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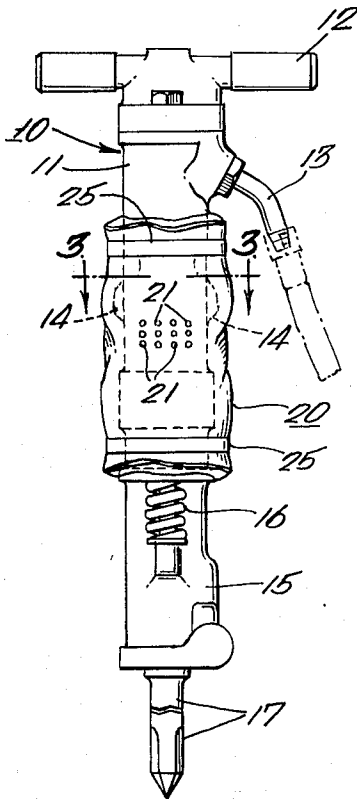
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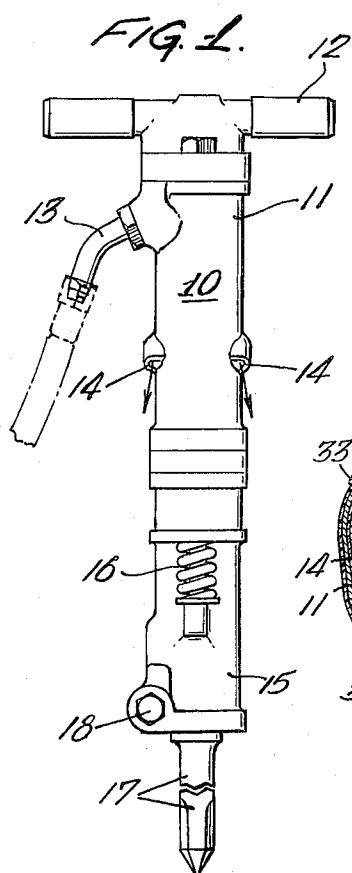
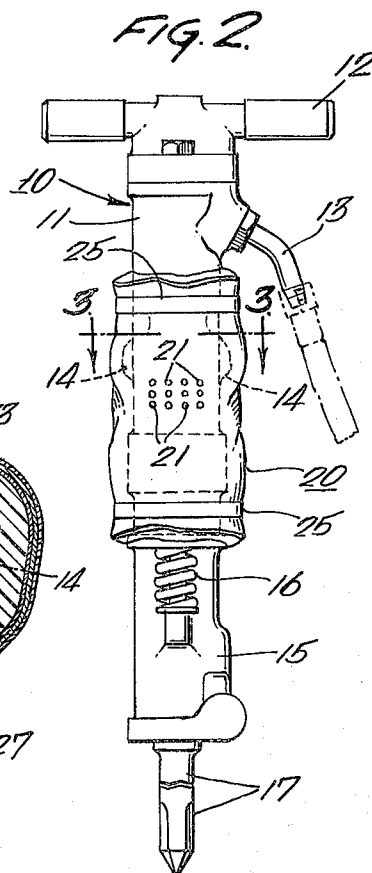
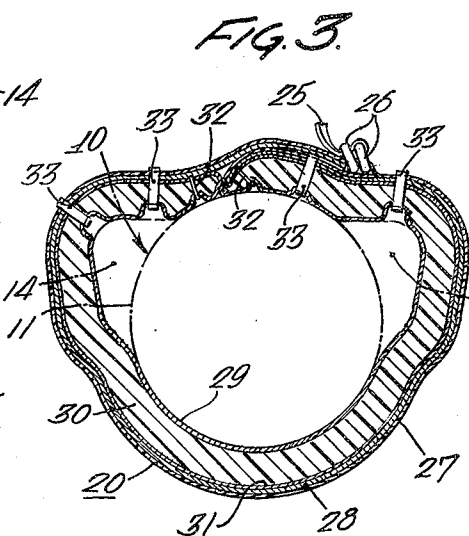
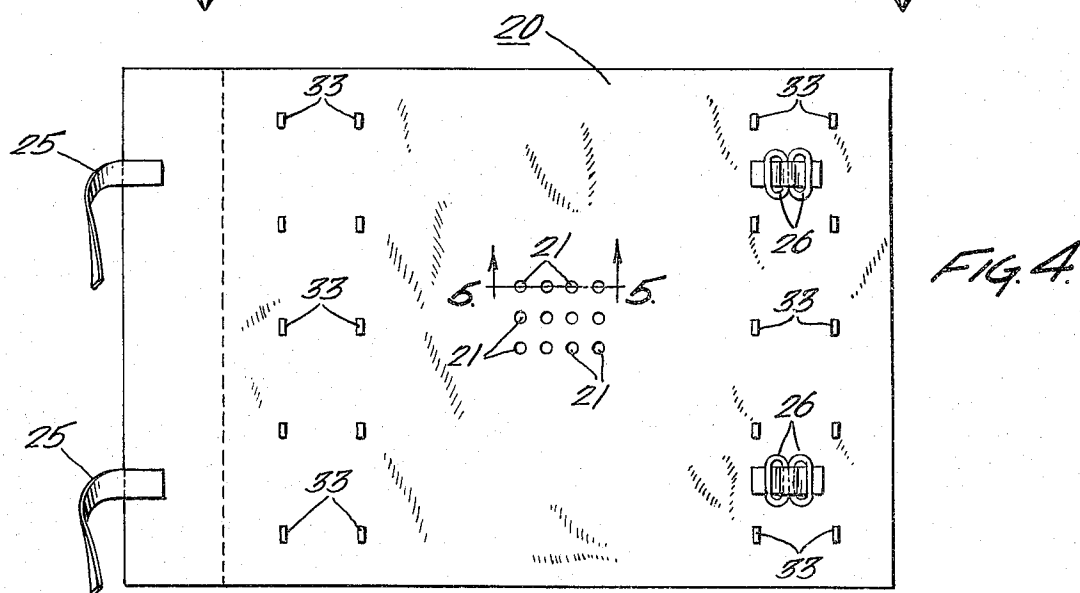
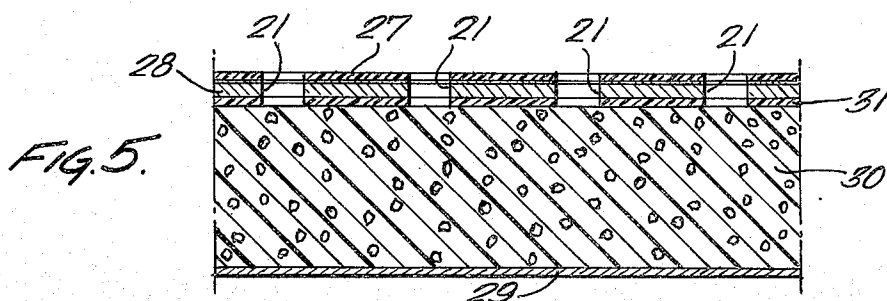
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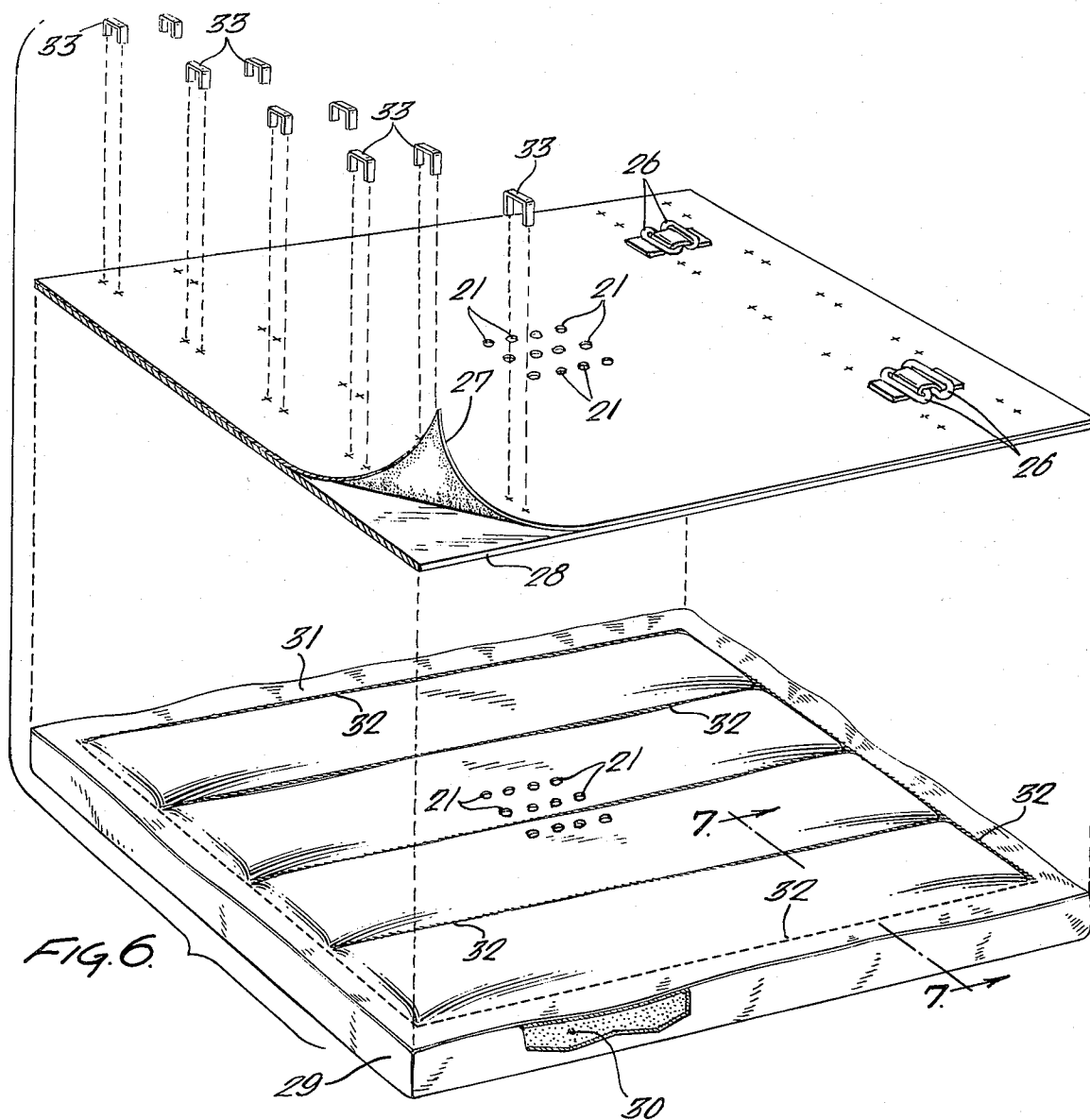
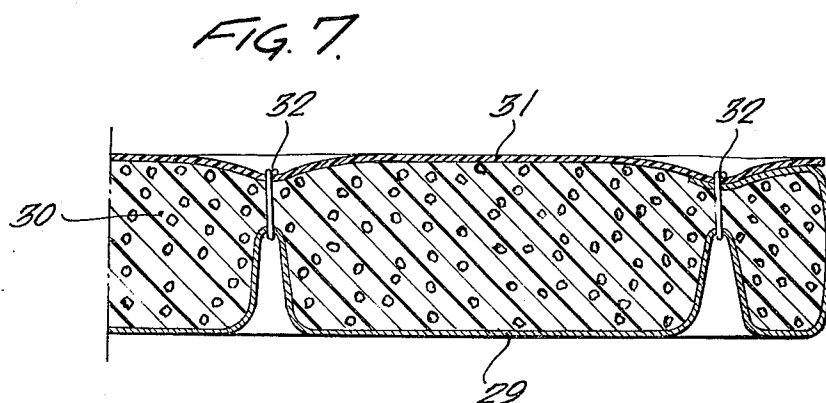
[57] ABSTRACT

This invention relates to an improved sound dampener or muffler primarily useful in reducing the noise level resulting from exhaust gases. The invention has particular applicability to the reduction of noise produced by pneumatic tools such as air hammers, air drills and air wrenches.

5 Claims, 7 Drawing Figures







EXHAUST MUFFLER

PRIOR ART

Mufflers for use on pneumatic hammers are not new as may be evidenced, for example, by U.S. Pat. Nos. 1,115,704 to Maynes, 2,949,975 to Plummer. For one reason or another, however, the prior art devices have been unsatisfactory in that they have not sufficiently reduced the noise or have been of only short life due to excessive vibration and hard usage, as well as bulkiness and their inability to be quickly installed and removed.

OBJECT OF THE INVENTION

The present invention provides an improved article of manufacture for muffling the noise caused by various types of equipment and especially pneumatic jack hammers such as commonly employed in breaking up paving, mortar and the like. It has been found that continued exposure to the noise generated by such equipment has a harmful effect upon the operator after periods of time and it has, therefore, been necessary to require only limited use not exceeding a time felt to be reasonably safe for the operator. With the improved muffler of this invention, the noise level is reduced to the point that far greater production can be obtained with less fatigue and harmful effects.

By providing a laminated covering for the exhaust ports of a pneumatic tool comprised of several layers of sound-deadening material selected to act in combination for maximum noise suppression, I have achieved a far superior muffler than those produced heretofore. The primary object, therefore, of the invention is to provide as an article of manufacture a sound-deadening material which is rugged, has high sound-deadening properties, is easy to install and remove from a pneumatic tool, and which is relatively lightweight and inexpensive.

DESCRIPTION OF THE DRAWINGS

Referring now more particularly to the drawings,

FIG. 1 illustrates the conventional pneumatic drill or jack hammer on which the muffler of the present invention is desirably used,

FIG. 2 illustrates the pneumatic tool of FIG. 1 with the muffler installed thereon,

FIG. 3 is an enlarged sectional as seen at 3—3 of FIG. 2 showing the muffler only, the pneumatic tool being indicated in broken lines,

FIG. 4 shows the muffler of FIG. 2 in its unrolled condition,

FIG. 5 is an enlarged sectional detail as seen at 5—5 of FIG. 4,

FIG. 6 is an exploded view showing the various laminations which comprise the muffler of FIG. 2, and

FIG. 7 is an enlarged sectional detail as seen at 7—7 of FIG. 6.

It will be understood that the muffler material as described hereinafter is illustrated as applied to the conventional pneumatic jack hammer since this is one of the most objectionable pneumatic tools from the standpoint of noise and operator fatigue. However, my improved laminated muffler can be used to equally good advantage on other pneumatic tools, internal combustion engines and as a sound-deadening material for similar devices.

The conventional pneumatic jack hammer 10 comprises a cylinder 11, a handle 12 attached to the upper end of the cylinder, suitable air hose and inlet connections 13, exhaust ports 14, 14 and a reciprocating piston assembly 15 utilizing one or more compression springs 16. A drill or hammer or other suitable tool 17 is secured at the bottom of the piston 15 by means of a clamp and bolt 18. The particular pneumatic tool described herein is merely representative of various types and sizes of pneumatic tools to which the invention can be applied.

A muffler assembly 20 is wrapped around the cylinder 11 of the pneumatic tool so that it encloses the exhaust ports 14, 14. The muffler 20 is provided with a plurality of apertures 21, 21 which permit the escape of exhaust gas through the non-porous portion of the muffler 20. The exhaust ports 21 are preferably spaced axially from exhaust ports 14 and may also be turned radially 180° therefrom in order to provide a substantial travel through the muffler, thus enhancing the sound-deadening property thereof. Muffler 20 is conveniently secured to cylinder 11 by means of one or more straps 25, 25 which are held in double "D" rings 26, 26.

Referring now more particularly to the FIGS. 6 and 7, the muffler 20 comprises an outer impregnated cloth or fabric 27 which is preferably a neoprene coated woven nylon material from 0.005 inch to 0.015 inch thick. This outer fabric serves as a protection against damage to the muffler and is of particular importance when used with pneumatic jack hammers of the type commonly employed in construction or paving work. These tools receive extremely rough treatment and are constantly thrown or dropped on sharp material such as concrete or stones. The fabric layer 27 can, of course, be of other natural or synthetic material, but nylon is preferred due to its high strength and elasticity whereby it can withstand shock and distortion. Likewise, the neoprene coating is not essential, but other elastomeric materials could be used, for example, natural rubber, butyl rubber or acrylonitrile. It will be understood in the event that when the improved muffler is to be used in situations where the possibility of damage or hard usage may not be present, the protective coating or layer 27 can be modified or eliminated.

The next lamination 28 is sheet lead, preferably 0.0075 to 0.015 inch thick. Here again, the preferred thickness of lead sheet 28 may be varied depending upon the extent of the muffling required in view of the noise level and also on the type of surface on which the tool is to be used. In such situations, other nonresonant sheet material could be employed such as tin, bismuth, zinc, copper or aluminum, the primary requirements being that the sheet lamination 27 be annealed sufficiently so that it can be shaped around the object or tool and also be non-resonant. The fabric layer or lamination 27 may be secured to the metallic layer 28 by means of a suitable adhesive depending upon the materials employed.

The third layer 29 comprises a porous sheet 30 which is securely encased in a fabric material 31 by means of stitching shown at 32 or staples, 33, 33. The casing 31 may also be a neoprene coated nylon fabric having a thickness between 0.005 inch and 0.015 inch. The porous material 30 is desirably a layer of flexible open-cell polyurethane sponge. This is important from the standpoint of diffusing the exhaust gas evenly through-

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out the muffler and/or at least around the periphery, both axially and radially of the pneumatic tool exhaust ports. Flexibility of the muffler as a whole is important to enable it to be wrapped around the various irregularities and protrusions of the particular tool to which it is applied. It may be desirable to use a thicker porous material 30 on larger tools but for heavy pneumatic tools, thickness for the porous material ranges from 1 inch to 2 inches.

It will be understood that the apertures 21 in the muffler assembly 20 must be provided through the metallic sheet and also through the various coated fabrics provided they are non-porous. However, the apertures do not extend through the porous material 30. FIG. 5 shows the apertures 21 extending through the layers 27, 28 and the outside portion of the case 31 for the porous material 30.

It will thus be apparent that I have provided an improved laminated material for reducing or deadening the noise emitted by various devices, particularly those discharging fluid at high velocity such as pneumatic tools, internal combustion engines and the like.

Having thus described my invention, I claim:

1. A sound-deadening laminated article of manufacture for use in the muffling of exhaust gas noises comprising an inner first sheet of fabric, an intermediate

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second sheet of open cell, elastomeric material secured to the surface of said inner first sheet, a third sheet of flexible lead of a thickness in the range 0.0075 inch to 0.015 inch secured to the surface of the sheet of elastomeric material, and an outer sheet of fabric secured to the surface of said flexible lead sheet.

2. The article of claim 1 in which the outer sheet of fabric is woven Nylon and is impregnated with neoprene and which has a thickness in the range of 0.005 inch to 0.015 inch.

3. A muffler for a pneumatic tool having at least one exhaust port comprising an inner sheet of open cell elastomeric material, a fabric casing for said elastomeric sheet, a second sheet of flexible sound deadening metal, an outer third sheet of protective impregnated fabric, means for laminating said sheets together, and means including at least one strap for securing said laminated sheets to the pneumatic tool covering the exhaust port.

4. A muffler in accordance with claim 3 in which the metallic sheet is provided with at least one aperture to permit passage of exhaust fluid therethrough.

5. A muffler in accordance with claim 4 in which the aperture is offset axially from the exhaust port.

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