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THERMAL SPARK RETARD

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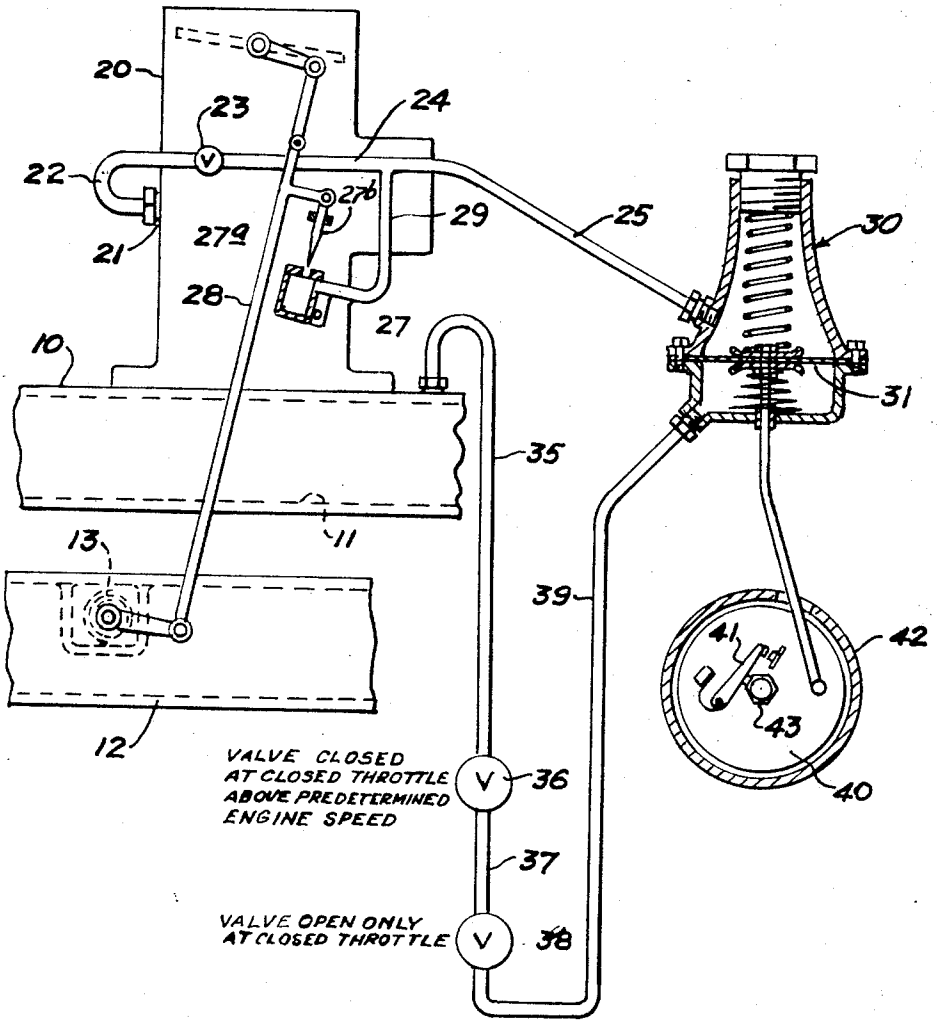

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THERMAL SPARK RETARD

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Continuation of application Ser. No. 503,035, Oct. 23, 1965. This application Oct. 5, 1967, Ser. No. 673,234
Int. Cl. F02p 5/10; F02m 7/00
U.S. Cl. 123—117 6 Claims

ABSTRACT OF THE DISCLOSURE

A device for retarding the spark of internal combustion engines by a thermostatic operated valve to vary the vacuum operated advance until the engine is warmed.

This is a continuation of application Ser. No. 503,035 filed Oct. 23, 1965, now abandoned.

This invention pertains to a device for retarding the spark of internal combustion engines for faster warm up, the retard to operate when the thermostat that operates the choke is holding the choke in a full or partial choke position.

Another feature is to vary the spark retard from cutting out the vacuum advance almost completely when the engine is cold enough for the thermostat to give a full choke to cutting out part of the vacuum advance at part choke.

Another feature is use of a tapered needle bleed valve in the circuit to the vacuum advance combined with a limited rate of flow of "vacuum" or suction from the intake manifold or carburetor tap to the diaphragm that controls the vacuum advance and the control of said needle bleed by the thermostat that operates the carburetor choke to reduce or eliminate the vacuum controlled spark advance when the thermostat is choking the cold engine and gradually returning the spark to full vacuum advance operation as the engine warms up and no choke is needed.

This retard, when the engine is cold, speeds up the warming up of the engine and reduces the unburned hydrocarbons during the warm up period.

The use of the thermostat that operates the carburetor choke to also operate the reduction or elimination of the vacuum advance effects an economy over using another heat sensor or thermostat for the spark control.

The advantages to this spark retard when the engine is cold is a faster warm up, reduced unburned hydrocarbons, reduced time the choke is needed, saving of fuel, less crankcase dilution due to reduced choking and reduced warm up time, faster warm up of car heater, etc.

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

I have illustrated my invention in the accompanying drawings, in which:

The figure is a side view partly in section and partly diagrammatic showing one form of the invention.

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

Carburetor **20** has port **21** which is connected to line **22** which leads to suction operated spark advance or retard device **30** through flow rate control valve **23**, tube **24**, tube **25**, substantially as is used conventionally except for valve **23**, all of which is described in Glenn's Auto Repair Manual, 1962 Edition, page 360 (a copy of which is included).

Bleed or selector valve **27** is connected between line **24** and line **25** by line **29**. Bleed needle **27***b* is operated by the motion of choke control rod **28** by thermostat **13** in

exhaust manifold **12** so that the orifice **27***a* is open when the choke **15** is closed and gradually closed as the choke **15** is opened.

Valve **27** when open renders the suction controlled side of spark advance mechanism **30** (the upper side of diaphragm **31**), as viewed in the figure inoperative and therefore retards the spark compared to normal while the engine is warming up for quicker warm up, less unburned hydrocarbons in the exhaust, and quicker car heater warm up. An idle engine retard may be used by passing the suction of intake manifold **10** through line **35** to valve **36** which is closed when the suction is above the idle suction to shut off or bleed the suction to the lower side of diaphragm **31** of device **30** when decelerating above a predetermined setting. From valve **36** suction passes through valve **38** which is opened when the throttle is closed or after the throttle is closed, as shown in my co-pending patent application Ser. No. 492,498 entitled "Engine Spark Control."

From valve **38** suction flows through line **39** to the under side of diaphragm **31** to give a retard to breaker plate **40** (which supports breaker arm **41** in the conventional manner) when high engine suction is applied to the under side of diaphragm **31**. This high suction and the retard by device **30** is effective when the engine is idling at closer or idle throttle setting but not when decelerating at higher engine speeds if valve **36** is used. If it is desirable to have the retard during decelerations to reduce brake fight or reduce unburned hydrocarbons or for other reasons, valve **36** may be left out and valve **38** only may control, in which case suction on the lower side of diaphragm **31** and retard of breaker plate **40** will result whenever valve **38** is open as when the throttle is closed or the control mechanism moves beyond the throttle closed position, all as described in my co-pending patent application Ser. No. 492,498, entitled "Engine Spark Control." Breaker plate **40** is mounted in distributor mechanism **42** in the conventional manner. Cam **43** may be driven by a governor advance mechanism (not shown) in a conventional manner.

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 description herein are purely illustrative and are not intended to be in any sense limiting.

I claim:

1. An internal combustion engine comprising at least one cylinder, an intake manifold and an exhaust manifold connected to said cylinder, and a carburetor for supplying fuel to said cylinder through said intake manifold, means for spark igniting the fuel in each cylinder, and means for varying the timing of the spark, said timing means comprising a suction operated motor, conduit means for connecting said motor to a suction source and atmosphere, and heat responsive means for gradually selectively connecting said conduit means to said suction source or atmosphere in accordance with the temperature of a component of said engine, said heat responsive means comprising a thermostat in the exhaust manifold and a valve connected without lost motion to the thermostat.

2. A device as defined in claim **1** wherein said heat responsive means comprises a temperature sensing motor and a valve connected thereto for producing operation of said suction operated motor to provide less suction operated spark advance with a cold motor than with a fully warmed up motor.

3. A device as defined in claim 1 wherein the component is the exhaust manifold.

4. An internal combustion engine comprising at least one cylinder, an intake manifold and an exhaust manifold connected to said cylinder, and a carburetor for supplying fuel to said cylinder through said intake manifold, means for spark igniting the fuel in each cylinder, and means for varying the timing of the spark, said timing means comprising a suction source and atmosphere, and heat responsive means for gradually selectively connecting said conduit means to said suction source or atmosphere in accordance with the temperature of a component of said engine, a choke valve, said heat responsive means comprising a thermostat and a selector valve connected thereto, and means connecting the choke valve and selector valve for concurrent movement by the thermostat whereby opening movement of the choke valve is concurrent with the closing movement of the selector valve.

5. A device as defined in claim 4 wherein said suction motor comprises a housing and a diaphragm therein dividing the housing into separate chambers, means connecting said conduit means to one of the chambers, a second conduit means connecting the other of said chambers to said manifold, and valve means in said second conduit for closing said conduit at full throttle operation of the engine and opening said conduit at engine idle closed throttle.

6. A device as defined in claim 5 in which said second conduit is closed at closed throttle decelerations above a predetermined engine speed.

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U.S. Cl. X.R.

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