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(54) **Upright and modular support assembly using same**

Ständer und eine modulare Trägervorrichtung mit solch einem Ständer

Element vertical et support modulaire comportant un tel élément

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## Description

**[0001]** The present invention relates to an upright and a modular support assembly which employs the upright described herein. The upright and the assembly using the upright can support loads greater than those carried by currently available uprights and modular assemblies.

## BACKGROUND OF THE INVENTION

**[0002]** A variety of modular support assemblies for storing or exhibiting articles are known. Such support assemblies usually include metal vertical beam-like members, also known as uprights, and horizontal support members, called brackets. Screws can be used to attach the brackets to the uprights. Alternatively, the uprights can be provided with holes, slots or apertures adapted to receive engagement means, usually hook-like extensions, extending from the rear surface of the brackets. Shelves, on which a load can be positioned, are supported by the brackets.

**[0003]** Israel Patent IL 112,757, entitled "Security Means for Shelves", describes brackets which are attached to uprights in a modular support assembly by hook-like members and tongue-like cutouts located at the rear of the brackets. These hook-like members are moved into holes in the upright while the tongue-like cutouts secure their position, preventing the brackets from accidentally moving and being released from the upright.

**[0004]** In prior art modular support assemblies, vertical uprights are typically constructed as shown in Figs. 1A-1I, to which reference is now made. Fig. 1A shows a prior art upright 10 before being subjected to a load. The beam-like upright 10 is generally a hollow piece of metal. The holes 60 for receiving support brackets are placed in the corners of the beam, or, alternatively, positioned in the faces of the beam. Usually, holes 60 are punched out when upright 10 is fabricated. Engagement means extend from the bracket and are constructed so as to fit into the holes 60 of upright 10.

**[0005]** Figs. 1B-1I show the result of torques and compressional forces produced by loads on upright 10 of Fig. 1A. The brackets positioned on upright 10 and the loads positioned thereon are not shown. However, it should be evident to one skilled in the art that too large a load placed on a bracket appended to upright 10 via the holes 60 shown generates a compressional force on upright 10 which leads to bending, and possibly even collapse, of the upright 10. It is also obvious to one skilled in the art that any hook-like member inserted into the holes 60 exerts a torque on that part of the upright 10 proximate to, and immediately above, the hook-like member, resulting in an outward and upward force which can lead to bracket disengagement and bending of the upright 10.

**[0006]** Relevant background art also includes US Pat. No. 4,711,420 and EP Pat. No. 0572447 B1.

**[0007]** US Pat. No. 4,711,420, to Cowler et al, discusses a bracket and post assembly. The post and bracket

are engageable by complementary interfitting means. The post has alternate vertically spaced outer and inner supports in the form of angled pieces. The bracket is configured to hook onto these supports.

**[0008]** EP Pat. No. 0572447 B1, to Lauterbach, discusses metal shelving units in which horizontal post connectors lockably engage vertical posts. The post connectors are constructed to have deformable locking tabs positioned between a pair of hooks.

## SUMMARY OF THE PRESENT INVENTION

**[0009]** Currently available modular support assemblies using horizontal support members, herein also referred to as brackets, which employ snap-in engagement with the assembly's vertical members, herein also referred to as uprights, often cause the uprights to bend and/or buckle under compressional forces and torques transmitted by the assembly's horizontal support members.

**[0010]** It is therefore an object of the present invention to provide an upright that can withstand greater compressional forces and torques produced by loaded snap-in generally horizontal support members than currently available uprights.

**[0011]** It is yet another object of the present invention to provide a modular support assembly employing uprights and /or horizontal members constructed and operative as described herein which can be used to support greater loads and torques.

**[0012]** It is a further object of the present invention to provide a horizontal support member for modular support assemblies which are easily engaged with the uprights described herein, and which prevent movement in at least one direction of the horizontal member with respect to the upright.

**[0013]** It is another object of the present invention to provide a modular support assembly and upright which are simple to construct and assemble.

**[0014]** Further objects of the invention will become apparent from the discussion herein below.

**[0015]** There is thus provided in accordance with the present invention an upright for use as a vertical support member in modular support assemblies. The upright includes a generally linear member having a polygonal cross-section defining a plurality of mutually adjacent faces. Each face resides in a generally flat plane, adjacent faces defining between them elongated corner portions. Each corner portion has one or more indentations formed along the length of the generally linear member. The upright also includes retaining structures formed around the one or more indentations, and the structures are positioned generally transverse to the long axis of the upright. The retaining structures are configured to define recesses in the one or more indentations, so that the recesses thus formed and configured can receive and retain insertable and interlockable engagement means extending from the rear surface of generally horizontal support

members. The faces of the linear member form and are operative as a quasi-corrugated perimeter of the linear member, thereby more easily supporting compressional forces acting on the upright produced by loads resting on horizontal support members. The faces also form a backing for the recesses resisting torques generated by loads on the horizontal support members. The torques act through the engagement means of the support structure when the engagement means are inserted into, and retained in, the recesses.

**[0016]** Further, in accordance with another embodiment of the present invention, an upright as described above further includes one or more ribs formed in the one or more indentations. The one or more ribs positioned substantially opposite to a corner portion of the upright.

**[0017]** Additionally, in accordance with a preferred embodiment of the present invention, the retaining structures are equally spaced in the direction of the long axis of the upright. In other embodiments, the retaining structures are unequally spaced in the direction of the long axis of the upright.

**[0018]** Further in yet another embodiment of the present invention, the retaining structures are unequally spaced in the direction of the long axis of the upright and the structures are positioned in groups, each group including a number of retaining structures, at least equal to the number of engagement means of a single horizontal support member.

**[0019]** Additionally, there is provided in accordance with the present invention, a modular support assembly which includes two or more uprights constructed according to any one of the above embodiments and two or more horizontal support members positioned generally transverse to the uprights. The support members have engagement means extending from the member. The uprights receive and retain the engagement means, the means being insertable into and interlockable with recesses of the upright. The retention in the recesses is effected by the retaining structures and the quasi-corrugated perimeter of the uprights.

**[0020]** In an alternative embodiment of a modular support assembly, the two or more support members further include flexible locking means for preventing translation of the support members within the recesses in the direction parallel to the long axis of the upright. The locking means are insertable within the recesses and extend rearwardly from the support members. In a further embodiment of the invention, the flexible locking means also prevents translation of the support members within the recesses in one or more directions generally perpendicular to the long axis of the upright.

**[0021]** Further, in a preferred embodiment of the of the modular support assembly, when not flexed, the flexible locking means lies in a plane of a lateral surface of the support member and when flexed, the locking means lies out of the plane of the surface.

**[0022]** Additionally, in a preferred embodiment of the

modular support assembly constructed according to the present invention, each of the two or more uprights has at least one horizontal support member engaged thereto.

**[0023]** Additionally, there is provided in accordance with an embodiment of the present invention, a horizontal support member for use with a modular support assembly, the member including one or more engagement means for snap-in insertion into recesses positioned in an upright of the assembly. The one or more engagement means extends towards the upright from the surface of the support member proximate to the upright. The one or more locking means is insertable into a recess in the upright, the locking means preventing motion of the support member within the recess of the upright.

**[0024]** Additionally, in a preferred embodiment of the invention, the one or more locking means of the support member is flexible and kept flexed when the engagement means are inserted into and engaged with the recesses. The one or more locking means is returned to its unflexed position after insertion into the recess in the upright.

**[0025]** Further, in yet another embodiment of the invention, when not flexed, the flexible locking means of the support member lies in the plane of a lateral surface of the support member and when flexed, the locking means lies out of the plane of the surface.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0026]** The present invention will be understood and appreciated more fully from the following detailed description taken in conjunction with the drawings in which:

Figs. 1A-1I show lengthwise side views of an upright constructed in accordance with the prior art before and after bending or buckling;

Figs. 2A-2C are respective top-side, side and top views illustrating an upright constructed according to a preferred embodiment of the present invention; Figs. 3A-3C are respective top-side, side and top views illustrating an upright constructed according to a second preferred embodiment of the present invention;

Figs. 4A-4D are side, top-side and top views illustrating a bracket for use with uprights constructed according to the present invention;

Figs. 5A-5D are side, top-side and top views illustrating another bracket for use with uprights constructed according to the present invention;

Figs. 6A-6C illustrate the method of engagement of brackets with uprights constructed according to the present invention;

Figs. 7A-7D and 8A-8D are respective side, enlarged side and top views of the brackets of Figs. 4A-4D and Figs. 5A-5D, respectively, engaged with uprights constructed according to the embodiment shown in Figs. 2A-2C; and

Figs. 9A-9D are respective side, enlarged side and top views of a bracket engaged with uprights con-

structed according to the embodiment shown in Figs. 3A-3C.

**[0027]** Similar elements in the Figures are numbered with similar reference numerals.

## DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

**[0028]** Modular support assemblies are widely employed, often as shelving units. These modular assemblies are comprised of generally horizontal support members, herein called brackets, which are attached to vertical support members, herein called uprights, the latter typically hollow metal polygonal structures. The brackets can be bolted directly to the upright or attached by "snap-in" insertion. Snap-in brackets are generally appended to the uprights by inserting hooks, which extend from the bracket's rear surface, into holes drilled in the corners or surfaces of the uprights. Shelves are placed on the inserted brackets for supporting loads. Torques and compressional forces generated by these loads act on the uprights, often causing them to bend and even buckle completely.

**[0029]** Applicant has realized that uprights having holes with a backing resist the torques and compressional forces produced by loads on appended brackets, better than currently existing hollow uprights. The backing can be viewed as a "quasi-corrugated" wall formed from the surfaces of the original polygonal structure. The "quasi-corrugated" perimeter of the upright resists the torque produced by the upper part of the engagement means when a load is placed on a shelf positioned on a horizontal support member. Additionally, using uprights having holes or recesses which can accommodate a locking means positioned on the rear surface of brackets prevents movement of the brackets, forestalling their unintentional disengagement. Using uprights constructed as described herein changes the forces on the engagement means of the brackets from bending to shear forces. In some embodiments the upright has an additional rib or ribs within the accepting recesses; this additional rib or ribs provides additional structural strength to the upright and prevents the formation of cracks during manufacture of the upright.

**[0030]** Reference is now made to Figs. 2A, 2B and 2C, in which top-side, side and top views, respectively, of an upright constructed according to a preferred embodiment of the present invention are illustrated. The upright, referenced generally 100, is typically fabricated from a hollow square-shaped metal beam-like member and possesses a plurality of recesses referenced 130 positioned at the corners of the member. Retaining structures referenced 110 are located at the top and bottom of each open face of every recess 130.

**[0031]** To better understand the structure and function of an upright fashioned according to the present invention, it is instructive to consider a method which can be

used to construct the upright. To form the upright, a series of cuts are made in the beam-like member at an angle of 45 degrees with respect to each corner. The cuts are spaced so that they form relatively closely spaced pairs, with each pair separated from its adjacent pairs by much larger spacings. The metal between adjacent pairs is then pushed inwards, thereby forming recesses 130. Each recess is defined by two retaining structures 110 which are formed from that portion of the metal beam-like member that is not pushed inwards. Recesses 130 and retaining structures 110 are configured and dimensioned to receive engagement means, and possibly one or more locking means, formed on the rear surface of brackets, described more fully below.

**[0032]** It is readily apparent to one skilled in the art that uprights constructed according to the present invention and similar to the one shown in Figs. 2A-2C, also may be formed by molding the upright as an integral structure directly. Furthermore, while the upright described above has been described as being formed of metal, any rigid material of sufficient mechanical strength can be used.

**[0033]** Unlike prior art vertical support members, uprights constructed according to the present invention have a cross-shaped core referenced 140, best seen in Fig. 2C. The arms of the cross separate adjacent corner recesses 130 and are formed when the metal between the larger spacings described above is pushed inward. The purpose of the cross-shaped core 140 is best seen in Figs. 7B-7C and Figs. 8B-8C below, where the arms of cross-shaped core 140 provide a support backing for the engagement means protruding from the rear of the bracket. Cross-shaped core 140 can be viewed as the upright's "quasi-corrugated" perimeter. It is readily apparent that such a structure is better able to withstand compressional stresses than prior art uprights having quadrilateral-shaped perimeters. A further discussion of the increased structural support provided by uprights constructed according to the present invention is described in connection with Figs. 7A-9D below.

**[0034]** Figs. 2A-2C show uprights that include retaining structures 110 positioned equidistantly from each other along the vertical axis of the upright. However, in other embodiments, structures 110 may be grouped into sub-units of two or more, each grouping suitable for engaging a single bracket.

**[0035]** In some embodiments, the upright is an integral unit, while in others, the upright is formed by joining together sections constructed as described above, typically by welding. This can be effected by joining the sections in a direction perpendicular to the long axis of the upright. In yet other embodiments, instead of using a hollow square beam-like member, the upright can be constructed by joining two U-shaped rails along their long axes, either before, but generally after, the formation of recesses 130 and retaining structures 110, constructed as described above. Finally, in still other embodiments, the upright may be formed from rectangular beam-like members.

**[0036]** In general, cross-shaped core 140 is formed from a hollow metal beam, but in some embodiments it can be formed from a solid metal beam. In such cases, recesses 130 and retaining structures 110 can be made by cutting or punching out suitably shaped blocks of metal from the corners so that a structure similar to that shown in Figs. 2A-2C is formed.

**[0037]** While we have herein above described recesses 130 as possessing no bottom, as best seen in Figs. 7A-9D discussed herein below, other embodiments contemplate uprights having recesses 130 which can have bottoms.

**[0038]** Reference is now made to Figs. 3A-3C, which illustrate respective top-side, side and top views of an upright constructed according to a second preferred embodiment of the present invention. While Fig. 2A shows an upright 100 whose central structure or core has a cross-like shape 140, Figs. 3A-3C show an embodiment where the cross-like core 140 of an upright, referenced generally 200, has a ridge referenced 120 positioned substantially opposite each of the corners of upright 200. Ridge 120 provides additional support to the bracket's engagement means; this support is best seen in, and will be discussed below in conjunction with, Fig. 9D.

**[0039]** Referring now to Figs. 4A-4D which illustrate respective side, top-side and top views of a bracket suitable for use with uprights constructed according to the present invention, a bracket, referenced generally 300, which has a truncated generally triangular shape with a plurality of engagement means referenced 330 projecting rearwardly from the edges of the bracket's, generally vertical, rear surface referenced 350 is shown. Engagement means 330 are configured and dimensioned to be received within recesses 130 and retained by retaining structures 110 of uprights 100 and 200 of Figs. 2A-3C. When engaged in the upright, bracket 300 is positioned in a plane substantially transverse to the plane of the upright. Engagement means 330 can be formed as hook-shaped elements or L-shaped lugs, but clearly a variety of other suitable engagement means capable of releasably interlocking or interconnecting with the uprights of the present invention may also be used.

**[0040]** On the edge of back surface 350 of bracket 300, at least one locking means referenced 340, here, a restraining stop, extends rearwardly. Locking means 340, typically positioned co-linear with a lateral surface referenced 360 of bracket 300, is flexible and can be bent out of the plane of lateral surface 360. Figs. 4B and 4D show this flexibility which facilitates the insertion of engagement means 330 into recesses 130 in uprights 100 and 200 described in Figs. 2A-3C.

**[0041]** Figs. 4A-4C show a bracket having three engagement means 330, however, it is readily apparent to one skilled in the art that more or less than three engagement means may be used. Similarly, more than a single locking means 340 can be provided. Bracket 300 is preferably formed of metal but it can be formed of any strong, rigid material capable of supporting a shelf and a load

placed thereon.

**[0042]** Figs. 5A-5D, to which reference is now made, illustrate side, top-side and top views of another type of bracket for use with uprights constructed according to the present invention. The bracket, generally referenced 400, illustrated in Figs. 5A-5D represents a bracket described in Israel Patent IL 112,757, which is hereby incorporated by reference. Fig. 5C shows the displacement of locking means referenced 440, here a tongue-like cut-out, after the bracket is inserted into recesses 130 and retaining structures 110 of upright 100 or 200 of Figs. 2A-2C and Figs. 3A-3C respectively. In the position shown in Fig. 5C, locking means 440 prevents movement of the inserted bracket within recesses 130.

**[0043]** Reference is now made to Figs. 6A-6C which illustrate the method of insertion of brackets into uprights constructed according to the present invention. Fig. 6A shows bracket 300 first being translated in the Y direction and being brought near to upright 200. Bracket 300 is then translated in the negative Z direction inserting engagement means 330 over retaining structures 110 and into recesses 130. While engagement means 330 is inserted over retaining structures 110 and into recesses 130, locking means 340 remains flexed as shown in Fig. 6B so as not to interfere with the insertion. Once engagement means 330 have been successfully inserted into recesses 130 as shown in Fig. 6B, locking means 340 is released and positioned in recess 130, as seen in Fig. 6C. Locking means 340 and retaining structures 110 prevent movement of bracket 300 parallel to the long axis of upright 200. Fig. 6C illustrates bracket 300 fully engaged in upright 200.

**[0044]** Figs. 7A-7D and 8A-8D, to which reference is now made, show side and top views of brackets engaged in upright 100, the latter constructed according to the preferred embodiment of the present invention shown in Figs. 2A-2C. The brackets are under a load exerting a force P in the direction shown. Figs. 7A-8D, especially the enlarged views of Figs. 7C and 8C, illustrate the locked position produced by locking means 340 and 440 which prevents translational motion in the direction parallel to the long axis of the upright. The enlarged views of Figs. 7B and 8B illustrate that a torque resulting from a load positioned on a shelf resting on brackets 300 and 400 rotating around engagement means 330 and 430 respectively, is resisted by walls referenced 180 of the upright's cross-shaped core 140.

**[0045]** Walls 180 are absent in prior art uprights, which, therefore, provide little or no resistance to torques produced by loads rotating around engagement means 330. Moreover, walls 180 can be viewed as the "quasi-corrugated" perimeter of the upright which can withstand compressional forces acting on the upright better than a quadrilateral shaped perimeter. As a result, structural failure of uprights constructed according to the present invention occurs at higher loads than with uprights constructed according to prior art. It should be noted that the construction of the upright according to the present invention ef-

fectively transforms the forces acting on engagement means 330 from bending to shear forces.

**[0046]** It is also readily apparent from Figs. 7A and 8A that the use of locking means 340 and 440 prevents unpremeditated release of engagement means 330 and 430, which could result in complete disengagement of brackets 300 and 400.

**[0047]** Reference is now made to Figs. 9A-9D, which illustrate the advantage of adding ribs 120 to walls 180 of cross-shaped core 140 of an upright constructed according to a preferred embodiment of the present invention. The ribs are positioned substantially opposite the corners of the upright, as mentioned above in reference to Figs. 3A-3C. As can be seen when comparing Fig. 9D with Figs. 7D and 8D, the addition of ribs 120 as shown in Figs. 9A-9D restricts movement of bracket 300 in the direction shown by the arrow in Fig. 9D. This additional restricted movement further reduces the possibility of unintended release of engagement means 330, which could result in the complete disengagement of bracket 300 from the upright. An additional advantage of the rib is that it prevents cracking of the upright during manufacture.

**[0048]** It will be appreciated by persons skilled in the art that the present invention is not limited by what has been particularly shown and described herein above. Rather the scope of the invention is defined solely by the claims that follow:

## Claims

1. An upright (100, 200) for use as a vertical support member in modular support assemblies which include horizontal support members (300, 400), each of the support members having insertable and interlockable engagement means (330, 430), said upright including:

a generally linear member, said member having a perimeter with a polygonal cross-section so as to define a plurality of mutually adjacent faces, each face residing in a generally flat plane so as to define therebetween elongate corner portions, each portion having at least one indentation formed therealong, along the length of said generally linear member; and retaining structures (110) entirely encompass said at least one indentation, said structures positioned generally transverse to the long axis of said upright, and configured to define recesses (130) in said at least one indentation, whereby each of said recesses (130) and retaining structures (110) thus formed and configured can receive and retain only a single insertable and interlockable engagement means (330, 430) of the horizontal support members (300, 400), and where said faces of said linear member form, a cross shaped core (140) of said linear

member, thereby more easily supporting compressional forces acting on said upright produced by loads resting on the horizontal support members, and where said faces (180) of said cross shaped core (140) form a backing for said recesses (130) resisting torques generated by loads on the horizontal support members acting through their engagement means when the engagement means are inserted into, and retained in, said recesses (130).

2. An upright (200) according to claim 1, further including at least one rib (120) formed in said at least one indentation, said at least one rib (120) positioned substantially opposite to a corner portion of the upright.
3. An upright (100, 200) according to claim 1, wherein said retaining structures (110) are equally spaced in the direction of the long axis of said upright.
4. An upright (100, 200) according to claim 1, wherein said retaining structures (110) are unequally spaced in the direction of the long axis of said upright.
5. An upright (100, 200) according to claim 1, wherein said retaining structures (110) are unequally spaced in the direction of the long axis of said upright (100, 200) and where said structures (110) are positioned in groups, each group including a number of retaining structures (110) at least equal to the number of engagement means (330, 430) of a single horizontal support member (300, 400).

6. A modular support assembly including:

at least two uprights (100, 200), each upright including;

a generally linear member, said member having a perimeter with a polygonal cross-section so as to define a plurality of mutually adjacent faces, each face residing in a generally flat plane so as to define therebetween elongate corner portions, each portion having at least one indentation formed therealong, along the length of said generally linear member; and retaining structures (110) entirely encompass said at least one indentation, said structures positioned generally transverse to the long axis of said upright, and configured to define recesses (130) in said at least one indentation; and

at least two horizontal support members (300, 400) positioned generally transverse to said uprights (100, 200), said support members (300,

400) having insertable and engageable engagement means (330, 430) extending from each of said support members (300, 400),

whereby each of said recesses (130) and retaining structures (110) of said uprights (100, 200) are configured to receive and retain only a single insertable and interlockable engagement means (330, 430) of said generally horizontal support members (300, 400), and where said faces of said linear member form a cross shaped core (140) of said linear member, thereby more easily supporting compressional forces acting on said upright (100, 200) produced by loads resting on said horizontal support members (300, 400), and where said faces (180) of said cross shaped core (140) form a backing for said recesses (130) resisting torques generated by loads on said horizontal support members (300, 400) acting through their engagement means (330, 430) when said engagement means (330, 430) are inserted into, and retained in, said recesses (130).

7. A modular support assembly according to claim 6, further including at least one rib (120) formed in said at least one indentation, said at least one rib (120) positioned substantially opposite to a corner portion of the upright (200).
8. A modular support assembly according to claim 6, wherein said retaining structures (110) are equally spaced in the direction of the long axis of said upright (100, 200).
9. A modular support assembly according to claim 6, wherein said retaining structures (110) are unequally spaced in the direction of the long axis of said upright (100, 200).
10. A modular support assembly according to claim 6, wherein said retaining structures (110) are unequally spaced in the direction of the long axis of said upright (100, 200) and where said structures (110) are positioned in groups, each group including a number of retaining structures (110) at least equal to the number of engagement means (330, 430) of a single horizontal support member (300, 400).
11. A modular support assembly according to claim 6, wherein said at least two support members (300, 400) further include flexible locking means (340, 440) for preventing translation of said support members (300, 400) within said recesses (130) in the direction parallel to the long axis of said upright (100, 200), said locking means (340, 440) insertable within said recesses (130) and extending rearwardly from said support members (300, 400).
12. A modular support assembly according to claim 11,

wherein said flexible locking means (340, 440) also prevents translation of said support members (300, 400) within said recesses (130) in at least one direction generally perpendicular to the long axis of said upright (100, 200).

13. A modular support assembly according to claim 11, wherein said flexible locking means (340,) when not flexed lies in a plane of a lateral surface (360,) of said support member (300,) and when flexed lies out of the plane of said surface.
14. A modular support assembly according to claim 6, wherein each of said at least two uprights (100, 200) has at least one horizontal support member (300, 400) engaged thereto.
15. A modular support assembly according to claim 6, wherein said horizontal support members (300, 400) include:

at least one engagement means (330, 430) for snap-in insertion into recesses (130) positioned in an upright (100, 200) of the assembly, said at least one engagement means (330, 430) extending towards the upright (100, 200) from the surface of said support member (300, 400) proximate to the upright (100, 200); and  
at least one locking means (340, 440) insertable into a recess (130) in the upright (100, 200), said locking means (340, 440) preventing motion of said support member (300, 400) within the recess (130) of the upright (100, 200).

16. A modular support assembly according to claim 11, wherein said flexible locking means (340) is kept flexed when said engagement means (330,) are inserted into and engaged with said recesses (130) and said locking means (340,) is returned to its unflexed position after insertion into said recess (130) in said upright (100, 200).

#### Patentansprüche

1. Ständer (100, 200) zur Verwendung als vertikales Stützelement in modularen Stützaufbauten, welche horizontale Stützelemente (300, 400) umfassen, wobei jedes Stützelement einsetzbare und verriegelbare Eingriffsmittel (330, 430) umfasst, wobei der Ständer Folgendes umfasst:

ein im Allgemeinen lineares Element, welches einen Umfang mit vieleckigem Querschnitt aufweist, dergestalt, dass eine Vielheit aneinander angrenzender Flächen definiert wird, wobei jede Fläche in einer im Allgemeinen flachen Ebene liegt, dergestalt, dass zwischen diesen langge-

- zogene Kantenabschnitte definiert werden, wobei entlang jedes Abschnittes, entlang der Länge des im Allgemeinen linearen Elements, mindestens eine Einbuchtung ausgebildet ist, und Haltestrukturen (110), welche die mindestens eine Einbuchtung in Gänze umgreifen, im Allgemeinen quer zu der langen Achse des Ständers angeordnet sind und dazu konfiguriert sind, Aussparungen (130) in der mindestens einen Einbuchtung zu definieren, wodurch jede der somit ausgebildeten und konfigurierten Aussparungen (130) und Haltestrukturen (110) nur genau eines der einsetzbaren und verriegelbaren Eingriffsmittel (330, 430) der horizontalen Stützelemente (300, 400) aufnehmen und halten kann, wobei die Flächen des linearen Elements einen kreuzförmigen Kern (140) des linearen Elements ausbilden und **dadurch** Druckkräfte, die von auf den horizontalen Stützelementen ruhenden Lasten auf den Ständer ausgeübt werden, einfacher abstützen können und wobei die Flächen (180) des kreuzförmigen Kerns (140) eine Verstärkung für die Aussparungen (130) bilden, die Drehmomenten widersteht, welche von Lasten auf den horizontalen Stützelementen über deren Eingriffsmittel ausgeübt werden, wenn die Eingriffsmittel in die Aussparungen (130) eingesetzt sind und dort gehalten werden.
2. Ständer (200) nach Anspruch 1, welcher ferner mindestens eine in der mindestens einen Einbuchtung ausgebildete Rippe (120) umfasst, die im Wesentlichen einem Kantenabschnitt des Ständers gegenüber angeordnet ist.
3. Ständer (100, 200) nach Anspruch 1, wobei die Haltestrukturen (110) in Richtung der langen Achse des Ständers gleichmäßig beabstandet sind.
4. Ständer (100, 200) nach Anspruch 1, wobei die Haltestrukturen (110) in Richtung der langen Achse des Ständers ungleichmäßig beabstandet sind.
5. Ständer (100, 200) nach Anspruch 1, wobei die Haltestrukturen (110) in Richtung der langen Achse des Ständers (100, 200) ungleichmäßig beabstandet und in Gruppen angeordnet sind, wobei jede Gruppe eine Anzahl von Haltestrukturen (110) umfasst, die mindestens gleich der Anzahl von Eingriffsmitteln (330, 430) eines einzelnen horizontalen Stützelements (300, 400) ist.
6. Modularer Stützaufbau, welcher Folgendes umfasst:
- mindestens zwei Ständer (100, 200), wobei jeder Ständer Folgendes umfasst:
- ein im Allgemeinen lineares Element, das einen Umfang mit vieleckigem Querschnitt aufweist, dergestalt, dass eine Vielheit aneinander angrenzender Flächen definiert wird, wobei jede Fläche in einer im Allgemeinen flachen Ebene liegt, dergestalt, dass zwischen diesen langgezogene Kantenabschnitte definiert werden, wobei entlang jedes Abschnittes, entlang der Länge des im Allgemeinen linearen Elements, mindestens eine Einbuchtung ausgebildet ist, und Haltestrukturen (110), welche die mindestens eine Einbuchtung in Gänze umgreifen, im Allgemeinen quer zu der langen Achse des Ständers angeordnet sind und dazu konfiguriert sind, Aussparungen (130) in der mindestens einen Einbuchtung zu definieren, und mindestens zwei horizontale Stützelemente (300, 400), die im Allgemeinen quer zu den Ständern (100, 200) angeordnet sind und einsetzbare und in Eingriff zu bringende Eingriffsmittel (330, 430) aufweisen, die jeweils von den einzelnen Stützelementen (300, 400) abstehen,
- wodurch jede der Aussparungen (130) und Haltestrukturen (110) der Ständer (100, 200) dazu konfiguriert ist, nur genau eines der einsetzbaren und verriegelbaren Eingriffsmittel (330, 430) der im Allgemeinen horizontalen Stützelemente (300, 400) aufzunehmen und zu halten, wobei die Flächen des linearen Elements einen kreuzförmigen Kern (140) des linearen Elements ausbilden und **dadurch** Druckkräfte, die von auf den horizontalen Stützelementen (300, 400) ruhenden Lasten auf den Ständer (100, 200) ausgeübt werden, einfacher abstützen können und wobei die Flächen (180) des kreuzförmigen Kerns (140) eine Verstärkung für die Aussparungen (130) bilden, die Drehmomenten widersteht, welche von Lasten auf den horizontalen Stützelementen (300, 400) über deren Eingriffsmittel (330, 430) ausgeübt werden, wenn die Eingriffsmittel (330, 430) in die Aussparungen (130) eingesetzt sind und dort gehalten werden.
7. Modularer Stützaufbau nach Anspruch 6, welcher ferner mindestens eine in der mindestens einen Einbuchtung ausgebildete Rippe (120) umfasst, die im Wesentlichen einem Kantenabschnitt des Ständers (200) gegenüber angeordnet ist.
8. Modularer Stützaufbau nach Anspruch 6, wobei die Haltestrukturen (110) in Richtung der langen Achse des Ständers (100, 200) gleichmäßig beabstandet sind.

9. Modularer Stützaufbau nach Anspruch 6, wobei die Haltestrukturen (110) in Richtung der langen Achse des Ständers (100, 200) ungleichmäßig beabstandet sind.

10. Modularer Stützaufbau nach Anspruch 6, wobei die Haltestrukturen (110) in Richtung der langen Achse des Ständers (100, 200) ungleichmäßig beabstandet sind und wobei die Strukturen (110) in Gruppen angeordnet sind, wobei jede Gruppe eine Anzahl von Haltestrukturen (110) umfasst, die mindestens gleich der Anzahl von Eingriffsmitteln (330, 430) eines einzelnen horizontalen Stützelements (300, 400) ist.

11. Modularer Stützaufbau nach Anspruch 6, wobei die mindestens zwei Stützelemente (300, 400) ferner biegsame Verriegelungsmittel (340, 440) umfassen, um Translationsbewegungen der Stützelemente (300, 400) innerhalb der Aussparungen (130) in einer zu der langen Achse des Ständers (100, 200) parallelen Richtung zu verhindern, wobei die Verriegelungsmittel (340, 440) in die Aussparungen (130) einsetzbar sind und nach hinten von den Stützelementen (300, 400) abstehen.

12. Modularer Stützaufbau nach Anspruch 11, wobei das biegsame Verriegelungsmittel (340, 440) Translationsbewegungen der Stützelemente (300, 400) innerhalb der Aussparungen (130) auch in mindestens einer zu der langen Achse des Ständers (100, 200) im Allgemeinen senkrechten Richtung verhindert.

13. Modularer Stützaufbau nach Anspruch 11, wobei das biegsame Verriegelungsmittel (340) in einer Ebene einer Seitenfläche (360) des Stützelements (300) liegt, wenn es nicht ausgelenkt ist, und außerhalb der Ebene der Fläche liegt, wenn es ausgelenkt ist.

14. Modularer Stützaufbau nach Anspruch 6, wobei jeder der mindestens zwei Ständer (100, 200) mindestens ein in Eingriff mit ihm befindliches horizontales Stützelement (300, 400) aufweist.

15. Modularer Stützaufbau nach Anspruch 6, wobei die horizontalen Stützelemente (300, 400) Folgendes umfassen:

mindestens ein Eingriffsmittel (330, 430) zum einrastbaren Einsetzen in Aussparungen (130), die in einem Ständer (100, 200) des Aufbaus angeordnet sind, wobei das mindestens eine Eingriffsmittel (330, 430) von der dem Ständer (100, 200) nächstliegenden Fläche des Stützelements (300, 400) aus auf den Ständer (100, 200) zu absteht, und mindestens ein Verriegelungsmittel (340, 440),

das in eine Aussparung (130) in dem Ständer (100, 200) einsetzbar ist und Bewegungen des Stützelements (300, 400) innerhalb der Aussparung (130) des Ständers (100, 200) verhindert.

16. Modularer Stützaufbau nach Anspruch 11, wobei das biegsame Verriegelungsmittel (340) ausgelenkt gehalten wird, während die Eingriffsmittel (330) in die Aussparungen (130) eingesetzt und mit diesen in Eingriff gebracht werden, und das Verriegelungsmittel (340) nach dem Einsetzen in die Aussparung (130) in dem Ständer (100, 200) zurück in seine nicht ausgelenkte Position gebracht wird.

## Revendications

1. Un montant (100, 200) pour utilisation comme support vertical dans des ensembles de support modulaire comprenant des traverses de support horizontal (300, 400), chacune des traverses étant munies d'un dispositif d'engagement insérable et à blocage réciproque (330, 430), ledit montant comprenant:

une traverse généralement linéaire, ladite traverse étant dotée d'un périmètre avec une section transversale polygonale de sorte à définir plusieurs faces mutuellement adjacentes, chacune des faces résidant en un plan généralement plat afin de définir entre elles des portions angulées allongées, chaque portion présentant au moins une indentation formée le long de la longueur de ladite traverse généralement linéaire ; et

des structures de fixation (110) englobant entièrement au moins une indentation, lesdites structures étant positionnées généralement transversalement le long de l'axe dudit montant et configurées pour définir des encoches (130) dans ladite indentation au moins,

en vertu de quoi chacune des dites encoches (130) et structures de fixation (110) ainsi formée et configurée peut recevoir et retenir uniquement un seul dispositif d'engagement insérable et à verrouillage réciproque (330, 430) des traverses de support horizontal (300, 400), et lesdites faces de ladite traverse linéaire forment un centre cruciforme (140) de ladite traverse linéaire, supportant ainsi plus aisément des forces de compression agissant sur ledit montant produites par les charges reposant sur les traverses de support horizontales, et où lesdites faces (180) desdits centres cruciformes (140) forment un soutien pour lesdites encoches (130) résistant aux couples générés par les charges sur les traverses de support horizontal agissant à travers leurs dispositif d'engagement lorsque les dispositifs d'engagement sont insérés et re-

tenus dans lesdites encoches (130).

2. Un montant (200) conforme à la revendication 1, comprenant en outre au moins une nervure (120) formée dans ladite indentation au moins, ladite nervure au moins (120) étant positionnée nettement à l'opposé d'une portion angulée du montant. 5
3. Un montant (100, 200) conforme à la revendication 1, au sein duquel les structures de fixation (110) sont uniformément espacées dans la direction de l'axe long dudit montant. 10
4. Un montant (100, 200) conforme à la revendication 1, au sein duquel lesdites structures de fixation sont espacées de façon inégale dans la direction de l'axe long dudit montant. 15
5. Un montant (100, 200) conforme à la revendication 1, au sein duquel les structures de fixation (110) sont espacées de façon inégale dans la direction de l'axe long dudit montant (100, 200) et où lesdites structures (110) sont positionnées en groupes, chacun des groupes comprenant un certain nombre de structures de fixation (100) au moins égal au nombre de dispositifs d'engagement (330, 430) d'une seule traverse de support horizontal (300, 400). 20 25
6. Un ensemble de support modulaire comprenant: 30
  - au moins deux montants (100, 200), chaque montant comprenant:
    - une traverse généralement linéaire dotée d'un périmètre avec une section transversale polygonale de sorte à définir plusieurs faces mutuellement adjacentes, chacune des faces résidant en un plan généralement plat afin de définir entre elles des portions angulées allongées, chaque portion présentant au moins une indentation formée le long de la longueur de ladite traverse généralement linéaire; et 35
    - des structures de fixation (110) englobant entièrement ladite indentation au moins, lesdites structures étant positionnées généralement transversalement le long de l'axe dudit montant et configurées pour définir des encoches (130) dans ladite indentation au moins; et 40
    - au moins deux traverses de support horizontal (300, 400) positionnées généralement transversalement par rapport aux dits montants (100, 200), lesdites traverses de support (300, 400) étant dotées de dispositifs d'engagement insérables et engageables (330, 430) s'étendant depuis chacune des dites traverses (300, 400), 45 50 55

en vertu de quoi chacune des dites encoches (130) et structures de fixation (110) desdits montants (100, 200) est configurée pour recevoir et retenir uniquement un seul dispositif d'engagement insérable et à verrouillage réciproque (330, 430) des dites traverses de support généralement horizontal (300, 400), et lesdites faces de ladite traverse linéaire, forment un centre cruciforme (140) de ladite traverse linéaire, supportant ainsi plus aisément des forces de compression agissant sur ledit montant (100, 200) produites par les charges reposant sur les dites traverses horizontales (300, 400), et où lesdites faces (180) desdits centres cruciformes (140) forment un soutien pour lesdites encoches (130) résistant aux couples générés par les charges sur lesdites traverses de support horizontal (300, 400) agissant à travers leurs dispositifs d'engagement (330, 440) lorsque lesdits dispositifs d'engagement (330, 340) sont insérés et retenus dans lesdites encoches (130).

7. Un ensemble de support modulaire conforme à la revendication 6, incluant en outre au moins une nervure (120) formée dans ladite indentation au moins, ladite nervure au moins (120) positionnée nettement à l'opposé d'une portion angulaire du montant (200).
8. Un ensemble de support modulaire conforme à la revendication 6, au sein duquel lesdites structures de fixation (110) sont espacées dans la direction de l'axe long dudit montant (100, 200).
9. Un ensemble de support modulaire conforme à la revendication 6, au sein duquel lesdites structures de fixation (110) sont espacées de façon inégale dans la direction de l'axe long dudit montant (100, 200).
10. Un ensemble de support modulaire conforme à la revendication 6, au sein duquel lesdites structures de fixation (110) sont espacées de façon inégale dans la direction de l'axe long dudit montant (100, 200) et où lesdites structures (110) sont positionnées en groupes, chaque groupe incluant un certain nombre de structures de fixation (110) au moins égal au nombre de dispositifs d'engagement (330, 430) d'une traverse de support horizontal unique (300, 400).
11. Un ensemble de support modulaire conforme à la revendication 6, au sein duquel lesdites deux traverses au moins (300, 400) comprennent en outre des dispositifs de verrouillage souples (340, 440) pour éviter toute translation des dites traverses de support

(300, 400) dans lesdites encoches (130) en direction parallèle à l'axe long dudit montant (100, 200), lesdits dispositifs de verrouillage (340, 440) insérables dans lesdites encoches (130) s'étendent en arrière à partir des dites traverses de support (300, 400). 5

12. Un ensemble de support modulaire conforme à la revendication 11, au sein duquel ledit dispositif de verrouillage souple (340, 440) évite également toute translation des dites traverses de support (300, 400) dans les encoches (130) dans au moins une direction généralement perpendiculaire à l'axe long dudit montant (100, 200). 10

13. Un ensemble de support modulaire conforme à la revendication 11, au sein duquel ledit dispositif de verrouillage souple (340) lorsqu'il n'est pas fléchi repose sur un plan d'une surface latérale (360) de ladite traverse de support (300) et lorsqu'il est fléchi repose en dehors du plan de ladite surface. 15 20

14. Un ensemble de support modulaire conforme à la revendication 6, au sein duquel chacun desdits deux montants au moins (100, 200) est muni d'au moins une traverse de support (300, 400) qui y est engagée. 25

15. Un ensemble de support modulaire conforme à la revendication 6, au sein duquel lesdits traverses de support horizontal (300, 400) comprennent: 30

au moins un dispositif d'engagement (330, 430) pour insertion par enclenchement dans les encoches (130) positionné dans un montant (100, 200) de l'ensemble, ledit dispositif d'engagement au moins (330, 430) s'étendant vers le montant (100, 200) à partir de la surface de ladite traverse de support (300, 400) proche du montant (100, 200); et 35

au moins un dispositif de verrouillage (340, 440) insérable dans une encoche (130) dans le montant (100, 200), ledit dispositif de verrouillage (340, 440) empêchant le mouvement de ladite traverse de support (300, 400) dans l'encoche (130) du montant (100, 200). 40 45

16. Un ensemble de support modulaire conforme à la revendication 11, au sein duquel ledit dispositif de verrouillage souple (340) est maintenu fléchi lorsque lesdits dispositifs d'engagement (330) sont insérés et engagés dans lesdites encoches (130) et ledit dispositif de verrouillage (340) est ramené en position non fléchie après insertion dans ladite encoche (130) dudit montant (100, 200). 50 55

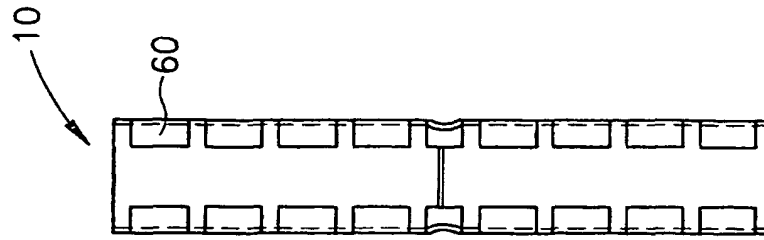


FIG. 1E  
PRIOR ART

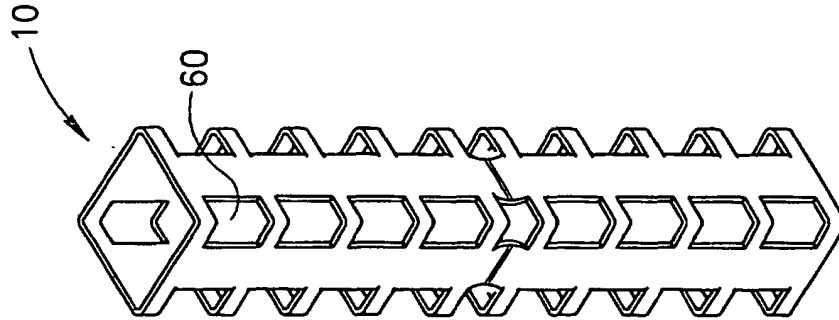


FIG. 1D  
PRIOR ART

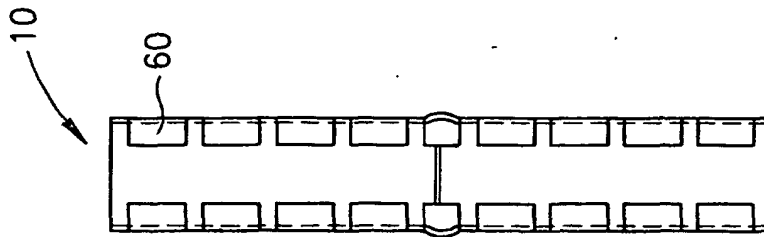


FIG. 1C  
PRIOR ART

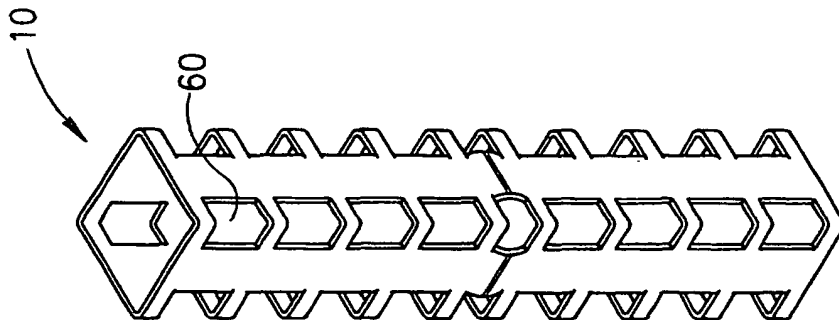


FIG. 1B  
PRIOR ART

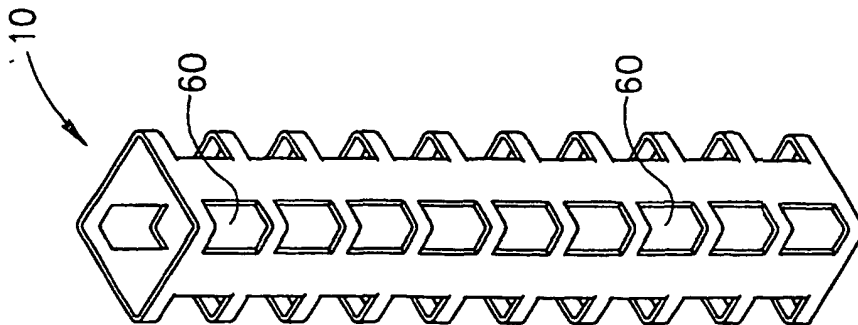


FIG. 1A  
PRIOR ART

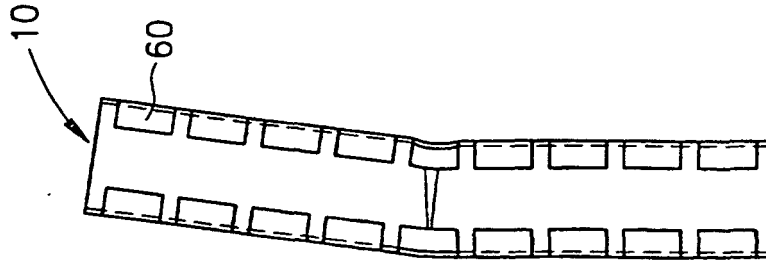


FIG. 1I  
PRIOR ART

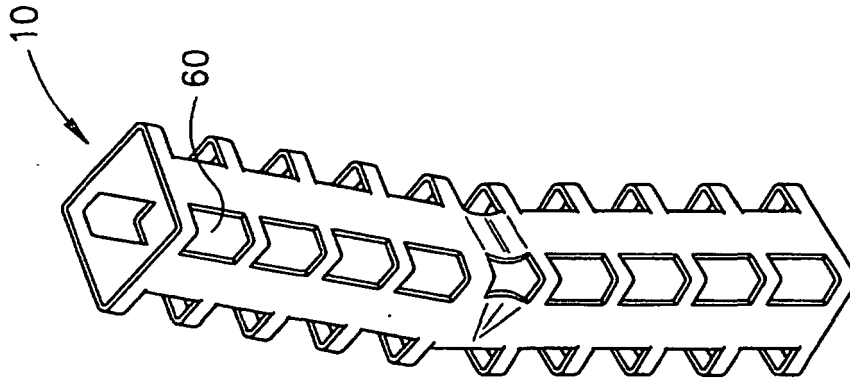


FIG. 1H  
PRIOR ART

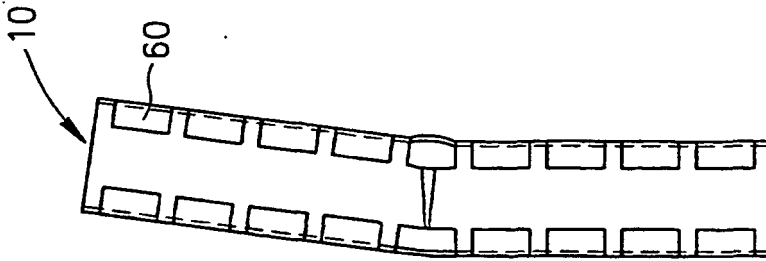


FIG. 1G  
PRIOR ART

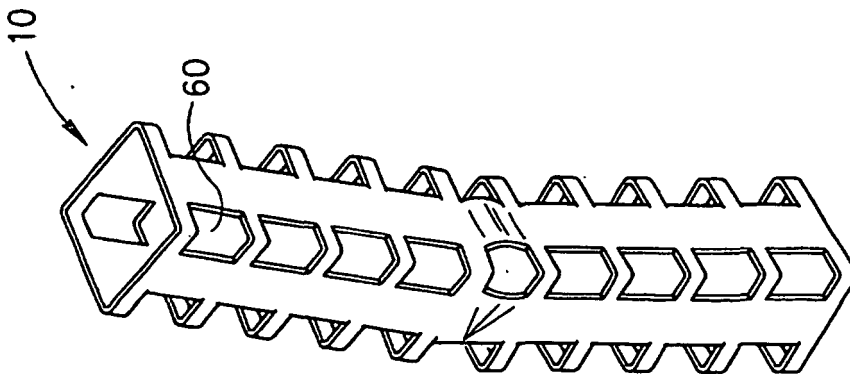
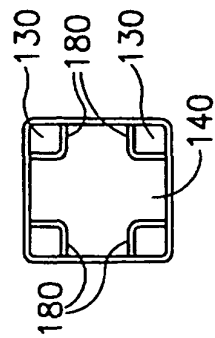
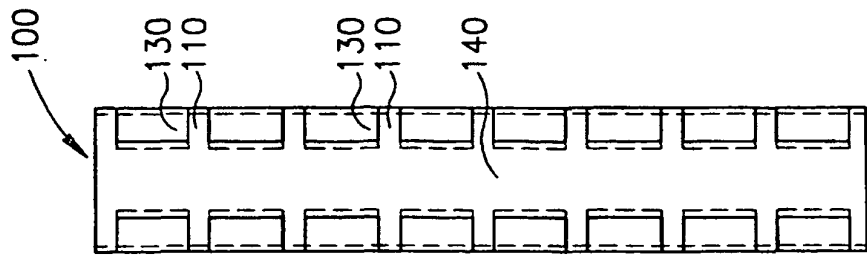
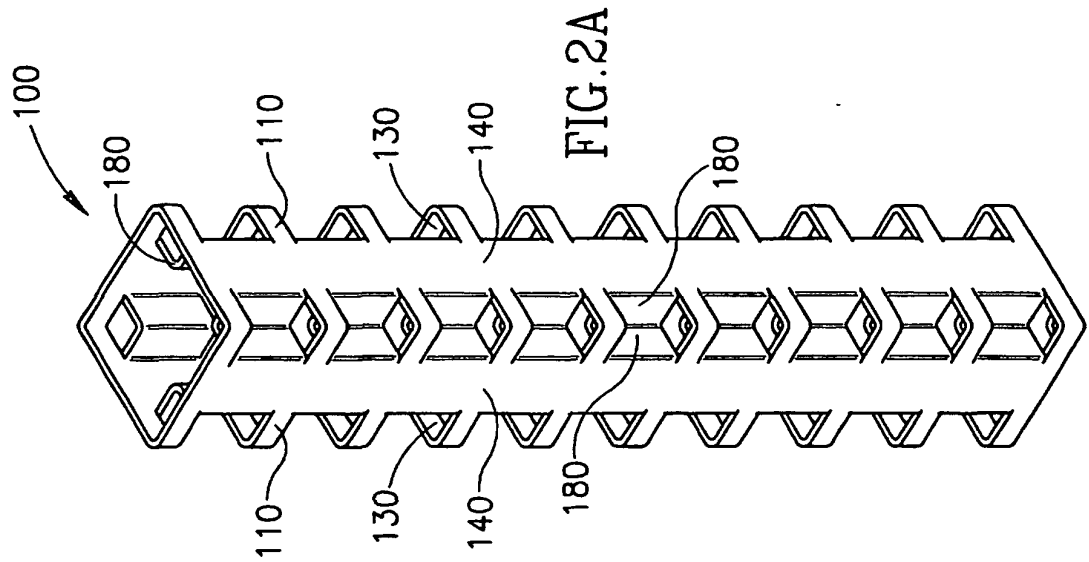
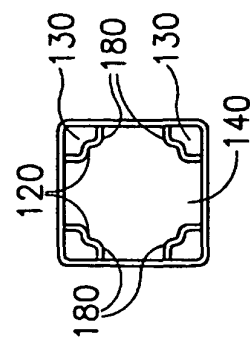
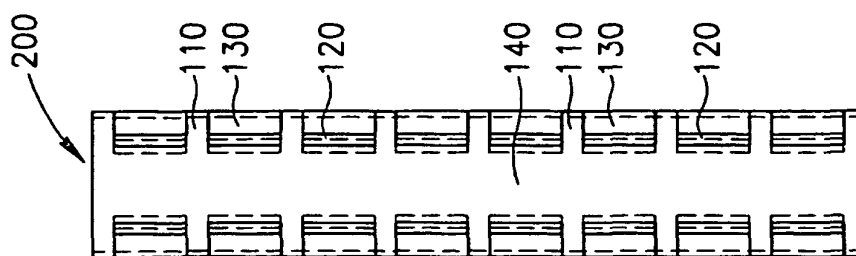
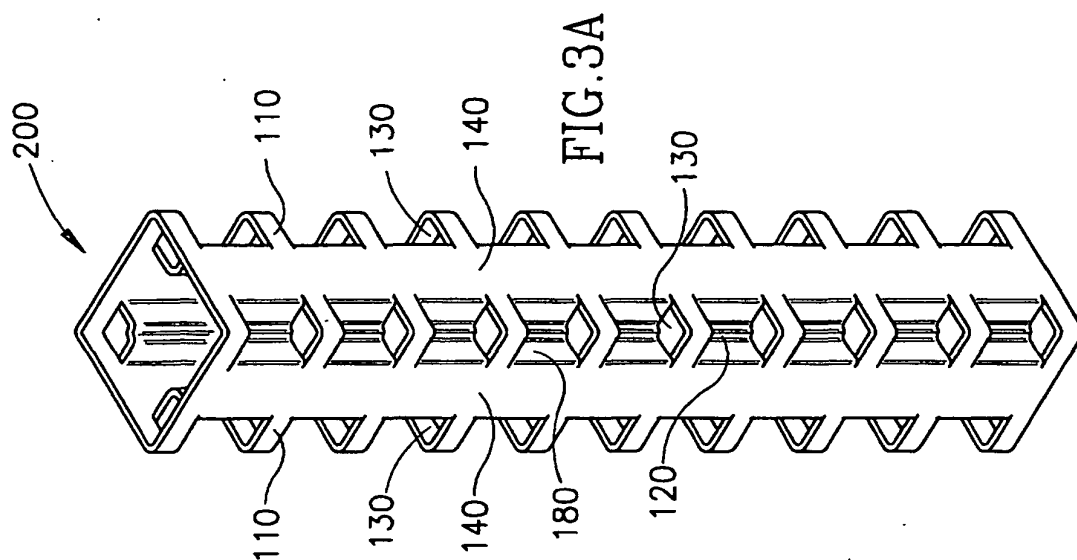


FIG. 1F  
PRIOR ART





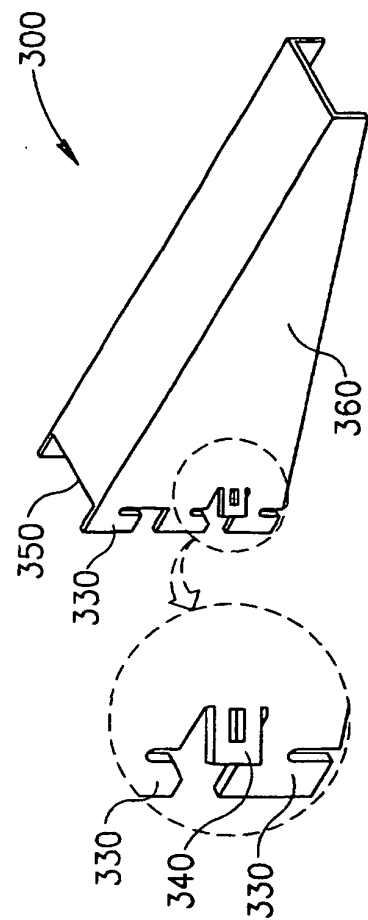


FIG. 4A

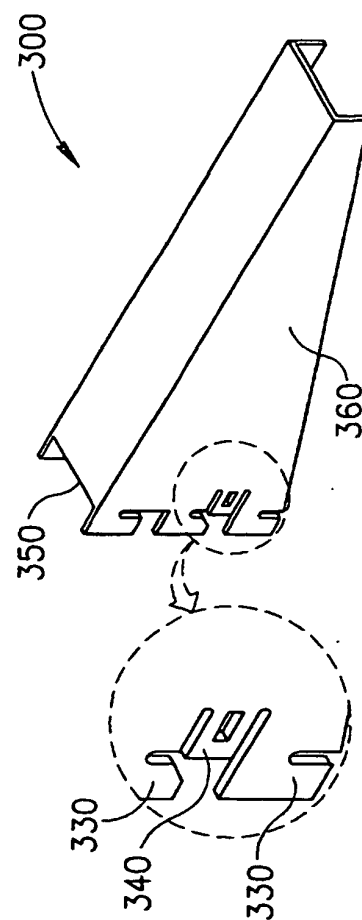


FIG. 4B

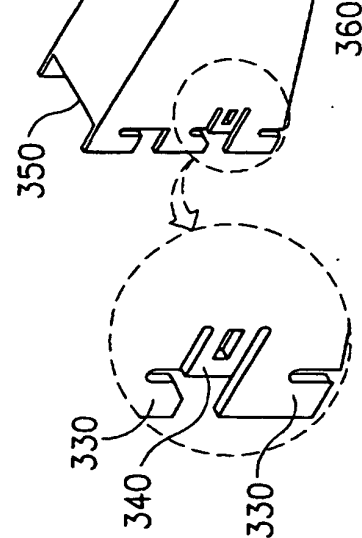


FIG. 4C

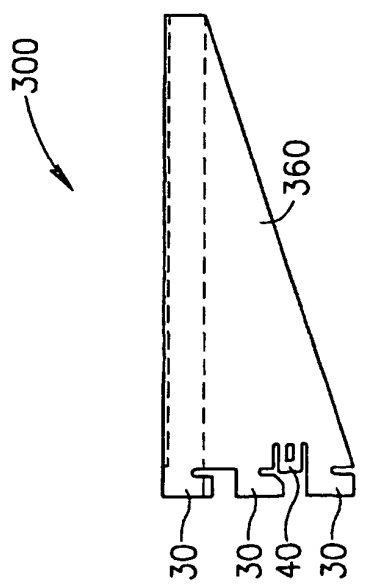
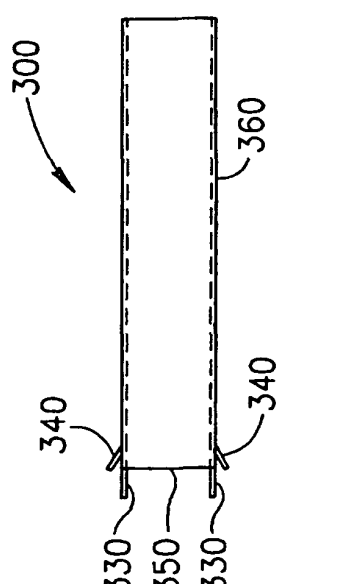


FIG. 4D



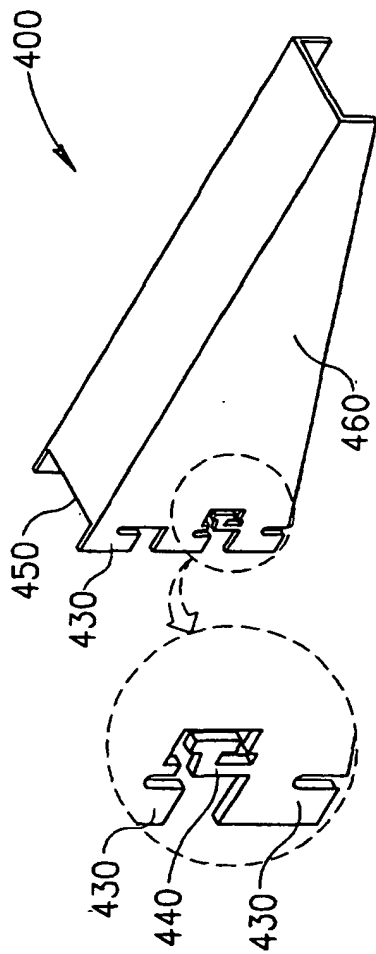


FIG. 5A

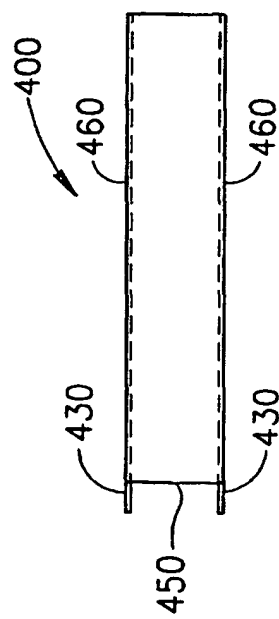


FIG. 5B

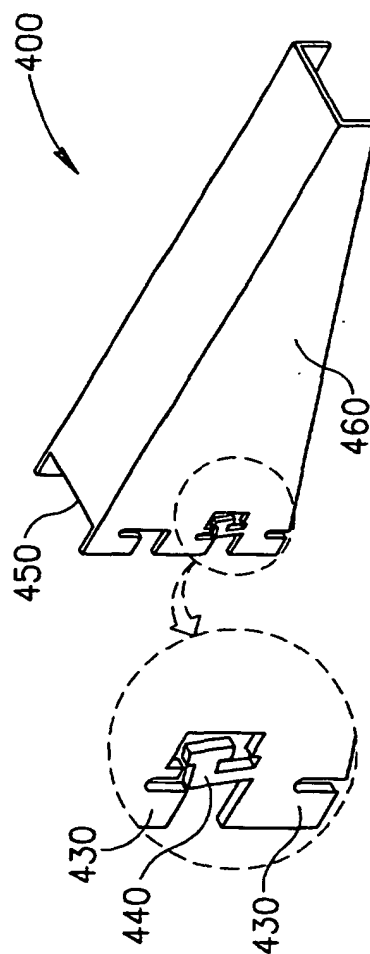


FIG. 5D

FIG. 5C

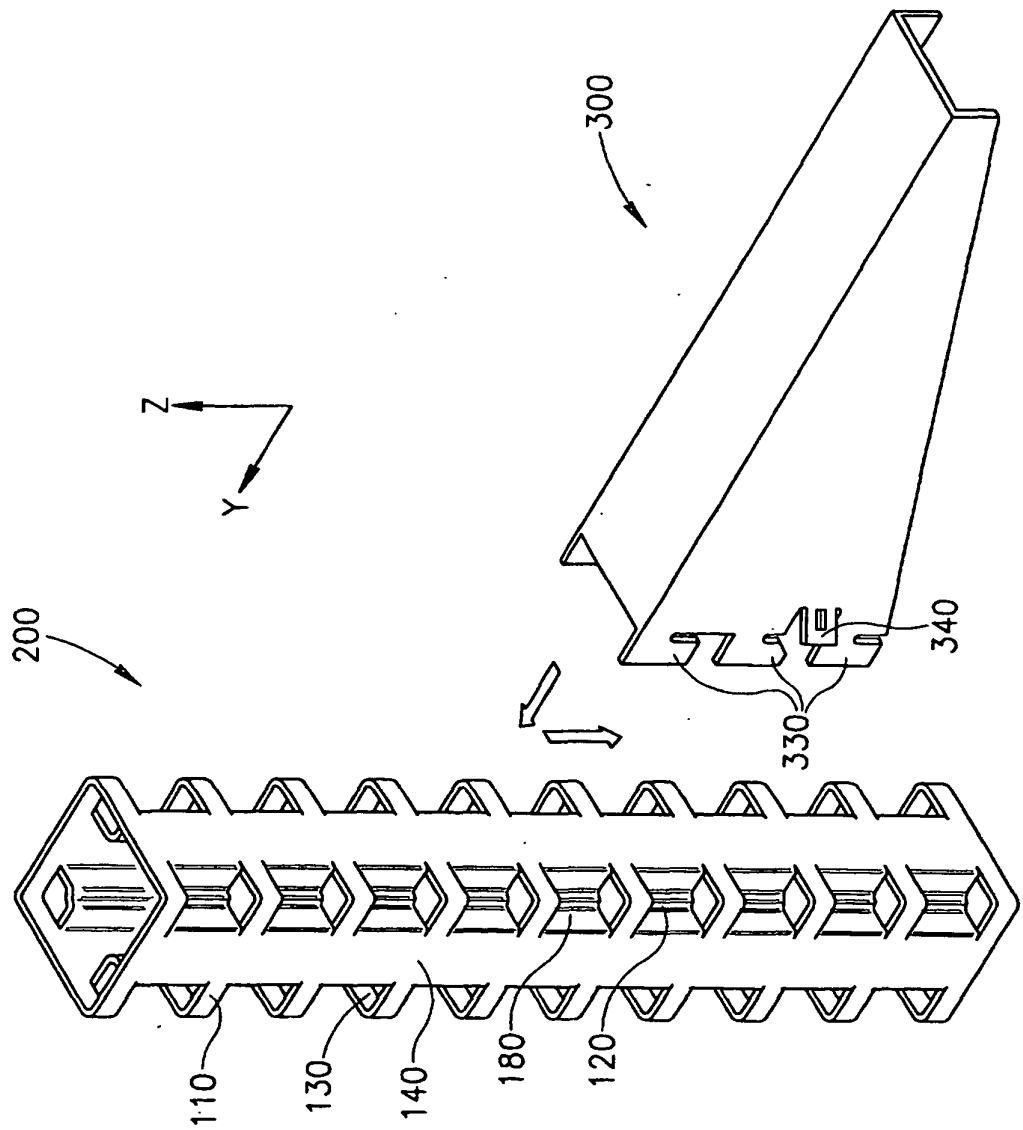


FIG. 6A

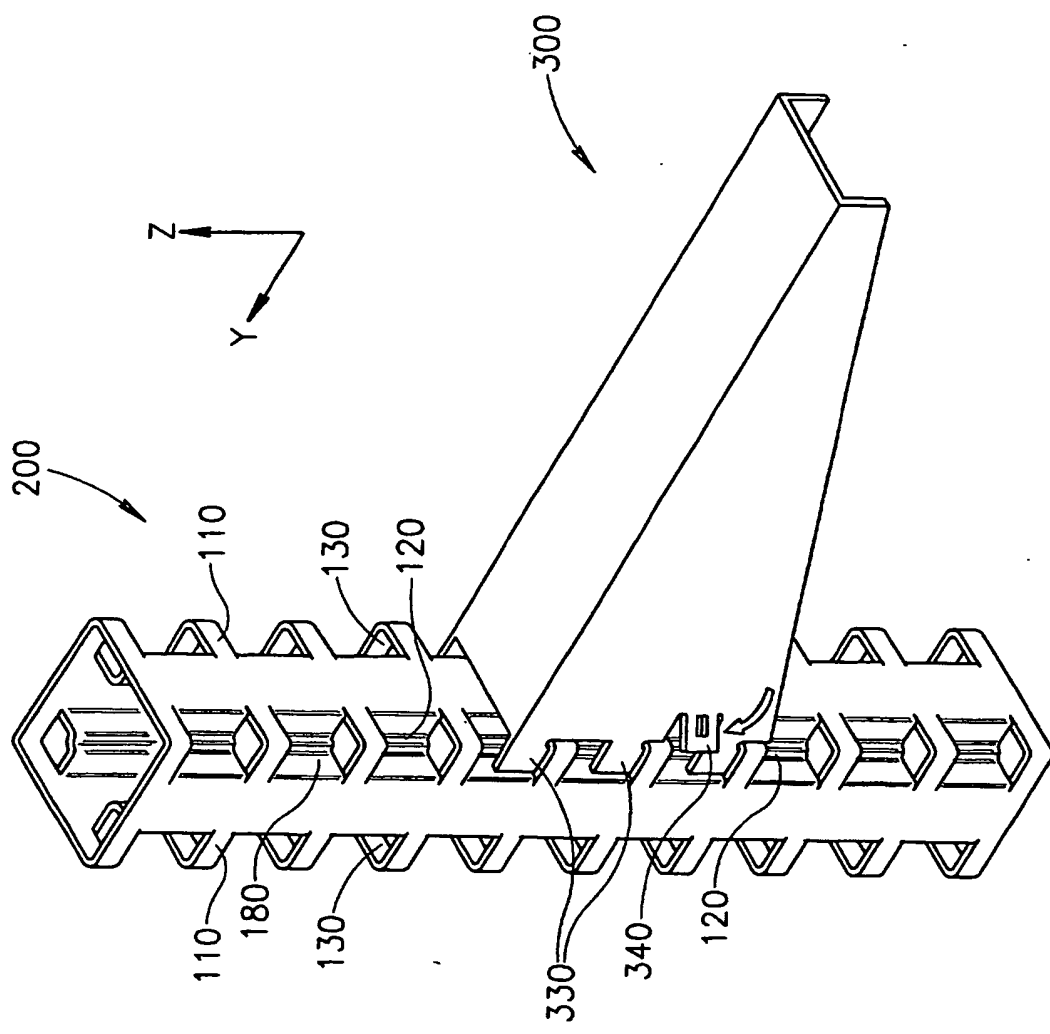


FIG. 6B

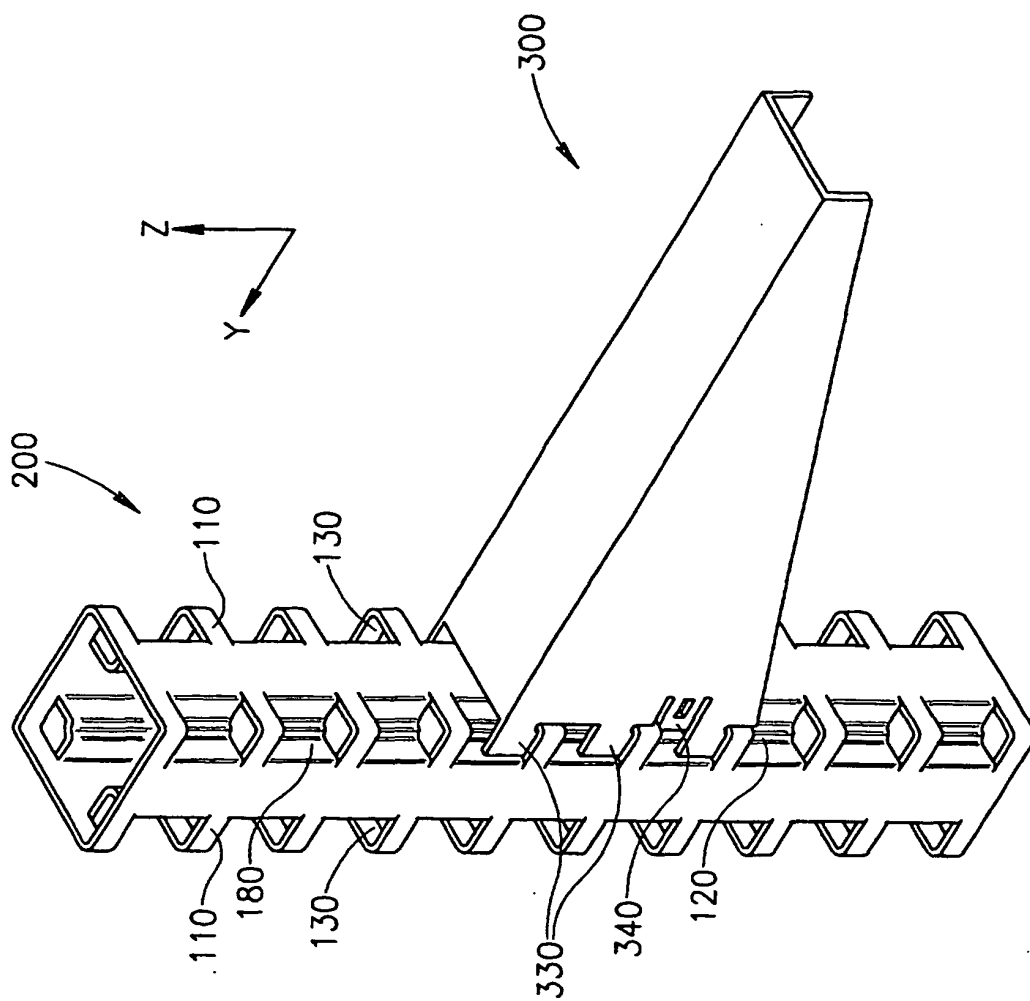


FIG. 6C

