TEMPERATURE SENSITIVE ANTI-DIESELING CONTROL

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ABSTRACT

The engine carburetor has a manifold vacuum controlled servo that normally prevents return of the carburetor throttle valve to a position more closed than a normal engine idle speed position; the servo, however, being rendered inoperative when the engine operating temperature exceeds a predetermined level so that the throttle valve can be closed; and, an engine temperature sensitive device moving above the predetermined temperature level to direct manifold vacuum to the spark ignition system to advance the same and increase engine idle speed, closing of the throttle valve by the servo compensating for and balancing the increase in engine idle speed by the spark advance mechanism to provide essentially a constant engine idle speed regardless of temperature changes to prevent engine dieseling upon engine shutdown.

1 Claim, 1 Drawing Figure
TEMPERATURE SENSITIVE ANTI-DIESELING CONTROL

This invention relates in general to an engine anti-dieseling control.

Present passenger car engines generally have some kind of device sensitive to engine operating temperatures that will advance the ignition timing when the operating temperature exceeds a predetermined level. Advancing the spark causes the engine to run more efficiently, for example, by shortening the combustion period and providing less heat rejection to the engine cooling system. This results in a reduction of the operating temperature to the desired level. The advanced spark also results in an increased engine idle speed for the same idle speed setting of the carburetor throttle valve.

Devices are also known for controlling the return position of the carburetor throttle valve and operative upon engine shutdown to permit closing of the throttle valve to reduce the quantity of air/fuel mixture to the engine to prevent dieseling.

In engines where the temperature responsive valve and the throttle positioner device are combined, the increased engine idle speed as a result of the operating temperature rising above the desired level acts to counteract the results desired by use of the throttle positioner. That is, when the engine is shut off, the now increased idling speed causes a longer rotation of the engine crankshaft prior to coming to rest, and a larger vacuum signal on the carburetor idle system sufficient to draw larger quantities of fuel/air mixture into the engine. This quantity may be sufficient to cause dieseling or afterrun of the engine.

The invention is directed to an engine anti-dieseling control in which the carburetor throttle valve is moved to a closed position from its normal idle speed position when the ignition system is advanced as a result of a rise in the engine operating temperature above the desired level, the closing of the throttle valve reducing the engine idle speed to its normal former level, thereby preventing dieseling of the engine upon engine shutdown.

Another object of the invention is to provide an engine anti-dieseling control including a manifold vacuum controlled servo normally restricting return movement of the carburetor throttle valve to a normal engine idle speed position, the servo being rendered inoperative and permitting closing of the throttle valve when the engine operating temperature rises above a desired level.

It is another object of the invention to provide an engine ignition timing control including an engine operating temperature sensitive valve that automatically advances the spark timing when the engine operating temperature exceeds a predetermined value, the temperature sensitive device also effecting closing of the carburetor throttle valve to reduce the idle speed by reducing the flow of fuel/air mixture to the engine, and thereby compensating for the increased idle speed that would normally exist due to the advanced spark.

Other objects, features and advantages of the invention will become more apparent upon reference to the succeeding detailed description thereof, and to the drawing illustrating a preferred embodiment thereof, wherein, the FIGURE illustrates schematically a cross sectional view of an engine ignition system embodying the invention.

The FIGURE shows a portion 10 of a downdraft carburetor of a known type. It includes the usual induction passage 12 open at its upper end 14 to air at ambient pressures that normally would be discharged from an air cleaner, not shown. At its lower end 16, the induction passage is adapted to be connected to the engine intake manifold, not shown, so as to subject passage 12 to manifold vacuum changes in a known manner. The passage 12 contains the usual fixed area venturi 18 and a throttle valve 20 fixed on a shaft 22 rotatably mounted in the walls of the carburetor.

The carburetor includes the usual idling system fuel/air channel 24. It is open at its upper end to the air horn section of the carburetor, and discharges at its lower end 26 into the induction passage past an adjustable needle valve 28. The idle system contains the usual transfer slot 30, the lower edge of which in this case is adapted to be aligned with the edge of the throttle valve plate 20 when the latter is in its closed position shown. The dotted line position 32 indicates the normal engine idle speed position of the throttle valve plate in which the transfer port then straddles the edge so as to increase the vacuum signal in the engine idle speed channel in a known manner.

Further details of construction and operation of the carburetor per se are not given since they are known and believed to be unnecessary for an understanding of the invention. Suffice it to say that the carburetor is calibrated to provide normal engine idling speed with the throttle valve positioned in the dotted line position 32. When the throttle valve is moved to the closed full line position, by means to be described, the decreased area of the transfer port slot reduces the vacuum signal acting on the idle channel fuel/air mixture to a point where the flow is ineffective to support combustion upon engine shutdown, thus preventing engine dieseling.

The means for controlling the position of the throttle valve includes a servo 40 controlled by intake manifold vacuum in a line 42 and having a plunger 44 positioned as a stop for cooperation with a lever 46 secured to the throttle valve shaft. More specifically, servo 40 includes a hollow two-piece shell 48 divided into an air chamber 50 and a manifold vacuum chamber 52 by an annular flexible diaphragm 54. Air communicates freely with chamber 50 through a plurality of holes 56. The plunger 44 is fixed to a cup-shaped piston 58 forming a part of a dash-pot assembly. The piston has a sliding and sealing fit within a sleeve 60 sealingly secured at one end to the diaphragm 54. At its opposite end 62, the sleeve 60 is crimped for a sliding but nonsealing frictional engagement with the plunger 44. A light spring 64 biases the piston 58 outwardly, a heavier spring 66 biasing the diaphragm 54 to the free position shown. The dash-pot piston 58 contains a number of orifices or vent holes 68 to control communication of air between the outer chamber 70 and the inner chamber 72 to provide the dash-pot action desired.

The lever 46, as stated previously, is fixed for rotation with the throttle valve shaft 22. It is biased against the end of plunger 44 by a tension spring 74 to close the throttle valve to its full line position shown. The force of spring 74 is greater than that of the light spring 64 so that spring 64 is not able to push the lever 46 to a particular setting. However, the force of spring 64 plus the frictional resistance to movement of the plunger 44
through sleeve 60 is sufficient, when the plunger is moved to its leftwardmost dotted line position 78 by the application of manifold vacuum to chamber 52, to prevent return of the throttle valve lever 46 beyond that position.

In starting the engine, therefore, the operator will initially depress the vehicle accelerator pedal, which will rotate the throttle valve 20 and lever 46 counterclockwise to a position away from the end of plunger 44. After the engine has started, intake manifold vacuum in passage 42 and chamber 52 will move the diaphragm 54 to the left moving plunger 44 to the dotted line position 78. Release of the accelerator pedal will then position the throttle valve at its idle speed position 32 in which it is partially open.

The flow of manifold vacuum to line 42 is controlled by an engine operating temperature responsive valve device 80 that controls the advance of the engine ignition system. The timing system includes the conventional distributor 82 having a breaker plate 84 mounted for a pivotal movement about a point 86 to advance or retard the ignition timing in a known manner. A vacuum controlled servo 86 has a rod 88 secured at one end to the breaker plate 84 and at its opposite end to an annular flexible diaphragm 90. The latter divides the servo into an air chamber 92 and a vacuum chamber 94. The vacuum chamber contains a spring 96 normally biasing the diaphragm and rod 88 to condition the distributor for a maximum retarded setting.

Chamber 94 is supplied with vacuum through a passage 98 connected at its opposite end to the upper end of the temperature responsive unit 80. The latter includes a valve that is inserted into the engine cooling fluid jacket so as to be sensitive to the coolant temperature changes to control the level of vacuum leading to servo 86.

More specifically, valve unit 80 has an outer casing having a pair of upper ports 102 and 104, the latter being connected to servo vacuum line 98. Port 102 is connected to a port 106 opening into carburetor induction passage 12 just above the closed position of throttle valve 20. Casing 100 also contains three lower ports 108, 109 and 110, the latter being connected to line 42 leading to servo 40. Port 108 is connected to an intake manifold port 112 opening into induction passage 12 below the closed position of throttle valve 20. Port 112 could equally be installed directly into the intake manifold of the engine. Port 109 is a vent.

The shell 100 of valve unit 80 has a hollow interior containing a partition 114 separating the upper and lower ports. Communication between the upper and lower ports is afforded through a central bore 116 which is normally closed by a ball valve 118. The latter is biased to the closed position by a spring 120.

The shell of valve unit 80 is secured in a boss 122 that is threaded as shown into the fluid cooling manifold 124 of the engine containing a suitable coolant 126. The lower portion of boss 122 has a stepped diameter bore 128 adapted to contain a thermastically responsive element 130 that expands and contracts as a function of the changes in temperature of the coolant 126 from a predetermined chosen level. The element 130 has a movable stem member 132 on which is secured a piston land 134 that is biased downwardly by a spring 136. A second stem 140 extending from land 134 is engageable with the ball valve 118.

As will be clear, expansion of the thermostatic element 130 will cause an upward movement of the stem 132 to unseat the ball valve 118. This then connects manifold vacuum from port 112 directly to the ignition distributor servo line 98 so as to fully advance the ignition timing, if it has not already been done, when the engine operating temperature exceeds the desired limit. Simultaneously, the upward movement of the piston land 134 will connect the vent line 109 to line 42 to vent the servo chamber 52 and permit spring 66 to return diaphragm 54 and plunger 44 to the full line position shown. This immediately permits the throttle valve spring 74 to close the throttle valve.

In overall operation, with the engine off, atmospheric pressure exists in all lines. Accordingly, the distributor is conditioned by servo spring 96 for a maximum retard setting, and servo 40 is as shown permitting throttle valve spring 74 to move the throttle valve to the full line closed position shown. The temperature responsive element 80 will be in the position shown if the engine operating temperature is normal.

Once the engine has been started, the throttle valve will be positioned in the dotted line position 32 for idle speed operation. Engine manifold vacuum in port 112 will have been supplied through port 110 to line 42 to servo chamber 52 to move the plunger 44 to the dotted line position so that upon release of the vehicle accelerator pedal (lever 46), the throttle valve return movement will have stopped at the idle speed position 32. The port 106 will be at atmospheric pressure as will servo chamber 94. Therefore, no advance of the ignition timing will occur at this time.

Assume now that the temperature of the cooling fluid 126 overheats for some reason. This causes a vertical movement of the thermostatic element 132 to unseat the ball valve 118 and connect manifold vacuum in line 112 to the servo chamber 94. This immediately moves the breaker plate to an advanced setting. This increases the engine operating efficiency by among other things shortening the overall combustion period, and thereby increases engine idling speed for the same quantity of air/fuel mixture flow through the carburetor idle channel to the engine. Simultaneously, the vacuum line 42 to servo chamber 52 of servo 40 has been vented through the exhaust duct 109 so that now the servo spring 66 can stroke the diaphragm 54 to the position shown permitting the carburetor throttle return spring 74 to rotate the lever 46 and throttle valve 20 to the closed position shown. This immediately reduces the idle channel mixture quantity flowing to the engine by reducing the vacuum signal acting on it, and thereby reduces the engine idling speed to that attained prior to the speedup caused by the temperature responsive valve 80. In other words, the engine speed decrease caused by the throttle valve positioner servo 40 offsets or essentially balances the increase in speed occasioned by the advanced setting when the operating temperature exceeds the desired limit.

Upon engine shutdown at this time, therefore, engine dieseling or afterrun will be prevented. The decay in manifold vacuum will cause an adjustment of the distributor toward a retarded setting and the fuel/air mixture to the engine will be insufficient to support combustion.

From the foregoing, it will be seen that the invention provides an engine anti-dieseling control that is operative in conjunction with an engine temperature control
to advance the spark in response to operating of the engine at an undesirable temperature level. It will also be seen that the invention prevents engine dieseling in such a system as just described when the engine temperature sensitive means is inoperative, by the throttle positioner closing the throttle valve upon engine shutdown to reduce the quantity of fuel/air mixture to the engine to a level insufficient to sustain combustion.

While the invention has been shown and described in its preferred embodiment, it will be clear to those skilled in the arts to which it pertain that many changes and modifications may be made thereto without departing from the scope of the invention.

I claim:

1. An engine anti-dieseling control comprising in combination, an engine carburetor having an induction passage open to atmospheric pressure at one end and adapted to be connected to an engine intake manifold at the opposite end so as to be subject to engine vacuum varying in level from ambient atmospheric pressure at engine shutdown to a maximum subatmospheric pressure level during engine decceleration operating conditions, a throttle valve rotatably mounted across the passage and movable from a closed position to an engine idle speed position and beyond to a wide open throttle position, and return, for controlling flow through the passage, an idle fuel/air mixture channel connected to the induction passage below the closed position of the throttle valve so that the idle channel is subjected to manifold vacuum at all times to provide normal idle and beyond normal idle speed mixture flow, the induction passage having a spark vacuum port and a manifold vacuum port located respectively above and below the closed position of the throttle valve, the induction passage also containing transfer port means connected to the idle channel and located so as to be traversed by the edge of the throttle blade in moving the throttle blade from a closed to an open position to thereby vary the idle channel vacuum signal by varying the area of the transfer port above the throttle valve edge exposed to ambient pressure levels, and control means for controlling movement of the throttle valve including spring means biasing the throttle valve to its return closed position, first servo means movable by manifold vacuum applied thereto to a position limiting return movement of the throttle valve to the engine idle speed position in which portions of the transfer port are both above and below the throttle valve edge, a distributor having a breaker plate movable in opposite directions to advance or retard the ignition timing, spring means biasing the breaker plate to a retard timing setting, and second servo means operable by vacuum to advance the timing, conduit means connecting the second servo means in a parallel flow path relationship to both the spark vacuum and manifold vacuum ports, and an engine temperature sensitive valve means in the conduit means movable in response to the attainment of an above normal engine operating temperature from one position connecting the spark port vacuum to the second servo means and the manifold vacuum to the first servo means to an alternate position connecting the manifold vacuum to the second servo means to advance the timing and venting the manifold vacuum from the first servo means to permit closing of the throttle valve to a position exposing more of the transfer port means to ambient pressure thereby decaying the idle channel vacuum signal to reduce idle channel fuel flow to reduce engine speed and prevent engine dieseling upon engine shutdown by reduction of the idle channel fuel/air mixture to an incombustible mixture upon engine shutdown.

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