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## PLASTIC COMPOSITION FOR WALLBOARD JOINTS

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This invention relates to plastic compositions, especially those which are used for finishing surfaces such as surfaces of wallboards erected upon supporting structure.

The invention particularly relates to so-called joint fillers and finishers which are used to fill the joints between wallboard panels and to fill and finish over the heads of the nails or fasteners which secure the wallboards to supports.

In the erection of wallboards, particularly those consisting of a core of hydraulic setting material, such as calcined gypsum, between cover papers bonded to the faces of the core, the fasteners, such as nails, are commonly driven through the face of the board into the support, such as the studs, behind the wallboard or panel. After completing the erection of the panels on a wall or ceiling it becomes necessary to fill up the slight recesses made by driving the nails so that the heads thereof are flush or slightly below the face of the wallboard and, as well, to fill up the joints between wallboards or panels where they meet upon the support or stud. Instead of applying to the wall strips of wood or other material to cover the joints between the wallboards to form panels in the wall as in former practice, it has become common to fill the joint with a plastic composition which will set and dry out and to apply to the joint a tape made of fabric, paper, metal or other material which is adhesively bonded to the face of the abutting or adjacent panels by a plastic material which also may serve as a finishing material for covering the tape. This finishing material may be spread out to a smooth surface over sufficient area to lose the effect of the thickness of the plastic material and the tape therebeneath.

The invention particularly relates to the finishing material above referred to but may relate in some cases to the joint filler material which is placed in the joints between the wallboard panels.

Plastic joint fillers and finishers of many different compositions have been used in the art and many of these compositions have used casein as the principal bonding or adhesive ingredient. The casein is put in condition for use by suspension in water with admixture of an alkaline material, usually an hydroxide of an alkaline metal or alkaline earth metal. The joint finishers and fillers in many cases contain filling or bonding materials, especially of mineral character, which are admixed with the casein and alkaline materials before suspension. In preparing such compositions for application to the joint, water is mixed therewith to the consistency which will enable the mix to be handled under the broad knife or other convenient tool for application of a limited amount thereof to the joint and for its spread upon the faces of the wallboards to the desired degree.

It is requisite with such compositions that the consistency shall be such as to avoid breaking of the layer as it is spread in the plastic condition. It is also highly desirable that cracking of the set material, drying out to a soft condition and other objections shall not develop as has been the case in the use of such casein compositions as fillers and finishers. Also, in many cases, the material in plastic condition upon standing for a time has tended to scum over to a horny coating or tough skin which creates lumps in the application which are difficult to smooth out or to reduce with sand paper to bring the texture of the surface at the filled and finished joint substantially to that of the adjacent surfaces of the wallboards. The conditions and objections referred to are particularly troublesome in hot sections of the country.

It is a feature of the invention that these difficulties are overcome to a substantial degree. The invention, as with the compositions of the prior art, utilizes casein. To secure suspension of the casein in the water used for securing the plastic set a high calcium hydrated lime, that is $CA(OH)_2$, is used. This type of suspension also provides a desired stickiness in the material in plastic condition and a glue-like strength in the filler or finisher. Various inert or mineral filling ingredients may be admixed with the casein glue as has been the practice heretofore. Such filling ingredients may include asbestos shorts or floats for securing smooth working and to prevent shrinkage cracks, mica to secure the working properties and to control or reduce somewhat the stickiness of the casein suspension. A substantial amount of a mineral filling, such as limestone, also may be used without detriment to the quality of the material as a finisher.

It is a feature of the invention that with the casein is mixed a clay in substantial amount relative to the amount of the casein. In general the amount of the clay may be 40 to 60% by weight of the sum of the casein and the clay. A clay having a fineness of 100% through 100 mesh and of a plastic nature is preferable. A composite material is available in the market having the characteristics of such a mixture of casein and clay and is known as Casein P. B. A. 26. This material is understood to contain about


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40–50% clay and the balance casein with possibly small amounts of other inert ingredients.

A particular feature of the invention is the incorporation of sodium fluoride in the mixture of ingredients above referred to. This material is in powdered form and preferably is used in technical grade. A typical formula for the composition of the invention is as follows:

*Formula*

| Material | Percent |
|---|---|
| Casein P. B. A. 26 | 17.968 |
| High calcium hydrated lime | 8.984 |
| Asbestos shorts | 9.982 |
| Fine white mica | 17.968 |
| Finely ground white limestone | 43.721 |
| Sodium fluoride $Na_2F_2$ | 1.198 |
| Yellow oxide | .179 |
| | 100.000 |

The asbestos shorts may be of such fineness that all of the material will pass an 8 mesh screen, at least 90% passing a 20 mesh screen and from 20 to 50% passing a 50 mesh screen.

The mica may be of such particle size that 99% or more passes a 50 mesh screen, with 93% passing 100 mesh and 67% passing 200 mesh.

The finely ground white limestone may typically have a screen test of 100% passing an 80 mesh screen, 95% passing 100 mesh and 70% or more passing a 200 mesh screen with not over 75% passing a 325 mesh screen.

The above screen tests are given as an indication of the particle size of the filling ingredients of the composition of the invention. Without departing from the invention variations may be made to suit particular requirements.

The amount of casein in the composition (present in the P. B. A. 26 in the above formula) may vary approximately from 7% to 15%. The amount of high calcium hydrated lime may vary approximately from 7% to 15% and the amount of sodium fluoride may be in the range from .5% to 5.0%. In general the ratio of the amount of high calcium hydrated lime to the Casein P. B. A. 26, that is the casein clay combination, is of the degree of 40 to 60%. Thus, in general, the amount of casein existing as casein in the formula, the amount of clay and the amount of lime are substantially of the same degree ranging from 7% to 15% of the total composition. Variations in the quantities of the other ingredients of the composition may be made to suit different conditions. It will be noted, however, that the composition provides for a high percentage of filling materials. This inclusion of the sodium fluoride affords a means of control of the plastic condition when this composition of materials is mixed with water while permitting the inclusion of the filling materials in substantial amounts. It particularly avoids or delays the skin and lump formation referred to.

This difficulty which is avoided by the inclusion of the sodium fluoride results from the action upon the casein of the lime which is used to suspend the casein in the water. There is formed by this reaction calcium caseinate which tends to form lumps in the compositions of the prior art as they are worked under the tool. These prior art products also increase in the tendency to form lumps upon standing prior to use so that it is necessary for them to be used promptly after admixture with the water. Incorporation of sodium fluoride in the composition of the invention affords a means of overcoming the difficulties and, as well, of securing a filler and finisher composition which, after admixture with the water may stand for six or seven hours without substantial tendency to lump.

The composition of the invention as given in the above formula will have a testing consistency of between 62 and 68 with an average of about 65. Variations in the amount of filler and other ingredients will vary this testing consistency. The proper consistency for application to the joint may be secured, however, by thinning with not substantially greater than three parts more of water than is required to bring the composition to testing consistency. This small addition of water thus avoids the inclusion of large amounts of water which must be dried from the set material. The working consistency is secured without incorporation of large amounts of water.

In the standards of the American Society for Testing Materials under designation C–2630 for the standard method of testing gypsum and gypsum products, the definition of "testing consistency" is given as follows:

"A neat mortar shall be considered of testing consistency when a penetration of 30 mm. plus or minus 2 mm. is obtained when tested in accordance with section 16 and the testing consistency shall be expressed as the number of cubic centimeters of water required to be added to 100 grams of the gypsum."

While in the formula above given high calcium lime is indicated and is preferable because of its higher alkalinity, dolomitic lime may be used, it being merely necessary to provide such an amount of this material that the lime content thereof is sufficient to act with the other ingredients for the purposes of the invention.

In place of the sodium fluoride, sodium carbonate or other similar alkaline materials may be used in the composition. The proportions of such alkaline materials, particularly sodium carbonate, may be substantially the same as when sodium fluoride is used.

Having thus described my invention I now claim:

1. Composition for wallboard joints to form upon mixing with water a mixture of plastic consistency capable of being worked under a trowel or broad knife and requiring 62–68 parts of water per 100 parts of the dry composition to produce testing consistency which comprises casein, clay, and lime each substantially in the range between 7% and 15%, an alkaline salt in amount not substantially greater than one-third the amount of one of said three ingredients, the balance of the composition comprising finely ground limestone as a predominant amount of said balance, and mineral fillers.

2. Composition according to claim 1 in which the alkaline salt is sodium fluoride.

3. Composition according to claim 1 in which the alkaline salt is sodium carbonate.

4. Composition for wallboard joints to form upon mixing with water a mixture of plastic consistency capable of being worked under a trowel or broad knife and requiring 62–68 parts of water per 100 parts of the dry composition to produce testing consistency which comprises casein, clay, and lime each substantially in the range between 7% and 15%, an alkaline salt in amount not substantially greater than one-third the amount of one of said ingredients, the balance of the composition comprising finely ground limestone as a predominant amount of said balance, asbestos shorts, and fine mica.


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5. A plastic mixture capable of being worked under a trowel or broad knife for application to wallboard joints comprising casein, clay, lime, an alkaline salt, asbestos shorts, fine mica, finely ground limestone, and water, the casein, clay, and lime being present in similar amounts substantially in the range between 7% and 15%, the alkaline salt being in amount not substantially greater than one-third of the amount of one of said three ingredients, the balance of the composition before mixture with water comprising finely ground limestone as a predominant amount of said balance, asbestos shorts, and fine mica, said plastic mixture containing water substantially in the range between 65 and 71 parts of water for 100 parts of the composition before mixing with water.

6. A composition for wallboard joints capable of forming with water a mixture of plastic consistency and of being worked under a trowel or broad knife and requiring substantially between 62 and 68 parts of water per 100 parts of the dry composition to produce testing consistency, said composition comprising 7 to 15% of casein and 7 to 15% of clay, 7 to 15% of high calcium hydrated lime, .5 to 5% of sodium fluoride, and between 78.5 and 50% of a filler material which comprises for the most part finely ground limestone.

7. A composition for wallboard joints capable of forming with water a mixture of plastic consistency and of being worked under a trowel or broad knife and requiring substantially between 62 and 68 parts of water per 100 parts of the dry composition to produce testing consistency, said composition comprising 7 to 10% of casein and 7 to 10% of clay, 7 to 10% of high calcium hydrated lime, 1 to 3% of sodium fluoride, and between 78 and 67% of a filler material which comprises finely ground limestone in predominant amount, fine mica and asbestos fiber.

8. A composition for wallboard joints capable of forming with water a mixture of plastic consistency and of being worked under a trowel or broad knife and requiring substantially between 62 and 68 parts of water per 100 parts of the dry composition to produce testing consistency, said composition comprising 7–15% of casein, 7–15% of clay, 7–15% of high calcium hydrated lime, .5–5.0% of sodium fluoride, limestone in predominant amount, asbestos fiber, and mica in an amount of the degree of twice the amount of the hydrated lime.

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