June 16, 1931. A. S. NOONAN 1,810,252

EXHAUST MUFFLER FOR INTERNAL COMBUSTION ENGINES

Filed March 17, 1930

Fig-1.

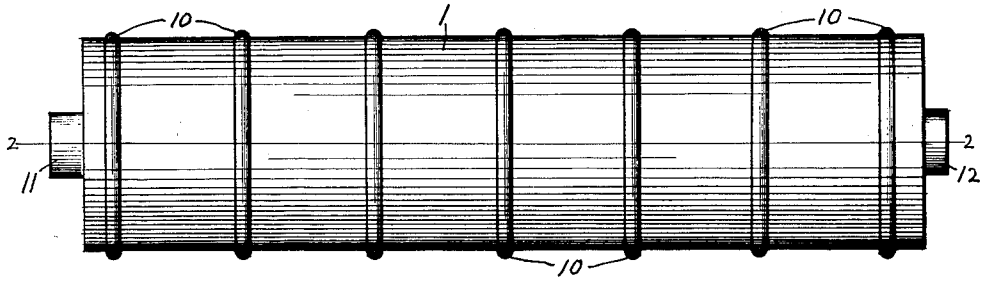


Fig-2.

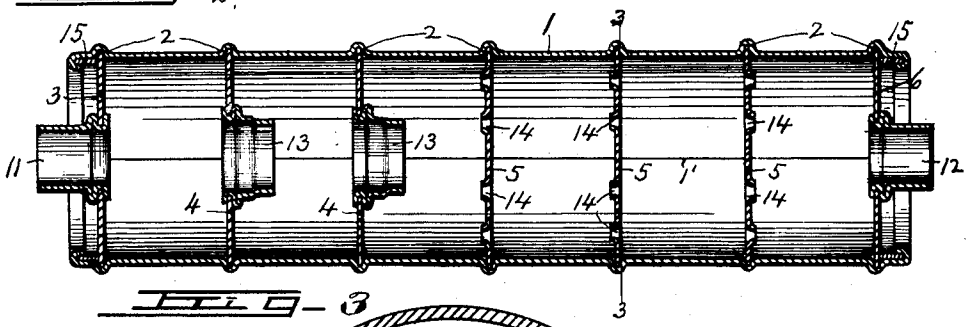


Fig-3

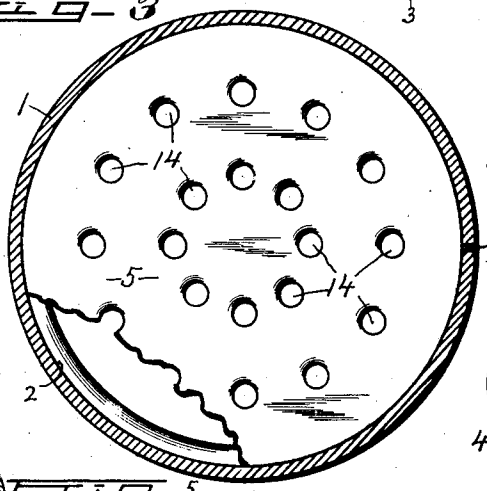


Fig-7.

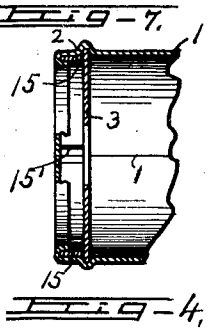


Fig-6.

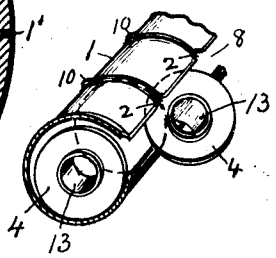


Fig-4.

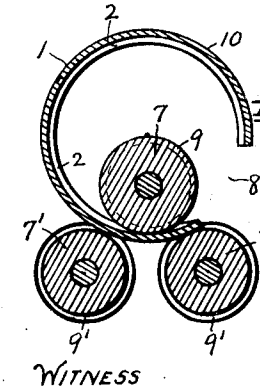
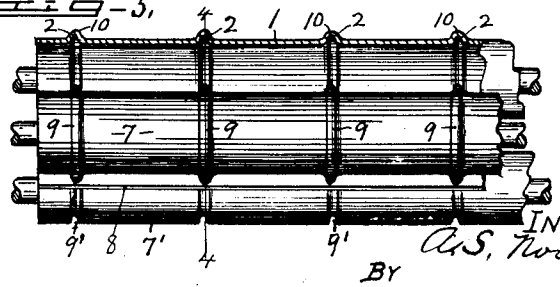


Fig-5.



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UNITED STATES PATENT OFFICE

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EXHAUST MUFFLER FOR INTERNAL COMBUSTION ENGINES

Application filed March 17, 1930. Serial No. 436,522.

This invention relates to an exhaust muffler for internal combustion engines but obviously may be used in connection with various detonators for reducing the noise incidental to explosion of combustible material without appreciable back pressure resistance.

These mufflers usually comprise a tubular shell having a plurality of transverse apertured partitions arranged in axially spaced relation within the tube for dividing the same into a series of compartments whereby the exhaust gases may alternately expand and contract in transit through the tube.

The main object of the present invention is to simplify the construction of the tube and partitions and the method of assembling the same for the purpose of greatly increasing the output for a given period of time and at the same time to produce a more sturdy and efficient muffler than has heretofore been practised by making the tube from a single piece of sheet metal and providing it with a series of perimetral internal grooves arranged in axially spaced relation and providing a corresponding number of partitions of equal perimetral length adapted to be placed in operative position within the grooves while the tube is still open at one side so that when the tube is closed upon the marginal edges of the partitions and the meeting edges welded or otherwise secured together, the partitions will be firmly held in operative position against relative axial movement.

Other objects and uses relating to specific parts of the muffler and to the specific steps in the process of manufacturing the same will be brought out in the following description.

In the drawings:

Figure 1 is a face view of an exhaust muffler embodying the various features of my invention.

Figure 2 is a longitudinal sectional view of the same muffler.

Figure 3 is an enlarged transverse sectional view taken in the plane of line 3—3, Figure 2.

Figure 4 is a diagrammatic sectional view of a system of rollers for bending the metal sheet into more or less circular form and simultaneously forming the grooves therein.

Figure 5 is a face view of portions of the bending rollers with the metal sheet partially bent therein.

Figure 6 is a perspective view of a portion of the partially formed tube showing the method of inserting the partitions or disks therein.

Figure 7 is a sectional view of one end of the muffler showing the open space between the ends of the split reenforcing ring for receiving adjacent portions of the welding metal.

As illustrated this muffler is made from a single piece of sheet metal of the desired length bent into the form of a tube —1— and simultaneously formed with a series of internal annular grooves —2— arranged in approximately uniformly spaced parallel relation lengthwise of the tube for receiving and retaining a corresponding number of circular sheet metal disks or partitions —3—, —4—, —5— and —6—.

The method of making this tube consists in feeding a flat sheet of metal between a series of, in this instance three, cooperative rollers —7— having their axes arranged at the angles of an isosceles or equilateral triangle in such a manner that when the sheet is fed between them it will be bent into more or less circular form corresponding approximately to the radius of the muffler tube when completed but leaving the opposite lengthwise edges of the sheet in sufficiently open or spaced relation as shown at —8—, Figures 4 and 6, to permit the insertion of the partitions flatwise through said opening into the interior of the partially formed tube —1— after which the partitions as they are inserted one by one within the tube may be turned by hand and seated in portions of their respective grooves —2— and therefore in parallel planes at right angles to the axis of the tube as shown in Figure 2, it being understood that when all of the partitions are thus placed in this position they will be temporarily supported by reason of the en-

gagement of portions of their peripheries in corresponding portions of their grooves.

One of the rollers as —7— is provided with a series of annular ribs or peripheral flanges —9— in axially spaced relation corresponding to the required spacing of the grooves —2— while the rollers —7'— are provided with complementary companion grooves —9'— cooperating with their respective annular ribs —9— to form the grooves —2— and incidentally forming a corresponding number of annular beads —10— on the periphery of the shell —1—.

That is, the grooves —2— form the annular seats for the peripheries of their respective partitions —3—, —4—, —5— and —6— while the annular beads —10— serve to reinforce or stiffen the tubular shell against radial strains thereby giving a more sturdy character to the muffler as a whole.

The partitions —3—, —4—, —5— and —6— are preferably made of flat sheet metal cut into circular form of the same circumferential length as the bases of their respective grooves —2— so that when the opposite longitudinal edges of the tubular shell —1— are secured together the peripheral walls of the grooves —2— will be brought into firm engagement with the peripheries of their respective partitions to hold the latter against relative axial or circumferential movement.

After all the partitions —3—, —4—, —5— and —6— have been placed within the partially formed tubular shell —1— in the manner shown in Figure 6, the tubular shell —1— will be compressed or contracted radially to bring its opposite longitudinal edges into more or less close proximity after which those edges will be welded or otherwise firmly secured together to form a gas-tight joint and at the same time causing the bases of the grooves —2— to be firmly impinged against the peripheries of their respective partitions to hold said partitions and tubular shell against relative movement.

The opposite end partitions —3— and —6— and their respective grooves —2— are arranged in close proximity to the ends of the tubular shell —1— and are provided with central apertures to receive axially extending tubular nipples —11— and —12— which extend outwardly or in opposite directions from their respective partitions, the tubular nipple —11— being adapted to be connected to the exhaust pipe of the engine for receiving the exhaust gases which, after passing through the muffler, are discharged through the outlet nipple —12—.

I preferably provide the two intermediate partitions —4— nearest the end partition —3— with central openings for receiving similar tubular nipples —13— which extend toward the outlet —12— from their respective partitions —4— as shown more clearly in Figure 2.

The remaining three intermediate partitions —5— are similar but differ from the remaining partitions in that they are provided with relatively small apertures —14— in staggered relation to the nipples and are preferably arranged in radially spaced relation about the axis of the muffler so that the portions of the partitions —5— in axial alignment with the nipples —11—, —12— and —13— will be substantially solid thereby causing the exhaust gases to be deflected laterally in transit from the nipples —13— through the apertures —14—.

Referring now to Figure 6 I have shown the tubular shell —1— as partially formed leaving an intervening space —8— between the opposite longitudinal edges thereof through which the disks or partitions —3—, —4—, —5— and —6— may be inserted flatwise, one of the disks being shown as having been inserted in its corresponding groove within the shell —1— while another disk is shown as being inserted flatwise through the intervening space —8— preparatory to seating it in its corresponding groove within the shell —1—.

As previously stated, when all the partitions are placed in operative position in their respective grooves within the shell —1—, the opposite longitudinal edges of the latter are brought together and welded or otherwise secured for firmly retaining the disks or partitions in operative position against axial or circumferential movement, it being understood that during the welding operation the welding material will come in contact with the adjacent edges of the disks to additionally hold them in operative position.

Suitable reinforcing rings —15— of metal are inserted into opposite ends of the muffler tube beyond the end edges thereof to abut against the adjacent end partitions —3— and —6— after which the end edges of the tube are crimped inwardly across the outer edges and inner faces of the adjacent rings to further reinforce said end edges and also to give a rounding finish thereto.

When welding the meeting edges of the muffler tube together, the welding material —1'— flowing into the joint is somewhat rough and thicker than the adjacent portions of the tube and may project slightly beyond the inner faces thereof and in order that the reinforcing rings —15— may be properly seated in the ends of the tube they are preferably split through one side and their ends separated to form an intervening space —15'— which is registered with the welded joint and is of sufficient size to permit the inwardly projecting portions of the welding material to project thereinto thereby assur-

ing a close fit of the rings —15— in the ends of the tube.

What I claim is:—

An exhaust muffler comprising a tube, transverse partitions secured within the tube near both ends thereof and provided with openings therethrough, said tube being divided through one side and its meeting edges welded together, and reinforcing rings fitted in opposite ends of the tube to abut against the adjacent partitions, said rings being divided through one side and having their meeting ends registered with the meeting edges of the tube, said tube having its outer ends crimped inwardly across the outer ends and inner faces of the adjacent rings to hold the latter in operative position.

In witness whereof I have hereunto set my hand this 3 day of March, 1930.

ALBERT S. NOONAN.