Sept. 6, 1966 R. H. ENSLEN ETAL 3,270,476

INSULATING BOARD

Filed Jan. 22, 1962 2 Sheets-Sheet 1

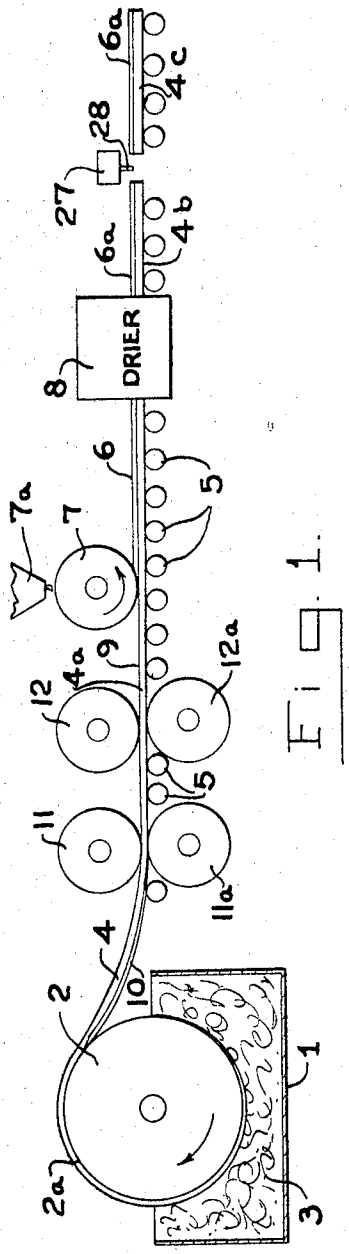


Fig. 1.

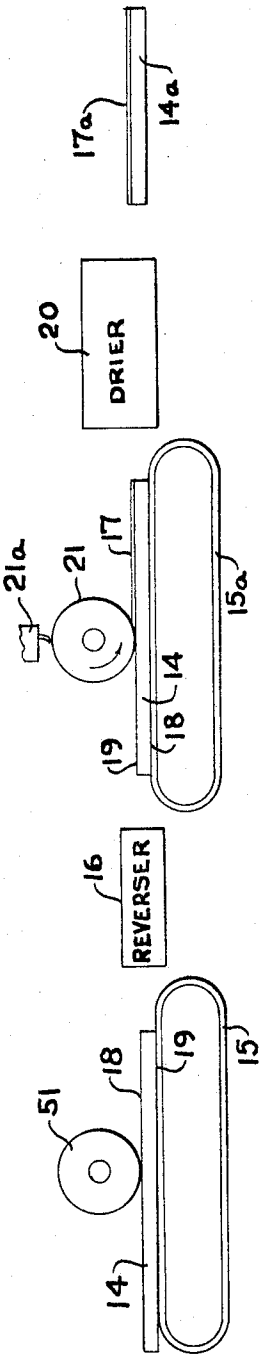


Fig. 2.

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Filed Jan. 22, 1962 2 Sheets-Sheet 2

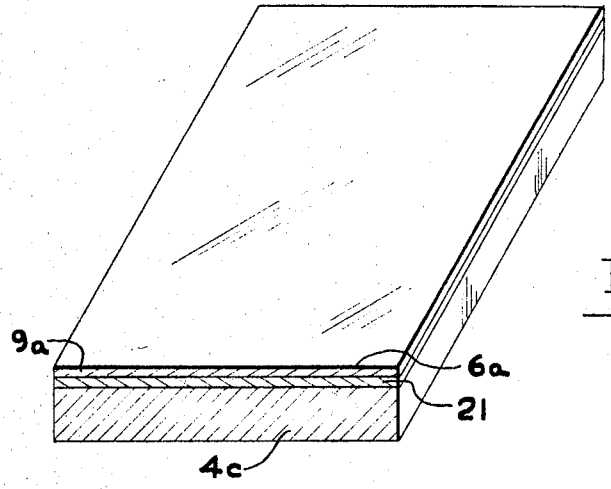
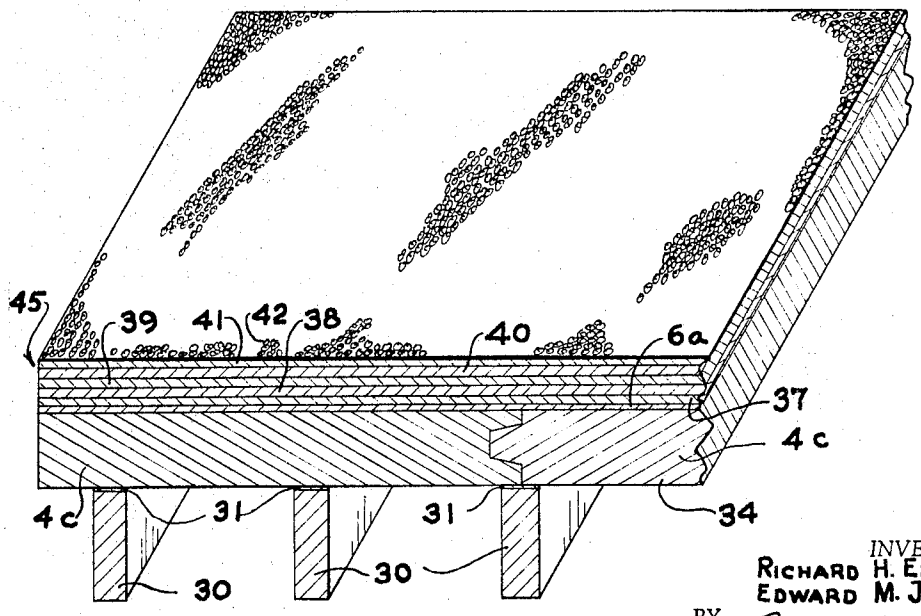


Fig. 3.

Fig. 4.



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INSULATING BOARD

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4 Claims. (Cl. 52—516)

This invention relates to insulating boards and roof coverings; and, in particular, it relates to a novel method of coating a fibrous insulating board, to the coating utilized, and to the fiberboard produced. The coated fiberboard, when utilized in an industrial application, as, for example, a roof covering or sheathing, exhibits and imparts certain advantages over prior installations of a similar nature.

Insulating deck fiberboards of general utility, made from cellulosic fibers, as, for example, wood fibers, bagasse, corn stalks, or the like, usually have sufficient density and exhibit such characteristics as to permit a satisfactory hot asphalt or bitumen built-up roof covering to be applied thereover. A proper bond between the asphaltic or bitumen covering and a major surface of the insulating deck is readily obtained; the interrelationship between the bond and the density of the fiberboard is such that the bond is not appreciably weakened over an extended period of exposure. A marked trend has commenced in the fiberboard industry, however, to manufacture the general purpose type insulating fiberboard into more restrictive categories, for example, in specific density ranges, or with emphasis on some other major characteristic of the fiberboard. With such selective manufacturing and marketing, specialized insulating fiberboard is of such a nature, that only those main fiberboard minimum standards or characteristics which are necessary to perform a particular job or to withstand certain conditions, are stressed or sought after; other standards or characteristics, not of significance to a particular installation, are ignored. For example, the insulating deck for a roof covering can be designed with a narrow piercing strength range, so as to exhibit that degree of piercing strength which is necessary to prevent average workingmen on the roof from breaking into a portion of the insulating deck only by standing or walking thereupon.

Thus, in the area wherein the particular invention described herein is concerned, a trend has been created to reduce the density of the general purpose insulating fiberboard to certain specified ranges, for use as an insulating deck, since fiberboards of general purpose or utility naturally exhibit a number of mechanical characteristics, primarily relating to strength, greatly exceeding the maximum requirements required of an insulating deck covering. With such a reduction in density, the mechanical properties have been lowered, generally speaking; nevertheless, the reduced density fiberboard, by and large, meets most building specifications on insulating deck coverings. With such reduction in density, some problems have arisen in properly applying asphaltic roof coverings over the insulating deck and properly maintaining such covering adhered after application. The main problem created is due to the fact that the asphalt (or other bituminous substance), used in forming the roof covering, has a marked tendency to have the volatile materials within itself to be absorbed by the low density fiberboard used as the insulating deck, either immediately upon application or subsequent thereto, thereby ultimately weakening the bond between the covering and the insulating deck. In addition, some of the lesser volatile asphaltic or bituminous solids are absorbed by the fiberboard over an extended period of time, resulting in a

fiberboard having a roof covering thereupon which eventually fails during inclement weather.

An object of this invention, therefore, is to provide a novel insulating fiberboard.

An additional object of this invention is to provide an insulating board having a novel type of coating and covering applied to at least one major face thereof.

A still further object of this invention is to provide a novel process for applying a coating to insulating fiberboards, or the like, during manufacture of such boards.

A further object of this invention is to provide an insulating fiberboard for roof deck covering use, or the like, which is of much lighter weight or density than previously used in such installations, but which, for these types of installations, exhibits the same important characteristics relative to absorption of liquids and binding of the roof covering as fiberboards of general utility, i.e., boards of the same basic nature but of much greater density.

Moreover, an additional object of this invention is to provide a novel type of light-weight roof deck with a roof covering thereupon, wherein the bond between the deck and the covering is made strong and which remains strong over an extended period of time.

An additional object of this invention is to provide a novel coating mixture for use with fiberboards, and the like.

In brief, the invention is concerned with the application of a coating to fiberboards, or the like, and which coating renders the surface of the fiberboard sealed, waterproof, and adaptable to have coverings and/or additional coatings to be applied thereover. The applied coating is of such a formulation that it is in part water soluble and in part water insoluble, and it is compatible with an asphaltic built-up roof covering applied thereover.

In general, the invention comprises the application of an asphalt (or bitumen), clay, and water mixture to a surface of a low density fiberboard, and which coating is compatible and workable with an asphaltic covering material used in forming built-up roofs. The coating, itself, may be applied to the fiberboard sheets during the manufacture of the fiberboard, necessitating the application of the coating while the fiberboard is still in its wet state, (i.e., containing approximately 30% to 40% solids and the remainder water), or it may be applied to the fiberboard subsequent to the manufacture thereof, i.e., when the board is in a completely dry state. When such coated fiberboards are applied as a roof deck and a built-up asphaltic roof covering is applied thereover, the asphalt or bituminous substances of the roof covering are compatible with the coating on the fiberboard, thereby forming a strong bond therewith rather than with the fiberboard itself, while the clay component prevents any absorption of the hot asphalt, applied as the covering, into the deck fiberboards. Thus, the coating on the roof deck fiberboards affords certain distinct advantages:

(a) it acts as a sealer preventing absorption by the fiberboard of any of the ingredients used as roof coverings,
(b) it acts as a waterproofing agent, preventing moisture absorption by the fiberboards, and
(c) it acts as a bonding agent to combine with covering mixtures, properly locking such covering mixtures to the fiberboards.

The above and other objects will be readily apparent from the preceding brief description and from the following more detailed description, and the included drawings attached hereto, wherein:

FIG. 1 is a schematic view of a manufacturing machine for producing insulating fiberboards and the like, showing

the manner of wet-end application of the coating on a surface of the formed wet fiberboard;

FIG. 2 is a partial schematic view showing the application of the coating on dry fiberboard;

FIG. 3 is an isometric view, partially in cross-section, of the insulating fiberboard of this invention; and

FIG. 4 shows a portion of a roof deck with the deck boards coupled to each other, and the coating and roof covering applied to a major surface of the deck.

Referring to FIG. 1, the apparatus therein schematically depicts a fiberboard fabricating machine for forming rigid insulation board from a dilute slurry, containing primarily fibers and water. The fibers used therein are usually obtained from wood; however, other cellulosic fibers may be used depending upon the supply; for example, corn stalks, sugar cane, waste paper fibers, or the like, may be utilized. In addition, non-cellulosic fibers may be utilized, either exclusively or in combination with cellulosic fibers. For purposes of simplicity, the description will be confined to cellulosic or wood fibers; it is to be understood that other fibers may be used in lieu thereof and still be within the purview of this invention.

The particular forming machine illustrated is of the Oliver type; however, a continuously forming machine of the Fourdrinier type, or other such machine for manufacturing fiberboards, may be substituted therefor. In the Oliver machine, a continuously rotating cylinder **2** has on its outer periphery **2***a* a foraminous surface connected to a vacuum source. The foraminous surface is rotated within a vat **1** having a slurry **3**, primarily of water and fibers. The slurry is maintained at a predetermined level, and the slurry is constantly fed and withdrawn so as to maintain the solids consistency fixed, usually at about ½% to 1½% solids. The fibers, and other solids which may be used within the slurry **3**, are gradually picked up by (or are deposited upon) the foraminous surface of the perimeter **2***a* thereby forming a web **4** of a predetermined thickness. The periphery, in effect, acts as a filter; the solids being deposited on the periphery while the water is passed centrally thereof and, usually, recirculated. When the web **4** is rotated to the upper portion of the cylinder **2**, sufficient water has been removed therefrom, whereby it can be doctored off the foraminous surface and deposited upon a plurality of parallel, free rolling rollers **5** via transfer sheet **10**. The rollers transfer the continuously formed web **4** from the Oliver cylinder to the other steps of the process, while continuously draining the water therefrom. The formed web **4** is passed adjacent opposed compressing rolls **11**, **11***a* and **12**, **12***a*, which assist in removing additional water from the web and in imparting thereto greater body. In commercial production, five or six of such paired, opposed rolls are used. At this stage of the process, the mat **4***a* has contained therein approximately 30%–40% solids; at the transfer sheet **10**, the mat contains about 20%–25% solids. In lieu of the opposed rolls **11**, **11***a* and **12**, **12***a*, a foraminous compressor belt may be utilized.

The mat **4***a* is then passed under an applicator **7**, which applies the asphaltic-clay coating of the present invention to the wet surface **9** of the mat **4***a*. The coating may be roller-coated, as illustrated, or it may be applied through a plurality of sprays fed from a pressurized supply source, or it may be applied in a brushing operation. The mat **4***a* has sufficient body, even though it contains about 60%–70% water, to receive the coating without marring of the surface or displacement of the fibers. With the roller-coater illustrated, a supply **7***a* continuously feeds the asphaltic-clay mixture to a surface of the roller-coater **7** in an amount sufficient to have the latter impart a proper thickness of coating **6** to the surface **9**.

The mat **4***a*, having the coating **6** applied on a major surface thereof, is then passed through drier **8**, wherein the traveling mat has the remainder of its moisture removed therefrom and the coating **6** on the mat is dried and integrally bonded to the surface **9** of the mat. The drier **8** may be a tunnel-type drier utilizing hot air, or

the drier may comprise a plurality of banks of infra-red lamps imparting heat directly to the passing mat. Other types of driers are also commercially available. The applied coating is of such a nature that it permits the water vapor from the fiberboard mat to pass therethrough, as the mat, during the drying cycle, emits water vapor from the lower surface (where the coating is not applied) and also from the upper surface (where the coating has been applied). In spite of the fact that the vapor is emitted from both major surfaces, no warpage or marked distortion of the fiberboard results, and the fiberboard maintains its relatively planar state, both dry and wet. This result is obtained even though the coating ultimately acts as a sealer and also a waterproofing agent. The sealing characteristic of the coating is imparted during the drying cycle, as the sealer characteristics of the coating prevent any appreciable absorption of the asphaltic or bitumen components of the mixture during drying or while the coating is wet.

The resultant mat is conveyed from the driers in the form of a continuous sheet *4b* of dried, interfelted, fibers, commonly known as insulating fiberboard, having a dried sealer-waterproof coating **6***a* thereupon. The continuous layer of fiberboard is subsequently passed by a transversely moving saw **27**, having a cutting blade **28**, which reduces the continuous layer into proper sheet length, as, for example, individual sheets **4***c*. If the drier is of the tier type, the sawing operation is usually performed prior to the drying step. The fiberboard is then cooled and stored.

In the above embodiment of the process of applying a sealer-waterproof coating to the fiberboard, the coating is applied thereto while the latter is in a wet state, containing approximately 60%–70% water. The particular coating of this invention may also be applied while the fiberboard is in the dry state, for example, applied at a stage subsequent to the drying operation. Referring to FIG. 2, a dried fiberboard **14**, depicted as being in small sheet form, as, for example, a 4′ x 8′ size, is conveyed on a conveyor **15**. If necessary, a major surface **18** of the sheet **14** may have applied thereto water, as, for example, from a roller-coater **15**. Such wetting of the surface of the sheet **14** is necessary with some types of manufactured fiberboards to prevent subsequent warpage of a coated sheet. This warpage is believed to result from the fact that some fiberboards, in their dry state, have adjacent both major surfaces thereof a plurality of areas under tension, which are created during the drying cycle by the drying of the surfaces of the fiberboard prior to complete drying of the interior of the fiberboard. Although such stresses may be removed, as, for example, by annealing in a steam bath or an oil bath, stress removal is not necessary since the dried board has such stresses on each major surface thereof, with one set of stresses on one major surface counterbalancing the group of stresses in the opposite major surface. The fiberboard may thus be in a stressed, equilibrium condition, and still maintained planar. Consequently, if the board has undergone a prior annealing process, the wetting of the board by a water roller-coater **15** may be omitted; otherwise, wetting of one major surface is made. As a result of such water application, the stresses adjacent the surface **18** have a tendency to be relieved causing cupping (temporary warpage) of the sheet **14**, since the equilibrium stress condition no longer exists. In effect, the fiberboard is made slightly concave, with the board appearing concave from the wetted side **18**.

The passing sheet of fiberboard is transported to a reversing unit **16** and placed upon a second conveyor **15***a*, with the uppermost side **18** becoming the lowermost side on the conveyor **15***a* and the lowermost face of the sheet on conveyor **15** becoming the uppermost face **19** of the sheet on conveyor **15***a*. The reversal of the sheet may be accomplished mechanically or manually, as de-

sired; a mechanical reverser is depicted as being used. The sheet 14 is transported by the conveyor 15*a* and past the applicator 21, which deposits an asphaltic-clay coating 17 upon the surface 19 of the sheet. The applicator, as in FIG. 1, may be fed from a supply source 21*a* in such an amount and at such a rate, as to apply a film of the proper thickness upon the surface 19 at the proper rate. The coating mixture, applied as an emulsion, acts as a liquid, and it penetrates to a sufficient depth at the surface 19 whereby the stresses at this surface are relieved also. The cupped sheet 14 reverts to an equilibrium stress condition and gradually returns to a planar state. Upon subsequent drying, an unequal stress condition is not created, and the sheet remains planar.

The wet coated sheet 14 may then be passed through a drier 20 to harden the coating 17 and integrally bond the coating with the surface 19 of the sheet 14. With dry fiberboard coating application, only the coating 17 need be dried; as a result, the drier 20 may be much smaller, although of the same general nature as drier 8 in FIG. 1. The resultant sheet 14*a* having the coating 17*a* upon a major surface thereof is then transported for shipment or for placement in storage, as required.

Referring to FIG. 3, which depicts a fiberboard sheet in an enlarged view, the basic sheet 4*c* may be of any convenient size, as, for example, 4′ x 8′, 2′ x 4′, or 4′ x 4′. The edges of the sheet are shown to be straight edged; however, the edges may be routed so as to form male-female surfaces suitable for joints, after the sheets are juxtapositioned each other to form a covering. The upper major surface of the fiberboard sheet has the dried coating 6*a* thereupon. Adjacent the surface 9*a* of the basic fiberboard sheet, the coating has penetrated thereinto so as to be interlocked therewith, as indicated by the area 21. In a fiberboard sheet wet coated, the interlocking area is slightly deeper than in a fiberboard sheet dry coated. This results from the fact that the wet sheet has a greater tendency to absorb the more volatile elements of the coating than a dried fiberboard sheet coated in the same manner. With either type of coating application, the sealer portion of the coating is effective to seal off the surface of the fiberboard, regardless of whether such surface is wet or dry, and to prevent any appreciable asphalt absorption. With fiberboards coated wet or dry, a black sheen is evidenced on the coated surface indicating very little deep asphalt penetration into or asphalt absorption, by the board.

Referring to FIG. 4, depicting a built-up roof in partial cross-section, the fiberboards 4*c* are placed upon roof rafters, purlins, girders, or the like, 30 comprising the bare roof structure of a particular building. The fiberboards may be laminated to each other to be of 1″ to 3″–4″ thickness, depending upon the insulating values desired to be imparted to the roof. Usually fiberboards manufactured on an Oliver or Fourdrinier machine have a maximum unlaminated thickness of about 1″ nominal; consequently, several of such sheets would ordinarily be laminated to each other to form an insulating deck between 1″–3″ thickness. To cause the insulating deck to be locked in with the basic girder, rafter, or purlin construction, adhesive 31 may be applied adjacent the contacting surfaces so as to firmly bind the two structures to each other. In lieu of adhesive securement, mechanical fasteners may be substituted therefor. In addition, and in order to form a more integrated construction, the side edges of the fiberboard sheets are beveled so as to result in interlocking joints between adjacent sheets.

After the sheets are secured to the basic roof structure, a coating of hot asphalt 37, usually at a temperature of approximately 500° or thereabouts, is poured over the exposed surface of the insulating fiberboards 4*c*, comprising the roof deck. The poured asphalt (or other type roofing bitumen) engages the coating 6*a*, and integrally bonds with the asphaltic component of the coating. The sealer portion of the coating however prevents any absorption of the covering asphalt 37, and the bond between the roof covering 40 and the fiberboards 4*c* exists at this area, i.e., between the covering material 37 and the asphaltic component of the coating 6*a*. Before the covering asphalt cools appreciably, a layer of asphalt impregnated felt 38 is applied over the liquid coating 37 and embedded thereinto. The roof covering is continued to be built up in this fashion, by alternate layers of liquid coating 39 and felt 40, depending upon whether a two, three, or four ply roof is desired. The last application is a coating of asphalt 41, on which are deposited granules 42. The latter are spread evenly over the surface of the roof and embedded into the ultimate coating 41.

Densities of fiberboard in the order of about 10–14 pounds per cubic foot in natural fiberboard, and about 11–15 pounds per cubic foot in asphalt impregnated fiberboard have been successfully utilized in roof coverings with good bonding between the applied asphalt 37 and the coating 6*a* (FIG. 4) and with very little penetration of the asphalt coating 37 into the body of the fiberboard. For example, under test conditions more severe than the hot asphalt mopping conditions which normally occur in the field, test boards heated for four minutes to a surface temperature of 190° F. after the application of the asphalt coating 37 at 500° F., showed no hot asphalt absorption. The test fiberboards had densities as low as 10 pounds per cubic foot and were sealer coated according to the present invention.

Ordinarily the sealer-waterproof coating 6*a* (FIG. 4) is applied only on one major surface of the sheets forming the insulating deck 34. This is due to practical considerations, as the coating may be applied to both sides, if so desired. However, even in those installations wherein hot asphalt is ordinarily applied to a solid deck surface (used instead of the spaced supports 30 shown in FIG. 4) to adhere the fiberboard deck 34 to the deck surface, the sealer-waterproof coating 6*a* need be applied only on one such surface, i.e., the upper surface of the deck. In such installations, for example, asphalt, used to adhere the deck fiberboards to the solid base and which is in contact with the undersurface of the roof deck fiberboards, solidifies quickly. Usually the hot asphalt has congealed to an appreciable extent, and the congealed portions cannot be absorbed into the board. In addition, gravity flow which assists absorption on the top surface of the insulating deck, does not take place.

After long service of the roof deck, asphalt absorption through the bottom surface of the roof deck does not create a similar condition as asphalt absorption adjacent the top surface of the insulating roof deck. The hazards are less on the bottom surface of the insulating roof deck due to two factors. First, the temperature during warm weather on the bottom side of the insulating deck never gets as high as that on the top side. It is during a period of relatively high ambient temperatures and corresponding high temperatures on the outer surface of the roof covering that the greatest danger of absorption of the top side bonding asphalt 37 exists. Second, any failure of the bonding asphalt on the bottom side of the insulating deck 34 (i.e., between the deck 34 and a solid undersurface) would free the built-up roofing 37, 38, 39, 40, 41 and the insulating deck 34 together as a unit. blowing off of the roof, for example, is most unlikely to occur, due to the great weight and considerable stiffness of the entire construction. On the other hand, failure on the upper side of the insulating deck 34 between the upper surface of the roof deck 34 and the coating 37, where no sealer coating is used, as a result of absorption of the asphalt coating 37 by the insulating deck 34 upon prolonged exposure, frees the roofing felts and intermediate asphalt. Failure of the roof covering is more likely to occur, even when the latter is subjected to moderate winds, although complete roof covering failure may not result.

By applying the sealer-waterproof coating in the manner recited herein (FIGS. 1 and 2) on fiberboards, the roof coverings, depicted in FIG. 4, accrue to themselves certain advantages. The insulating deck is made lighter, and the individual fiberboard sheets are easier to handle by an application crew. Since very little absorption results, hot mopping of the coating asphalt **37** is easier and cheaper. In addition, the lower density fiberboards are well known to have greater insulating characteristics than fiberboards having greater density. By the application of the sealer-waterproof coating, the density of the fiberboards used in the insulating deck **34** may safely be reduced by an additional approximately 7%–8%. With such reduction in density, the insulating value of the roof correspondingly increases.

It is in the area of asphalt absorption, however, that the main benefit of the present invention lies. Asphalt absorption may occur in two ways. During application of the covering asphalt **37**, absorption occurs due to the very high temperatures of the applied asphalt, which may be in the vicinity of 500° F. If the fiberboards are not coated, the hot asphalt, or the more volatile components thereof, are readily absorbed by the fiberboards. With fiberboards, coated in the manner described herein, softening of the asphaltic component of the sealer-waterproof coating is not followed by absorption of the coating asphalt into the board. The sealer, at all times, acts as a barrier against any penetration of the mopped asphalt into the fiberboard.

Asphalt absorption in uncoated fiberboards may also occur slowly over an extended period of time, as, for example, over three to four years, or more, exposure of the covering. During such prolonged exposure, the coating **37**, when the boards are not sealer-coated, is gradually absorbed by the portion of the insulating deck subjacent thereto. During summer weather, afternoon temperatures of the roof covering may reach as high as 170° F., resulting in a considerable resoftening of the applied asphalt **37**. While very little absorption occurs at any one period of such temperature elevation, the effect is cumulative on prolonged exposure. If cumulative absorption exceeds a certain amount, the bond between the roof covering **38**, **39**, **40**, **41**, and the insulating deck **34** becomes weaker and weaker. During cold weather, it is possible for moisture to condense along the uppermost surface of the roof deck **34** in areas of weak bond and beneath the first felt layer **38**. Upon alternate freezing and thawing, the covering bond becomes weaker and weaker, and deterioration is aggravated by the alternate moisture and ice condition. Ultimately a tearing across the covering occurs, and the wind assists in destroying the covering by placing stresses to the laminated felt layers.

However, with the sealer-waterproof coating applied as described herein, absorption of the applied asphalt over an extended period of time does not occur. On prolonged exposure, the sealer portion of the coating *6a* resists the action of the coating **37** to be absorbed and coating *6a* properly separates the coating **37** from the insulating deck **34** at all times. The waterproofing portion of the coating prevents moisture penetrating into and adjacent the sealer portions, thereby avoiding the alternate freezing and thawing effect noted. Moreover, the waterproofing characteristics prevent attack to the sealer, thereby avoiding weakening of the bond. Consequently, there is no gradual absorption of the coating asphalt into the surface of the deck **34** over an extended period of time.

The particular coating of the instant invention comprises as asphaltic emulsion-clay mixture. An exemplary coating formulation on a dry basis consists of 40% asphalt and 60% clay. The particular formulation on a liquid basis is as follows:

	Weight
Asphalt emulsions (50% solids)	30.9
Flintsize 33–C, manufactured by the Flintkoe Co.	54.5
Clay primer slurry (48.5% solids)	14.6
Dilution water.	

The emulsion-clay slurry and dilution water were intermixed so as to comprise a 44% solids blend. The slurry was applied to a wet fiberboard having a solids content of about 35% at the rate of 22 lbs. per M square feet of fiberboard surface.

The particular clay sealer used is described more fully in United States Patent No. 2,708,643 of Anthony J. Page and David R. P. Haig, issued on May 17, 1955, and assigned to Johns-Manville Corporation of New York, N.Y. The sealer comprises either a synthetic or a natural mixture of about 75%–95% by weight of a non-swelling clay or clay mineral (for example, clays of the kaolinite group, such as, kaolinite and endelite, and the micaceous group, such as, illite and attapulgite) and from approximately 5%–25% of a swellable clay mineral of fine particle size (for example, swelling colloidal clay minerals which can expand along the C crystal axis without altering the other two major crystal axes (A or B), such as, montmorillonite or bentonite, hectorite, and beidellite). Exemplary of a natural mineral mixture is a natural ball clay mined at Crenshaw, Mississippi, and known as Mississippi M and D clay. This clay essentially comprises a mixture of kaolinite and montmorillonite, has a bonding modulus of about 210 lbs. per sq. in., and leaves upon ignition a lignitish residue. When used herein, the expression "a clay having the clay characteristics of Mississippi M and D clay" is intended to define a clay which has the same chemical and physical properties as Mississippi M and D clay regardless of the location where mined or the vendor thereof.

Additives may be used with the clay primarily to enable the formation of a relatively high solids concentration dispersion for ease in application of substantial amounts of the essential mineral mixture. Kaolin clays such as Tako or a ball clay such as Cooley are found to be satisfactory for use with natural clay mixtures. A further disclosure and description of the clay mixtures is disclosed in the above cited patent.

Preferably, the sealer component should be in the approximate range of about 40%–90% and the asphalt emulsion in the approximate range of about 60%–10%, the percentages being calculated by weight of total dry solids. Water is ordinarily used as the carrier, the amount of water being variable depending upon the method of application. With application by a roller, a suspension of about 40%–45% solids in water was found to be very satisfactory. The preferred coverage of the sealer-waterproof coating is in the approximate range of 15 to 25 lbs. (of solids on a dry, weight basis) per 1000 sq. ft. of surface. However the extent of coverage may be altered to fit various requirements.

While the asphaltic emulsions are preferred for the coatings of the present invention, asphaltic waxes may be substituted therefor. The asphaltic emulsions and the asphaltic waxes utilized in the present invention are of the type formed from petroleum residues, as, for example, the pressure distilled pitches. Many types of such asphaltic emulsions—the latter term also including bituminous emulsions—are marketed by the Flintkote Corporation. An example of such an emulsion manufactured by that firm is Flintsize 33–C. Another asphalt emulsion found to be satisfactory is "Bitusize BB", made by the American Bitumen Corp. Generally speaking, the asphaltic component is in the higher melting range, preferably being in the range of melting points between about 170° F. to about 230° F. The asphaltic waxes are somewhat similar to the asphaltic emulsions used, being also a petroleum residue. Paraffins, wax tailings, and

scale wax are examples of such asphaltic waxes or petroleum based waxes.

Anomalous with the basic concepts of the present invention, i.e., the design of fiberboards with limited characteristics so as to be adaptable for certain specific uses only, the characteristics of the sealer-coated fiberboard have been proven to be such, that the coating material may be used with other types of fiberboard, primarily of greater densities, where such fiberboard has other uses than as a roof covering. The coating material of the present invention has certain characteristics which make it adaptable as a waterproofing agent for sheathing type fiberboards, the latter having a density between about 18 to about 25 pounds per cubic foot. Moreover, in addition to exhibiting excellent waterproofing characteristics, the coating compound does not support combustion. Thus, while the particular sealer-waterproofing mixture is particularly useful in roof covering use as a sealer and waterproofer for insulation fiberboard roof decks, it may be used in other fiberboard applications wherein either the sealer characteristic or the waterproofing characteristic or a combination of the two characteristics are required, preferably the latter.

Certain of the waxes, while found to be satisfactory, were somewhat difficult to apply. For example, the following formulation produced a satisfactory coating, but the mixture could only be sprayed on satisfactorily.

Example

	Percent by weight on a dry solids basis
Clay Mixture, Johns-Manville 3–118, clay primer	80
Wax emulsion, Nopco 2252	20

It is believed that the asphaltic waxes used as the waterproofing agents in the formulations, as, for example, wax-tailings, perform satisfactorily if care is used in the application thereof. The percentages used would be in the same ratios as those delineated with the asphaltic-clay mixtures.

While the invention has been described in rather full detail, it will be understood that these details need not be strictly adhered to and that various changes and modifications may suggest themselves to one skilled in the art, all falling within the scope of the invention as defined by the subjoined claims.

What we claim is:

1. A roof covering comprising a roof base, a plurality of cellulosic fiberboards on said roof base, said fiberboards being juxtapositioned to form a relatively continuous surface, said fiberboards having a density between approximately 10–15 pounds per cubic foot, each fiberboard having a coating mixture of clay and an asphaltic substance integrally bonded to the upper major surface thereof, a built-up roof covering on said major surfaces of the fiberboards, said covering being adhered to the major surfaces by a bituminous composition.

2. A roof covering comprising a relatively continuous insulation layer comprised of a plurality of juxtapositioned fiberboards, each fiberboard having on its upper surface a coating mixture of clay and a waterproofing agent selected from the group consisting of asphalt, asphaltic waxes and mixtures thereof integrally bonded therewith, each of said fiberboards having a density between about 10–15 pounds per cubic foot, a built-up roof covering adhered to the upper surface of the insulation layer by a bituminous composition.

3. A roof covering as recited in claim 1, wherein the coating mixture comprises by weight about 40% to 90% clay and about 60% to 10% asphaltic substance.

4. A roof covering as recited in claim 3, wherein the clay comprises a mixture of swellable clay and non-swellable clay.

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CHARLES E. O'CONNELL, *Primary Examiner.*

JACOB SHAPIRO, *Examiner.*

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,270,476 September 6, 1966

Richard H. Enslen et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 6, line 64, for "blowing" read -- Blowing --; column 7, line 72, for "as" read -- an --; column 8, lines 1 to 5, the Table should read as shown below instead of as in the patent:

	Weight
Asphalt Emulsions (50% solids) FLINTSIZE 33-C, Manufactured by the Flintkote Co.	30.9%
Clay Primer Slurry (48.5% solids)	54.5%
Dilution Water	14.6%

Signed and sealed this 26th day of September 1967.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents