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HANS-EBERHARD JACOBY ET AL

CONTROL MECHANISM FOR CARBURETORS OF INTERNAL COMBUSTION ENGINES

Filed Nov. 28, 1934 2 Sheets-Sheet 1

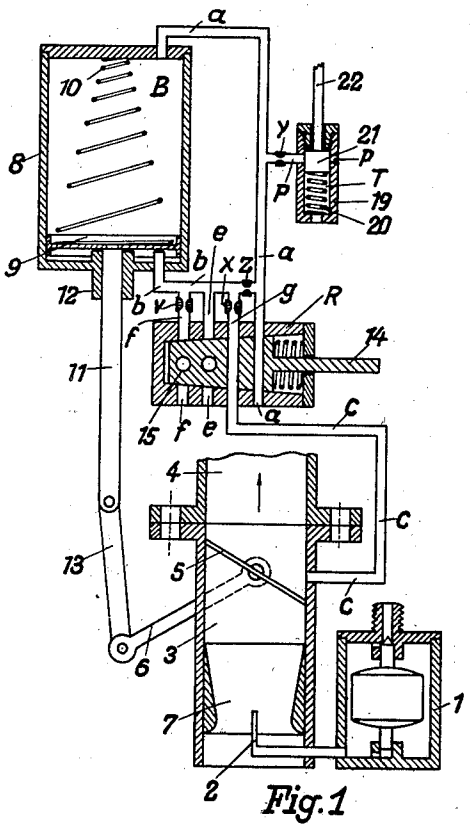


Fig.1

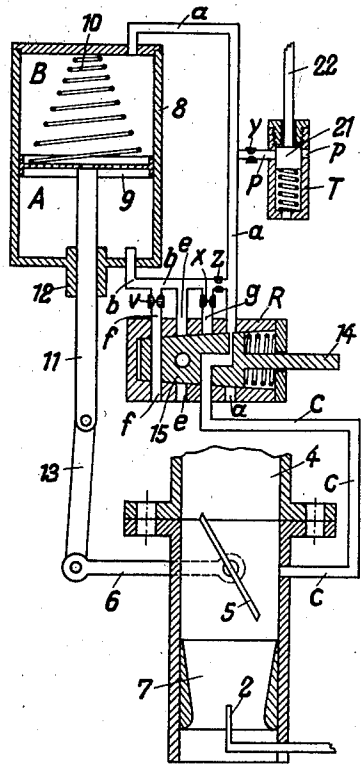


Fig.2

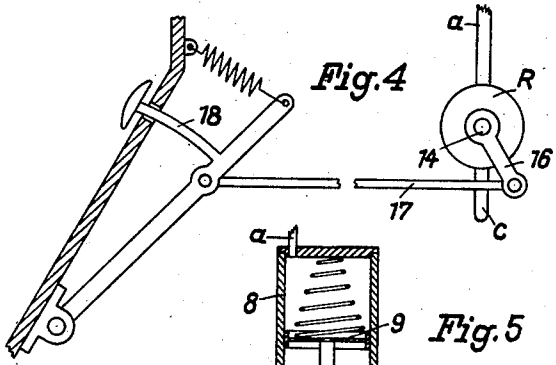


Fig.4

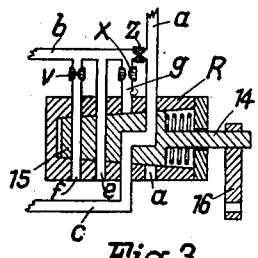


Fig.3

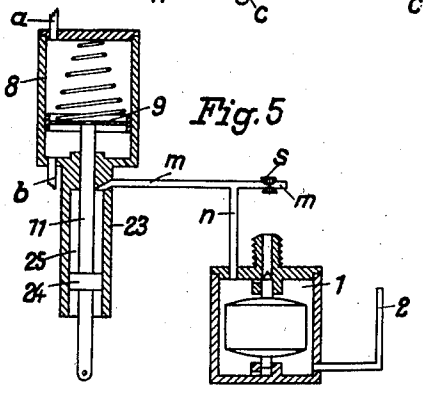


Fig.5

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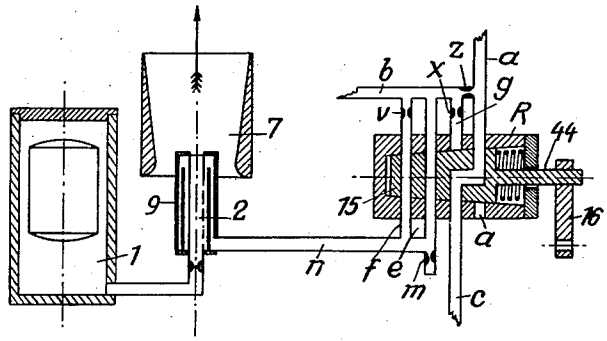


Fig. 6

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CONTROL MECHANISM FOR CARBURETORS OF INTERNAL COMBUSTION ENGINES

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7 Claims. (Cl. 123—103)

This invention relates to control mechanism for carburetors of internal combustion engines.

The accelerator of interal combustion engines has hitherto been controlled solely by touch. By such a method the carburetor cannot be operated with the maximum efficiency and economy. The object of the invention therefore is to provide means whereby the opening and closing of the throttle is controlled more efficiently and economically than hitherto.

The invention consists of a control mechanism for carburetors of internal combustion engines in which the opening or closing of the throttle is effected by a device controlled by the suction in the mixing chamber, the degree of suction being transmitted to the device by means operated by the accelerator lever or pedal, characterized in that the throttle is connected to a piston which is mounted in a cylinder and subjected to the action of a compression spring, said piston dividing the cylinder into two chambers which are connected to the atmosphere and the mixing chamber according to the position of the control device, and that the control device proper comprises a plug cock comprising a stationary member and a movable member controlled by the pedal, pipe connections leading from the stationary member to the two chambers of the cylinder, to the atmosphere and to the mixing chamber and passage ways in the movable member, some of the pipe connections being opened and/or closed according to the position of the plug of the cock.

In order that the invention may be more clearly understood one particular embodiment thereof will now be described, by way of example, with reference to the accompanying drawings wherein:—

Fig. 1 is a diagrammatic sectional view of the device showing the position of the parts when the throttle is closed.

Fig. 2 is a similar view showing the position of the parts when the throttle is in action.

Fig. 3 is a cross-section of one form of control device in the position which corresponds to the fully open position of the throttle.

Fig. 4 shows the mechanical connection of the accelerator pedal with the control device, and

Fig. 5 illustrates an auxiliary device for use in connection with carburetors of older type.

Fig. 6 illustrates the device in the case when the carburetor is operating with secondary air for the main jet.

In these drawings the float chamber of the carburetor with float and needle valve is indicated at 1. From this chamber the liquid fuel passes through the jet 2 into the current of air which flows through the venturi 7 and the mixing chamber or throttle chamber 3 past the throttle 5 into the inlet pipe 4 of the engine.

In the known type of carburetors the throttle 5 is operated directly by the accelerator pedal 18 Fig. 4 through the lever 6, but according to the present invention the lever 6 is pivoted to a rod 13 which in turn is connected to a rod 11 which forms the rod of a piston 9, and passes through a stuffing box 12 fitted into the bottom of a cylinder 8. The piston 9 is subject to the action of a compression spring 10 which normally tends to displace the piston 9 in a direction corresponding to the closing of the throttle.

Furthermore, a control device R is provided which, for example, may be in the form of plug cock having plug 15 provided with passage ways, hereinafter described in detail. The plug 15 has an extension 14 to which is connected an arm 16 Fig. 4 pivotally connected to a rod 17 attached to the pedal 18. Operation of the pedal 18 will therefore cause the valve body 15 of the control device R to rotate, as indicated in Fig. 4.

The casing R of the control device is connected by a pipe *c* to the mixing chamber 3 in such a manner that the pipe *c* opens into said mixing chamber 3 between the throttle 5 and the inlet pipe 4 of the engine. The space above the piston 9 in the cylinder 8 is connected to the casing R by a pipe line *a*, and the space A below the piston 9 is connected to the casing R by a pipe line *b* and by branch pipes *e*, *f*, and *g*. Furthermore, pipes *b* and *a* are interconnected by a branch pipe having a restriction Z. The lower part of the casing R is provided with openings *a*, *e* and *f* through which the pipes *a*, *e*, *f* open into the atmosphere according to the respective positions of the plug 15. In the pipes *f* and *g* restrictions *v* and *x* are disposed between the casing R and the pipe *b*.

The pipe *a* has a branch *p* which leads through a restriction *y* to an auxiliary device T which comprises a cylinder 19 wherein is mounted a piston 21 subject to the action of a compression spring 20. The piston rod 22 of piston 21 may be actuated independently by hand, mechanically or electrically by means of a thermostat, which measures the temperature of the engine.

The operation of the device is as follows:—

When the throttle is closed, that is when the pedal is not depressed, the parts occupy the position shown in Fig. 1. The plug cock R connects the pipe *c* through pipe *g*, restriction *x* and pipe

b with the space A below the piston 9 and the pipes *e* and *f* are closed, while the pipe *a* communicates with the atmosphere. In this position the throttle 5 is closed automatically by the suction in the inlet pipe 4 between the throttle 5 and the engine. In the known arrangement, in which the pedal operates directly on the throttle, it frequently happens that the throttle 5 is closed suddenly when the pedal is released, for example when the vehicle is stopped. In such cases the disadvantage is experienced that a jolt is felt in the vehicle because the braking action of the engine becomes too strongly effective. Furthermore, owing to the inertia of the moving liquid fuel the sudden cutting off of the air stream causes the fuel to overflow from the float chamber 1 towards the jet 2 (dripping) whereby undesirable loss of fuel is caused. Both of these defects are eliminated by the provision of the restriction or damper *x* in the pipe *g*. The effect of this restriction is to moderate the closing action of the throttle 5, so that a sudden jolt in the vehicle and loss of fuel will not occur.

When the pedal 18 is depressed for "speeding up" the engine the plug 15 is rotated with the aid of members 17, 16 and 14 so that the parts then occupy the position shown in Fig. 2. The pipes *e* and *g* are thus closed, the pipe *f* is connected to the atmosphere and the connection of the pipe *a* with the atmosphere is interrupted.

Through the pipe *f* atmospheric air is admitted to the space below the piston 9 through the restriction *v* and pipe *b*. The vacuum in the inlet pipe 4 between the throttle 5 and the engine now becomes effective through pipe *c* and pipe *a* in the space B above the piston 9. Through the restriction *z* air is by-passed from pipe *b* into pipe *a*, so that the vacuum in the pipe *a* will reach a part value of the suction in pipe *c* according to the position of plug 15, the movement of the throttle thereby sensitively following the fluctuations of the suction. Due to the suction in pipe *a* and thus in the space B piston 9 is lifted in a certain proportion to the counter pressure of spring 10 so that the piston 9 will occupy a certain position for example that shown in Fig. 2. When the piston rises the throttle 5 is opened by means of the connections 11, 13, 6 as shown in Fig. 2. The restriction *v*, now that the restriction *x* is inoperative, produces the same effect as described in connection with said restriction *x*, that is the damping of the movement of the throttle 5.

When the pedal 18 is brought into its end position, or fully depressed as shown in Fig. 4 (fully opened position throttle), the plug 15 is moved into the position shown in Fig. 3. Now in addition to the pipe *f*, the pipe *e* is also connected to the atmosphere, whereby the damping action of the restriction *v* is destroyed, and moreover, the connection of pipe *c* and pipe *a* is no longer damped.

In the known arrangement of throttle control the position of the throttle 5 was directly dependent upon the position of the pedal 18, but this is not the case in the arrangement described. The position of the throttle 5 is controlled, according to the position of the plug cock, by the air speed or the suction in the inlet pipe 4 in front of the throttle 5, said suction being transmitted by the plug cock R in a sensitive manner to the space B and becoming operative there in the manner described.

The described arrangement is obviously applicable to other vehicles, for example aeroplanes, where a lever takes the place of the accelerator pedal 18.

When the engine is cold the hitherto usual "speeding up" of the engine may be avoided for example by causing the piston 21, 22 of the auxiliary device T, which may be controlled by a known thermostat to open the pipe *p* (Fig. 2). A certain amount of auxiliary air will then enter to the pipe *a* through the restriction *y*, whereby the suction in the pipe *a* is reduced according to the position of the valve R as shown in Figs. 2 or 3, so that the piston 9 and therewith the throttle 5 is opened to a lesser extent.

In order that the device according to the present invention may be applied to carburetors of older type (e. g. without accelerator pump), the stuffing box 12 (Figs. 1 and 2) is constructed in the form of a cylindrical extension 23 (Fig. 5). Mounted on the piston rod 11 is an auxiliary piston 24, which is adapted to displace the air column in an auxiliary cylinder 25 according to the movement of the piston 9. From the uppermost point of the auxiliary cylinder 25 a pipe *m* leads to the atmosphere through the restriction *s*. From this pipe a branch pipe *n* disposed between the damper *s* and the cylinder 25 leads to the float chamber 1 which is sealed in an air tight manner. The operation of this arrangement is as follows:—

When the piston 9 is raised by the suction so as to open the throttle 5 the piston 24 is lifted by the piston rod 11, so that the air in the auxiliary cylinder 25 is expelled through the pipe *m*. The restriction *s* however chokes the air being expelled, so that a pressure is developed in the pipes *m* and *n* in the float chamber 1, whereby the difference of pressure between the fuel level and the fuel jet 2 necessary for the feed of the fuel is temporarily increased and a greater amount of fuel is supplied, so that according to the degree of acceleration of the mixture column the temporary enrichment with fuel is effected automatically. When the piston 9 descends the opposite effect is produced, air being drawn through the restriction *s* and pipe *m*, so that a vacuum is established in the float chamber 1 causing a reduction in the supply of fuel.

In carburetors provided with a secondary air supply arrangement 9 (Fig. 6) at the main jet 2 the pipes *f* and *e* may be combined into one pipe *n* which on one side communicates with the atmosphere through a restriction *m* and on the other side supplies the necessary secondary air to the main jet.

The invention is not limited to the particular construction of the control device shown in the drawings. If necessary further connection may be opened and closed by the control device.

We claim:—

1. In a control mechanism of the throttle for carburetors of internal combustion engines of the kind where the throttle is operated by an adjusting device worked by the pedal in such a manner that the position of the throttle is made dependent from the suction in the suction pipe, the combination, a suction pipe of the motor, a lever operated throttle, a venturi disposed within said pipe and a carburetor having a jet tube directed into said venturi, an adjusting device comprising a cylinder with a spring controlled piston and a link connection with the lever of the throttle, a control device comprising a lever operated manifold plug cock inserted between said cylinder and the suction pipe, a spring controlled pedal and a link connection between the pedal and lever of said

cock, a first pipe connection between the upper space of the cylinder and the cock to establish communication with the atmosphere and a restricted second pipe connection between the lower space of the cylinder and the cock and a pipe connection between cock and throttle chamber to establish a through communication according to the adjusting of the plug cock, and two additional pipe connections between the second pipe connection and the cock adapted to establish communication with the atmosphere, one of these two connections being provided with a restricting device and restricted connection between the first and second pipe connections.

2. In a mechanism according to claim 1 for the start with a cold motor, the combination with an independently operated auxiliary device comprising a cylinder having a spring controlled piston and an air inlet in said cylinder and a restricted pipe connection with the first pipe connection.

3. In a mechanism according to claim 1 adapted to work with carburetors of an older type the combination with an open cylinder attached to the stuffing box of the cylinder having a spring controlled piston, a piston fitting this open cylinder and provided on the piston rod of the cylinder having the spring controlled piston, an air conduit communicating with the closed space of said open cylinder having a restricted outlet to the atmosphere and a pipe connection branched off said air conduit and communicating with the air space of the float chamber of the carburetor.

4. In a mechanism according to claim 1 adapted to carburetors operating with secondary air for the main jet, two of the branch pipes (*f*, *e*) from the chamber (A) below the piston are combined into one pipe which on one side is connected to the atmosphere through a damper and on the other side supplies the necessary secondary air to the main jet (2).

5. Mechanism according to claim 1 wherein the plug cock connects the suction pipe with the lower cylinder space, and the first pipe connection communicates with the atmosphere and the two auxiliary connections are closed when the throttle is in closing condition.

6. Mechanism according to claim 1 wherein the plug cock keeps the non restricted auxiliary connection and the restricted second connection closed and the restricted auxiliary connection communicates with the atmosphere and the first connection communicates in a restricted manner with the throttle chamber when the pedal is in a depressed condition.

7. Mechanism according to claim 1 wherein the plug cock keeps the two auxiliary connections in communication with the atmosphere and the first connection in communication with the throttle chamber in a non restricted manner to abolish the effect of the restricted auxiliary connection when the pedal is fully depressed.

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