

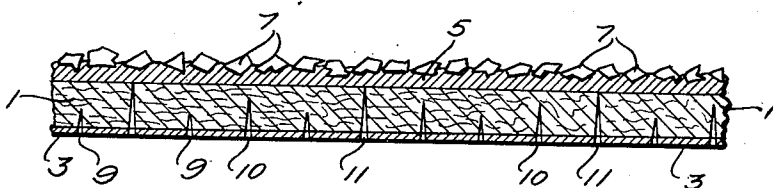
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COVERING MATERIAL

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COVERING MATERIAL.

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This invention relates to covering materials which are intended to be impervious and weather resisting. More especially the invention relates to impregnated felted sheets carrying thereon a protective weather and water resisting coating. More particularly, the invention relates to asphalt roofing and shingle elements.

Protective coatings as above broadly described are typified by so-called asphalt roofing in which in common practice a base sheet of felted fibre is impregnated with bituminous saturant, usually asphalt, to bond the fibres together and to provide in part the weather-resisting characteristic of the covering. Ordinarily in coverings which are to be exposed to the weather, such as roll roofing and shingles, upon such a "saturated," that is an impregnated, felt sheet as a base a coating of high melting point asphalt is applied of such thickness and of such composition and consistency as to form the impervious overlying layer adhering to the "saturated" base. In many cases for decoration and for better protective capacity a granular surfacing material, ordinarily of mineral origin, is applied to the coating to adhere thereto. This surfacing affords resistance to mechanical abrasion and should be opaque to intercept the light and prevent actinic action of the sun's rays upon the bituminous materials. It is desirable in such covering materials to have a thoroughly impregnated base felt and to have a uniformly spread coating and one completely covering and sealing the base sheet, that is, without openings therethrough.

In the ordinary methods of manufacture now in use while the process is being carried on a fairly high degree of impregnation may be obtained and a substantially complete covering of the faces of the base by the coating may be secured. Nevertheless, in commercial practice it has so far not been possible to produce a covering or roofing sheet of fibrous material so thoroughly impregnated that air and moisture, and especially moisture, are completely excluded from and are prevented from being absorbed by the finished sheet. Because of the condition that the impregnation and coating operations ordinarily take place with the materials at a high temperature, i. e., of the degree of 300° to 450° F., and for other reasons, air and moisture commonly are contained within the finished "saturated" and coated sheet, being drawn therein upon contraction of the impregnating and coating materials upon cooling or being absorbed after the covering is shipped or put into service.

Because the usual process of applying the coating to the base involves running the sheet through a bath of the high melting point asphalt, whereby the coating becomes applied to both sides of the sheet, air and moisture may become entrapped within the saturated felted structure

of the sheet. This may be the case even though the coating on the "back" side may be reduced by scraping to a relatively thin layer. The high melting point coating asphalt tends to fill the surface pores or interstices of the impregnated felt on its outer face and upon setting at ordinary air temperatures to prevent easy passage of the entrapped air and moisture outwardly from the saturated base when expansion of the air and vapor occurs as the roofing becomes heated, for example, under the heat of the sun.

One of the difficulties resulting from these conditions is that expansion of the air and moisture within the impregnated felted structure may bulge the coating upon the base sheet. When this action occurs adjacent the outer face of the sheet, that is, the face upon which the coating to be exposed to the weather is carried, "blistering" may occur. This blistering is the result of the pushing off of the coating and of the granules with which the sheet is surfaced, as in ordinary asphalt shingles or so-called slate surfaced roofing. The sheet then ceases to be impervious to water and becomes unsightly, the appearance being marred by the resulting uneven surface and the exposure of asphalt where the granules are pushed off. The more or less capillary passages by which at leisure air and particularly moisture have entered the body of the impregnated felted structure do not afford sufficient area of discharge when the covering becomes rapidly heated with concomitant expansion of the entrapped air and moisture. Rupture of the enlarged bubbles or pockets of air or vapor is the result.

It is an object of the invention to overcome these difficulties and to minimize the blistering and effects thereof.

It is a further object of the invention to produce a covering in which provision is made for release of the air or vapors as they become heated.

It is another object of the invention to provide a process of producing such roofing or covering.

While in the past it has been thought that the application of coating material to the underside or back face of the roofing sheet or shingle served to improve the resisting qualities of the roofing and its durability, this undercoating has been of little service for this purpose. The greatest resistance to water and the action of the elements must be on the outer face of the roofing. The coating which is applied to the under face becomes detrimental from the viewpoint of the tendency of the roofing to blister for the reasons which have been given above.

According to the invention it is proposed to form perforations in the base sheet extending from the back or under face thereof into the felted structure of the base. These perfora-

tions will be spaced over the face of the sheet and will extend in the general case varying distances into said base sheet. Some of the perforations may extend only a fraction of the distance but others may extend substantially to that face of the base sheet to which the outer or weather resisting coating adheres. By the provision of sufficient number of such perforations and in view of their being open at the under face of the roofing, when the pocket of air or vapor tends to form and expand under the heat of the sun it is possible for this air or moisture under the pressure caused by the heating to find relief through one or more of the perforations and to be discharged at the back face of the sheet. While in many cases a perforation may actually extend to such a pocket, in other cases the expansion may take place a short distance through the felted structure itself until it reaches a perforation. A sufficient number of perforations close enough together are formed in the sheet according to the invention to limit the size to which a pocket may increase before finding relief through the perforation. The perforations also will be so spaced that the pockets which may tend to form just beneath the coating on the outer or weather face of the roofing will not increase to such an extent before reaching a perforation that a blister of any substantial size will be formed. Thus the pushing off of the coating and the resulting deterioration and marring of the appearance will be prevented.

The action which has been referred to is assisted by the characteristic of the outer or weather resisting coating of the roofing which causes it to strongly adhere to the saturated base sheet and because of its having a substantial thickness. The consistency or density of the coating in its set condition at ordinary temperatures, moreover, causes it to afford a substantial barrier against which the expanding gases and vapor may act providing they can find outlet toward the opposite face of the roofing. As the coating is of plastic nature, however, and particularly is thermoplastic under the heat of the sun, this resistance affording a barrier becomes greatly reduced when heated so that the blistering may occur unless the relief which the invention provides is available.

The figure in the drawing shows a cross-section of a roofing sheet embodying the invention.

In the figure the base sheet 1 is a felt as ordinarily used in the manufacture of asphalt roofing, which is impregnated with an asphalt "saturant" of so-called low melting point. As in ordinary roofing manufacture upon the back side, that is, the underside of the roofing which would be next to the roof deck, a relatively thin back coating 3 is applied as in the ordinary roofing. Upon the opposite face of the impregnated base 1 the usual weather resisting coating 5 is applied so as to adhere to the impregnated felt base. In the particular example illustrated in the drawing, granules 7 are applied to the coating 5 and embedded part way therein to afford a mechanical abrasion resisting surfacing and one which intercepts the actinic rays of the sun.

Throughout the extent of the roofing sheet and in spaced relation are provided perforations 9, 10 and 11. These perforations extend from the back face into the impregnated felted structure of the base. Some of these perfora-

tions, such as 9, extend only a short distance into the felted structure. Others, such as 10, extend to a greater distance and still others, such as 11, extending substantially to the face of the base upon which the outer or weather coating adheres. The spacing of the perforations 9, 10 and 11 may be of the degree of between $\frac{1}{32}$ " and $\frac{1}{2}$ " in order that the size of any blister which may start to develop between two perforations may be limited. In other words, as the pocket or blister tends to increase by expansion of the gas or vapor contained therein in general its increase in any lateral direction will not need to be greater than about half of the distance between two perforations in order to find relief. The development of large size pockets which heretofore have caused blistering is prevented.

It will be clear that the perforations are open at the back face of the sheet. This is accomplished by making the perforations in the finished sheet, that is, the sheet to which the coating has been applied, since in ordinary roofing practice it is more convenient to apply first the coating to both faces of the impregnated sheet. By passing the sheet through a coating bath a certain amount of coating may remain upon the back face even though its thickness is substantially reduced by passing the dipped and coated sheet over a scraper or other device for removal and limitation of the thickness of this back coating. After passing from the coating bath the sheet may be carried over a roll having thereon pins or spines of varying lengths and if desired of varying diameters so that the spines will enter the coated base from the back or under face thereof to form the perforations in the manner and arrangement shown and above described. The lengths of the pins or spines, however, should not be such as to puncture the coating on the outer face of the sheet. The sheet may be thus passed over the perforating roll after the coating has set to the desired degree so that the back coating will not tend to close over the open ends of the perforations which are at the back face. To secure the action desired according to the invention these ends of the perforations should be left open so that ready escape of the expanded gas and vapor may take place.

To accomplish the results which have been described in a practical manner and with apparatus and devices adaptable in the ordinary roofing machines, the roll referred to above should be of substantial diameter in order that as the roofing sheet moves tangentially into contact with the roll the motion of the pins on the circumference of the roll will be in a path which is not at a great angle to the sheet. Especially for those pins which are of such length as to pass through the impregnated base substantially to the underside of the barrier coating, such a limited angularity of approach is desirable in order that these pins shall not tear the base or too greatly enlarge the perforations which they are intended to make during their approach to and recess from the roofing sheet.

In some cases, in view of variations in the thicknesses of the base sheets which pass thereover it may occur that the outer extremities of the longer pins will enter the barrier coating to some extent. A slight entrance or indentation of the barrier coating from the underside will not be objectionable. As indicated above, however,

the length of the pin or spine should be limited so as not to so far enter the coating that the coating will be punctured or will become punctured by expansion of a bubble or pocket of gas or vapor. It is important that the outer coating shall not lose its function as the barrier acting to force the gas and vapor toward the back face of the sheet. For the purposes of ordinary asphalt roofing sheets, therefore, the length of the pins or spines may vary from .020" to .100".

The diameter of these pins or spines is determined in consideration of their necessary strength and resistance to bending and to wear as the sheet is passed thereover and while also considering the function of the pins or spines of producing a perforation of sufficient cross-sectional area for leakoff of the gas or vapor to provide the desired relief. The diameter or cross-section of the pin or spine should be so limited, however, that it will readily enter the impregnated felt structure without so deforming the general lay of the impregnated base that its structure and the appearance of the finished roofing sheet will be changed. Such displacement of the material of the impregnated base must be effected, nevertheless, as to form a perforation with the necessary cross-section to insure that the cumulative area of the perforations will provide relief throughout the sheet for any gas or vapor which is entrapped or contained therein. For the purposes of ordinary asphalt roofing manufacture the diameter of the pins or spines may be from .010" to .100".

In consideration of the limitations of the dimensions of the pins and spines to produce perforations suitable for the invention, for practical asphalt roofing manufacture the spacing of the perforations, that is, of the pins and spines upon the roll, is within the range of $\frac{1}{8}$ " to $\frac{1}{4}$ " from center to center of the pins. These perforations, however, may be made in the sheet in staggered arrangement or in alignment lengthwise and crosswise of the sheet.

The invention has been described in its particular embodiment in connection with a roofing sheet impregnated with asphalt and coated with coating asphalt. It is, however, not limited to such materials but is applicable to coverings which are formed with a base, particularly an impregnated base, in which a certain amount of air, gas or vapor is contained which is subject to expansion upon being heated. It is a particular feature of the invention that a coating adheres to the face of the base opposite to that from which the perforations extend, which coating is of such character, of such thickness and consistency, as to afford a barrier substantially impervious to the passage therethrough of gaseous and vaporous material to force these gaseous and vaporous materials as they expand to pass out at the back face of the sheet.

The product of the invention may be produced by other methods than that which is carried out with the spined roll above described. For example, the sheet of roofing or a roofing element may be placed in a platen type of press having the spines upstanding from one of the platen faces. As the sheet or element is pressed between the platens the spines will enter the face of the sheet or element to form the perforations.

Also, within the scope of the invention, the impregnated base sheet may have perforations formed therein before the barrier coating is applied to the face of the sheet. Any of the perforations which may extend to said face of the

sheet will then be closed by the barrier coating as is desirable. Care should be taken, however, that any coating applied to the back or underface of the sheet does not close the ends of the perforations which are at this back face.

Having thus described my invention I now claim:

1. A roofing sheet comprising a base of felted structure having upon a face thereof a coating of plastic adhesive material in set condition adhering to said face, said coating in said set condition being substantially impervious to passage therethrough of gaseous or vaporous material, said base being perforated from the face thereof opposite to that to which said coating adheres, said perforations extending within the structure of said felted base to provide leakoff passages for gases and vapors contained within the felted structure.

2. A roofing sheet comprising a base of felted structure impregnated with an impregnating material in plastic condition, said impregnated base having adhering to a face thereof a coating of plastic adhesive material in set condition, said coating in said set condition being substantially impervious to passage therethrough of gaseous or vaporous material, said base being perforated from the face thereof opposite to that to which said coating adheres, said perforations being open at said opposite face and extending within the structure of said impregnated felted base to provide leakoff passages for gases and vapors contained within said impregnated base.

3. A roofing sheet comprising a base of felted structure impregnated with a thermoplastic material, said impregnated base having adhering to a face thereof a coating of thermoplastic material, said coating in set condition being substantially impervious to passage therethrough of gaseous or vaporous material, said impregnated base being perforated from the face thereof opposite to that to which the thermoplastic coating adheres, said perforations extending within said impregnated base and providing leakoff passages for gases and vapors contained within the impregnated felted structure.

4. A roofing sheet comprising a base of felted structure impregnated with an asphalt saturant, said impregnated base having adhering to a face thereof a coating of asphalt capable of setting at air temperatures to form a barrier to passage therethrough of gaseous or vaporous material, said impregnated base being perforated from the face thereof opposite to that to which the asphalt coating adheres, said perforations extending within said impregnated base and providing passages for discharge at said opposite face of gases and vapors contained within the impregnated base.

5. A roofing sheet comprising a base of felted structure impregnated with an asphalt saturant, said impregnated base having adhering to a face thereof a coating of asphalt capable of setting at air temperatures to form a barrier to passage therethrough of gaseous or vaporous material, said impregnated base being perforated from the face thereof opposite to that to which the asphalt coating adheres, said perforations extending within said impregnated base and providing passages for discharge at said opposite face of gases and vapors contained within the impregnated base, at least some of said perforations extending to the face of said base to which said asphalt coating adheres.

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