Feb. 3, 1934. G. A. NEW 1,946,914

SOUND ABSORBING AND INSULATING COMPOSITION

Filed March 30, 1931

Fig. 1.

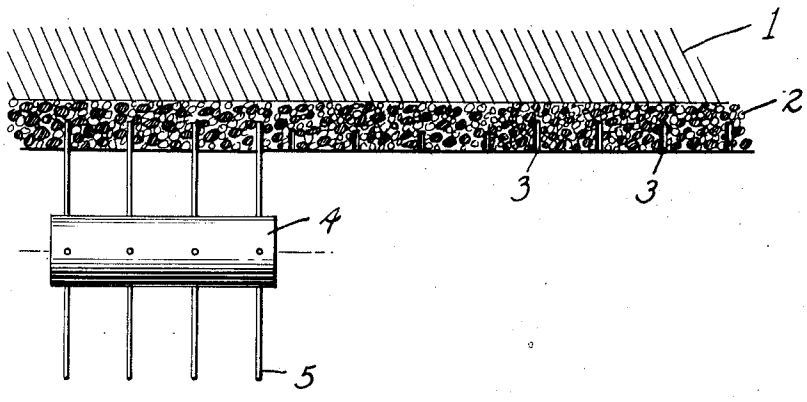


Fig. 2.

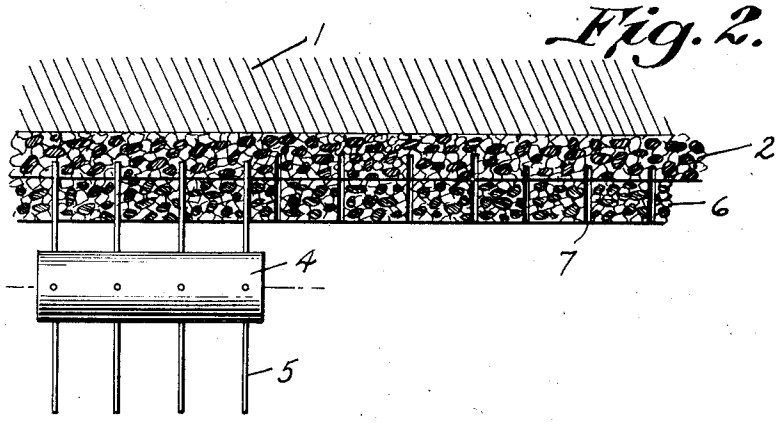
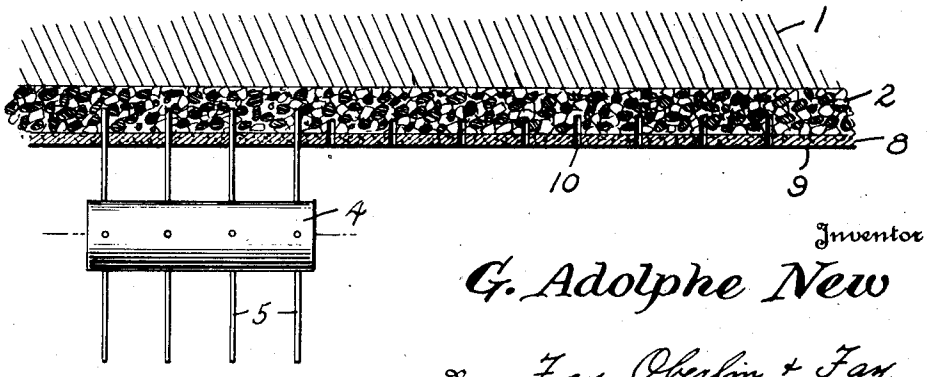


Fig. 3.



Inventor

G. Adolphe New

By Fay Oberlin & Fay

Attorneys

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asbestosclaims.law/library/23681/1

Patented Feb. 13, 1934 1,946,914

UNITED STATES PATENT OFFICE

1,946,914

SOUND ABSORBING AND INSULATING COMPOSITION

Gustave Adolphe New, Lakewood, Ohio, assignor, by mesne assignments, to National Gypsum Company, Buffalo, N. Y., a corporation of Delaware

Application March 30, 1931. Serial No. 526,574

3 Claims. (Cl. 72—17)

The present invention, relating as indicated to a sound absorbing and insulating composition, is more particularly directed to a new and improved composition of this character which may be applied in plastic form to produce a wall or ceiling coating having high sound absorbing and insulating properties. A further object of the invention is the provision of a material of this character which will be inexpensive to manufacture and apply and one which will be high in sound absorbing capacity. The invention relates more particularly to a combination in a wall composition or treatment of a treated base coat of a high sound absorbing capacity accompanied with a washable finish coat.

My invention then consists of the steps hereinafter fully described and particularly pointed out in the claims; the following description setting forth in detail certain steps embodying the invention, such disclosed steps constituting, however, but one of the various ways in which the principle of the invention may be used.

Fig. 1 is a horizontal section of a wall and base coat applied thereto; Fig. 2 is a similar section showing a base and top coat; and Fig. 3 is a similar section of a modification.

In the treatment of walls in houses, schools, hospitals, auditoriums, etc., it is common practice to apply a specially prepared plaster having sound absorbing capacity over an ordinary so-called scratch or brown coat of common plaster which is first applied to plaster board, wooden or metal lath or similar material. This initial base coat has no sound absorbing value and is not heat or cold resisting so that the only sound absorption obtained in the usual treatment is that which is secured from the specially prepared surface coat, which ordinarily consists of gypsum, stucco and asbestos.

In order to obtain a highly efficient sound-absorbing and insulating wall and one having a high value of insulation which is today so much desired, I have developed a method and a compound to be used therein which produce not only a greater insulation against heat and cold, but also a very much higher sound absorbing value than in the method described above. My improved method consists in the application over a wall 1, ceiling or other surface to be treated, which may be formed of plaster board, brick, concrete or like material, of a base coat 2 consisting of freshly calcined gypsum stucco as a binder, together with asbestos, shredded paper, cornstalk pulp or the like, mineral wool and a material such as granulated cork, granulated felt or mineral material, such as Zonolite, in the proportions of 25% of stucco, 52% of asbestos, 2% of Zonolite and 20% of mineral wool. The gypsum stucco should have a consistency or slump of not more than five inches in diameter, according to the specifications of the American Society for Testing Materials.

No explanation need be made either as to the character or the purpose of the asbestos, paper pulp or the like, as both are materials which are light in weight for their bulk and both are either porous or produce porosity in a material in which they are used. The mineral wool, however, is of considerable importance and requires some further explanation.

Zonolite is a non-metallic mineral which, when calcined at 3000°, expands or literally explodes, producing approximately 16 times the original bulk of material, and having a weight of about 8½ pounds per cubic foot. When cooled after this treatment it is a cork-like material containing numerous air cells and is both very light and relatively cheap. It is immune to the effects of temperature, moisture or acids, and I have found that this material ground to about 8-mesh is particularly well suited to use in the composition I have described.

Mineral wool is a molten silica rock. When in molten state it is drawn by means of passing steam into long fibers. The latter are then annealed making the mass very porous, elastic and tough. Slag wool may be substituted; it is made from the refuse of blast furnaces by blowing steam or hot air through the molten slag.

This composition, formed of the materials and in the proportions stated, is applied in the same manner as the ordinary brown coat or scratch coat of plaster to a wall 1 and, when set, forms a highly porous layer 2 of considerable insulating value and of high sound absorbing capacity.

This scratch coat 2 will set if mixed in the ordinary way in approximately three to four hours and before it is set, and before the crystallization is complete I puncture the entire mass of material by means of a roller 4 or block provided with a plurality of projecting pins 5 of sufficient depth to pass through the entire thickness of this base coat, as shown in Fig. 1. Treatment of the surface in this manner with a large number of very minute openings 3, which are necessarily irregularly arranged since it is impossible and undesirable for the workmen to exactly space the same or to apply the roller or puncturing tool 4 uniformly over the surface,

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greatly increases the surface area, and acts as receiving openings 3 for sound waves striking the surface. When the pins 5 penetrate into the mass of material 2 they displace the coarse flakes of the expanded rock wool and produce additional voids in the material. There is thus formed a sound absorbing base coat on the wall to be treated.

I next apply a finish or surface coat 6 to the coating just described in which substantially the same materials are applied as in the base coat 2, the proportions being changed as may be required to produce smooth or coarse surfaces and to produce different colored coatings. The general proportions of this surface coat 6 are, however, those of the base coat 2 and the physical characteristics and functions are substantially the same. It will be understood that there may be substituted for the gypsum stucco in either or both the base or surface coatings, Keene cement, hydraulic cement or other carbonaceous or cementitious material.

The surface coat 6 is applied in a plastic condition over the base coat, being troweled smooth in the usual manner and sufficiently to work particles of the top coat into the openings and pores of the base coat. It is then punctured in the same manner as the base coat with tools 4 having projecting pins 5 of a length sufficient to pass through the thickness of the top coat 6 and into the base coat 2 beneath. After the surface has thus been punctured and provided with an immense number of very fine openings 7 to act as sound receiving recesses it may be textured or floated in any of the usual manners without materially decreasing its sound absorbing efficiency. The surface coat 6, as well as the base coat 2 of the material, consists of a mass of fine cells, pores or channels opening into each other and produces a maze of passages into which sound is led, not only through the natural openings in the surface, but also the artificial openings 7 produced by the puncturing so that the sound waves striking the surface are carried through innumerable tortuous channels and are thus forced to give up their energy, causing the sound to be converted into the walls of these passages. The resulting wall has high insulation value and remarkably high sound absorbing capacity, and is but slightly more expensive in application and is capable of being treated in all of the usual ways to produce various appearances of wall.

The above described composition has high sound-absorbing value but some low structural value on account of the softness of the material when dry. In order to increase the hardness of the material so that it may be washed, while retaining a sufficient sound absorbing value, I may omit one or the other of the ingredients named above. Thus for hardness or washability the asbestos may be omitted or reduced in quantity and the mineral wool increased.

Also in order to produce a washable surface 9 the base composition described above is coated with a thin film 8 approximately $\frac{1}{16}$ of an inch thick of a mixture consisting of white Portland cement (50%), mineral fibre (18%), asbestos (30%), and a small amount, (say 2%) of aluminum stearate. This composition, which of course may be varied somewhat, both as to the quantities of the ingredients used and as to the particular ingredients, is coated over the previously described composition 2 and then punctured, forming openings 10 within, say an hour, of its application, in order to provide an exterior finish which may be washed or scrubbed. Furthermore, the application of this finishing coat produces a harder set in the underlying material and increases the total structural value by a material amount.

The application of a thin coat 8 of this washable dense and hard material over an underlying layer of soft material improves the sound absorption very considerably. Recent tests show an increase in the absorptive capacity of a given wall consisting of the mixture here described as the underlying coat of approximately 50%, which is secured by the application of a thin, hard washable outer coat 8 of the composition and in the manner described. In addition to the increase in the sound absorption the light reflecting quality and capacity of the wall is also increased a very considerable amount.

The advantages of the foregoing constructions will be seen to consist in the provision of a base coat which may or may not be perforated in combination with a finish coat that in no way diminishes the sound absorbing qualities of the base coat. In one instance (Fig. 2) the outer or finish coat comprises a relatively soft wall which in itself is sound absorbent. This wall may be perforated and if the base coat has been perforated the perforation in some instances will coincide to form rather lengthy continuous passages within which the sound may be entrapped. If, on the other hand, a hard washable surface is desired the construction illustrated in Fig. 3 may be utilized and here again the coinciding perforations may be availed of, which in addition to the natural voids forms an excellent means of absorbing the energy of the sound waves.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the composition and method herein disclosed, provided the ingredients or steps stated by any of the following claims or the equivalent of such stated ingredients or steps be employed.

I therefore particularly point out and distinctly claim as my invention:—

1. In a method of sound-proofing a surface, the steps which consist in applying thereto in a plastic condition a mixture of a sound absorbing composition, forming a multiplicity of minute sound absorbing recesses, and then applying a second coating of plastic sound absorbing material of relatively harder composition over the first named coating and forming a series of sound absorbing recesses extending substantially through both coatings.

2. In a method of sound-proofing a surface, the steps which consist in applying thereto a relatively thick soft sound-absorbing composition, then applying a relatively thin hard washable composition over said first-named composition and providing a multiplicity of minute recesses extending through said outer layer of hard composition.

3. A sound absorbing wall including a layer of a cementitious material, asbestos and mineral wool, and a second layer comprising Portland cement, mineral fibre and aluminum stearate.

G. ADOLPHE NEW.