May 24, 1932. M. MALLORY 1,859,309

CONTROL DEVICE FOR IGNITION TIMERS

Filed Oct. 12, 1931

Fig. 1

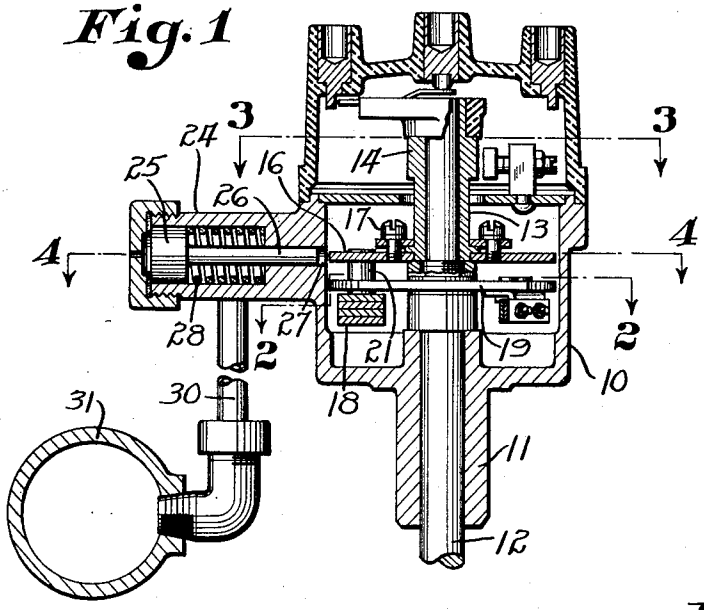


Fig. 2

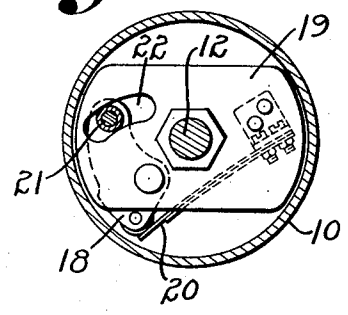


Fig. 3

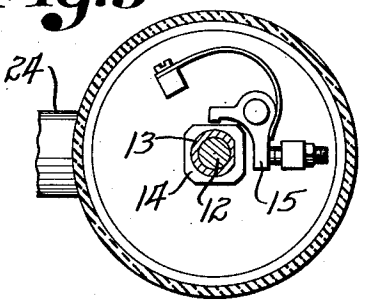


Fig. 5

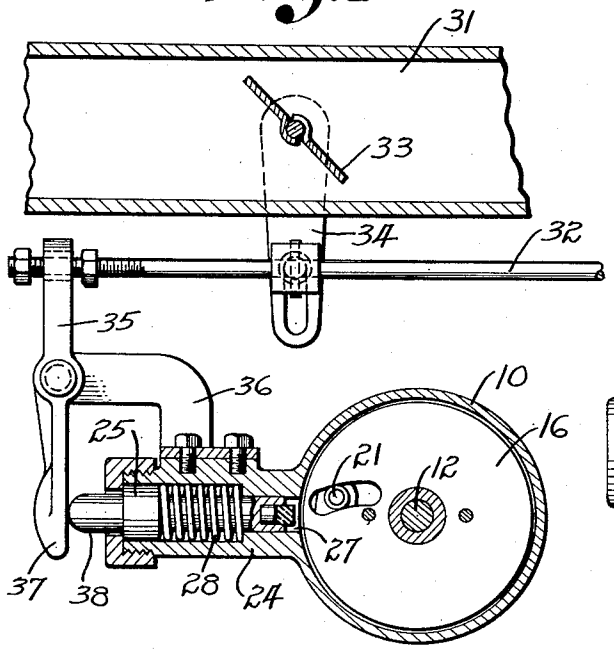
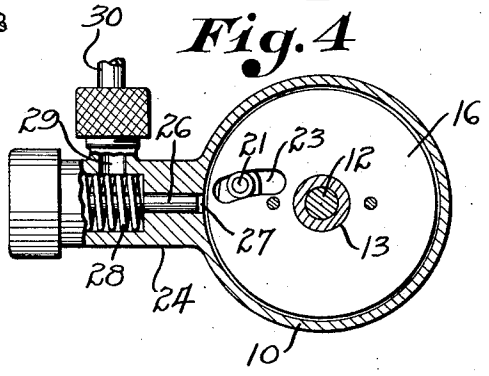


Fig. 4



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UNITED STATES PATENT OFFICE

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CONTROL DEVICE FOR IGNITION TIMERS

Application filed October 12, 1931. Serial No. 568,237.

This invention relates to a control device for ignition timers, with particular reference to the condition present when, with the engine idling, the throttle is suddenly opened.

In order to insure a smooth and steady operation when the engine is idling, it is necessary to set the timer so that the spark will occur when the crank is 5° to 10° past dead center. With such setting, when the throttle is open, if the initial spark advance depends primarily upon a centrifugal governor, no advance will take place until there has been a considerable increase in speed and as a consequence the pick-up will be slow. On the other hand, if the spark is initially set where it should be for the best performance after the throttle is opened, it will cause the operation of the engine to be jerky when idling or perhaps to stop altogether.

With the above facts in mind, it is the object of the present invention to control the timing automatically in such a manner that in idling the spark will occur when the crank is at an appreciable angle past dead center, but when the throttle is opened, the spark will be immediately advanced so that it will occur before the crank reaches dead center. The subsequent control of the timing as the speed of the engine increases may be effected by any suitable means. That is, it may be controlled solely by a centrifugal governor, by the vacuum in the fuel intake, or by a combination of both, or it may be controlled manually by a connection with the throttle or independently thereof.

The present embodiment of my invention will be more particularly described in connection with the accompanying drawings, in which—

Figure 1 is a vertical sectional view of a timer with which the invention is associated;

Figure 2 is a section taken on the line 2—2 of Figure 1;

Figure 3 is a section taken on the line 3—3 of Figure 1;

Figure 4 is a section taken on the line 4—4 of Figure 1; and

Figure 5 is a section of the timer similar to Figure 4, but shows in connection therewith a modified form of the invention.

As shown in the drawings, the invention is associated with an ignition timer comprising a housing 10 formed with a bearing 11 for the timer shaft 12. A sleeve 13 is mounted for relative circumferential movement on the shaft 12 and is provided with a cam 14 which actuates the circuit breaker 15. The relative position of the sleeve 13 and cam 14 with reference to the timer shaft 12 is controlled through the medium of a circular plate 16 which is secured to the sleeve by screws 17 or other suitable means.

The position of the plate 16, as the speed of operation increases, is usually controlled by a suitable centrifugal governor which, in the present instance, includes a weight 18 pivoted to a plate 19 which is secured to the shaft 12. The movement of the weight 18 about its pivot under the influence of centrifugal force is opposed by a spring 20. The weight 18 is provided with a lug 21 which extends through an arcuate slot 22 in the plate 19, thus positively limiting the pivotal movement of the weight. The lug 21 also projects into a curved slot 23 in the plate 16 which is eccentric to the axis of the weight so as to cause an advance movement of the plate 16 and circuit breaker 14 as the weight is moved outwardly under the influence of centrifugal force.

In order to control the timing in accordance with the invention, when the engine is idling, the housing 10 is formed with a lateral extension 24 within which a piston 25 is operable. The piston has a stem 26 which is adapted to project into a bore 27 extending through the wall of the housing 10 in the same plane as the plate 16. The inner end of the stem 26, when it comes in contact with the edge of the plate 16, acts as a brake on the latter to retard the spark. The extension 24 houses a coil spring 28 which normally acts against the head of the piston 25 to urge the latter toward the outer end of the housing, thus moving the brake out of contact with the plate 16.

The cavity which contains the spring 28 has a port 29 connected by a suitable conduit 30 with the intake manifold or some other part of the fuel intake as indicated at 31.

Thus, when the throttle is closed, so that the operation of the engine even though idling causes a considerable vacuum in the fuel intake passageway 31, the suction thus created overcomes the tension of the spring 28 and causes the inner end of the stem 26 to act on the plate 16 to retard the spark so that it will take place after the crank has passed dead center. This insures a steady operation when idling. When the throttle is opened, this immediately relieves the vacuum in the passageway 31 sufficiently to permit the spring 28 to act on the head of the piston 25 and relieve the plate 16 from the action of the brake. The result is that whenever the throttle is opened the spark is immediately advanced so that it occurs at 5° or 10° in advance of dead center and its subsequent timing will, in the present instance, be controlled by the normal action of the centrifugal governor. When the engine is operating at high speed, there may be sufficient vacuum in the intake to again apply the brake but by that time the centrifugal force on the governor will be sufficient to overcome the friction of the brake and hold the spark advanced.

In the modification shown in Figure 5, the same retardation of the spark, when the engine is idling, is effected directly through the operation of the throttle rod 32 by which the throttle valve 33 is controlled through the medium of the arm 34. In this construction the throttle rod 32 is connected by any suitable means with a rocker arm 35 mounted on a bracket 36 located adjacent the extension 24. The end 37 of the rocker arm 35 is adapted to engage the end 38 of the piston 25, which projects beyond the end of the extension 24. As shown, there is a lost motion between the throttle rod 32 and the rocker arm 35. As the throttle rod 32 is advanced to close the throttle valve 33 for idling, it rocks the arm 35, causing the end 37 to engage the projecting end of the piston and to move the brake into frictional contact with the plate 16, thus retarding the spark. As soon as the throttle rod 32 is moved in the opposite direction to open the throttle valve 33 either partially or fully, the piston 25 is immediately under control of the spring 28 and the brake is withdrawn from contact with the plate 16.

From the foregoing description, it will be seen that I have provided a timer controlling device which may be initially set so that in idling the spark will occur after the crank passes dead center and yet, the moment the throttle is opened, the brake is moved to inoperative position, permitting the spark to advance immediately to a normal position 5° or 10° in advance of dead center, after which it may be controlled in any suitable manner in accordance with the speed of the engine or other conditions under which the engine is operated.

It will be understood that the invention may be further modified in various respects without departing from the scope of the invention as defined in the claims.

What is claimed is:

1. In an internal combustion engine, the combination with a timer shaft and a circuit breaker cam movable circumferentially with respect thereto, said cam being initially set for causing a spark after passing dead center position when the engine is idling, of means for immediately advancing the cam, when the throttle is opened, to cause the spark to occur in advance of dead center position.

2. In an internal combustion engine, the combination with a timer shaft and a circuit breaker cam movable circumferentially with respect thereto, of means acting on said cam to delay the spark only when the engine is idling.

3. In an internal combustion engine, the combination with a timer shaft and a circuit breaker cam movable circumferentially with respect thereto, of means rendering the timing later than normal only when the engine is idling.

4. In an internal combustion engine, the combination with a timer shaft and a circuit breaker cam movable circumferentially with respect thereto, of means for normally controlling the timing in accordance with the speed of the engine, and means rendering the timing later than normal only when the engine is idling.

5. In an internal combustion engine, the combination with a timer shaft and a member including a circuit breaker cam movable circumferentially with respect to the shaft, of a brake, and means for applying the brake to said member only when the engine is idling.

6. In an internal combustion engine, the combination with a timer shaft and a member including a circuit breaker cam movable circumferentially with respect to the shaft, of means normally controlling the timing, a brake, and means for causing the brake to engage said member, rendering the timing later than normal, only when the engine is idling.

7. In an internal combustion engine, the combination with a timer shaft and a member including a circuit breaker cam movable circumferentially with respect to the shaft, of means normally controlling the timing, a brake, and means, operable by the closing of the throttle to idling position, to apply the brake to said member to retard the timing.

8. In an internal combustion engine, the combination with a timer shaft and a member including a circuit breaker cam movable circumferentially with respect to the shaft, of a brake operable by suction from the fuel in-

take passage of the engine to engage said member and retard the timing, and a spring opposing such operation of the brake, said spring being so tensioned as to be overcome by the relatively high vacuum produced by idling with the throttle closed but not at low speeds when the throttle is partly or wholly open.

In testimony whereof I have hereunto signed my name to this specification.

MARION MALLORY.