Sept. 8, 1942. F. M. ALLEN 2,295,070

FELT LINING

Filed April 17, 1939

Fig. 1.

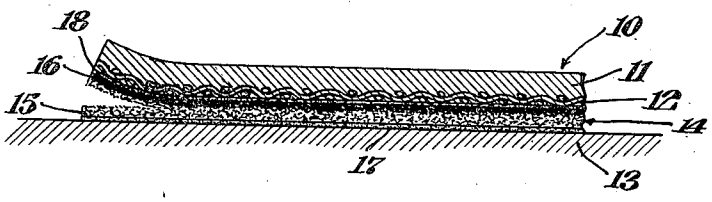


Fig. 2.

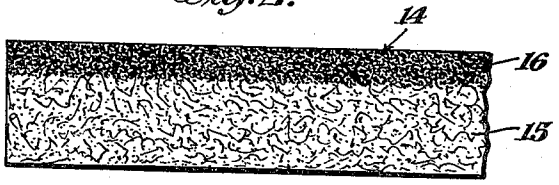
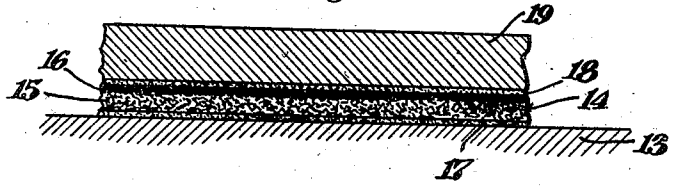


Fig. 3.



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Patented Sept. 8, 1942 2,295,070

UNITED STATES PATENT OFFICE

2,295,070

FELT LINING

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Application April 17, 1939, Serial No. 268,250

3 Claims. (Cl. 117—140)

This invention relates to felt lining sheets and the manufacture and installation thereof. It relates especially to felt lining sheets suitable, for example, for interposition between a covering material such as linoleum and a support such as a floor, wall, article of furniture or the like.

Heretofore felt lining sheets have been provided between covering materials such as linoleum and a support such as a floor. The felt lining that has been used for this purpose has been of two types, namely, dry felt and a uniformly impregnated or waterproofed felt.

It has been usual practice heretofore in installing a covering material such as linoleum in bonded relation to a floor, using a felt lining sheet between the linoleum and the floor, to first bond the lining sheet to the support using a hand spread adhesive, and thereafter to bond the linoleum to the upper side of the lining sheet using an additional quantity of adhesive. This adhesive is usually of water soluble character. Where the lining is of dry or unimpregnated felt it constitutes a relatively weak membrane susceptible of de-lamination under varying service conditions and is particularly subject to damage during the period immediately following installation and before the adhesive dries out and hardens. When such dry felt is used the adhesive sets fairly rapidly due to the fact that the felt is readily wetted by the solvent (usually water) of the adhesive and such solvent is quickly dispersed through the dry felt. The fact that the adhesive sets rapidly is disadvantageous, however, when portions of the covering material such as linoleum are to be cut out and replaced by special insets. In such cases the adhesive rapidly becomes bonded to the dry felt to such an extent that some of the dry felt pulls away from the body of the felt lining when the desired portion of the covering material is removed, thus leaving an uneven base for the insets.

When felt highly impregnated with a bituminous saturant as, for example, a felt of rag and paper fibre impregnated to the extent of about 50% (one part saturant to one part fibre) with a bituminous material having a softening point (determined by the known ball and ring method) of about 115° F. to 200° F., is used as an interliner in the manner mentioned above, the felt sheet does not laminate under service conditions and is water and moisture-resistant. Moreover, due to the greater imperviousness of the saturated felt, the water in the adhesive evaporates slowly causing very slow setting of the adhesive. This slow setting of the adhesive facilitates cutting out desired portions of the covering material after the installation thereof and the replacing of such cut-out portions with insets. Such highly impregnated felt has serious disadvantages, however, inasmuch as the tendency of the saturated felt to excessively retard setting of the adhesive layers both above and below the felt results in the finished installation being subject to denting even under light loads for several days until the adhesive has hardened. An even more serious difficulty incident to the use of such highly impregnated felt is that such felt is extremely difficult to remove from a support after it has become bonded thereto. Dry felt can be quite readily removed especially when a water dissociable adhesive has been used to bond it to a support, inasmuch as the felt is readily permeable to water and permits the water to pass through the felt and dissociate the adhesive so that the felt and adhesive can be readily removed. When a saturated felt has been used its lack of permeability makes it extremely difficult and costly to remove after it has once bonded to a support.

Felt linings impregnated uniformly throughout but containing a lesser percentage of asphaltic binder than is present in the saturated felt above described have also been used as lining sheets but such felts are an unsatisfactory compromise between dry felt on the one hand and highly impregnated felt on the other hand. When the degree of impregnation is low it results in too rapid setting of the adhesive for inset work and in too slow setting of the adhesive layer that bonds the felt lining to the support.

It is a purpose of this invention to afford a felt lining sheet that overcomes difficulties such as those hereinabove referred to which are incident to lining sheets heretofore used.

It is a feature of lining felt embodying this invention that while it contains bituminous material (or equivalent waterproofing binder material) throughout, the bituminous material is non-uniformly distributed in the sheet so that the felt at and adjacent one side of the sheet contains substantially more of the bituminous material than the felt at and adjacent the other side of the sheet. It is a further feature of this invention that a lining felt of the character referred to is installed with the side comprising the lesser amount of bituminous material adjacent the support and with the side comprising the greater amount of bituminous material adjacent the overlying covering material. Further features of this invention relate to the proportions of the binder material in the different parts

of the lining sheet. Still another feature of this invention relates to the physical form in which the binder is distributed among the fibres of the sheet so as to secure the desired permeability to water while obtaining high resistance to lamination. Still further features of this invention relate to the method of making the improved lining sheet and to the installation of the lining sheet.

In order to afford a clearer understanding of this invention and of the purposes, features and advantages thereof, it will be described in connection with certain specific examples of the practice thereof.

A lining sheet which I have found to be very satisfactory for positioning between a support such as a floor and an overlying covering material such as linoleum consists of a felt sheet of rag and paper fibres comprising a body portion that contains about 5% to about 30% of a bituminous binder. The percentages just mentioned and mentioned elsewhere in the specification and in the claims represent the percentage by weight of the defined constituent in relation to the total weight of the impregnated sheet or sheet zone in question. Preferably the amount of bituminous binder in the body portion of the sheet is within the range of about 5% to about 20% and in usual practice is about 10% to about 20%. The body portion of the sheet, aside from the bituminous binder, consists essentially of fibrous material, although the felt may contain a minor proportion of filler material. One side of such felt sheet is impregnated with a bituminous binder so that a portion or zone of the felt at and adjacent one side of the sheet contains more than 30% of bituminous material and preferably contains about 40% to about 60% of bituminous material. It is to be noted that the lining felt contains bituminous binder throughout but this binder is so apportioned that the lining sheet is divided into two dissimilar layers or zones, one layer or zone at and adjacent one side of the sheet containing a greater proportion of bituminous material than the layer or zone at and adjacent the other side of the lining sheet. Usually it is desirable that the difference in the proportion of binder between the two layers or zones be greater than about 10%, preferred results being obtained when the difference in binder is about 20% to about 50%. For the body portion or layer of the sheet containing the lesser proportion of bituminous binder a bituminous binder having a softening point of about 160° F. to about 170° F. is preferably used, although the softening point of this bituminous binder is subject to wide variation and bituminous binders having a softening point between the range of 130° F. and 200° F. may be advantageously employed according to this invention.

The felt lining sheet may be produced by first preparing a sheet of rag and paper fibres comprising asphaltic material of the character and in the limited amount required for the body portion thereof. Thereafter, the sheet of felt is impregnated from one side only with a bituminous material which only penetrates about one-eighth to one-third of the thickness of the sheet. The bituminous material thus subsequently applied to one side only of the sheet preferably has a softening point somewhat lower than the softening point of the bituminous material in the body of the sheet. Preferably the softening point of the bituminous material that is subsequently added to one side of the sheet has a softening point of about 110° F. to about 120° F., although the softening point of the bituminous material that is thus subsequently added may vary considerably in the practice of this invention, bituminous materials having a softening point of about 100° F. to about 130° F. being advantageous.

One typical satisfactory product which I have produced comprises a body portion or zone at and adjacent one side of the sheet containing about 12% of bituminous binder, about 80% of fibre (e. g., mixed rag, wood and paper fibres) and the balance mineral filler material. Such a sheet is approximately .050 inch to .055 inch in thickness and weighs about one pound per square yard. The asphaltic binder has a softening point of about 160° F. One side of this sheet is impregnated with a bituminous material having a softening point of about 115° F. The amount of impregnating material applied approximates 0.2 pound per square yard and it penetrates about one-fourth the thickness of the sheet, thus producing a zone at or adjacent one side of the sheet which as a whole contains about 50% of bituminous material. The bituminous material in the body portion of the felt sheet is distributed as much as possible in the form of particles binding the fibres together but leaving as large a proportion as possible of the surface of the fibres in an uncoated condition, thereby promoting the absorptiveness and permeability of the body portion of the felt. While the felt sheet has a layer at and adjacent one side thereof which contains considerably more bituminous material than the body portion of the sheet, the portion of the sheet containing the greater amount of bituminous material is preferably also somewhat permeable, although the body portion of the sheet is considerably more permeable.

When a lining sheet of the character above described is installed, this is preferably done by bonding the lining sheet to the surface of a support such as a floor by ordinary linoleum cement in a water-activated condition. The side of the lining felt containing the lesser proportion of bituminous material is bonded to the support. A covering material such as sheet linoleum is then bonded to the upper side of the lining felt by ordinary linoleum cement.

When a felt lining sheet is made and installed as above described, I have found that the defects incident to the employment of the felt lining sheets heretofore used are overcome and that the new structure is very advantageous. In the first place, no part or layer of the lining sheet is sufficiently weak to de-laminate under service conditions. During the installation the porosity and permeability of the layer of the lining felt adjacent the floor is such that the water of the linoleum cement is rapidly absorbed by the felt, thus permitting a rapid setting of the cement used for bonding the lining to the floor. On the other hand, the cement which is used for bonding the linoleum to the upper side of the lining sheet does not set as rapidly as the cement used for bonding the lining sheet to a floor due to the fact that the upper portion or layer of the lining sheet is much less permeable than the lower portion to the water used in the adhesive and therefore the dissipation of the water from the adhesive is retarded, thus retarding the setting of the adhesive. The delayed setting of the adhesive which bonds the linoleum to the lining sheet permits the lifting out of desired portions from the body of the linoleum from periods up to 1½ to 2 hours after the linoleum has been initially

bonded to the lining sheet without damaging the felt of the lining sheet in any way. This facilitates the positioning of border strips and other insets in the linoleum after the linoleum has been bonded to the lining sheet.

It is a further advantage of my improved lining sheet that while the lining sheet will not delaminate under service conditions, the removal of the overlying linoleum is facilitated, inasmuch as the body portion or layer of the lining sheet containing the lesser proportion of bituminous binder can be laminated or split by pulling the linoleum from the floor. The body portion of the lining sheet or zone having the lower binder content affords a cleavage layer which permits the sheet lincleum to be readily stripped from the floor. Preferably the lamination strength or resistance to splitting of such body portion or zone of the lining sheet should be slightly less than the strength of the backing fabric or other foundation sheet of the linoleum which is normally about 20 to 25 pounds per foot of width of the goods. After the sheet linoleum has been stripped from the floor with cleavage in the body portion or zone of lower binder content it is a relatively simple matter to remove the portion of the felt of the lining sheet which remains adherent to the floor, inasmuch as this portion is readily permeable to water so that the water can strike through it and soften or dissociate the adhesive used for bonding the lining sheet to the floor. As has been mentioned above, it is a very difficult procedure to attempt to remove a highly impregnated lining felt from the floor because of its imperviousness to water.

A lining sheet, according to this invention, can be produced in several ways. Preferably the lining sheet is produced by first preparing a furnish suitable for a paper-making operation, which furnish includes an amount of bituminous material which is desired in the body portion or layer of the lining sheet. In an application of William Y. Irwin, Jr., executed on even date herewith (Serial No. 268,345, filed April 17, 1939); is described one suitable method of preparing and felting such a furnish. As described in this application a paper-making furnish is prepared containing bituminous material recovered from scrap bituminized fibrous material, together with fibres derived from wood, rags, newsprint or the like, and together with any filler material such as mineral filler, pigments, particles of hardened oxidized oil or the like that may be present in the scrap. The furnish contains uncoated fibres and the bituminous material is distributed through the furnish in the form of particles so that when a sheet of felt is formed from the furnish by a paper-making operation a major proportion of the surface of the fibres in the sheet is substantially uncoated although the particles of bituminous material distributed throughout the sheet serve to bond the fibres of the sheet together. After the sheet of felt thus produced has been dried, the felt, according to the present invention, is impregnated on one side with a bituminous material in a heat liquefied condition. This can be done, for example, when the sheet comes from the drying unit of the paper machine. In making a lining sheet, according to the example above given, bituminous material having a softening point of about 115° F. is heated to a temperature of about 300° F. and is applied to one side of the sheeted felt. Under such conditions the bituminous material penetrates about one-eighth to one-third through the body of the sheet. The use of bituminous material having a relatively low softening point is desirable, inasmuch as such bituminous material more rapidly penetrates substantially into the body of the felt and gives greater flexibility to the product than is obtained with bituminous material of higher softening point. The bitumen applied to the sheet usually penetrates the sheet so as to produce a zone in which the proportion of bitumen gradually diminishes toward the inner side thereof.

A lining felt produced as above described is especially desirable, inasmuch as the body portion of the felt containing the lesser proportion of bituminous binder is left in a condition which readily permits the absorption and permeation of water or other liquid. This is due to the fact that a large proportion of fibres is not coated with the bituminous binder, the fibres being bonded together, however, by the distributed bitumen particles. When the body portion is thus left so as to permit the ready absorption and permeation by water or other solvent, a water activated adhesive used to bond the lining sheet to a sub-surface sets more quickly, inasmuch as the water can disperse very readily into the body portion of the lining. Moreover, when the lining sheet is stripped from the floor with cleavage in the body portion or zone of lower binder content the felt remaining on the floor can be more readily removed, inasmuch as water can very readily penetrate through the felt and dissociate the adhesive that bonds it to the floor.

A lining sheet having a body portion which has a high degree of permeability and absorptiveness for water or other solvent can be produced by other methods. In general such a felt can be produced by distributing bituminous material in the form of finely divided discrete particles through uncoated fibres in a paper-making furnish and then producing a felt from the furnish by a paper-making operation as by the use of a paper-making cylinder or a Fourdrinier machine. And after the felt sheet has been produced containing the bituminous material in the form of discrete particles uniformly distributed through the uncoated fibres of the felt, the felt can then be treated so as to impregnate the felt at and adjacent one side of the sheet with additional bituminous material. This is preferably done by applying the bituminous material in a heat liquefied condition.

Another method of producing a lining sheet having a partially impregnated body portion or layer is to distribute bituminous material in an emulsified condition together with fibres in a paper-making furnish. When this is done the bituminous material is very uniformly distributed on the fibres in the felt, each fibre of the resulting product having the appearance of being individually coated with a thin coating of the bituminous material. For example, a felt sheet can first be produced from a paper-making furnish containing emulsified bituminous binder so as to produce a sheet containing approximately 15% of bituminous material. After this sheet has been dried it can be treated on one side thereof so that a layer of felt at and adjacent one side of the sheet will contain substantially more bituminous material (e. g., about equal parts of fibre and binder) than the felt at and adjacent the other side of the sheet. A lining sheet of this character is, however, regarded as somewhat less desirable for most purposes than the type hereinabove referred to wherein the fibres in the body

portion of the sheet are for the most part uncoated with the bituminous material. When the fibres are coated with bituminous material in the body portion of the sheet such body portion of the sheet is less absorptive and less permeable to water. This lack of wettability, permeability and absorptiveness of the body portion of the sheet interferes with the rapid absorption of the water used in the cement for bonding the lining sheet to a sub-surface. Moreover, the lack of wettability and permeability of the body portion of the sheet interferes with the removal of any felt which remains on the sub-surface after the lining sheet has been stripped from the sub-surface with cleavage at the body portion or layer of the lining sheet.

A lining sheet embodying this invention and installations using such lining sheet are shown for purposes of exemplification in the accompanying drawing wherein

Figure 1 is a sectional elevation of a portion of ordinary sheet linoleum secured to a support using a lining sheet according to this invention, a portion of the linoleum sheet being stripped from the support;

Figure 2 is a sectional elevation of a portion of the lining sheet per se; and

Figure 3 is a sectional elevation of the lining sheet in combination with another covering material and a support.

Referring to Figures 1 and 2, sheet linoleum is indicated generally by the reference character 10. The sheet linoleum includes a layer 11 of linoleum composition which presents an ornamental and wear-resisting surface and which is integral with a strain-resisting backing fabric 12 which may, as shown, be in the form of a suitable heavy fabric such as burlap. Interposed between the sheet linoleum and the support 13 is a lining sheet which is indicated generally by the reference character 14. The lining sheet consists of a body portion or layer 15 which comprises a limited amount of uniformly distributed bituminous binder. On the side of the sheet adjacent the sheet linoleum is a layer 16 which contains a greater amount of bituminous material than the body portion 15. The body portion or layer 15 is bonded to the support 13 by a layer of adhesive 17 and the layer 16 is bonded to the lower side of the sheet linoleum by a layer of adhesive 18.

In Figure 1 a portion of the linoleum is shown as pulled away from the support 15 in order to indicate what happens when the linoleum is thus stripped from the support. The weakest bond between linoleum and the support is at the body portion or zone 15 of the lining sheet. As indicated in the drawing, cleavage occurs in this zone leaving the adhesive layer 17 and a part of the felt of layer 15 bonded to the floor. After the linoleum has been thus removed, a solvent, e. g., water, adapted to dissociate the adhesive of adhesive layer 17 can be applied to the felt which remains bonded to the floor and since the felt is very permeable to the solvent, it is possible to quickly and easily remove the felt and adhesive from the surface of the support.

In Figure 1 this invention has been indicated in connection with conventional sheet linoleum. It is apparent, of course, that lining felt embodying this invention may be used in connection with other kinds of covering materials. For example, it is apparent that this invention can be used in connection with sheet linoleum having an impregnated felt backing fabric instead of a woven fabric backing. Moreover, the lining sheet can be used in connection with linoleum tiles which are essentially of uniform composition throughout, and usually have no backing fabric.

In Figure 3 a lining sheet embodying this invention is shown in combination with covering material 19 which may be of uniform composition throughout or may consist of any number of different layers. The covering material 19 is shown as bonded to the upper side of the lining sheet containing the greater proportion of bituminous binder by adhesive 18 and the lower side of the lining sheet is bonded to the support 13 by adhesive 17.

In using a lining sheet according to this invention the lining sheet is normally first bonded to the floor and thereafter the covering material is bonded to the upper side of the lining sheet. However, it is not beyond the scope of this invention first to bond the lining sheet to the back of the surfacing sheet, e. g., in the manufacture of a preformed covering structure, and then bond the lower surface of the lining sheet containing the lesser amount of bituminous binder to a support by means of a suitable cement or adhesive.

In using the lining sheet any ordinary linoleum adhesive may be used. A suitable linoleum adhesive which is extensively used at the present time consists of a mixture of lignin and clay in the proportion of one part of lignin to about one part of clay together with sufficient water to render it spreadable. Such an adhesive hardens by the drying out of the water. This type of adhesive is dissociable by water after it has hardened so that the adhesive can be readily removed from a support to which it has been applied upon application of water thereto.

It has been mentioned that it is preferred to make a felt lining sheet embodying this invention by first making a felt containing bituminous material uniformly distributed therethrough by a paper-making operation and thereafter applying bituminous material in a heat liquefied condition to one side only of the felt sheet thus produced. It is apparent, however, that a felt lining sheet embodying this invention can be made in other ways. For example, a preformed felt can be partially impregnated with bituminous material as by impregnating the felt in bituminous material thinned with a suitable solvent, removing the solvent, and thereafter additional bituminous material can be applied to one side only of the felt. This method is not preferred, however, inasmuch as the portion of the felt containing the lesser amount of bituminous binder is less absorbent and permeable to water than when the felt is made so as to contain substantially uncoated fibres bonded together with particles of a bituminous binder. Moreover, instead of applying the bituminous material to one side only of the felt sheet in a heat liquefied condition, the bituminous material can be applied when thinned by a solvent or when in the form of an emulsion, provided the bituminous material as applied is concentrated at one side only of the lining sheet. The bitumen should penetrate to a substantial depth within the felt rather than being in the form of a superficial coating, inasmuch as when the bituminous material penetrates into the felt some porosity of the side or layer of the felt sheet comprising the greater amount of bituminous material can be retained. It is desirable to have the lining sheet permeable to water throughout the thickness thereof, although, as explained hereinabove, the lining sheet should be substan-

ially less permeable at the side of the sheet comprising the greater proportion of bituminous binder than in the body portion or layer of the sheet containing a lesser proportion of the binder. In order that the zone of the lining sheet containing the greater amount of binder retain at least some permeability it is usually desirable that the proportion of binder in this zone taken as a whole be not in excess of about 60%, although if substantially complete impermeability is desired an even greater quantity of bitumen can be used in this zone. Any suitable bituminous binder material may be used such as asphalts, pitches, etc.

Reference has been made hereinabove to the use of bituminous material as a waterproofing binder material for the felt lining sheet. This has been done because bituminous materials are regarded as superior to other binder and waterproofing materials for the purposes of this invention. However, it is not entirely without the scope of some aspects of my invention, broadly considered, to utilize other waterproofing binder materials. For example, a felt can initially be partially impregnated substantially uniformly throughout with a bituminous binder as described hereinabove and thereafter one side of the felt can be treated with a waterproofing binder material such as wax, drying oils, etc. so as to decrease the permeability of the lining felt on one side only thereof. Moreover, in the body portion or layer of the lining sheet other waterproofing binder materials may be used such as rosin, paraffin wax, etc.

Although this invention has been described in connection with certain specific embodiments thereof, it is to be understood that this has been done merely for purposes of illustration and that the scope of this invention is to be governed by the language of the following claims.

I claim:

1. As an article of manufacture, a flexible felt lining sheet the fibers of which constitute a resilient mass substantially as formed by a felting operation, said felt lining sheet containing bituminous material throughout the thickness thereof and comprising a first zone at and adjacent one side thereof that contains about 5% to about 30% of bituminous material and a zone at and adjacent the other side of said sheet that contains over about 30% of bituminous material and that contains at least about 20% more of bituminous material than said first zone, said lining sheet being at least somewhat permeable to moisture throughout the thickness thereof, the fibers of said second zone being free of a substantial amount of surface uncoated by bituminous material, and said first zone containing fibers substantially uncoated with bituminous material but interspersed with particles of bituminous material that bond said fibers together, and said first zone being substantially more permeable to and absorptive of moisture than said second zone.

2. As a lining sheet, a flexible sheet of fibrous felt containing bituminous material throughout the thickness thereof and permeable to moisture throughout the thickness thereof, there being a first zone at and adjacent one side of the felt and constituting the major part of the thickness of the felt containing about 5% to about 20% of bituminous material in the form of discrete particles interspersed among and bonding the fibers in said zone together leaving the major portion of the surface of the fibers in said zone uncoated with bituminous material and leaving said zone in a water-absorptive and readily-permeable condition, and there being a second zone at and adjacent the other side of said felt and constituting at least about one-eighth the thickness of said felt containing about 40% to about 60% of bituminous material which occurs as a coating for substantially all of the surface of the individual fibers in said second zone and bonds the fibers in said zone together, but which does not coat the surface of the felt sheet as a whole and leaves said second zone permeable to moisture so as to permit gradual dissipation of moisture therethrough, said second zone being substantially less water-absorptive and less permeable to moisture than said first zone.

3. As a lining sheet, a flexible sheet of fibrous felt containing bituminous material throughout the thickness thereof and permeable to moisture throughout the thickness thereof, there being a first zone of substantial depth at and adjacent one side of said felt sheet containing about 5% to about 30% of bituminous material which bonds the fibers in said zone together, but which leaves said zone readily permeable to moisture, and there being a second zone of substantial depth at and adjacent the other side of said felt sheet containing more than about 30% of bituminous material which occurs as a coating for substantially all of the surface of the fibers in said second zone and bonds the fibers in said zone together, but which does not coat the surface of said felt sheet as a whole and leaves said second zone permeable to moisture so as to permit gradual dissipation of moisture therethrough, the proportion of bituminous material in said first zone being at least about 10% less than the proportion of bituminous material in said second zone, and said first zone being substantially more permeable to moisture than said second zone.

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