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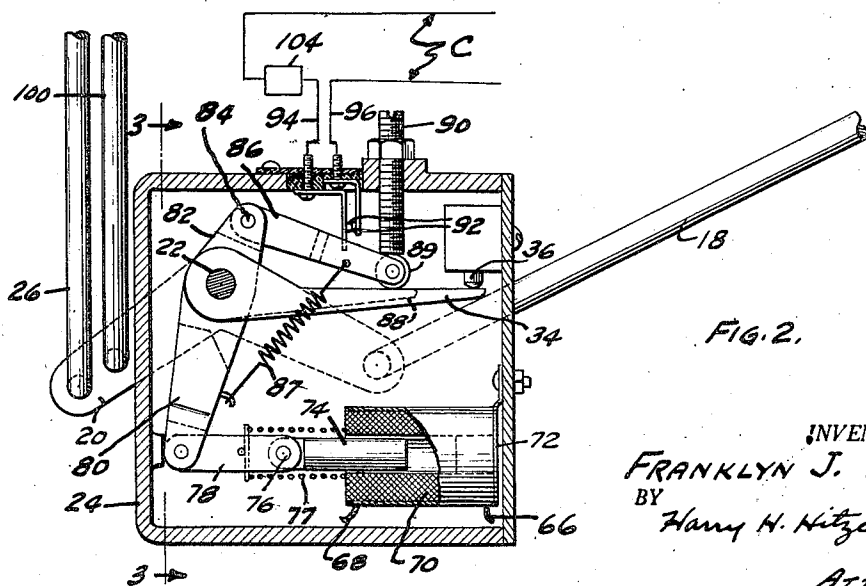
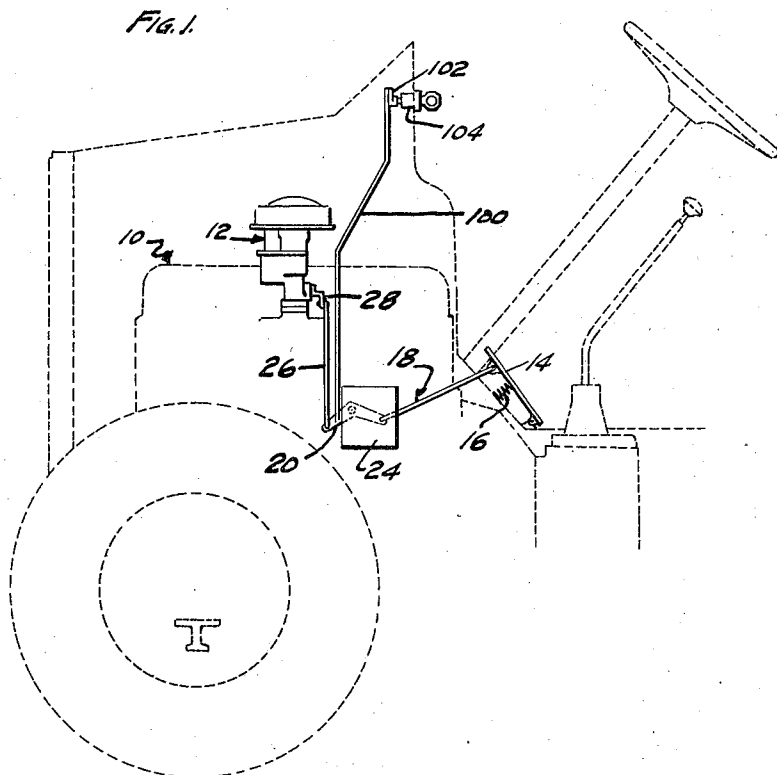
F. J. TAFT

2,434,871

MOTOR IDLING PERIOD CONTROL

Filed Sept. 18, 1945

2 Sheets-Sheet 1



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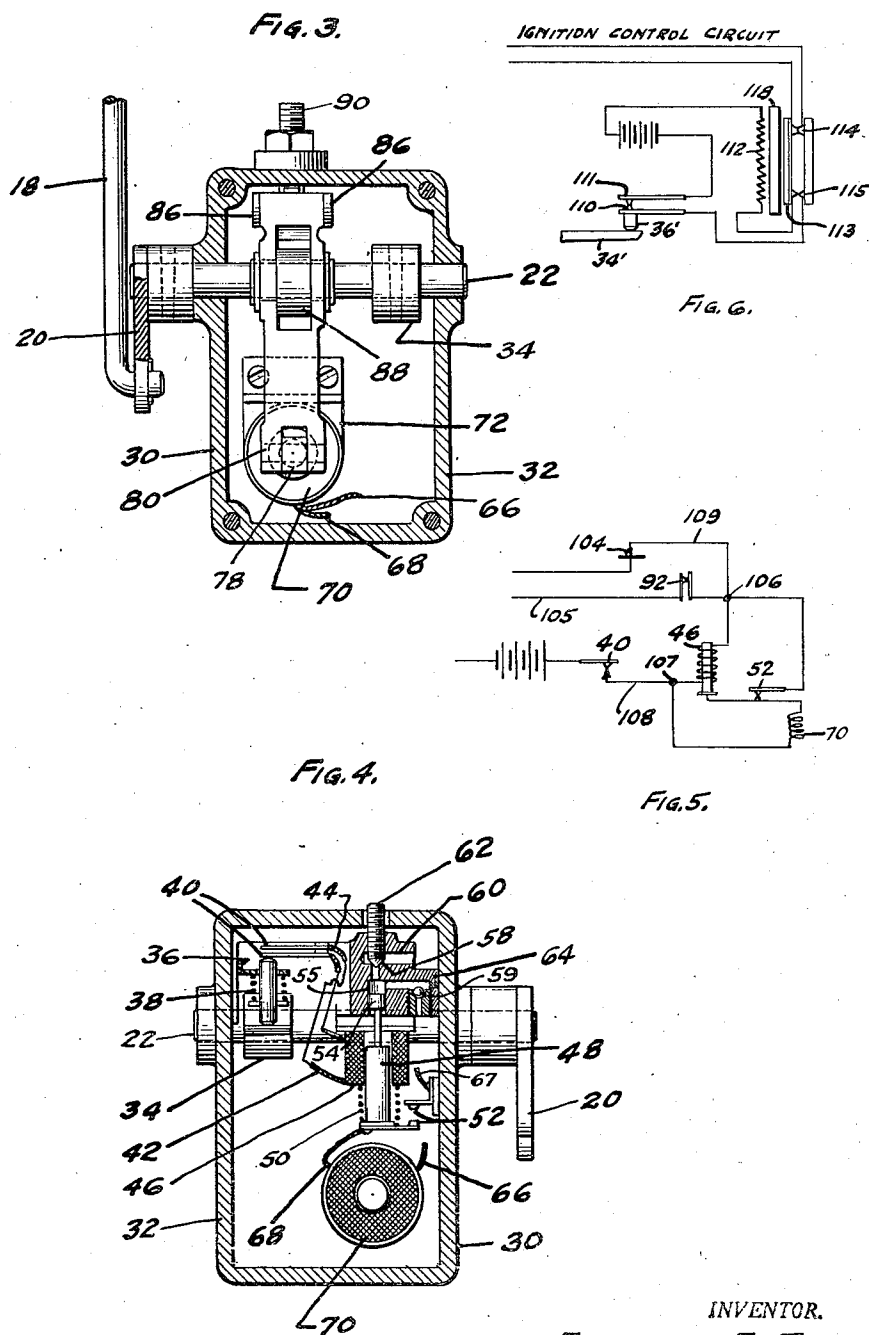
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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MOTOR IDLING PERIOD CONTROL

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My invention relates to a motor idling period control and particularly improvements in mechanism for controlling the operation of internal combustion motors and to similar devices.

My invention relates more particularly to improvements in such mechanism for controlling the idling period of an internal combustion motor after the load has been taken off, such for example as an automotive vehicle which has been brought to a stop without the ignition switch being opened to stop the motor.

One of the methods which I employ to shut off the motor is stopping the flow of combustion fuel to the same. This is accomplished by means of a mechanism interposed between the throttle or accelerator and the carburetor which is adapted when pressure is released from the accelerator to close off the supply of fuel to the engine a predetermined period of time after the motor has started "idling." Another method may be by means of the above and a mechanism co-actional therewith for simultaneously shutting off the ignition.

An object of the invention is to provide means for automatically stopping the operation of an internal combustion engine after idling in excess of a predetermined length of time. In its more general aspect, the invention provides means for rendering inoperative the ignition system in an internal combustion engine for stopping the same after a predetermined excessive idling period. In another form, the invention provides means for cutting off the flow of fuel to accomplish the same objective. A combination of these two means is also within the purview of this invention.

Another object of the present invention is to provide a mechanism for shutting off the supply of fuel to the carburetor of an internal combustion motor a determined period of time after the load has been released and the motor is idling.

A further object of the invention is to provide a mechanism of the type described for shutting off the supply of fuel to the carburetor and simultaneously shutting off the ignition for the motor a determined period of time after the load has been released and the motor is idling.

A further object of the invention is to provide a mechanism of the type described, manually adjustable so that the idling period can be varied within limits as desired before the engine is automatically cut off.

A further object of the invention is to provide mechanism for breaking the ignition circuit a

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determined period of time after the load has been released and the motor is idling.

A further object of the invention is to provide a mechanism of the type described capable of automatically resetting itself after each operation.

Other objects and advantages will be more apparent from the following description wherein reference is had to the accompanying two sheets of drawings upon which:

Fig. 1 is a generally diagrammatic view of a portion of an automotive vehicle showing the installation and my improved mechanism in association with the motor and other parts; Fig. 2 is fragmentary side view of the motor idling period control unit and associated parts with portions thereof broken away in section to more clearly show other parts; Fig. 3 is a cross sectional view of the same taken generally on the line 3—3 of Fig. 2; Fig. 4 is a vertical sectional view taken generally on the line 4—4 of Fig. 2; Fig. 5 is a circuit diagram of the electrical connections for the motor control system; and Fig. 6 is a diagrammatic view of a modified form of system.

In the embodiment of the invention which I have chosen to illustrate, in Fig. 1, I have shown a portion of an automotive vehicle which may include the motor 10, carburetor 12 and foot pedal or accelerator 14. They are standard or conventional in most automobiles at the present time. The accelerator 14 is normally provided with a compression spring member 16 between the same and the floor board to bring the accelerator back to normal position whenever foot pressure is released. I provide a push rod 18 pivotally connected between the accelerator and one arm of a bell crank lever 20 which is keyed to a shaft 22 positioned in the idling period control unit housing 24. The opposite arm of the bell crank lever is pivotally connected to a rod 26 that extends upwardly and operatively connects with the carburetor control lever 28 of the carburetor 12. In normal operation this connection functions similar to that usually found between the accelerator and the carburetor control lever, i. e. to control the fuel feed to the engine.

Shaft 22, which is mounted in suitable bearings in the side walls 30 and 32 of the housing 24, has a lever 34 keyed thereto and extending laterally to underlie a vertically disposed pin member 36. The pin member 36 is positioned in a suitable bracket for supporting the same and permitting up and down movement, the upward movement being directed against a coiled spring 38. Upward movement of the pin 36 is adapted

to close electrical switch members 40 mounted upon a suitable insulated member inside the housing 24. Electrical conductors 42 and 44 extend from switch members 40 through suitable terminals for connection to a battery to a solenoid 46 which has a core 48 axially positioned therein and adapted to be moved upwardly when the solenoid is energized. At the end of a predetermined upward movement of the same against a compression spring 50 contact points 52 are closed. Core 48 carries piston 54 for movement in the bore 55 to eject air therein through the needle valve opening 58 and passageway 60. The period of time required for this movement is controlled by an adjusting screw 62 positioned in the housing 64 for the cylinder bore 56. This housing may be suitably supported within the unit housing 24.

Electrical connection 58 extends from switch points 52 to a solenoid 10. Wires 66 and 67 are for connection to a battery. Solenoid 70 is supported on one of the side walls of the housing 24 by a suitable bracket 72. The solenoid 70 has an axially positioned core 74 pivotally connected at 76 to a link 78. The link 78 may be pivotally connected at its opposite end to a lever 80 that is rotatably mounted on the shaft 22 and is provided with an upward extension 82 that carries a pin 84. I provide a pair of spaced links 86 mounted upon opposite sides of the portion 82 of the lever 80 rotatable on pin 84 which extend forwardly and support a roller 89. The roller 89 is positioned between a rigidly disposed lever 88 and an adjustable screw 90 mounted in the upper wall of the housing 24. I provide a switch 92 positioned in the path of roller 89 for a purpose which will be hereinafter explained. Suitable electrical conductors 94 and 96 extend therefrom.

The operation of the foregoing apparatus will now be explained. When the rod 18, connected to the accelerator, is pushed forward by depressing the accelerator pedal, the carburetor control lever is operated to control the quantity of fuel supply to the motor in a normal manner. When pressure upon the foot pedal is released the spring 16 returns the foot pedal or accelerator to normal idling position and moves the lever 34 in the control unit to the position shown in Fig. 2 to close the contacts 40. Current thus energizes the solenoid 46 which attracts core 48 upwardly at a speed generally determined by the size of the needle valve opening 58. It is assumed that core 48 fits snugly in the solenoid bore so that little air leakage occurs. As the plunger approaches the end of the bore the contacts 52 are closed, thereby energizing the solenoid 70. This draws the core 74 inwardly to move the lever 80. Movement of the lever 80 moves the roller 89 to the left (as shown in Fig. 2). At the same time the shaft 22 is being rotated counterclockwise as viewed in Fig. 2, thereby pulling down on the carburetor control rod 26 to shut off completely the supply of fuel to the engine to stop the motor. In the final stage of the movement of the roller 89 to the left, switch 92 is opened thereby breaking the circuit and deenergizing the solenoids 46 and 70. Compression spring 77 positioned between the end of solenoid 70 and a shoulder on the link 78 thereupon releases and returns the lever 80 to its original position as shown in Fig. 2. This permits spring 38 to open switch 40 and also permits the solenoid plunger 48 to be returned to its original position by the compression spring 50. Relief valve 59 is provided to permit a quick return. This valve communicates with

bore 55 and is adapted to admit air to the bore but close on compression in bore 55. The roller 89, however, by reason of the action of spring 87 rests against the side of the adjustable screw member 90 holding open the switch 92. This is true by reason of the fact that the lever 80 is rotatably mounted upon the shaft 22. When the driver places his foot on the accelerator pedal 14 and moves the rod 18, bell crank lever 20 and arm 88 rigidly connected thereto are moved downwardly. Spring 87 pulls the roller down in contact with the arm 88 and it again rides over the end of post 90 and is positioned beneath the same to reset the mechanism. The contacts 92 will again be closed and the mechanism is ready for another cycle of operation to shut off the flow of fuel to the engine when the period of idling exceeds the time for the travel of the piston 54 in the cylinder 55.

The same mechanism may also operate to shut off the ignition switch of the automotive engine if desired. For this purpose I provide a rod 100 connected adjacent the rod 26 to the bell crank lever 20 and extending upwardly to connect to the arm of lever 102 associated with the ignition switch 104. Thus when the motor has idled a determined period and the mechanism is operated to hold down the lever 26 to shut off the supply of fuel to the carburetor, it will also operate the ignition switch to shut off the ignition.

As an alternative form of operation to shut off the ignition to the motor, I connect the conductors 94 and 96 directly in the main circuit C which passes through the ignition switch 104. Thus, when the circuit through wires 94 and 96 is broken at points 92, the ignition circuit is broken and the engine will stop.

Referring now to Fig. 5, supply cable 105 going to the high side of the usual automobile battery 40 may be connected through switch 92 to junction 106. From junction 106, solenoid winding 46 is connected to junction 107. From junction 106, connection is taken to switch 52, the circuit continuing through solenoid 70 to junction point 107. From junction 107, lead 108 goes to switch 40 and thence to the other side of the battery or ground as the case may be.

In the event that switch 92 is to control the ignition system, lead 109 may be taken from junction 106 to ignition switch 104 and then the circuit continued on in the customary manner. In such case, it is clear that the high side of the battery will be connected to ignition switch 104 through lead 105.

Referring now to Fig. 6, an alternative form of the invention is shown wherein a delay action in a thermostatic system is relied upon for cutting off the ignition circuit in an engine after the engine has idled for a predetermined length of time. The throttle mechanism including the linkage between 18 and 26 may be as shown in Figures 1 to 4 inclusive. Thus, lever 34' will control button 36' as in Fig. 2. Button 36' is carried by movable switch member 110 adapted to cooperate with fixed switch member 111 in a manner similar to switch 40 in Fig. 4. Switch contacts 110 and 111 control a circuit including heater 112. Heater 112 is operatively associated with thermostatic switch 113. Switch 113 may be any one of a number of different types adapted to snap open or close. Such snap acting thermostatic switches are well known in the art and are used for electric sadirons, various household heating appliances and are widely used for industrial purposes. Thermostatic switch 113 is

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adapted to have contacts 114 closed in the cold condition. Upon energization of heating coil 112, thermostatic switch 113 will be heated and snapped open. Switch contacts 114 are in the ignition control circuit and may be in series with the usual ignition key controlled switch.

It is preferred to provide means for preventing heater 112 from being continuously energized. To this end, the lead connecting movable switch contact 110 may be disposed in series with a pair of contacts 115 carried by thermostatic switch 113. These contacts are mounted so that they are electrically insulated from other circuits.

In order to control the response time for the thermostatic switch after initial energization of heating coil 112, it may be desirable to dispose a block 118 of suitable heat insulating material such as asbestos, or even an air space, between heating coil 112 and thermostatic switch 113.

It is possible to design the entire thermostatic switch and heating coil assembly so that continuous heating of coil 112 for a predetermined period of time will be necessary for thermostatic switch 113 to open. Thus, as an example, the heat loss and heat transmission of the entire assembly may be so adjusted that continuous heating of heater 112 for a period of say fifteen minutes will be necessary to open thermostatic switch 113. In the event that intermittent idling periods of one or two minutes occur, heating coil 112 will be energized for a short period of time. However, as long as these small idling periods occur at infrequent intervals, the predetermined cut off time of fifteen minutes will still be maintained. If frequent idling periods occur, then it is possible that the system will cut off after a continuous idling of less than fifteen minutes, say ten minutes.

It is preferred, however, to provide ready cooling of thermostatic switch 113 so that it may return to its closed condition quickly after the heating coil has deenergized. Thus, thermostatic switch 113 may be so designed that it will not open up to a temperature of 200° F. as an example. By having a temperature differential between open and closed positions of say ten degrees F. as an example, it follows that switch 113 will close when the temperature drops to 190° F. By providing adequate ventilation and properly designing the heating coil, it is possible to have the thermostatic switch go to its closed position within a few seconds after it has opened. In such a case, it is possible for thermostatic switch 113 to go off and on at a relatively slow rate. By utilizing a thermostatic switch which opens and closes with a substantial sound, the opening and closing of the thermostatic switch may serve as a warning signal. In any event, such continued operation of the thermostatic control system will prevent damage to the ignition system by virtue of continuous current flowing therethrough when the engine is dead and will also prevent unnecessary drain on the battery.

From the foregoing description, it will be apparent to those skilled in the art that I have provided a novel and effective mechanism for stopping the operation of an internal combustion engine after a desired idling period. While I have illustrated and described an embodiment thereof, in connection with the motor of an automotive vehicle, it will be apparent that the same mechanism may be employed in connection with stationary engines, marine engines, or any other type of internal combustion engine which it may be desirable to have automatically stop within a

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given period of time after its work load is removed.

I contemplate that modifications and changes may be made in the exact details shown herein and I do not wish to be limited in any particular; rather what I desire to secure and protect by Letters Patent of the United States is:

1. Mechanism for controlling the flow of fuel through a carburetor including a foot throttle, a rod connected thereto, a bell crank lever having one end connected to said rod, a carburetor, a rod connected between said carburetor and the other end of said bell crank lever, a pivot shaft for said bell crank lever, and solenoid operated means associated with said shaft for permitting the rotation of the same to stop the flow of fuel through said carburetor a predetermined period of time after pressure on said foot throttle has been released.

2. Mechanism for controlling the flow of fuel through a carburetor including a foot throttle, a rod connected thereto, a bell crank lever having one end connected to said rod, a carburetor, a rod connected between said carburetor and the other end of said bell crank lever, a pivot shaft for said bell crank lever, and solenoid-operated means associated with said shaft for permitting rotation thereof to stop the flow of fuel through said carburetor a predetermined period of time after pressure on said foot throttle has been released, said solenoid-operated means including adjustable means for controlling the period of rotation of said shaft.

3. An idling control mechanism for internal combustion engines of the type having an electric switch for controlling the ignition system, a throttle valve having an engine idling position and an engine shut-off position, and a manually operable control for disposing said valve in said positions, said mechanism comprising first means coupled to said throttle valve, second means coupled to said switch, and time delay mechanism associated with said control for operating said first and second coupled means simultaneously to move said throttle valve to its engine shut-off position and said switch to an ignition system deenergizing position, respectively, a predetermined period of time after operation of said control disposing said throttle valve in said idling position.

4. An idling period control mechanism for automotive vehicle motors having an accelerator, a carburetor and control means between said accelerator and said carburetor comprising a housing, a shaft positioned therein and extending to one side thereof, a bell crank lever rigidly mounted on said shaft, a rod connecting one end of said lever to said accelerator, a second rod connecting the other end to said carburetor, an arm secured to said shaft, a pair of electrical contacts, means associated with said arm for closing said contacts, electrical conduits from said contacts, a solenoid associated therewith, a plunger in said solenoid, a piston thereon, a cylinder in which said piston reciprocates, a needle valve control for said cylinder, a second solenoid controlled by said piston, said second solenoid having a plunger, a link connected thereto, a lever pivotally connected to said link and rotatably mounted on said bell crank lever shaft, a pair of arms carried by said lever, a roller mounted therebetween, said roller movable when said second solenoid is energized to permit said shaft to rotate to actuate the rod connected between said bell crank lever and the carburetor to shut off the supply of fuel

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through the same, said roller adapted in its final movement to break the circuit for said solenoids, whereby the mechanism returns to normal position.

5. Mechanism of the type described including a foot throttle, a rod connected thereto, a bell crank lever having one end connected to said rod, a carburetor, a rod connected between said carburetor and the other end of said bell crank lever, a pivot shaft for said bell crank lever, and means associated with said shaft for opening the ignition circuit a pre-determined period of time after pressure on said foot throttle has been released.

6. Mechanism of the type described including a foot throttle, a rod connected thereto, a bell crank lever having one end connected to said rod, a carburetor, a rod connected between said carburetor and the other end of said bell crank lever, a pivot shaft for said bell crank lever, and means associated with said shaft for opening the ignition circuit, said means including contact members normally closing said circuit but adapted to open the same a pre-determined period of time after pressure on said foot throttle has been released.

7. Mechanism of the type described including a foot throttle, a rod connected thereto, a bell crank lever having one end connected to said rod, a carburetor, a rod connected between said carburetor and the other end of said bell crank lever, a pivot shaft for said bell crank lever and means associated with said shaft for opening the ignition circuit, said means including contact members normally closing said circuit but adapted to open the same and solenoid means for opening said contact members a pre-determined period of time after pressure on said foot throttle has been released.

8. An idling period control mechanism for automotive vehicle motors having an accelerator, a carburetor and control means between said accelerator and said carburetor, said mechanism including time delay mechanism associated with said accelerator for shutting off the supply of fuel to said motor a pre-determined period of time after pressure on said accelerator has been released.

9. An idling period control mechanism for automotive vehicle motors having an accelerator, a carburetor and control means between said accelerator and said carburetor, said mechanism including time delay mechanism associated with said accelerator for opening the ignition circuit of said motor a pre-determined period of time after pressure on said accelerator has been released.

10. An idling period control mechanism for automotive vehicle motors having an accelerator, a carburetor and control means between said accelerator and said carburetor, said mechanism including time delay mechanism associated with said accelerator for opening the ignition circuit of said motor a pre-determined period of time after pressure on said accelerator has been released, said time delay mechanism including a connection between said control means and the ignition switch for said motor.

11. An idling period control mechanism for automotive vehicle motors having an accelerator, a carburetor and control means between said accelerator and said carburetor, and time delay mechanism associated with said control means

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for shutting off the supply of fuel to said motor a pre-determined period of time after pressure on said accelerator has been released, said time delay mechanism including a solenoid operated connection between said control means and said carburetor.

12. An idling control mechanism for internal combustion engines having a throttle valve and a manual control for said throttle valve adjustable from an engine shut-off position to any desired running position, said mechanism comprising means coupled to said throttle valve and to said manual control for determining an engine idling position as one normal limit of the throttle valve adjustment, and means responsive to a pre-determined dwell of said throttle valve in its idling position for moving said throttle valve to an engine shut off position.

13. An idling control mechanism for internal combustion engines of the type having a manually adjustable throttle valve and an ignition system with an electric switch for controlling the same, said mechanism comprising a supervising switch in series with said ignition control switch, means mechanically coupled to said throttle valve for maintaining said supervising switch in an engine running position during all normal throttle positions, said throttle having a normal idling position, and means responsive to a predetermined dwell of said throttle in said idling position for operating said switch to deenergize the ignition system and stop the engine.

14. An idling control mechanism for internal combustion engines of the type having a manually controlled throttle valve where said throttle valve has a normal idling position, said mechanism comprising a first electric switch, thermostatic means for controlling said switch, a heating coil for said thermostatic means, a second switch for controlling said heating coil, means for maintaining said second switch open under all normal throttle valve conditions, and means responsive to a predetermined dwell of said throttle valve in an idling position for closing said second switch, whereupon said heating coil may be energized to actuate said first electric switch, and means controlled by said first switch for stopping the engine.

15. The mechanism of claim 14 wherein said first switch is adapted to be connected in series with the ignition circuit of said engine.

16. The mechanism of claim 14 wherein said thermostatic means for controlling said first switch and said heating coil have a heat transmitting path providing a substantial time delay.

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