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2,281,963

SOUND DEADENER

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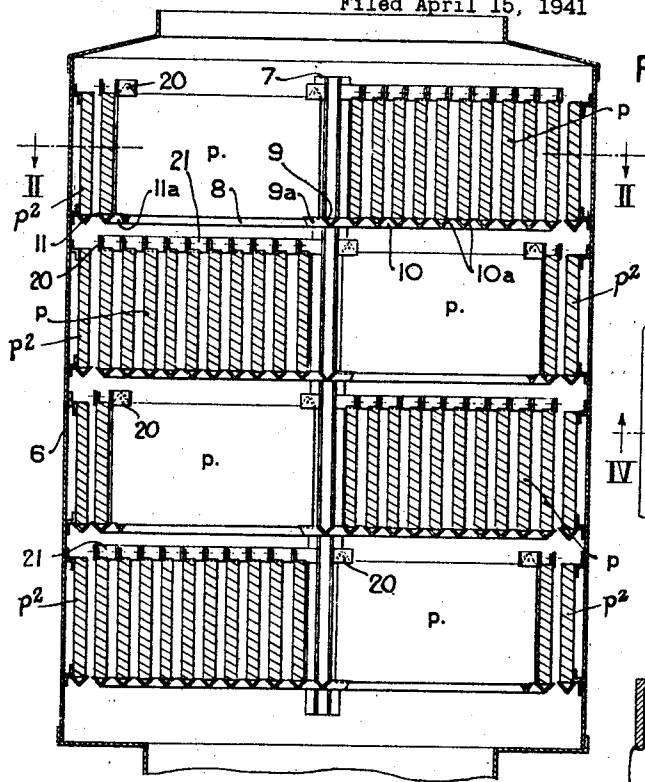


FIG. 1

FIG. 3

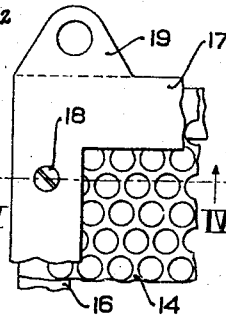


FIG. 4

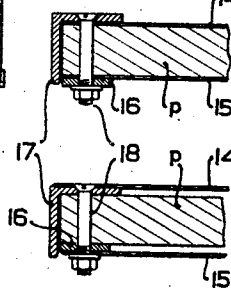


FIG. 5

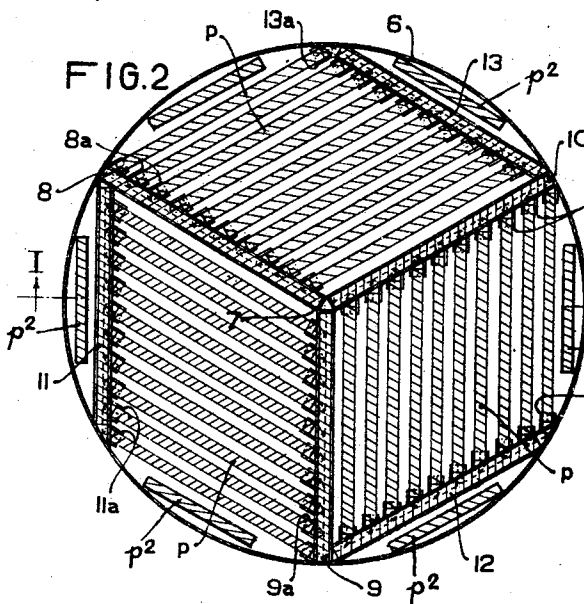
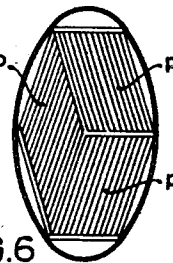


FIG. 2

FIG. 6



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UNITED STATES PATENT OFFICE

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SOUND DEADENER

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4 Claims. (Cl. 181-42)

This invention relates to a sound-deadener for a gas conduit, for instance the exhaust conduit of an internal combustion engine, having the usual circular, or an elliptical cross-section.

Known sound-deadeners comprise a plurality of rectangular flat plates of sound absorbing material and arranged in spaced parallel relation to each other and to the axis of the conduit. This arrangement necessitates the use of plates of different lengths (measured in a cross-sectional plane), which is uneconomical. Moreover, the sound absorption in such a device is not uniform throughout the cross-section, unless the widths of the passages between the plates are so chosen that for each passage the ratio between the circumference, covered by sound absorbing material, of its cross-section and the area thereof has one and the same value. This is very difficult to realize and, owing to the small length of the end plates, practically impossible. Consequently, the sound absorption in the short end passages is insufficient and the sound absorbing effect of the central passages is for the greater part neutralized, unless the end passages are obturated.

In order to obviate these drawbacks, it has already been proposed so to arrange a number of equally sized plates as to fill up, in cross-sectional view, the inscribed quadrangle of the circular conduit. This arrangement, however, has the disadvantageous feature that a relatively great part, viz. about 36% of the cross-sectional area of the conduit is located outside said square, and is, therefore, to be considered as lost space.

If the gases should be allowed to flow through the four segmental passages outside the square, the sound waves would be propagated for the major part therethrough and the sound deadening effect of the plates inside the square would hardly be noticeable. In view thereof, it is necessary to obturate said outer passages, but this causes the resistance to flow of the gases through the conduit to be increased by about 150%, since said resistance is proportional to the square of the gas velocity.

The object of the present invention, which also contemplates the use of equally sized sound absorbing plates, is to considerably reduce the lost space as compared with the arrangement just referred to. According to this invention, the plates are arranged in three groups, each of which occupies in cross-sectional view, a rhomb formed by two adjacent equilateral triangles of the inscribed regular hexagon, the plates of each group being parallel to one side of the rhomb

involved. In case of a conduit having an elliptical cross-section (which can be considered as the oblique projection of a circle), the regular hexagon is deformed into an irregular one, and the rhombs into parallelograms.

A sound deadener in accordance with the invention occupies about 83% of the cross-sectional area of the conduit, so that the increase of the resistance to flow, as compared with the circular cross-section, is only 45%.

In the drawing:

Figs. 1 and 2 are an axial section and a cross-section, respectively, of one embodiment of the invention, the sections being taken on the line I—I in Fig. 2 and on the line II—II in Fig. 1, respectively.

Fig. 3 is a fragmentary side elevation of one of the sound absorbing plates illustrating the construction thereof, including the surrounding frame.

Fig. 4 is a detail horizontal sectional view taken on the line IV—IV of Fig. 3.

Fig. 5 is a horizontal sectional view similar to Fig. 4, illustrating a modified arrangement wherein the perforated plates are secured to the outer faces of the frame instead of to the inner faces as in Fig. 4.

Fig. 6 is a diagrammatic cross sectional view of a modified form of the invention, illustrating its adaptation to an elliptical flue or stack.

In view of the explanation given, Fig. 2 will hardly need further explanation. Extending between the wall of a cylindrical casing 6 and a central column 7, and at angular distances of 120°, are three angle bars 8, 9, 10 mounted with their openings upward. Similar angle bars 11, 12, 13 extend parallel to the bars 9, 10, 8, respectively. Welded to each bar 8—13 are ten short, horizontal, equally spaced angles 8a—13a, each pair of opposed angles supporting a rectangular sound-absorbing plate *p*.

The outer ends of the bars 8—13 are the angular points of an inscribed regular hexagon. Consequently, all plates *p* have the same length, so that the uniformity of their spacing ensures uniform absorption of the sound throughout the cross-section. As stated, the lost space, i. e. the cross-sectional area between the sides of the hexagon and the casing wall, is relatively small. If said area is not obturated, each of the segmental passages may accommodate a short sound-absorbing plate *p*² (see Fig. 2).

The sound deadener illustrated comprises four vertically spaced units, the plates of each unit forming an angle of 60° with the adjacent plates

of the adjacent unit. Obviously, the number of said units may be varied according to circumstances.

Glass wool has proved to be very suitable as a material for the sound-absorbing plates. As plates of this material are rather brittle, they are preferably framed and covered by perforated metal sheets. Figs. 3 and 4 show such a construction, Fig. 4 being a section along the line IV—IV of Fig. 3. Plate *p* is covered on either side by perforated steel sheets 14, 15, which directly engage the material thereof.

The frame is composed of two parts, the one being formed of flat iron 16, the other of angle iron 17, said parts being interconnected by bolts 18. By means of lugs 19, the frame can be secured to the offset ears 20 carried by horizontal strut 21.

According to Fig. 5, the plates 14, 15 are clamped to the outside of the frame 16, 17, so that they do not directly engage the glass wool.

Fig. 6 shows that the invention can as well be applied to a conduit having an elliptical cross-section. Obviously, all of the plates *p* have the same length.

What I claim is:

1. A sound-deadener adapted to be accommodated in a gas conduit of circular cross-section and comprising a plurality of relatively narrowly spaced flat plates of sound-absorbing material, wherein the plates are arranged in three groups, each of which occupies, in cross-sectional view, a rhomb formed by two adjacent triangles of

the inscribed regular hexagon, and wherein the plates of each group are parallel to one side of the rhomb involved.

2. A sound-deadener adapted to be accommodated in a gas conduit of elliptical cross-section and comprising a plurality of relatively narrowly spaced flat plates of sound-absorbing material, wherein the plates are arranged in three groups, each of which occupies, in cross-sectional view, a parallelogram formed by two adjacent triangles of the inscribed hexagon which is the oblique projection of a regular hexagon inscribed in a circle of which the contour of the elliptical cross-section is the corresponding projection, the plates of each group being parallel to one side of the parallelogram involved.

3. A sound-deadener as claimed in claim 1, and comprising at least two axially spaced units, the plates of each unit forming an angle of 60° with the adjacent plates of the adjacent unit.

4. A sound deadener for gas conduits of tubular cross section, comprising a plurality of plates of sound absorbing material disposed parallel to the axis of the conduit, said plates being supported in spaced relation in three groups within the cross sectional area of the conduit, and the plates of each group being arranged within a parallelogram formed by two adjacent triangles of an inscribed hexagon, said plates in each group being parallel to one side of their related parallelogram.

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