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THROUGH-FLOW SPARK ARRESTER

Original Filed Dec. 27, 1965

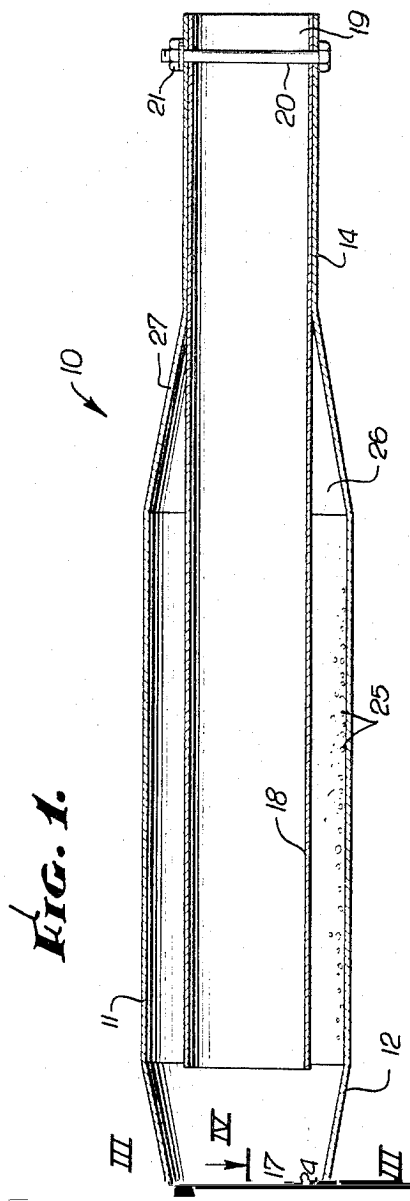


FIG. 1.

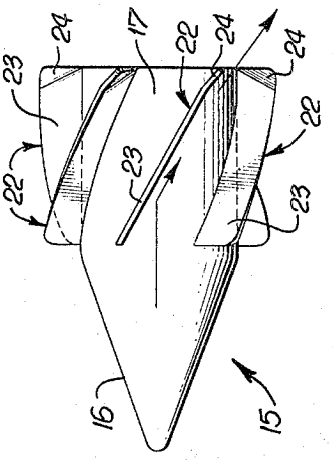


FIG. 4.

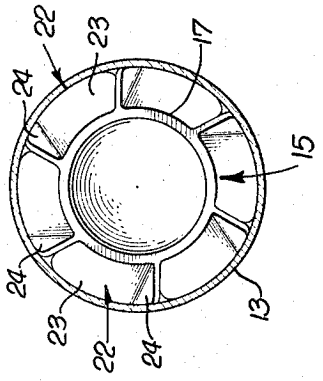
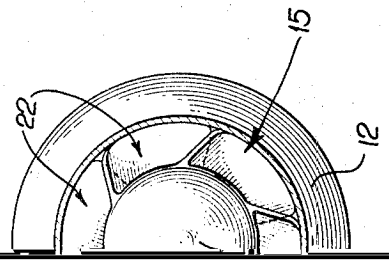


FIG. 3.



2.

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THROUGH-FLOW SPARK ARRESTER

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Continuation of application Ser. No. 516,627, Dec. 27, 1965. This application Dec. 8, 1967, Ser. No. 697,543
6 Claims. (Cl. 55—448)

ABSTRACT OF THE DISCLOSURE

A through-flow spark arrester having an outer shell with an enlarged center section which is axially between inlet and outlet sections connected to it by conical portions. The inlet section has means to accelerate and whirl entering gases, and a tubular outlet extends through the center and outlet sections, providing a trap chamber between it and the outer shell.

Cross reference to related application

This application is a continuation of my application Ser. No. 516,627, filed Dec. 27, 1965 now abandoned.

Background of the invention

Spark arresters for small internal combustion engines in vehicles, such as motorcycles or other trail vehicles, or in generators, used in proximity to forests, must conform to standards which establish minimum performance and maintenance requirements designed to minimize the risk from exhaust spark fires.

The performance of spark arresters is measured by "arresting efficiency" which is defined as the percent of carbon particles retained or destroyed by the spark arrester when tested under prescribed conditions in a standard apparatus. An arresting efficiency of at least 80 percent is required for all flow rates from 10 percent of the "rated minimum flow rate" to the "rated maximum flow rate." The "rated maximum flow rate" is defined as the maximum rate of flow at which the back pressure, i.e., the differential pressure from intake to discharge of the arrester, is one pound per square inch. The "rated minimum flow rate" is defined as ten times the lowest flow rate at which 80 percent arresting efficiency is obtained. The "rated flow range" of the arrester is the range of flow rates, in cubic feet per minute, between the rated maximum flow rate and the rated minimum flow rate. Upon determination of the rated flow range of a specific spark arrester, it may be applied in the system of an engine which has an exhaust flow rate within the rated flow range under operating conditions of maximum speed and power.

The drop in arresting efficiency with increase in back

increase in back pressure. Some of these devices, for example, provide a structure which causes a re-circulation of gases, usually through a type of trap chamber. Such devices also have the effect of decreasing the arresting efficiency while at the same time increasing back pressure.

In other instances, the prior art has provided highly complex and expensive devices which would be unsatisfactory for the present purposes.

Summary of the invention

The present invention provides a through-flow spark arrester having three main components. The first is an outer shell which has an enlarged center section, and in axial alignment therewith, inlet and outlet sections of relatively smaller diameter. The inlet and outlet sections are connected to the center section by truncated conical portions. Within the inlet section there is a second component, which is in the nature of a cone and cylinder structure positioned coaxially in the inlet section and terminating at the junction of that inlet section with the adjacent conical portion. This structure has fins which extend in the annular space between it and the inside wall of the inlet section, and are so positioned as to impart a whirling motion to the gases and particles passing through this inlet section. In addition, the arrester by virtue of the thus reduced cross sectional area of the inlet section causes the exhaust gases and carbon particles flowing through it to be accelerated to a velocity significantly higher than the entry velocity thereof. The third component is a tubular outlet positioned coaxially within the outer shell and having its entry end adjacent the plane which passes through the juncture of the expanding conical portion (which is near the inlet section) and the enlarged center section, the other conical portion and into the outlet section, being sealed relatively to the outlet section. This construction thereby provides a trap chamber between the tubular outlet and the outer shell which has an entrance only at the annular space surrounding the inlet of the tubular outlet; this trap chamber in normal operation has no outlet. Accordingly, the gases and carbon particles are initially accelerated by the device in the inlet section, and are also caused to have a whirling motion. Immediately after leaving the inlet section, the cross sectional area of the gas passage through the spark arrester substantially increases, so that there is a reduction in the velocity of the gases; however, the carbon particles have substantial momentum due to the velocity imparted to the mass thereof and continue at a relatively high velocity generally in a direction outwardly of the axis of the arrester. They thereby enter into the trap chamber between the tubular outlet and the outer shell. During the initial operation, there is some entry of gas into this trap chamber, to the extent that the gas therein is compressed somewhat. Thereafter

changing direction of flow while being separated from carbon particles contained therein.

It is another object of this invention to disclose and provide a spark arrester for internal combustion engines having a displacement up to about 80 cubic inches and adapted to operate in a vertical, horizontal or inverted position.

It is a further object of this invention to disclose and provide a spark arrester which may be economically constructed and assembled and which requires a minimum of maintenance.

Other objects and advantages will be apparent from a reading of the following description and drawing

A gas outlet from the spark arrester **10** is provided by a tubular outlet **18** which is positioned within the outer shell. Tubular outlet **18** has an inlet end positioned adjacent the juncture of the enlarging conical portion **12** and the center section **11**, and extends through the center section **11**, the diminishing conical portion **27** and the outlet section **14**. The tubular outlet **18** has a discharge end **19** which terminates at about the end of the outlet section **14**. A portion of the outer surface of tubular outlet **18** is in substantial engaging contact with the inner surface of the outlet section **14**, being held in assembled relation thereto, sealed against the escape of gases and carbon particles by conventional means such as bolt **20**

and nut **21**. The outer shell comprising center section **11**

the spirit and scope of the present invention as defined by the appended claims.

I claim:

1. A through-flow spark arrester for an internal combustion engine comprising:

a tubular outer shell comprising a center section positioned between inlet and outlet sections, said inlet and outlet sections being of smaller diameter than said center section, in axial alignment therewith, and joined thereto by truncated conical portions, which respectively enlarged and diminish in the direction of flow, said center section being relatively long and said inlet and outlet sections being relatively short;

means centrally disposed within said inlet section for reducing the cross sectional area thereof and causing the gases and particles flowing therethrough to achieve an increased velocity and a whirling motion, whereby said particles have imparted to them a force urging them away from the axis of said arrester, said means terminating adjacent the juncture of said inlet section and the adjacent conical portion, said means including a plurality of circumferentially spaced fins lying in planes angularly related to the

of the tubular outlet without substantial change of direction and thence passing from said arrester.

2. A spark arrester as defined in claim 1 wherein each of said fins includes a leading portion and a trailing portion, said trailing portion including a deflecting tab disposed in angular relatonship to the longitudinal axis of said leading portion.

3. A spark arrester as defined in claim 2 wherein the leading portion of the fin is slanted to the longitudinal axis of said means at an angle of about 45 degrees and the deflecting tab is slanted at an angle of about 15 degrees.

4. A spark arrester as defined in claim 2 wherein the deflecting tab is disposed at an angle of about 15 degrees to the longitudinal axis of the leading portion.

5. A spark arrester as defined in claim 1, wherein the said fins are spaced apart about 60 degrees.

6. A spark arrester as defined in claim 1, and including releasable means for holding said tubular outlet in said position in said outlet section, whereby said tubular outlet may be readily removed from said outer shell.

References Cited