Sept. 4, 1928. 1,683,504

J. J. VERTREES, JR

AIR VENT VALVE FOR COMBUSTION ENGINES

Filed Nov. 16, 1926

Fig. 1.

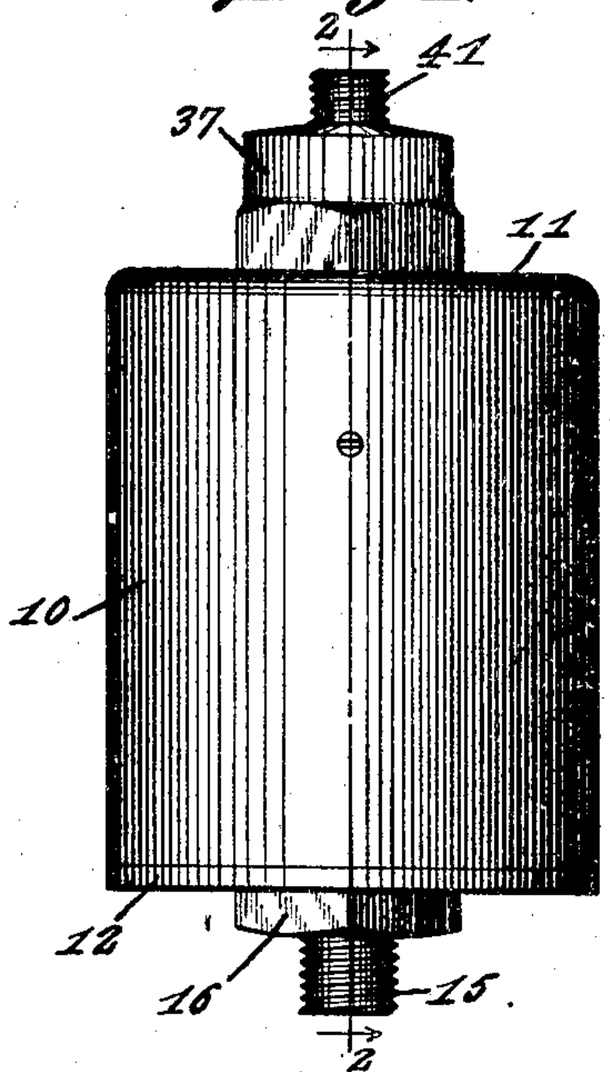


Fig. 2.

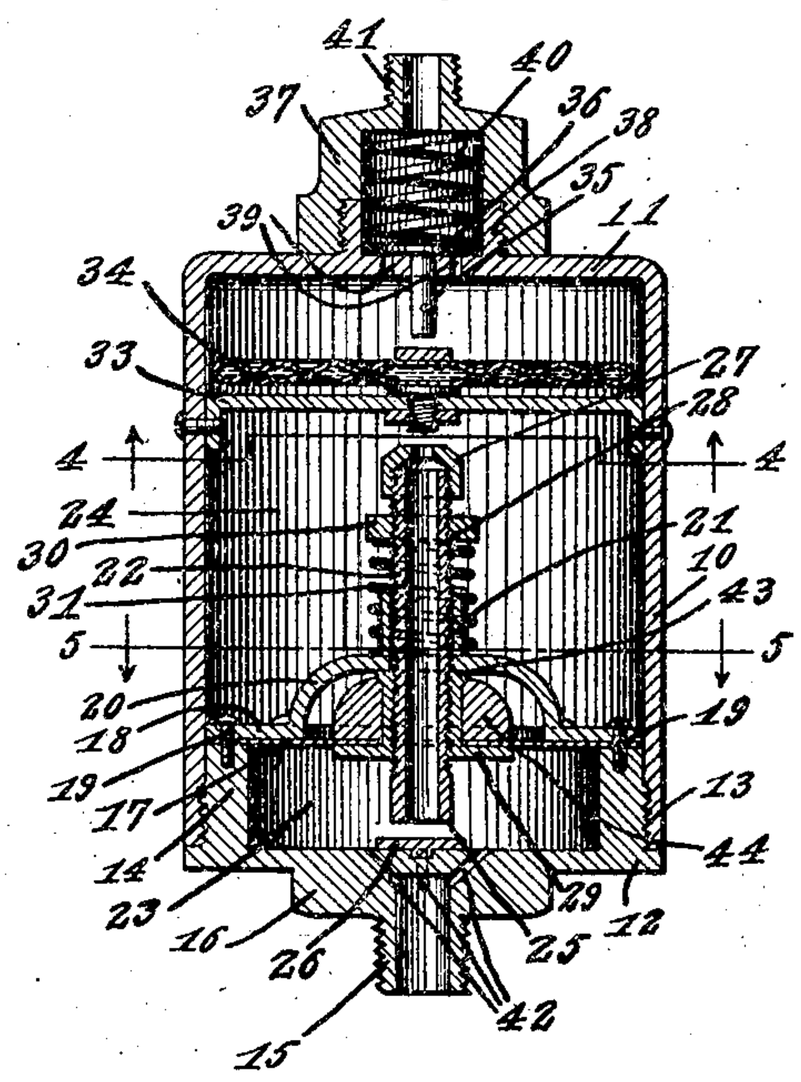


Fig. 3.

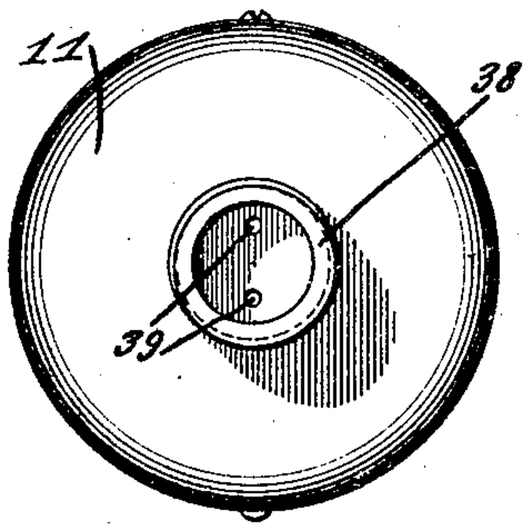


Fig. 5.

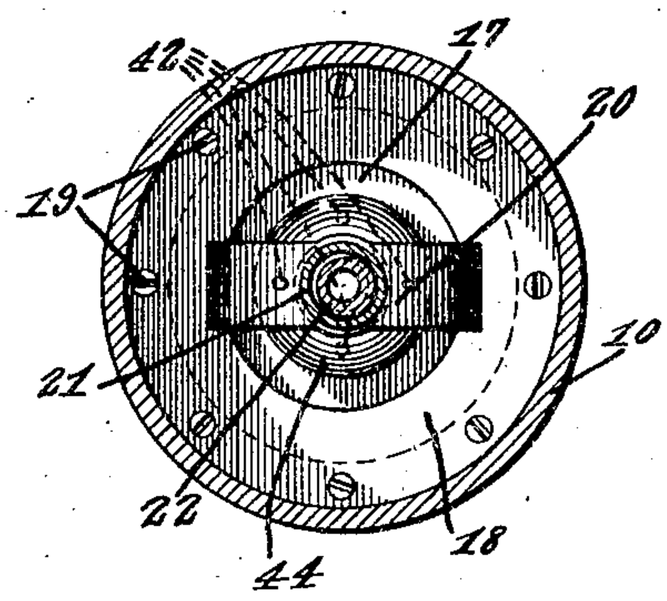
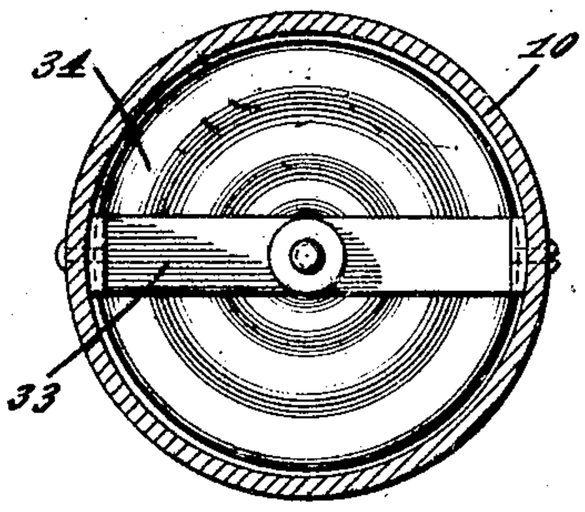


Fig. 4.



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UNITED STATES PATENT OFFICE.

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AIR-VENT VALVE FOR COMBUSTION ENGINES.

Application filed November 16, 1926. Serial No. 148,697.

The invention relates to a vent valve for internal combustion engines, and more particularly to the class of thermostatically controlled auxiliary air vent valves for internal combustion engines, used in automobiles or other vehicles.

The primary object of the invention is the provision of a device of this character, wherein the operation is automatic, as the same is thermostatically controlled to admit air to the manifold of internal combustion engines between the carbureter and the intake valves, the air being admitted to the manifold after the engine has become warmed by the explosions to the proper working degree and such valve is then controlled by the vacuum pull of the manifold, the valve structure being novel in form.

Another object of the invention is the provision of a valve structure of this character wherein the same operates against vacuum and not with it and such valve is only operable when the engine has become warmed, as the valve proper is thermostatically controlled and will fully close when the engine is idling and such valve gradually opened as the vacuum decreases below a given point and the full opening of the valve is effected when no vacuum is present in the manifold, thereby admitting the full amount of air to said manifold to effect a perfect combustion of the gases with a minimum consumption of fuel.

A further object of the invention is the provision of a valve structure of this character, wherein the operation thereof will positively assure perfect combustion of the gases and will minimize carbon formation in the internal combustion engine and with a minimum consumption of fuel.

A still further object of the invention is the provision of a valve structure of this character, which is comparatively simple in construction, thoroughly reliable and efficient in its purpose, strong, durable, and inexpensive to manufacture and install.

With these and other objects in view the invention consists in the features of construction, combination and arrangement of parts, as will be hereinafter more fully described, illustrated in the accompanying drawing, disclosing the preferred embodiment of the invention, and pointed out in the claims hereunto appended.

In the accompanying drawing:

Figure 1 is a side elevation of a valve structure constructed in accordance with the invention.

Figure 2 is a vertical longitudinal sectional view through the same.

Figure 3 is a top plan view showing the head cap removed.

Figure 4 is a sectional view on the line 4—4 of Figure 2 looking in the direction of the arrows.

Figure 5 is a sectional view on the line 5—5 of Figure 2 looking in the direction of the arrows.

Similar reference characters indicate corresponding parts throughout the several views in the drawing.

Referring to the drawing in detail, the valve structure comprises a cylindrical body or shell 10 having a closed top 11 and an opposite open bottom, into which latter is adapted to be removably engaged a bottom section 12, preferably engaged therein through the medium of screw threads 13 formed interiorly of the body or shell 10 and exteriorly of an annular rim 14 respectively, the rim being formed on the bottom section 12 inset from the outer periphery thereof so as to telescope within the body or shell 10 as is apparent from Figure 2 of the drawing. The bottom section 12 has formed centrally thereof an externally threaded nipple 15, which is built up from a wrench engaging boss 16 externally of the shell or casing 10 and formed on said bottom section 12. This nipple 15 is tapped into the intake manifold of an internal combustion engine, between the location of the carbureter and the intake valves. It is of course to be understood that the said nipple can be piped to the intake manifold of the internal combustion engine if desired or otherwise mounted for the communication of the valve structure with said manifold.

Arranged interiorly of the body or shell 10 and superimposed upon the rim 14 of the bottom section 12 is a disc or diaphragm 17 upon which is superimposed a spider frame 18 the latter and the disc or diaphragm 17 being anchored or held fast to the rim 14 through the medium of fasteners 19. The frame 18 is centrally formed to provide a crown 20 having a centrally located guide column 21 in which is slidably fitted an air tube 22 adapted

to establish communication between the lower chamber 23 and the upper chamber 24, respectively within the body or shell 10 at opposite sides of the disc or diaphragm 17. The lower end 25 of the tube 22 constitutes a valve adapted to engage a seat 26 mounted centrally on the bottom section 12 at the inner face thereof and when this tube has its lower end seated communication is shut off between the chambers 23 and 24. The upper end of the tube 22 carries a perforated cap 27 and this tube is exteriorly threaded at 28 to adjustably engage a coupler 29 carried by the flexible diaphragm or disc 17 and also for the adjustable mounting of the spring seating ring 30 against which plays one end of a coiled expansion spring 31 encircling said tube 22, the other end of this spring being seated upon the crown 10 of the spider frame 18. The ring 30 can be readily adjusted on the tube 22 to increase or decrease the tension of the spring 31 as will be obvious.

Suitably mounted within the body or shell 10 near the closed top 11 thereof is a cross support 33 having anchored centrally thereon a diaphragm type of thermostatic device 34 which is operable upon the stem 35 of a disc valve 36 confined within a removable cap 37 threaded upon a hollow boss 38 formed centrally exteriorly upon the top 11 of the body or shell 10. This disc-valve 36 normally closes air inlet ports 39 formed in the top 11 of the body or shell 10 and said disc-valve is normally held in closing position through the medium of a coiled expansion spring 40 held within the cap 37, which is provided with an air inlet nipple 41 formed centrally on the cap 37 as is clearly shown in Figures 1 and 2 of the drawing. This air inlet nipple 41 has communication with the atmosphere as will be apparent.

The nipple 15 on the bottom section 12 has communication with a plurality of air passages 42 provided in the bottom section 12 concentrically of the valve seat 26 and opens into the lower vacuum chamber 23 which has communication with the upper air chamber 24 to the air tube 22 hereinbefore described.

It is of course to be understood that the amount of air intake is varied by the size of the perforation in the cap 27 on the air tube 22. It is necessary that the area of the passage in the nipple 15 be twice the area of the passage in the tube 22. Furthermore it is also necessary that the passages 42 be of a combined area equal to the area of the passage in the nipple 15. The air intake passages or ports 39 must be in combined area larger than the area of the perforation in the cap 27 and also the passage in the nipple 41 must be in area as large as the combined area of the ports 39.

The upward movement of the tube 22 within the chamber 24 is limited by means of a stop flange 43 formed on the coupler 29 at its upper end, which flange is adapted to contact with the crown 20 of the spider frame 18 as will be clearly apparent in Figure 2 of the drawing. The coupler 29 is fitted with a locking nut 44 for the disc or diaphragm 17.

In the operation of the valve structure, it is assumed that the same has been tapped into the manifold of the internal combustion engine, the vacuum pull when the said engine is operating acts against the disc or diaphragm 17 through the nipple 15 and passages 42, thus causing the air tube 22 to become lowered bringing its lower end 25 against the seat 26, which closes the air passage through said tube 22. It is of course understood that the tension of the spring 31 is regulated by the ring 30 to that degree which when the engine is idling allows the air tube 22 to seat firmly in closing position. As the vacuum pull of the engine decreases, as when the carbureter valve is open, the tension of the spring 31 lifts the tube 22 from its seat which permits air to enter through the center of the said tube 22, passages 42 and nipple 15, thence to the manifold of the engine.

The amount of air entering the manifold of the engine is regulated as to maximum by the perforation in the cap 27, this being varied according to the size of the engine. It is of course understood that before air can be admitted to the manifold the thermostatic device 34 has been operated by the temperature of the engine so as to open the disc valve 36 to lift the same from the ports 39 against the resistance of the spring 40 in the cap 37, so that atmospheric air can enter the passage in the nipple 41, ports 39 thence into the chamber 24 in the body or shell 10, which admitted air is controlled and regulated by the tube 22 which is operated in a manner as hereinbefore described.

What is claimed is:—

1. A device of the character described, comprising a body, normally closed spring controlled means carried by said body for admitting atmospheric air when open, a thermostatically controlled device within said body and active upon said normally closed means to automatically open the same, and normally open means within the body for delivering air therefrom into an intake manifold of an internal combustion engine and automatically closed by vacuum within said manifold to arrest delivery of air to the latter.

2. A device of the character described, comprising a body, normally closed spring controlled means carried by said body for admitting atmospheric air therein when open, a thermostatically controlled device within the body and active upon the normally closed means to automatically open the same, normally open means within the body for delivering air therefrom into an intake mani-

fold of an internal combustion engine and automatically closed by vacuum within said manifold to arrest delivery of air to the latter, and means for regulating the air delivery means within the body.

3. A device of the character described, comprising a body, normally closed means for admitting atmospheric air to the body, a thermostatically controlled device within the body and active upon the normally closed means to automatically open the same, means for delivering air from the body into an intake manifold of an internal combustion engine and automatically controlled by vacuum within said manifold, means for regulating the air delivery means within the body, and means mounted within the body and supporting the air delivery means therein.

4. A device of the character described, comprising a body, normally closed means for admitting atmospheric air to the body, a thermostatically controlled device within the body and active upon the normally closed means to automatically open the same, means within the body for delivering air therefrom into an intake manifold of an internal combustion engine and automatically controlled by vacuum within said manifold, means for regulating the air delivery means within the body, a flexible diaphragm mounted within the body and supporting the air delivery means therein, and means for attaching the body to the manifold and forming an air delivery passage.

5. A device of the character described, comprising a body, normally closed means for admitting atmospheric air to the body, a thermostatically controlled device within the body and active upon the normally closed means to automatically open the same, means within the body for delivering air therefrom into an intake manifold of an internal combustion engine and automatically controlled by vacuum within said manifold, means for regulating the air delivery means within the body, a flexible diaphragm mounted within the body and supporting the air delivery means therein, means for attaching the body to the manifold and forming an air delivery passage, and means within the body for the mounting of the thermostatically controlled device.

6. In a device of the character described, a body having a removable bottom and provided with passages through the top and bottom of said body, a valve normally closing the passages in the top of said body, a flexible diaphragm supported within the body and dividing it into independent chambers, an air tube carried by the diaphragm and establishing communication between the chambers, a valve seat formed on the bottom and adapted to be engaged by the air tube for shutting off communication between the chambers, means normally holding the air tube in open position, means for regulating the last named means, and a thermostatic device within the body and active upon the valve controlling the passages in the top of said body to open said valve.

7. In a device of the character described, a body having a removable bottom and provided with passages through the top and bottom of said body, a valve normally closing the passages in the top of said body, a flexible diaphragm supported within the body and dividing it into independent chambers, an air tube carried by the diaphragm and establishing communication between the chambers, a valve seat formed on the bottom and adapted to be engaged by the air tube for shutting off communication between the chambers, means normally holding the air tube in open position, means for regulating the last named means, a thermostatic device within the body and active upon the valve controlling the passages in the top of said body to open said valve, and a cap enclosing the said valve and having an air passage opening to the atmosphere.

8. In a device of the character described, a body having a removable bottom and provided with passages through the top and bottom of said body, a valve normally closing the passages in the top of said body, a flexible diaphragm supported within the body and dividing it into independent chambers, an air tube carried by the diaphragm and establishing communication between the chambers, a valve seat formed on the bottom and adapted to be engaged by the air tube for shutting off communication between the chambers, means normally holding the air tube in open position, means for regulating the last named means, a thermostatic device within the body and active upon the valve controlling the passages in the top of said body to open said valve, a cap enclosing the said valve and having an air passage opening to the atmosphere, and a bridge member located within the body and having a guide for said air tube.

In testimony whereof, I affix my signature hereto.

JOHN J. VERTREES, JR.