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METHOD FOR CONSTRUCTING AN INSULATED ROOF STRUCTURE

Filed Feb. 3, 1969

FIG-1

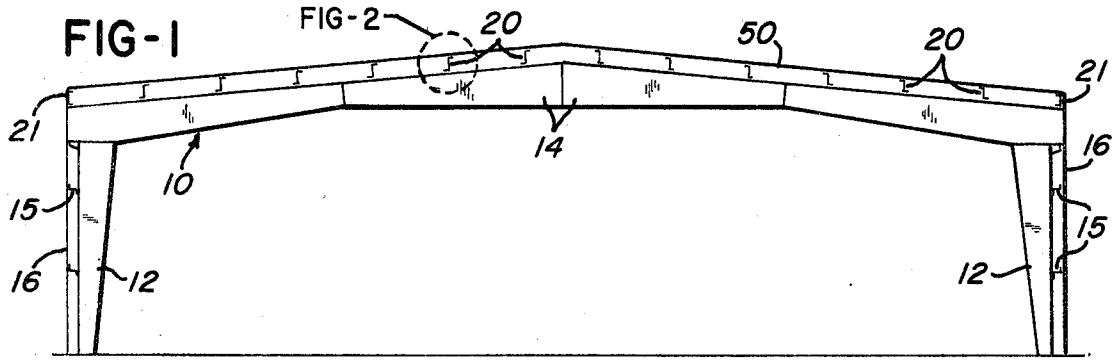


FIG-2

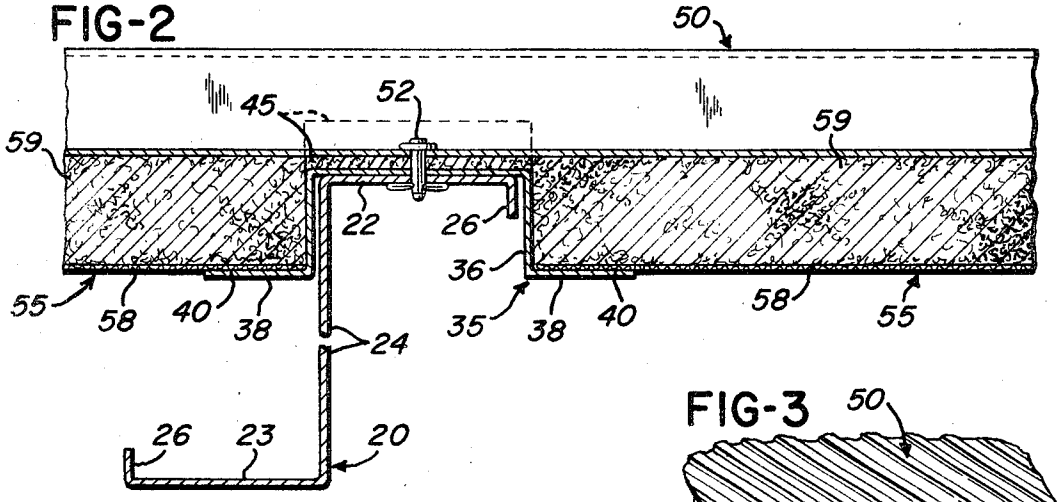


FIG-3

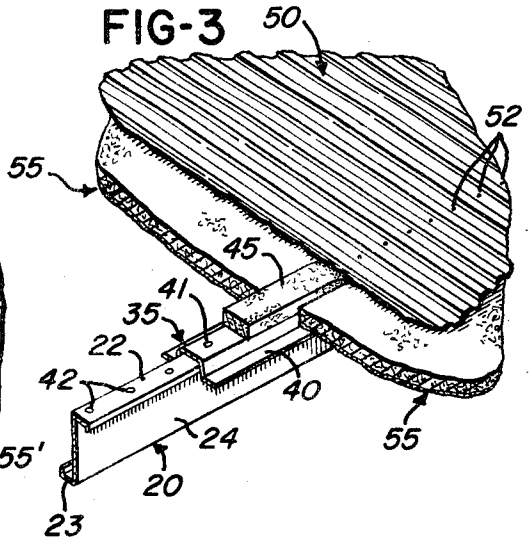
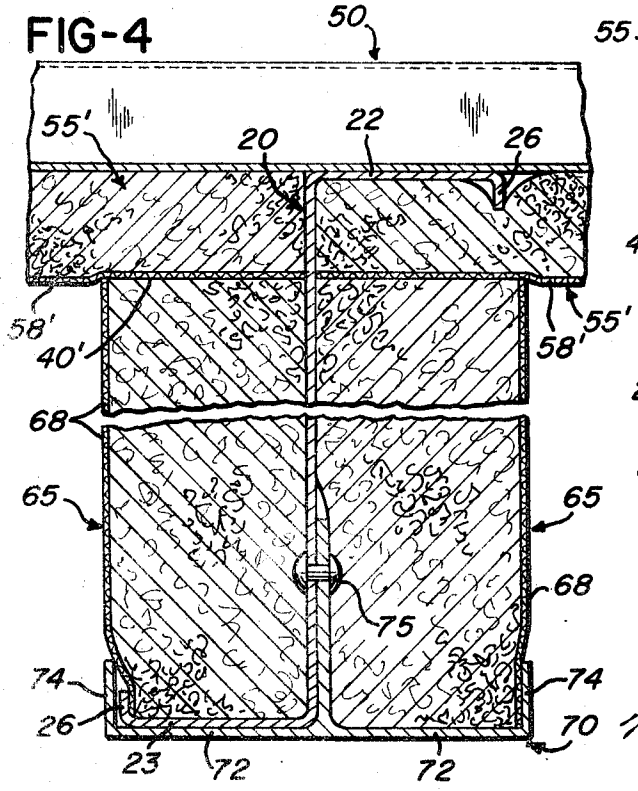


FIG-4



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METHOD FOR CONSTRUCTING AN INSULATED ROOF STRUCTURE

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U.S. Cl. 52—743 1 Claim

ABSTRACT OF THE DISCLOSURE

A roof structure includes a plurality of parallel spaced elongated purlins, and metal roof panels are secured to the upper surfaces of the purlins. Elastically flexible insulation panels are installed after the roof panels are secured to the purlins and are supported adjacent the underneath surfaces of the roof panels by longitudinally extending cap members mounted on the purlins. The insulation panels may also be supported by insulation strips positioned adjacent the sides of the purlins.

BACKGROUND OF THE INVENTION

In the construction of a roof for a metal building, usually a plurality of laterally extending roof or wedge beams are supported at longitudinally spaced intervals defining a plurality of laterally extending bays each having a predetermined width, as for example, 18, 20 or 24 feet. A plurality of longitudinally extending purlins are mounted on the wedge beams and are spaced laterally at predetermined intervals, as for example, 5 feet. Usually, the purlins have a C-shaped or a Z-shaped cross-sectional configuration, and the ends of the lower flange of each purlin are rigidly secured to the adjacent wedge beams by suitable screws or rivets.

After the purlins are secured to the wedge beams, strips of insulation material are unrolled laterally across the purlins after which a plurality of overlapping ribbed metal roof panels are secured to the upper flanges of the purlins thereby compressing the insulation material between the underneath surfaces of the roof panels and the top surfaces of the purlins. If the day selected for installing the roof happens to be windy or gusty, there is considerable difficulty in positioning and retaining each strip of insulation material while the overlying metal roof panels are positioned and secured to the adjacent purlins by either screws or rivets. Moreover, it is necessary to handle alternately both metal roof panels and rolls of insulation material, usually resulting in considerable labor inefficiency in the assembly of the roof. Furthermore, it is not uncommon for the insulation material to sag between the purlins thereby presenting an undesirable appearance from within the building and also creating air spaces between the roof panels and the insulation material where humid air can collect and condense on the underneath surfaces of the metal roof panels.

SUMMARY OF THE INVENTION

The present invention is directed to an improved roof structure especially suited for metal buildings and a method of constructing the roof structure which significantly increases the labor efficiency for assembling a roof by enabling the insulation panels to be installed after the roof panels are installed. Thus on days when the weather is clear and favorable for working outside, the metal roof panels can be installed, and the installation of the insulation panels can be delayed till a day when the weather is unfavorable for working outside. The roof structure of the invention also provides for retaining the insulation panels adjacent the underneath surface of the overlying roof panels so that there are no air spaces whereby moisture can condense on the underneath surfaces of the roof panels.

In accordance with one embodiment of the invention, an elongated channel-shaped cap member constructed of either metal or plastic is mounted on the upper flange of each purlin. Each cap member includes outwardly projecting and longitudinally extending coplanar flanges which provide support surfaces spaced under the roof panels by a predetermined distance. A strip of insulation material is attached to the upper surface of each cap member and is compressed when the metal roof panels are secured to the purlins by either screws or rivets.

After the roof panels are installed, a plurality of elastically flexible insulation panels are positioned between the purlins, and each insulation panel is flexed while opposite edge portions are inserted onto the support surfaces provided by the flanges of the adjacent cap members. Preferably, each insulation panel comprises a pad of fiber glass having one side covered by a sheet of decorative vinyl material which also serves as a vapor barrier. In accordance with another embodiment of the invention, the support surfaces for the insulation panels are provided by strips of insulation material which are positioned adjacent the sides of each purlin and are supported by a longitudinally extending trim member attached to the lower surface of the purlin.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a somewhat schematic vertical section of a building having a roof constructed in accordance with the invention;

FIG. 2 is an enlarged fragmentary section of the portion of the roof indicated in FIG. 1;

FIG. 3 is a fragmentary perspective view of the roof portion shown in FIG. 2; and

FIG. 4 is a fragmentary section of a roof constructed in accordance with another embodiment of the invention;

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 shows a metal building which includes a series of laterally extending inverted U-shaped frames **10** each consisting of a pair of tapered wall columns **12** which are rigidly connected by tapered roof or wedge beams **14**. The frames **10** are spaced at longitudinal intervals, as for example, 18 feet, 20 feet or 24 feet corresponding to the bay length desired. Horizontally extending girts **15** each having a Z-shaped cross-sectional configuration, are mounted on the columns **12** in vertically spaced relation and are preferably formed with prepunched holes for attaching vertical metal wall panels **16**.

A plurality of longitudinally extending purlins **20** are mounted on the wedge beams **14** in parallel spaced relation and between longitudinally extending eave struts **21**. Each purlin **20** extends the length of one bay and preferably has a Z-shaped cross-sectional configuration formed by a longitudinally extending upper flange **22** connected to a lower flange **23** by a web portion **24**. The end portions of the lower flange **23** of each purlin **20** are secured to the supporting wedge beams **14** by either rivets or screws (not shown). A longitudinally extending rib portion **26** projects from each flange **22** and **23** in parallel spaced relation to the web portion **24**. Each eave strut **21** has a C-shaped cross-sectional configuration and a height equal to that of the purlins **20**.

An elongated cap member **35** is mounted on each purlin **20** and includes an inverted channel portion **36** and outwardly projecting longitudinally extending flanges **38** forming coplanar support surfaces **40**. Preferably, the channel portion **36** of each cap member **35** includes a series of prepunched holes **41** which align with corre-

sponding prepunched holes **42** formed within the upper flange portion **22** of the adjacent purlin **20**. Similar cap members with only one flange **38** are mounted on the eave struts **21**.

An elongated strip **45** of insulation material is secured to the upper surface of each cap member **35** by a suitable cement. Preferably, each strip **45** of insulation material is formed of fiberglass and has a minimum thickness of approximately one inch. A plurality of ribbed metal roof panels **50** are mounted on the purlins **20**, and the edge portions of adjacent panels are overlapped to form a water tight seal therebetween. Preferably, each roof panel **50** has prepunched holes which align with the holes **41** and **42**, and a series of rivets **52** secure the roof panels **50** to the purlins **20** compressing the insulation strips **45** between the underneath surafces of the roof panels and the top surfaces of the purlin cap members **35**. The metal roof panels **50** may also be secured to the purlins **20** by screws which are usually either of the self-drilling type or the self-tapping type.

A plurality of insulation panels **55** are positioned between the purlins **20** and opposite edge portions of each insulation panel **55** are supported by the surfaces **40** of the opposing adjacent flanges **38** which are spaced from the underneath surfaces of the roof panels **50** by a distance slightly less than the thickness of the insulation panels **55**. Thus each insulation panel **55** is supported in firm contact with the underneath surface of the overlying roof panels **50** to avoid dead air spaces between the insulation panels **55** and the roof panels **50**.

Each insulation panel **55** is formed by laminating a sheet of decorative vinyl **58** to a fiberless pad **59** thereby producing a semi-rigid panel which is elastically flexible so that when the panel is folded and released, it will snap back to its original planar condition. One such insulation panel which provides satisfactory performance is produced by Johns-Manville and includes tongue and groove edge portions for forming the laterally extending unsupported joints between adjacent purlins **20** within each bay.

The elastic flexibility of each insulation panel **55** enables the panels to be installed after the roof panels **50** are secured to the purlins **20**. That is, each roof insulation panel **55** is partially folded in the center while the opposite edge portions are inserted into the sapces defined between the flanges **38** of the adjacent purlin cap members **35** and the overlying roof panels **50**. When the insulation panel **55** is released, it snaps into a position in firm contact with the underneath surface of the overlying roof panels.

Referring to FIG. 4 which shows another embodiment of the invention, the metal roof panels **50** are secured directly to the upper flanges **22** of the purlins **20** such as by the rivets **41** shown in FIG. 2. A plurality of insulation panels **55'** are supported adjacent the underneath surfaces of the roof panels **50** by the edge support surfaces **40'** of a pair of strips **65** of insulation material positioned adjacent opposite sides of each purlin **20**. Preferably, each insulation panel **55'** has a vinyl covering **58'**, and each strip **65** of insulation material has a similar vinyl covering **68** to provide a decorative appearance for the underneath side of the roof.

The insulation strips **65** are supported adjacent the sides of each purlin **20** by a decorative trim strip **70** having generally an inverted T-shaped cross-sectional configuration. Each trim strip **70** includes one flange portion **72** which extends adjacent the underneath surface of the lower flange **23** of the corresponding purlin **20** which supports one of the insulation strips **65**. Another flange portion **72** of each trim strip **70** forms a support for the other insulation strip **65**. A longitudinally extending rib or flange **74** projects upwardly from each flange portion **72** of each trim strip **70** and serves to retain the adjacent insulation strip **65**. The trim strips **70** may be formed as either a plastic or a metal extrusion and are secured to the purlins **20** by longitudinally spaced rivets **75** or suitable screws.

From the drawing and the above description, it is apparent that a roof structure constructed in accordance with the present invention provides desirable features and advantages. As a primary advantage, the roof structure of the invention provides for installing the insulation panels **55** or **55'** after the roof panels **50** are installed. Thus it is unnecessary to handle insulation panels and roof panels alternately or simultaneously while installing the roof, which is especially undesirable when the roof of the building is being installed on a windy or gusty day. Thus, the roof panels **50** can be efficiently installed on a day when the weather is favorable for working outside and the installation of the insulation panels **55** or **55'** can be postponed until a day when the weather is not favorable such as a rainy, windy or snowy day.

The combination of the purlin cap members **35** and the elasically flexible insulation panels **55** also enables each insulation panel **55** to be installed in position adjacent the underneath surfaces of the overlying roof panels so that there is no air space where humid air can collect and condense on the underneath surface of the roof panels. The insulation strip **45** on each purlin cap member **35** has been found helpful in avoiding the condensation of moisture on the underneath surface of the flange **22** of each purlin **20**.

In the embodiment shown in FIG. 4, each insulation panel **55'** may be placed in position adjacent the underneath surfaces of the overlying roof panels **50** after which the supporting insulation strips **65** are placed in position adjacent the sides of the corresponding purlins **20**. In addition, the vinyl coverings **58'** on the insulation panels **55'** cooperate with the vinyl covering **68** on the insulation strips **65** and the trim strips **70** to provide the roof with a decorative inside appearance with the insulated purlins providing a beam-like effect.

While the forms of apparatus and method herein described constitute preferred embodiments of the invention, it is to be understood that the invention is not limited to these precise forms of apparatus and method, and that changes may be made therein without departing from the scope and spirit of the invention.

What is claimed is:

1. An improved method of constructing a roof on a building having a plurality of parallel spaced elongated purlins, comprising the steps of securing longitudinally extending strips of insulation material to the upper surfaces of a plurality of elongated cap members each having outwardly extending coplanar flanges, mounting said cap members on the upper surfaces of said purlins with said flanges projecting laterally between said purlins and below the upper surfaces of said purlins by a predetermined distance, positioning a plurality of substantially rigid roof panels over said purlins and said strips of insulation material, securing said roof panels to said purlins with fasteners extending through said cap members, partially folding a plurality of semi-rigid and elastically flexible insulation panels each having a thickness substantially equal to said predetermined distance, inserting opposite edge portions of each said insulation panel between the adjacent said flanges of said cap members and the overlying said roof panel, and releasing each said insulation panel to position said insulation panel in contact with the underneath surface of the overlying said roof panel.

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ALFRED C. PERHAM, Primary Examiner

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