June 18, 1963 R. R. UNDERHILL 3,093,934

EXPANSION JOINT

Filed May 13, 1960

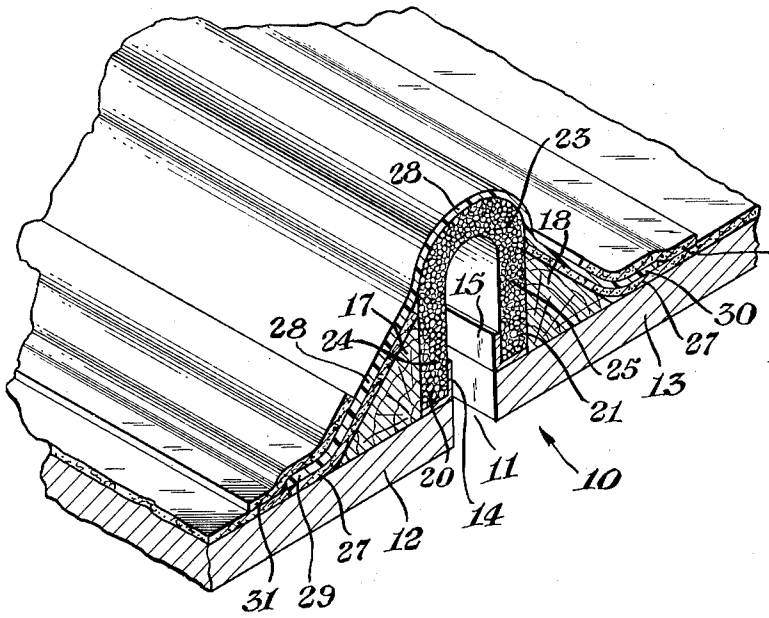


Fig. 1

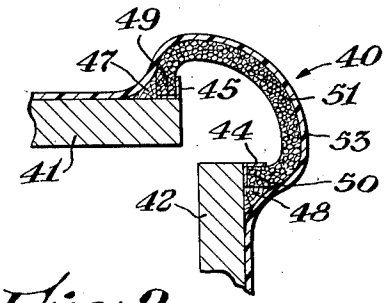


Fig. 2

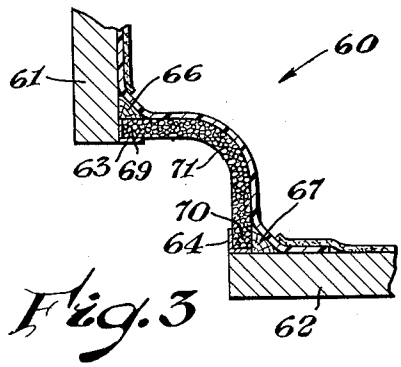


Fig. 3

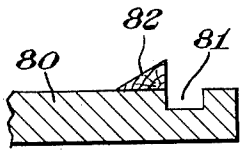


Fig. 4

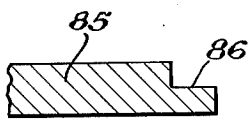


Fig. 5

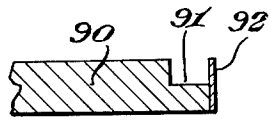


Fig. 6

INVENTOR.
Richard R. Underhill
BY Robert B. Ingraham
AGENT

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EXPANSION JOINT

Richard R. Underhill, Midland, Mich., assignor to The Dow Chemical Company, Midland, Mich., a corporation of Delaware

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This invention relates to expansion joints and a method of preparing expansion joints and, more particularly, relates to water-proof roof expansion joints.

Much difficulty has been encountered in the construction of large roofs in providing suitable expansion joints to prevent buckling or deformation of the roof under widely varying ambient temperatures. Various slide and lap joints have been tried and generally found unsuitable because of leakage during rain and wind storms. Strips of flexible material have been cemented to adjacent edges of the roof sheets or panels and such joints have found limited acceptance. Frequently, such joints fail because of constant flexure in or about the cemented area and suffer from added disadvantage that insulation is difficult or impossible to install.

Current roof deck construction frequently calls for the application of prefabricated sheets or panels containing insulation between external surfaces. These panels often employ clips or other means by which they may be secured to the supporting roof framework. The simple provision of a flexible strip for an expansion joint on the roof built from prefabricated sheets is generally inadequate as the strips are generally subject to damage and represent a substantial noninsulated area. The inclusion of thermal insulating material under such joints, wherein the insulating material is subjected to compression between the roof deck sheets, usually results in rapid failure of the material after a few compressive cycles.

Thus, it would be advantageous if weather-tight, durable, expansion joints were provided suitable for use in roofing.

It would be further advantageous if such an expansion joint were provided with lasting thermal insulation.

It would be beneficial if such a joint were easily fabricated and not readily subject to physical damage.

These advantages and other benefits may be obtained by providing an expandable roofing joint comprising a pair of sheets having upper and lower faces and adjacent edges; means defining an upwardly facing recess adjacent the edges of the upper faces of the adjacent edges of said pair of sheets; a generally U-shaped flexible foamed plastic member, having one leg positioned in each of said recesses; a flexible strip passing over said U-shaped member and affixed to each of said sheets.

Further features and advantages of the invention will be more apparent in the following description and specification taken in connection with the accompanying drawing wherein:

FIGURE 1 is an isometric sectional view of an expansion joint in a flat roof deck in accordance with the invention;

FIGURE 2 is a cross-sectional schematic view of an outside corner expansion joint fabricated in accordance with the invention;

FIGURE 3 depicts an inside corner expansion joint; and

FIGURES 4, 5 and 6 illustrate alternative configurations of an upwardly facing recess in the edge of a roof deck sheet.

In FIGURE 1 there is illustrated an isometric view of an expansion joint indicated generally by the reference numeral **10**. The joint **10** seals the space **11** between the roof deck sheets **12** and **13**. A metal angle **14** is positioned at the edge of sheet **12**, and a similar angle

15 is located at the edge of sheet **13**. Immediately adjacent the horizontal leg of the angles **14** and **15** are provided fillet strips **17** and **18**. An upwardly facing recess **20** is formed between the vertical leg of angle **14** and fillet strip **17**, and a second upwardly facing recess **21** is formed between the vertical leg of angle **15** and the fillet strip **18**. A generally U-shaped flexible foam plastic member **23** is positioned with its legs **24** and **25** seated in recesses **20** and **21**. A layer of roofing felt **27** covers the upper surfaces of sheets **12** and **13** and the major face of the filiet strips **17** and **18**. A flexible plastic strip **28** overlays the foam insert **23** and the fillet strips **17** and **18** and is secured to the roofing felt by an adhesive (not shown). The edges **29** and **30** of the flexible plastic strip **28** are overlayed by roofing felt edge strips **31** and **32** and are subsequently secured in place by suitable adhesive (not shown).

FIGURE 2 represents a schematic cross-sectional view of an outside ninety-degree expansion joint generally indicated by the reference numeral **40**. The joint **40** is constructed in a manner similar to joint **10** of FIGURE 1 and comprises sheets **41** and **42** having affixed near their edges angles **44** and **45** and fillet strips **47** and **48** spaced from the vertical legs of the angles **44** and **45** forming the recesses **49** and **50**. A generally U-shaped foamed plastic member **51** extends from recesses **49** and **50**, and the entire joint is overlayed with flexible plastic strip **53**.

There is depicted in FIGURE 3 a schematic cross-sectional view of an inside ninety-degree joint in accordance with the invention generally indicated by the reference numeral **60**, wherein the roof deck sheets **61** and **62** are provided with the angles **63** and **64**, fillet strips **66** and **67**, and generally forming recesses **69** and **70** containing the opposite legs of a generally U-shaped flexible foamed plastic member **71**. This assembly is overlayed with a flexible plastic strip **72**.

FIGURE 4 shows a cross-sectional view of an alternate form which may be employed to provide an upwardly facing recess. A sheet **80** is provided with a groove **81** and fillet strip **82** while in FIGURE 5 a roof deck sheet **85** is provided with a simple rabbet **86**.

In FIGURE 6 a roof deck sheet **90** has formed therein a rabbet **91** and a cap strip **92** and provided to form a three-sided recess.

Expansion joints in accordance with the invention may readily be fabricated on the site employing conventional materials of construction.

With reference to FIGURE 1 roofing sheets **12** and **13** may be conventional, built-up steel roofing decking, concrete, plastic foam laminates, wood planking, plywood, or other conventional materials. Angles **14** and **15** may be secured to the edge of roof decking by means of adhesives, bolts, screws, clips, or other fastening means. The fillet or cant strips **17** and **18**, if desired, may be fabricated from wood, metal, concrete, or other similar materials of construction and secured in position by conventional fastening means. Roofing felt **27** or other coating material is then applied to cant strips **17** and **18** and roof decking **13** and **14**. A flexible foamed plastic member **23** may readily be formed from a flat plank of flexible foamed plastic by manually bending it into a U-shaped configuration and inserting the legs **24** and **25** into the recesses **20** and **21**. This assembly is subsequently capped with a flexible flat plastic strip **28** such as that obtained commercially under the trade name SARALOY(R) 400, a formulated vinylidine chloride copolymer containing carbon black. Advantageously, this flexible plastic strip **28** covers the entire joint assembly and is secured to the cant strips **17** and **18** and roof decking sheets **13** and **14** by a suitable adhesive. For further assurance of weather resistance, a layer of bituminous adhesive is applied to the edges **29** and **30** of the flexible plastic strip **28**, and tapes **31** and **32** of

roofing felt is raised over the edges of the plastic strip **28** and the surface of the roof deck sheets **12** and **13**. Felt strips **31** and **32** are then coated with another layer of bituminous mastic. Thus, a sound weather-tight expansion joint **10** is formed which exhibits no appreciable tendency to deteriorate with time and weather. This joint **10** also provides an excellent insulation between the interior and exterior of the building.

The expansion joints **40** and **60** illustrated in FIGURES 2 and 3 are fabricated in a manner similar to joint **10**. Roof sheets **80**, **85**, and **90**, as shown in FIGURES 4, 5, and 6, may be formed with a groove or rabbet to receive the flexible foam plastic material. The angles **14** and **15** of FIGURE 1 may be omitted. The cant strips **17** and **18** advantageously are employed to reduce the bend necessary in roofing felt **27** where the plastic strip **28** is secured to the roof deck sheets **13** and **14**. The cant or fillet strips **17** and **18** advantageously tend to eliminate weather damage caused by snow and ice and also serves to decrease the degree of flexure necessary in the plastic strip **28**.

The retaining lip **92** shown in FIGURE 6 or its mechanical equivalents such as the vertical legs of the angles **14** and **15** is particularly beneficial if there is any possibility of occasional foot traffic over a joint or other mechanical deflecting forces which might be applied directly or indirectly to foamed plastic member **28**. Although the rabbet arrangement of FIGURE 5 is often less expensive to install the retaining lip of FIGURES 1, 2, 3, 4, and 6 prevent the legs **24** and **25** of the U-shaped member **23** from becoming displaced from their intended location.

A wide variety of flexible foamed resinous plastic members **28** may be employed in the practice of the invention such as foamed polyethylene, foamed polypropylene, flexible polyurethane foams, and copolymers of ethylene, foamed polyvinyl chloride, foamed rubber, and similar materials. The cap strip **28** may be prepared from various rubbers which have been formulated to resist exterior exposure plastics such as formulated polyvinyl chloride and polyvinylidene chloride compositions usually incorporating an inert filler such as SARALOY(R) 400. Other flexible material such as flexible impregnated woven fabric, felts, and the like may be employed in the practice of the invention.

The present expansion joint is susceptible of being embodied with various alterations and modifications differing in detail from that which has been described in the preceding description and specification. Therefore, it is to be fully understood that all of the foregoing is intended to be merely illustrative and is not to be construed or interpreted as being restrictive or otherwise limiting of the present invention excepting as is set forth and defined in the hereto appended claims.

What is claimed is:

1. A roof expansion joint comprising a pair of sheets having first and second faces and adjacent spaced edges, the sheets being capable of movement relative to one another in the plane of each sheet,

a retaining lip at the adjacent edge of each of the sheets and generally normal to the first face

a cant strip secured to said first face, spaced from the retaining lip,

the cant strip being generally parallel to the retaining lip and in cooperative combination with the lip forming a recess,

the cant strip having an inclined surface, the inclined surface terminating adjacent the first face and remote from the retaining lip, and also terminating at the recess face,

a generally U-shaped flexible foam plastic member having the terminal portion of one of the legs positioned in a recess of one of said sheets and the other leg in the other recess of the other sheet,

and a flexible sealing strip passing over the U-shaped member and secured to each sheet and cant strip.

2. A joint in accordance with claim 1, wherein said retaining lip is one leg of a metal angle.

3. A joint in accordance with claim 1, wherein said sheets are coplanar.

4. A joint in accordance with claim 1, wherein said sheets form an outside corner.

5. A joint in accordance with claim 1, wherein said sheets form an inside corner.

6. A joint in accordance with claim 1, wherein said plastic member is polyethylene foam.

7. A joint in accordance with claim 1, wherein said flexible strip is a copolymer of vinylidene chloride containing carbon black.

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