United States Patent

[11] **3,570,461**

[72] Inventor **Vincent Guarnaschelli**
Greenlawn, N.Y.

[21] Appl. No. **881,532**
[22] Filed **Dec. 2, 1969**
[45] Patented **Mar. 16, 1971**
[73] Assignee **The Nycal Company, Inc.**
Carlstadt, N.J.
Continuation-in-part of application Ser. No. 726,109, May 2, 1968, now Patent No. 3,495,578.

[54] **POSITIVE CRANKCASE VENTILATING DEVICES**
15 Claims, 11 Drawing Figs.

[52] **U.S. Cl.** **123/119**
[51] **Int. Cl.** **F02m 25/06**
[50] **Field of Search** ..... 123/119 (B), 119 (D), (Inquired), 119 (D2), 124, 119 (A)

[56] **References Cited**
UNITED STATES PATENTS

2,080,588	5/1937	Whittington	123/119B
2,482,226	9/1949	Thome	123/119B
3,176,670	4/1965	Sinibaldi	123/119B
3,190,275	6/1965	Serruys	123/119D
3,495,578	2/1970	Guarnaschelli	123/119B

Primary Examiner—Wendell E. Burns
Attorney—Frank Ledermann

ABSTRACT: Connected into the downdraft side of the carburetor at one end and adapted to be connected via a conduit into the crankcase at the other end, an adjustable flow control valve is cam operated by the accelerator pedal linkage or mechanism which controls the degree of opening of the butterfly valve, or engine throttle. The valve has a range between a minimum and a maximum flow positions and is adjusted to provide for minimum flow when the throttle is at its minimum opening while the engine is idling and for maximum flow when the throttle is wide open at its maximum position.

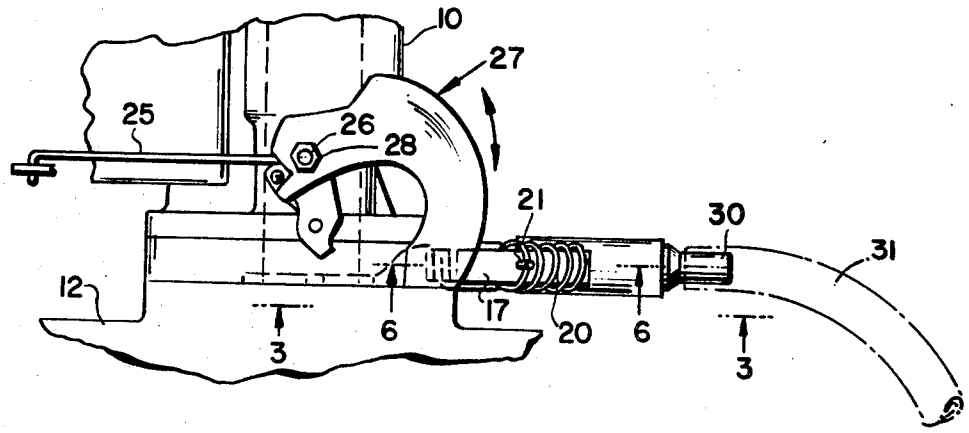


FIG.1

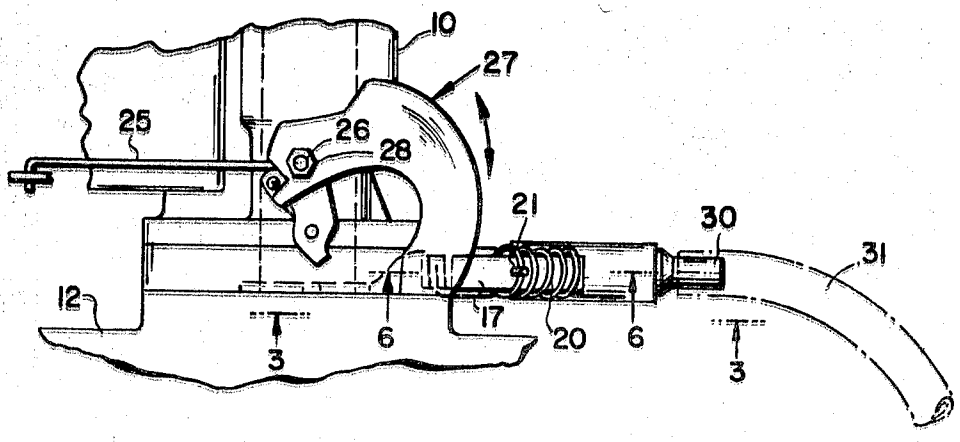


FIG.2

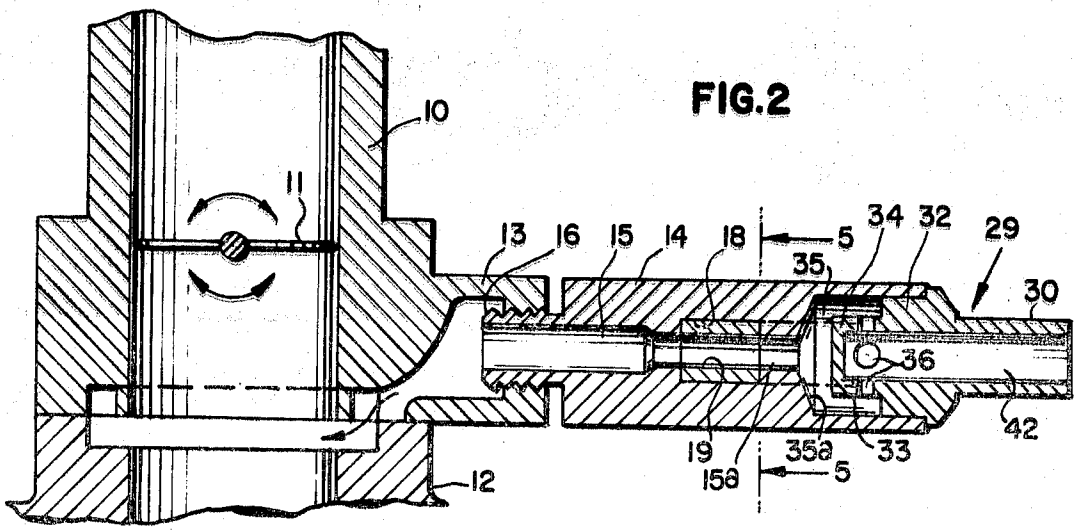


FIG.3

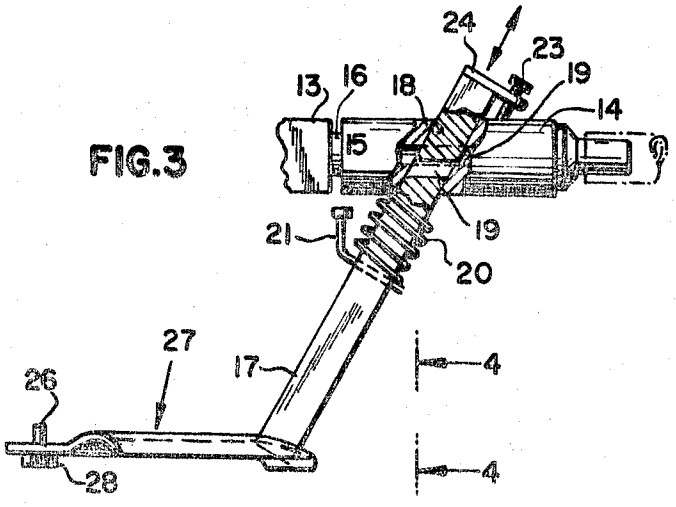
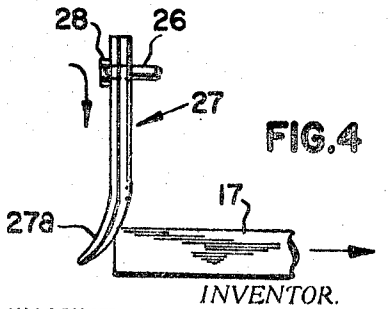


FIG.4



INVENTOR.
VINCENT GUARNASCHELLI
BY
F. Lederman
ATTORNEY

FIG.5

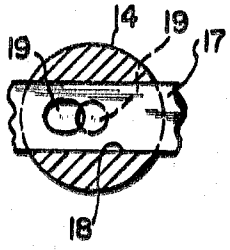


FIG.6

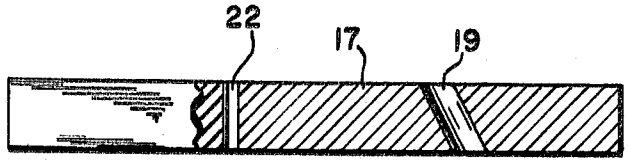


FIG.7

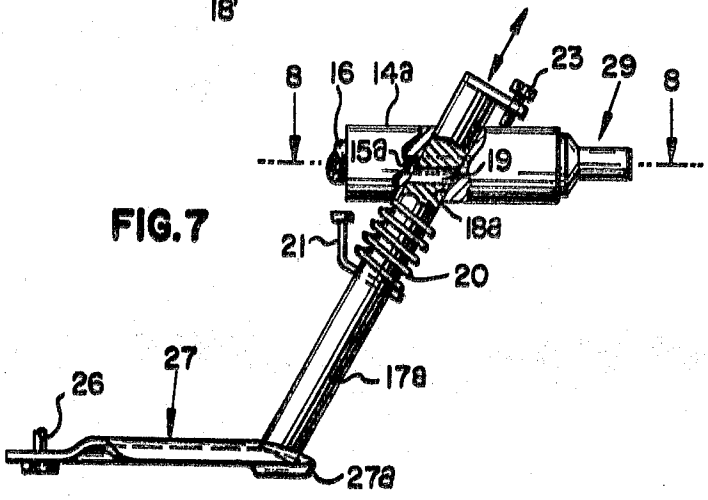


FIG.10

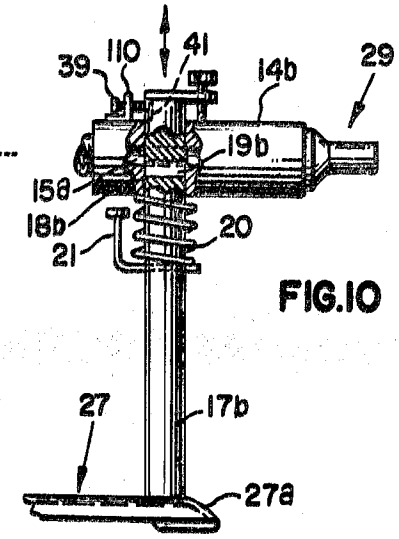


FIG.11

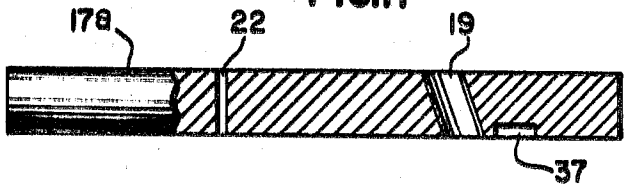


FIG.9

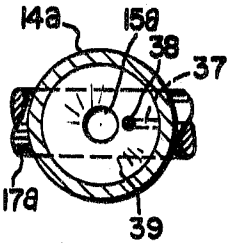
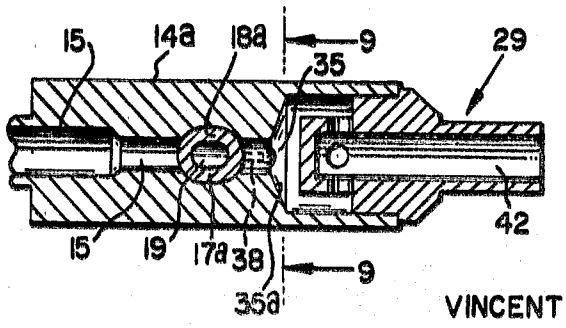


FIG.8



INVENTOR.
VINCENT GUARNASCHELLI

BY F. Lederman

ATTORNEY

POSITIVE CRANKCASE VENTILATING DEVICES

This application is a continuation-in-part of application Ser. No. 726,109, filed May 2, 1968 now U.S. Pat. No. 3,495,578.

The present invention aims to eliminate the escape of crankcase fumes or gases, hereinafter termed "blowby," into the atmosphere, by feeding such gases into the intake manifold at the rate at which they are formed. Such rate is at a minimum when the intake suction is at its maximum, which is the condition at idling speed of the engine. This rate increases with increase of engine speed whereas the intake suction decreases with engine speed. Hence it is necessary that means be provided to feed the blowby into the intake manifold at a minimum rate at idling speed and to increase the rate of such feeding substantially proportionally as engine speed increases.

In the above-identified application the device was disclosed as being operated by a pivoted link connected to the accelerator mechanism; in the present application the device is preferably operated by a cam preferably fixed to the throttle shaft so that the area of the passage through the device increases or decreases proportionally as the throttle opening is, respectively, increased or decreased.

Referring briefly to the accompanying drawings:

FIG. 1 is a fragmentary elevational view of a portion of an internal combustion engine, which portion includes a carburetor, the intake manifold and the throttle actuating mechanism, with an embodiment of the present invention wherein the stem of the flow-control valve is shown in normal or minimum flow position at idling engine speed.

FIG. 2 is a fragmentary central longitudinal cutaway view through the carburetor, the intake manifold and the instant flow-control valve of FIG. 1 but showing the flow-control valve in maximum open position as at maximum engine speed.

FIG. 3 is an enlarged fragmentary view taken along the line 3–3 of FIG. 1, with parts broken away and partly in section, but showing the hole through the valve stem in minimum alignment with the passage through the valve housing.

FIG. 4 is a fragmentary view taken along the line 4–4 of FIG. 3.

FIG. 5 is a sectional view taken on the line 5–5 of FIG. 2, but showing the through passage through the housing in minimum open position.

FIG. 6 is an enlarged view, partly in section along the line 6–6 of FIG. 1, of the slideable valve stem per se of FIGS. 1 through 5, which stem is noncircular in cross section.

FIG. 7 is a view similar to FIG. 3 but showing a slideable valve stem which is circular in cross section.

FIG. 8 is an enlarged sectional view taken along the line 8–8 of FIG. 7.

FIG. 9 is a fragmentary sectional view taken on the line 9–9 of FIG. 8.

FIG. 10 is a view similar to FIG. 7 but of a modified arrangement of parts.

FIG. 11 is an enlarged view similar to FIG. 6 but showing the cylindrical valve stem per se of FIGS. 7 through 9.

Referring in detail to the drawings, the numeral 10 designates a carburetor of which but a single barrel is shown although it may of course have more than one barrel, the downdraft or downstream side of which below the butterfly 11 feeds into the intake manifold.

A nipple 13 extends radially from the lower end of the carburetor, the passage through which leads into the lower end of the carburetor and/or into the manifold 12. The representation of the top of the latter and the bottom of the carburetor in FIG. 1 is partly diagramatical rather than actually representative of a specific structure as the only requirement to disclose the invention is that blowby enter below the butterfly, i.e., in the direction of the curved arrow, FIG. 2.

Referring first to the form of the invention illustrated in FIGS. 1 through 5, a housing 14 having a longitudinal through passage 15, 15*a* has a nipple 16 screwed into the nipple 13. At an acute angle, shown by way of example as approximately 70°, to the housing 14, a valve stem 17 which has a non circular cross section, here shown by way of example as a square rectangle, is slidably mounted in a hole 18 of complementary

cross sectional dimensions and extending through the housing at the same acute angle of approximately 70°. This stem has a cylindrical or passage therethrough of the same diameter as the passage 15*a*, shown at 19 in FIGS. 2, 3 and 6 at a complementary angle, that is, approximately 20°, to the axis of the housing. Thus the passage 19 extends in the same longitudinal direction as the passage 15, 15*a*.

In FIG. 3 is shown in somewhat exaggerated form the normal position of the stem 17 with respect to the housing 14 when the engine is idling, with the hole 19 at minimum alignment with the passage 15, 15*a*, at which time intake suction is at its maximum. A spring 20, shown coiled about the stem 17 between the housing 14 and a stop 21 illustrated merely by way of example as a bent pin anchored in a hole 22, FIG. 6, in the stem, serves to urge the stem to the left, FIG. 1. To limit the position of the stem as urged by the spring to the left to minimum alignment of the passages 19 and 15*a*, a second stop shown in the form of an adjustable screw 23 in an arm 24, FIG. 3, is provided on the stem at or near its outer end which projects from the other side of the housing. This screw serves to regulate the degree of minimum alignment at the time of installation of the device and, as may be later required by the particular engine. Of course the two stops 21 and 23 might also be reversed and the spring 20 might be provided between the housing and the arm 24 or the screw 23.

One manner of actuating the device is illustrated in the drawing. The butterfly 11 is actuated by the accelerator mechanism which includes a link 25 which turns the shaft 26 on which the butterfly is rigid. One end of this shaft is extended through the carburetor wall, to which end a cam 27 is rigidly attached, as by a lock nut 28, so that the cam turns clockwise, FIG. 1, as the butterfly opens.

The cam 27 has a curvature, shown in FIG. 4, such that as it turns together with the butterfly, its curved end portion 27*a* pushes the stem 17 upward, FIG. 3 and to the right, FIG. 4, to increase the alignment of the passage 19 with the passage 15*a*. As the throttle opens, therefore, the passage through the housing is proportionally opened wider until, at substantially maximum throttle opening or maximum engine speed the said passage through the housing is fully opened as shown in FIG. 2.

At the inlet end of the housing, that is, the right-hand end, FIGS. 1—3, the housing has an enlarged internal diameter to enclose a space or chamber 35. A construction is provided as a protection against backfire in the form of a hollow plug 29 whose outer end is shaped into a nipple 30 to receive the end of a conduit, pipe or hose 31 leading from the crankcase, not shown. This plug includes a body portion 32 which may be force fitted or otherwise registered in the space 35 and has an inner reduced extension 34 extending part way toward what may be termed the tapering base 35*a* of the chamber 35. A plurality of circumferentially spaced holes 36 is provided in the circumferential wall 33 communicating between the chamber 35 and the passage through the nipple 30, shown at 42. The latter passage has a larger diameter than the passage 15*a*. The passage 42 is closed or blocked at its inner end by a blocking wall 34 and the holes 36 are positioned between this wall and the body portion 32.

The construction described in the preceding paragraph serves to prevent flaming backfire from entering the hose 31 and thus passing into the crankcase. Assuming that a cylinder backfires, the backfire which may enter the chamber 35 expands therein and is deflected into and through the holes 36. In taking this course, the flame by deflection and heat absorption or transference to the metallic parts of which the device is made, preferably, is rapidly quenched and cooled. The wall 34 provides a block in the path of the backfire and prevents the flame from passing beyond the plug 29. Since a suction stroke almost instantaneously follows a backfire, the quenched backfire gases are immediately sucked back into the intake manifold. Heat radiating vanes, not shown, may of course be applied on the outside of the housing 14.

The modification shown in FIGS. 7, 8 and 9 is similar to the form above described except that the stem 17*a* is cylindrical instead of rectangular, as is also the passage 18*a* through the housing 14*a*. In view of the angle to the axes of the passages 15*a* and the hole 19 at which the section 8–8 of FIG. 7 on which FIG. 8 is taken, both of these passages appear elliptical in FIG. 8. To prevent rotation of the stem 17*a* and to limit it to longitudinal movement, a short longitudinal groove 37 is provided in the stem into which projects a pin or screw 38 riding in the said groove and anchored in and projecting from the tapering wall 35*a* of the chamber 35 into the passage 18*a*.

FIG. 10 is illustrated a modification which is otherwise similar to that of FIG. 7 but differs therefrom in that the cylindrical stem 17*b* is at right angles to the housing 14*b* so that the passage 18*b* therethrough is again cylindrical but has its axis at right angles to the axis of the passage 15*a*, the axis of the passage 19*b* through the stem being also at right angles to the axis of the stem. Means to prevent rotation of the stem 17*b* is shown as a screw 39 supported in a bracket 40 attached to the housing, with the screw registering in a longitudinal groove 41 in the stem.

In all of the modifications disclosed the stem is actuated by a cam of which that shown at 27 is an example, which moves or pushes the stem from a position of minimum alignment between the passage through the housing and the passage through the stem to a position of maximum alignment between these passages proportionally as the throttle is opened wider. The extreme positions between minimum and maximum alignment of these passages is set by the length of stroke of the stem provided between stops such as shown, by way of example, at 21 and 23.

I claim:

1. In an internal combustion engine having an opening into the downdraft side of the carburetor thereof, a housing having a longitudinal passage therethrough and including an inlet end and an outlet end, said outlet end being connected to said opening, said housing having a second passage extending therethrough at an angle to said longitudinal passage and intersecting said longitudinal passage, a stem longitudinally slideable in said second passage and having a third passage extending therethrough in the same direction as said longitudinal passage, said longitudinal passage and said third passage having substantially the same cross-sectional area, limit stop means limiting slideable movement of said stem between a first position in which said longitudinal passage and said third passage are in minimum mutual alignment and a second position in which the same are substantially in maximum mutual alignment, said inlet end of the housing being adapted to be connected to a conduit leading from the crankcase of the engine to convey crankcase gases into said opening, a cam operatively connected to the accelerator mechanism of the engine and engaging the end of said stem remote from said housing for rotation of the cam proportionally as the butterfly valve of the engine is actuated, said cam having a configuration such that it moves said stem from said first position toward said second position proportionally as said butterfly valve is more widely opened, and means on said stem for normally urging said stem into said first position.

2. In an internal combustion engine according to claim 1, said angle being an acute angle.

3. In an internal combustion engine according to claim 1, said second passage and said stem being complementarily noncircular in cross section.

4. In an internal combustion engine according to claim 1, said second passage and said stem being complementarily rectangular in cross section.

5. In an internal combustion engine according to claim 2, said second passage and said stem being complementarily rectangular in cross section.

6. In an internal combustion engine according to claim 1, said stem extending through both sides of said housing, said limit stop means comprising a first projection on the stem on one side of the housing engageable with the housing when said stem is in said first position and a second projection on the stem on the other side of the housing engageable with the housing when said stem is in said second position.

7. In an internal combustion engine according to claim 6, said means consisting of a spring surrounding positioned between one of said projections and said housing.

8. In an internal combustion engine according to claim 7, said means consisting of a coiled spring surrounding positioned between said second projection and said housing.

9 In an internal combustion engine according to claim 6, said second projection including an adjustable screw whose axis is directed toward said housing.

10. In an internal combustion engine according to claim 2, said second passage and said stem being complementarily circular in cross section.

11. In an internal combustion engine according to claim 1, said angle being a right angle.

12. In an internal combustion engine according to claim 2, said second passage and said stem being complementarily circular in cross section, and means constraining said stem to longitudinal movement.

13. In an internal combustion engine according to claim 11, said second passage and said stem being complementarily circular in cross section, and means constraining said stem to longitudinal movement.

14. In an internal combustion engine according to claim 1, the inlet end portion of said housing having an enlarged internal diameter, a unitary plug having including a body portion registering part way in said inlet end portion and an inner extension of smaller diameter than said body portion extending from said body portion thereby providing a circumferential space around said inner extension, a nipple extending from the outer end of said body portion and adapted to have said conduit connected thereto, said plug including a blocking wall at the inner extremity of said inner extension blocking the longitudinal passage through the plug, said inner extension having a plurality of spaced holes through the circumferential wall thereof between said blocking wall and said body portion.

15. In an internal combustion engine having an opening in the downdraft side of the carburetor thereof, a housing having a longitudinal passage therethrough and an inlet and an outlet end, said outlet being connected to said opening, said housing having a second passage extending therethrough at an acute angle to said longitudinal passage and intersecting said longitudinal passage, a stem longitudinally slideable in said second passage having a third passage extending therethrough in the same direction as said longitudinal passage, said longitudinal passage and said third passage having substantially the same cross- sectional area, limit stop means limiting slideable movement of said stem between a first position in which said longitudinal passage and said third passage are in minimum mutual alignment and a second position in which the same are substantially in maximum mutual alignment, said inlet end of said housing being adapted to be connected to a conduit leading from the crankcase of the engine to convey crankcase gases into said opening, and means operatively connected between the accelerator mechanism of the engine and one end of said stem for sliding said stem from said first position toward said second position proportionally as the butterfly valve of the engine is more widely opened, and means on said stem normally urging said stem into said first position.