June 5, 1934. J. MAZER 1,961,374

SOUND ABSORBING STRUCTURE

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Fig. 1.

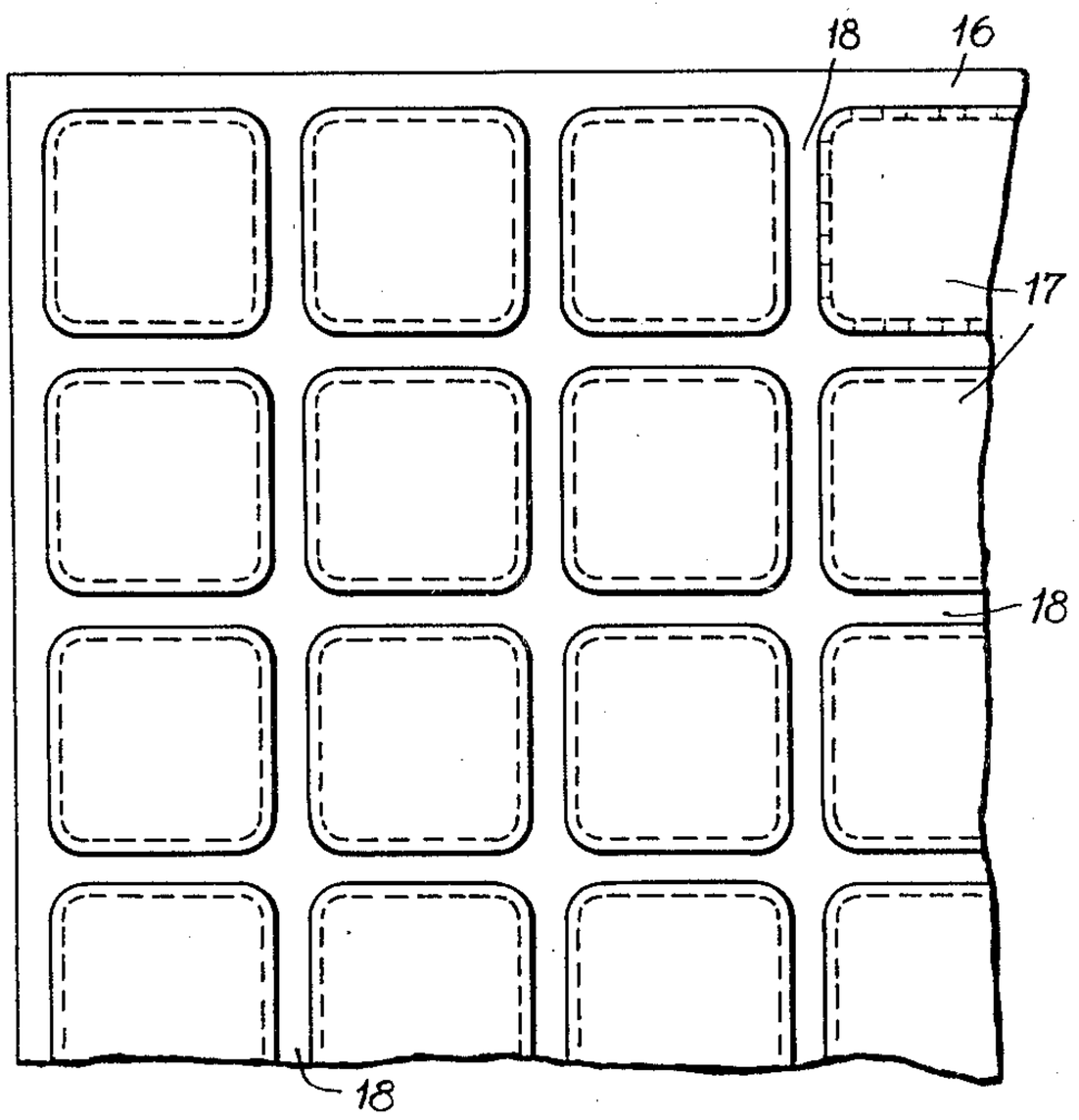



Fig. 2.

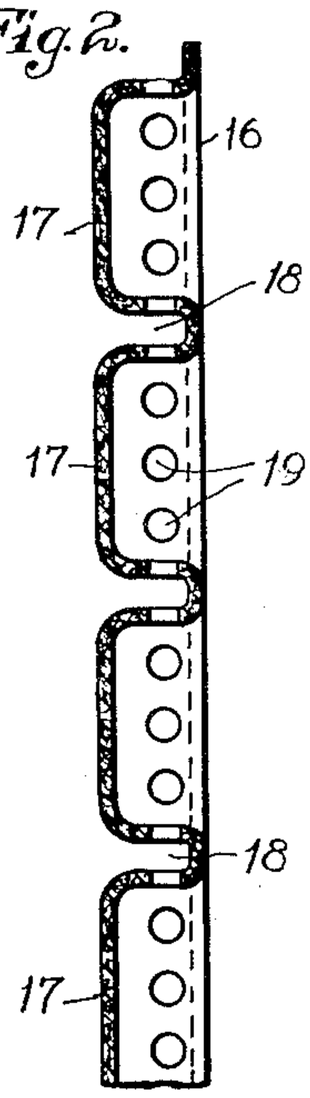



Fig. 3.

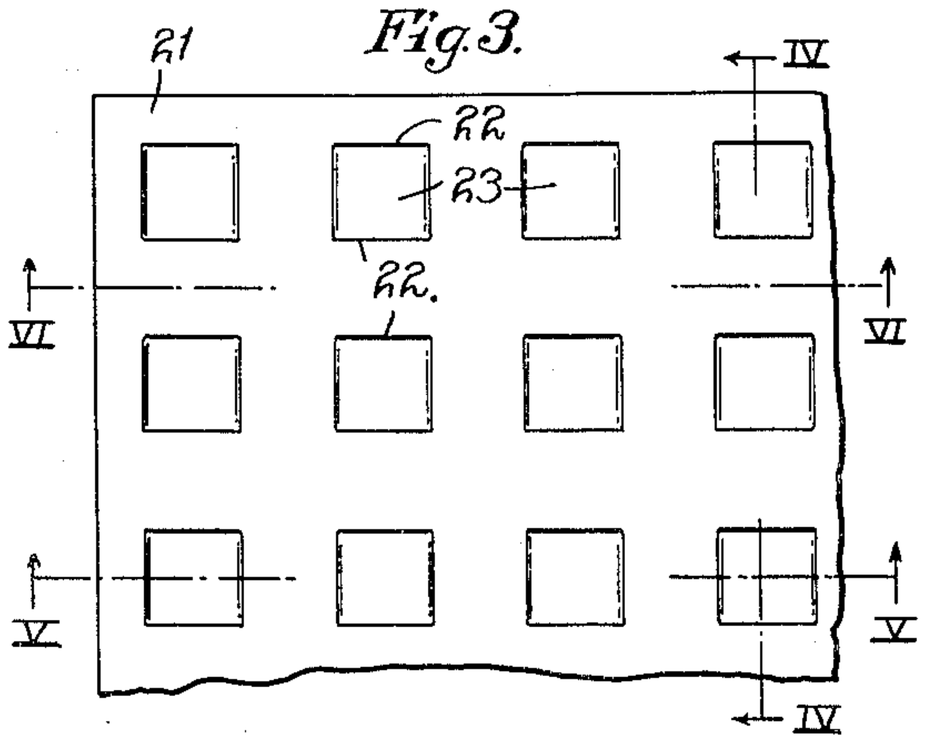



Fig. 4.

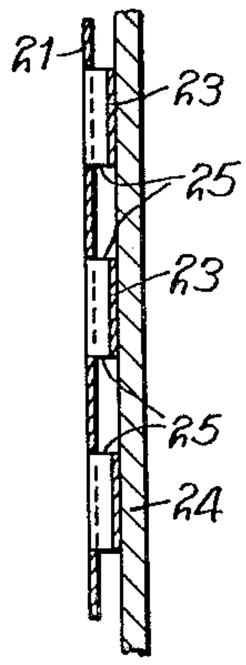
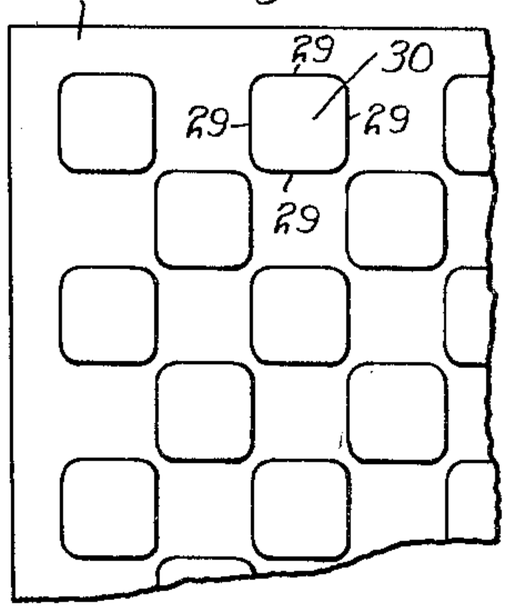



Fig. 8.



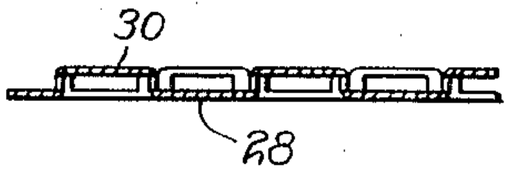




Fig. 9.

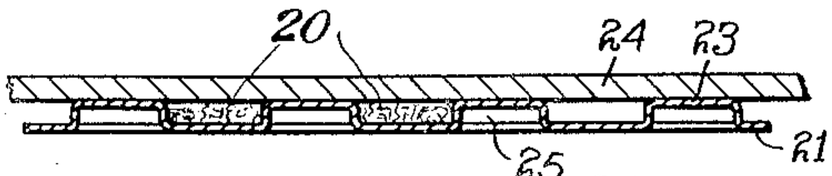



Fig. 5.

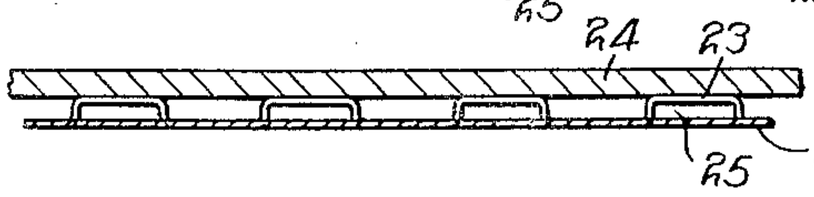



Fig. 6.

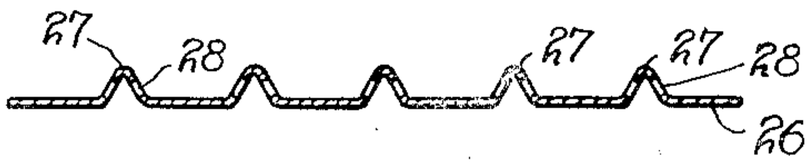



Fig. 7.

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Fig. 10.

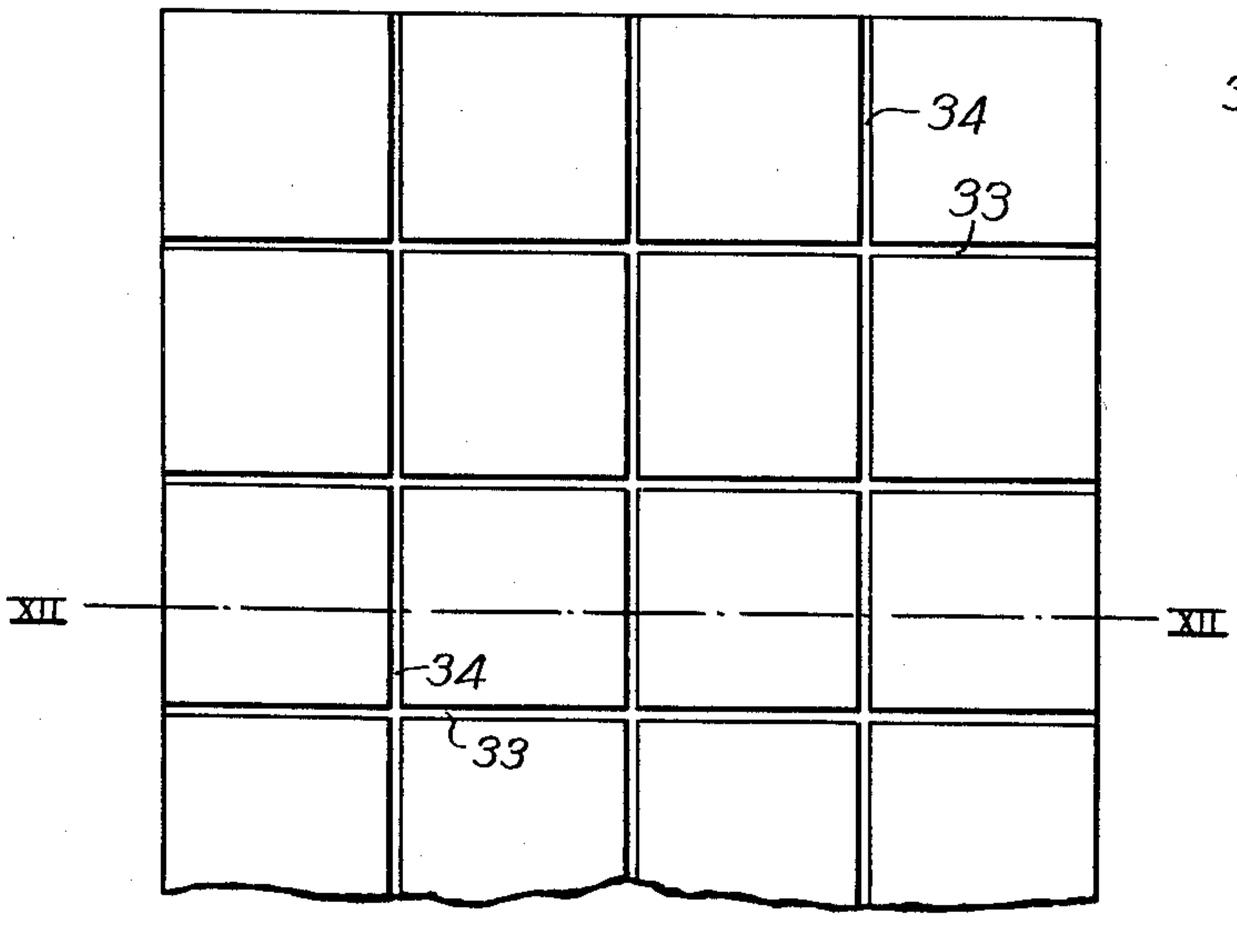



Fig. 11.

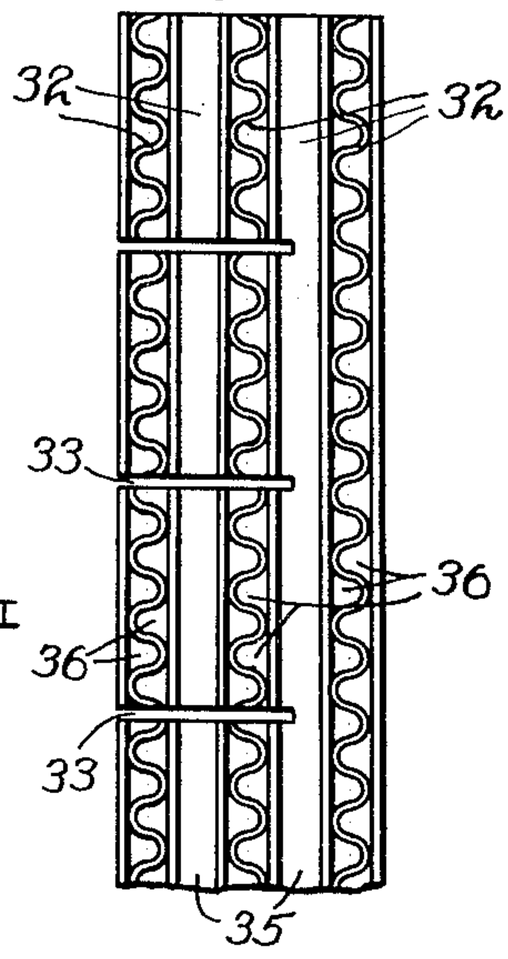



Fig. 12.

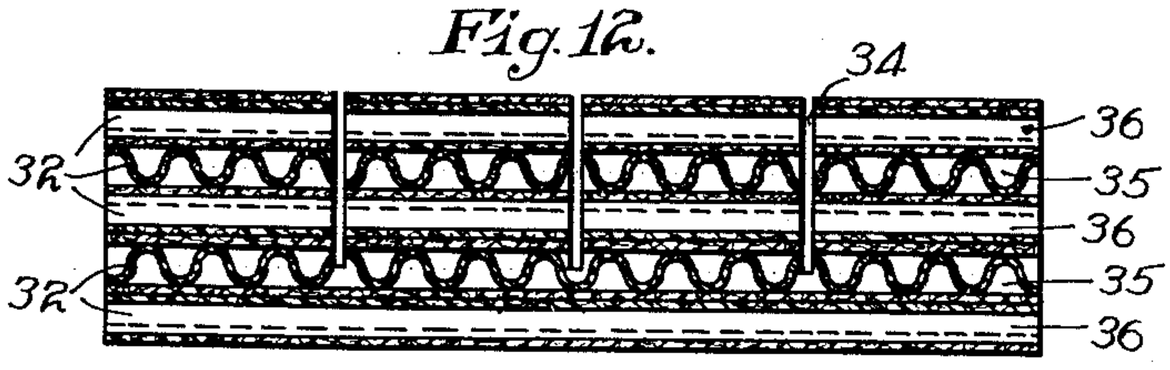



Fig. 13.

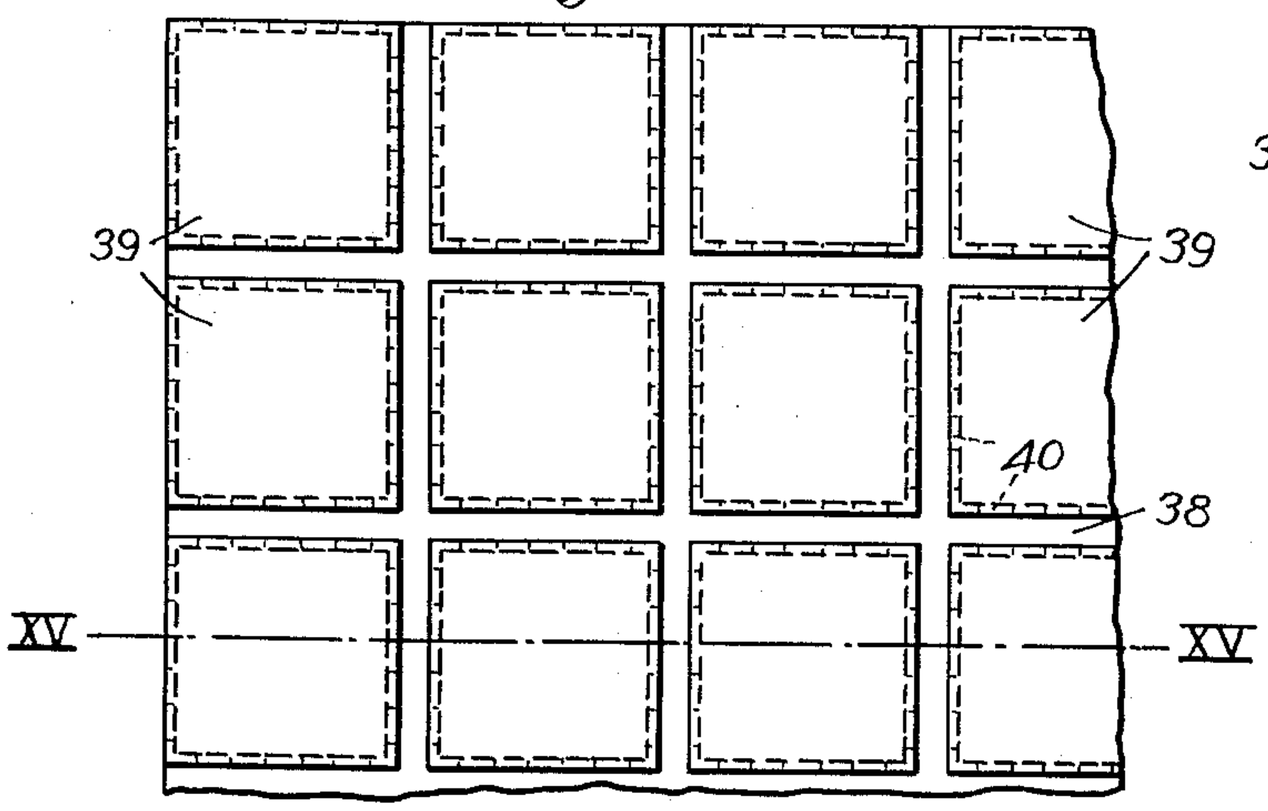



Fig. 14.

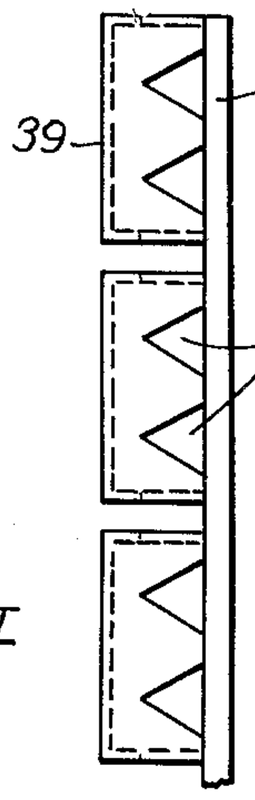
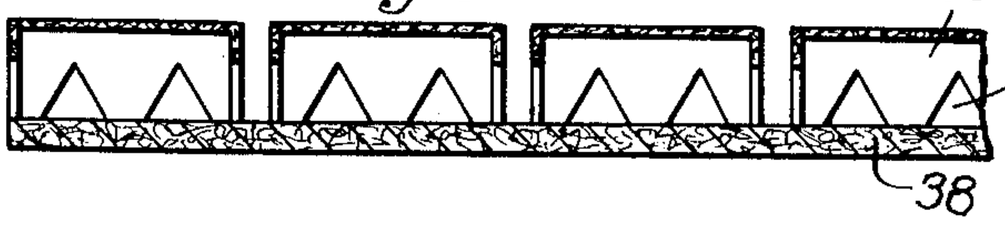



Fig. 15.

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Patented June 5, 1934 1,961,374

# UNITED STATES PATENT OFFICE

1,961,374

## SOUND-ABSORBING STRUCTURE

Jacob Mazer, Stonehurst, Upper Darby Township, Delaware County, Pa.

Application March 10, 1930, Serial No. 434,504

14 Claims. (Cl. 181—30)

My invention relates to sound-absorbing structures, and more particularly to those of the type employed for facing the interiors of buildings.

Acoustical materials heretofore employed have included various types, such as mats of felt, porous bodies of materials that are either inherently of a sound-absorbing nature, such as felt, or of a more rigid nature, in the latter case, the openings being of such width and depth as to absorb the sound waves by reflection back and forth between the walls of the perforations.

In the case of fibrous bodies, objection has been raised because they ordinarily present a rough surface which accumulates dirt and does not lend itself readily to decorative effects. If a smooth covering is applied to the exposed surface of such fibrous bodies and painted, the appearance thereof will be enhanced, but the paint or other coating material tends to obstruct the minute passages through which the sound waves should have free access to the body of absorbing material.

In the case of the more rigid bodies having perforations exposed to the sound waves, these perforations have been so numerous as to render the sound-absorbing bodies unsightly, and dirt accumulates in the holes.

One object of my invention is to provide a sound-absorbing structure that can be readily formed into units, each of predetermined sound-absorbing capacity, and which can be easily installed.

Another object of my invention is to provide a sound-absorbing unit whose body portion is provided with ample cavities or spaces for the absorption of sound waves by multiple reflection, or wherein sound-absorbing material, such as a fiber may be placed, and a unit which nevertheless presents to the eye a surface that is apparently substantially unbroken, and wherein openings extending from the surface thereof into communication with the interior spaces are not clearly visible, or, where visible, are of pleasing appearance and arrangement.

Another object of my invention is to provide a sound-absorbing unit which contains a sufficient number of sound-absorbing passageways, but which nevertheless presents a large amount of unbroken surface that may be shaped and decorated to produce various ornamental effects.

Another object of my invention is to provide a sound-absorbing unit wherein sound waves first enter passageways that extend in a direction generally perpendicular to the face of the unit and then spread laterally into spaces located behind the front surface of the unit.

As above-indicated, and as hereinafter described more in detail, the sound-absorbing unit in its various forms is provided with a series of formulated, or definitely formed, passageways and recesses, as distinguished from prior art structures which are composed of more or less loosely-assembled fibres, and wherein the resulting minute spaces between the various fibrous strands have no definite arrangement or predetermined capacity for entrapping and causing dissipation of sound waves. While the said fibrous bodies may have a multitude of small spaces or recesses, their sound-absorbing capacity is dependent largely upon the inherent elasticity of the body, whereas the applicant, by definitely forming passageways and recesses, can secure accurately predetermined sound-absorbing capacity.

Some of the various forms which my invention may take are shown in the accompanying drawings, wherein Figure 1 is a face view of a portion of a sound-absorbing unit; Fig. 2 is a sectional view thereof; Fig. 3 shows another form of unit; Figs. 4, 5 and 6 are views taken on the lines IV, V and VI, respectively, of Fig. 3; Fig. 7 shows a modification of the structure of Fig. 3; Figs. 8 and 9 are face and sectional views respectively, of still another modification; Fig. 10 is a face view of a further modification of the structures of Figs. 1 to 9; Fig. 11 is an edge elevational view of the structure of Fig. 10; Fig. 12 is a sectional view, taken at right angles to the view of Fig. 11; Fig. 13 is a face view of still another modification; Fig. 14 is an edge elevational view of the structure of Fig. 13, and Fig. 15 is a sectional view thereof.

In Fig. 1, I show a sound-absorbing unit 16 that may be pressed from pulp board or an asbestos sheet to form raised portions 17 that are spaced somewhat from one another, such spaces 18 being of groove-like form and narrow relative to the areas of the raised portions 17. The sides of the raised portions 17 are perforated as shown at 19, to permit of communication between the grooves and the interior of the cup-like or raised portions 17. The unit 16 could be formed of fiber board, metal, or any other suitable material, since I do not depend greatly upon any inherent sound absorbing capacity of the material itself, but upon the arrangement of openings and spaces for absorbing the sound waves by multiple reflection.

If the body were provided simply with the grooves 18, the holes 19 being omitted, it would have much less sound-absorbing capacity, since the sound would be reflected from the grooves

18. In the structure shown, however, much of the sound waves which enter the grooves 18 will enter the holes 19 to the interior of the raised portions 17 and be there absorbed by further reflection between the interior surfaces.

The raised portions may be of various colors and are sufficiently close together to produce a tile-like effect, the grooves 18 having the appearance of lines of division between the various raised portions.

In Figs. 3 to 6, I show a unit 21 that may be stamped from sheet metal or other suitable material. In making this structure, a series of short slits are formed in the sheets, as at 22, to permit of the stamping of depressions or deflected portions 23 therefrom. The stamping of the sheet and the slitting thereof may be performed simultaneously by a single die.

The deflected portions may seat against a wall surface as indicated at 24 and serve to hold the body portion 21 of the unit spaced from the wall. Viewed at a distance, as ceilings usually are, the depressed portions 23 have substantially the same appearance as the face of the sheet, thus causing the unit to present an appearance that is much more unbroken than if the depressed portions 23 were eliminated entirely and the sheet merely perforated.

The sound waves which impinge against the exposed surfaces of the portions 23 will be largely deflected through passages 25 to the spaces behind the body of the sheet 21, these passages 25 resulting from slitting and deflecting portions of the metal.

In Fig. 7, I show a sheet 26 that may be of metal or other material. In this structure, somewhat widely spaced ribs or corrugations 27 are formed in the sheet 26 and perforations 28 are provided in the sides of these ribs to afford communication between the grooves of the ribs and the rear side of the sheet 26. These perforations may be formed either previously to or after the stamping of the ribs 27. The interior bottom surfaces of the ribs 27 will be visible to one standing at the front side of the sheet and will therefore serve to reduce the perforated or broken appearance of the sheet. Here, as in the structures of Figs. 1 to 6, the sound waves will be deflected laterally through the openings 28 into the space behind the sheet, although in the case of Fig. 7, more of the sound waves will pass directly through the openings 28 into the said space, particularly those sound waves which approach the sheets in angular directions.

In the structures of Figs. 1 to 7, fibrous material may be placed in the spaces behind the face of the unit for the purpose of more effectively absorbing the sound, as shown at 20 in Fig. 5, although in most instances, this additional material will not be required.

Referring now to Figs. 8 and 9, I show a unit 28 of sheet-like material wherein four slits 29 are formed, to permit stamping of raised portions 30 from the body of the sheets 28, these raised portions to be applied against a wall as at 24 in Fig. 5. The slits 29 do not intersect one another, but material is left at each corner of each raised portion to maintain its connection with the sheet. In this structure, as in the other structures, the sound waves will impinge mainly in a direction perpendicular to the sheet and will be deflected into the spaces beneath the raised portions 30.

In Figs. 10, 11 and 12, I show a unit composed of a series of layers 32 of corrugated board that may be glued or otherwise fastened together and the composite structure slitted as indicated at 33 and 34, slits intersecting one another. The slits 33 extend transversely of and communicate with the channels 35 of two of the corrugated boards, while the slits 34 extend transversely of and communicate with the channels 36 in the other corrugated boards. A greater or less number of layers of corrugated board may be provided, as desired. The sound waves will enter the slots 33 and 34 and be mainly deflected into the channels 35 and 36. However, since the slots 33 and 34 intersect each other, some sound waves from the slots 33 will also enter the channels 36, by way of the channels 34, while some of the sound waves which initially enter the grooves 34 will also enter the channels 35 by way of the grooves 33.

The face of the unit, by reason of the slots, will present a tile-like or mosaic effect and they may be colored and otherwise decorated, if desired.

In Figs. 13, 14 and 15, I show a structure wherein the unit is composed of a base sheet or board 38, to which sound-absorbing members 39 of box-like form are secured, as by gluing. These members 39 may be of card board or other suitable material and are spaced some distance apart to provide channels or grooves into which sound waves may enter. The sides of the members 39 are perforated as at 40, so that the sound waves may enter such members and not be reflected from the slots or spaces between the blocks 39. These blocks 39, as in the case of the structures of some of the other figures, lend themselves readily to decoration, and all of the structures shown, except perhaps those of sheet metal, can be readily cut to fit spaces of various sizes.

It will be understood that the units may be fastened to a wall or other supporting structure in any suitable manner as by cementing or nailing them thereto.

I claim as my invention:—

1. A sound-absorbing unit comprising a body having a plurality of formulated passages interiorly thereof and extending in a direction approximately parallel to the plane of the body, and perforations extending through the face of said body and each communicating with a plurality of the said passages, mainly through openings which extend approximately parallel to the plane of the unit.

2. A sound-absorbing unit comprising a body having a plurality of formulated passages interiorly thereof and extending in a direction approximately parallel to the plane of the body, and apertures in the face of said body each having communication with a plurality of the said passageways, mainly through openings which extend approximately parallel to the plane of the unit.

3. A sound-absorbing unit comprising a body having a plurality of formulated passages interiorly thereof and extending in a direction approximately parallel to the plane of the body, and elongated apertures in the face of said body each having communication with a plurality of the said passageways, the longitudinal direction of said apertures being transverse to the direction in which said passages extend.

4. A sound-absorbing unit composed of a body of layer-like structure, formulated passageways in one layer extending parallel to the plane of the sheet, passageways in the other layer extending in a direction transverse to the first-named passageways, and parallel to the plane of

the sheet, the body being provided with apertures extending through the outer surface thereof into communication with the said passageways.

5. A sound-absorbing unit composed of a body of layer-like structure, formulated passageways in one layer extending parallel to the plane of the sheet, passageways in the other layer extending in a direction transverse to the first-named passageways, and parallel to the plane of the sheet, the body being provided with apertures extending through the outer surface thereof into communication with the said passageways, certain of said apertures extending across the face of the unit in directions transverse to the other apertures.

6. A sound-absorbing unit composed of a body of layer-like structure, formulated passageways in one layer extending parallel to the plane of the sheet, passageways in the other layer extending in a direction transverse to the first-named passageways, and parallel to the plane of the sheet, the body being provided with apertures extending through the outer surface thereof into communication with the said passageways, certain of said apertures extending across the face of the unit in directions transverse to the other apertures, and intersecting therewith, to provide communication between all of said apertures and all of said passageways.

7. A sound-absorbing unit provided with a plurality of recesses intermediate its front and rear surfaces, and formulated passageways extending from the front surface of the unit rearwardly, and a greater number of passageways communicating with the first-named passageways and extending laterally thereof and affording the principal lines of communication between the first-named passageways and the said recesses.

8. A sound-absorbing unit consisting of concavo-convex portions mounted with their convex surfaces exposed, the said portions being spaced apart and having perforations in their side walls.

9. A sound-absorbing unit comprising a body provided with a plurality of openings extending through the exposed surface thereof, and having a plurality of formulated recesses communicating with each of said openings and disposed rearwardly of only the unperforated areas of the exposed surface of the unit.

10. A sound-absorbing body comprising a facing sheet having portions thereof deflected in directions generally perpendicular to the plane of the sheet, with perforations through the side walls of said deflected portions to produce openings in directions generally parallel to the plane of the sheet, the deflected portions being of shallow depth relative to the areas of the undeflected portions.

11. A sound-absorbing body comprising a facing sheet having portions thereof deflected in directions generally perpendicular to the plane of the sheet, with perforations through the side walls of said deflected portions to produce openings in directions generally parallel to the plane of the sheet, the deflected portions being of shallow depth relative to the areas of the undeflected portions, and fibrous material disposed behind the said sheet.

12. A sound-absorbing body comprising a facing sheet having slits formed therein with certain portions between said slits deflected in a direction perpendicular to the plane of the sheet.

13. A sound-absorbing body comprising a facing sheet having rearwardly disposed portions exposed at their front faces and provided with perforations in their sides, and adapted to engage a supporting surface disposed rearwardly of the sheet, the distance between the outermost plane of the sheet and the plane of said front faces being short relative to the widths of the outermost areas of the sheet.

14. A sound-absorbing unit provided with a plurality of recesses disposed rearwardly of its front surface, and formulated passageways exposed at the front surface of the unit, and a greater number of passageways communicating with the first-named passageways and extending laterally thereof, and affording the principal lines of communication between the first-named passageways and the said recesses.

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