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THROTTLE BLADE CONTROL MECHANISM FOR PREVENTING ENGINE DIESELING

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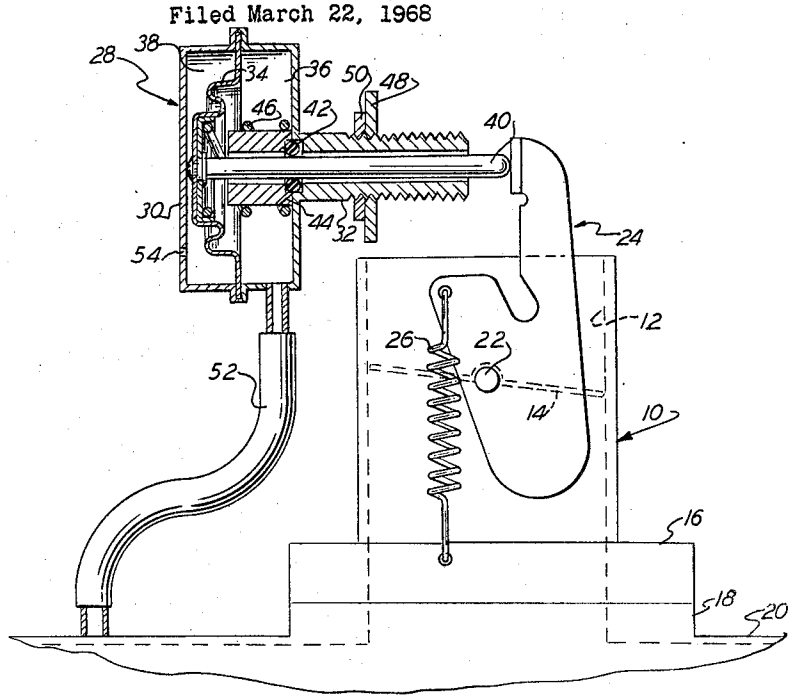


FIG. 1

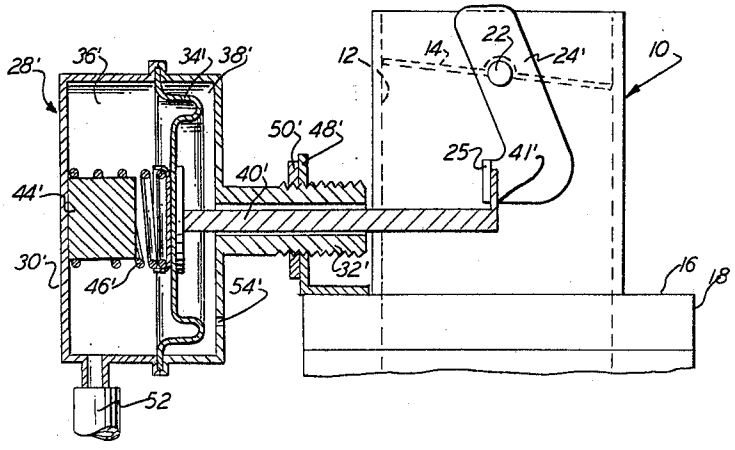


FIG. 2

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THROTTLE BLADE CONTROL MECHANISM FOR PREVENTING ENGINE DIESELING

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ABSTRACT OF THE DISCLOSURE

A control mechanism responsive to manifold pressure in the intake manifold positions the throttle blade in a partially open fast idling position when the engine is idling normally and permits the throttle blade to close completely when the engine ignition is shut off. The control mechanism also assists in engine starting and does not interfere with normal throttle blade operation even though manifold pressures might vary widely.

SUMMARY OF THE INVENTION

Numerous tests have demonstrated that adding additional air to the intake manifold of an internal combustion engine during deceleration considerably reduces the quantity of undesirable compounds in the engine exhaust. A wide variety of devices have been proposed to admit this additional air, but each of the devices added considerable expense to the engine. While some of the prior art devices acted directly on the throttle blade itself, each contained a complicated mechanism for closing the blade to its normal idling position during the latter phase of deceleration to achieve a normal engine idling speed of about 500–600 r.p.m.

It has now deen discovered that positioning the throttle blade where the engine would idle at about 800–900 r.p.m. reduces exhaust emissions during deceleration to an acceptable level. Such engines coupled with manual transmissions can idle at the higher r.p.m. without seriously objectionable operating characteristics except for a condition referred to as "dieseling." Dieseling is the tendency of the engine to continue operating after the ignition system has been turned off, and it is caused by the ignition of the additional air-fuel mixture admitted to the engine induction system by hot deposits in the engine cylinder or, in high compression engines, by the compression ignition characteristics of the mixture in the cylinders.

Dieseling has been prevented by connecting an electrical solenoid to the engine ignition system so the solenoid is actuated whenever the engine ignition system is turned off. The plunger of the solenoid is connected to the throttle blade so actuation of the solenoid more completely closes the throttle blade, thereby cutting off the air-fuel mixture and preventing continued operation. A timing device was included in the electrical circuit of the solenoid and turned off the solenoid after a short period of operation to prevent unnecessary loss of electrical energy. While this electrical system operated satisfactorily, it was far too expensive to become commercially acceptable.

The control means provided by this invention responds to intake manifold pressure to permit the throttle blade to close further whenever dieseling conditions are present, thereby reducing the amount of air-fuel mixture and halting any dieseling. In an internal combustion engine having a metering device such as a carburetor to the intake manifold, the control means of this invention comprises a movable stop adapted to position the throttle blade in an engine idling position or an engine stopping position whenever the conventional throttle closing means moves the throttle blade toward its closed position. A pressure responsive device that communicates with the intake manifold is connected to the stop and is arranged so the stop is moved to the engine idling position when manifold pressure in the intake manifold is relatively low and to the engine stopping position when the manifold pressure is relatively high. The stop is not directly connected to the throttle blade, and the throttle blade is positioned in the conventional manner during normal engine operation without any interference from the stop.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a schematic showing a sectional view of the control mechanism of this invention with the movable stop positioning the throttle blade in an engine stopping position. FIGURE 2 is an improved arrangement in which the control mechanism is a greatly simplified, completely sealed construction.

DETAILED DESCRIPTION

Referring to FIGURE 1, the lower part of a conventional carburetor is designated by numeral **10**. Carburetor **10** contains an induction passage **12**, and a conventional throttle blade **14** is mounted in induction passage **12**. A flange **16** at the lower end of carburetor **10** is fastened to a corresponding flange **18** on the intake manifold **20** of an internal combustion engine. Induction passage **12** accordingly communicates with the passage in intake manifold **20**.

Throttle blade **14** is fastened to a shaft **22** that is rotatably mounted in carburetor **10**. Shaft **22** projects outside of the carburetor where it is connected to a level **24**. A spring means **26** has one end anchored to flange **16** and the other connected to lever **24** and urges throttle blade **14** into a closed position.

A control mechanism **28** comprises a housing **30** connected to an externally threaded barrel **32**. Inside housing **30**, a flexible diaphragm **34** divides the housing interior into two chambers **36** and **38**. A rod **40** is connected to diaphragm **34** and extends through chamber **36** and barrel **32** to terminate a short distance outside of the end of barrel **32**. Rod **40** serves as the movable stop means. An O-ring **42** seals the space between rod **40** and housing **30**.

A positioning pad **44** is mounted concentrically with rod **40** within chamber **36**, and a compressive spring **46** located by pad **44** bears on diaphragm **34**. Barrel **32** is threaded into a bracket **48** fastened on carburetor body **10** by conventional means (not shown). A lock nut **50** is threaded on barrel **32** to prevent vibration from loosening the assembly. Chamber **36** is connected to the passage in the intake manifold by a short length of hose **52**, and chamber **38** is connected to atmosphere by a bleed port **54**.

FIGURE 1 operates in the following manner: When the engine is idling, the pressure in the intake manifold **20** is relatively low, with a typical value being a vacuum of about 16 inches of mercury. This vacuum is applied to chamber **36** via hose **52** where it overcomes the force of spring **46** and draws diaphragm **34** to the right, thereby moving rod **40** to the right. Rod **40** acts through lever **24** to hold throttle blade **14** open by a small amount sufficient to idle the engine at about 800–900 r.p.m.

When the ignition system of the engine is deactivated, the manifold pressure in intake manifold **20** rises to a vacuum of about 6–8 inches of mercury if the engine is dieseling, or to substantially atmospheric pressure if the engine has stopped all operation. Spring **46** overcomes the forces exerted on the diaphragm by manifold pressures greater than the vacuum produced by dieseling and moves diaphragm **34** to the left in FIGURE 1. Rod **40** then permits lever **24** to pivot a short distance counterclockwise, thereby positioning throttle blade **14** where the air-fuel mixture flowing through induction passage **12** is sub-

stantially halted. Without this air-fuel mixture, the engine is unable to continue dieseling.

Turning now to FIGURE 2, components which are the same as the components in FIGURE 1 are designated by the same numerals while the changed components are designated by primed versions of those numerals. On the carburetor itself, a projecting tab **25** is added to the lower side of the lever **24'**. The housing **30'** of control mechanism **28'** contains a diaphragm **34'** dividing the housing into two chambers **36'** and **38'** with chamber **36'** being located at the rear of the housing. Chamber **36'** is connected to the engine intake manifold by hose **52** and chamber **38'** communicates with the atmosphere through port **54'**.

An aligning pad **44'** is fastened to the rear wall of housing **28'**, and a compressive spring **46'** is located by pad **44'** and bears on diaphragm **34'**. A rod **40'** is fastened to the other side of diaphragm **34** and passes through chamber **38'** and barrel **32**. At its outer end, rod **40'** has a bent up tab **41'** adapted to contact tab **25**. Bracket **48'** fastens the control valve to the carburetor flange by any conventional fastening means.

The FIGURE 2 construction performs the same function as the FIGURE 1 construction in a more efficient manner. In FIGURE 2, when the engine is idling and the manifold pressure is low, diaphragm **34** is drawn to the left and tab **25** contacts tab **41'** in a slightly clockwise position of the throttle blade where engine idling at a relatively high speed results. When the engine ignition system is turned off, the manifold pressure rises toward atmospheric pressure and spring **46'** urges diaphragm **34'** and tab **41'** to the right so throttle blade **14** has substantially closed by the time tab **25** stops against tab **41'**.

The primary advantage of the FIGURE 2 construction lies in the fact that the seal around rod **30** is eliminated. Without this seal, the friction forces acting on the rod are greatly reduced and more accurate positioning can be accomplished.

During engine cranking, intake manifold pressure falls below a vacuum of 6" Hg and the force exerted on the diaphragm by this vacuum positions the stop means so the throttle blade is opened to the engine idling position. In this position, the throttle blade admits an additional fuel-air mixture that assists in starting most engines. If, on the other hand, engine characteristics dictate starting with the mixture from the idling jets only, the control mechanism can be calibrated to hold the throttle blade in the closed position during cranking and move the blade to the idling position when the engine starts.

Thus, this invention provides a control means responsive to intake manifold pressure that permits higher engine idling speeds while positively preventing engine dieseling. The control means performs a stopping function only and does not interfere with normal operation of the throttle blade even though such operation might produce manifold pressures above and below the actuating point of the control valve. In addition, the control means can be calibrated to assist in the engine starting operation.

What is claimed is:

1. In an internal combustion engine having a metering device connected to an intake manifold, said metering device having a throttle blade for controlling flow and throttle closing means for urging said throttle blade toward its closed position, a control means for positioning said throttle blade according to the manifold pressure within said intake manifold comprising

a movable stop means adapted to position said throttle blade in a partially open, engine idling position and a substantially closed engine stopping position when the throttle closing means moves the throttle blade toward its closed position and

a pressure responsive means including a housing and a flexible diaphragm defining one wall of a chamber in said housing, said chamber communicating with the intake manifold, said diaphragm being connected to said stop means, said pressure responsive means moving said stop means to said partially open, engine idling position when manifold pressure is relatively low and moving said stop means to said substantially closed engine stopping position when manifold pressure is relatively high to prevent dieseling of said engine.

2. The engine of claim **1** in which the pressure responsive means moves the stop means to the engine stopping position whenever manifold pressure rises above a vacuum of about 8 inches of mercury.

3. The engine of claim **2** in which the stop means comprises a member having a tab means at its outer end, said tab means contacting a tab operably connected to the throttle blade to stop movement of the throttle blade towards its closed position, said tab means permitting movement of the throttle blade to its substantially closed position when the intake manifold pressure is relatively high.

4. The engine of claim **3** in which the control means positions the throttle blade in an engine idling position during engine cranking.

5. The engine of claim **4** in which the housing includes a pad means for bearing against said diaphragm to limit movement of said diaphragm in one direction whereby said pad means determines the position of the stop means providing the partially open, engine idling position of the throttle blade.

6. The engine of claim **5** in which the housing is threadably mounted to said metering device whereby rotating said housing relative to said metering device changes the position of the stop means when movement of the diaphragm is limited by said pad.

7. The engine of claim **1** in which the housing includes a pad means for bearing against said diaphragm to limit movement of said diaphragm in one direction whereby said pad means determines the position of the stop means providing the partially open, engine idling position of the throttle blade.

8. The engine of claim **1** in which the housing is threadably mounted to said metering device whereby rotating said housing relative to said metering device changes the position of the stop means when movement of the diaphragm is limited by said pad.

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