

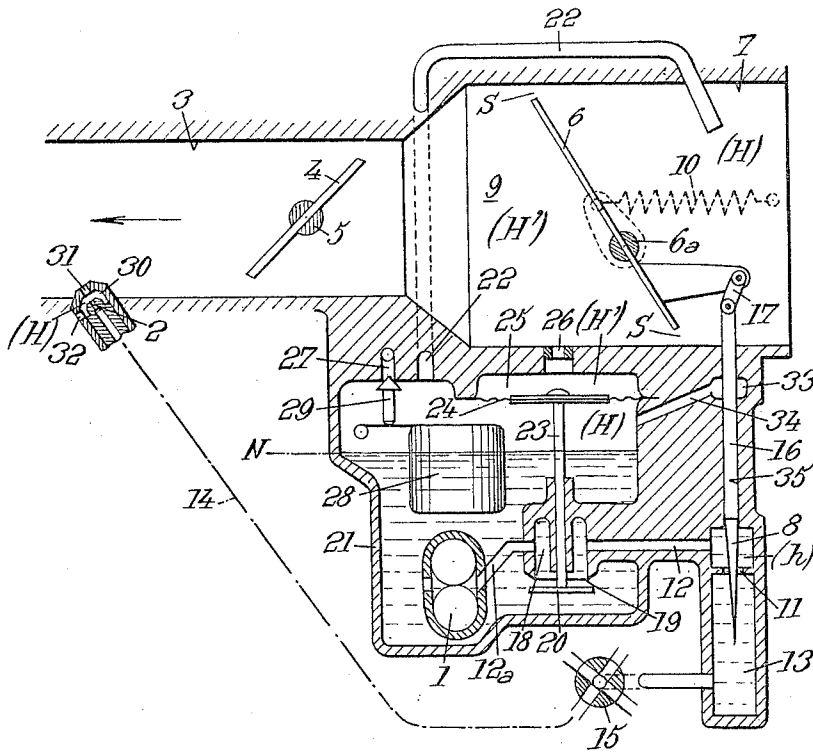
Nov. 29, 1966

A. L. MENNESSON

3,288,445

CARBURETTING DEVICES FOR INTERNAL COMBUSTION ENGINES

Filed June 4, 1964



INVENTOR
ANDRE' LOUIS MENNESSON
BY
Bailey, Stephens & Stettin
ATTORNEYS

1

2

3,288,445 CARBURETTING DEVICES 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

Filed June 4, 1964, Ser. No. 372,565

Claims priority, application France, June 8, 1963, 937,473

5 Claims. (Cl. 261—36)

The present invention relates to carburetting devices for internal combustion engines which comprise a pump adapted to deliver fuel through at least one injection orifice communicating with the induction pipe of the engine, a main throttle valve, operable by the driver, located in said induction pipe upstream of said injection orifice, an auxiliary throttle valve, disposed in said induction pipe upstream of the main throttle valve and adapted to open automatically and gradually as the air flow rate through said pipe increases, and a fuel metering member disposed between the pump and the injection orifice and actuated by said auxiliary throttle valve, the two throttle valves limiting between them, in said induction pipe, a suction chamber.

The chief object of my invention is to provide a device of this kind which is capable of delivering at any time a weight of fuel substantially proportional to the weight of air flowing through said induction pipe irrespective of variations of the suction existing in said chamber.

For this purpose according to the present invention, the carburetting device is characterized by the following features:

(a) A pressure regulator is provided for keeping the fuel, upstream of the metering member, at a pressure h such that the difference between this pressure h and the atmospheric pressure H is constantly and substantially proportional to the difference between the atmospheric pressure H and the pressure H' existing in said chamber;

(b) Means are provided for constantly maintaining at the outlet of the injection orifice, a pressure substantially equal to the atmospheric pressure;

(c) The metering member is such that the whole of the passage of variable cross section area it determines for the fuel and of the injection orifice of constant cross section is equivalent, concerning the fuel flow rate, to a single orifice of a cross section area constantly and substantially proportional to the cross section area left free in the induction pipe by the auxiliary throttle valve.

A preferred embodiment of the present invention will be hereinafter described with reference to the appended drawing, given merely by way of example, and in which the only figure is a diagrammatic vertical section of a carburetting device made according to the present invention.

The carburetting device comprises the following elements:

A pump 1, for instance a gear pump, driven either by the internal combustion engine or by an electric motor and capable of delivering fuel through at least one injection orifice 2 communicating with the induction pipe 3 of the internal combustion engine;

A main throttle valve 4 located upstream of injection orifice 2 in pipe 3, said main throttle valve being carried by a spindle 5 actuated by the driver through suitable distance control means;

An auxiliary throttle valve 6 located upstream of the main throttle valve 4 in the portion of pipe 3 that forms an air intake 7, said air intake being generally

provided with an air filter, not shown by the drawing, said auxiliary throttle valve 6 being adapted to open (or close) automatically and gradually as the air flow rate through air intake 7 increases (or decreases); and

A fuel metering member 8 located between pump 1 and injection orifice 2 and actuated by auxiliary throttle valve 6, the two throttle valves 4 and 6 limiting between them, in pipe 3, a suction chamber 9.

Concerning throttle valve 6, it consists of a shutter secured to a spindle 6a and eccentrically disposed so that it tends to open under the effect of the air stream flowing through air intake 7. A spring 10 (or a counterweight) urges said valve 6 toward the closed position.

Throttle valve 6 might also consist, in a manner known in itself and in particular as disclosed by the British Patent No. 962,819, filed November 28, 1961, of a piston slidable transversally in pipe 3 under the effect of the difference between the pressures existing in air intake 7 respectively upstream and downstream of this piston. Use might also be made of a mushroom-shaped valve slidable along the axis of a vertical branch of air intake 7 and urged in the downward direction by its weight.

Anyway the suction existing in chamber 9 depends upon the air flow rate through air intake 7 and upon the characteristics of spring 10 (or equivalent return means), this suction being possibly substantially constant.

Concerning metering member 8, it consists of a needle the cross section of which is variable along its length, said needle being movable in a diaphragm 11 so that the annular space left in diaphragm 11 around the needle has an area variable according to the longitudinal position of needle 8. The fuel comes from pump 1 through a conduit 12 and after its passage through diaphragm 11 it is evacuated through a chamber 13 and a conduit 14 leading to injection orifice 2. If the engine is provided with several injection orifices such as 2, a distributor 15 is provided between chamber 13 and the respective conduits 14.

The metering needle 8 is rigid with a sliding rod 16 projecting into air intake 7 and linked to shutter 6 through a link 17.

Now, according to the present invention, the carburetting device includes:

A pressure regulator adapted to keep the fuel, upstream of metering member 8, at a pressure h such that the difference between this pressure h and the atmospheric pressure H is constantly and substantially proportional to the difference between the atmospheric pressure H and the pressure H' existing in chamber 9, and

Means for constantly providing, at the outlet of injection orifice 2, a pressure substantially equal to the atmospheric pressure H ,

The metering member 8 being so shaped and so connected to auxiliary throttle member 6 that the whole of the variable cross section passage it determines for the fuel in diaphragm 11 and of injection orifice 2 is equivalent, concerning the flow rate of fuel, to a single orifice of a cross section s constantly and substantially proportional to the cross section S left free in air intake 7 by the auxiliary throttle member 6.

s being proportional to S ($s=KS$, K being a constant), in view of the mechanical connection between auxiliary throttle valve 6 and rod 16, the position x of rod 16 (i.e. the distance between a point of said rod and a point of the passage 35 in which it is slidable) and the value of cross section s are bound together by a relation:

$$s=f(x) \quad (1)$$

On the other hand, for every value of cross section s , there exists a cross section s_1 of the passage left in dia-

phragm 11 by the needle 8 which forms the fuel metering member such that the whole of passage s_1 and fixed orifice 2 gives the same flow rate, for a liquid supplied to said diaphragm under a given pressure h , than a single orifice of section s .

Therefore

$$s_1 = f_1(s) \quad (2)$$

Consequently

$$s_1 = f_1[f(x)]$$

or

$$s_1 = F(x) \quad (3)$$

It is possible experimentally, by varying the area of passage through diaphragm 11, to know the flow rate of liquid therethrough as a function of this area. For instance it suffices manually to give a needle of known, for instance conical shape, a multiplicity of positions in diaphragm 11 so that for each of these positions the angular area of the passage is known, and to measure the flow rate for each of these positions.

It is then possible to determine the shape of a needle 8 which complies with the above condition (3).

The drawing shows an embodiment of the invention.

The pressure regulator consists of a container 18 into which opens the delivery conduit 12a of pump 1 and from which conduit 12 starts. Said container 18 is provided with an end aperture limited by a seat 19 and with which cooperates a valve 20 consisting of a flat disc. Said aperture opens into a tank 21 which is kept substantially at the atmospheric pressure H through a conduit 22 connected to air intake 7 in the portion thereof upstream of auxiliary throttle valve 6. Valve 20 is linked through a rod 23 with a diaphragm 24 which separates tank 21, where the pressure is equal to the atmospheric pressure H , from a chamber 25 connected through an orifice 26 with a chamber 9 where the pressure is H' . If S_1 is the effective surface of diaphragm 24 and S_2 is the effective surface of valve 20, diaphragm 24 is subjected to an upward force equal to $S_1 (H - H')$ and valve 20 is subjected to the action of a downward force equal to $S_2 (h - H)$. For any position of equilibrium of movable system 20-23-24, the two forces in question are equal to each other so that the difference $h - H$ is truly proportional to the difference $H - H'$.

Advantageously, as shown, tank 21 is used as a constant level chamber, fuel arriving thereto from a tank (not shown) through a conduit 27 controlled by a float 28 and a needle valve 29. Pump 1, and also container 18, are disposed inside tank 21 below the normal level N of fuel, whereas diaphragm 24 is located above said level.

The means for constantly providing at the outlet of injection orifice 2 a pressure substantially equal to the atmospheric pressure H comprise a chamber 30 provided on the one hand with two orifices in line with each other, to wit, orifice 2 and an orifice 31 which opens directly into induction pipe 3 downstream of throttle valve 4 and on the other hand with an orifice 32 communicating with the atmosphere, possibly through air intake 7, the respective cross sections of orifices 31 and 32 being in a ratio to each other such that the atmospheric pressure H exists substantially in chamber 30. Thus the flow rate of fuel is not influenced by the suction existing in pipe 3 downstream of throttle valve 4 and it depends solely, on the one hand upon the difference existing between pressure h existing upstream of diaphragm 11 and pressure H existing downstream of injection orifice 2 and, on the other hand upon the free area of diaphragm 11 and the cross section of orifice 2, the whole of these two last mentioned surfaces being equivalent to the cross section s of a single orifice subjected to said pressure difference.

Finally it is of interest to provide, about rod 16, a groove 33 connected through a conduit 34 with tank 21, for instance, as shown, to the portion of this tank located above level N . Said groove 33 communicates with passage 35 in which rod 16 is slidable and collects the fuel

which may leak from conduit 12 through passage 35, thus preventing it from reaching air intake 7.

The device above described may include any known system for enriching or weakening the fuel and air mixture and also a starting system acting either by adjunction of a supplementary fuel feed orifice or by modification of the pressure inside the constant level chamber or at any other point of the conduits of the device.

The carburetting device works as follows:

The weight Pa of air flowing through pipe 3 measured opposite auxiliary throttle valve 6 is $Pa = Ks\sqrt{H - H'}$, whereas the weight of fuel is $Pe = K's\sqrt{h - H}$. Now, as above stated, on the one hand $h - H$ is proportional to $H - H'$ and on the other hand s is constantly proportional to S . As a consequence, the weight of fuel Pe is constantly proportional to the weight of air Pa for a given time period, irrespective of the variations of the suction H' existing in chamber 9.

By way of example, the diameter of auxiliary throttle member 6 is about 60 mm., the eccentricity of its mounting being 5 mm. The total longitudinal displacement of rod 16 is about 20 mm. Needle 8 is of substantially frusto-conical shape, its diameter at its ends being one millimeter and two millimeters, respectively. The diameter of diaphragm 11 depends upon the dimensions of the internal combustion engine used in connection with the carburettor.

In a general manner, while the above description discloses what is deemed to be a practical and efficient embodiment 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 in connection with an internal combustion engine, a carburetting device for said engine which comprises, in combination, an induction pipe leading to said engine, a main throttle valve in said induction pipe, said main throttle valve being operable to control the operation of the internal combustion engine, an auxiliary throttle valve in said induction pipe located upstream of said main throttle valve, yielding means for automatically urging said auxiliary throttle valve toward its closed position, said throttle valves limiting between them, in said induction pipe, a suction chamber, fuel feed means including a delivery orifice in communication with said induction pipe downstream of said main throttle valve, a casing, diaphragm means mounted in said casing for dividing the inside thereof into two spaces, means for placing one of said spaces in communication with said suction chamber, means for placing the other of said spaces in communication with the atmosphere, a fuel delivery pump, fuel pressure regulating means comprising a container mounted between the output of said pump and said fuel feed means, a discharge valve mounted on said container and operatively connected with said diaphragm means, said fuel feed means comprising a fuel delivery conduit leading from said container to said delivery orifice, and fuel metering means in said delivery conduit between said pressure regulating means and said delivery conduit orifice, said fuel metering means being operatively connected with said auxiliary throttle valve for controlling the flow rate of fuel from said delivery orifice so that said flow rate is proportional to that which would be obtained by the flow of fuel through a single orifice of a cross section substantially proportional to the cross section area left free in said induction pipe by said auxiliary throttle valve.

2. A carburetting device according to claim 1 wherein the lower portion of said casing constitutes a constant level chamber, said pump being located in said constant level chamber below the normal level of fuel therein and said diaphragm means being above said level.

3. A carburetting device according to claim 1 wherein the lower portion of said casing constitutes a constant

5

level chamber, said pump and said container being located in said constant level chamber below the normal level of fuel therein and said diaphragm means being above said level.

4. A carburetting device according to claim 1 in which said fuel metering means comprises a metering member, and a rod rigid with said metering member, operatively connected with said auxiliary throttle valve, said induction pipe being provided with a passage for slidably accommodating said rod, said passage including a groove surrounding said rod for collecting fuel travelling along said passage.

5. For use in connection with an internal combustion engine, a carburetting device for said engine which comprises, in combination, an induction pipe leading to said engine, a main throttle valve in said induction pipe, said main throttle valve being operable to control the operation of the internal combustion engine, an auxiliary throttle valve in said induction pipe located upstream of said main throttle valve, yielding means for automatically urging said auxiliary throttle valve toward its closed position, said throttle valves limiting between them, in said induction pipe, a suction chamber, a fuel delivery conduit having a delivery orifice, means forming around said delivery orifice a chamber having two orifices, one of which is located opposite said delivery orifice and opens into said induction pipe downstream of said main throttle valve, the other of said chamber orifices being between said last mentioned chamber and the atmosphere, a casing, diaphragm means mounted in said casing for dividing the inside thereof into two spaces, means for placing one of said spaces in communication with said suction chamber, means for placing the other of said spaces in communication with the atmosphere, a fuel delivery pump, fuel pres-

6

sure regulating means comprising a container mounted between the output of said pump and said fuel delivery conduit, a discharge valve mounted on said container and operatively connected with said diaphragm means, and fuel metering means in said delivery conduit, said fuel metering means comprising a transverse partition in said delivery conduit provided with a hole, and a needle of non-uniform cross section slidable in said hole to control the cross section area thereof available for the flow of fuel, means for operatively connecting said needle with said auxiliary throttle valve so that the displacements of said auxiliary throttle valve cause said needle to move in said hole coaxially therewith, said needle being so shaped and said last mentioned connecting means being made such that the flow rate of fuel from said delivery orifice is proportional to that which would be obtained by the flow of fuel through a single orifice of a cross section substantially proportional to the cross section area left free in said induction pipe by said auxiliary throttle valve.

References Cited by the Examiner

UNITED STATES PATENTS

2,445,099	7/1948	Wirth	261—50 X
2,574,670	11/1951	Sweeney	261—50 X
2,908,488	10/1959	Stewart.	
2,957,464	10/1960	Dolza.	
2,996,051	8/1961	Mick.	
3,006,329	10/1961	Armstrong et al.	
3,061,286	10/1962	Mennesson	261—36

HARRY B. THORNTON, *Primary Examiner.*

T. R. MILES, *Assistant Examiner.*