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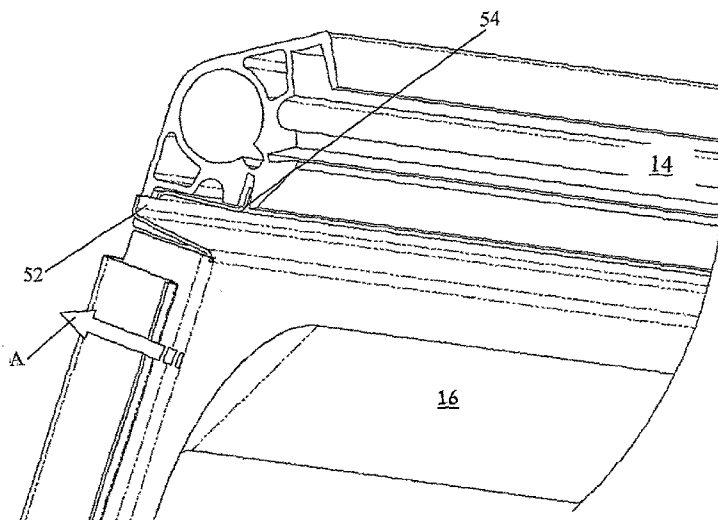
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(54) Title: SNAPPED FLEXIBLE PANELS



(57) Abstract: An improved system and method for providing a collapsible structure which is light-weight, easy to assemble and disassemble, stable and rigid when assembled and requires small room for stowing when disassembled is disclosed. The structure according to some embodiments of the present invention comprises a supporting frame or structure preferably consisting of multiple beams and poles and plurality of panels installable between them. The supporting structure may preferably be built of beams and poles having special connectors fitly insertable into the ends of the beams and poles, and formed to snap-fit onto the side of these poles or beams. The panels of the structure are formed with specially formed ends which are made to snap-fit into specially formed grooves alongside these poles and beams. The snap connection of the various elements of the structure provides easy assembling along with rigid and stable construction.

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## SNAPPED FLEXIBLE PANELS

### FIELD OF THE INVENTION

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[001] The present invention relates to a system and method for constructing and dismantling of flexible but rigid structure and/or frames. In particular the invention is applicable to easy to build and to collapse structures and constructions.

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### SUMMARY OF THE INVENTION

[002] The present invention provides a system and method for easy construction and dismantling of a structure, such as shades, greenhouses, pergolas, fences, outdoor covers such as for bicycles, storage for gardening tools and the like, as well as light frames. The present invention provides also a system and method for easy and relatively very strong connection of the structure panels to the structure supporting construction, such as poles and beams or frames. The system and method of the present invention allows a small room for stowing away and/or mobility of the structure when in collapsed position and easy, virtually installation by a single man from collapsed position of the structure. The poles and beams of the structure of the present invention may be constructed from light-weight profiles of corrosive-resistant materials such as aluminum, rigid plastic or the like. The panels of the present invention may be made of thin, relatively flexible and opaque, transparent or semi-transparent material, such as Polycarbonate, Polypropylene, PolyVinylChloride (PVC), Polymethilmethacrylate (PMMA), PolyethyleneTerephthalate (PET), tin, aluminum and the like. The poles and beams of the structure of the present invention may typically be of a rectangular shape with plane or corrugated / wavy formation, having special designed bent shape of its ends made to easily snap into place in the construction beams and poles and hard to snap out.

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[003] The side walls of the structure of the present invention may form a rectangular shape with two inclined facets of roof, but it may have other shapes as well, as long as the construction comprises plurality of facets, each constructed of combination of beams, poles and panels.

[004] In order to allow easy assembling of a structure according to the present invention, wide utilization of snap-on or snap-in connectors and connecting means is done, taking the advantage of a snap connection means that is easy to install and typically provides a very rigid connection. Accordingly, plurality of snap connectors are disclosed in this application, providing snap connection means to connect beam to beam, beam to pole, panel to beam and panel to pole. Also disclosed, according the invention, other quick-connect means, such as quick fasteners, built to provide quick and easy to operate means of connection.

## BRIEF DESCRIPTION OF THE FIGURES

[005] The present invention will be understood and appreciated more fully from the following detailed description taken in conjunction with the figures in which:

Figure 1 is a schematic illustration of an embodiment of a structure according to some embodiments of the present invention;

Figures 2A – 2B are schematic illustrations of details of connections of beams and poles and panels according to some embodiments of the present invention;

Figures 3A – 3E are schematic illustrations of details of connections of beams and poles and panels according to some embodiments of the present invention;

Figures 4A – 4E are schematic illustrations of details of connectors for connecting of beams and poles and fasteners for same according to some embodiments of the present invention;

Figures 5A – 5C are schematic illustrations of snap connection of a panel to a beam or pole according to some embodiments of the present invention; and

Figures 6A and 6B are schematic illustrations of threading connection of a panel to a beam or pole according to some embodiments of the present invention.

[006] It will be appreciated that for simplicity and clarity of illustration, elements shown in the figures have not necessarily been drawn to scale. For example, the dimensions of some of the elements may be exaggerated relative to other elements for clarity. Further,

where considered appropriate, reference numerals may be repeated among the figures to indicate corresponding or analogous elements.

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## DETAILED DESCRIPTION OF THE INVENTION

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[007] The system and method according to embodiments of this invention enable easy assembly and disassembly of a structure construction. The structure according to the present invention, when assembled, is lightweight, rigid and stable. When disassembled the structure of the present invention requires a very small room for stowing or conveying.

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[008] Attention is made to Figure 1, which is a schematic illustration of a structure 10 according to some embodiments of the invention. Structure 10 comprises plurality of poles 12, beams 14 and panels 16. The supporting construction of structure 10 comprises plurality of poles 12 and beams 14. Poles 12 extend substantially upright when being part of a side wall and inclined with respect to the ground when being part of the roof. Beams 14 extend substantially horizontally. The construction illustrated in Fig. 1 has a rectangular projection on the ground and two inclined facets of roof but it would be apparent to a person with ordinary skill in the art that structure 10 may have many other shapes such as hexagon, octagon, and the like. Accordingly, the facets of the roof of designs of structure 10 other than rectangular shall be adapted to fit.

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[009] In order to ensure quick assembling and disassembling of structure 10 of the present invention, substantially all connections of beam to beam, beam to pole, pole to pole and panels to construction are based on snap-connectors which are designed to provide easy but strong connections. Attention is made now to Figs. 2A – 2B, which are schematic illustrations of details of connections of beams 14, poles 12 and panels 16 according to some embodiments of the present invention. Fig. 2A depicts an upwardly view at a combination of one roof beam 14 connected to several roof poles 12 with several panels 16 installed in

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between. Beam 14 is made with several longitudinal grooves which may support the fastening of connectors 22 installed at the ends of poles 12, and the fastening of panels 16, as will be discussed in more details herein below. Panels 16 may be fastened to beams 14 and poles 12, for example, by snap attaching and/or threading the edges of panels 16 into corresponding grooves in beams 14 and poles 12.

[0010] Fig. 2B depicts a downwardly view at a combination of one roof beam 14, several roof poles 12 and several panels 16 according to the present invention. The special design of longitudinal grooves in beam 14 may clearly be seen, as well as the inverse U shaped edge of panel 16. Attention is made to panel 16 depicted in the left lower part of Fig. 2B, shown in a pre-snapped position. In that panel 16 it may be noticed an inverse U shaped edge close to beam 14, which may be used for snap-attaching panel 16 to beam 14, as will be discussed in more details herein below. Panels 16 may be attached to beams 14 and poles 12 by other methods, for example, by threading the edges of panels 16 into corresponding grooves in beams 14 and poles 12.

[0011] In order for beams 14 and poles 12 to strongly connect to each other in order to form a stable construction for structure 10, a set of connectors may be used. Typically such connectors may be formed to have an insertable end designed to fit into a longitudinal cavity at the end of a beam 14 or a pole 12 and a snap-on end to fit onto a pole 12 or a beam 14. Attention is made now to Figs. 3A – 3E depicting various views and arrangements of beams 14, poles 12 and suitable connectors to provide for connection of same to each other. Fig. 3A illustrates a pole 12 (showing one end only) and a connector 34, according to embodiments of the present invention. Pole 12 is shown with two sets of grooves 12A along its sides and a longitudinal cavity 12B in its center. Grooves 12A are made to support the snap-in connection and/or threading connection of a panel 16 to pole 12, as will be discussed in more details later on. Longitudinal cavity 12B has a shape that supports insertion of an end connector 34 in a fastened manner. Connector 34 may be made with insertable end 34A having substantially the complementary shape of cavity 12B so as to tightly fit into cavity 12B when inserted. Alternatively, in some embodiments of the present invention connector 34 may be an integral part of pole 12, e.g., pole 12 and connector 34 may be formed in one piece. Connector 34 may include a second end 34B having curves and facets made to snap-fit onto a side of a beam 14 or a pole 12. For beam 14 and pole 12 having a set of grooves 12A or similar extending along substantially the whole length of the beam or the pole the design

34B of connector 34 allow for connection of pole 12 substantially at any point along the side of beam 14. Connector 34 as illustrated in Fig. 3A provides a substantially right-angled connection, yet other angles of connection may be supported by connector 34, as may be required. Fig. 3B exemplifies installation of connectors 34 at both ends of pole 12. Figs. 3C-3E depict closer, partially blown, view details of connector 34 in various uses for connecting of a pole 12 to beam 14, where pole 12 is substantially perpendicular to the longitudinal axis of beam 14, and the angle between the two connectors 34 is deducted from the specific design of beam 14, as may be required by the specific design of structure 10.

[0012] The construction of structure 10 may gain additional stability and strength if additional strength is given to connectors used in it. Attention is made now to Figs. 4A – 4E which are schematic illustrations of details of connectors for connecting of beams and poles according to some embodiments of the present invention. Connector 34 may be equipped with fastening end 34C installed as part of section 34B. Fastening end 34C is made to protrude from connector 34 towards fastening end 34C of another connector 34 installed against it, as illustrated in Fig. 4A. When properly snapped onto beam 14 the two fastening ends 34C may be fastened to each other by fastening device 34D, thus adding fastening force to connectors 34. Figs. 4B-4D depict fastening arrangement of connector 34 having different design and Fig. 4E illustrates fastening arrangement of connector 34 similar to that of Fig. 4A.

[0013] Although the present invention is not limited in this respect, the strength of structure 10 as well as the ease of assembly of same may further be improved if assembly of panels 16 onto construction made of poles 12 and beams 14 is carried out with snap-on connecting means. According to other embodiments of the present invention panels 16 may also be attached to poles 12 and beams 14 by other easy manners, for example, by threading, as will be described in more details below. Attention is made now to Figs. 5A – 5C, which are schematic illustrations of snap connection of a panel to a beam or pole according to some embodiments of the present invention. Panel 16 may be equipped at least at one of its edges with a specially designed inverse U shaped like curve 52 that ends at its edge distal from panel 16 with a narrow bent 54. In accordance with the design of U shaped curve 52 and bent 54, groove 56 and groove 58 may be prepared along beam 14. When panel 16 is pushed towards beam 14 so that U shaped curve 52 goes deeper into groove 56, as depicted by the

wide arrow (marked A) in Figs. 5A – 5C, bent 54 first may slightly and flexibly slip over the inclined facet of beam 14 which leads toward groove 58, and when U shaped curve 52 reaches substantially full penetration into groove 56, bent 54 flexibly slips into groove 58, as illustrated in Fig. 5C. At this position, panel 16 is tightly locked and fastened to beam 14, or pole 12, as the case may be. The special design and the tight match of the curve 52 and bent 54 into their respective grooves gives panel 16 extra constructive and supporting force. When U shaped curve 52 and bent 54 are made on all edges of panel 16, and when beams 14 and poles 12 surrounding panel 16 are equipped with grooves 56 and 58, panel 16 is fixedly and strongly attached to the construction of beams and poles, giving it extra strength. Use of panels 16 with U shaped curve 52 and bent 54 as discussed above may make assembling of panels 16 onto beams and poles construction a very easy and quick job, as all it requires is to push panel 16 in the direction illustrated by the wide arrow A until it snap-clicked into its secured place. Disassembling of panels 16 may be done either by using a special tool designed to pull bent 54 back from groove 58, or by out-threading panel 16 from grooves 56 and 58 along the longitudinal axis of the respective beam or pole. Panel 16 may further be made with corrugations 17 having possibly various designs, in order to boost its self strength and improve its appearance.

[0014] Attention is now made to Figs. 6A and 6B which are schematic illustrations of threading connection of a panel to a beam or pole according to some embodiments of the present invention. Fig. 6A illustrates threading of panel 16 to a structure of beams 14 and poles 12. Panel 16 may be fastened to poles 12 or beams 14 by threading the edges of panel 16 into corresponding grooves along a longitudinal axis of poles 12 or beams 14. The threading may be done, for example, by inserting panel 16 in the direction illustrated by the arrows B. As shown in Fig. 6B, panels 16 may be fastened to at least some of beams 14 and/or poles 12 by threading the edges of panel 16 into grooves 14A and/or grooves 12A of those panels. Additionally or alternatively, panels 16 may be fastened to at least some of beams 14 and/or poles 12 by a fastening device 44 which may fasten panel 16 to beam 14 and/or pole 12, for example, by snap connecting into beam 14 and/or pole 12.

[0015] It is further noted that use of panel 16 according to some embodiments of the present invention may be in conjunction with construction other than a structure made of poles 12 and beams 14. For example, a structure comprising any kind of frame, built to

support at least one end of panel 16, may be used, as long as such frame comprises installation grooves made to properly accept panel 16, as discussed above with respect to poles 12 and beams 14.

5 [0016] Structure 10 made according to embodiments of the present invention is therefore easy and fast to assemble, easy and fast to disassemble, easy to convey and requires small room for stowing. Structure 10 does not require use of bolts and / or nuts for assembling. It may provide enhanced strength while maintaining use of simple-to-install connecting means. Structure 10 may be used as a greenhouse if panels 16 are transparent; it  
10 may be used as an outdoor garage, as a warehouse, as a fully closed room for any use or as a semi closed room, and the like.

[0017] It will be appreciated by persons of ordinary skill in the art that according to some embodiments of the present invention other designs of snap-on easy to assemble  
15 constructions according to the principles of the present invention are possible and are in the scope of this application.

[0018] While certain features of the invention have been illustrated and described herein, many modifications, substitutions, changes, and equivalents will now occur to those of ordinary skill in the art. It is, therefore, to be understood that the appended claims are  
20 intended to cover all such modifications and changes as fall within the true spirit of the invention.



## [0019] CLAIMS

## 1. A structure comprising:

5 a plurality of poles adapted to form the substantially vertical elements in a construction of said structure;

a plurality of beams adapted to form the substantially horizontal elements in said construction;

a plurality of panels adapted to be installed between consecutive pairs of said poles and consecutive pairs of said beams;

10 wherein said poles and said beams are adapted to receive connectors, each of said connectors is adapted to tightly fit at a first end into a respective cavity at the end of said poles and said beams and are further adapted at its second end to snap-fit onto a side of said pole or said beam, and

15 wherein said poles and said beams are being equipped with grooves along longitudinal axis of said pole or said beam, said grooves adapted to receive edges of said panels.

2. A structure according to claim 1, wherein each of said panels being equipped with a bent at least at one of its edges, said bent is for snap fitting to said grooves.

3. A structure according to claim 2, wherein said bent comprises a U like portion  
20 extending from the panel area and ending with a narrow portion substantially parallel to the area of the panel, said U like portion and narrow portion are for tightly matching respective grooves shaped in said poles and said beams.

4. A structure according to claim 1, wherein each of said connectors further comprise at its second end a fastening end for being fastened to another fastening end of another  
25 connector.

5. A structure according to claim 4, further comprising a fastening device to enable fastening of two fastening ends to one another.

6. A structure according to claim 2, wherein said panels are removable from said poles and said beams by pulling said bent from the side of said pole or said beam.

30 7. A structure according to claim 1, wherein said panels are removable from said poles and said beams by threading out edges of said panels along said grooves.

8. A structure according to claim 1, wherein edges of said panels are insertable into said grooves by threading said edges along said grooves.

9. A structure according to claim 1, wherein said panels comprise corrugations.
10. A structure according to claim 1, wherein said connectors are formed in one piece with said poles at least at one end of said poles.
11. A panel comprising:
  - 5 a first portion and a second portion being circumferential to said first portion at least at one edges of it, said second portion being equipped with a bent for snap-fitting to a side of a frame built to receive said at least one edge.
12. A panel according to claim 11, wherein said first portion has a shape selected from a list comprising a rectangular, a pentagon, a hexagon and an octagon.
- 10 13. A panel according to claim 11, wherein said first portion is being formed according to one of the following list flat, corrugated and wavy.
14. A panel according to claim 11, wherein said bent comprises a U like portion extending from the panel area and ending with a narrow portion substantially parallel to the area of the panel, said U like portion and said narrow portion are for tightly  
15 matching respective grooves shaped in said frame.
15. A panel according to claim 11, wherein said panel is removable from said frame by pulling said bent from the side of said frame.
16. A panel according to claim 11, wherein said panel is removable from said frame by threading out said bent along longitudinal axis of said frame.
- 20 17. A panel according to claim 11, wherein said panel is connectable to said frame by threading said bent along longitudinal axis of said frame.
18. A method to form a structure, comprising the steps of:
  - connecting connectors at the ends of plurality of beams and plurality of poles;
  - 25 snap-fit connecting said plurality of poles and plurality of beams by said connectors to construct a crisscross construction; and
  - connecting plurality of panels between said poles and said beams by inserting edges of said panels into grooves along longitudinal axis of said poles or said beams.
19. A method according to claim 18, wherein said connecting comprise snap-fit connecting of a bent being shaped at least at one edge of said panel, said bent is for  
30 snap-fitting to a side of said pole or said beam.
20. A method according to claim 19, wherein said bent comprises a U like portion extending from the panel area and ending with a narrow portion substantially parallel

to the area of the panel, said U like portion and narrow portion are for tightly matching respective grooves shaped in said poles and said beams.

21. A method according to claim 19, further comprising fastening at least one of said connectors to another connector by fastening ends formed in said connectors.

5 22. A method according to claim 21, wherein said fastening is by a fastening device.

23. A method according to claim 19, further comprising removing said panels from said poles and said beams by pulling said bent from the side of said pole or said beam.

24. A method according to claim 18, further comprising removing said panels from said poles and said beams by threading out edges of said panels along said grooves.

10 25. A method according to claim 18, wherein said connecting comprise insertion of edges of said panels into said grooves by threading said edges along said grooves.

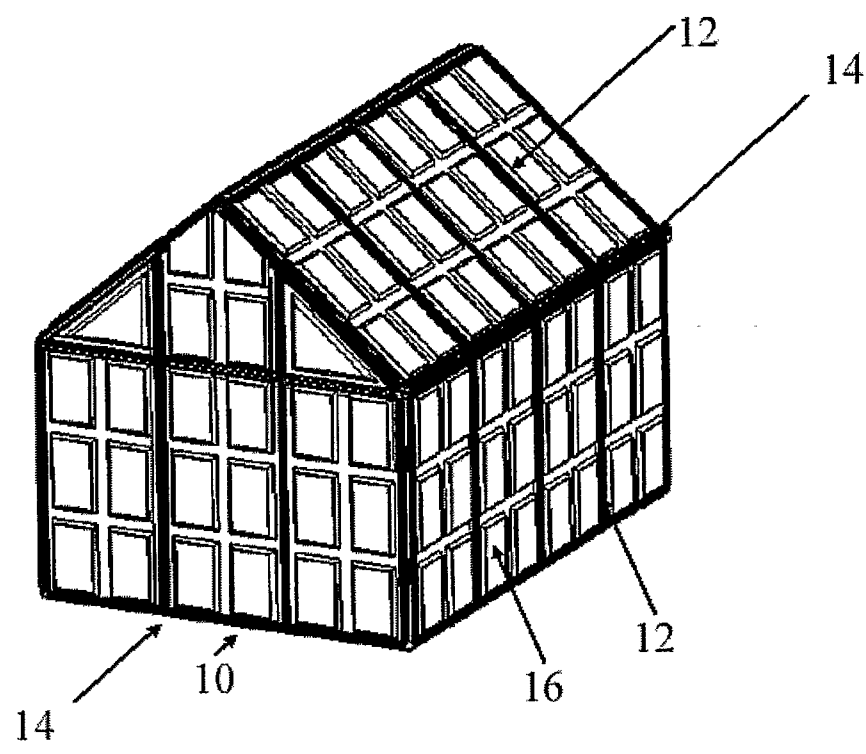


Fig. 1

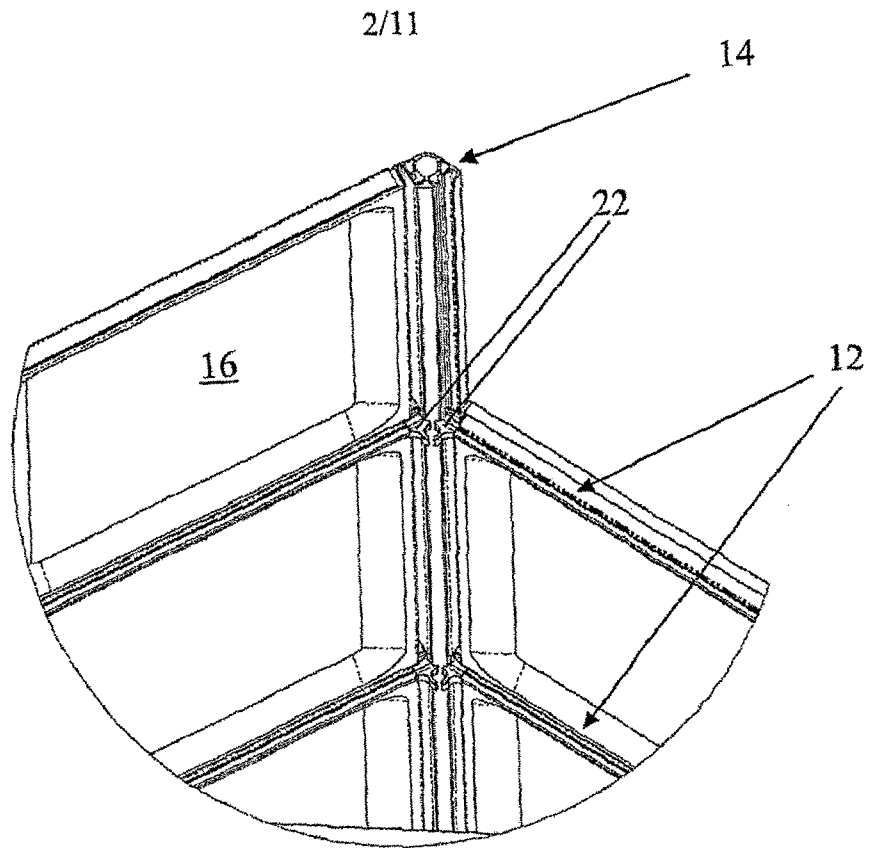


Fig. 2A

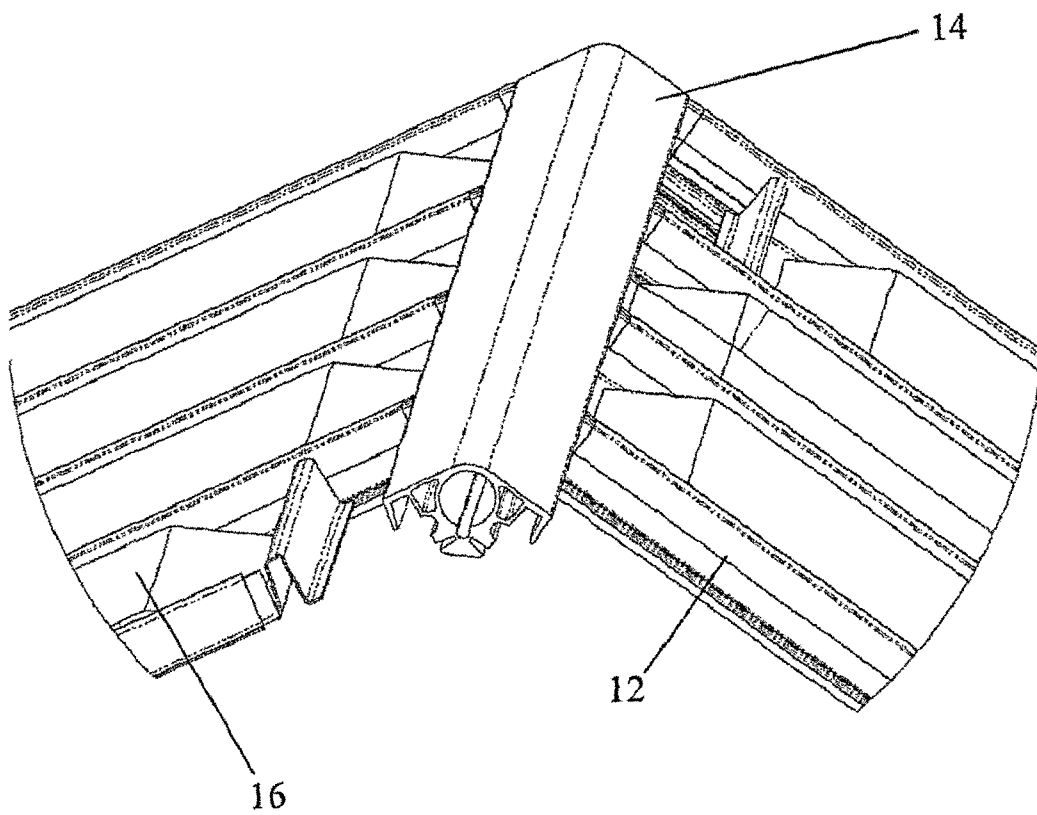


Fig. 2B

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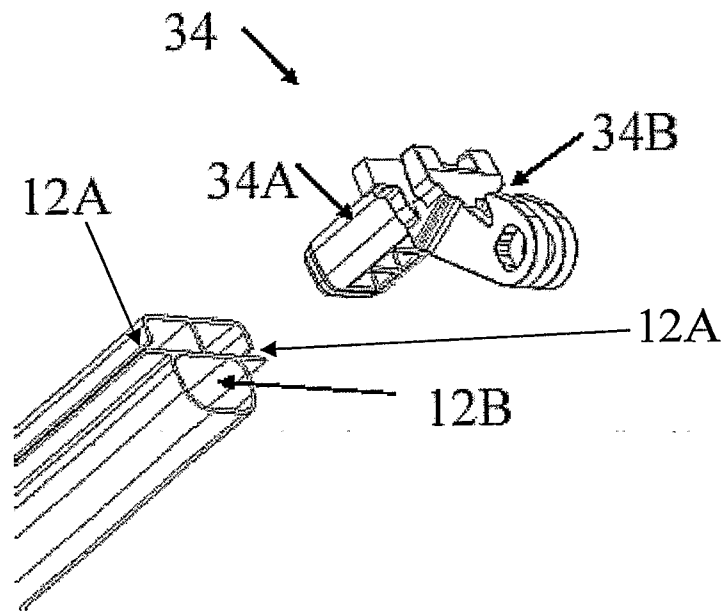


Fig. 3A

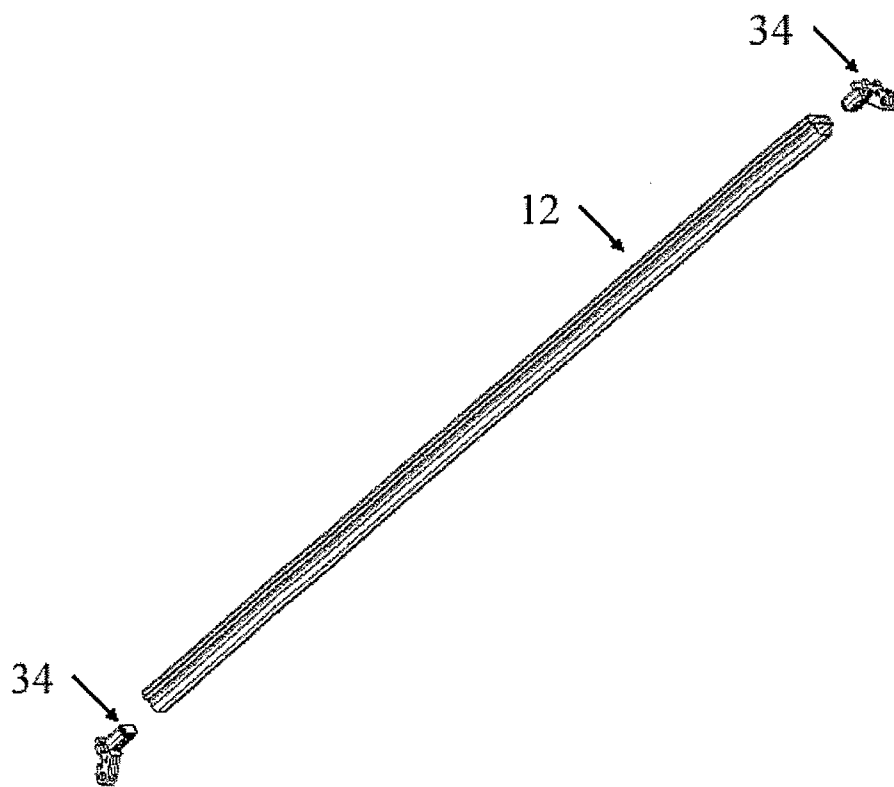


Fig. 3B

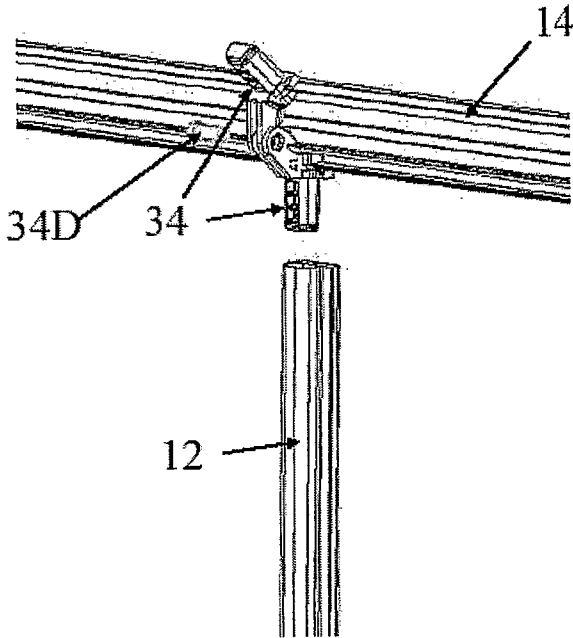


Fig. 3C

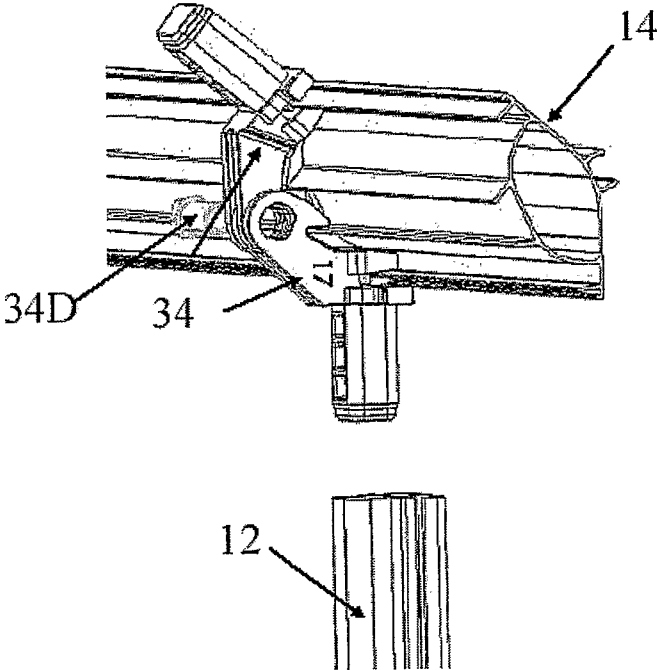


Fig. 3D

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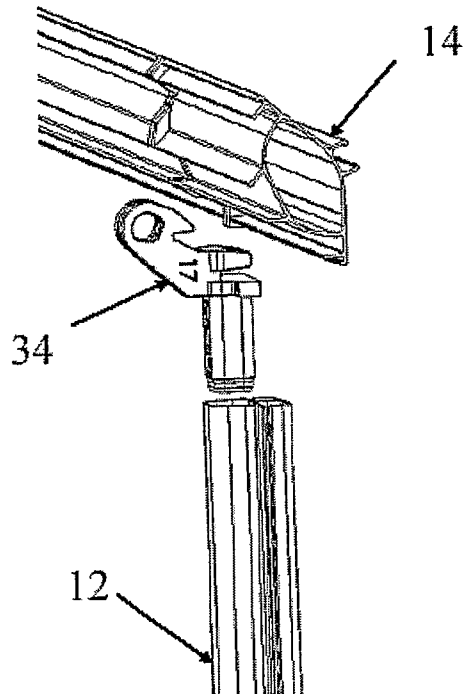


Fig. 3E



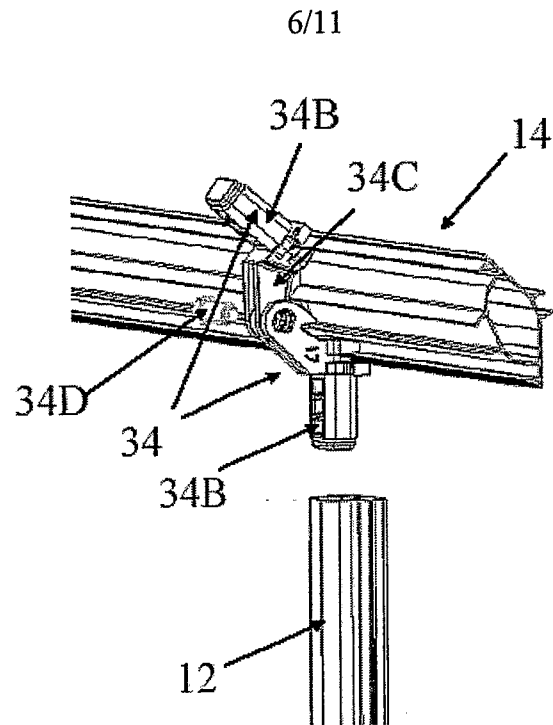


Fig. 4A

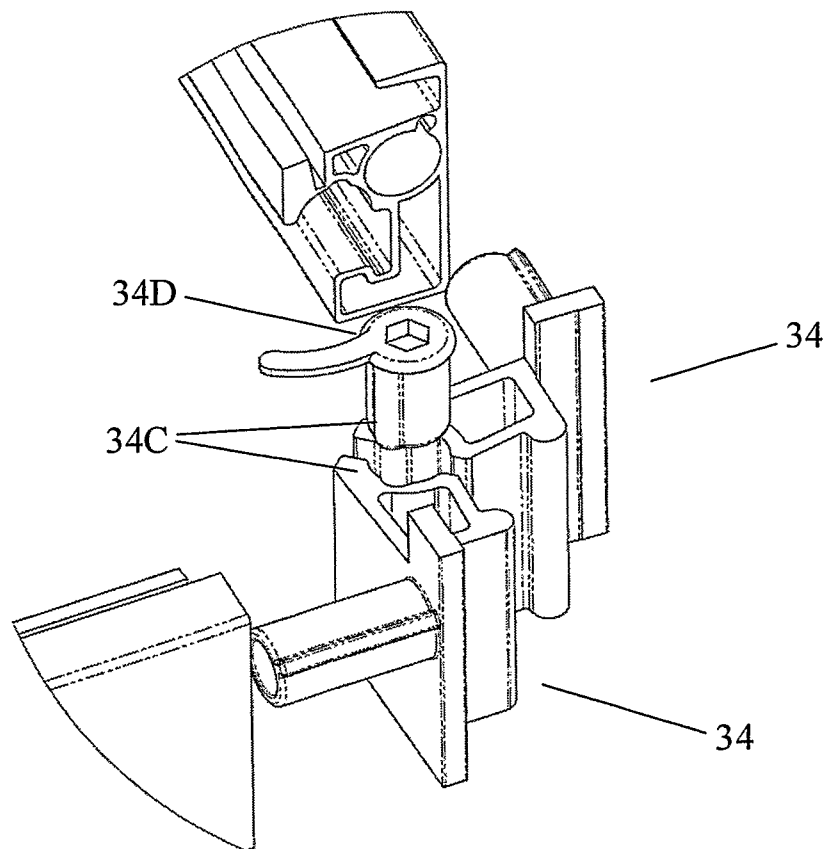


Fig. 4B

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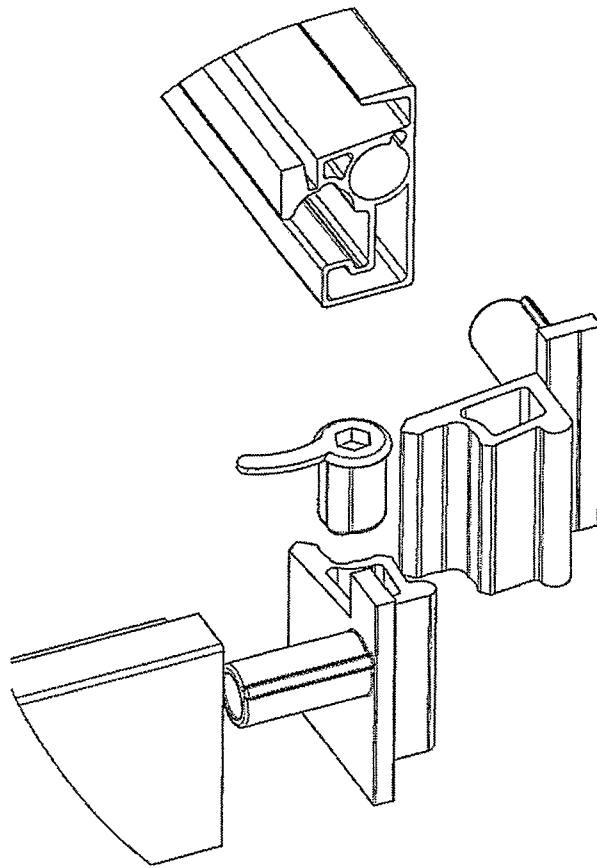


Fig. 4C

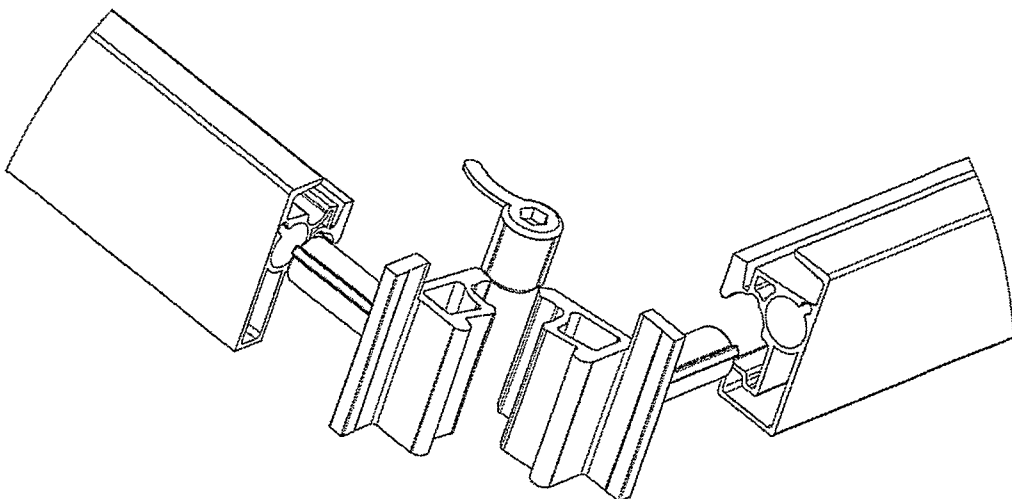


Fig. 4D

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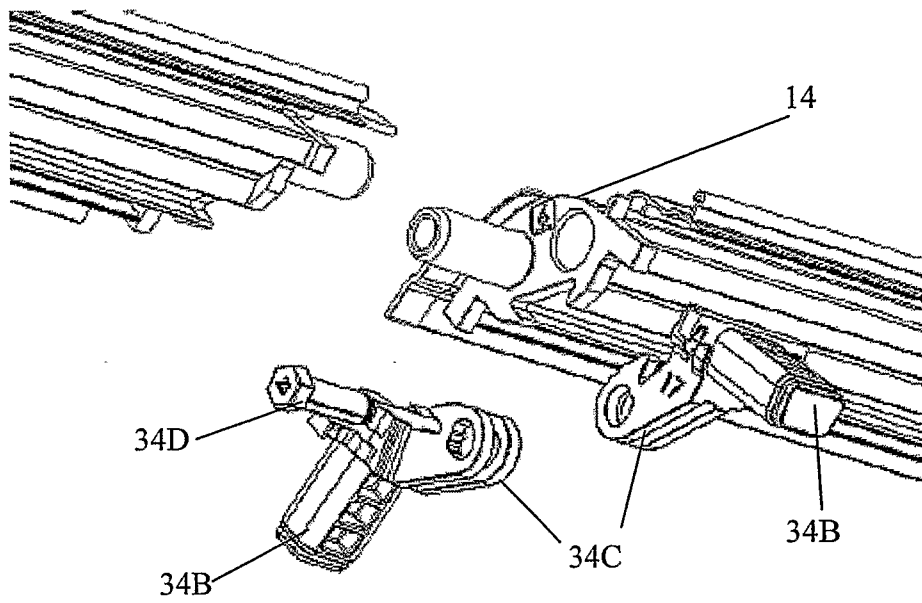


Fig. 4E

9/11

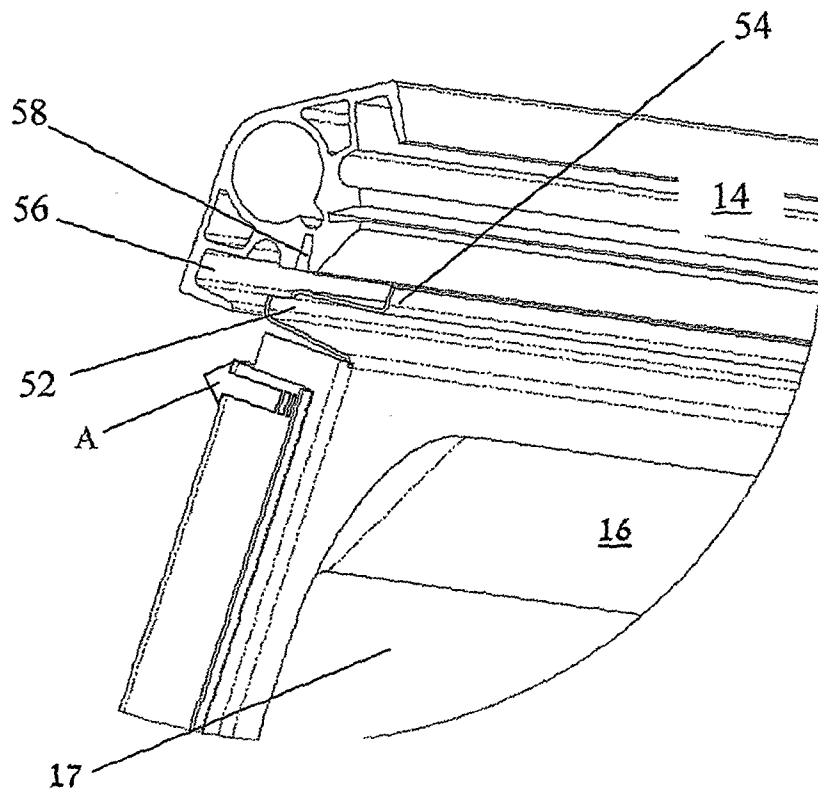


Fig. 5A

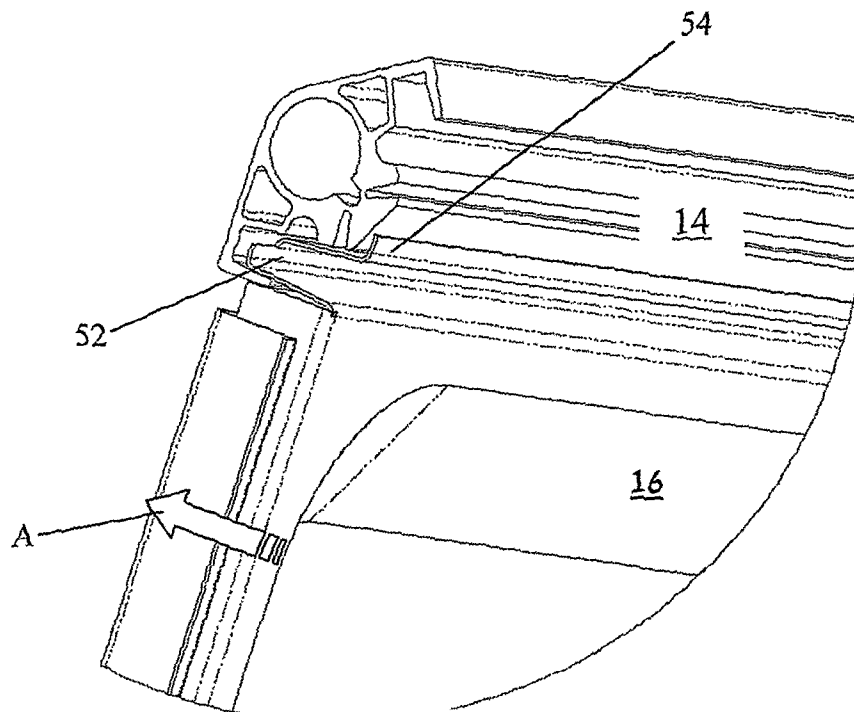


Fig. 5B

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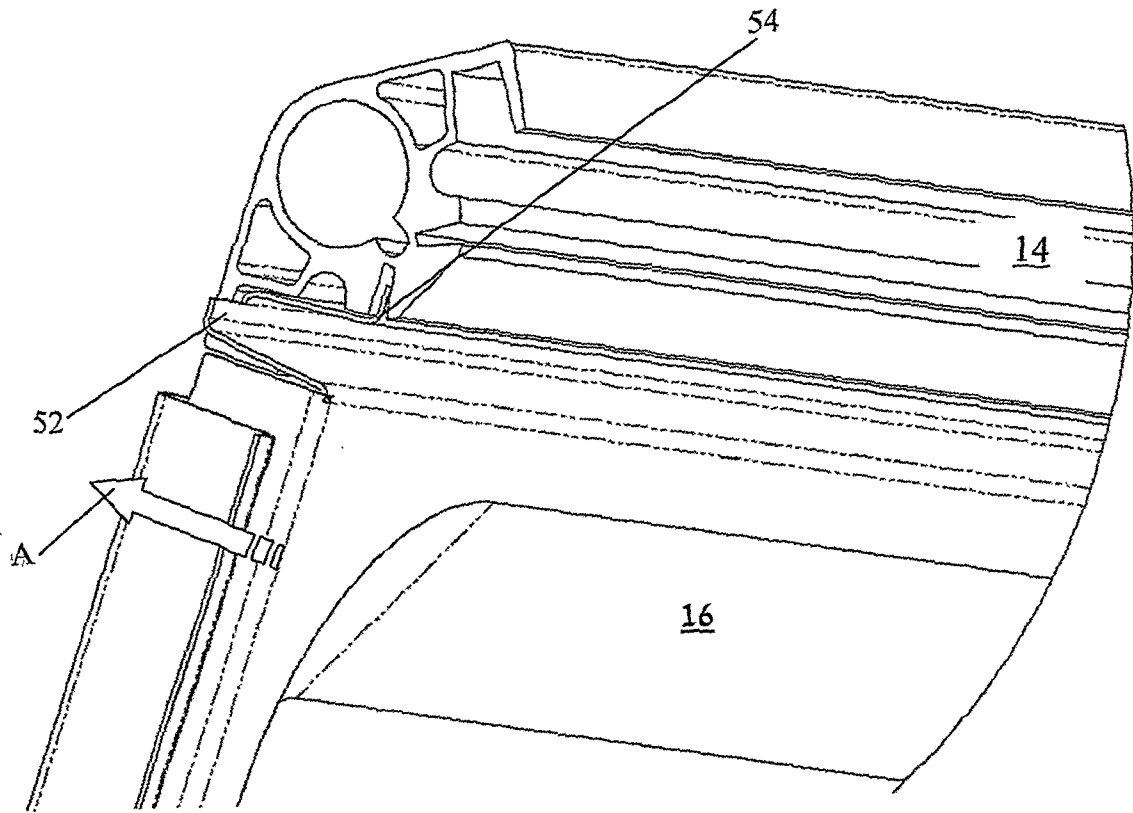


Fig. 5C

11/11

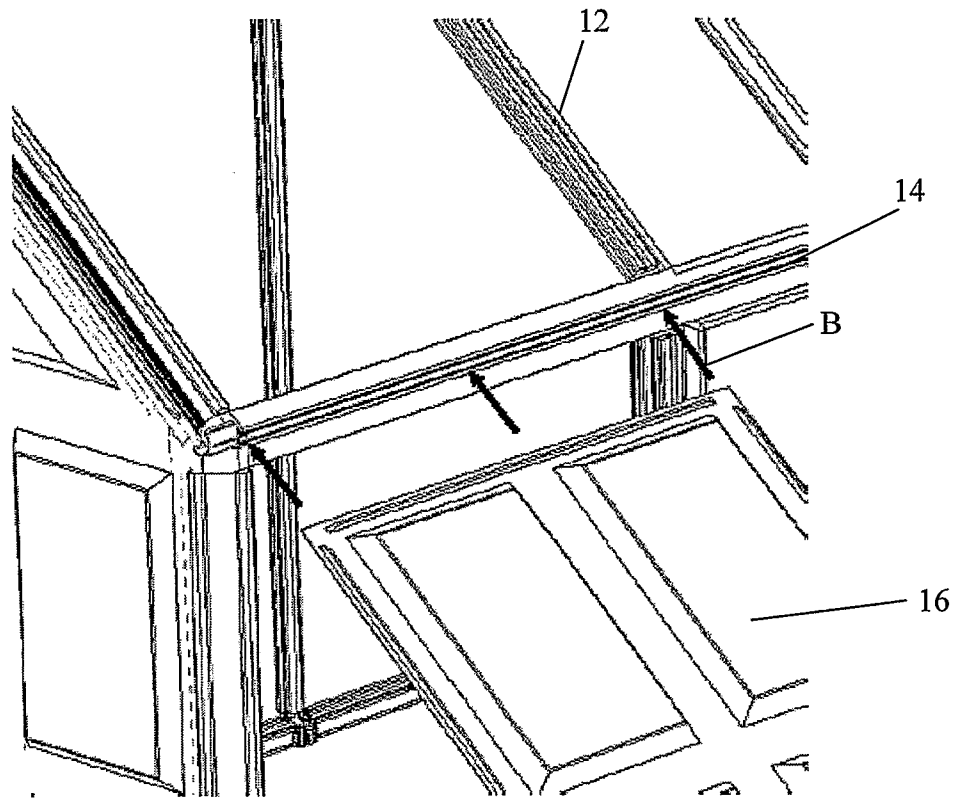


Fig. 6A

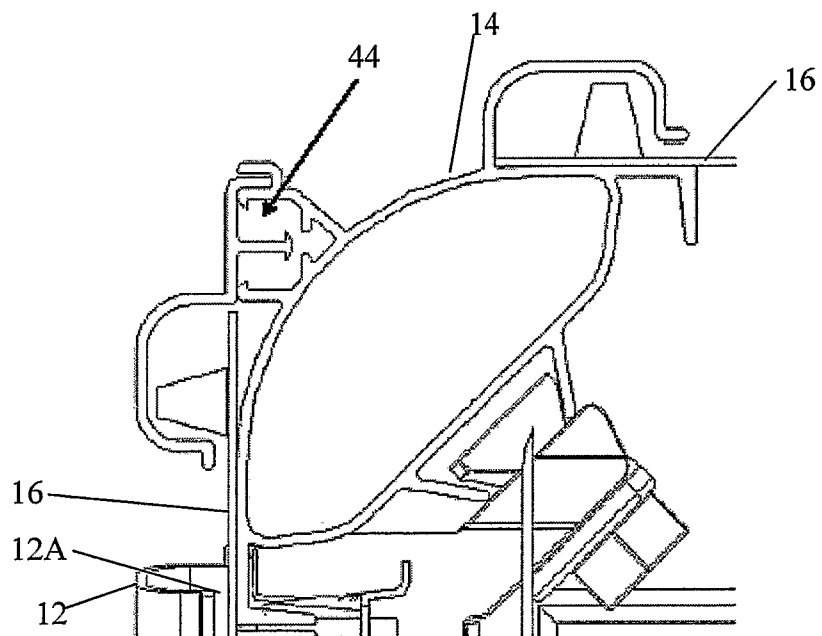


Fig. 6B