106/88

Patented Aug. 14, 1945 2,382,561

UNITED STATES PATENT OFFICE

2,382,561

SELF-OPENING, SOUND-ABSORBING PLASTER

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No Drawing. Application May 19, 1941, Serial No. 394,141

11 Claims. (Cl. 106—88)

This invention relates to a self-opening, sound-absorbing plaster with a cementitious base and which may be used as a trowel-applied plaster upon regular brown base coats, gypsum lath and the like or made in the form of sound-absorbing slabs or blocks to be attached to walls and ceilings.

Broadly stated this invention consists in providing a recrystallizing binder or cementitious mass which may be partially calcined gypsum or similar substance adapted to be made plastic by the addition of water and which, after a time, will set into a hard mass, mingling with such substance an appropriate filler material, an aerating substance such as pulverized soap bark or other aerating matter, a surface active agent, adding water and agitating the mass thereby entrapping within the mass a substantial quantity of air in the form of bubbles, the surface active agent serving to act upon the surface tension of the filaments of the froth bubbles causing them to break in due time and open up the body and surface of the mass into myriads of interconnected pores.

So far as I am aware, no one has heretofore discovered that porosity may be achieved in the body and surface of such a plaster mass by subsequently weakening the relatively firm filaments of froth bubbles within the mass through the employment within the mix of a chemical that will weaken the filaments of the froth bubbles and thereby cause the froth bubbles to break in due time.

The presence of the surface active chemical imparts many further and additional advantages as hereinafter more fully shown. It avoids the need for prolonged agitation of the mass. It avoids the need for gas-forming matter and for stippling and other after-treatment to open pores within the body and upon the surface of the mass.

Many efforts heretofore have been made by those skilled in the art to produce sound-absorbing plasters with gypsum or similar cementitious base through the employment of aerating agents of which pulverized soap bark is an example. These plasters have been relatively unsatisfactory for the following reasons: First, when a sufficiently large amount of aerating matter is included in such a mass as to cause aeration with a limited amount of agitation, bubbles of strong surface filaments are formed which convey with them continuous thin formations of the binder which crystallize and bridge over the potential pores in the body and upon the surface of the mass and remain so bridged after the mass has dried out thereby resulting in a mass of very poor sound-absorbing properties. Second, the efforts of those skilled in the art to overcome the prohibitive condition of firm bubble filaments by reducing the amount of aerating matter have not been successful as when smaller ratios of aerating matter are employed, long and vigorous agitation of the mass in the presence of water is necessary in order to achieve appreciable aeration as a step toward forming a sound-absorbing mass. This prolonged and vigorous agitation causes partial crystallization of a substantial part of the binder prior to troweling the mass into its final physical shape thereby resulting in a structurally weak mass. Third, the addition of substantial amounts of gas-forming matter heretofore so frequently tried by many manufacturing concerns to promote aeration and lessen agitation is likewise harmful as the gas-forming matter crystallizes within the mass during agitation and undesirably affects the binder by hastening the crystallization of the binder during agitation thereby further injuring the plaster mass. Fourth, the presence of gas-forming substances in substantial amount causes efflorescence and the floating to the surface of particles of the binder thereby closing the surface openings of the potential pores. Stippling and many other forms of abrasion have been undertaken by others to overcome these difficulties which add to the cost as well as result in unsightly walls and ceilings.

I have discovered that all of these difficulties can be overcome by the inclusion of a minor amount of a surface active agent.

The presence of the surface active agent achieves several unexpectedly desirable results in such plaster masses when aerating matter is also present. First, when a surface active agent is present as herein shown, a substantially increased amount of aerating matter may be effectively employed without causing the ultimate bridging over of the potential pores. Second, due to the presence of the surface active agent the harmful gas-forming matter which undesirably accelerates the setting of the binder during agitation may be omitted when desired thereby avoiding appreciable crystallization of the binder during agitation. Third, the presence of the surface active agent avoids efflorescence and also the floating of particles of the binder over the surface openings of the mass. Fourth, the presence of the larger ratio of aerating matter made possible by the employment of the surface active agent enables full aeration to be achieved with brief agitation which is a substantial advantage as it avoids the prior crystallization of the binder heretofore caused by long agitation or the presence of substantial

amounts of gas-forming matter. Fifth, and probably the most important feature of all, the surface active agent acts upon the surface tension of the froth bubbles and reduces, in due time, the filament strength of the bubbles of the aerating matter causing them to break after the mass has been troweled on the wall or formed into blocks thereby opening the body and surface of the mass into a connectedly porous, highly sound-absorbing mass of great structural strength.

An important feature of this discovery is that a large part of the effect of the surface active agent upon the surface tension of the bubble filaments comes at a time substantially after the physical effect of the aerating agent upon the mass. That is, the aerating matter forms the froth bubbles wtihin the mass during agitation in the presence of water where these bubbles remain sufficiently long to support the mass during its application as a plaster or its formation into blocks, whereas thereafter and in due course the surface active agent takes effect upon the filaments of the froth bubbles causing them to burst and thereby serving at the proper time as a defoaming agent for the mass which transforms the body and the surface of the mass into a highly porous mass that sets firmly about the filler material.

It is known that many of the alcohols and their comparable fatty acids, oils and esters contain an active principle designated as a surface active agent which has many uses in the arts. Most of these alcohols and their comparable fatty acids, oils and esters are in liquid state and are not readily soluble in or miscible with water. In many instances these characteristics are handicaps in the employment of their surface active principle in dry mixes or in conjunction with water. It is also known that such substances as sulphur or sulphur and sodium become a carrier or vehicle for such surface active chemical or principle, and when in proper chemical unification with such surface active substances convey the surface active principle into solubility or miscibility with water and that some of these reaction products have the further advantage of being dry compounds. As this invention is concerned with the employment of the surface active principle, a listing of all possible carriers or the details of the methods employed to chemically unify the surface active principle or chemical with its vehicle or its formation into a dry substance appear not to be germane to this disclosure. The words "sulphonated" and "sulphonation" when employed herein and in the appended claims represent an effective form of vehicle and each is intended to include the sulphates, sulphonates, and the reaction products of sulphuric acids, sulphuryl acids and sulphonic acids and mixtures and combinations of the same in any desired proportion whereby to form the said vehicle.

As examples of the surface active principle in chemical combination with a carrier, some of the more common are the sulphonated reaction products of castor oil and other similarly reacting oils as well as the sulphonated reaction products of the fatty acids, the sulphonated reaction products of the appropriate alcohols, the sulphonated reaction products of naphthalene, the sulphonated reaction products of the lauryl and cetyl compounds and the sodium or like salts of such sulphonated substances. The list of equivalents is obviously too extended to include herein in its entirety. These are given as examples and the scope of my invention and the spirit of the appended claims are not limited to the employment of these compounds. There are many other well known oils and compounds which contain the surface active principle and which unite with a vehicle and convey their surface active properties to the dry or liquid reaction product and which are effective for the use herein shown and are regarded herein and in the appended claims as chemical equivalents of the preferred chemicals named herein. For the purposes of this invention the term "defoaming substance consisting of a surface active chemical" refers to any chemical that has the herein described properties of acting upon the surface tension of froth bubbles within such a mass whereby to cause them to break in due time.

The liquid surface active agents of which Turkey red oil (sulphonated castor oil) is among the more widely known as well as the dry surface active agents may be employed in the fabrication of the herein shown plasters, blocks, slabs and the like. When these blocks, slabs and other forms are made in factories the liquid surface active agents may be mixed readily with the water of fabrication or other ingredients. However, surface active agents that are in dry state are preferred for general use as these dry substances can more readily be mixed into the dry plaster mix and transported dry for use by the addition of water at the time of use. Examples of these dry substances are sodium lauryl sulfate and sodium cetyl sulfate each of these being the sodium salt of the half sulfuric acid esters of normal primary fatty alcohols by which I mean alcohols containing from 8 to 18 carbon atoms in the molecule. Another example of such sulfonated dry surface active substances which I have found effective for the purpose herein shown is alkylated napthalene soduim sulphonate by which I mean alkylated napthalene sodium sulfonates such as isopropyl naphthalene sodium sulfonate, isobutyl naphthalene sodium sulfonate and the like, the di-isos being preferred and sodium alkyl sulfonate is another example of dry sulfonated surface active equivalents for the herein described use as a defoamer.

The liquid or dry surface active agents which are also referred to herein as surface active chemicals do not react appreciably adversely upon the recrystallizing or setting properties of the binder.

The effects produced by the presence of the surface active agent are pronounced or unexpectedly impressive in such plaster compositions as herein described and when employed in the combination as herein shown the proportion of the surface active agent to the total mass must be restricted to minor ratios preferably from ¼ pound to less than 6 pounds to the ton. Some of the surface active chemicals when employed alone in substantial ratios with pure water will cause froth bubbles to form within the water but become de-foamers when employed in minor ratios in a plaster mix of the kind herein shown. The term "de-foaming" when used herein and in the appended claims means a de-foaming substance when employed with such mixes as herein described.

Conventional aerating agents are effective for the aerating purposes herein shown. Saponaceous substances such as pulverized soap bark are preferred, however, as they do not appreciably attract termites and do not adversely affect the cementing properties of the binder to a noticeable degree.

In the preferred embodiment of this invention binders of calcic substances such as partially calcined gypsum base stuccos such as mixing plant stucco, plaster of Paris and other gypsum stucco, all of which are referred to herein generically as gypsum stucco, are employed. Mixing plant stucco is partially calcined gypsum stucco which is unretarded, unaccelerated and unfibered.

Any appropriate filler material may be employed in the herein described plaster. Rock wool, mineral wool or expanded slag are desirable as they are inorganic matter. Expanded slag has a further advantage of requiring a relatively small amount of water to plasticize the mass in which it is the major filler ingredient. As appropriate organic fibrous or like matter will serve sufficiently well physically to be practical for such use it is regarded herein and in the appended claims as an equivalent of the rock wool, mineral wool or expanded slag.

The inclusion of such matter as commercial retarders in appropriate amounts when desired to retard setting of the calcic binder, plasticizing matter such as asbestos, bentonite or talc as well as coloring matter and hair or like fibre when desired are regarded as factors well known to those skilled in the art and are therefore covered in the spirit of the claims.

For the further aid of those desiring to use this invention the following examples or formulae of sound-absorbing compounds made with a calcic binder are given in parts by weight:

No. 1. Mixing plant stucco 1500 commercial retarder 1½, powdered soap bark 14, sodium lauryl sulfate ¾, rock wool 500.

No. 2. Mixing plant stucco 1500, commercial retarder 1½, powdered soap bark 14, sulfonated castor oil 2, rock wool 500.

No. 3. Mixing plant stucco 1500, commercial retarder 1¾, powdered soap bark 14, alkylated naphthalene sodium sulfonate 1, rock wool 500.

No. 4. Mixing plant stucco 1400, commercial retarder 1¾, powdered soap bark 14, sodium alkyl sulfonate ½, rock wool 600.

No. 5. Mixing plant stucco 1400, commercial retarder 1¾, powdered soap bark 14, sodium cetyl sulfate 5, rock wool 600.

No. 6. Mixing plant stucco 1600, commercial retarder 2, powdered soap bark 14, sodium lauryl sulfate ¾, expanded slag 1600.

The surface active substances shown herein are of commercial grade many of which contain a relatively high proportion of inactive sodium salts and standardizing matter. For example, the sodium lauryl sulfate contains about 45% of the active principle, the alkylated naphthalene sodium sulfonate contains 65% to 70% of the active principle and the sodium alkyl sulfonate contains about 35% of a mixture of sodium salts of sulfonated petroleum hydrocarbons which constitute the active principle. Other modes of applying the principle of my invention may be employed, change being made as regards the materials employed, provided the ingredients stated in any of the following claims or the equivalent of such stated ingredients be employed and I do not wish my invention to be limited to the particular materials or proportions given herein except in accordance with the spirit and scope of the appended claims.

Having described my invention, I claim:

1. A dry plaster mix which after being plasticized with water and agitated will set into a hard, porous, sound-absorbing mass said mix comprising a binder from the group consisting of partially calcined gypsum, plaster of Paris and gypsum stucco, filler material, soap bark and a surface action de-foaming substance consisting of sodium lauryl sulfate.

2. A plastic plaster mass which will dry and set into a hard, porous, sound-absorbing mass said plastic mass comprising a binder from the group consisting of partially calcined gypsum, plaster of Paris and gypsum stucco, water, filler material, soap bark in aerated state and a surface active de-foaming substance consisting of sodium lauryl sulfate.

3. A plastic plaster mass which will dry and set into a hard, porous, sound-absorbing mass said plastic mass comprising partially calcined gypsum, water, filler material, a water soluble saponin glucoside in aerated state and a defoaming substance consisting of a surface active chemical from the group consisting of sulphonated castor oil, sodium lauryl sulfate, sodium cetyl sulfate, alkylated naphthalene sodium sulfonate and sodium alkyl sulfonate.

4. A dry plaster mix which after being plasticized with water and agitated will set into a hard, porous, sound-absorbing mass, said mix comprising a recrystalizing calcic binder from the group consisting of gypsum stucco, plaster of Paris and partially calcined gypsum, filler material, soap bark and a defoaming substance from the group consisting of sulfonated castor oil, sodium lauryl sulfate, sodium cetyl sulfate, alkylated naphthalene sodium sulfonate and sodium alkyl sulfonate.

5. A plastic plaster mass which will dry and set into a hard, porous, sound-absorbing mass said plastic mass comprising a recrystalizing calcic binder from the group consisting of gypsum stucco, plaster of Paris and partially calcined gypsum, filler material, water, soap bark in aerated state and a defoaming substance from the group consisting of sulfonated castor oil, sodium lauryl sulfate, sodium cetyl sulfate, alkylated naphthalene sodium sulfonate and sodium alkyl sulfonate.

6. The process of making a hard, interconnectedly porous, self-opening, sound absorbing mass which comprises steps of (1) mixing together a calcic recrystalizing binder from the group consisting of gypsum stucco, plaster of Paris and partially calcined gypsum, filler material, water, soap bark and a water-compatible defoaming agent from the group consisting of sulfonated castor oil, sodium lauryl sulfate, sodium cetyl sulfate, alkylated naphthalene sodium sulfonate and sodium alkyl sulfonate (2) agitating the mixture whereby to form an aerated plastic mass with soap bark bubbles and the said defoaming substance well distributed therein (3) forming the resultant aerated plastic mass into the desired physical shape prior to appreciable action of the said defoaming substance upon the aeration bubbles formed from the said soap bark and (4) allowing the mass to dry and harden.

7. A process of making a hard, porous, self-opening, sound-absorbing plaster which comprises the steps of (1) mixing together usual plaster ingredients (including a calcic recrystalizing binder from the group consisting of gypsum stucco, plaster of Paris and partially calcined gypsum, filler material and water) and cooperating addition agents of two classes, one of the said classes consisting of sulfonated castor oil, sodium lauryl sulfate, sodium cetyl sulfate, alkylated naphthalene sodium sulfonate and sodium alkyl sulfonate and mixtures thereof and the other

said class being the foaming glucoside soap bark, the material of the first class of addition agents being present in the proportion of approximately .0125% to approximately .3% by weight and the second class of addition agent being present in the proportion of approximately .7% to approximately .75% by weight, (2) agitating the mixture to entrap air and then allowing the resulting mass to dry and harden.

8. A dry plaster mix which after being plasticized with water and agitated will set into a hard, porous, sound-absorbing mass, said mix comprising a recrystalizing calcic binder from the group consisting of gypsum stucco, plaster of Paris and partially calcined gypsum, an aerating agent consisting of a water soluble saponin glucoside and a defoaming substance from the group consisting of sulfonated castor oil, sodium lauryl sulfate, sodium cetyl sulfate, alkylated naphthalene sodium sulfonate and sodium alkyl sulfonate.

9. A plastic plaster mass which will dry and set into a hard, porous, sound-absorbing mass said plastic mass comprising a recrystalizing calcic binder from the group consisting of gypsum stucco, plaster of Paris and partially calcined gypsum, filler material, a water soluble saponin glucoside in aerated state and a defoaming substance from the group consisting of sulfonated castor oil, sodium lauryl sulfate, sodium cetyl sulfate, alkylated naphthalene sodium sulfonate and sodium alkyl sulfonate.

10. A plastic plaster mass comprising a calcic substance from the group consisting of partially calcined gypsum, plaster of Paris and gypsum stucco, water, soap bark in aerated state and a surface active agent from the group consisting of sulfonated castor oil, sodium lauryl sulfate, sodium cetyl sulfate, alkylated naphthalene sodium sulfonate and sodium alkyl sulfonate.

11. A plastic plaster mass comprising a calcic substance from the group consisting of partially calcined gypsum, plaster of Paris and gypsum stucco, water, a water soluble saponin glucoside in aerated state and a surface active agent from the group consisting of sulfonated castor oil, sodium lauryl sulfate, sodium cetyl sulfate, alkylated naphthalene sodium sulfonate and sodium alkyl sulfonate.

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