of diaphragm 50. The springs 40 and 56 are selected so that spring 40 is stronger than spring 56. The springs 40 and 56 constantly oppose each other. This will cause the rod 64 to constantly engage stop 68. When the parts are in the normal position, that is, when neither of the fluid motors 34 or 56 are energized, the wall 42 will limit the movement of the parts to the right. This means the diaphragm 50 will be in the position shown in Fig. 1. When the parts are in this position and the distributor parts are properly set the engine timing will be in the normal retard position. When the engine is cold, the thermal responsive valve 70, which may be of any suitable type, will be in the position shown in Fig. 1.

Thus the conduit 44 will be connected through suction line or passage 72 with a source of suitable engine suction. During cranking periods neither of the fluid motors 34 or 36 will be sufficiently energized to move diaphragms 38 or 50. This result is accomplished by properly selecting springs 38 and 56 so a greater suction vacuum than that occurs during cranking periods will be required to overcome the force of the respective springs on the diaphragms. After the engine has begun operation, the suction through conduits 72 and 44 will cause diaphragm 38 to move to the left. This will cause stop 68 to likewise move to the left and permit the spring 56 to move diaphragm 50 and rod 64 to the left until diaphragm 50 engages wall 53. The movement of rod 64 to the left will cause breaker plate to rotate clockwise and retard the engine timing an amount greater than the normal retard. The amount of abnormal retard of course will depend upon the characteristics of the engine on which the device is used. In this connection it is contemplated that an additional 10 degree retard is all that will be required.

During the periods of initial engine operation, that is, when the temperature of the engine remains below a predetermined value as determined by the calibration of the thermostatic member 74 of valve 70, the entire force of the engine suction will be imposed on diaphragm 38 to cause the spark advance of the engine to be retarded. When the thermostatic member 74 is sufficiently heated, the thermostat 74 will cause the valve 70 to move so conduit 60 is connected to the engine suction through conduit 72. When this occurs the spring 40 will urge diaphragm 38 to the right and return the stop 68 to the position shown in Fig. 2, which is the normal retard position. If the suction force in conduit 60 is increased due to the operation of the engine, the diaphragm 50 will respond in the conventional manner to advance the spark in a normal manner which is well known to those skilled in the art.

While the spark advance override which is accomplished by the fluid motor 40 as heretofore set forth may be used with any type of distributor, it is particularly adapted to be used with a distributor which has a centrifugal advance mechanism such as disclosed in the Crawford et al. Patent 2,107,470 or in the distributor mentioned supra. When used with these distributors, the centrifugal advance mechanism will operate in the conventional manner and will advance the spark in response to engine speed. This means the device according to the present invention will effectively cancel some of the centrifugal advance during periods when the engine is cold. This arrangement will permit the engine to heat up rapidly without appreciably detracting from the operation of the engine.

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.

What is claimed is as follows:

1. An ignition device for an internal combustion engine having an intake passage in which suction is created in response to operation of the engine, comprising in combination; a timer having an oscillatable member for varying the sparking impulses of said timer, a vacuum motor connected with said passage and having an actuating rod movable between predetermined limits, for oscillating said

member in response to variations in suction in said passage, a second vacuum motor connected with said suction passage for increasing one of said limits of movement of said rod, and a temperature responsive means controlling the connections of said motors with said suction passage whereby said second motor is actuated only when the temperature of said engine is below a predetermined value.

2. An ignition device for an internal combustion engine having a passage in which a variable pressure is created in response to the operation of said engine, comprising in combination; an ignition timer for said engine having a movable member, a fluid responsive motor having a fluid passage connection with said engine passage and having an element movable between predetermined limits for moving said member in response to pressure variations in said engine passage, a second fluid motor having a fluid passage connection with said engine passage and having an element movable in response to variations in said engine passage for changing one of said limits and temperature responsive valve means controlling both of said fluid passage connections and arrange to disconnect said first fluid motor and connect said second fluid motor with said engine passage when the temperature of said means is less than a predetermined value.

3. An ignition timer for an internal combustion engine wherein the timer is responsive to engine suction, comprising in combination; a rotatable breaker plate, a first vacuum device connected to said breaker plate and normally biased to move the breaker plate to one position, a second vacuum device connected to said first device and normally biased to prevent movement of the breaker plate, a lost motion connection between said two vacuum devices wherein the position of one of said devices limits the biased movement of the other of said devices, and temperature responsive means connected to both of said vacuum devices and to a source of engine suction, said temperature responsive means being adapted to selectively connect either one of said vacuum devices to said source of suction in accordance with variations in engine temperature.

4. An ignition timer for an internal combustion engine wherein the timer is responsive to engine suction, comprising in combination; a rotatable breaker plate, a first vacuum device connected to said breaker plate and normally biased to move the breaker plate to one position, a second vacuum device in opposed alignment with said first device and providing a resilient stop for said first device, and temperature responsive means connected to both of said vacuum devices and to a source of engine suction, said temperature responsive means being adapted to selectively connect either one of said vacuum devices to said source of suction in accordance with variations in engine temperature.

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