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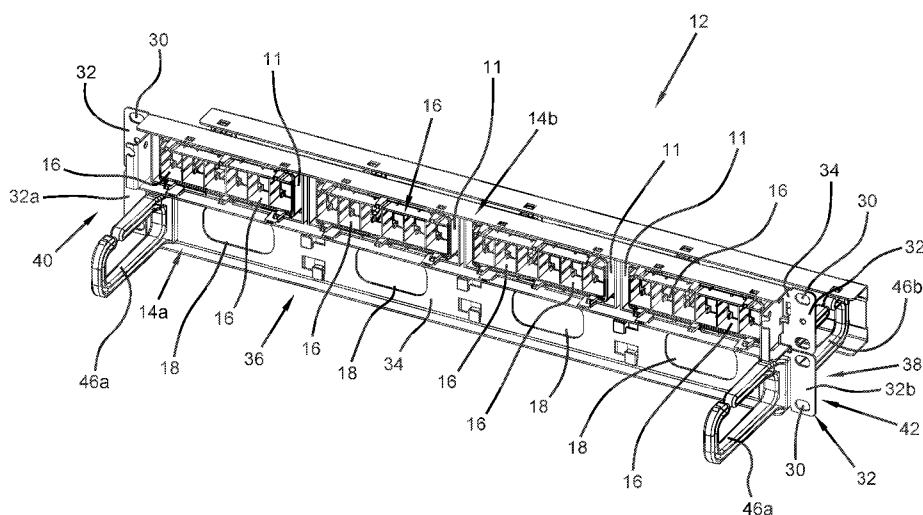
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(54) Title: CABLE MANAGEMENT RING AND PANEL FOR TELECOMMUNICATIONS EQUIPMENT

FIG. 5



(57) Abstract: One aspect of the present disclosure relates to cable guides that include first and second cable rings which define first and second horizontal cable channels, respectively. The first and second cable rings can be mounted back-to-back via the same mounting feature on a telecommunications equipment rack or cabinet. Another aspect of the present disclosure relates to the use of cable rings on a telecommunications equipment rack with pass-through holes. Another aspect of the present disclosure relates to cable rings that include mounting structures thereon for mounting a door for use with a telecommunications equipment rack or cabinet.

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CABLE MANAGEMENT RING AND PANEL FOR TELECOMMUNICATIONS EQUIPMENT

CROSS-REFERENCE TO RELATED APPLICATION

5 This application is being filed on February 25, 2020 as a PCT International Patent Application and claims the benefit of Chinese Patent Application No. 201910136741.5, filed on February 25, 2019, the disclosure of which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

10 The present disclosure relates to generally to cable management for use in telecommunications systems. More particularly, the present disclosure relates to cable management structures for use with telecommunications equipment.

BACKGROUND

 In the telecommunications industry, telecommunications equipment (active
15 and/or passive) is housed in a series of equipment racks to permit higher densities of connections per unit of floor space. Installing a large number of connections in an equipment rack is efficient with respect to floor space but places a premium on the ability to manage and maintain the cables leading to and away from these equipment racks. A telecommunications installation might have outside plant or network infrastructure cables
20 connected to switching equipment housed in a series of telecommunications equipment racks, local distribution cables connected to the same switching equipment in the racks, and patch cords and cross-connect jumpers linking the switching equipment. The switching equipment being connected can be located within the same rack, in adjacent racks, in racks within the same linear row or aisle, or in racks in different aisles. In
25 addition, electrical power and thus power cables must be supplied to the switching equipment. All of these cables must be provided with paths or cable management structures within the equipment racks and between the equipment racks. Copper cables, fiber cables and hybrid cables may all need proper management to protect the cables, and keep them organized.

The racks within a particular telecommunications installation may have a series of horizontal paths or troughs which serve both types of cross-connect cables. Other cables may need to be managed as well. Vertical paths or troughs may also be provided. For improved operational and maintenance efficiency, some apparatus for organizing and segregating these as intra-rack and inter-rack should be provided. Other improvements to allow easier entry and exit of cables to the troughs are desirable.

SUMMARY

One aspect of the present disclosure relates to cable guides including first and second cable rings which define first and second cable channels, respectively. The first and second cable rings can be mounted back-to-back by the same mounting feature on a telecommunications equipment rack or cabinet.

Another aspect of the present disclosure relates to the use of cable rings on a telecommunications equipment rack with pass-through holes.

Another aspect of the present disclosure relates to cable rings that include mounting structures thereon for mounting a door for use with a telecommunications equipment rack or cabinet.

Another aspect of the present disclosure relates to a cable management apparatus. The cable management apparatus can include a panel that includes a front side, an opposite rear side, and a first end positioned opposite from a second end.

A horizontal panel can include a left mounting bracket positioned at a left end of the panel and a right mounting bracket positioned at a right end of the panel.

The front and rear sides of the panel can share a mounting interface integrally formed therewith. At least one first cable ring can have a first connection interface intermateable with the mounting interface at the front side of the panel and at least one second cable ring can have a second connection interface intermateable with the mounting interface at the rear side of the panel. The at least one first and second cable rings are adapted to mount at the same mounting interface in a back-to-back orientation to provide for a double sided panel.

Another aspect of the present disclosure relates to a cable ring for providing a pathway for routing fiber optic cable. The cable ring can include a connection interface including an anchoring plate and engagement members located on the anchoring plate. The engagement members can each having a hook member that extends parallel to the anchoring plate. The anchoring plate can have first and second arm members that

together form a loop that defines an inner area. The first arm member extending in a transverse direction relative to the anchoring plate and the second arm member extending parallel to the first arm member. The first and second arm members can each have a proximal end that is fixed on the anchoring plate and a distal free end. The distal free ends
5 together define an opening that provides access to the inner area.

A further aspect of the present disclosure relates to a telecommunications system that includes a cable management frame for connection to a telecommunications rack. The cable management frame can include a front side, an opposite rear side, and a left end positioned opposite from a right end. The cable management frame can include a
10 left mounting bracket positioned at the left end of the cable management frame and a right mounting bracket positioned at the right end of the cable management frame. The front and rear sides of the cable management frame can share a mounting interface integrally formed therewith. The telecommunications system can include a plurality of first cable rings that can each have a first connection interface intermateable with the mounting
15 interface at the front side of the cable management frame and at least one second cable ring having a second connection interface intermateable with the mounting interface at the rear side of the cable management frame. The at least one second cable ring can be adapted to mount at the same mounting interface in a back-to-back orientation with at least one first cable rings of the plurality of first cable rings to provide for a double sided cable
20 management frame.

A variety of additional aspects will be set forth in the description that follows. The aspects can relate to individual features and to combinations of features. It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory only and are not restrictive of the broad
25 inventive concepts upon which the examples disclosed herein are based.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and constitute a part of the description, illustrate several aspects of the present disclosure. A brief description of the drawings is as follows:

30 FIG. 1 is a front view showing a telecommunications equipment rack in accordance with principles of the present disclosure;

FIG. 2 is an enlarged view of a portion of the telecommunications equipment rack of FIG. 1 showing a horizontal cable management apparatus with a cover in accordance with the principles of the present disclosure, and an equipment panel;

FIG. 3 is a rear view of the telecommunications equipment rack of FIG. 1;

5 FIG. 4 is an enlarged view of a portion of the telecommunications equipment rack of FIG. 3;

FIG. 5 is a perspective rear view of the horizontal cable management apparatus of FIG. 4 showing a plurality of cable rings mounted single sided and double sided thereon, and an equipment panel;

10 FIG. 6 is a perspective enlarged view of the horizontal cable management apparatus showing the cable ring mounted single sided thereon;

FIGS. 7-9 are multiple views of the cable ring shown in FIG. 6;

FIG. 10 is a perspective front view of the horizontal cable management apparatus of FIG. 5 showing the cover mounted thereon, and an equipment panel; and

15 FIG. 11 is a partial exploded view of the horizontal cable management apparatus and equipment panel of FIG. 10 with the cover and a few cable rings removed.

DETAILED DESCRIPTION

The present disclosure is described with reference to the accompanying drawings, in which certain 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 that are pictured and described 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. It will also be appreciated that the embodiments disclosed herein can be combined in any way and/or combination to provide many additional embodiments.

25 Telecommunications component racks or cabinets are utilized for holding a plurality of telecommunications components, usually in a vertical stack. Such racks are used in many environments, such as network server farms, telephone switching stations, electronic equipment closets of office buildings containing large amounts of networked electronic equipment, or in countless other environments in which electrical or optical signals need to be switched between numerous electronic components. In some cases the telecommunications components are active or passive. It is not uncommon for a plurality of racks to be tightly packed side by side in a room, with each rack containing a number of

vertically stacked components, such as routers, patch panels, cable trays, data processing equipment, switching equipment, etc. Furthermore, the number of wires and cables that enter and exit the components in the racks can be voluminous, leading to an environment in which it is very difficult to mount and dismount components to and from the racks.

5 These telecommunications component racks often comprise a base, four vertical posts and a few horizontal rails running between the posts to hold the structure together. The posts and/or rails may include holes for mating with holes on the components so that bolts can be placed through the mating holes to attach the components to the racks. For example, holes on a component or flanges align with corresponding
10 holes on a rack such that the component or flanges can be bolted to the rack through the mating holes, thereby affixing the component to the rack.

 FIGS. 1 and 3 illustrate an example telecommunications equipment rack 10 for accepting components in accordance with the principles of the present disclosure. The telecommunications equipment rack 10 of the figures is exemplary and the disclosure is
15 not limited to application in such racks. The disclosure may be applied to other forms of racks as well as cabinets and the like.

 FIGS. 2 and 4, show an exemplary component, such as, a cable management apparatus 12, and a telecommunications equipment 15. Rack 10 can include a plurality of cable management apparatus 12, and a plurality of telecommunications
20 equipment 15, as desired. Cable management apparatus 12 is provided in the example for managing the cables to and from equipment 15. Equipment 15 can be a telecommunications panel, a cable management panel, a cable management frame, a cross-connect patch panel, or other.

 Cable management apparatus 12 includes a frame 14a for holding cable
25 management structures, such as cable rings. Telecommunications equipment 15 includes further frame 14b (in this case an equipment frame). The equipment 15 may be used for mounting at least one connector module 11 that includes a plurality of jacks 16. In the example, depicted, a plurality of connector modules 11 is depicted and each includes a plurality of jacks 16. The connector modules 11 can each include any of a
30 variety of jacks for receipt of a plug of a patch cord or other transmission cable. The jack and plug allows fairly rapid connection and disconnection between two jacks in the same patch panel, or between one jack in the patch panel and another jack in a nearby patch panel, with the patch cord. One type of jack and plug arrangement for a patch panel is an

RJ45 type connector. Fiber panels with fiber adapters and fiber cables can also be used. Active or passive panels may be used. As shown, connector modules 11 are passive copper modules.

While cable management apparatus 12 is shown in a horizontal orientation in the example, vertical orientations can also be provided by turning the frame 14a 90 degrees.

In certain examples, the frame 14a of cable management apparatus 12 may include pass-through holes 18 to assist in the separation and routing of cables (not shown in order not to obscure the disclosure) through the rack 10, although alternatives are possible. Airflow may be facilitated too. In some cases, pass-through holes 18 can be covered, or not present at all.

Racks 10 comprise a base 20, four posts 22 (although two are depicted) rising vertically from the base 20, and a top 24. It may also comprise one or more horizontal rails (not shown) to provide structural support for the rack 10. A plurality of components, such as the cable management apparatus 12, may be installed in the rack 10. Commonly, the posts 22 and/or the rails include holes 26 for accepting bolts or other fasteners 28 that may be used to affix the cable management apparatus 12 to the rack 10. These holes 26 will align with holes 30 defined in the frame 14a. Frame 14b mounts in a similar manner. Each of frames 14a, 14b may be affixed to the rack 10 by the nuts and bolts 28 or other fasteners passing through the mating holes 26 of the rack 10 and the holes 30 of the frame 14a and the frame 14b.

In certain examples, as seen in FIG. 2, the frames 14a, 14b can respectively have flanges 32 (e.g., mounting brackets) extending laterally from its front face 34. The flanges 32 can bear the holes 30 for aligning with the corresponding holes 26 on the rack 10.

In certain examples, the frame 14a of the cable management apparatus 12 may be formed by injection-molded plastic, although alternatives are possible. Alternatively, the frame 14a may be formed of aluminum and formed by a casting process, for example. It should be understood that the frame 14a may be formed of any material and made by any forming process known to those skilled in the art without departing from the scope of the present disclosure.

Turning to FIG. 5, the frame 14a of the cable management apparatus 12 may include a front side 36, an opposite rear side 38, and a left end 40 positioned opposite from a right end 42. The frame 14a of the cable management apparatus 12 includes a left

mounting bracket 32a positioned at the left end 40 of the frame 14a and a right mounting bracket 32b positioned at the right end 42 of the frame 14a. In certain examples, the left and right mounting brackets 32a, 32b can be integrally formed with (e.g., formed in one seamless piece with) the frame 14a, although alternatives are possible.

5 Referring to FIGS. 6-9, the front and rear sides 36, 38 of the frame 14a of the cable management apparatus 12 share mounting interfaces 44 (e.g., opening, cutout, hole) defined and integrated therewith. The mounting interfaces 44 are generally rectangular in shape, although alternatives are possible. The frame 14a may include any number of mounting interfaces 44. In the example depicted in FIG. 5, there are five
10 mounting interfaces 44, although alternatives are possible.

The cable management apparatus 12 also includes cable rings 46 that can be arranged and configured to be mounted in the mounting interfaces 44. The cable rings 46 can be utilized for providing a pathway for routing fiber optic cable or patch cords horizontally to other equipment, such as, a vertical manager. In certain examples, the
15 frame 14a can be adapted for back-to-back installation of the cable rings 46 (see FIG. 10). That is, the cable rings 46 can be arranged and configured double sided on the frame 14a such that the cable rings 46 are configured on both the front and rear sides 36, 38 of the frame 14a.

In certain examples, the frame 14a can be adapted for single installation of
20 the cable rings 46. That is, the cable rings 46 can be arranged and configured single sided on the frame 14a (see FIG. 6) such that the cable rings 46 are configured on the front side 36 of the frame 14a. Alternatively, the rings 46 can be solely on the rear side 38.

When the cable rings 46 are mounted back-to-back, both first and second cable rings 46a, 46b (e.g., front cable ring and rear cable ring) are mounted in the same
25 mounting interface 44. That is, when the first and second cable rings 46a, 46b are installed in a back-to-back orientation, the cable rings 46a, 46b can share a single mounting interface 44 which allows for additional cable ring installations and reduces the possibility of running out of mounting positions. Thus, when the first and second cable rings 46a, 46b are mounted to the frame 14a, the first and second cable rings 46a, 46b are
30 not positioned offset from one another, but are positioned back-to-back to one another in axial alignment.

In the example depicted, five cable rings 46 can be mounted on the frame 14a at the front side 36 and/or five cable rings 46 can be mounted on the frame 14a at the

rear side 38. It will be appreciated that any number cable rings may be mounted on the frame 14a provided the number of corresponding mounting interfaces 44.

In certain examples, at least one first cable ring 46a can be mounted at the front side 36 of the frame 14a and at least one second cable ring 46b can be mounted at the rear side 38 of the frame 14a, although alternatives are possible.

In certain examples, the cable rings 46 can each have a connection interface 48 arranged and configured to be intermateable with the mounting interfaces 44 at the front side 36 and/or the rear side 38 of the frame 14a. In certain examples, the connection interfaces 48 of the cable rings 46 can intermate with the mounting interfaces 44 via a snap-fit connection, although alternatives are possible. In certain examples, the connection interfaces 48 of the cable rings 46 can intermate with the mounting interfaces 44 via a friction fit engagement, although alternatives are possible.

The connection interfaces 48 of the cable rings 46 can each include an anchoring plate 50 with engagement members 52. The engagement members 52 can be positioned at opposite ends of the anchoring plate 50. A first engagement member 52a may be positioned near a proximal end 49 of the anchoring plate 50 and a second engagement member 52b may be positioned near an opposite, distal end 51 of the anchoring plate 50. The first and second engagement members 52a, 52b can be offset from each other such that the first and second engagement members 52a, 52b are not positioned directly below or above one another as in the example orientation. In certain examples, the first engagement member 52a may be positioned adjacent a first side 53 of the anchoring plate 50 and the second engagement member 52b may be positioned adjacent a second side 55 of the anchoring plate 50.

The engagement members 52 can each have a hook member 54 that extends parallel to the anchoring plate 50. The mounting interfaces 44 can each define an opening 56 in the frame 14a which thereby creates an edge 58 in the frame 14a. When the connection interfaces 48 of the cable rings 46 are intermateable with the mounting interfaces 44, the engagement members 52 are adapted to engage respective openings 56 defined by the mounting interfaces 44 of the frame 14a such that the hook members 54 receive the edge 58 of the frame 14a. In certain examples, the connection interfaces 48 of the cable rings 46 can intermate with the mounting interfaces 44 via a snap-fit connection, through a snap 90, including a ramp 92 and a shoulder 94. Shoulder 94 engages a top edge 96 of opening 56 in which it positioned. Such a construction prevents inadvertent removal of the cable rings 46 from the mounting interfaces 44.

The anchoring plate 50 may also define recesses 62 that are respectively positioned adjacent to the engagement members 52a, 52b such that the recesses 62 are offset from each other, in an opposite manner to the engagement members 52a, 52b. That is, a first recess 62a may be positioned adjacent the second side 55 of the anchoring plate 50 at the proximal end 49 and the second recess 62b may be positioned adjacent the first side 53 of the anchoring plate 50 at the distal end 51.

When the first and second cable rings 46a, 46b are mounted to the mounting interfaces 44 of the frame 14a in the back-to-back orientation, front faces 60 of the respective engagement members 52a, 52b of the anchoring plate 50 of the first cable ring 46a can be received in respective recesses 62a, 62b of the anchoring plate 50 of the second cable ring 46b such that the hook members 54 can have enough space to engage the edge 58 of the frame 14a when mounted thereon and the front faces 60 of the respective engagement members 52a, 52b of the anchoring plate 50 of the second cable ring 46b can be received in respective recesses 62a, 62b of the anchoring plate 50 of the first cable ring 46a such that the hook members 54 can have enough space to engage the edge 58 of the frame 14a when mounted thereon. In this manner, the engagement members 52a of the respective first and second cable rings 46a, 46b can be mounted in the same opening 56 of the mounting interface 44 and the engagement members 52b of the respective first and second cable rings 46a, 46b can be mounted in the same opening 56 of the mounting interface 44 to allow for back-to-back installation that is not offset.

Still referring to FIG. 9, the cable ring 46 can include first and second arm members 64, 66, together forming a loop in one example that defines an inner area 68 that provides a pathway for routing cable. The first arm member 64 can extend in a transverse direction relative to the anchoring plate 50 and the second arm member 66 can extend in a transverse direction relative to the anchoring plate 50 such that the second arm member 66 also extends in a direction parallel to the first arm member 64. The first and second arm members 64, 66 can each have a proximal end 70 that is fixed on the anchoring plate 50 and a distal free end 72. The distal free ends 72 of the first and second arm members 64, 66 can together define an opening 74 (e.g., gap) that provides cable access to the inner area 68.

In certain examples, the first arm member 64 can include a curved portion 76 that forms the distal free end 72 thereof. In certain examples, the curved portion can include a protrusion 78 (e.g., bumps, studs, tabs, ramp) on a first side 80 (e.g., top side)

and an opposite, second side 82 (e.g., bottom side) thereof. Arm members 64, 66 are constructed to not have sharp edges or ends that might damage the cables.

When the first and second cable rings 46a, 46b are mounted to the frame 14a, in a back-to-back manner relative to one another in axial alignment, the respective connection interfaces 48 do not interfere with one another.

When only one of a first and second cable ring 46a, 46b is mounted to the frame 14a at a given pairs of locations 44, the openings 56 are still fully covered. See FIG. 6. In some environments, this is important to not have exposed openings in frame 14a.

Referring to FIGS. 10-11, the cable management apparatus 12 may optionally include a cover 84 (e.g., removable cover, door) that can be arranged and configured to attach to the plurality of cable rings 46 positioned at the front side 36 of the frame 14a and/or the rear side 38 of the frame 14a. The cover 84 can include a main body 86 and opposing first and second flanges 88, 90 that extend outwardly from the main body 86 in a direction generally perpendicular to the main body 86. The first and second flanges 88, 90 can each define apertures 92 spaced along a length L of the respective first and second flanges 88, 90 between ends 94, 96 thereof. The apertures 92 can be arranged and configured to receive the protrusions 78 of the cable rings 46 to be secured thereto.

In certain examples, the cover 84 can be in a snap-fit engagement with the cable rings 46, although alternatives are possible. In certain examples, the cover 84 can be in a friction fit engagement with the cable rings 46, although alternatives are possible. In certain examples, the cover 84 may be hingedly coupled to the cable rings 46. In certain examples, the cover 84 can be in a press fit engagement with the cable rings 46, although alternatives are possible.

In certain examples, the cover 84 and/or the cable rings 46 can be manufactured of a polymeric material, although alternatives are possible. In certain examples, the cover 84 may be manufactured of a metallic material, although alternatives are possible.

The various examples described above are provided by way of illustration only and should not be construed to limit the scope of the present disclosure. Those skilled in the art will readily recognize various modifications and changes that may be made with respect to the examples and applications illustrated and described herein without departing from the true spirit and scope of the present disclosure.

What is claimed is:

1. A cable management apparatus comprising:
a panel including a front side, an opposite rear side, and a left end positioned opposite from a right end, the panel including a left mounting bracket positioned at the left end of the panel and a right mounting bracket positioned at the right end of the panel;
the front and rear sides of the panel sharing a mounting interface integrated therewith;
at least one first cable ring having a first connection interface intermateable with the mounting interface at the front side of the panel; and
at least one second cable ring having a second connection interface intermateable with the mounting interface at the rear side of the panel;
wherein the at least one first and second cable rings are adapted to mount at the same mounting interface in a back-to-back orientation to provide for a double sided panel.
2. The cable manager apparatus of claim 1, wherein the connection interface of the at least one first and second cable rings intermate with the mounting interface via a snap-fit connection.
3. The cable manager apparatus of claim 1, wherein the first and second connection interfaces each include an anchoring plate with engagement members, the engagement members each having a hook member that extends parallel to the anchoring plate, wherein when the first and second connection interfaces are intermateable with the mounting interface, the engagement members are adapted to engage respective openings defined in the panel such that the hook members receive an edge of the panel.
4. The cable manager apparatus of claim 3, wherein the first and second connection interfaces each include a snap for engaging the panel.
5. The cable manager apparatus of claim 4, wherein when the first and second cable rings are mounted to the panel in the back-to-back orientation, front faces of the hook members of the engagement members of the anchoring plate of the first connection interface are received in respective recesses defined in the anchoring plate of the second connection interface.

6. The cable manager apparatus of claim 5, wherein the hook members are offset from one another on the anchoring plate for each cable ring.

7. The cable manager apparatus of claim 5, wherein the mounting interfaces are openings through the panel.

8. The cable manager apparatus of claim 1, further comprising a first removable cover adapted to attach to the at least one first cable ring at the front side of the panel.

9. The cable manager apparatus of claim 8, wherein the first removable cover is in a snap-fit engagement with the at least one first cable ring.

10. The cable manager apparatus of claim 1, wherein the panel is mounted to a telecommunications rack.

11. The cable manager apparatus of claim 10, wherein an equipment panel is mounted to a telecommunications rack.

12. A cable ring for providing a pathway for routing telecommunications cables, the cable ring comprising:

a connection interface including an anchoring plate;

engagement members located on the anchoring plate, the engagement members each having a hook member that extends parallel to the anchoring plate, wherein the anchoring plate defines recesses for receiving front faces of engagement members of another anchoring plate of another cable ring; and

first and second arm members together forming a loop that defines an inner area, the first arm member extending in a transverse direction relative to the anchoring plate, the second arm member extending parallel to the first arm member;

the first and second arm members each having a proximal end that is fixed on the anchoring plate and a distal free end, the distal free ends together defining an opening that provides access to the inner area.

13. The cable ring of claim 12, wherein the first arm member includes a curved portion that forms the distal free end thereof.

14. The cable ring of claim 13, wherein the curved portion includes a protrusion on a top side and an opposite, bottom side thereof.

15. The cable ring of claim 12, wherein the respective hook members and the respective recesses are offset from one another.

16. A telecommunications system comprising:
a cable management frame for connection to a telecommunications rack, the cable management frame including a front side, an opposite rear side, and a left end positioned opposite from a right end, the cable management frame including a left mounting bracket positioned at the left end of the cable management frame and a right mounting bracket positioned at the right end of the cable management frame;
the front and rear sides of the cable management frame sharing a mounting interface integrated therewith;
a plurality of first cable rings each having a first connection interface intermateable with the mounting interface at the front side of the cable management frame;
and
at least one second cable ring having a second connection interface intermateable with the mounting interface at the rear side of the cable management frame;
wherein the at least one second cable ring is adapted to mount at the same mounting interface in a back-to-back orientation with at least one of the plurality of first cable rings to provide for a double sided cable management frame.

17. The telecommunications system of claim 16, wherein the connection interfaces of the plurality of first cable rings and the at least one second cable ring intermate with the mounting interface via a snap-fit connection.

18. The telecommunications system of claim 16, further comprising a first removable cover adapted to attach to the plurality of first cable rings at the front side of the cable management frame.

19. The telecommunications system of claim 18, wherein the first removable cover is in a snap-fit engagement with the plurality of first cable rings.

20. The telecommunications system of claim 16, wherein the first and second connection interfaces each include an anchoring plate with engagement members, the engagement members each having a hook member that extends parallel to the anchoring plate, wherein when the first and second connection interfaces are intermateable with the mounting interface, the engagement members are adapted to engage respective receptacles defined in the cable management frame such that the hook members receive an edge of the cable management frame.

21. The telecommunications system of claim 20, wherein the first and second connection interfaces each include a snap for engaging the frame.

22. The telecommunications system of claim 21, wherein when the first and second cable rings are mounted to the frame in the back-to-back orientation, front faces of the engagement members of the anchoring plate of the first connection interface are received in respective recesses defined in the anchoring plate of the second connection interface.

23. The telecommunications system of claim 22, wherein the hook members are offset from one another on the anchoring plate for each cable ring.

24. The telecommunications system of claim 16, wherein the mounting interfaces are openings through the frame.

FIG. 1

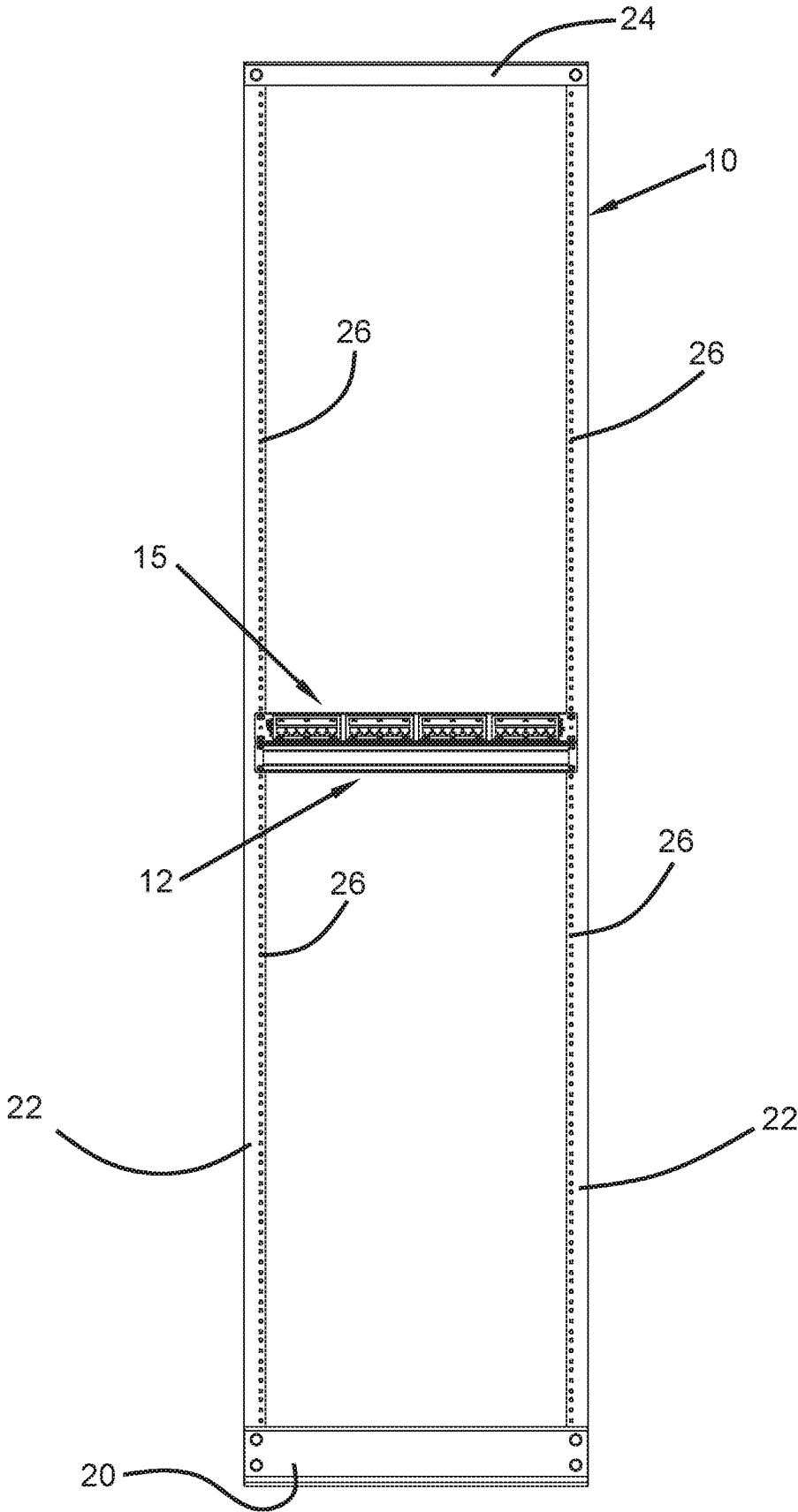


FIG. 2

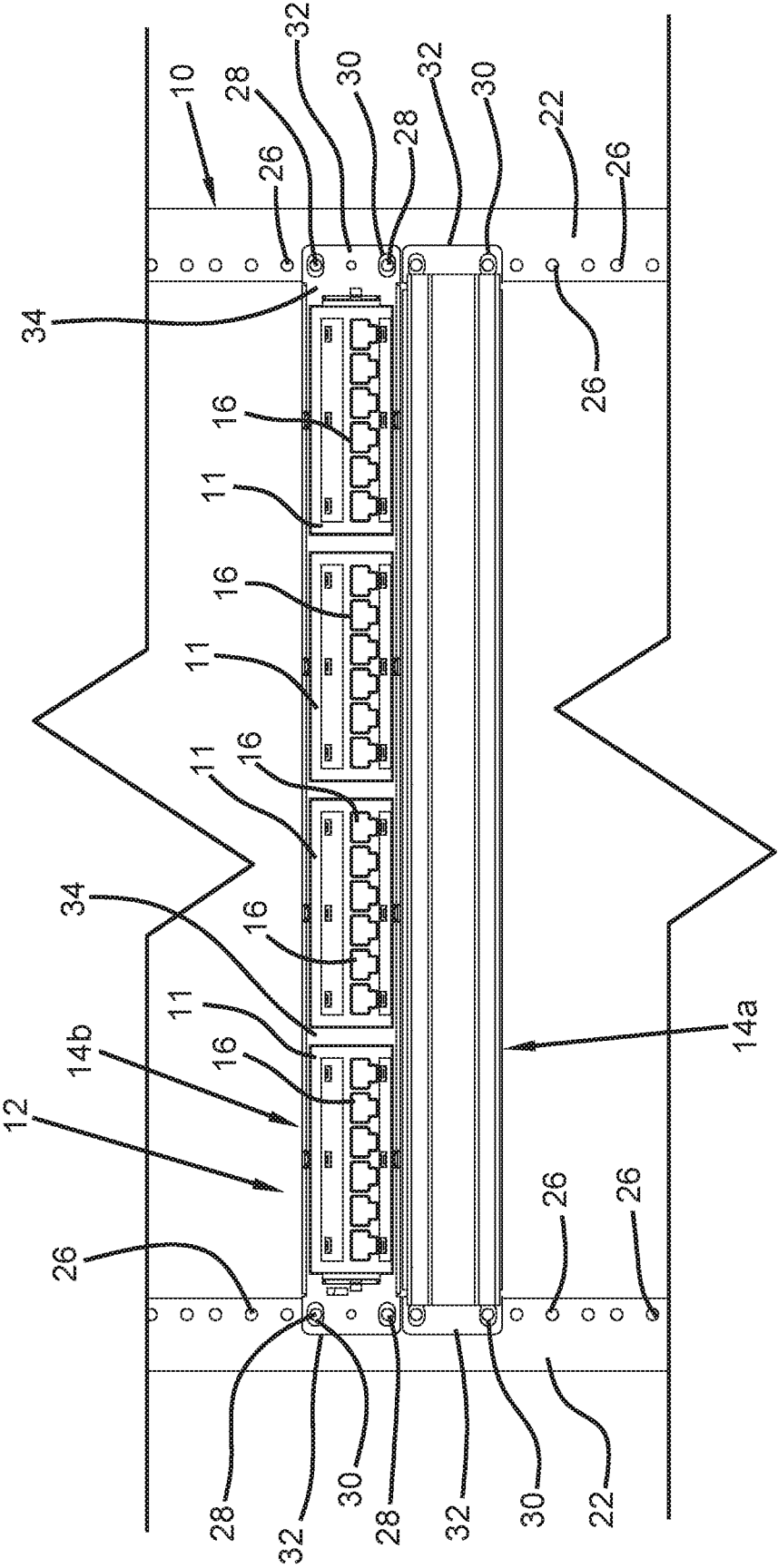


FIG. 3

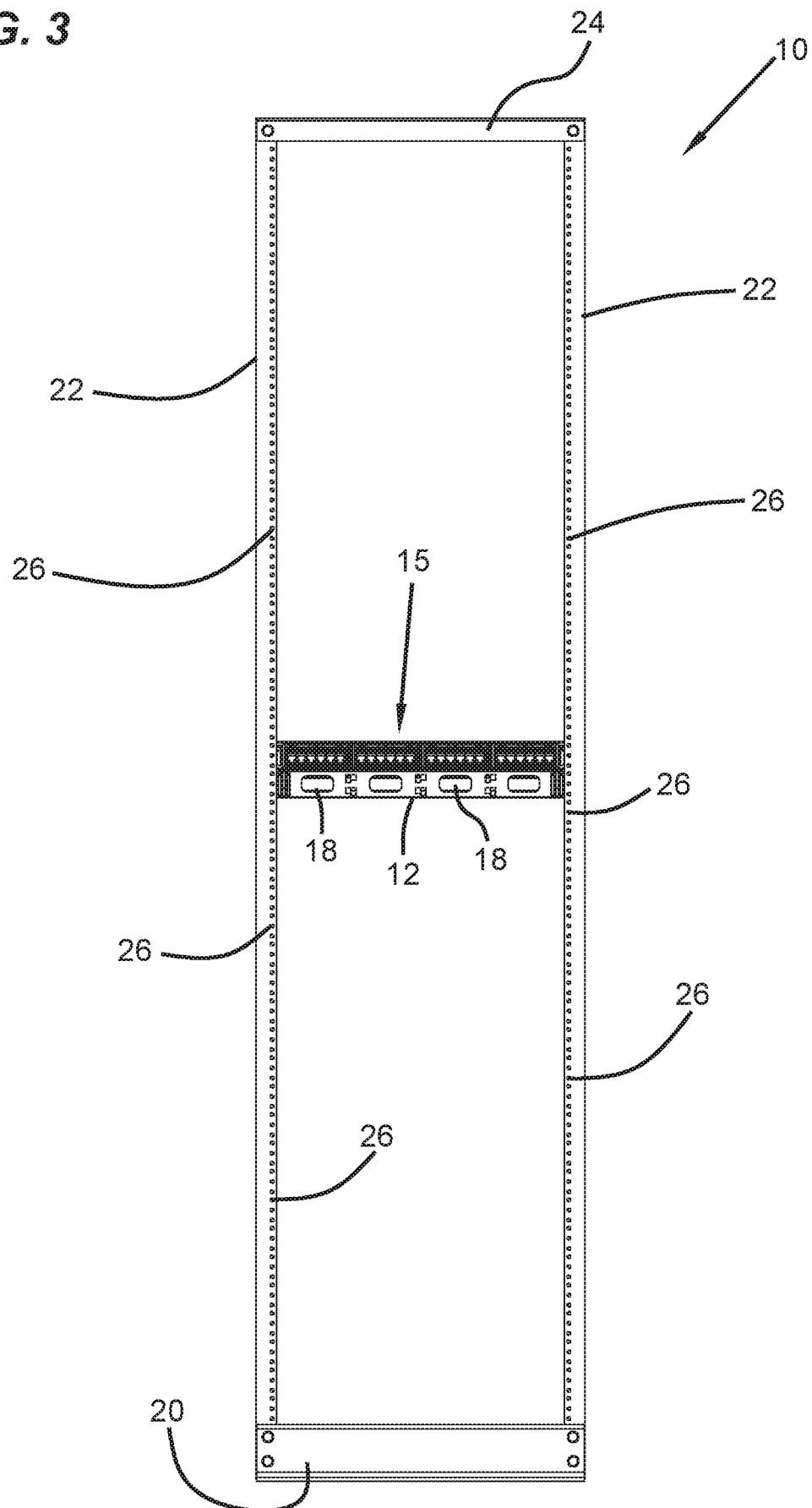


FIG. 4

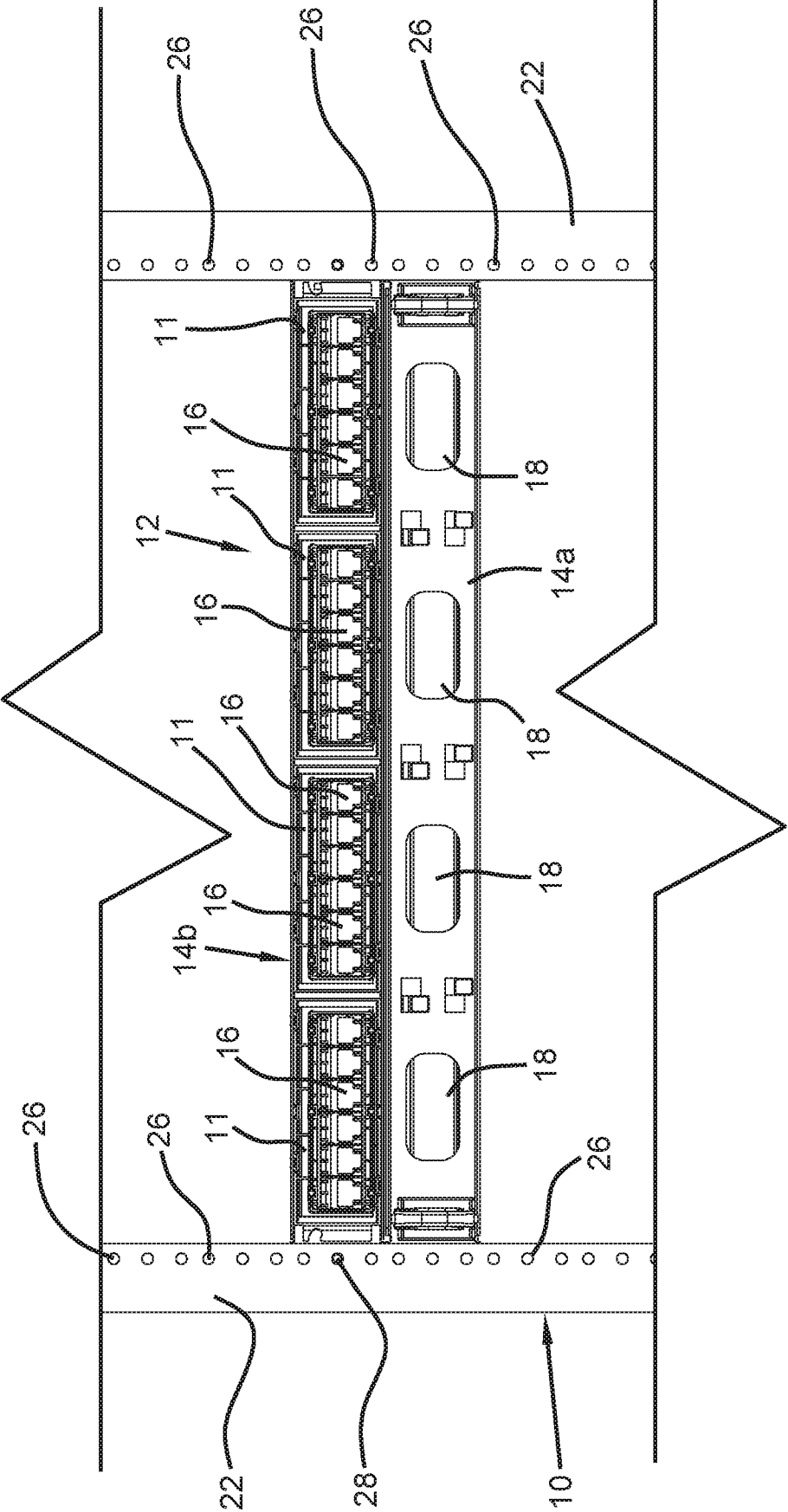


FIG. 5

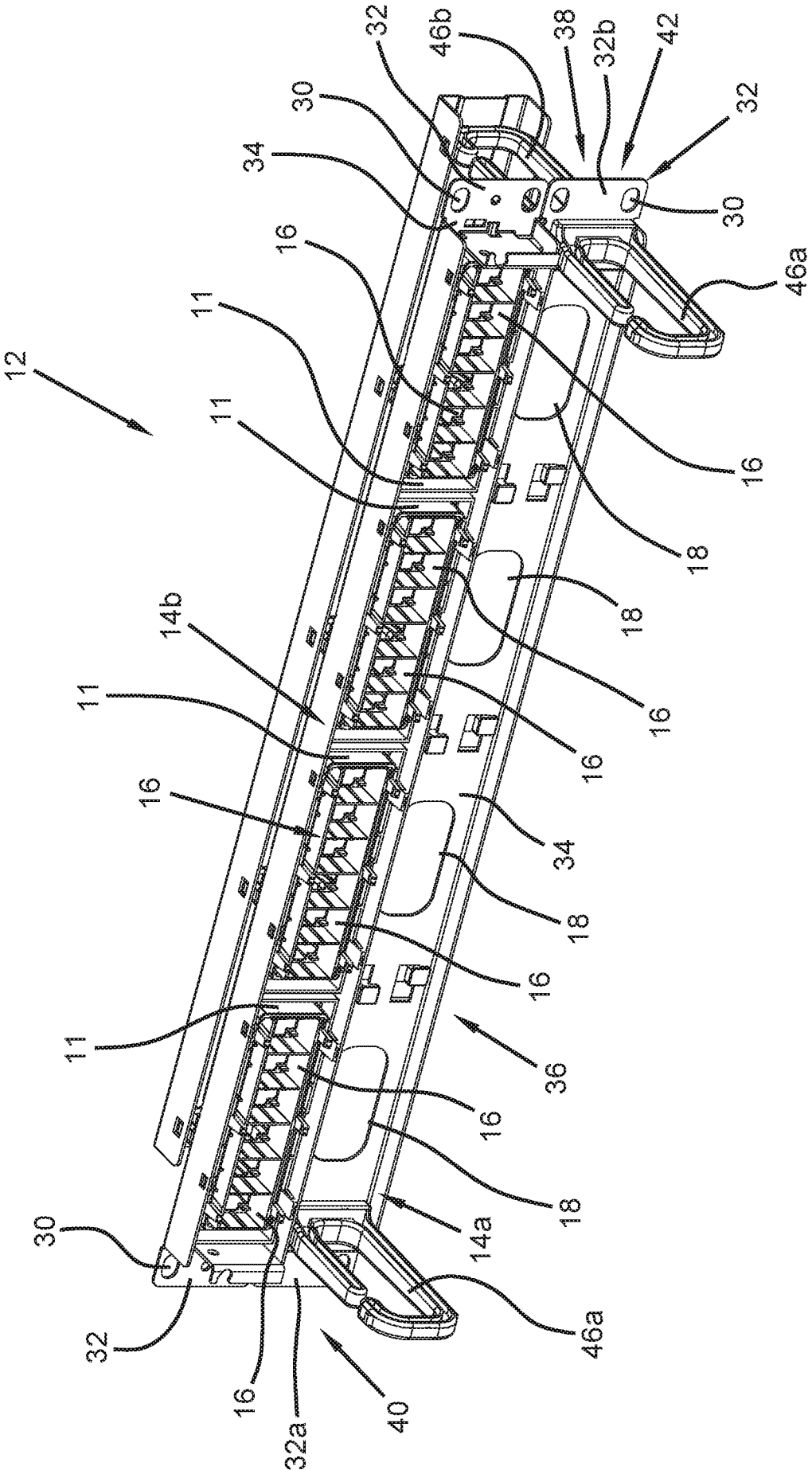
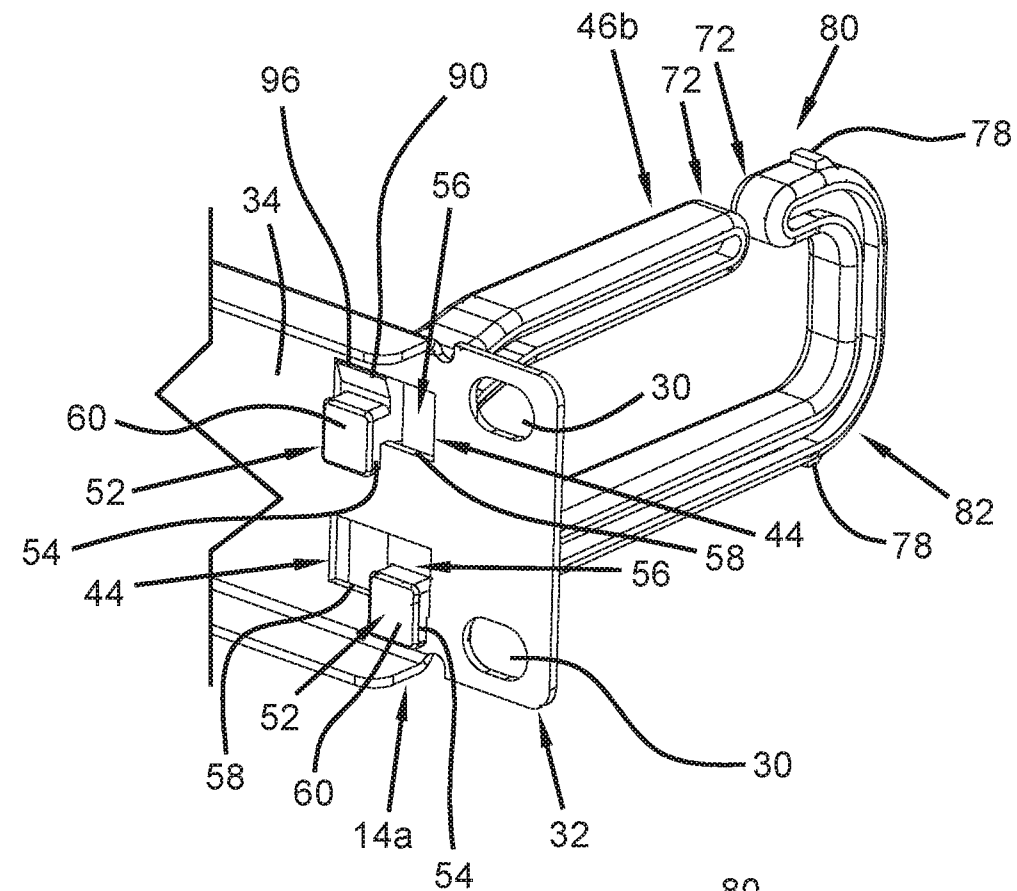
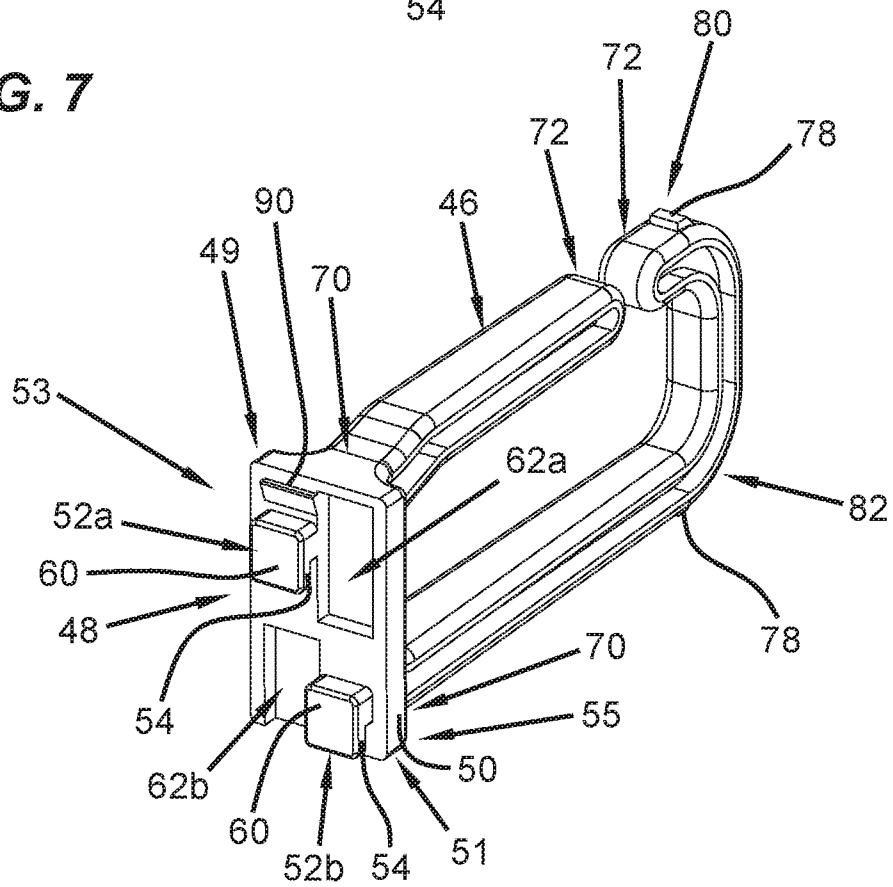


FIG. 6**FIG. 7**

7/9

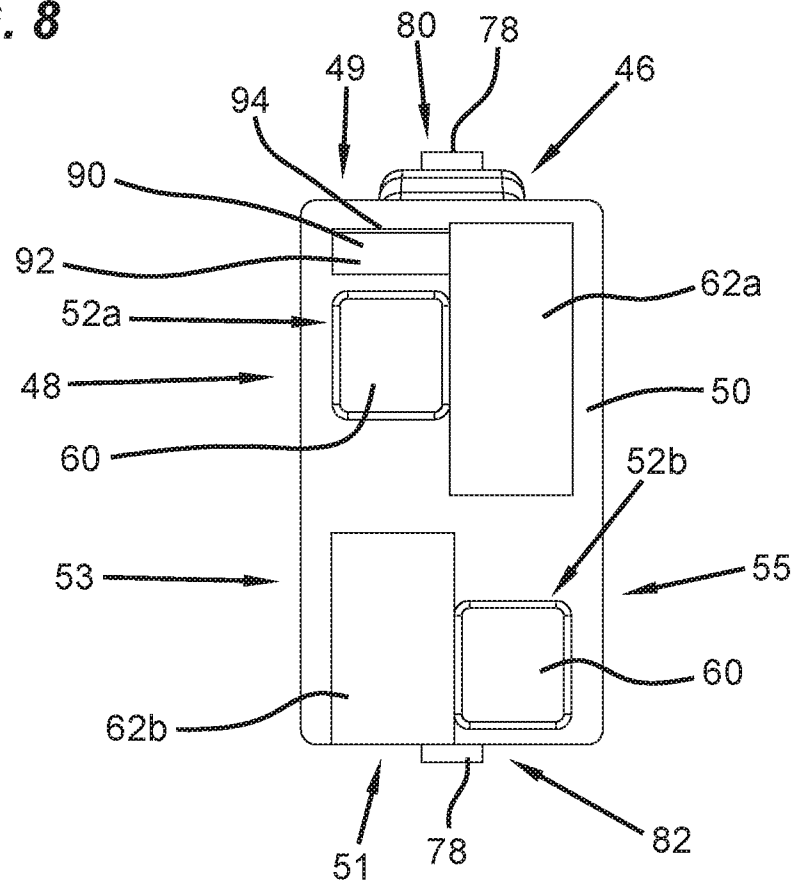
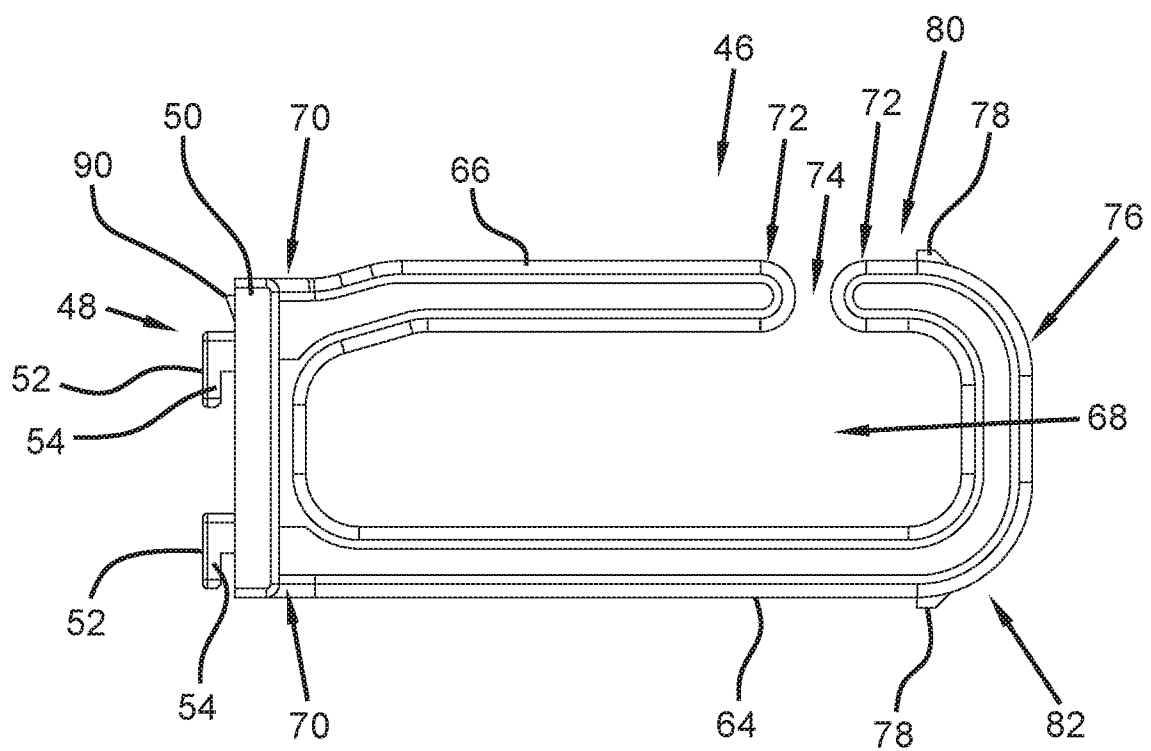
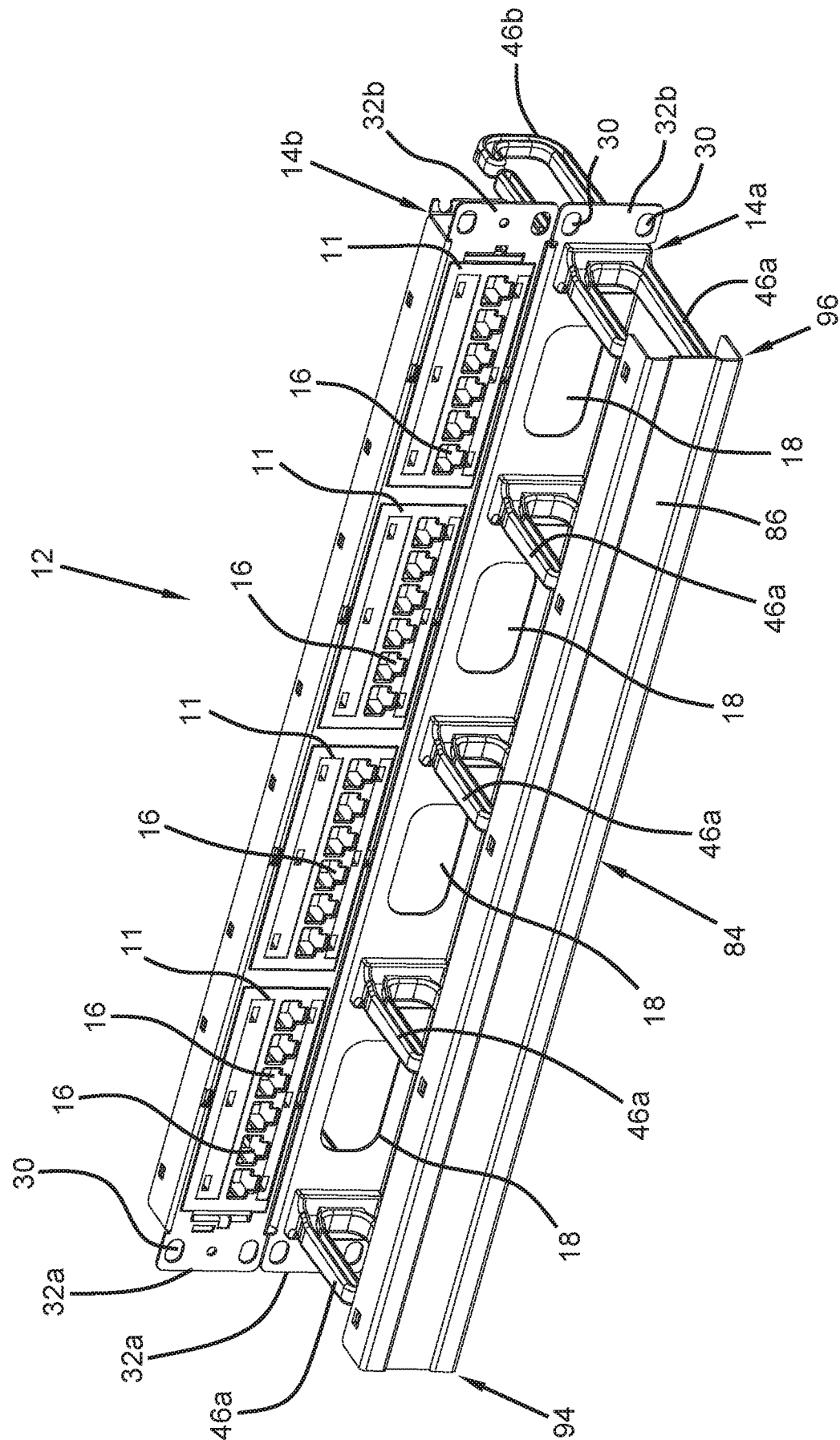
FIG. 8**FIG. 9**

FIG. 10



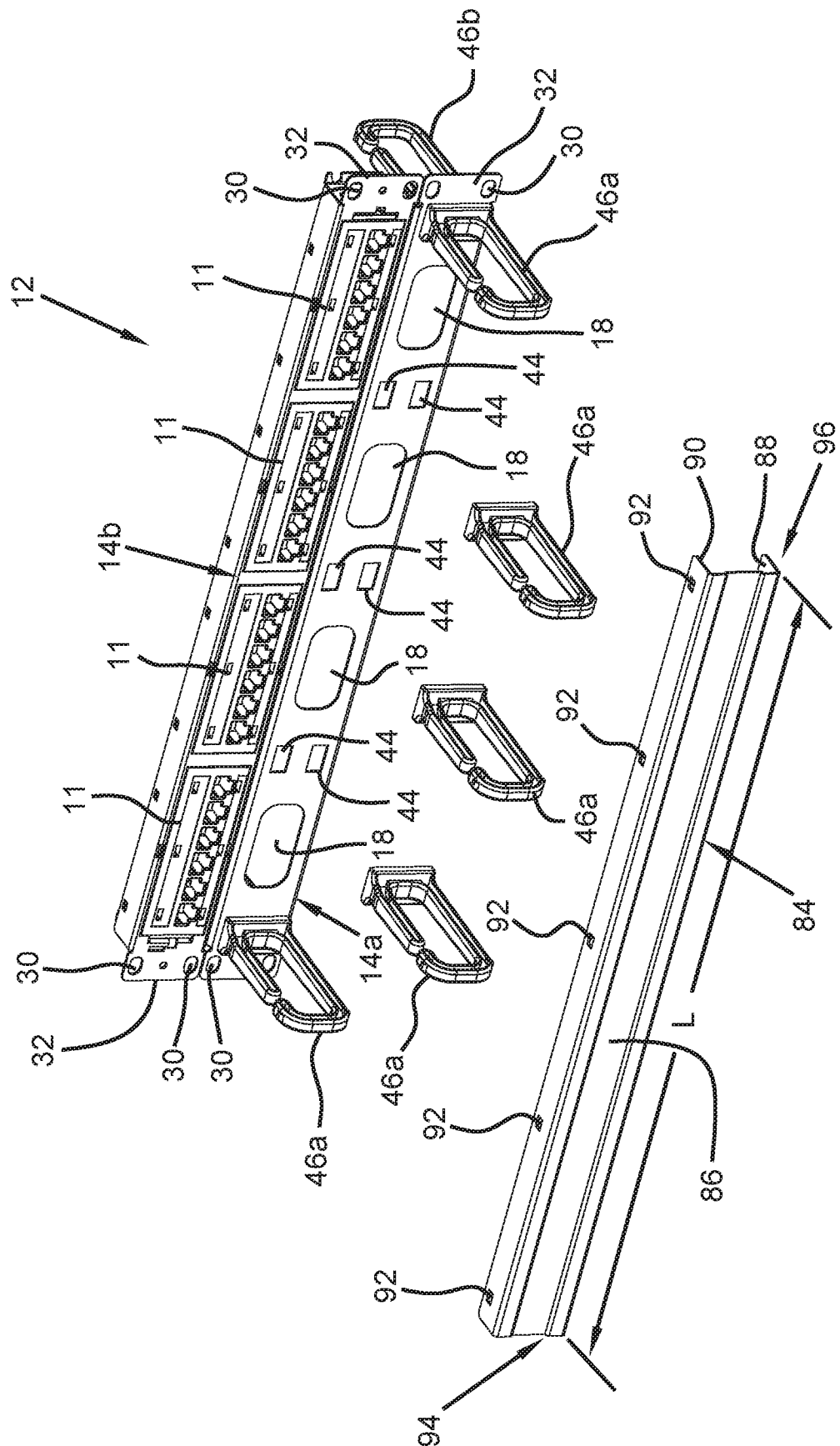


FIG. 11

A. CLASSIFICATION OF SUBJECT MATTER**H02G 3/02(2006.01)i, G02B 6/46(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)

H02G 3/02; F16B 15/00; F16L 3/23; G02B 6/36; H02G 003/08; H02G 3/30; H02G 3/32; H02G 3/36; G02B 6/46

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: cable, ring, back-to-back, mount, hook, loop

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5868362 A (BASSEL H. DAOUD) 09 February 1999	1-7
Y	See column 3, line 29 - column 4, line 38, and figures 2-3, 6A-7.	8-24
Y	US 2004-0206532 A1 (MICHAEL J. MCGRATH et al.) 21 October 2004 See paragraph 35, and figure 7.	8-9, 18-19
Y	WO 2012-158440 A1 (COMMSCOPE, INC. OF NORTH CAROLINA et al.) 22 November 2012 See paragraphs 19, 36, and figure 11.	10-11, 16-24
Y	US 05987203 A (JOHN N. ABEL et al.) 16 November 1999 See column 4, lines 22-26, claim 18, and figure 2A.	12-15
A	CN 102361289 A (TYCO ELECTRONICS RAYCHEM B.V.) 22 February 2012 See the whole document.	1-24



Further documents are listed in the continuation of Box C.



See patent family annex.

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"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

19 June 2020 (19.06.2020)

Date of mailing of the international search report

22 June 2020 (22.06.2020)

Name and mailing address of the ISA/KR

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2020/019673

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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