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R. B. KUHN

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MUFFLER

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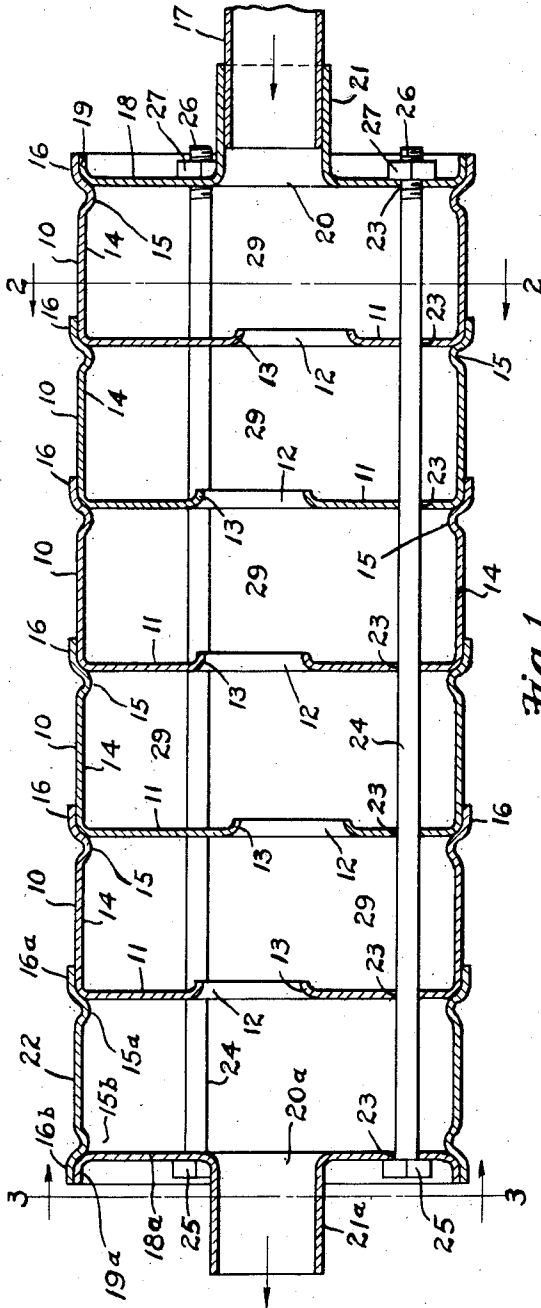


Fig. 1

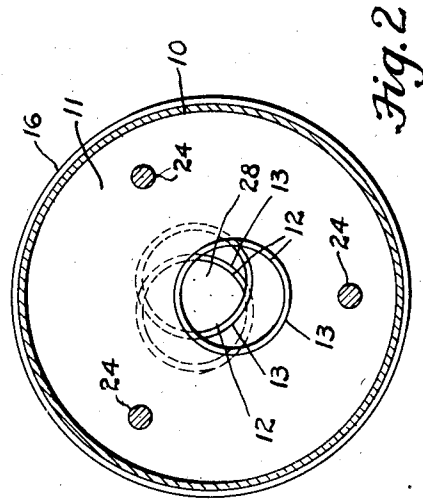


Fig. 2

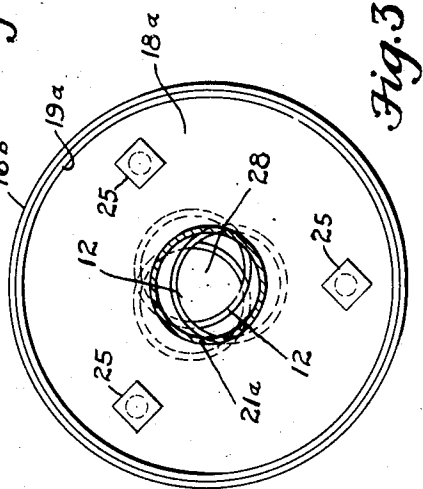


Fig. 3

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## UNITED STATES PATENT OFFICE

2,395,005

## MUFFLER

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9 Claims. (Cl. 181—49)

The invention relates to mufflers for the exhaust of internal combustion engines, and more particularly to a muffler of the cup type in which a plurality of substantially similar cups are assembled upon the exhaust pipe of an engine.

It is an object of the invention to provide a simple, efficient and low-cost muffler made entirely of sheet metal stampings capable of mass production.

Another object is to provide a muffler having a plurality of expansion chambers communicating with each other through contracted openings.

Still another object is to provide a muffler that will effectively silence the noise due to the exhaust of gases coming from an internal combustion engine without producing any undesirable high back pressure.

A further object is the provision of a muffler formed of a plurality of similar cup-like sections, whereby it can be readily added to or subtracted from to adjust the muffler to any particular design of engine to which it may be desirable to attach it.

It is a still further object of the invention to provide a muffler comprising a plurality of expansion chambers communicating with each other through eccentrically located openings so arranged that a portion of each opening is located in the axial center of the muffler whereby a portion of the exhaust gases pass axially through the muffler while the remainder of the exhaust gases travel spirally around the axis of the muffler and expand within the several chambers of the muffler.

Still another object is to provide a muffler made of a plurality of sheet metal sections each of which has a protective covering of vitreous enamel thereon to protect the metal from rust.

The above objects together with others which will be apparent from the drawing and following description or which may later be referred to, may be attained by constructing the improved muffler in the manner illustrated in the accompanying drawing in which:

Figure 1 is a longitudinal sectional view through a muffler constructed in accordance with the invention;

Fig. 2 a transverse section through the muffler, taken on the line 2—2, Figure 1 and

Fig. 3 a sectional view taken on the line 3—3, Figure 1.

Referring now to the drawing, in which similar numerals refer to similar parts throughout, the improved muffler may be formed of a plurality of similar cup-shaped sections indicated generally

at 10, each comprising the bottom wall 11 with an eccentric opening 12 therein surrounded by an intumed annular flange 13, and a substantially cylindrical side wall 14 having an inwardly disposed annular bead 15 near its edge and terminating in the enlarged cylindrical flange portion 16 of such diameter as to snugly fit over the bottom portion of similar cup sections.

In assembling the muffler any desired number of these cup sections may be placed together in the manner shown in Fig. 1, the number of the sections used depending upon the particular engine to which it is desired to attach the muffler.

At the end of the muffler toward the exhaust pipe 17 of the engine a disc 18 is fitted into the open end of the next adjacent cup section 10, this disc having a peripheral flange 19 of proper dimensions to snugly fit within the outer flange portion 16 of the cup section.

The disc 18 is provided at its center with a concentric opening 20, of substantially the same size as the openings 12 in the bottom walls 11 of the cup sections, this opening 20 being surrounded by an elongated, cylindrical neck 21 of suitable dimensions to fit snugly around the end of the exhaust pipe 17 from the engine. This neck 21 may be clamped or otherwise rigidly attached to the exhaust pipe 17 in any usual and well-known manner.

At the opposite, or exhaust, end of the muffler is provided a cylindrical section 22 having an annular bead 15a and terminal flange 16a at one end adapted to receive the bottom portion of the adjacent cup section 10 and provided at its other end with the annular bead 15b and terminal flange 16b, to receive the annular flange portion 19a of the end disc 18a.

The disc 18a is provided at its center with the concentric opening 20a of substantially the diameter of the openings 12 in the cup sections, said opening being surrounded by the cylindrical exhaust neck 21a through which the exhaust gases are discharged from the muffler.

A plurality of small apertures 23 may be located at equally spaced points near the peripheries of the bottom walls 11 of the cup sections and the end discs 18 and 18a to receive the tie rods 24 which are provided at one end with heads 25 for contacting the outer surfaces of one of the end discs, the opposite ends thereof being screw threaded as at 26 to receive the nuts 27 which contact the outer surfaces of the other end disc to hold all of the parts in assembled condition as shown in the drawing.

In order to prevent the sheet metal parts of

the muffler from being attacked by rust or corrosion each part is preferably coated with a vitreous enamel such as is commonly used upon enameled sheet metal cooking utensils and the like.

In assembling the muffler the cup sections 10 are so positioned that the eccentric openings 12 in the bottom wall of each cup section are located at a 120° angle beyond the next preceding opening 12 as best shown in Figs. 2 and 3, so that the openings 12 are located spirally around the longitudinal axis of the muffler, a portion of each opening overlapping the longitudinal axis of the muffler as indicated at 28 in Figs. 2 and 3.

This provides for a straight axial path through the center of the muffler through which a portion of the exhaust gases may pass in a straight line from the exhaust pipe 17 to the exhaust neck 21a of the muffler, while the remainder of the exhaust gases will travel in a spiral path around the axis permitting this portion of the gases to expand in each of the cup chambers 29 so as to effectively silence the noise due to the exhaust gases coming from the engine.

The portion of the exhaust gases traveling in a straight line axially through the center of the muffler will act in the manner of an injector to suck the expanding gases from the expansion chambers and carry them out of the muffler.

From the above it will be obvious that the improved form of a muffler not only provides for a portion of the gases to travel spirally around the axis of the muffler and to expand in each of the chambers 29 but by permitting a portion of the exhaust gases to travel in a straight line axially through the muffler, these expanding gases will be continuously withdrawn from the muffler preventing any back pressure.

It will further be seen that the enameled surfaces of the muffler will be protected against rust or corrosion and that the entire muffler may be readily taken apart for cleaning, repairing or readjusting.

I claim:

1. A muffler of hollow cylindric form having a plurality of spaced transverse walls dividing the interior of the muffler into a plurality of expansion chambers, means for connecting one end of the muffler to the exhaust pipe of an engine, there being an exhaust outlet at the other end, of the muffler, each of said transverse walls having an eccentric opening therein, said openings being spirally staggered around the longitudinal axis of the muffler and a portion only of each opening overlapping the longitudinal axis of the muffler, the longitudinal axial portion of the muffler being entirely unobstructed.

2. A muffler of hollow cylindric form having a plurality of spaced transverse walls dividing the interior of the muffler into a plurality of expansion chambers, means for connecting one end of the muffler axially to the exhaust pipe of an engine, there being an axial exhaust outlet at the other end of the muffler, each of said transverse walls having an eccentric opening therein, said openings being spirally staggered around the longitudinal axis of the muffler and a portion only of each opening overlapping the longitudinal axis of the muffler, the longitudinal axial portion of the muffler being entirely unobstructed.

3. A muffler of hollow cylindric form having a plurality of spaced transverse walls dividing the interior of the muffler into a plurality of expansion chambers, means for connecting one end of the muffler to the exhaust pipe of an engine,

there being an exhaust outlet at the other end of the muffler, each of said transverse walls having an eccentric opening therein, a peripheral flange around each opening and disposed toward the exhaust pipe of the engine, said openings being spirally staggered around the longitudinal axis of the muffler and a portion only of each opening overlapping the longitudinal axis of the muffler, the longitudinal axial portion of the muffler being entirely unobstructed.

4. A muffler of hollow cylindric form having a plurality of spaced transverse walls dividing the interior of the muffler into a plurality of expansion chambers, means for connecting one end of the muffler axially to the exhaust pipe of an engine, there being an axial exhaust outlet at the other end of the muffler, each of said transverse walls having an eccentric opening therein, a peripheral flange around each opening and disposed toward the exhaust pipe of the engine, said openings being spirally staggered around the longitudinal axis of the muffler and a portion only of each opening overlapping the longitudinal axis of the muffler, the longitudinal axial portion of the muffler being entirely unobstructed.

5. A muffler comprising a plurality of cup-like sections each having an inwardly disposed annular concavo-convex bead near its open end and an enlarged annular flange beyond said bead for fitting over the closed end of the next adjacent section, the bottom wall of each cup-like section having an eccentric opening therein, said openings being spirally staggered around the longitudinal axis of the muffler and a portion only of each opening overlapping the longitudinal axis of the muffler the longitudinal axial portion of the muffler being entirely unobstructed, means for connecting one end of the muffler to the exhaust pipe of an engine and an exhaust outlet at the other end of the muffler.

6. A muffler comprising a plurality of cup-like sections each having an inwardly disposed annular concavo-convex bead near its open end and an enlarged annular flange beyond said bead for fitting over the closed end of the next adjacent section, the bottom wall of each cup-like section having an eccentric opening therein, said openings being spirally staggered around the longitudinal axis of the muffler and a portion only of each opening overlapping the longitudinal axis of the muffler the longitudinal axial portion of the muffler being entirely unobstructed, means for connecting one end of the muffler to the exhaust pipe of an engine and an exhaust outlet at the other end of the muffler each of said sections being coated with a vitreous enamel.

7. A muffler comprising a plurality of cup-like sections each having an inwardly disposed annular concavo-convex bead near its open end and an enlarged annular flange beyond said bead for fitting over the closed end of the next adjacent section, the bottom wall of each cup-like section having an eccentric opening therein, said openings being spirally staggered around the longitudinal axis of the muffler and a portion only of each opening overlapping the longitudinal axis of the muffler the longitudinal axial portion of the muffler being entirely unobstructed, means for connecting one end of the muffler axially to the exhaust pipe of an engine and an axial exhaust outlet at the other end of the muffler.

8. A muffler comprising a plurality of cup-like sections each having an inwardly disposed annular concavo-convex bead near its open end and an enlarged annular flange beyond said bead for

fitting over the closed end of the next adjacent section, the bottom wall of each cup-like section having an eccentric opening therein, said openings being spirally staggered around the longitudinal axis of the muffler and a portion only of each opening overlapping the longitudinal axis of the muffler the longitudinal axial portion of the muffler being entirely unobstructed, means for connecting one end of the muffler to the exhaust pipe of an engine and an exhaust outlet at the other end of the muffler and a peripheral flange around each opening and disposed toward the exhaust pipe of the engine.

9. A muffler comprising a plurality of cup-like sections each having an inwardly disposed an- 15

nular concavo-convex bead near its open end and an enlarged annular flange beyond said bead for fitting over the closed end of the next adjacent section, the bottom wall of each cup-like section having an eccentric opening therein, said openings being spirally staggered around the longitudinal axis of the muffler and a portion only of each opening overlapping the longitudinal axis of the muffler the longitudinal axial portion of the muffler being entirely unobstructed, means for connecting one end of the muffler axially to the exhaust pipe of an engine and an axial exhaust outlet at the other end of the muffler.

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