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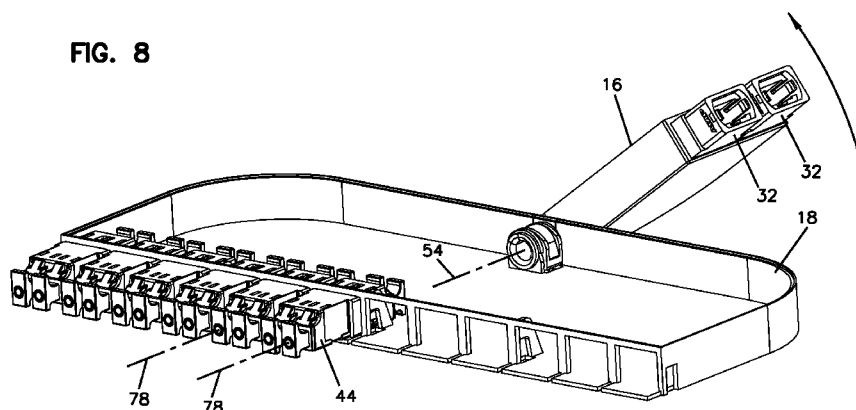
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(54) Title: TELECOMMUNICATIONS MODULE WITH HINGEABLE INPUT

FIG. 8



(57) Abstract: A telecommunications module (10, 210) includes an input (12) and an output (14). The module includes an input housing (16) and a main housing (18). A port (20) connects the input housing (16) to the main housing (18) for cables to pass. Input housing (16) is hingedly connected at a hinge (52) to the main housing (18), allowing the input housing to be placed in at least two positions relative to the main housing (18). An MPO breakout module (10, 210) is provided wherein the inputs are in the form of a multi-fiber cable (26) with or without a terminating MPO connector (30) which is broken out into individual connectors (40).

TELECOMMUNICATIONS MODULE WITH HINGEABLE INPUT

Cross-Reference to Related Application

5 This application claims the benefit of U.S. Patent Application Serial No. 62/141,055, filed on March 31, 2015, the disclosure of which is incorporated herein by reference in its entirety.

Background of the Invention

10 The present invention relates to fiber optic modules for telecommunications systems. Various fiber optic connections can be managed by modular elements including inputs and outputs. Further improvements are desired.

Summary of the Invention

15 One aspect of the present invention concerns a module including at least one input and one or more outputs. The input defines an axis which is generally perpendicular to an axis of the one or more outputs. The module includes a housing with an input housing portion and a main housing portion. The input housing portion is hingedly mounted to the main housing portion about a hinge axis which is parallel to the axis of each of the one or more outputs.

20 In one example embodiment, the input can be in the form of one or more MPO cables and/or connectors. In one example embodiment, the outputs can be in the form of single fiber connectors and adapters, such as SC, LC, or LX.5.

25 The input housing portion is connected to the main housing portion by a hinge which defines a port or passage for passing of fibers from the input to the one or more outputs. The input housing portion and the main housing portion manage the internal cables extending between the input and the one or more outputs.

 In one example embodiment, the module defines an MPO breakout housing for breaking out at least twelve fibers of an MPO cable into twelve separate outputs. Two MPO cables can be broken out into twenty-four separate outputs.

Brief Description of the Figures

Figure 1 shows a top perspective view of one example of a telecommunications module;

Figure 2 shows the module of Figure 1 in exploded perspective view including two MPO input connectors and adapters and twelve (six duplex) output connectors and adapters in the form of LC type, with twelve more LC type not shown;

Figure 3 shows the module of Figure 2 without any adapters or connectors;

Figure 4 shows an enlarged view of the module of Figures 1-3 including the hinge, with a clip element removed from the hinge;

Figure 5 shows a further exploded view of the hinge of Figure 4;

Figure 6 shows a further exploded view of the hinge of Figure 4;

Figure 7 shows an enlarged view of the hinge of Figure 4 fully assembled;

Figure 8 shows an input housing being rotated relative to a main housing of the module of Figures 1-7 in order to switch the orientation of the one or more inputs;

Figure 9 shows the module of Figure 1, mounted to a frame member;

Figure 10 shows the module of Figure 1, with the input housing rotated to an alternative position, and wherein the module is mounted in a different location on the frame member;

Figure 11 shows an example frame member used to hold the modules of Figures 1-10; and

Figure 12 shows an alternative module in top view with different outputs, and showing an example internal cable routing.

Detailed Description

Referring now to Figures 1-8, an example module 10 is shown including an input 12 and an output 14. In Figure 1, a single input 12 is shown with a plurality of outputs 14. Module 10 includes a body construction including an input housing 16 and

a main housing 18. A port or passage 20 allows for cables to pass from input housing 16 into main housing 18. An input cable 26 can be connected to module 10 at input 12. One or more output cables 28 can be connected to module 10 at the outputs 14.

In the illustrated example, input 12 includes an MPO adapter 32 which
5 receives an MPO connector 30 connected to cable 26. An opposite end of adapter 32 is another MPO connector 34. An MPO cable 26 includes at least twelve fibers. Those fibers are broken out within the interior of module 10 for individual outputs at outputs 14. As shown, internal cables 36 extend from MPO connector 34 through passage 20 into main housing 18. In main housing 18, a plurality of single fiber connectors 40,
10 such as LC type, are provided in one example. Connectors 40 connect to adapters 42, such as LC type adapters. LC adapters define LC connector ports 44 for connecting to LC connectors on each of output cables 28. Such connections of the connectors and adapters allow for quick connection of cables to module 10. Alternatively, a multi-fiber cable 26 can enter module 10 and pass directly through port 20 to main housing 18 for
15 distribution to each of outputs 14 to form a pigtailed module. The LC adapters 42 are duplex-style. As shown in an example alternative module 210 in Figure 12, the outputs 14 can be in the form of SC type connectors and adapters.

Module 10 includes a hinge 52 between input housing 16 and main housing 18. Hinge 52 defines a hinge axis 54 which allows for input housing 16 to be
20 placed in at least two positions relative to main housing 18.

Input housing 16 includes a base 60, a side wall 62, and at least one port 64 for receiving input cable 26 and/or adapter 32. As shown, port 64 includes two openings 66, each one sized for an adapter.

Main housing 18 includes a base 70 and a side wall 72. Base 70 defines
25 ports 74. As shown, ports 74 include openings 76 for receiving one or more adapters 42.

Hinge axis 54 is generally perpendicular to input axis 68 of input 12. Hinge axis 54 is generally parallel to the output axis 78 of each of the outputs 14. As illustrated, input housing 16 can be moved between positions for more convenient cable
30 routing for input 12 relative to outputs 14. With such a design, a single module 10 can

be manufactured and then configured by movement of input housing 16 relative to main housing 18 in such a manner that improved cable management and cable protection is provided. A lock can be provided to secure, hold or retain input housing 16 in the desired position.

5 Main housing 18 includes a cover 80 for enclosing an interior of main housing 18. A designation strip 82 can be mounted to the top of cover 80, as desired. Input housing 16 includes a cover 86 which encloses an interior of input housing 16. Both of the covers 80, 86 can be snap fit into position, and removed if necessary. Alternatively, covers 80, 86 can be more securely affixed, such as with fasteners, or
10 more permanently with adhesive.

 Hinge 52 includes a base trough 88 associated with main housing 18. A hinge shaft 90 extends from input housing 16. A slot 92 is provided in hinge shaft 90 so as to allow cable access into port 20 for ease of use and to allow for preterminated cables. A projecting finger 94 on cover 86 closes slot 92 upon placement of cover 86
15 on the input housing 16. Hinge shaft 90 includes a flange 96. A clip 98 holds finger 94 and hinge shaft 90 in position on base trough 88 so that a bearing surface 99 can allow for input housing 16 to rotate relative to main housing 18.

 Referring now to Figures 9-11, module 10 is shown mounted to a frame member 100 which includes a cable input/output 102 on one side of frame member 100
20 and a cable input/output 104 on an opposite side of frame member 100. Body 106 of frame member 100 defines two module holding locations 108, 110 on opposite sides of frame member 100. As shown, module 10 can be mounted in either the module holding location 108 in a first configuration of module 10, and in alternative mounting location 110 where module 10 is placed in the alternative configuration.

25 Frame member 100 can be any fixture or other mounting device for holding one or more modules 10. Frame member 100 can be a fixed device, mounted to a rack, cabinet, or telecommunications frame. Frame member 100 can also be a pivotally mounted unit mounted to a tray which is slidable within a chassis, such as in the arrangement disclosed in PCT Publication No. WO 2014/118227, the disclosure of
30 which is hereby incorporated by reference. The module 10 can be utilized in other

frames, wherein the orientation of cable entry for the inputs needs to be adjusted depending upon the orientation of the modules in the frame, such as from the front, or from the sides.

As shown in Figures 1-8, two MPO connectors allow for connection to
5 twenty-four LC type connectors and adapters, wherein the fibers from each cable connect to one of the LC type adapters. In the case of the module 210 of Figure 12, one twelve-fiber cable connects to twelve SC connectors and adapters.

Parts List

	10	module
	12	input
	14	output
5	16	input housing
	18	main housing
	20	port/passage
	26	input cable
	28	output cable
10	30	MPO connector
	32	MPO adapter
	34	MPO connector
	36	internal cables
	40	LC connector (SC)
15	42	LC adapter (SC)
	44	LC connector port (SC)
	52	hinge
	54	hinge axis
	60	base
20	62	side wall
	64	port
	66	opening
	68	input axis
	70	base
25	72	side wall
	74	port
	76	opening
	78	output axis
	80	cover
30	82	designation strip

	86	cover
	88	base trough
	90	hinge shaft
	92	slot
5	94	finger
	96	flange
	98	clip
	99	bearing surface
	100	frame member
10	102	cable input/output
	104	cable input/output
	106	body
	108	module holding location
	110	module holding location
15	210	module

What is claimed is:

1. A telecommunications module (10, 210) comprising:
a module housing including an input housing (16), and a main housing (18) with a port (20) between the input housing (16) and the main housing (18);
an input (12) on the input housing (16);
an output (14) on the main housing (18);
a hinge (52) located between the input housing (16) and the main housing (18), wherein the input housing (16) has at least two positions relative to the main housing (18).
2. The telecommunications module (10, 210) of claim 1, wherein the hinge (52) defines a hinge axis (54); wherein the hinge axis (54) is generally perpendicular to the input (12) of module (10), and wherein the hinge axis (54) is generally parallel to the outputs (14) of the module (10).
3. The telecommunications module (10, 210) of claims 1 and 2, wherein the module (10) is mountable to a frame member (100) in one of two positions, wherein the input housing (16) is rotated relative to the main housing (18) when the module (10) is positioned in either of the first and second positions.
4. The telecommunications module (10, 210) of claims 1-3, wherein the input (16) is in the form of a cable (26).
5. The telecommunications module (10, 210) of claims 1-3, wherein the input (16) is in the form of an MPO connector (30).
6. The telecommunications module (10, 210) of claims 1-5, wherein the hinge (52) includes an axial slot.

7. The telecommunications module (10, 210) of claims 1-6, wherein the hinge (52) includes a shaft (90) formed by the input housing (16).

8. The telecommunications module (10, 210) of claims 1-7, wherein the hinge (52) defines the port (20) for allowing cables (26) to pass from the input housing (16) to the main housing (18).

9. The telecommunications module (10, 210) of claims 1-8, wherein the output (14) is in the form of either an LC or an SC connector (44).

10. The telecommunications module (10, 210) of claims 1-9, wherein the output (14) defines a plurality of outputs (14) formed by individual connectors (44) of either the LC or the SC format mounted to the main housing (18).

11. The telecommunications module (10, 210) of claims 1-10, wherein the first and second positions of the at least two positions faces the input (12) in the opposite directions.

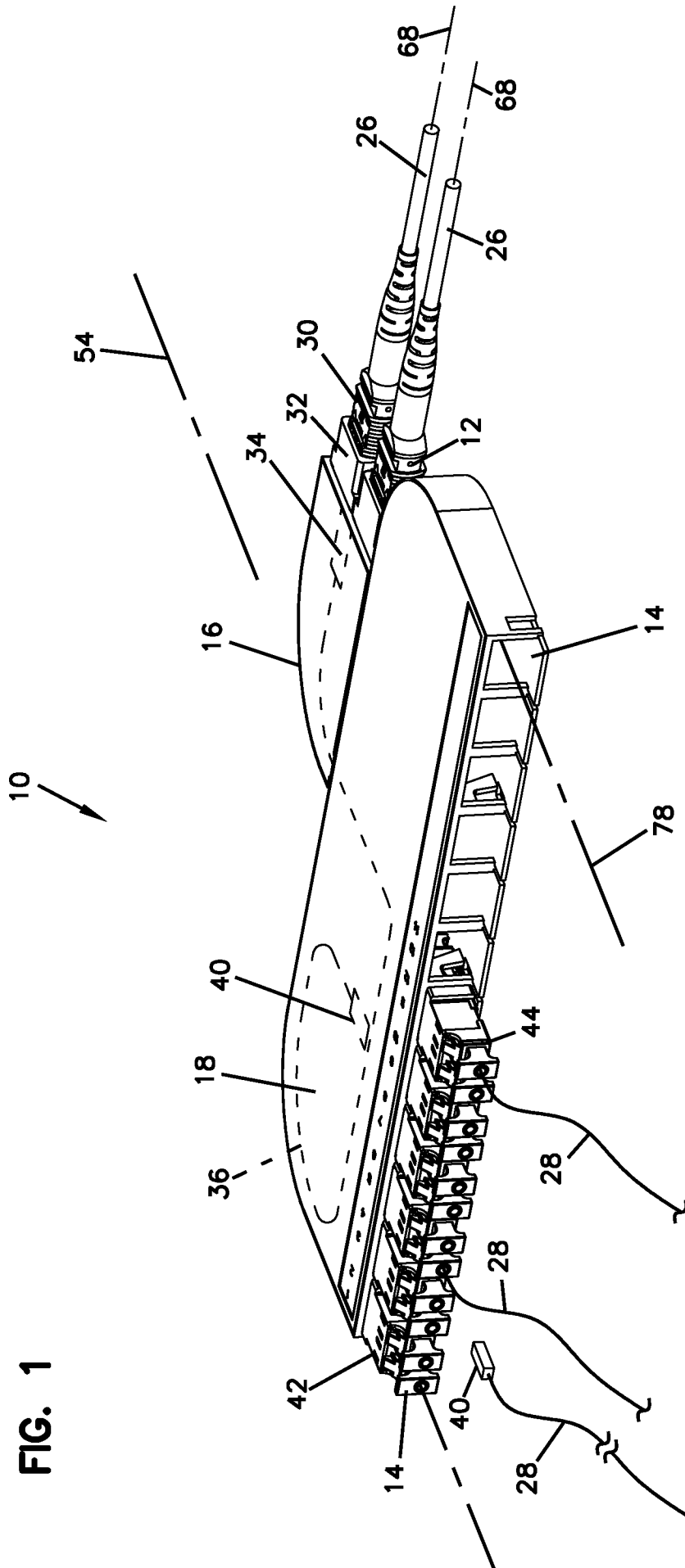
12. The telecommunications module (10, 210) of claims 7-11, wherein the shaft (90) defines a longitudinal slot (92) to allow cable access into port (20).

13. The telecommunications module (10, 210) of claims 1-12, wherein the hinge (52) includes a shaft (90) defining a generally cylindrical bearing surface (99) for providing smooth rotational motion between input housing (16) and main housing (18).

14. The telecommunications module (10, 210) of claims 1-13, wherein the input (12) is in the form of at least two MPO connectors (30), each terminating at least twelve fibers.

15. The telecommunications module (10, 210) of claims 1-14, wherein the hinge (52) further includes a removable snap-on clip (98) for attaching the input housing (16) to the main housing (18).

FIG. 1



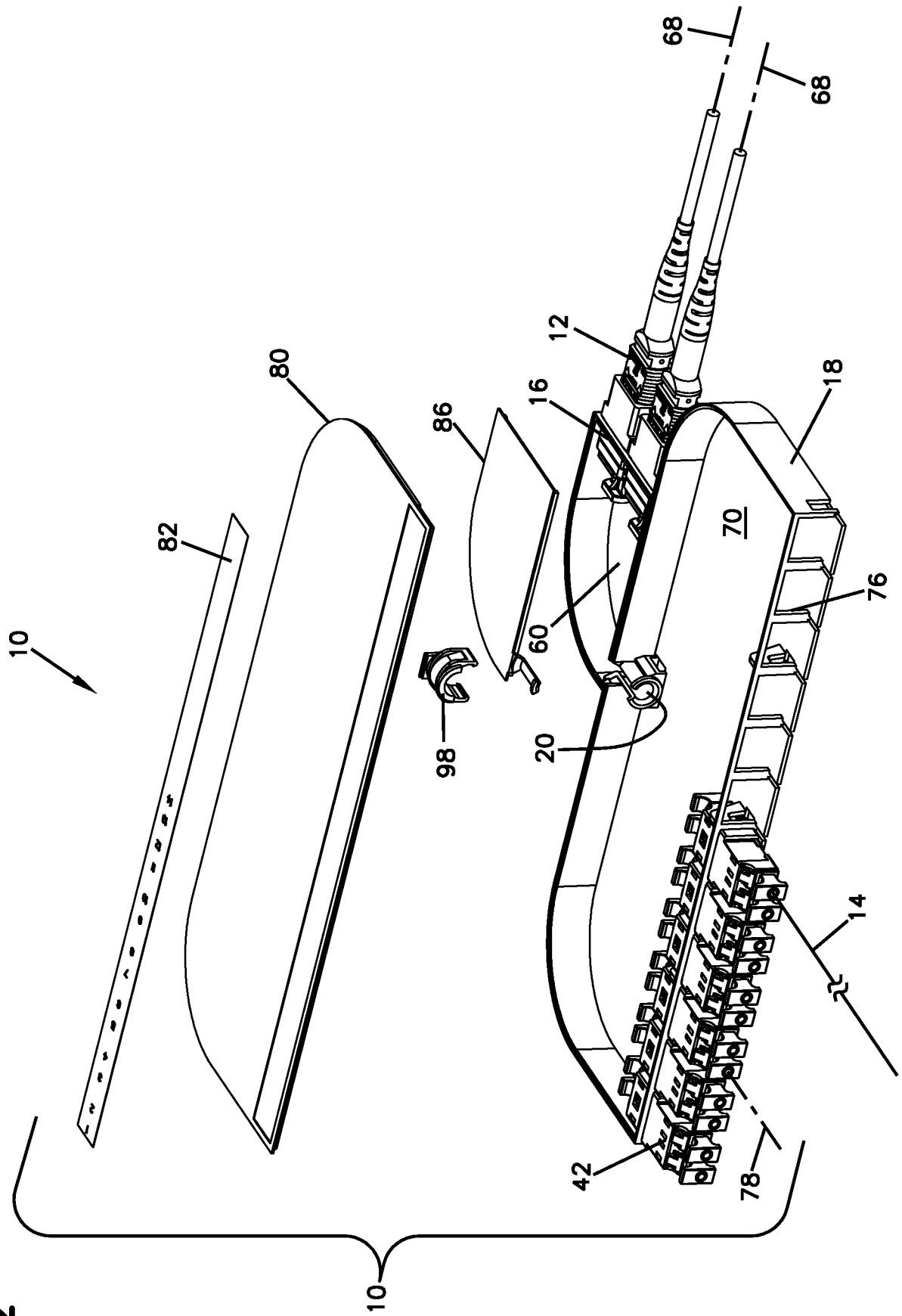


FIG. 2

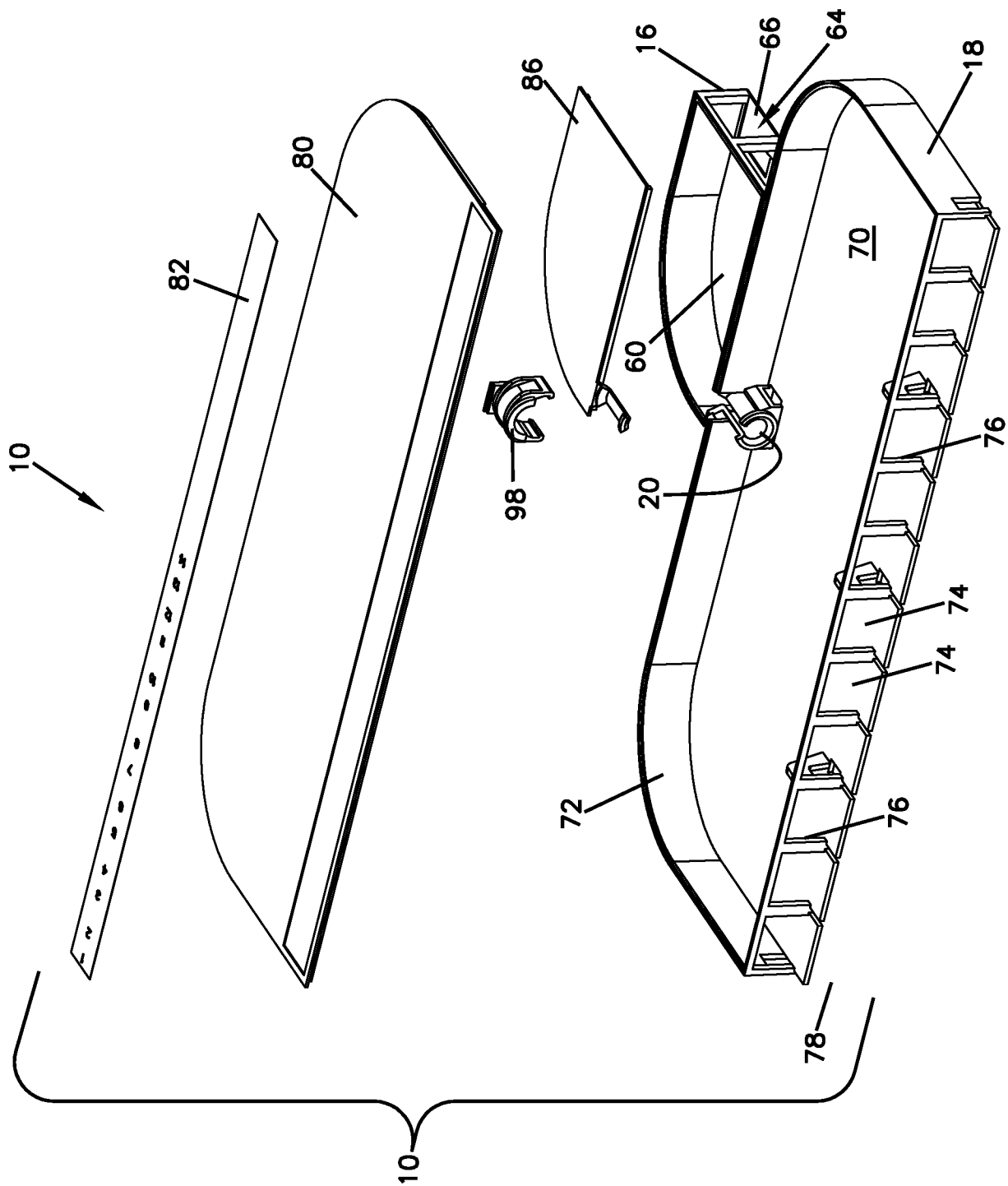
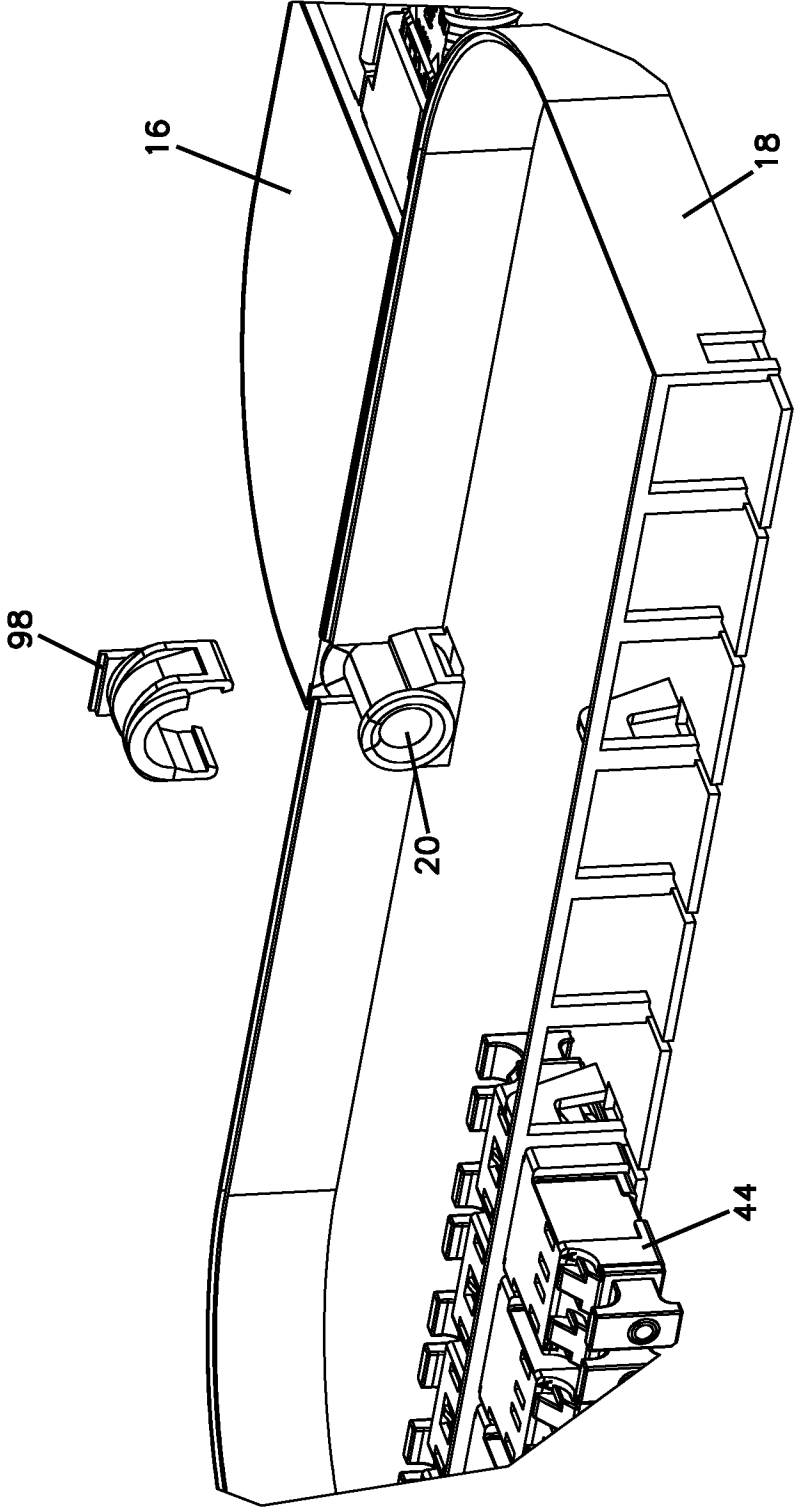


FIG. 3

FIG. 4



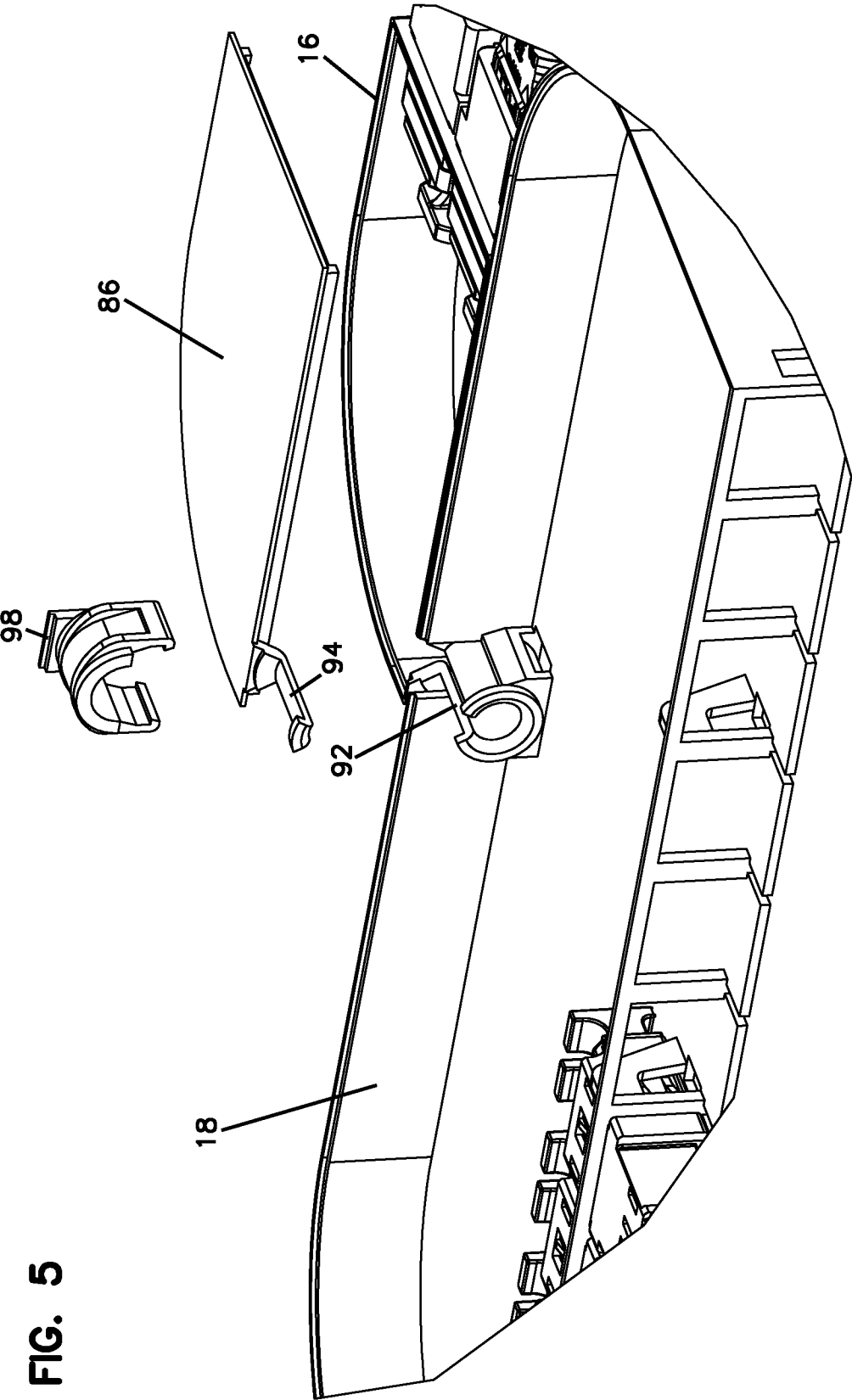


FIG. 5

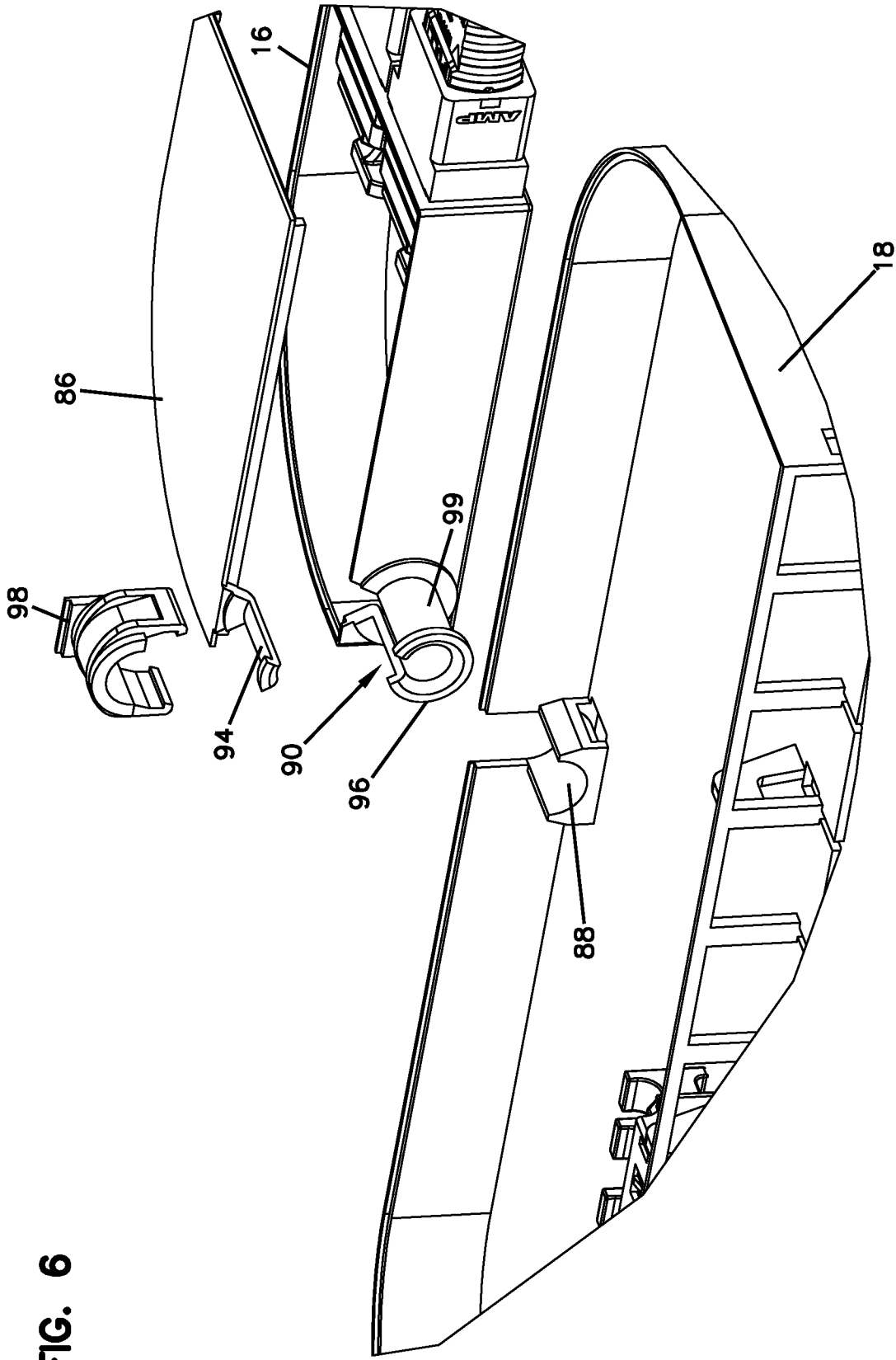


FIG. 6

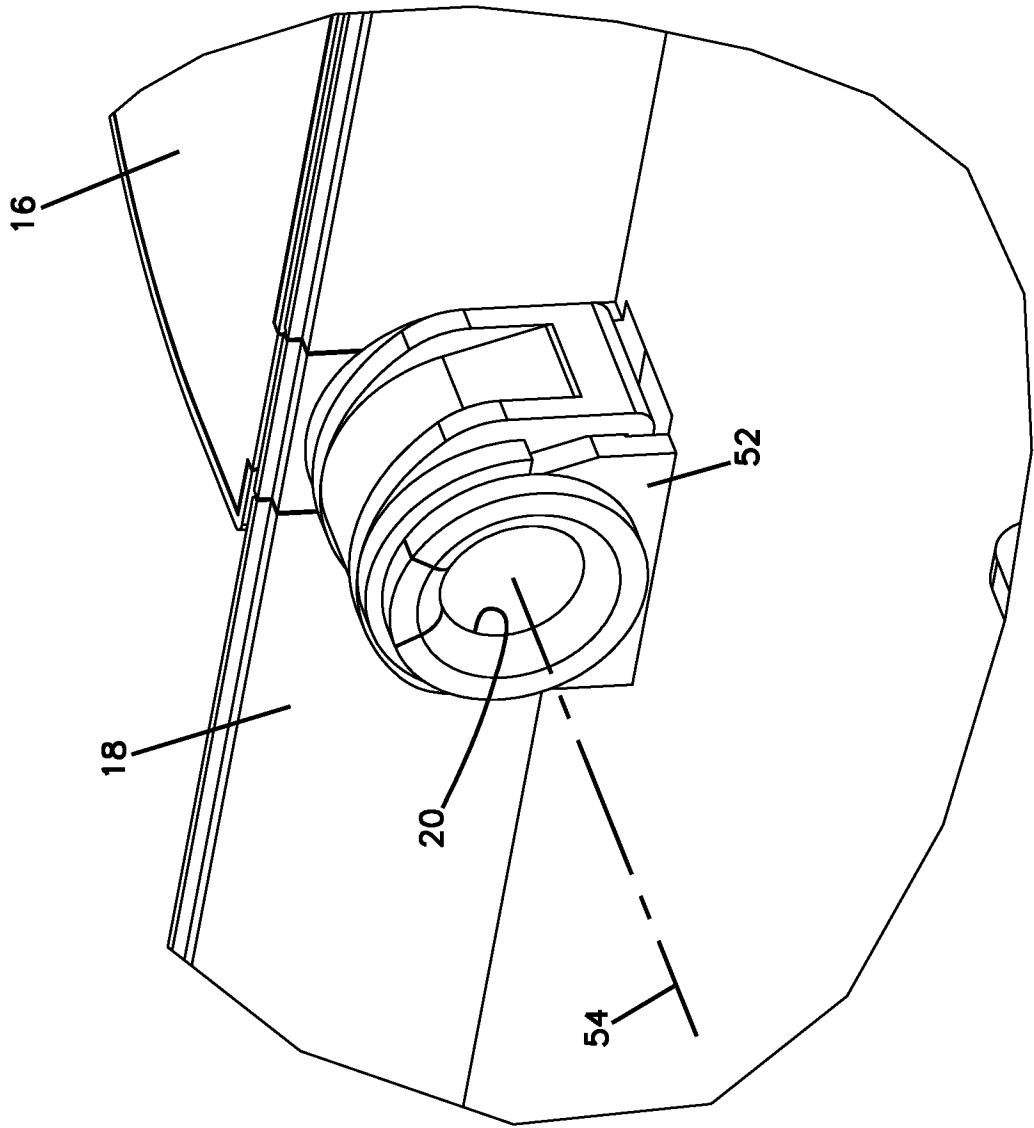
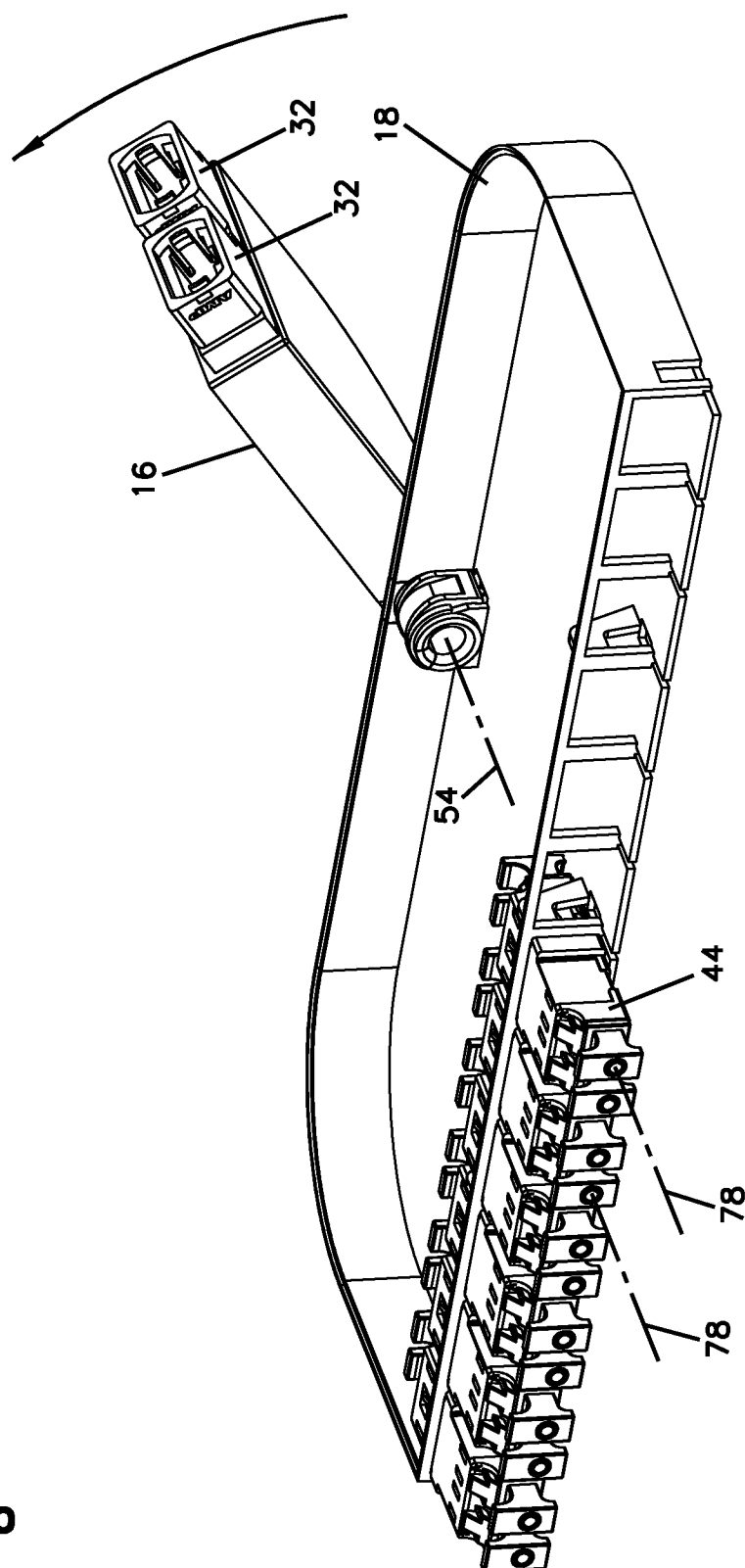


FIG. 7

FIG. 8



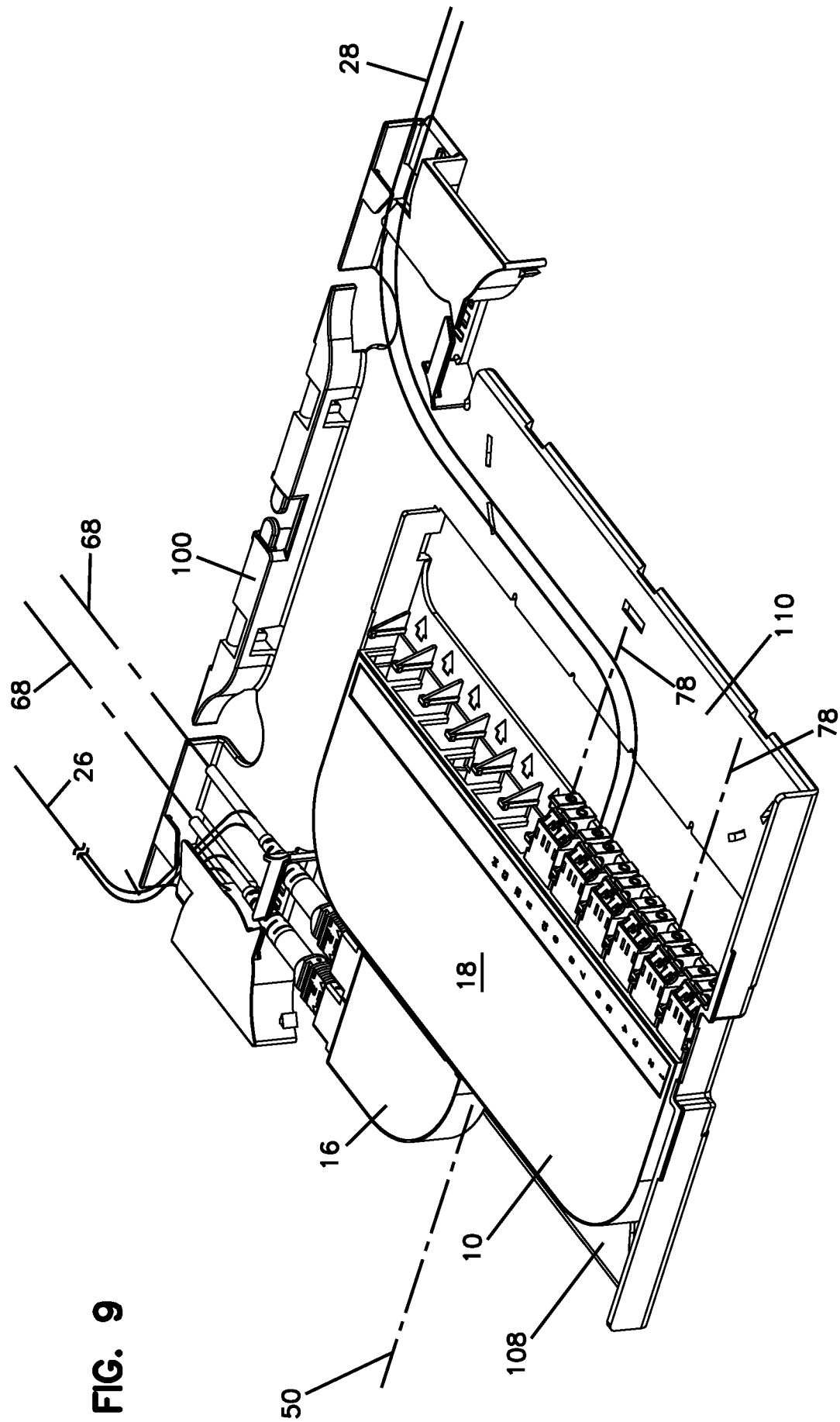


FIG. 9

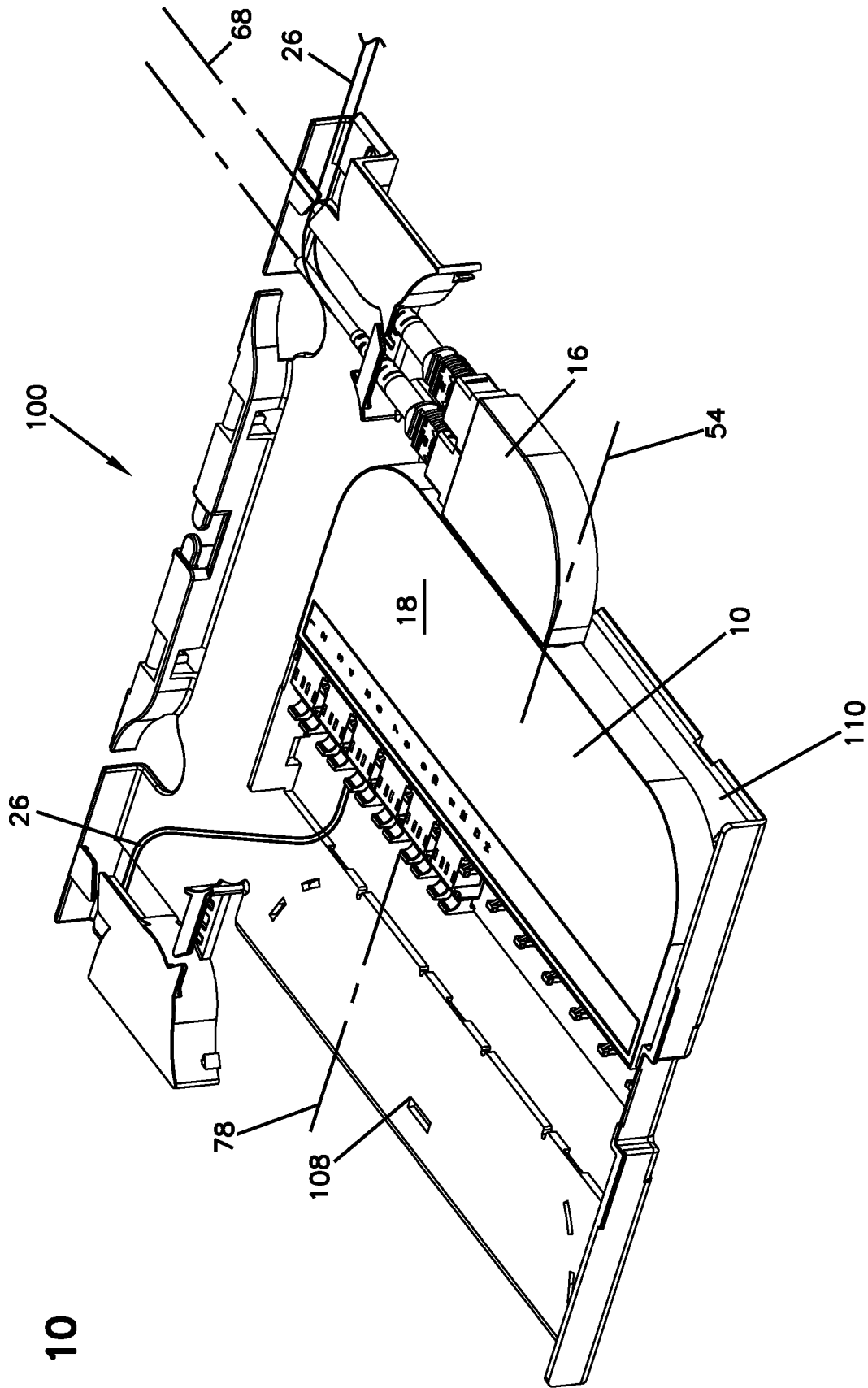


FIG. 10

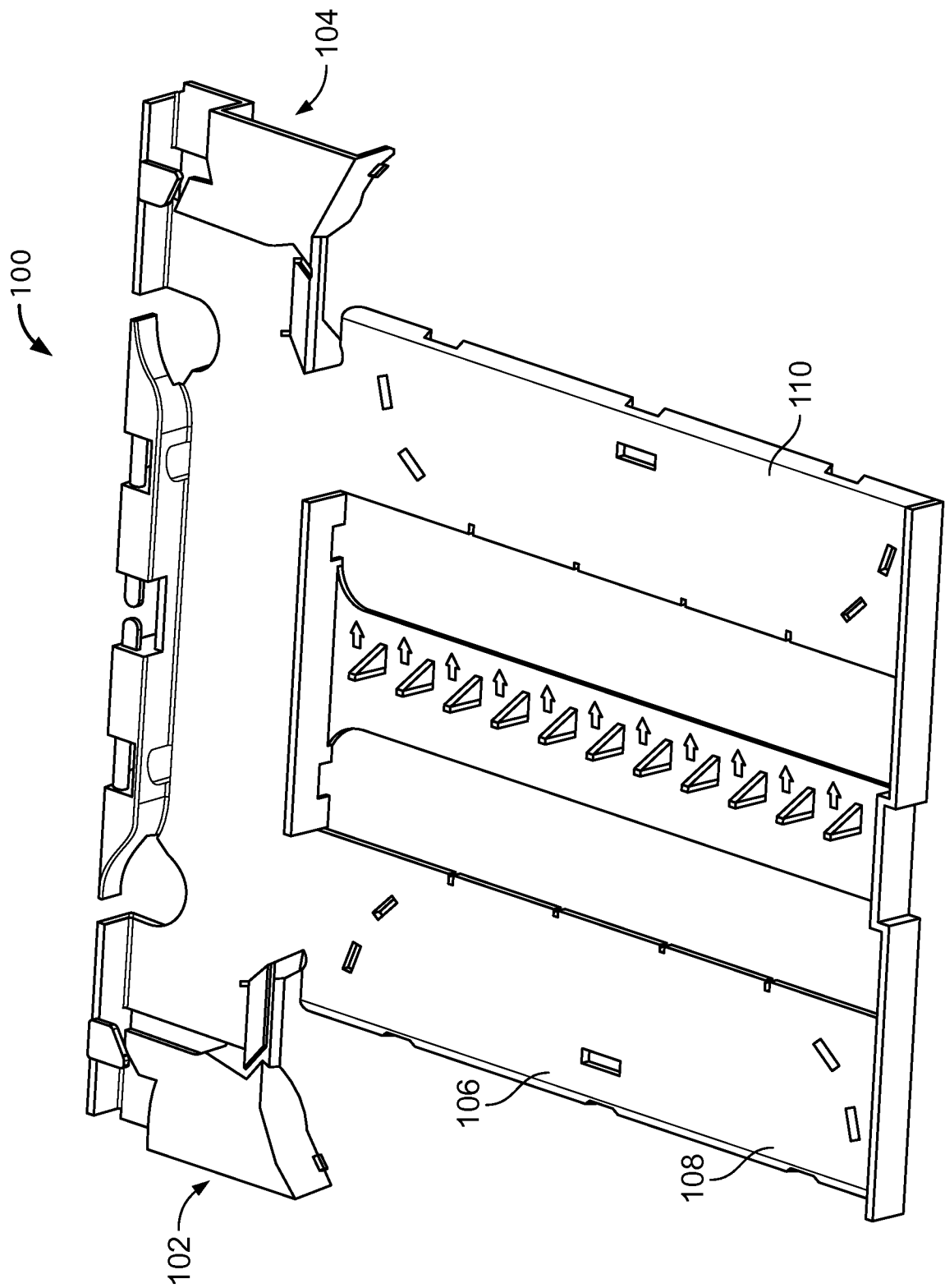


FIG. 11

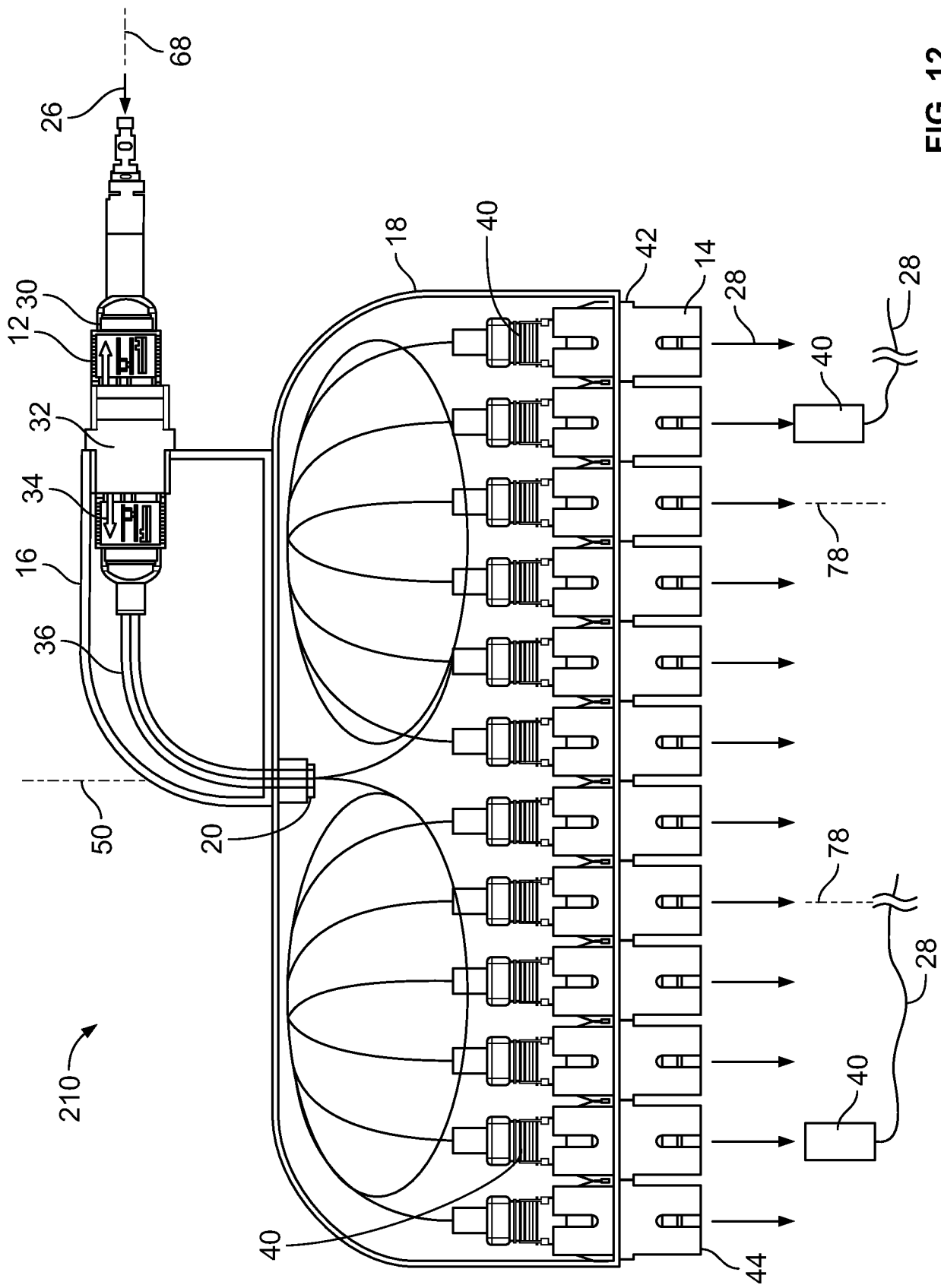


FIG. 12

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2016/057123

A. CLASSIFICATION OF SUBJECT MATTER
INV. G02B6/44
ADD. G02B6/38

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)
G02B

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

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

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2009/245743 A1 (COTE MONIQUE L [US] ET AL) 1 October 2009 (2009-10-01)	1-7, 9-11, 13-15
Y	paragraphs [0052] - [0063]; figures 3-6	8
A	-----	12
A	US 2013/089292 A1 (OTT MICHAEL JAMES [US] ET AL) 11 April 2013 (2013-04-11) paragraphs [0048] - [0055]; figures 1-9	5,9,10, 14
Y	-----	
Y	WO 2014/055316 A1 (MOTOROLA MOBILITY LLC [US]) 10 April 2014 (2014-04-10) abstract paragraphs [0042] - [0053]; figures 1-5	8
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Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

10 June 2016

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20/06/2016

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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2016/057123

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2014/133822 A1 (DE LOS SANTOS CAMPOS CESAR ALEJANDRO [MX] ET AL) 15 May 2014 (2014-05-15) abstract paragraphs [0028] - [0055]; figures 1-8 -----	12

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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