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(54) **MODIFIABLE RACK POST BRACKET**

(57) A rack is provided that includes a top frame and a bottom frame connected by at least one post. The post is slidably configured within the rack. The rack also includes a plurality of brackets installed on the post. Each of the brackets within the plurality of brackets is configured to rotate with respect to the at least one post.

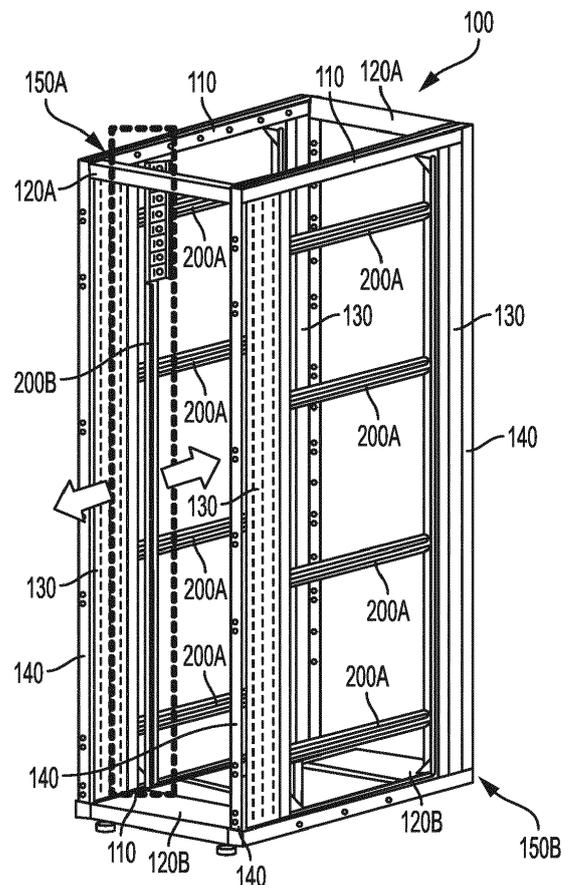


FIG. 1A

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Description

FIELD OF THE INVENTION

[0001] The present disclosure relates to a bracket assembly, and more particularly, to a modifiable bracket assembly for a server rack.

BACKGROUND

[0002] Computer enclosures and other types of electronic equipment are sometimes mounted in a vertical rack structure. This technique is referred to as "rack mounting" and is frequently used, for example, with server-type computers. Most rack structures include four vertical corner posts. Pairs of horizontal slide rail assemblies are attached to the corner posts to create slots or drawers into which the computer enclosures are received or inserted. These horizontal slide rails are known in the art as brackets.

[0003] Rectangular-shaped metal chassis are used for the storage and ready accessibility of magnetic disk drive storage media. Typically, the chassis' body is mounted with screws to the brackets within the storage rack. As installed, the chassis is accessible at its front and back for viewing, replacement, repair, and monitoring of its contents. The chassis can vary in depth, as there are various standards for the depth of such chassis or the storage racks.

[0004] A smaller chassis (with respect to depth) may be preferred based on the size of the equipment stored in the chassis. A smaller chassis may also be preferred because it is more portable than larger counterparts with greater depth. However, a small size chassis is not deep enough to be mounted to a larger-sized storage rack, thereby limiting its installation to only small size storage racks. The need to purchase racks of different sizes results in extra expense accompanied by a need for additional storage space to fit the varying sizes of the storage racks and chassis. Moreover, the common state of the art prevents chassis of varying sizes from being mounted together in one conveniently located storage rack.

SUMMARY

[0005] Particular and preferred aspects of the present invention are set out in the accompanying independent and dependent claims. Features of the dependent claims may be combined with features of the independent claims as appropriate, and in combinations other than those explicitly set out in the claims.

[0006] The various embodiments concern a rack for storing various sized chassis. The rack includes a top frame and a bottom frame connected by at least one post. The post is slidably configured within the rack. The rack also includes a plurality of brackets installed on the post. Each of the brackets within the plurality of brackets is configured to rotate with respect to the at least one post.

[0007] In some embodiments, the top frame includes a first set of front-to-back beams and top side-to-side beams. Furthermore, the bottom frame includes a second set of front-to-back beams and bottom side-to-side beams. The rack can also include vertical posts connected to the top frame and the bottom frame. The rack can also include rail assemblies connected to the vertical posts. In an exemplary embodiment, the post includes openings for mounting configured to mount at least one piece of electronic equipment. In some embodiments, the post includes mounting openings configured to mount the plurality of brackets. In some embodiments, each bracket within the plurality of brackets includes an L-shaped first portion and a planar second portion. The L-shaped first portion includes a plurality of mounting openings. In some embodiments, the planar second portion includes a threaded member and an alignment hole.

[0008] Additional features and advantages of the various embodiments will be set forth in the description; or can be learned by practice of the herein disclosed principles. The features and advantages of the various embodiments can be realized and obtained by means of the instruments and combinations particularly pointed out in the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] In order to describe the manner in which the above-recited disclosure and its advantages and features can be obtained, a more particular description of the principles briefly described above will be rendered by reference to specific examples illustrated in the appended drawings. These drawings depict only exemplary embodiments, and are therefore not to be considered to be limiting of the scope of the various embodiments or the claims. The principles are described and explained with additional specificity and detail through the use of the following drawings.

FIG. 1A illustrates a perspective view of a rack, showing the post installed in a first position, according to one or more embodiments.

FIG. 1B illustrates a perspective view of a rack, showing the post installed in a second position, according to one or more embodiments.

FIG. 2 illustrates a perspective view of a post installed within the rack of FIGS. 1A and 1B, according to one or more embodiments.

FIG. 3 illustrates a perspective view of a bracket installed onto the post of FIG. 2, according to one or more embodiments.

FIG. 4 illustrates a perspective view of a plurality of individual brackets installed onto the bracket assembly of FIG. 3, according to one or more embodiments. FIG. 5 illustrates a perspective view of an individual bracket of FIG. 4, according to one or more embodiments.

FIG. 6 illustrates a perspective view of the brackets of FIG. 5 configured to rotate within the rack, according to one or more embodiments.

DETAILED DESCRIPTION

[0010] The various embodiments are described with reference to the attached figures, wherein like reference numerals are used throughout the figures to designate similar or equivalent elements. The figures are not drawn to scale, and they are provided merely to illustrate the various embodiments. Several embodiments are described below with reference to example applications for illustration. It should be understood that numerous specific details, relationships, and methods are set forth to provide a full understanding of the various embodiments. One having ordinary skill in the relevant art, however, will readily recognize that the various embodiments can be practiced without one or more of the specific details or with other methods. In other instances, well-known structures or operations are not shown in detail to avoid obscuring certain aspects of the various embodiments. The various embodiments are not limited by the illustrated ordering of acts or events, as some acts may occur in different orders and/or concurrently with other acts or events. Furthermore, not all illustrated acts or events are required to implement a methodology in accordance with the various embodiments.

[0011] In general, the various embodiments are directed to a modifiable post bracket for chassis of varying sizes within a rack server. In one or more implementations, the movable post enables an operator to effectively utilize the space within the rack. Moreover, the modifiable post brackets can vary in orientation. The modifiable post brackets allow chassis of different depths to be installed for a particular position of the movable post. Furthermore, the modifiable post brackets enable an operator to install the chassis in either the front or the rear of the rack. The size of a piece of rack-mounted equipment is typically described as a rack unit, identified as "U". A rack unit is a unit of measure defined as 44.50 millimeters (1.752 in). It is most frequently used as a measurement of the overall height of 19-inch and 23-inch rack frames, as well as the height of equipment that mounts in these frames. The height of the frame or equipment is expressed as multiples of rack units. For example, a typical full-size rack cage is 42U high, while equipment is typically 1U, 2U, 3U, or 4U high. For example, equipment that is one rack unit tall is often referred to as "1U"; equipment that is two rack units tall as "2U"; and so on. The disclosed post brackets also provide varying U numbers. This enables chassis and other electronic components installed directly within the rack to have additional space.

[0012] FIG. 1A illustrates a perspective view of a rack 100 of an exemplary embodiment. The rack 100 may be one of a plurality of racks installed in a data center. The rack 100 includes front-to-back beams 110, top side-to-side beams 120A, bottom side-to-side beams 120B, ver-

tical posts 130, rail assemblies 200A, post 200B, and face plates 140. The front-to-back beams 110 and the top side-to-side beams 120A are connected to form a top frame 150A. Similarly, the front-to-back beams 110 and the bottom side-to-side beams 120B are connected to form a bottom frame 150B. In some embodiments, the front-to-back beams 110 are permanently connected to the side-to-side beams 120A, 120B. For example, the front-to-back beams 110 are connected to the side-to-side beams 120A, 120B using permanent connectors such as rivets and welds. In alternative embodiments, the front-to-back beams 110 are removably connected to the side-to-side beams 120A, 120B. For example, the front-to-back beams 110 are connected to the side-to-side beams 120A, 120B using removable connectors or fasteners, such as nuts and bolts, screws, or the like.

[0013] The vertical posts 130 are connected to the top and bottom frames 150A, 150B to form the rack 100. Specifically, the vertical posts 130 are connected to the side-to-side beams 120A, 120B. In some embodiments, the vertical posts 130 are removably connected to the side-to-side beams 120A, 120B. For example, the vertical posts 130 are connected to the side-to-side beams 120A, 120B using removable connectors, such as nuts and bolts and screws. In alternative embodiments, the vertical posts 130 are permanently connected to the side-to-side beams 120A, 120B. For example, the vertical posts 130 are permanently connected to the side-to-side beams 120A, 120B using permanent connectors, such as rivets and welds.

[0014] In some embodiments, the face plates 140 are removably connected to the side-to-side beams 120A, 120B and vertical posts 130. For example, the face plates 140 are connected to the side-to-side beams 120A, 120B and vertical posts 130 using removable connectors, such as nuts and bolts and screws. In alternative embodiments, the face plates 140 are permanently connected to side-to-side beams 120A, 120B. For example, the face plates 140 are connected to side-to-side beams 120A, 120B using permanent connectors, such as rivets and welds. The face plates 140 provide additional stiffness to the rack 100, and more particularly, to the side-to-side beams 120A, 120B and vertical posts 130.

[0015] The rail assemblies 200A are connected to the vertical posts 130 of the rack 100. In some embodiments, the rail assemblies 200A are removably connected to the vertical posts 130. For example, the rail assemblies 200A are connected to the vertical posts 130 using removable connectors, such as nuts and bolts and screws. In alternative embodiments, the rail assemblies 200A are permanently connected to the vertical posts 130. For example, the rail assemblies 200A are connected to the vertical posts 130 using permanent connectors, such as rivets and welds.

[0016] As shown in FIGS. 1A and 1B, the post 200B is connected to the rack 100, and more particularly, to the rail assemblies 200A. Preferably, the post 200B is connected to the rack 100 at the rail assemblies 200A

near the top and bottom frames 150A and 150B. In an alternative embodiment, the post 200B is connected to the rack 100, and more particularly, to the front-to-back beams 110 of top and bottom frames 150A, 150B. Although one post 200B is exemplified in the figures for simplicity purposes, more than one post can be implemented in various embodiments. For example, another post can be implemented opposite of post 200B such that a chassis (not shown) can be supported within the rack 100. The post 200B is adjustable. That is, the post 200B is removably connected using removable connectors, such as nuts and bolts and screws.

[0017] For example, as shown in FIG. 2, the post 200B can include threaded holes 210 configured to receive mounting bolts 220. The threaded holes 210 can also be implemented to align the mounting bolts with side openings 114 of the rail assembly 200A. In securing the post 200B to the rail assemblies 200A, the mounting bolt 220 effectively secures the post 200B to the rack 100. In some embodiments, the threaded holes 210 and the mounting bolts 220 are engaged and tight. Thus, the post 200B is secured to the rail assemblies 200A. In other embodiments, the threaded holes 210 and the mounting bolts 220 are engaged, but loose. Thus, the post 200B is able to slide along the elongated openings 114 of the rail assemblies 200A. This enables the post 200B to be positioned at any number of locations along the elongated opening 114 of the rail assemblies 200A.

[0018] Referring back to FIG. 1B, the post 200B is shown in a second position along the axis. Depending on the location of the post 200B, additional cable routing areas might be provided, for example, in the front of the rack 100 and in the back of the rack 100.

[0019] FIG. 3 illustrates a perspective view of a bracket assembly 300 installed onto the post 200B of the rack 100. The post 200B can include mounting openings 340 and a bracket assembly 300. The mounting openings 340 can be implemented for installing the bracket assembly 300. The bracket assembly 300 can be configured to mount electronic equipment, such as servers, patch panels, and switches, in the rack 100. Furthermore, the bracket assembly 300 can be configured to mount accessories, such as patch panel cassettes and cable management fingers in the cable routing area (not shown) of the rack 100. The bracket assembly 300 can be made of sheet metal or any other material capable of withstanding the weight of the chassis (not shown) when the chassis is inserted inside the rack 100. The bracket assembly 300 is discussed in greater detail below with respect to FIG. 4.

[0020] FIG. 4 illustrates a perspective view of the plurality of individual brackets 301N installed onto the bracket assembly 300 of the post 200B. The bracket assembly 300 can include a plurality of individual brackets 301N. As illustrated, a bracket 301N can be L-shaped when held horizontally and viewed from the top. The bracket 301N can include a plurality of mounting openings 302N for mounting electronic equipment, such as servers,

patch panels, and switches, in the rack 100. Each bracket 301N can be removably connected to the post 200B, using removable connectors, such as nuts and bolts and screws. In some rare embodiments, each bracket 301N can be permanently connected to the post 200B, using permanent connectors, such as rivets and welds. Alternatively, each bracket 301N and the post 200B can be integrally formed. For example, the bracket 301N can be configured to snap-fit into the post 200B. As such, each bracket 301N can be configured to be quickly and easily removed from the post 200B, providing greater access to the bracket 301N.

[0021] FIG. 5 illustrates a perspective view of an individual bracket 301N. The bracket 301N can be 1U. Thus, the bracket 301N can be one rack unit tall. In some embodiments, the bracket 301N can vary in height size to correspond with electronic equipment that may have a height of multiple rack units. Each bracket 301N has a generally L-shaped first portion 305N and a generally planar second portion 306N. First portion 305N of bracket 301N can include mounting openings 302N for mounting electronic equipment, such as servers, patch panels, and switches, in the rack 100. The mounting openings 302N can be configured to receive, for example, horizontal blanking panels and vertical blanking panels for sealing open areas of the rack (of FIG. 4) to separate cooled intake air and heated exhaust air. The generally planar second portion 306N can include threaded members 308 and alignment holes 307. The bracket 301N can be secured to the post 200B (of FIG. 4) via the threaded members 308 with screws or nuts and bolts (not shown). For example, the bolts (not shown) can be inserted through the alignment holes 307 in the second portions 306N and secured by nuts (not shown). Thus, the bracket 301N can be rigidly secured to the post 200B. In some embodiments, the bracket 301N can include an individual aligned hole 307, about which the bracket 301N is configured to rotate. The rotating bracket 301N is discussed in greater detail below with respect to FIG. 6.

[0022] FIG. 6 illustrates a perspective view of the plurality of individual brackets 301N configured to rotate within the rack 100. Each individual bracket 301N can be oriented in a different direction based on the preference and needs of the operator. For example, the chassis can have various sizes. The disclosed bracket 301N enables a configuration where multiple chassis (not shown) of various sizes are installed into a single rack 100. Despite the various sizes of the chassis (not shown), an operator may want the chassis installed into the rack to be accessible at a consistent location. For example, the rack 100 can be designed as a flush mount configuration, where the chassis (not shown) installed in the rack 100 are flush at an opening of the rack 100 despite their varying sizes. Furthermore, the rack 100 can be designed as a center mount configuration, where the chassis installed in the rack 100 are centered within the rack 100 despite their varying sizes. When orienting the rack 100 to either a flush mount configuration or to a center mount configu-

ration, the individual brackets 301N can be rotated 180 degrees, as needed. Furthermore, the post 200B can be positioned along the front-to-back beams 110 as needed. Where a chassis (not shown) is mounted in a flush mount configuration the corresponding bracket 301N can be oriented such that the first portion 305N (shown in FIG. 5) is located towards the center of the rack 100. Moreover, where a chassis (not shown) is mounted in a center mount configuration the corresponding bracket 301N can be oriented such that the first portion 305N (shown in FIG. 5) is located towards the front of the rack 100.

[0023] The plurality of rotatable brackets 301N can provide structural stability to support a computer system of other equipment in a two post rack. In some embodiments the brackets 301N can be oriented to mirror one another in a two post rack. Thus, a chassis can be mounted to the posts of the rack 100 such that brackets 301N are mounted on opposite faces of the posts of the rack, providing the necessary structural stability to the chassis (not shown) and the posts of the equipment rack. In addition, because the various embodiments can accommodate a sliding mechanism for the post 300A, the disclosed rack 100 provides for the serviceability of a computer system mounted in the rack 100.

[0024] The disclosed rack 100 is also able to accommodate computer systems and other housing of electronic units of varying heights. Traditional computer systems, especially server systems, are finding more application in telecommunications and internet service provider environments.

[0025] While particular embodiments of the present invention have been shown and described, it will be obvious to those skilled in the relevant arts that changes and modifications may be made without departing from the invention in its broader aspects. Therefore, the aim in the appended claims is to cover all such changes and modifications that fall within the true spirit and scope of the invention. The matter set forth in the foregoing description and accompanying drawings is offered by way of illustration only and not as a limitation. The actual scope of the invention is intended to be defined in the following claims when viewed in their proper perspective based on the prior art.

[0026] The terminology used herein is for the purpose of describing particular embodiments only and is not intended to limit the invention. As used herein, the singular forms "a", "an", and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. Furthermore, to the extent that the terms "including", "includes", "having", "has", "with", or variants thereof are used in either the detailed description and/or the claims, such terms are intended to be inclusive in a manner similar to the term "comprising."

[0027] Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. It will be further understood that terms, such as those defined in

commonly used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art, and will not be interpreted in an idealized or overly formal sense unless expressly so defined herein.

[0028] Although particular embodiments have been described herein, it will be appreciated that the invention is not limited thereto and that many modifications and additions thereto may be made within the scope of the invention. For example, various combinations of the features of the following dependent claims can be made with the features of the independent claims without departing from the scope of the present invention.

Claims

1. A rack (100) comprising:
 - a top frame (150A) and a bottom frame (150B) connected by at least one post (200B), wherein the post (200B) is slidably configured within the rack (100); and
 - a plurality of brackets (301N) installed on the post (200B), wherein each of the brackets (301N) within the plurality of brackets (301N) is configured to rotate with respect to the at least one post (200B).
2. The rack (100) of claim 1, wherein the top frame (150A) comprises a first set of front-to-back beams (110) and top side-to-side beams (120A).
3. The rack (100) of claim 1 or claim 2, wherein the bottom frame (150B) comprises a second set of front-to-back beams (110) and bottom side-to-side beams (120B).
4. The rack (100) of any preceding claim, further comprising vertical posts (130) connected to the top frame (150A) and the bottom frame (150B).
5. The rack (100) of claim 4, further comprising rail assemblies (200A) connected to the vertical posts (130).
6. The rack (100) of any preceding claim, wherein the at least one post (200B) comprises mounting openings (340) configured to mount at least one piece of electronic equipment.
7. The rack (100) of any preceding claim, wherein the at least one post (200B) comprises mounting openings (340) configured to mount the plurality of brackets (301N).
8. The rack (100) of any preceding claim, wherein each bracket within the plurality of brackets (301N) com-

prises an L-shaped first portion (305N) and a planar second portion (306N).

9. The rack (100) of claim 8, wherein the L-shaped first portion (305N) comprises a plurality of mounting openings (302N). 5
10. The rack (100) of claim 8 or claim 9, wherein the planar second portion (306N) comprises a threaded member (308) and an alignment hole (307). 10
11. The rack (100) of any preceding claim, wherein when the post (200B) slidably configured within the rack (100) is one position at least two of the plurality of brackets (301N) are configured in different positions allowing for at least two chassis of varying sizes. 15

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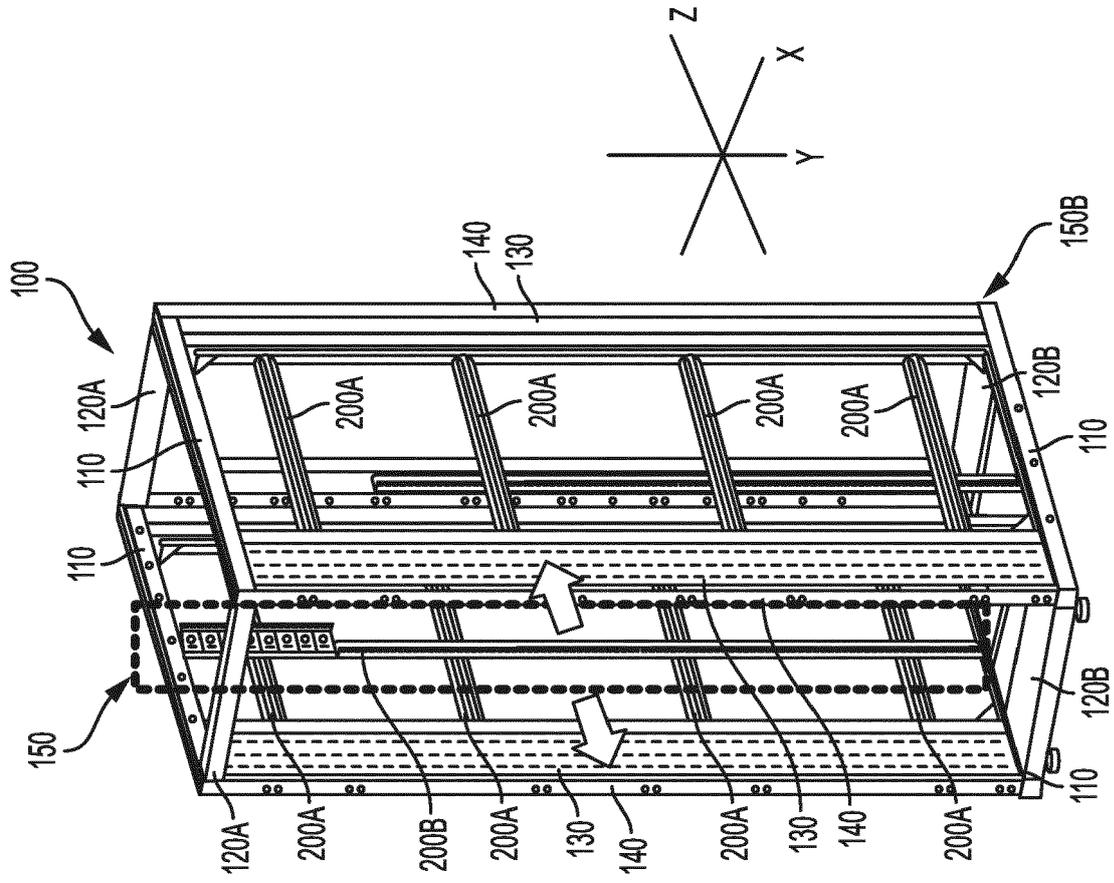


FIG. 1B

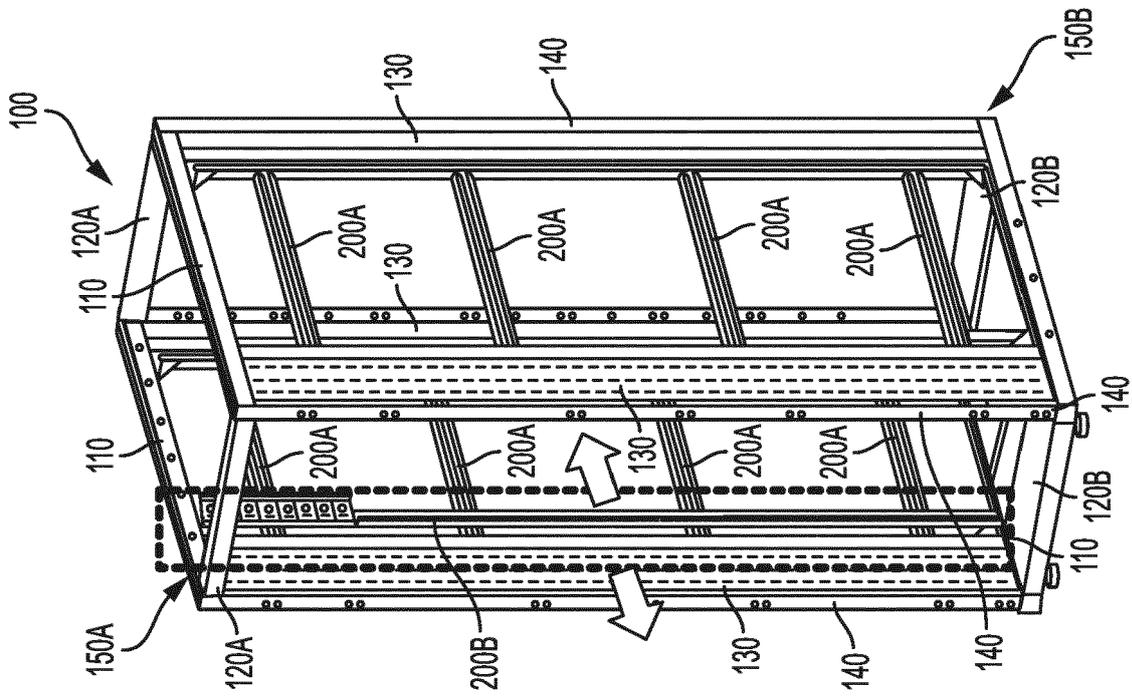


FIG. 1A

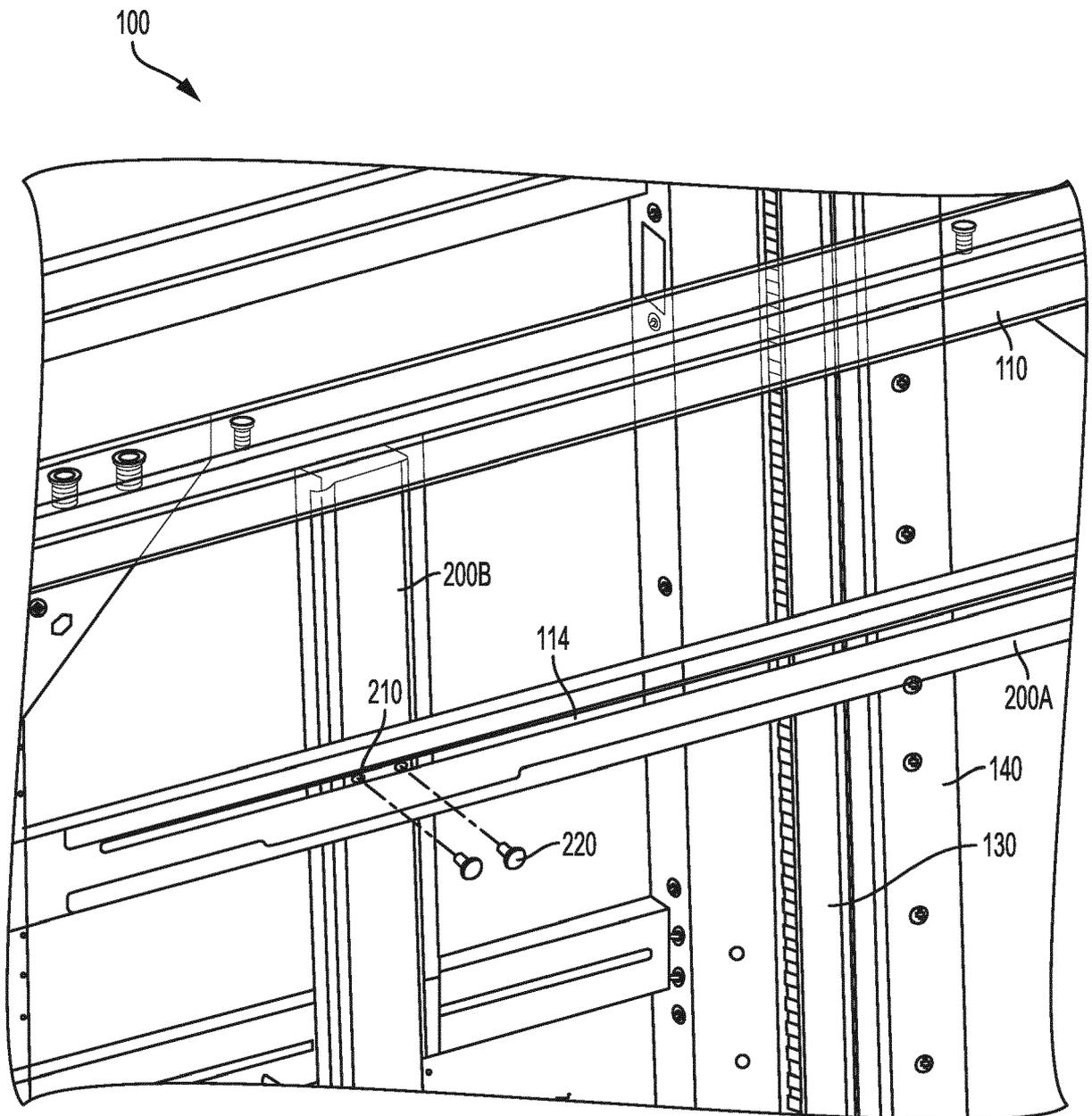


FIG. 2

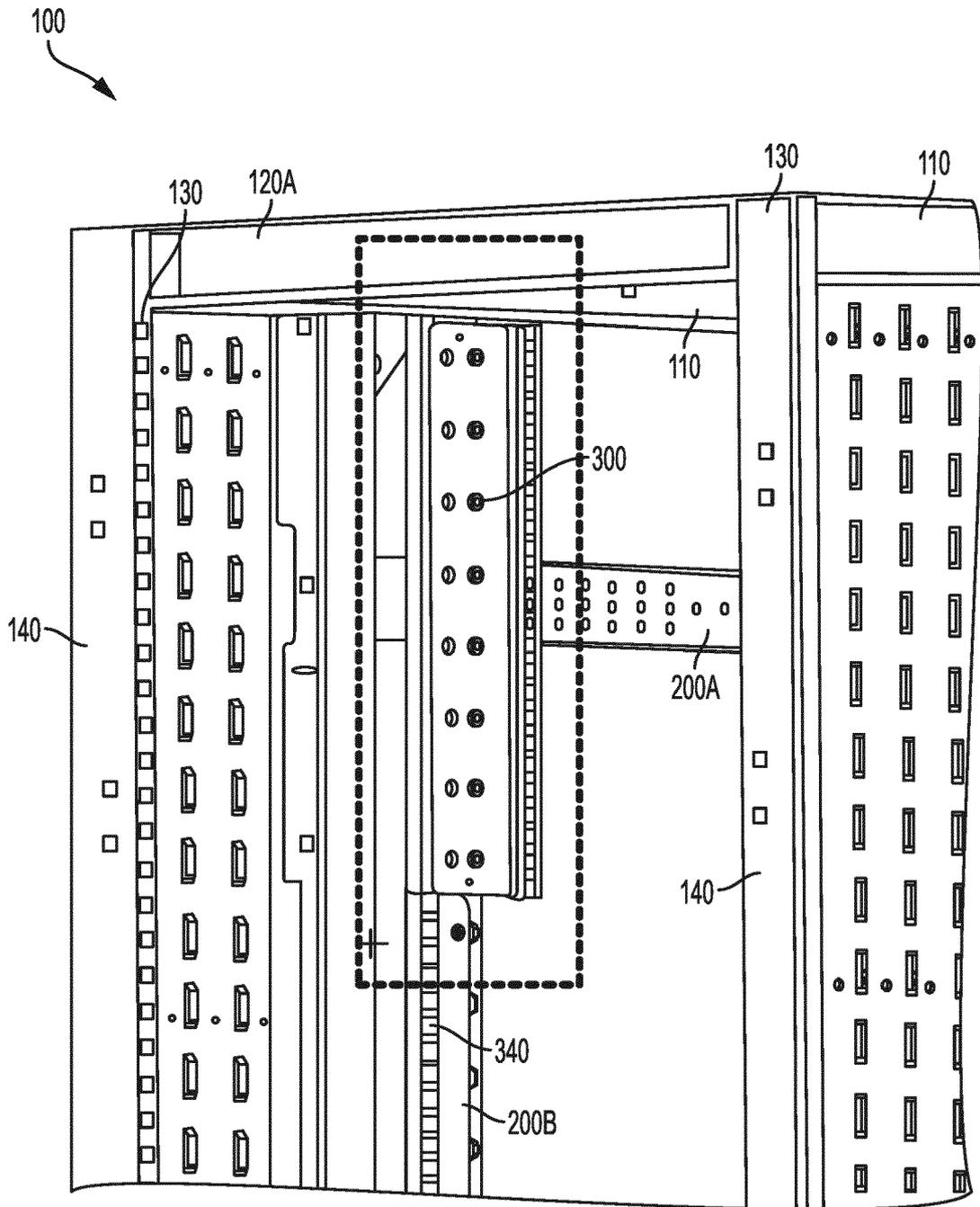


FIG. 3

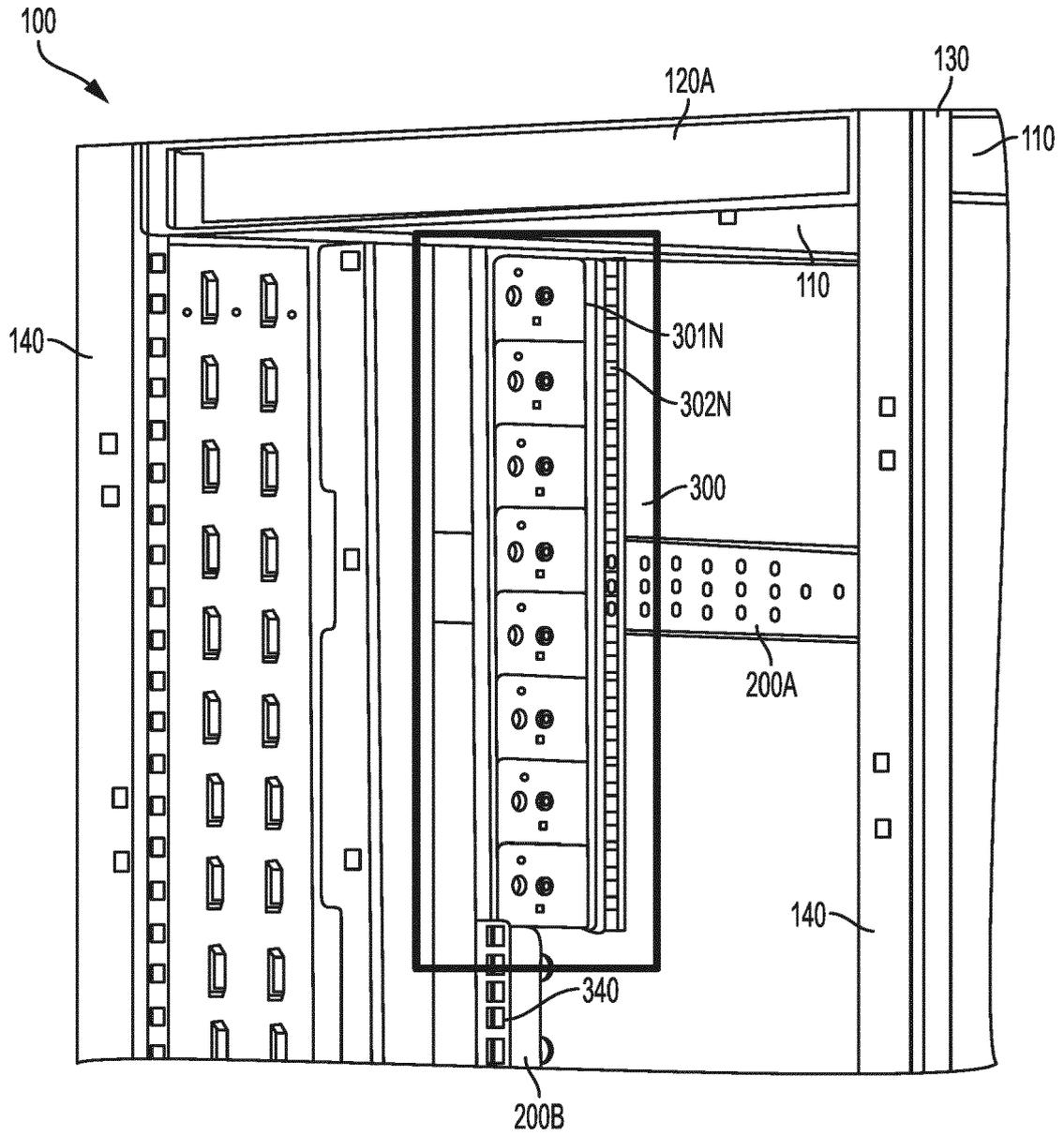


FIG. 4

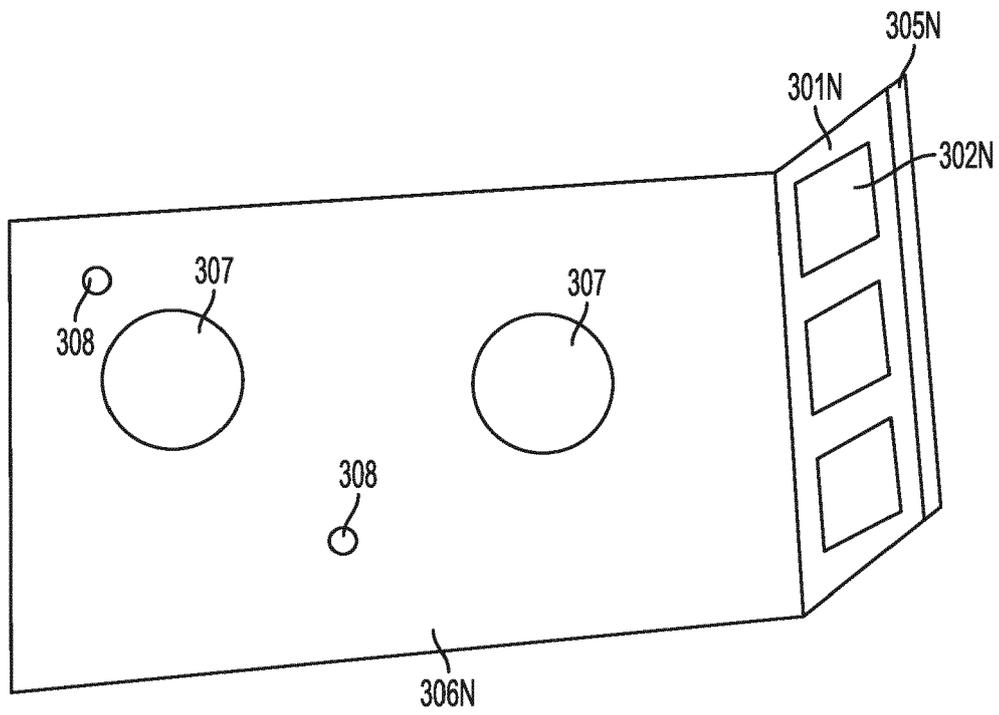


FIG. 5

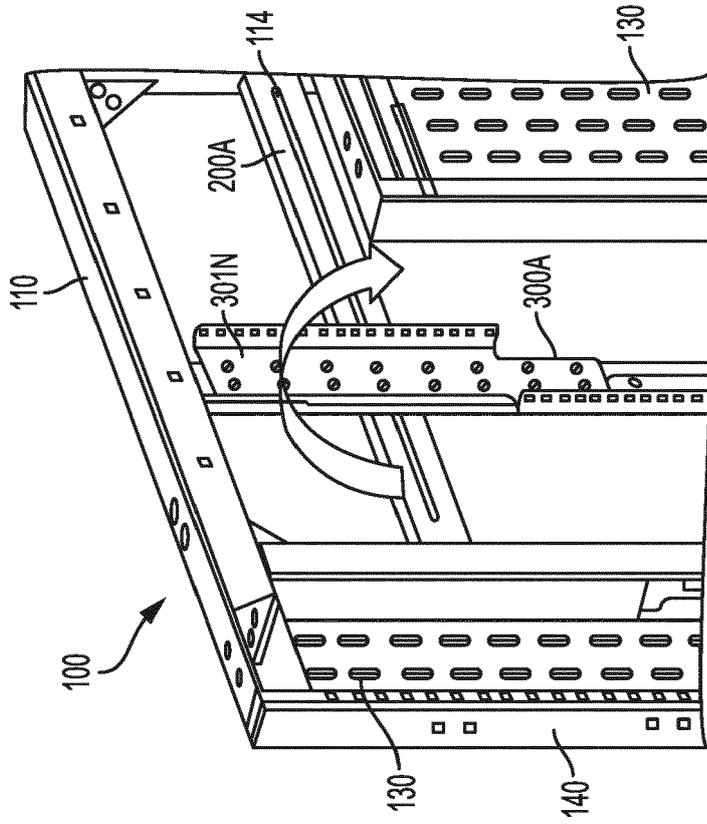
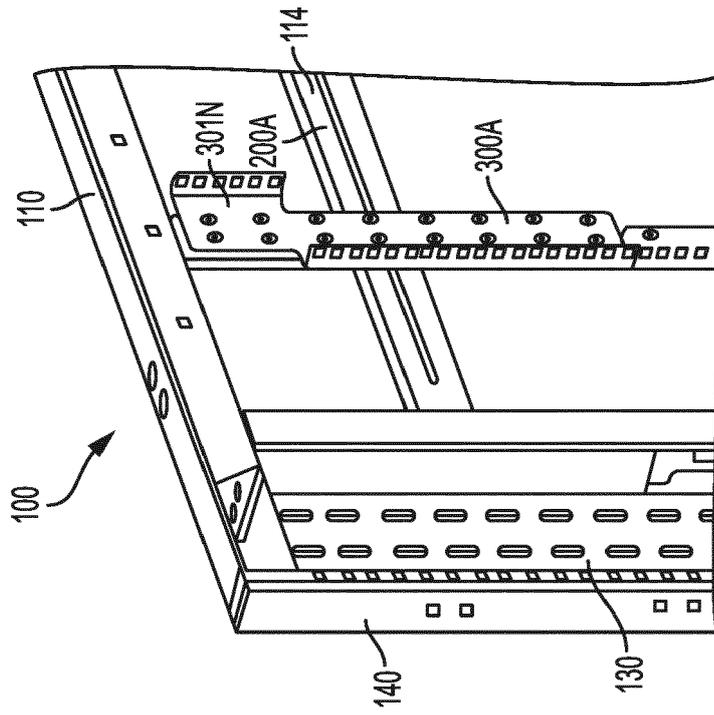


FIG. 6



EUROPEAN SEARCH REPORT

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2015/366094 A1 (SEGROVES ROGER D [US] ET AL) 17 December 2015 (2015-12-17) * paragraph [0102] - paragraph [0103]; figures 19-21 * * paragraph [0107]; figures 22-24 * -----	1-11	INV. H05K7/14
A	US 9 814 156 B2 (INNOVATION FIRST INC [US]) 7 November 2017 (2017-11-07) * column 6, line 6 - line 24; figure 5 * -----	1-11	
A	US 2004/183409 A1 (RINDERER ERIC R [US]) 23 September 2004 (2004-09-23) * paragraph [0039] - paragraph [0040]; figure 1 * -----	1-11	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			H05K
Place of search		Date of completion of the search	Examiner
The Hague		18 December 2018	Rubenowitz, Astrid
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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18-12-2018

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82