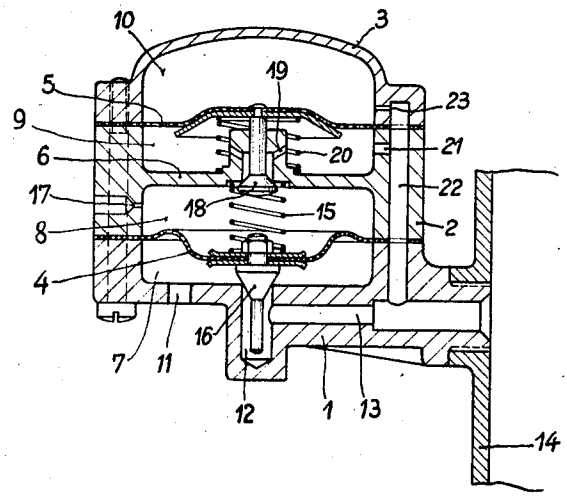
Aug. 13, 1940. R. LINDER 2,211,336

APPARATUS FOR PREVENTING STALLING OF CARBURETOR ENGINES

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Fig. 1.



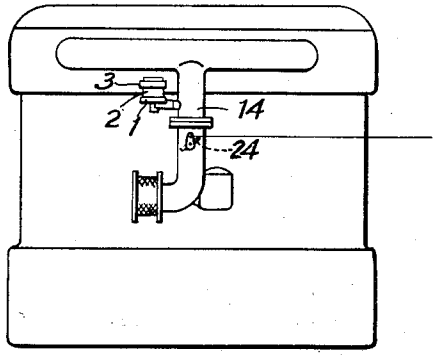


Fig. 2.

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APPARATUS FOR PREVENTING STALLING OF CARBURETOR ENGINES

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9 Claims. (Cl. 123—124)

It is possible in carburetor engines of vehicles, should the supply of gas be shut down to no load and declutching effected at the same time, for the engine to stall. This unexpected stalling of the engine is due to the following cause. Especially when travelling with maximum gas, i. e. with the throttle valve opened and with small speed, a comparatively large quantity of fuel remains suspended on the wall of the induction pipe. Now if the gas is suddenly shut off for any reason, i. e. if the carburetor throttle has to be closed and the clutch disengaged, a high partial vacuum suddenly arises in the induction pipe between the throttle valve and the engine. Consequently the fuel still present in the induction pipe, especially the fuel deposited on the wall of the induction pipe, vapourises very quickly, so that for running under no load, the engine temporarily receives a mixture which is too rich and which no longer being ignitable causes stalling. If it is then desired to start up the engine again, this is also not usually successful immediately, especially with down draught carburetors because too rich a mixture is still present in the induction pipe.

The present invention has for its object the elimination of this drawback, and accordingly there is provided a safety device by means of which the induction pipe between the throttle valve of the carburetor and the engine is temporarily connected to the atmosphere in dependence on the rapid increase in partial vacuum occurring on sudden closing of the throttle valve. By this means, the engine receives air on sudden closing of the throttle valve, so that the mixture remains ignitable corresponding to the "no load" conditions and the engine is prevented from stalling.

The invention is more particularly described with reference to the accompanying drawing, which shows in Fig. 1 one form of construction in section by way of example. Fig. 2 shows, in smaller scale and in side elevation, the device illustrated in Fig. 1 mounted on the induction pipe of an internal combustion engine.

In the drawing, the casing of the device consists of three parts, 1, 2, 3. The interior of the casing is divided into four chambers 7, 8, 9 and 10 by two diaphragms 4, 5 respectively stretched between the parts 1–2, 2–3, and by a rigid intermediate wall 6 in the part 2.

The chamber 7 is permanently in communication with atmosphere through a wide opening 11 and is in communication through bores 12, 13 with the interior of the induction pipe 14 behind the carburetor throttle valve 24. A valve 16 is secured to the diaphragm 4 and is loaded in the closing direction by a spring 15, whereby it normally tends to close the entrance of the bore 12 into the chamber 7.

The chamber 8 is in communication with atmosphere through a relatively narrow or restricted opening or throttle 17 and further is adapted for communication with the chamber 9 through ducts 19 controlled by a valve 18. The valve 18 is secured to the diaphragm 5 for displacement therewith and is loaded in the closing direction by a spring 20.

The chamber 9 communicates through a relatively wide opening 21 with a bore 22 which leads to the bore 13 and thus also to the induction pipe 14. The chamber 10, separated from the chamber 9 by the diaphragm 5, is also in communication with the bores 22, 13 and the induction pipe, but through a relatively narrow or restricted opening or throttle 23.

The device operates in the following manner:

When the engine is stationary and in normal operation, the valves 16 and 18 are closed by their springs 15 and 19, since the pressures on both sides of the diaphragms 4 and 5 are balanced. Atmospheric pressure is maintained in the chambers 7 and 8 whilst in the chambers 9 and 10 the particular induction pipe pressure subsists. Now if, when the engine is running, the degree of vacuum in the induction pipe is suddenly increased by rapid closing of the throttle valve, then this increase in vacuum immediately takes effect to the full extent in the chamber 9 on account of the relatively wide opening 21, while in the chamber 10 it becomes effective only gradually on account of the relatively narrow opening 23.

Consequently there arises below the diaphragm 5 a higher vacuum than above said diaphragm, so that the diaphragm 5 moves downwards against the spring 19 and opens the valve 18. At the same time, however, there also occurs in the chamber 8, which is in communication with the atmosphere only through the relatively narrow opening 17, which greatly hinders the passage of air, a partial vacuum which moves the diaphragm 4 upwards against the spring 15 and opens the valve 16. As a result atmospheric air is sucked into the induction pipe through the bore 11, the chamber 7, and the bores 12, 13, so that the mixture, which is rich in fuel, resulting or present in the induction pipe, receives a corresponding addition of air and remains capable of ignition.

This condition continues to exist until, after a short time, such as a few seconds, a pressure

balance has again arisen in the chambers 10, 9 or 8, 7 whereby, firstly, owing to gradual increase in the partial vacuum, in the chamber 10 (due to the narrow opening 23), the valve 18 closes and then, through the narrow opening 17, atmospheric pressure becomes established in the chamber 8, which is now cut off from the induction pipe, said atmospheric pressure permitting the spring 15 to close the valve 16 and to prevent further admission of extra air to the induction pipe.

By suitable variation in the relative cross-section of the openings 17, 21, 23 and of the bores 13, 22 and of the volumes formed by the chambers 8, 9 and 10, the supply of extra air can be adapted as regards time and quantity to the needs of the engine.

It is further appropriate to connect the bore 22 to the air inlet bore 13 at an angle in such a way that owing to the inflowing air a dynamic partial vacuum occurs at the point of connection and thus an undesired early destruction of the degree of vacuum in the chamber 9 is avoided.

The division of the device into a control unit 9, 10, 5, 18 and an air supplying unit which is separated therefrom and only responds to pressure alterations passed on by the control unit has the advantage that after the device has been changed around to closing, any additional admission of air, for instance through the opening 17, is prevented and consequently the method of operation of the engine with the device closed is not influenced in any way.

An essential point in the device is that it only responds on rapid increases in partial vacuum, that is, on rapid closing of the throttle valve and then automatically returns gradually into its inoperative position. On gradual variation of suction in the induction pipe, that is on normal supply or withdrawal of gas when travelling, the device remains unaltered in its sealing position.

Although diaphragms 4, 5 are to be preferred as they respond more rapidly and do not jam easily, it will be appreciated that pistons may be used if necessary in place thereof.

I declare that what I claim is:

1. Apparatus for preventing stalling of carburetor engines on rapid closure of the throttle valve thereof, comprising pressure sensitive means, valve means controlled thereby and a conduit, between atmosphere and that part of the induction pipe of said engine in rear of the said throttle valve, in which said pressure sensitive means and said valve means are located, said conduit constituting the sole connection of said pressure sensitive means and said valve means with said induction pipe, said pressure sensitive means and said valve means being operable to allow air to pass to the said induction pipe part only on rapid increase in the partial vacuum, occurring in said part of said pipe on sudden closing of the throttle valve.

2. Apparatus for preventing stalling of carburetor engines on rapid closure of the throttle valve thereof comprising pressure sensitive means, valve means controlled thereby and a conduit, between atmosphere and that part of the induction pipe of said engine in rear of the said throttle valve, in which said pressure sensitive means and said valve means are located, said conduit constituting the sole connection of said pressure sensitive means and said valve means with said induction pipe, said pressure sensitive means and said valve means being operable to allow air to pass to the said induction pipe part only on rapid increase in the partial vacuum occurring in said part of said pipe on sudden closing of the throttle valve, and means for rendering said pressure sensitive means inoperative gradually.

3. Apparatus for preventing stalling of carburetor engines on rapid closure of the throttle valve thereof, comprising a conduit between atmosphere and that part of the induction pipe of said engine in rear of the said throttle valve, pressure sensitive means in said conduit and including a pressure sensitive member operable by variations in pressure on opposite sides thereof, valve means controlled thereby, and control means controlling the application of the pressure in said induction pipe to said pressure sensitive means; whereby said pressure sensitive means and valve means are operable to allow air to pass to the said induction pipe part only on rapid increase in the partial vacuum occurring in said pipe part on sudden closing of the throttle valve, said control means gradually restoring a pressure balance on opposite sides of said pressure sensitive member after the sudden rise in partial vacuum in said induction pipe, whereby the supply of air through said device is gradually cut off from said pipe.

4. Apparatus for preventing stalling of carburetor engines on rapid closure of the throttle valve thereof, comprising pressure sensitive means which is located in a conduit between atmosphere and that part of the induction pipe of said engine in rear of the said throttle valve, and is operable to allow air to pass to the said induction pipe part only on rapid increase in the partial vacuum occurring in said pipe part on sudden closing of the throttle valve, said pressure sensitive device including a control unit and an air supply unit, the latter of which is responsive to adjustment effected by pressure variations in the control unit.

5. A pressure sensitive device for preventing stalling of carburetor engines on rapid closure of the throttle valve thereof, comprising a casing in communication with atmosphere and divided into chambers by at least one diaphragm with the induction pipe of the engine in rear of the throttle valve in communication with separate chambers respectively through conduits having relatively wide and narrow orifices, and an inlet valve in said casing controlling the air supply from atmosphere to said induction pipe, the diaphragm separating said chambers setting up a pressure difference on rapid closure of the throttle valve to open said inlet valve.

6. A pressure sensitive device for preventing stalling of carburetor engines on rapid closure of the throttle valve thereof, comprising a casing divided into four chambers by two diaphragms and an intermediate bored partition, a valve carried by each diaphragm with one of said valves controlling said bore and the other valve controlling the supply of air to the induction pipe of said engine in rear of said throttle valve, the chamber containing the said inlet valve having a relatively large opening for inlet of air from atmosphere and the chamber separated therefrom by one of the diaphragms having a relatively narrow opening to atmosphere, and conduits between said inlet valve and said induction pipe and between said induction pipe and the chambers on opposite sides of said diaphragm carrying said valve for controlling said bore, said conduits having orifices of relatively wide and

narrow section respectively with said last mentioned chambers, whereby on sudden rise in vacuum in said pipe said inlet valve is opened and then gradually closed on establishment of pressure equilibrium in said pressure sensitive device through the medium of the orifices of relatively narrow section.

7. Apparatus as claimed in claim 6, and wherein a dynamic partial vacuum is produced by air flowing to the induction pipe at the point where the conduit between said inlet valve and said pipe merges into the conduit between said pipe and those chambers which are separated by the diaphragm carrying the valve for controlling the bore in the partition.

8. Apparatus for preventing stalling of carburetor engines on rapid closure of the throttle valve thereof, comprising an auxiliary valve for allowing air to pass into the induction pipe between said throttle valve and the engine, and pressure sensitive means, including means controlling the application of the pressure in said induction pipe to said pressure sensitive means, adapted to open said auxiliary valve only on rapid increase in the partial vacuum occurring in the induction pipe on sudden closing of the throttle valve.

9. Apparatus for preventing stalling of carburetor engines on rapid closure of the throttle valve thereof, comprising an auxiliary valve for allowing air to pass into the induction pipe between said throttle valve and the engine, and pressure sensitive means, including means controlling the application of the pressure in said induction pipe to said pressure sensitive means, adapted to open said auxiliary valve temporarily only, and only on rapid increase in the partial vacuum occurring in the induction pipe on sudden closing of the throttle valve.

RUDOLF LINDER.