July 16, 1929. W. H. G. FURNIVALL ET AL 1,721,385

EXHAUST SILENCER

Filed April 13, 1928

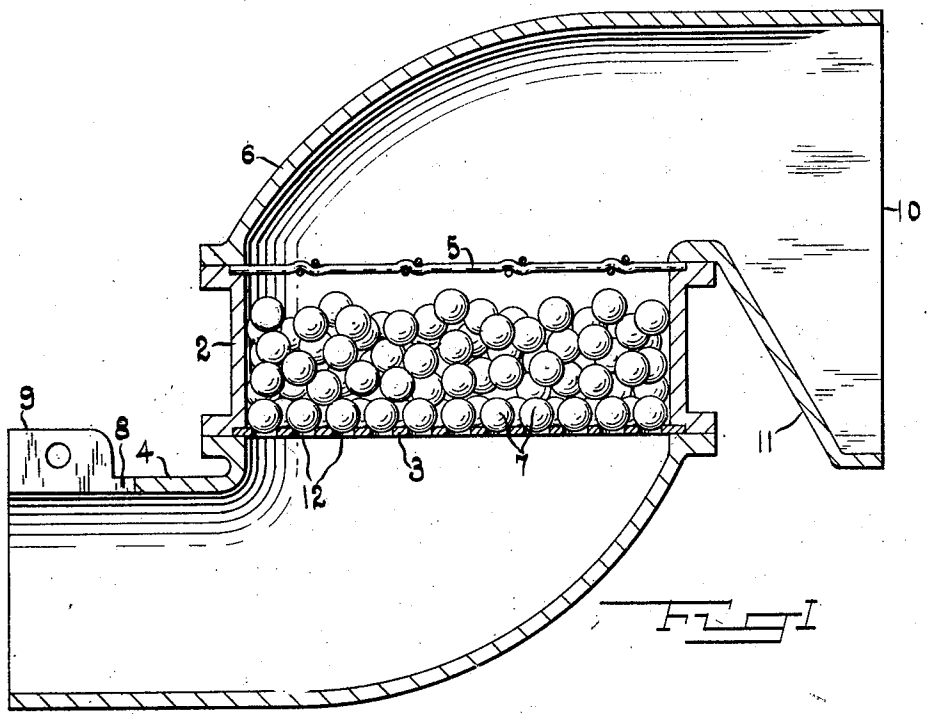


Fig I

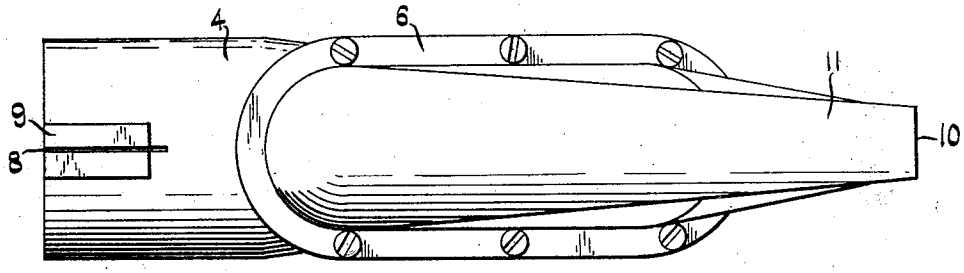


Fig II

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UNITED STATES PATENT OFFICE.

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EXHAUST SILENCER.

Application filed April 13, 1928, Serial No. 269,819, and in Germany August 26, 1926.

The present invention refers to exhaust silencers of the kind comprising a container partially filled with a loose mass of balls. At the base of the container is a perforated partition, through which the exhaust gases are conducted into the container; and the balls are of such size that they are lifted and agitated by the gases. Thereby they deprive the gases of their noise producing energy or so modify such energy as to reduce the noise; whilst the agitation of the balls prevents accumulation of carbon and other solid deposits in the silencer.

The purpose of the invention is to provide a silencer of this kind which minimizes back pressure in the engine.

The invention is illustrated in the accompanying drawing in which

Fig. I is a longitudinal vertical section of a silencer and

Fig. II is a plan.

The ball container comprises a member 2 with vertical walls, a perforated base plate 3 clamped between the members 2 and 4, and a wire mesh screen 5 similarly clamped between members 2 and 6. A loose mass of balls 7 partially fills the ball container; and, when dormant, rests on the base plate 3. The member 2 is considerably elongated on one horizontal axis *a* which in practice is the axis lying fore-and-aft of a motor vehicle on which the silencer is fitted.

The hollow inlet member 4 is split at 8 and provided with bolt lugs 9 for clamping it to the end of a horizontal exhaust pipe. It extends parallel with the axis *a* and is curved to deliver the exhaust gases upwardly to the ball container.

The hollow outlet member 6 is bolted to the upper end of the ball container and conducts the gases to the rearwardly directed and flattened orifice 10 of a fish tail 11, extending in the general direction of the axis *a* but oppositely to the member 4.

It will be seen that the exhaust gases flow first horizontally, then upwardly and then again horizontally, but the elongation of the ball chamber in the direction of their horizontal flow enables the changes of direction to be made in easy curves; this being a factor in minimizing the back pressure.

The wire screen 5 has the usual rectangular mesh preferably with oblong openings, so that its openings cannot be substantially closed by the balls even if the balls are thrown against it.

The holes 12 in the plate 3 are circular; and their diameter and distance are so proportioned to the diameter of the balls that it is possible for the balls to settle into all or substantially all of the holes. Balls of $\frac{3}{8}$ inch in diameter have been found suitable for a motor car exhaust silencer. With balls of this size the provision of holes of $\frac{5}{16}$ inch diameter and spaced $\frac{7}{16}$ inch apart enables all or practically all the holes to be occupied by the lowermost layer of a mass of balls settling by gravity.

The successive opening of the engine exhaust valves tends to cause the gases to pass through the exhaust system in a series of waves of pressure alternating with waves of rarefaction. The point at which the gases are discharged from the silencer into the atmosphere acts as a mode from which such waves are reflected back into the exhaust system, so interfering with on-coming waves and raising the back pressure in the system.

The effect of the construction described is that the balls are raised and agitated by a wave of pressure and thereby diminish its noise-making capacity. When the succeeding wave of rarefaction arrives, the balls settle back onto the plate 3, enter the holes 12 or a substantial number of said holes and act as non-return valves to prevent the gases or the atmospheric air from flowing back into the exhaust pipe.

We claim:

An exhaust silencer comprising two elbow-shaped members, the one an exhaust member, having a cylindrical end adapted to be clamped to an exhaust pipe and having an upwardly directed end of oval cross section having its major axis parallel to the axis of the cylindrical end, and larger in area than said cylindrical end, the other elbow-shaped member being an exhaust outlet member, having a discharge end flattened to provide a narrow elongated discharge slot, and having a downwardly directed oval shaped end of similar area and cross section to the corresponding end of the inlet member, an intermediate drum of oval cross section secured between the oval ends of the inlet and outlet members, upper and lower

screens for said drum clamped between said drum and the adjacent members, balls in said drum between said screens, the lower screen being formed with perforations of such size and spacing as to be substantially all occluded by the balls, when in state of repose, the upper screen being provided with non-round perforations of ball retaining width.

In testimony whereof we have signed our names to this specification.

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