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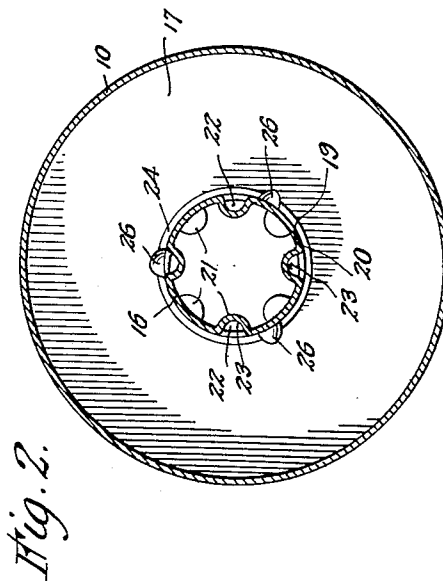
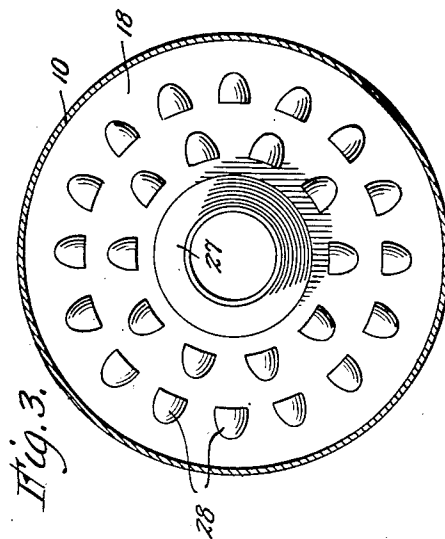
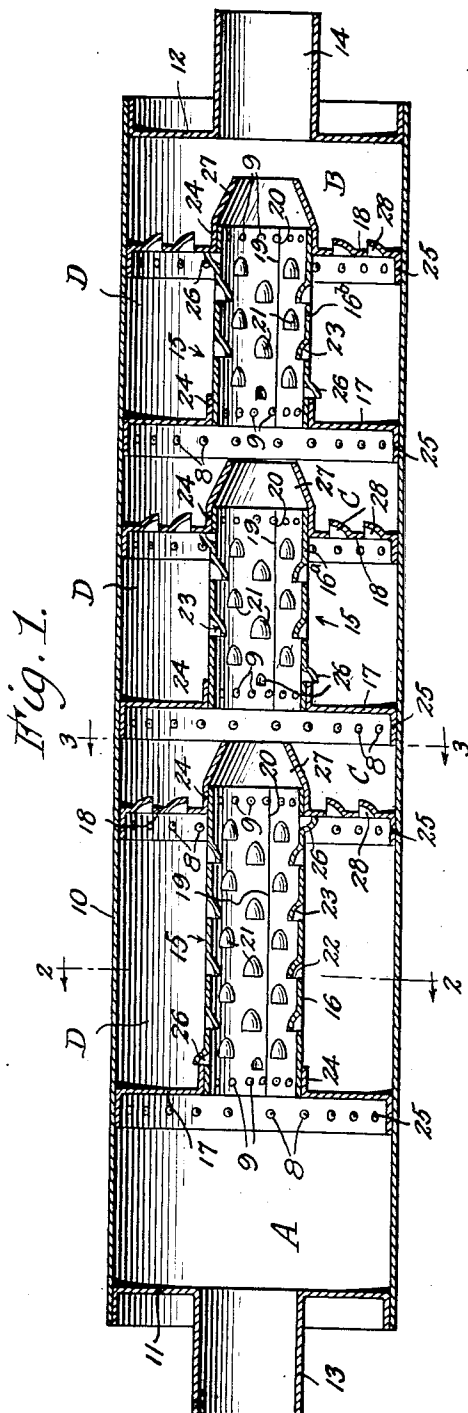
W. T. SCARRITT

2,213,614

MUFFLER

Filed May 18, 1939

2 Sheets-Sheet 1



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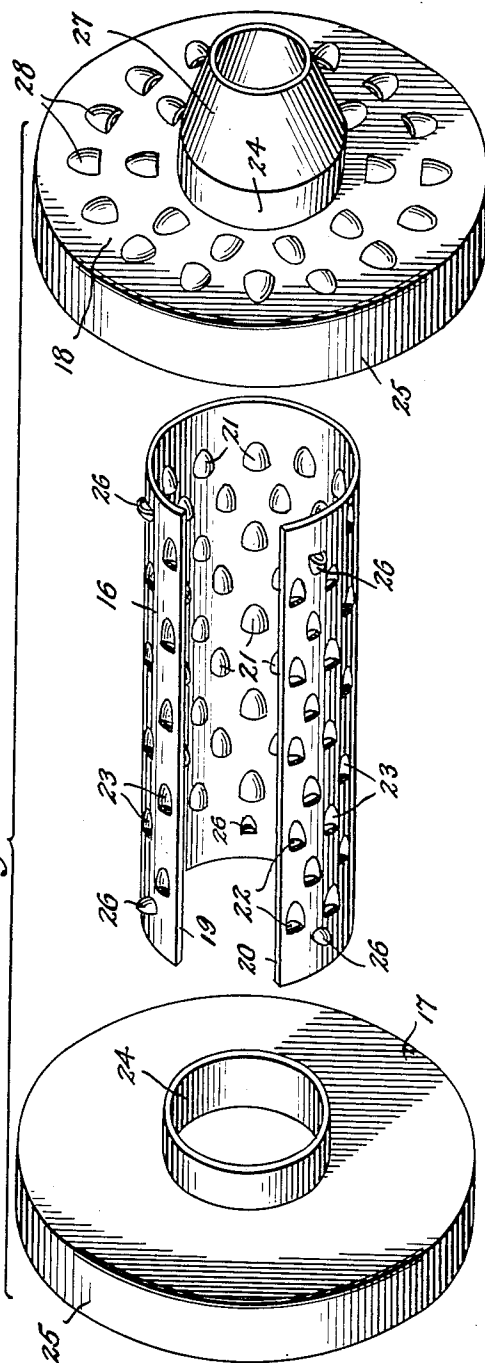
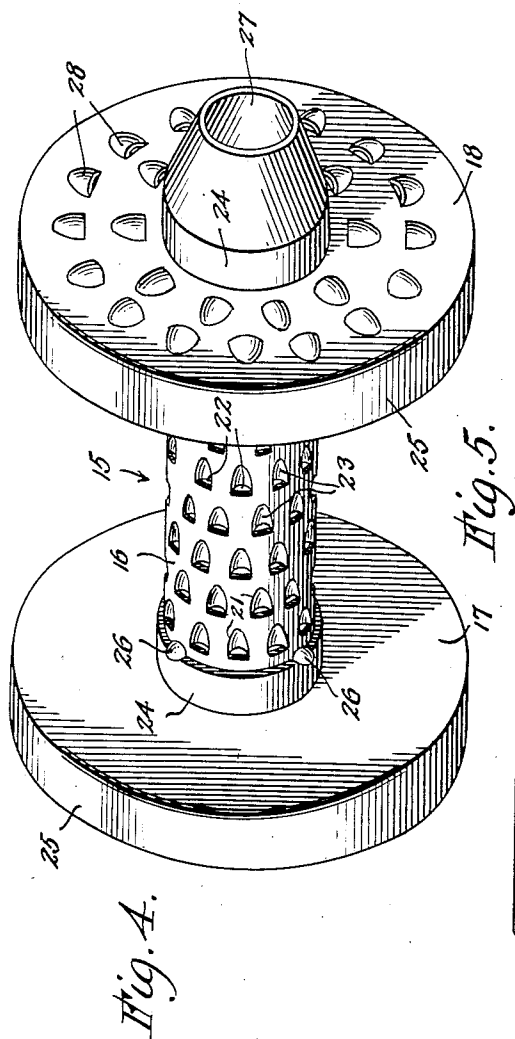
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2,213,614

MUFFLER

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Application May 18, 1939, Serial No. 274,350

1 Claim. (Cl. 181—48)

This invention relates to mufflers for deadening the sound waves resulting from the explosions of internal combustion engines and the discharge of the exhaust gases therefrom.

5 The invention provides a muffler which breaks up and deadens the explosive peaks of the sound waves by abruptly decreasing the velocity of the gases at the inlet and outlet ends of the muffler by means of expansion chambers directly communicating with the inlet and outlet thereof and by providing intermediate the said chambers restricted passageways through which the gases pass at relatively greater velocity with a portion of the gases directed into attenuation chambers surrounding the restricted passageways. The gases being retarded in their flow through the expansion chambers produce an interference of the peaks of succeeding explosions to thereby muffle or deaden the explosive peaks and produce attenuations of the sound wave which pass with the gases through the restricted passageways at high velocity and are caused to enter the chambers surrounding the restricted passageways which confine the gases therein and produce whirls or streams which interact with each other.

10 The invention further comprehends a muffler including an outer shell provided with end walls having inlet and outlet openings therein respectively, transverse partition walls separating the interior of the muffler into expansion and attenuation chambers, and longitudinally extending inner tubes carried by adjacent pairs of partitions and providing restricted passageways joining the expansion chambers at the ends thereof and having inwardly directed louvers for directing the gases from the passageways into the attenuation chambers between the partitions.

15 The invention further provides a muffler of the indicated character having partitioning units which subdivide the interior of the muffler into attenuation and expansion chambers, each of said partitioning units comprising a longitudinally extending duct constructed of sheet material which is rolled into tubular form with the longitudinal edges thereof disposed in abutting relation, and a pair of annular partition walls having flanged inner and outer peripheries, the ends of the tubular duct being disposed within the inner flanged peripheries thereof for holding the longitudinal edges of the sheet material in abutting relation and the duct in tubular formation, and one of said annular partition walls having an inwardly directed frusto tubular terminal formed integrally with the inner flanged

periphery projecting into the adjacent expansion chamber.

With the foregoing and other objects in view, reference is now made to the following specification and the accompanying drawings illustrating the preferred form of the invention. 5

In the drawings:

Fig. 1 is a longitudinal sectional view of a muffler constructed in accordance with the invention. 10

Fig. 2 is an enlarged vertical sectional view taken approximately on the line 2—2 of Fig. 1.

Fig. 3 is a similar view taken approximately on the line 3—3 of Fig. 1.

Fig. 4 is an enlarged perspective view of one of the muffler partitioning units. 15

Fig. 5 is an enlarged collective perspective view of the muffler partitioning unit showing the elements thereof in separated juxtaposition.

Referring to the drawings by characters of 20 reference, the muffler includes an outer tubular shell 10 and end walls 11 and 12 secured to the shell at its opposite ends and which end walls are provided with outwardly projecting aligned tubular collars 13 and 14 for connection respectively with the exhaust and tail pipes of the motor vehicle. 25

In order to provide means for producing an interference of the sound waves of the explosions, a plurality of partitioning units 15 are arranged in longitudinally spaced relation within the shell 10 and with the endmost units spaced from the end walls 11 and 12 to provide within the shell expansion chambers A and B at the opposite ends thereof in direct communication with the inlet and outlet openings 13 and 14 and intermediate expansion chambers C between the partitioning units 15. One of the units 15 is of relatively greater length than the other two as illustrated. 30

The partitioning units 15 each includes a longitudinally extending duct indicated by the reference characters 16, 16a and 16b respectively and a pair of annular partition walls 17 and 18 circumferentially secured upon the opposite ends of the ducts 16 to provide attenuation chambers D between the walls 17 and 18 and between the ducts and the shell 10 in surrounding relation with the ducts. The ducts are each constructed of a length of sheet material which is bent or rolled into tubular formation with the opposite longitudinal edges 19 and 20 thereof disposed in abutting relation. 35

Prior to the bending or rolling of the sheet into tubular formation, the same is transversely slitted 40 45 50 55

at longitudinally and transversely spaced points and at one side of each of the slits the body of the sheet is offset to form inwardly offset louvers 21 having forwardly directed openings 22 and inclined surfaces 23 for intercepting a portion of the exhaust gases passing through the ducts and directing the same into the attenuation chambers D.

The annular partition walls 17 and 18 are each provided with inner and outer circumferential flanges 24 and 25 and in practice the walls are secured in position within the shell 10 by spot welding as at 8 or otherwise securing the flanges 25 of either one or both of the partition walls to the shell 10. The inner flanges 24 of the partition walls are telescopically fitted over the opposite ends of the ducts and are spotwelded as at 9 or otherwise secured thereon to thereby retain the ducts in tubular formation and the longitudinal edges 19 and 20 of the sheet in abutting relation, while disposing the ducts in longitudinal alignment with each other and with the inlet and outlet openings 13 and 14.

The ducts 16 adjacent their ends are provided with outstruck circumferentially spaced lugs 26 providing shoulders against which the partition walls abut. The partition walls 18 are provided with inwardly directed frusto-conical terminals 27 formed integrally with the flanges 24 and extending rearwardly therefrom in prolongation of the ducts while between the flanges 24 and 25 the partition walls 18 are provided with rearwardly projecting radially arranged louvers 28 similar to the louvers 21.

In the embodiment illustrated, the muffler is provided with three partitioning units 15 but the same may be of any desired number depending upon the length of the muffler required for a particular motor vehicle. A plurality of partitioning units 15 of varying length are preferably employed as it has been determined that the efficiency of the units 15 in blanketing sound waves of a particular pitch has definite relation with the length of the unit. In order, therefore, to provide means within the muffler which is effective for blanketing or deadening the sound waves of different pitches, the foremost unit 15 is of relatively greater length than the two following units and the units are spaced apart within the muffler and from the end walls 11 and 12 thereof so that each unit may function to blanket the sound wave to which it is attuned in accordance with its particular length without interference by the adjacent unit.

In operation the exhaust gases entering the chamber A through the restricted inlet 13 expand in said chamber with a consequent decrease in the velocity of the gases so that the sound waves of succeeding explosions are caused to interfere with each other within the said chamber to thereby produce a deadening or initial muffling effect of the peaks of the explosion. The gases then

enter the forward end of the duct of the foremost unit 15 which, being of a relatively lesser cross sectional area, causes an increase in velocity of the gases with a portion thereof being deflected through the louvers 21 into the surrounding attenuation chamber D setting up a series of whirls within the said chamber thereby effecting an interference with each other which breaks up and muffles the sound waves. The undeflected remaining proportion of the gases in the stream passing through the foremost duct 16 encounter the frusto-conical terminal 27 which causes an acceleration and a projection of the gases in jet form into the expansion chamber C between the first and second units while the streams of gases emerging from the attenuation chamber D through the louvers 28 are directed radially inward causing interference with the gases emerging from the frusto-conical terminal 27 into the expansion chamber C. The gases from the expansion chamber C are then directed into the duct of the succeeding units 15 where the action is repeated, the succeeding units being of a lesser length than the first unit, functions more effectively to blanket and muffle the sound waves of a different pitch or length until the gases enter the final expansion chamber B from which they escape through the outlet.

It thus follows that there are alternate stages of decrease and increase in the velocity of the gases as the same pass successively through the expansion chambers and ducts, while a proportion of the gases is caused to travel through tortuous or sinuous paths where they alternately set up interference streams in the attenuation chambers and in the expansion chambers between the units and at the discharge end of the muffler.

What is claimed is:

A muffler including an outer tubular shell having end walls provided with inlet and outlet openings, partitioning units including tubular ducts of different lengths disposed within said shell in spaced relation with each other and with the end walls of the shell and aligned with said inlet and outlet openings, and transverse partition walls surrounding the tubular ducts at the ends thereof and engaging the inner surface of the outer shell so as to divide the interior of the shell into attenuation chambers surrounding the tubular ducts and expansion chambers between the partitioning units and at the opposite ends of the shell in communication with said inlet and outlet openings, said tubular ducts having inwardly directed louvers for directing exhaust gases into the surrounding attenuation chambers, and the partition wall adjacent the discharged end of each unit having louvers for respectively directing exhaust gases from the attenuation chambers into the communicating expansion chambers.

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