June 20, 1967 W. L. BUTTERFIELD ET AL 3,326,366

ROLLED WATERPROOFING MATERIAL

Filed April 8, 1963

Fig. 1.

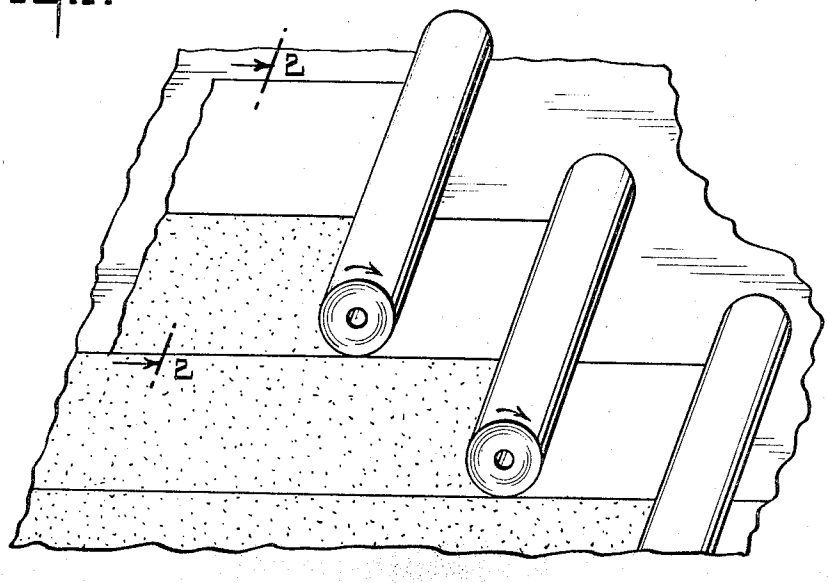


Fig. 2.

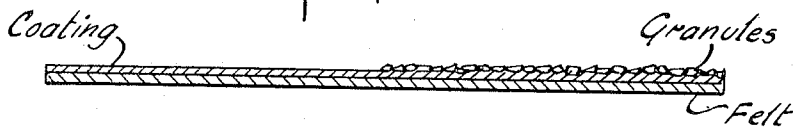


Fig. 3.

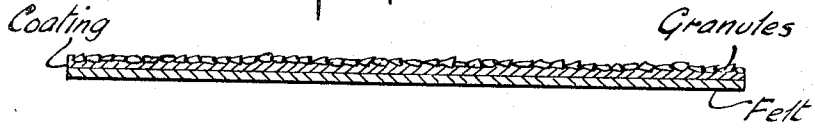
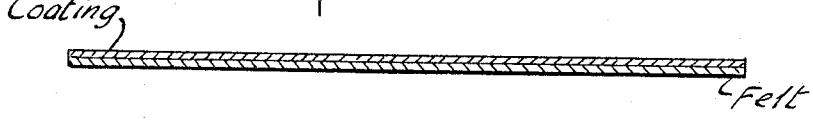


Fig. 4.



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ROLLED WATERPROOFING MATERIAL

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4 Claims. (Cl. 206—59)

This application is a continuation-in-part of applicants' application Ser. No. 844,785, filed Oct. 6, 1959, and now abandoned.

This invention relates to an improved waterproofing material and more particularly to waterproofing material in roll form having improved cold weather flexing characteristics.

Waterproofing material has been supplied in rolled-up form for many years and has been used on sidewalls of buildings and in the formation of built-up roofs wherein overlapped sections of the material are used to form one or more plies of the finished roof. Conventional waterproofing material of this type has a felt base impregnated with a bitumen and coated on at least one side with a coating type of asphalt. Although such material has sufficient flexibility to permit it to be formed in roll form, it has certain disadvantages, particularly evident in cold weather, resulting from its being rolled up, such as a tendency to re-roll after being unrolled and a tendency for the edges of the unrolled material to curl. Both of these characteristics are particularly undesirable for a roll roofing product since they make the task of adhering, usually by an adhesive, the roofing material to the roof deck considerably more difficult. A further disadvantage common to conventional products of this type is a tendency of the material to crack upon unrolling in cold weather, which cracking can adversely affect its waterproofing properties. It is also advantageous in roof deck covering work for the product to be somewhat limp so that "fishmouthing" can be avoided and so that the material will conform to uneven decks instead of bridging slight depressions to create weak spots in the roofing. The problems caused by insufficient flexibility of existing waterproofing materials supplied in roll form have been previously recognized, however applicants are the first to produce such a material showing significant improvement in flexing characteristics, especially in cold weather, over conventional materials, without adversely affecting other desirable properties of such conventional materials.

It is an object of this invention to provide a rolled waterproofing material having improved flexing characteristics.

It is a further object of this invention to provide a rolled waterproofing material which remains flexible and exhibits reduced cracking when unrolled at temperatures below freezing.

It is a further object of this invention to provide a rolled waterproofing material which exhibits improved resistance to rerolling and edge curling when unrolled.

It is a further object of this invention to provide a rolled waterproofing material of increased limpness to improve its ability to conform to uneven surfaces.

Bitumens, and specifically asphalt, are for certain purposes classified according to their softening point and penetration properties, and such properties are consequently referred to in this application. Where referred to herein, the softening point is expressed in degrees Fahrenheit as determined by the Ring and Ball ASTM Method of Test D–36, and the penetration is expressed in the conventional units of millimeters over ten (mm./10) as determined at 77° F., 100 grams, 5 seconds by ASTM Method of Test D–5.

Conventional rolled products have been used in the past as sheathing materials for shingles and siding, liners for walls and floors, base sheets for membrane waterproofing, protective wrappers for machinery, flashing, and many other uses. Applicants' new product may be used in any environment where rolled waterproofing materials have previously found acceptance, and is particularly valuable in those environments where improved flexibility and cold weather performance are desirable. It should be understood, therefore, that where this application and the examples set forth refer to applicants' new product as "roll roofing," this term is merely used for convenience and is not intended to limit the invention as to the end use of such product.

In accordance with this invention, the improved characteristics of applicants' new product are attained by coating a bitumen saturated felt with a catalytically blown asphalt having from 15 to 45% filler included therein. It has been found that only by this combination of a filled catalytically blown asphalt as a coating for a bitumen saturated felt are the desired features obtainable.

The new rolled product of this invention may include any common felt of the type presently used for making roofing products, such as wood fiber and/or rag felt, asbestos paper or fiberglass webs. The width and length of the felt may be varied for different purposes, one conventional size being 36 feet long and 36 inches wide. After formation of the felt it is saturated with any conventional saturating asphalt, such as one having a softening point in the range of 105°–115° F. and a penetration of between 150 and 180. It has been found that catalytically blown asphalt may be conveniently used for saturation, as well as for coating, where the felt is formed of fiberglass webs or mats which include continuous or chopped strands of textile quality fiberglass. The felt is then coated, preferably on both sides, with a filled catalytically blown asphalt in an amount of from two to ten times the weight of the dry felt, although the amount of coating asphalt may be varied for specialized uses of the end product.

One specific catalytically blown coating asphalt useful in practicing the invention herein is obtained by air blowing an asphalt in the presence of a phosphorous catalyst which is stable at the temperatures involved in the air blowing process. This process of catalytic air blowing of asphalt using a phosphorous catalyst and the product produced by the process are more fully described in U.S. Patent 2,450,756, dated Oct. 5, 1948. As pointed out in this patent, stable compounds usable as a catalyst in the process include phosphorous pentoxide, red phosphorous, and stable sulfides of phosphorous such as phosphorous sesquinsulfide, phosphorous sulfide and phosphorous pentasulfide.

The unfilled catalytically blown asphalt used in the coating according to the present invention must have a softening point in the range of 210° F.–230° F. and a penetration of greater than 35. As is known, the greater the penetration, the softer the asphalt; and, therefore, the upper limit for penetration is, as a practical matter, that point at which the asphalt is too soft for proper handling. Softening points and penetrations within the required range can be obtained with non-catalytically blown asphalts having high oil contents, however it has been found that such materials exude oil, have relatively poor weatherability and are not sufficiently ductile for use in a rolled paterproofing material. Hence, such non-catalytically blown asphalts are excluded from the scope of the appended claims. The coating asphalt required by this invention must also include from 15% to 45% by weight of a granular filler, such as mica, slate flour, diatomaceous earth, or the like, having a particle size such that at least a majority passes through a 200 mesh

screen. Such a coating asphalt is compatible with conventional roofing emulsions used for saturating felts and has less of a tendency to exude oil than conventional coating asphalts. The filled coating asphalt should be applied in an amount of about 20–40 lbs. per 108 sq. ft. of felt when applied in approximately equal amounts to both sides of the felt.

With reference to the attached drawings:

FIG. 1 is a perspective view showing several rolls of roofing being applied to a roof;

FIG. 2 is a cross sectional view of one type of roofing in accordance with the present invention;

FIG. 3 is a view of an alternative type of roofing in accordance with the present invention;

FIG. 4 is a view of another alternative type of roofing in accordance with the present invention.

The drawings show various types of roll roofing products which can advantageously use the principles of the present invention, and are merely illustrative in nature. Thus, FIGS. 2, 3 and 4 illustrate different types of conventional roll roofing; the FIG. 2 embodiment having only half of its upper surface coated with granules, the FIG. 3 embodiment having its entire upper surface coated with granules and the FIG. 4 embodiment having its entire upper surface free of granules. FIG. 1 is illustrative of the manner in which roll roofing is applied to a roof, specifically using the type of roll roofing illustrated in cross-section in FIG. 2. All of the various embodiments of roll roofing shown in the drawings include a felt **10** having a back coating **11** and a face coating **12**. The granules are identified by reference numeral **13**. As is conventional, mica or other release material, may be dusted on any surfaces of the sheet which are not coated with granules to help prevent sticking in the roll.

As has previously been stated, the new rolled product made in accordance with the present invention must utilize a catalytically blown asphalt as the coating material in order to obtain the improved flexibility at low temperatures, since non-catalytically blown asphalts do not impart such a property to the product. Although the product produced according to the invention is specifically designed for application at low temperatures, its properties at relatively high temperatures are equal to, if not superior to, conventional rolled products. By the inclusion of 15% to 45% of a granular filler material in the coating material, it has been found that problems of sticking when the roll is stored at relatively high temperatures are avoided. Thus, because of the coaction created by the use of a coating material having a catalytically blown asphalt and 15% to 45% of a granular filler, applicants have been able to produce a rolled product which might be termed "universal" in that it can be stored and used over a very wide range of temperatures. None of the rolled products previously conceived of approach such a universality of use.

The following specific example will illustrate the use of the present invention to make a roll roofing product:

An all wood fiber felt weighing 30 lbs. per 480 sq. ft. was saturated with an asphalt, having a softening point of 110° F. and a penetration of 170, by the conventional hot saturating method. The saturated felt was then coated on both sides with 30 lbs. of catalytically blown coating asphalt per 108 sq. ft. of felt. The coating asphalt had been air blown in the presence of 0.5% phosphorous pentoxide catalyst at a temperature of 450° F. for 6 hours and, prior to filling, had a softening point of 215° F. and a penetration of 40. The coating asphalt included 20% by weight of mica as a filler, the mica particles having a size such that they passed through a 200 mesh screen.

In order to more clearly point out the improved properties of rolled products utilizing a filled catalytically blown asphalt as compared to rolled products using non-catalytically blown asphalt, the following comparative tests were conducted.

Two samples of rolled roofing were prepared, one using asphalt which had been air blown in the presence of 1% phosphorous pentoxide (Sample A) and the other using the same type of asphalt which had been air blown without any catalyst being present (Sample B). In both cases, a coating composition was made by combining the blown asphalt with 40% by weight of granular dolomite as a filler, which coating composition was then used to coat both sides of a conventional saturated roofing felt, in an amount of about 30 lbs. per 108 sq. ft. of felt, distributed approximately equally on each side. The samples were then cut and rolled into identical two inch diameter rolls, and subjected to storage and operating tests. After storage for 5 hours at 140° F., neither Sample A or Sample B showed any signs of sticking upon being unrolled. In order to test the cracking characteristics of the samples, the rolls were unrolled in a cold room at various temperatures and the number of cracks which occurred were measured, the results being as follows:

Temperature of Unrolling, ° F.	Cracks per Lineal Foot	
	Sample A	Sample B
10	55	90
24	5	31
29	0	6
48	0	0

These tests clearly demonstrate the improved non-cracking characteristics of applicants' new rolled product in cold weather application.

In another test, two 36 foot rolls of Sample A and two 36 foot rolls of Sample B were stored for one week at 20° F., and were then unrolled. The rolls of Sample A were unrolled by merely kicking the rolls, whereas the Sample B rolls had to be unrolled by hand. After being unrolled to their full length, the amount of rerolling which occurred was measured and the results are as follows:

Sample A.—Roll **1** rerolled 3 feet and Roll **2** rerolled 4¾ feet for an average rerolling distance of 3⅞ feet;

Sample B.—Roll **1** rerolled 9 feet and Roll **2** rerolled 13 feet for an average rerolling distance of 11 feet.

Thus, the sample rolls made according to applicants' invention rerolled an average of only slightly more than 11% of their length, whereas the sample rolls made in the conventional manner rerolled an average of more than 30% of their length, which clearly demonstrates another advantage obtained by the use of applicants' invention.

In field tests of a product produced in accordance with this invention, it was observed that at 28° F. the rolls unrolled more easily and had less tendency to edge curl and reroll than conventional roll roofing. It was also noticed that at this temperature bonding of the edges of the roll roofing to the roof could be obtained by merely brooming, whereas in the case of conventional roll roofing bonding of the edges could only be obtained by a "walking in" procedure followed by brooming.

As can be seen from an analysis of the laboratory and field tests described above, applicants' new roll product exhibits superior low temperature application and storage characteristics without any sacrifice in high temperature application and storage characteristics. Because this product lays down readily at both high and low temperatures, the prior practice of laying the curvature of the roll down on the roof to eliminate edgecurling and buckling may be dispensed with, thus making application of the product easier. Furthermore, by the use of applicants' new roll products, problems previously encountered with regard to edgecurling, rerolling, unrolling, bonding to the surface to be covered, and cracking are either minimized or eliminated. These new products also result in the formation of tighter end laps and a greater conformity to uneven surfaces.

What is claimed is:

1. A waterproofing material in continuous rolled form comprising a felt base sheet saturated with a bitumen and coated on at least one side with a waterproof coating composition, said coating composition consisting essentially of an asphalt which has been air blown in the presence of a phosphorous catalyst, said catalytically air-blown asphalt having a softening point in the range of about 210° F. to about 230° F. when tested by the Ring and Ball ASTM method of Test D–36 and a penetration at 77° F., 100 grams, 5 sec. of greater than 3.5 mm. when tested by ASTM method of Test D–5, and from 15% to 45% by weight based on the weight of the coating of a granular mineral filler having a particle size such that a majority thereof will pass through a 200 mesh screen.

2. A waterproofing material in accordance with claim 1 wherein said phosphorous catalyst is phosphorous pentoxide.

3. A waterproofing material in accordance with claim 1 wherein said phosphorous catalyst is present in an amount of at least 1% by weight of the total weight of the asphalt being air blown.

4. A waterproofing material in accordance with claim 1 wherein said felt base sheet is made from filaments of textile quality fiber glass which is saturated with an asphalt that has been air blown in the presence of a phosphorous catalyst.

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