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(71) Applicant: **Caoduro, Carlo**
36010 Monticello Conte Otto, VI (IT)

(72) Inventor: **Caoduro, Carlo**
36010 Monticello Conte Otto, VI (IT)

(74) Representative: **Bonini, Ercole**
Studio Bonini srl
Corso Fogazzaro 8
36100 Vicenza (IT)

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(54) **Shed roofing for openings in the roof of buildings.**

(57) Shed roofing (1; 20; 30; 40; 50) for openings (A) in the roofs (T) of buildings comprising: a pair of pitches converging together (2, 3; 22, 23; 32, 33; 42, 43) that define an asymmetrical cross-section with the concavity (6) facing towards the opening (A); an opaque area (7; 27) in one pitch (2; 22; 32; 42); a pair of shaped end members (4), each arranged at one of the extremities of

the pitches (2, 3; 22, 23; 32, 33; 42, 43); a perimeter border (18; 21; 31; 41) delimiting the pitches (2, 3; 22, 23; 32, 33; 42, 43) and the end members (4) for resting on a base (S) delimiting the opening (A). The pitches (2, 3; 22, 23; 32, 33; 42, 43) and the perimeter border (18; 21; 31; 41) consist of a continuous shaped surface (9, 10, 24; 34, 35; 44) made as a single element.

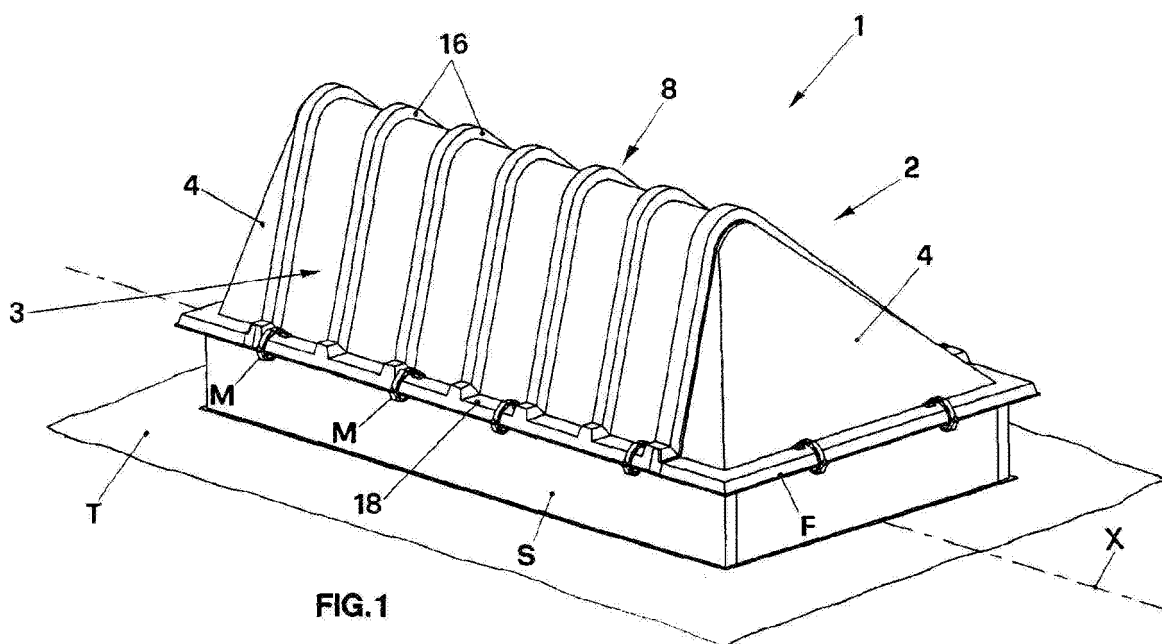


FIG. 1

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Description

[0001] This invention relates to a type of shed roofing particularly suitable for installation over openings in the roofs of buildings.

[0002] It is common knowledge that, in the building sector, a shed roof, or sawtooth roof, is a roof with converging pitches used particularly in industrial sheds that is installed over openings in the roof of the building and enables the interior of the building to be illuminated with diffuse daylight and a low level of ultraviolet irradiation.

[0003] To be more precise, this roofing consists of flat or curved pitches that converge together upwards, aligned in a longitudinal direction defined by the opening to which they are applied and sloping at different angles in relation to the horizontal.

[0004] The less steeply sloping pitch is opaque and faces south, while the more steeply sloping pitch is transparent and faces north, thus enabling the diffusion of light in the interior while containing direct irradiation.

[0005] According to the known state of the art, in the first embodiments of shed roofing, the transparent pitch was glazed while the opaque pitch was made of prefabricated concrete panels of considerable dimensions and weight, making their installation on the roof of the building rather difficult and costly.

[0006] This method was used for large-scale shed roofing.

[0007] Shed roofing of the above-described type is no longer used, not only due to the difficulties of its construction, but also because its large dimensions would entail such high heating costs these days as to make the solution unfeasible.

[0008] In an attempt to retain the advantages of shed roofing, as explained above, while avoiding any excessive energy consumption and simultaneously containing the manufacturing costs and assembly problems, shed roofing is currently made in smaller dimensions, called "mini-shed" roofing, wherein the opaque pitch is made of lightweight insulated panels.

[0009] Moreover, the transparent pitch is made of either glass or a plastic material, and consists of a plurality of aligned surfaces, each complete with opening and closing devices for the purposes of air circulation.

[0010] Such shed roofing of new design overcomes at least some of the previously-mentioned problems of the older-style shed roofing, but it still poses the problem of being laborious to build and requiring rather lengthy installation times and specially-qualified personnel.

[0011] Moreover, its use does not always enable the designer to optimize the lighting inside the building.

[0012] The present invention aims to overcome these residual drawbacks too.

[0013] To be more specific, a first object of the invention is to realize shed roofing that is more straightforward to construct than the shed roofing of known type and that consists of fewer components than the latter for the corresponding surface area to cover.

[0014] Another object of the invention is to realize shed roofing that is easier to install than the shed roofing of known type.

5 **[0015]** A further object of the invention is to realize shed roofing that is lighter in weight than the shed roofing of known type.

[0016] Another object is for the shed roofing of the invention to be suitable for building in a greater variability of shapes than the shed roofing of known type.

10 **[0017]** Another, not necessarily last object is for the shed roofing of the invention to be more versatile to use than the shed roofing of known type.

15 **[0018]** The aforesaid objects are achieved by a type of shed roofing for openings in the roofs of buildings that, in accordance with the main claim, comprise:

- at least one pair of pitches converging together that develop along the longitudinal axis identified by said opening and that define for said roofing an asymmetrical cross-section with respect to said longitudinal axis, with the concavity facing said opening;
- a ridge for connecting said converging pitches;
- at least one opaque area in at least one of said pitches;
- 25 - a pair of shaped end members each arranged at one of the extremities of said pitches;
- a perimeter border delimiting said pitches and said end members, which is rested on a base delimiting said opening,

30 characterized in that said at least one pair of converging pitches, said ridge and at least one stretch of said perimeter border consist of at least one continuous shaped surface made as a single element.

35 **[0019]** According to one embodiment, each pair of converging pitches, the ridge and at least one stretch of the perimeter border consist of just one continuous shaped surface made as a single element.

40 **[0020]** According to another embodiment, each pair of converging pitches, the ridge and at least one stretch of the perimeter border consist of two continuous shaped surfaces placed one over the other to create a cavity.

45 **[0021]** In both of these embodiments, the shaped end members may also be built to form a single element with the shaped surfaces.

[0022] The opaque area is defined by a coating applied to one or both the shaped surfaces.

[0023] In the case of two overlapping surfaces, the opaque area is defined by an opaque filler element, preferably but not necessarily with thermal and/or acoustical insulation features, which is inserted in the cavity.

[0024] In a further embodiment, the opaque area is defined by a combination of one or more coatings and the filler element.

55 **[0025]** In all the above mentioned embodiments, with a single or double shaped surface, the perimeter border delimiting the shed roofing extends outwards from said roofing and it rests on and is stably but removably at-

tached to the base delimiting the opening by means of clamps or screws.

[0026] Alternatively, the shed roof may be connected to the base by means of hinges, with a frame inserted between the perimeter border of the roofing and the base.

[0027] In said second case, means may be provided to enable movement so that the shed roofing can be opened by rotating it around the axis identified by hinges.

[0028] The shed roofing may be composed of just one pair of pitches, or of several pitches aligned and overlapping to cover a stretch along the longitudinal axis of the opening to which it is applied.

[0029] One of the advantages of the shed roofing of the invention is that it is easy to manufacture because, both in the version with a single shaped surface and in the version with two overlapping shaped surfaces, it can be made in the workshop out of thermosetting plastic sheet and subsequently installed on the base delimiting the opening in the roof of the building.

[0030] Another advantage is that, though easier to build and install, the shed roofing of the invention retains the previously-mentioned advantages typical of this type of roofing.

[0031] Finally, another advantage lies in that the same shed roofing of the invention can be installed either in a fixed version or in an openable version, respectively, depending on whether it is attached to the base by means of clamps or by means of hinges.

[0032] The aforementioned objects and advantages will be better illustrated in the description of preferred embodiments of the shed roofing of the invention, which is provided below with reference to the attached drawings wherein:

- fig. 1 shows an axonometric view of the shed roofing of the invention, applied to an opening in the roof of a building;
- fig. 2 shows a side view of the shed roofing of fig. 1
- fig. 3 shows another side view of the shed roofing of fig. 1;
- fig. 4 shows a cross-section of a preferred embodiment of the shed roofing of the invention, in the cutting plane A-A of fig. 2;
- fig. 4a shows an enlarged cross-section of a detail in fig. 4;
- fig. 4b shows an enlarged cross-section of the same detail in fig. 4 in another embodiment;
- fig. 5 shows the longitudinal section of the preferred embodiment of the shed roofing of the invention, in the cutting plane B-B of fig. 3;
- fig. 6 shows a cross-section of a first variant of the shed roofing of the invention, in the cutting plane A-A of fig. 2;
- fig. 6a shows an enlarged cross-section of a detail in fig. 6;
- fig. 7 shows a longitudinal cross-section of the aforesaid first variant, in the cutting plane B-B of fig. 3;
- fig. 8 shows a cross-section of a second variant of

the shed roofing of the invention, in the cutting plane A-A of fig. 2;

- fig. 9 shows a longitudinal cross-section of the aforesaid second variant, in the cutting plane B-B of fig. 3;
- fig. 10 shows a cross-section of a third variant of the shed roofing of the invention, in the cutting plane A-A of fig. 2;
- fig. 11 shows a longitudinal cross-section of the aforesaid third variant, in the cutting plane B-B of fig. 3;
- fig. 12 shows an axonometric view of the outside of the roofing of the invention, made according to the second and third variants represented in figures 8, 9 and 10, 11, respectively;
- fig. 13 shows an axonometric view of another variant of the shed roofing of the invention, applied to an opening in the roof of a building;
- fig. 14 shows an axonometric view of an installation of the shed roofing of the invention, applied to an opening in the roof of a building.

[0033] The preferred embodiment of the shed roofing of the invention is shown in the front and side views in figures 1 to 3 and in cross-section in figures 4 and 5, where it is globally indicated by the numeral **1**.

[0034] It is applied to an opening **A** in the roof **T** of a building and is particularly suitable for use in industrial sheds to obtain the uniform and diffuse lighting of the interior, avoiding any direct irradiation.

[0035] The roofing comprises a pair of converging pitches **2, 3** developing mainly along a longitudinal axis **X** identified by the opening **A** and delimited at each extremity by shaped end members **4**.

[0036] The two pitches **2, 3** converge upwards, thereby defining a substantially triangular and asymmetrical cross-section for the shed roofing with respect to the longitudinal axis **X**, with the concavity **6** facing the opening **A**.

[0037] At the upper end where they converge, the pitches **2, 3** are connected together by means of a ridge **8**, while at the lower end they have a border **18** for resting on the base **S** delimiting the opening **A**.

[0038] The two pitches **2, 3** slope upwards on a different gradient with respect to the horizontal supporting plane **K** of the base **S** and, to be more precise, one of said pitches, i.e. the pitch **2**, lies at an angle of inclination α , that is less steep than the angle of inclination β of the opposite pitch **3**.

[0039] The less steeply sloping pitch **2** has an opaque area **7**, which shields the underlying interior against the light, while the more steeply sloping pitch **3** is transparent and is preferably oriented northwards, so as to provide the interior with indirect daylight.

[0040] Both the shaped end members pieces **4** are preferably, but not necessarily, opaque.

[0041] To be more specific, as shown in figures 4 and 5 and in the details in figures 4a and 4b, the roofing according to the invention has the pitches **2, 3**, the ridge **8**, and at least one stretch of the border **18**, consisting of

two continuous shaped surfaces **9, 10**, each of which is made in a single element, that lie one over the other, separated from one another so as to create a cavity **11**.

[0042] Alternatively, each shaped end member **4** may also be incorporated in the two continuous shaped surfaces **9, 10**, forming a single element therewith.

[0043] The shaped surface **9, 10** is preferably, but not necessarily, made by thermosetting of a plastic sheet material.

[0044] Thus, each shaped surface **9, 10** is made as a single element, offering benefits in terms of manufacturing economies, structural strength and also the esthetic effect of the end product.

[0045] In the shaped surfaces **9, 10**, the opaque area **7** is obtained by means of an opaque coating **12** applied to one or both surfaces and consists of a layer of paint or a layer of other material applied by means of adhesive substances, as shown in the detail in fig. 4a.

[0046] According to a further embodiment, the opaque area **7** consists of an opaque filler element **13** inserted or injected in the cavity **11**, as shown in the detail in fig. 4b.

[0047] Clearly, the opaque filler element **13** inserted or injected in the cavity **11** may also be used in combination with the application of the aforementioned opaque coatings **12**.

[0048] Moreover, the opaque filler element **13** is preferably made of a thermally and/or acoustically insulating material.

[0049] The application of the opaque coating **12** prevents the passage of light, while the application of the opaque filler element **13** in the cavity **11** also has thermal and acoustic insulating effects.

[0050] Concerning the shaped surfaces **9, 10**, it is particularly evident from figures 1 to 3, that each of these surfaces may include ribbing **16** arranged at right angles to the longitudinal axis **X** and across the ridge **8**.

[0051] This makes it possible to obtain a structure that, even if it is made with shaped sheets of limited thickness, such as thermosetting plastic sheet material, can nonetheless ensure a considerable mechanical strength that enables the roofing to withstand heavy loads.

[0052] From the practical standpoint, the two shaped surfaces **9, 10** forming the pitches **2** and **3**, the ridge **8** connecting the two, the border **18** and the end members **4**, if any, are manufactured by thermosetting and consequently come to form a single element.

[0053] The two shaped surfaces **9, 10** are then placed one over the other, maintaining a gap between them so as to create a cavity **11**.

[0054] If the end members **4** are not incorporated in said single element, they are attached to the shaped surfaces **9, 10** by means of a partial overlap either in dry conditions or with sealants inserted between them.

[0055] The opaque coatings **12** or opaque filler **13**, or both, for defining the opaque area **7**, are applied to the shaped surfaces **9, 10** prior to the attachment of the end members **4**.

[0056] The resulting shed roofing **1** is installed by rest-

ing the perimeter border **18** delimiting the shed roof element on the base **S** provided around the perimeter of the opening **A** in the roof **T** of the building.

[0057] The first variant of the shed roofing of the invention is shown in cross-section and longitudinal section, respectively, in figures 6 and 7, where it is globally indicated by the numeral **20**.

[0058] The roofing **20** is composed, here again, of two converging pitches **22** and **23**, connected by a ridge **28**, but it differs from the previously-described roofing in that the pitches **22, 23**, the ridge **28** and at least one stretch of the border **21**, consist of a single continuous shaped surface **24**, made as a single element.

[0059] Alternatively, each shaped end member may also be incorporated in the same continuous shaped surface **24**, with which it consequently constitutes a single element.

[0060] Here again, the pitch **22** forming the less steeply sloping angle α with respect to the horizontal **K**, has an opaque area **27** created by an opaque coating **29** visible particularly in the detail in fig. 6a.

[0061] A second variant of the shed roofing of the invention is shown in the cross-section in fig. 8 and in the longitudinal section in fig. 9, where it is globally indicated by the numeral **30**.

[0062] This second variant **30** only differs from the preferred embodiment described with reference to figures 1 to 5 in that the converging pitches **32, 33** connected by means of the ridge **38**, the perimeter border **31** and the end members, if any, consist of two shaped surfaces **34, 35** lying one over the other with a gap between them, both of which have a smooth surface and consequently lack any ribbing.

[0063] A third embodiment of the shed roofing of the invention is shown in the cross-sections of fig. 10 and in the longitudinal section of fig. 11, where it is globally indicated by the numeral **40**.

[0064] This third variant only differs from the first variant described herein in that the two converging pitches **42, 43** connected by means of the ridge **48**, the perimeter border **41** and the end members, if any, consist of a single shaped surface **44**, again with a smooth surface finish and consequently lacking any ribbing.

[0065] The shed roofing of the invention built according to the second or third variants respectively described in **30, 40**, is illustrated in the axonometric view of fig. 12, where it is shown mounted on the base **S** delimiting the opening **A**.

[0066] As illustrated in the further variant of fig. 13, the shed roofing of the invention indicated by the numeral **50** consists of several pairs of pitches **52, 53** aligned with one another and installed one after the other in the direction of the longitudinal axis **X**, and each of the aforesaid pitches may be in the form of any of the previously-described variants.

[0067] To give an example, the roofing **50** of fig. 13 is built by axially joining pairs of converging pitches **2, 3** according to the embodiment illustrated in the figures

from 1 to 5.

[0068] In structural terms, the roofing 50 is built by aligning or overlapping sections of the pitches either in dry conditions or with sealants inserted between them.

[0069] As concerns one of the various applications of the shed roofing of the invention, this may involve the stable but removable attachment of its perimeter border 18 to the base S by means of screws or clamps M of known type, as shown in figures from 1 to 13.

[0070] This gives rise to a removable but nonetheless stable application of the roofing over the opening A in the roof T of the building.

[0071] According to another application, shown in fig. 14, by inserting the frame F between the base S and the border of the roofing, the shed roofing 1 can be made openable by providing suitable hinges and mechanical or pneumatic actuators P.

[0072] Based on the above considerations, it is clear that, in all the variants illustrated and described herein, the shed roofing of the invention achieves all the established and previously-stated objects.

[0073] In particular, the shed roofing of the invention is of more straightforward design, more lightweight and easier to install than the shed roofing of known type in that it consists of fewer, more lightweight components.

[0074] Moreover, the typical advantages afforded by shed roofing structures are maintained, i.e. a uniform lighting in the interior of the building with a consequently greater protection against changes in the color of the materials inside the room.

[0075] Of course, even if it has not been explicitly illustrated and described herein, the form of the shed roofing may differ from the one illustrated. The pitches may equally consist of variously-shaped plane surfaces and may thus, for instance, be rounded to form a single panel with one or more cavities, so as to use the shed roofing of the invention to achieve any particular esthetic effects sought by the designer.

[0076] Should the shed roofing undergo any modification not described or illustrated herein, but that nonetheless come within the scope of the following claims, any such variants or modifications shall nonetheless be considered as protected by the present patent.

[0077] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. Shed roofing (1; 20; 30; 40; 50) for openings (A) in the roofs (T) of buildings comprising:

- at least one pair of pitches converging with one

another (2, 3; 22, 23; 32, 33; 42, 43) and developing along the longitudinal axis (X) identified by said opening (A), that define an asymmetrical cross-section for said roofing (1; 20; 30; 40; 50) with respect to said longitudinal axis (X), with the concavity (6) facing towards said opening (A);

- a ridge (8) for connecting said converging pitches (2, 3; 22, 23; 32, 33; 42, 43);

- at least one opaque area (7; 27) in at least one of said pitches (2; 22; 32; 42);

- a pair of shaped end members (4), each arranged at one of the extremities of said pitches (2, 3; 22, 23; 32, 33; 42, 43);

- a perimeter border (18; 21; 31; 41) delimiting said pitches (2, 3; 22, 23; 32, 33; 42, 43) and said end members (4) for the purpose of resting them on a base (S) delimiting said opening (A),

characterized in that said at least one pair of pitches converging with one another (2, 3; 22, 23; 32, 33; 42, 43), said ridge (8; 28; 38; 48) and at least one stretch of said perimeter border (18; 21; 31; 41), consist of at least one continuous shaped surface (9, 10; 24; 34, 35; 44) made as a single element.

2. Shed roofing (20; 40) according to claim 1) **characterized in that** each of said at least one pair of converging pitches (22, 23; 42, 43), said ridge (28; 38; 48) and at least one stretch of said perimeter border (21; 41) consist of a single continuous shaped surface (24; 44) made as a single element.

3. Shed roofing (1; 30; 50) according to claim 1) **characterized in that** each of said pairs of converging pitches (2, 3; 32, 33), said ridge (8; 28; 38; 48) and at least one stretch of said border (18; 31), consist of two continuous shaped surfaces (9, 10; 34, 35), each of which is made as a single element, one overlapping the other and the two being kept separate so as to create a cavity between them (11).

4. Shed roofing (20; 40) according to claim 1) **characterized in that** each of said pairs of converging pitches (22, 23; 42, 43), said ridge (28; 38; 48), said shaped end members (4) and said perimeter border (21; 41) consist of a single continuous shaped surface (24; 44) made as a single element.

5. Shed roofing (1; 30; 50) according to claim 1) **characterized in that** each of said pairs of converging pitches (2, 3; 32, 33), said ridge (8; 28; 38; 48), said shaped end members (4) and said perimeter border (18; 31), consist of two continuous shaped surfaces (9, 10; 34, 35), each made as a single element, one overlapping the other and the two being kept separate so as to create a cavity between them (11).

6. Shed roofing (1; 20; 30; 40; 50) according to claim 1) **characterized in that** said at least one opaque area (7; 27) is part of the pitch (2; 22; 32; 42) that, in relation to the plane (K) defined by said base (S) has a less steeply sloping angle of inclination (α) than the angle of inclination (β) of the opposite pitch (3; 23; 33; 43). 5
7. Shed roofing (1; 20; 30; 40; 50) according to claim 6) **characterized in that** said at least one opaque area (7; 27) is defined by at least one opaque coating (12; 29) applied to said pitch (2; 22; 32; 42) having a less steeply sloping angle of inclination (α) than the angle of inclination (β) of the opposite pitch (3; 23; 33; 43) 10 15
8. Shed roofing (1; 20; 30; 40; 50) according to claim 7) **characterized in that** said opaque coating (12; 29) is a layer of a coloring substance. 20
9. Shed roofing (1; 20; 30; 40; 50) according to claim 7) **characterized in that** said opaque coating (12; 29) is an opaque film applied by means of adhesive substances. 25
10. Shed roofing (1; 30; 50) according to either of the claims 3) or 5) **characterized in that** said at least one opaque area (7) is defined by an opaque filler element (13) inserted in said cavity (11). 30
11. Shed roofing (1; 30; 50) according to claim 10) **characterized in that** said opaque filler element (13) is a thermally and acoustically insulating material. 35
12. Shed roofing (1; 20; 50) according to claim 1) **characterized in that** each of said continuous shaped surfaces (9, 10; 24) has a plurality of ribbing elements (16; 26) evenly distributed one after the other along said longitudinal axis (X), and at right angles to said longitudinal axis (X), and crossing over said perimeter border (18; 21) and said ridge (8; 28). 40
13. Shed roofing (30; 40) according to claim 1) **characterized in that** each of said continuous shaped surfaces (34, 35; 44) has a smooth surface finish. 45
14. Shed roofing (1; 20; 30; 40) according to claim 1) **characterized in that** it comprises a pair of said converging pitches (2, 3; 22, 23; 32, 33; 42, 43), closed at each extremity by a respective end member (4). 50
15. Shed roofing (50) according to claim 1) **characterized in that** it comprises two or more pairs of said converging pitches (2, 3) aligned one after the other along said longitudinal axis (X), partially overlapping one another and closed at each extremity by a respective end member (4). 55
16. Shed roofing (1; 20; 30; 40; 50) according to claim 1) **characterized in that** it is made of thermosetting plastic material.

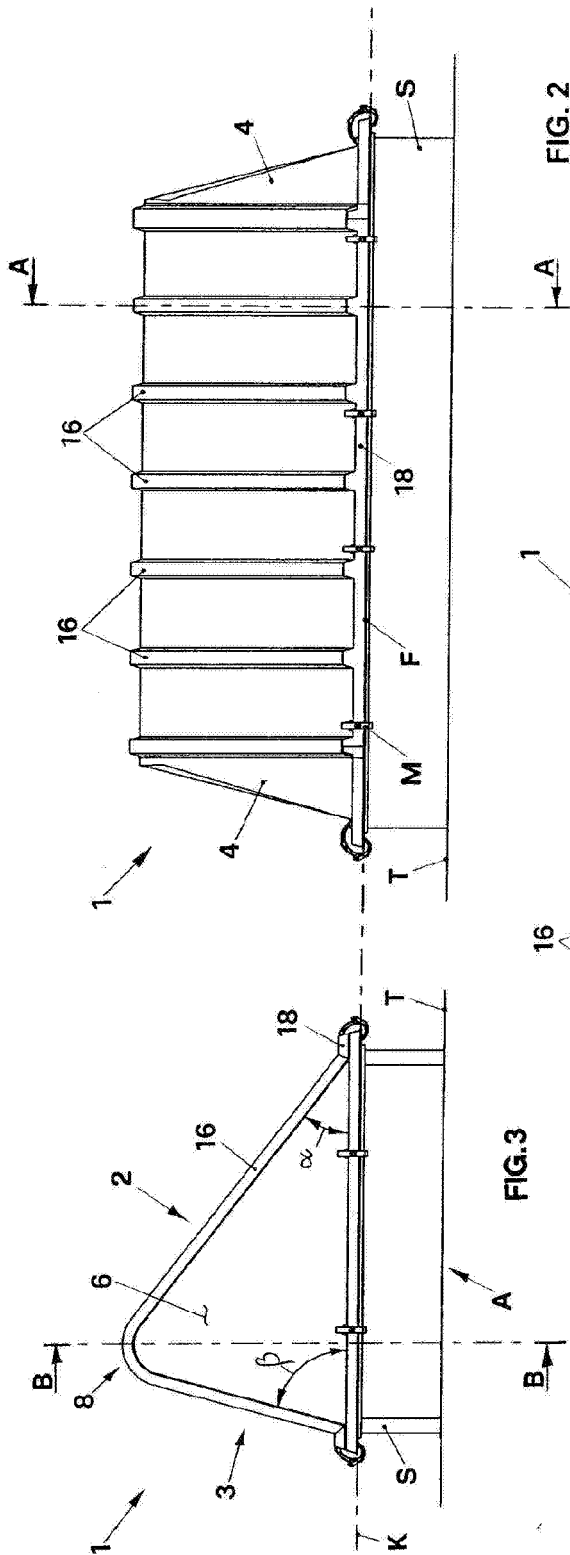


FIG. 2

FIG. 3

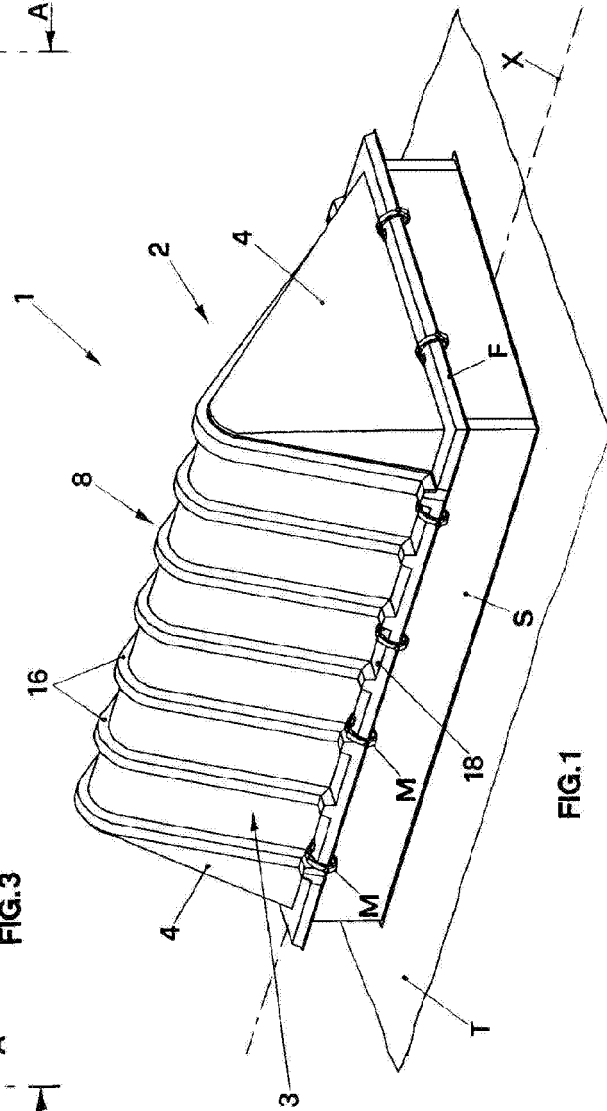


FIG. 1

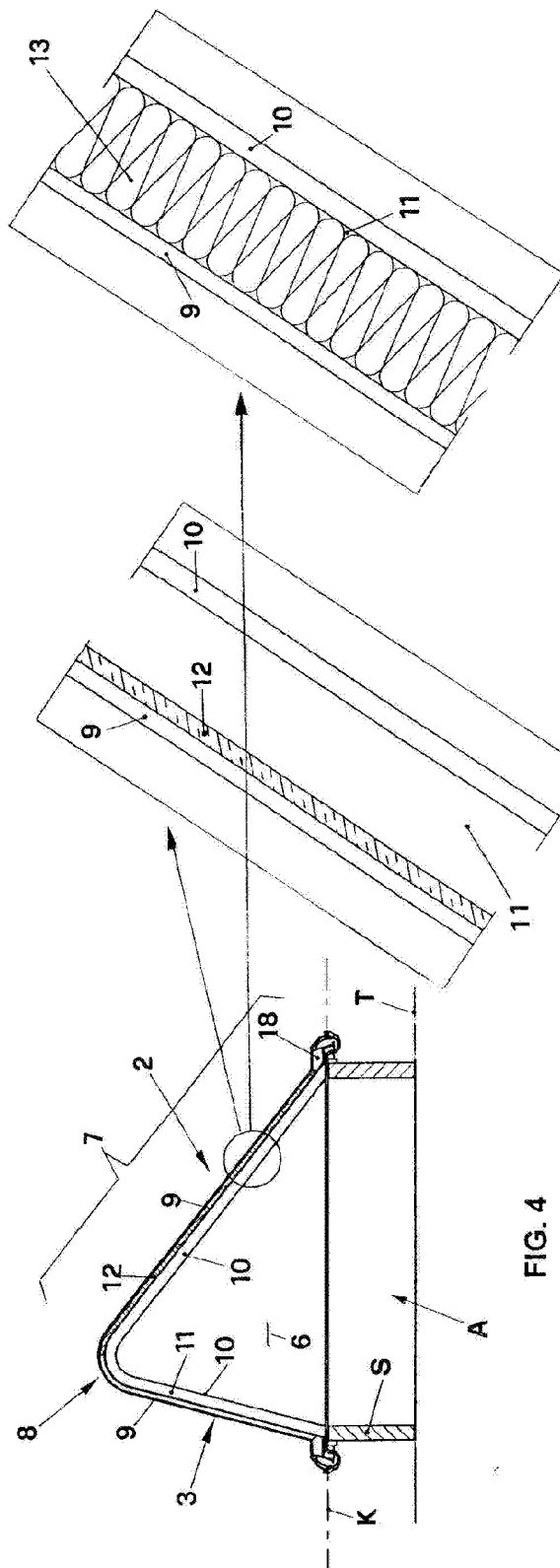


FIG. 4

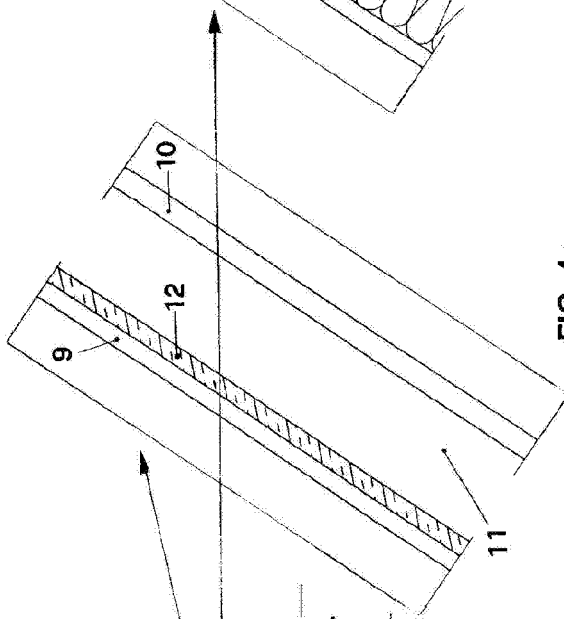


FIG. 4a

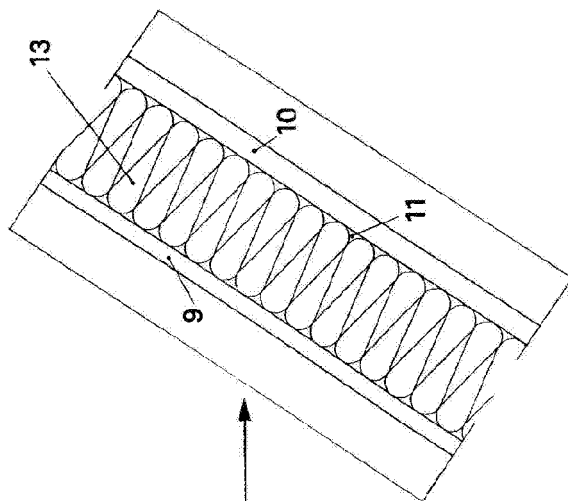


FIG. 4b

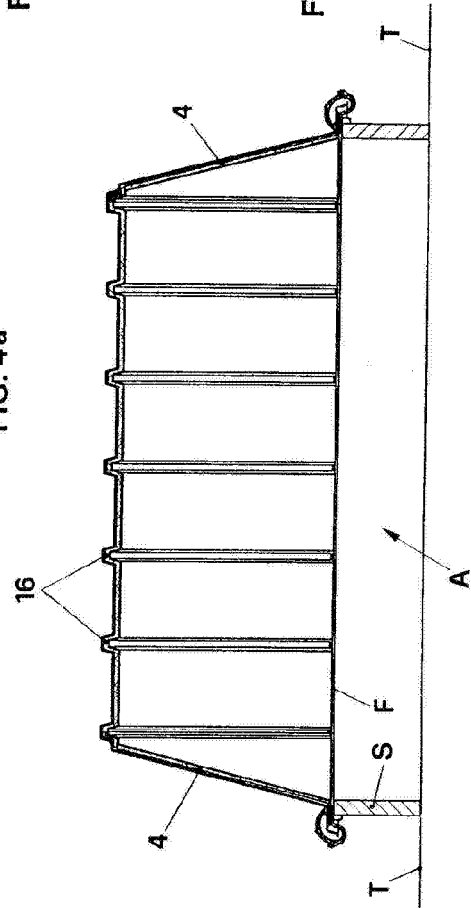


FIG. 5

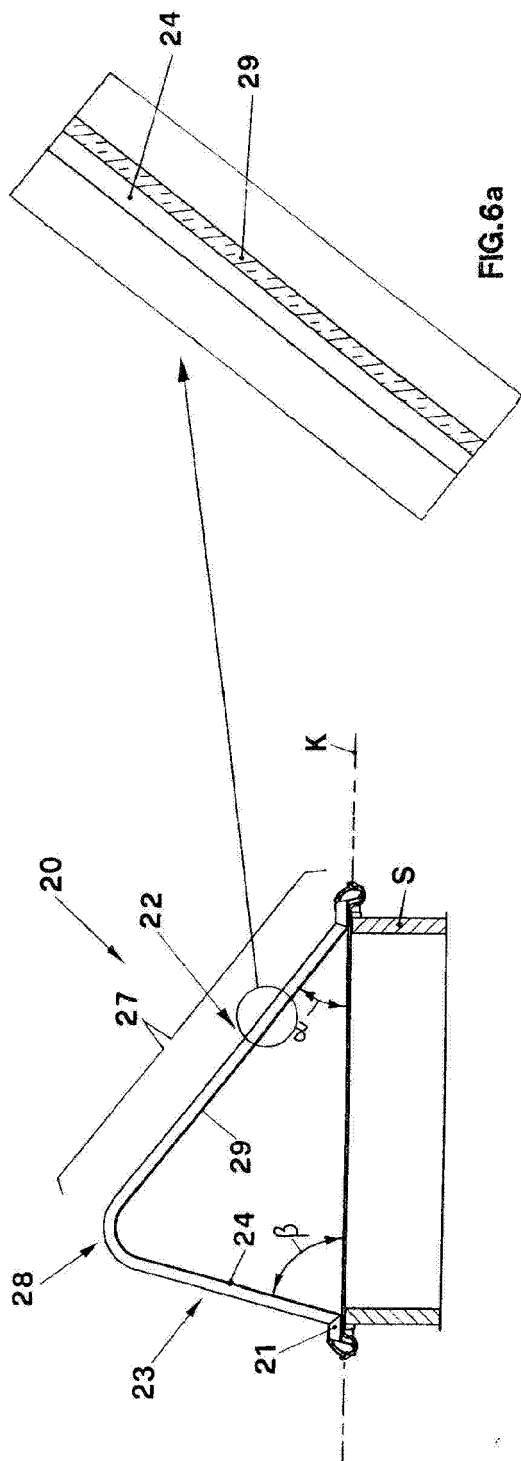


FIG. 6

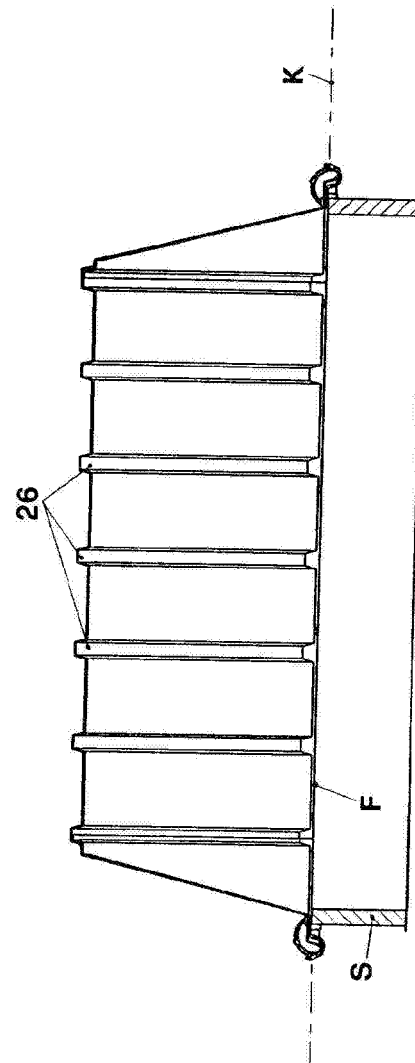


FIG. 7

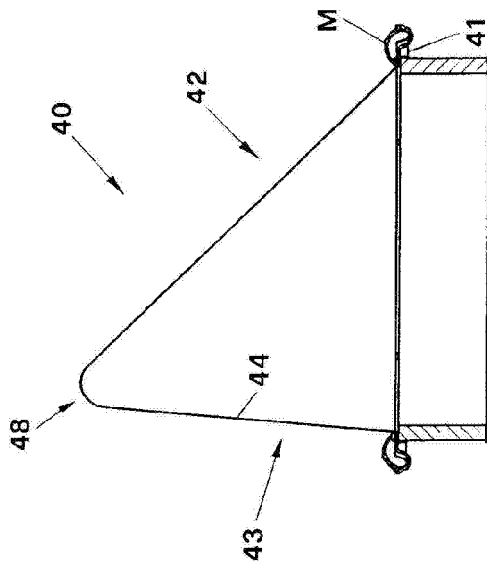


FIG. 10

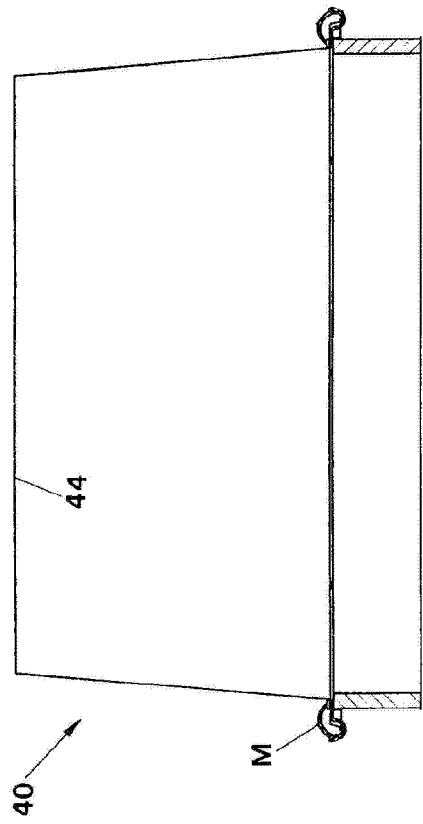


FIG. 11

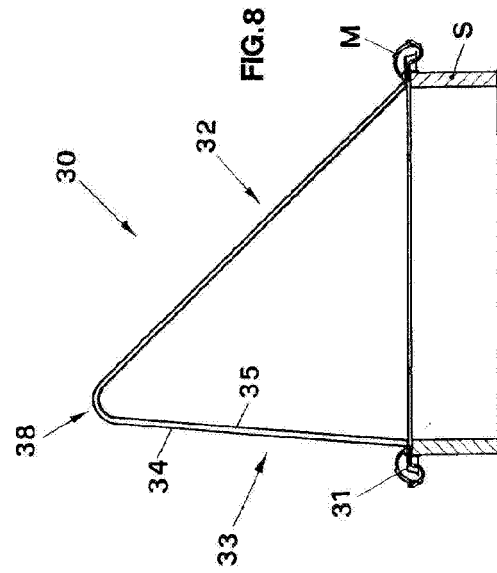


FIG. 8

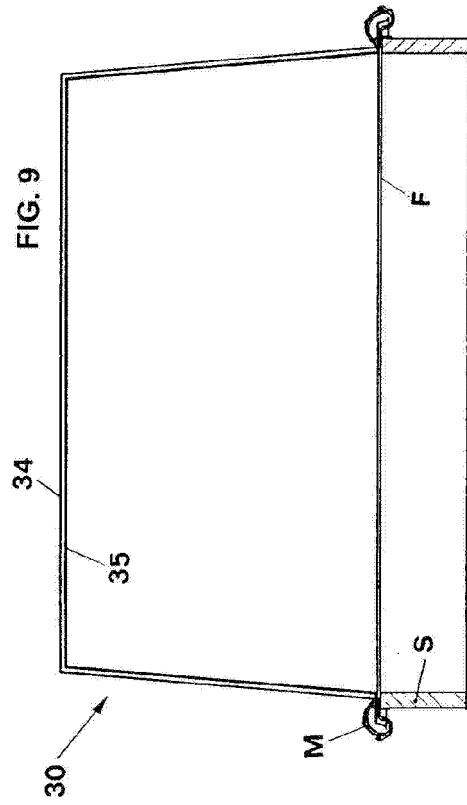


FIG. 9

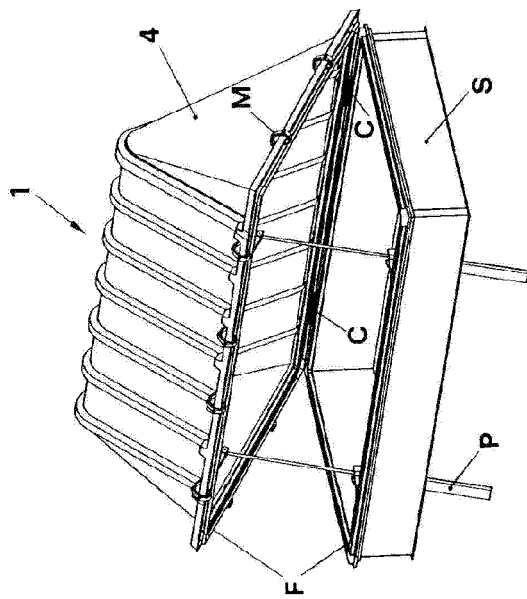


FIG. 14

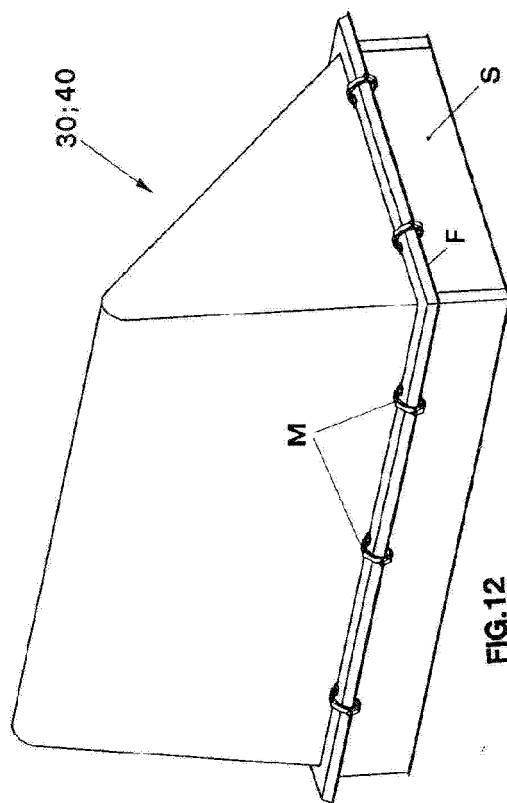


FIG. 12

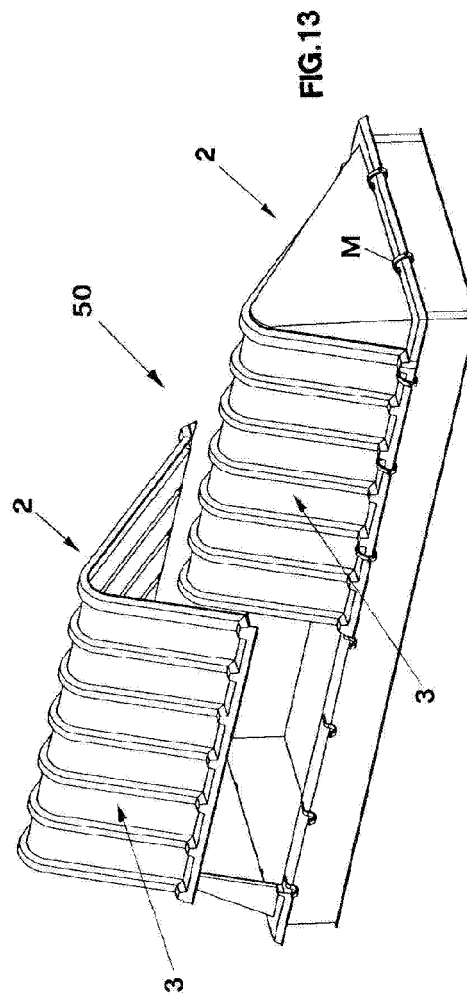


FIG. 13