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[21] Appl. No. **80,743**

[22] Filed **Oct. 14, 1970**

[45] Patented **Dec. 28, 1971**

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[32] Priority **Dec. 23, 1967**

[33] **Germany**

[31] **P 15 76 694.6**
Continuation of application Ser. No.
784,660, Dec. 18, 1968, now abandoned.
This application Oct. 14, 1970, Ser. No.
80,743

[51] Int. Cl. **F02p 5/04**

[50] Field of Search **123/117 A**

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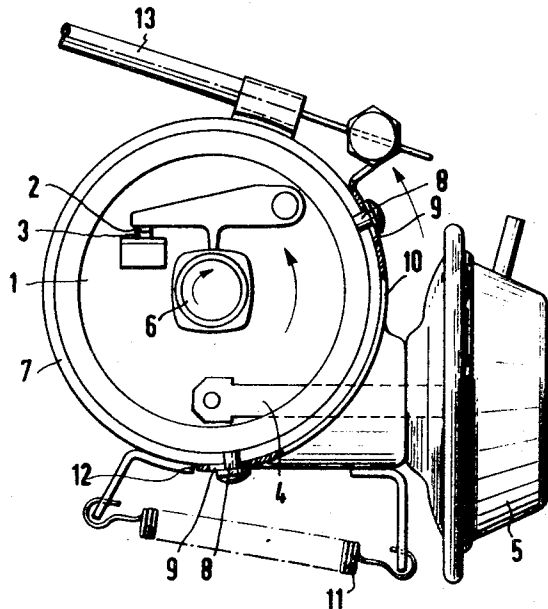
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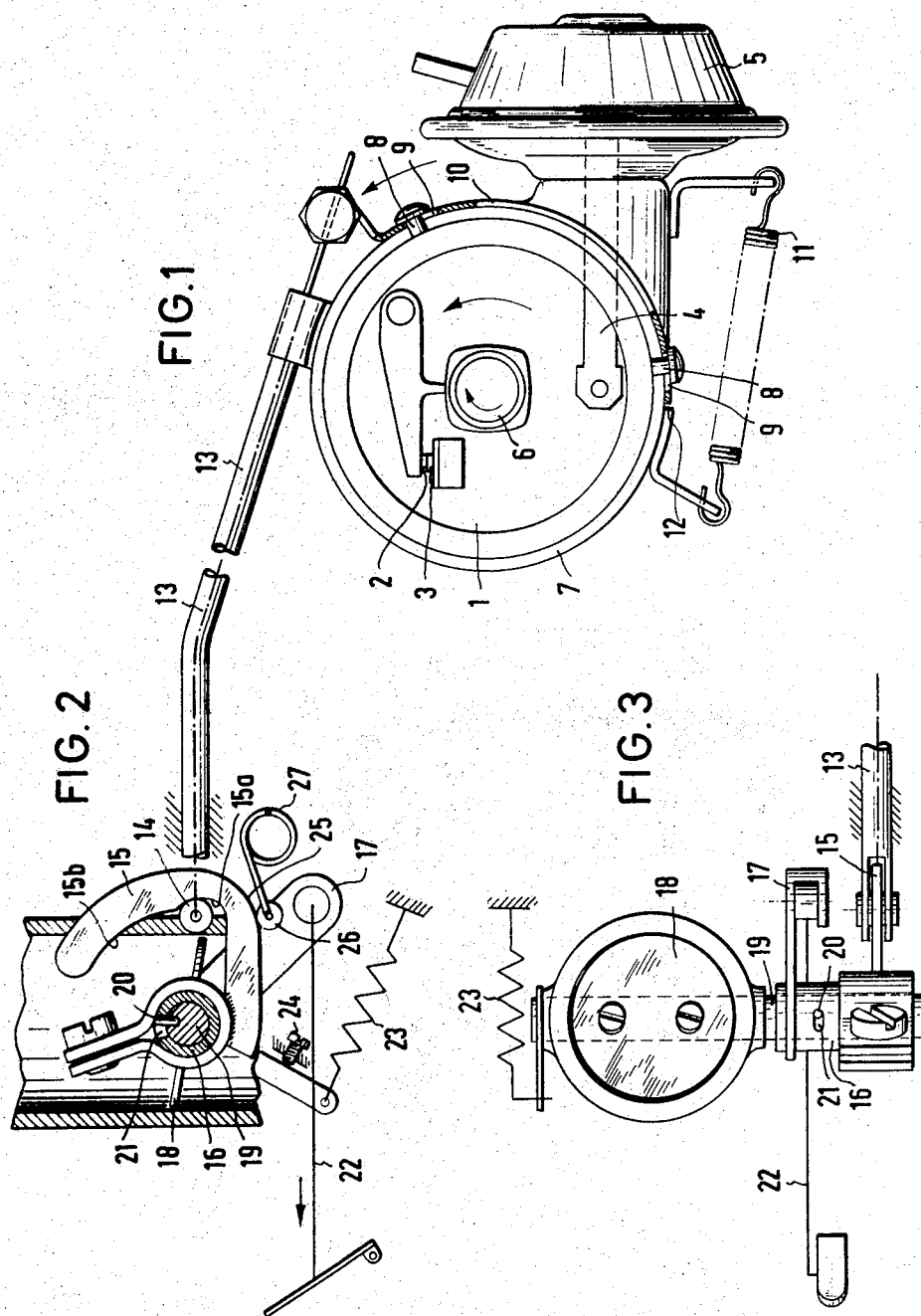
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[54] **IGNITION DISTRIBUTOR FOR MOTOR VEHICLES**
10 Claims, 3 Drawing Figs.

[52] U.S. Cl. **123/117 A**

ABSTRACT: The vacuum governor box is mounted free to move on the distributor housing. Linkage connected to the accelerator pedal moves the box in dependence on the position of the pedal so as to advance the spark, or begin to advance it, at a time before the throttle valve moves from its idling position.





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IGNITION DISTRIBUTOR FOR MOTOR VEHICLES

The invention relates to an ignition distributor for vehicle engines, the distributor including an automatic spark timer.

At the present time the usual distributor of this kind customarily incorporates a centrifugal governor dependent on engine speed together with a vacuum governor operating in the partial-load region, and sometimes it incorporates only a vacuum governor that varies spark timing in dependence on both the partial load and the r.p.m. Because of the design of these distributors, it is impossible to suddenly and sufficiently change from a retarded spark when idling, necessary for good combustion, to an advanced spark for acceleration. Since priority is given to good acceleration, particularly as the throttle valve begins to open from the idling position, the basic setting of the distributor corresponds to a relatively high spark advance. As a consequence, an excessively high spark advance must be set during idling, resulting in an idling r.p.m. that is too high. In order to reduce the idling r.p.m., the throttle valve is adjusted to a nearly closed position. The result is that the engine, while it idles (and particularly when the vehicle is pushed or coasts) is fed a very excessively rich mixture which the exhaust pipe discharges only as partly burned into the atmosphere.

The purpose of the invention is to reduce exhaust emission by influencing the spark timing, whereby the fuel is well or completely burned during idling and coasting, and good operation is insured under partial and full load.

In accordance with the invention, the ignition distributor incorporates a further spark timing control that is independent of the vacuum and centrifugal governors of the distributor, and also incorporates mechanical means responsive to the position of the accelerator pedal for operating the spark timing control so as to advance the spark 10° to 20° , with respect to the spark timing at idling, before, or as, the throttle valve begins to open.

It has been suggested that this additional control can be made by turning the entire distributor about its axis. In accordance with the invention, the control is accomplished with less expense, as against the suggestion, using an ignition distributor having a vacuum governor or vacuum box. In conventional distributors, the vacuum controls the position of a rotatable contact breaker plate that carries the contact breaker points. The plate, located in the distributor housing, is moved by a rod connected to a diaphragm exposed to vacuum. The invention is based upon the fact that the rod and thus the plate can also be moved by moving the housing of the vacuum box.

The distributor of the invention provides a contact breaker plate that can be turned independently of the turning caused by the vacuum governor linked thereto, and it also provides a vacuum box, which forms part of the governor and is connected by a rod to the contact breaker plate, and which can be moved relative to the distributor housing. The movement of the box can be accomplished in one of three different ways:

It can pivot on the outer surface of a round distributor housing by means of an arcuate mounting strip; or it can be pivotally connected on one side to the housing to tilt about an axis parallel to the drive spindle of the distributor; or it can be mounted to move in a straight line along the axis of the rod linked to the contact breaker plate.

In a particularly advantageous embodiment of the invention, the additional timing control is operated by a curved guide member that pulls or drags the throttle valve shaft in rotation and forms a unit with the throttle valve lever. A roller, connected to a timing control member for moving the vacuum box, such as a Bowden cable, engages the guide member.

The invention enables the basic setting of presently available ignition distributors to be set at retarded spark, whereby the throttle valve can remain further open without increasing the idling speed with respect to the idling speed with an advanced spark. Consequently, more fuel is injected into the cylinders with a higher proportion of air under all operating conditions that accompany the idling position of the throttle

valve. Since the r.p.m.-dependent timing adjustment (centrifugal or vacuum governor) of the distributor of the invention remains unaffected, the two controls cooperate to insure good combustion, and acceptably low hydrocarbon emission, not only during idling, but also when the vehicle is pushed. Independently thereof, the amount by which the additional control advances the basic setting of the vacuum and centrifugal governors can be freely changed, and thus optimally suited to the engine requirements in such a way that the ignition timing abruptly changes from retardation to advance just as the throttle valve begins to open. This enables a vehicle to accelerate faster from idling to cruising speed than is otherwise possible.

Further objects of the invention will be apparent from the following description when considered in connection with the accompanying drawing in which;

FIG. 1 is a top view of the ignition distributor of the invention, with cover removed;

FIG. 2 is a sectional view of a carburetor connected to the distributor; and

FIG. 3 is a top view of the carburetor of FIG. 2.

The contact breaker plate 1, carrying the contact breaker points 2 and 3 and positioned above the rod 4, can be turned on the distributor driving spindle 6, provided with breaker cams, through an angle corresponding in effect to the vacuum in the intake manifold relayed by the vacuum box 5. In accordance with the invention, the vacuum box is no longer rigidly mounted on the distributor housing 7, but instead is mounted free to pivot on the housing by means of two mounting bolts 8 in two circumferentially elongated slots 9, and an arcuate mounting strip 10. A spring 11 holds the vacuum box in the normal position (before installation), in which the strip 10 is pulled against a stop 12. A Bowden control cable 13 enables the vacuum box 5 to be turned in the direction of the arrow, FIG. 1, whereby the contact breaker plate 1 is turned in the direction of advanced ignition, which is opposite to the direction, FIG. 1, (indicated by an arrow) in which the distributor driving spindle turns. Not illustrated are the two other possible ways of adjustably mounting the vacuum box, that is, pivotally connecting one side of the box to the distributor housing so that the box is free to tilt about an axis parallel to the distributor drive spindle 6, or mounting the box free to move in the direction of the axis of the rod 4.

A roller 14 is connected to the end of the Bowden cable 13 to a lever (not shown) operated by the Bowden cable. The roller engages a curved guide member 15 having one inner path 15a, corresponding to the basic setting "retarded spark or ignition" (10° crankshaft after upper dead center), and another inner path 15b, corresponding to the basic setting "advanced spark or ignition" 10° before upper dead center). The member 15 and the operating lever 17 of the throttle valve 18 are mounted on a driving collar 16 to form a unit. The guide-member 15 is pushed onto the shaft 19 of the throttle valve 18 and, as a type of drag member for the shaft 19, is connected to the shaft by the collar 16, which is connected to the shaft by a pin 20 that projects into a circumferentially elongated slot 21 in the collar. A link or cable 22 connects the throttle valve lever 17 to the accelerator pedal. A return spring 23 holds the throttle valve 18 in its closed position determined by an adjustable stop 24. The periphery of the guide member 15 is circular. The lower part of the periphery of the guide member 15 (as seen in FIG. 2) has a recession or curved sector 25; and when the member 15 is in its idling position, a spring 27 acts on the periphery of the member by a roller 26 which presses against the recession 25, whereby the member 15 is held in the end position corresponding to retarded ignition, the pin 20 pressing against one end of the elongated slot 21.

If the accelerator pedal is depressed from the idling position (shown on the drawing), the throttle valve lever 17 and the guide member 15 are turned through an arc permitted by the length of the range slot 21; but the throttle valve 18 is not moved and therefore remains closed. The roller 14 now contacts the inner path or section 15b of the member 15, causing

the Bowden cable 13 to shift the vacuum box 5, whereby the basic setting of the distributor is advanced from 10° after upper dead center to 10° before upper dead center. Once the other end of the slot 21 presses against the pin 20, and the accelerator pedal is farther depressed, the throttle valve or flaps 18 begins to open. When letting up on the accelerator, the throttle valve closes before the basic setting of the distributor is set back to retarded ignition.

In some circumstances the engine r.p.m. may change in a jerky or irregular manner when varying the basic setting of the distributor. In accordance with the invention, this can be avoided by making the transition between the inner paths 15a and 15b less steep and so positioning it that the change to path 15b is smooth until the throttle valve begins to open.

Although the preferred embodiments of the invention have been described, the scope of, and the protection afforded thereby are limited solely by the appended claims.

We claim

1. In an internal combustion engine having a movable accelerator pedal and having an ignition distributor including a distributor housing, a vacuum governor and a vacuum box for said vacuum governor, means mounting said vacuum box for movement relative to said distributor housing, mechanical means connecting said vacuum box to said pedal for movement therewith, a contact breaker plate disposed for movement in said distributor housing, and a rod linked to said contact breaker plate and operated by said vacuum box for moving said contact breaker plate when said vacuum box moves and also in accordance with the vacuum in said box.

2. The combination defined by claim 1, wherein said distributor housing has a round surface and said mounting means includes an arcuate strip which is movable on said round surface of the distributor housing and to which said vacuum box is fixed.

3. The combination of claim 1, including a drive spindle for the ignition distributor, said mounting means including a pivot connecting one side of said vacuum box to said distributor housing for tilting of said vacuum box about an axis parallel to said drive spindle.

4. The combination of claim 1 wherein said mounting means for the vacuum box supports said vacuum box for movement in the direction of the axis of said rod.

5. The combination defined by claim 1 including a carburetor throttle valve 18, a throttle valve control lever 17 and means connecting same to the accelerator pedal, a shaped first guide member 15, a shaft 19 for said throttle valve 18, said lever 17 and guide member 15 together forming a unit carried for rotary movement on said shaft 19, and having a lost motion connection with said shaft for relating said shaft in dependence on the position of said pedal of the accelerator, a roller

14 engaging said guide member 15 and moved when said guide member moves, and a spark timing control member 13 connecting said roller to said vacuum box for moving said vacuum box in dependence on the position of said roller and as determined by said guide member.

6. The combination of claim 5, wherein said unit includes a collar journaled on said shaft and formed with an elongated slot extending circumferentially with respect thereto, there being a pin in said shaft projecting into said slot to form said lost motion connection, said slot and pin cooperating to permit said guide member and throttle valve lever to move freely with respect to said shaft for a predetermined distance before said guide member and said shaft are interconnected for rotary movement together, whereby the advancement of the spark can begin before said throttle valve begins to open.

7. The combination defined in claim 5, further including means defining first and second shaped guide paths 15a and 15b on said guide member for determining the position of said roller, said guide paths respectively corresponding to retarded and advanced spark, said roller engaging at least one of said guide paths in dependence on the position of said guide member.

8. The combination of claim 1, including a carburetor throttle valve, a throttle valve control lever, connected to the accelerator pedal for movement therewith, a shaped guide member, a shaft for said throttle valve, said lever and guide member together forming a unit rotatably carried by said shaft and having a lost motion connection therewith to rotate said shaft responsive to continued movement of the accelerator pedal, a roller engaging said guide member and moved when said guide moves, and a spark timing control member connected to said roller for moving said vacuum box in dependence on the position of said roller as determined by said guide member, and resilient means for holding said guide member in the retarded spark position, said roller engaging said first guide path when said throttle valve is closed and the accelerator pedal is not depressed.

9. The combination of claim 1, including resilient means for biasing said vacuum box to its retarded spark position.

10. The combination of claim 5, including first and second shaped guide paths in and governed by said guide member for determining the position of said roller, said guide paths respectively corresponding to retarded and advanced spark, said roller engaging at least one of said guide paths in dependence on the position of said guide member, and a transition path between said first and second guide paths for determining the time, with respect to the beginning of the opening of the throttle valve, and the speed at which the distributor timing is changed between retarded and advanced spark.

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