June 28, 1949. C. C. HERITAGE 2,474,398

SURFACE FLUXING COATED LINER

Filed April 21, 1943 4 Sheets-Sheet 1

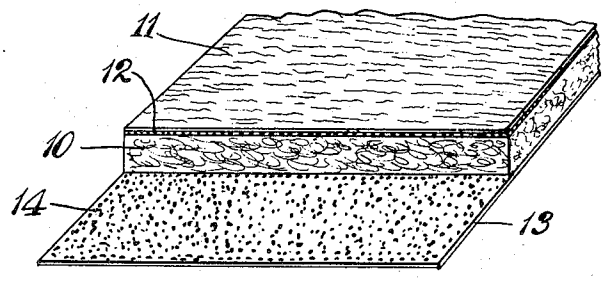


Fig. 1

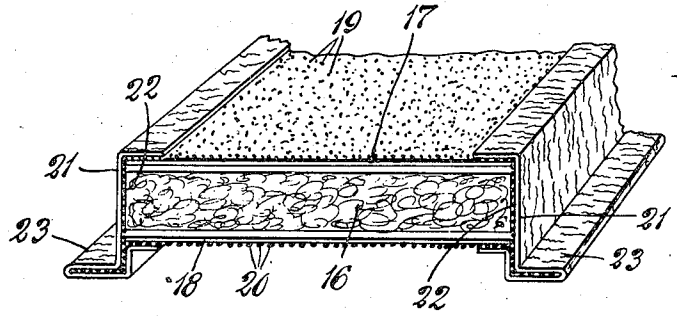


Fig. 2

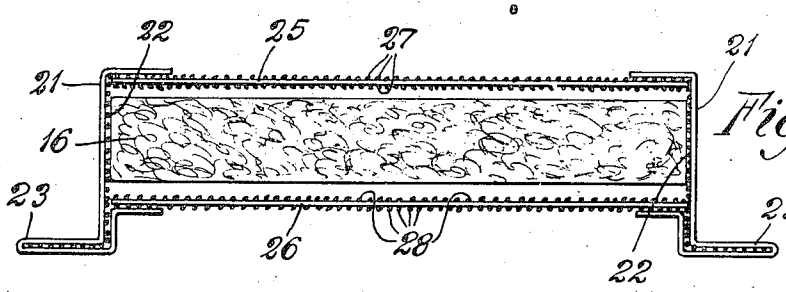


Fig. 3

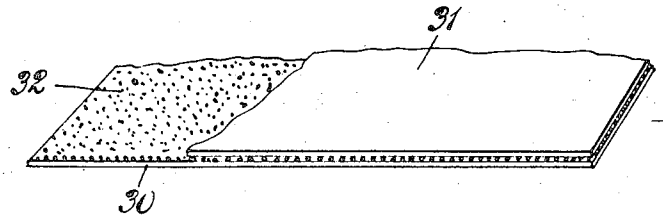


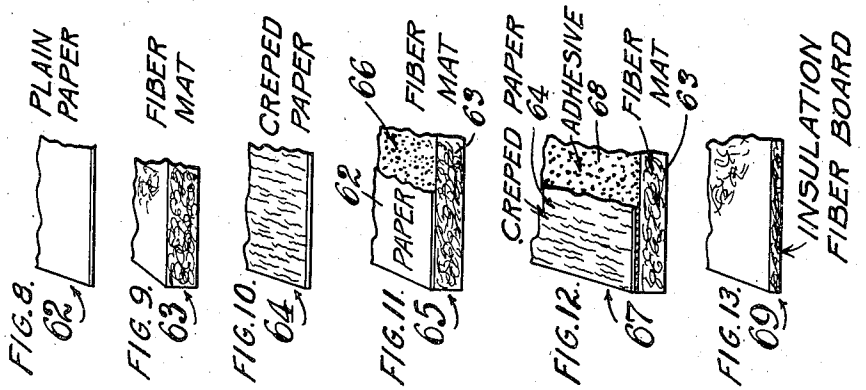
Fig. 4

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SURFACE FLUXING COATED LINER

Filed April 21, 1943 4 Sheets-Sheet 2



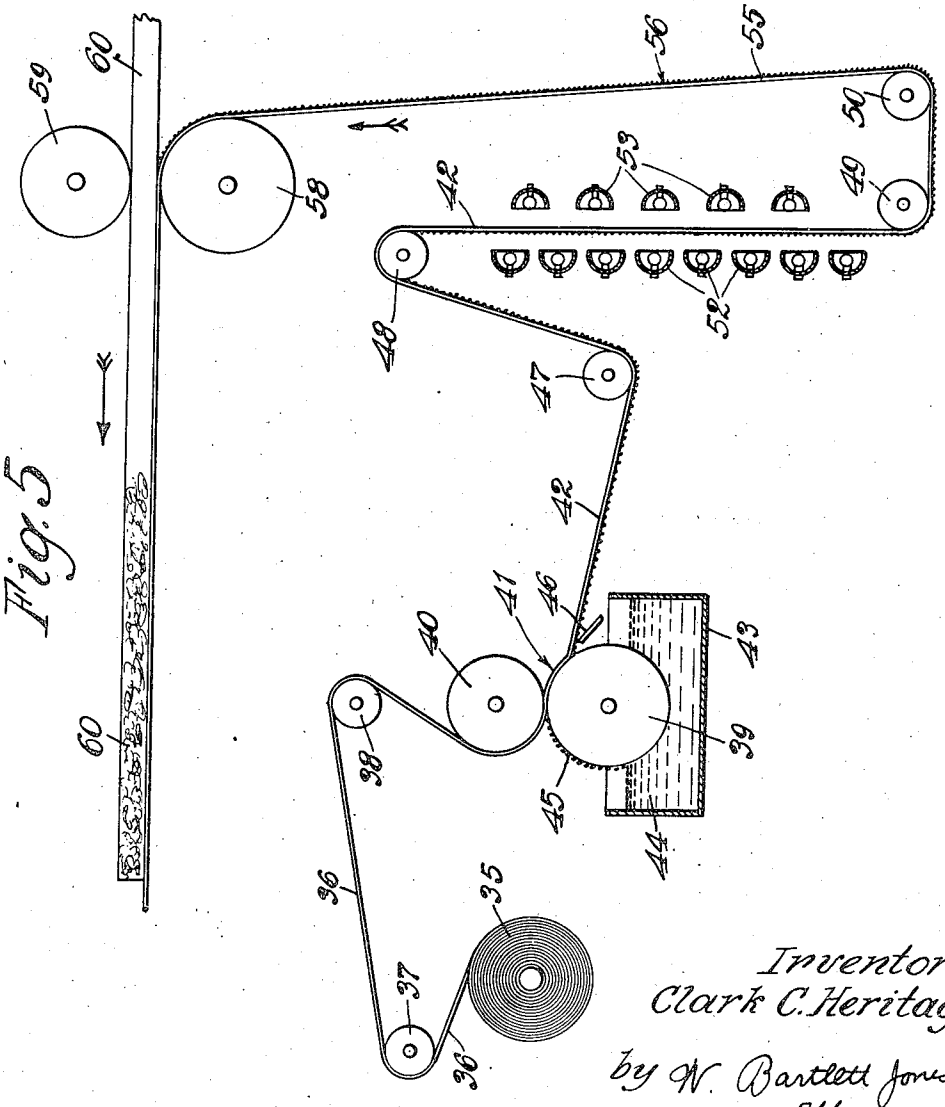


Fig. 5

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SURFACE FLUXING COATED LINER

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4 Sheets-Sheet 3

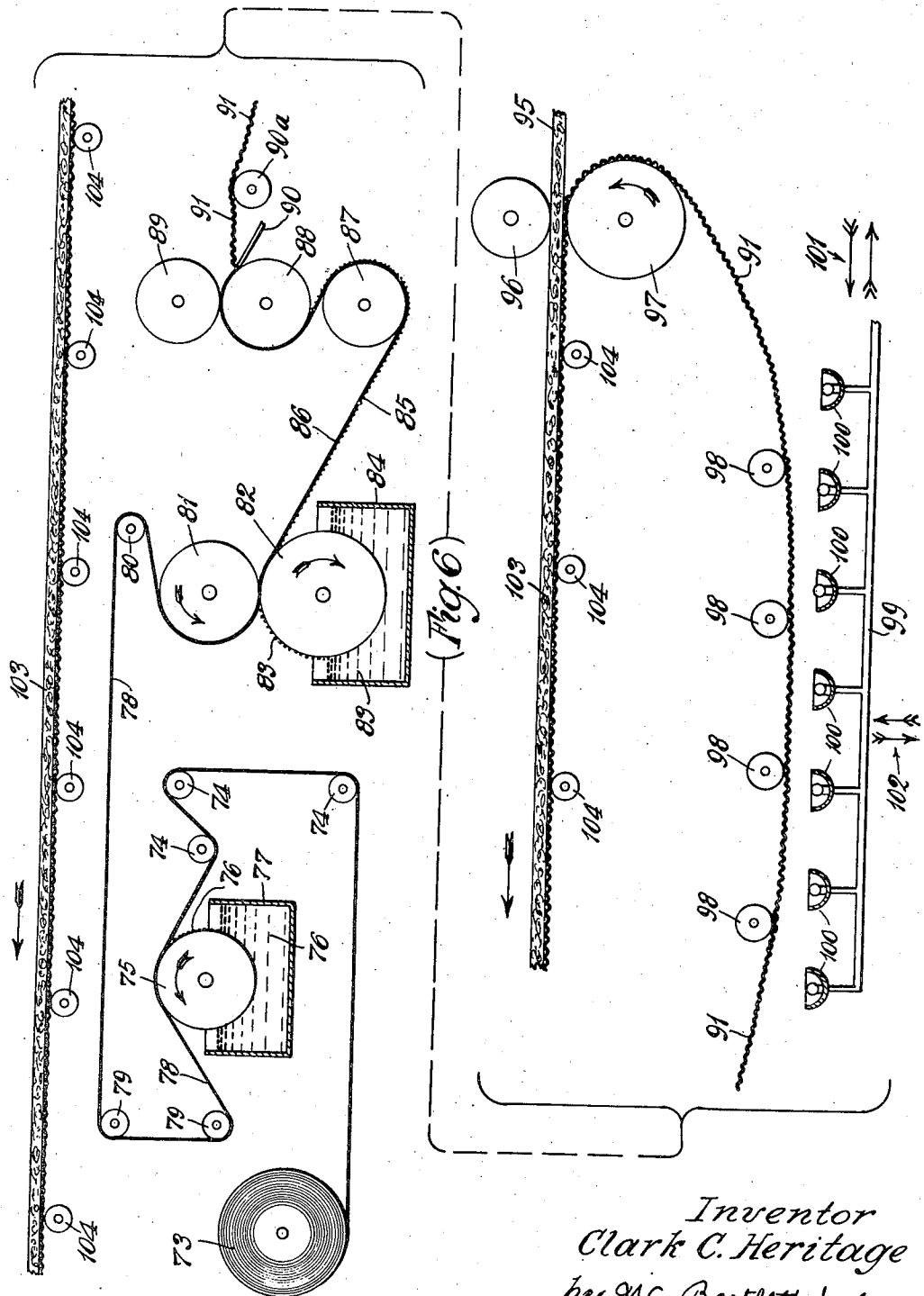


Fig. 6

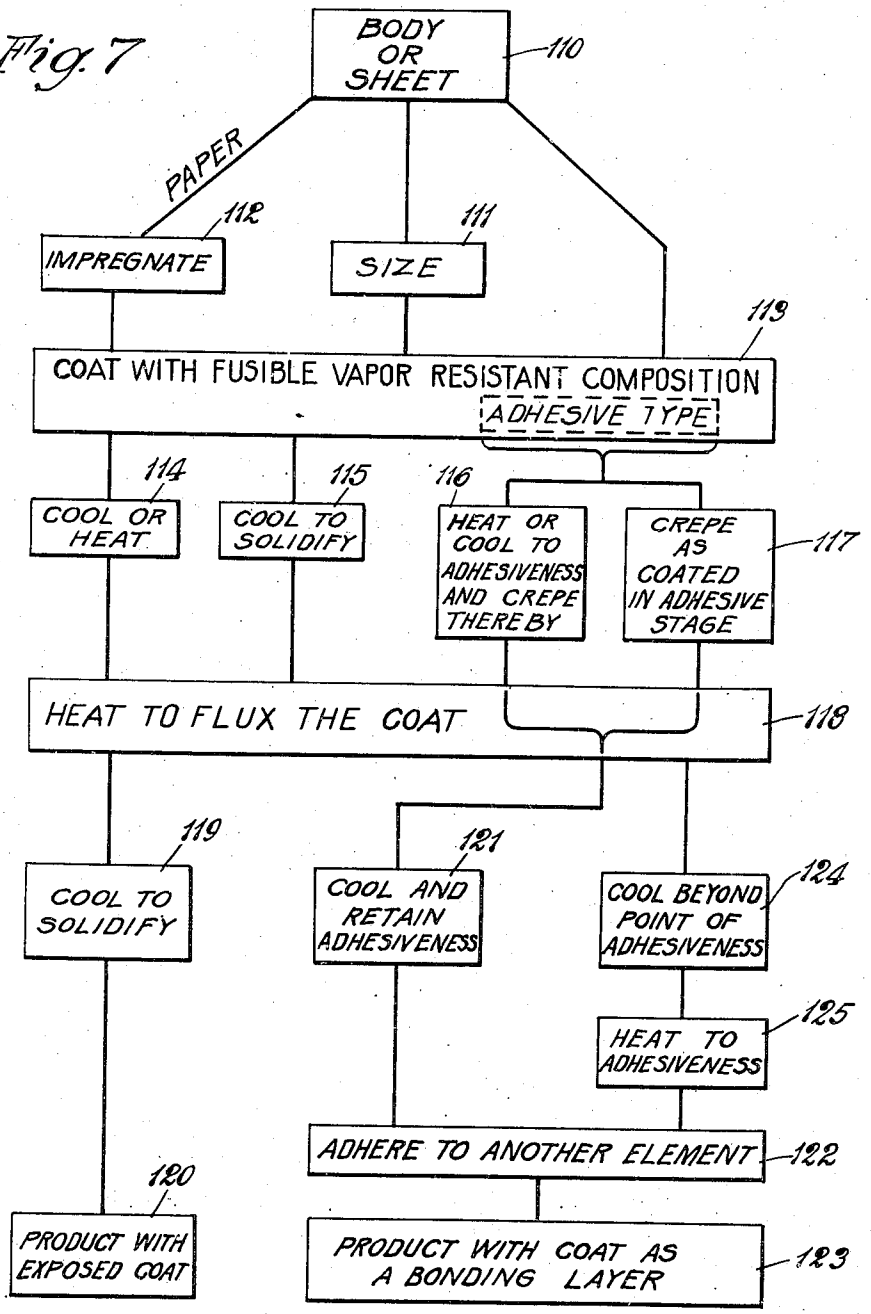
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SURFACE FLUXING COATED LINER

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Fig. 7



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2,474,398

SURFACE FLUXING COATED LINER

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Application April 21, 1943, Serial No. 483,897

17 Claims. (Cl. 154—33.05)

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The present invention relates to the fields of water-vaporproofing and of thermal insulation, and particularly to the improvements of elements therefor which function to resist the transmission of water-vapor. However, the said elements and the invention are not limited in utility to the thermal insulation field wherein a particular problem has been encountered.

To illustrate the problem, it is pointed out that when an insulating wall separates a warm region from a cold region, as for example in a house or like structure, wherein high moisture content of the air far exceeds the moisture content of the air of the cold region, there is a water-vapor pressure differential tending to move water-vapor through the wall. There is danger of vapor in the wall, and especially in insulation in the wall, encountering such a low temperature that it may condense to water, and even form ice. Much trouble has arisen from this cause in insulated houses.

Common expedients to minimize the danger are the provision of independent wall elements, or elements associated with the insulation, which exhibit resistance to the transmission of water-vapor. More common is the provision of insulating bodies, as blankets, bats, or other forms which carry imperforate liners having such resisting qualities. These have been referred to as water-vapor barriers, but because the ones herein referred to are imperfect as barriers, they are herein referred to as "resistors."

Resistors have been used as separate elements, that is, as sheets mounted above a ceiling, or inside a wall, apart from insulating material otherwise supplied. But also such resistors have been used as liners carried by insulating bodies, with or without facial adhesion between the resistors and the insulation, and on one or both sides of the insulation.

Paper coated with asphalt or like bitumen or other heat-softening normally solid material or composition is commonly used to provide resistors. These are made by applying a layer of the fused material to a sheet, as by a coating roll. A particular method is used in some cases where the liner sheet is creped, as described in the U. S. patent to Rowe No. Re. 17,633. Paper is run over a roll carrying hot bitumen, whereby the paper sticks to the roll, and then the paper is removed by a doctor blade in such a manner as to effect creping of the paper as it leaves the roll.

The present invention is based upon the discovery that such creped paper, and also uncreped paper coated by a roll with hot bitumen or the

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like, and other forms of material coated by any method wherein there is a mechanical pull away from the hot-coated material, are all very non-uniform in the quality of resistance to transmission of water-vapor. Irregularities in the form of minute "pin-holes" or pores, possibly arising in part from small air bubbles in the coating material, have been found spotted throughout the area in such a manner that various test specimens of small test area, as commonly tested, have a wide deviation in measured resistance. Such sheets are unreliable, non-uniform, poor as resistors, and furthermore are difficult to produce with controlled properties to meet specified or even desirable requirements.

It is an object of the present invention to overcome the above defects in hot-coated sheet-materials to be used as water-vapor resistors.

It is an object of the invention to flux the surface of the coat of such materials by the application of heat in such a manner as to effect a flow in the coat, while the coat is freely exposed without contact, to seal the pores or pin-holes.

It is a particular object to subject the mechanically coated material to radiant heat to attain a fluxing temperature, greatest at the exposed surface, whereby to impart greater vapor resistance to the coat.

Various other and ancillary objects and advantages of the invention will become apparent to those skilled in the art from the following description and explanation of the invention, given in connection with the accompanying drawings, in which:

Fig. 1 represents a layer of insulating material having its faces covered with liners treated according to the present invention;

Fig. 2 represents a layer of insulation with visual liners and mounting flanges, the latter being related to structure for sealing the edges of the insulation;

Fig. 3 is a modification of the structure of Fig. 2 with liners not adhesively secured to the insulating body;

Fig. 4 represents a duplex asphalted paper embodying the present invention;

Fig. 5 is a diagrammatic illustration of apparatus employed in practicing the process of the present invention, including pictorial illustrations of material which may be combined with the treated product;

Fig. 6 is a two-part view of apparatus normally aligned for applying the invention to paper having the asphalt treatment on both sides thereof,

and for applying the fluxed side to other material; and

Fig. 7 is a diagrammatic summary of various combinations or steps which may employ the present invention.

Figs. 8 through 13 represent various sheet-like materials which may be combined with the adhesive asphalted creped paper in the manner shown in Fig. 5 between the combining rolls thereof.

The invention may be appreciated by reference to several illustrative forms of insulation, some of which may be made under the Spafford Patent No. 2,075,835. In Fig. 1, 10 is an insulating body which may be a mat, slab, or bat, or pile, of insulating material, preferably a felted bat of mineral, animal, or vegetable fiber, and preferably flexible in a blanket form. It has a creped paper liner 11 with asphalt or other composition adhesive 12 securing it to body 10. This is commonly made by the creping process above described which discharges the sheet with hot and tacky creping material. The tacky side of the sheet is stuck to the body of insulation 10, and then cooled. In particular, when the adhesive creped sheet is applied to an element with a substantially smooth surface, the ridges of the creping provide therewith interfaces upon adhesion, and the ridges protect the valleys of the creping from adhesive contact, all as clearly shown in Fig. 6. Thus pores, pin-holes and imperfections are frozen and preserved. Sheet 13 represents a plain or uncreped sheet of paper, with asphalt or other composition adhesive 14, uniting it to the mat 10. The applied hot coat 14 on paper 13 is commonly stuck to the insulation body 10 while the coat is still tacky from the coating operation, and then the applied liner is cooled, thus to set the imperfections.

Figs. 2 and 3 represent insulation in which the liners are not facially adhered to the insulation body, but are carried thereby as a result of other means of attachment. Fig. 2 represents a structure wherein only one asphalt or like coat is used, being located on the outside of each liner, while Fig. 3 shows an asphalt or like coat on both the outside, and the inside but not in adhesive contact with the insulation as in Fig. 1.

In Fig. 2, numeral 16 represents a body of insulation like 10 in Fig. 1. Liners 17 and 18 are paper, creped or uncreped, but preferably creped as in Fig. 1, with asphalt or composition coats 19 and 20, respectively, on the exposed faces of the liners. A strip of sheet material 21, preferably hot adhesive asphalted creped paper, with asphalt 22 on the inside, is applied as an edge seal in a well known manner, first over the liner 17, then adhesively to the side edge of body 16, then beyond it and reversely upon itself to provide an angular mounting flange 23, then over liner 18.

In Fig. 3 the structure is the same as in Fig. 2, except that liners 25 and 26 each have two asphalt or like coats 27 and 28, respectively, the inside coats being free from adhesive contact with the insulation body 16. One of the coats on each sheet may be an impregnating coat in which case it is not subject to the fluxing of the present invention.

Various combinations of the elements of Figs. 1, 2 and 3 may be made and many of these are known.

Fig. 4 represents another form of resistor well known as duplex paper. It consists of two paper sheets, 30 and 31, both creped or uncreped, or

one creped and the other uncreped, united by a layer of asphalt or the like 32. This is commonly made by mechanically applying hot asphalt or the like to one sheet with or without creping by use of the coat as creping adhesive, and while the coat is tacky, uniting it to the second sheet.

According to the present invention all the coat-bearing sheets above referred to, after coating, are exposed to heat of a temperature sufficient to fuse or flux the asphalt, or other material, if not asphalt, at least to a slight depth at the surface, forming what is referred to as a fusion skin. Any suitable heating means may be employed. But where there is danger of fire, or where the sheet, such as the paper may be injured at the temperature preferably applied to the coat, a source of radiant heat is preferred.

Radiant heat is available from any incandescent source, but infra-red electric light bulbs, with adequate reflectors are preferred. These may be placed in banks and arranged in number and extent, and in spacing from the coat to be heated, in accordance with conditions. In practice a continuous web of the coated material is moved past such a bank of lamps, and the speed of travel in part determines the arrangements and extent of the bank of lights.

In using such a bank, the sheet carrying a cooled freshly applied, yet still hot coat, or an already chilled solidified coat, is moved past the lamps, and so subjected to radiant heat that the coat absorbs the radiant energy and melts, without equally heating the sheet vehicle which carries the coat. A complete surface fluxing occurs to a sufficient depth to effect glazing the surface, and flow in the surface, whereby a uniform surface layer, or substantially unbroken fusion skin, without pin-holes or imperfections is produced. Air-bubbles within the coat expand and burst.

The next step is to chill the glazed fusion skin with its softened or melted surface, and to use the resulting resistor with such chilled surface remaining free, where the chilling is to the point of complete solidification. However, the chilling may extend to the point of near-solidification with a non-flowing coat presenting tackiness or adhesiveness, whereby the coat may be pressed into adhesive union with another body. Such sheets may be used in the structures of Figs. 2 and 3.

In order to illustrate how the invention is carried out in a simple manner, various procedures and combinations are shown or indicated in Figs. 5 and 6.

In Fig. 5 a supply of sheet material 35, such as kraft paper, is fed as a traveling web 36 to a series of rolls including idler rolls. First it passes over idler roll 37, then idler roll 38, from which it runs to a coating device to apply a fused composition, such as asphalt. The coating device has a coating roll 39 and an upper press roll 40. The web 36 runs between these and on leaving it adheres in the region 41 to roll 39, being pulled off as a coated web 42. The roll 39 runs in a vat 43 of melted asphalt or the like 44, which carries a considerable supply 45 of the viscous material to the nip of the rolls 39 and 40. If desired, a doctor blade 46 may be employed by advancing it from the position shown, to contact the roll, whereby to crepe the sheet as shown in said Re. 17,633.

The coated web 42 travels for a considerable distance, wherein it cools to effect solidification of the asphalt, over a water-cooled idler roll 47 to roll 48 which drops the web 42 vertically to

idler rolls 49 and 50 which reverse the travel to an upward direction. The distance between rolls 48 and 49 is sufficient to provide a heating zone wherein the coated paper is heated to flux the already chilled coat.

The preferred supply of heat is a bank of infrared lamps 52, each comprising an incandescent electric bulb and a reflector, diagrammatically illustrated. In this heating zone the lamps 52 effect melting of at least the exposed surface layer of the coat on web 42, but it is to be understood that the whole depth of the coat may be fluxed. To secure this effect, and to shorten the time of exposure to the lamps 52, the uncoated side of the web 42 may be heated by a second bank of lamps 53 on the opposite face of web 42, preferably of less power in the case of paper. These limit loss of heat by radiation, derived from the lamps 52, and also add heat derived from lamps 53 to effect control and flexibility of the operation, as may be required by reason of changes in the coating material, the amount of it, the speed of travel, the vehicle sheet 35, and other factors.

Beyond idler 49, the fluxed surface cools and in cooling it passes from a highly fluid condition, through a viscous tacky condition, to a solid condition. The cooling web is indicated by numeral 55 and its coat by numeral 56.

The web 55 may thus be cooled to solidify the coat 56, thereby providing a highly uniform water-vapor transmission resistor. But where it is desired to be combined by adhesion to some other element, the combination is preferably effected while the cooling coat 56 is still tacky. In Fig. 5 the tacky web 55 is shown passing through combining rolls 58 and 59 with the coat 56 exposed to the nip of the rolls. Combining roll 58 has a controlled temperature to bring the sheet to the proper adhesive state, if it should be too cool on reaching the roll. Into the nip some other element 60 is fed for adhesive union to the tacky web 55.

The element 60 may be numerous structures, only some of which are included in Figs. 8 through 13.

Fig. 8 represents a plain sheet of paper designated 62, such as kraft paper. Fig. 9 represents a fiber mat 63, which may be a low density felted fiber insulation blanket. Fig. 10 represents creped paper 64, which may be plain or asphalted, the latter being, for example, such as may be produced as described in Fig. 6. Fig. 11 represents a lined fiber mat 65, such as a fiber mat 63 united by adhesive 66, such as asphalt, to paper or other liner, for example, the paper 62. Fig. 12 represents a composite structure 67 comprising a lined fiber mat, such as mat 63, united by adhesive 68, such as asphalt, to creped paper, such as paper 64. Fig. 13 represents fiber insulation board 69. The said structures of Figs. 8 through 13 are merely representative of materials which may be combined with the sheet 56, in the same way as the structure generally designated 60 is combined with paper 56 between the rolls 58 and 59. It is also understood that the element 60 in Fig. 5 may be omitted, the adhesive paper 56 being moved away from the roll 58 while it is cooling to a non-tacky stage.

Fig. 6 in particular represents treating or coating both faces of a sheet and also a creping operation with hot asphalt or other hot plastic material as the creping adhesive. This peeling of the sheet to crepe it disturbs the coating much more than the simple peeling illustrated at 41 (Fig. 5) without creping, whereby the amount of pin holes, pores or other imperfections is much greater in a so-creped sheet. Therefore, the present invention is particularly important in conjunction with the described type of creping process.

Fig. 6 shows an arrangement for making a sheet in which both sides of the sheet, preferably paper are treated with fusible materials. For example, one side is treated to saturate or impregnate it with asphalt or the like having a melting point which is relatively low with respect to the melting point of asphalt or the like applied to coat the other side and used also as the creping adhesive. The saturating asphalt is applied at a higher temperature than the coating asphalt, to induce penetration, and the coating and creping asphalt or the like is applied at a lower temperature to minimize penetration and to provide a coat.

In Fig. 6, a supply of sheet material, preferably kraft paper 73 is fed forward and then reversely over idlers 74, over a coating roll 75 running in hot saturating asphalt or other impregnating substance 76 contained in open tank 77 in which the lower part of the roll 75 dips into the melted material. Kraft paper so treated becomes black on the uncoated side, as a result of use of asphalt to saturate it.

The saturated web 78 runs over idlers 79 to move in a forward direction to idler 80 which reverses it onto the top roll 81 of a pair of rolls 81 and 82. Roll 82 runs in hot coating asphalt 83 in tank 84, whereby to form a coat of asphalt 85 on web 86, which in a short travel cools to a tacky stage as it runs to a stack of three rolls 87, 88 and 89 for creping. Roll 88 may be heated to bring the asphalt to a proper degree of tackiness for creping. It passes as shown leaving the center roll at the top, from which it is peeled by a doctor blade 90, providing creped sheet 91. If this sheet is cooled and tested as a water-vapor resistor, it is highly imperfect as such and very non-uniform. After this point, the fluxing heat of the present invention is applied. A small lifting roll 90*a*, with a wire wound spirally around it, to minimize contact area, is located just beyond the doctor blade 90 to maintain regularity in the peeling.

Since the cooled sheet after the fluxing operation may advantageously be secured to other material, using the tacky coat, after some cooling from fluxing, the remaining portion of the figure illustrates an arrangement of the parts to effect such use. Numeral 95 represents an element or structure to which the web 91 is to be applied. It enters the nip of two rolls 96 and 97 which are positioned remotely from the creping roll 88, at a point to provide a fluxing zone and a cooling zone, the latter to cool the fluxed sheet to a point where it is tacky. Roll 97 may be heated to increase the temperature of the coat, if necessary, to the point of tacky adhesiveness for union with the element 95. As shown in Fig. 6, only portions of the surface of the creped sheet are secured to portions of the element 95, the valleys of the creping being pockets bridged by the element 95 which is united to and across the peaks of the creping ridges.

As illustrated, the creped web 91 hangs in a span, but to adjust its position more fixedly than that of a free hanging one, positioning means, such as idler rolls 98, are provided. Below the span heating means to flux the coat is provided, and made as a unit for adjustment either way

along the path of the web, to control the position of the fluxing and cooling zones. Such means is preferably a bank 99 of radiant heat lamps 100, adjustable along the path of the web as indicated by arrows 101, and adjustable to and from the web as indicated by arrows 102. The resulting combined product is indicated at 103, moving away on rollers 104.

The element 95 may be plain paper, creped paper, insulation board, insulation mats or blanket of loosely felted animal, vegetable or mineral fiber, such materials being illustrated in Fig. 5 by numerals 62 to 70. However, other materials not listed may be used, as desired.

In Fig. 7 the invention is illustrated diagrammatically with numerous variations herein described in reference to specific illustrations of them, which are not intended to limit the invention.

Numeral 110 (Fig. 7) represents a body or sheet to be treated, such as paper, cloth, asbestos, felt, cellophane, fiber board, wood veneer, plywood, and the like. It may be surface sized in any known way, as indicated at 111, largely to prevent penetration of the coating material, or as indicated at 112 it may be impregnated or saturated with any suitable material, one example having been given for paper. The material 110 with or without the sizing or impregnating is then coated with a suitable fusible substance having a suitable property of resistance to the transmission of water-vapor. When the coating material exhibits adhesive properties, when hot, such as asphalt, sheet material having such a coat may be creped using the coating material as creping adhesive, or any material coated with it may be united, later, to some other body, as described.

Suitable resistant materials are bitumens, such as asphalt, waxes such as paraffin, rosin, coal tar pitch, stearin pitch, stearic acid, coumaron resin, ozokerite, wax tailings, and numerous others. Compounded mixtures may be used, of which asphalt containing paraffin is one. Another is a mixture of asphalt and montan wax with or without paraffin as described in the U. S. Patent No. 2,299,144 to Heritage and Walter.

The resistant material is provided as an adherent, substantially integral coat consisting of fusible material. It is preferably coated onto the sheet mechanically by a coating roll from a fused condition, but it may be deposited otherwise as for example by spreading a powdered form or a fiber on to a cold or heated body to receive it, with suitable heat to fuse and spread it, or spraying it in a melted condition. This is all indicated by block 113.

The applied coat may be heated or cooled, as shown at 114, or cooled to the point of solidification as shown at 115. Where creping is effected, the coat may be cooled or heated as required to suitable adhesiveness for creping, as shown at 116, which includes the creping operation, or as shown at 117, it may be creped directly without cooling, depending upon the nature of the substance and its degree of adhesiveness in the condition of application, as for example, shown in Fig. 5.

The coated creped or uncreped material is then heated to a fluxing temperature, whereby the coat loses imperfections acquired in coating or induced by creping. This heating is indicated at 118.

During the fluxing, contact of a make-and-break type is not harmful since disturbances will be obliterated by the flow permitted by fluxing. But as it cools, make-and-break adhesive contact will lead to imperfections which should be avoided. In the adhesive stage, a "make" contact, without a break of contact, as is used in the adhesive unions described, does not introduce imperfections, even though it may disturb the glazed surface continuity.

Therefore, the fluxed coat may be cooled, as at 119 to a solid exposed coat giving product 120 with glazed exposed coat, or it may be cooled to a point where it does not flow, yet adhesiveness is retained, as shown at 121, after which it is united to another element, as shown at 122, to provide laminated products 123. Also the fluxed coat may be cooled, as at 124, to lose adhesiveness, then be reheated as at 125 to acquire adhesiveness. Then it may be united with other elements as at 122.

Example

A paper such as may be produced by the arrangement of Fig. 6, that is, saturated from one side with asphalt, then creped with asphalt applied to the other side, has been greatly improved in its water-vapor resistance by fluxing the asphalt.

Water-vapor resistance is the reciprocal of water-vapor transmission (W. V. T.) which is herein expressed in terms of water-vapor passed, in lbs. per 2500 sq. ft., per 24 hours, per 1 lb. vapor pressure differential per sq. inch.

An asphalt creped paper without fluxing is given below as the "control." Case A below is the result of treating the paper for 10 seconds to a single bank of radiant-heat lamps, three inches from the face having the creping asphalt. Case B below applies a bank of lamps three inches from both faces of the sheet for 10 seconds.

In cases A and B, the sheet travels at about 125 feet per minute past the lamps and is first chilled to normal room temperature prior to exposure to the lamps. The following table gives the W. V. T. of the control and of cases A and B, several test specimens being given.

Control (No Treatment)	Case A (One Side)	Case B (Both Sides)
52.4	23	6.00
54.9	20.8	12.30
49.5	19.8	6.00
50.5	36.0	15.10
55.5	23.9	5.04
[1] 52.5	[1] 24.7	[1] 8.9

[1] Average.

The table immediately above shows that the improvement in water-vapor transmission resistance is due to the fluxing, and that fluxing may be practiced on one side or both sides of a sheet bearing material suitable for such fluxing.

In the claims there is used the term "make-and-break adhesive contact," by which is meant a touching of a tacky and adhesive material which is soft and yielding and in such state that pulling away the touching surface lifts some of the material by adhesion to the touching surface, or in other words tend to string out forming tack-pulls in pulling away the touching surface. Even though this stringing out finally breaks and the material flows back to the original body, there will have been a disturbance of the desired fusion skin, with possible incorporation of air. The effect to be avoided is exemplified in an extreme

modification by pulling taffy. Where the fluxed surface is united by the material of the coat to other materials which touch or penetrate only a part of the fusion skin, it is a characteristic of the product of the invention that exposed coat in such structures is substantially entirely fusion skin.

The invention is subject to numerous changes and modifications falling within its scope as expressed in the appended claims.

I claim:

1. The method of making a water-vapor resistor which comprises subjecting to a fluxing heat an applied exposed substantially integral coat of fusible material which material has the property of resisting the transmission of water-vapor, and the property of adhesiveness when not liquid and when hot and nearly solidified, and thereby fluxing at least the exposed surface of the coat, cooling the resulting fluxed coat at least to the point of substantial solidification at which said adhesiveness exists while avoiding make-and-break adhesive contact with the exposed surface of the coat during the cooling to said adhesive condition, and uniting the resulting adhesive coat to another surface by the adhesiveness of said coat.

2. The method of making a water-vapor resisting sheet, which comprises applying to sheet material an adherent substantially integral coat of fusible substance having the property of resisting the transmission of water-vapor, exposing the said coat to a fluxing heat and thereby fluxing at least the exposed surface of the coat, and cooling the resulting fluxed coat at least to the point of substantial solidification while avoiding make-and-break adhesive contact with the exposed surface of the coat during the cooling to said point.

3. The method of making a water-vapor resisting sheet, which comprises applying to sheet material an adherent substantially integral coat of fusible substance having the property of resisting the transmission of water-vapor, exposing the said coat to a fluxing heat and thereby fluxing at least the exposed surface of the coat, and cooling the resulting fluxed coat to solid non-adhesive condition while avoiding make-and-break adhesive contact with the coat during the said cooling.

4. The method of making a water-vapor resisting sheet, which comprises applying to sheet material a substantially integral coat of fusible substance having the property of resisting the transmission of water-vapor and having the property of being adhesively tacky when hot and when nearly solid, exposing the said coat to a fluxing heat and thereby fluxing at least the exposed surface of the coat, cooling the resulting fluxed coat to the point of such adhesiveness while avoiding make-and-break adhesive contact with the exposed surface of the coat during the cooling to said adhesive condition, and uniting the resulting adhesive coat with the surface of another element by the adhesiveness of said coat.

5. The method of making a water-vapor resisting sheet, which comprises applying to sheet material a substantially integral coat of fusible substance having the property of resisting the transmission of water-vapor and having the property of being adhesively tacky when hot and when nearly solid, exposing the said coat to a fluxing heat and thereby fluxing at least the exposed surface of the coat, cooling the resulting fluxed coat

to the point of such adhesiveness while avoiding make-and-break adhesive contact with the exposed surface of the coat during the cooling to said adhesive condition, and uniting only portions of the resulting adhesive coat with portions of the surface of another element by the adhesiveness of said coat.

6. The method of making a water-vapor resisting sheet, which comprises applying to sheet material a substantially integral coat of fusible substance having the property of resisting the transmission of water-vapor, and having the property of being adhesively tacky when hot and when nearly solid, exposing the said coat to a fluxing heat and thereby fluxing at least the exposed surface of the coat, cooling the resulting fluxed coat to the point of such adhesiveness while avoiding make-and-break adhesive contact with the exposed surface of the coat during the cooling to said adhesive condition, and uniting only portions of the resulting adhesive coat with some of the fibers of an insulating body by the adhesiveness of said coat.

7. The method of making a creped sheet having resistance to the transmission of water-vapor, which comprises applying to sheet material to be creped a fusible substance having the property of resisting the transmission of water-vapor and the property of being adhesive when hot and nearly solid, causing said coated sheet while in an adhesive condition to adhere to a creping roll and removing the sheet therefrom by a doctor blade to effect creping of the sheet, exposing the said coat material on the creped sheet to a fluxing heat and thereby fluxing at least the exposed surface of the coat, and cooling the resulting fluxed coat at least to the point of substantial solidification while avoiding make-and-break adhesive contact with said coat during the said cooling.

8. The method of making a creped sheet having resistance to the transmission of water-vapor, which comprises applying to sheet material to be creped a fusible substance having the property of resisting the transmission of water-vapor and having the property of being adhesive when hot and nearly solid, causing said coated sheet while in an adhesive condition to adhere to a creping roll and removing the sheet therefrom by a doctor blade to effect creping of the sheet, exposing the said coat material on the creped sheet to a fluxing heat and thereby fluxing at least the exposed surface of the coat, and cooling the resulting fluxed coat first to the point of near-solidification and then to solidification thereby to destroy the adhesive character of the coat, while avoiding make-and-break adhesive contact with the coat during the cooling and while the coat is in the adhesive condition.

9. The method of making a creped sheet having resistance to the transmission of water-vapor, which comprises applying to sheet material to be creped a fusible substance having the property of resisting the transmission of water-vapor and having the property of being adhesive when hot and nearly solid, causing said coated sheet while in an adhesive condition to adhere to a creping roll and removing the sheet therefrom by a doctor blade to effect creping of the sheet, exposing the said coat material on the creped sheet to a fluxing heat and thereby fluxing at least the exposed surface of the coat, cooling the resulting coat to the point of adhesiveness and near-solidification while avoiding make-and-break adhesive contact with the coat during the cooling and while the coat is in the adhesive condition, and uniting the

sheet to another element by the adhesiveness of the coat in the nearly solid condition.

10. The method of making a creped sheet having resistance to the transmission of water-vapor, which comprises applying to sheet material to be creped a fusible substance having the property of resisting the transmission of water-vapor and the property of being adhesive when hot and nearly solid, causing said coated sheet while in an adhesive condition to adhere to a creping roll and removing the sheet therefrom by a doctor blade to effect creping of the sheet, exposing the said coated material on the creped sheet to a fluxing heat and thereby fluxing at least the exposed surface of the coat, cooling the resulting fluxed coat to the point of near-solidification while avoiding make-and-break adhesive contact with the coat during the cooling and while the coat is in the adhesive condition, and uniting the sheet to other sheet material by the adhesiveness of the coat in the nearly solid condition.

11. The method of making a creped sheet having resistance to the transmission of water-vapor, which comprises applying to sheet material to be creped a fusible substance having the property of resisting the transmission of water-vapor and having the property of being adhesive when hot and nearly solid, causing said coated sheet while in an adhesive condition to adhere to a creping roll and removing the sheet therefrom by a doctor blade to effect creping of the sheet, exposing the said coating material on the creped sheet to a fluxing heat and thereby fluxing at least the exposed surface of the coat, cooling the resulting fluxed coat to the point of near-solidification while avoiding make-and-break adhesive contact with the coat during the cooling and while the coat is in the adhesive condition, and uniting the sheet to an insulating body by the adhesiveness of the coat in the nearly solid condition.

12. A water-vapor resisting structure comprising in combination one member having therein a continuous layer of fusible adhesive material having the property of resistance to the transmission of water-vapor which layer is characterized by substantially unbroken fusion skin, and another element having its surface united to said member by the adhesiveness when hot of said materials.

13. A water-vapor resisting structure comprising in combination one member having therein a continuous layer of fusible adhesive material

having the property of resistance to the transmission of water-vapor which layer is characterized by substantially unbroken fusion skin, and another element having its surface united to said member at only portions of said skin by the adhesiveness when hot of said material.

14. A water-vapor resisting structure comprising in combination one member having therein a continuous layer of fusible adhesive material having the property of resistance to the transmission of water-vapor which layer is characterized by substantially unbroken fusion skin, and another element presenting at its surface a mass of fibers providing inter-fiber void spaces, some of said fibers being united to said member at only portions of said skin by the adhesiveness when hot of said material.

15. A duplex paper comprising two sheets of paper secured together by fusible adhesive material having the property of resisting the transmission of water-vapor, said material being present between the two sheets of paper as a layer characterized by a substantially continuous fusion skin.

16. An insulating structure comprising an insulating body and a sheet liner united to the face of said body by a layer of fusible adhesive material having the property of resisting the transmission of water-vapor, said layer being continuous and being characterized by a substantially continuous fusion skin.

17. A creped sheet having bituminous creping adhesive on a face thereof in the form of a substantially continuous coat on said face, said layer being characterized by a substantially continuous fusion skin.

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