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FLAME ARRESTOR FOR INTERNAL COMBUSTION ENGINES

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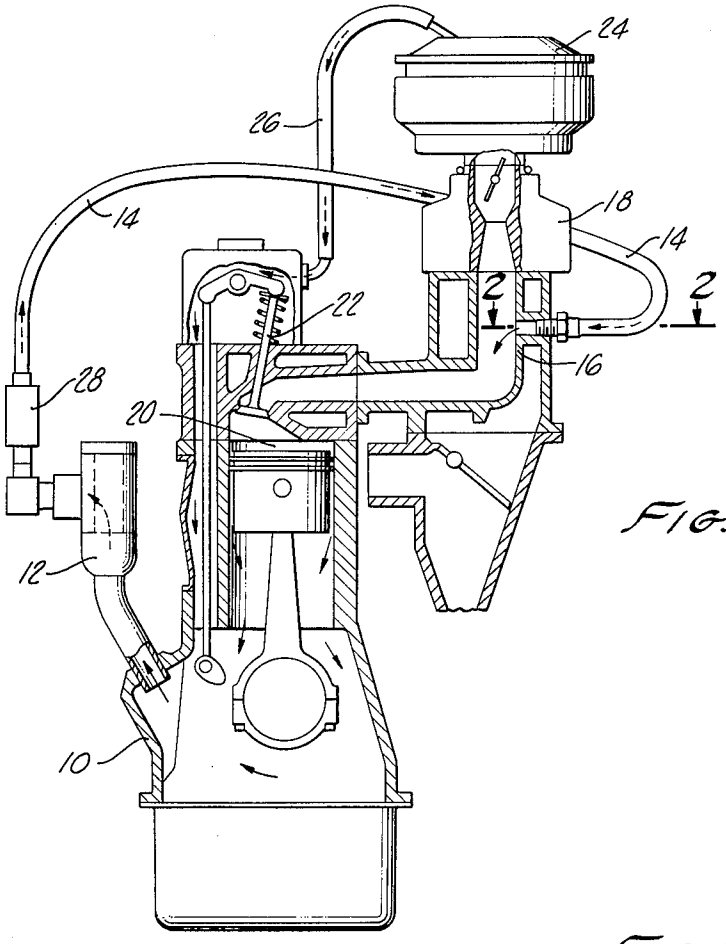


FIG. 1.

FIG. 2.

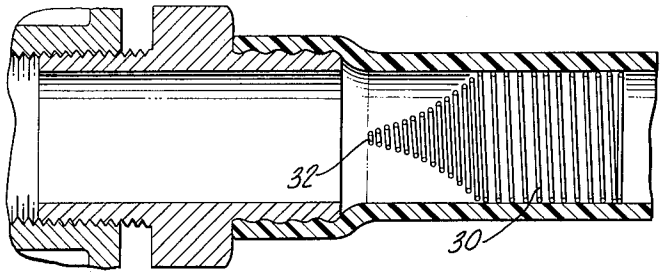
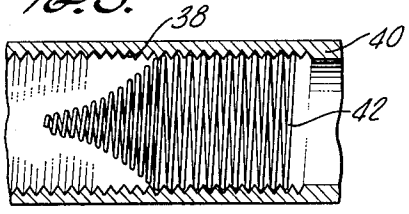


FIG. 3.



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FLAME ARRESTOR FOR INTERNAL COMBUSTION ENGINES

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3 Claims. (Cl. 123—119)

This invention relates to recovery of crankcase fumes from an internal combustion engine and more particularly relates to a flame arrestor for arresting flame propagation through a crankcase ventilation system.

Many proposals have been made to return crankcase blowby fumes through conduits to the induction system of an internal combustion engine, and such systems generally provide a check valve or other valve mechanism in the conduit between the crankcase and the intake manifold. This valve varies an opening in such conduit in response to predetermined conditions to control the passage of fumes from the crankcase to the intake manifold through the conduit.

Engine backfires result in flame propagation through the induction system and any conduits in open communication therewith, thus exposing the aforementioned recycle conduits to such flames. Flame propagation through the crankcase recycle conduit into the crankcase could result in a dangerous explosion in the crankcase as could propagation of the flame through the carburetor and the air cleaner through a "fresh air" line connecting the air cleaner with the rocker arm cover. Hence, it is desirable to provide a flame arrestor in any conduits connected with the induction system in order to prevent flame propagation into areas which would result in explosions.

Flame arrestors of the prior art such as check valves, mesh screen, etc. must be replaced or cleaned periodically since the buildup of dirt, grime, etc. on the flame arrestor will restrict the flow of gases through the conduit. Furthermore, these flame arrestors are less effective in preventing flame propagation when the flame arrestor surface is covered with dirt and grime. Relatively stiff coil springs have heretofore been proposed as flame arrestors, however, such springs were not self-cleaning nor able to expand or compress sufficiently to give any appreciable benefit.

It is, therefore, an object of my present invention to provide a self-cleaning flame arrestor for positioning in conduits communicating with the induction system of an internal combustion engine.

Other objects and a more complete understanding of my present invention may be had by reference to the following specification and the appended claims when taken in conjunction with the drawings, wherein:

FIG. 1 shows in partial cross section an internal combustion engine equipped with a crankcase ventilation system;

FIG. 2 shows an enlarged cross-sectional view taken on line 2—2 of FIG. 1 showing the flame arrestor of my present invention positioned in a crankcase recycle conduit;

FIG. 3 shows an enlarged cross-sectional view of the flame arrestor of my present invention in a modified tube or pipe adapted to receive the flame arrestor.

Briefly described, my present invention relates to a self-cleaning flame arrestor positionable in a conduit and designed to be sufficiently flexible to move in response to the passage of fluids through said conduit.

Referring now more particularly to the drawings, FIG. 1 shows an internal combustion engine wherein fumes from the crankcase **10** are collected through the oil fill pipe **12** and passed through a conduit **14** which communicates with the intake manifold **16** below the carburetor **18**. With this ventilation system, the recycled crankcase fumes are mixed with the incoming charge from the carburetor and passed into the combustion chamber **20** when the intake valve **22** is opened.

In the above-mentioned crankcase ventilating system, the engine should be essentially sealed to the escape of fumes. A continual supply of fresh air may be supplied from the clean side of the air cleaner **24** through conduit **26**. The passage of crankcase fumes through the conduit **14** is controlled by a recycle valve **28**, as disclosed in my Patent No. 3,077,871, issued February 19, 1963 for "Crankcase Ventilating System for Internal Combustion Engines," or any of the many crankcase recycle control valves available to those skilled in the art.

A backfire in the combustion chamber **20** gives rise to a flame which is propagated through the induction system and carburetor and, consequently, out through any openings therein. The propagation of a flame through the conduit **14** to the crankcase could result in a serious engine fire as could the entry of a flame into the rocker arm cover through the fresh air line **26** from the clean air side of the air cleaner **24**. Consequently, it is desirable to insert flame arrestors in any conduits leading from the induction system, such as conduit **14** leading from the intake manifold, or conduit **26** leading from the air cleaner, at a point close to the induction system.

Conventionally, a wire mesh screen, for example, as shown at **33** in FIGS. 2 and 3 of the aforementioned patent, is positioned in the conduit to quench the flame propagation. As shown in FIG. 2, my present invention provides a novel tapered cone flame arrestor **30** positioned in the conduit **14** with the tapered coil end **32** facing the flame, that is, facing downstream or towards the intake manifold. Where the conduit **14** is of a sufficiently flexible material, such as rubber, the flame arrestor **30** may be helically twisted into place, and the flame arrestor at its larger end should be of a size slightly larger than the inside diameter of the flexible conduit **14** so that the flame arrestor will resist the tendency to migrate further into the conduit towards the crankcase. The flame arrestor **30** may be installed also in line **26** with the tapered coil end **32** of the spring facing the air cleaner **24**. Where a metal conduit is utilized, as shown in FIG. 3, internal threads **38** may be provided in the conduit **40** into which the large end of the tapered coil **42** may be threaded.

With the flame arrestor **30** positioned with the tapered coil end facing the induction manifold, the normal flow of gases through the conduit **14** would tend to elongate the flame arrestor coil or open the same, thus facilitating the flow of gases past the flame arrestor; however a flame propagated from the opposite direction, that is, from the induction manifold through the conduit, would tend to cause the flame arrestor spring **30** to compress, thus advantageously providing a greater mass of flame quenching material to absorb or quench the heat from the flame. Although the precise mannner in which a flame is arrested by spring **30** is not fully understood, it is also theorized that the spring when compressed may arrest the flame without heat absorption or quenching, as by sharply reducing the oxygen supply. The effectiveness of the compression of the spring in quenching the flames appears to be confirmed by the fact that when the flame arrestor **30** is turned around so that the tapered coil end **32** faces the crankcase, a flame may be propagated past the flame arrestor device **30**.

Although my present invention has been described herein with respect to a particular embodiment with a certain degree of particularity, the scope of my present invention should not be so limited but should be afforded the full scope of the appended claims.

I claim:

1. In a crankcase ventilating system for internal combustion engines having an opening in the engine above the oil level through which blowby fluids can escape the engine and conduit means providing fluid communication between said opening and the induction system of said engine from which a backfire flame may be propagated, said opening being subject to the crankcase pressure, the improvement comprising:

a flexible tapered coil flame arrestor positioned in said conduit with the smaller end of said coil facing said induction system.

2. In a crankcase ventilating system for internal combustion engines having an opening in the engine above the oil level through which blowby fluids can escape the engine and conduit means providing fluid communication between said opening and the induction system of said engine, said opening being subject to the crankcase pressure, the improvement comprising:

a heat conductive flexible helical member positioned in said conduit with the apex of said helical member oriented towards said induction system, the tapered portion of said helical member being free to move

or vibrate with the passage of fluids through said conduit from said crankcase to said induction system, said helical member tending to elongate when said fluids are passed through said conduit from said crankcase to said induction system, said member tending to compress when the flame is propagated through said conduit and contacts the apex of said helical member.

3. The apparatus of claim 1 including an air cleaner device attached to said induction system and a conduit extending between said air cleaner and said crankcase, said latter conduit being opened to permit the passage of fresh air from said air cleaner to said crankcase, and a second tapered coil flame arrestor positioned in said second conduit with the tapered coil end of said conduit oriented towards said air cleaner.

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