

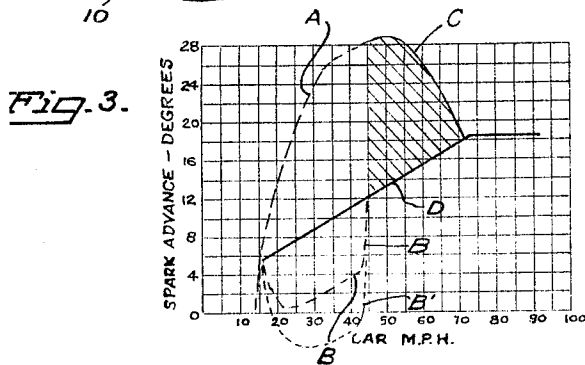
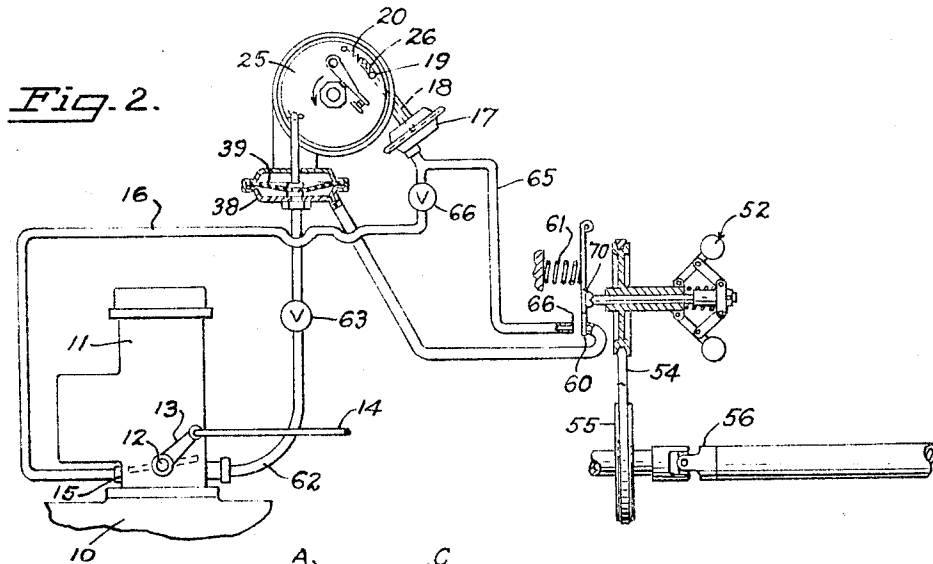
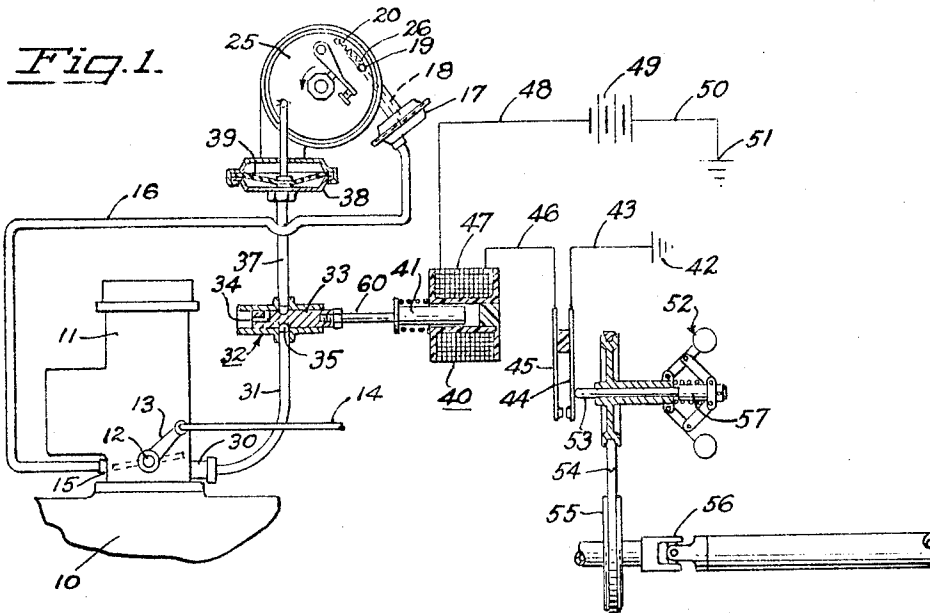
Sept. 13, 1966

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3,272,191

ENGINE SPARK CONTROL FOR REDUCING SMOG

Filed March 4, 1965



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ENGINE SPARK CONTROL FOR REDUCING SMOG

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Filed Mar. 4, 1965, Ser. No. 445,815
14 Claims. (Cl. 123—117)

This application is a continuation-in-part of my prior filed copending application entitled, "Engine Spark Control," Serial No. 219,473, filed August 27, 1962 and now abandoned.

This invention relates to spark control means for an engine such as used to propel a motor vehicle and more particularly to a spark control for reducing smog.

A spark control that partially retards the spark at idle operation and at low speed cruises will result in lower unburned hydrocarbon emissions from the exhaust than if the spark were advanced for best power output or were advanced as is customary on many vehicles produced in the United States today. Such a spark control would produce a great deal less of the smog producing unburned hydrocarbons at the exhaust of the vehicle.

According to one form of this information a spark retard is controlled by a speed sensitive device driven by the engine drive train from the engine to the rear wheels so the speed sensitive device is sensitive to vehicle road speed as opposed to engine speed.

According to a second embodiment of the invention the circuit interruptor such as the breaker plate in the motor distributor is retarded at idle condition or at low motor speed by enabling a spark retard mechanism and simultaneously disabling a spark advance mechanism. At higher vehicle speeds the spark retard mechanism is disabled and the spark advance means is enabled to provide normal spark advance above a predetermined road speed.

In both of the embodiments of this invention the retardation of the spark during idle provides faster engine warmup, this being highly beneficial, especially in vehicles with heaters.

It is an object of this invention to provide a vehicle speed controlled spark advance and retard device.

It is a further object of this invention to provide a vehicle speed controlled smog reducing device.

It is a still further object of this invention to provide a vehicle speed controlled device for decreasing engine warmup time.

Another object of this invention is to provide a means to retard the breaker plate in a vehicle motor distributor at low or no vehicle speeds and return it to normal advance above a predetermined road speed.

Another object of this invention is to accomplish this spark control by power from the engine manifold suction.

Still another object of this invention is to control the suction that controls the special spark control by a speed sensitive control for a bleed valve in the line to the suction control of the spark control.

Yet another object of this invention is to provide a speed sensitive control of a solenoid that controls the power that operates the special spark timing control.

Still another object of this invention is to provide automatic retarding of the engine spark at no or low vehicle speeds compared to current spark advances at these speeds to achieve a reduction in the unburned hydrocarbon emissions in the exhaust and automatically return the spark advance to normal beyond such vehicle speeds.

Still another object of this invention is to provide means to cut out the vacuum carburetor spark advance mechanism.

Yet another object of this invention is to power said special spark advance by a mechanism such as by intake vacuum so that such special retard device is inactive at

full or almost full throttle operations for good full power at low speeds or all speeds with full or almost full open throttle.

Other features of this invention will be pointed out in the accompanying specification and claims.

I have illustrated two specific embodiments of my invention, which are provided by way of example and not of limitation, in the accompanying drawings in which:

FIG. 1 is a side elevation partly cut away showing a portion of an engine and one form of the invention partly schematic;

FIG. 2 is similar to FIG. 1 but showing another form of the invention; and

FIG. 3 is a graph showing one type of spark advance that may be accomplished with this invention.

In all figures like numerals of reference refer to corresponding parts.

In FIG. 1 I have shown an engine 10, a carburetor 11 having a throttle shaft 12, a throttle control arm 13 and a throttle rod 14. A carburetor vacuum advance port 15 is connected by line 16 to carburetor spark advance diaphragm 17 in the usual manner such as explained in Glenn's New Auto Repair Manual, page 360, paragraphs 4-156 and 4-157.

Carburetor vacuum advance diaphragm unit 17 is connected to control rod 18 which has a turned end 19 that rides in slot 26 of breaker plate 25. Spring 20 is attached to turned end 19 and to breaker plate 25 to urge plate 25 to move clockwise so that turned end 19 rides against the end of slot 26 nearest the anchoring of spring 20 to plate 25 (clockwise as viewed in FIG. 1).

Port 30 is located below the throttle butterfly that is carried on throttle shaft 12 and connected to tube 31. Tube 31 connects to solenoid actuated valve 32. Solenoid 40 is actuated above a predetermined road speed by governor 52 closing contact on switch arms 44 and 45 to complete the circuit from ground 51 through wire 50, battery 49, wire 48, solenoid coil 47, wire 46, arm and contact 45, contact and arm 44, wire 43 to ground 42. As the vehicle speed increases collar 57 prevents governor pin 53 from moving much past contact closing position. Governor 52 is driven by belt 54 from pulley 55 on a vehicle speed sensing means such as drive train 56 from the engine to the rear axle and wheels not shown.

When the solenoid 40 is not energized, as shown in FIG. 1, plunger 41, shaft 60, and valve plunger 33 are in the position shown with groove 35 connecting tube 37 to tube 31 so that retard diaphragm mechanism 38 is energized, moving breaker plate 25 counterclockwise. When solenoid 40 is energized at speeds above a predetermined level, port 34 aligns with line 37 to vent it to atmosphere so that spring 20 can advance breaker plate 25 so that turned end 19 rides against the end of slot 26 nearest the anchoring of spring 20 to plate 25. The governor 52 could be driven by the engine if the special spark retard control was desired at low engine speeds rather than at low car speeds. The retardation of the spark at low car speeds also provides faster engine warmup.

In FIG. 2 the governor controls a bleed valve 60 that is urged to open position by spring 61 and connected to special spark control diaphragm 39 in housing 38 so as to effect the spark timing as described in FIG. 1. When the car speed is below a predetermined limit, the governor 52 closes bleed valve 60 and engine vacuum pulls diaphragm 39 to the position shown in FIG. 2 for more retard (less advance) than normal. When the car speed is above said predetermined limit, the governor 52 opens bleed valve 60 and due to the limit on the flow of engine suction from the intake manifold through pipe 62 past metering valve 63 to diaphragm 39 in housing 38, the diaphragm 39 will be subject to atmospheric pressure on both sides

and spring 20 will return breaker plate to normal with end 19 against the end of slot 26 nearest the anchoring of spring 20 to return breaker plate 25 to normal spark advance above such speed.

FIG. 2 also shows a further control which may be desirable, wherein a bleed line 65 connects to a bleed valve 66 operated by governor 52 but open to bleed carburetor advance diaphragm mechanism 17 at low speeds and have it operate normally when special diaphragm 39 is bled by valve 60. Metering valve 63 might be necessary to limit the dilution of the manifold mixture during bleeding by valve 66. This control would prevent carburetor advance mechanism 17 from bucking special retard mechanism 38 at low speeds. Spring 61 urges follower 70 towards the governor but is easily overcome by the governor action. Advance mechanism 17 may employ the usual spring to buck the suction for proper advance control.

FIG. 3 shows a curve of one form to spark advance or control that could be obtained from this invention. Dotted curve A and C is a normal spark advance curve (see paragraph 4-157, page 360, Glenn's New Auto Repair Manual) as obtained by a governor (not shown below the breaker cam 70) which gives the inclined line D and the carburetor spark advance above line D. With this device the spark advance could be line B and C with the line B being the better burning control for less smog producing exhaust and the line C for better top performance when exhaust produced smog is not too bad. Advance B' might be used if more retard at lower speeds is desired by greater action of diaphragm 39. The transition from normal advance to low speed retard could be at much lower speeds if desired.

I have illustrated my invention in these various forms; however, many other variations may be possible within the scope of this invention.

To those skilled in the art to which this invention relates many changes in construction and widely differing embodiments and applications of the invention will suggest themselves without departing from the spirit and scope of the invention. The disclosures and descriptions herein are purely illustrative and are not intended to be in any sense limiting.

What I claim is:

1. In an engine having a fuel supply system, an intake manifold, a spark distributor, spark advance means for acting on said distributor and actuated by suction from said intake manifold to advance the spark when said suction is applied, spark retard means for acting on said distributor and actuated by said suction from said intake manifold to retard the spark when said suction is applied, the combination therewith of a speed-sensing engine-driven governor and first and second governor-controlled valves, said first valve controlling the application of said suction to said spark advance means, and second valve controlling the application of said suction to said spark retard means, said governor controlling said valves to provide substantially full intake manifold suction to the said spark advance means at high governor speeds, and at the same time to provide substantially no suction on said spark retard means, said governor acting on said valves at lower governor speeds to provide higher suction to said spark retard means than to said spark advance means.

2. The combination of claim 1 in which said valves are bleed valves that open to bleed the suction to atmosphere and close to apply said suction to their respective spark advance and retard means.

3. In an internal combustion engine having a carburetor air intake manifold, a spark ignition, distributor, a current interrupter mounted on a partially rotatable plate in said distributor and a first motor with a movable wall, suction from said intake manifold operating said first motor, the improvement comprising first valve means for controlling said suction from said intake manifold to said first motor, said first valve means controlling said

suction so that said first motor retards said current interrupter more than normal when said first valve is in position to apply high suction to said motor, a second motor operated by suction developed between said carburetor and said engine, second valve means for controlling said suction to said second motor, said second motor rotating said current interrupter to a spark advanced position when high suction is applied to said second motor, said first valve for controlling suction to said first motor being interconnected to the control means for the suction to said second motor whereby when said second motor is being actuated by engine developed suction to advance said spark said first motor is cut off from engine developed suction to power said first motor and speed responsive means for operating said valves.

4. A device as defined in claim 3 in which said current interrupter is a breaker plate.

5. In an internal combustion engine having a carburetor air intake manifold, a spark ignition, distributor, a current interrupter mounted on a partially rotatable plate in said distributor and a first motor with a movable wall, suction from said intake manifold operating said motor, the improvement comprising valve means for controlling said suction from said intake manifold to said first motor, said valve means controlling said suction so that said first motor retards said current interrupter more than normal when said valve is in position to apply high suction to said first motor, a second motor operated by suction developed between said carburetor and said engine, said second motor rotating said current interrupter to a spark advanced position when high suction is applied to said second motor and drive shaft speed responsive means for operating said valve.

6. A device as defined in claim 5 wherein said circuit interrupter is a breaker plate.

7. An internal combustion engine for a motor vehicle having a drive shaft, an ignition system including a vacuum controlled spark advance means, a vacuum controlled spark retard means, a drive shaft speed sensing device, a valve controlled by said drive shaft speed sensing device for applying high engine developed suction to said retard device at predetermined low drive speeds to retard said spark advance means, said valve applying high suction to said retard device at a wide range of engine speeds while said engine is idling and said vehicle is stationary.

8. A device as defined in claim 7 in which the control of engine developed suction to said spark retard means includes a first bleed valve operated by said speed sensing device.

9. A device as defined in claim 8 further including a second bleed valve also operated by said speed sensing device so arranged that when said first bleed valve is open said second bleed valve is closed and vice versa so that engine suction is applied to said spark retard means when said speed sensing device is driven at a low speed and applying substantially no suction to said spark advance means, when said speed sensing device is driven at high speeds said engine suction is applied to said spark advance means and substantially no engine suction is applied to said spark retard means.

10. An internal combustion engine for a motor vehicle having an ignition system including a vacuum controlled spark advance means, a vacuum controlled spark retard means, a speed sensing device, a valve controlled by said speed sensing device for applying high engine developed suction to said retard device at predetermined low speeds to retard said spark advance means and for then applying high engine suction to said spark advance means at predetermined high speeds, said valve applying high suction to said retard device at predetermined speeds while said engine is idling and said vehicle is stationary.

11. A device as defined in claim 10 in which the control of engine developed suction to said spark retard

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means includes a first bleed valve operated by said speed sensing device.

12. A device as defined in claim 11 further including a second bleed valve also operated by said speed sensing device so arranged that when said first bleed valve is open said second bleed valve is closed and vice versa so that engine suction is applied to said spark retard means when said speed sensing device is driven at a low speed and applying substantially no suction to said spark advance means, when said speed sensing device is driven at high speeds said engine suction is applied to said spark advance means and substantially no engine suction is applied to said spark retard means.

13. An internal combustion engine for a motor vehicle having an ignition system including a vacuum controlled spark advance means, a vacuum controlled spark retard means, a drive shaft driven by said engine, means for sensing the speed of rotation of said drive shaft, a valve controlled by said speed sensing means for applying high engine developed suction to said retard device at predetermined low drive shaft speeds to retard said spark advance means, said valve applying high suction to said retard device at various engine speeds while said vehicle is stationary.

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14. An internal combustion engine for a motor vehicle having an ignition system including a vacuum controlled spark advance means, a vacuum controlled spark retard means, a drive shaft driven by said engine, means for sensing the speed of rotation of said drive shaft, a valve controlled by said speed sensing means for applying high engine developed suction to said retard device at predetermined low drive shaft speeds to retard said spark advance means and for then applying high engine suction to said spark advance means at predetermined drive shaft speeds, said valve applying high suction to said retard device at various engine speeds while said vehicle is stationary.

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