Feb. 14, 1939. H. F. WEISS 2,147,276

SOUND-ABSORBING CONSTRUCTION

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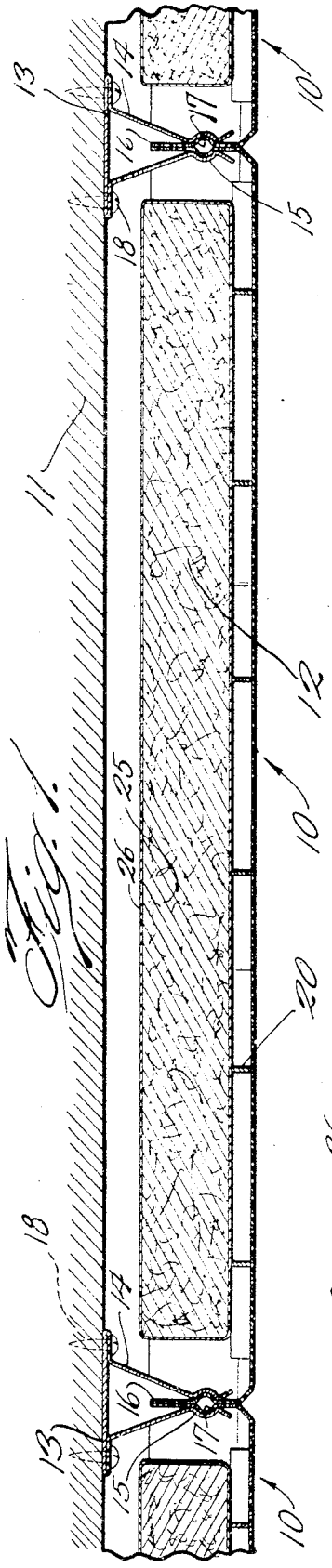


Fig. 1.

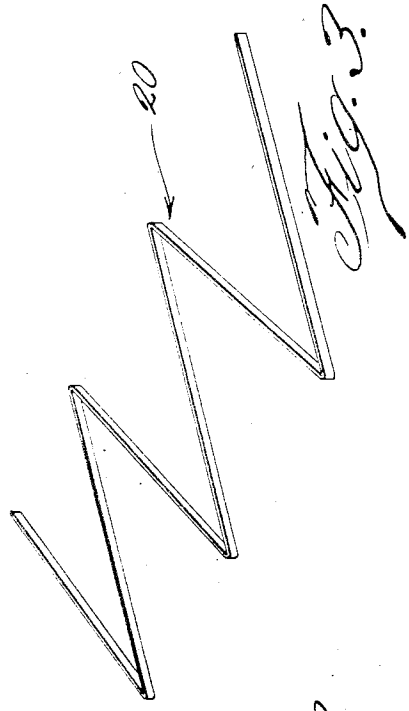


Fig. 3.



Fig. 4.

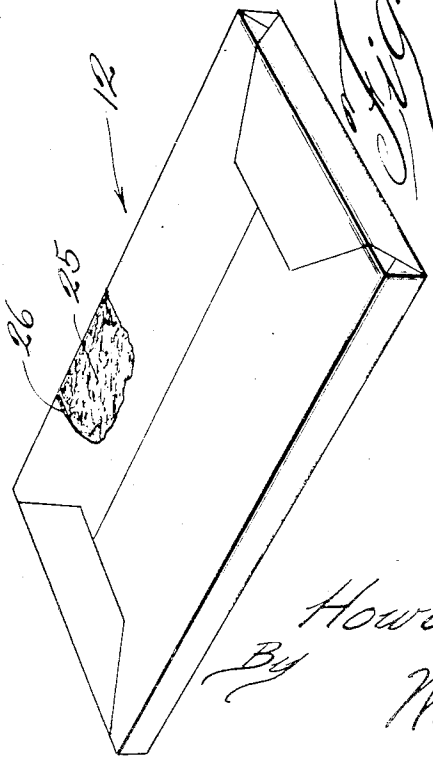


Fig. 2.

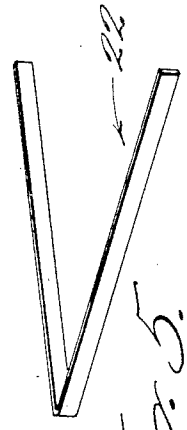


Fig. 5.

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UNITED STATES PATENT OFFICE

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SOUND-ABSORBING CONSTRUCTION

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Application February 6, 1937, Serial No. 124,350

3 Claims. (Cl. 20—4)

This invention relates to improvements in sound-absorbing constructions, particularly those in which the sound-absorbing material is concealed behind a decorative facing. An example of such a construction is disclosed in Norris United States Patent 1,726,500. The invention relates more particularly to a sound-absorbing unit which is adapted for use in such a construction.

The Norris patent discloses a sound-absorbing construction in which a foraminous sheet is used as a facing and supporting member for sound-absorbing material such as hairfelt, mineral wool, composition fiber board, balsam wool, porous ceramic bodies, and the like. These materials usually are not used in their loose fibrous or granular condition, because they are inconvenient to handle and it is difficult to obtain uniformity of acoustical results, and the loose fibers or granules filter through the openings of the foraminous facing and into the room below. The materials usually are fabricated into units by felting or bonding with an adhesive. Even when such units are used, the surface fibers or particles thereof become loosened and broken, particularly during shipment and handling, whereby the handling and installing operations are inconvenient and messy. In addition, the loose particles sift down through the openings of the facing after the sound-absorbing installation has been made. Similar results are experienced where the acoustical treatments are applied in situations where atmospheric conditions, or the vibration of the building, causes disintegration of the sound-absorbing material. In addition, where units of slender mineral fibers are used the fibers penetrate the skin of the workman and cause irritation and injury.

It is the object of the present invention to provide sound-absorbing units for treatments of the character described, which may be composed of loose fibrous or granular materials and which overcome the difficulties which have heretofore attended the use of such materials.

It is also the object of the invention to provide sound-absorbing units in which the sound-absorbing material may be felted or bonded together, in which the objectionable shedding of loose fibers or particles is prevented.

It is a further object of the invention to provide an improved sound-absorbing construction comprising a foraminous facing and the said improved sound-absorbing unit.

Briefly, the invention provides a body of sound-absorbing material which is enclosed in a wrapper, and confined by the wrapper against the escape of fine particles, the wrapper being of such character that the sound-absorbing effectiveness of the material is not modified appreciably by it. I have discovered that a body of porous sound-absorbing material, whether it be of fibrous or ceramic character, may be confined in a wrapper of thin, flexible sheet material, which may be solid and impervious to the passage of air, or substantially so, whereby the escape of fine particles therefrom is prevented, without modifying or impairing appreciably the ability of the porous material to absorb sound.

In the drawing:

Fig. 1 is a sectional plan view of the sound-absorbing construction of this invention assembled and applied to a wall or ceiling surface;

Fig. 2 is a perspective view of a sound-absorbing unit constructed in accordance with this invention;

Figs. 3, 4 and 5 are perspective views of different forms of members adapted to support the sound-absorbing unit in spaced relation to the facing.

In the sound-absorbing construction illustrated in Fig. 1, the facing is in the form of thin perforated sheet metal pans 10 which are supported in spaced relation to the surface of the ceiling 11 and carry the sound-absorbing units 12. The pans are supported in position by means of metal furring strips 13, which are T-shaped in cross section and are fastened to the wall or ceiling 11 by any suitable means, such as screws 18. The furring strips have leg portions 14 which extend downwardly from the ceiling surface and are provided with outwardly directed longitudinal beads 15. The pans have their marginal portions 16 turned upwardly at right angles to the main portions thereof, and the marginal portions are provided with inwardly directed beads 17 along at least two opposite sides thereof. The said marginal portions 16 are inserted between the leg portions 14 of the furring strips with the beads 17 in engagement with the grooves formed by the beads 15 of the furring strips, whereby the pans are supported firmly in position.

The sound-absorbing unit 12 may be supported directly in contact with the interior surface of the facing members 10, but preferably, it is arranged in spaced relation to the facing member. A suitable spacing means is shown in Fig. 3 and comprises a narrow zigzag shaped strip 20 of cardboard, chipboard, or the like. Other forms may be used, such as the circular strip 21 shown in Fig. 4 or the V-shaped strip 22 shown in Fig.

5. The spacing member is disposed with its edges in contact with the facing and the sound-absorbing unit and may be glued to the surface of the sound-absorbing unit, and is arranged over the length and width of the sound-absorbing unit in such manner as to form an adequate support.

The sound-absorbing unit consists of a body of porous, fibrous, granular or ceramic material **25** enclosed in an envelope or wrapper **26** of thin, flexible sheet material. In the sound-absorbing unit which is shown in Fig. 2, the sound-absorbing material may be in the form of a flexible pad of felted fibers, such as hairfelt, or a semi-rigid tile of wood fibers or mineral wool, or a rigid tile of porous ceramic substance, or it may be a body of loose fibrous or granular material, such as wood fibers, mineral wool, crushed pumice, coke, slag or the like.

The sheet material of the wrapper may be folded and arranged in overlapping relation as shown, and the folded portions may be joined to the body portion by means of an adhesive to form a unit which is convenient to handle. If desired, the overlapping portions may be glued together in such a manner as to seal the sound-absorbing material within the wrapper, and insure that no loose particles will escape from the wrapper. The wrapper may be in the form of a preformed, open-ended bag into which the sound-absorbing material, either in the shape of loose fibers or granules, or a preformed unit, may be inserted, and the open end of the bag folded and glued shut. The unit may be formed by depositing the sound-absorbing material on a traveling web of the wrapping material, cutting the web into sheets, and folding and sealing as described. The wrapper may be in any desired form which will confine the sound-absorbing material in a suitable manner.

The wrapper may be composed of any thin, flexible sheet material, which may be folded readily and is substantially impervious to air and will prevent the escape of fine particles of the sound-absorbing material. Suitable sheet materials are sized or unsized paper, asbestos paper, metal foil, such as foil of zinc, copper, aluminum, and other metals and alloys, and films of film-forming materials, such as regenerated cellulose and cellulose esters and ethers. Paper of various kinds and thicknesses may be employed, but a thin flexible paper in which the fibers are arranged irregularly, is preferred, an example of such material being kraft paper of approximately 0.0025 inch thickness. The metal foil may vary in thickness, also, aluminum foil of 0.003 inch thickness being an example of a suitable metal foil. The sheet material need not be quite solid and imperforate. Some of the thinner papers have a multiplicity of minute openings, or pores therein. Such pores are too small to permit the escape of any appreciable quantity of particles of the sound-absorbing material. Such paper may not be quite impervious to air, but it is substantially so, and is included among the substantially impervious materials, as that term is used herein. On the other hand, the wrapper may be free of openings and entirely impervious to air, as is moisture-proof regenerated cellulose.

If the sheet material is flammable, it may be flame-proofed to reduce fire hazards by treating it with a suitable flame-proofing material, such as a hot solution of ammonium sulphate. If the sheet material is of such character that it absorbs moisture and shrinks upon drying, it may be humidified prior to wrapping the body of sound-absorbing material. After the body is wrapped, the sheet material may be allowed to dry and the resulting slight shrinkage produces a tighter and more compact and convenient wrapper than is obtained when dry sheet material is used.

It has been found that the sound-absorbing effect of a body of sound-absorbing material is not impaired by a wrapper of the character described herein. The general sound-absorbing characteristics are substantially the same. The wrapper causes a slight increase in the sound-absorbing effect at low frequencies and a slight decrease at high frequencies. As the thickness, stiffness, or imperviousness of the wrapping material is increased, the described modifying effect upon the properties of the sound-absorbing material is increased. If it is desired to use a relatively heavy or dense sheet material the modifying effect at high frequencies may be minimized or avoided by puncturing the same with a multiplicity of minute perforations or pin pricks. The function of confining the absorbing material is not impaired by these minute punctures.

In addition to the advantages incident to the prevention of fine particles of the absorbing material from sifting down through the foraminous facing, the wrapped sound-absorbing units of this invention provide the advantages of permitting the use of less expensive loose fibrous or granular sound-absorbing materials and the making of the units of such materials in predetermined shape, size and density whereby they have a uniform, predetermined sound-absorbing effect. The units are compact articles which may be handled with ease and facility, and which do not cause any mess, or irritation to the skin of the workman. In addition, the wrapper prevents the accumulation of dust in the interstices of the sound-absorbing material which may otherwise occur with use, and which results in a reduction in the sound-absorbing effect. It also tends to prevent the entrance of vermin where materials of organic composition are used.

I claim:

1. In combination with a wall or ceiling surface of a room, a foraminous, sound-transparent member in spaced relation to said wall or ceiling surface and a sound-absorbing unit between said wall or ceiling surface and said foraminous member, and in spaced relation to said foraminous member, said sound-absorbing unit comprising a body of porous, sound-absorbing material and a wrapper of thin, flexible substantially air-impervious sheet material enclosing said body, and means for spacing said unit from said foraminous member comprising narrow strip material between and in edge contact with said unit and said foraminous member.

2. The combination of claim 1 in which the strip material is adhesively joined to the sound-absorbing unit.

3. The combination of claim 1 in which the narrow strip material is of zigzag shape and is arranged across substantially the length and width of the foraminous member and the sound-absorbing unit.

HOWARD F. WEISS.