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M. H. KLIEFOTH

1,959,057

SOUND ABSORBING CONSTRUCTION

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Fig. 1.

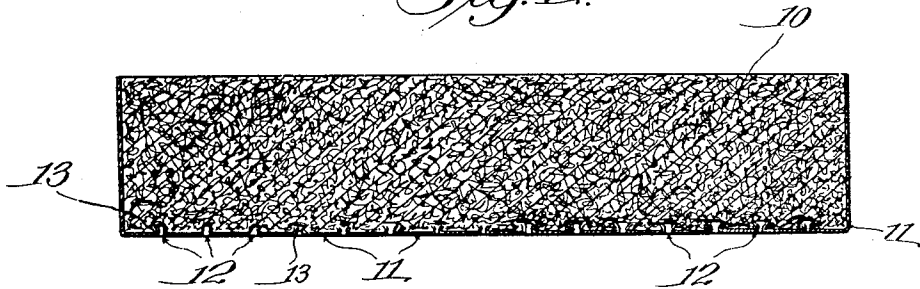


Fig. 2.

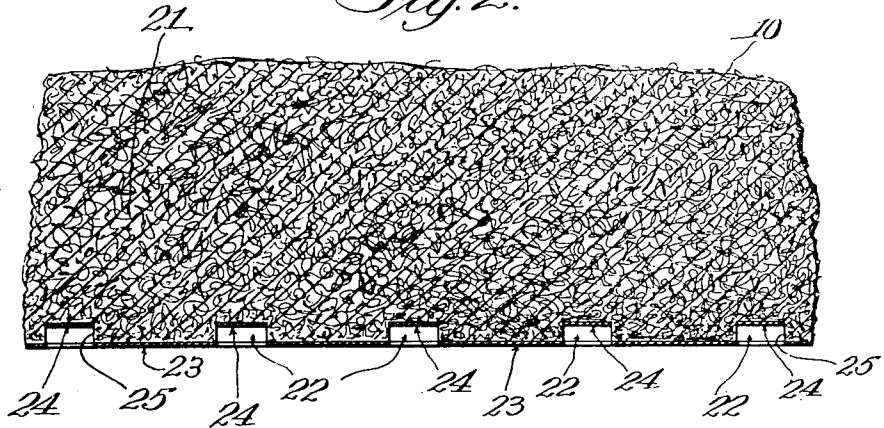
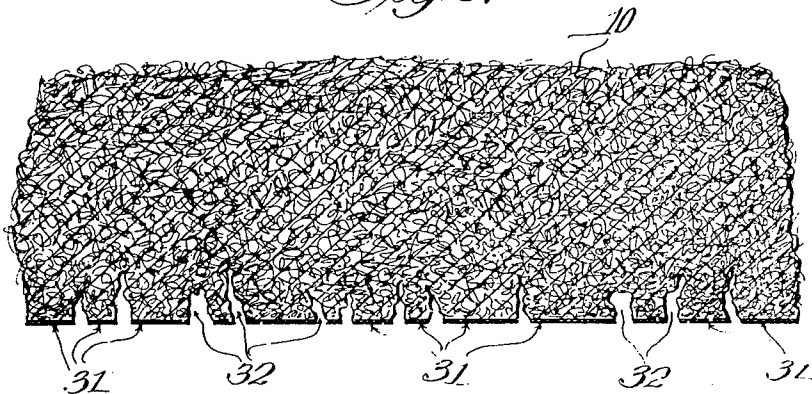


Fig. 3.



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SOUND ABSORBING CONSTRUCTION

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15 Claims. (Cl. 154—28)

This invention relates to improvements in sound-absorbing construction and particularly to a sound-absorbing construction with a non-continuous metal facing formed in situ.

- 5 The R. F. Norris Patent No. 1,726,500, issued August 27, 1929, discloses a sound-absorbing construction in which a perforated metal sheet or other substantially non-sound-absorbing membrane, preferably rigid, is used as a facing for sound-absorbing material such as balsam-wool, hairfelt, porous ceramic products and the like. In the Norris construction the perforated facing material preferably is rigid enough to support the sound-absorbing material without sagging. It is preferably erected independently of the sound-absorbing material which is afterwards located adjacent to it on the side away from the source of sound. The perforations are of such size and number that the unperforated portion of the surface exposes an apparently substantially continuous surface to the sound waves and one which may be decorated readily. To avoid the exposure of fastening means to the eye a supporting structure of furring strips is used in connection with the perforated metal units which are preferably pan-shaped.

- In the improved construction herein described I retain many of the advantages of the perforated-metal-faced sound-absorbing construction but avoid the necessity of using an expensive supporting structure. My improved metal-faced sound-absorbing construction, in which the sound-absorbing material supports the metal facing, may be glued, nailed or otherwise fastened to walls and ceilings as is done with hairfelt pads and other similar sound-absorbing blocks at the present time. The cost of this method of installation is comparatively low. Furthermore, my improved construction stiffens and strengthens the sound-absorbing pads, and permits easy cleaning and decorating.

My invention is described in connection with the accompanying drawing in which:

- Fig. 1 is a cross-section of a sound-absorbing pad or tile with a coating formed in situ and perforated to allow sound to pass through said coating;

- Fig. 2 shows a cross-section of a sound-absorbing material with depressions therein, the horizontal surfaces being coated with metal;

- Fig. 3 shows a cross-section of a sound-absorbing material made of coarse material with large openings at the surface, the exposed outer surface being coated with metal.

- In my improved construction I form a thin layer of metal in situ on the face of a sound-absorbing material, preferably in the form of a pad or the like, which is subsequently mounted, as by gluing or otherwise, on the surface to be treated. The metal is formed on the surface

which is exposed to the sound that is to be absorbed. This thin metal layer is formed by spraying or electroplating as will be described in more detail hereinafter.

The sound-absorbing material which is faced with the metal may be any sound-absorbing material which may be formed into thick layers or pads, and which has enough cohesion so that the facing may be formed in situ and thereby made substantially integral therewith. Loosely bound hairfelt is unsuitable because of the poor cohesion. When the metal is formed on it, it is torn off easily. A sound-absorber having the structure of heat insulating building boards and similar materials, is especially suitable. Sound-absorbing tile made by cementing packed asbestos, mineral wool, or the like together into a porous form also is suitable. Certain types of plaster and ceramic sound-absorbers also may be used.

In the simplest form of my invention, the sound-absorbing material 10 is sprayed with a molten metal such as zinc, copper, aluminum or any other suitable metal or alloy so that a thin layer 11 is formed on the surface. This layer may be extended to cover the edges of the absorber as shown in Fig. 1 and may completely encase the sound-absorbing pad. Such a thin metal layer, formed in situ, adheres tightly to a non-metallic surface and especially to the porous surface of a sound-absorber. The metal layer may then be made discontinuous to allow the sound to pass into the absorber by punching or drilling holes 12 through it. The metal tangs 13 formed by a punching operation may remain to help hold the metal surface.

It is possible, however, to form a discontinuous thin metal layer during the spraying operation. This is accomplished by manipulating the spray gun which blows the molten metal onto the surface in the form of fine globules resembling a spray so that a porous film of metal is formed. The metal film is penetrated by countless small holes that resemble pores and which allow the sound to pass through. In another variation, designs may be made whereby predetermined areas of the absorber surface are not coated. A stencil is mounted on the surface of the absorber and only the absorber surface back of the cut-out areas of the stencil are coated with metal, thereby leaving openings through the deposited metal for the passage of sound. These openings may be supplemented by porous metal in the coated areas and/or by punched or drilled holes in the coated areas.

In another modification, Fig. 2, the surface of the sound-absorber 21 is filled with depressions 22 which may vary in diameter and depth to suit the particular material used. The surface is then sprayed with metal to form a thin coating 23 on the most exposed horizontal surface and also a

thin coating 24 on the horizontal surface at the bottom of the depressions, the side walls 25 of the depressed portions being substantially free of the sprayed metal. This method may be varied and the product varied considerably, as will be apparent to those skilled in the art. For instance, if there is used a sound-absorber composed of relatively coarse material such as coarse reeds, coarse excelsior, or large ceramic particles, then as shown in Fig. 3, the metal spraying operation coats mostly the exposed, substantially horizontal surfaces 31. Some metal enters the openings 32 but not enough to plug the openings or coat the side walls to any extent, thereby allowing the sound to enter the porous interior and be absorbed.

Instead of spraying the metal onto the absorber to form the coating in situ, it is possible to electroplate the absorber and obtain similar results. However, electroplating introduces complications which make it less desirable to use than spraying. The absorber becomes filled with corrosive electrolyte which is difficult to remove and which may disintegrate it. The absorber should therefore be of water repellant material. The face of the absorber may be treated with graphite to make it conductive or it may be coated with a conductive sulphide such as silver sulphide in the same way as other non-conductive materials such as flowers, paper, glass and the like are treated preparatory to electroplating. The electro-deposited metal may be deposited in porous form, it may be deposited in a substantially continuous film which may be perforated afterward to make it discontinuous, or it may be deposited in predetermined areas to form a discontinuous film. The technique required for the deposition of these various films will be understood by those skilled in the art of electroplating.

The metal film which is formed by spraying has a pleasing matte appearance. It is not advisable to paint or decorate a porous metal film since the pores become filled with paint to thereby decrease the sound-absorbing value of the construction. Where the metal surface is to be decorated the openings should be sufficiently large to prevent bridging, as is described in said Norris Patent 1,726,500, but also should be spaced so that the surface remains decoratable and presents the appearance of a substantially continuous surface.

I claim:

1. A sound-absorbing construction comprising a sound-absorbing material having a thin metallic facing formed in situ, said facing having direct openings therethrough for the passage of sound.

2. A sound-absorbing construction comprising a sound-absorbing material having a thin metallic facing formed in situ, said facing having a multiplicity of non-tortuous openings therethrough, resulting from the depositing operation, to expose said sound absorbing material to the sound waves.

3. A sound-absorbing construction comprising a sound-absorbing material having a thin metallic facing formed in situ, said facing having non-tortuous openings therethrough to expose said sound absorbing material to the sound waves, at least one of said openings being formed by a punching operation.

4. A sound-absorbing construction comprising a sound-absorbing material having a thin facing of sprayed metal formed in situ, said fac-

ing having numerous small direct openings therethrough for the passage of sound.

5. A sound-absorbing construction comprising a sound-absorbing material having a thin porous facing of sprayed metal formed in situ, the pores constituting direct openings formed during the spraying operation and permitting the passage of sound waves through said facing.

6. A sound-absorbing construction comprising a sound-absorbing material having a thin facing of metal electrodeposited in situ, said facing having a multiplicity of non-tortuous openings therethrough for the passage of sound.

7. A sound-absorbing construction comprising a sound-absorbing material having depressed areas in the surface which is exposed to the sound-waves, said exposed surface having a thin facing of sprayed metal formed in situ, the side walls of said depressed areas being substantially free of said sprayed metal.

8. A sound-absorbing construction comprising a sound-absorbing material having a thin metallic facing formed in situ, said facing having non-tortuous openings formed therethrough, at least some of said openings being of predetermined size and shape and resulting from the control of the formation of said metallic facing.

9. The combination with a wall or ceiling, of a sound-absorbing construction secured thereto and comprising a sound-absorbing material having a thin metallic facing formed in situ, said facing having direct openings therethrough for the passage of sound.

10. The combination with a wall or ceiling, of a sound-absorbing construction secured thereto and comprising a sound-absorbing material having a thin metallic facing formed in situ, said facing having a multiplicity of non-tortuous openings therethrough, resulting from the depositing operation, to expose said sound-absorbing material to the sound waves.

11. The combination with a wall or ceiling, of a sound-absorbing construction secured thereto and comprising a sound-absorbing material having a thin metallic facing formed in situ, said facing having non-tortuous openings therethrough to expose said sound absorbing material to the sound waves, at least one of said openings being formed by a punching operation.

12. In the method of making a sound-absorbing construction, the step which comprises forming in situ a thin metallic facing on the surface of a sound-absorbing material, by spraying on the metal in molten form.

13. The method of making a sound-absorbing construction which comprises electroplating a non-continuous thin metallic facing onto a surface of a sound-absorbing material.

14. The method of making a sound-absorbing construction which comprises making a sound-absorbing material with a surface having depressed areas and spraying said surface with a thin metallic coating to leave the side walls of said depressed areas substantially free of metal.

15. The method of making a sound-absorbing construction which comprises forming in situ a thin metallic coating directly on predetermined areas of a surface of a sound-absorbing material, to thereby form a non-continuous, thin, metallic facing having non-tortuous openings therethrough.

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