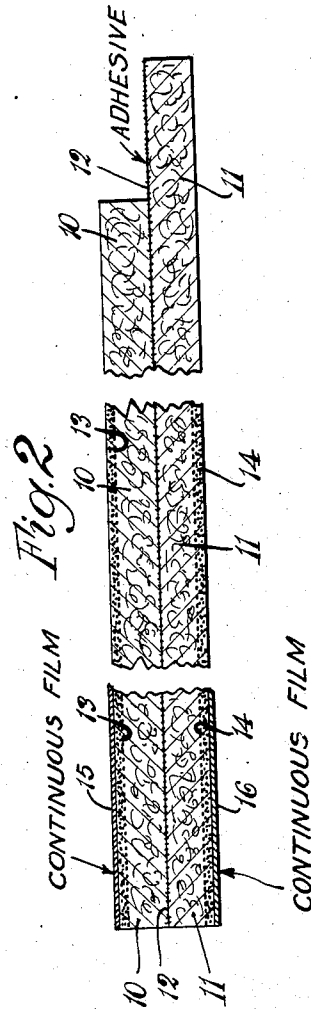
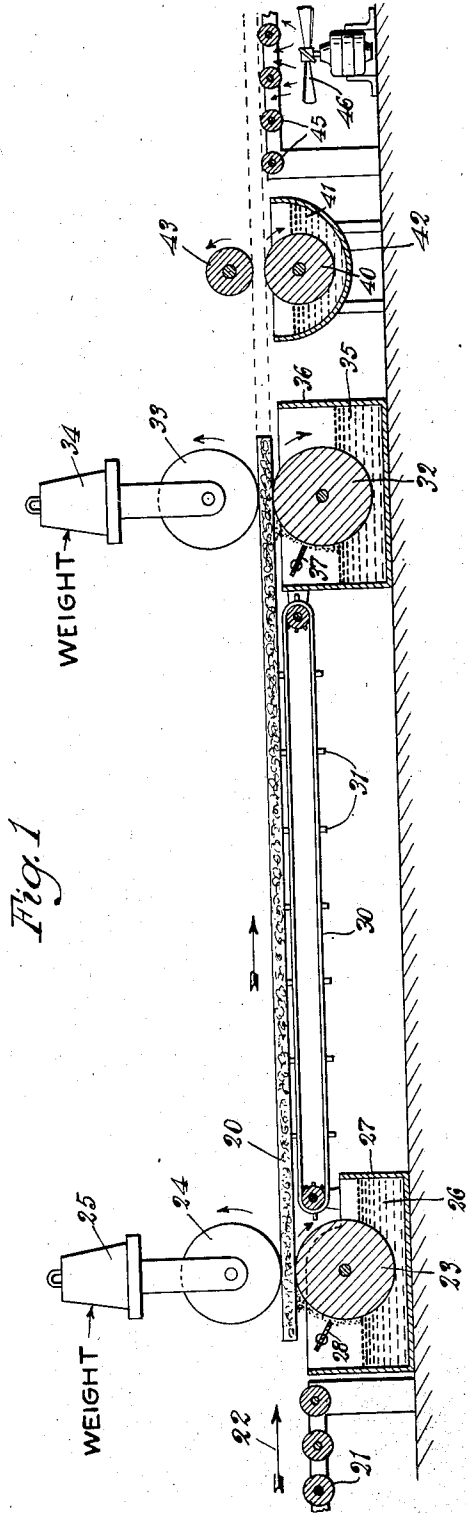


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FUSIBLE COATING COMPOSITION

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FUSIBLE COATING COMPOSITION

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The present invention relates to building material, and in particular to a product useful as sheathing.

For many years the studs of houses have been covered outside with board, over which a building paper is placed to receive finishing structure such as shingles or clap board. More modern developments offer insulation board as panels or other form larger than board, usually wider, but not usually longer. Labor of installation is lessened, and a better thermally insulating wall is obtained. The wider forms make less crack-opening in the structure. The forms are free from knot-holes and are cut with well squared edges, permitting close placing of adjacent pieces and practical closure of the joints.

The use of insulation sheathing couples the requirements of giving strength to the house structure, and insulation value to the wall. These requirements translated to the board are opposed to each other, because insulation value depends upon low density material, and lowering the density of material lowers its strength. Therefore some reasonable compromise is effected, resulting in a quite porous body structure. This structure offers a depository for water, not only in the pores but in the areas of the material exposed to the pores. Such a board also transmits moisture vapor readily, and allows within it a considerable quantity of air containing moisture as vapor. The very position of such a board in a wall as sheathing, exposes the board to a cold temperature such that the moisture vapor in the board may be condensed to water. This permits more moisture to enter and to condense. Thus, the board may become wet, even though it is not in contact with liquid water.

Wetting of the board by absorption of liquid water coming into contact with the board, or by condensation of water vapor in the board, is disastrous to the two main functions of the board. Wetting it causes loss of strength, and loss of insulating value. It is therefore a major problem with insulation sheathing to protect it from water by rendering board less absorptive of water which may contact it, and by rendering it more resistant to the entry of water vapor, and to the transmission of water vapor.

The use of insulation sheathing in the outside wall of a house is attended with the dangers described, which must be considered in the design of the wall. The higher moisture content of the interior in cold weather tends to flow to the outside where there is a lower moisture content. The moisture content in a wall is often such that it condenses forming ice or water accumulatively somewhere in the wall. One of the most common places for such condensation in non-insulated as well as in insulated walls, has been in the colder portions of the wall. Melting and

evaporating during warm weather cause lifting or peeling of the paint.

One remedy is to use a structure in the wall which prevents the passage of moisture. Use of a perfect moisture barrier is expensive or impractical, and as a result imperfect moisture-barrier material is in use today.

It is an object of the present invention to combine thermal insulation building board and imperfect moisture-barrier material, into a prefabricated form, which is successful in protecting itself, and the wall in general, when used as insulation sheathing.

It is a further object of the invention to so combine the insulation and the moisture barrier material that use of it as sheathing in a non-insulated wall, or an otherwise insulated wall, will protect from condensation, both the insulation of the sheathing, and the exterior wall structure applied over the sheathing.

A further object of the invention is to provide insulating sheathing and a coating substance on both sides thereof, the one for the outside serving as an improvement over the building paper commonly used over lumber sheathing, and those on both sides serving as moisture barriers.

Further objects of the invention pertain to the manufacture of a particular type of sheathing as hereinafter described. Among these, it is an object to provide a moisture-barrier coating which permits the coated board to be cut or worked without fouling the tools by sticking to them; to provide a coating substance which is physiologically inert; to provide a coating material which is highly efficient as a barrier to air, water, or water vapor, considering its thickness; to provide coated boards which may be stacked without sticking to each other; and to provide a surface which is hard, water-proof, black and glossy.

Various other and ancillary objects and advantages of the invention will be apparent from the following description and explanation of the invention as explained with reference to the accompanying drawing in which:

Fig. 1 illustrates more or less diagrammatically, in side elevation and partial cross-section, a machine for coating board.

Fig. 2 represents a coated board of this invention, in the stages of its production.

The invention is preferably practiced by using any of the well-known insulating boards which are found on the market, having a density of about 17 lbs. per cu. ft. These are commonly a vegetable fiber board of considerable rigidity and strength, and suitable for nailing across studding. Insulation boards have varying thicknesses, and one of the most common forms is wallboard designed to be secured to the interior face of wall

studs, such boards having a thickness of from $\frac{3}{8}$ inch to $\frac{1}{2}$ inch. Practical considerations rule that this is generally too thin for use in substitution for the common $\frac{3}{8}$ inch sheathing board. Where such wallboard is readily available, it is preferred in practicing the present invention to laminate two thicknesses of such wallboard, to provide a base to be coated. Where a thicker felted board is available it is preferred to use one which is about $\frac{7}{8}$ inch to 1 inch thick, as the base to be coated.

The most important property of the coating is moisture-vapor-transmission resistance. This can be utilized fully, only when the coating is continuous. Hence, the coating is formulated for obtaining such property at permissible cost. It must be used in quantities not wasteful of it, and hence a minimum thickness is desired. Application of such a composition to provide a single coat presents several problems. The coating should not soak into the board to be wasted, and thus to prevent forming a continuous film. Desirably, it should adhere without soaking in. Actually, the coating herein described, does not soak in, and does not adhere well. The board itself presents another problem. Numerous fibers project from the surface to be coated, which interfere with forming a continuous thin film. Thus, having these problems, they have been met by using a priming coat on the board. This is such as to bond the desired continuous coat, to impregnate the surface of the board, to seal off pores in the surface, and to lay down the fibers on the surface of the board. Thus the priming coat forms a base for a continuous coat of the desired composition, applied in quantities permitting economic usage of the composition, and uniform application.

The choice of the priming coat is limited by certain factors other than cost and sizing value. The coat applied over the priming coat (as will later be described), is hard to a certain degree, and capable of being chipped when not highly heated. In cutting the coated board, the material of the outside coating is inclined to flake or chip insofar as its own character is concerned, but this may be prevented by selecting the two coating compositions to give a bond between them greater than the strength of the outer coating itself, as it is involved in the act of chipping. This selection is such that there is a compatibility between the two, such as a tendency of the two to dissolve in or wet each other under the conditions of contact.

In meeting these various requirements, the following procedure has been worked out. The operations are described in order to serve as a basis for further explanation. However, it is to be understood that the invention is not to be considered as limited to the details or specific disclosures that are herein given to illustrate the invention.

One panel of $\frac{3}{4}$ inch board or two panels of $\frac{3}{8}$ inch insulating board of 17 lb. per cu. ft. density cemented facewise together using any suitable cement, may be used. Board is used which is quite smooth or plane on both faces, as distinguished from specially roughened surfaces desirable for decorative effect. The preferred form is "Nu-Wood" made by the Wood Conversion Company of Cloquet, Minnesota, from wood fiber.

The laminating adhesive may be hydrated cellulose, glue, starch, gum, asphalt, or the like, but preferably a water-proof adhesive is used. The

two surfaces to be united are coated with such an adhesive, the boards combined, and the resulting laminated units stacked in weighted piles for about 2 hours more or less, depending on the character of adhesive employed. This sets the adhesive.

The $\frac{3}{4}$ inch board is coated on one face with a melted base coat, which cools rapidly, and preferably in the same machine it is then coated over the said base coat with a melted top coat, which also cools or sets rapidly. The reverse face is then similarly treated. The coated boards of the same size are piled evenly to expose the edges. Where each board is desired to be a completely treated article, the edges of the boards, as presented in such stack may be similarly coated with priming coat and top coat. This may be accomplished by spraying the said materials; or any other materials desired for function or appearance, may be applied to the edges, preferably for convenience, while the boards are stacked.

The remaining disclosure concerns the characters of the top coat, and the base coat; the machine adaptable to the said coating compositions; and the properties of the resulting board.

The top coat

One of the important properties sought is moisture-vapor-transmission resistance. An asphaltic composition has these properties to useful extent for its low cost. But it has a tackiness when warm or heated, such that it would foul tools used to cut board coated with it. A saw and other tools are readily fouled by an asphalt coat on board.

Montan wax is a suitable moisture-barrier substance but it is too expensive. Gilsonite is also a suitable moisture-barrier coating material, but it is brittle, and its melting point for economic utilization is too high. Montan wax and gilsonite may be mixed to give a lower-melting point than that of gilsonite. Either the gilsonite or the montan wax may vary from 25% to 75%. However, we prefer to go further on account of high costs of such mixtures as are easily workable at reasonably available steam pressures, such as correspond to temperatures from 350° F. to 380° F.

We have found that by taking a satisfactory mixture of montan wax and gilsonite as a basis for departure, we may reduce the montan wax to a much lower percentage without losing valuable properties of the mixture, or acquiring undesirable ones. By replacing a part of it with cheaper materials, we may use an asphalt for part of it and a cheap paraffin wax for another part, but we must keep some of the montan wax. We have arrived at the followed preferred formula, in which the permissible variations are also given:

Top coat

	Preferred	Variations
	Per cent	Per cent
Stanolite (Note 1).....	13	10 to 15
Gilsonite (Note 2).....	67	60 to 75
Montan wax (crude) (Note 3).....	14	10 to 30
Paraffin was (crude) (Note 4).....	6	0 to 8

NOTE 1.—Residue of oil cracking process, Standard Oil Company of Indiana, Whiting, Indiana. Melting point specified 170° F. by ball and ring, and may be as high as 200° F. Hard. Fractures at room temperature. Very fluid above melting point.
NOTE 2.—Softening point 286° F. to 295° F. by ball and ring.
NOTE 3.—Softening point 181° F. to 205° F. by ball and ring.
NOTE 4.—Melting point 124° F. to 126° F., but higher and lower melting paraffin wax may be used.

The presence of the gilsonite prevents tackiness from the asphalt until the temperature reaches about 160° F. This is a safe limit to protect tools under the ordinary conditions of working with tools. Melting point and composition may be varied to alter the temperature at which tackiness begins. The temperature of 160° F. herein given is not intended as a limitation, but only as an example within the range of the compositions disclosed.

Base coat

The base coat may be of many things which perform the desired functions. Any bituminous substance may be used, as it may be handled and applied in much the same way as the top coat. Any material may be chosen which is one of the ingredients of the top coat, thus to assure its solubility therein, and to assure a good bond. Naturally the cheapest constituent is employed, which is the "Stanolite." This is coated onto the board and is practically absorbed by the top layer of the board.

Covering power

The aim is to secure the greatest result with a minimum of cost. The less expensive priming coat permits the more expensive top coat to be well anchored to the board, and to be evenly and thinly applied for highly efficient results at satisfactory low costs. For example, the thinness of coating may be controlled by fluidity of the composition and adjustment of the coating mechanism, such as rolls, for a given speed. The following coverings of the preferred compositions have been found satisfactory as a goal to obtain good results at minimum cost:

Covering	Covering power
	Lbs. per M. sq. ft.
Base coat applied at 250° F.	27.5
Top coat applied at 355°-380° F.	35

The foregoing is roughly the minimum which it is possible to obtain with the temperatures of application given. Practical operations produce board with a slightly increased amount, namely about 37.5 lbs. base coat and 42.5 lbs. top coat per M. sq. ft. covered. More may be used without harm, and with improved results, but at a cost rendering higher quantities undesirable, where lower quantities give satisfactory results. By using higher temperatures of application, less quantities of the two preferred coats may be applied with satisfactory results. In this way the base coat may be used at 20 lbs. per M. sq. ft., and the top coat at 30 lbs. per M. sq. ft. It is also to be understood that variations in composition will modify the coverage at any particular temperature of application. The range given represents practical commercial results. The range from 27.5 lbs. to 37.5 lbs. for the base coat, and from 35 lbs. to 42.5 lbs. for the top coat, of the preferred compositions, is the preferred embodiment of the invention, and the embodiment with reference to which the following data is given.

The coated board

Heretofore, insulation sheathing has been known with a surface treatment of asphalt or the like. So far as known at the present time, no product with a continuous film has even been

produced, and hence there has been no product with the properties hereinafter set forth.

The outward characteristics of the board are: gloss, hardness, non-brittleness, non-chipping, non-peeling, non-tackiness, non-tool-fouling.

Measured characteristics of the board show that its lateral strength is equivalent to lumber. With respect to liquid water, it does not expand or swell on contact with water. Its water absorption is indicated by the fact that 15 gms. of water are absorbed per 1000 sq. cm. of coated surface in 24 hours with the surface of the board 1 inch below the surface of water at 70° F. This is about one-quarter of the absorption of the best known other product of this general character, of which other product the surface is not continuously coated.

With respect to the atmosphere, the passage of air itself and of water vapor are measurable. For example, its perviousness to air is indicated by the passage of 1 cu. ft. of air per 100 sq. ft. in 1 hour at a pressure of 1 inch of water. This is important, since if it transmits air readily, it must transmit moisture vapor readily. The transmission of moisture vapor is practically possible without transmitting the associated air. Hence, the practical imperviousness to air does not indicate a like imperviousness to moisture vapor.

Its moisture-barrier effect is represented by the measured transmission of 10 gms. of water (as vapor) per 1 sq. meter, in 24 hours under a partial pressure differential corresponding to that established by air atmospheres at 80° F. with 90% relative humidity on one side of the test panel and 0% relative humidity on the other side of the test panel. This is about one-fifth of the transmission of the best known product for similar use, of which product the surface lacks a continuous film coating.

The insulation value is not created or altered by the present invention, and is determined by choice of the insulating board. That herein specifically referred to gives the product an insulating value designated in known terms of $K=.32$. However, the invention preserves that value when the product functions as applied insulation, by keeping the insulating body dry.

In the drawing, the numerals 10 and 11 represent two layers of insulation board united by adhesive 12 into a thicker board. The numerals 13 and 14 represent the priming composition absorbed respectively by the surfaces of boards 10 and 11 onto which it is coated. Numerals 15 and 16 represent films of the ultimate coating applied respectively to the saturated surfaces of board plies 10 and 11.

In Fig. 1 the board 20 to be coated moves forward on rollers 21 in direction of arrow 22 into the nip of rolls 23 and 24. Roll 24 is represented as weighted or balanced by weight 25, whereby to adjust the pressure of the board onto coating roll 23. The roll 23 runs in a pool 26 of melted priming composition in tank 27. Adjustable scraper 28 removes a surplus of material picked up by the roll to leave a controlled quantity for application to the board 20. The board absorbs the material on roll 23 to such extent that the board may be supported in its forward movement. An endless conveyer belt 30, presents spaced bars 31, with narrow faces or edges to carry the board to another coating station.

The board 15 enters between rolls 32 and 33, of structure like that described, with weight 34, pool of coating composition 35, tank 36 and

scraper 37. At this station enough of composition 35 is applied to leave on cooling a continuous film (15 and 16) on the board. The coated surface is run over a roll 40, which runs in cold water 41 in tank 42. Pressing roll 43 above the water roll assures cooling contact with the water to set the melted composition sufficiently at least to permit it running on conveyer rollers 45. Under these a fan 46 provides a current of air to remove heat from the board and from the rollers 45.

Although we have described the invention so far in its preferred form it is to be understood that the operations may be greatly varied. For example, the same effect in a wall may be obtained by coating on one side the two layers of $\frac{3}{8}$ inch board above referred to, and using one layer on each side of the stud. Also such boards coated on one face may be laminated after coating. Laminated board as described may be coated on but one face, to be used in the interior side, leaving the exterior and uncoated face exposed. The invention also concerns the composition, and also its application to insulating board to give a moisture-barrier on the surface.

Since the specification shows that the coating film does permit the product to transmit some moisture vapor, it is obvious that the coating itself and the article coated, are not "perfect" moisture-vapor barriers, in the true sense of the word "perfect." Therefore, anything short of "perfect" is termed an imperfect barrier. The problem presented is to use an imperfect barrier of such character, that it practically gives the benefits of a perfect barrier for the ordinary conditions of its use.

We claim:

1. A coating composition for application in

melted form to produce a coating having imperfect moisture-barrier properties, which is hard and non-tacky at ordinary temperatures and at temperatures up to about 160° F., said composition comprising essentially 10% to 15% asphalt, 60% to 75% gilsonite, 10% to 30% montan wax, and 0% to 8% paraffin wax.

2. A fusible coating composition consisting of gilsonite and material selected from the group consisting of montan wax, paraffin wax and asphalt, said gilsonite and said material being present as a mixture in which either one of the gilsonite and the selected material may vary from 25% to 75% of the said mixture, the selected material being so chosen as to provide in the entire composition from 10% to 20% of montan wax.

3. A fusible coating composition consisting of gilsonite and material selected from the group consisting of montan wax, paraffin wax and asphalt, said gilsonite and said material being present as a mixture in which either one of the gilsonite and the selected material may vary from 25% to 75% of the said mixture, the selected material being so chosen as to provide in the entire composition from 10% to 30% of montan wax and from 10% to 15% of asphalt.

4. A coating composition for application in melted form to produce a coating having imperfect moisture-barrier properties, which is hard and non-tacky at ordinary temperatures and at temperatures up to about 160° F., said composition consisting of asphalt 13%, gilsonite 67%, montan wax 14%, and paraffin wax 6%.

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