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ENGINE DEVICE FOR REDUCING UNBURNED HYDROCARBONS

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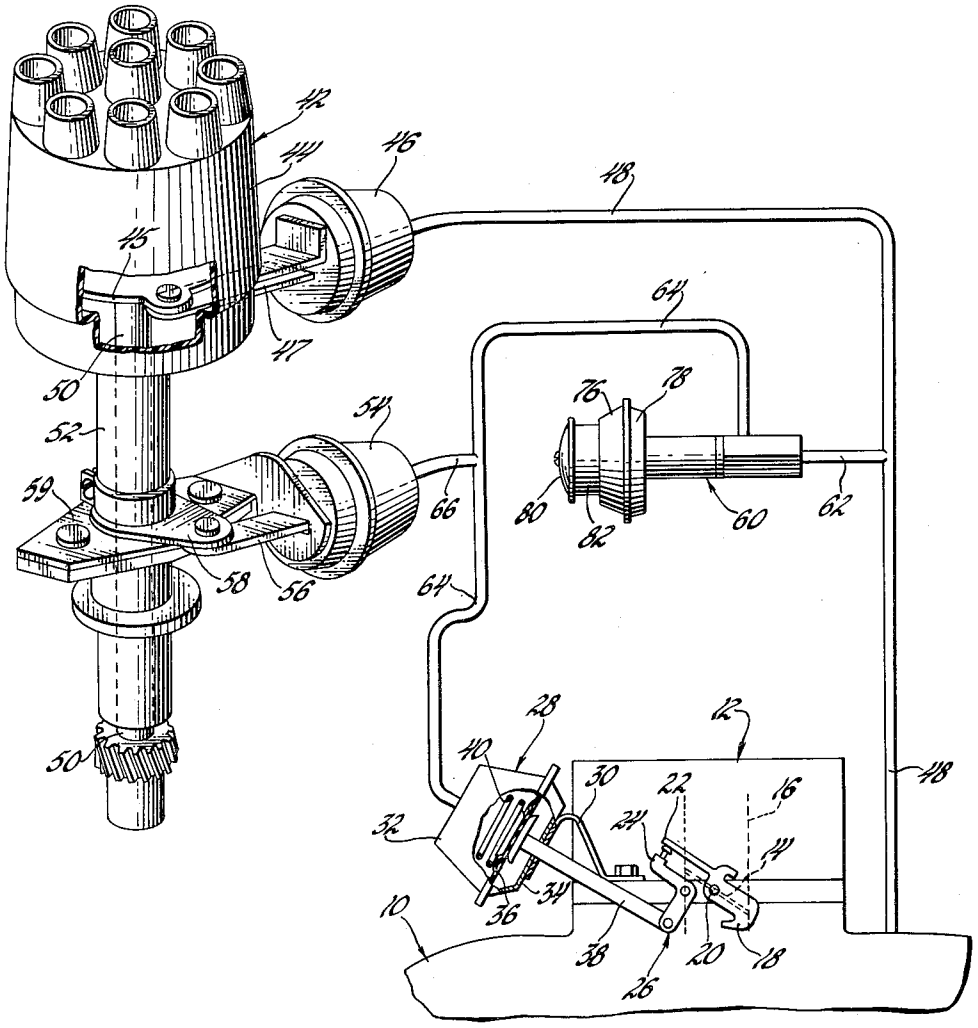


Fig. 1

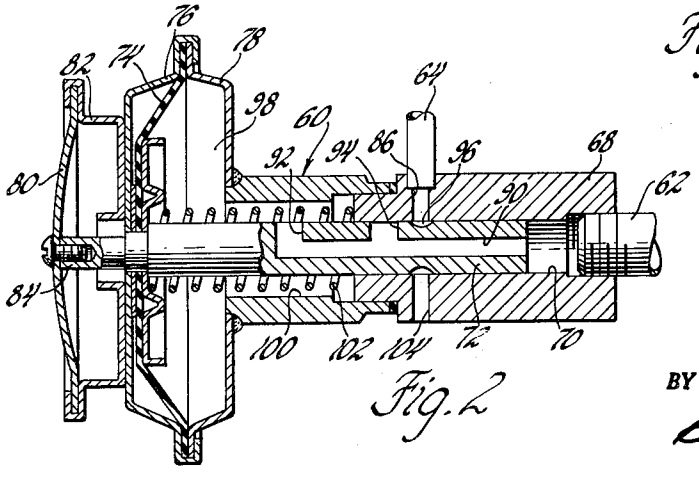


Fig. 2

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ENGINE DEVICE FOR REDUCING UNBURNED HYDROCARBONS

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The present invention relates to a charge forming device for an internal combustion engine constructed so as to considerably reduce the emission of unburned hydrocarbons from the engine. More specifically, the present invention relates to a mechanism which is designed to reduce unburned hydrocarbons during vehicle coasting operation.

It is well known in the automotive fuel systems art that during vehicle coasting conditions fuel continues to be drawn through the carburetor even though the throttle is closed and as a consequence unburned hydrocarbons are discharged through the vehicle exhaust system resulting in a contamination of the atmosphere. In the past, various types of mechanisms have been developed to overcome this emission of unburned fuels. The most common approach has been to provide means for positively cutting off the flow of fuel during coasting operation.

In general, coasting fuel shut-off devices have not proved to be commercially acceptable for several reasons, one of which has been the cost and complication of such devices. In addition, however, cutting off the flow of fuel during coasting operation has had a very definite operating disadvantage in that the carburetor fuel supply lines as well as the intake manifold are dried out during coasting operation. As a consequence, when the operator again desires to resume normal driving operation the engine has frequently stalled for want of fuel and a definite jerk or bump is felt in restarting of the engine.

In the present invention, when the vehicle is coasting, means is provided for slightly opening the throttle whereby sufficient air is admitted to the engine to maintain a combustible mixture in the combustion chamber, even in the presence of the high exhaust dilution which occurs under coasting conditions. In this way the fuel is compeltely combusted leaving the exhaust relatively free of unburned hydrocarbons. At the same time, means is provided for retarding the engine's spark so that the fuel-air mixture being burned during coasting does not contribute to the engine power output.

More specifically, the present invention includes a manifold vacuum responsive mechanism operatively connected to both the throttle and the engine spark distributor in such a way that under normal engine operating conditions the throttle is controlled by the operator and the distributor is controlled in its normal manner. However, under conditions of abnormally high manifold vacuum, as would occur during engine vehicle coasting conditions, the manifold vacuum responsive mechanism will be actuated to move the throttle to a slightly opened position and also to rotate the distributor to retard the spark.

The details as well as other objects and advantages of the present invention will be apparent from a perusal of the detailed description which follows:

In the drawings:

FIGURE 1 is a diagrammatic representation of the invention embodied on an engine; and

FIGURE 2 is an enlarged sectional view of the vacuum switch.

Referring to FIGURE 1, an engine intake manifold is indicated generally at **10** on which a carburetor **12** is

mounted to supply a combustible charge thereto. Carburetor **12** includes a throttle valve **14** rotatably disposed in induction passage **16** for controlling the quantity of combustible charge supplied to the intake manifold. A lever **18** is fixed to throttle shaft **20** and includes an extended portion **22** adapted to be engaged by one end **24** of a bellcrank lever **26** pivotally mounted on the carburetor casing.

A first servo device, indicated generally at **28**, is mounted on the carburetor casing through a suitable bracket **30**. The servo includes a pair of casing members **32** and **34** which coact to peripherally clamp a flexible diaphragm **36** therebetween. A rod **38** is centrally secured to diaphragm **36** while the other end of the rod is suitably articulated to lever **26**. A spring element **40** is disposed between casing **32** and diaphragm **36** and under normal operating conditions urges lever **26**, through diaphragm **36** and rod **38**, to a position not affecting the operation of throttle **14**.

An electrical spark distributor is indicated at **42**. Distributor **42** is of conventional design and includes a terminal housing **44** within which a breaker plate **45** is disposed for rotative adjustment relative to the housing to vary spark advance. Rotation of the breaker plate is controlled in the conventional manner by a servo device **46** articulated thereto through a link **47** and which device communicates through a conduit **48** with manifold **10**. In the normal manner, variations in manifold vacuum will be transmitted to servo device **46** which will in turn vary the spark advance. The spark will be retarded under conditions of low manifold vacuum and advanced under conditions of high vacuum.

The distributor rotor, not shown, is adapted to be driven by a camshaft driven shaft **50** which extends through a base member **52** into housing **44**. Housing or cap **44** is clamped to base **52** the latter which also supports breaker plate **45**.

A bracket or collar **59** is mounted on the engine block or other engine supporting part and supports servo device **54** to permit rotation of base **52**.

An additional servo device **54** is connected through a link **56** and a lever **58** fixed to base **52** to permit the base to be adjusted to vary spark advance independently of breaker plate controlling servo device **46**.

The actuation of servo devices **28** and **54** is controlled by vacuum switch device **60**. Switch **60** communicates through conduit **62** with manifold vacuum conduit **48** and, in turn, with servo devices **28** and **54** through conduits **64** and **66**. Referring to FIGURE 2, switch **60** includes a body **68** within the bore **70** of which a valve member **72** is slidably disposed. One end of valve member **72** is centrally secured to a flexible diaphragm **74** peripherally clamped between casings **76** and **78**. Casing **78** is suitably secured to valve body **68**. An overcenter spring **80** is mounted within a casing **82** fixed to casing **76**. Casing **82** is centrally apertured to permit a stud portion **84** to extend therethrough and be secured to spring **80**.

Conduits **62** and **64** respectively communicate with bore **70** and radial port **86** in valve body **68**. Valve member **72** includes an axial passage **90** having spaced radial ports **92** and **94**. An annular groove **96** is formed in member **72**. Radial port **92** continuously admits manifold vacuum to chamber **98** formed by diaphragm **74**, casing **78** and enlarged portion **100** of valve body **68**. Under normal engine operating conditions, spring **102** will bias diaphragm **74** and valve member **72** to the position shown in FIGURE 2 against the force of manifold vacuum acting on the diaphragm. In this position, annular groove **96** registers with port **86** venting servo de-

vices 28 and 54 to atmosphere through port 104 in body 68.

Under vehicle coasting conditions, however, manifold vacuum will increase sufficiently in chamber 98 to move diaphragm 74 and valve member 72 to the right against the force of spring 102. In this latter position, radial port 94 in valve member 72 registers with port 86 admitting manifold vacuum to conduit 64. Under these conditions, servo 28 moves throttle 14 to a slightly open position while servo 54 retards the distributor advance whereby any fuel drawn through carburetor 12 during coasting will be consumed without adding appreciably to the power output of the engine.

Overcenter spring 80 insures that valve member 72 will not hunt between the two positions in which port 86 is either communicated with the atmosphere or manifold vacuum.

We claim:

1. An internal combustion engine comprising an inlet manifold, a carburetor mounted on said manifold and adapted to supply a combustible mixture thereto, said carburetor including a rotatable throttle valve adapted to control the quantity of combustible mixture supplied to said manifold, a first servo device adapted to engage said throttle valve when said valve is in a closed position to move said valve to a partially open position, a spark distributor mechanism, a second servo device adapted to vary the spark advance of said spark distributor mechanism, a vacuum switch mechanism normally venting said first and second servo devices to atmosphere, a third servo device connected to said vacuum switch mechanism, conduit means communicating said third servo device with said inlet manifold whereby when manifold vacuum exceeds a predetermined value said third servo device will move said vacuum switch mechanism to admit manifold vacuum to said first and second servo devices causing said first servo device to partially open said throttle valve and said second servo device to retard said spark distributor mechanism spark advance.

2. An internal combution engine comprising an inlet manifold, a carburetor mounted on said manifold and adapted to supply a combustible mixture thereto, said carburetor including a rotatable throttle valve adapted to control the quantity of combustible mixture supplied to said manifold, a first servo device adapted to engage said throttle valve when said valve is in a closed position to move said valve to a partially open position, a lost motion connection between said first servo device and said throttle valve permitting said valve to be opened irrespective of the operation of said device, a spark distributor mechanism, a second servo device adapted to vary the spark advance of said distributor mechanism, a vacuum switch mechanism normally venting said first and second servo devices to atmosphere, a third servo device connected to said vacuum switch mechanism, conduit means communicating said third servo device with said inlet manifold whereby when manifold vacuum exceeds a predetermined value said third servo device will

move said vacuum switch mechanism to admit manifold vacuum to said first and second servo devices causing said first servo device to partially open said throttle valve and said second servo device to retard said distributor mechanism spark advance.

3. An internal combustion engine comprising an inlet manifold, a carburetor mounted on said manifold and adapted to supply a combustible mixture thereto, said carburetor including a throttle valve adapted to control the quantity of mixture supplied to said manifold, a first servo device adapted to operatively engage the throttle valve when said valve is in a closed position and to move said valve to a partially open position, an electrical spark distributor including a base, a terminal housing mounted on said base, and a breaker plate mounted on said base and rotatable relative thereto, a second servo device connected to said breaker plate and adapted to rotate said plate relative to said housing, first conduit means communicating said second servo device with said inlet manifold whereby manifold vacuum is adapted to act on said second device, a third servo device connected to said distributor base and adapted to adjustably rotate the same, and a vacuum switch including an adjustable valve member, a diaphragm connected to said member, second conduit means communicating said vacuum switch with said first and third servo devices, spring means normally biasing said valve member to a position communicating said second conduit means to atmosphere to render said first and third servo devices inoperative, additional conduit means communicating said vacuum switch diaphragm with said inlet manifold, manifold vacuum acting on said diaphragm being adapted to overcome said spring under certain operating conditions and move said valve member to a position communicating said additional conduit means with said second conduit means to render said first and third servo devices operative respectively to move said throttle valve to a partially open position and to retard the distributor spark.

4. An internal combustion engine as set forth in claim 3 in which a lost motion connection is provided between said first servo device and said throttle valve permitting said valve to be opened irrespective of the operation of said device.

5. An internal combustion engine as set forth in claim 1 which includes a fourth servo device operatively connected to the spark distributor mechanism to vary the spark advance thereof, and conduit means continuously communicating said fourth device with the inlet manifold.

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