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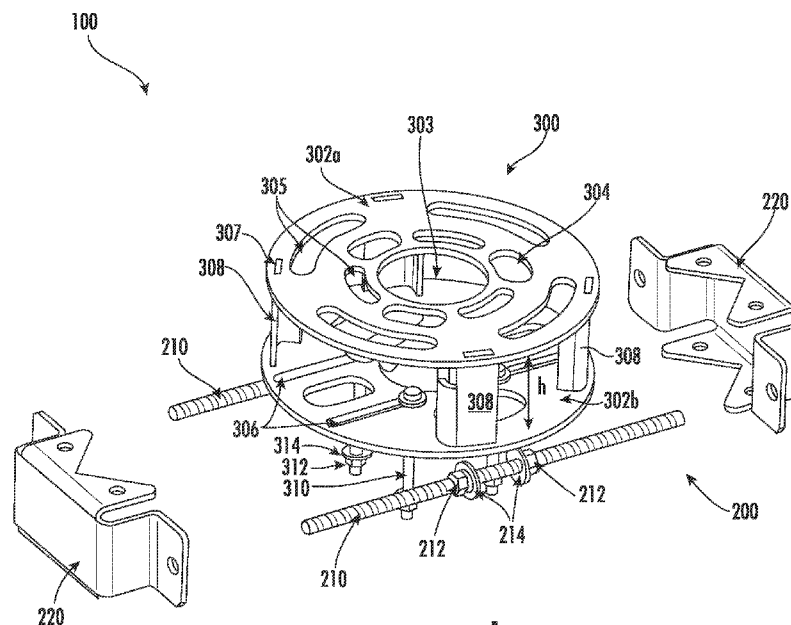


FIG. 1

(57) Abstract: The present disclosure describes an adapter for mounting pole top mounts to a square mounting pole. A square pole adapter kit includes two threaded rods and two adapters. Each adapter includes a main body, top and bottom members, and a pair of flanges. The top and bottom members of the adapters include triangular recesses that are sized and configured to receive a corner of a square mounting pole. Square pole adapter systems and assemblies are also provided.



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SQUARE POLE ADAPTERS FOR TELECOMMUNICATIONS EQUIPMENT MOUNTS

Related Application(s)

[0001] The present application claims priority to and the benefit of U.S. Provisional Patent Application Serial No. 63/001,731, filed March 30, 2020, the disclosure of which is hereby incorporated herein in its entirety.

Field

[0002] The present application is directed generally toward telecommunications equipment, and more particularly, square pole adapters for telecommunications equipment mounts.

Background

[0003] Currently, a majority of pole top telecommunications equipment is designed to be mounted on top of a cylindrical mounting pole (*e.g.*, a utility pole). Thus, a majority of pole top equipment and mounts available today have circular mounting plates that may be easily installed on the top of the pole. However, there are some situations when a technician may need to install the same telecommunications equipment on the top of a square mounting pole. There may be a need for a device that would allow current available pole top telecommunications equipment to be mounted to a square mounting pole without the need to modify the circular mounting plates of the telecommunications equipment.

Summary

[0004] A first aspect of the present invention is directed to a square pole adapter kit. The kit may include two threaded rods and two adapters. Each thread rod may have corresponding nuts and washers. Each adapter may include a main body, top and bottom members, and a pair of flanges. The top member of each adapter may be integral with the main body and bent inwardly such that the top member extends generally perpendicularly to the main body. The top member includes a triangular recess and a plurality of apertures with each aperture being configured to receive a respective fastener from a pole top mount. The bottom member of each adapter may be integral with the main body and bent inwardly such that the bottom member extends generally perpendicularly to the main body and generally parallel with the top member.

The bottom member includes a triangular recess and a plurality of apertures with each aperture configured to receive the fastener from the pole top mount. The flanges extend outwardly from opposing sides of the main body and each flange includes an aperture sized and configured to receive a threaded rod. The triangular recesses of one adapter are sized and configured to receive a corner of a square mounting pole and the triangular recesses of the other adapter are sized and configured to receive an opposing corner of the square mounting pole.

[0005] Another aspect of the present invention is directed to a square pole adapter system. The system may include a pole top mount and a square pole adapter kit. The pole top mount may include a top mounting plate and a bottom mounting plate coupled to and spaced apart from the top mounting plate by a plurality of support members. The top mounting plate may have a first routing aperture located in the center of the plate and a first plurality of elongated apertures located circumferentially around the first routing aperture. The bottom mounting plate may have a corresponding second routing aperture in the center of the plate and a second plurality of elongated apertures located circumferentially around the second routing aperture. The bottom mounting plate may further include two pairs of elongated slots, each pair of slots extending outwardly from opposing sides of the second routing aperture. Each elongated slot may be sized and configured to receive a fastener. The adapter kit may include two threaded rods and two adapters. Each thread rod may have corresponding nuts and washers. Each adapter may include a main body, top and bottom members, and a pair of flanges. The top member may be integral with the main body and bent inwardly such that the top member extends generally perpendicularly to the main body. The top member includes a triangular recess and a plurality of apertures with each aperture being configured to receive the fastener from the bottom plate of the pole top mount. The bottom member may be integral with the main body and bent inwardly such that the bottom member extends generally perpendicularly to the main body and generally parallel with the top member. The bottom member includes a triangular recess and a plurality of apertures with each aperture configured to receive the fastener from the bottom plate of the pole top mount. The flanges extend outwardly from opposing sides of the main body and each flange includes an aperture sized and configured to receive a threaded rod. The triangular recesses of one adapter are sized and configured to receive a corner of a square mounting pole and the triangular recesses of the other adapter are sized and configured to receive an opposing corner of the square mounting pole. Each fastener is inserted through a slot in the bottom mounting plate of the pole top mount and corresponding apertures in the top and bottom members of an adapter, thereby securing the adapters to the bottom mounting plate of the pole top mount.

[0006] Another aspect of the present invention is directed to a square pole adapter system assembly. The assembly may include a square mounting pole, a pole top mount, and a square pole adapter kit. The pole top mount may include a top mounting plate and a bottom mounting plate coupled to and spaced apart from the top mounting plate by a plurality of support members. The top mounting plate may have a first routing aperture located in the center of the plate and a first plurality of elongated apertures located circumferentially around the first routing aperture. The bottom mounting plate may have a corresponding second routing aperture in the center of the plate and a second plurality of elongated apertures located circumferentially around the second routing aperture. The bottom mounting plate further includes two pairs of elongated slots with each pair extending outwardly from opposing sides of the second routing aperture. A fastener may be inserted through each elongated slot. The square pole adapter kit may include two threaded rods and two adapters. Each thread rod may have corresponding nuts and washers. Each adapter may include a main body, top and bottom members, and a pair of flanges. The top member may be integral with the main body and bent inwardly such that the top member extends generally perpendicularly to the main body. The top member includes a triangular recess and a plurality of apertures with each aperture receives a respective fastener extending from the bottom plate of the pole top mount. The bottom member may be integral with the main body and bent inwardly such that the bottom member extends generally perpendicularly to the main body and generally parallel with the top member. The bottom member includes a triangular recess and a plurality of apertures with each aperture receiving a respective fastener extending from the bottom plate of the pole top mount and through the apertures of the top member, thereby securing the adapters to the pole top mount. The flanges extend outwardly from opposing sides of the main body and each flange includes an aperture that receives a threaded rod. The triangular recesses of one adapter receive a corner of the square mounting pole and the triangular recesses of the other adapter receive an opposing corner of the square mounting pole. The corresponding nuts and washers are tightened on the respective threaded rods and against the flanges of the adapters, thereby securing the square pole adapter kit to the square mounting pole.

[0007] It is noted that aspects of the invention described with respect to one embodiment, may be incorporated in a different embodiment although not specifically described relative thereto. That is, all embodiments and/or features of any embodiment can be combined in any way and/or combination. Applicant reserves the right to change any originally filed claim and/or file any new claim accordingly, including the right to be able to amend any originally filed claim to depend from and/or incorporate any feature of any other claim or claims although

not originally claimed in that manner. These and other objects and/or aspects of the present invention are explained in detail in the specification set forth below. Further features, advantages and details of the present invention will be appreciated by those of ordinary skill in the art from a reading of the figures and the detailed description of the preferred embodiments that follow, such description being merely illustrative of the present invention.

Brief Description of the Figures

[0008] **FIG. 1** is a perspective view of an adapter system for a square pole according to embodiments of the present invention.

[0009] **FIG. 2A** is a perspective view of an exemplary adapter for a 12-inch pole top that may be used with the adapter system of **FIG. 1** according to embodiments of the present invention.

[0010] **FIG. 2B** is a top view of the adapter of **FIG. 2A**.

[0011] **FIG. 3A** is a perspective view of an exemplary adapter for an 18-inch pole top that may be used with the adapter system of **FIG. 1** according to embodiments of the present invention.

[0012] **FIG. 3B** is a top view of the larger adapter of **FIG. 3A**.

[0013] **FIG. 4** is an enlarged top perspective view of a lower plate of a pole-top module that shows the cable routing and mounting aperture patterns for the 12-inch pole top adapter system of **FIG. 1**.

[0014] **FIG. 5** is an enlarged top perspective view of a lower plate of a pole-top module that shows the cable routing and mounting aperture patterns for an 18-inch pole top adapter system of **FIG. 1**.

[0015] **FIG. 6** is a top view comparing the cable routing and mounting patterns for a 12-inch pole top adapter system and an 18-inch pole top adapter system.

[0016] **FIG. 7A** is a perspective view of an adapter system according to embodiments of the present invention secured to a 3.5-inch square pole.

[0017] **FIG. 7B** is a bottom sectional view of the adapter system of **FIG. 7A** taken along line 7B-7B.

[0018] **FIG. 7C** is a perspective view of an adapter system according to embodiments of the present invention secured to a 6.0-inch square pole.

[0019] **FIG. 7D** is a bottom sectional view of the adapter system of **FIG. 7C** taken along line 7D-7D.

[0020] **FIG. 7E** is a perspective view of an adapter system according to embodiments of the present invention secured to an 8.5-inch square pole.

[0021] **FIG. 7F** is a bottom sectional view of the adapter system of **FIG. 7E** taken along line 7F-7F.

[0022] **FIG. 8A** is a side view of the 12-inch pole top adapter system assembly according to embodiments of the present invention secured to a 3.5-inch square pole, 6.0-inch square pole, and an 8.5-inch square pole (left to right).

[0023] **FIG. 8B** is a bottom sectional view of each adapter system assembly of **FIG. 8A** taken along line 8B-8B.

[0024] **FIG. 9A** is a side view of the 18-inch pole top adapter system assembly according to embodiments of the present invention secured to a 3.5-inch square pole, 6.0-inch square pole, and an 8.5-inch square pole (left to right).

[0025] **FIG. 9B** is a bottom sectional view of each adapter system assembly of **FIG. 9A** taken along line 9B-9B.

[0026] **FIG. 10A** is a photograph of an adapter system according to embodiments of the present invention secured to a square pole.

[0027] **FIG. 10B** is an enlarged photograph of the adapter system of **FIG. 10A**.

[0028] **FIG. 11** is a photograph of an adapter system assembly according to embodiments of the present invention.

Detailed Description

[0029] The present invention now is described more fully hereinafter with reference to the accompanying drawings, in which embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art.

[0030] The present invention now will be described more fully hereinafter with reference to the accompanying drawings, in which illustrative embodiments of the invention are shown. Like numbers refer to like elements throughout and different embodiments of like elements can be designated using a different number of superscript indicator apostrophes (*e.g.*, **10'**, **10''**, **10'''**).

[0031] In the figures, certain layers, components or features may be exaggerated for clarity, and broken lines illustrate optional features or operations unless specified otherwise. This

invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art.

[0032] It will be understood that, although the terms first, second, etc. may be used herein to describe various elements, components, regions, layers and/or sections, these elements, components, regions, layers and/or sections should not be limited by these terms. These terms are only used to distinguish one element, component, region, layer or section from another region, layer, or section. Thus, a first element, component, region, layer, or section discussed below could be termed a second element, component, region, layer, or section without departing from the teachings of the present invention. The sequence of operations (or steps) is not limited to the order presented in the claims or figures unless specifically indicated otherwise.

[0033] 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 specification and relevant art and should not be interpreted in an idealized or overly formal sense unless expressly so defined herein. Well-known functions or constructions may not be described in detail for brevity and/or clarity.

[0034] The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of 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. It will be further understood that the terms "comprises" and/or "comprising", when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof. As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items.

[0035] As used herein, phrases such as "between X and Y" and "between about X and Y" should be interpreted to include X and Y. As used herein, phrases such as "between about X and Y" mean "between about X and about Y." As used herein, phrases such as "from about X to Y" mean "from about X to about Y."

[0036] Pursuant to embodiments of the present invention, adapter kits are provided that may allow a pole top mount (and associated telecommunications equipment) to be mounted on top of a square mounting pole. Square pole adapter systems and assemblies are also provided. Embodiments of the present invention will now be discussed in greater detail with reference to **FIGS. 1-11**.

[0037] Referring to **FIG. 1**, a square pole adapter system **100** according to embodiments of the present invention is illustrated. The square pole adapter system **100** may comprise a pole top mount **300** and a square pole adapter kit **200**. As discussed herein, the square pole adapter system **100** of the present invention may be used to mount telecommunications equipment **400**, **400'** on top of a range of different sized square mounting poles **150**. For example, in some embodiments, the square pole adapter system **100** may be used for square mounting poles **150** having dimensions ranging from about 3.5 inches square to about 8.5 inches square.

[0038] As shown in **FIG. 1**, in some embodiments, the pole top mount **300** may include a top mounting plate **302a** and a bottom mounting plate **302b** that are spaced apart by a plurality of support members **308**. In some embodiments, the mounting plates **302a**, **302b** may be circular in shape and may have a diameter (**d**) in the range of about 8 inches to about 18 inches. The top mounting plate **302a** is spaced apart a distance (**h**) from the bottom mounting plate **302b**. As shown in **FIG. 1**, in some embodiments, the distance (**h**) between the mounting plates **302a**, **302b** is approximately equal to the height of the support members **308** located therebetween. The support members **308** are circumferentially spaced apart from each other and provide structural support to the pole top mount **300**. In some embodiments, the ends of each support member **308** may be secured adjacent to an outer periphery of the top and bottom mounting plates **302a**, **302b**, respectively. In some embodiments, the ends of each support member **308** may be secured within a respective slot **307** in the top and bottom mounting plates **302a**, **302b**. In some embodiments, the ends of each support member **308** may be secured to the top and bottom mounting plates **302a**, **302b** via welding.

[0039] In some embodiments, the top and bottom mounting plates **302a**, **302b** of the pole top mount **300** may each comprise a routing aperture **303** located in the center of the plate **302a**, **302b**. Each routing aperture **303** is sized and configured such that a plurality of cables **159** may be routed into and/or through the pole top mount **300** (*see, e.g., 4*). In some embodiments, each routing aperture **303** is sized and configured to receive and secure a mounting member **420'** of the telecommunications equipment **400** that may be mounted to the pole top mount **300** (*see, e.g., FIG. 5*), through which, in some embodiments, cables may be routed.

[0040] In some embodiments, the top and bottom mounting plates **302a**, **302b** further comprise a plurality of mounting apertures **304**. The mounting apertures **304** may be elongated slots that extend circumferentially around the routing aperture **303** in each mounting plate **302a**, **302b**. Each mounting aperture **304** is configured to receive a fastener **410** (e.g., a bolt) (see, e.g., **FIGS. 4** and **6**). The mounting apertures **304** allow the pole top mount **300** to be secured to a mounting structure **150** and/or allow telecommunications equipment **400** be secured to the pole top mount **300**. In some embodiments, the top and bottom mounting plates **302a**, **302b** may further comprise a plurality of cable apertures **305**. Similar to the mounting apertures **304**, the cable apertures **305** may be elongated slots that extend circumferentially around the central routing aperture **303** in each mounting plate **302a**, **302b**. Each cable aperture **305** may be sized and configured such that a cable **159** may be inserted there through (see, e.g., **FIG. 6**).

[0041] As shown in **FIG. 1** and **FIGS. 4-6**, in some embodiments, the cable apertures **305** may be wider than the mounting apertures **304**, for example, to accommodate the diameter of a cable **159** versus the diameter of a bolt (i.e., fastener **410**). As shown in **FIGS. 4-6**, the cable apertures **305** and mounting apertures **304** are positioned and configured in the top and bottom mounting plates **302a**, **302b** such that the pole top mount **300** can accommodate different sized pole-top modules for telecommunications equipment **400**, **400'**. For example, **FIGS. 4** and **6** illustrate the alignment of cable and mounting apertures **304**, **305** in the top mounting plate **302a** of the pole top mount **300** with the cable and mounting apertures **404**, **405** in the bottom mounting plate **402b** of a 12-inch pole-top module for telecommunications equipment **400**. **FIGS. 5** and **6** illustrate the alignment of cable and mounting apertures **304**, **305** in the top mounting plate **302a** of the pole top mount **300** with the cable and mounting apertures **404'**, **405'** in the bottom mounting plate **402b** of 18-inch pole-top module for telecommunications equipment **400'**. Thus, as shown in **FIGS. 4-6**, the square pole adapter system **100** of the present invention (i.e., the cable and mounting apertures **304**, **305** of the pole top mount **300**) may be utilized for a variety of different sized pole-top modules for telecommunications equipment **400**, **400'** (e.g., 12-inch and 18-inch).

[0042] As shown in **FIG. 1** and **FIGS. 7A-7F**, in some embodiments, the bottom mounting plate **302b** further comprises two pairs of elongated slots **306**. Each pair of slots **306** extends outwardly from opposing sides of the central routing aperture **303**. Each elongated slot **306** is sized and configured to receive a fastener **310** (e.g., a bolt). As discussed further herein, the elongated slots **306** allow the pole top mount **300** to be adjustable to fit on top of different sized square mounting poles **150**.

[0043] The square pole adapter system **100** of the present invention further includes a square pole adapter kit **200**. The square pole adapter kit **200** may include two threaded rods **210** and a pair of adapters **220**. Each thread rod **210** has corresponding nuts **212** and washers **214** that may be used to help secure the adapters **220** (and pole top mount **300**) to a square mounting pole **150**.

[0044] Referring now to **FIGS. 2A-2B**, an exemplary adapter **220** that may be used with the square pole adapter kit **200** of the present invention is illustrated. The adapter **220** comprises a main body **222**, a top member **224a**, a bottom member **224b**, and a pair of flanges **226**. The top member **224a** may be integral with the main body **222** and bent inwardly such that the top member **224a** extends generally perpendicularly to the main body **222**. As shown in **FIGS. 2A-2B**, the top member comprises a triangular recess **223** and a plurality of apertures **225** on opposing sides of the triangular recess **223**. As discussed in further detail below, each aperture **225** is sized and configured to receive a respective fastener **310** from the pole top mount **300**.

[0045] Similar to the top member **224a**, the bottom member **224b** of the adapter **220** may be integral with the main body **222** and bent inwardly such that the bottom member **224b** extends generally perpendicularly to the main body **222** and extends generally parallel with the top member **224a**. Also mirroring the top member **224a**, the bottom member **224b** comprises a triangular recess **223** and a plurality of apertures **225** sized and configured to receive a respective fastener **310** from the pole top mount **300**. The triangular recesses **223** of the top and bottom members **224a**, **224b** are sized and configured to receive a corner edge of a square mounting pole **150**.

[0046] The flanges **226** extend outwardly from opposing sides of the main body **222** of the adapter **220**. Each flange **226** comprises an aperture **227** that is sized and configured to receive a respective threaded rod **210**. In some embodiments, the main body **222**, top and bottom members **224a**, **224b**, and flanges **226** may be bent from a single piece of steel to form monolithic adapter **220**.

[0047] The adapters **220** illustrated in **FIGS. 2A-2B** may be used with square mounting poles **150** having dimensions up to 6 inches square. Referring to **FIGS. 3A-3B**, an alternative adapter **220'** that may be used with the square pole adapter kit **200** of the present invention is illustrated. The adapter **220'** shown in **FIGS. 3A-3B** is similar to adapter **220** described herein except for the adapter **220'** has a longer main body **222'** than the main body **222** of adapter **220**. The longer main body **222'** allows the adapter **220'** to be used with square mounting poles **150** having dimensions greater than 6 inches square. For example, in some embodiments,

adapter **220** may have a main body **222** having a length (**l**) in the range of about 4 inches to about 6 inches and the adapter **220'** may have a main body **222'** having a length (**l'**) in the range of about 6 inches to about 9.5 inches.

[0048] Using the square pole adapter kit **200**, a pole top mount **300** may be secured on top of a square mounting pole **150** (*see, e.g., FIGS. 7A-10B*). First, fasteners **310** (*e.g.*, bolts) are each inserted through a respective slot **306** in the bottom mounting plate **302b** of the pole top mount **300**. Each fastener **310** is further inserted through respective apertures **225** in both the top and bottom members **224a**, **224b** of the adapters **220** such that the triangular recesses **223** of each adapter **220** face toward each other (*i.e.*, the triangular recesses **223** open inward toward the routing apertures **303** of the pole top mount **300**). The fasteners **310** are partially tightened (*e.g.*, with nuts **312** and washers **314**, *see e.g., FIG. 1*) such that each adapter **220** is secured to the bottom mounting plate **302b** of the pole top mount **300**, but still loose enough such that the fasteners **310** are able to slide within their respective slots **306** in the bottom mounting plate **302b** (and thereby providing the ability to adjust the adapters **220** to fit around the desired square mounting pole **150**).

[0049] Next, the bottom mounting plate **302b** (with the adapters **220** attached) is placed on top of the square mounting pole **150** and the threaded rods **210** are inserted through corresponding apertures **227** in opposing adapters **220**. The triangular recesses **223** of each adapter **220** are aligned with opposing corners of the square mounting pole **150** and slid toward each other (*i.e.*, the fasteners **310** are slid within the slots **306** in the bottom mounting plate **302b**) until the opposing corners of the square mounting pole **150** are received securely within a respective triangular recess **223**. The nuts **212** and washers **214** are threaded onto the ends of the threaded rods **210** that extend through the flanges **226** of the adapters until the nuts **212** and washers **214** are tightened against the flanges **226** of the adapters **220**, thereby securing the adapters **220** against the square mounting pole **150** (*i.e.*, securing opposing corners of the square mounting pole **150** within the triangular recesses **223** of the adapters **220**) (*see, e.g., FIGS. 7A-7F, 8B, 9B, and 10A-10B*). Finally, the fasteners **310** are fully tightened, thereby securing the pole top mount **300** to the adapters **220** and to the top of a square mounting pole **150**.

[0050] As shown in **FIGS. 7A-7F**, the fasteners **310** and slots **306** allow the square pole adapter system **100** to be adjustable, thereby allowing a pole top mount **300** to be secured to a range of different sized square mounting poles **150**. For example, as illustrated in **FIGS. 7A-7B**, the square pole adapter system **100** may be used with a 3.5 inch square mounting pole **150**. As shown in **FIGS. 7A-7B**, the smaller adapter **220** illustrated in **FIGS. 2A-2B** may be used

and the fasteners **310** are slid to an interior end of the slots **306** (*i.e.*, the end of the slot that is adjacent to the routing aperture **303** of the bottom mounting plate **302b**). As illustrated in **FIGS. 7C-7D**, the square pole adapter system **100** may be used with a 6.0 inch square mounting pole **150**. As shown in **FIGS. 7C-7D**, the smaller adapter **220** may be used and the fasteners **310** are slid to approximately the middle of the slots **306**. As illustrated in **FIGS. 7E-7F**, the square pole adapter system **100** may be used with an 8.5 inch square mounting pole **150**. As shown in **FIGS. 7E-7F**, the larger adapter **220'** illustrated in **FIGS. 3A-3B** may be used and the fasteners **310** are slid to an exterior end of the slots **306** (*i.e.*, the end that is adjacent to an outer periphery of the bottom mounting plate **302b**).

[0051] Referring to **FIGS. 8A-8B** and **FIGS. 9A-9B**, after the square pole adapter system **100** is secured to a square mounting pole **150**, a pole-top module for telecommunications equipment **400**, **400'** may be mounted and secured to the top mounting plate **302a** of the pole top mount **300**. **FIGS. 8A-8B** illustrate a pole-top module for telecommunications equipment **400** (*e.g.*, antenna or radio) having a diameter of about 12 inches and secured on top of different sized square mounting poles **150** (*i.e.*, shown from left to right: a 3.5 inch square mounting pole **150**, a 6.0 inch square mounting pole **150'**, and a 8.5 inch square mounting pole **150''**). **FIGS. 9A-9B** illustrate a pole-top module for telecommunications equipment **400'** having a diameter of about 18 inches and secured on top of different sized square mounting poles **150** (*i.e.*, shown from left to right: a 3.5 inch square mounting pole **150**, a 6.0 inch square mounting pole **150'**, and a 8.5 inch square mounting pole **150''**).

[0052] As shown in **FIGS. 7A, 8A, 9A, and 9B**, in some embodiments, the square pole adapter system **100** may further include a transition cover **160**. The transition cover **160** may be used to conceal the adapter kit **200** and/or pole top mount **300** when installed on top of a mounting pole **150**. The transition cover **160** may provide an aesthetic transition from the mounting pole **150** to the pole-top module **400**, **400'** mounted on top of the pole **150**.

[0053] **FIGS. 10A-10B** are photographs showing an exemplary adapter system **100** (*i.e.*, adapter kit **200** and pole top mount **300**) secured to the top of a square mounting pole **150** according to embodiments of the present invention. **FIG. 11** is a photograph showing an exemplary adapter system **100** secured to the top of a square mounting pole **150** and with a pole-top module for telecommunications equipment **400** mounted and secured to the adapter system **100** according to embodiments of the present invention.

[0054] The foregoing is illustrative of the present invention and is not to be construed as limiting thereof. Although exemplary embodiments of this invention have been described,

those skilled in the art will readily appreciate that many modifications are possible in the exemplary embodiments without materially departing from the novel teachings and advantages of this invention. Accordingly, all such modifications are intended to be included within the scope of this invention as defined in the claims. The invention is defined by the following claims, with equivalents of the claims to be included therein.

That which is claimed is:

1. A square pole adapter kit, comprising:
two threaded rods, wherein each thread rod has corresponding nuts and washers; and
two adapters, each adapter comprising:
a main body;
a top member integral with the main body and bent inwardly such that the top member extends generally perpendicularly to the main body, the top member comprising a triangular recess and a plurality of apertures, each aperture configured to receive a respective fastener from a pole top mount;
a bottom member integral with the main body and bent inwardly such that the bottom member extends generally perpendicularly to the main body and generally parallel with the top member, the bottom member comprising a triangular recess and a plurality of apertures, each aperture configured to receive the fastener from the pole top mount; and
a pair of flanges extending outwardly from opposing sides of the main body, each flange comprising an aperture sized and configured to receive a threaded rod,
wherein the triangular recesses of one adapter are sized and configured to receive a corner of a square mounting pole and the triangular recesses of the other adapter are sized and configured to receive an opposing corner of the square mounting pole.
2. The square pole adapter kit of Claim 1, wherein the square mounting pole has dimensions in the range of about 3.5 x 3.5 inches to about 8.5 inches x 8.5 inches.
3. The square pole adapter kit of Claim 2, wherein the square mounting pole is 3.5 inches x 3.5 inches, 6.0 inches x 6.0 inches, or 8.5 inches x 8.5 inches.
4. The square pole adapter kit of any one of the preceding claims, wherein the adapters are secured to a bottom mounting plate of the pole top mount by the fasteners.
5. The square pole adapter kit of Claim 4, wherein the square pole adapter kit and the pole top mount are mounted and secured on top of the square mounting pole.

6. The square pole adapter kit of Claim 5, wherein a pole-top module for telecommunications equipment is mounted and secured to a top mounting plate of the pole top mount.

7. A square pole adapter system, comprising:
a pole top mount, the mount comprising:

a top mounting plate having a first routing aperture located in the center of the plate and a first plurality of elongated apertures located circumferentially around the first routing aperture; and

a bottom mounting plate coupled to and spaced apart from the top mounting plate by a plurality of support members, the bottom mounting plate having a corresponding second routing aperture in the center of the plate and a second plurality of elongated apertures located circumferentially around the second routing aperture,

wherein the bottom mounting plate further comprises two pairs of elongated slots, each pair extending outwardly from opposing sides of the second routing aperture, each elongated slot being sized and configured to receive a fastener; and
a square pole adapter kit, the adapter kit comprising:

two threaded rods, wherein each thread rod has corresponding nuts and washers; and

two adapters, each adapter comprising:

a main body;

a top member integral with the main body and bent inwardly such that the top member extends generally perpendicularly to the main body, the top member comprising a triangular recess and a plurality of apertures, each aperture configured to receive the fastener from the bottom plate of the pole top mount;

a bottom member integral with the main body and bent inwardly such that the bottom member extends generally perpendicularly to the main body and generally parallel with the top member, the bottom member comprising a triangular recess and a plurality of apertures, each aperture configured to receive the fastener from the bottom plate of the pole top mount; and

a pair of flanges extending outwardly from opposing sides of the main body, each flange comprising an aperture sized and configured to receive a threaded rod,

wherein the triangular recesses of the adapters face each other, and wherein the triangular recesses of one adapter are sized and configured to receive a corner of a square mounting pole and the triangular recesses of the other adapter are sized and configured to receive an opposing corner of the square mounting pole,

wherein each fastener is inserted through a slot in the bottom mounting plate of the pole top mount and corresponding apertures in the top and bottom members of an adapter, thereby securing the adapters to the bottom mounting plate of the pole top mount.

8. The square pole adapter system of Claim 7, wherein the square mounting pole has dimensions in the range of about 3.5 x 3.5 inches to about 8.5 inches x 8.5 inches.

9. The square pole adapter system of Claim 8, wherein the square mounting pole is 3.5 inches x 3.5 inches, 6.0 inches x 6.0 inches, or 8.5 inches x 8.5 inches.

10. The square pole adapter system of any one of Claims 7-9, wherein the top mounting plate of the pole top mount is sized and configured to secure a pole-top module for telecommunications equipment having a diameter in the range of about 12 inches to about 18 inches.

11. The square pole adapter system of any one of Claims 7-10, wherein a pole-top module for telecommunications equipment is mounted and secured to a top mounting plate of the pole top mount.

12. The square pole adapter system of any one of Claims 7-11, wherein the fasteners are configured to slide within the elongated slots, thereby allowing the adapters to be adjustable to fit around different sized square mounting poles.

13. A square pole adapter system assembly, comprising:
a square mounting pole;
a pole top mount, the mount comprising:

a top mounting plate having a first routing aperture located in the center of the plate and a first plurality of elongated apertures located circumferentially around the first routing aperture; and

a bottom mounting plate coupled to and spaced apart from the top mounting plate by a plurality of support members, the bottom mounting plate having a corresponding second routing aperture in the center of the plate and a second plurality of elongated apertures located circumferentially around the second routing aperture,

wherein the bottom mounting plate further comprises two pairs of elongated slots, each pair extending outwardly from opposing sides of the second routing aperture, wherein a fastener is inserted through each elongated slot; and

a square pole adapter kit, the adapter kit comprising:

two threaded rods, wherein each thread rod has corresponding nuts and washers; and

two adapters, each adapter comprising:

a main body;

a top member integral with the main body and bent inwardly such that the top member extends generally perpendicularly to the main body, the top member comprising a triangular recess and a plurality of apertures, each aperture receives a respective fastener extending from the bottom plate of the pole top mount;

a bottom member integral with the main body and bent inwardly such that the bottom member extends generally perpendicularly to the main body and generally parallel with the top member, the bottom member comprising a triangular recess and a plurality of apertures, each aperture receiving a respective fastener extending from the bottom plate of the pole top mount and through the apertures of the top member, thereby securing the adapters to the pole top mount; and

a pair of flanges extending outwardly from opposing sides of the main body, each flange comprising an aperture that receives a threaded rod,

wherein the triangular recesses face each other, and wherein the triangular recesses of one adapter receive a corner of the square mounting pole and the triangular recesses of the other adapter receive an opposing corner of the square mounting pole, and wherein the corresponding nuts and washers are tightened on the respective threaded rod and against the

flanges of the adapters, thereby securing the square pole adapter kit to the square mounting pole.

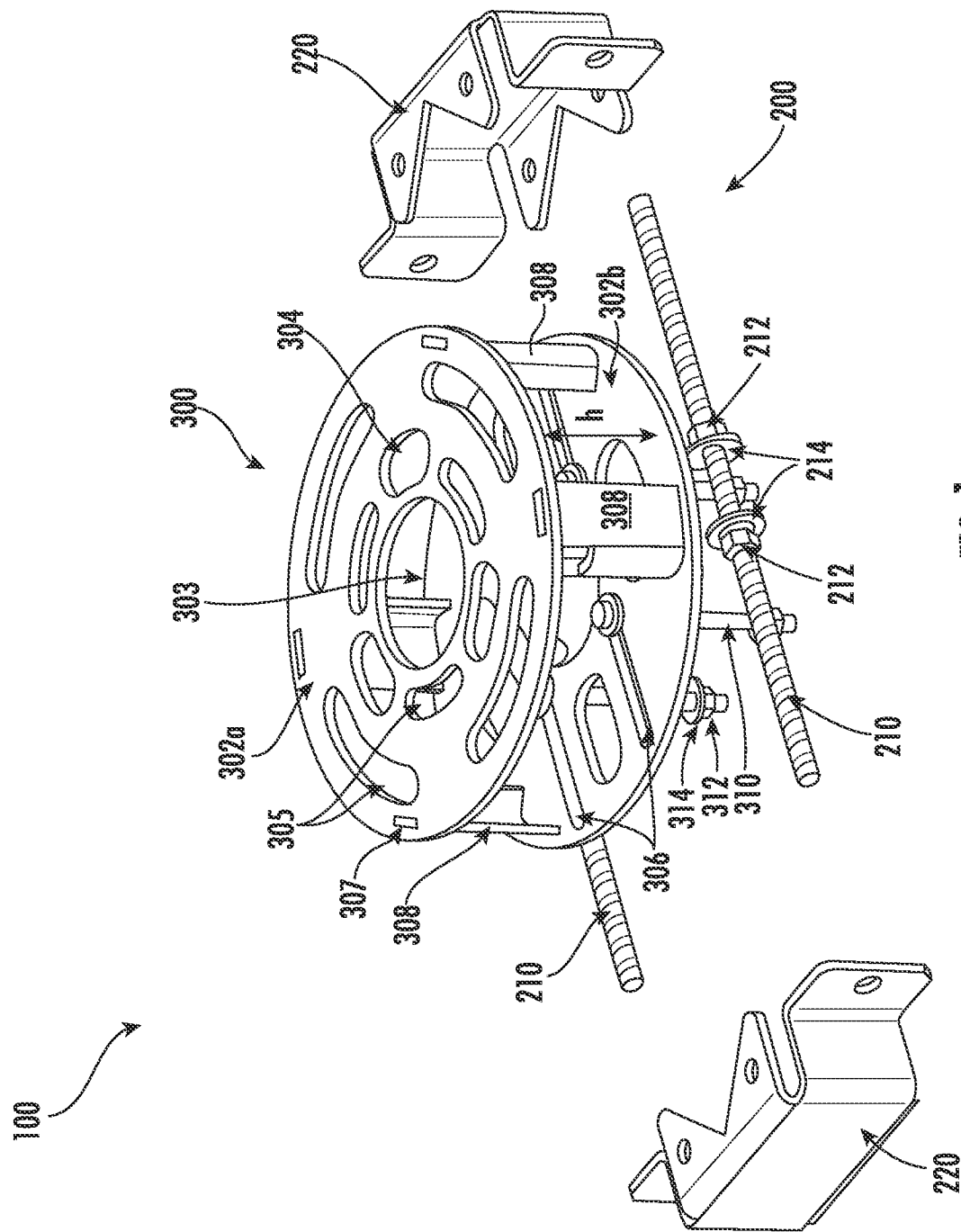
14. The square pole adapter system assembly of Claim 13, wherein the square mounting pole has dimensions in the range of about 3.5 x 3.5 inches to about 8.5 inches x 8.5 inches.

15. The square pole adapter system assembly of Claim 14, wherein the square mounting pole is 3.5 inches x 3.5 inches, 6.0 inches x 6.0 inches, or 8.5 inches x 8.5 inches.

16. The square pole adapter system assembly of any one of Claims 13-15, wherein the top mounting plate of the pole top mount is sized and configured to secure a pole-top module for telecommunications equipment having a diameter in the range of about 12 inches to about 18 inches.

17. The square pole adapter system assembly of any one of Claims 13-16, wherein a pole-top module for telecommunications equipment is mounted and secured to a top mounting plate of the pole top mount.

18. The square pole adapter system assembly of any one of Claims 13-17, wherein the fasteners are configured to slide within the elongated slots, thereby allowing the adapters to be adjustable to fit around different sized square mounting poles.



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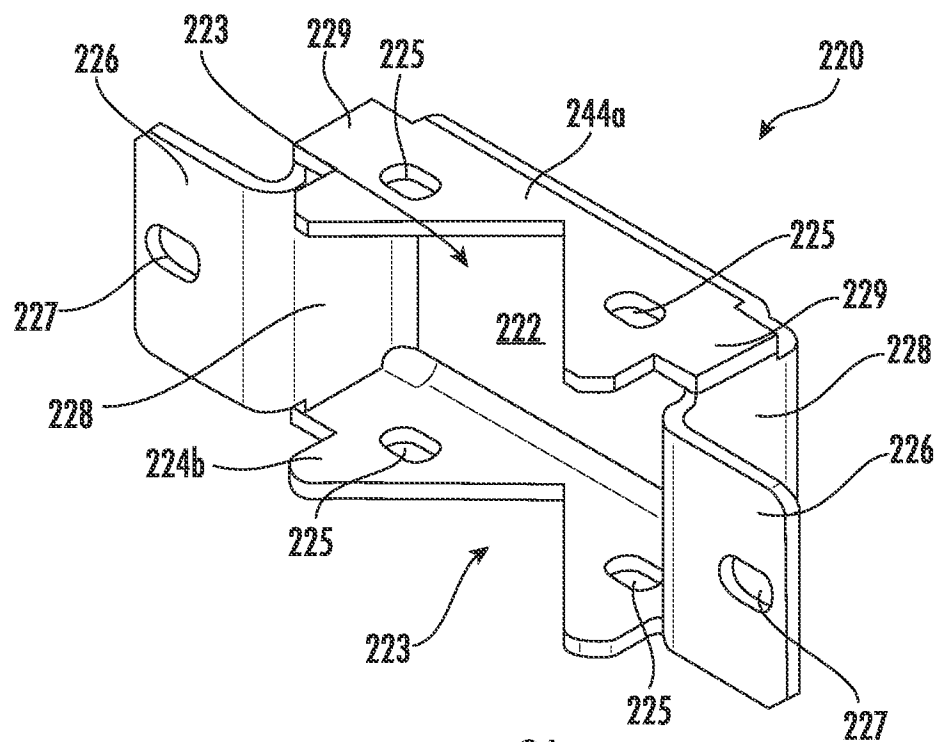


FIG. 2A

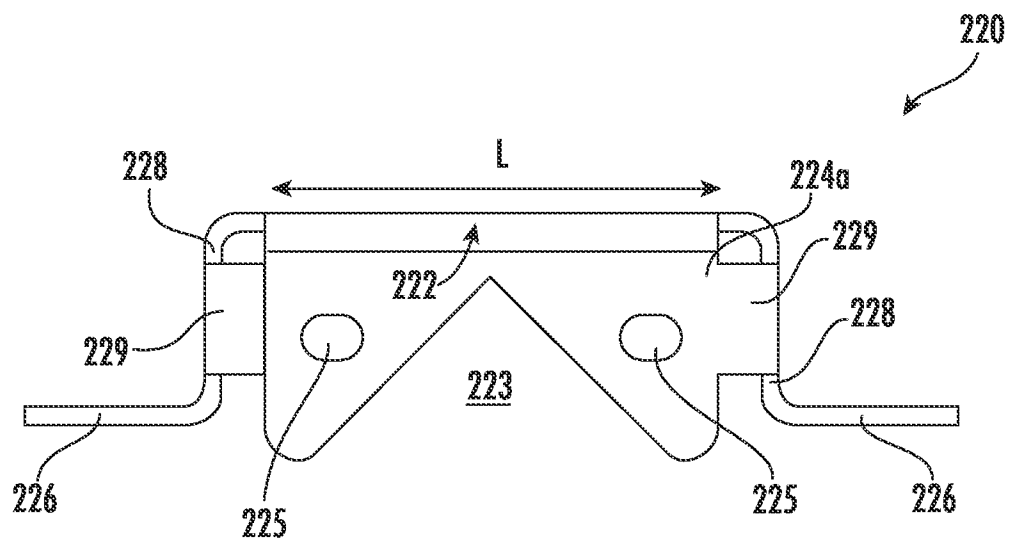
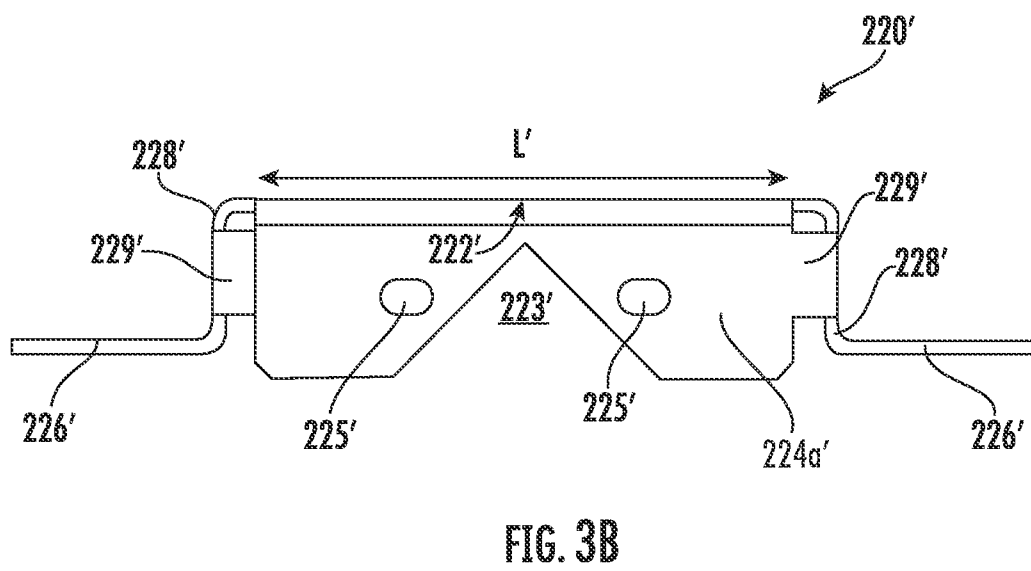
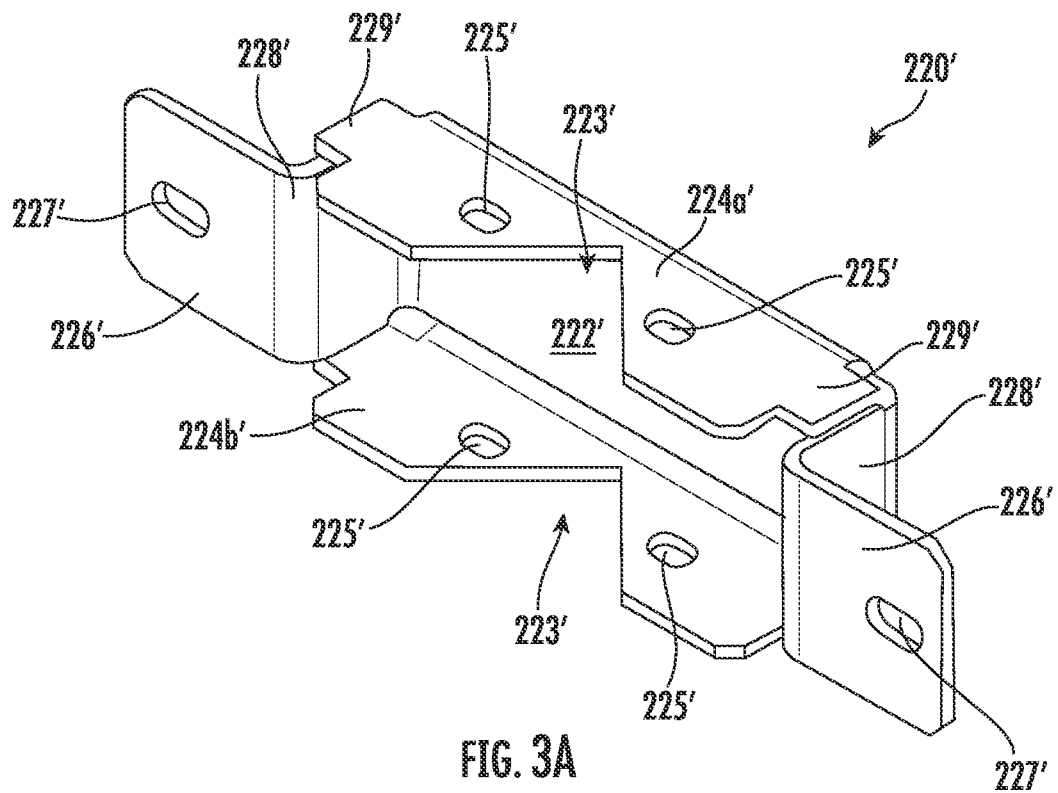


FIG. 2B

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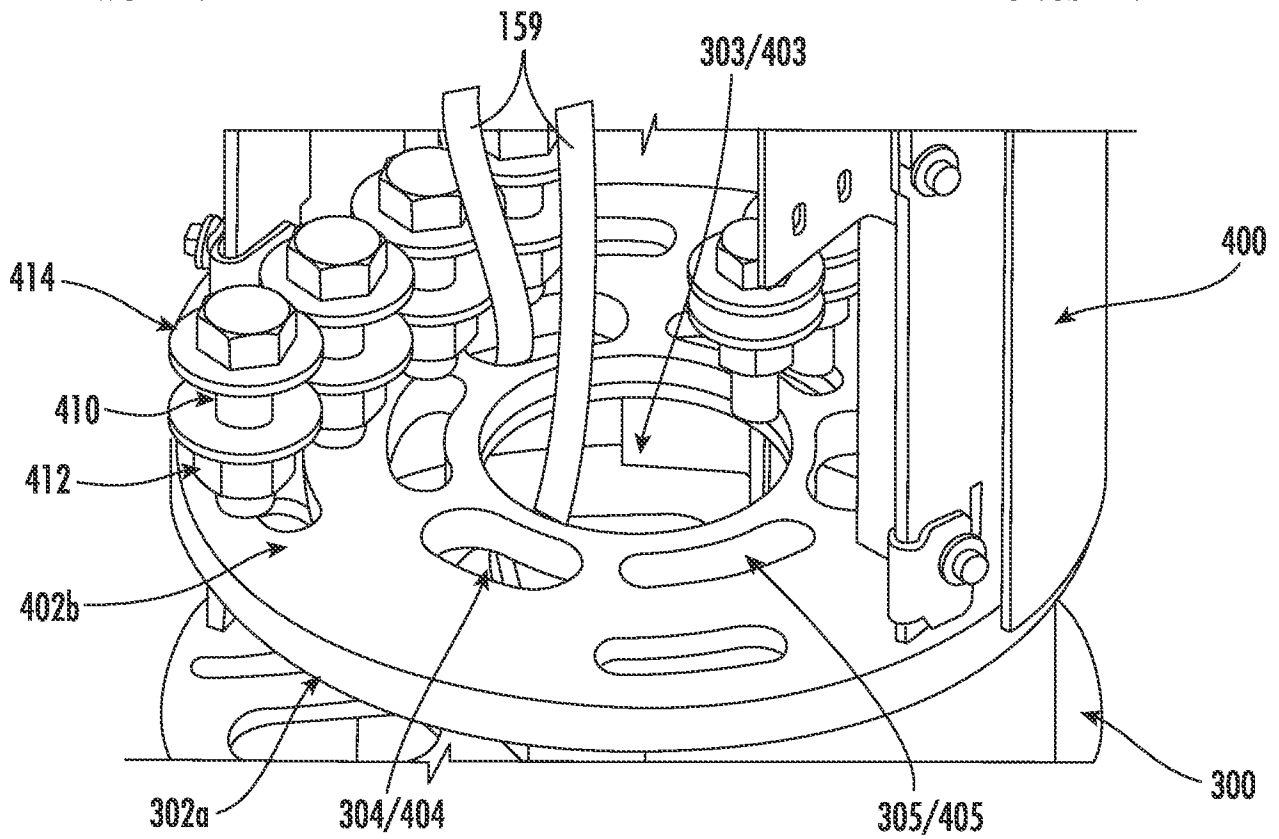


FIG. 4

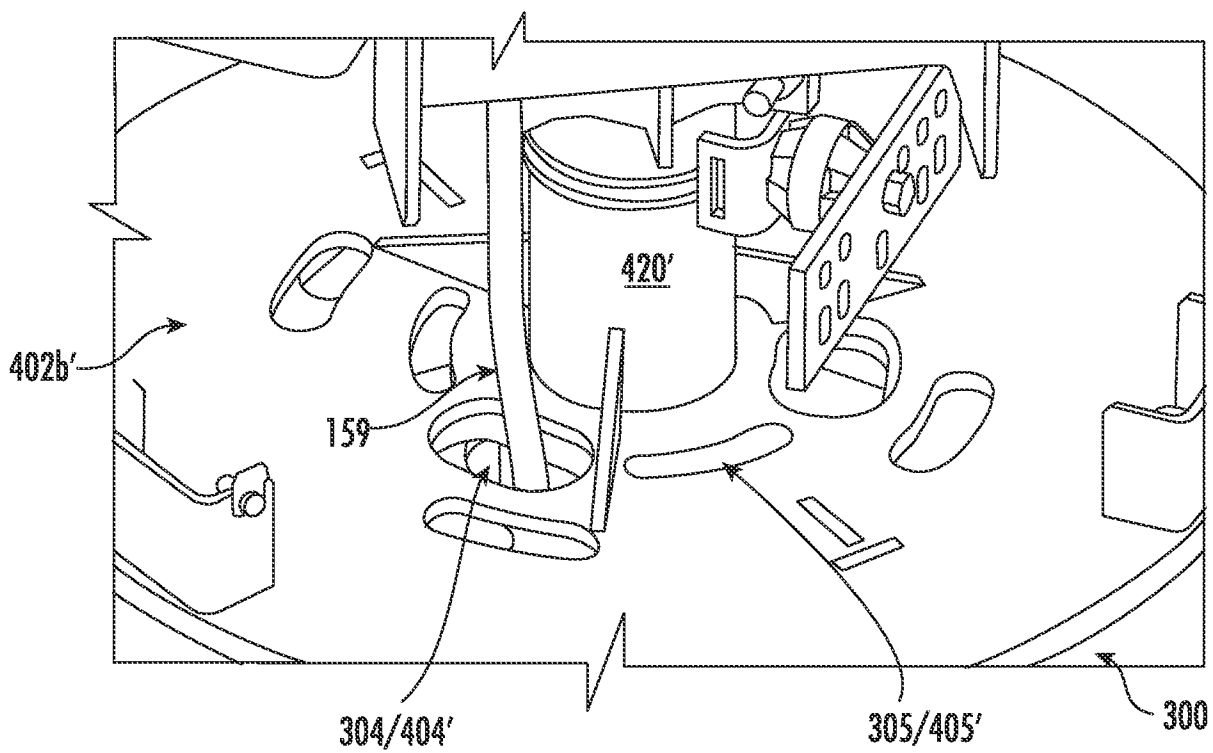
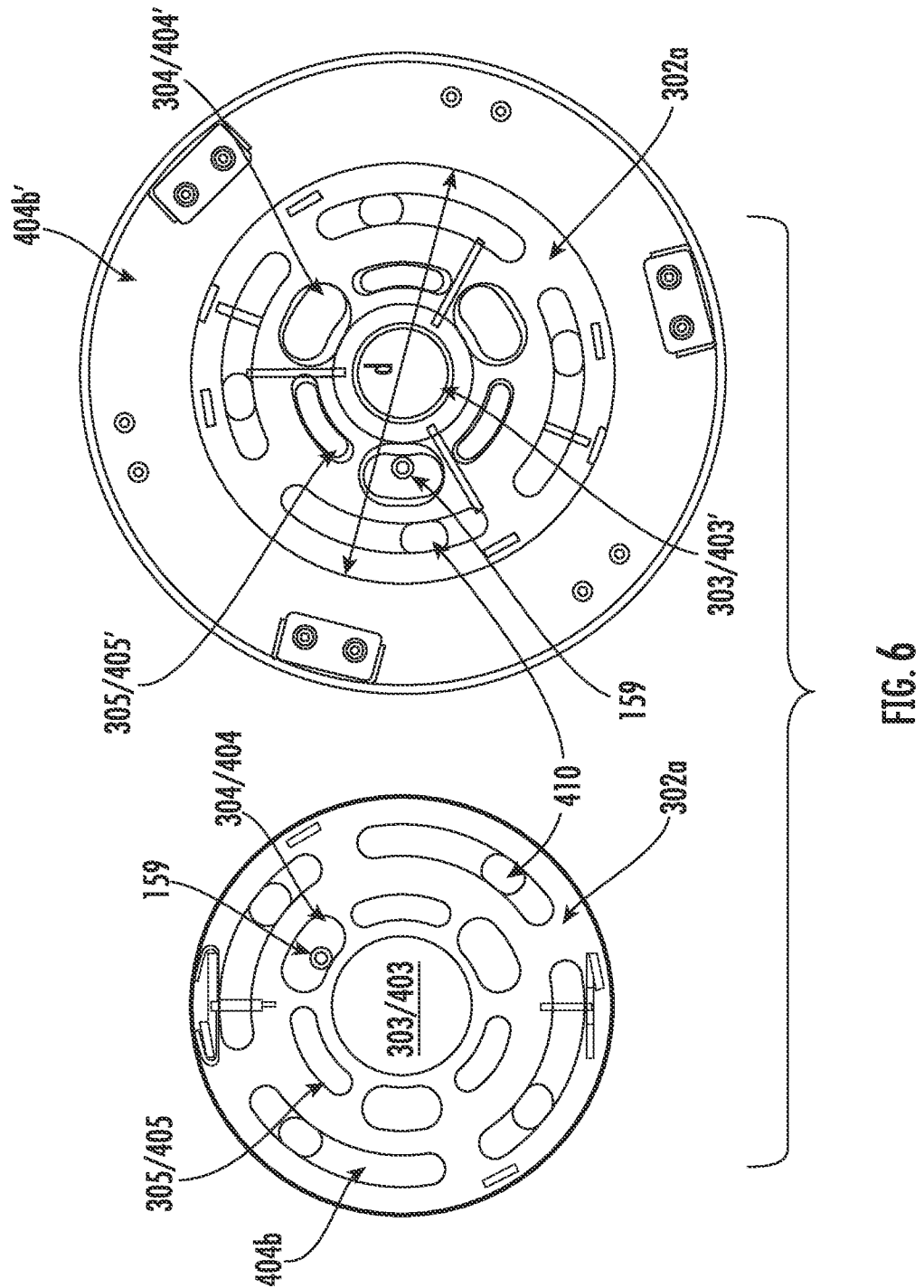


FIG. 5

SUBSTITUTE SHEET (RULE 26)



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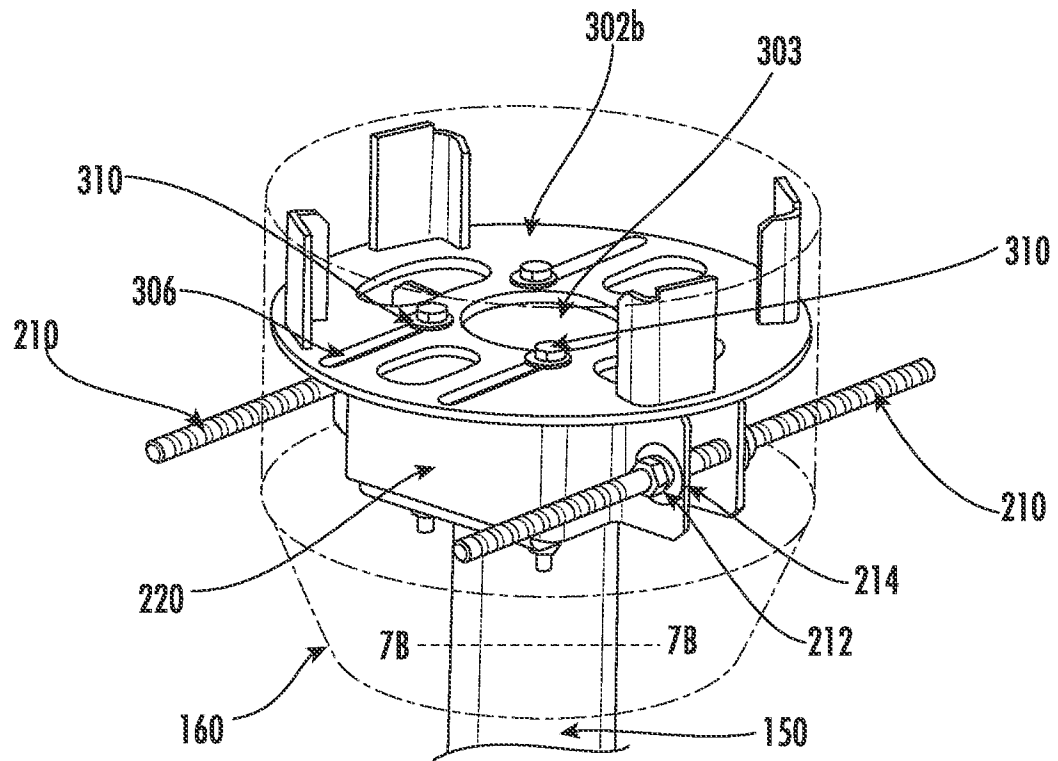


FIG. 7A

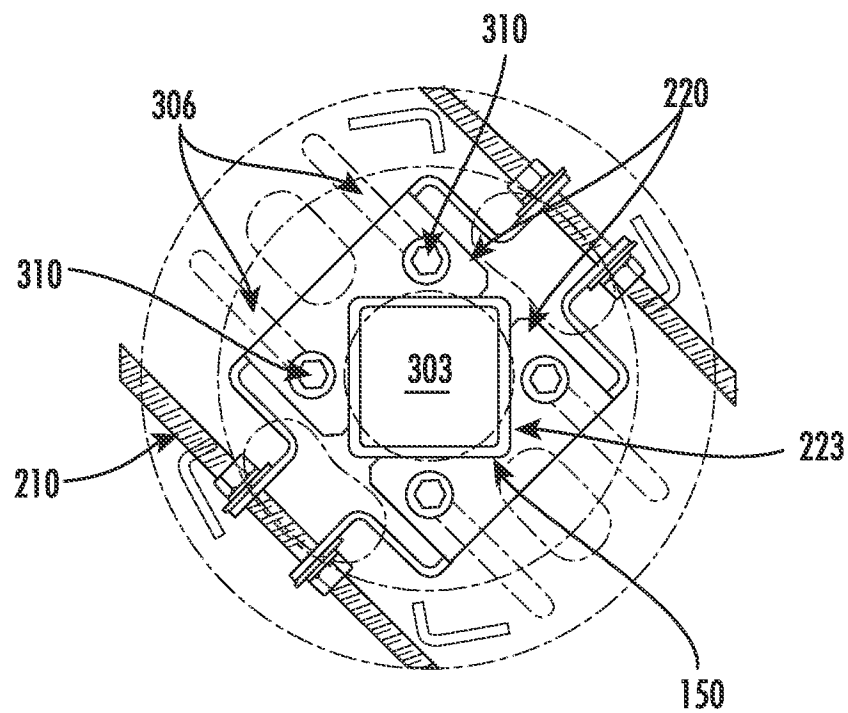


FIG. 7B

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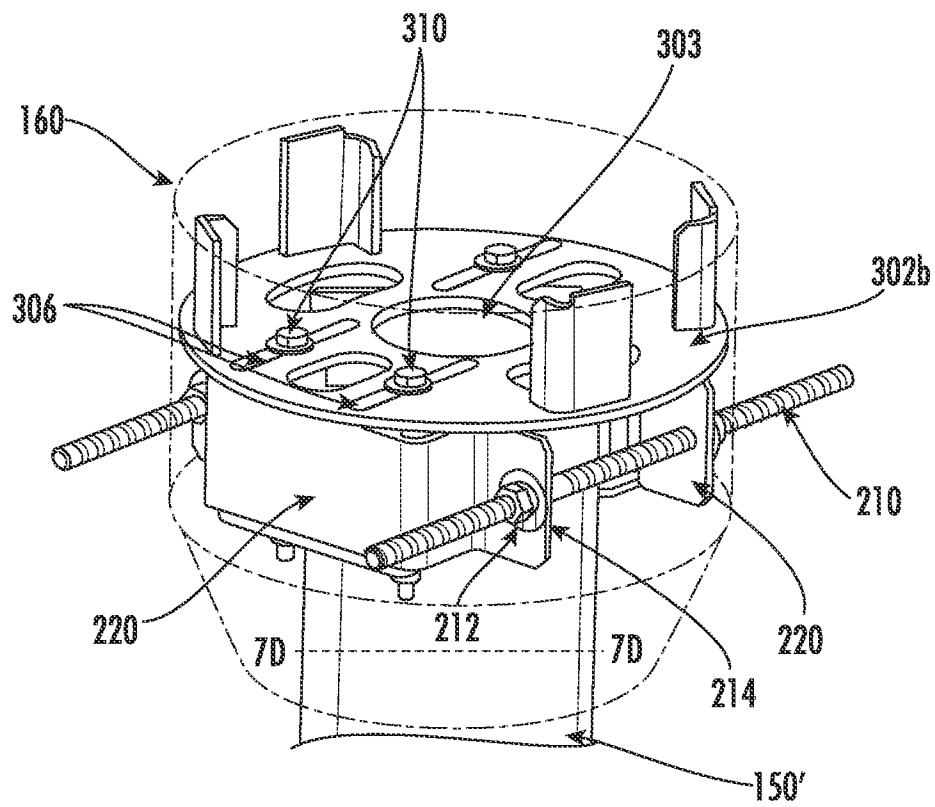


FIG. 7C

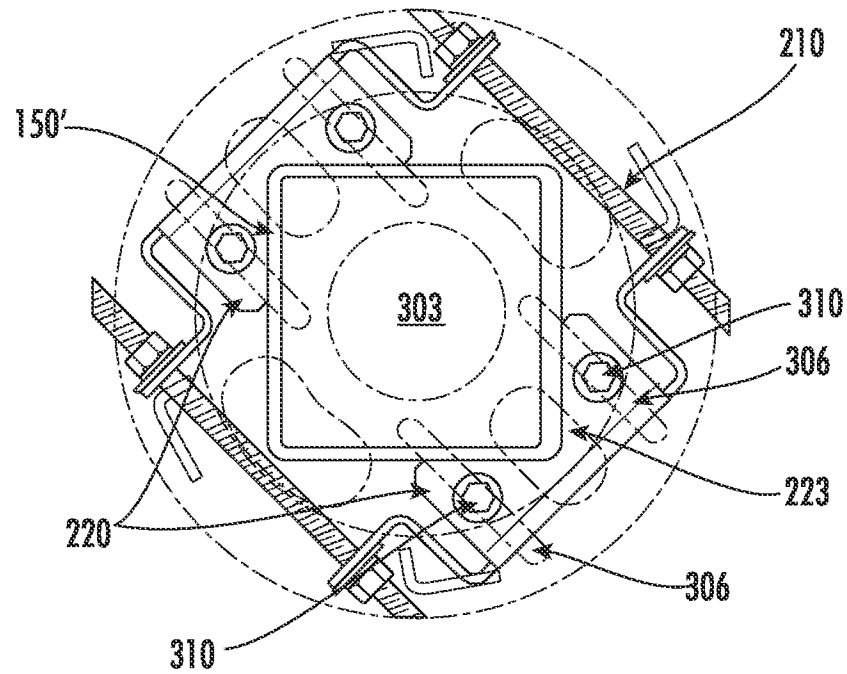


FIG. 7D

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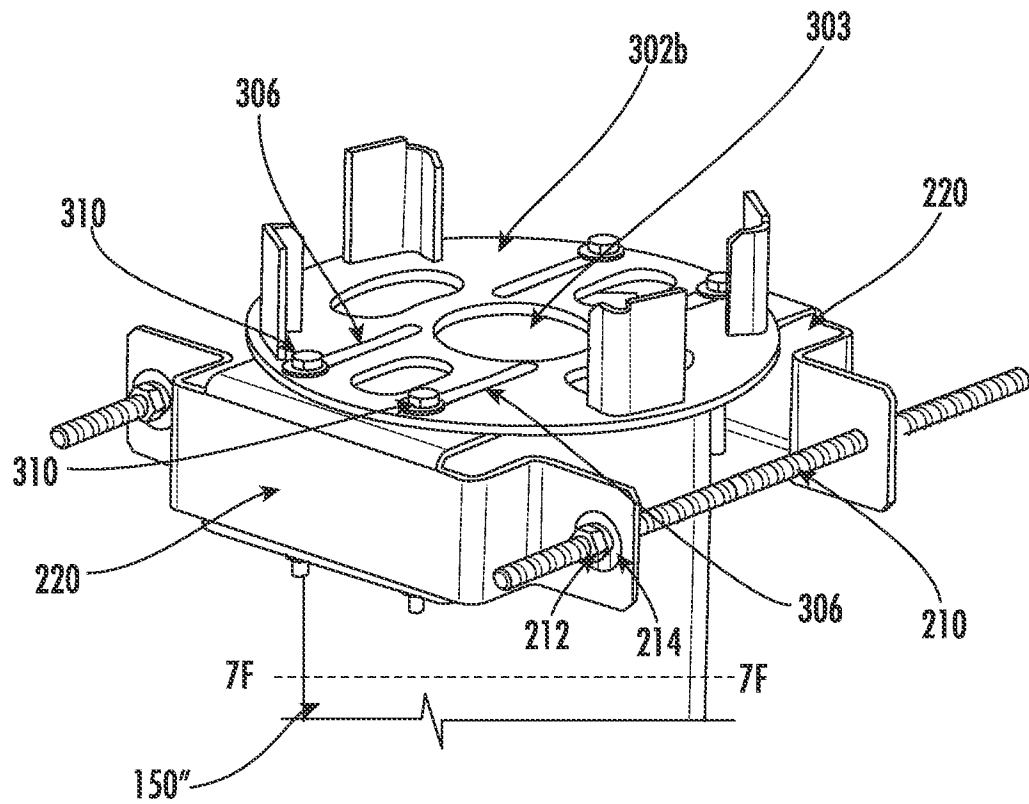


FIG. 7E

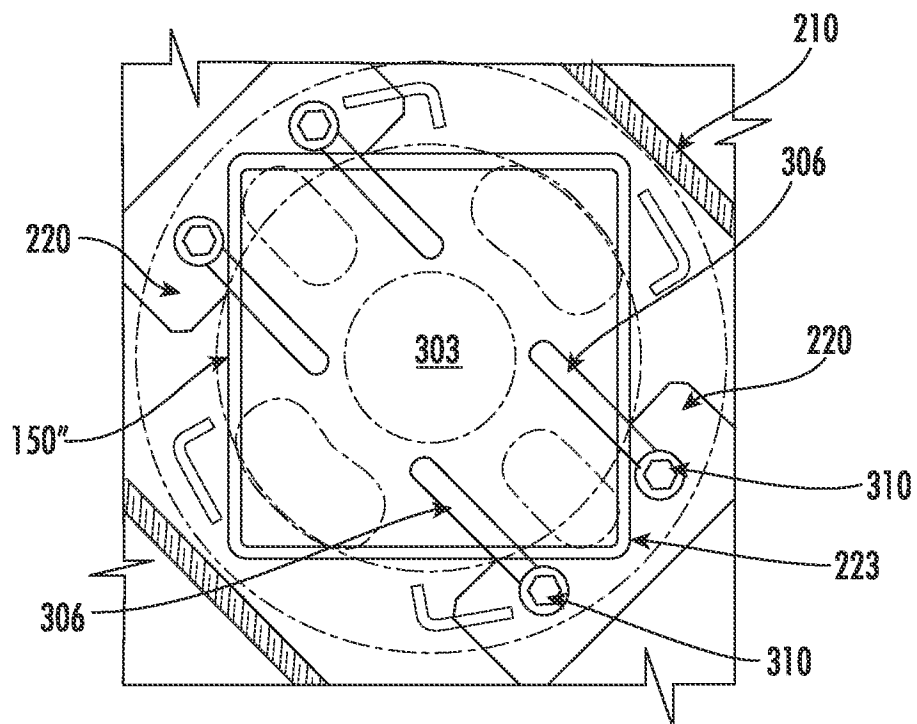


FIG. 7F

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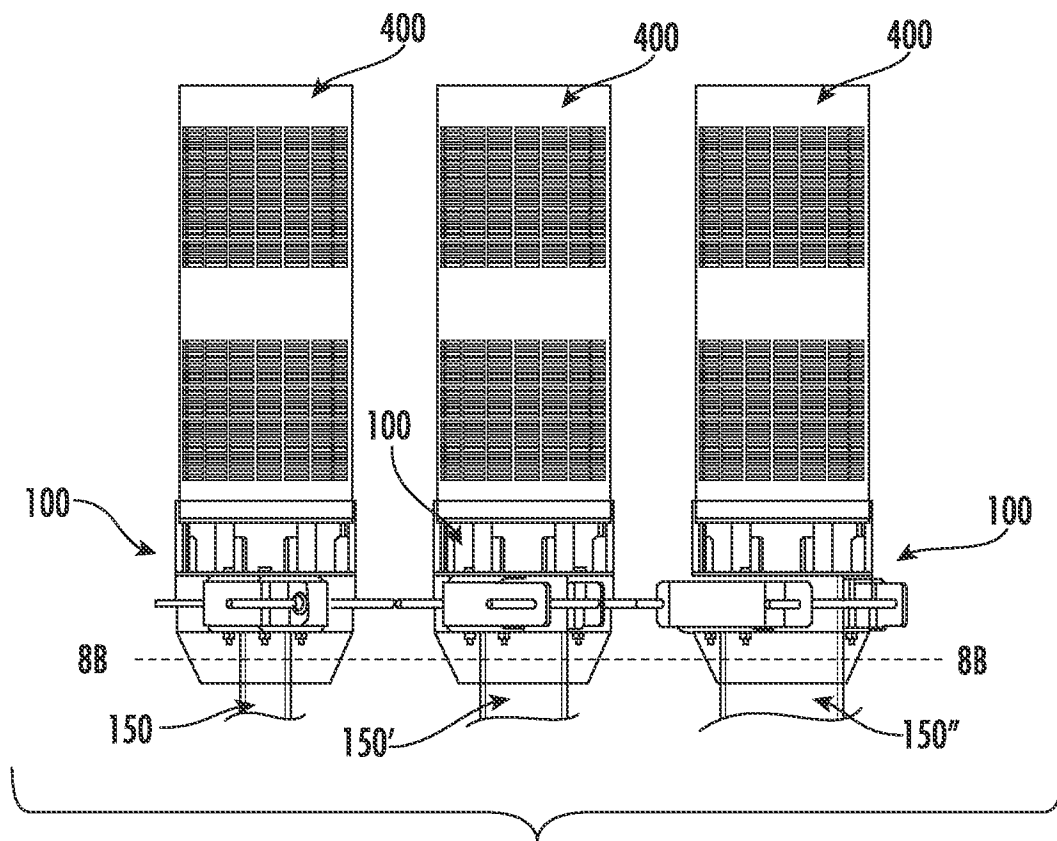


FIG. 8A

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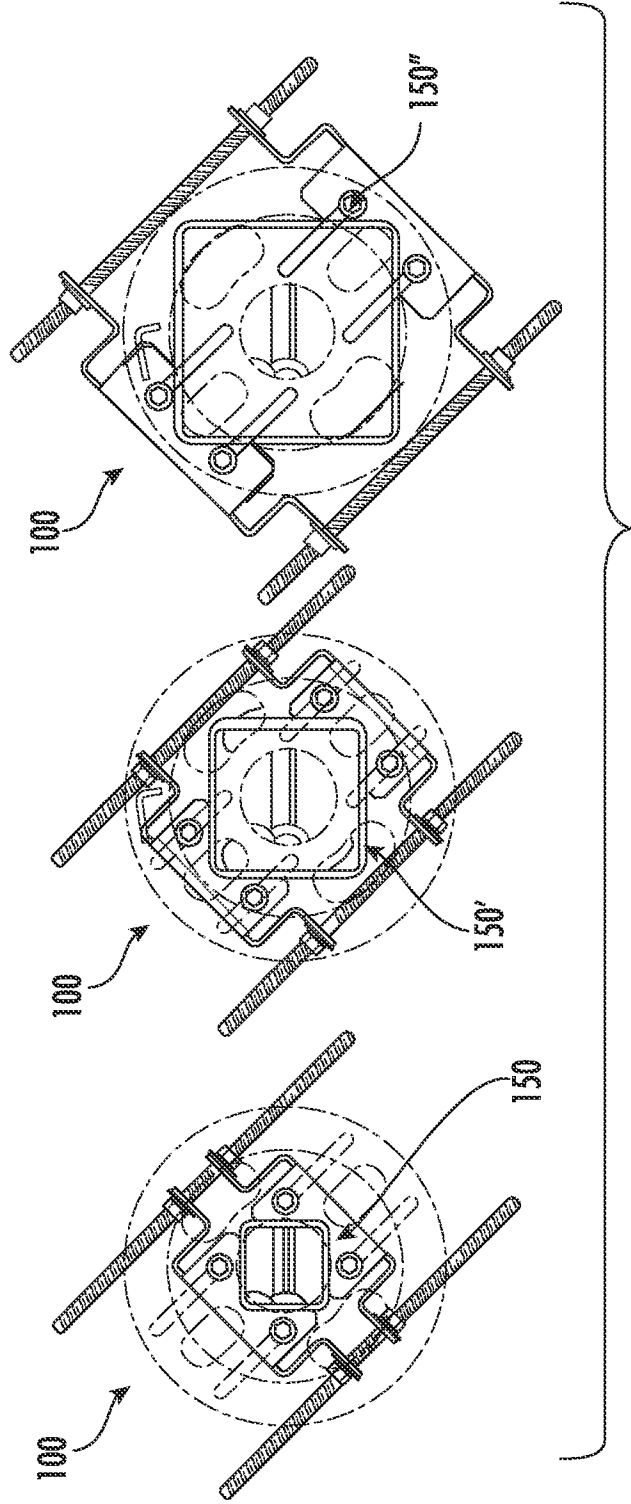


FIG. 8B

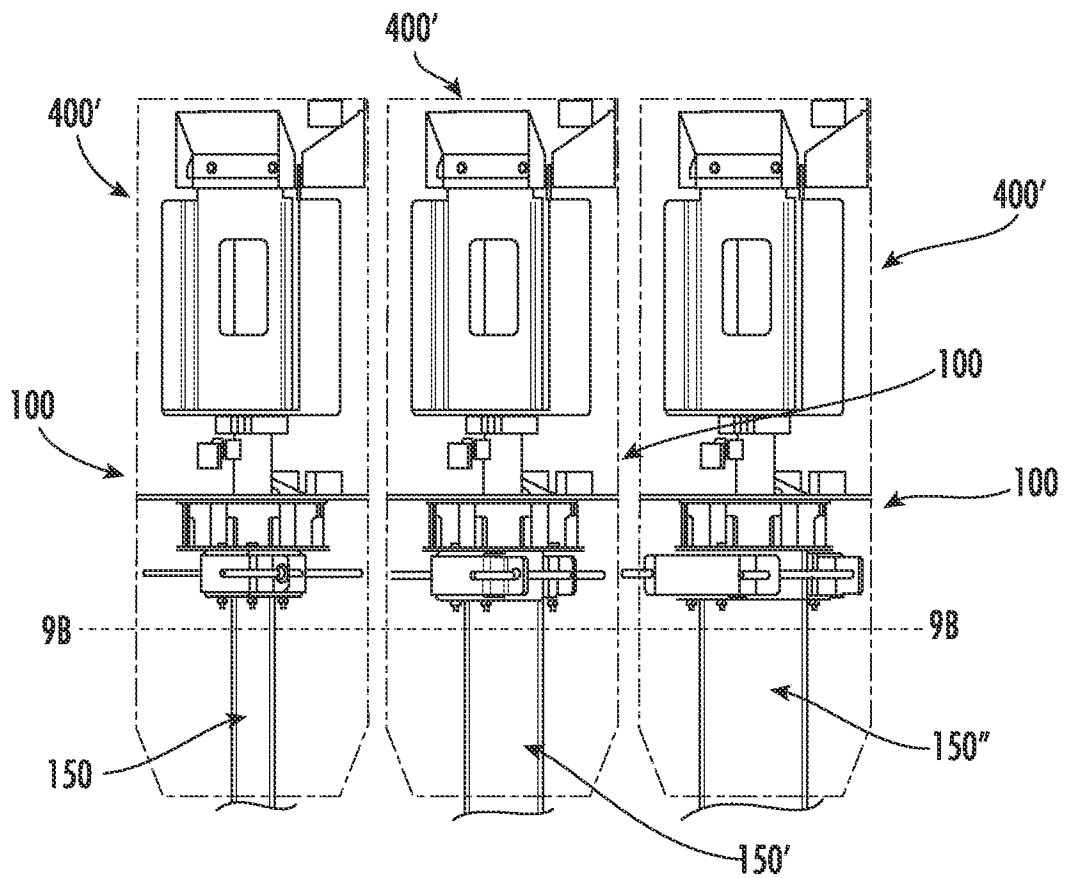


FIG. 9A

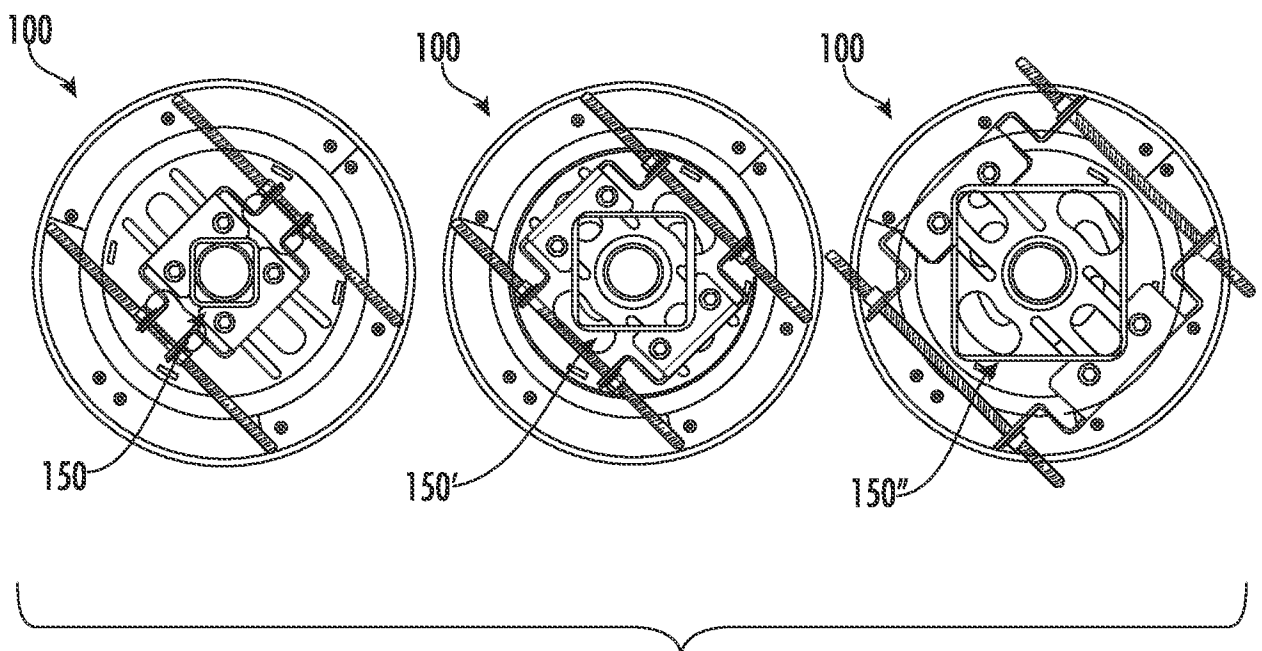


FIG. 9B

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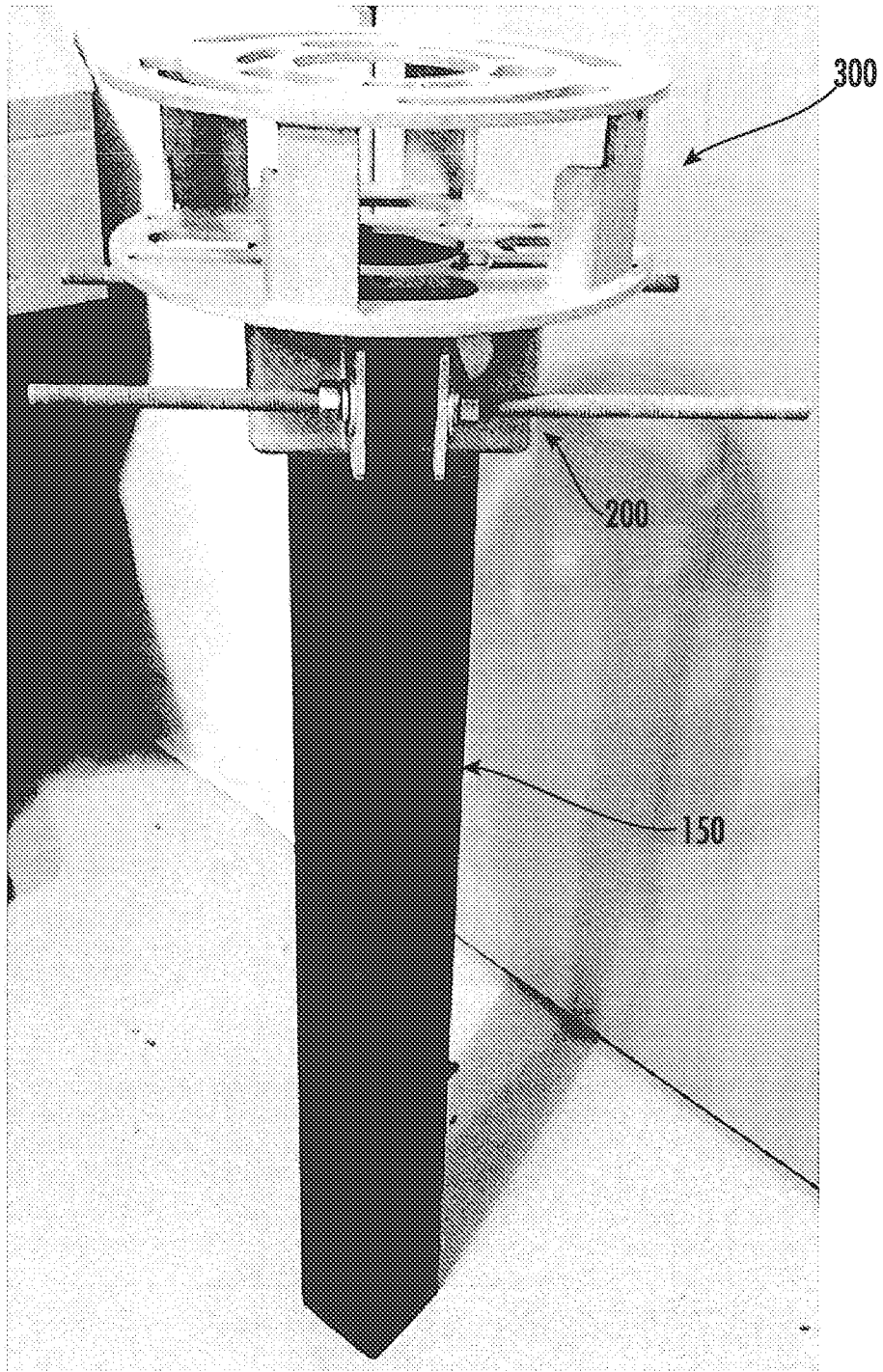


FIG. 10A

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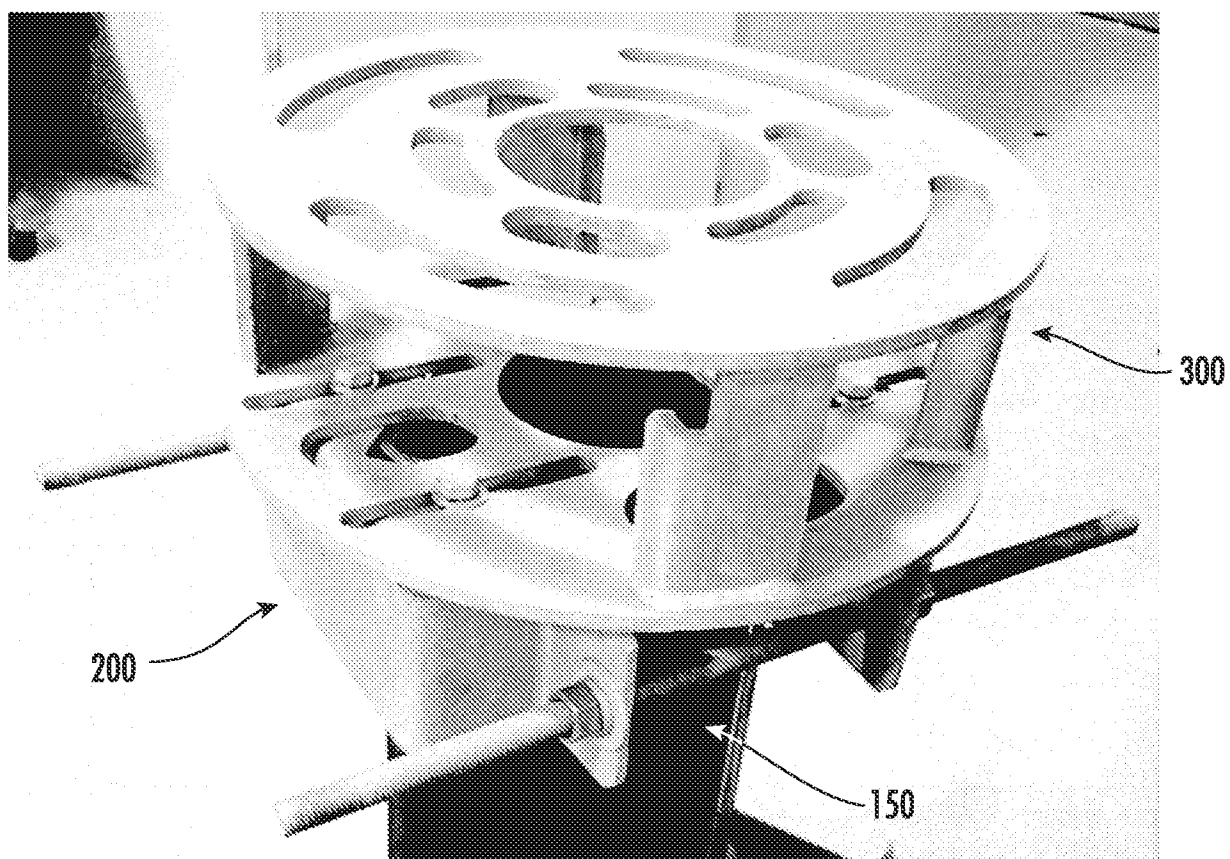


FIG. 10B

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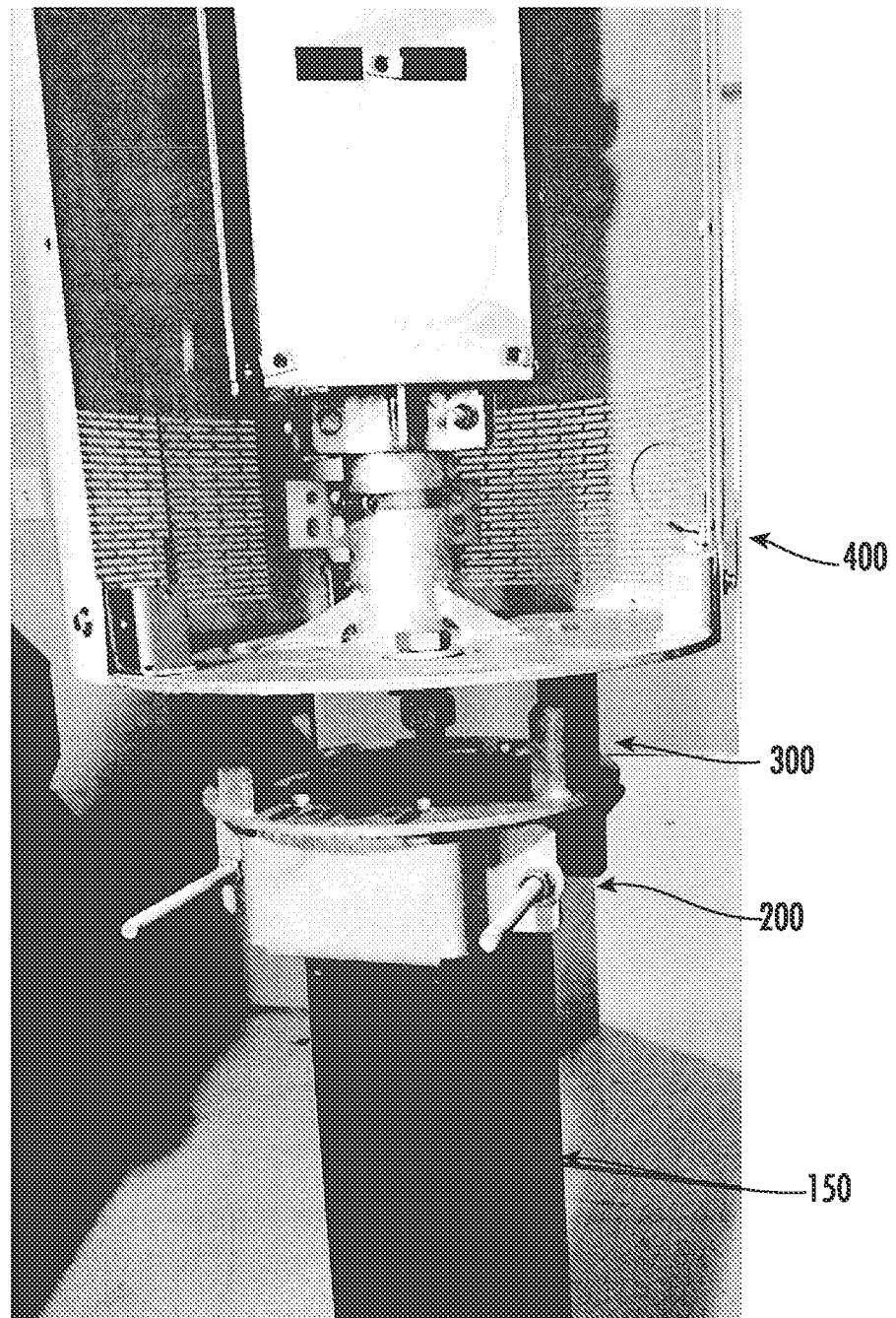


FIG. 11

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2021/017557

A. CLASSIFICATION OF SUBJECT MATTER**F16M 11/04**(2006.01)i; **F16M 11/22**(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F16M 11/04(2006.01); F16M 13/02(2006.01); H01Q 1/12(2006.01); H01Q 9/34(2006.01)

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

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & Keywords: telecommunication, antenna, square, pole, mount, adapter, bolt, thread, post, mast

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2001-0015707 A1 (OBY, LAWRENCE R.) 23 August 2001 (2001-08-23) paragraphs [0019], [0021], [0036], [0038]-[0039], claim 1, and figures 1-2, 4, 6, 7A-7C	1-18
Y	WO 99-45310 A1 (ALLGON AB. et al.) 10 September 1999 (1999-09-10) claims 1, 5 and figure 5	1-18
A	CN 204118232 U (SUZHOU SHANGKE PRODUCT TEST CENTRE) 21 January 2015 (2015-01-21) claim 1 and figure 1	1-18
A	US 2012-0299796 A1 (ANGSERYD, JAN) 29 November 2012 (2012-11-29) claim 1 and figures 1-3	1-18
A	WO 2018-048624 A1 (COMMSCOPE TECHNOLOGIES L.L.C.) 15 March 2018 (2018-03-15) claim 1 and figures 1-2	1-18

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

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

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

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

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

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

“&” document member of the same patent family

Date of the actual completion of the international search

07 May 2021

Date of mailing of the international search report

07 May 2021

Name and mailing address of the ISA/KR

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/US2021/017557

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				BR	9908402	A	19 December 2000
				CN	1289396	A	28 March 2001
				SE	513164	C2	17 July 2000
				SE	9800663	A	04 September 1999
				US	6283425	B1	04 September 2001
				WO	99-45310	A8	20 April 2000
CN	204118232	U	21 January 2015	None			
US	2012-0299796	A1	29 November 2012	CN	102754277	A	24 October 2012
				EP	2532045	A1	12 December 2012
				WO	2011-096864	A1	11 August 2011
WO	2018-048624	A1	15 March 2018	CN	109478708	A	15 March 2019
				EP	3510665	A1	17 July 2019
				US	2020-0321678	A1	08 October 2020