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FLOOR COVERING

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This invention relates to floor coverings and their manufacture, and is especially concerned with a novel paint particularly adapted for this purpose. In suitable forms of embodiment, the invention improves and simplifies manufacture, obviates fire hazard, improves the waterproof qualities of the product, and affords other advantages that will hereinafter become apparent. It is especially adapted and advantageous for the so-called felt base type of floor covering, and is hereinafter described and explained with particular reference thereto.

As at present generally manufactured, felt base floor covering consists of a bibulous sheet of fibrous material (e. g., "rag felt") impregnated or saturated with hydrocarbon or bitumen, and having a print design in paint on its upper face. Between the printed paint design and the bituminated felt base is an under coat or "stop coat", applied to the upper side of the base prior to the imprinting of the design. This stop coat serves to prevent components of the bituminous (asphaltic) saturant of the base from "striking through" into the print design and marring its appearance. The under side of the bituminated felt base is given a "back coat" (generally of red paint), to improve its appearance and to increase the waterproofness of the product. There may also be a final top coat of clear varnish or lacquer, applied over the print design.

Referring, now, more particularly to the stop coat and the back coating, these are at present generally of different characters, the stop coat consisting of a pigmented oil varnish and the back coat generally of a pigmented hardened rosin varnish. Both of these contain varying percentages of volatile solvent, and require heat and time for thorough drying, especially the stop coat. Also, the volatile solvent gives rise to a certain fire hazard.

For the back coat, aqueous casein paints have occasionally been used, consisting of casein with a chemical (such as borax, soda ash, etc., commonly employed in the casein industry) for rendering it soluble or dispersible in the water, with or without a hardening agent such, for example, as formaldehyde, formalin, paraformaldehyde and other aldehydes, hexamethylenetetramine, and the like. Such a casein paint does not present the fire hazard of paints containing volatile solvents, as above mentioned; but it is very deficient in waterproofness, so that a back coat of it rubs off easily when wet. And when it has been attempted to use sufficient hardening agent to render such a casein back coat waterproof and

prevent it from rubbing off when wet, then the casein coat or film became so hard as to lose most or all of its flexibility. In other words, it was rendered rigid and incapable of bending with the felt base, etc.

Whether a casein back coat or a hardened rosin one with a volatile solvent be used with an oil varnish stop coat, such as above described, separate operations are required, of course, to apply these two different coats to the two sides of the felt base and to dry them thereon.

I have found that by modification of aqueous casein paint such as heretofore employed for the back coat, it can be rendered sufficiently hard and waterproof not to rub off when wet without its flexibility being impaired. On account of its waterproofness and flexibility, furthermore, my improved type of casein coating is also adapted for use as the stop coat, in lieu of the oil varnish above mentioned. Using such similar coats on both sides of the base, I find it feasible to apply and dry them at a single operation, and very quickly as compared with the times required for the coatings heretofore used.

For the purposes of my invention, I employ along with casein (and pigment) non-siccative flexilizing ingredient, and also, in general, a hardening or condensing agent for the casein, such, for example, as the formaldehyde, formalin, paraformaldehyde and other aldehydes, hexamethylenetetramine, and the like before mentioned. I have found rubber either raw or reclaimed, synthetic rubber, as "Duprene", "Thiokol" and the like, etc. to be suitable non-siccative flexilizing agents to counteract the rigidifying tendency of the hardening agent,—with the further advantage of waterproofing properties of its own. Any type of emulsion or dispersion of the flexilizing agent in water may be employed, such as the aqueous rubber emulsion generally known in the trade as "Latex", or artificial dispersions or emulsions of raw or reclaimed rubber, or synthetic rubber, such as are produced by the dispersion of solutions of rubber in aqueous media containing a dispersing agent, or by milling with an emulsifying agent and dispersing in water.

Casein paint of this character dries primarily by evaporation, and requires very little time or heat to develop a finished film free from tack. Its waterproof hardness and flexibility when dried (combined with its immiscibility and lack of solvent action with reference to the bituminous saturation of the felt base) render it very suitable and desirable as a stop coat, as well as for a back coat.

Generally speaking the non-siccative flexilizer will be the minor proportion with respect to the casein and will preferably, though not necessarily be used in amount less than 10% of the amount of casein and in amount of the order of 1% of the amount of casein.

While I have hereinafter given specific formulae, proportions, and methods for the preparation of a suitable casein paint in accordance with my invention, yet it will be understood that these are subject to wide variation. For example, the percentage of casein necessary to bond pigment in a paint varies with the character of the pigment; and the amount of flexilizing agent required depends on the degree of flexibility desired, as well as on the expense permissible. Nor do I desire to be wholly limited to the order and time relation in which the various ingredients are brought together as hereinafter described, although I have found this order particularly advantageous in insuring the desired qualities for the paint when used.

My preferred method of compounding the paint consists, briefly, in first cooking and dissolving the casein with water and the necessary dissolving chemical, as, for example, an alkali, as borax and/or soda ash or trisodium phosphate, then adding this casein solution to a solution or slurry of the wetted pigment, and finally adding a hardening and flexilizing solution (such, for example, as a dilute solution of formalin and rubber emulsion) just before using the paint.

Before entering on the details of compounding such paint, I will give a formula therefor on the dry basis, by weight, without taking account of the necessary water. The proportion of water to casein and to pigment is variable, of course, depending on the desired thickness of the paint as well as on the fineness of the pigment employed. One such dry formula is as follows:

	Percent
Casein.....	12.664
Borax.....	1.772
Trisodium phosphate.....	0.126
Pigment.....	85.101
Rubber latex.....	0.334
Formalin.....	0.003

To prepare 300 gallons of paint according to this formula, I may proceed in detail as follows:

Sixty gallons (500 lbs.) of water is heated, in a kettle of approximately 175 gals. capacity, to a temperature of 85 to 90° F. 199 lbs. of dry casein is then gradually added, care being taken to avoid lumping of the casein as much as possible. As a dissolving agent for the casein may be added 28 lbs. of borax with two pounds of trisodium phosphate, dissolved in 6 gals. (50 lbs.) of warm water. Any lumps formed must eventually be skimmed off, completely dissolved in warm water, and in this form returned to the kettle. The mixture is agitated and the temperature gradually raised to approximately 175° F.; but it should not be allowed to go much over 180° F. The temperature is maintained for about thirty minutes, or until the film of the glue produced is perfectly clear, indicating that all particles of the casein are thoroughly dissolved or dispersed in the water.

For the cheaper types of pigment that may be used in this paint, such as lithopone, clays, slate flours, etc., the pigment solution or slurry may be made up with about 80 gals. (663 lbs.) of water to 1336 lbs. of pigment. The pigment is added and mixed in with the water, and the mixture agi-

tated until the pigment is entirely wetted and a smooth slurry produced.

The casein and pigment solutions having both been prepared, the next step is to add the former to the latter and mix them together: generally, however, the casein solution should first be cooled somewhat. As a rule, the mixing of these solutions will require at least thirty minutes. After the first ten minutes of mixing, the speed of the agitating or stirring mechanism should be reduced to approximately 30 R. P. M., to avoid the incorporation of air into the casein and pigment solution.

For the hardening and flexilizing solution, 70 gals. of water are measured or weighed into a tank, and 9.5 lbs. (or 1.14 gals.) of 40% formaldehyde and two gallons of rubber latex (containing approximately 33% rubber) are added and thoroughly stirred in.

The hardening and flexilizing solution should not be added to the pigment and casein solution until just before the paint is to be used. Moreover, when the hardening and flexilizing solution is added to the casein-pigment solution, the latter should be at a temperature of somewhere between 65° F. and 70° F.; and if necessary, it should be specially cooled to about this temperature.

The viscosity of the finished paint thus prepared can, of course, be varied by increasing or decreasing the total amount of water, or by varying the proportion of pigment to casein slightly.

This casein paint can be applied to the bituminated base by immersion (running the base through the paint), or by any of the mechanical means now available for such purposes. Brushes may be introduced into the mechanical system to insure evenness of the coating. Moreover, the paint can be applied to the base immediately after the latter has been saturated with hot asphalt, so as to take advantage of the residual heat in the bituminated sheet (as it emerges from the hot saturation bath) to dry the paint rapidly. To expedite the final drying, the sheet may be passed in loops through a chamber through which warm or heated air is circulated, or any other suitable method may be employed.

The above described formula and method give a dried casein coat or film of ample flexibility for floor coverings of this general type, the flexibility being greatest when the amount of dried paint per square yard lies between about 0.125 lb. and 0.20 lb. While enough must be used to give an even coating that thoroughly covers the surface to which it is applied, the thicker the film, on the other hand, the poorer its flexibility. The flexibility of the dried coat or film, described above, is due primarily to the presence of the rubber, and the proportion of casein and rubber also determines the waterproof value. The proportion in the foregoing formula represents about the minimum of rubber that will give the pliability and waterproofness required for floor covering of this character: the proportion of rubber may, however, be increased as much as considerations of cost will permit.

The proportion of formaldehyde, where such is used, to casein should generally lie between that stated in the formula, which given the maximum of waterproofness (with the above minimum of rubber) that is consistent with the requisite flexibility, and about 12 oz. of 40% formaldehyde to 18 lbs. casein, which is about the maximum possible without definite thickening of the paint prior to its application to the sheet. The

exact effect of the formaldehyde is so dependent on its concentration when added to the paint and on the temperature of the latter at that time that it is hard to state a definite maximum absolutely; but any undue thickening of the paint during the process of applying a batch of it to the base sheet shows that the maximum has been reached.

The proportion of casein to pigment stated in the formula is about the lowest permissible for the particular character of pigment.

The time, manner, and method of adding the hardening or condensing agent and the non-siccative flexilizer to the previously mixed casein and pigment appear to be important to the development of the desired waterproofing qualities. The waterproof quality of this casein film greatly exceeds any heretofore realized with a corresponding degree of flexibility.

This application is a continuation in part of the application filed by me Serial No. 516,503, filed February 17, 1931, which is a division of application Serial No. 171,077, filed February 25, 1927.

What I claim and desire to protect by Letters Patent is:

1. A flexible floor covering including a bitumen impregnated base provided with a waterproof and strike proof coating of casein paint containing insolubilized casein in dominating proportion, rubber in minor proportion and pigment in amount in excess of the amount of casein and rubber together.

2. A flexible floor covering including a bitumen impregnated base provided with a waterproof and strike proof covering containing casein in dominating proportion, rubber in minor proportion dispersed with the casein and pigment in amount in excess of the amount of casein and rubber together.

3. A flexible floor covering including an impregnated base provided with a waterproof and strike proof covering containing rubber in minor proportion dispersed with a casein-formaldehyde addition product and pigment in excess of the amount of casein and rubber together.

4. A flexible floor covering including a bitumen impregnated base provided with a waterproof and strike proof coating of casein paint containing insolubilized casein in dominating proportion and rubber in minor proportion with respect to each other and pigment in amount in excess of the amount of casein and rubber together.

5. A flexible floor covering including a bitumen impregnated base provided with a waterproof and strike proof coating of casein paint containing pigment insolubilized casein in dominating proportion, rubber in minor proportion with respect to each other, said rubber being present in an amount of the order of 1% of the casein and the pigment being in amount in excess of the amount of rubber and casein together.

6. A bituminated material including a bituminated base provided with a waterproof and strike proof coating of casein paint containing insolubilized casein in dominating proportion, rubber in minor proportion and pigment in amount in excess of the amount of casein and rubber together.

7. A bituminated fabric including a bituminated fabric base provided with a waterproof and strike proof coating of casein paint containing insolubilized casein in dominating proportion, rubber in minor proportion and pigment in amount in excess of the amount of casein and rubber together.

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