Patented Jan. 4, 1938 2,104,082

UNITED STATES PATENT OFFICE

2,104,082

BUILDING MATERIAL AND PROCESS OF MAKING SAME

Lester Kirschbraun, New York, N. Y., assignor, by mesne assignments, to The Patent and Licensing Corporation, New York, N. Y., a corporation of Massachusetts

No Drawing. Continuation of application Serial No. 615,472, June 4, 1932, which is a division of application Serial No. 519,432, March 2, 1931. This application March 27, 1935, Serial No. 13,367

4 Claims. (Cl. 91—68)

This application is a continuation of my co-pending application Serial No. 615,472, filed June 4, 1932 as a division of my co-pending application Serial No. 519,432, filed March 2nd, 1931.

This invention relates to composite building material especially adapted for use as roofing material, siding material and like purposes.

An object of the invention resides in the production of building material having a surface coating on one or both faces thereof possessing weathering properties far superior to those attainable with asphalt coating now commonly in use in the commercial production of composite roofing material.

Another object of the invention resides in the provision of a coating layer on one or both faces of a suitable base material which by virtue of its own peculiar properties will impart to the product a high degree of fireproofness.

Still another object of the invention resides in the provision of a product having one or both faces thereof coated with material of a character such that it is capable of withstanding internal flow at high temperatures and other action of the weather which are destructive of asphalt coatings as now commonly used.

In the asphalt roofing industry at the present time large quantities of products are made in a wide variety of forms and shapes in which a base of felted fibrous material suitably impregnated with a saturant such as low melting point asphalt, is coated on one or both faces thereof with a layer of blown asphalt applied in molten condition to the base. The destructive action of the sun and weather upon coating of this kind is well known. The destruction of this coating material is apparently due to polymerization induced by the sun's rays, causing a hardening of the outermost surface of the coating. Under the action of elevated temperatures, this hardened or brittle outer surface tends to undergo a form of minute flow as a result of the internal flow and contraction of the hardened outer layer over the, as yet, unpolymerized portion, which brings fresh material to the surface. The cumulative effect of this action causes numerous cracks and checks to form in the surface layer into which cracks the softer and still unaffected portions flow and themselves become subject to the polymerizing action. The net result is that in time, the entire coating becomes badly checked and cracked throughout its depth. These cracks and checks permit ready access of water and moisture to the base material and cause deterioration thereof.

The invention, in one of its forms is adapted to the manufacture of roofing as well as siding, sheathing and other building material having as its base a foundation of felted fibres such as rag, vegetable, asbestos and similar fibres formed into a web on any standard felt making machine. It is to be understood, however, that the invention is not restricted to use in connection with a base comprising a felted fibrous foundation but is applicable to products in which the base may be of wood, asbestos cement compositions, and other well known base materials suitable for roofing and other building purposes.

Briefly stated, the invention consists in the use of a dispersion of waterproofing material, such as asphalt, in water, for coating the surface or surfaces of any desired type of base material to be employed for the purpose indicated. The dispersion in accordance with the invention is one which is made in such a way and with essentially inorganic or mineral dispersing agent of such a character that when the water content has evaporated and the dispersed particles have coalesced, will produce a resultant film in which the material employed as the dispersing agent occurs in the form of a gel or honeycomb structure of such a nature as will impart mechanical stability or staticity to the dried film.

The suitability of aqueous dispersion of bitumen for accomplishing the objects of the invention may be observed and recognized by a microscopic examination, according to the following technic: a very thin film of the dispersion is painted out on a microscope slide, the film being sufficiently thin to transmit light, and the specimen is then allowed to dry thoroughly; the dried specimen is then washed with benzol or other bituminous solvent for leaching away the bitumen by placing the slide in an inclined position and dropping the solvent upon the slide at the upper end thereof so as to allow the solvent to flow or run over and away from the dried specimen, the operation being thus continued until all the bitumen is leached out as evidenced by the disappearance of the black or dark color thereof; the solvent is then allowed to evaporate completely from the specimen upon microscopic examination of the residual material of the specimen, one should observe a honeycomb or cellular structure with the shape of the individual cells resembling rather closely the shape of configuration of the bituminous particles originally contained in the aqueous dispersion. Aqueous dispersions, the dried films of which possess adequate mechanical stability for accomplishing the principal object of the invention respond to the fore-

going test by leaving a residual structure as described, whereas in the case of those which are generally not suitable, no residue is left after the treatment described.

An aqueous dispersion of, for example, 110 to 180° F. melting point steam reduced asphalt is preferably employed and may be made in accordance with Patent No. 1,734,437, granted to me November 5th, 1929. More particularly the dispersion is preferably, in accordance with the invention, one which is made with material such as bentonite as the dispersing agent. A characteristic and noteworthy property of a dispersion of this character is the infusibility of the dried film of the dispersion. That is to say, the dried film under the action of high heat as for instance the heat of a direct flame or other action, will ash itself in place without exhibiting any movement relative to the base. The importance of this property of the coating material from the point of view of fire protection afforded thereby, will at once be apparent to those skilled in the art. If the heat that may thus develop is as high or even higher than the melting point of the asphalt, the mechanical stability of the film and its resistance to flow will prevent the coating from flowing and even if the heat is sufficiently high to cause the asphalt to ignite, the asphalt will form into a carbonized crust and ash itself in place.

I have further discovered that a coating material in the form of a dispersion as indicated exhibits greater and more firm retention of surfacing material such as crushed mineral grit, than do the ordinary coatings of asphalt in molten condition.

The film of wet dispersion coating offers no resistance or impediment to the reception of or impingement by granular surfacing material, which thus becomes readily partially submerged in the coating layer and surrounded and wetted on the lower portions thereof with the soating material. Then as the water of the dispersion is evaporated through the interstices between adjacent granules and the thickness of the coating layer becomes correspondingly decreased there is left upon these portions of the granules a film of asphalt extending outwardly of the general plane of the dried coating layer to a height corresponding to the original thickness of the wet dispersion coating layer in which the granules were imbedded, thus firmly anchoring the granules in the coating layer.

Furthermore due to the better wetting of the surfacing material by the coating, the latter exhibits no tendency to blistering such as frequently occurs with the usual coatings of molten asphalt.

This bonding of the surfacing material to the coating layer is further augmented by virtue of the more adhesive nature of the steam reduced asphalt that may be employed in the form of an aqueous dispersion in accordance herewith. These properties of the dispersion coatings, together with the mechanical stability of the dried film thereof, as above pointed out, offer the advantage that comparatively thinner final films of coating material may be employed with far better resistance to weathering action, and greater relative or comparative quantities of mineral surfacing may be forced into or embedded in the coating layer.

Thus, where a dispersion of the character herein described is applied at such a rate as to leave a dried coating film of such thickness that say sixteen pounds of asphalt cover one hundred square feet or surface, crushed slate to the amount of sixty pounds per one hundred square feet may be readily applied. Similarly where the coating is applied in thinner films, as for example to provide a coating in which say nine pounds of asphalt (dry weight) cover one hundred square feet of surface, mineral surfacing to the extent of about twenty-five pounds per one hundred square feet may be employed. This is in marked contrast to the manufacture of mineral surfaced material in which molten asphalt is employed as the coating material, where under normal conditions the ratio of surfacing to coating per unit generally is about one to one, and even under extraordinary conditions of applying the surfacing, as e. g. using heated slate and severe pressure for embedding the same, this ratio does not exceed two to one.

Another important feature of the invention which results from the use of aqueous dispersions as coating material is the ease with which mineral or inorganic fillers may be incorporated in the coating material to provide bulking and/or weighting effects such as may be obtained by the use of slate dust, finely ground diatomaceous earth, or the like. Mineral fillers as well as certain water soluble, fireproofing salts may readily be incorporated in the coating material to a controllable and greater extent than is possible with molten asphalt.

In adapting the invention in practice to the production of roofing or siding material in which the base consists of a felted fibrous foundation, the latter may first be impregnated with a water-resistant material such as asphalt in any convenient or suitable manner. In order that the layer of coating material may not be susceptible to "sliding" over the roofing base due to the presence of an excess of the saturant on the surface thereof, the step of impregnation should be carried out and so regulated as to ensure all of the saturant being soaked or drawn into the pores of the base and the surface excess substantially completely removed before the dispersion coating is applied. In this way there will be no superficial film of the relatively low melting point saturant interposed between the base and the layer of dispersion coating to give rise to any sliding of the coating layer over the base. Accordingly after the step of impregnation has been properly carried out as indicated, a film of the asphalt dispersion may be applied to one or both surfaces thereof in any convenient way, the application of the dispersion being regulated so as to form a film which upon elimination of water will be of a thickness from say 0.010 inch up to approximately 0.050 inch. Inasmuch as elimination of the water from the dispersion coating results in an appreciable decrease in the thickness of the layer applied, it will be understood that due account should be taken of this factor in accordance with the water content of the dispersion employed.

Where the product is to carry a surfacing layer of comminuted grit or the like it is important to apply the surfacing material to the coated sheet while the coating layer is still substantially wet, and in any event before sufficient water has been eliminated to bring about the condition in which the honeycomb or gel structure of the coating film is about to begin to form, as otherwise the application of the comminuted surfacing material may interfere with the formation of the gel or honeycomb structure and impair the mechanical stability or the static nature of the final dried coating layer which provides the fire resisting

properties above pointed out. I have found that with dispersions containing approximately 40% water in the external phase thereof, it is not well to permit more than about 10 or 20% of the water content in the film to be eliminated before the surfacing material is applied. This quantity may, however, vary with variations in the water content of the particular dispersion employed.

Furthermore, in order to realize the advantages of the invention as heretofore described, it is desirable that the size of the comminuted surfacing material be regulated in accordance with the thickness of the dispersion layer in order to avoid, during the subsequent processing, exudation of the wet dispersion coating upwardly through the interstices between the particles of surfacing material when the surfaced base is conducted over, around or in contact with various parts of the machine, as in the manufacture of felt base material where the operation requires at sundry times, passing the sheet around drums for various purposes, as will be hereinafter explained. Thus, for example, where the coating film is about 0.010 inch in thickness, the surfacing material should be of such a size that it will pass a screen of 10 mesh and be retained on a screen of 30 mesh. On the other hand, where the coating layer is of a thickness approximately 0.025, the surfacing material should be of such size as to pass a screen of 6 mesh and be retained on a screen of 20 mesh. An advantage of the invention resides in the fact that the surfacing material when applied to the wet film assists materially in the subsequent elimination of water from the film by virtue of the capillary spaces between the adjacent particles of the surfacing material and also the porous nature thereof. Where the invention is employed in the manufacture of products from a foundation sheet of fibrous material which is first impregnated with molten saturant such as low melting point asphalt, the residual heat in the saturated or impregnated sheet further assists in the elimination of water from the coating layer.

After the surfacing material has been showered upon the wet film of the coating as above described, the coated and surfaced material may then be subjected to drying conditions whereby the water contained in the coating film may be progressively expelled therefrom as rapidly as possible without causing ebullition, after which the material may be subjected to a pressing operation for causing the surfacing layer to be properly embedded in the coating layer and smoothening the surface thereof, and finally where necessary or desirable, to cooling conditions.

If desired, after one face of the sheet has been coated, surfaced and dried, the sheet may be reversed and coated with the dispersion on the reverse face, followed by the application of surfacing material thereto before or after being subjected again to drying conditions for completely drying the coating layer on the reverse face; finally passing the sheet over cooling drums and/or through a cooling stage.

The invention also finds adaptation and affords a marked advance in the production of building material in which the base is of wood. I have found in accordance with the present invention that the dispersion material as heretofore described, when applied to a wooden base serves, in addition to a weather protection medium to impart to the wood base a substantial degree of fireproof qualities by virtue of the infusibity and static qualities of the resultant bituminous coating layer. The fireproofness of the base may be still further increased by incorporation of soluble fireproofing salts such as ammonium phosphate, in the dispersion, which will penetrate into the wood base when the aqueous dispersion is applied thereto, so that upon elimination of the water, these salts will be present in the pores of the base and impart additional fireproofness thereto.

The dispersion coatings as herein described, are likewise advantageous in the production of building materials in which the base is of metal, such as corrugated sheet iron. In such cases the dispersion coating material may serve a weather protective and rust inhibitive median or it may have incorporated therein rust inhibiting materials such as soluble chromate salts, for this purpose.

Rigid materials such as asbestos cement compositions, as commercially made from mixtures comprising approximately 96% of Portland cement and 4% of asbestos fibre, although usually considered to be of fireproof nature, may nevertheless be improved in their weather and wear resisting properties by application thereto of the dispersion coatings as herein described. In such cases the dispersion coating may be applied to the base and the coated base may be surfaced with mineral grit, at any convenient point in the manufacture. Thus, for example, where the asbestos cement composition shingles are made by a wet-machine operation, as illustrated for example in patent to Ledeboer No. 1,790,822, the dispersion coating and an overlying layer of surfacing material may be applied to the formation stripped from the collecting cylinder or make-up roll of the fabricating machine, after partial or complete elimination of water from the base sheet or slab, and after the dispersion layer has been dried to the desired extent, units of desired size and shape may be cut in any convenient way from the slab. If desired, the coating material may be applied as indicated to asbestos cement shingles after they have been formed of the desired size and shape in accordance with practice known in the asbestos cement shingle art. Thus, the asbestos cement shingles may be sprayed with, or immersed in a bath of, the dispersion coating material, the coating being applied in the desired thickness and the coating step followed by a surfacing operation under conditions as herein described. In any event, the weather and wear resisting properties of the asbestos cement type shingles may be enhanced in accordance with the invention. An added advantage of coating this type of shingle with dispersion coatings as herein described resides in the fact that mineral surfacing of various colors may be applied to produce cement type shingles in a variety of colors without necessitating the use of expensive pigments as is now required in the asbestos cement shingle art. The coating material as thus applied to asbestos cement shingles also functions as a cushion to prevent breakage of the shingles in the packages during handling and transport due to the normally fragile character of these shingles. Moreover, since the aqueous dispersion may be readily applied to the wet formation stripped from the collecting cylinder, as well as to the partially or completely dried slab, as explained above, the dispersion may thus be made to serve as a medium for insuring proper curing of the asbestos-cement composition.

While the object and advantages of the invention as heretofore described will be appreciated by those skilled in the art, it may be pointed out

here that this invention comprises a radical departure in the roofing industry for the manufacture of composite roofing or like material, and also that other types of emulsions, the dried films of which do not have the resistance to flow or the mechanical stability and static properties of the dispersions employed in accordance with my invenion, as well as cut-backs or similar compositions which require fibre to reinforce the coating and to prevent flow thereof, do not possess the weathering ability and other advantages that accrue from the present invention. Where fibres are employed to reinforce the film and prevent flow, they exhibit a tendency to absorb moisture as soon as the film surrounding the fibres have undergone the least weathering action. The absorption of moisture by the fibres may then cause the fibres to swell and induces cracking of the coating particularly under frost action and additionally the fibres, being of organic nature, are readily susceptible to decay, as a result of all of which, avenues for the entrance of moisture to the base are readily presented.

Having thus described my invention it will be apparent to those skilled in the art that numerous variations and changes may be made therein without departing from the spirit of the invention as set forth in the appended claims.

I claim as my invention:

1. In the process of producing shingles of the asbestos-Portland cement composition type, the improvement which comprises the steps of applying to a surface of the formed composition a coating layer comprising an aqueous dispersion of bitumen, partially embedding comminuted surfacing material in said layer, and drying the thus coated composition to remove the water of said dispersion layer and thereby bind the said comminuted material to said surface.

2. In the process of producing shingles of the asbestos-Portland cement composition type, the improvement which comprises the steps of applying to a surface of the formed composition before complete drying of the latter, a coating layer comprising an aqueous dispersion of bitumen, partially embedding comminuted surfacing material in said layer, and drying the thus coated composition whereby to complete the setting of the asbestos-Portland cement composition and simultaneously to remove the water of said dispersion layer and thereby bind the said comminuted material to said surface.

3. As an article of manufacture, a shingle of asbestos-Portland cement composition having the surface thereof to be exposed to the weather coated with a layer comprising a water-free film of an aqueous dispersion of bitumen, said coating film having the dispersing agent distributed therethrough in a honeycomb structure, said film having comminuted surfacing material partially embedded therein to furnish a wear-resisting and decorative layer for said coated surface.

4. As an article of manufacture, a shingle of asbestos-Portland cement composition having the surface thereof to be exposed to the weather coated with a layer comprising a water-free film of an aqueous dispersion of bitumen, said coating film having the dispersing agent distributed therethrough in a honeycomb structure, said film having comminuted surfacing material partially embedded therein to furnish a wear-resisting and decorative layer for said coated surface, individual particles of said surfacing material being coated with films of said coating material extending outwardly of the general plane of the coating film on said surface.

LESTER KIRSCHBRAUN.