Nov. 15, 1955 J. HALLIDAY ET AL 2,723,723

COMBINED MUFFLER AND SPARK ARRESTER

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Fig. 1.

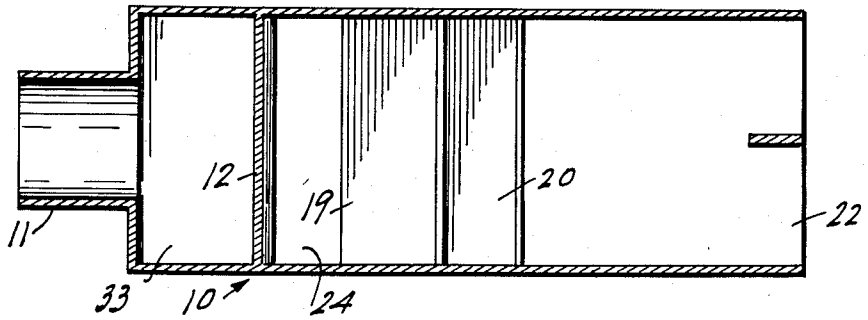
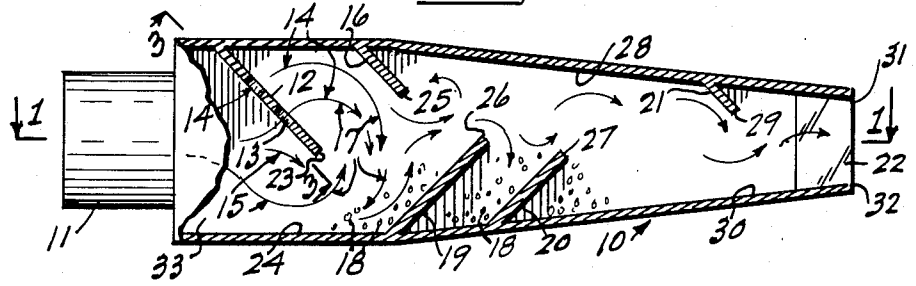


Fig. 2.



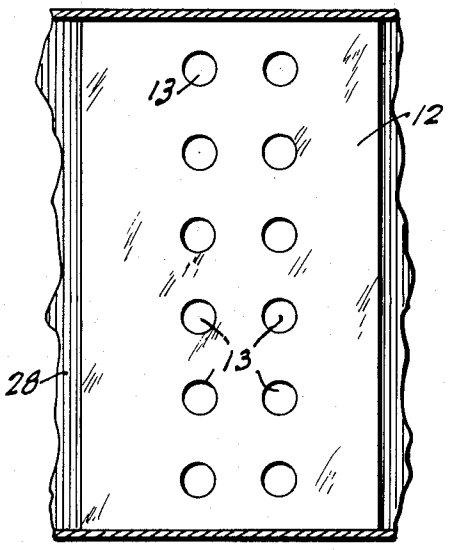


Fig. 3.

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COMBINED MUFFLER AND SPARK ARRESTER

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4 Claims. (Cl. 181—70)

This invention relates to improvements in mufflers or silencers for internal combustion engines, and particularly to mufflers for the exhaust of the engines of trucks used in fire hazard areas such as in dry grass country and forests, and provides a new type of muffler which is very efficient in arresting and retaining sparks, thus effectively contributing toward the protection of fire hazard areas from fire, since it is known that fires are often started from sparks discharged with the exhaust, the usual type of muffler being designed only for their silencing effect with practically no spark arresting capabilities.

This muffler allows for substantially unrestricted flow of the exhaust gases since the areas at all restrictive points are equal, yet producing violent eddies which cause retention of solids within the muffler.

The objects and advantages of the invention are as follows:

First, to provide a combined muffler and spark arrester which will effectively retain solids through eddying or cyclonic action while permitting relatively free exhaust of the gases.

Second, to provide a muffler as outlined with eddy forming pockets for acceptance and retention of sparks and other solids to provide a spark free exhaust.

Third, to provide a muffler as outlined in which the areas at all restrictions are equal for uniform flow of gases through such restrictive areas.

Fourth, to provide a muffler as outlined which is simple in construction and efficient in operation.

In describing the invention reference will be had to the accompanying drawings, in which:

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

Fig. 2 is a side sectional elevation of the invention.

Fig. 3 is an enlarged view of the initial eddy promoting deflector and is taken on a line 3—3 of Fig. 2.

The invention is shown rectangular in cross-section and which is the preferred form though not so limited, the rectangular section proving the most efficient, and consists of a box-like structure **10** having a connection **11** for connection to the engine exhaust pipe.

A plurality of baffles are fixed within this box-like structure and consisting of an initial upper eddy forming baffle **12** which is provided with a plurality of passages **13** to provide for both, through passage of gases as indicated at **14** and deflection of gases as indicated at **15** with the gases passing through the passages being deflected by a second upper eddy forming baffle **16** which causes deflection of these gases to the previously deflected gases as they return about the lower edge of the baffle, causing an intermixing and violent eddying as indicated at **17** to cause dropping of the solids as indicated at **18** back of the initial lower baffle **19**, the gases then passing over the two spaced lower baffles **19** and **20** with another expansion occurring between these baffles to drop any remaining sparks or solids, a final deflection occurring when the baffle **21** is reached.

The housing is tapered from the base of the baffle **19** to the exhaust end **22**, and the minimum space between the terminal end of any baffle and the closest surface is identical with that between the upper and lower edges of the exhaust and, in other words, the area between the edge **23** of baffle **12** and the bottom wall **24**, between the end **25** of baffle **16** and the closest point on baffle **19**, the edges **26** and **27** of baffles **19** and **20** and the top wall **28**, between the edge **29** of baffle **21** and the sloping bottom wall **30**, and between the upper and lower edges **31** and **32** of the exhaust end are all substantially identical to provide all restrictions to a predetermined value and with decreased expansions to the exhaust end, the areas being substantially equal to 40% of the area at the initial end **33** of the housing. Thus an efficient muffler and spark arrester is provided which is very effective in silencing the exhaust and which retains all solids, thereby protecting areas where fire hazards exist from sparks ordinarily discharged with the exhaust gases.

The baffles are shown at their most efficient angle, sloping in the direction of the exhaust end at an angle of 45 degrees, thus no back pressure is created as is created when the baffles are vertical or sloping toward the intake end **11**. However, this angle should not be below 40 or above 50 degrees, as the efficiency drops off as the angle is either decreased or increased.

I claim:

1. A muffler comprising a housing rectangular in cross-section and having a top wall, a bottom wall, and side walls, an intake end having an exhaust pipe connection, and a discharge end having substantially one-half the cross-sectional area of the intake end, a plurality of upper baffles coextensive with the upper half of the cross-sectional area of the muffler at their respective locations, and a plurality of lower baffles coextensive with the lower half of the cross-sectional area at their respective locations, and with all baffles inclined in the direction of the discharge end, said baffles including a first upper baffle having its upper end in slightly spaced relation to the intake end, and a second upper baffle in spaced relation toward said discharge end from said first upper baffle, a first lower baffle having its connection to said bottom wall substantially in vertical alignment with the top connection for the second upper baffle, and a second lower baffle located in spaced relation toward said discharge end from said first lower baffle, all surfaces and free edges of said baffles being spaced from the closest adjacent surface or edge of wall or baffle a minimum distance equal to the height of the discharge end for equal cross-sectional areas of passages, said first upper baffle having passages formed therethrough for diversion of gases simultaneously to the second upper and the first lower baffles to create violent opposing eddies for discharge of solids to the intake end side of the first lower baffle with the gases then passing upwardly about the first lower baffle and eddying thereover to the intervening space to the second lower baffle for further deposit of solids between the first and second lower baffles.

2. A structure as defined in claim 1, said housing being uniform in cross-section from said intake end throughout approximately one-third of the length of the housing and thence tapering to the discharge end to approximately one-half the height of the intake end, with the housing uniform in width throughout its length, and with said baffles inclined from their points of connection to the top and bottom walls toward said discharge end at an angle of approximately 45 degrees to the horizontal axis of the housing.

3. A combined muffler and spark arrester comprising a housing having a top wall, a bottom wall, side walls, and an intake end wall having an exhaust pipe connection, and having a discharge end, a plurality of upper and lower baffles mounted in said housing, with the upper and

lower baffles having their respective upper and lower edges fixed to the respective top and bottom walls, and their side edges fixed to the side walls, and all inclined in the direction of the discharge end at an angle of substantially 45 degrees to the horizontal axis of the housing, and including a first upper baffle fixed to the top wall in slightly spaced relation to said intake end wall, a first lower baffle having its lower end connected to the bottom wall substantially in alignment with the plane of said first upper baffle, and a second upper baffle located in a plane substantially in alignment with the upper free edge of the first lower baffle, and passages provided through said first upper baffle for diversion of part of the gases through the passages for deflection by said second upper baffle toward the surface of said first lower baffle with the remainder of the gases deflected in opposition to said deflected part of the gases, by said first upper baffle to the bottom wall and thence upwardly by the first lower baffle for creating violent eddying for deposit of solids on the intake end side of the first lower baffle, and a second lower baffle in spaced relation from said first lower baffle toward said discharge end for deposit of additional solids from the eddying gases flowing over the top edge of the first lower baffle.

4. A structure as defined in claim 3, a third upper baffle located about midway between said second lower baffle and said discharge end to create, in cooperation with said second lower baffle further eddying of the gases for deposit of remaining solids in the pocket formed on the discharge end side of the second lower baffle, all spacing between baffles and between the baffles and walls being substantially equal to the spacing between the bottom and top walls at the discharge end.

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