US 20060101777A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2006/0101777 A1**

Lapointe (43) **Pub. Date: May 18, 2006**

(54) **INSULATING ROOFING SYSTEM FOR FLAT ROOFS**

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(21) Appl. No.: **11/237,963**

(22) Filed: **Sep. 29, 2005**

(30) **Foreign Application Priority Data**

Sep. 29, 2004 (CA) 2,482,878

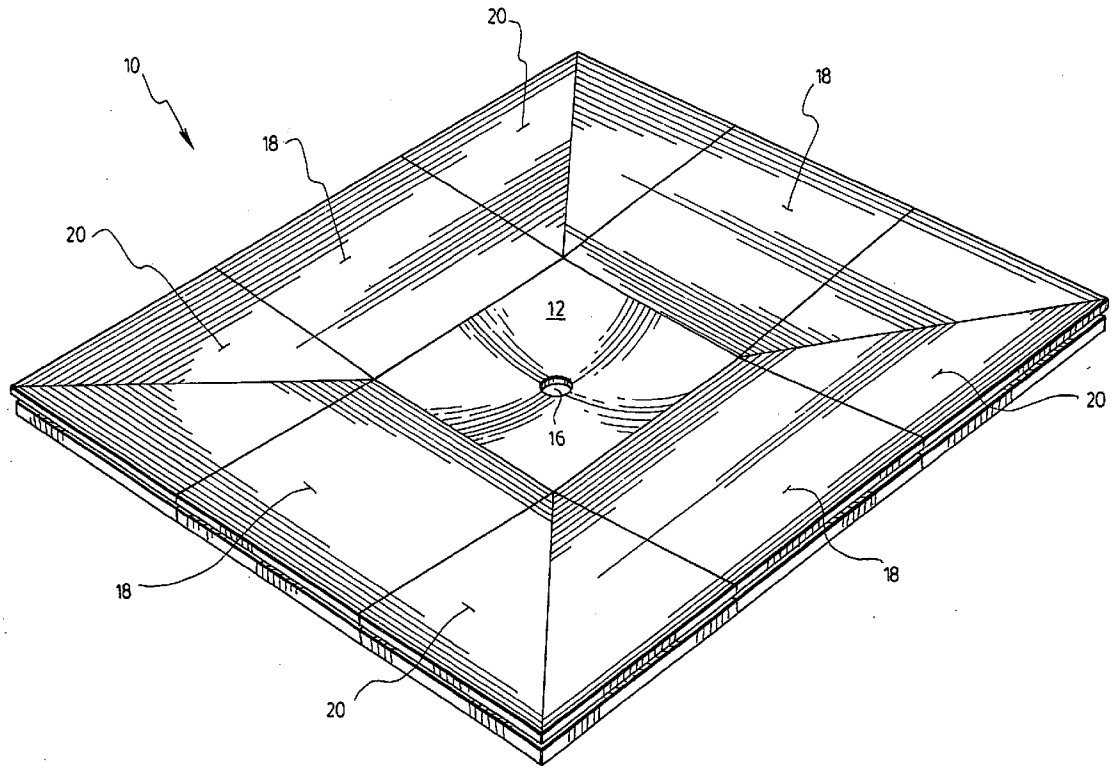
Publication Classification

(51) **Int. Cl.**
E04C 3/30 (2006.01)

(52) **U.S. Cl.** **52/734.2**

(57) **ABSTRACT**

A roofing system for a substantially flat roof structure is provided, including a central panel with a substantially concave surface provided with a through hole at the centre for engaging a drainage system of the flat roof, and a first row of panels assembled around the central panel. The row of panels includes tapered side panels interlocked to the sides of said the central panel and tapered corner panels interlocked with adjacent side panels. Optionally at least one further row of side and corner panels may be assembled around the first row of panels. The side and corner panels are shaped so as to retain a constant slope to direct water away from their outside edges towards the through hole of the central panel. The panels are interlocked using a system with shiplap joints.



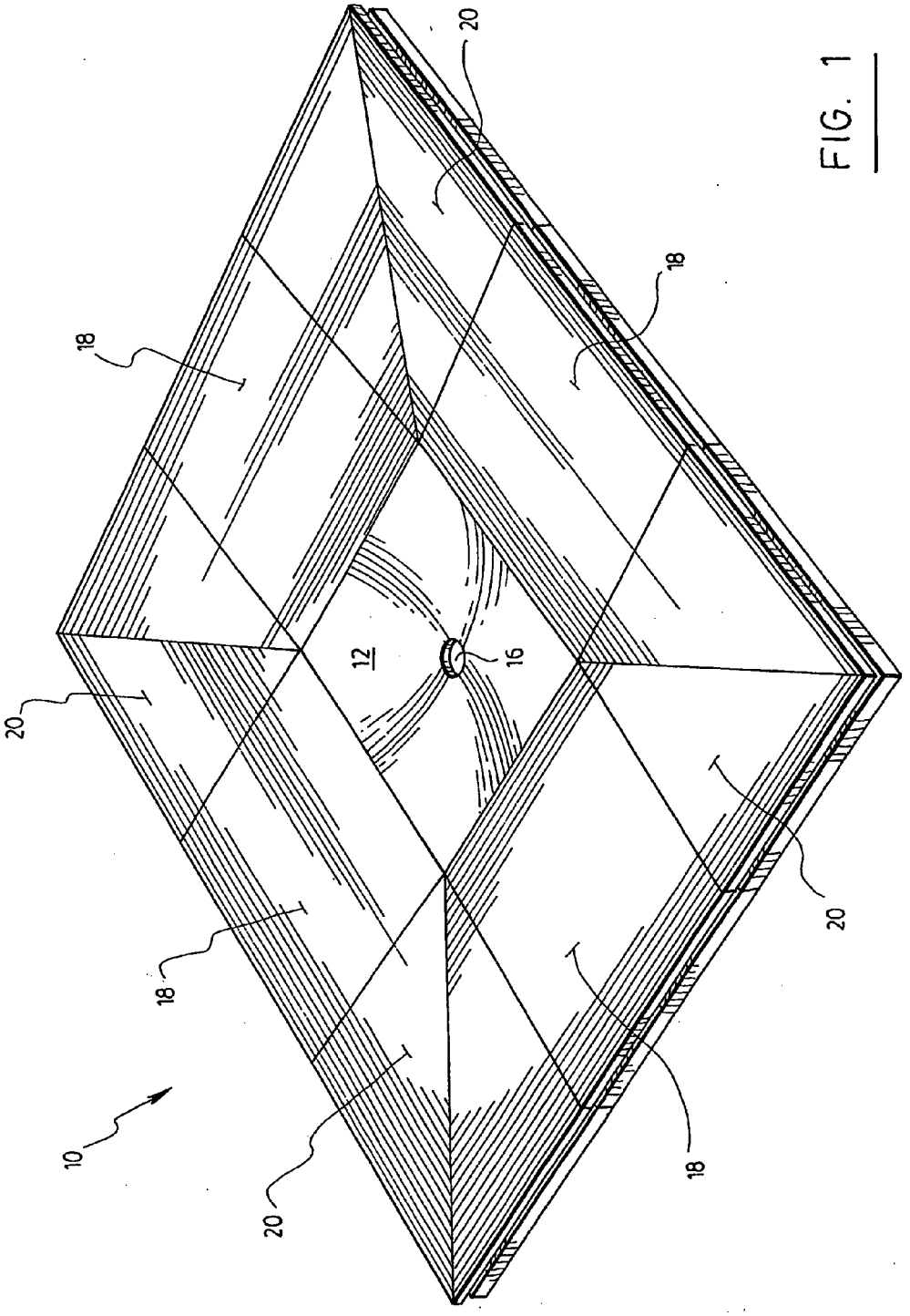


FIG. 1

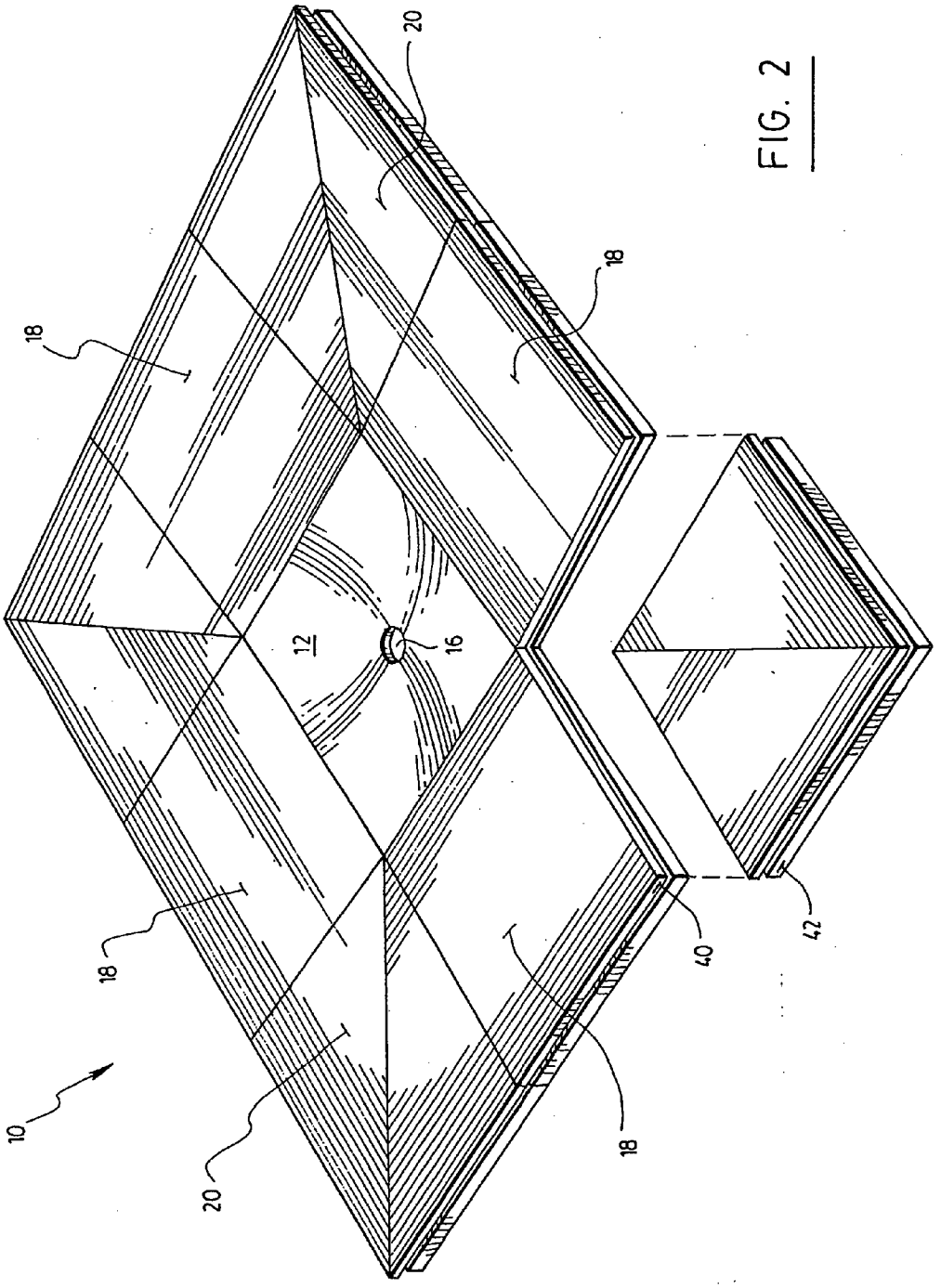


FIG. 2

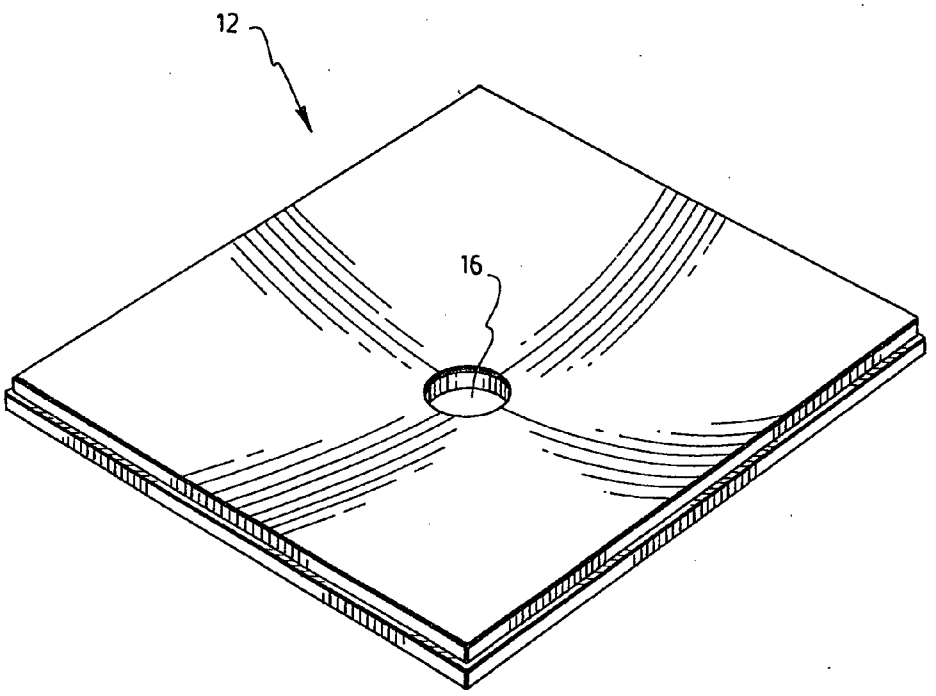


FIG. 3a

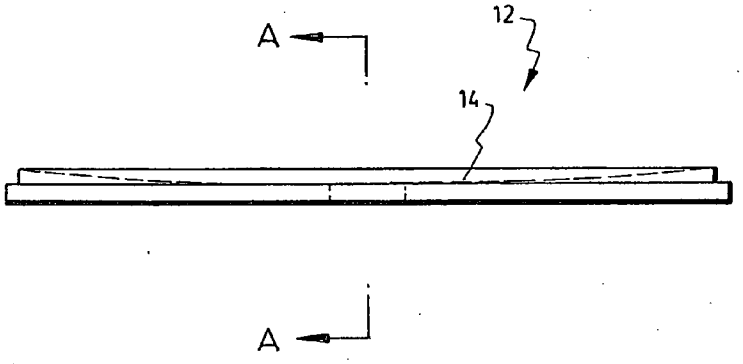


FIG. 3b

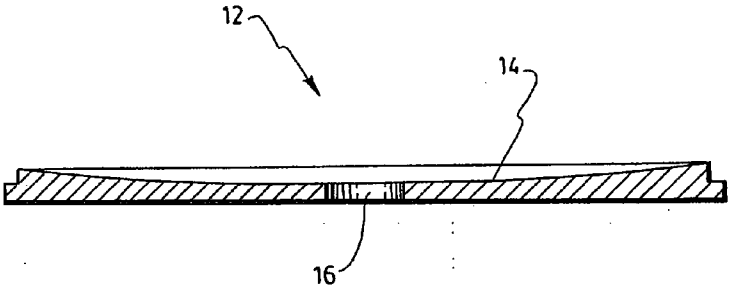


FIG. 3c

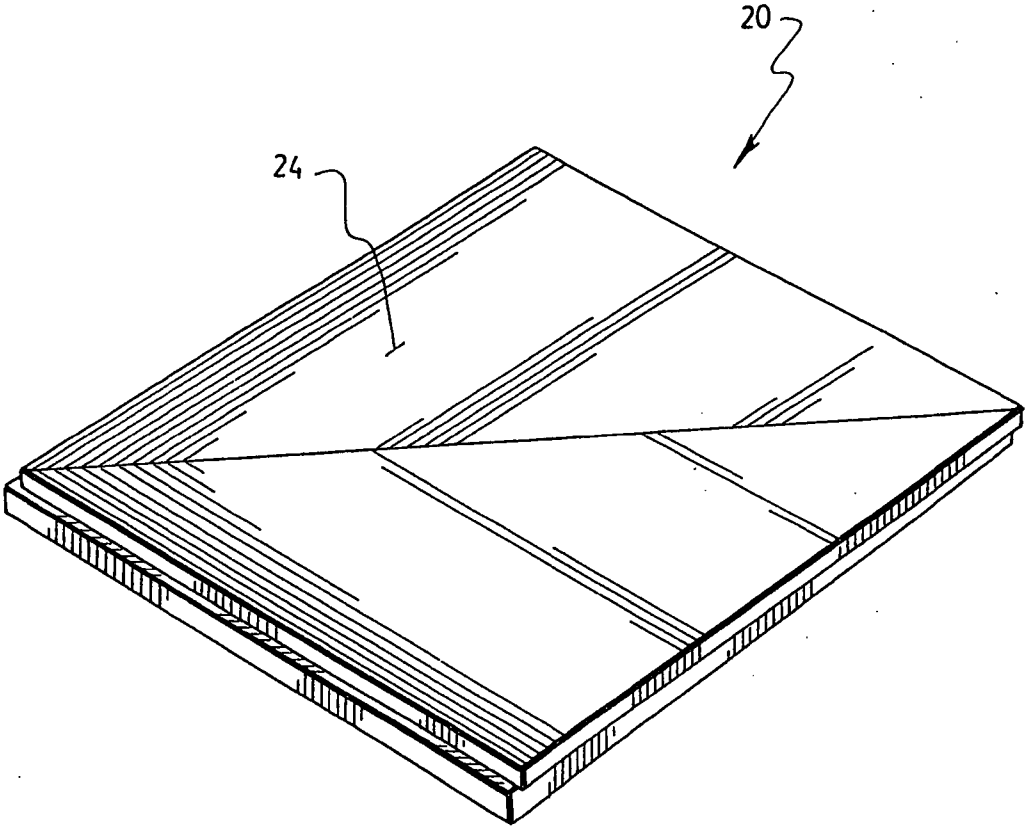


FIG. 4a

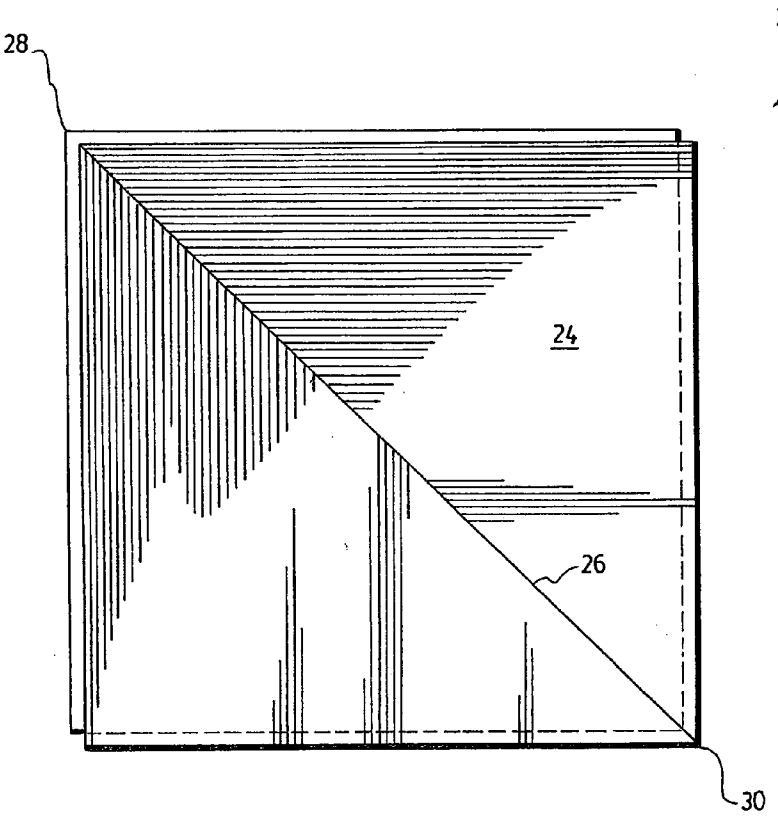


FIG. 4b

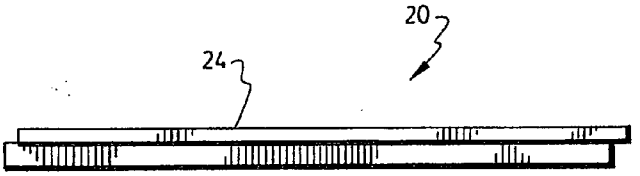


FIG. 4c

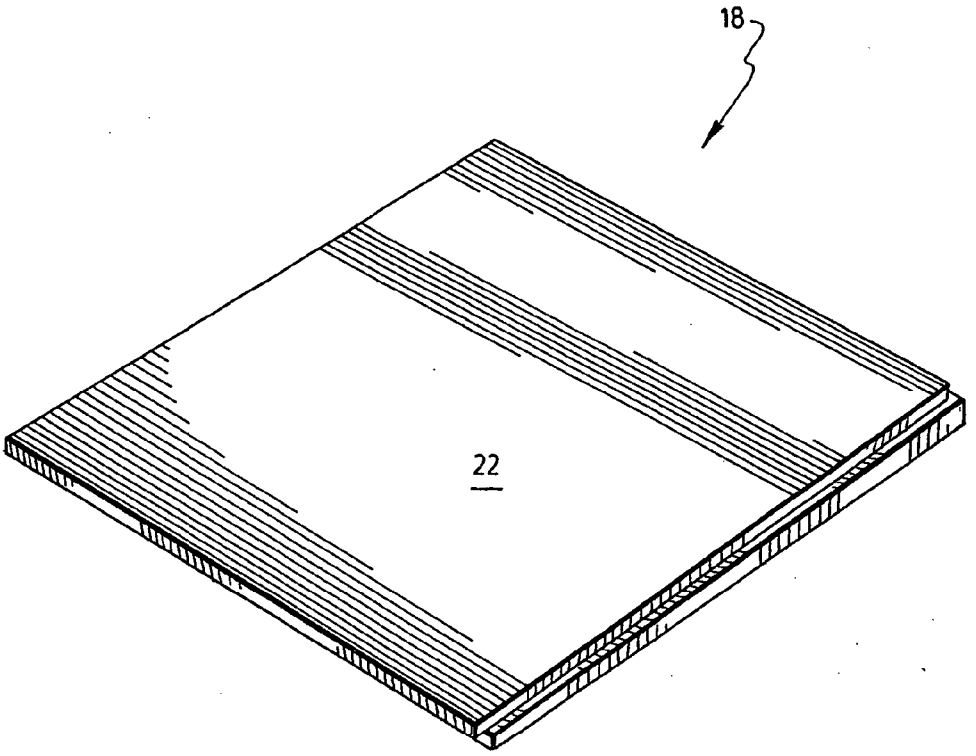


FIG. 5a

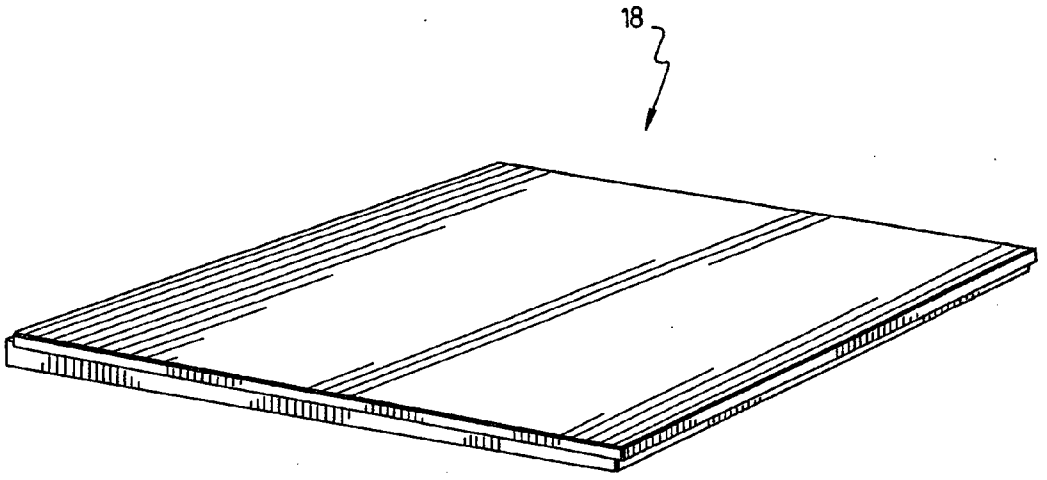


FIG. 5b

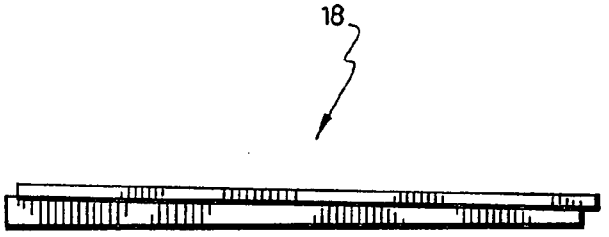


FIG. 5c

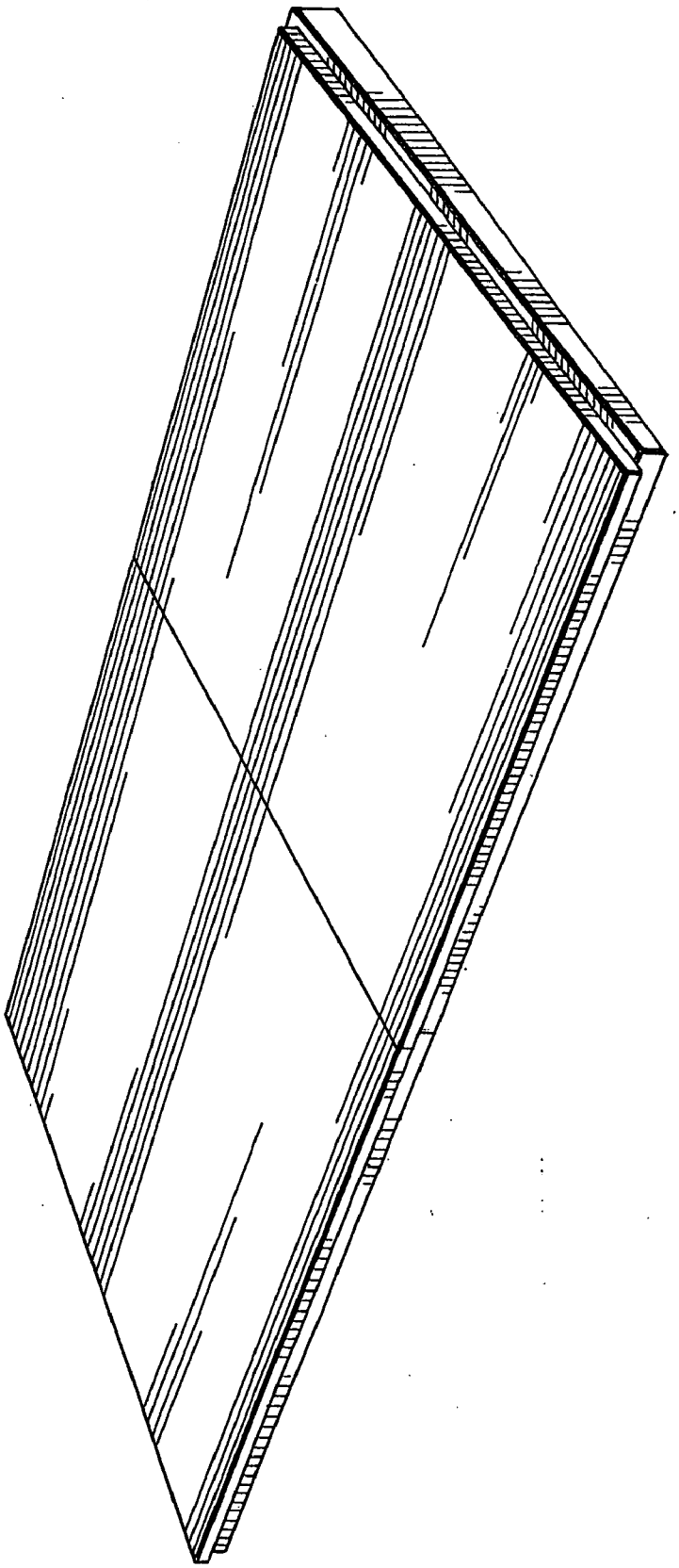
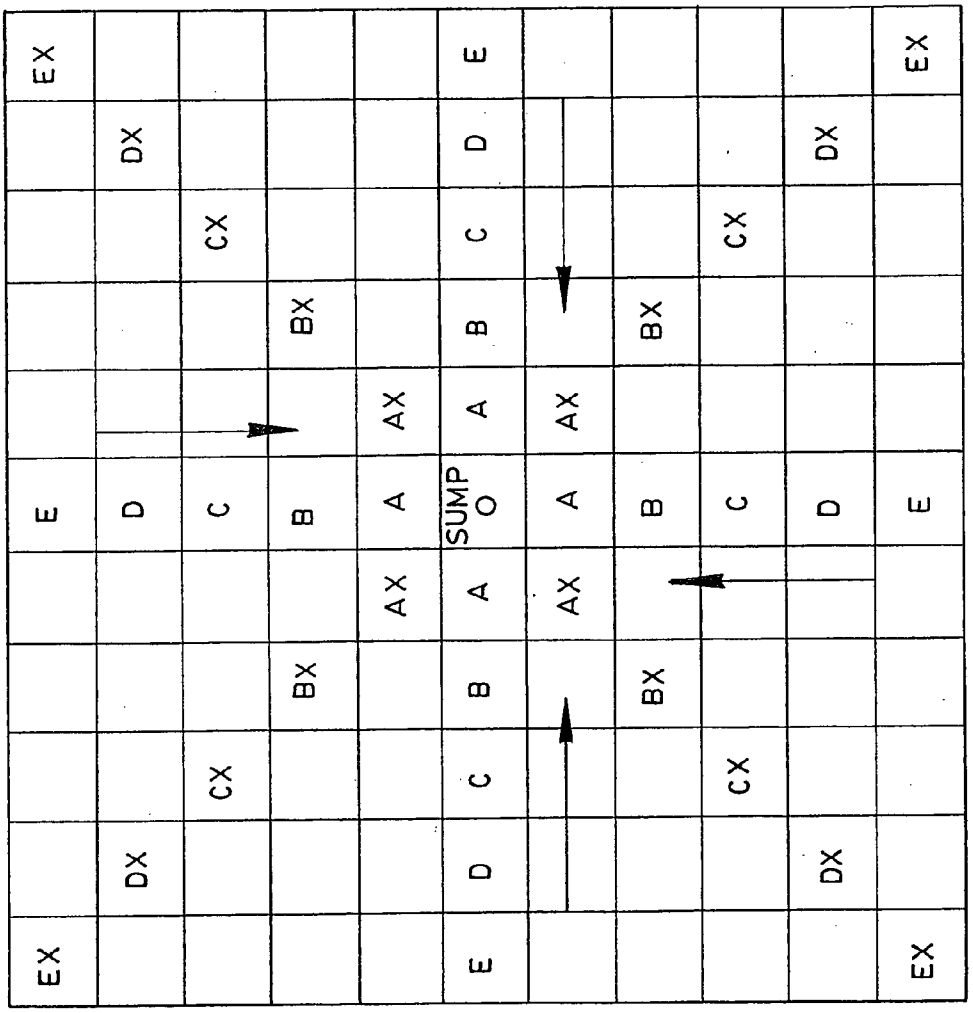


FIG. 5d

FIG. 6



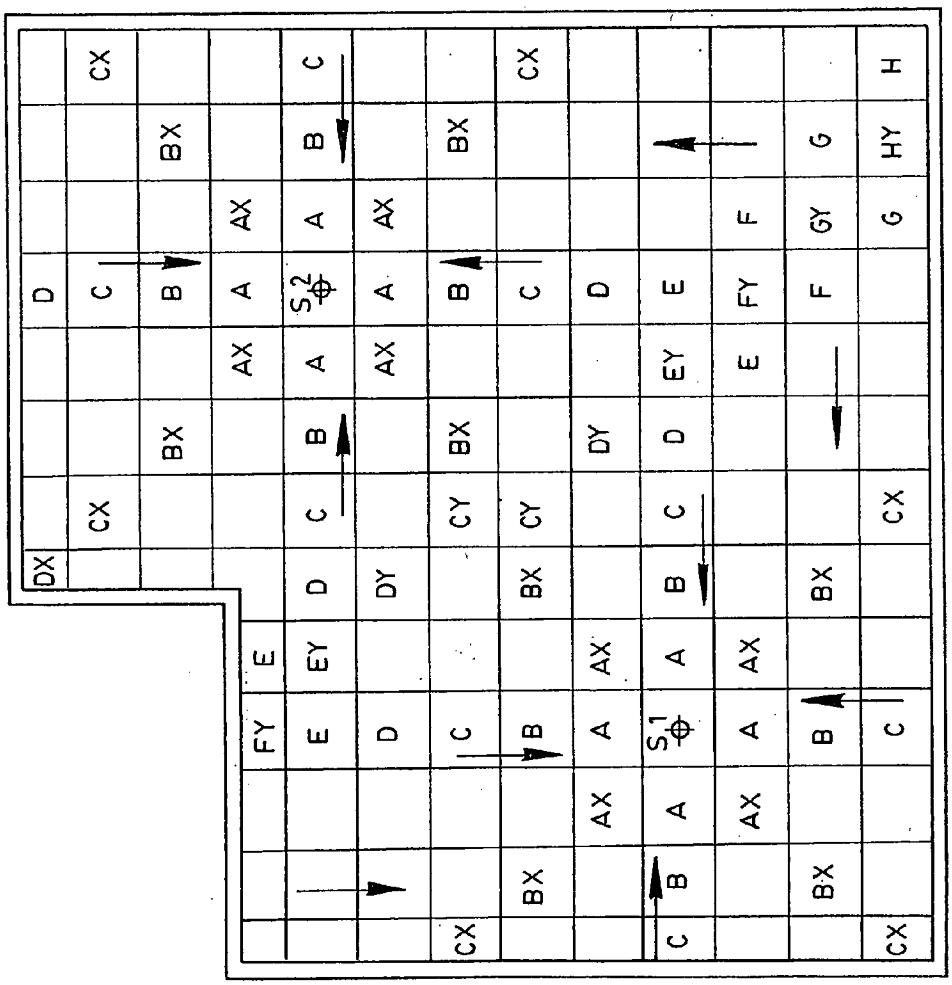


FIG. 7

INSULATING ROOFING SYSTEM FOR FLAT ROOFS

FIELD OF THE INVENTION

[0001] The present invention relates to a roofing system, and more specifically, to such a system for insulating flat roofs while facilitating water drainage therefrom.

BACKGROUND OF THE INVENTION

[0002] A lot of buildings, houses or the like are provided with substantially flat roofs. Typically, such flat roofs are provided with a water drain for evacuating excess of water in at least one predetermined location.

[0003] In this connection, there are known in the art systems for giving a slight slope to a flat roof in order to prevent the build-up thereon of standing water from heavy rain or melted snow. Such roofing systems generally include a plurality of panels or blocks disposed onto the surface of the roof. A well-known system consists of roofing saddles which are assembled on site using triangular panel units. Most of the time, each panel unit of a roofing saddle must be modified on site by cutting or trimming, as necessary, thus introducing a margin of error and resulting in a defective instalment.

[0004] Another example of a roofing system for flat roof consists of crickets made of a plurality of rectangular blocks of uniform thickness and rectangular blocks which are uniformly tapered from one side to another. The crickets are fabricated on the building site, therefore necessitating cutting blocks of uniform or tapered thickness and trimming blocks to fit. This means intensive labor operation and wastage of material from which the blocks are made.

[0005] Moreover, one known drawback of such known systems concerns the tightness of blunt-end joints between the panels or blocks. Overtime, these joints, which are usually filled with a compound such as adhesives or silicone based compounds, may become deteriorated from exposure to environmental elements and therefore gradually causing the roof to loose some of its insulating properties, and creating what are called "thermal-bridges".

[0006] It is therefore an object of the present invention to provide an insulating waterproofing system for flat roofs made of prefabricated panels, which requires no on site trimming.

[0007] It is also an object of this invention to provide a roofing system including prefabricated panels easily assembled by means of interlocks, preventing thermal bridges to affect the roofing system.

SUMMARY OF THE INVENTION

[0008] The present invention is designed to overcome deficiencies of the prior art discussed above.

[0009] In accordance with a first aspect of the present invention, there is provided an insulating roofing system for a substantially flat roof structure, said flat roof structure being provided with at least one drainage system, said insulating roofing system comprising:

[0010] a central panel with a substantially concave top surface, said central panel being provided with a through hole at a centre thereof, capable of operatively engaging said at least drainage system of the flat roof,

[0011] a row of panels assembled around said central panel consisting of four tapered side panels each in an interlocking engagement with one of the sides of said central panel and four tapered corner panels in an interlocking engagement with adjacent said side panels, said tapered side and corner panels being shaped so as to define a constant slope to direct water away from outside edges of said side and corner panels towards the through hole of said central panel;

[0012] wherein said central, side and corner panels all have substantially identical perimeter dimensions and said interlocking engagements use a system with shiplap joints wherein an upper protruding edge of each panel overlaps a lower protruding edge of an adjacent panel.

[0013] In accordance with a second aspect of the present invention, there is also provided a method for installing an insulating roofing system on a substantially flat roof structure, said flat roof structure being provided with a drainage system, said method comprising the following steps:

[0014] a) providing a central panel with a substantially concave top surface, said central panel being provided with a through hole at a centre thereof;

[0015] b) providing a plurality of tapered side panels having a top surface with a constant slope;

[0016] c) providing a plurality of tapered corner panels designed so that their top surface is invaginated along a line defined between the outermost and the innermost corners of said corner panels;

[0017] d) engaging and fixing said central panel with said drainage system of the flat roof structure;

[0018] e) in a clockwise manner, successively assembling in an interlocking engagement side panels to the sides of said central panel and corner panels with adjacent said side panels, forming a first row of panels around said central panel;

[0019] wherein said tapered side and corner panels are shaped so as to define a constant slope to direct water away from outside edges of said side and corner panels towards the through hole of said central panel; and

[0020] wherein said central, side and corner panels all have substantially identical perimeter dimensions and said interlocking engagement use a system with shiplap joints wherein an upper protruding edge of a panel overlaps a lower protruding edge of an adjacent panel.

[0021] Advantageously, there present invention provides an insulating roofing system for substantially flat roofs having good drainage functions with easy, problem-free installation. In addition, the system according to the preferred embodiments of the invention can be used without effort and material waste as generated most of the time in this construction area. This is accomplished thanks to the simple geometric relationship between the components of the present roofing system. The present roofing system is also versatile and affords various structural alternatives to accommodate a variety of drain configurations.

[0022] Other objects, features and advantages of the invention will be readily appearing from the following detailed description of the preferred embodiments thereof taken in conjunction with the drawings.

BRIEF DESCRIPTION OF THE FIGURES

[0023] **FIG. 1** is a perspective view of a roofing system according to a preferred embodiment of the present invention.

[0024] **FIG. 2** is a different perspective view of the roofing system shown in **FIG. 1**, with one of its panels disassembled.

[0025] **FIG. 3***a* is a perspective view of one of the central panel of the roofing system shown in **FIG. 1**; **FIG. 3***b* is a side view of the central panel of **FIG. 3***a*; **FIG. 3***c* is a cross-sectional view taken along lines A-A of **FIG. 3***b*.

[0026] **FIG. 4***a* is a perspective view of a corner panel of the roofing system shown in **FIG. 1**; **FIG. 4***b* is a top view of the corner panel of **FIG. 4***a*; **FIG. 4***c* is a side view of the corner panel of **FIG. 4***a*.

[0027] **FIG. 5***a* is a perspective view of a side panel of the roofing system of **FIG. 1**; **FIG. 5***b* is different perspective view of the same side panel; **FIG. 5***c* is a side view of the side panel of **FIG. 5***a*; **FIG. 5***d* is a perspective view of two side panels of the roofing system in an interlocking position.

[0028] **FIG. 6** is a plan top view of a roof covered by the roofing system according to a preferred embodiment of the present invention.

[0029] **FIG. 7** is a plan top view of a roof covered by the roofing system according to another preferred embodiment of the present invention.

DESCRIPTION OF PREFERRED EMBODIMENTS

[0030] Referring now to FIGS. **1** to **5**, there is shown an insulating roofing system **10** designed for use with buildings or houses having a substantially flat roof. By "substantially flat", it will be understood by one skilled in the art that the roof according to the present invention need not be precisely horizontally planar, but does give the visual impression of being flat. The roof is usually provided with a drainage system, such as conventional water pipes.

[0031] As shown in **FIG. 1**, the insulating roofing system **10** of the present invention typically includes a plurality of panels, defined below as a central panel **12**, side panels **18** and corner panels **20**. In the preferred embodiment, all panels are made of waterproof insulating material such as, but not limited to, expanded and extruded polystyrene, polyisocyanurate, urethane, fibreglass, fibreboard and mineral fibre.

[0032] With reference to **FIGS. 3***a*, **3***b* and **3***c*, and as mentioned above, the roofing system includes a central panel **12** with a substantially concave top surface **14**. Preferably, the central panel is symmetric and has a constant slope of about 2% (see **FIGS. 3***b* and **3***c*). The central panel **12** is provided with a through hole **16** at its centre (see **FIG. 3***a*) and is capable of operatively engaging with the drainage system of a flat roof, such as a water drain pipe. Any appropriate known manner of connecting the through hole **16** to an existing, modified or new drainage system may be used, as will be appreciated by one skilled in the art.

[0033] Referring back to **FIG. 1**, the roofing system **10** also includes a row of panels assembled around the central panel **12**, consisting of side panels **18** interlocked with the central panel **12** and corner panels **20** interlocked with adjacent side panels **18**.

[0034] Referring to **FIGS. 5***a*, **5***b* and **5***c*, it can be seen that each side panels **18** preferably has a tapered shape when seen from the side, so that its top surface defines a slight slope from the outside edge **32** of the panel, towards its inside edge **34** which is to be connected to the central panel. This slope is preferably constant and should be sufficient to guide water towards the central panel without interfering with the visually "flat" aspect of the roof. In the preferred embodiment, it is of about 1%.

[0035] The corner panels are better seen in **FIGS. 4***a*, **4***b* and **4***c*. In the present embodiment, they are designed in such a way that their top surface **24** is somewhat invaginated along the line **26** defined between the outermost **28** and innermost **30** corners thus allowing the water to be drained in direction of the central panel **12** (see **FIGS. 4***a* and **4***b*). It will be appreciated that any other shape achieving the same result is however considered within the scope of the present invention.

[0036] In a preferred embodiment, the central, side and corner panels have a perimeter dimension of at about 1×1 m. They are preferably square or rectangular shaped, but may be given another form according to the design of a particular roof.

[0037] Referring to **FIGS. 2 and 5***d*, it can be seen that the panels of the roofing system are joined together in such a way that each of the panels overlaps the one next to it in a shiplap joint, and not in a blunt end joint. In this type of connection, an upper protruding edge **40** of a panel overlaps a lower protruding edge **42** of an adjacent panel. This way of interlocking the panels of the roofing system, also called with "cohesive panel edges" allows to efficiently joining the panels together and offers the advantage of cutting thermal-bridges to ensure a long lasting insulation of the flat roof.

[0038] Referring back to **FIG. 1**, a preferred method of installing an insulating roof system as disclosed above will now be explained. In accordance with this method, for on site installation of the roofing system **10**, the user will first fix and engage the central panel **12** with the drainage system of the roof. Then, in a clockwise manner, starting with a side panel **18**, the user will secure a first side panel **18** to the side of the central panel **12** and secure a corner panel **20** to the side of the first side panel **18**. Then the user will secure a second side panel to the next available side of the central panel **12** and so forth until a first row of panels is completed around the central panel **12**.

[0039] In order to cover the whole surface of a roof, one or more additional rows of corner and side panels may of course be provided. In one possible embodiment, shown in **FIG. 6**, a plurality of fully completed additional rows of panels may be concentrically assembled around the first row of panels placed around the central panel (sump), consisting of side panels (A, B, C, D and E) and corner panels (AX, BX, CX, DX and EX), so as to completely cover the whole surface of a flat roof. In the illustrated embodiment, the

second row B will include three side panels on each side, for a total of twelve side panels; the third row C includes five side panels per side, the fourth row D includes seven, and so on. A more complex configuration is shown in **FIG. 7**, where a plurality of roofing systems are used each having a central panel (S**1** or S**2**) provided with a through hole at its centre, and a plurality of fully completed or partially completed rows of panels consisting of side panels (A, B, C, D, E, F, G, H) and corner panels (AX, BX, CX, DX, CY, DY, EY, FY, GY, HY). Each of central panel (S**1** or S**2**) is connected to the drainage system of the flat roof via their through hole, thus allowing the drainage of water from various locations of the flat roof.

[**0040**] Advantageously, all panels of the present insulation roof system may be cut (see for example side panels C, D and E and corner panels CX, DX and FY on the edges of the flat roof in **FIG. 7**), factory laminated to other roofing board or shortened to comply with the size and configuration of the roof.

[**0041**] Finally, once the flat roof has been covered with the roofing system of the present invention, the roofing system may be fastened by means known to one skilled in the art to the roof and then covered with a layer of asphalt based compounds or any other roof coverings which are suitable for roofs having a slope gradient as contemplated by the present invention.

[**0042**] Although preferred embodiments of the present invention have been described in detail herein and illustrated in the accompanying drawings, it is to be understood that the invention is not limited to these precise embodiments and that various changes and modifications may be effected therein without departing from the scope or spirit of the present invention.

1. An insulating roofing system for a substantially flat roof structure, said flat roof structure being provided with at least one drainage system, said insulating roof system comprising:

a central panel with a substantially concave top surface, said central panel being provided with a through hole at a centre thereof, capable of operatively engaging said at least drainage system of the flat roof;

a row of panels assembled around said central panel consisting of four tapered side panels each in an interlocking engagement with one of the sides of said central panel, and four tapered corner panels in an interlocking engagement with adjacent said side panels, said tapered side and corner panels being shaped so as to define a constant slope to direct water away from outside edges of said side and corner panels towards the through hole of said central panel; wherein said central, side and corner panels all have substantially identical perimeter dimensions and said interlocking engagements use shiplap joints wherein an upper protruding edge of each panel overlaps a lower protruding edge of an adjacent panel.

2. A roofing system as defined in claim 1 wherein the substantially concave top surface of said central panel has a slope of 2%.

3. A roofing system as defined in claim 1, wherein said tapered side panels have a surface with a slope of about 1%.

4. A roofing system as defined in claim 1, wherein said tapered corner panels have a surface with a slope of about 1%.

5. A roofing system as defined in claim 1, wherein said tapered corner panels are designed so that their top surface is invaginated along a line defined between the outermost and innermost corners of said corner panels.

6. A roofing system as defined in claim 1, wherein said central, side and corner panels are made of waterproof material.

7. A roofing system as defined in claim 6 wherein said waterproof material is selected form the group consisting of expanded and extruded polystyrene, polyisocyanurate, urethane, fibreglass, fibreboard and mineral fibre.

8. A roofing system as defined in claim 1 wherein the perimeter dimensions of said central, side and corner panels are of at least 1 meter on each side thereof.

9. A roofing system as defined in claim 1, comprising at least one additional row of said tapered side and corner panels assembled around said row of panels.

10. A roofing system as defined in claim 9 characterized in that said at least additional row of said tapered side and corner panels completely surrounds said row of panels.

11. A roofing system as defined in claim 9 characterized in that said at least additional row of said tapered side and corner panels partially surrounds said row of panels.

12. A method for installing an insulating roofing system on a substantially flat roof structure, said flat roof structure being provided with a drainage system, said method comprising the following steps:

a) providing a central panel with a substantially concave top surface, said central panel being provided with a through hole at a centre thereof;

b) providing a plurality of tapered side panels having a top surface with a constant slope;

c) providing a plurality of tapered corner panels designed so that their top surface is invaginated along a line defined between the outermost and the innermost corners of said corner panels;

d) engaging and fixing said central panel with said drainage system of the flat roof structure;

e) in a clockwise manner, successively assembling in an interlocking engagement side panels to the sides of said central panel and corner panels with adjacent said side panels, forming a first row of panels around said central panel;

wherein said tapered side and corner panels are shaped so as to define a constant slope to direct water away from outside edges of said side and corner panels towards the through hole of said central panel; and

wherein said central, side and corner panels all have substantially identical perimeter dimensions and said interlocking engagement use a system with shiplap joints wherein an upper protruding edge of a panel overlaps a lower protruding edge of an adjacent panel.

13. The method as defined in claim 12 which further comprises a step of interlocking, in a clockwise manner, additional side and corner panels to the side and corner panels of said first row of panels, forming at least one additional row of panels to increase the whole surface of said insulating roofing system.

14. The method as defined in claim 12 which further comprises a step of interlocking said side and corner panels of said insulating roofing system to side and corner panels of at least one further insulating roofing system as defined in claim 1, allowing the drainage of water from various locations of said flat roof structure.

* * * * *