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C. F. BURGESS

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SOUND ABSORBING CONSTRUCTION

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Fig. 1.

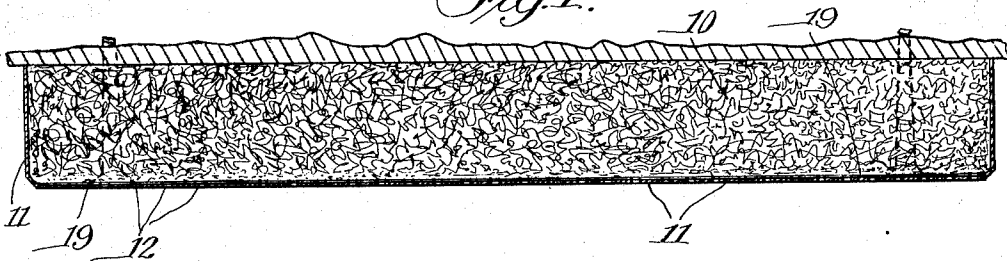


Fig. 2.

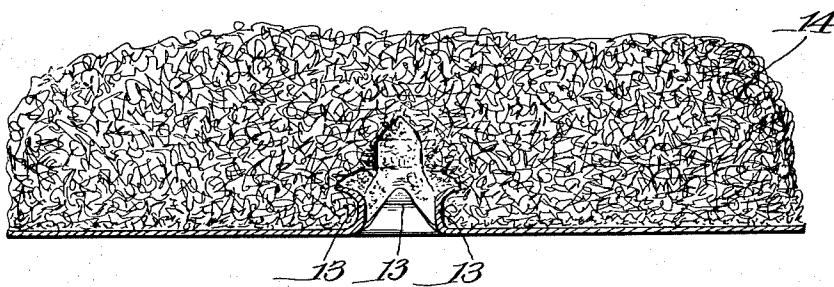
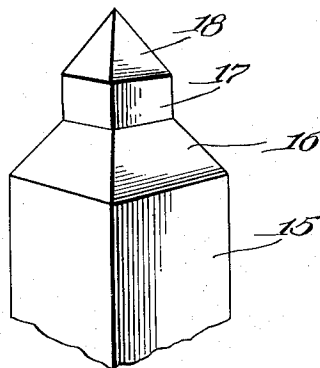


Fig. 3.



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UNITED STATES PATENT OFFICE

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SOUND ABSORBING CONSTRUCTION

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13 Claims. (Cl. 154-44)

This invention relates to improvements in sound-absorbing constructions and more particularly to a sound-absorbing construction having a perforated metal facing. It is directed especially to a sound-absorbing pad having a perforated metal foil facing secured thereto.

The R. F. Norris patent No. 1,726,500 of 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-absorber without sagging. It is usually erected independently of the absorber which may afterwards be placed adjacent to it on the side away from the eye. The perforations are of such size and number that the imperforate 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 my improved construction I retain some of the advantages of the perforated-metal-faced sound-absorbing construction but avoid the necessity of using an expensive supporting structure. My improved perforated-metal-faced sound-absorbing construction may be glued, nailed or otherwise fastened to walls, ceilings and other surfaces, 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.

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

Fig. 1 shows a cross section of a pad made in accordance with one method of my invention;

Fig. 2 shows in cross section the details of the combined punched foil and absorbing pad formed in the preferred way;

Fig. 3 shows, on a larger scale, the punch used to form the preferred perforations.

In my improved construction I utilize thin metal foil in most instances. Copper foil about 0.002 inch thick made by an electro-deposition process is now available and is used to advantage. Aluminum foil is also available and in lesser thicknesses. Zinc foil and tin foil are also pro-

duced commercially and hence available for this purpose. The tin foil has the disadvantage that it is soft. Nickel and Monel metal foil may be used. The necessity for using a foil having a certain hardness or stiffness to secure the maximum advantages of my invention will become apparent as the description progresses. The copper, aluminum, and zinc foil may be obtained commercially of the required stiffness or hardness. It is probable that iron foil is also available though it has the disadvantage of rusting and being less corrosion resistant. The thickness of the foil used depends on its physical properties, availability, and cost per unit of area of surface covered. Although it is desirable to use the foil as thin as possible to lessen the cost of the sound-absorbing construction it is possible to use metal in thicknesses several times heavier than the above 0.002 inch copper foil, the thickness being determined by the supporting strength of the underlying material against the perforating pressure.

The sound-absorbing pad which is faced with the perforated metal may be any sound-absorbing material which may be formed into panels or pads and which has enough cohesion so that the facing may be attached thereto and made integral therewith. Loosely bound hairfelt is unsuitable because of the poor cohesion. When the metal foil is mounted on it by gluing or by the perforating operation to be described, it is torn off easily. A sound absorber of the structure of 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 are suitable. Certain types of plaster and ceramic sound-absorbers may also be used.

In the simplest form of my invention the sound-absorbing material 10 is faced with the perforated metal foil sheet 11. The size and number of the perforations 12 is in accordance with the description in the Norris patent. The metal foil, after perforating, is coated with a suitable adhesive and caused to adhere to the face of the pad or secured if desired in other ways. The foil may extend beyond the face of the pad and be made to cover the edges of the pad as shown and may be secured thereto in various ways. This adds to its appearance and gives added strength. Also, said foil conforms to the surface to which it is caused to adhere, whether the same is flat or otherwise formed. The perforated foil facing does not decrease the sound-absorbing quality of

the tile, provided of course that the glue or other adhesive is not allowed to coat the absorber opposite the perforations in the foil and thereby prevent the sound waves from entering the interior of the pad. The gluing operation makes the foil integral with the sound-absorbing pad.

The preferred form of my invention is made by placing the unperforated metal foil on the face of the sound-absorbing pad. The foil may be glued to the surface though this is not necessary. The foil is then perforated so that the metal displaced is not sheared off but forms tangs 13 which are forced into the sound absorber 14 as shown greatly enlarged in Fig. 2. If the punch used is properly designed, the form of the tangs can be controlled, that is, they may be made of any predetermined size and shape. The tangs may be anchored in the absorber as shown. It is apparent that if the metal foil is not hard or stiff enough the tangs cannot be forced into the absorber.

The preferred type of punch necessary to control the tangs without distorting and tearing the foil irregularly is described and claimed in Patent 1,837,451, issued December 22, 1931, on an application filed December 19, 1930 by Herman C. Lee. The punch, shown in Fig. 3, is polygonal in cross section, the number of sides depending upon the number of tangs that are desired. It consists of the body portion 15 by which the punch is held and the upper end of which is of a cross section equal to the size of perforation desired, usually from .004 to .0123 square inch in area. The body portion terminates in a truncated-pyramid portion 16 above which is an extension 17 of the body portion but decreased in cross-section. This portion then terminates in the pyramidal portion 18. When this double-pyramid punch is forced into the foil and absorber the result shown in Fig. 2, is obtained, the upper ends of the tangs being bent at an angle to the base portion of the tangs. This angle depends upon the angle of the truncated pyramid portion of the punch. The foil thereby becomes anchored in the absorber to become attached thereto and integral therewith. In addition, the foil which extends into the depression in the absorber, lines the side walls thereof. This is desirable since the metal foil facing may be painted and decorated without having the paint or other decorative material reach the absorber. Furthermore, the absorber is recessed sufficiently to be practically invisible to the eye.

The foil may be enameled or decorated prior to the punching operation to obviate the necessity for decorating afterward. The perforated metal facing may be applied to small or large tiles or to large panels or slabs which may be glued, nailed, screwed to or otherwise mounted on the surface to be treated. It is usually desirable to extend the foil beyond the face of the tile to cover the edges thereof as shown in Fig. 1 but such edges need not be punched. In some cases the foil may be extended to cover the back of the pad to completely encase it. Such completed encased pads are used advantageously under certain conditions.

In an alternative construction but one which is not preferred, the metal is punched separately leaving the tangs projecting outwardly. The sound absorber is then pressed onto the tangs. This method requires stiff metal or heavier metal to prevent bending of the tangs so that the absorber may be pressed into engagement with

the perforated sheet of metal to force the tangs into said absorber the maximum distance.

In another modification the foil is attached, as by gluing, to a thin sheet of non-metallic material 19 such as kraft paper or thin sheeting. This composite is used, as a facing for the sound absorber, with the lining adjacent the absorber, in the same manner as the foil is used. Where the tangs anchor the foil sufficiently to the sound absorber, as illustrated in Fig. 2, the lining does not have to be glued to the foil but may be inserted loosely. This lining reinforces the foil and hence adds strength to the structure.

I claim:

1. A sound-absorbing construction comprising a self sustaining sound-absorbing material faced with perforated metal foil, the tangs resulting from the perforating of said foil projecting into said material.

2. A sound-absorbing construction comprising a self-sustaining sound-absorbing material faced with perforated metal foil, said perforations being formed with the foil in place on said material, the pointed tangs resulting from the perforating of said foil projecting into said material, with the points spread apart and being anchored therein to hold said foil in place.

3. A sound-absorbing construction comprising a self-sustaining sound-absorbing material faced with metal foil with polygonal shaped perforations, said perforations being formed with the foil in place on said material, a multiplicity of hook-like tangs projecting inwardly from the perimeter of each foil perforation, said tangs resulting from said perforating operation and projecting into said material.

4. A sound-absorbing construction comprising a self-sustaining sound-absorbing material faced with perforated metal foil glued thereto, said perforations being formed after gluing said foil to said material, the tangs resulting from the perforating of said foil projecting into said material.

5. A sound-absorbing construction comprising a self-sustaining sound-absorbing material faced with perforated metal foil glued thereto, said perforations being polygonal shape and being formed with said foil glued to said material, the tangs resulting from the perforating of said foil extending inwardly into said material and lining the side walls of the depression formed in the material by said perforating operation.

6. A sound-absorbing construction comprising a self-sustaining sound-absorbing material faced with perforated metal foil, said metal foil extending beyond the face of said material and facing at least one edge of said material, the tangs resulting from the perforating of said foil projecting into said material.

7. A sound-absorbing construction comprising a self-sustaining sound-absorbing material faced with perforated metal foil, said metal foil extending beyond the face of said material and completely enclosing said material, the tangs resulting from the perforating of said foil projecting into said material.

8. A sound-absorbing construction comprising a self-sustaining sound-absorbing material faced with a perforated metal foil, the tangs resulting from the perforating of said foil projecting into said material, said tangs being of predetermined size and shape.

9. A sound-absorbing construction comprising a self-sustaining sound-absorbing material faced with reenforced perforated metal foil attached

thereto, said reenforcing comprising a sheet of thin material between said foil and said absorber.

5 10. A sound-absorbing construction comprising a self-sustaining sound-absorbing material faced with perforated metal foil lined with a sheet of fibrous material, the tangs resulting from the perforating of said foil projecting into said sound-absorbing material.

10 11. The method of making a sound-absorbing construction which comprises facing a sound-absorbing material with a metal foil, perforating said foil, forcing the tangs formed by said perforating operation into said material and
15 spreading the inner ends of said tangs laterally to provide positive engagement therewith.

12. The method of making a sound-absorbing

construction which comprises gluing a metal foil face onto a sound-absorbing material, perforating said foil, forcing the tangs formed by said perforating operation into said material and spreading the inner ends of said tangs laterally to provide positive engagement therewith. 5

13. A sound absorbing construction consisting of a wall or ceiling surface with a facing attached thereto comprising a self-sustaining sound absorbing material faced with perforated metal foil, the tangs resulting from the perforating of said foil projecting into said material, the surface of the absorbing material opposite to that faced with the perforated metal foil being adjacent said wall or ceiling surface. 10 15

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