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water proof mortar process

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PROCESS OF CONSOLIDATING OR WATERPROOFING MORTAR

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5 Claims. (Cl. 106—85)

This invention relates to a process of consolidating or water-proofing or tightening mortar, the expression "mortar" including both lime mortar and cement mortar and mixtures thereof of compositions ordinarily used.

It is the aim of the present invention to achieve the well-known very good consolidating or water-proofing effect of the lime soap formed in the mortar itself with the free lime when fatty acids of high molecular weight are incorporated therein in such a manner that the formation of the lime soap takes place in the finest possible distributed form and so that on the one hand the maximum possible protective effect is obtained and on the other hand scum formation is at the same time practically completely prevented. To this end, in accordance with the present invention, fatty acids of high molecular weight, or a mixture of the same, with saponifiable fats and/or oils, are emulsified in alkaline solution with simultaneous employment of non-saponifiable oils and/or fatty substances in the presence of emulsifiers and protective colloids, such as albumenoid substances or degradation products of the same, such as glue of low swelling power and increased solubility in water, and sulphite spent liquor, the resulting emulsion being incorporated with the mortar during the mixing.

The term "protective colloid" is used to indicate that the emulsion contains substances which, in addition to the effect of the dispersive emulsifier proper, protect the emulsion against coagulating influences. In the present case, the result is thus obtained that when the saponifiable substances, which are in fine dispersion, meet with the free lime of the mortar, no coarse flakes of soap are formed, but the flakes of soap are gradually formed in extremely finely divided condition.

It may be considered that the albumenoids and sulphite waste liquor constitute an emulsifier for fatty acids and non-saponifiable mineral oil.

The water-proofing effect of the emulsion in reaction with the mortar is consequently produced by the formation of lime-soaps in the finest state of distribution, avoiding at the same time any scum film which loosens the mortar structure and reduces the coherency. This is attained, according to the invention, in that:

1. Use is made of the combined antifoaming emulsifier and protective colloid effect of an observable chemically reacting mixture of sulphite spent liquor and albumenoids or other protective colloid. The existence of this reaction is evidenced by the formation of xanthoprotein.

2. The fatty acids of high molecular weight or a mixture of same with saponifiable fats or oils are not employed alone but in mixture with non-saponifiable oils and/or fatty substances. Suitable saponifiable substances are oleic acid, stearic acid, abietic acid, linolenic acid. A suitable non-saponifiable oil is mineral oil.

It has hitherto not been known that the lime-soaps could be formed in the mortar in the finest state of subdivision by introducing highly dispersed fatty acids, which normally react like lime-water spontaneously with formation of coarse flakes, with the aid of such emulsifiers and protective colloids and the anti-foaming agent. This is made possible only by the property exhibited by the emulsion, of being able to contain free fatty acids and alkali hydroxide without producing the typical alkali soap reactions. Evidently there is present in this instance a suspension colloid and not, as in the case of soaps, an emulsion colloid. With my emulsion colloid, which forms a suspension colloid, when shaken up vigorously, no foam can be observed in the dilution 1:20 with water, in contrast to a true soap solution of similar concentration, any foam or scum bubbles which have formed breaking instantaneously on standing, this being not the case with the soap solution, which forms a true emulsion colloid. Moreover, the viscosity of the emulsion is very small compared with that of the soap solution, the comparative value being approximately 10% of the value for a glycerine solution taken as 100%. Thus, a hydrated soap representing an emulsion colloid, containing 8% oleic acid, 3% potassium hydroxide and 89% water, is found to have a viscosity of 4957 centipoises. This high value is due to the characteristic strong hydration of the soap molecules. If according to my method here described a mixture is made of 8% oleic acid, 3% potassium hydroxide, 12% sulphite waste liquor, 5% albumen substance and 72% water, there results a viscosity of only 4.4 centipoises. Thus, hydration is strongly diminished, likewise the foaming ability, which means that the system has turned into a suspension colloid and that the combined albumen-sulphite waste liquor-emulsifier is to be considered the carrier of the emulsion.

The following examples illustrate the formation of the highly dispersed lime soaps using my emulsion:

5 grams of potash soap (8% oleic acid) and 5 grams of the foregoing emulsion (8% oleic acid) were each separately dissolved in water and made up to 100 cubic centimeters. After

the addition of 10 grams of Portland cement to each sample, the mixture was shaken vigorously 20 times in a measuring cylinder and after standing for 15 minutes the sediment which had formed was read off. This amounted in the case of the soap solution to 40 cubic centimeters of granular, flaky parts, a portion of the cement forming a stiff mass with the foam on the top. In the case of the emulsion, the sediment amounted to 14 cubic centimeters of very fine particles, the overlying solution containing a turbid milk of some cement with emulsion particles. The scum or foam above the liquid, had broken or decomposed. A comparison test without addition of my emulsion yielded a sediment of 12 cubic centimeters.

This shows that in spite of the presence of free fatty acids and free alkali in the emulsion, stability cannot be attained by means of soaps, but only by the addition of a composite emulsifier constituted of albumenoid substances and sulphite waste liquor. As thorough experiments have shown, it is not possible to produce a useful, stable emulsion with one of the components alone, so that this combination is of quite special importance.

According to the known processes it is desirable either to add lime-soaps to the mortar either in the finest possible state of subdivision or to cause them to be so formed therein. This latter is extremely difficult on account of the extraordinarily high reactivity of the lime-soaps, if the lime-soaps are added to the mortar in a completely formed state, the fatty substances are combined either with the lime or with the clay and slate and absorbed. The grain size of such suspensions, which are mostly pasty and which exist when the formed lime soaps are added to the mortar, must in no case be less than 10 microns, whereas that of clear emulsions is far below this and of the order of 0.1 micron. My emulsion therefore gives also, with any desired water dilution, clear or only faintly turbid stable solutions, whereas the suspensions due to addition of complete lime soaps form sediments rapidly. Inasmuch as the range and preserving effect rapidly increase with the reduction of the particle size, this shows that the present invention constitutes a substantial advance.

That a fine dispersion is often desirable in order to attain a more intensive effect, is generally known; however, the solution of the problem proposed in the present process has nothing to do with the dispersion, for instance by a Plauson colloid mill. It has also been suggested that the generally prejudicial, loosening effect of scum forming colloid substances in the mortar may be prevented by addition of small quantities of salts of higher fatty acids or sulphonation products of such higher fatty acids. Comparatively large quantities of albumenoid substance with a little addition of scum or foam-preventing media are used. The water-proofing of the mortar is in such cases not effected by lime-soaps as in the case of the present invention, but it is based upon the consolidating effect of albumenoid substances, which are easily moistenable substances dissolved in water in a more or less molecularly dispersed form.

The water-proofing process of the present invention provides a true emulsion which, for preventing scum or foam formation, contains not only unsaponifiable oils and/or fatty substances, but also the combined albumenoid-sulphite spent liquor emulsifier, and the water-proofing and con-

solidating effect of which in the mortar is based chiefly on the formation of water-repellent lime-soaps. In this instance, the object is to prevent scum formation.

The improvement which is attained according to the invention is clearly shown by the following table of different samples of mortar:

One mortar which has been tested had the composition

	Parts by weight
Cement	1
Sand of mixed grain sizes	3
Water, containing 2% of the tightening emulsifier medium, (percentage calculated on cement)	10

Substances added	Weight of the mortar per unit of volume	Mortar condition
None	2.01	Permeable.
Emulsion added according to the present invention.	2.01	Satisfactorily water-tight.
Insoluble soaps without soluble soaps.	2.01	Somewhat permeable.
Insoluble soaps with alkali soaps.	1.95	Satisfactorily water-tight reduced coherency.
Pure alkali soaps with and without soluble additions.	1.80-1.90	Satisfactorily water-tight strongly reduced coherency.

The favorable results achieved by the use of emulsions in accordance with the present invention including reduction of scum film is due to the fact that the fatty acids of high molecular weight or a mixture of same with saponifiable fats or oils, are mixed with unsaponifiable oils and/or fats and the fatty acids or mixtures are then emulsified with albumen in combination with sulphite spent liquor in alkaline solution. Tests have shown that albumen products alone are not sufficiently effective as regards scum or foam prevention and that on the other hand the sulphite spent liquor, if employed alone, did not emulsify satisfactorily and also did not prevent scum or foam formation completely and that both the albumen products and sulphite spent liquor must be used. It was also necessary to add unsaponifiable fatty substances.

It has further been ascertained that a stable emulsion had to be obtained in which free fatty acids could exist side by side with free alkali without forming a soap, this being recognized from the low viscosity of the emulsion of the order of 4.4 centipoises. This was achieved by employing albuminoids or equivalent and sulphite spent liquor simultaneously, and a mixture of these substances with the fatty acids and unsaponifiable oils as free as possible from water was boiled in the presence of potash lye and then worked up with water to form a liquid emulsion. When albumen is used, it appears that the sulphite spent liquor then reacts chemically with the albumen, probably in such a manner that gluco-proteides are formed. Thus there may be used the mixture which has been mentioned above of 8% oleic acid, 3% potassium hydroxide, 12% sulphite waste liquor, 5% albumenoid and 72% water. Soda lye can be substituted, but potash lye is preferable. In any case, the xantho-protein reaction and also other albumen reactions are no longer given in a distinctively positive manner. It would be very difficult to give a more detailed discussion herein concerning the chemical reactions. Apparently the lignine sulphonic salt is especially effective

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in the sulphite spent liquor for preventing the scum or foam formation.

According to the present invention, such emulsions can be prepared by treating fatty acids of high molecular weight, with or without saponifiable fats and oils, in mixture with unsaponifiable oils and/or fatty substances in alkaline solution with employment of emulsifiers or protective colloids, such as vegetable mucilages and vegetable gum, polymeric carbohydrates, such as albuminoid substances, and sulphite spent liquor to form a stable emulsion.

As an example of my method may be mentioned:

(a) 5 kilograms of stearic acid are mixed with 6 kilograms of mineral oil and there is added a mixture of 12 kilograms sulphite waste liquor and 7 kilograms albumenoid substance such as glue and there are added 20 kilograms of water; this is then boiled at a temperature of 100° C. until a bond has resulted. Thereupon, the whole is allowed to cool to 85°, and 6 kilograms of potash lye (50%) are added. After the reaction is completed, 44 kilograms of water heated to a temperature of 60° C. are stirred into the mixture.

If liquid fatty acids are used instead of stearic acid, a highly dispersed liquid emulsion can be obtained. Other solid fatty acids which may be used are palmitic acid, and oleic acid. As another example:

(b) 10 kilograms of oleic acid are heated with 5 kilograms of mineral oil to 110° C. and therewith are mixed homogeneously 10 kilograms of albumenoid products and 15 kilograms of sulphite waste liquor at 100° C. After cooling off to 80° C., 4 kilograms of 50% potash lye solution are added and mixed until a uniform bond indicates the end of the reaction. Thereupon the whole is mixed with 56 kilograms of water of 80° C.

The emulsions produced in this manner dissolve in water either to a clear solution or with faint turbidity. Added to the mortar mixing water in a quantity of about 2 grams for 100 grams mortar, these emulsions make it possible to produce excellent water-proofing effects without impairing the quality of the mortar, this being due to the fact that the active substances can be distributed in the mortar in a highly dispersed state and that the formation of water-repellent lime-soaps owing to the protective effect of the emulsifiers takes place without formation of scum film and in such finely distributed form that the utmost preserving effect is ensured. Another advantage of these emulsions is that they possess a high wetting effect and reduce the amount of water necessary for the mixing of the mortar, this being very important for obtaining proper coherency of the mortar. The amount of water required for mixing and forming the mortar is reduced about 1 to 2%

and this substantially increases the mortar solidity. The mortar so prepared is plastic, it does not break apart in a dry state, but is in itself coherent, and retains the wetting water.

The present application is a continuation-in-part of my original application Serial No. 53,933, filed December 11, 1935.

I claim:

1. A water-tight mortar formed by mixing substantially one part by weight of cement with three parts by weight of sand and ten parts by weight of conditioned water, said water containing substantially two percent by weight of the weight of cement, of a tightening medium formed by treating in a potash solution stearic acid in the presence of a chemically reacting mixture of sulphite waste liquor and albumen.

2. A water-tight mortar formed by mixing substantially one part by weight of cement with three parts by weight of sand and ten parts by weight of conditioned water, said water containing substantially two percent by weight of the weight of cement, of a tightening medium formed by boiling substantially five parts by weight of stearic acid with six parts by weight of mineral oil, twelve parts by weight of sulphite waste liquor and seven parts by weight of albumenoid substance, and adding after cooling six parts by weight of potash lye, and diluting with forty-four (44) parts by weight water.

3. A water-tight mortar formed by adding to a wet cement mortar a conditioner formed by boiling substantially five parts by weight of stearic acid with six parts by weight of mineral oil, twelve parts by weight of sulphite waste liquor and seven parts by weight albumenoid substance, and adding after cooling six parts by weight potash lye, and diluting with forty-four (44) parts by weight water.

4. A water-tight mortar formed by adding to a wet lime mortar a conditioner formed by boiling substantially five parts by weight of stearic acid with six parts by weight of mineral oil, twelve parts by weight of sulphite waste liquor and seven parts by weight albumenoid substance, and adding after cooling six parts by weight potash lye, and diluting with forty-four (44) parts by weight water.

5. A water-tight mortar formed by mixing substantially one part by weight of cement with three parts by weight of sand and ten parts by weight of conditioned water, said water containing substantially two percent by weight of the weight of cement, of a tightening medium formed by boiling ten parts by weight oleic acid, five parts by weight mineral oil, ten parts by weight albumenoid substance and fifteen parts by weight sulphite waste liquor, and adding after cooling four parts by weight potash lye, and diluting with fifty-six (56) parts by weight of water.

CARL LETTERS.