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AIR INLET CONTROL MECHANISM

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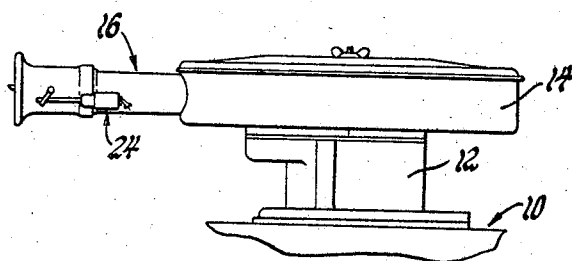


Fig. 1

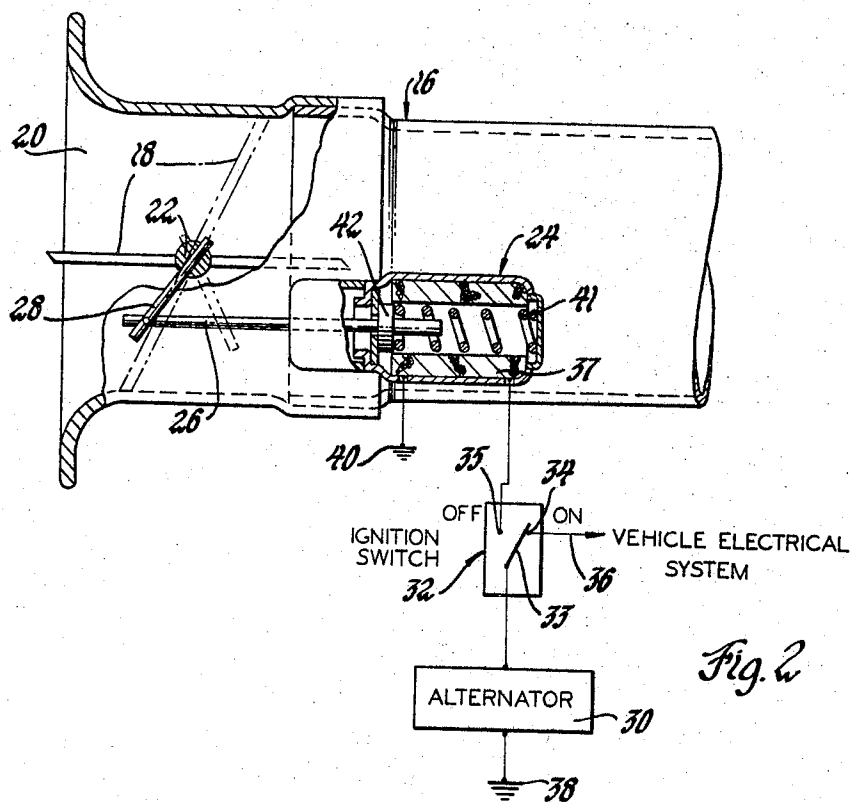


Fig. 2

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AIR INLET CONTROL MECHANISM

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5 Claims

ABSTRACT OF THE DISCLOSURE

An air inlet control mechanism for preventing dieseling in internal combustion engines wherein a solenoid, energized by the residual power supplied by the alternator after the ignition has been turned off, closes an air cleaner shutoff valve thereby stopping air flow to the engine.

Under various operating conditions, certain high compression internal combustion engines will experience auto-ignition or dieseling after the vehicle ignition has been turned off. This effect may be caused by a number of factors such as a high compression ratio, carbon deposits on the combustion chambers, high underhood temperatures, high ambient temperatures, as well as other conditions that have not, as yet, been completely understood. In an attempt to eliminate this problem, certain devices have been proposed in the prior art wherein the air inlet supply or the idling air supply is choked after the ignition has been turned off. However, these devices have primarily relied upon a solenoid, continuously energized while the vehicle is in operation, which, in the deenergized state, biases the valve member to the closed position. Should a failure occur in the solenoid, wiring or contacts of such a device while the engine is being operated, the excessively rich fuel mixture obtained from the carburetor after the air supply has been closed produces a "flooded" condition that results in a stalling of the engine. Alternatively, in devices where the control device regulates the air supply in an auxiliary duct, idling operation of the engine is impaired until the system defect is corrected.

The present invention overcomes the above-mentioned problems by providing a simple, fail-safe arrangement wherein a solenoid, operatively connected to a valve member in the snorkle of the air cleaner, is in the unenergized condition when the engine is in operation or at rest. The solenoid, electrically connected to the generator or alternator of the vehicle only when the ignition switch is in the "off" position, is electrically powered by the residual energy from the alternator to move the valve member to the closed position thereby shutting off the engine air supply, which, in turn, effectively eliminates dieseling of the engine. Because the solenoid is actuated only between the time the ignition switch is turned off and the engine comes to a rest, a relatively inexpensive solenoid can be used since only an intermittent operation for short periods of time is required.

Accordingly, the objects of this invention are: to provide an engine air inlet control mechanism which is activated after the ignition switch has been turned off so as to move a normally open valve member to the closed position thereby closing off the engine air supply and preventing autoignition to provide; an antidieseling device for an internal combustion engine wherein a solenoid, actuated during the time interval between the ignition switch being turned to the "off" position and the time the engine comes to rest, moves a normally open valve member in the snorkle of the air cleaner to a closed position thereby shutting off the engine air supply and preventing autoignition in the engine; and to provide an air inlet control device wherein the vehicle alternator is

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electrically connected to a solenoid when the ignition switch is in the "off" position such that the solenoid is energized to move a valve member contained in the snorkle of the vehicle air cleaner to a closed position thereby choking off the air supply and preventing continued operation under a dieseling condition.

These and other objects will be apparent to one skilled in the art upon reading the following detailed description, reference being made to the accompanying drawings in which:

FIGURE 1 is a partial side elevational view of a motor vehicle engine having an air cleaner and silencer assembly incorporating the present invention; and

FIGURE 2 is an enlarged partial cross-sectional view showing the solenoid operated valving mechanism on the snorkle of the air cleaner assembly shown in FIGURE 1 and the electrical system required for its operation.

Referring to FIGURE 1, the reference numeral 10 designates a conventional internal combustion engine adapted to drive a suitable motor vehicle, not shown, and includes a carburetor supporting the usual air cleaner and silencer assembly 14 which includes an air inlet snorkle 16. Also, it will be understood that, while not specifically shown, the engine 10 is combined with a conventional electrical system including an ignition system and an engine driven battery charging device such as a generator or an alternator.

Referring to FIGURE 2, the air inlet snorkle 16 includes a butterfly valve member 18 rotatably supported within the air supply duct 20 by a pivot shaft 22, and a conventional solenoid 24 operatively connected to the valve member 18 by means of a reciprocable rod 26 and a lever 28. The solenoid 24 is adapted to be electrically connected to an engine driven alternator 30 through a conventional vehicle key-operated ignition switch 32 having a switch member 33 selectively engageable with spaced contact members 34 and 35, respectively, identified as the engine "on" and "off" positions. During periods when the ignition switch 32 is in the "on" position established by switch member 33 engaging contact 34, a dynamoelectric machine such as the alternator 30 supplies electrical energy to the conventional vehicle electrical system generally indicated at 36. While a direct current generator may be successfully used in the present invention, the preferred embodiment utilizes an alternating current generator of the types shown and described in Redick 3,219,860, Colvill 3,244,900 or Brown 3,252,025, all of which are assigned to the assignee of the present invention.

When the ignition switch 32 is in the "off" position, the alternator 30 is electrically connected to the coil 37 of the solenoid 24 through the following circuit: ground 38; alternator 30; switch 32; coil 37; ground 40. Preferably, the switch 32 is electrically connected to the alternator 30 at a point between the silicone diode rectifiers. In the unenergized state, a coiled spring 41, compressively contained within the core of the solenoid 24, engages the armature 42, which is rigid with the rod 26, and biases the valve member 18 to a normally open position as shown in full lines.

The above system is designed to operate after the ignition switch 32 has been turned off and until the engine and alternator come to rest. In operation, after the ignition switch 32 has been turned to the "off" position, there is sufficient residual magnetism remaining in the alternator 30 such that a residual power producing capacity will be maintained until the engine and the alternator have come to rest. In other words, after the engine 10 has been turned off, the output of the alternator 30 will decay to zero from its operation output as the engine comes to rest. The solenoid 24 should be selected so that it is energized under the above conditions and has

sufficient strength to permit the armature 42 to overcome the biasing of spring 41 and move the valve member 18 to the illustrated phantom line closed position. It will be appreciated that, inasmuch as the air supply to the carburetor 12 is choked off, the engine 10 will come to rest without experiencing dieseling or autoigniting operation. When the engine 10 has come to rest, the alternator 30 ceases the supply of energy to operate the solenoid 24 and the spring 41 returns the armature 42, and accordingly the valve member 18, to the normally open position.

Thus, it will be seen that the required operation for the solenoid 24 is highly intermittent and only for short periods of time thereby permitting the use of a relatively inexpensive design. Additionally, because the engine air supply is completely choked off only when the solenoid 24 is energized, an effective and simple system is provided for eliminating the undesirable dieseling operation of the engine as well as providing a fail-safe system in the event that one of the component parts malfunctions.

It should also be mentioned that the present air inlet control mechanism will effectively prevent operation of the engine if the latter is started by circumventing the ignition switch 32 as is a common practice in car thievery. Once the engine is started in this manner, the alternator 30 energizes the solenoid 24 thereby closing the valve member 18. With the air supply duct 20 closed, an excessively rich fuel mixture is produced in the carburetor that floods and, subsequently, stalls the engine.

Since other changes and modifications will be apparent to one skilled in the art, the scope of the invention, as defined by the appended claims, is intended to cover such alterations of the illustrative embodiment.

What is claimed is:

1. An air inlet control mechanism for an internal combustion engine having an ignition system, a source of electrical power driven by the engine and an air inlet supply duct for the latter, comprising: a valve member in the air supply duct movable between an open position wherein the flow of air through said supply duct is substantially unobstructed and a closed position wherein the flow of air is prevented; means operatively connected to the valve member and adapted to be energized by said electrical power for moving the valve member to the closed position; and switch means associated with the ignition system for electrically connecting the source of electrical power to said first mentioned means to energize the latter when the ignition system is deenergized.

2. An air inlet control mechanism for an internal combustion engine having an ignition system, a source of electrical power driven by the engine and an air inlet supply duct, comprising: a valve member rotatably supported in the air supply duct, said valve member movable between an open position wherein the flow of air through said supply duct is substantially unobstructed and a closed position wherein the flow of air is prevented; spring means biasing the valve member toward the open position; electrical means adapted to be energized by residual electrical power generated by said source of electrical power, said electrical means operatively connected to the valve member and adapted upon energization to move the valve member to the closed position; and switch means associated with the ignition system for electrically connecting the source of electrical power to said electrical means when the ignition system is deenergized.

3. An air inlet control mechanism for an internal combustion engine having an ignition system, a generator driven by the engine and an air inlet supply passage for

the latter, comprising: a valve member in the air inlet supply passage movable between an open position wherein the flow of air through said supply duct is substantially unobstructed and a closed position wherein the flow of air is prevented; spring means biasing the valve member to the open position; a solenoid adapted to be energized by the decaying electrical power developed by the generator after the ignition system is deenergized while the engine is running and before the same has come to rest, said solenoid operatively connected to the valve member and adapted upon energization to move the valve member to the closed position, and switch means associated with the ignition system for electrically connecting the generator to the solenoid when the ignition system is deenergized.

4. An air inlet control mechanism for the air inlet supply passage of an internal combustion engine having an ignition system, an alternating current generator driven by the engine that develops a decaying electrical power after the ignition system is deenergized while the engine is running and before the latter has come to rest, said mechanism comprising: a valve rotatably supported in the air supply passage, said valve movable between an open position wherein the flow of air through said supply duct is substantially unobstructed and a closed position wherein the flow of air is prevented; spring means biasing the valve to the open position; a solenoid energized by the decaying electrical power developed by the alternating current generator and operatively connected to the valve for moving the valve to the closed position when energized; and manually operable switch means associated with the ignition system and including electrical contacts for electrically connecting the generator to the solenoid when the ignition system is deenergized.

5. An air inlet control mechanism for an internal combustion engine having an ignition system including a manually operable ignition switch, an alternating current generator driven by the engine that develops a decaying electrical power after the ignition system is deenergized while the engine is running and before the same has come to rest, and a carburetor provided with an air cleaner including an exterior air inlet supply passage, said control mechanism comprising: a valve rotatably supported in the air inlet supply passage, said valve movable between an open position wherein the flow of air through said supply duct is substantially unobstructed and a closed position wherein the flow of air is prevented; spring means biasing the valve to the open position; a solenoid energized by the decaying electrical power developed by the alternating current generator and operatively connected to the valve for moving the valve to the closed position when energized; and electrical contacts associated with the ignition switch for electrically connecting the generator to the solenoid when the ignition system is deenergized.

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