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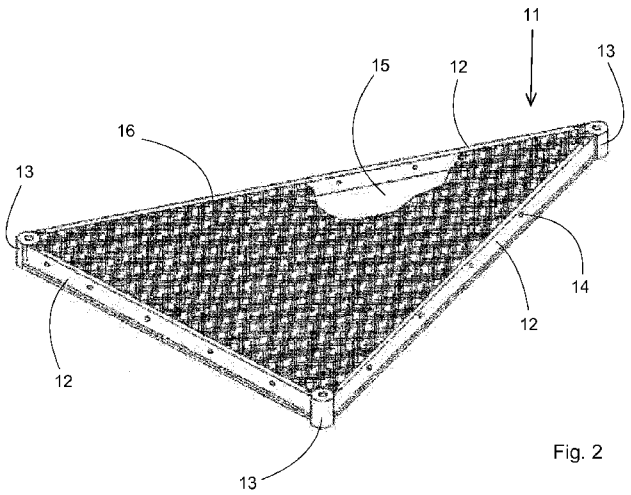


Fig. 2

(57) Abstract: The present invention relates to a building element (11) comprising a number of interconnected profiles (12), wherein at least three interconnected profiles define an opening (15) there between, which opening is substantially covered by a polymeric sheet material (16) connected to each of the at least three profiles, characterized in that each profile is provided with a longitudinal undercut groove (17) comprising a longitudinal undercut part (19) and a longitudinal entrance (18) thereto wherein a portion of the sheet material (30) is clamped between a wall (22, 23) of the undercut part and at least one clamping means (34) being located at least partially in the undercut part, which clamping means being locked by at least one locking means against movement with respect to the wall of the undercut part and which clamping means being rigid..

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BUILDING ELEMENT COMPRISING A NUMBER OF INTERCONNECTED PROFILES, BUILDING STRUCTURE AND METHOD FOR BUILDING A BUILDING STRUCTURE

The invention relates to a building element comprising a number of interconnected profiles, wherein at least three interconnected profiles define an opening there between, which opening is substantially covered by a sheet material connected to each of the at least three profiles. The invention further directs to a building structure comprising at least one of said building elements and to a method for building a building structure.

An example of a building element and a building structure, which is known from GB1109139, finds uses in housing apparatus such as radar equipment and is commonly known as a radome. The known building structure comprises a number of interconnected triangular component parts. Each triangular component part comprises three interconnected rigid members defining an opening there between, which opening is substantially covered by a sheet material connected to each of the three rigid members. Each rigid member comprises a flap portion near an edge thereof, which flap portion defines together with the edge a V-shape channel. An adhesive material is spread into the V-shape channel after which an edge of the sheet material is inserted into the V-shape channel. Subsequently, the flap portion is rolled down over the edge of the rigid member so that after the adhesive is cured, the sheet material is both adhesively and mechanically clamped to the rigid members. After a number of such triangular component parts have been made, the triangular component parts are connected to each other to form the building structure. Other examples of building elements and building structures are for instance disclosed in document US2877877, which discloses a metallic building structure and particularly a prefabricated framework for securing anchoring a plurality of metallic sheets to present a smooth uninterrupted surface having no projections such as bolts. US2008/0263835A1 discloses a device for fixing a fabric that includes a frame of polygonal shape that comprises at least one insert, the fabric being wedged between the frame and the insert, the frame including a groove with a shrunken mouth and the insert including a horseshoe-shaped body that is elastically deformable and can be inserted forcibly into the groove. DE3842089A1 describes a device for fixing a sheet material comprising a profile and elastically deformable fastening elements.

Also other uses of the building structure are possible such as in theatres, swimming pools, hospitals and the like.

A disadvantage of the known building structure is that during its assembly the ambient environmental conditions must be advantageous (e.g. minimal winds, no precipitation etc.) in order to reduce the risk of collapsing of a partially assembled building structure due to for example wind forces acting on the relatively large surface of the sheet material. Another disadvantage is that in case of damaging of the sheet material, a complete triangular component part needs to be removed and replaced.

The object of the invention is to provide a building structure which can easily be built and maintained, whilst the sheet material is firmly fixed to the interconnected profiles.

This object is achieved by a building element that comprises a number of interconnected profiles, wherein at least three interconnected profiles define an opening there between, which opening is substantially covered by a polymeric sheet material connected to each of the at least three profiles, characterized in that each profile is provided with a longitudinal undercut groove comprising a longitudinal undercut part and a longitudinal entrance thereto wherein a portion of the sheet material is clamped between a wall of the undercut part and at least one clamping means being located at least partially in the undercut part, which clamping means being locked by at least one locking means against movement with respect to the wall of the undercut part and which clamping means being rigid.

Advantageously, the building element according to the present invention provides , a firm connection between the sheet material and the profile in the building element and the building structure of the invention. In case of relatively large forces on the sheet material due to for example heavy winds, the clamping means maintains the same position with respect to the undercut part so that the sheet material remains firmly clamped there between. By releasing the locking means and removing the clamping means, the sheet material can be easily removed e.g. for inspection or maintenance and replaced in case damages occur.

The building element of the invention may also be easily formed, e.g. by first attaching the profiles to each other to define an opening there between and thereafter mounting the sheet material by connecting it to the profiles in order to cover said opening. In one preferred way of mounting said sheet material to the profiles, a portion of said sheet material is inserted into said undercut part after which the

clamping means are inserted into said undercut part. Preferably, the clamping means are inserted into the undercut part through the longitudinal entrance of the longitudinal undercut groove, so in a direction perpendicular to the longitudinal direction of the groove.

The portion of the sheet material is preferably clamped in the undercut part by a number of spaced apart clamping means. Preferably, the sheet material is connected to the profile by a first clamping means at a first position along the longitudinal undercut groove, where after the sheet material is connected to the profile by a second clamping means at a second position along the longitudinal undercut groove. This has the advantage that at each position the sheet material can be tensioned between the clamping means before the clamping means are being locked with the locking means. A further advantage is that the sheet material can be gradually connected to the profile in longitudinal direction by a single person.

The clamping means in the building element according to the present invention are rigid. It should be noted that the term “rigid" as used herein defines a structure which will not, without modification, adapt to a shaped surface. The clamping means are made of a rigid material. The term “rigid material” as used herein is meant to encompass rigid materials, semi-rigid (partially flexible materials), and substantially any materials that are not or are partially flexible or elastic, i.e. that display no or very low elastic deformation (e.g. bending, stretching, twisting) under load. For instance, the rigid material can have a Young modulus of higher than 5, higher than 10, higher than 30, higher than 50, higher than 100 or higher than 200 GPa and up to 1000 GPa, as measured with ASTM E111-04 (2010). The rigid material may be selected from a group comprising metals such as (stainless or galvanized) steel, aluminum, brass or bronze or carbon fiber, composites, ceramics, glass, sapphire, plastic, or the like.

The edge of the sheet material is preferably located outside the longitudinal undercut groove, whilst the portion of the sheet material being clamped in the undercut part is located at a distance of the edge of the sheet material. After the sheet material is being positioned between the clamping means and the wall of the undercut part, the sheet material may be tensioned by pulling at the edge thereof. In this manner an optimized contact surface between the clamping means and the sheet material may be obtained.

The sheet material can be tensioned between the profiles, for example, by pulling on the edge material, then locking the clamping means, and, if desired cutting the excess sheet material. It is also possible to attach the sheet

material at the premises of the manufacturer prior to field use. An advantageous way of tensioning said sheet is by using metal grommets installed on said sheet via e.g. puncturing holes. After tensioning and locking the excess sheet material may then be removed.

Another embodiment of the building element according to the invention is characterised in that the clamping means in the building element according to the present invention preferably comprise a bolt and a nut. The bolt is typically threated into the nut. Such clamping means are well known for the skilled person in the art. The clamping means in the building element according to the invention preferably comprise a roll-in T-nut. A roll-in T-nut can easily be inserted through the longitudinal entrance into a longitudinal undercut part. Such a roll-in T-nut preferably comprises a relatively large smooth curved surface against which the sheet material is to be clamped, since such embodiment may reduce the risk of damaging the sheet material.

Another embodiment of the building element according to the invention is characterised in that the locking means comprises a bolt, which is threaded into the roll-in T-nut. Such a locking means can easily be attached to and removed from the roll-in T-nut. The locking force can easily be adjusted by tightening the bolt.

Another embodiment of the building element according to the invention is characterised in that the clamping means comprises a drop-in T-stud. Such a drop-in T-stud can easily be inserted into the undercut part by a single person by grasping a bolt of the drop-in T-stud with one hand and inserting it into the undercut part whilst maintaining the sheet material in the undercut part with another hand.

Another embodiment of the building structure according to the invention is characterised in that the locking means comprises a nut, which is threaded onto the drop-in T-stud. Such a locking means can easily be attached to and removed from the bolt of the drop-in T-stud. The locking force can easily be adjusted by tightening the nut.

The bolt and the nut in the clamping means in the building element according to the present invention are rigid, i.e. comprise of a rigid material, as defined herein above. Preferably, the rigid material of the clamping means is a metal selected from the group comprising steel, aluminium, bronze, brass, and the like.

Another embodiment of the building element according to the invention is characterised in that each of the at least three profiles are provided with the longitudinal undercut groove, and at least three portions of the sheet material are clamped in the undercut part of the respective longitudinal undercut groove by the at

least one clamping means being located at least partially in the undercut part, which clamping means being locked by the at least one locking means against movement with respect to the longitudinal undercut groove. In this manner the sheet material can easily be connected along all sides to the profiles. The sheet material only needs to be cut in the desired shape and can easily be replaced in case of a damaged sheet material.

A sheet is typically a portion of a material having a length dimension, a width dimension and a thickness dimension, wherein the thickness dimension is significantly smaller than the length and width. The width and the length of the sheet material are only limited by the practicalities, such as by production equipment; and by the size and shape of the building element. For instance, if the building structure is a radome, the sheet in each building element may have a width of at least 200 mm, preferably at least 500 mm, more preferably at least 1000 mm, even more preferably at least 2000 mm, even more preferably at least 3000 mm, even more preferably at least 5000 mm and most preferably at least 10000 mm. For instance, the surface area of the sheet for a building element (e.g. in a radome) comprising three interconnected profiles may be at least 0.005 m^2, preferably at least 5 m^2, more preferably at least 10 m^2 and more preferably at least 15 m^2. The average thickness of the sheet may be between 0.001 mm and 200 mm, preferably at least 0.01 mm, more preferably at least 0.03 mm, even more preferably at least 0.6 mm, even more preferably at least 1 mm, even more preferably at least 5 mm and most preferably at least 10 mm and at most 150 mm. The sheet may be a monolayer or a multilayer sheet, wherein multiple layers can be the same or different materials. The sheet is preferably flexible, i.e. it may be folded or bended. A measure of the flexibility of said sheet may be when a sample of said sheet having a supported end, i.e. the end thereof which is placed on a rigid support such as a table; a free end, i.e. the unsupported end; and a length of 500 mm between the rigid support and the free end, will deflect under its own weight with an angle of preferably more than 3°, more preferably more than 10°, even more preferably of more than 30°, with respect to the horizontal. Such a sheet is known in the art and is disclosed for instance in document WO2011045321, WO2012/110091 and WO2012/126885.

By the term “polymeric sheet material” is herein understood that the sheet material comprises a polymer. Any polymer that is suitable to be formed in a sheet can be employed in the sheet of the building element according to the present invention, such as any thermoplastic polymers, e.g. polyesters, polyolefin, polyamides, polyacrylates, or the like. Preferably, the sheet material consists of a polymer. More

preferably, the sheet material comprises polyethylene fibers, preferably a woven fabric comprising polyethylene fibres, an Esscolam-membrane, a Gore-Tex-membrane and/or a Teflon-coated fiberglass membrane. The sheet may further comprise any conventional additives, e.g. stabilizers, antioxidants, lubricants and the like in an amount of 0 to 30 wt%.

In particular a woven fabric comprising polyethylene fibres, e.g. ultra high molecular weight polyethylene (UHMWPE) fibers, is very suitable to be used as sheet material for a radome since such a fabric can be produced relatively thin whilst having a desired strength. Furthermore, it was observed that when the building structure of the invention is used as a radome, the interference of such fabric with the electromagnetic waves emitted and received by an antenna protected by the radome is limited. A suitable embodiment of a sheet material containing a woven fabric comprising UHMWPE fibers is, for example, known from WO2011/045321 and WO 2012/126885, included herein by reference. Preferably, said woven fabric is impregnated and/or coated with a matrix material selected from the group consisting of a thermoset material, thermoplastic material, elastomer material and plastomer material. Most preferred matrix material is a plastomer, more preferably an ethylene octane copolymer, e.g. Exact® from DexPlastomers (NL).

Another embodiment of the building element according to the invention is characterised in that the profile is made of extruded aluminium, metal or a low dielectric material. By extruding aluminium, a relatively light profile with a desired shape of the longitudinal undercut groove can easily be made. Also other metals or low dielectric materials can be used and for example be extruded into the desired shape. The building element can be made in advance after which a number of building elements can be interconnected to form the building structure. It is also possible to connect a number of sets of at least three interconnected profiles to each other after which the sheet material is connected to each set of interconnected profiles.

The invention also relates to a building structure comprising at least one building element according to the invention. Preferably, the building structure is a radome.

The invention also relates to a method for building the building structure according to the invention wherein a number of profiles are being interconnected to form an erected frame. Each profile is provided with a longitudinal undercut groove, which longitudinal undercut groove comprises a longitudinal undercut part and a longitudinal entrance thereto. The erected frame comprises a number of

sets of at least three interconnected profiles. Each set defines an opening between the at least three interconnected profiles. After the frame has been erected each opening is being substantially covered by a polymeric sheet material connected to each of the at least three profiles by clamping a portion of the sheet material in each profile between a wall of the undercut part and at least one clamping means being located at least partially in the undercut part. The clamping means is locked by at least one locking means against movement with respect to the wall of the undercut part and which clamping means being rigid.

By covering the openings between the profiles with the sheet material after the frame has been erected, the sheet material do not hinder the erecting of the frame and the frame can be erected even under relatively harsh weather conditions. The sheet material can be connected to the profiles after erecting the frame and at any desirable and suitable moment.

The invention also relates to the use of the building element as described herein in a radome.

These and other aspects of the invention will now be described in more detail, with reference to the appended drawings showing currently preferred embodiments of the inventions, wherein:

Figure 1 shows a building structure according to the prior art,

Figure 2 shows a building element of a building structure according to the invention,

Figure 3 shows a perspective view of a part of the building element as shown in figure 2, with a first embodiment of a clamping device of comprising a drop-in T-nut,

Figure 4 shows a side view of the building element as shown in figure in figure 2, with a second embodiment of a clamping device of comprising a roll-in T-nut,

Figure 5 shows a perspective view of the roll-in T-nut as shown in figure 4,

Figure 6A-6C show three steps for mounting the roll-in T-nut as shown in figure 5 in a profile of a building structure according to the invention,

Figure 7A and 7B show a front view and side view of a third embodiment of a clamping device of comprising drop-in T-stud.

In the figures, same reference numbers are used for corresponding elements.

Figure 1 shows a building structure 1 according to the prior art, comprising a platform 2 on which a geodesic or spherical structure 3 is mounted. The spherical structure 3 is partly cut away to be able to show the interior thereof. Inside the spherical structure 3 a radar antenna structure can be located, in which case the building structure 1 forms a radome. The building structure 1 comprises a number of preformed triangular parts 4 which are connected to each other.

Figure 2 shows a building element 11 of a building structure according to the invention, comprising three longitudinal extruded aluminium profiles 12 which are interconnected by means of aluminium corner elements 13. Each profile 12 is provided with a number of spaced apart holes 14 for bolts (not shown) to connect a profile of one building element 11 to a profile 12 of another building element 11. The interconnected profiles 12 define an opening 15 there between. The opening 15 is substantially covered by a sheet material 16 connected to each of the three profiles 12. From a number of such building elements 11 a building structure according to the invention can be made in the same spherical shape as the building structure 1.

Figure 3 shows a perspective view of a part of the building element 11 as shown in figure 2. The profile 12 is provided with a longitudinal undercut groove 17 comprising a longitudinal entrance 18 and a longitudinal undercut part 19. As can better be seen in figure 4, wherein a side view of the same profile 12 is being shown, the longitudinal entrance 18 is bounded by two longitudinal wall portions 20, 21 extending parallel to each other and which are spaced apart by a distance b. The longitudinal undercut part 19 comprises two wall portions 22, 23 extending perpendicular to the wall portions 20, 21 and in opposite directions to each other. The wall portions 22, 23 extend parallel to a front side 24 of the profile 12 but are located at a distance d thereof. Opposite ends 25, 26 of the wall portions 22, 23 are connected to each other by a curved wall portion 27. The wall portions 20, 21, the wall portions 22, 23 and the front side 24 of the profile 12 define two longitudinal flanges 28, 29 which form the undercut of the groove 17.

The building element 11 as shown in figure 3 further comprises a first embodiment of clamping devices. Each clamping device comprises a drop-in T-nut 30 with a central nut part 31 and two side flanges 32. Each side flange 32 is provided with a number of parallel ridges 33. The drop-in T-nut 30 has a width B1 which is smaller than the distance b between the wall portions 20, 21 and a length B2 which is larger than the distance b.

The building element 11 also comprises locking means. Each locking means comprises a bolt 34 with a shaft 35 that can be treaded into the central nut part 31 of the drop-in T-nut 30 and a head 36 with a larger diameter than the shaft 35.

The sheet material 16 comprises preferably a woven fabric comprising polyethylene fibres, like a UHMWPE based membrane, as known from WO2011/045321 of applicant. Such membrane combines a high strength with a relatively small thickness. Essentially, the strength of the UHMWPE fibre in a woven fabric allows the wind load forces to transfer from the fibre directly into the profiles 12. The sheet material 16 may also comprise an Esscolam-membrane, a Gore-Tex membrane and/or a Teflon-coated fiberglass membrane. To connect the sheet material 16 to the profile 12, a main part 37 of the sheet material 16 is positioned at the level of the lower wall portion 20, an edge portion 38 of the sheet material 16 is positioned at the level of the upper wall portion 21, whilst a portion 39 of the sheet material 16 between the main part 37 and edge portion 38 is folded through the longitudinal entrance 18 into the longitudinal undercut part 19. To maintain the sheet material 16 in the longitudinal undercut groove 17, a drop-in T-nut 30 is brought into a position wherein the length B2 extends parallel to the longitudinal direction X of the longitudinal undercut groove 17 and the width B1 extends in a direction Z. In this position the drop-in T-nut 30 is inserted through the longitudinal entrance 18 into the longitudinal undercut part 19. As soon as the side flanges 32 are fully located in undercut part 19, the drop-in T-nut 30 is rotated over 90 degrees in a direction R about the Y-axis so that the flanges 32 are located opposite to the wall portions 22, 23 with the sheet material 16 positioned there between. If desired a tensioning force can be applied on the edge portion 38 to tension the main part 37 of the sheet material 16. While tensioning the sheet material 16, the clamping device needs to be kept at a distance of the wall portions 22, 23 to enable the sheet material to slide along the clamping means. After tensioning, the shaft 35 of the bolt 34 is threaded into the central nut part 31 of the drop-in T-nut 30, until the flanges 32 of the drop-in T-nut 30 with the ridges 33 are pressed against the wall portions 22, 23 with the sheet material 16 between them and the head 36 of the bolt 34 is pressed on both sides of the longitudinal entrance 18 against the front side 24 of the profile 12. In the same manner a number of drop-in T-nut 30 and bolts 34 are connected to the profile 12 at desired intervals. The portion 39 of the sheet material 16 is now firmly connected to the profile 12 and no movement of the sheet material 16 and /or the drop-in T-nuts 30 with respect to the profile 12 is possible. However, in case that the sheet material 16 need to be replaced, the bolts 34

are simply removed, the drop-in T-nuts are rotated over 90 degrees in a direction opposite to the direction R and are removed as well, after which the portion 39 of the sheet material 16 can be removed from the longitudinal undercut groove 17 through the longitudinal entrance 18. In the same manner as described above, the sheet material 16 is connected to all the profiles 12.

Figure 5 shows a perspective view of a perspective view of another embodiment of a clamping means comprising a roll-in T-nut 40. The roll-in T-nut 40 is half-cylindrical shaped and comprises a main surface 41 and a curved surface 42. A threaded hole 43 extends perpendicular to the main surface 41. The main surface and the curved surface are rigid, i.e. made of a rigid material as defined herein above. The main surface 41 is furthermore provided with a handle 44. The handle may be made of a flexible, semi-flexible or a rigid material and may allow the clamping means to be mounted in a predetermined angle in a predetermined direction of the profile of the building element of the invention (such as shown in Figures 6A-C). The handle may be positioned at substantially any location of the main surface of the clamping means and may span across one or more dimensions of the main surface (e.g., across a width, length, or height of the main surface). In some instances, the main surface may be substantially flat or planar, may represent a three-dimensional object (e.g., a molded or machined component), or the like.

Figure 6A-6C show in three steps the mounting of the roll-in T-nut 40 as shown in figure 5 in a profile 45 of a building structure according to the invention. The profile 45 differs from the profile 12 in that it comprises two parallel longitudinal undercut grooves 17, one on the front side 24 and one on the backside 46. For the sake of clarity the sheet material 16 is not shown in the figures 6A-6C. To insert the roll-in T-nut 40 in the undercut part 19, the roll-in T-nut 40 is brought into a position wherein the main surface 41 extends perpendicular to the front side 24. In this position the roll-in T-nut 40 can be guided through the longitudinal entrance 18 (see figure 6A). As soon as the roll-in T-nut 40 is partly located inside the undercut part 19, the roll-in T-nut 40 can be rotated about the longitudinal direction X (see figure 6B) until the roll-in T-nut 40 is fully located inside the undercut part 19 and can be slit in the Z-direction so that the main surface 41 is located opposite both wall portions 22, 23 (see figure 6C). This position of the roll-in T-nut 40 is also shown in figure 4. A bolt 36 can then be treaded into the hole 43 to press the main surface 41 against the wall portions 22, 23 wherein the sheet material 16 is being clamped between the main surface 41 and the

wall portions 22, 23. The handle 44 can be used to facilitate the insertion and/or removal of the roll-in T-nut 40 from the groove 17.

Figures 7A and 7B show a front view and side view of a third embodiment of a clamping device suitable for the building structure and building element according to the invention. The clamping device comprises a drop-in T-stud 50 with a central part 51 and two side flanges 52. Each side flange 52 is provided with a number of parallel ridges 53. The central part 51 comprises a longitudinal threaded shaft 54 extending perpendicular to the flanges 52. The drop-in T-stud 50 cooperates with a locking means comprising a nut. (not shown). The drop-in T-stud 50 can be inserted in the groove 17 in the same manner as the drop-in T-nut 30.

It is also possible that the edge portion 38 is located inside the groove 17. However, having the edge portion 38 of the sheet material 16 located outside the groove 17 has the advantage that a tension force can be applied to the edge portion 38 of the sheet material 16 whilst locking the locking means.

It is also possible to connect a number of profiles 12 to one corner element 13 wherein one profile 12 forms a longitudinal side of two adjacent openings and one corner element 13 forms the corner of a number of openings 15.

It is also possible to connect four or more profiles 12 to each other to form a square-shaped, rectangular-shaped, pentagon-shaped opening.

It is also possible to have a clamping means having a similar length in longitudinal direction X as the edge portion 38 of the sheet material 16.

Having a number of spaced apart clamping means has the advantage that one person can easily attach the sheet material to the profiles by locally inserting a part of the sheet material 16 inside the groove 17, applying the clamping means and the locking means and then continue this process at another part of the sheet material. By increasing the number of clamping means a more even wind loading distribution from the sheet material to the profiles is obtained.

The profiles can also be made of other materials or of a low dielectric material like pultruded fiberglass.

List of references:

1 building structure
2 platform
3 spherical structure
4 triangular parts

11 building element
12 profiles
13 corner element
14 hole
15 opening
16 sheet material
17 groove
18 entrance
19 undercut part
20 wall portion
21 wall portion
22 wall portion
23 wall portion
24 front side
25 end
26 end
27 wall portion
28 flange
29 flange
30 T-nut
31 nut part
32 side flange
33 ridge
34 bolt
35 shaft
36 head
37 part
38 portion
39 portion
40 T-nut
41 surface
42 surface
43 hole
44 handle
45 profile

46	back side
50	T-stud
51	part
52	flange
53	ridge
54	shaft
B1	width
B2	length
b	distance
X	direction
Z	direction
R	direction

CLAIMS

1. A building element comprising a number of interconnected profiles, wherein at least three interconnected profiles define an opening there between, which opening is substantially covered by a polymeric sheet material connected to each of the at least three profiles, characterized in that each profile is provided with a longitudinal undercut groove comprising a longitudinal undercut part and a longitudinal entrance thereto wherein a portion of the sheet material is clamped between a wall of the undercut part and at least one clamping means being located at least partially in the undercut part, which clamping means being locked by at least one locking means against movement with respect to the wall of the undercut part and which clamping means being rigid.
2. The building element according to claim 1, characterised in that the portion of the sheet material is clamped in the undercut part by a number of spaced apart clamping means.
3. The building element according to claim 1 or 2, characterized in that the edge of the sheet material is located outside the longitudinal undercut groove, whilst the portion of the sheet material being clamped in the undercut part is located at a distance of the edge of the sheet material.
4. The building element according to any one of the preceding claims, characterized in that the clamping means comprise a bolt and a nut.
5. The building element according to any one of the preceding claims, characterized in that the clamping means comprises a roll-in T-nut.
6. The building element according to claim 4, characterized in that the locking means comprises a bolt, which is threaded into the roll-in T-nut.
7. The building element according to any one of the preceding claims 1-3, characterized in that the clamping means comprises a drop-in T-stud.
8. The building element according to claim 6, characterized in that the locking means comprises a nut, which is threaded onto the drop-in T-stud.
9. The building element according to any one of the preceding claims, characterized in that at least three portions of the sheet material are clamped in the undercut part of the respective longitudinal undercut groove by the at least one clamping means being located at least partially in the undercut part, which clamping means being locked by the at least one locking means against movement with respect to the longitudinal undercut groove.

10. The building element according to any one of the preceding claims, characterized in that the sheet material comprises a woven fabric comprising polyethylene fibres, an Esscolam-membrane, a Gore-Tex-membrane and/or a Teflon-coated fiberglass membrane.

11. The building element according to any one of the preceding claims, characterized in that the profile is made of extruded aluminium, metal or a low dielectric material.

12. A building structure comprising at least one building element according to any one of the preceding claims.

13. The building structure according to claim 11, wherein the building structure is a radome.

14. Method for building the building structure according to claim 11 or claim 12, characterized in that a number of profiles are being interconnected to form an erected frame, wherein each profile is provided with a longitudinal undercut groove, which longitudinal undercut groove comprises groove comprises a longitudinal undercut part and a longitudinal entrance thereto, which erected frame comprises a number of sets of at least three interconnected profiles, wherein each set defines an opening between the at least three interconnected profiles, wherein after the frame has been erected each opening is being substantially covered by a polymeric sheet material connected to each of the at least three profiles by clamping a portion of the sheet material near each profile between a wall of the undercut part and at least one clamping means being located at least partially in the undercut part, which clamping means being locked by at least one locking means against movement with respect to the wall of the undercut part and which clamping means being rigid.

15. Use of the building element according to any one of claims 1 to 10 in radomes, theatres, swimming pools and hospitals.

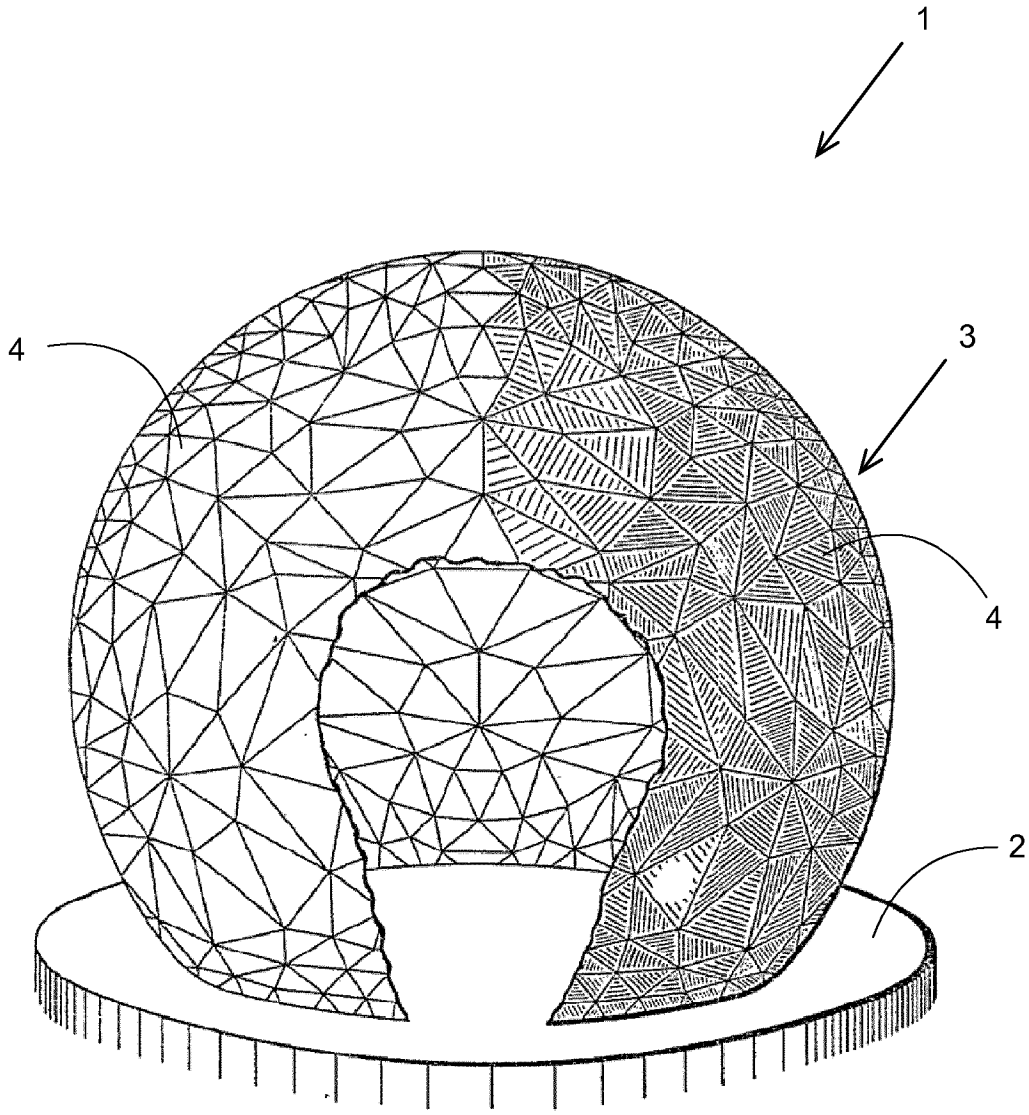


Fig. 1

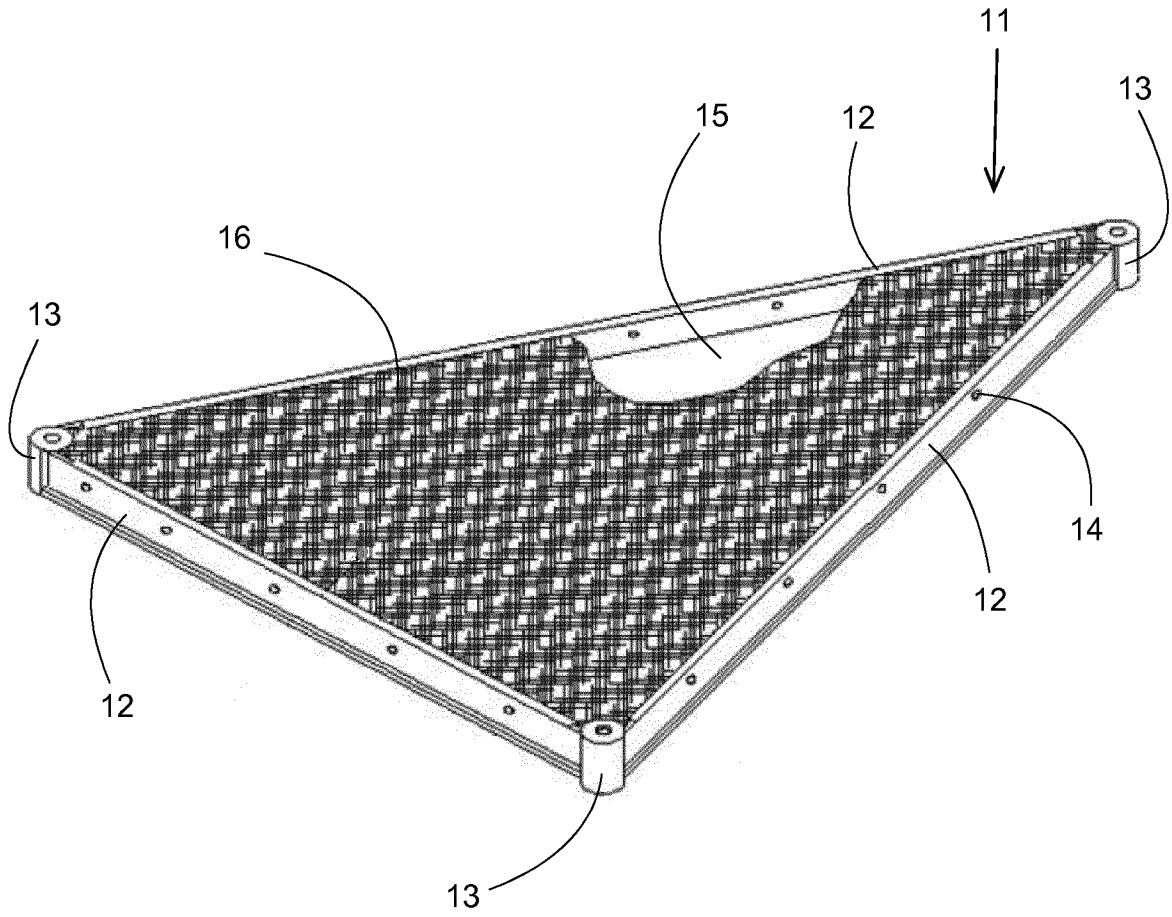
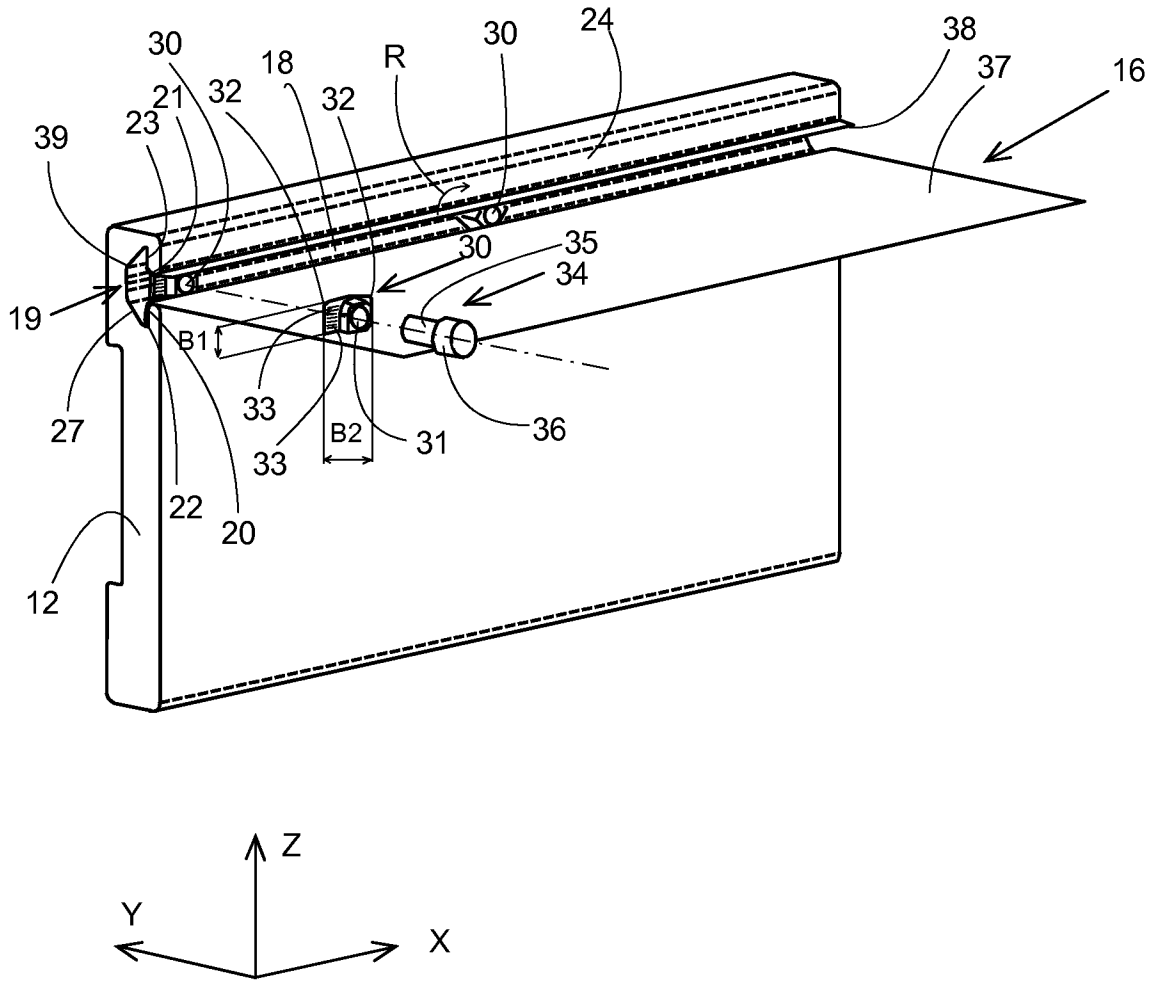


Fig. 2


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Y
X

Fig. 3

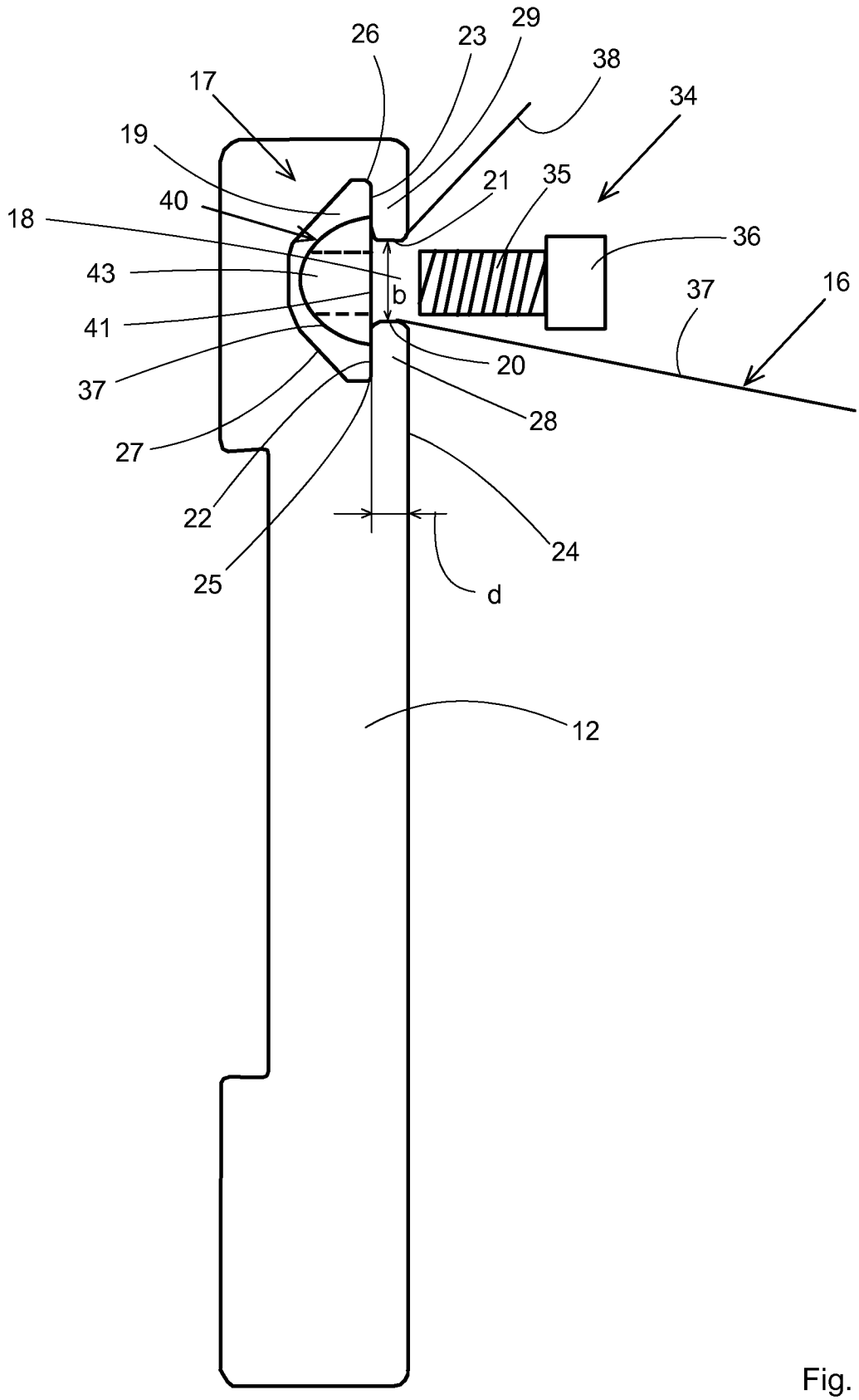

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Fig. 4

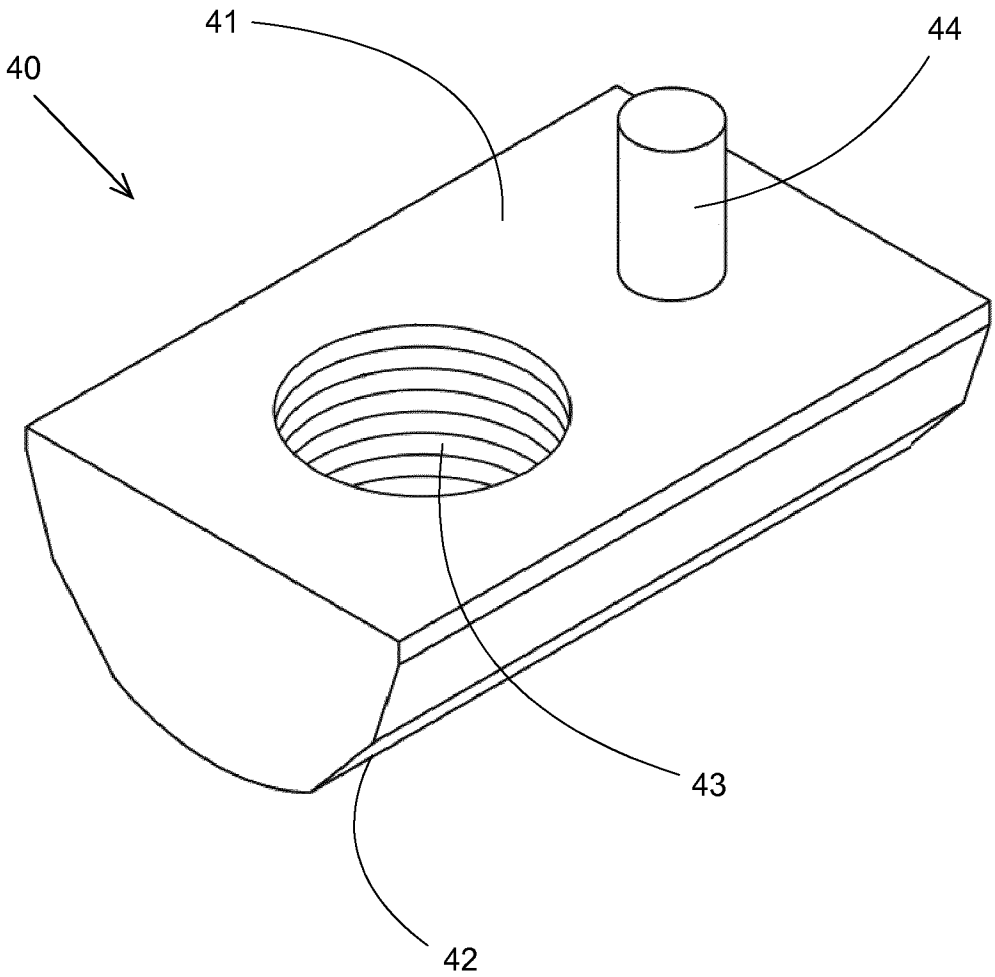


Fig. 5

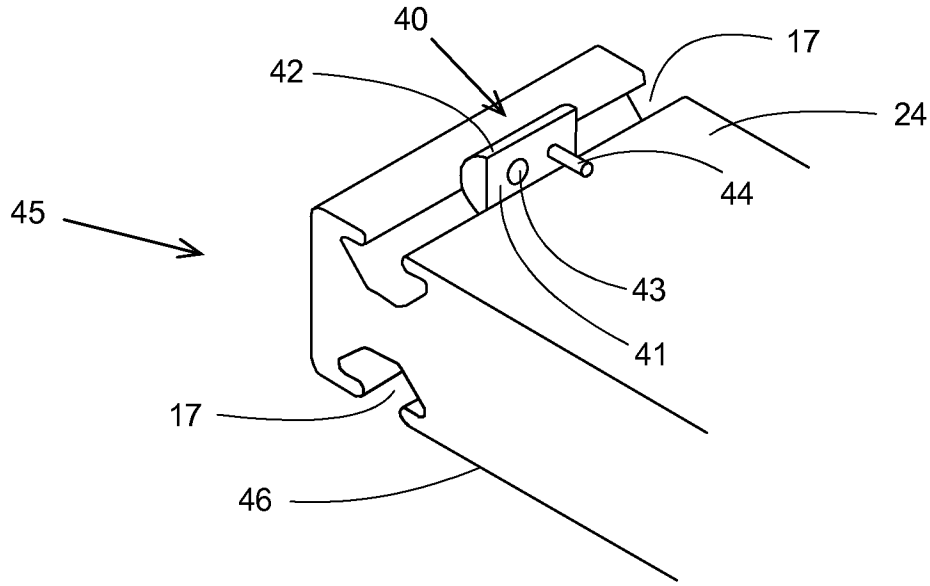


Fig. 6A

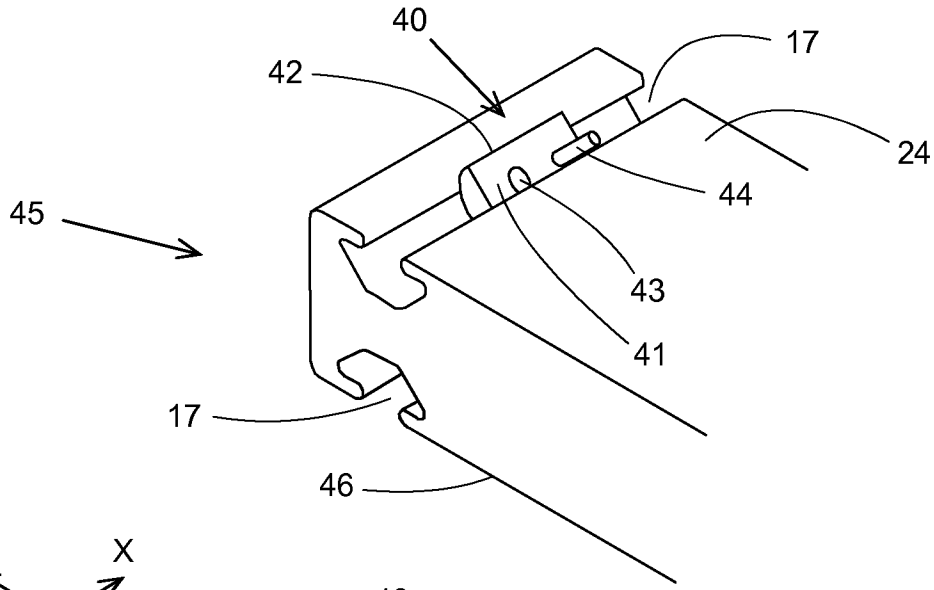


Fig. 6B

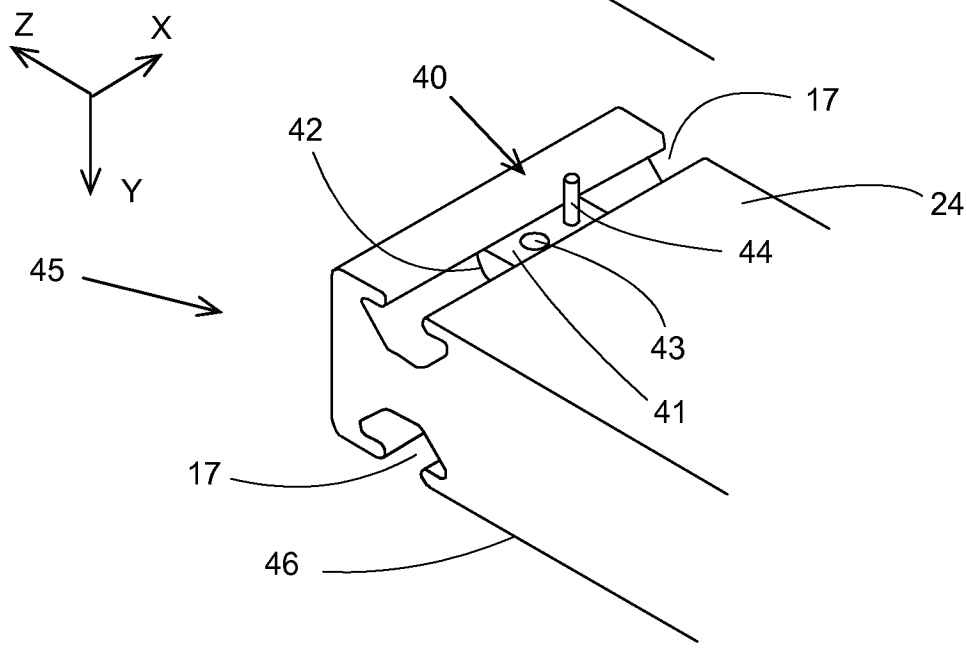


Fig. 6C

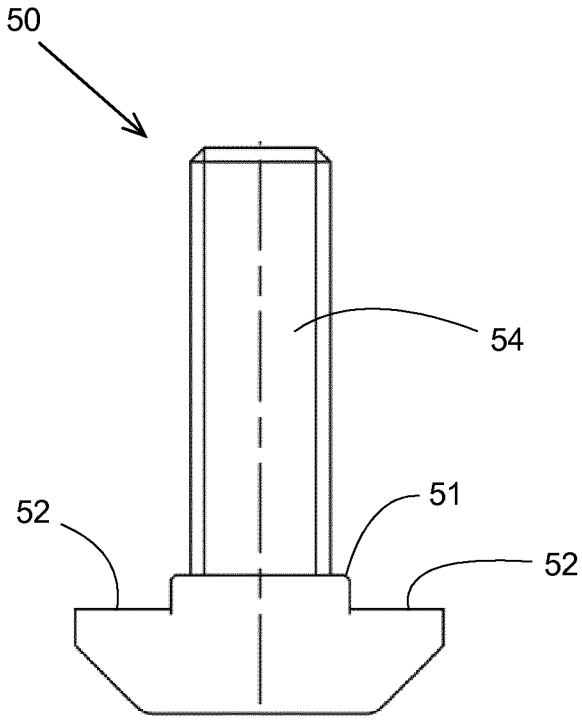


Fig. 7A

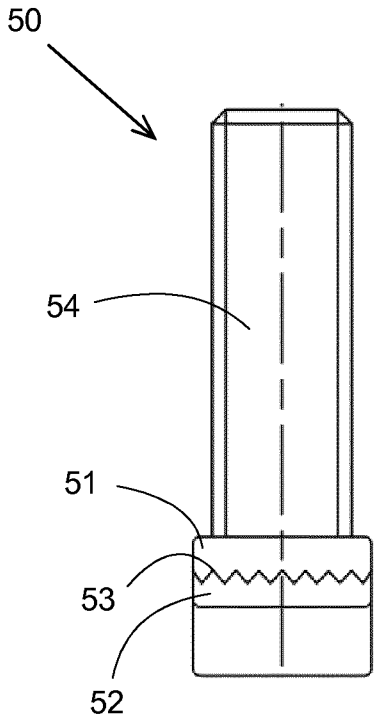


Fig. 7B

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2014/055080

A. CLASSIFICATION OF SUBJECT MATTER
INV. E04B1/32
ADD. F16B5/06 F16B37/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F16B E04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2 877 877 A (DAVIS JR HUGH N) 17 March 1959 (1959-03-17) column 2, line 9 - column 3, line 44; figures 1-9	1-4,9-15
A	US 3 088 559 A (FARNSWORTH LEE P ET AL) 7 May 1963 (1963-05-07) column 3, line 16 - column 5, line 2; figures 1-12	1,4-6, 9-15
A	EP 0 218 339 A1 (HIGSON MARTIN THOMAS) 15 April 1987 (1987-04-15) abstract; figures 1-17	1,9-15

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
20 May 2014	27/05/2014

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Couprie, Brice

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2014/055080

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2877877 A	17-03-1959	NONE	
US 3088559 A	07-05-1963	NONE	
EP 0218339 A1	15-04-1987	AU 581601 B2	23-02-1989
		AU 6209186 A	02-04-1987
		CA 1279967 C	12-02-1991
		DE 3664653 D1	31-08-1989
		EP 0218339 A1	15-04-1987
		GB 2180863 A	08-04-1987
		US 4736551 A	12-04-1988