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J. REINDL

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SPARK ARRESTERS

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Fig. 1.

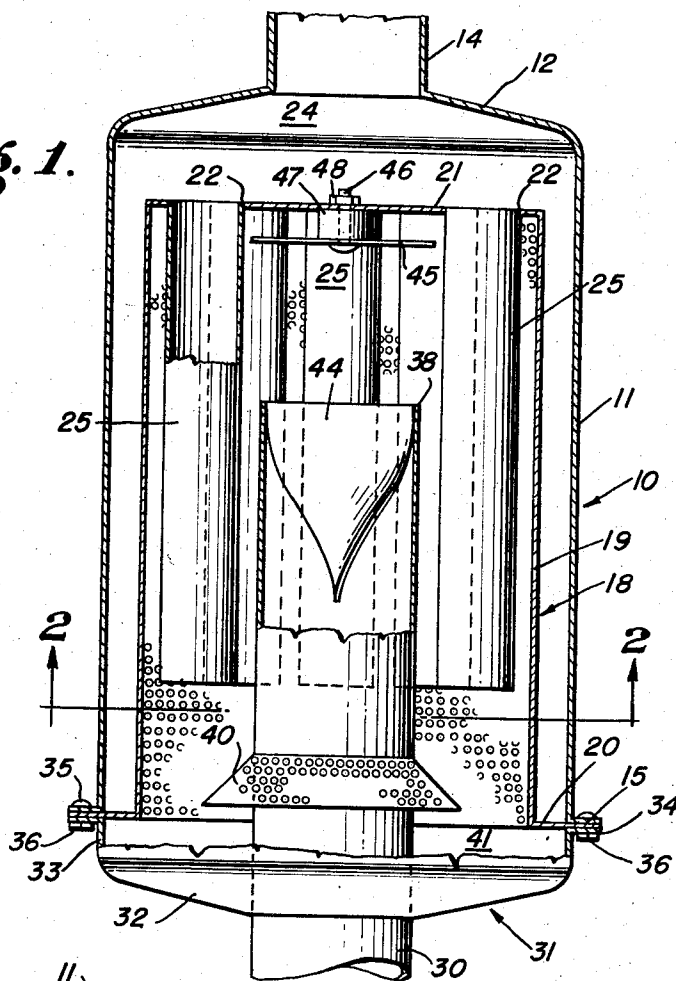
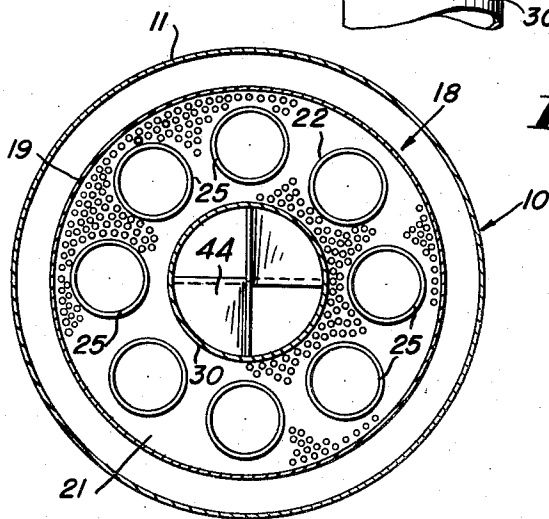


Fig. 2.



INVENTOR,
JOSEPH REINDL.
BY
John W. Land
Attorney

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SPARK ARRESTERS

Joseph Reindl, Topanga, Calif.

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10 Claims. (Cl. 183—91)

This invention relates generally to spark arresting devices and relates more particularly to spark arresters for the exhausts of internal combustion engines.

While the invention has particular utility in connection with internal combustion engines, and is shown and described in such connection, it is to be understood that its utility is not confined thereto.

It is well known that the exhausts of internal combustion engines often contain sparks which could set fires should they fall onto dry materials. This is a serious problem when equipment using internal combustion engines is used in forested areas and the like and it is an object of the present invention to provide a spark arrester for internal combustion engines which will substantially eliminate the hazards or danger of fire from sparks discharged by the exhaust of internal combustion engines.

Another object of the invention is to provide a device of this character that will trap the carbon particles from the engine exhaust and prevent said particles from escaping through the outlet pipe.

Still another object of the invention is to provide a device of this character wherein the exhaust gases are rapidly cooled.

A further object of the invention is to provide a device of this character wherein back pressure of the exhaust gases is reduced to a minimum.

A still further object of the invention is to provide a device of this character that is highly effective in silencing or muffling the exhausts of internal combustion engines.

A still further object of the invention is to provide a device of this character that is highly efficient.

Another object of the invention is to provide a device of this character that can be easily and quickly taken apart for cleaning and for replacement of burned out parts, and that may be as easily and quickly reassembled.

Still another object of the invention is to provide a device of this character that may be taken apart and reassembled without detaching same from the motor.

A further object of the invention is to provide a device of this character that is compact and sturdy in construction.

A still further object of the invention is to provide a device of this character that is relatively simple in construction and may be produced at relatively small cost.

The characteristics and advantages of the invention are further sufficiently referred to in connection with the following detailed description of the accompanying drawings which are for illustrative purposes only, and represent one embodiment. After considering the disclosed example, skilled persons will understand that variations may be made without departing from the principles disclosed, and the employment of any structures, arrangements or modes of operation that are properly within the scope of the appended claims are contemplated.

Referring to the drawings:

Fig. 1 is a view of the device, partially in longitudinal section, showing the interior construction thereof; and

Fig. 2 is a sectional view taken on lines 2—2 of Fig. 1.

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Referring more particularly to the drawings, the device comprises an outer shell, indicated generally at 10, having a vertical cylindrical portion 11 with an upper end wall 12 inclined inwardly and upwardly and having an axially arranged outlet pipe 14 extending upwardly from said top wall 12. The outlet pipe may be integral with the upper end wall or it may be secured thereto by welding or by any other suitable means. At the lower end, the cylinder 11 has an outwardly extending annular flange 15.

Within the outer shell 10 is an inner shell, indicated generally at 18. The inner shell includes a perforated cylindrical portion 19 of smaller external diameter than the internal diameter of the cylinder 11 and arranged coaxially therewith, said cylindrical portion 19 of the inner shell being perforated. At the lower end, the cylindrical portion 19 has an outwardly extending flange 20 which extends outwardly to the periphery of the flange 15. Cylinder 19 is of less length than the cylinder 11 and is provided at its upper end with an end wall 21 having a plurality of annularly arranged and spaced openings 22. It is to be noted that the end wall is also perforated, as thus shown in Fig. 2, and is spaced downwardly from the end wall 12 of the outer shell so as to define an upper chamber 24.

Each of the openings 22 is provided with a depending tube 25, the upper end of each tube being received within a respective opening 22 and welded or otherwise suitably secured to the end wall 21. The tubes 25 are approximately three-fourths the length of the cylinder 19 so that the lower ends of said tubes are spaced upwardly of the lower end of said cylinder.

There is an inlet pipe 30 which extends upwardly within the cylinder 19 and in coaxial arrangement therewith, the upper end of said pipe 30 being spaced below the upper end wall 21 of the cylinder 19. A closure for the lower end of the device comprises a bowl, indicated generally at 31, which is shallow and has a downwardly and inwardly inclined bottom wall 32 provided with an axial opening through which the pipe 30 extends and to which said wall 32 is secured by any suitable means such as welding, brazing, or the like. The upper portion 33 of the bowl is cylindrical and of substantially the same diameter as the diameter of the cylinder 11, and about the upper open end of said bowl is a flange 34 which extends outwardly to the peripheries of the flanges 15 and 20. The flanges may be secured together by any suitable means, the means shown comprising screws 35 and nuts 36, said screws being received in registered openings provided therefor in the flanges 15, 20 and 34. Alternatively, a clamp or clamps may be used to secure the parts together.

The upper end portion of the pipe 30 extends upwardly with respect to the tubes 25 substantially two-thirds the length of said tubes so that the upper open end 38 of said pipe is spaced downwardly from the wall 21 substantially a third of the length of said pipes 25. Spaced upwardly from the bottom of the bowl 31 is a perforated, frusto-conical retainer shield 40 having an axial opening at the upper end for reception of the pipe 30, said upper end of the retainer shield being secured to said pipe by welding, brazing or any other suitable means. The larger diameter of the shield is at the bottom and, said shield comprising a trap for carbon particles entrained in the exhaust gases, the carbon particles being collected in the space 41 between the shield 40 and the bottom 32 of the bowl 31.

In order to create a vortex action for faster cooling and better distribution of the gases passing through the device, a helical vane 44 is secured in the upper end portion of the pipe 30 with the upper end of said vane in substantially the same plane as the upper end 38 of said pipe,

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Spaced upwardly from the upper open end 38 of pipe 30 is a deflector plate 45 coaxial with said pipe and of larger diameter than the diameter of said pipe. Plate 45 is secured to the upper wall 21 of the inner shell 18 by means of a screw 46 which is received in an axial opening provided therefor, said plate 45 being spaced downwardly of the wall 21 by means of a spacer 47 on screw 46, the assembly being secured by means of nut 48 on said screw 46.

Exhaust gases from an internal combustion engine to which the device is secured pass through the pipe 30 and are caused to swirl by the vane 44 as said gases pass out of said pipe. The gases then strike the deflector plate 45 and are deflected outwardly. The main portion of the gases pass outwardly through the perforations of the inner shell 18. The main force of the incoming gases is substantially reduced. Some of the incoming gases also flow downwardly and carry the carbon particles entrained therewith along therewith. When the down flowing gases reach the lower open end of the tubes 25, said gases pass into and through said tubes. However, the force of the gases is reduced to such an extent that it is impossible to carry the carbon particles upwardly through the tubes 25 and said carbon particles will then fall downwardly into the space 41. The retainer shield will prevent the carbon particles in said space from being disturbed and carried upwardly. Hence, any carbon particles that may be still burning are prevented from escaping from the device.

The combined passage area of the small tubes 25 is equal to the area of the inlet pipe 30 and hence, back pressure is kept at a minimum. It has been found that by splitting the gases so that some of it flows through the perforated shell 18 and some through the small by-pass tubes 25, effective silencing of the exhaust is effected.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description and it is thought that it will be apparent that various changes may be made in the form, construction and arrangement of the parts of the invention without departing from the spirit and scope thereof or sacrificing all of its material advantages, the form herein before described being merely one embodiment.

I claim:

1. A spark arrester, comprising: an outer cylindrical shell arranged vertically and open at the bottom, an upper end wall having an axial opening therein, and an outwardly extending annular flange at the lower end of said shell; an outlet pipe secured to said end wall in register with the opening therein; a perforated coaxial inner cylindrical shell shorter than the outer shell and having an outside diameter smaller than the inside diameter of the outer shell to thereby provide an annular passage between said cylindrical shells, a horizontal wall at the upper end of the inner shell, said wall having a plurality of annularly arranged and spaced openings therein, there being a chamber between said wall and the upper end wall of the outer shell in communication with said annular chamber, and an outwardly extending annular flange at the lower end of said inner shell, said flange extending outwardly to the periphery of the flange of the outer shell; a by-pass tube for each of the openings in said horizontal wall, said tubes being secured to said horizontal wall and depending within the inner shell, the length of said by-pass tubes being approximately three-fourths the length of the inner shell; means closing the lower end of the outer shell, said means comprising a shallow bowl having a cylindrical part substantially the same diameter as the outer shell and an outwardly extending annular flange at the upper free end of said cylindrical part of the bowl, extending outwardly substantially to the periphery of the flange of the outer shell, the bottom of said bowl having a coaxial opening therein; means for releasably securing together the flanges of the inner and outer shells and the bowl; an inlet pipe extending upwardly through

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the opening in the bottom of the bowl and secured therein, the upper end of said pipe extending axially into the inner shell approximately two-thirds upwardly with respect to the depending by-pass tubes; a frusto-conical, perforated baffle secured about said inlet pipe in upwardly spaced relationship to the bottom of the bowl, the large part of said baffle being at the bottom; a helical vane secured within the inlet pipe at the upper open end thereof; and a deflector secured to the horizontal wall of the inner shell in upwardly spaced, coaxial relationship to the inlet pipe, said deflector also being spaced downwardly from said upper end wall.

2. A spark arrester, comprising: a vertically arranged cylindrical outer shell open at the bottom, a top wall therefor having an axial opening therein, and an outwardly extending annular flange at the lower end of said shell; an outlet pipe secured to said top wall in register with the opening therein; a perforated coaxial cylindrical inner shell shorter than the outer shell and having an outside diameter smaller than the inside diameter of the outer shell to thereby provide an annular passage between said shells, an end wall at the upper end of the inner shell, said end wall having a plurality of annularly arranged and spaced openings therein, and an outwardly extending annular flange at the lower end of said inner shell, said flange extending outwardly to the periphery of the flange of the outer shell; a by-pass tube for each of the openings in the upper end wall of the inner shell, said tubes being secured to said upper end wall and depending within the inner shell, the length of said by-pass tubes being approximately three-fourths the length of the inner shell; means closing the lower end of the outer shell, said means comprising a shallow bowl, the bottom of said bowl having a coaxial opening therein; means for releasably securing together the bowl and the inner and outer shells; an inlet pipe extending upwardly through the opening in the bottom of the bowl and secured therein, the upper end of said pipe extending axially into the inner shell approximately two-thirds upwardly with respect to the depending by-pass tubes; a downwardly and outwardly inclined perforated baffle secured about said inlet pipe in upwardly spaced relationship to the bottom of the bowl; and a deflector secured to the upper end wall of the inner shell in upwardly spaced, coaxial relationship to the inlet pipe.

3. In a spark arrester: a hollow outer shell open at the bottom and having a top end wall with an outlet opening therein; a hollow, perforated inner shell smaller than the outer shell thereby providing a passage between the shells, said passage being closed at the bottom and communicating with said outlet; an upper end wall at the upper end of the inner shell, said wall having a plurality of annularly spaced openings therein; a by-pass tube for each of the openings in the upper end wall of the inner shell, said tubes being secured to said upper end wall and depending within said inner shell, the lower, open free ends of said tubes being spaced upward of the lower end of said inner shell; closure means for the lower end of the outer shell; means for securing together the inner and outer shells and the means closing the lower end of the outer shell; an inlet pipe extending upwardly through an opening in said closure means, said pipe extending into the inner shell with the upper free end of said inlet pipe spaced downwardly from the upper end wall of the inner shell; baffle on said inlet pipe in upwardly spaced relationship to said closure means; and a deflector secured to the upper end wall of the inner shell in upwardly spaced relationship to the upper end of said inlet pipe.

4. In a spark arrester: a hollow outer shell open at the bottom and having a top end wall with an outlet opening therein; a hollow, perforated inner shell smaller than the outer shell thereby providing a passage between the shells, said passage being closed at the bottom and

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communicating with said outlet; an upper end wall at the upper end of the inner shell, said wall having a plurality of annularly spaced openings therein; a by-pass tube for each of the openings in the upper end wall of the inner shell, said tubes being secured to said upper end wall and depending within said inner shell, the lower, open free ends of said tubes being spaced upwardly of the lower end of said inner shell; closure means for the lower end of the outer shell; means for securing together the inner and outer shells and the means closing the lower end of the outer shell; an inlet pipe extending upwardly through an opening in said closure means, said pipe extending into the inner shell with the upper free end of said inlet pipe spaced downwardly from the upper end wall of the inner shell; and baffle on said inlet pipe in upwardly spaced relationship to said closure means.

5. In a spark arrester: a hollow outer shell having an outlet at one end; a hollow, perforated inner shell within said outer shell, there being a longitudinally extending passage between said shells, said passage being closed at one end and communicating with said outlet; an end wall at the end of the inner shell adjacent said outlet, said wall having a plurality of spaced openings therein; a by-pass tube for each of said openings, said tubes extending longitudinally from said wall and within said inner shell; an inlet pipe extending into the inner shell from the end opposite the end having said wall, the inner end of said inlet pipe being spaced from said wall; a frusto-conical, perforated baffle on said inlet pipe; a helical vane secured within the inlet pipe at the inner end thereof; and a deflector secured to the wall of the inner shell in spaced relationship to the inner end of the inlet pipe and in alignment therewith.

6. In a spark arrester: a hollow outer shell having an outlet at one end; a hollow, perforated inner shell within said outer shell, there being a longitudinally extending passage between said shells, said passage being closed at one end and communicating with said outlet; an end wall at the end of the inner shell adjacent said outlet, said wall having a plurality of spaced openings therein; a by-pass tube for each of said openings, said tubes extending from said wall and within said inner shell; an inlet pipe extending into the inner shell from the end opposite the end having the wall, the inner end of said inlet pipe being spaced from said wall; a frusto-conical, perforated baffle on said inlet pipe; and a deflector secured to the wall of the inner shell in spaced relationship to the inner end of the inlet pipe and in alignment therewith.

7. In a spark arrester: a hollow outer shell having an outlet at one end; a hollow, perforated inner shell within said outer shell, there being a longitudinally extending passage between said shells, said passage being closed at one end and communicating with said outlet; an end wall at the end of the inner shell adjacent said outlet, said wall having a plurality of spaced openings therein; a by-pass tube for each of said openings, said tubes extending

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from said wall and within said inner shell; and an inlet pipe extending into the inner shell from the end opposite the end having the wall, the inner end of said inlet pipe being spaced from said wall; and an annular baffle in the lower portion of said spark arrester.

8. In a spark arrester: a hollow outer shell having an outlet at one end; a hollow, perforated inner shell within said outer shell, there being a longitudinally extending passage between said shells, said passage being closed at one end and communicating with said outlet; an end wall at the end of the inner shell adjacent said outlet, said wall having a plurality of spaced openings therein; a by-pass tube for each of said openings, said tubes extending from said wall and within said inner shell; and an inlet pipe extending into the inner shell from the end opposite the end having the wall, the inner end of said inlet pipe being spaced from said wall.

9. In a spark arrester: a vertically arranged tubular outer shell having an inlet at the bottom and an outlet at the top; a tubular, perforated inner shell of smaller cross sectional area than the outer shell and arranged vertically within said outer shell, there being a longitudinally extending passage between said shells, said passage being closed at the bottom and communicating at the upper end with said outlet; an end wall at the upper end of said inner shell, said wall having a plurality of spaced openings therein; an inlet pipe extending upwardly into the inner shell from the lower end thereof end having its outlet spaced downwardly from said wall; and a by-pass tube for each of the openings in said wall, said tubes depending from said wall and having the lower end portions thereof disposed between the inner shell and said inlet pipe.

10. In a spark arrester: a hollow outer shell having an outlet at one end; a hollow, perforated inner shell within said outer shell, there being a longitudinally extending passage between said shells, said passage being closed at one end and communicating with said outlet; an end wall at the end of the inner shell adjacent said outlet, said end wall of said inner shell having a plurality of relatively large spaced openings therein; a longitudinally extending by-pass tube for each of said openings, said tubes extending into the space defined by the inner shell; and an inlet pipe extending into the inner shell from the end opposite the end having the wall, the inner end of said inlet pipe being spaced from said wall.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 2,884,092

April 28, 1959

Joseph Reindl

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, line 57, for "upward" read -- upwardly --; column 6, line 29, for "end" read -- and --.

Signed and sealed this 20th day of October 1959.

(SEAL)

Attest:

KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents