March 24, 1970 C. H. VOGES ETAL 3,502,000

ADJUSTING DEVICE FOR THROTTLE VALVES

Filed March 10, 1967

FIG. 1

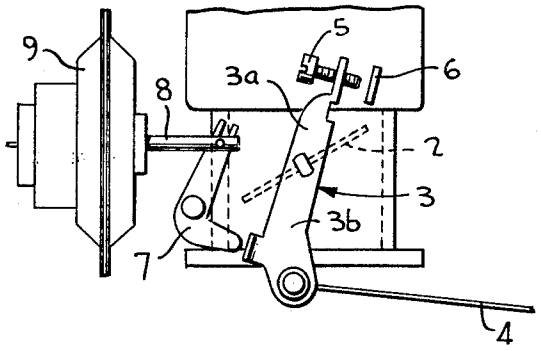
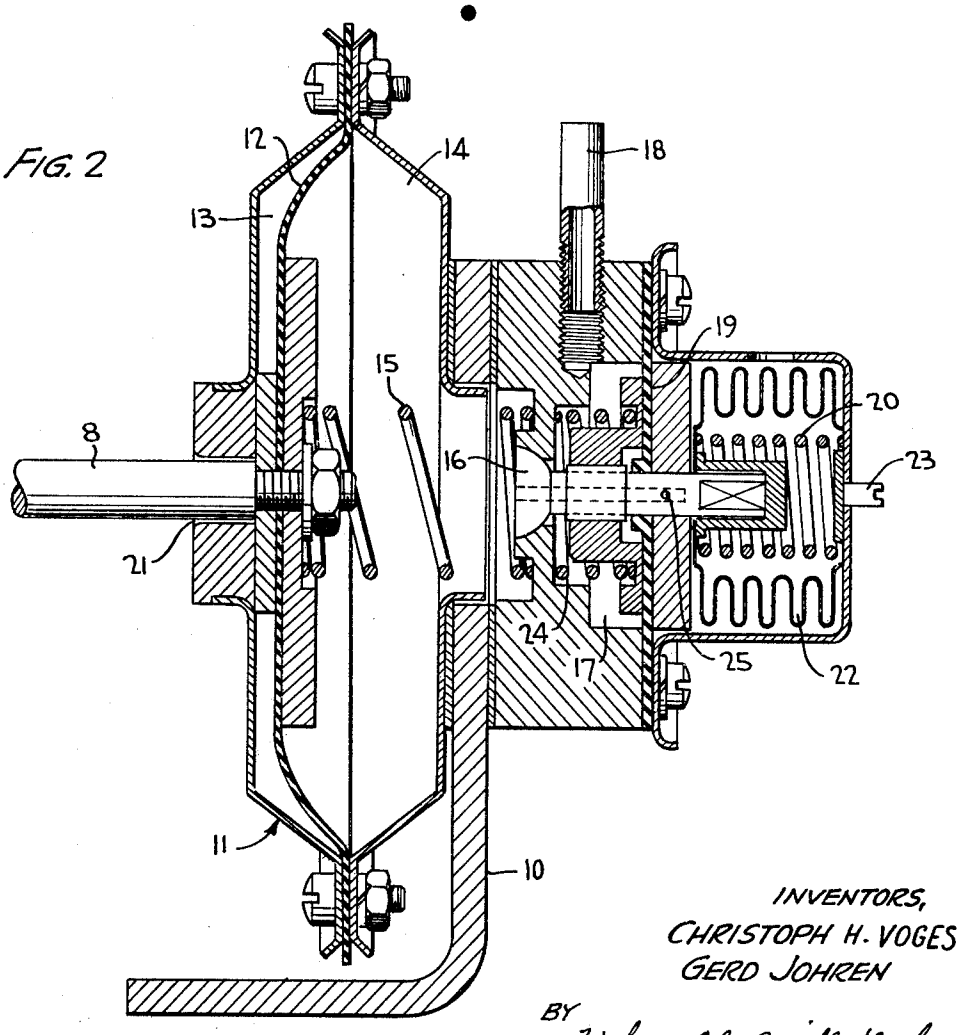



FIG. 2

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United States Patent Office

3,502,000

Patented Mar. 24, 1970



3,502,000

# ADJUSTING DEVICE FOR THROTTLE VALVES

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Filed Mar. 10, 1967, Ser. No. 622,230
Claims priority, application Germany, Mar. 11, 1966, 1,526,548
Int. Cl. F15b *13/042, 11/10;* F02d *11/08*
U.S. Cl. 91—47 1 Claim

## ABSTRACT OF THE DISCLOSURE

An adjusting device for the throttle valves for the carburetors of internal combustion engines operating in dependence on the underpressure of the suction pipe to the engine and effective independently of the altitude of the motor vehicle.

This invention relates to an adjusting device for throttle valves operating in dependence on the underpressure of the suction pipe of the engine of a motor vehicle. The fluctuation of the underpressure is due to changes in air pressure when altitude changes.

Pneumatic dashpots have been known which delay the return of the throttle into the closing position (idling position) by the fact that an arm of the control lever of the throttle valves will encounter a pestle or rammer of the dashpot shortly before the closing position of the throttle valve. The pestle, at the same time, must shift a membrane clamped in the housing and it must drive out the air through a narrow opening from one of the housing chambers. In this manner it is to be avoided that the motor stops at a sudden release of the gas pedal.

Furthermore, devices of a similar mechanical construction have been known where the membrane is controlled in dependence on the underpressure. At the same time, beginning with a sudden underpressure, a limit is to be set for the movement of the throttle valve. In this manner, the poisonous or objectionable part of the exhaust gas can be lowered or decreased. In these devices, also, provision has been made, as a rule, that a closing of the throttle valve at a sudden release of the gas pedal will take place in a delayed manner despite the then sudden reduction of the underpressure.

The present invention is based on the realization that the underpressure adduced for control purposes is to a large extent dependent on the atmospheric pressure and that, in this manner, the control characteristic of the adjusting device will depend on the altitude at which the vehicle is used. As is well known, the atmospheric pressure drops with an increasing altitude of the locality and, in proportion with that, the absolute pressure of the suction pipe, correspondingly, the difference of these two pressures, the underpressure of the suction pipe, is then also changed. If the atmospheric pressure, for example, drops from 1.0 to 0.8 atmosphere, then the underpressure of the suction pipe decreases, for example, from 0.5 to 0.4 atmosphere. Therefore, an adjusting device balanced as to the low plains then becomes ineffective in the case of travel in high mountains. Vice versa, the closing movement of the throttle valve of a device adjusted in the mountains would be limited in an undesirably pronounced manner in the case of travel in the low plains, so that the underpressure of the suction pipe would keep the throttle valve open even during idling or increase of the idling speed.

In order, therefore, to allow the adjusting device to become effective independently of the altitude of the locality, the proposal is made that the change of the underpressure, which is effective for the control, be compensated



automatically in dependence on the atmospheric pressure with the assistance of an evacuated spring-loaded diaphragm box that is an aneroid case.

Further objects of the invention will be apparent from the following description when considered in connection with the accompanying drawing in which:

FIGURE 1 is a diagrammatic view showing the basic method of operation of an adjusting device of a throttle valve, and

FIG. 2 is a cross sectional view of an adjusting device of a throttle valve with a pressure casing according to the invention connected thereon.

FIG. 1 shows the discharge part of a carburetor **1**, with the throttle or butterfly valve **2** indicated, shown in a dashed line. The throttle valve is connected with an adjusting lever **3** which can be adjusted in a known manner by means of a Bowden cable **4** by the gas pedal which has not been shown. The normal idling position of the throttle valve **2** is determined by an adjustable stop screw **5**, which can be screwed into an arm **3***a* of the adjusting lever **3** of the throttle valve and which cooperates with a stop **6** on the carburetor housing. The second arm **3***b* of the lever cooperates with a two-armed lever **7**, one of the arms of which having been articulated to the pestle or rod **8** of a diaphragm device **9**, the construction of which will be explained in connection with FIG. 2.

The adjusting device, attached to a cross member or right-angle arm **10** of the carburetor **1**, has a housing **11**, that has been subdivided into two chambers **13** and **14** by a diaphragm **12**. The diaphragm **12** has been fixedly connected with the already described pestle or rod **8**. When the engine is turned off, the diaphragm **12** is pressed by a spiral spring **15** into the left-hand final position shown in FIG. 2, as a result of which the rod **8**, FIG. 1, is pushed into its right-hand final position, and, as a result thereof, the closing movement of the throttle valve **2** is not limited. The chamber **14** can be connected by a valve **16** with a chamber **17**, which is in constant connection by a tube **18** with the suction pipe of the engine which latter is not shown. The chamber **17** has been closed on one side by a diaphragm **19**, to which the valve body **16** has been attached. Normally, the diaphragm **19** is pressed into its right-hand end position by a spring **24**, and in the case of underpressure in the suction pipe, it is made to bulge out toward the left, counter to the effect of the spring **24**, and, in doing so, it will open the valve **16**. As a result thereof, an underpressure will also build up in the chamber **14** and the diaphragm **12** is pressed toward the right, counter to the effect of the spiral spring **15**, since the air of the atmosphere can flow into the chamber **13** through the annular opening **21**. At the same time, the stop for the adjusting lever **3** of the throttle valve becomes effective. In the valve body **16**, an opening **25** of a small diameter, has been provided through which air continuously flows into the chamber **14**. This increase in pressure in the chamber **14** is only partially reduced by the opened valve **16**, because the valve acts as a flow throttle, as a result of which the underpressure in chamber **14** becomes less than in the chamber **17**. In the case of a sudden drop in the underpressure in the suction pipe, as a result thereof the valve **16** will, first of all, be closed, whereupon the underpressure in the chamber **14** is reduced only gradually by means of the opening **25**. In the case of a sudden release of the gas pedal, therefore, the throttle valve **2** will reach its closed position in a delayed manner.

The description of the adjusting device for the throttle valve, as described, corresponds to the status of the prior art. As described in the introduction, the underpressure of the suction pipe, fluctuating with the altitude of the locality in which the vehicle travels, would however make the

efficiency of the device strongly dependent on the altitude. According to the invention, therefore, an additional evacuated spring-loaded diaphragm case (aneroid box) **22** has been provided, which exerts a force on the control valve **16** which is dependent on the dropping atmospheric pressure, which force corresponds to the force that is lacking on the membrane **19** in the case of a dropping underpressure of the suction pipe.

This force increases in the case of a dropping atmospheric pressure in the same measure in which the force on the control diaphragm decreases because of the simultaneously decreasing underpressure in the suction pipe.

The sum of forces from the aneroid case **22** and the control diaphragm **19** remains constant in any atmospheric pressures, so that the adjusting device will respond independently of altitude.

The adjustment of the point of response of the adjusting device is possible with the aid of the adjusting screw **23**, by which an adjusting spring **24** below the control diaphragm **19** and the diaphragm case **22** can be tightened in relation to one another.

We claim:

**1**. Throttle valve closure limiter for internal combustion engines comprising a diaphragm chamber consisting of a housing and a diaphragm the outer side of which is exposed to atmospheric pressure, an adjusting member connected to the diaphragm and arranged on the outer side thereof, a second diaphragm chamber consisting also of a housing and a diaphragm with the housing having means



to connect the chamber to a suction pipe of the engine and the outer side of the diaphragm being exposed to atmospheric pressure, springs within both diaphragm chambers to press the diaphragms outwardly, a valve provided between the two diaphragm chambers and connected to the second diaphragm and arranged on the inner side thereof, a shaft of the valve penetrating the second diaphragm and having an outlet opening of small diameter on the outer side of the second diaphragm, and in communication with the first-mentioned diaphragm chamber, a spring, an evacuated case connected to the outer side of the second-mentioned diaphragm urged by the last-mentioned spring, and setting means for adjusting the pressure of the last mentioned spring.

**References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 1,978,862 | 10/1934 | Gregg | 91—47 |
| 3,027,884 | 4/1962 | Bale et al. | 123—117.1 |
| 3,169,513 | 2/1965 | Hennequin | 91—47 |
| 3,266,473 | 8/1966 | Rhodes | 123—103 |
| 3,355,992 | 12/1967 | Jacobson et al. | 91—47 |
| 2,205,354 | 6/1940 | Gregg et al. | 123—119 |

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U.S. Cl. X.R.

91—468; 123—103