Dec. 13, 1938. E. SCHENK 2,140,210

ACOUSTIC STRUCTURE

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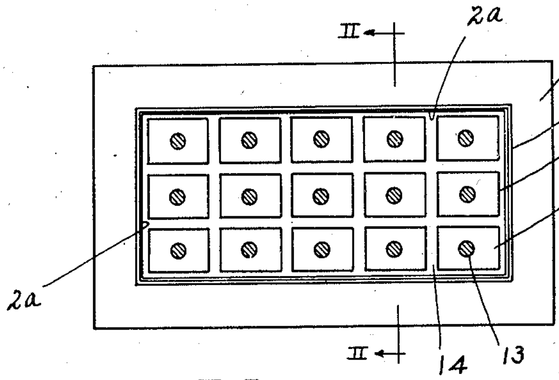

Fig. I.

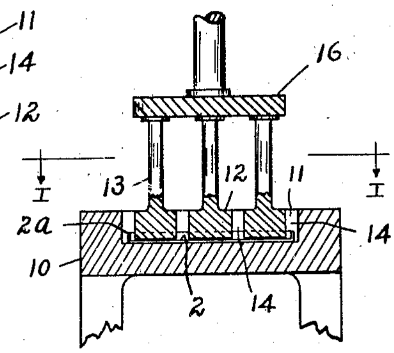

Fig. II.

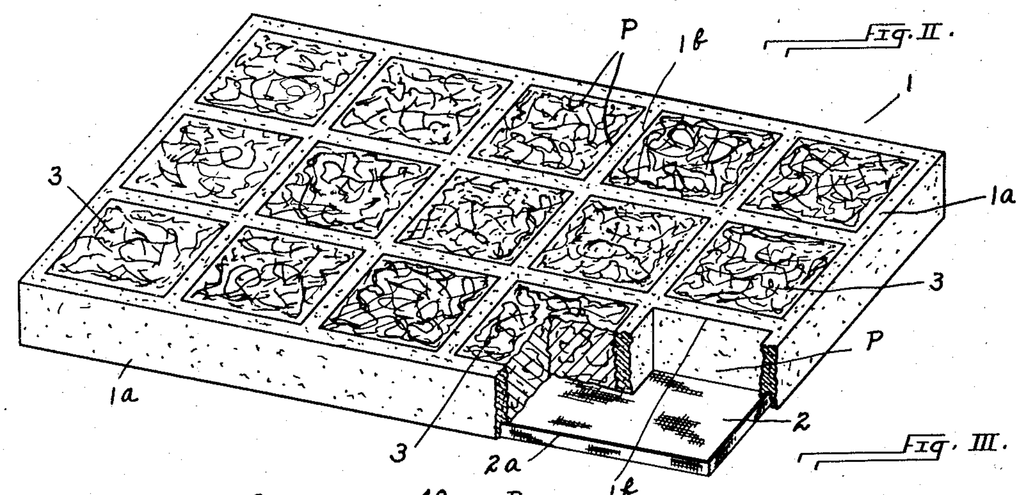

Fig. III.

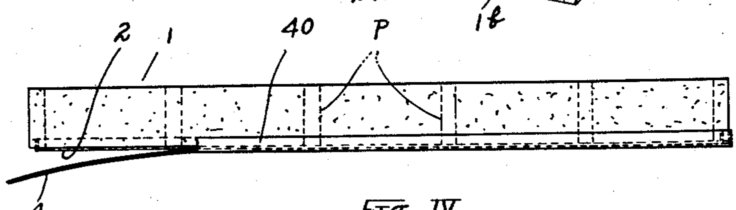

Fig. IV.

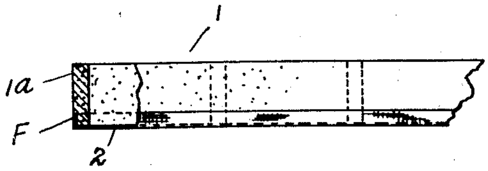

Fig. V.

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ACOUSTIC STRUCTURE

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Application January 7, 1938, Serial No. 183,838

3 Claims. (Cl. 72—18)

My invention relates to building construction, and consists in an acoustical structure adapted to be embodied in or assembled upon the walls of buildings.

The art is familiar with many devices and structures for inhibiting the transmission of sound through the walls of buildings. Mineral wool, comminuted cork, and other sorts of sound-deadening materials have been embodied in or applied to walls for this purpose, and ordinarily such material is embodied in panel-like units for assembly in or upon the walls.

More particularly, my invention consists in a shallow container for mineral wool, or other sound-absorbing material, and in an acoustical unit embodying such container and mineral wool.

In the accompanying drawing Fig. I is a view, partly in plan and partly in horizontal section, of apparatus in which my container is constructed; Fig. II is a view of the apparatus in vertical section, the plane of section of Fig. II being indicated at II—II in Fig. I and that of Fig. I at I—I in Fig. II; Fig. III is an isometric view, showing the container to larger scale, a portion of the container being broken away to reveal structural detail; Fig. IV is a view in side elevation of the container, illustrating partly in side elevation and partly in section an external covering that may be applied to the exposed face of the completed unit; and Fig. V is a fragmentary view, showing the container partly in side elevation and partly in vertical section, and illustrating a modification in structural detail.

The acoustical building unit of the invention consists in a container for mineral wool or other suitable sound-absorbing material. The container comprises a rectangular body of fretwork 1, having a flexible sheet 2 of wire netting or screen, or a flexible sheet of other open-work structure, secured upon its lower face, as viewed in Figs. III to V of the drawing.

The flexible sheet 2 forms bottoms for the pockets in the body of fretwork, and such pockets are filled with mineral wool 3, as shown in Fig. III. The structure, thus constituted, comprises a panel-like unit that is adapted to be assembled in common plane and edge to edge with like units in or upon a wall structure. Various means are known in the art for assembling acoustical panels in a wall structure, and a detailed consideration of them is unnecessary to a full understanding of this invention. Suffice it to say, that the assembly of units 1, 2, 3 provides in effect a blanket of mineral wool over the expanse of the ceiling or wall to which application is made, and such blanket is effective in inhibiting the transmission of sound through the wall, particularly sounds of low pitch.

Upon the perforate sheet 2, which forms the lower or outer surface of my acoustical unit, I apply a thin facing 4 (Fig. IV). This facing 4 may consist of wall paper, tin-foil, aluminum foil or the like (carrying surface ornamentation if desired) pasted or glued to the sheet 2. The facing 4 may be applied to each unit individually, as indicated in Fig. IV, with marginal edges 40 of the facing sheet turned upward and secured against the four sides of the body 1. Alternately, the facing 4 may be applied after a plurality of units have been assembled in common plane in or upon a wall structure, the application being made after the manner that ordinary wall paper is applied to plaster walls.

The applied facing 4 provides within the area of each opening in the sheet 2 a small flexible diaphragm, that vibrates under the influence of sound waves, particularly waves of high pitch, and the assembled sheets 2 and 4, over the area of the bottom of each pocket (P) in the body 1, forms a relatively large diaphragm that vibrates under the influence of sound waves of moderate pitch. Thus, the assembled sheets 2 and 4 provide a multiplicity of minute diaphragms extending in common plane and in such plane forming a plurality of relatively large diaphragms. As embodied in a wall structure these diaphragms vibrate under the impingement of sound waves, and thus the energy of the sound waves, otherwise effective in transmitting sound through the wall structure, is dissipated in effecting noiseless oscillation of the diaphragms. Those sound waves, particularly the waves of sound of low pitch, which are not dissipated by the diaphragms are absorbed or deenergized by the bodies 3 of mineral wool within.

Advantageously, the open-work sheets 2 used in the construction of my accoustical units are made of electro-magnetic or electro-conductive material, such as iron-wire screen, and the facing 4 applied to such sheets consists in a sheet of dielectric, such as paper, carrying a thin facing of electro-conductive material, such as aluminum foil. This composite facing is applied with the dielectric sheet against the wire screen (2), and as thus assembled the structure provides a multiplicity of electric condensers, as described in my co-pending application for Letters Patent, Serial No. 174,339, filed November 13, 1937. Thus, the diaphragms, which dissipate the energy of sound waves in the manner described above, comprise flexible electric condensers adapted to oscillate in the earth's magnetic field, or an electric field produced by the electrical charging of the sheets **2**. As explained in my said co-pending application, the oscillation of the diaghragms is dampened in such field; the oscillation of the diaphragms in such field generates small electric currents that are dissipated, or grounded through the metal sheets **2**. Thus it is that the energy of the sound waves is converted into electric energy and dissipated.

Conveniently, the facing **4**, or the composite facing mentioned above, may be perforated in the manner illustrated and described in my said co-pending case.

Turning to a more minute consideration of the construction of my acoustical unit, it is to be understood that, advantageously, I form the body of fretwork **1** integrally in a molding operation, and in such operation the body is shaped and hardened in situ upon the open-work sheet **2**. More specifically, I provide a table or bed **10** including a rectangular matrix **11** of the size and shape of the outer side walls of the body **1**, and into such matrix I introduce and secure a plurality of core members **12**. The core members are identical in size and shape with the pockets P desired in the body **1**, and in the matrix **11** the core members are spaced from the side walls of the matrix and from one another, as indicated in Fig. I. Conveniently, all of the core members are by rigid stems **13** secured to a common head **16**, and such head is adapted to be raised and lowered at will, to shift the core members as a unit to and from positions within the matrix **11**.

In the production of my unit, the sheet **2** of wire-screen, or other cancellate material, is first laid flat upon the floor of the matrix **11**, and then the core members are lowered into the matrix, clamping the sheet **2** to the floor of the matrix as shown in Fig. II. Into the spaces **14** around and between the core members in the matrix **11**, I introduce concrete, or other suitable self-hardening material. A concrete of relatively fine aggregate and dry mix serves well. In the matrix the concrete is tamped down and pressed into the openings in and molded upon the portions of the sheet **2** exposed at the bottoms of the spaces **14**. When the molded body of concrete sets and hardens, the screen **2** is integrated to the lower edge of the sides **1a** and partitions **1b** of the body.

Indeed, each rectangular portion of the screen 2 that forms the bottom of a pocket P in the body **1** is firmly bonded to the lower edges of the walls **1a**, **1b** that define such pocket. A particularly effective, economical, and sturdy structure is thus provided.

In refinement, the marginal edges **2a** of the sheet may be folded from the plane of the sheet, in such manner that, when the sheet is introduced to the matrix **11**, the flanges extend upward between the outer surfaces of the assembled cores **12** and the side walls of the matrix **11**. (Note Fig. II.) Accordingly, when concrete is shaped and hardened in the manner described, the outer peripheral edge of the sheet **2** is deeply embedded in the outer walls of the molded body, as shown at E in Fig. III.

While the flanged edges **2a** of the sheet **2** will ordinarily be embodied and wholly enveloped within the edges of the outer walls **1a** of the body of fretwork in the manner described, it is contemplated that alternately such flanged edges may be so positioned as to overlap upon the outer surfaces of the molded walls **1a**, or they may lie flush with the surfaces of such walls, as indicated at F in Fig. V.

I claim as my invention:

1. An acoustical structure including a rectangular frame having one or more partitions providing within the frame a plurality of pockets, a reticulate flexible sheet of metal integrated with said frame and providing for two or more of said pocket's bottoms that lie in common plane and extend in uninterrupted continuity, bodies of sound-absorbing material included in said pockets, and a foil-coated sheet of dielectric material applied to said reticulate sheet, with the foil-coated surface outward.

2. An acoustical structure including a rectangular frame having one or more partitions providing within the frame a plurality of pockets, a reticulate flexible sheet marginally integrated with the edges of the sides of said frame and medially integrated with the edges of said partitions, forming for a plurality of said pocket's bottoms that extend in common plane and provide in the uninterrupted continuity of the sheet a plurality of diaphragm-supporting elements, bodies of sound-absorbing material included in said pockets, and a sheet of facing material applied to the first-named sheet, substantially as described.

3. An acoustical structure including a frame having one or more partitions assembled with a reticulate sheet of metal, said frame being integrally molded and hardened in situ upon said reticulate sheet, with the marginal portions of the sheet embedded in the body material of the external side walls of the frame and medial portions of the sheet partially embedded in the body material of said partitions, said assembly providing a plurality of pockets whose bottoms are formed by said sheet, bodies of sound-absorbing material included in said pockets, and a sheet of facing material applied to the first-named sheet, substantially as described.

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