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ROOFING INSTALLATION

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Fig. 1

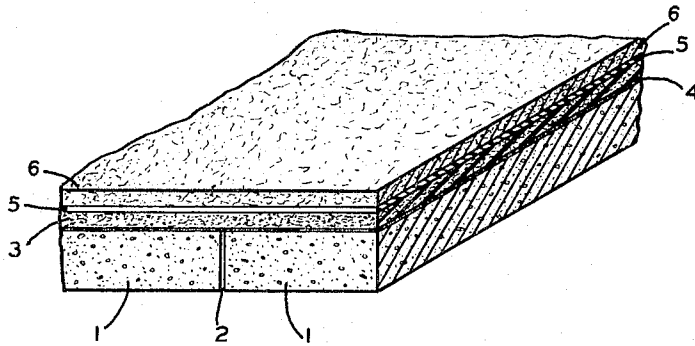
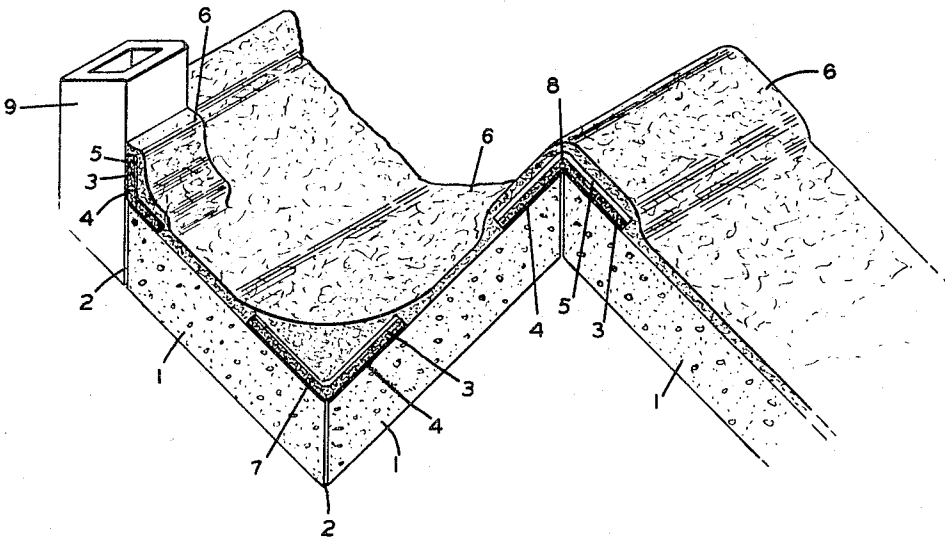


Fig. 2



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ROOFING INSTALLATION

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10 Claims. (Cl. 161-205)

This invention relates generally to roof installations. More particularly, the invention relates to roof installations adapted to maintain the roof in a sealed condition despite the expansion and contraction of structural members which open and close joints. Still more particularly, the invention relates to a defined base sheet.

There has always been a problem in keeping a roof sealed throughout the wide variety of weather conditions normally found in the middle latitudes. Metal, concrete, and wooden roof structural members expand and contract as the temperature changes. Wooden members expand and contract in response to moisture pickup. These changes can open and close the joints between structural members by as much as one inch, while one-quarter inch changes are quite commonly met with. Under such conditions, it is extremely difficult to construct a roof installation which will remain sealed over an extended period of time in the region of the joints.

In the past it has been customary to utilize glass fiber cloth as a base sheet to place over such joints to bridge the joints, followed by successive coatings of liquid neoprene (neoprene dissolved in a solvent therefor) in order to form a sealing system. This system has not been completely satisfactory. Glass fiber cloth has low elongation. Additionally, part of the difficulty has been due to the fact that many roofs require the ability to withstand pedestrian traffic. Such traffic imposes an even heavier burden of durability on the roof installation since the installation is subject to pounding from above as well as movement from below. The above-described glass fiber installation has not proved completely satisfactory.

There is, therefore, a great need for a roofing installation which will last for many years in those areas of the roof where joints are constantly opening and closing in response to environmental conditions.

It is the primary object of the present invention to supply such an installation. It is a further object of the present invention to supply a roofing installation particularly usable over the joints in roofs, or over areas in roofs in which cracks are likely to appear in the actual roofing structural members, and on which pedestrian traffic may occur. It is a further object of the present invention to supply a roof installation particularly suitable as a flashing between such roofing structural members as chimneys, plywood roofing sheet, vent stocks, and the like.

These objects have been accomplished in an effective and straight-forward manner. The invention comprises in combination a flexible two-ply laminated base sheet adhesively secured to abutting structural members on each side of a joint, or in the region of a potential crack. Overlying the laminated base sheet is a top, weather-resistant coating which may also be resistant to pedestrian traffic. The laminated base sheet comprises a bottom lamina of felted rubber-bonded asbestos fibers having affixed thereto a top lamina of cured neoprene having a thickness in the range of 0.005-0.03 inch.

The critical feature and the heart of the present invention resides in the role played by the laminated base sheet in the roofing installation. The bottom component—the bottom lamina—of the laminated base sheet is felted rubber-bonded asbestos fibers. Preferably this sheet will

be made by one of the known beater-saturation processes for forming rubber-bonded asbestos sheets on a Four-drinier wire. Although a dry-laid felt asbestos sheet could be prepared and subsequently saturated and thus bonded with a rubber latex, such procedures are difficult to carry out due to the weakness of the dry-laid asbestos sheet formed without a binder; subsequent saturation is difficult. The bottom lamina must be of felted asbestos fibers and not woven asbestos since it is expected that the bottom lamina will break or tear as the roof structural members pull apart under environmental conditions. A woven sheet of long-fibered asbestos fibers will have too high a tensile strength to serve in the installation of the present invention. Additionally, a break will affect too wide an area of the sheet. Asbestos, as opposed to cellulose, will be the fiber used to make the sheet in order that the sheet will have the necessary inertness and chemical resistance to the weathering conditions normally found in a roofing installation. Cellulosic sheets soon deteriorate. Additionally, such asbestos sheets can readily be adhesively secured to the roofing structural members which make up the actual roof prior to the placement of any coating or covering over the structural members. As mentioned earlier, these structural members will generally be wood planks or sheets, concrete, and metal sheets or strips. The asbestos sheet will preferably be bonded in accordance with beater saturation processes with any suitable synthetic rubber, generally in an amount of about 5-30% by weight rubber based on the dry weight of the fibers. Rubbers used for bonding may be the butadiene-styrene copolymers, the butadiene-acrylonitrile copolymers, neoprene, butyl rubbers, and other synthetic rubbers. The asbestos sheet will generally have a thickness in the range of about 5-50 mils and will have a tensile strength somewhere in the range of 300-2,000 pounds per square inch. The tensile strength of a beater saturated asbestos sheet may generally be improved if needed by calendering the sheet, preferably at elevated temperatures in the range of about 100-500° F.

The top lamina of the laminated base sheet will be a cured film of neoprene rubber. Neoprene is polychloroprene. The top lamina of neoprene may be placed on the bottom lamina of rubber-bonded asbestos by any convenient means. A solvent solution of neoprene may be sprayed, painted, doctored, or rolled onto the asbestos sheet, several applications being needed normally in order to build up the requisite thickness of the neoprene sheet. Alternatively and preferably, the neoprene may be compounded on a mill with the requisite curing agents such as zinc oxide and magnesium oxide, along with any curing accelerators if desired, reinforcing agents, lubricants, fillers, and diluent rubbers, followed by calendering the neoprene batch directly onto the rubber-bonded asbestos sheet. If the neoprene batch is separately formed into a film, the film must subsequently be affixed to the rubber-bonded asbestos sheet in some suitable manner as by pressing, rolling, calendering, and the like. If the neoprene is calendered directly onto the rubber-bonded asbestos sheet, no adhesive will be needed since the calendering operation itself at elevated temperatures, usually in the range of about 130-170° F., serves to fix the neoprene sheet to the rubber-bonded asbestos sheet to form the laminated base sheet. The thickness of the rubber sheet will be in the range of 0.005-0.03 inch. Sheets thinner than the stated minimum are insufficiently strong to withstand both pedestrian traffic and the roof movement. Sheets thicker than the stated maximum may be, in a cured condition, too brittle to withstand the elongation to which the top neoprene lamina is subjected during movement of the roof structural members. An elongation of 100-500% will thus be established in the top

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neoprene layer once it is subjected to cure. Curing is carried out at an elevated temperature, preferably after the neoprene sheet has been calendered onto the rubber-bonded asbestos sheet. The rubber face of the resulting laminate may be coated with a thin film of talc to prevent sticking. The laminate may then be rolled up, and placed in a suitable oven for cure, generally at a temperature in the range of 300–330° F. Although diluent rubbers such as reclaimed rubber stock may be admixed with the neoprene rubber during the mixing of the batch, the finished stock should contain at least 50% neoprene rubber, based on total rubbers present, in order that the final film will possess sufficient of the unusually excellent weather-resistant properties of neoprene. If reclaimed rubber stock is used in relatively small amounts in the neoprene film, staining of light-colored weather coatings may occur over the years. Where staining is not important, as for instance in an installation where black is the predominant color and in which there is no concern for the staining of the weather coat, such compositions may be used. A suitable series of formulations is as follows:

Ingredients:	Parts by weight
Polychloroprene (neoprene) -----	100
Semireinforcing carbon black -----	50–100
Furnace carbon black -----	0–20
Magnesium oxide -----	1–8
Zinc oxide -----	1–10
Lubricant and processing aid -----	0–5
Antioxidant -----	0–5
Curing accelerator -----	0–2

The flexible elastic base sheet is easily installed directly on the structural roof members subject to expansion and contraction. Any suitable adhesive may be used which will maintain the asbestos lamina of the base sheet firmly affixed to the structural roof members. The commercially available contact neoprene adhesive may be used. However, with such adhesives, the sheet cannot then be shifted or moved from its position once it has been laid. For this reason it is preferred that any of the commercially available neoprene latex adhesives be used to hold the flexible elastic base sheet in position over a joint in the structural roof members. Once the adhesive has dried, the base sheet will be held firmly in position. Subsequent movement of the structural roof members in expansion or contraction which will open or close the joints therebetween will break or rupture the asbestos lamina, but will not break or rupture the cured neoprene lamina of the base sheet. Thus the integrity of the roof is maintained. The roof remains sealed against water leakage while allowing the structural roof members to expand and contract. If desired, the rupturing or breaking of the asbestos lamina may be controlled by scoring or perforating the asbestos lamina prior to adding the neoprene lamina.

One of the advantages of using the rubber-bonded asbestos sheet is the obtaining of a good strong bond between the sheet and the structural roof member by means of an adhesive. Direct use of a rubber sheet on the structural roof member will not allow the development of a tenacious bond. Additionally, the rubber sheet will be subjected to greater stresses in the absence of the intervening asbestos lamina. Scoring or perforating the asbestos sheet allows the retention of the tenacious bond between the base sheet itself and the structural roof members.

The final element in the installation of the present invention is the top coating—the weather-resistant coating—to be applied to the roofing on top of the flexible elastic base sheet described above. This weather-resistant coating may be any of the top coatings known in the art. It may comprise successive coatings of neoprene or chlorosulfonated polyethylene rubber, each applied in solvent solution. Alternatively, the top weather-resistant coating overlaying the laminated base sheet may be applied from

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a resin or rubber latex, again applied in a sufficient number of coatings to yield a weather-resistant coating having the desired thickness. Hot asphalt may be used. The asphalt will be covered with gravel or with other materials to facilitate pedestrian traffic. If nail holes in the roof can be tolerated, any of the nailed top roof coverings may be used; the nails will not affect the operation of the laminated elastic base coating sheet to maintain the joints sealed during movement of the structural roof members. Hence the top overlaying roof coating may be any of the known coatings used to weatherproof the roof and to allow pedestrian and other traffic thereover.

The elastic base sheet of the present invention may be prepared in any convenient width, as for example 36 inches. When prepared in such widths, it may also be shipped and applied in the same widths. If an entire roof is to be covered with the sheet, overlapping joints may be established using an adhesive to establish a bond in the overlapped areas. Although the roofing installation of the present invention is primarily designed to cope with the opening and closing of cracks and joints, it may profitably be applied to a roof which has no joints or cracks but in which cracks or joints may subsequently appear by virtue of the settling of the building or the shifting of the structural roof members.

In the drawings,

FIG. 1 shows a simplified section of a roofing installation of the present invention, and

FIG. 2 shows a simplified roofing installation of the present invention as it might actually be installed on a roof. The parts of the elastic base sheet and top overlaying weather-resistant coating are not drawn to scale for the sake of clarity in description.

Referring to FIG. 1, the adjacent structural roof members 1 abut and form the joint 2. The rubber felted asbestos lamina 3 is adhesively secured to the structural members 1 at the adhesive line 4. Above the asbestos lamina 3 is the cured neoprene sheet 5 affixed to the asbestos lamina 3. On top of the laminate formed by the sheet 3 and sheet 5 is the top weather-resistant coating 6 which may be fabricated of any of the known top coatings used in roof installations and the like.

Referring to FIG. 2 where like numbers identify like parts in FIG. 1, the structural members 1 form the joints 2 to which are adhesively secured by the adhesive 4 the laminate made up of sheets 3 and 5. Overlaying the laminate is the top weather-resistant coating 6. In FIG. 2 it can be seen that one application of the roof installation of the present invention is made in the valley formed by the structural members at 7 and also at the peak 8. Additionally, the roof installation of the present invention is used as a flashing between the chimney 9 and the flat roof structural member 1 adjacent the chimney. Pedestrian traffic may proceed along the valley 7. In all these installations, the joints 2 will remain sealed for years even when the roof members expand and contract sufficiently to open the joints 2 by as much as an inch.

We claim:

1. A flashing material for use in a roof installation and adapted to maintain the roof in a sealed condition in spite of the opening and closing of the joints and cracks, said flashing material comprising in combination a two-ply laminated base sheet adhesively secured to adjacent structural members on each side of a joint, and a top, weather-resistant coating overlaying the laminated base sheet, the laminated base sheet comprising a bottom breakable lamina of felted rubber-bonded asbestos fibers having affixed thereto a top stretchable lamina of cured neoprene having a thickness in the range of 0.005–0.03 inch and which will not break when said bottom lamina breaks.

2. A flashing material according to claim 1 wherein the thickness of said top lamina of cured neoprene is about 0.01–0.015 inch.

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3. A flashing material according to claim 1 wherein the thickness of said bottom lamina of felted rubber-bonded asbestos fibers is about 0.025 inch.

4. A flashing material according to claim 1 wherein said top weather-resistant coating comprises a neoprene coating.

5. A flashing material according to claim 1 wherein said top weather-resistant coating comprises a chloro-sulfonated polyethylene rubber.

6. A flashing material according to claim 1 wherein said top weather-resistant coating comprises an asphalt coating.

7. A flashing material according to claim 1 wherein said top lamina of cured neoprene includes an additional rubber in an amount of less than 50% by weight based on the weight of the neoprene.

8. A flashing material according to claim 1 wherein said laminated base sheet is adhesively secured to said structural members by means of a neoprene adhesive.

9. A laminated base sheet adapted for use in a roof installation to maintain the joints in the roof in a sealed

condition, said sheet comprising a bottom lamina of felted rubber-bonded asbestos fibers, and a top lamina secured thereto of cured neoprene having a thickness in the range of 0.005-0.03 inch, said bottom lamina being adapted to break as roof structural members pull apart under environmental conditions while said top lamina remains unbroken.

10. A laminate according to claim 9 wherein said bottom lamina has a thickness of 5-50 mils.

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