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(54) **INSULATED MODULAR ROOF SYSTEM**

(71) Applicant: **Mod Panel Manufacturing Ltd.**, Edmonton (CA)

(72) Inventor: **David KENNEDY**, Edmonton (CA)

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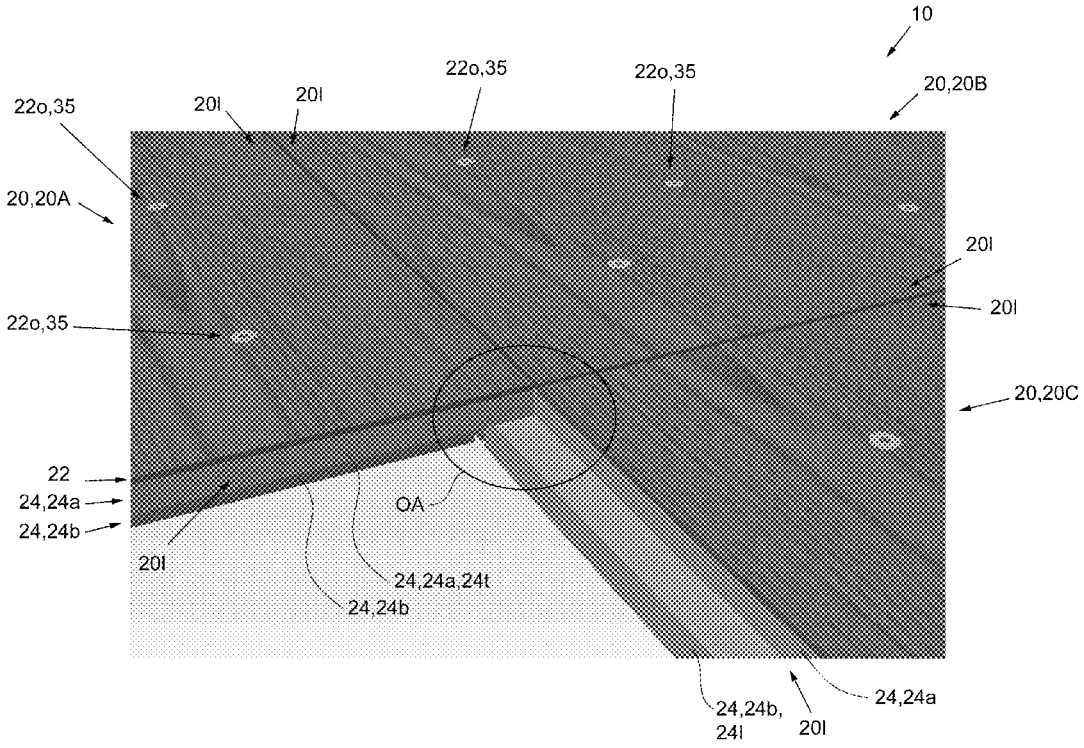
(57) **ABSTRACT**

In one aspect there is provided an insulated modular roof system for a roof structure. The system comprises a plurality of modular panels suitable for installation onto the roof structure and a water-proof membrane. Each of the modular panels comprises a first planar member, an insulating layer covering substantially all of the first planar member and a plurality of lateral edges. Each of the plurality of lateral edges provides either a step-like configuration or a reverse step-like configuration. When installed on the roof structure, the plurality of modular panels are positionable so as to place the plurality of lateral edges of any two adjacent modular panels in a generally overlapping arrangement.



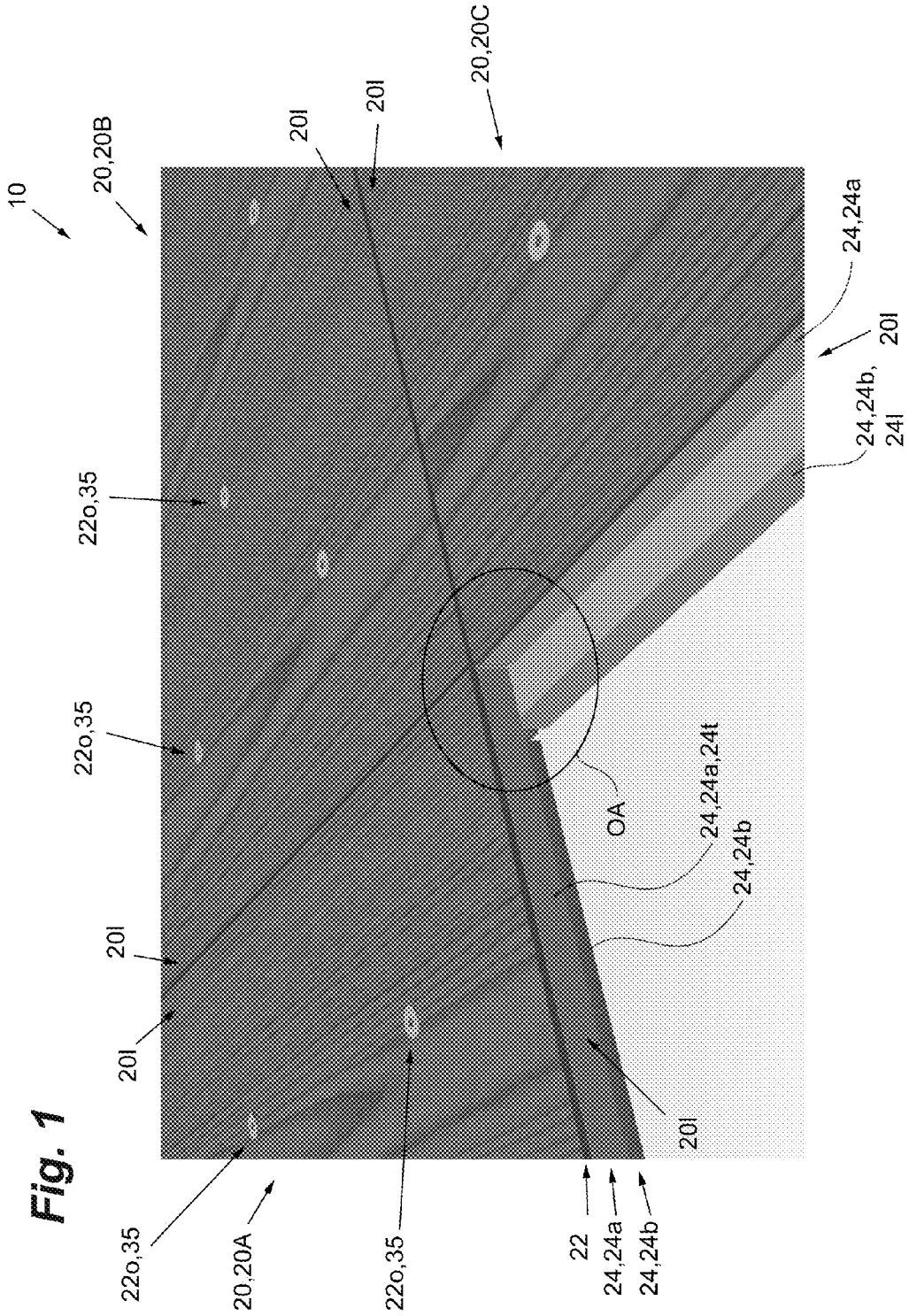

10
20,20B
20I
20I
20,20C
24,24a
20I
24,24b,
24I
22o,35
22o,35
OA
24,24a,24t
24,24b
20I
20I
20I
22o,35
20,20A
22o,35
22
24,24a
24,24b

Fig. 1

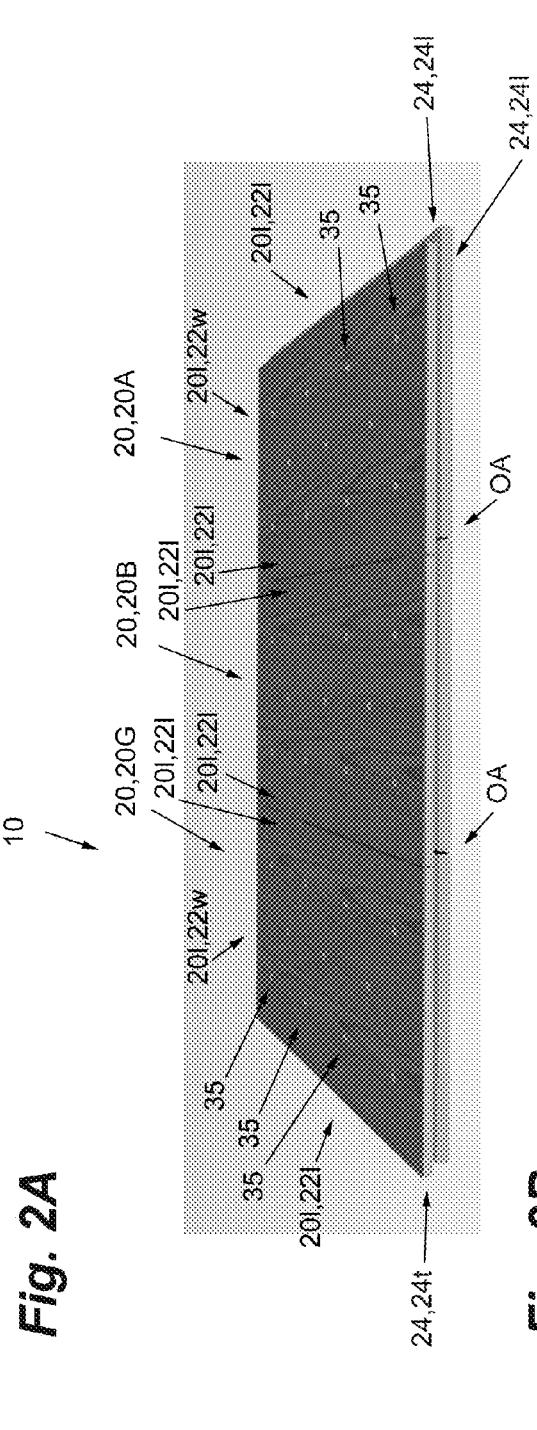


Fig. 2A

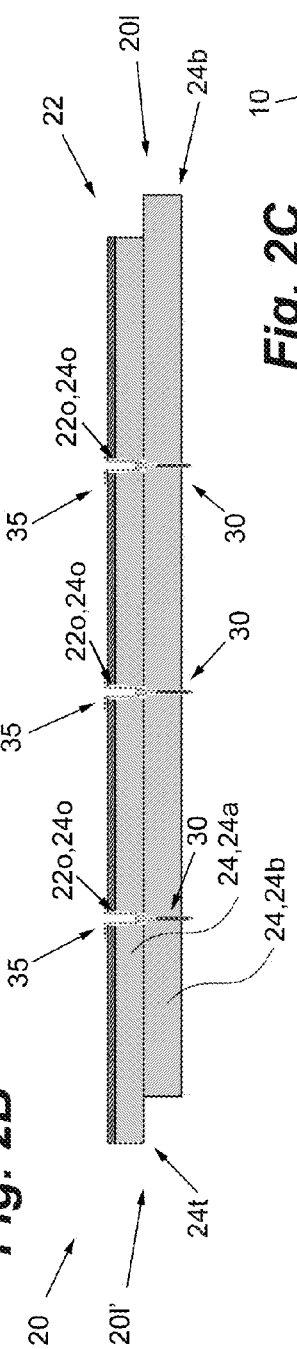


Fig. 2B

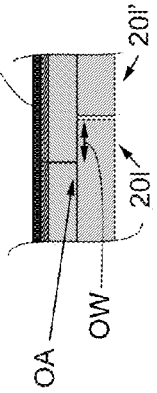


Fig. 2C

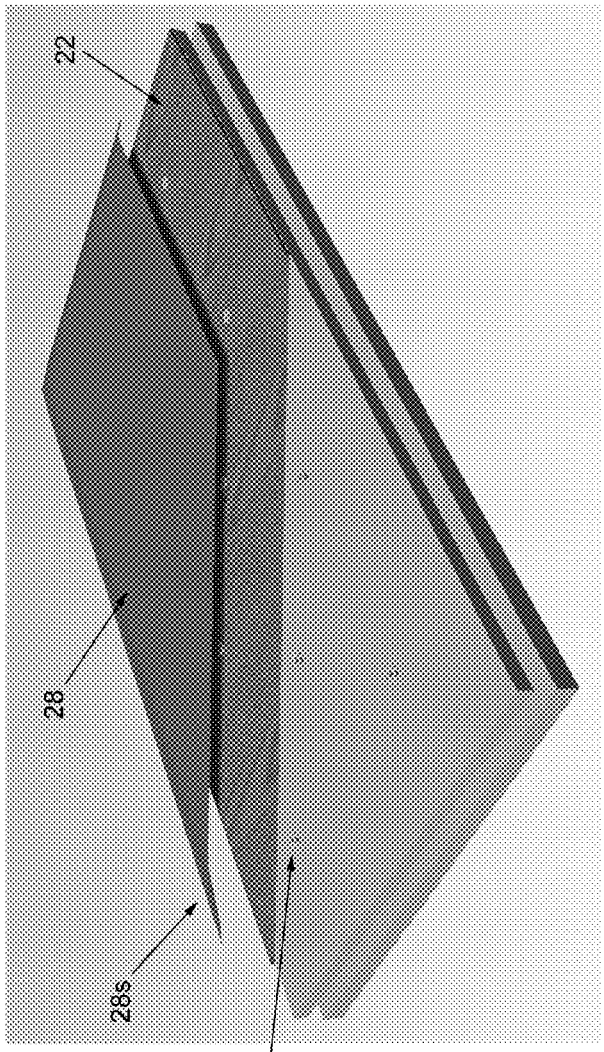


Fig. 3A

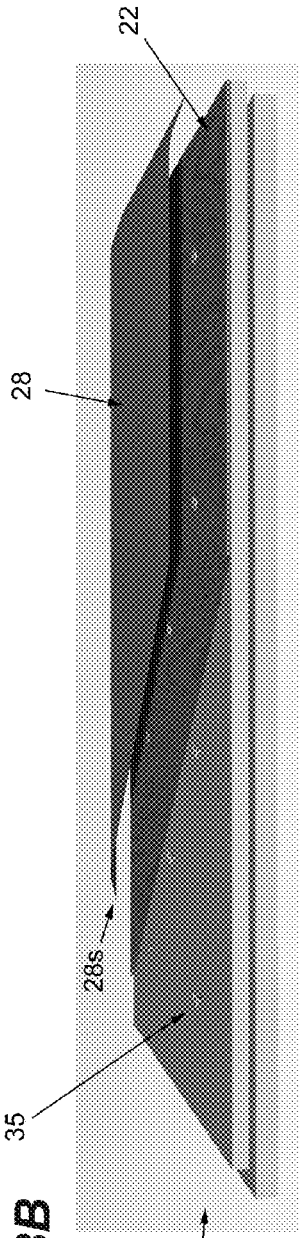


Fig. 3B

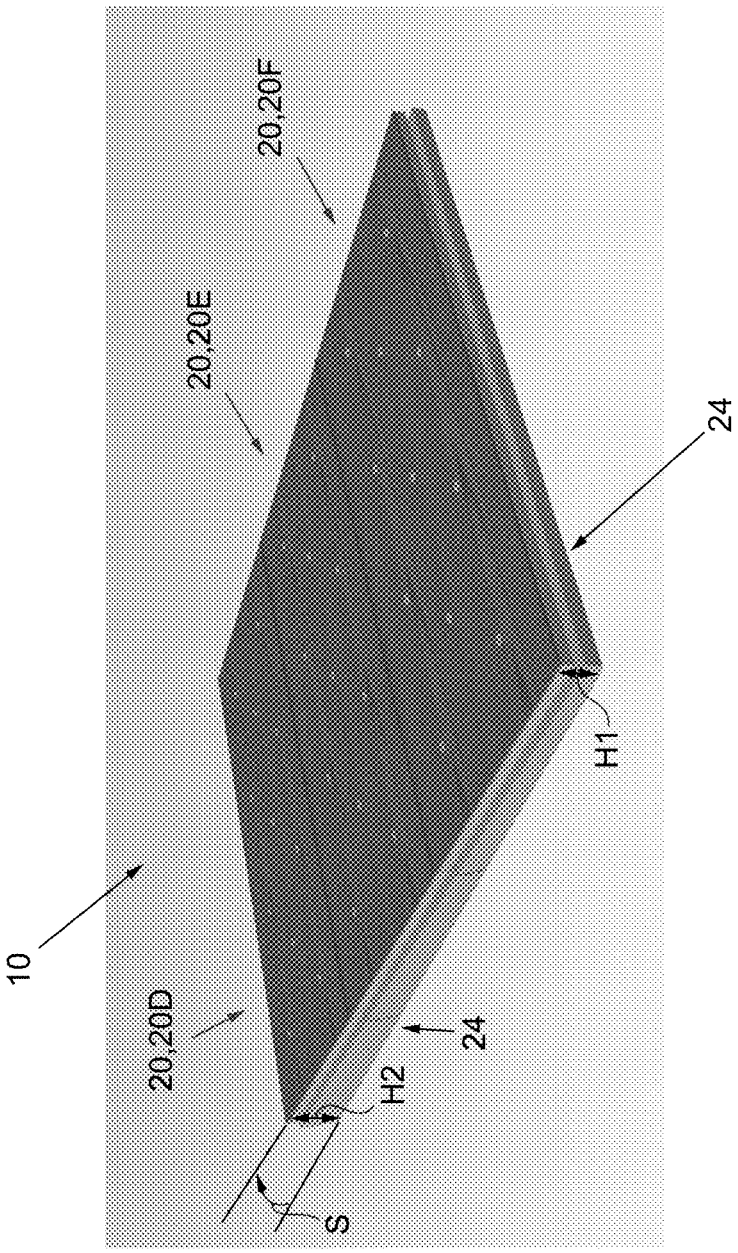


Fig. 4

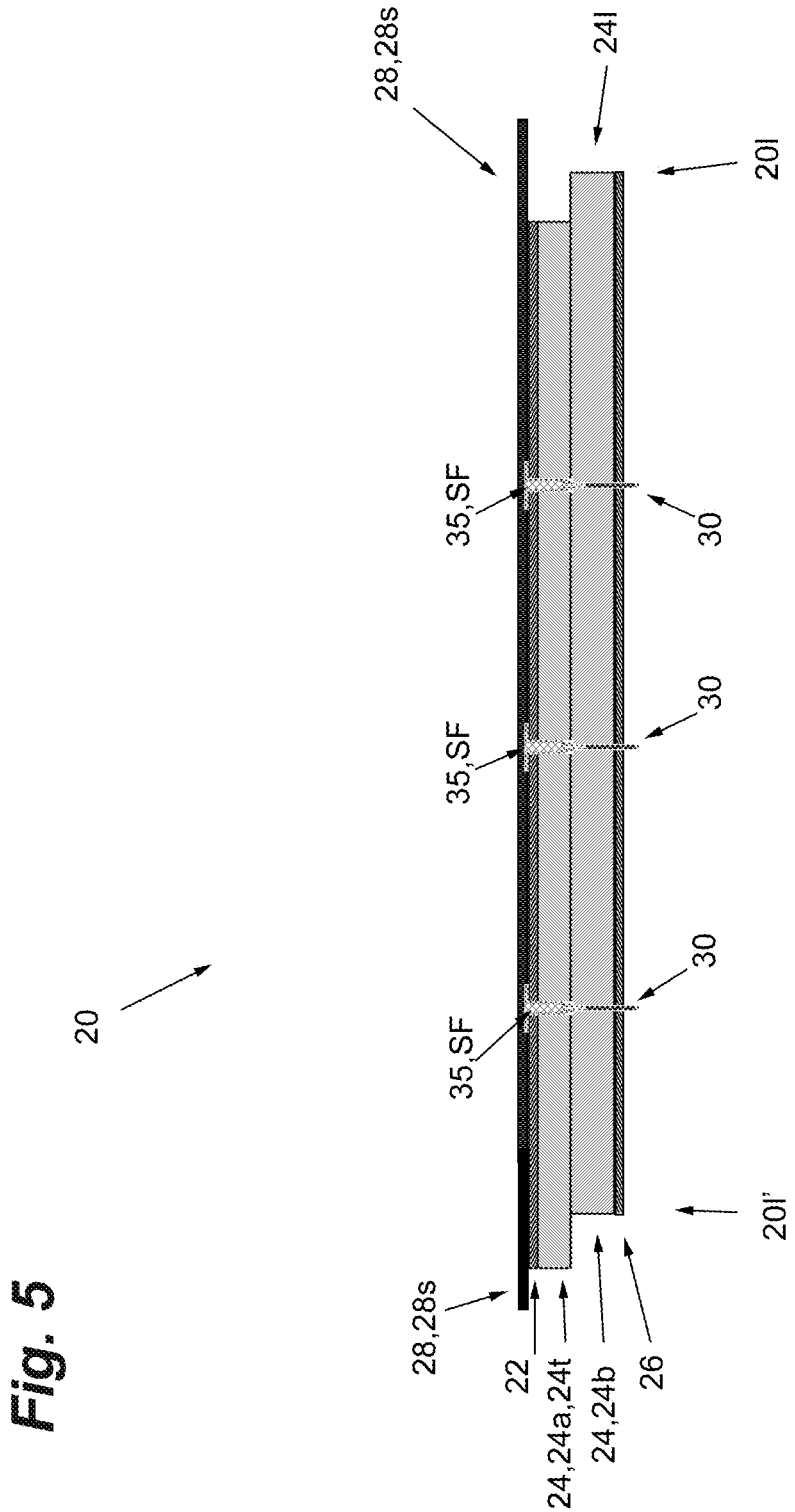
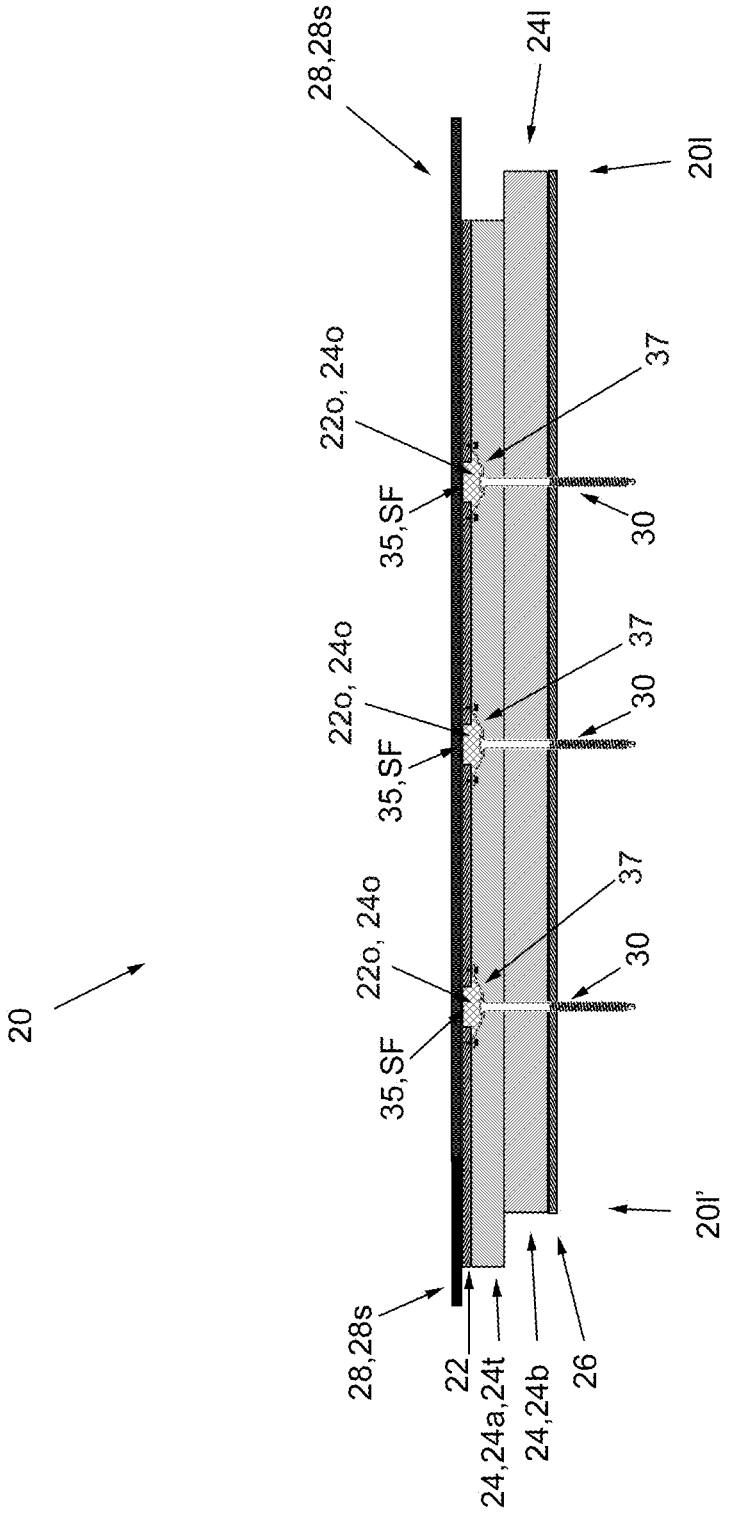

20
28,28s
24l
20l
35,SF
30
35,SF
30
35,SF
30
20l'
28,28s
22
24,24a,24t
24,24b
26

Fig. 5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22o, 24o
37
35,SF
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22o, 24o
37
35,SF
30
22o, 24o
37
35,SF
30
20l'
28,28s
22
24,24a,24t
24,24b
26

Fig. 6

INSULATED MODULAR ROOF SYSTEM

FIELD OF THE INVENTION

[0001] This invention relates to roofing systems, in particular insulated modular roofing systems.

BACKGROUND OF THE INVENTION

[0002] The background information discussed below is presented to better illustrate the novelty and usefulness of the present invention. This background information is not admitted prior art.

[0003] Various roofing systems are known both for flat and sloped roofs to insulate and waterproof the roof. On flat roofs the most common roofing system for waterproofing is a built up laminar structure comprising a plurality of felt layers with each layer or series of layers over-laid with a hot bituminous (tar) composition to bind the felt to the roof. A layer of gravel tops off the structure. However, this is a very labour intensive process and requires onsite machines and equipment (e.g. to provide the hot tar).

[0004] In recent years, as the advantages of applying insulation on the exterior as opposed to the interior of the roof deck have become known, the built up roof structure has been applied over insulation materials, typically sheets of insulation material. This created new problems as the insulating materials had poor mechanical properties, needed to be fastened to the roof deck, are subject to degradation by UV radiation and absorbed moisture. In addition such built up roof systems are very labour intensive making them less economical.

[0005] Numerous attempts have been made unsuccessfully to solve one or more of these problems. For example, U.S. Pat. No. 6,418,687 is directed for retro-fitting roofs, is field applied and non-modular. In particular, the foamed in place insulation described in this patent is designed to be applied over a roof deck or existing roof substrate and a rubber membrane is then glued over top of the sprayed insulation. Although this addresses some of the problems, a foamed-in place roofing installation is still very labour intensive to apply and requires spray foaming equipment on-site. Furthermore, when one spray-foams a large surface area there are often ripples, localized hills and valleys and other imperfections that are formed and which translate into corresponding ripples, hills, valleys and imperfections in the overlying rubber membrane. These imperfects can then trap water or other precipitation in localized areas, preventing desired run-off, and ultimately resulting in ponding and of such standing water seeping through cracks in the rubber membrane.

[0006] Additionally, even on roofs that are classified as being "flat" it may desirable to have a slight roof slope for water to run off. A typical minimum roof slope is 1% (⅛" per 1'). However, minimum slope for a "flat" roof is often set by building code to 2%. However, even for an experienced and skilled spray-foam application worker, it is difficult to create a flat non-ponding surface using an on-site, foamed-in place insulation method. Moreover, it is very difficult, if not impossible, to create a slightly sloped roofing surface (from one side of the roof to another) using such an on-site, foamed-in place insulation method; especially in new construction wherein there is no pre-existing, pre-sloped roof deck. In such cases, the system and method of U.S. Pat. No. 6,418,687 will simply not work.

[0007] Therefore, what is needed is a modular roofing system which can be applied in new buildings, reduces on-site installation time, does not require a pre-existing, pre-sloped roof deck, does not require (or reduces the need for) on-site spay-foaming equipment, can be installed by unskilled laborers and can provide for an overall slope to the resulting roof structure.

SUMMARY OF THE INVENTION

[0008] In one aspect there is provided an insulated modular roof system for a roof structure. The system comprises a plurality of modular panels suitable for installation onto the roof structure and a water-proof membrane. In this aspect, each of the modular panels comprises a first planar member, an insulating layer covering substantially all of the first planar member and a plurality of lateral edges. Each of the plurality of lateral edges provides either a step-like configuration or a reverse step-like configuration. When installed on the roof structure, the plurality of modular panels are positionable so as to place the plurality of lateral edges of any two adjacent modular panels in a generally overlapping arrangement.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] Referring to the drawings, several aspects of the present invention are illustrated by way of example, and not by way of limitation, in detail in the figures, wherein:

[0010] FIG. **1** is a perspective, partial cut-away view of most of the components of a first embodiment of the insulated modular roof system;

[0011] FIG. **2**A is a perspective side view of most of the components of the embodiment of the insulated modular roof system of FIG. **1**;

[0012] FIG. **2**B is a sectional side view of a modular panel of the embodiment of the insulated modular roof system of FIG. **1**;

[0013] FIG. **2**C is a sectional side view of the modular insulated roof system of the embodiment of FIG. **1**, illustrating the overlapping area and overlap width;

[0014] FIGS. **3**A and **3**B are partially exploded and partially cut-away perspective views of a modular panel of another embodiment of the insulated modular roof system of FIG. **1**, with the water-proof member provided in sections on each modular panel;

[0015] FIG. **4** is a perspective view of most of the components of another embodiment of the insulated modular roof system, illustrating a slight slope to the overall roof system;

[0016] FIG. **5** is a sectional side view of another embodiment of a modular panel, with the water-proof member provided as a section on each modular panel, having a second planar member and wherein the thermal break is a tube washer; and

[0017] FIG. **6** is a sectional side view of yet another embodiment of a modular panel, with the water-proof member provided as a section on each modular panel, having a second planar member and wherein the thermal break is a bracket depending from the first planar member.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0018] The following description is of preferred embodiments by way of example only and without limitation to the

combination of features necessary for carrying the invention into effect. Reference is to be had to the Figures in which identical reference numbers identify similar components. The drawing figures are not necessarily to scale and certain features are shown in schematic or diagrammatic form in the interest of clarity and conciseness.

[0019] A first preferred embodiment of the insulated modular roof system **10** of the present invention is shown in FIGS. **1**-**3**B. The system **10** is comprised of a plurality of modular panels **20** (individually identified as **20**A-**20**G) and a water-proof member **28**. The water-proof member **28** may be provided in sections on each modular panel **20** (e.g. as shown in of FIGS. **3**A, **3**B and **5**) or it may be provided separately and placed (or sprayed) over a plurality of adjacent panels **20** (e.g. the embodiment of FIG. **2**C). When installed on a building or roof structure (not shown), a plurality of modular panels **20** will preferably be placed, with their lateral edges **20***l* in a generally overlapping arrangement OA similar to a tongue-and-groove joint, so as to substantially cover the desired surface area of the roof structure (not shown); e.g. see the arrangement of panels **20**A, **20**B and **20**C in FIG. **1**.

[0020] FIG. **1** illustrates three modular panels **20** of a preferred embodiment of the system **10**, labelled individually as **20**A, **20**B and **20**C. Each modular panel **20** preferably comprises a first planar member **22** overlying an insulating layer **24**, the panel **20** having a plurality of lateral edges **20***l*. A second planar member **26** is optionally provided to support the insulating layer **24**, the first planar member **22** and the water-proof member **28** when module **20** is placed on a roof structure; see the embodiment of FIG. **5**.

[0021] In the embodiment of FIG. **1**, first planar member **22** is a substantially rectangular planar member, having a length **22***l* and a width **22***w*. Insulating layer **24** preferably further comprises a first sublayer **24***a* and a second sublayer **24***b* portion. More preferably, the first and second sublayers **24***a*, **24***b* are also of a planar configuration each having a length **24***al*, **24***bl* and a width **24***aw*, **24***bw* of substantially the same dimensions as the length **22***l* and a width **22***w* of the first planar member **22**. Even more preferably, the first planar member **22** and the first sublayer **24***a* are oriented or positioned within the panel **20** so that their lengths **22***l*, **24***al* and widths **22***w*, **24***aw* are substantially aligned, while the second sublayer **24***b* is oriented or positioned in an offset manner within the panel **20** (as shown in FIGS. **1**-**3**B).

[0022] Accordingly, this arrangement of the first planar member **22**, the first sublayer **24***a* and the second sublayer **24***b* provides for adjacent modular panels **20** to be positioned with their lateral edges **20***l* in a generally overlapping arrangement OA. In particular, first sublayer **24***a* provides a step-like configuration at one lateral edge (e.g. **20***l*) comprising a lower edge of insulating materials **24***l*, while second sublayer **24***b* provides a reverse step-like configuration at the panel's opposing edge (e.g. **20***l*') comprising a top edge of insulating material **24***t* see FIG. **2**B. Top and lower edges of insulating material **24***t*, **24***l* cooperate together to create the overlapping arrangement OA, see FIGS. **2**C. Advantageously, overlapping arrangement OA between adjacent modular panels **20** result in the system **10** having a monolithic type insulation formation from one modular panel (e.g. **20**A) to the next panel (e.g. **20**B).

[0023] As mentioned, in some embodiments of the invention a water-proof member **28** portion is provided preassembled on each panel (see FIGS. **3**A, **3**B and **5**). When installed on a building or roof structure, the modular panel **20** may be referred to as a roofing panel **20**, the first planar member **22** may be referred to a top planar member **22** and any second planar member **26** may be referred to as a bottom planar member **26**; with the insulating layer **24** being generally sandwiched between the bottom and top planar members **22**, **24**.

[0024] The use of "roofing", "top," and "bottom" are used herein as respective references to the orientation of the modular panel **20** on a substantially flat roofing structure, but there may be uses of the present disclosure where the modular panel **20** may be used in different orientations or on other parts of a building, such as in a substantially vertical orientation on the side of a building, used as siding. The term "up" and "down" may be used with respect to the ground. More specifically, the term "up" may be used to describe a vector that is normal to the ground and away from the ground. More specifically, the term "down" may be used to describe a vector that is normal to the ground and pointing toward the ground. A normal is a vector that is perpendicular to a surface such as the ground surface. In one embodiment, normal may be defined as a constituent being at +/−90 degrees with respect to a plane. During manufacturing of the modular panel **20**, however, the insulating layer **24** may be placed or sprayed on the first planar member **22** (said member **22** then being a "bottom" planar member during the manufacturing process); the modular panel **20** subsequently flipped over, so that first planar member **22** generally overlays insulating layer **24** when placed on a roof structure **24**, then being a "top" planar panel.

[0025] The first and second planar members **22**, **26** may be rigid members constructed from oriented strand board (OSB), plywood, gypsum board, cement board or other suitably strong material typically used for sheathing in the roof construction industry. Advantageously, first planar member **22** provides additional support and protection to the system **10**, as compared to U.S. Pat. No. 6,418,687 where a rubber membrane is simply applied over top of sprayed insulation.

[0026] In one embodiment of the insulated modular roof system **10**, first planar member **22** is preferably made up ⅜ inch thick oriented strand board (OSB) sheets, measuring approximately 96 inches×48 inches (8 feet×4 feet) in length and width. Preferably, insulating layer **24** has a thickness of at least 2 inches, with top and lower edges **24***t*, **24***l* of insulating layer **24** cooperating together to create an overlapping arrangement OA between adjacent modular panels **20**. More preferably, the overlapping arrangement OA of this embodiment provides for an overlap width OW of at least 2 inches. Advantageously, overlapping arrangement OA provides further insulating and vapour barrier features to the system **10**.

[0027] Modular panels **20** may be fastened or mounted to a roof structure (not shown) via one or more fasteners **30** driven, mounted or screwed through first planar member **22** and insulating layer **24** (and any second planar member **26**) at a desired position, e.g. as illustrated in FIGS. **1**-**3**. Preferably, a thermal barrier or thermal break **35** is provided to reduce or prevent the flow of thermal energy from the roofing structure (not shown) through the modular panels **20** and out to the environment.

[0028] In the embodiments of FIGS. **1**-**5**, the thermal break **35** is a polyamide tube washer having a flanged washer-like top **35***w* and a tubular member **35***t* depending

therefrom. A suitable tube washer **35** is the HTK 50™ telescopic tube washer manufactured by EJOT UK Ltd of Leeds, United Kingdom. The tubular member **35***t* is preferably inserted through appropriately sized and aligned openings **22***o*, **24***o* in the first planar member **22** and insulating layer **24**, with washer-like top **35***w* overlaying the top of the first planar member **22** (see FIGS. **2**B and **5**). Fasteners **30** can inserted through washer-like top **35***w* and then positioned through, and captured by, the tubular member **35***t* to then engage the roofing structure (not shown); see FIGS. **2**B and **5**. Prior to placement of the water-proof member **28** over the first planar member **22**, tube washer **35** and openings **22***o*, **24***o* may be filled with a spray foam (SF) to further reduce or prevent the flow of thermal energy from the roofing structure through the fastener **30** (see FIG. **5**).

[0029] The embodiment of FIG. **6** is similar to the embodiment of FIG. **5**, but in this embodiment the thermal break **35** comprises a bracket member **37** mounted to, and depending from, the first planar member **22** into the insulating layer **24**. Bracket member **37** is suitable to capture a screw- or bolt-like fastener, which may be inserted through appropriately sized and aligned openings **22***o*, **24***o* in the first planar member **22** and insulating layer **24**. Prior to placement of the water-proof member **28** over the first planar member **22**, bracket **37** and openings **22***o*, **24***o* may be filled with spray foam (SF) to further reduce or prevent the flow of thermal energy from the roofing structure through the fastener **30**.

[0030] Advantageously said openings **22***o*, **24***o* and thermal break **35** provide ease of access to an installer to fasten modular panels **20** to a roof structure (i.e. access from the top of panel **20**), while also reducing or preventing the flow of thermal energy from any underlying roof structures (as compared to simply driving a fastener through panel from the top). Fasteners **30** may be any suitable fastener, e.g. those types of fasteners used in the roofing industry to fasten sheathing to a roofing structure. For example, fasteners **30** may be self-tapping metal screws. Or if using HTK 50™ telescopic tube washers, then fasteners **30** are preferably the EJOT Dabo™ screw model TKR-4.8™ also manufactured by EJOT UK Ltd of Leeds, United Kingdom. Alternatively, modular panels **20** may be mounted to the roofing structure using a glue or construction adhesive.

[0031] As is now understood, the bulk of the insulating properties of the system **10** are derived from the insulating layer **24** of the modular panels **20**. Advantageously, the overlapping area OA significantly reduces onsite labour, e.g. as compared to cases where spray foam is applied onsite to the entire roofing surface, or along joints between adjacent panels. Any spray foam application of the present system **10** is optional and then only in any openings **22***o*, **24***o* and in the thermal breaks **35**.

[0032] Advantageously, a roof or roofing structure may quickly be covered by a plurality of modular panels **20** arranged in overlapping configuration. More advantageously, by mounting the modular panels **20** to the roof structure via a tube washer **35** thermal bridge through the first planar member **22**, and by covering the thermal bridge openings **22***o*, **24***o* with spray foam SF, the amount of heat loss through the system **10** is minimized as compared to cases where a modular panel **20** is mounted to a roof structure via a fastener that penetrates the first planar member **22**, the insulating layer **24** and any second planar member **24**. Instead, in the embodiment of the present system **10**, any thermal bridging that might otherwise occur across fastener(s) **30** is significantly reduced or eliminated by having the fastener(s) **30** engage the first planar member **22** via the thermal breaks **35**.

[0033] The insulating layer **24** is preferably a polyurethane foam insulation and, more preferably, is a closed cell foam. In other embodiments, the insulating layer **24** may be comprised of a foamed synthetic resin made of polystyrene, polyethylene, acrylic resin, phenol resin, urea resin, epoxy resin, diallylphthalate resin, urethane resin and the like.

[0034] Advantageously, the use of closed cell foam insulation in the insulating layer **24**, along with the overlapping arrangements OA and an overlap width of at least 2 inches, provides an air/vapor/water barrier between the modular panel **20** and inherent in system **10**, so as to efficiently insulate roofs and roofing structures; especially once the panels **20** are fastened to the roofing structure. More advantageously, the resulting system **10** will then have a monolithic type insulation formation from one modular panel (e.g. **20**A) to the next panel (e.g. **20**B), providing an air tight system **10** and eliminating the need for an external vapor barrier.

[0035] The invention thereby provides an insulated modular roofing system **10** that can be quickly installed on a roofing structure, with minimal on-site labour, with a desired slope S pre-manufactured in each modular panel **20** and with a continuous (inherent) vapour barrier across the modular panels **20** on the roofing structure. Advantageously, the invention may allow for the roofing of a building without the need for additional vapour control, such as separate polyethylene sheets that are typically used between a roof deck or roof structure and any overlying insulating material.

[0036] The thickness of the insulating layer **24** may be determined by the insulation value that is desired to be achieved by the system **10**. For example, a 3.33 inch thick insulating layer **24** comprised of 2-pound medium density, closed-cell polyurethane foam insulation, with the first and second planar member **22**, **26** comprising ⅜ inch thick OSB sheets will typically provide an insulating value of R-20 to the modular panel **20** and the system **10**. A 5.83 inch thick insulating layer **24** comprised of 2-pound polyurethane foam insulation, with the first and second planar member **22**, **26** comprising ⅜ inch thick OSB sheets will typically provide an insulating value of R-35. Advantageously, a closed-cell foam is resistant to water absorption.

[0037] During manufacture of the modular panel **20**, the insulating layer **24** may be sprayfoam-applied onto the first planar member **22** and then such spray foam insulating layer **24** may cut or shaped to the desired thickness and slope S. This may be accomplished using a horizontal band saw or a horizontal fastwire foam cutter. The CUTLAS™ horizontal fastwire foam cutter is designed for slicing polyurethane foam into sheets of desired thickness and would be suitable for this application.

[0038] For example, a partially assembled modular panel **20**, with a first planar member **22** measuring 4 feet×8 feet may have the insulating layer **24** sprayfoamed thereon to a minimum thickness (e.g. of at least 3.5 inches). This partially assembled modular panel **20** can then be moved through a CUTLAS™ horizontal fastwire foam cutter which is then set to cut off a thin top section of the spray foamed insulating layer **24** (e.g. to a height of 3.33 inches), thereby providing a smooth top surface, suitable to receive the second planar member. Alternatively, where a roof slope is desired, the CUTLAS™ horizontal fastwire foam cutter can

be adjusted to cut the insulating layer **24** at a pre-set slope, resulting in a modular panel **20** that has that desired slope S with the insulating layer **24** having a first thickness (or height) H**1** at one end of the panel **20***a* and a second thickness (or height) H**2** at an opposing end **20***b* of the panel (see the embodiment of FIG. **4**).

[0039] Advantageously, by having a smoothly cut insulating layer **24**, and by utilizing the first planar member **22**, the water-proof member **28** on outside or top surface of the system **10** of modular panels **20** will be substantially smooth, thereby reducing or fully eliminating ponding or pooling of trapped water or other precipitation in localized areas. Furthermore, if a slight slope S has been provided by the modular panels **20**, then water or other precipitation will generally be directed to quickly run off of the outside or top surface of the system **10**.

[0040] The water-proof membrane **28** is preferably an ethylene-propylene diene mar (EPDM) rubber membrane, but it may also be made of other suitable water-proof roofing material such as a membrane made from a variety of materials such as styrene-butadiene rubber, acrylonitrile-butadiene rubber, chloroprene rubber, butadiene rubber, isoprene rubber, butyl rubber, ethylene-propylene rubber, polyisobutylene, styrene-butadiene-styrene block copolymer, styrene-isoprene-styrene block copolymer, chlorinated polyethylene, polyurea coating, ethylene-vinyl acetate copolymer, or SBS modified bitumen roofing membrane.

[0041] In the embodiments where the water-proof membrane **28** is provided in sections on each modular panel **20** (e.g. FIGS. **3**A, **3**B and **5**), the length and width dimensions of such section **28***s* of the water-proof member **28** is preferably larger than the length and width of the first planar member **22**, so as to overlap with adjacent sections **28***s* once any modular panels **20** are placed in an overlapping arrangement OA. Advantageously, such overlapping sections **28***s* of water-proof member **28** can be taped and sealed (e.g. with seam tape and/or a solvent adhesive), after installation of the modular panels **20**, so as to provide an overall water-proof member **28** to the system **10**. For example, an installer can apply 75 mm (3") wide EPDM seam tape to membrane **28** overlaps using a solvent adhesive.

[0042] Those of ordinary skill in the art will appreciate that various modifications to the invention as described herein will be possible without falling outside the scope of the invention. In the claims, the word "comprising" is used in its inclusive sense and does not exclude other elements being present. The indefinite article "a" before a claim feature does not exclude more than one of the features being present.

1. An insulated modular roof system for a roof structure, comprising:
- a plurality of modular panels suitable for installation onto the roof structure; and
- a water-proof membrane,
- wherein each of said plurality of modular panels comprises:
  - a first planar member;
  - an insulating layer covering substantially all of the first planar member; and
  - a plurality of lateral edges;
- wherein each one of said plurality of lateral edges provides either a step-like configuration or a reverse step-like configuration; and
- wherein, when installed on the roof structure, the plurality of modular panels are positionable so as to place the plurality of lateral edges of any two adjacent modular panels in a generally overlapping arrangement.

2. The insulated modular roof system of claim **1** wherein the first planar member of each of the plurality of modular panels has a length and a width;
- wherein the insulating layer of each of the plurality of modular panels further comprises a first sublayer and a second sublayer;
- wherein each of the first and second sublayers are of a planar configuration; and
- wherein the first and second sublayers each have a length and a width of substantially the same dimensions as the length and a width of the first planar member.

3. The insulated modular roof system of claim **2** wherein, for each of the plurality of modular panels, the first sublayer is oriented within the modular panel so that the length and width of the first sublayer is substantially aligned with the length and widths of the first planar member;
- wherein, for each of the plurality of modular panels, the second sublayer is oriented within the modular panel in an offset manner to both the first planar member and the second sublayer so as to provide a step-like configuration at a first lateral edge of said plurality of lateral edges and a reverse step-like configuration at an opposing second lateral edge of said plurality of lateral edges; and
- wherein the step-like configuration in one of said plurality of modular panels cooperates with the reverse step-like configuration of an adjacent modular panel of said plurality of modular panels to form the overlapping arrangement.

4. The insulated modular roof system of claim **3** wherein the overlapping arrangement provides for an overlap width of 2 inches.

5. The insulated modular roof system of claim **4** wherein, each of the plurality of modular panels, further comprises:
- at least one thermal barrier suitable to accept a fastener; and
- at least one opening through the planar member, said opening configured to accept said thermal barrier therethrough.

6. The insulated modular roof system of claim **4** wherein, each of the plurality of modular panels, further comprises:
- at least one opening through the planar member, said opening configured to accept a fastener therethrough; and
- for each of said at least one opening, a bracket member depending from the first planar member into the insulating layer and aligned with said at least one opening; and
- wherein the bracket member is configured to capture a fastener.

7. The insulated modular roof system of claim **3**, wherein the insulating layer of each of said plurality of modular panels has a pre-set slope having a first thickness at one end of each of said modular panel and a second thickness at an opposing end of each of said modular panel.

8. An insulated modular roof system for a roof structure comprising:
- a plurality of modular panels suitable for installation onto the roof structure; and
- a water-proof membrane,

wherein each of said plurality of modular panels comprises:

an insulating layer having a plurality of lateral edges;

wherein each one of said plurality of lateral edges provides either a step-like configuration or a reverse step-like configuration; and

wherein, when installed on the roof structure, the plurality of modular panels are positionable so as to place the plurality of lateral edges of any two adjacent modular panels in a generally overlapping arrangement.

9. A modular roofing panel suitable for installation onto a roof structure, the modular roofing panel comprising:

a first planar member;

an insulating layer covering substantially all of the first planar member; and

a plurality of lateral edges;

wherein each one of said plurality of lateral edges provides either a step-like configuration or a reverse step-like configuration; and

wherein, when a plurality of modular panels is installed on the roof structure, said plurality of modular panels are positionable so as to place the plurality of lateral edges of any two adjacent modular panels in a generally overlapping arrangement.

10. The insulated modular roof system of claim **9** wherein the first planar member has a length and a width;

wherein the insulating layer further comprises a first sublayer and a second sublayer;

wherein each of the first and second sublayers are of a planar configuration; and

wherein the first and second sublayers each have a length and a width of substantially the same dimensions as the length and a width of the first planar member.

11. The insulated modular roof system of claim **10** wherein the first sublayer is oriented within the modular panel so that the length and width of the first sublayer is substantially aligned with the length and width of the first planar member;

wherein the second sublayer is oriented within the modular panel in an offset manner to both the first planar member and the second sublayer so as to provide a step-like configuration at a first lateral edge of said plurality of lateral edges and a reverse step-like configuration at an opposing second lateral edge of said plurality of lateral edges; and

wherein the step-like configuration of said modular panel is suitable to cooperate with a reverse step-like configuration of another adjacent modular panel so as to form the overlapping arrangement.

12. The insulated modular roof system of claim **11** wherein the overlapping arrangement provides for an overlap width of 2 inches.

13. The insulated modular roof system of claim **12** further comprising:

at least one thermal barrier suitable to accept a fastener; and

at least one opening through the first planar member, said opening configured to accept said thermal barrier therethrough.

14. The insulated modular roof system of claim **12** further comprising:

at least one opening through the planar member, said opening configured to accept a fastener therethrough; and

for each of said at least one opening, a bracket member depending from the first planar member into the insulating layer and aligned with said at least one opening; and

wherein the bracket member is configured to capture a fastener.

15. The insulated modular roof system of claim **11**, wherein the insulating layer of each of said plurality of modular panels has a pre-set slope having a first thickness at one end of each of said modular panel and a second thickness at an opposing end of each of said modular panel.

16. A modular panel suitable for installation onto the roof structure, the modular panel comprising:

a section of water-proof membrane;

an insulating layer having a plurality of lateral edges;

wherein each one of said plurality of lateral edges provides either a step-like configuration or a reverse step-like configuration; and

wherein, when installed on the roof structure, the plurality of modular panels are positionable so as to place the lateral edges of any two adjacent modular panels in a generally overlapping arrangement.

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