July 25, 1944. M. MALLORY 2,354,472

IGNITION SYSTEM

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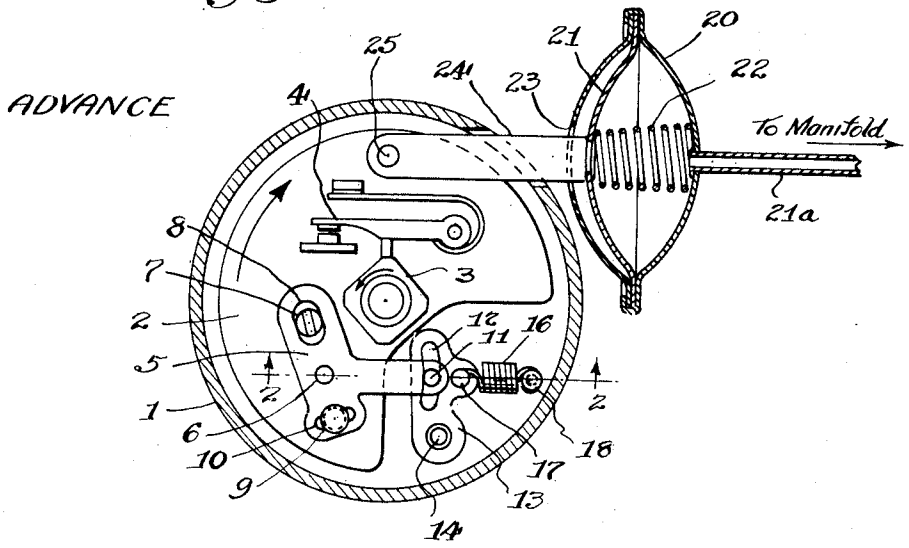
Fig. 1



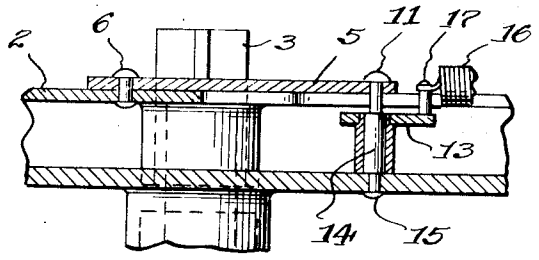




Fig. 2

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## IGNITION SYSTEM

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5 Claims. (Cl. 200—31)

This invention relates to an ignition system for an internal combustion engine and more particularly to the type of ignition system wherein the spark is advanced and retarded by the pressures in the intake passageway of the engine.

In the present ignition systems using a centrifugal governor or intake pressures of the engine to advance the spark, it has been difficult to produce different spark advance curves suitable for the different types of engines, without using a different spring for each advance curve required. It is one of the objects of this invention to produce a more simple spark advance mechanism which can be adjusted to effect the required spark advance curves on many different type engines, with the use of only one tension spring. This object is achieved by an arrangement for varying the tension of the spring in the spark advance mechanism which co-acts with the pneumatic pressure device for controlling the advance of the spark.

In most engines, the spark should start to advance as soon as the speed is raised above idle, which is generally 400 R. P. M. However, the slope on which the spark advances in relation to the engine speed greatly varies in different engines. For example, one engine may require 20° spark advance at 3000 R. P. M.; another engine may require 20° spark advance at 2500 R. P. M.; while a third engine may require 20° spark advance at 2000 R. P. M., but in each case the spark should start to advance at 400 R. P. M. The spark advances at the same engine R. P. M. on each of the different engines but finishes at a different R. P. M. for each engine. With my invention, the finish of the advance curve can therefore be varied; i. e., the spark advance mechanism can be adjusted to finish spark advance curve at different engine speeds, without changing the time at which the spark starts to advance. If the mechanism is set so that the spark will start to advance at 400 R. P. M. of the engine, it can be adjusted so that the spark will be fully advanced at 3000, 2500, or 2000 R. P. M. and still the spark will start to advance at the same point; namely, 400 R. P. M.

Fig. 1 is a plan view partly in section showing my pressure-timed ignition system.

Fig. 2 is a section along the line 2—2 of Fig. 1.

My ignition system comprises a stationary housing 1, a circuit breaker plate 2 rotatably mounted in housing 1, a cam 3 arranged in the usual manner to rotate in the direction of the arrow, a circuit breaker 4 pivotally mounted on plate 2, and an adjustment arm 5 pivotally mounted on circuit breaker plate 2 by means of pin 6. Arm 5 is adjustable about pivot 6 by means of an eccentric screw 7 which engages arm 5 in elongated slot 8. Arm 5 is held in adjusted position by means of set screw 9 which threads into plate 2 and engages arm 5 on opposite sides of slot 10. A pin 11 anchored in arm 5 engages arcuate slot 12 in lever 13 pivoted on pin 14 which is anchored in the housing 1 as at 15. Tension spring 16 is connected at one end to pin 17 anchored in lever 13 and at the other end to pin 18 anchored in the housing 1. A suction device comprising a housing 20 is connected by conduit 21a into the intake manifold of the engine (not shown). A flexible diaphragm 21 is mounted in the housing 20 and is biased to the left, Fig. 1, by compression spring 22. The housing 21 communicates with atmosphere through opening 23. Diaphragm 21 is connected to circuit breaker plate 2 by rod 24. Rod 24 passes through opening 23 in housing 20 and has one end fixed to the diaphragm 21 and the other end pivotally connected to the circuit breaker plate 2 by means of pin 25 anchored in plate 2.

The operation of the device is as follows: As the intake manifold pressures cause suction device 20 to move circuit breaker plate 2 in counter direction to the rotation of cam 3, as indicated by the arrow on plate 2, pin 11 in arm 5 will start to move in slot 12 of lever 13 toward pivot pin 14, thereby giving spring 16 a greater leverage over plate 2 and the suction device. Slot 12 is in the form of an arc having its center at pivot pin 6. If a spark curve is needed which will finish late or at high engine speed, it will only be necessary to loosen screw 9 and turn eccentric screw 7 so that pin 11 will be closer to pivot pin 14: this will give spring 16 still greater leverage over suction device 20. If it is desired to have the spark advance finish earlier, arm 5 is adjusted so that pin 11 will be further away from pin 14 thereby decreasing the leverage of spring 6 over suction device 20.

It is evident from the above that the finish of the spark curve can be varied without affecting the start of the curve because any adjustment of arm 5 does not affect the initial tension of spring 16. Any adjustment of arm 5 affects the tension of spring 16 only after the circuit breaker plate has started to advance under the influence of suction device 20.

It is evident that the above mechanism would be useful in other than ignition systems, for example, it could be used for controlling a governor throttle valve for an internal combustion engine.

I claim:

1. In combination, a member rotatably supported, a suction operated device connected to said member and adapted to rotate the same, resilient means opposing said suction operated device in the rotation of said member, a stationary anchor, a lever, said resilient means being connected to said anchor and lever, a shiftable connection between said lever and said rotatable member arranged to shift toward the pivot of said lever as the rotatable member is rotated by said suction device whereby the leverage exercised by said resilient means in opposition to the suction operated device is increased.

2. In combination, a member rotatably supported, a suction operated device connected to said member and adapted to rotate the same, a tension spring opposing said suction operated device in the rotation of said member, a stationary anchor, a lever, said tension spring being connected to said anchor and lever, a shiftable connection between said lever and said rotatable member arranged to shift toward the pivot of said lever as the rotatable member is rotated by said suction device whereby the leverage exercised by said tension spring in opposition to the suction operated device is increased.

3. In combination, a member rotatably supported, a suction operated device connected to said member and adapted to rotate the same through a limited arc, a stationary anchor, a lever, a spring between said anchor and lever, a shiftable connection between the lever and rotatable member arranged to shift relative to the pivot point of said lever as the suction operated device moves the rotatable member whereby the leverage exercised by said spring in opposition to said suction operated device is varied during the rotation of said member.

4. In an ignition system for an internal combustion engine, a housing, a circuit breaker cam rotatable in said housing, a circuit breaker plate rotatably mounted in said housing, a suction operated device adapted to be connected into the intake manifold and connected to said circuit breaker plate for advancing said plate in counter direction to the rotation of the circuit breaker cam as the pressure in the intake manifold decreases, a lever pivoted on said housing, a pin and slot connection between said lever and said circuit breaker plate, a spring connected at one end to said lever and at the other end to said housing whereby the leverage exerted by the spring in opposition to said suction device increases as the circuit breaker plate is advanced by the suction device.

5. In an ignition system for an internal combustion engine, a housing, a circuit breaker cam rotatable in said housing, a circuit breaker plate rotatably mounted in said housing, a suction operated device adapted to be connected into the intake manifold and connected to said circuit breaker plate for advancing said plate a limited distance in counter direction to the rotation of the circuit breaker cam as the pressure in the intake manifold decreases whereby the spark is advanced, a lever pivotally supported on said housing, a spring connected between said housing and said lever, an adjustable arm pivoted on said circuit breaker plate, a shiftable connection between said arm and lever whereby, as the circuit breaker plate advances, the said shiftable connection travels relative to the pivot for said lever and thereby varies the leverage exerted by said spring in opposition to said suction device, the said adjustable arm being adjustable on said circuit breaker plate and relative to the pivot for said lever to vary the leverage exerted by said spring over said suction device irrespective of the position of said breaker plate.

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