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(54) **Title**: ROOFING UNDERLAYMENT WITH NAIL SEALING SYSTEM

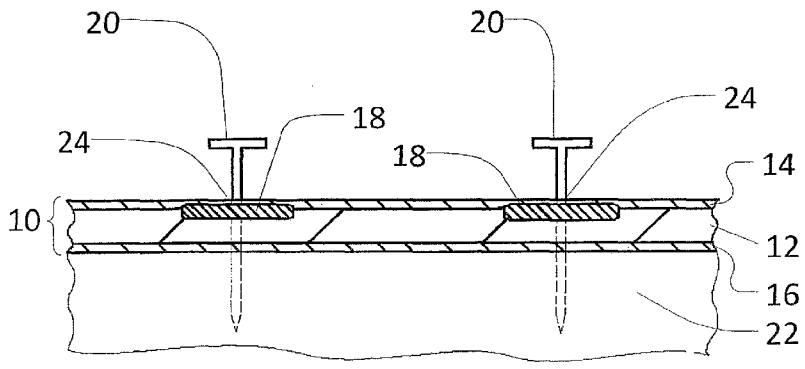


FIG. 2

(57) **Abstract**: A sheet of roofing underlayment (10) comprises a base layer (12), a water-impermeable coating layer (14) laminated to one side of the base layer, and a plurality of spaced-apart sealant areas (18) between the coating layer and the base layer, comprising a sealant adapted to form a seal around a fastener (20) penetrating the sheet. The sealant area may be continuous or intermittent strips. The sealant forms a water-tight seal around the fasteners used to attach the roofing underlayment to a roof deck (22).

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ROOFING UNDERLAYMENT WITH NAIL SEALING SYSTEM

Field of the Invention

The invention pertains to roofing underlayments, and in particular to a system for preventing water leakage around fasteners that are used to secure roofing underlayment to a roof deck.

Background of the Invention

The basic structure of a typical roofing underlayment is a woven scrim layer (or a non-woven layer) with a waterproof coating on both sides. In use, nails are driven through the roofing underlayment to attach it to a roof deck. This makes holes through the underlayment and there is a susceptibility to water leakage around the nails. It is known in the art to include in a multilayer roofing underlayment a layer that is adapted to seal around nails, e.g. Thai et al., US 2010/0178827; Binkley et al., US 2007/0077838; Zickell et al., US 2007/0071946; and Sandrasegaran et al., WO 2010/070466. However, these systems require use of a full layer of the sealant, including across areas of the sheet where nailing will not occur.

Summary of the Invention

The invention provides nailing sealant areas or strips inside the layers of a sheet of underlayment that provide a seal around the fasteners passing through the sheet.

According to one aspect of the invention, there is provided a sheet of roofing underlayment, comprising a base layer, a water-impermeable coating layer laminated to a first side of the base layer, and a plurality of

spaced-apart sealant areas between the coating layer and the base layer, comprising a sealant adapted to form a seal around a fastener penetrating the sheet.

Further aspects of the invention and features of specific embodiments of the invention are described below.

Brief Description of the Drawings

Figure 1 is a cross-sectional view through one embodiment of the roofing underlayment.

Figure 2 is a cross-sectional view through the underlayment of Fig. 1 nailed to a roof deck.

Figure 3 is a cross-sectional view through a second embodiment of the underlayment.

Figure 4 is a cross-sectional view through a third embodiment of the underlayment.

Detailed Description of the Preferred Embodiments

Referring first to Figures 1 and 2, the roofing underlayment **10** comprises a base layer, namely a woven scrim layer **12**, laminated to a first coating layer **14** on one side and to a second coating layer **16** on the opposite side.

The scrim comprises woven tapes which may be made of various resins, including polyolefins such as polyethylene and polypropylene, polyesters, polystyrene, nylon, and ethylene acrylic copolymers. The base layer may be a woven, non-woven or film layer. The coating layers are water impermeable and may comprise any of the same resins as the scrim. The

scrim may have a weight of about 75 grams per square meter, alternatively a weight in the range of 25-150 gsm. The coatings may have a thickness of about 1.5 mil, alternatively a thickness in the range of 0.3-3.5 mil.

The sealant areas **18** are spaced-apart strips positioned between the scrim **12** and the first coating layer **14**, which in use is the upper layer of the sheet. In the view of Fig. 1, the strips **18** extend into the plane of the paper. The sealant material may be any of various seal-forming adhesives, including hot melt adhesive, silicone, glue, modified bitumen and rubberized asphalt. The sealant areas **18** may be black or dark-colored to be visible through the coating **14**. During the manufacture of the underlayment, the strips of sealant are applied between the first coating layer **14** and the scrim layer **12**. They are placed in nailing areas such as along the longitudinal edges of the sheet, and, alternatively also across the middle of the sheet. For example, there may be three continuous parallel strips of sealant **18** across the sheet (at the middle and two longitudinal edges) of about 2 inches (5 cm) wide and about 5 mil thick. Alternatively, the strips may be intermittent rather than continuous, or a combination of continuous and intermittent.

In one embodiment, a sealant is employed that does not cure during the process of manufacturing the roofing underlayment. It remains liquid until a fastener, e.g. a nail, passes through the coating, exposing the sealant to air or humidity and causing the sealant to cure and form a rubbery gasket around the nail. In a second embodiment, the sealant cures during the process of manufacturing the roofing underlayment.

The thickness of the top coating layer **14** or of the scrim layer **12**, or both, may be reduced in the area of the sealant strips **18**, as shown in Figure 1, so that the sheet **10** has a substantially uniform thickness. This facilitates winding up of the sheet evenly into a roll, avoiding build-up in the roll in the areas of the strips. Alternatively, roll buildup can be managed by making the strips intermittent, or having intermittent spots of sealant. Alternatively, roll buildup can be managed by osculation of the sealant strips. In such embodiment, the osculation of the strips is done by means of the mechanism of delivering the stops being slightly moved left and right traversing across the web, preventing the sealant strips from stacking upon themselves layer after layer. Instead of the roll containing build-up in one spot the build-up is distributed over a space of approximately 8 inches (20 cm).

Figure 2 shows the sheet of roofing underlayment **10** laid in place on a roof deck **22**, with the second coating layer **16** being the bottom layer in direct contact with the deck, and the first coating layer **14** being the upper layer. Nails **20** are driven through the sheet along the strips **18**, forming holes **24** through the sheet. The sealant forms a seal around the nails, preventing water infiltration to the deck. Alternatively, staples or screws can be used in place of nails.

Referring next to Figure 3, a further embodiment of the roofing underlayment **30** has additional sealant areas. Sealant areas or strips **32** are provided on the underside of the sheet, laminated to the outside of the second coating layer **16**, aligned with the sealant areas **18** between the first coating layer **14** and the scrim layer **12**. Additional sealant areas or strips **34** are provided on the upper side of the sheet, laminated to the first

coating layer **14** and aligned with the sealant areas **18** and **32**. This arrangement enhances the sealing around fasteners driven through the sealing areas **34**, **18**, **32**. Alternatively, the roofing underlayment **30** may have only the internal sealant areas **18** and the top sealant areas **34**, or only the internal sealant areas **18** and the bottom sealant areas **32**.

Figure 4 shows a further embodiment of the roofing underlayment **40**. The sealant area **18** is positioned between the scrim layer **12** and the second coating layer **16** (in use, the layer in contact with the roof deck), rather than between the scrim layer **12** and the first coating layer **14** (in use, the top layer). The roofing underlayment **40** is otherwise the same as the roofing underlayment **10** as described above.

As will be apparent to those skilled in the art in the light of the foregoing disclosure, many alterations and modifications are possible in the practice of this invention without departing from the scope thereof. Accordingly, the scope of the invention is to be construed in accordance with the following claims.

Claims

1. A sheet of roofing underlayment, comprising:

   (a) a base layer;

   (b) a water-impermeable coating layer laminated to a first side of the base layer; and

   (c) a plurality of spaced-apart sealant areas between the coating layer and the base layer, comprising a sealant adapted to form a seal around a fastener penetrating the sheet.

2. A sheet according to claim 1, wherein the sealant is uncured and is adapted to cure upon exposure to air or humidity.

3. A sheet according to claim 1, wherein the sealant is cured.

4. A sheet according to any one of claims 1-3, wherein the sealant is one of a hot melt adhesive, silicone, glue, modified bitumen and rubberized asphalt.

5. A sheet according to any one of claims 1-4, wherein the sealant areas are colored and visible through the coating.

6. A sheet according any one of claims 1-5, wherein the sealant areas comprise continuous or intermittent strips.

7. A sheet according to claim 6, wherein the strips are located along two longitudinal edges of the sheet.

8. A sheet according to claim 7, wherein at least one continuous or intermittent strip is located along a middle part of the sheet.

9. A sheet according to any one of claims 1-8, wherein the base layer is a scrim.

10. A sheet according to any one of claims 1-8, wherein the base layer is a non-woven.

11. A sheet according to any one of claims 1-8, wherein the base layer is a film.

12. A sheet according to any one of claims 1-11, wherein the base layer comprises one of a polyolefin, a polyester, polystyrene, nylon, and an ethylene acrylic copolymer.

13. A sheet according to any one of claims 1-12, wherein the coating layer comprises one of a polyolefin, a polyester, polystyrene, nylon, and an ethylene acrylic copolymer.

14. A sheet according to any one of claims 1-13, further comprising a second coating layer laminated to a second side of the base layer.

15. A sheet according to any one of claims 1-14, wherein the thickness of the base layer or the coating layer, or both, adjacent to the sealant areas is less than the thickness of the base layer or the coating layer, respectively, in non-adjacent areas.

16. A sheet according to claim 15, wherein the sheet has a substantially uniform thickness.

17. A sheet according to claim 6, wherein the strips osculate along a longitudinal direction of the sheet.

18. A sheet according to any one of claims 1-17, further comprising a second plurality of spaced-apart sealant areas laminated to the outside of the sheet and aligned with the sealant areas between the coating layer and the base layer.

19. A sheet of roofing underlayment, comprising:

(a) a base layer;

(b) a first water-impermeable coating layer laminated to a first side of the base layer;

(c) a second water-impermeable coating layer laminated to a second side of the base layer; and

(d) a first plurality of spaced-apart sealant areas between the coating layer and the base layer, comprising a sealant adapted to form a seal around a fastener penetrating the sheet.

20. A sheet according to claim 19, further comprising a second plurality of spaced-apart sealant areas laminated to the outside of the first coating layer and aligned with the first plurality of sealant areas.

21. A sheet according to claim 19 or 20, further comprising a third plurality of spaced-apart sealant areas laminated to the outside of the second coating layer and aligned with the first plurality of sealant areas.

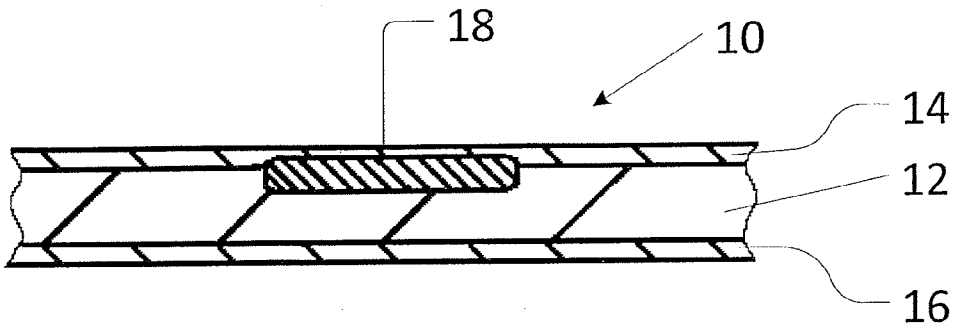


FIG. 1

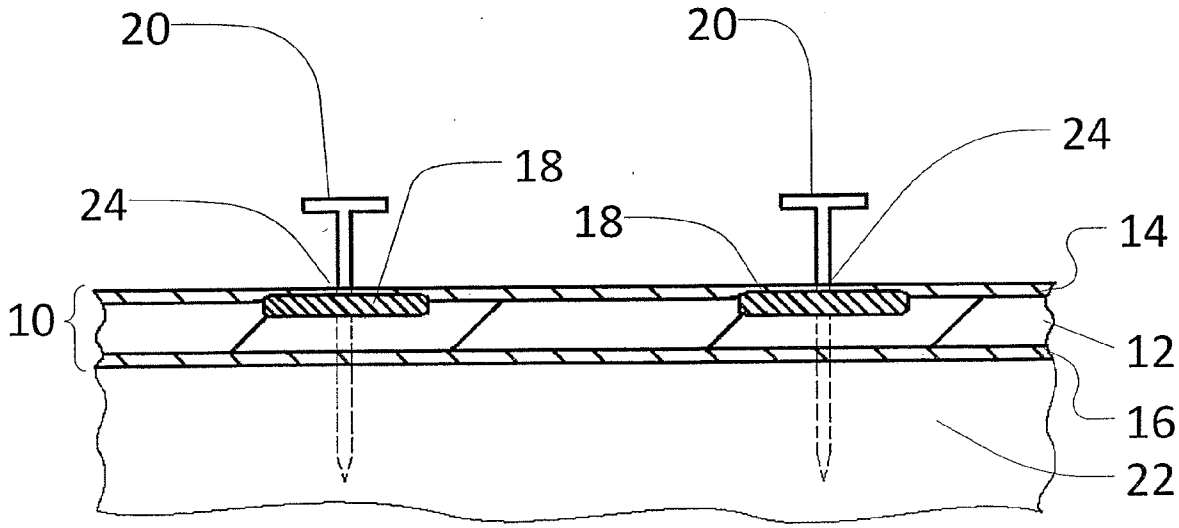


FIG. 2

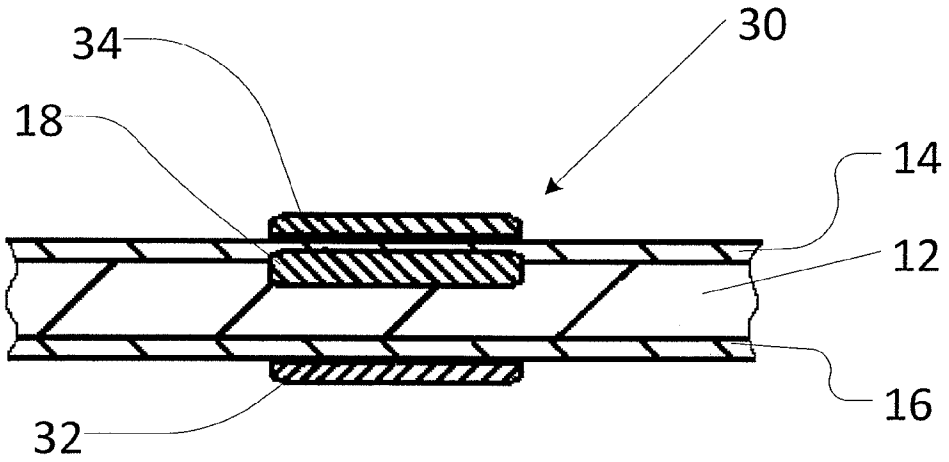


FIG. 3

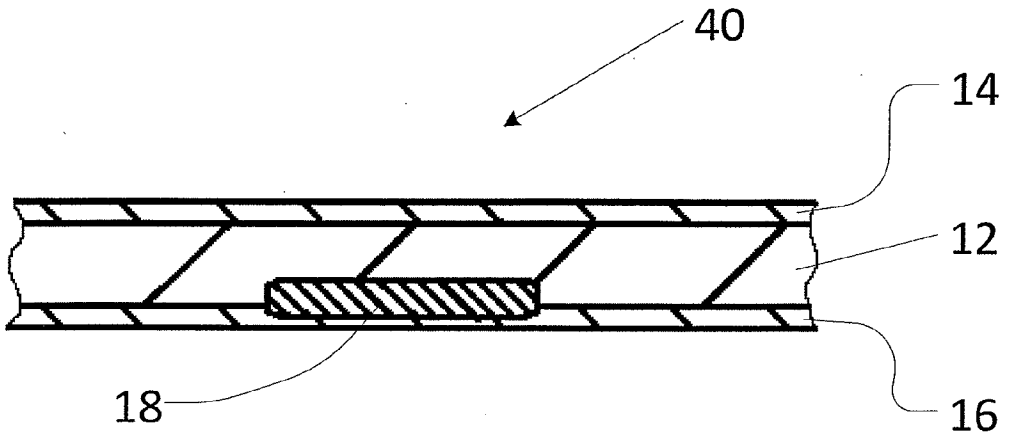


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA2013/050344

A. CLASSIFICATION OF SUBJECT MATTER
IPC: ***E04D 5/00*** (2006.01)
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC (2006.01): E04D, E04D 5/00, E04D 5/02, E04D 12/00, E04D 5/12, B32B 7/02, B32B 27/00, B32B 5/00, B32B 7/04, B32B 7/10

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database(s) consulted during the international search (name of database(s) and, where practicable, search terms used)
Canadian Patent Database (CPD), EPOQUE (Epodoc), Google Patents, and Google Search Engine
Keywords: underlayment, roof, roofing, seal, water, proof, impermeable, fastener, nail, staple, layer, base, coating, core, internal, strip

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2010/0178827 A1 (THAI, H. T., et al.) 15 July 2010 (15-07-2010) *Whole Document*	1, 3, 4, 6, 9, 10, 12 and 13
Y	US 7201946 B2 (COLLINS, D. A., et al.) 10 April 2007 (10-04-2007) *Whole Document*	1, 3, 4, 6 to 14, and 19
Y	US 2007/0077838 A1 (BINKLEY, J. A., et al.) 05 April 2007 (05-04-2007) *Whole Document*	1, 3, 4, 6, and 10 to 13
Y	US 2007/0071946 A1 (ZICKELL, T. J., et al.) 29 March 2007 (29-03-2007) *Whole Document*	1, 4, 6, 14 and 19
Y	WO 2010/070466 A1 (SAN-DRASEGARAN, S. P., et al.) 24 June 2010 (24-06-2010) *Whole Document*	1, 4, 6, 9, 11, 14, and 19
Y	CA 2734927 A1 (ZICKELL, T., et al.) 25 September 2011 (25-09-2011) *Whole Document*	1, 3, 4, 6, 9, 10, 12, 14, and 19

[ ] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
05 June 2013 (05-06-2013)	26 July 2013 (26-07-2013)

Name and mailing address of the ISA/CA	Authorized officer
Canadian Intellectual Property Office Place du Portage I, C114 - 1st Floor, Box PCT 50 Victoria Street Gatineau, Quebec K1A 0C9 Facsimile No.: 001-819-953-2476	Genevieve Scott (819) 953-1627

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		WO2004106659A3	08 June 2006 (08-06-2006)
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		US2007137130A1	21 June 2007 (21-06-2007)
		US2010233408A1	16 September 2010 (16-09-2010)