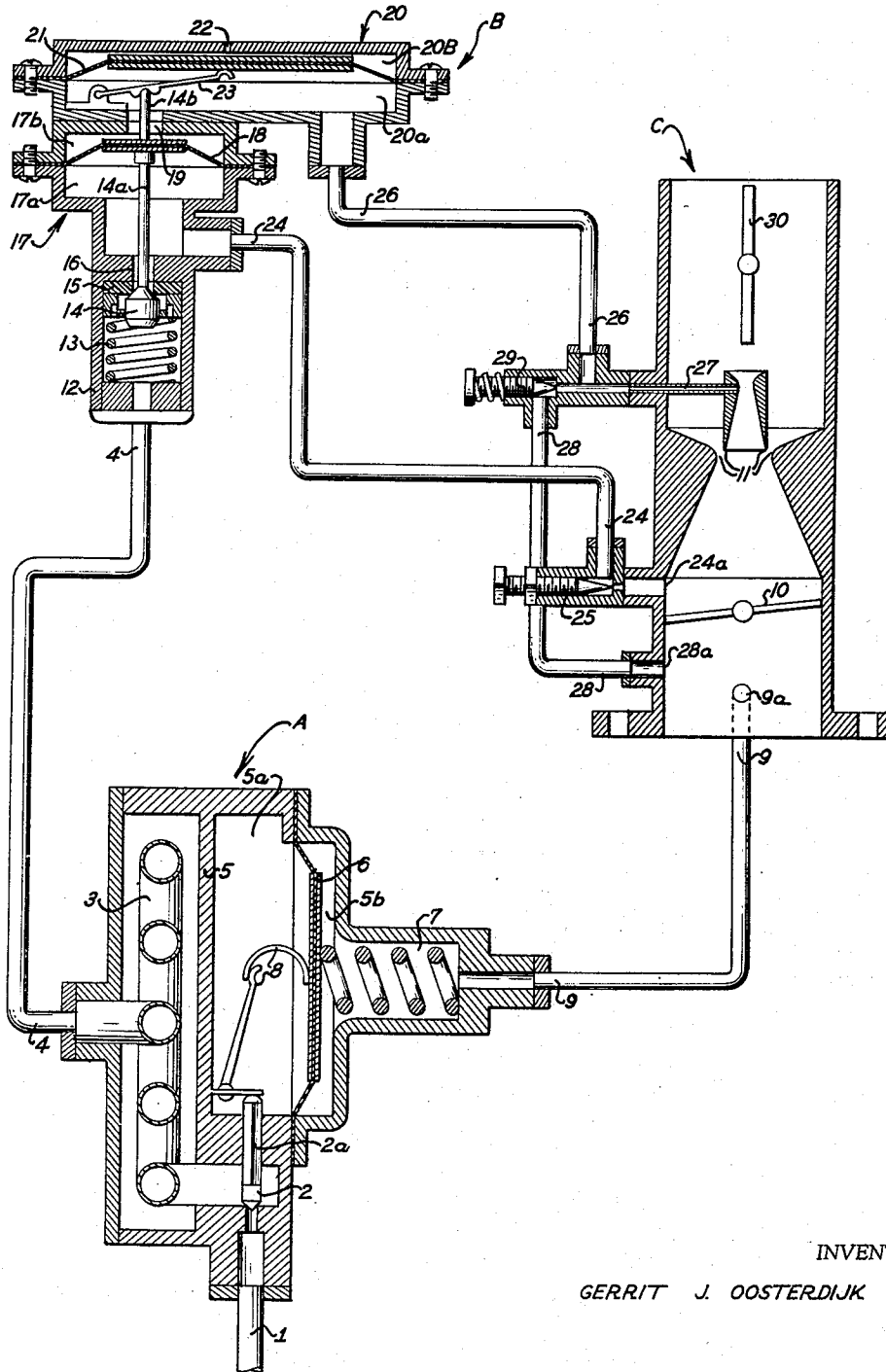


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DEVICE FOR FEEDING A COMBUSTION MOTOR
WITH LIQUIFIED PETROLEUM GAS
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DEVICE FOR FEEDING A COMBUSTION MOTOR WITH LIQUIFIED PETROLEUM GAS

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3 Claims. (Cl. 48—184)

The invention relates to devices for feeding combustion motors with L.P.G. (liquified petroleum gas), the L.P.G. usually consisting of a liquid mixture of propane and butane.

In known devices of this type, liquid fuel from a supply tank is fed via a high-pressure control valve, a heat exchanger and a low-pressure control valve in a gaseous condition to a carburetor, under a pressure lower than the atmospheric pressure, so that the gas must be sucked into the carburetor by means of the suction of the motor.

This adjustment of the pressure of the gas, however, has the disadvantage that the velocity of the gas is low and consequently the gas-passages such as, for example, those in the pressure control-valves and in the carburetor, must have large dimensions, whereby not only the adjustment of the device becomes difficult, but also the device must be large, so that the mounting of the known devices in normal motor-cars is rather difficult.

It is an object of the invention to remove these disadvantages by the provision of a device in which the L.P.G. gas is injected into the carburetor with a variable pressure above atmospheric and preferably increasing proportionally with the number of revolutions of the motor.

It is a further object of my invention to provide means for automatically adjusting the overpressure in relation to the load of the motor and other conditions of operation.

To achieve the above objects and such other objects as may become apparent as this specification proceeds, the invention provides an arrangement and construction of parts as illustrated in the accompanying drawing which schematically shows a device for feeding a combustion motor of a motor car with liquified petroleum gas.

In this drawing a high-pressure control device is generally indicated by A, a low-pressure control device by B and a carburetor by C.

Liquid fuel from a supply tank (not shown) is forced by gas-pressure in this tank via line 1 to the control device A and is reduced in pressure and gasified by means of a high-pressure valve 2 and then flows via the heat-exchanger 3, which may be heated by the radiator-system water of the motor, and via conduit 4 to the low-pressure control device B.

The high-pressure valve 2 is provided with a square pin 2a guided in a circular hole in the wall 5 of the pressure control chamber 5a, which chamber is separated by a spring loaded membrane 6 from a second pressure control chamber 5b.

The position of the membrane 6 is transmitted to the valve 2 by means of a suitable mechanism 8.

The control chamber 5b communicates with the carburetor C by means of a conduit 9 debouching at 9a into a part of the carburetor, which in the direction of the flow through this carburetor is situated behind the venturi 11 and the gas valve 10, which are arranged in conventional manner in the carburetor.

By means of the conduit 4, the fuel, which is in a gase-

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ous condition, flows into valve housing 12 of low-pressure control valve 14 which is pressed onto its seat 15 by the pressure of the gas.

When the valve 14 is opened, the gas flows through the valve passage 16 into a first compartment 17a of a pressure control chamber 17, which compartment by means of a membrane 18 is separated from a second compartment 17b, which via an opening 19 is in continuous communication with the first compartment 20a of a second control chamber 20, which compartment 20a by means of a membrane 21 is separated from a second compartment 20b, communicating with the atmosphere by means of a hole 22. The surface area of membrane 21 is larger than that of membrane 18.

The low-pressure valve 14 is suspended from the membrane 18 by means of the vertical valve stem 14a. The adjusted position of the membrane 21 in the second control chamber 20 is transmitted to the end 14b of the valve stem 14a passing through the opening 19 by means of a suitable mechanism or lever 23 which amplifies the force exerted by membrane 21.

From the compartment 17a of the first control chamber 17 the gas flows to the carburetor C through a conduit 24 debouching into the carburetor at 24a, which place seen in the direction of flow through the carburetor is situated behind the venturi 11 and before the gas-valve 10.

The passage of the gas through this conduit 24 can be controlled by means of a main-adjusting screw 25.

The compartment 20a of the second control chamber 20 is connected via the conduit 26 to a small tube 27 ending inside the venturi 11. A branch conduit 28 from the conduit 26 debouches into the carburetor at 28a, which place seen in the direction of flow through the carburetor is situated behind the venturi 11 and behind the gas valve 10.

The passage through this branch conduit 28 can be controlled by means of an adjusting screw 29.

The choke-valve in the carburetor is indicated by 30. The operation of the device described hereinbefore is as follows:

The liquid fuel from the supply tank flows via the conduit 1 through the low-pressure valve 2 which reduces the pressure. This reduction in pressure depends on the tension of the spring 7 and on the vacuum at 9a in the carburetor C, behind the gas-valve 10. The lower this vacuum will be, the more the gas pressure will be decreased. When the motor is under full load, practically no vacuum will exist at 9a and the gas pressure in the high-pressure control-valve will be high.

However, with the motor idling and with the gas-valve 10 in a slight opened position, the vacuum will be high and consequently, the gas-pressure will be low. Dependent on the load of the motor, in the device according to the invention the gas pressure in the high-pressure control valve can vary between about a quarter of an atmosphere to one atmosphere above atmospheric. However, the maximal gas pressure cannot be chosen above about 1 atmosphere above atmospheric, as otherwise the device could not operate in strong frost. More particularly, at about 20° C. frost, the gas pressure in the supply tank decreases to about one atmosphere.

After having passed the high-pressure control device A, the now gaseous fuel flows via the heat-exchanger 3 and the conduit 4 to the low-pressure control device B.

When the motor is started, during which the choke valve 30 is closed, a vacuum will be present in the conduit 26, dependent on the vacuum in the venturi 11 and in the tube 27 and on the pressure in the conduit 28, which vacuum in the conduit 26 will become active in the chamber 20a. By means of this vacuum a force is exerted on the membrane 21, which via the mechanism

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23 is transmitted to the valve 14, which valve is pressed onto its seat 15 by the gas pressure in the chamber 12.

When the force exerted by the membrane 21 on the valve 14 becomes larger than the force on the valve exerted by the gas pressure, the valve will be opened and the gas will flow to the carburetor C via the compartment 17a and the conduit 24.

Simultaneously in the compartment 17a, a pressure will be generated which exerts a force on the membrane 18. This force will try to close the valve 14, so that a certain position of equilibrium of the valve will be obtained.

If the motor rotates at normal speed, a vacuum will be generated in the venturi 11, which vacuum is proportional to the volume of air sucked in by the motor per unit of time.

Consequently, the lower the number of revolutions of the motor and the load, the lower this vacuum will be. As this vacuum will act in the compartment 20a, the force on the membrane 21 will vary with the load or the number of revolutions of the motor. Thus the pressure in the compartment 17a will vary in the same ratio, as the membrane 18 will try to balance the force.

The result will be that the gas will flow with a pressure dependent on the volume of air which per unit of time flows to the motor, and is consequently dependent on the number of revolutions of the motor, the gas flowing to the motor from the compartment 17a via the conduit 24 and to the carburetor. The volume of the gas supplied is dependent on the passage 24a which can be adjusted by means of the adjusting screw 25. The pressure of the gas at this passage 24a, however, is independent of this adjustment, as this pressure is adjusted by the action of the membranes 18 and 21. In practice, the injection-pressure of the gas into the carburetor varies from slightly above atmospheric pressure to about 0.75 atmospheres above atmospheric.

Because, when the motor idles or is at low speed and the gas-valve 10 is practically closed so that practically no vacuum in the venturi 11 is present, the branch conduit 28 is used to transfer the vacuum at the lower side of the gas-valve to the pressure control conduit 26. The vacuum in this conduit can be adjusted by means of the adjusting screw 29.

While in the foregoing there has been shown and described a preferred embodiment of this invention, it is to be understood that changes in the details of construction, combination and arrangement of parts may be re-

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sorted to without departing from the spirit and scope of the invention as claimed.

What I claim is:

1. Apparatus for supplying liquified petroleum gas from a supply tank to a carburetor having a venturi, said apparatus comprising a high pressure control valve, a first conduit connecting said supply tank with said high pressure control valve, a low pressure control valve, a second conduit connecting said high pressure control valve with said low pressure control valve, a control chamber adjoining said low pressure control valve, a first membrane in said control chamber, means coupling said first membrane with said low pressure control valve, a second membrane in said control chamber, the said first membrane dividing said control chamber in a first compartment between said first membrane and said low pressure control valve and communicating through the latter with said second conduit, the said first and second membranes defining a second compartment, said control chamber being provided with a third compartment outside said second membrane and in communication with the atmosphere, means coupling said second membrane with said first membrane and amplifying the pressure exerted on said second membrane while transferring the same to said first membrane, a third conduit connecting said first compartment with said carburetor, and a fourth conduit connecting said second compartment with said venturi, the means coupling said first membrane and said low pressure control valve providing that the latter is further opened when the pressure in said second compartment decreases.

2. Means as claimed in claim 1, wherein said third conduit is connected with a part of said carburetor downstream from said venturi.

3. Apparatus as defined in claim 1 in which said high pressure control valve is provided with a control chamber, a membrane disposed in said last named chamber, means connecting said last named membrane and said high pressure valve to actuate the same, a fluid pressure chamber on one side of said last named membrane and a conduit connecting said fluid pressure chamber and said carburetor downstream from said venturi.

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