March 27, 1934. J. MAZER 1,952,766

SOUND ABSORBING MATERIAL AND METHOD OF MAKING THE SAME

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Fig.1.

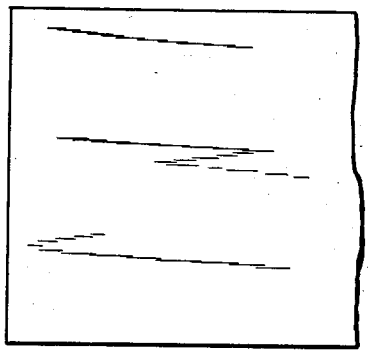


Fig.2.

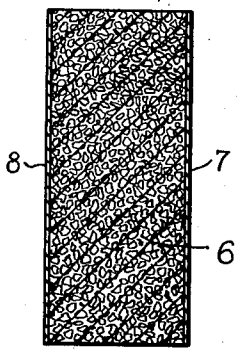


Fig.3.

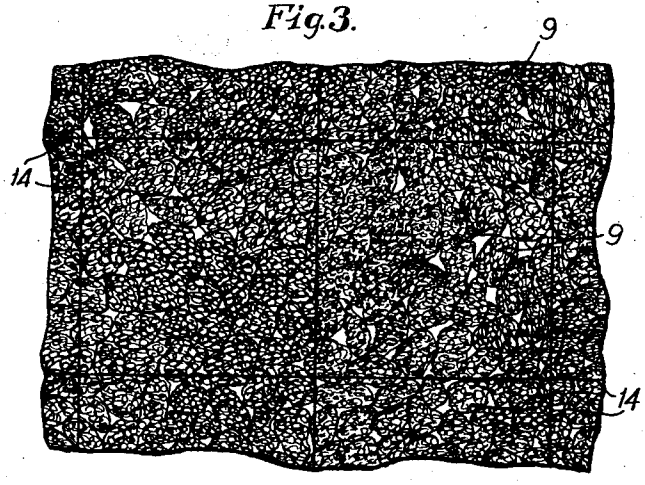
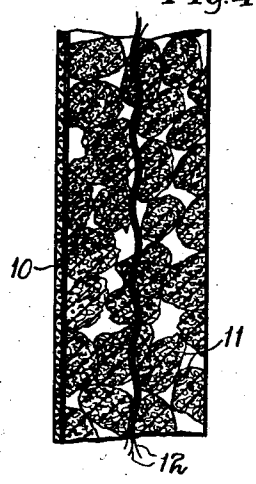


Fig.4.



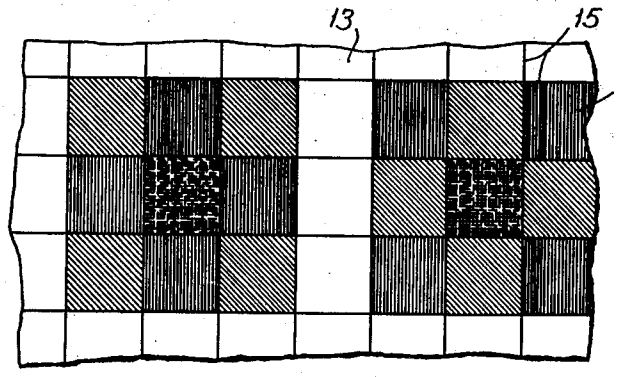


Fig.5.

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SOUND ABSORBING MATERIAL AND METHOD OF MAKING THE SAME

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Application January 2, 1930, Serial No. 418,005

7 Claims. (Cl. 154—28)

My invention relates to sound-absorbing material and a method of making the same, and more particularly to materials such as are applied to the walls and ceilings of auditoriums and other rooms, to improve the conditions for hearing or to reduce noise by definitely absorbing and controlling reverberation of sound waves.

One object of my invention is to provide sound-absorbing material which is highly elastic and flexible, so that it will yield under slight impacts such as those of sound waves, and which can be handled without damage and readily compressed or expanded to snugly fill designated wall spaces.

Another object of my invention is to provide a porous sound-absorbing body or unit having intercommunicating pores of desired sizes and wherein the walls of the pores are elastic.

A further object of my invention is to provide a sound-absorbing body that is of generally improved characteristics in the way not only of sound-absorption, but which is simple of manufacture and conveniently handled and installed.

Another object of my invention is to provide a sound-absorbing material of such nature that the particles entering into the completed body may be assembled at the place of installation or may be formed into units of various sizes, and such units assembled in such manner that there are no objectionable visible lines of division between the units.

Still another object of my invention is to provide sound-absorbing material of such character that it may present a highly decorative appearance without the necessity of applying a decorative facing thereto after installation.

In the accompanying drawing, Figure 1 is a face view of sound absorbing material made according to my invention; Fig. 2 is a sectional view thereof; Fig. 3 shows a modification of the structure of Fig. 1; Fig. 4 is a sectional view showing another modification, and Fig. 5 is a face view showing still another modification.

Material which I employ is of a sponge-like nature containing, throughout the mass, cells of desired sizes, depending upon the percentages and pitches of sounds to be absorbed. Thus, for sounds of comparatively low pitch, such as those in the neighborhood of the first octave of the musical scale (64 vibrations per second), cells of a given size will be effective in the absorption of those sounds, while in the neighborhood of the higher octaves of the musical scale, the fifth, sixth and seventh (1024, 2048 and 4096 vibrations per second, respectively), for example, cells of smaller size will be employed.

One composition of which my sound units may be formed consists of an ordinary rubber compound containing sufficient sulphur to effect vulcanization thereof in the usual manner. With this compound, I incorporate materials which may form cells in the rubber either by dissolving away portions of the rubber or by forming gases therein which will expand under heat and about which the rubber will become set upon vulcanization of the mass.

Sponge rubber is made in various colors and I may assemble small bits of sponge rubber of a given color as hereinafter set forth to form a sound-absorbing unit, or I will take small bits of sponge rubber of various colors and assemble them into a unit to produce a variegated and hence decorative effect.

Not only will a unit made in this manner be in itself of pleasing appearance without the necessity of decorating it, but it is of different sound-absorbing capacity than an integral mass of sponge rubber. In the case of an integral mass of rubber, its sound-absorbing capacity is determined by the inherent number and sizes of the cells or pore spaces. In the case of a body composed of a plurality of bits of sponge rubber, the sound-absorbing capacity is increased through the presence of additional pore spaces between the bits of rubber entering into the completed unit.

In Figs. 1 and 2, I show a sound-absorbing body composed of sponge rubber or similar elastic porous material, as disclosed in my application Serial No. 380,328, filed July 23, 1929, except that in the present instance, the porous body is made up of a plurality of particles of sponge rubber or the like that are glued or vulcanized together. As shown more clearly in Fig. 2, the porous body 6 has smooth facings 7 and 8 that may consist of sheets of rubber or cloth to which the sponge-like body is fastened by rubber cement or other suitable material. In the case of rubber facings, the sponge particles could be caused to adhere thereto by vulcanizing the mass between heated metal plates, the facings 7 and 8 with the interposed sponge rubber particles being loosely assembled and placed between heated metal plates and subjected to pressure.

The sheets 7 and 8 could be dispensed with and the spongy mass placed between heated plates to effect vulcanization of the particles. If the heat and pressure were sufficient, a skin-like facing or film would be formed on the surfaces of the mass, as indicated at 7 and 8.

The particles can be glued together by rubber

cement and the smooth facings dispensed with if desired, as shown in Fig. 3, it being understood that the various particles may be of a given color and size or of different colors and sizes depending upon the decorative and sound-absorbing effect desired.

Each of the block-like devices 9 in Fig. 3 may be composed of a plurality of smaller bodies of sponge particles that are formed by gluing the particles together. The larger blocks would be formed by assembling the smaller blocks together, with their abutting edges in snug engagement with one another, so as to avoid the presence of any marked line of division between such smaller blocks. The edges of the sponge particles are of course flexible, so that when one block is brought into proximity to another, the edge particles thereof will intermingle, leaving no distinctive line of division. The larger blocks 9 can of course be assembled in a similar manner, that is, brought together with such sufficiently snug fit as will cause yielding and the intermingling of the particles at the abutting edges and leaving no perceptible line of division between them.

The sponge particles can be applied either directly to a ceiling after first applying glue cement or other suitable adhesive on the ceiling or it can be formed into units as above described and the units applied to a ceiling or wall by gluing or in any other suitable manner.

Referring to Fig. 4, I show a structure wherein a reinforcing facing 10 is provided for one side of the sponge body 11 and reinforcing strands of vegetable or mineral fibres 12 are contained within the spongy mass 11. The strands 12 may be in the form of a loosely woven mat or simply laid in place during assembly of the sponge particles to form the body 11, while the body 11 may be fastened to the facing 10 by glue, rubber cement, vulcanizing or other suitable means.

In Fig. 5, I show a sound-absorbing structure composed of spongy blocks 13 of various colors. These blocks may be formed as are the blocks 9 and secured to a facing or a backing sheet such as the facings 8 or 10, or applied directly to a wall or ceiling in various mosaic patterns. The blocks 13 are indicated as of various size particles and of various colors such as red, green, yellow, etc., but it will be understood that each block may be of various sizes of particles and variegated color instead of a single given color.

From the foregoing, it will be seen that I provide a sound-absorbing structure that is not only composed of material which is inherently porous, but pores are formed between the particles entering into the structure as shown more clearly in Figs. 2, 3 and 4, and these intervening pores are more numerous than would be the case if particles were not of irregular contour. Furthermore, the structure can be readily formed to various degrees of thickness, can be flexed and compressed to effect snug fit with a wall surface and can be stretched to completely fill a space which is of somewhat larger dimension than the unit being applied thereto. Again, the material has great sound-absorbing capacity per unit of weight, thus not adding excessive weight to the building by reason of its installation thereon, and a given body of the material may be composed of spongy pieces which are of different porosities.

Decorative effects can be produced in the facing, to simulate lines of division, by means of a wire mesh formed into the pattern indicated by the lines 14 of Fig. 3, and the lines 15 of Fig. 5, such wires being heated and pressed against the material. The wire could of course be of heavier metal to form more pronounced lines and wire mesh of other shapes could of course be employed.

Another manner in which the pieces of rubber could be applied to a surface in various patterns would be by employing a pattern sheet of mesh-like form having openings therethrough, such as the spaces defined by the lines 15 of Fig. 5, or a sheet having openings formed therethrough of various other shapes, through which opening various colors of the spongy pieces could be applied to a wall, similar to the manner employed to apply decorations in color by means of stencil designs.

While I have more particularly described a sound-absorbing structure composed of elastic sponge-like material, I also contemplate the use of flexible particles or yieldable particles, such as bits of sheet rubber, that are not necessarily of such great porosity as a unit formed of sponge-like particles. In such a structure, there is flexibility and yieldability which makes for sound absorption, and also pore-like spaces between adjacent particles.

I claim as my invention:—

1. A sound-absorbing body composed of loosely assembled pieces of elastic sponge-like material of irregular contour and held in superposed relation.

2. A sound-absorbing body composed of pieces of flexible sponge-like material assembled in a non-compact mass, and interspersed reinforcing strands, all connected together in unitary relation.

3. A sound-absorbing body consisting of non-compact pieces of elastic sponge-like material assembled in superposed relation and connected to a flexible sheet.

4. A sound-absorbing body composed of a non-compacted mass of irregularly-shaped pieces of springy sponge rubber assembled in unitary relation.

5. A sound-absorbing body composed of pieces of rubber assembled in non-compact relation, but united by vulcanization with a skin-like facing.

6. The method of making sound-absorbing material which comprises assembling a plurality of elastic sponge-like pieces in non-compact relation, and vulcanizing the same to form a skin-like facing uniting said pieces.

7. A sound-absorbing body composed of irregularly shaped pieces of sponge-like material of various sizes, supported in unitary relation to form a mass with irregularly-shaped interparticle spaces that are also of various sizes.

JACOB MAZER.