March 16, 1943. A. C. GUTENBERG ET AL 2,314,141

VACUUM CONTROLLING DEVICE FOR CARBURETORS

Filed April 4, 1941

Fig. 1.

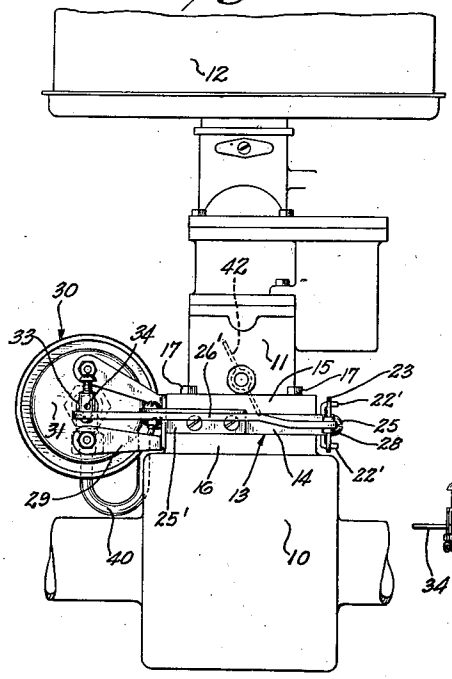


Fig. 4.

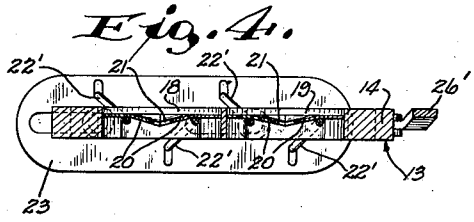
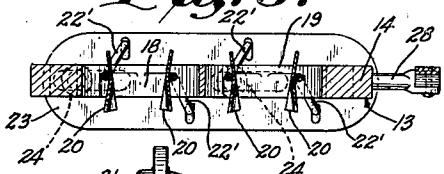


Fig. 5.



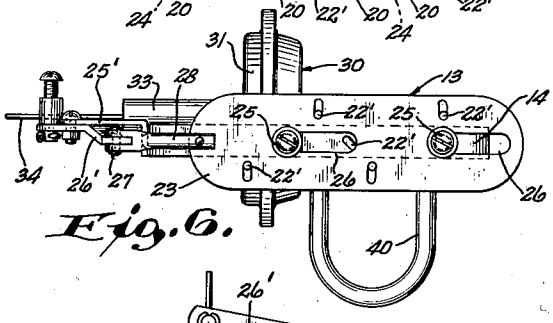


Fig. 6.

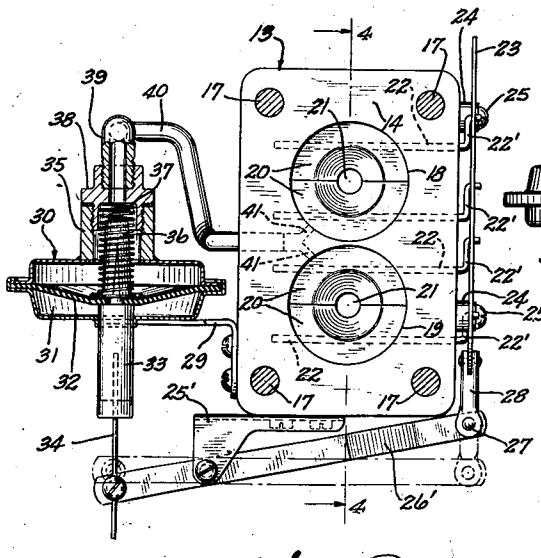


Fig. 2.

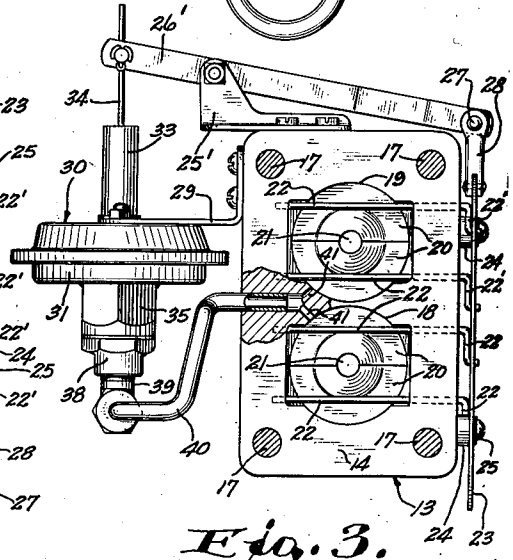


Fig. 3.

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VACUUM CONTROLLING DEVICE FOR CARBURETORS

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2 Claims. (Cl. 137—153)

This invention relates to improvements in vacuum controlling devices for carburetors, and more particularly to controlling devices for internal combustion engine carburetors of the type utilized in motor vehicles.

One of the objects of the present invention is to provide in an internal combustion engine, a controlling device interposed between the carburetor and the intake manifold for automatically controlling fuel flow and for maintaining the fuel mixture in a condition to insure the highest efficiency in engine performance.

A further object of the invention is to provide an internal combustion engine carburetor controlling device which operates automatically to maintain the vacuum in the carburetor and manifolds as constant as possible.

A further object of the invention is to provide a vacuum controlling device for carburetors which, during engine operation, automatically functions to insure a proper and efficient mixture of fuel and air in the carburetor.

A further object of the invention is to provide a controlling device of the character described with which any carburetor equipped internal combustion engine may be provided with a minimum of trouble and modification, and which, in its operation, requires no attention nor manipulation.

A further object of the invention is to provide a vacuum controlling device for carburetors which is of very simple construction, is strong and durable, is inexpensive to manufacture and install, and is well adapted for the purpose set forth.

With the above and other objects in view the invention consists of the improved vacuum controlling device for carburetors, and its parts and combinations as set forth in the claims, and all equivalents thereof.

In the accompanying drawing in which the same reference characters indicate the same parts in all of the views:

Fig. 1 is a side view of a portion of an internal combustion engine showing particularly the carburetor and the intake manifold, with the improved controlling device interposed between the two;

Fig. 2 is an enlarged plan view of the controlling device with portions thereof in section;

Fig. 3 is an enlarged inverted plan view of the controlling device with portions broken away and in section;

Fig. 4 is a longitudinal sectional view taken on line 4—4 of Fig. 2;

Fig. 5 is a similar sectional view only showing the gates of the controlling device in fully opened position; and

Fig. 6 is a side view of the controlling device.

Referring now more particularly to the drawing there is illustrated in Fig. 1 the particular portions of an internal combustion engine with which the improved controlling device is associated, said portions including an intake manifold 10, and a carburetor 11. In the exemplification shown the carburetor 11 is of the down-draft type, although this is not essential, and the carburetor has associated therewith a conventional air cleaner 12.

The improved controlling device, designated generally by the numeral 13, is adapted to be interposed between the carburetor and the intake manifold. Said device includes a flat plate member 14 which is clamped between the carburetor flange 15 and the manifold flange 16 by bolts 17. As is shown most clearly in Figs. 2 and 3 the plate member 14 is formed with a pair of circular openings or ports 18 and 19. Each port is controlled by a pair of complementary, semi-circular dished gates 20, the central portions of the gates being recessed to provide, in each pair, a small circular port 21. Each of said gate elements is carried by the shank portion of a crank pin 22, all of said crank pins being journaled in spaced relation in the plate member 14. The angular ends 22 of the crank pins project laterally of a side edge of the plate member 14 and are revolubly engaged in slots in a reciprocal plate 23. Said plate 23 is slidably mounted adjacent the outer side edge of the member 14, against bosses 24, by means of bolts 25 and slots 26.

The front end of the plate member 14 has affixed thereto a bracket 25' to which is intermediately pivotally connected a lever 26'. The outer end of said lever is pivotally secured, as at 27, to an arm 28 which is in turn rigidly secured to the forward end of the reciprocal plate 23.

The side of the member 14, opposite the reciprocal plate 23, carries a bracket 29 which supports a vacuum unit 30. This unit includes a hollow casing 31 which is internally divided by a flexible diaphragm 32. A plunger 33, slidably extending through an opening in one side of the casing 31, has its inner end secured to one face of the diaphragm. The outer end of the plunger carries a rod 34 which is adjustably secured to the inner end of the lever 26'.

The opposite side of the casing 31 is provided with an integral bushing 35 into which projects a protuberance 36 affixed to the corresponding face of the diaphragm. Said protuberance is sur-

rounded by a coiled spring 37 lodged within the bushing and engaging a screw threaded, bored, packing nut 38 at the outer end of the bushing. A nipple 39 is in threaded engagement with the packing nut and said nipple has connected thereto one end of a tubular connection 40. The tubular connection 40 extends into a bore therefor in the plate member 14 and communicates with a pair of diverging ducts 41, the latter having their outer ends exteriorly open on the under face of the member 14 adjacent the openings 18 and 19.

It has long been recognized that during the operation of a motor vehicle acceleration and deceleration is at times spasmodic and sudden, and there is a tendency on the part of the operator to open the carburetor butterfly valve too quickly and fully. Under these conditions too much and too rich a mixture of fuel will flow through the carburetor to the engine and all of this fuel will not be consumed and it may choke the mechanism and furthermore cause objectionable engine knocking, besides forming a condensate on the cylinder walls and diluting the lubricant. The present invention seeks to automatically overcome and prevent these undesirable conditions in the following manner:

The carburetor controlling device is based on the principle of providing a large opening between the carburetor and the intake manifold of the engine when there is an adequate vacuum in the system, and in automatically reducing or restricting this opening when there is an inadequate vacuum in the system. The inadequacy of the vacuum most frequently attains when the vehicle foot throttle is depressed too quickly whereby the carburetor butterfly valve is opened to too great an extent. Under these conditions an excess amount of fuel flows through the carburetor, or the fuel passes therethrough too rapidly to become properly atomized and mixed with air.

An internal combustion engine functions efficiently if the mixture of air with gasoline is maintained within a range of from approximately 1.3% to approximately 3%. The present improvement seeks to maintain as constant as possible this mixture relationship and is undertaken through the medium of maintaining a proper vacuum within the system. The maintenance of a proper vacuum within the system beneficially affects the air and gasoline mixture by substantial control of the velocity with which the mixture passes through the carburetor. For instance, if the fuel enters and passes through the carburetor at an established, constant velocity, it will be in the carburetor for a desired period and will take on a certain amount of air during that period. Variations in the time of passage of the fuel through the carburetor which is affected by velocity, will vary the amount of air taken into the mixture, but by maintaining a constant velocity through a constant vacuum the mixture can be kept within the range specified.

With reference to the device illustrated, if the butterfly valve 42 of the carburetor is opened too fully too quickly the vacuum in the system will be destroyed or drop materially. The vacuum conditions occur in the intake manifold 10 and as the ducts 41 open below the plate 14 and therefore within the intake manifold the pressure conditions are transmitted through the connection 40 into the vacuum unit casing 31 to flex the diaphragm 32 in the manner shown in full lines in Fig. 2. This movement of the diaphragm reacts on the plunger 33 and rod 34 whereby the lever 26' assumes the full line position of Fig. 2 and the plate 23, through the connections, is reciprocated rearwardly, acting on the cranks 22 to move and hold the gates 20 in closed positions. Then, there are only the restricted openings 21 between the discharge side of the carburetor and the intake manifold for fuel mixture passage. Obviously the fuel passage through the carburetor will be decelerated and restricted and the fuel will take on more air than if its passage to the intake manifold was unrestricted.

This action will quickly correct the lack of vacuum within the system and when the proper vacuum is established its influence, via the tube 40, will cause the diaphragm 32 to return to its unflexed position. Then the lever 26 will be automatically moved toward or to the dotted line position of Fig. 2 and the plate 23 will be reciprocated in the other direction. This movement of the plate, through the cranks 22, will swing the gates 20 toward open positions thereby enlarging the openings between the carburetor and the intake manifold. Under the latter conditions fuel may flow through the carburetor more rapidly than under the conditions previously mentioned and the mixture will be richer, but only so long as an adequate vacuum is maintained and the adequacy of the vacuum is directly related to the efficiency of the engine operation.

From the foregoing description it will be seen that the improved vacuum controlling device for carburetors is of simple construction, operates automatically, and is well adapted for the purposes described.

What is claimed in the invention is:

1. A fuel flow control device for an internal combustion engine having a fuel flow duct, comprising a pair of complementary, hingedly mounted shutters variably controlling the opening through said duct, said shutters having an opening therein to provide a minimum fuel flow orifice, oscillatory crank members for jointly moving said shutters, a vacuum device having a flexible diaphragm therein, an engine connection extending to the vacuum device for operating it, said vacuum device having a reciprocal element connected to the diaphragm, and means for transmitting motion from said reciprocal element to the crank members.

2. A fuel flow control device for an internal combustion engine, comprising a valve block having a circular opening therein, a pair of complementary, semi-circular shutters hingedly mounted within said opening to variably control the same, there being a minimum fuel flow orifice in said shutters, oscillatory crank members movably mounted in said block and connected with said shutters for jointly moving the same, a vacuum device adjacent the valve block and having a flexible diaphragm therein, reciprocal member connected to said diaphragm, means for transmitting engine suction and vacuum conditions to the diaphragm of said vacuum member to cause movement of said reciprocal member, and means for transmitting motion from said reciprocal element to the crank members.

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