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CRANKCASE FUME ELIMINATOR

Filed Dec. 26, 1963

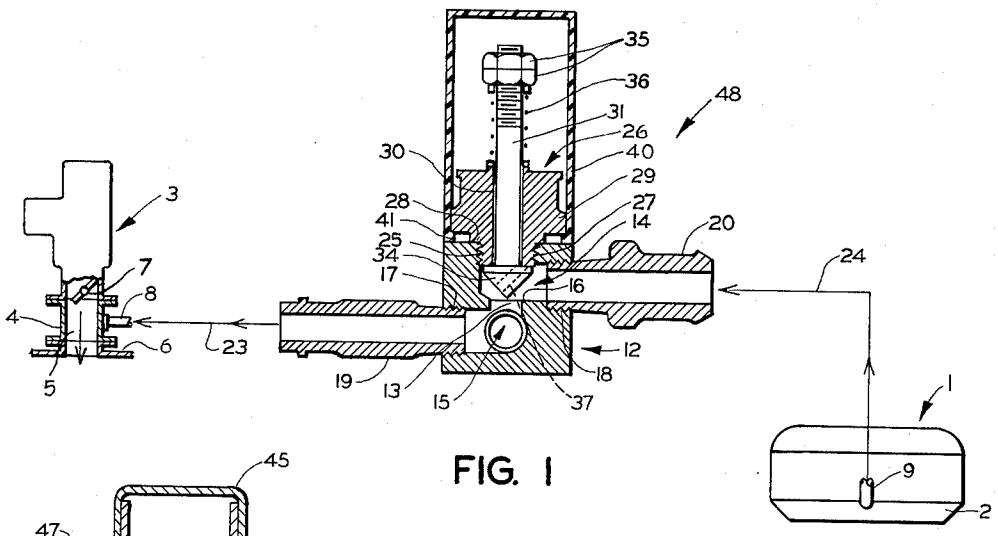


FIG. 1

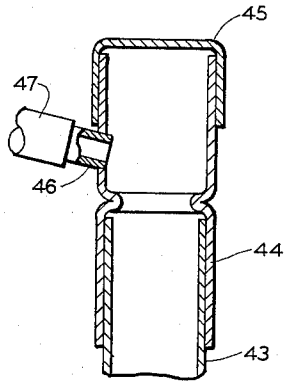


FIG. 4

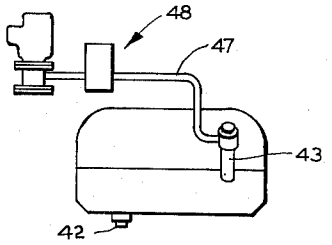


FIG. 3

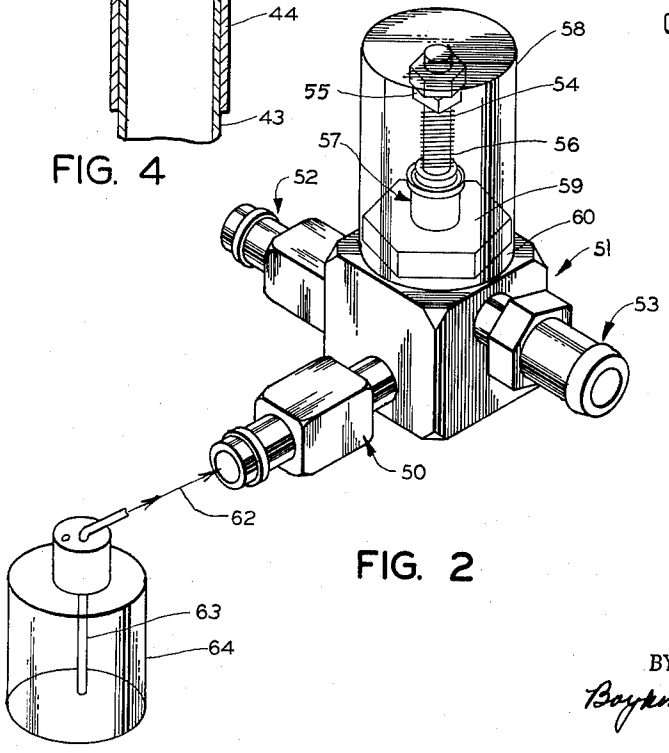


FIG. 2

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CRANKCASE FUME ELIMINATOR

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1 Claim. (Cl. 123—119)

This invention relates to means for eliminating the fumes in the crankcases of internal combustion engines.

During recent years, and at the present time, widespread efforts are being made to eliminate the fumes in the crankcases of internal combustion engines in automobiles. Heretofore these fumes have been discharged into the atmosphere, thereby contributing to the progressive contamination of the air by gases and impurities that are detrimental to life and health. In some states laws have been passed making manadatory the installation of devices in automobiles for reducing the fumes discharged into the air from crankcases.

The basic principle of most devices intended to eliminate or to at least reduce the amount of fumes discharged into the air from crankcases, has been the withdrawal of said fumes from crankcases, and the ejection thereof into the combustible mixture that is drawn into the cylinders of the engine and burned. Thus, it has been anticipated that said fumes will be burned with the mixture and will then be discharged into the air as a product of combustion.

However, some of the installations are quite expensive to install and to maintain, while others may become wholly inoperative within a relatively short time due to the building up of carbon and tarry solids in the devices, at critical points, long before the time when compulsory inspections are required, and when choked with such impurities, such devices make no provision for cleaning them, hence there is no alternative except to replace the devices.

One of the objects of this invention is the provision of a device adapted to be positioned in a conduit, duct or pipeline that communicates between the crankcase and the intake manifold of an internal combustion engine, which device is automatically actuatable in response to variations in the gas pressure or the degree of vacuum in the fuel line between the carburetor and the cylinders of the engine for drawing the fumes from the carburetor into the fuel mix for burning in the cylinders, and which device is so constructed as to visibly indicate proper or improper operation of the device, so that a mere outside inspection of the device will positively indicate whether or not it is operating satisfactorily.

Another object is the provision of a device, as above described, that may be quickly adjusted, without disassembly thereof or removal from its position, so as to be operative under the desired degree of vacuum in the fuel line.

A still further object of the invention is the provision of a device for accomplishing the above-mentioned objects, which device is economical to make and to install, and that may be cleaned of impurities in a matter of minutes, if not seconds, without removal from the system, thus eliminating the necessity for replacement and greatly shortening the time required for cleaning.

A still further object of the invention is the provision of a device, in combination with the crankcase and fuel line to an internal combustion engine, at a point in said line where it is responsive to variations in the vacuum produced by suction from the cylinders for drawing the fumes from the crankcase into the fuel mixture, and which device is further provided with means for introducing into the fuel mixture from the carburetor a metered amount of any desirable chemical agent for cleaning the valves and for promoting cleaner combustion, and which device is also so constructed and arranged that its operation is clearly visible to an observer.

It should be noted at this point that the periodic inspections in those states where laws make such inspections mandatory have little value in accomplishing the intended purpose of eliminating crankcase fumes if the devices become inoperative long before the inspections are due. By the present invention, a service station attendant, the driver of the vehicle, or anyone else that may desire to do so, can readily see in a moment if the device is working properly without stopping the engine and without removing the device or any part of the device, and its position in combination with the carburetor and engine is such that it is accessible for viewing.

Other objects and advantages will appear in the drawings and in the description.

In the drawings FIG. 1 is a vertical cross-sectional view taken through the device in combination with a carburetor and the engine and crankcase of an internal combustion engine, the carburetor and engine, including the crankcase, being semidiagrammatically indicated, and the gas lines leading to and from the device being indicated diagrammatically by lines.

FIG. 2 is an enlarged, isometric view of a slightly modified form of fume eliminator separate from a carburetor and engine.

FIG. 3 is a reduced size, simplified, semidiagrammatic view showing the invention of FIG. 1 applied to the crankcase of an internal combustion engine in which the device is connected with the oil filling pipe.

FIG. 4 is an enlarged fragmentary view showing the cap over the oil filling pipe of FIG. 3 and the connection between the fume line and the device of this invention.

In detail, referring to FIG. 1, a conventional internal combustion engine is indicated at **1**, the crankcase being indicated at **2**, and a conventional down-draft carburetor at **3**.

The carburetor **3** may be supported on an annular collar or fitting **4** that forms part of the passageway **5** or conduit leading to the intake manifold **6**. The usual throttle valve **7** is normally positioned in the carburetor ahead of passageway **5**.

When the engine is idling, there is a relatively high partial vacuum in passageway **5**, and when the throttle valve is opened to a greater degree and the engine is accelerated, this partial vacuum in passageway **5** is decreased.

The present crankcase fume eliminator, like others, is interposed in a conduit that communicates at one end with the upper portion of the crankcase and the passageway **5**. The collar **4** may be provided with a nozzle **8** projecting outwardly thereof and communicating with passageway **5**, and the crankcase may also be provided with a nipple **9** projecting therefrom and communicating with the inside of the upper portion of the crankcase.

The fume eliminator comprises a body, generally designated **12**, formed with a chamber **13** thereon having an upper portion **14** and a lower portion **15**.

An annular horizontally disposed shoulder **16** defines the juncture between said upper portion **14** of chamber **13** and the lower portion **15**.

One of the sides of the body **12** is formed with a laterally directed opening **17** communicating with the lower chamber **15**, and the opposite side of body **12** is also formed with a laterally directed opening **18** communicating with the upper chamber **14** above the annular shoulder or seat **16**.

The sides of openings **17**, **18** are threaded for threadedly connecting with nipples **19**, **20** respectively, which nipples project from said body. A tube **23** is connected at one end thereof with the nipple **8** on the collar **4** and at its opposite end with the nipple **19**, while a tube **24** is connected at one end thereof with nipple **9** that is on

the upper portion of crankcase 2 and at its opposite end with the nipple 20.

The upper side of body 12 is formed with an upwardly directed circular opening 25 that is coaxial with the annular seat 16. The sides of opening 25 are threaded, and a valve mount in the form of a vertically disposed generally cylindrical member generally designated 26 is secured on said body 12 by an externally threaded, reduced diameter, downwardly projecting portion 27 that is in threaded engagement with the threads in said opening 25.

A downwardly facing shoulder 28 on member 26 at the juncture between portion 27 of said member, and the remainder thereabove, is adapted to seat against the upper side of body 12 around opening 25 when the cylindrical member is secured onto body 12.

The part 29 of member 26 above and adjacent to the shoulder 28 may be of hexagonal horizontal cross-sectional outer contour to provide flat faces for engagement by the jaws of a wrench to facilitate tightening said member in position, and for removing it.

A central, vertical through bore 30 formed in the member 26 is coaxial with the annular seat 16 in body 12 and is adapted to slidably support a vertical stem 31 thereon for vertical reciprocable movement of said stem.

The stem 31 is provided with a conical valve member 34 on its lower end, the conical surface of which extends convergently downwardly and is adapted to seat against the annular seat 16 when the stem 31 is moved downwardly.

The space between seat 16 and the horizontal flat lower end or projection 27 is sufficient to permit substantial upward movement of valve member 34 until the horizontal flat upper surface of valve member 34 engages the lower surface of projection 27.

The upper end portion of stem 31 is threaded, and a pair of nuts 35 are threadedly secured on said threaded upper end portion.

A helical spring 36 around stem 31 reacts between the lower nut 35 and the member 26 to hold the valve member 34 elevated so that the tubes or conduits 23, 24 will be in communication through chamber 13.

The tension on spring 31 is adjusted by the nuts 35 so that, under the relatively high partial vacuum that will be in chamber 13 when the motor 1 is idling, the valve member 34 will move downwardly to seat against the annular seat 16, but as soon as this partial vacuum is reduced by acceleration of the motor for driving the vehicle, the member 34 will be elevated under the force of spring 36 and the suction in the passageway 5 at the carburetor will draw the fumes from the crankcase into the fuel passing into the engine, where they will be burned.

A relatively small, diagonally extending duct 37 may be formed in member 34 to provide a communication between the upper and lower portions 14, 15 of chamber 13 when member 34 is seated on seat 16. This duct may be called a safety duct, since its function is to preclude dangerous pressure building up in the crankcase, should member 34 become stuck in closed position.

A transparent housing 40, which may be of plastic, is secured over the projecting portion of stem 31, including the nuts 35, and this housing may be yieldably sprung over the portion 29 at the lower end of the housing so that the inwardly projecting bead 41 around the lower end of the housing will yieldably engage below said portion 29. The housing can be sprung off the portion 29, when and if desired, but otherwise it will be held in stem-enclosing position.

The provision of the transparent housing in the structure described is an important feature of the invention, as is the provision of means for quickly removing the member 26 to enable quick access to chamber 13 and to member 34.

By the present structure, it is merely necessary for an inspector to glance at the fume eliminator and to accelerate the engine to determine whether or not the eliminator is working properly for removing the fumes from the crankcase when the vehicle is being driven.

Should the stem 31 and nuts 35 be stationary when the engine is accelerated, it is only necessary to unscrew the member 26, wipe out the housing 13 and clean member 34 and the device should again be in working order. The device is not removed from the line.

In automobiles made during the last few years, the collar 4 and nipple 8 are usually standard equipment, as is nipple 9 on the crankcase, hence the installation of the device is easy and no special drilling and tapping is required.

In older models, where a ventilation tube has been standard (FIG. 4), such tube may be closed by a plug 42 or by any other suitable means, and the conventional cap on the oil filling pipe 43 (FIGS. 3, 4) may be substituted by a tube 44 (FIG. 4) having a removable cap 45 on its upper end, and a nipple 46 projecting from a side of the tube 43 below said cap. The tube 47, corresponding to tube 24, may connect nipple 46 with the fume indicator, the latter being generally designated 48. Otherwise the description of FIG. 1 applies, and the fume indicator in FIG. 1 may also be generally designated 48.

FIG. 2 illustrates a modification of the fume indicator of FIG. 1, the principal modification being the provision of a third nipple 50 threadedly secured in a third opening in the body 51 of the fume indicator at the same level as the nipple 19 of FIG. 1. The interior of the body 51 is the same as that of FIG. 1 and nipples 52, 53 correspond to nipples 19, 20 of FIG. 1.

The stem 54 of the modified form has a valve member (not seen) within body 51, and said stem, valve member, adjusting nuts 55 and helical spring 56 may be identical with the stem 31, valve member 34, nuts 35 and spring 36 of FIG. 1. The stem supporting member 57 of FIG. 2 functions in the same manner as the stem supporting member 26 of FIG. 1, except that the lower portion of the transparent housing 58 merely frictionally engages the corners of the nut portion 59 for holding it in place, instead of having a bead and releasably locking to the stem supporting member. However, the structure of FIG. 1, in this latter respect, is preferable.

The nipple 50 may be connected by a hose or pipe 62 with a tube 63 extending into a receptacle 64 and to a point adjacent to the bottom of the latter. This receptacle may contain an anti-carbon forming chemical or other chemical adapted to be intermittently drawn through the fume eliminator and into the fuel line leading from the carburetor to the engine. The capacity of the tube 63 is preferably such as to restrict the flow of liquid to the desired amount, although it will be approximately directly proportional to the fluid pressure or partial vacuum generated within the lower chamber in the fume eliminator, hence no liquid will be drawn into the fuel line when the engine is idling, but a metered amount will be drawn into the fuel line when the vehicle is being driven.

In the event the nipple 50 is not used, it may be capped or otherwise closed. In any event, whether used or capped, the operation of the device for eliminating crankcase fumes will not be affected.

It may be noted at this point that prior devices having generally the principle of operation of the present invention, have usually been in the form of an elongated cylinder with the inlet being at one end thereof for connection by a pipe or tube with the crankcase, and the outlet for connection with a pipe or tube leading to the carburetor or fuel line.

Where the term "fuel line" is used herein, it is intended to refer to that portion of the line between the throttle valve and the engine, or where the suction from

the pistons produces the partial vacuum for drawing the air-fuel mix into the cylinders.

The above mentioned inlet and outlet ends of conventional fume eliminators are coaxial with the cylinder and with each other, and the valve member and spring are within the cylinder and coaxial with the latter. Thus the fumes pass over the spring. The cylinder is normally horizontal.

In actual practice sludge-like material quickly builds up in the cylinder and around the spring thereby progressively impairing the action of the valve member until it becomes inoperative and sticks in the closed position. Also, deposits are held around the valve seat, which contributes to rendering the device inoperative.

In the present invention, springs 36 (FIG. 1) and 56 (FIG. 2) are completely out of contact with the crankcase fumes, and the latter move downwardly below the valve member 34 to the line 23. By this arrangement, there is practically no accumulation of solids to detrimentally effect the operation of the fume eliminator after many thousands of miles of operation of the vehicle.

It is to be understood that the description is not intended to limit the invention to the details thereof, and the claim annexed hereto is intended to cover any modifications that may come within the scope thereof and within the spirit of the invention.

I claim:

A crankcase fume eliminator comprising;

(a) a hollow body providing a chamber therein having an upper portion and a lower portion and a verticle passageway connecting said upper portion and said lower portion having an annular horizontally disposed seat at its upper end coaxial therewith;

(b) an inlet opening into said upper portion and means for connecting said inlet with a line communicating with the crankcase of an internal combustion engine for carrying fumes from the latter to said upper portion;

(c) an outlet opening into said lower portion and means for connecting said outlet with the part of the fuel line leading from the carburetor to the intake manifold of said engine whereby the suction within said chamber will vary according to the speed of said engine with said suction being greatest at the idling speed of said engine and progressively less as said engine is accelerated;

(d) valve means including a valve member within the upper portion of said chamber coaxial with said seat movable from an elevated position when said suction in said chamber is least to a lowered position against said seat when said suction in said chamber is greatest;

(e) indicator means on said valve member projecting outwardly of said housing and visible for observation at all times;

(f) yieldable means reacting between said indicator means and said housing yieldably holding said valve member elevated in open position spaced from said seat against the influence of suction within said chamber when said suction is least and movable under the influence of such suction to closed position when said suction is greatest; and

(g) said valve member being provided with a duct communicating between said upper and said lower portions of said chamber when said member is moved to said closed position for preventing accumulation of dangerous pressure in said crankcase when said crankcase eliminator is on an engine with said upper portion connected with such crankcase and with said lower portion connected with said carburetor in the event said valve member should be stuck in its closed position.

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