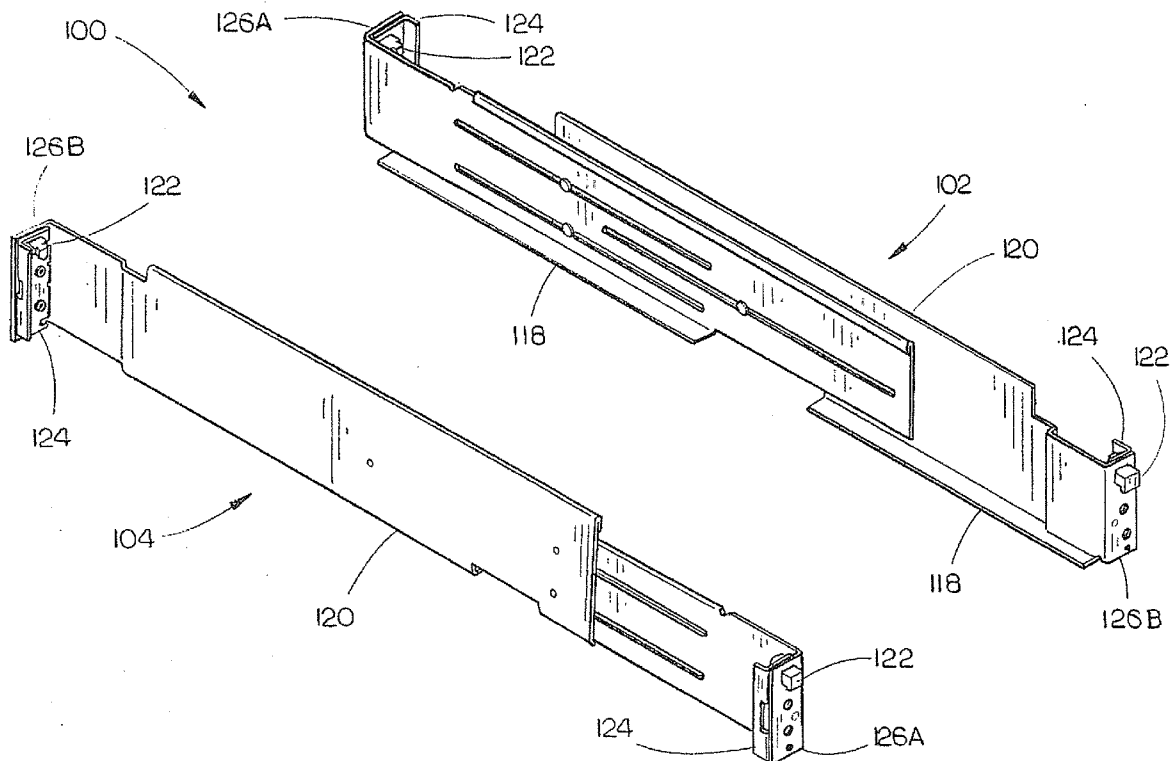


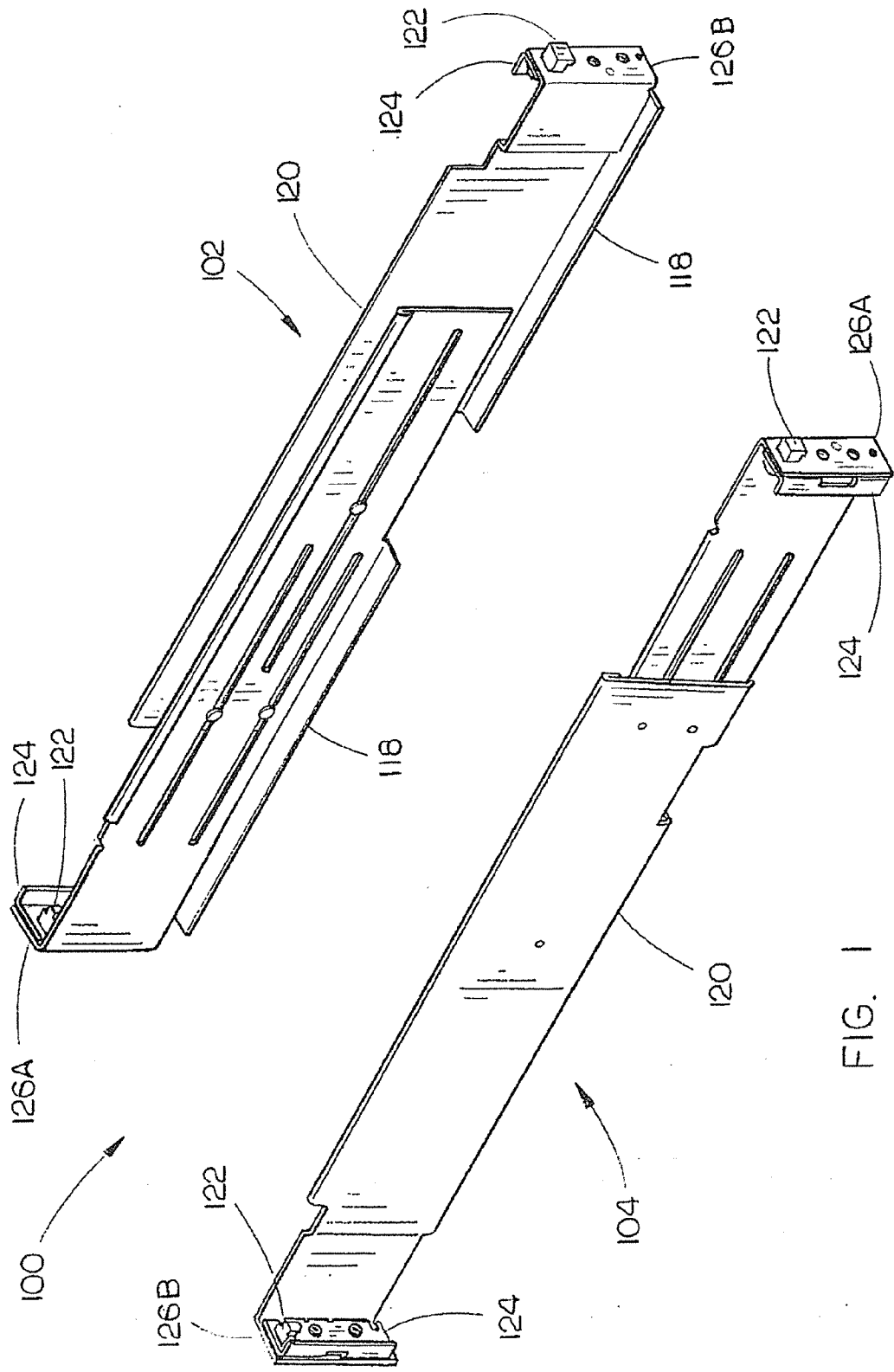


US 20140086665A1

(19) **United States**(12) **Patent Application Publication**
Baik et al.(10) **Pub. No.: US 2014/0086665 A1**(43) **Pub. Date: Mar. 27, 2014**(54) **RAIL SYSTEM FOR SUPPORTING
EQUIPMENT IN A RACK****Publication Classification**(71) Applicant: **NETAPP, INC.**, Sunnyvale, CA (US)(72) Inventors: **David J. Baik**, Sunnyvale, CA (US);
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Dave Howard, Austin, TX (US)(73) Assignee: **NETAPP, INC.**, Sunnyvale, CA (US)(21) Appl. No.: **14/033,816**(22) Filed: **Sep. 23, 2013****Related U.S. Application Data**(63) Continuation of application No. 13/095,310, filed on
Apr. 27, 2011, now Pat. No. 8,562,086.(51) **Int. Cl.**
A47B 88/00 (2006.01)(52) **U.S. Cl.**
CPC **A47B 88/0085** (2013.01)
USPC **403/13**(57) **ABSTRACT**

A rail system for supporting equipment in a rack is disclosed. The rail system may include: a first support rail assembly extending between a pair of vertical columns; a second support rail assembly extending between a different pair of vertical columns. Each support rail assembly may include: a support rail having opposite ends; aligners configured to align the opposite ends of the support rail with apertures of vertical columns; and mounting plates configured to removably secure the aligners to the opposite ends of the support rail. At least one mounting plate may be further configured to define at least one receiving portion for receiving a fastener for securing an equipment supportable in the rack.





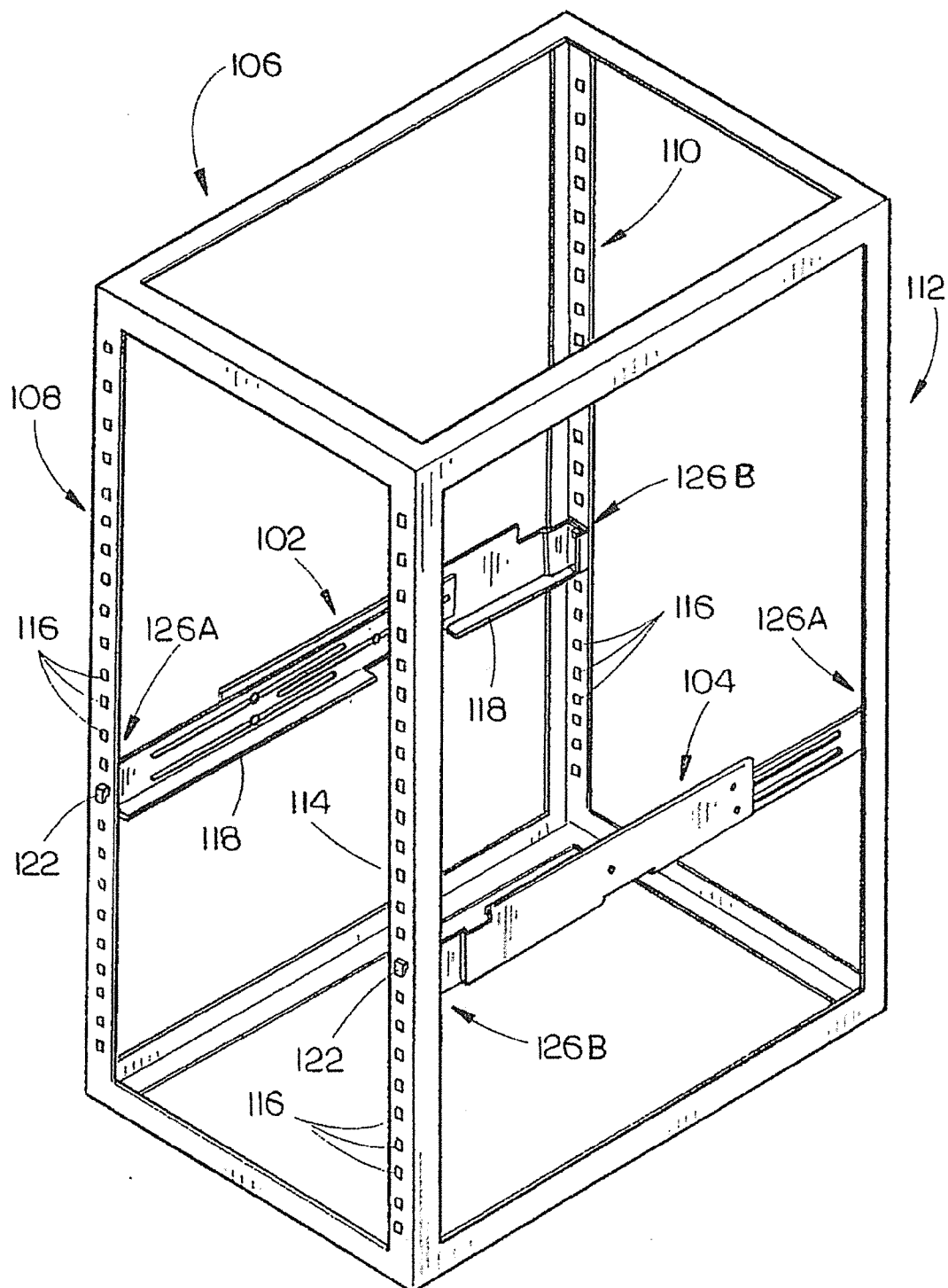
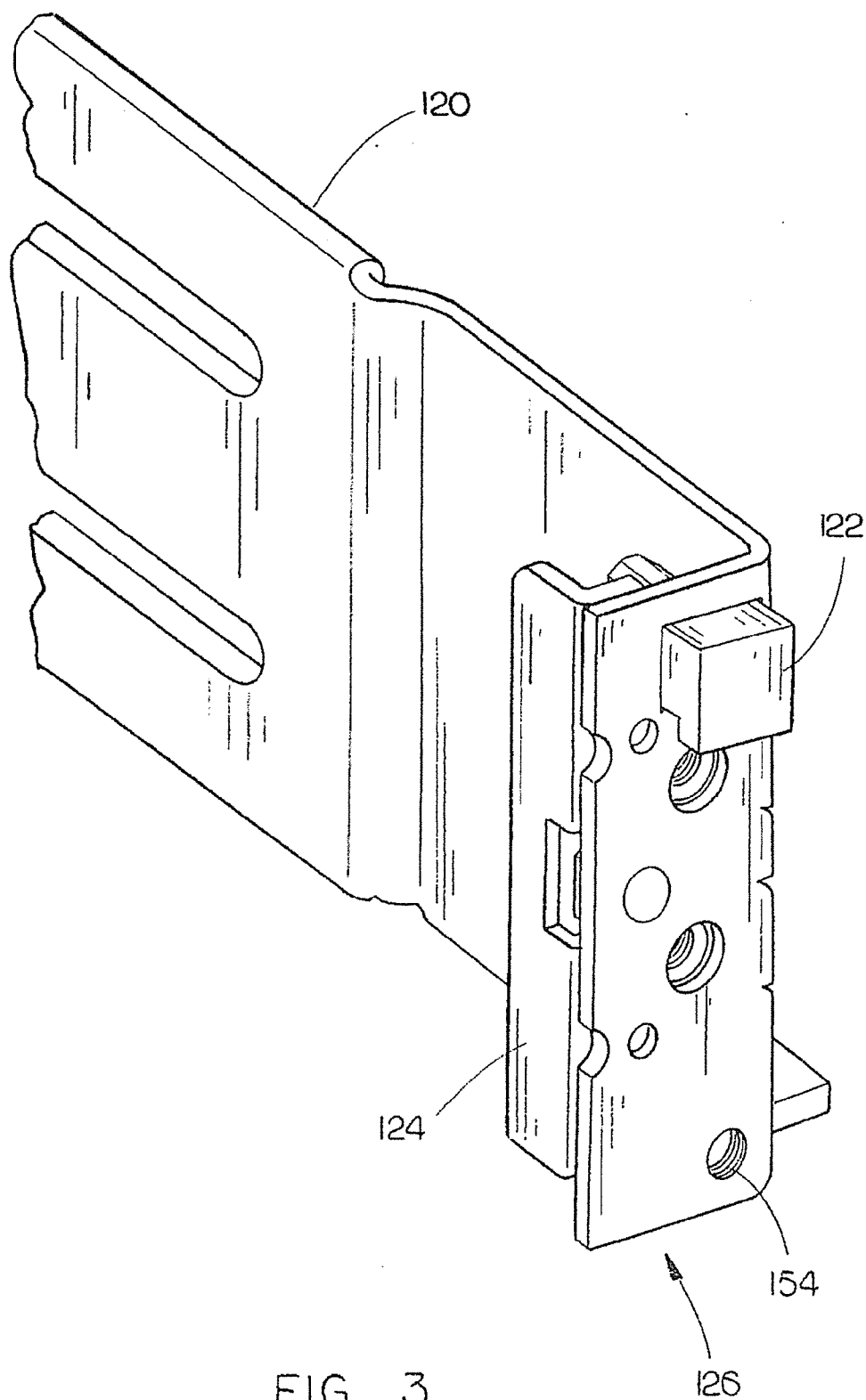


FIG 2



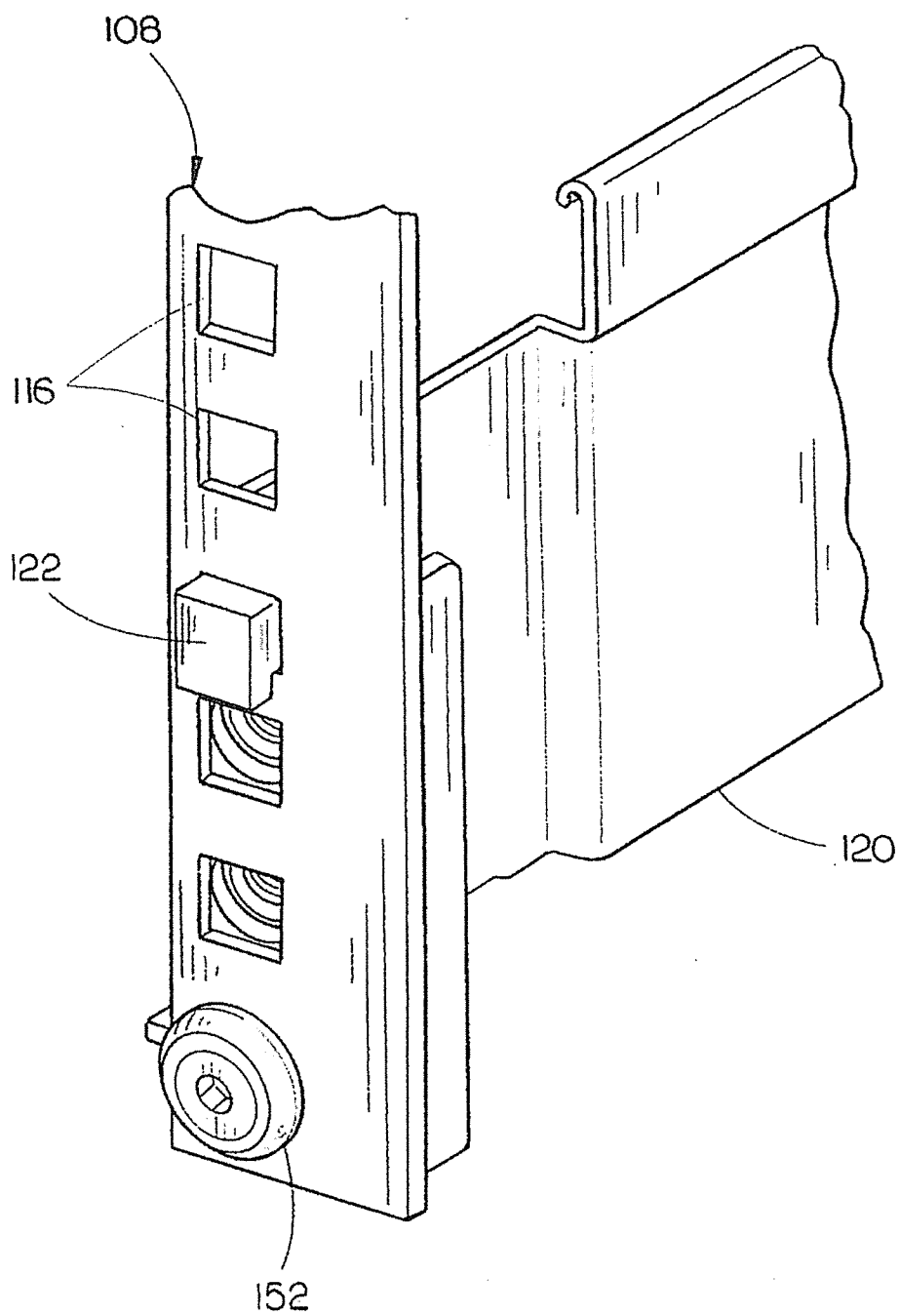


FIG. 4

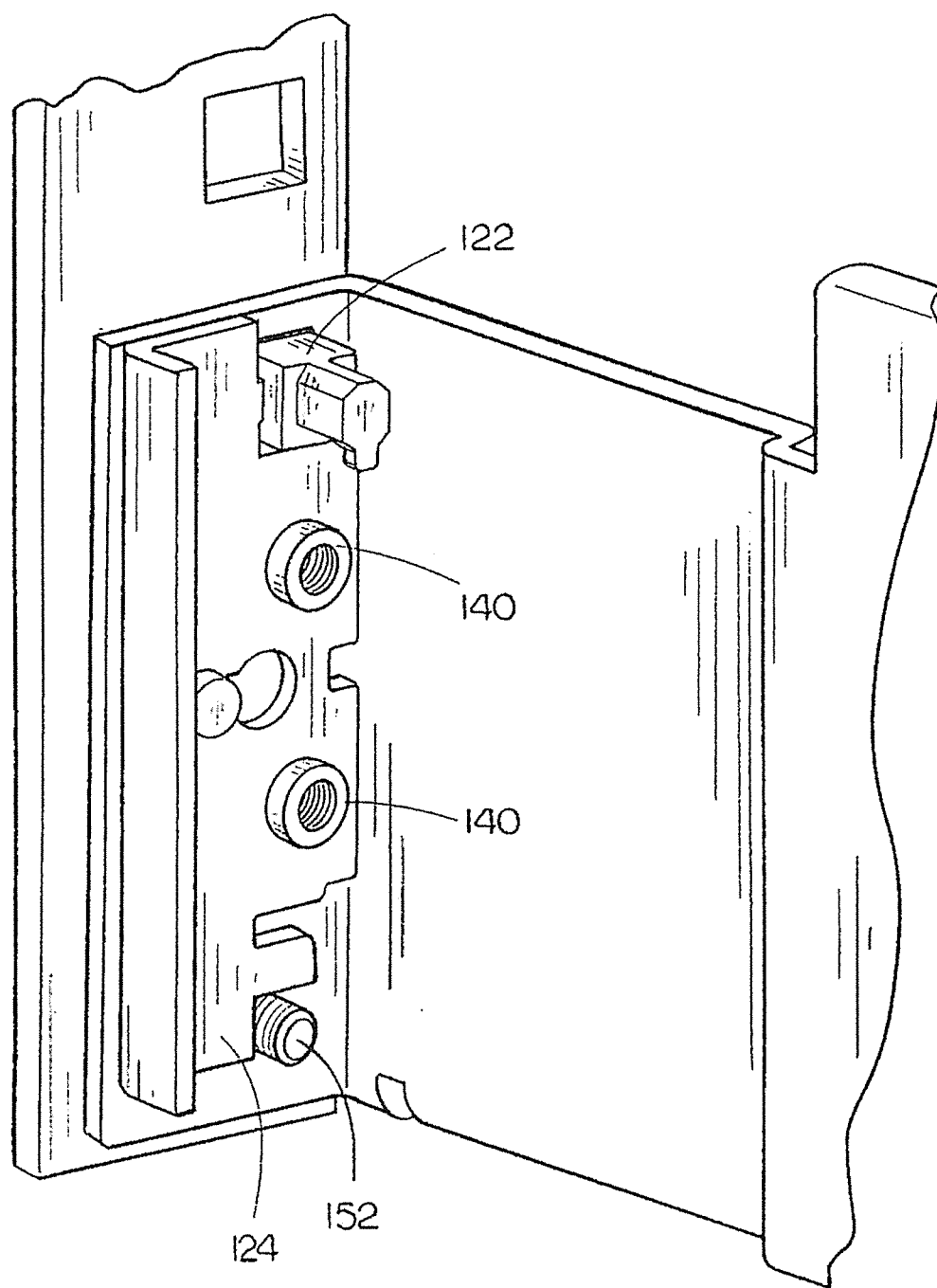


FIG. 5

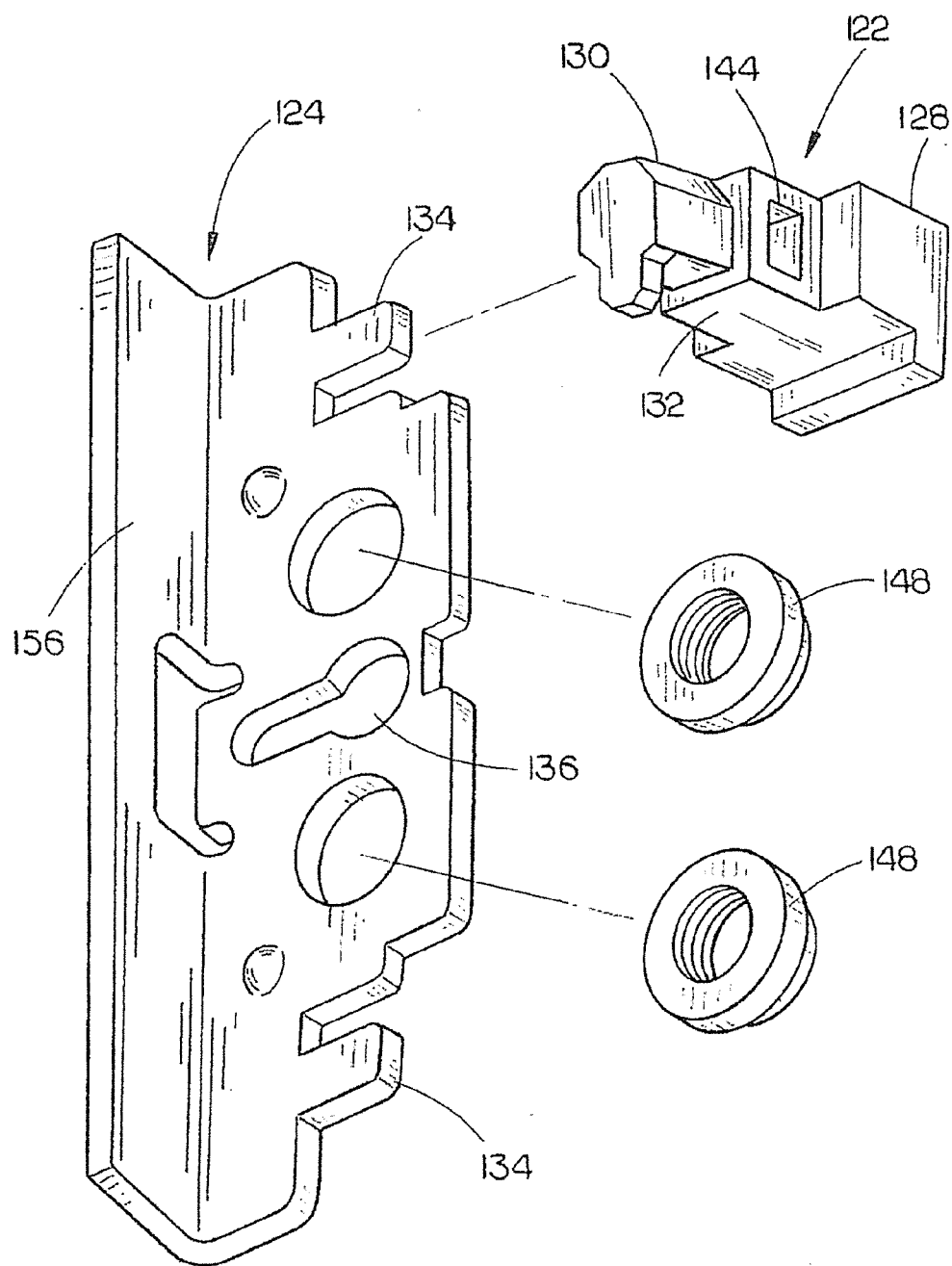
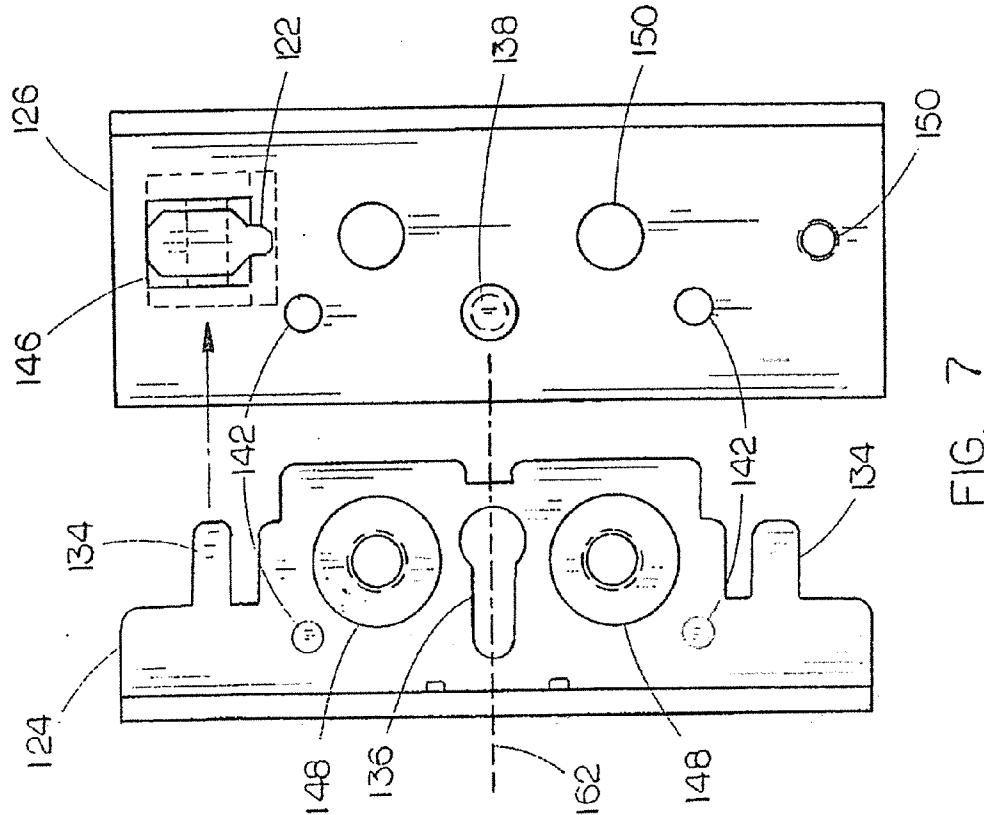
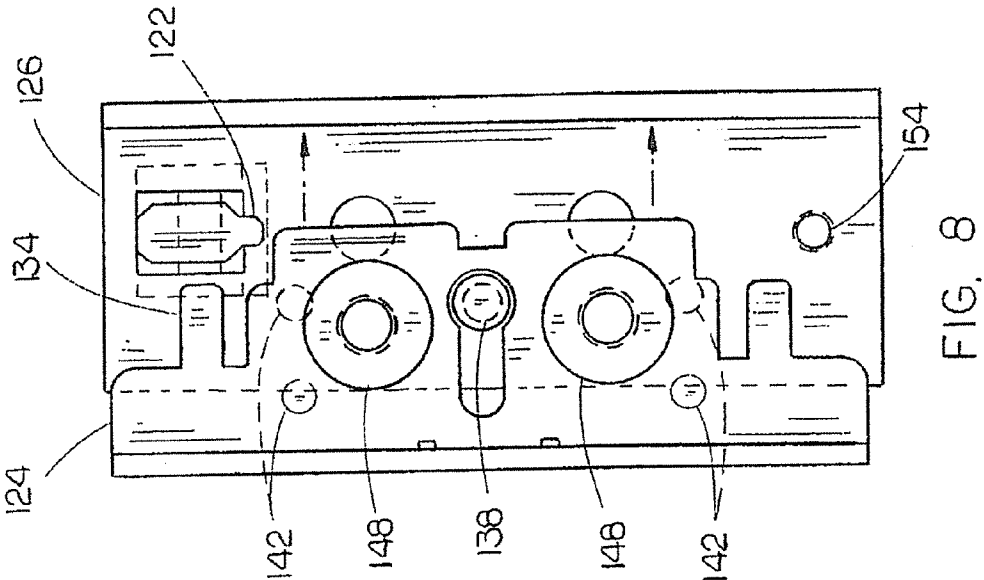


FIG. 6



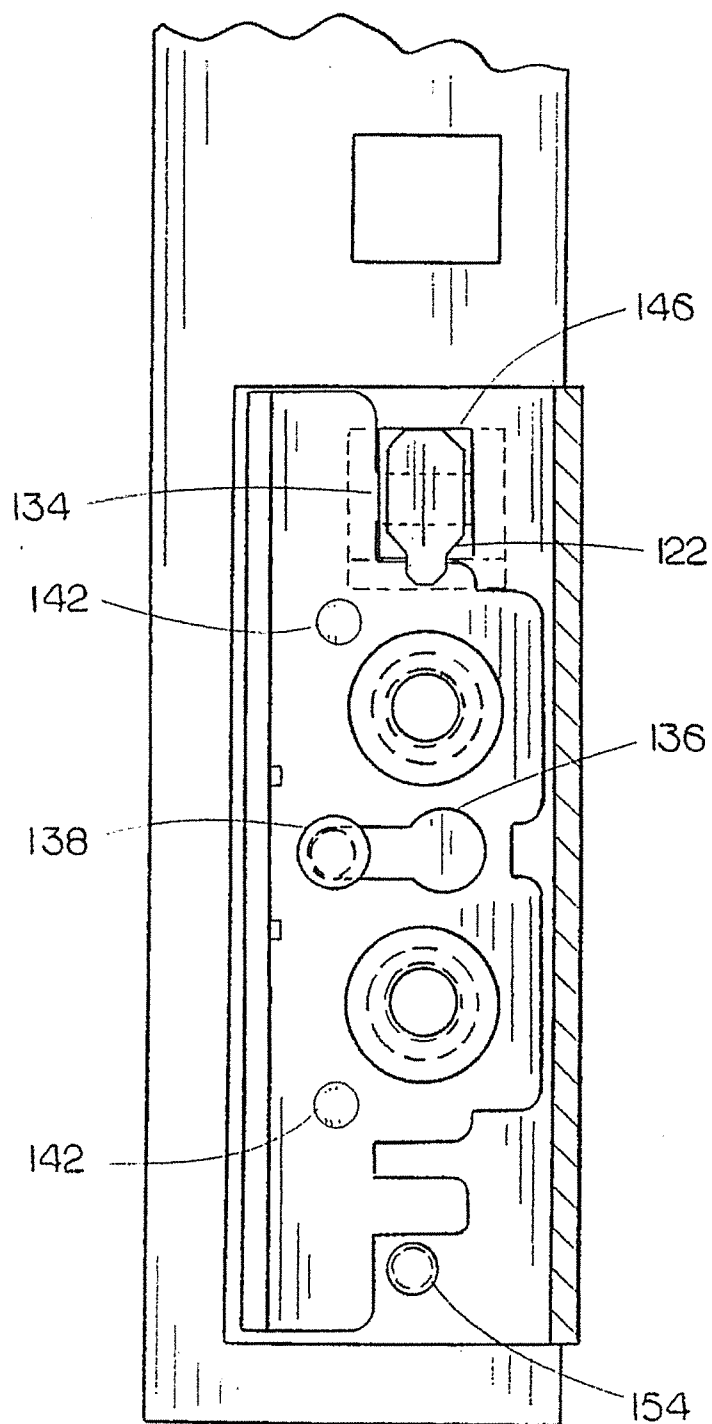


FIG. 9

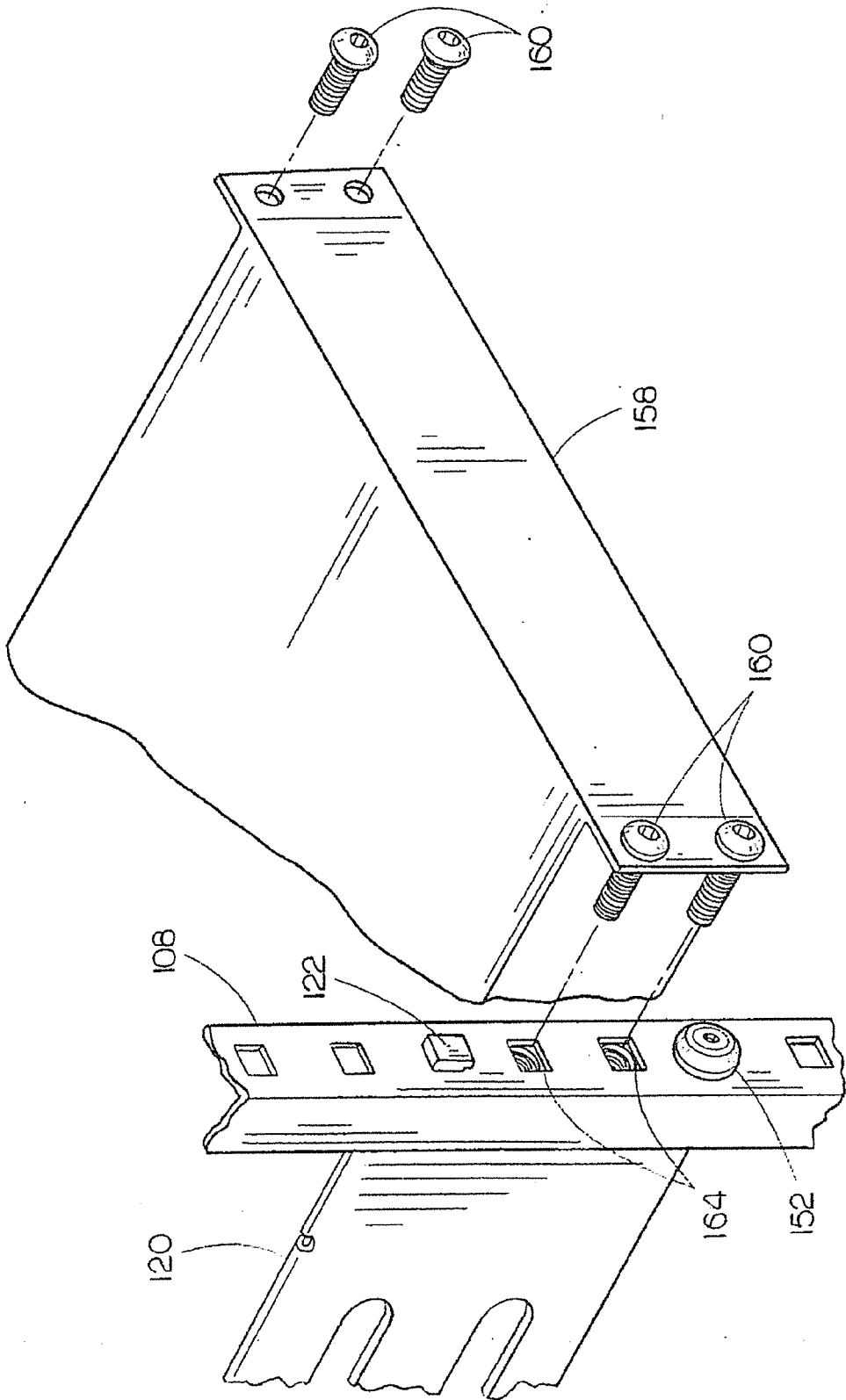


FIG. 10

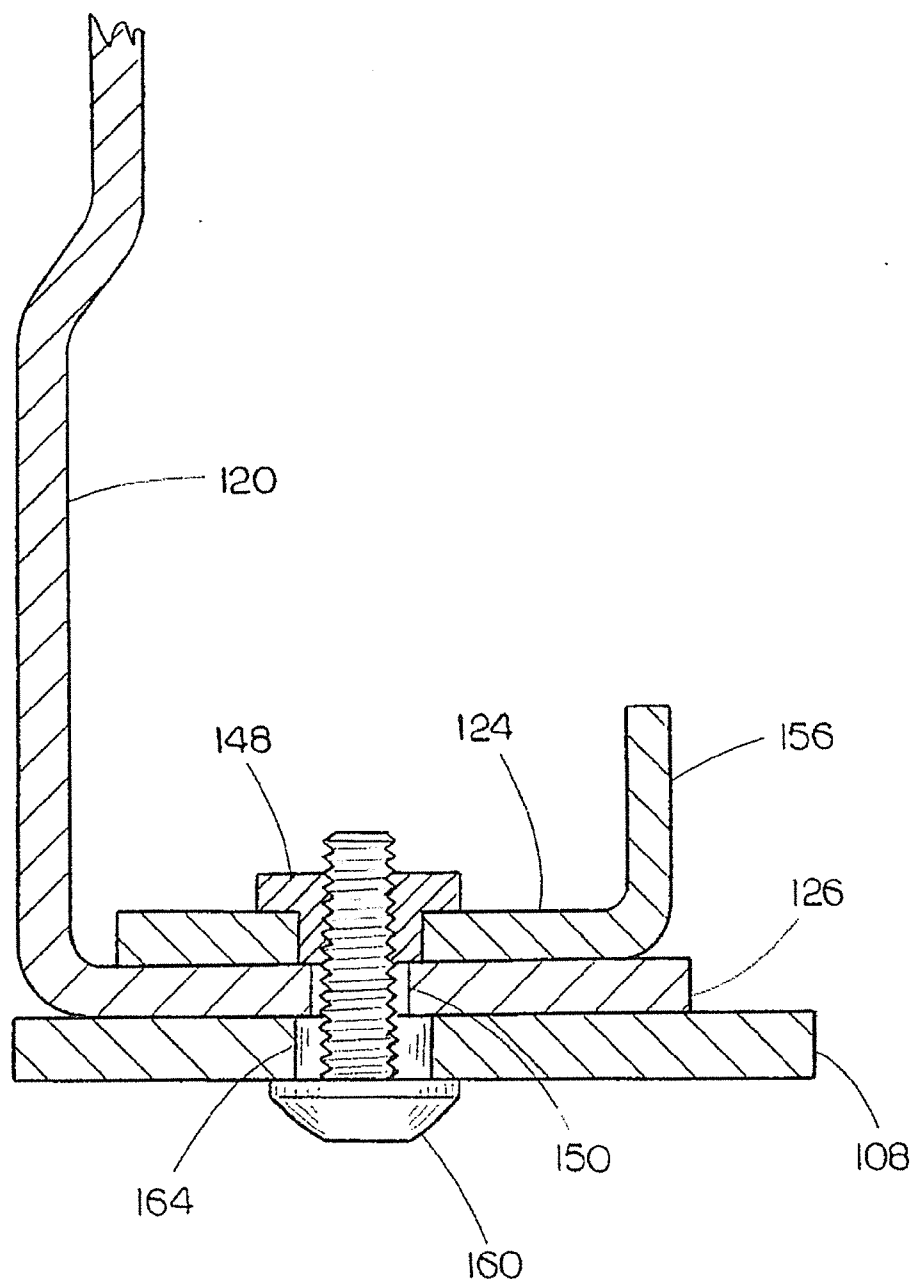


FIG. 11

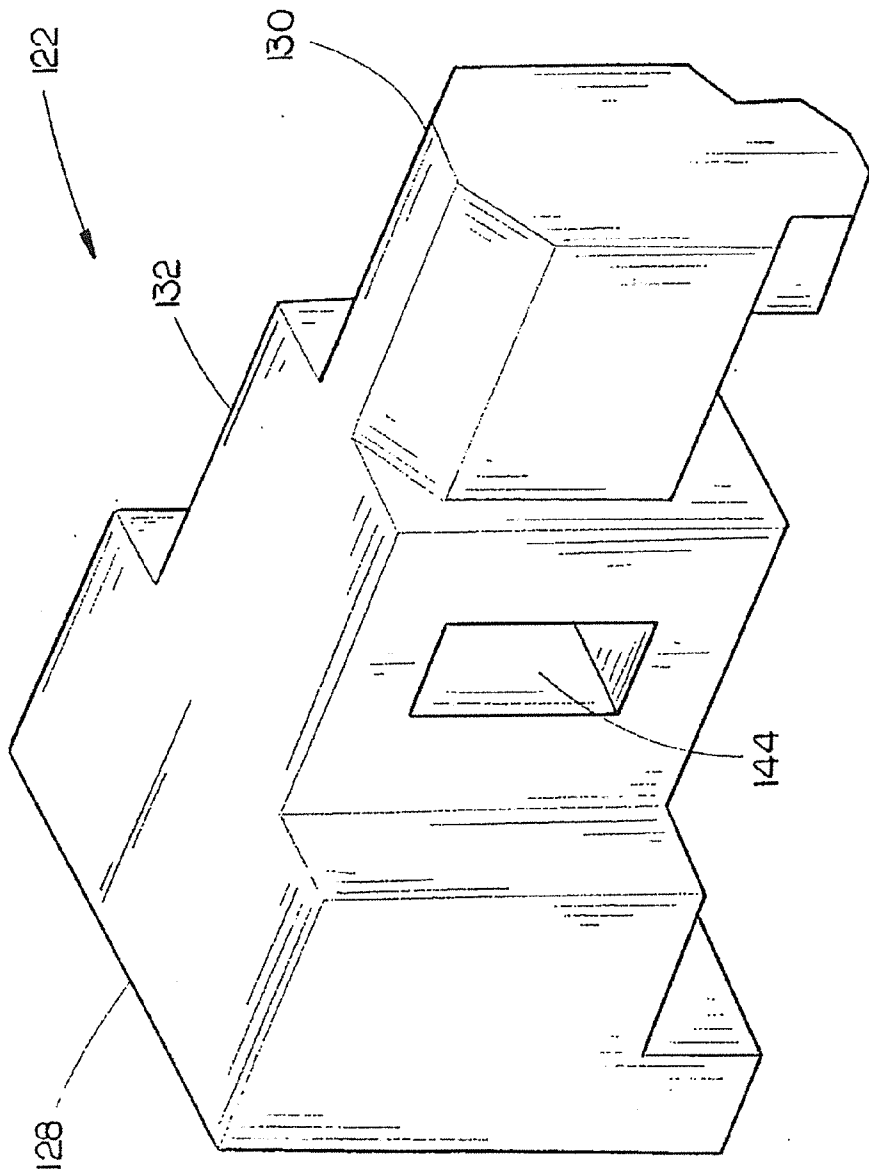


FIG. 12

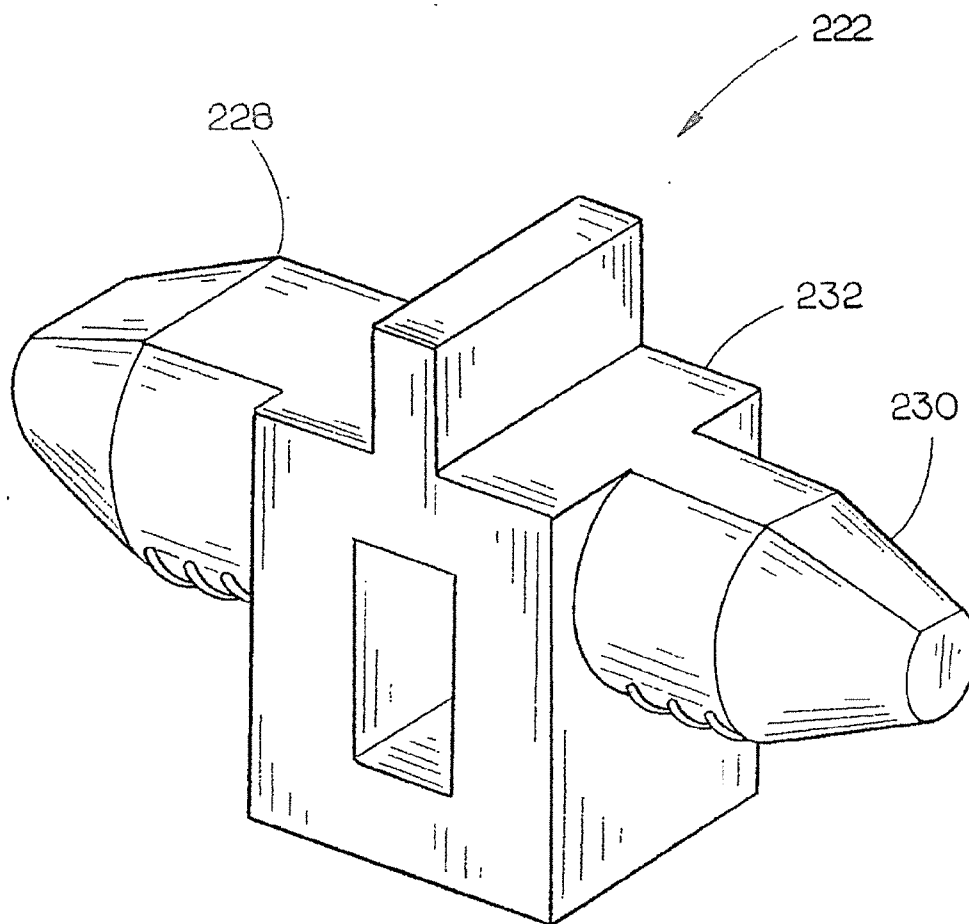


FIG. 13

RAIL SYSTEM FOR SUPPORTING EQUIPMENT IN A RACK

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application is a continuation of co-pending application Ser. No. 13/095,310, filed on Apr. 27, 2011, the entire contents of which are hereby incorporated by reference.

TECHNICAL FIELD

[0002] The disclosure generally relates to support rails, and more particularly to a rail system for supporting components in a rack.

BACKGROUND OF THE INVENTION

[0003] Various types of racks may be provided for supporting equipment such as computers, servers, routers or the like. Most racks may include multiple vertical columns. Each vertical column may have multiple apertures defined thereof for receiving horizontal support rail assemblies. For example, four vertical columns may be provided to define corners of a rectangular equipment rack. One support rail assembly may only be mounted horizontally and extend between a pair of vertical columns on a left side of the rectangular rack; another support rail assembly may only be mounted horizontally and extend between another pair of vertical columns on a right side of the rectangular rack. The support rail assemblies may include support panels or shelves for receiving and supporting equipment in the rack.

[0004] Various devices and designs may be utilized for securing the support rail assemblies to the vertical columns. However, the known designs may be complicated and time consuming to install. Furthermore, different equipment racks may be configured differently. For example, the apertures on the vertical columns may vary in size and/or shape depending on the particular rack manufacturer. In addition, certain devices supported in the rack may include fasteners that need to be secured to the support rail assemblies for additional security. These fasteners supplied with such certain devices may also vary in size and/or shape. Differences in rack configurations and/or fastener types may therefore further complicate the design of the support rail assemblies.

SUMMARY OF THE INVENTION

[0005] The present disclosure is directed to a rail system for supporting equipment in a rack. The rail system may include two rail assemblies that are physically identical, with one being oriented in an opposing side with respect to another when installed in the rack. The identical rail assemblies may eliminate the need for different left side and right side designs and may reduce installation time of the rail system.

[0006] Each rail assembly includes a support rail, a set of aligners and a set of mounting plates. The support rail is configured to extend between a pair of vertical columns of the rack. The aligners are configured to align the opposite ends of the support rail with apertures on vertical columns. The mounting plates are configured to removably secure the aligners to the opposite ends of the support rail. The mounting plates may be further configured to define receiving portions for receiving fasteners for securing equipment supportable in the rack.

[0007] Additional sets of aligners may be provided to accommodate for different types of vertical column apertures. Each set of aligners may be configured to engage with a particular type of aperture, allowing a user to choose the appropriate aligners based on the size, shape (e.g., square, rectangular, round or the like), or thread pattern (e.g., threaded or unthreaded) of the apertures on the vertical columns of the rack.

[0008] Furthermore, additional sets of mounting plates may also be provided to accommodate for different types of screws associated with the equipment supportable in the rack. Each set of mounting plates may be configured for receiving a particular type of screw which allows the user to select an appropriate mounting plates based on the type of screw associated with the equipment.

[0009] It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory only and are not necessarily restrictive of the present disclosure. The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate subject matter of the disclosure. Together, the descriptions and the drawings serve to explain the principles of the disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The numerous advantages of the disclosure may be better understood by those skilled in the art by reference to the accompanying figures in which:

[0011] FIG. 1 is an isometric view of a rail system of the present disclosure;

[0012] FIG. 2 is an isometric view of the rail system of FIG. 1 installed in a rack;

[0013] FIG. 3 is a partial isometric view of an end of a support rail with an aligner and a mounting plate attached;

[0014] FIG. 4 is a partial isometric view of an end of a support rail aligned and secured to a vertical column of a rack;

[0015] FIG. 5 is another partial isometric view of the end of the support rail aligned and secured to the vertical column illustrated in FIG. 4;

[0016] FIG. 6 is an isometric view of a mounting plate and an aligner;

[0017] FIG. 7 is an illustration depicting a mounting plate to be attached to a mounting flange at an end of a support rail;

[0018] FIG. 8 is an illustration depicting the mounting plate being attached to the mounting flange at an end of the support rail;

[0019] FIG. 9 is an illustration depicting the mounting plate fully attached to the mounting flange at an end of the support rail;

[0020] FIG. 10 is a partial isometric view depicting a device supportable in the rack;

[0021] FIG. 11 is a partial cross-sectional view depicting a screw received by a mounting plate attached to an end of a support rail;

[0022] FIG. 12 is an isometric view of a reversible aligner; and

[0023] FIG. 13 is an isometric view of another reversible aligner.

DETAILED DESCRIPTION OF THE INVENTION

[0024] Reference will now be made in detail to the subject matter disclosed, which is illustrated in the accompanying drawings.

[0025] Referring generally to FIGS. 1 through 9, a rail system 100 having a first rail assembly 102 and a second rail assembly 104 is shown. The rail system 100 may be installed in a rack 106. The rack 106 may include four vertical columns 108, 110, 112 and 114 defining corners of the rack 106. Each vertical column may include multiple apertures 116. The first rail assembly 102 may be mounted horizontally and extend between vertical columns 108 and 110 on one side of the rack 106. The second rail assembly 104 may be mounted horizontally and extend between vertical columns 112 and 114 on the opposite side of the rack 106.

[0026] As illustrated in FIGS. 1 and 2, the first rail assembly 102 and the second rail assembly 104 are physically identical, with one being oriented in an opposing side with respect to another. The design of rail assemblies 102 and 104 eliminates the need for different left side and right side assemblies and may also reduce installation time.

[0027] In one embodiment, each rail assembly includes a support rail 120, a pair of aligners 122 and a pair of mounting plates 124. Each support rail 120 is configured to extend between two vertical columns of the rack 106. The aligners 122 are attached to the opposite ends of each support rail 120, and are utilized to align the support rail 120 with the appropriate apertures located on the vertical columns. Once the support rail 120 is aligned between the two columns, fasteners 152 (as illustrated in FIGS. 4 and 5) may be utilized to secure each end of the support rail 120 to the corresponding columns. For example, each end of the support rail 120 may define a threaded hole 154 configured for receiving a screw (e.g., an M4 screw). The screw may pass through an aperture of the column and engage the threaded hole 154 to secure this end to the vertical column.

[0028] It is contemplated that the support rail 120 may include two slidably connected portions configured to provide an adjustable length for the support rail 120. Alternatively, the support rail 120 may be configured as a fixed length rail without departing from the spirit and scope of the present disclosure. The support rail 120 may include support panels or shelves 118 for receiving and supporting equipment in the rack.

[0029] Each support rail 120 includes two mounting flanges 126A and 126B located on the two opposite ends of the support rail 120. In the example illustrated in FIG. 2, the mounting flange 126A of the support rail in the first rail assembly 102 may be mounted to the vertical column 108, and the mounting flange 126B of the support rail in the first rail assembly 102 may be mounted to the vertical column 110. Similarly, the mounting flange 126A of the support rail in the second rail assembly 104 may be mounted to the vertical column 112, and the mounting flange 126B of the support rail in the second rail assembly 104 may be mounted to the vertical column 114.

[0030] Each support rail 120 is associated with a pair of aligners 122. Each one of the pair of aligners 122 is attachable to one of the mounting flanges 126 of the support rail 120. The aligners 122 are utilized for aligning the two opposite ends of the support rail 120 with the corresponding apertures on the vertical columns. Since different racks may provide different types of apertures on the vertical columns, the aligners 122 are not permanently fixed to the support rail 120. Instead, each aligner 122 in accordance with the present disclosure is removably attachable to a mounting flange 126. In this manner, if the aligner 122 currently attached to the mounting flange 126 does not match the aperture on the vertical column,

the attached aligner 122 may be removed and replaced with another that better matches the aperture.

[0031] It is contemplated that various types of aligners may be provided for engaging with different types of apertures. For example, multiple sets of aligners may be provided with each rail kit package. Each set of aligners may be configured to engage with a particular type of aperture. In this manner, the user installing the rail system may choose the appropriate set of aligners based on the size, shape (e.g., square, rectangular, round or the like), or thread pattern (e.g., threaded or unthreaded) of the apertures on the vertical columns.

[0032] It is also contemplated that the aligners 122 may be designed to be reversible (as illustrated in FIG. 6). That is, each aligner 122 may include a first alignment insert 128 for engaging a first type of vertical column aperture. The aligner 122 may also include a second alignment insert 130 for engaging a second type of vertical column aperture. The first alignment insert 128 and the second alignment insert 130 may be joined together via a connector 132. In this manner, each aligner 122 may support two different types of apertures.

[0033] As illustrated in FIGS. 7 through 9, each mounting flange 126 may define an opening 146 for receiving an aligner 122. In addition, a mounting plate 124 may be utilized to secure the aligner 122 to the mounting flanges 126. In one embodiment, each mounting plate 124 defines a guiding slot 136 for engaging with a post 138 located on the mounting flange 126. The mounting plate 124 may slide relative to the mounting flange 126 according to the guiding slot 136. Additional snap-fit alignment mechanisms 142 may be utilized to align and retain the mounting plate 124 once it is slid into the installed position (as depicted in FIG. 9). Sliding the mounting plate 124 into the installed position causes a tab 134 located on the mounting plate 124 to be inserted into a receiver 144 defined on the aligner 122, locking the aligner 122 in place.

[0034] To remove the aligner 122, the mounting plate 124 may be removed from the installed position and moved away from the mounting flange 126. Doing so unlocks the aligner 122, allowing the aligner 122 to be removed, reversed or replaced if needed. In one embodiment, to provide better handling for the user to slide the mounting plate 124, the L-shaped plate configuration may include a gripping edge 156. However, it is understood that the L-shaped plate configuration is merely exemplary; mounting plate having various other shapes may be utilized without departing from the spirit and scope of the present disclosure.

[0035] It is contemplated that the mounting plate 124 may be designed to be symmetric with respect to a central axis 162. Mounting flange 126A (on one end of the support rail 120) and the mounting flange 126B (on the other end of the support rail 120) may receive their corresponding mounting plates 124 in opposite directions. A symmetric design may allow same mounting plates to be utilized for either end of the support rail 120. That is, the user may simply reverse the vertical orientation of a mounting plate 124 to engage with either the mounting flange 126A or the mounting flange 126B.

[0036] Once the support rail assemblies 102 and 104 are securely attached to the rack 106, they may be utilized to support equipment. While the support shelves 118 provided by the support rails may be adequate for supporting certain types of equipment in the rack 106, other types of equipment may need to be coupled to the support rail assemblies for additional security. Referring to FIG. 10, a device/equipment

158 having multiple fasteners **160** that may be secured to the support rail assemblies is shown. To provide support for such devices, each mounting plate **124** may be further configured to define one or more receiving portion for receiving fasteners **160**.

[0037] As illustrated in FIGS. 7 through 9, each mounting flange **126** may define one or more openings **150** and each mounting plate **124** may define one or more receiving portions **148**. The openings **150** on the mounting flange **126** and the receiving portions **148** on the mounting plate **124** are aligned when the mounting plate **124** is placed into the installed position. Furthermore, as illustrated in FIGS. 10 and 11, the openings **150** (already aligned with the receiving portions **148**) may coincide with the apertures **164** of the vertical column **108**. In this manner, the fasteners **160** may pass through the apertures **164** of the vertical column as well as the openings **150** of the mounting flange **126**, and then engage with the receiving portions **148** of the mounting plate **124**.

[0038] It is contemplated that the fasteners **160** associated with different devices may vary. For example, one device may utilize M5 screws while another may utilize 10-32 screws. To accommodate for various types of screws, multiple sets of mounting plates **124** may be provided. Each set of mounting plates **124** may be configured for receiving a particular type of screw (e.g., M4, M5, 10-32, 12-24 or the like). The user may choose the appropriate set of mounting plates **124** based on the type of fasteners or screws associated with the device. Different mounting plates **124** for receiving different screws may be made visually distinguishable to the user. For example, each mounting plate may include markings to indicate the specific fastener type a mounting plate is configured to receive.

[0039] It is also contemplated that various techniques may be employed to produce mounting plates for receiving different screw types. For example, a mold may be provided for each type of mounting plate. Alternatively, as illustrated in FIG. 6, each mounting plate may include separately molded basis plate and receiving portions **148**. To produce a mounting plate for receiving a particular type of screw, receiving portions **148** designed for that particular type may be selected and press fit into a basis plate. In this manner, only the receiving portions **148** may need to be produced differently for different types of screws, but the design for the basis plate may remain substantially the same.

[0040] FIGS. 12 and 13 illustrate two types of aligners **122** and **222** that may be utilized. As illustrated in FIG. 12, aligner **122** includes a first alignment insert **128** for engaging a square aperture of a first size, a second alignment insert **130** for engaging a square aperture of a second size, and a connector **132** joining the two alignment inserts together. The connector **132** also defines a receiver **144** for receiving a tab from a mounting plate as previously described. Similarly, as illustrated in FIG. 13, aligner **222** includes a first alignment insert **228** for engaging a circular aperture of a first size, a second alignment insert **230** for engaging a circular aperture of a second size, and a connector **232** joining the two alignment inserts together. The alignment inserts **228** and **230** may also include threads for engaging threaded apertures. It is understood that the aligners **122** and **222** are merely exemplary, aligners for engaging various other types of apertures may be utilized without departing from the spirit and scope of the present disclosure.

[0041] The rail system **100** in accordance with the present disclosure eliminates the need for different left side and right side assemblies, allowing the same type of support rails **120** to be used for either side. Furthermore, aligners **122** removably attached to each end of the support rail **120** may accommodate for different vertical column aperture sizes/shapes. In addition, mounting plates **124** utilized to secure the aligners **122** also defines one or more receiving portions for receiving screws from various devices. The mounting plates **124** are designed to be interchangeable in order to accommodate for different screw sizes associated with various types of devices.

[0042] It is contemplated that the rail system **100** in accordance with the present disclosure may be packaged as a kit. Each kit may include one or more identical support rail assemblies. Each rail assembly includes a support rail as previously described. Each rail assembly also includes one or more pairs of aligners. More than one pair of aligners may be included to allow the user to select the appropriate ones that best fit the vertical column apertures. Each rail assembly further includes one or more pairs of mounting plates. More than one pair of mounting plates may be included to allow the user to select the appropriate ones based on the type of screws used by the equipment. For instance, each rail assembly may include four pairs of mounting plates that are configured for receiving M4, M5, 10-32, and 12-24 screw types respectively.

[0043] The rail kit in accordance with the present disclosure may be utilized with any type of rack manufactured by various manufactures/sellers.

[0044] It is believed that the system and method of the present disclosure and many of its attendant advantages will be understood by the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the components without departing from the disclosed subject matter or without sacrificing all of its material advantages. The form described is merely explanatory.

What is claimed is:

1. A reversible aligner configured for use in a support rack, the aligner comprising:

- a first alignment insert configured for engaging a first type of vertical column aperture;
- a second alignment insert configured for engaging a second type of vertical column aperture; and
- a connector attaching the first alignment insert to the second alignment insert, the connector defining a receiver configured for receiving a tab of a mounting plate that allows the mounting plate to removably secure the aligner.

2. The reversible aligner of claim 1, wherein the first alignment insert is configured for engaging a first aperture of a first size.

3. The reversible aligner of claim 2, wherein the second alignment insert is configured for engaging a second aperture of a second size, and wherein the first and second sizes are different.

4. The reversible aligner of claim 3, wherein each of the first and second apertures are square or round.

5. The reversible aligner of claim 1, wherein at least one of the first and second alignment inserts includes threads.

6. The reversible aligner of claim 1, wherein the first and second alignment inserts extend in opposite directions from the connector.

7. A reversible aligner configured to be coupled to either end of a support rail, the aligner comprising:

a first alignment insert configured for engaging a first aperture having a first shape;
a second alignment insert configured for engaging a second aperture having a second shape, wherein the first and second shapes are different; and
a connector attaching the first alignment insert to the second alignment insert, the connector defining a receiver configured for receiving a tab of a mounting plate that allows the mounting plate to removably secure the aligner.

8. The reversible aligner of claim **7**, wherein the first alignment insert is configured for engaging a first aperture of a first size.

9. The reversible aligner of claim **8**, wherein the second alignment insert is configured for engaging a second aperture of a second size, and wherein the first and second sizes are different.

10. The reversible aligner of claim **9**, wherein each of the first and second apertures are square or round.

11. The reversible aligner of claim **7**, wherein at least one of the first and second alignment inserts includes threads.

12. The reversible aligner of claim **7**, wherein the first and second alignment inserts extend in opposite directions from the connector.

13. A reversible aligner configured to be coupled to either end of a support rail, the aligner comprising:

a first alignment insert configured for engaging a first aperture having a first size;
a second alignment insert configured for engaging a second aperture having a second size, wherein the first and second sizes are different; and
a connector attaching the first alignment insert to the second alignment insert, the connector defining a receiver configured for receiving a tab of a mounting plate that allows the mounting plate to removably secure the aligner.

14. The reversible aligner of claim **13**, wherein the first alignment insert is configured for engaging a first aperture of a first shape.

15. The reversible aligner of claim **14**, wherein the second alignment insert is configured for engaging a second aperture of a second shape, and wherein the first and second shapes are different.

16. The reversible aligner of claim **15**, wherein each of the first and second apertures are square or round.

17. The reversible aligner of claim **13**, wherein at least one of the first and second alignment inserts includes threads.

18. The reversible aligner of claim **13**, wherein the first and second alignment inserts extend in opposite directions from the connector.

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