July 15, 1969 A. L. MENNESSON 3,455,260

CARBURETTORS FOR INTERNAL COMBUSTION ENGINES

Filed Oct. 24, 1966 3 Sheets-Sheet 1

Fig. 1.

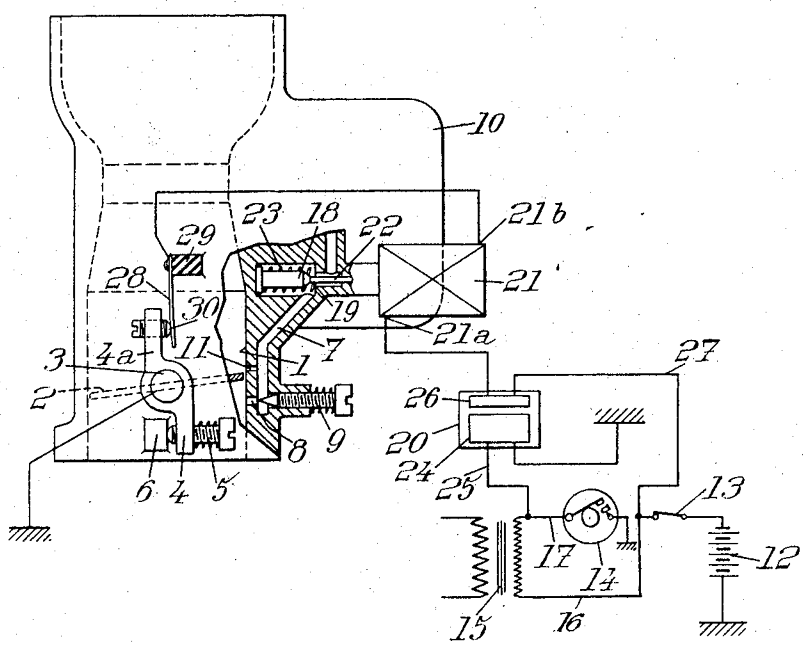


Fig. 2.

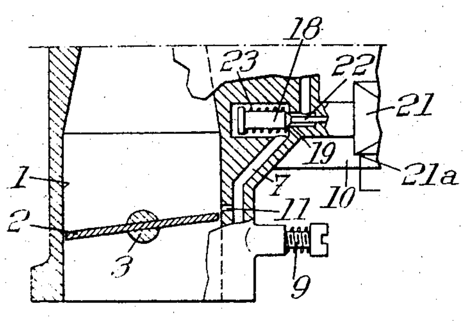
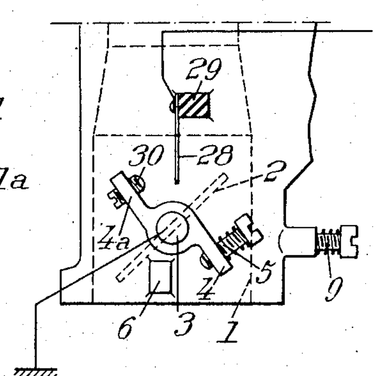


Fig. 3.



INVENTOR

André Louis Mennesson

BY

Bailey, Stephens & Huettig

ATTORNEY

July 15, 1969 **A. L. MENNESSON** **3,455,260**

CARBURETTORS FOR INTERNAL COMBUSTION ENGINES

Filed Oct. 24, 1966 3 Sheets-Sheet 2

Fig. 5.

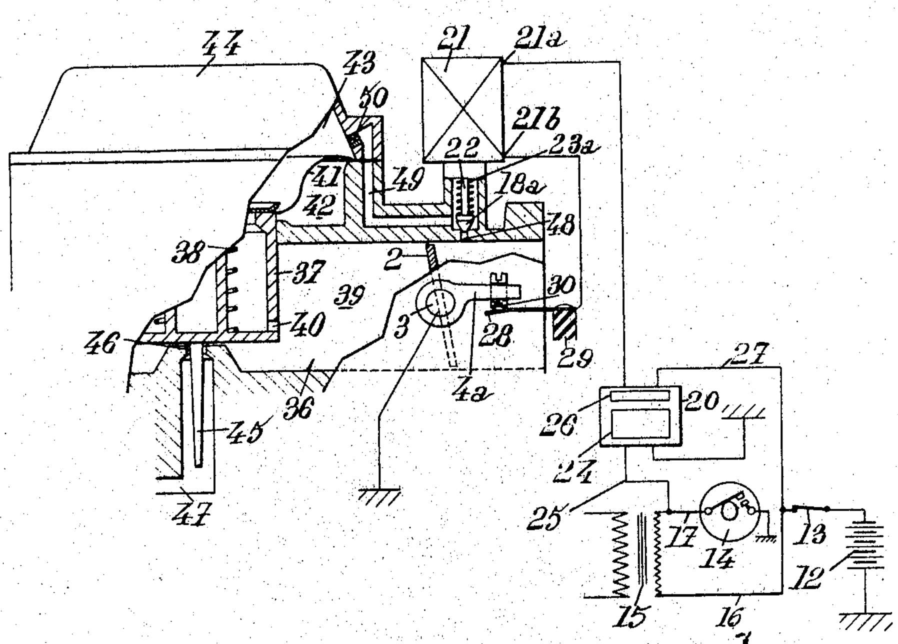
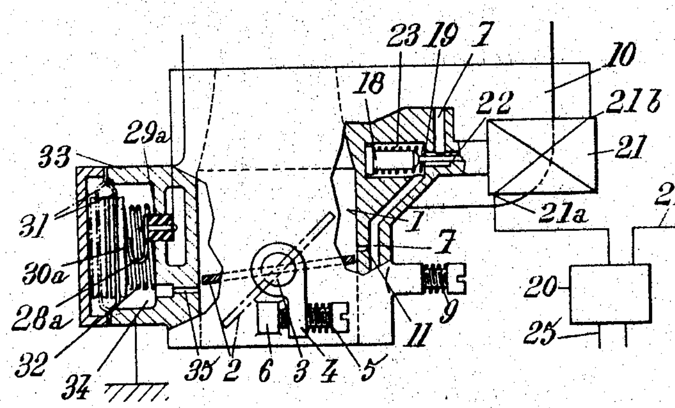


Fig. 4.



INVENTOR

André Louis Mennesson

BY

Bailey, Stephens & Huettig

ATTORNEY

CARBURETTORS FOR INTERNAL COMBUSTION ENGINES

Fig. 6.

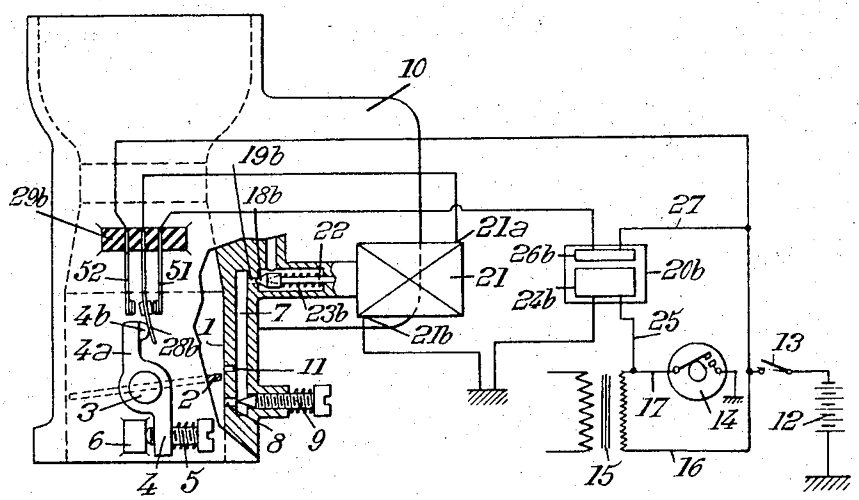
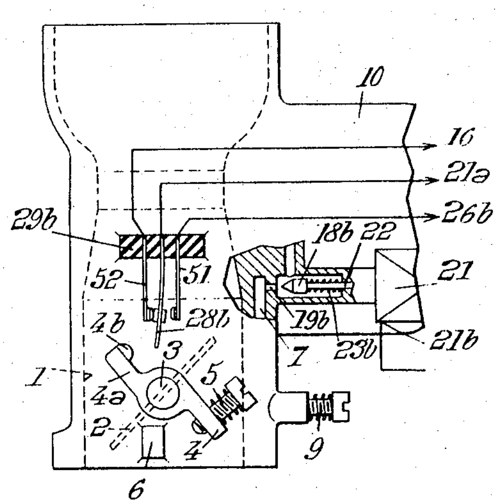


Fig. 7.



INVENTOR
ANDRÉ LOUIS MENNESSON
BY
Bailey, Stephens & Huettig
ATTORNEY

United States Patent Office

3,455,260
Patented July 15, 1969

3,455,260
CARBURETTORS FOR INTERNAL COMBUSTION ENGINES

André Louis Mennesson, Neuilly-sur-Seine, France, assignor to Societe Industrielle de Brevets et d'Etudes S.I.B.E., Neuilly-sur-Seine, France, a French society

Filed Oct. 24, 1966, Ser. No. 589,094
Claims priority, application France, Oct. 25, 1965, 36,134
Int. Cl. F02m *3/04*
U.S. Cl. 123—97 5 Claims

ABSTRACT OF THE DISCLOSURE

The carburettor includes means for controlling the fuel flow in an idle fuel passage. These means prevent this fuel flow when the ignition switch is off. When the ignition switch is on, these means are responsive both to a device (which is itself responsive to the engine speed) and switching means (which are themselves responsive to the position of the throttle valve) for (1) permitting this flow of fuel when the engine speed is below a given value and said throttle valve is simultaneously closed, (2) permitting this flow when said throttle valve is open and (3) preventing this flow when the engine speed is above said given value and said throttle valve is simultaneously closed.

The present invention relates to internal combustion engine carburettors having means responsive either directly or indirectly to the position of the main throttle valve (also called "throttle member" in the present specification and claims) in the carburettor induction pipe for stopping at least partly the feed of fuel to said induction during the engine slowing down periods that follow the closing of said throttle valve. The invention is more especially concerned with carburettors for motor car engines.

The stopping (or reduction) of fuel feed to an internal combustion engine when it is driven by the vehicle, instead of driving it, has the advantages, on the one hand, of saving fuel and, on the other hand, of stopping the delivery into the atmosphere of toxic exhaust gases.

It is known that the conditions of slowing down of the engine have in common with the conditions of idling the closing of the throttle valve but are distinguished from the idling conditions by an engine speed greater than a given limit; on the other hand, the conditions of slowing down of the engine have in common with the conditions of normal running a speed greater than this limit but are distinguished from normal running conditions by the closing of the throttle valve. This closing can be evaluated either directly, by the position of a part rigidly connected with said throttle valve, or indirectly, in particular by the suction existing in a suitably chosen portion of the induction pipe.

The object of the present invention is to provide an improved construction of carburettor taking into account the number of revolutions per minute of the engine.

According to the present invention, in a carburettor having means capable of stopping at least partly the feed of fuel to the carburetor induction pipe when, the main throttle valve being closed, the number of revolutions per unit of time of the internal combustion engine, is above a limit value, said limit valve is determined by means for counting the number of breaks per unit of time of the engine ignition current.

Preferred embodiments of the present invention will be hereinafter described with reference to the appended drawings, given merely by way of example, and in which:

FIG. 1 is a diagrammatic view, partly in vertical section and partly in elevation of a carburettor made according to a first embodiment of the invention, in the position corresponding to idling;

FIGS. 2 and 3 show some elements of the carburettor of FIG. 1 in positions corresponding respectively to a slowing down of the engine and the normal running thereof;

FIG. 4 is a view similar to FIG. 1 showing a second embodiment of a carburettor according to the present invention, in idling position, the dot-and-dash lines indicating the normal running position of the throttle valve;

FIG. 5 is an elevational view with portions in section of a carburettor made according to a third embodiment of the invention in the position corresponding to idle of the engine;

FIG. 6 is an elevational view with parts in section of a fourth embodiment of the invention in the position corresponding to the stopping of the engine;

FIG. 7 is a view similar to FIG. 6 but corresponding to the normal running of the engine.

According to the embodiment of FIGS. 1 to 3 inclusive; the carburettor is of the downdraught type and comprises an induction pipe **1** provided with a main throttle valve consisting of a butterfly valve mounted on a spindle **3**. On this spindle are fixed a first lever (not shown) adapted to be acted upon by the driver and a second lever **4** carrying an adjustment screw **5** which cooperates with an abutment **6** to determine the idling position of the throttle valve. A conduit **7** opens into induction pipe **1** downstream of throttle valve **2** through an idling orifice **8** adjustable by a screw **9**. This conduit **7** is fed with an air and fuel mixture supplied from a constant level chamber **10**. Conduit **7** also communicates with induction pipe **1** through an orifice **11** located in such manner that it passes from upstream to downstream position with respect to throttle valve **2** when said valve is opened. Thus the total delivery rate increases gradually from idling to normal running position. The main jet means and the usual accessories of the carburettor have not been shown because they are not necessary to understand the present invention.

The ignition circuit of the engine comprises an electric battery **12**, a switch **13**, a contact breaker **14** and an ignition coil **15**. Reference numerals **16** and **17** designate the conductors of the ignition primary circuit located on either side of the primary winding of coil **15** and connected respectively to switch **13** and contact breaker **14**.

The means for acting upon the delivery of fuel during the engine slowing down periods comprise a fuel feed valve **18** adapted to cooperate with a seat **19** so as to be able to stop, either wholly or at least mostly, the delivery of fuel when the engine speed is above a predetermined limit e.g. above idling speed. In the embodiment of FIGS. 1 to 3, seat **19** is provided in conduit **7**. In order to make the last mentioned means responsive to variations of the number of revolutions per minute of the engine, there is provided a device **20** capable of measuring this number of revolutions per minute by counting the number of breaks of the ignition current per minute produced by the contact breaker **14**. Valve **18** is controlled by an electromagnet **21**, through the movable core **22** thereof, against the action of a spring **23**. Current is fed, or not, to electromagnet **21** according to the number of revolutions per minute of the engine through a circuit in which is inserted a switch responsive to the position of throttle valve **2**.

According to the embodiments of FIGS. 1 to 4, valve **18** is closed, against the action of spring **23**, by electromagnet **21** and device **20** is arranged in such manner as to feed said electromagnet **21** with current when the number of revolutions per minute of the engine is higher than the above indicated limit.

As shown by FIG. 1, device **20** comprises a circuit **24** fed, in series with the primary winding of coil **15**, through a conductor **25** connected with conductor **17**, and also a relay **26** adapted to connect one of the terminals **21**a of electromagnet **21** to conductor **16** through a conductor **27**, that is to say to connect said terminal **21**a with battery **12** when, at the same time, switch **13** is closed and circuit **24** records a number of revolutions per minute of the engine higher than that corresponding to idling. Furthermore, the other terminal **21**b of electromagnet **21** is grounded thrugh a switch linked to the position of throttle valve **2**.

More particularly, in the embodiment of FIGS. 1 to 3, this last mentioned switch consists of a flexible conductor blade **28** carried by an insulating block **29** and adapted to be contacted by a stud **30** operatively connected with throttle valve **2**. For instance, said stud **30** consists of a screw carried by a second arm **4**a of lever **4**, through which stud **30** is grounded.

In the embodiment of FIG. 4, blade **28**, insulating block **29** and stud **30** of FIGS. 1 to 3 are replaced by a deformable blade **28**a, a block **29**a and a stud **30**a respectively. Stud **30**a is connected indirectly with throttle valve **2** due to the fact that it is carried by a deformable diaphragm **31** subjected to the action of a return spring **32**. Diaphragm **31** limits, inside a casing **33**, a chamber **34** connected through a duct **35** of restricted cross section, with a portion of induction pipe **1** located in such manner as to shift from a downstream position to an upstream position with respect to throttle valve **2** when said throttle valve is opened. Stud **30**a is grounded through diaphragm **31** and casing **33** which, in this case, are both metallic. When throttle valve **2** is closed and the internal combustion engine is running, the suction transmitted through duct **35** to diaphragm **31** overcomes the action of spring **32** and stud **30**a is in contact with blade **28**a. When throttle valve **2** is open, as shown in dot-and-dash lines, the action of spring **32** becomes preponderating and stud **30**a is moved away from blade **28**a.

In both cases, blade **28** or **28**a is in contact with stud **30** or **30**a only if throttle valve **2** is closed and if, in the second case, the internal combustion engine is running and sucking in air through pipe **1**.

The operation of the embodiment of FIGS. 1 to 3 is as follows:

When the number of revolutions per minute of the internal combustion engine is below a given limit (for instance from 1200 to 1500 revolutions per minute) and in particular under idling conditions, the parts are in the respective positions shown by FIG. 1. Switch **13** is closed, circuit **24** does not let current flow through relay **26** and electromagnet **21** is therefore not energized. Spring **23** keeps valve **18** open and the idling air and fuel mixture can therefore flow freely through conduit **7**.

Under normal running positions (number of revolutions per minute of the engine higher than the above mentioned limit and throttle valve **2** open), the parts come into the position of FIG. 3. Relay **26** permits current to flow therethroguh but stud **30** is out of contact with blade **28** so that electromagnet **21** is not energized. Idling conduit **7** is open as in the case of FIG. 1.

If the internal combustion engine is then slowed down by closing throttle valve **2**, relay **26** permits current to flow therethrough as in the case of FIG. 3 (number of revolutions per minute of the engine higher than the above mentioned limit) but, furthermore, stud **30** is in contact with blade **28** as in the case of FIG. 1 (throttle valve **2** closed) whereby electromagnet **21** is energized and therefore valve **18** closes idling conduit **7**. As soon as the slowing down has become sufficient to make the number of revolutions per minute of the engine to drop below the above mentioned limit, the elements again come into their positions of FIG. 1. When the engine is stopped, switch **13** cuts off from battery **12** not only the ignition circuit but also the relay **26** of device **20**.

The operation of the embodiment of FIG. 4 is the same as that of the embodiment of FIGS. 1 to 3. The positions shown in solid lines and in dot-and-dash lines in FIG. 4 correspond to those shown by FIGS. 1 and 3,, respectively.

FIG. 5 shows the application of the invention to a carburettor different from the conventional carburettor with fixed choke means. In this case the carburettor is of the type where the cross sections for air and fuel are variable. Such a carburettor comprises a main pipe **36** provided with a throttle valve **2** actuated through a spindle **3**. The device for automatically adjusting the cross section of the air passage in accordance with the flow rate comprises a sliding valve **37** urged toward the inside of pipe **36** by a spring **38** and in the opposed direction by the effect of the suction existing in chamber **39** extending between sliding valve **37** and throttle valve **2**, and this owing to a hole **40** transmitting said suction to a diaphragm **41**. In this embodiment of the invention, diaphragm **41** forms a partition between two chambers **42** and **43**. The lower chamber **42** is connected with the atmosphere whereas the upper chamber **43** is closed by a lid **44**.

It is known that, with such an arrangement, whatever be the air flow rate, sliding valve **37** occupies a position such that the effect of the suction from chamber **39** upon diaphragm **41** is balanced by the action of spring **38**.

The fuel flow rate is adjusted by a needle **45** of suitable profile movable together with sliding valve **37** and which determines the cross section of the annular space left between itself and a calibrated orifice **46** surrounding it. Fuel is fed through a conduit **47** from a constant level chamber analogous to chamber **10** of FIG. 1 and which is connected with the atmosphere or with the carburettor air inlet. Thus air and fuel are fed under the same pressure difference, to wit, the difference between atmospheric pressure and the pressure existing in chamber **39**. It suffices to have the flow passage sections determined respectively by sliding valve **37** (air) and needle **45** (fuel) substantially proportional to each other to obtain a constant richness of the fuel and air mixture fed to the internal combustion engine.

In a carburettor of this type, there is provided, according to the present invention, a device analogous to that shown by FIGS. 1 to 3. In particular this device comprises electromagnet **21**, resilient blade **28** and device **20**, as in the case of FIG. 1.

The present case differs from those above described in that the feed of fuel under idling conditions does not take place through a special conduit but through the annular passage between calibrated orifice **46** and needle **45**.

In this case electromagnet **21** fed as above described, is made to act upon a valve **18**a against the action of a spring **23**a, this valve **18**a being capable of closing an orifice **48** which communicates with pipe **36** downstream of throttle valve **2**. Orifice **48** leads to a conduit **49** provided with a calibrated orifice **50** and which opens into chamber **43**. The operation of valve **18**a takes place in a direction opposed to that of the vlave **18** of the proceding embodiments since valve **18**a tends to be closed by spring **23**a and to be opened by electromagnet **21**.

The operation of the carburettor of FIG. 5 is as follows:

Under idling conditions proper, the parts occupy the position illustrated by FIG. 5. It has already been explained with reference to FIGS. 1, 2 and 3 that, in these conditions, relay **26** does not transmit current to electromagnet **21**. Spring **23**a then applies valve **18**a against orifice **48**, preventing any communication between pipe **36** and chamber **43**. The internal combustion engine is then fed with fuel in the same idling conditions as if the means according to the present invention did not exist.

On the contrary, during a slowing down period following the closing of throttle valve **2**, electromagnet **21** is fed with current because relay **26**, same as circuit breaker

28, 30 permits the passage of current, which has for its effect to lift valve 18*a* and to open orifice 48.

In these conditions, a portion of the suction existing in pipe 36 downstream of throttle valve 2 is transmitted to chamber 43. The ratio of the respective cross sections of orifices 50, 40 is such that there is produced in chamber 43 a suction greater than in chamber 39. This causes sliding valve 37 to move upwardly, this upward movement being however limited by spring 38. It follows that the suction in chamber 39 decreases since, under slowing down conditions, throttle valve 2 is closed and the lifting displacement of sliding valve 37 increases the cross section of the passage of communication with the atmosphere.

If the suction existing in chamber 39, therefore acting upon orifice 46, becomes sufficiently weak, the flow rate of fuel decreases and may even become zero, the fuel having a tendency to drop back to the same level as in the constant level fuel chamber in the absence of any suction. Therefore, when the slowing down conditions are fulfilled, that is to say closing of throttle valve 2 and relatively high number of revolutions per minute of the internal combustion engine, the flow rate of fuel through orifice 46 is reduced or even made equal to zero. As soon as the number of revolutions per minute of the engine drops below the limit value above referred to, relay 26 no longer permits the flow of electric current, valve 18*a* closes orifice 48 and sliding valve 37 comes back into the position indicated by FIG. 5, which immediately restores the idling fuel flow.

Of course, the operation would be the same if sliding valve 37 were replaced by any other equivalent throttling means, for instance an eccentrically pivoted flat valve.

According to a modification (not shown) of FIG. 5, the fuel metered through the space between fixed calibrated orifice 46 and needle 45 instead of being sucked into conduit 36 by the air stream, might be sent to a pump and, thence into injectors generally disposed downstream of throttle valve 2.

According to the embodiment of FIGS. 6 and 7, valve 18*a* which cooperates with a seat 19*b* provided in conduit 7, is adapted to be opened by electromagnet 21 against the action of a spring 23*b* and the device 20*b* for controlling said electromagnet 21 causes current to flow through relay 26*b* when it records a speed of the internal combustion engine lower than the above indicated limit (circuit 24*b* being arranged as the circuit 24 of FIGS. 1 to 3) and cuts off the current flow through relay 26*b* when it records a speed higher than the limit. Furthermore, electromagnet 21 must be fed with current not only when the internal combustion engine is idling (relay 26*b* then causing current to flow therethrough), throttle valve 2 being then closed, but also every time said throttle valve 2 is open.

For this purpose, two feed circuits are provided in shunt with each other for electromagnet 21, to wit, a first circuit passing through relay 26*b* and through a first switch connected with main throttle valve 2 and a second circuit passing through a second switch connected with said main throttle valve 2, this second circuit being independent of relay 26*b*.

As shown by FIGS. 6 and 7, these two switches are controlled by a resilient contact blade 28*b* permanently connected with the terminal 21*a* of the winding of electromagnet 21 and operated by a projection 4*b* carried by arm 4*a* rigid with the spindle 3 of throttle valve 2. This blade 28*b* cooperates, on one side thereof, with a contact blade 51 connected to conductor 16 through relay 26*b* and, on the other side, with contact blade 52 which is directly connected to said conductor 16. The other terminal 21*b* of the winding of electromagnet 21 is permanently grounded. Blade 28*b* tends, by its own resiliency, to be in contact with blade 52 but it is brought into contact with blade 51 by projection 4*b* when throttle valve 2 is closed. Blades 28*a*, 51 and 52 are carried by an insulating block 29*b* and projection 4*b* either is made of insulating material or is carried by an insulated portion of blade 28*b*.

The embodiment of FIGS. 6 and 7 works as follows:

When the internal combustion engine is stopped the parts are in the respective positions shown by FIG. 6. Switch 13 is open. Therefore electromagnet 21 is not fed with current. Valve 18*b* is applied against its seat 19*b* by spring 23*b* and conduit 7 is closed.

If the internal combustion engine is started and caused to run at idling speed, after its ignition circuit has been closed by means of switch 13, electromagnet 21 is energized by the first above mentioned circuit including relay 26*b* and blades 51 and 28*a*, since the number of revolutions per minute of the internal combustion engine is low and throttle valve 2 is closed. Valve 18*b* is therefore opened by electromagnet 21 and permits an idling fuel and air mixture to flow through conduit 7. The only elements of FIG. 6 that have been displaced are therefore switch 13 and valve 18*b* which now occupy the positions shown in dot-and-dash lines on FIG. 6.

If throttle valve 2 is now opened, the parts come into their normal running positions illustrated by FIG. 7. Electromagnet 21 remains energized, but now it is through the second of the above mentioned circuits, including blades 52 and 28*b* and valve 18*b* remains open. Relay 26*b* is in its non conducting position.

If now throttle valve 2 is closed from the position of FIG. 7, so as to slow down the internal combustion engine, the parts come into the respective positions thereof shown in solid lines in FIG. 6, with the only exception of switch 13 which is now closed, i.e. in the position shown in dot-and-dash lines. This is due to the fact that the second feed circuit of electromagnet 21 is open, blades 28*b* and 52 being no longer in contact with each other, while the first feed circuit is also open, despite blades 28*b* and 51 being in contact with each other, since relay 26*b* is no longer in the position where it transmits current, as the internal combustion engine is running at a speed above the limit value. Valve 18*b* is therefore closed and prevents the idling air and fuel mixture from reaching idling orifice 8.

As soon as the number of revolutions per minute of the engine drops below the above indicated limit (from 1200 to 1500 revolutions per minute), relay 26*b* permits the flow of current therethrough and electromagnet 21 opens valve 18*b*. The idling air and fuel mixture then flows to orifice 8.

In comparison with the preceding embodiments, that illustrated by FIGS. 6 and 7 has the following supplementary advantages. Relay 26*b*, which is rather delicate is energized (i.e. electric current flows therethrough) only during idling running, that is to say for relatively short periods. Furthermore, as soon as the ignition circuit is opened by switch 13, valve 18*b* closes and prevents the air and fuel mixture from reaching the engine. This avoids any risk of the engine running by self ignition, a risk which is rather frequent in modern engines having a high compression ratio.

In what precedes, it has been deemed unnecessary to give detailed descriptions of devices 20 and 20*b*, because suitable types of these devices exist on the market.

In a general manner, while the above description discloses what are deemed to be practical and efficient embodiments of the present invention, said invention is not limited thereto as there might be changes made in the arrangement, disposition and form of the parts without departing from the principle of the invention as comprehended within the scope of the appended claims.

What I claim is:

1. For use with an internal combustion engine having an ignition circuit which includes an ignition switch, a carburettor for said engine which comprises, in combination,

an induction pipe,

a throttle member in said induction pipe, said throttle member being movable by an operator of the engine between a substantially closed position and a position of maximum opening, and vice-versa,

fuel passage means for idling running opening into said induction pipe downstream of said throttle member,

a device responsive to the engine speed,

switching means responsive to the position of said throttle member,

and fuel flow controlling means actuated by an electric circuit including said ignition switch, said fuel flow controlling means being adapted, when said ignition switch is switched off, to prevent at least partly the flow of fuel through said fuel passage means,

said fuel flow controlling means beng responsive when said ignition switch is switched on, both to said device and to said switching means for

(1) permitting the flow of fuel through said fuel passage means when the engine speed is below a given value and said throttle member is simultaneously substantially closed,

(2) permitting the flow of fuel through said fuel passage means when said throttle member is in any other position,

(3) and preventing at least partly the flow of fuel through said fuel passage means when the engine speed is above said given value and said throttle member is simultaneously substantially closed,

wherein said fuel flow controlling means includes a valve, resilient biasing means urging said valve towards a substantially closed postion which prevents, at least partly, the flow of fuel through said fuel passage means, and an electromagnet disposed in said electric circuit, in series with said ignition switch, said electric circuit further including a source of current in series with said ignition switch, said electromagnet being adapted, when energized, to open said valve which permits the flow of fuel through said fuel passage means, and said electromagnet being further adapted, when de-energized, to release said valve whereby said resilient biasing means can return said valve to its substantially closed position,

and wherein said electric circuit includes two branches, namely a first branch and a second branch, in parallel with each other but in series with said electromagnet, said ignition switch and said source of current, for energizing said electromagnet, said first branch including a relay operative by said device and adapted to be energized and hence closed when the engine speed is lower than said given value and de-energized and hence open when said engine speed is higher than said given value, said switching means comprising a first switch and a second switch, said first switch being disposed in said first branch and said second switch being disposed in said second branch, said first switch being closed and said second switch being open when said throttle member is substantially closed, and said first switch being open and said second switch being closed for all other positions of said throttle member.

2. A carburettor according to claim **1** wherein said valve is disposed in said fuel passage means.

3. A carburettor according to claim **1** wherein said switching means is mechanically actuated by said throttle member.

4. For use with an internal combustion engine having an ignition circuit which includes an ignition switch and a contact breaker acting periodically to break the ignition current, a carburettor for said engine which comprises, in combination,

an induction pipe,

a throttle member in said induction pipe, said throttle member being movable by an operator of the engine between a substantially closed position and a position of maximum opening, and vice-versa,

fuel passage means for idling running opening into said induction pipe downstream of said throttle member,

a device responsive to the engine speed, said device comprising counting means responsive to the number per unit time of current breaks in said ignition circuit,

switching means responsive to the position of said throttle member,

and fuel flow controlling means actuated by an electric circuit including said ignition switch, said fuel flow controlling means being adapted, when said ignition switch is switched off, to prevent at least partly the flow of fuel through said fuel passage means,

said fuel flow controlling means being responsive, when said ignition switch is switched on, both to said device and to said switching means for

(1) permitting the flow of fuel through said fuel passage means when the engine speed is below a given value and said throttle member is simultaneously substantially closed,

(2) permitting the flow of fuel through said fuel passage means when said throttle member is in any other position,

(3) and preventing at least partly the flow of fuel through said fuel passage means when the engine speed is above said given value and said throttle member is simultaneously substantially closed,

wherein said fuel flow controlling means includes a valve, resilient biasing means urging said valve towards a substantially closed position which prevents, at least partly, the flow of fuel through said fuel passage means, and an electromagnet disposed in said electric circuit, in series with said ignition switch, said electric circuit further including a source of current in series with said ignition switch, said electromagnet being adapted, when energized, to open said valve which permits the flow of fuel through said fuel passage means, and said electromagnet being further adapted, when de-energized, to release said valve whereby said resilient biasing means can return said valve to its substantially closed position,

and wherein said electric circuit includes two branches, namely a first branch and a second branch, in parallel with each other but in series with said electromagnet, said ignition switch and said source of current, for energizing said electromagnet, said first branch including a relay operative by said device and adapted to be energized and hence closed when the engine speed is lower than said given value and de-energized and hence open when said engine speed is higher than said given value, said switching means comprising a first switch and a second switch, said first switch being disposed in said first branch and said second switch being disposed in said second branch, said first switch being closed and said second switch being open when said throttle member is substantially closed, and said first switch being open and said second switch being closed for all other positions of said throttle member.

5. A carburettor according to claim **4**, wherein said switching means comprise:

a first contact blade forming part of said first switch and disposed in said first branch,

a second contact blade forming part of said second switch and disposed in said second branch,

and a third contact blade forming part both of said first switch and of said second switch, and connected in series with said electromagnet, said ignition switch and said source of current, said third contact blade being resilient and tending, by its own resiliency, to make contact with said second contact blade and to break contact with said first contact blade;

and wherein said throttle member is adapted to engage mechanically said third contact blade when said throttle member is substantially closed to bring said third contact blade out of contact with said second contact blade and into contact with said first contact blade, and said throttle member is further adapted to release said third contact blade for all other positions of said throttle member to permit said third contact blade to move, by its own resiliency, out of contact with said first contact blade and into contact with said second contact blade.

References Cited

UNITED STATES PATENTS

3,251,352 5/1966 Walker.
3,153,746 10/1964 Atkinson -------- 123—102 X
3,310,044 3/1967 Haverstick.

WENDELL E. BURNS, Primary Examiner

U.S. Cl. X.R.

30—30.4; 123—102