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(54) **CONNECTOR REPLACEMENT METHODS AND SYSTEMS IN A NETWORK ELEMENT CHASSIS**

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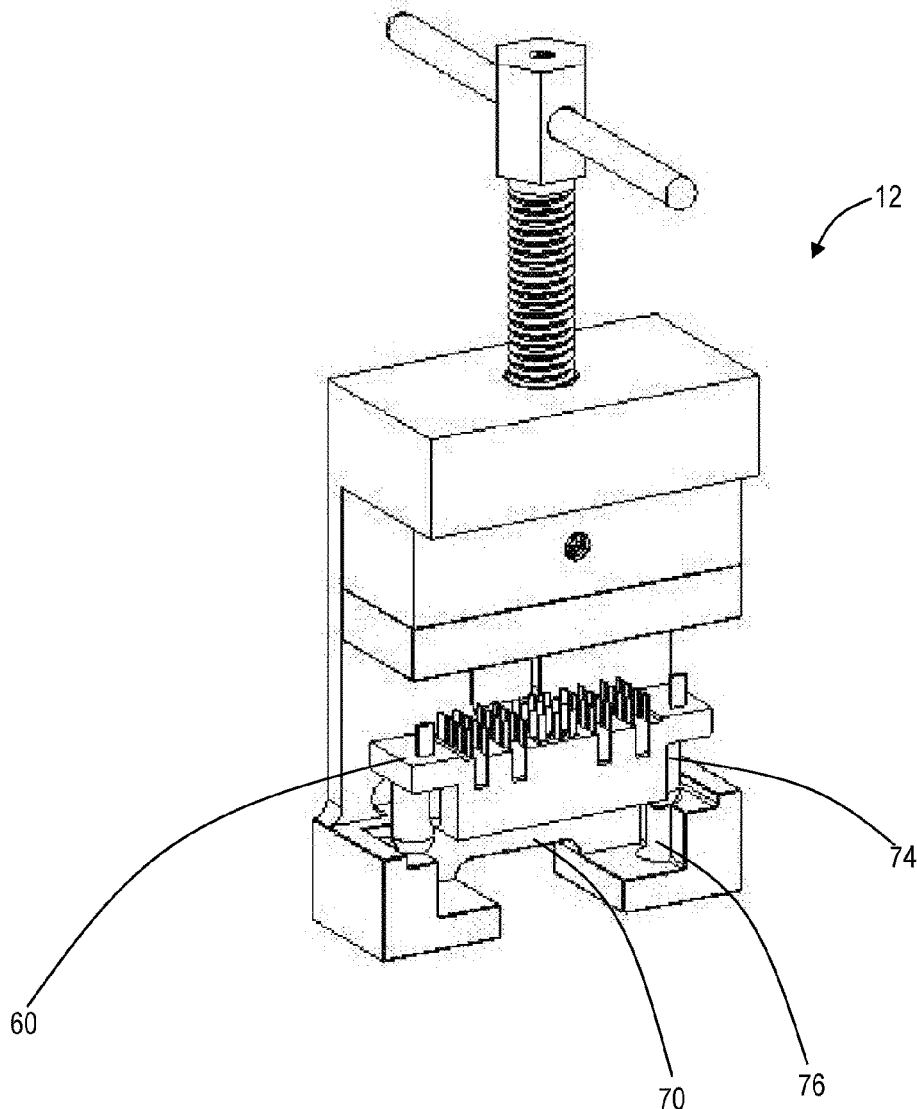
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(57) **ABSTRACT**

A connector replacement method in a network element chassis includes obtaining physical access to a backplane in the network element chassis, while the network element chassis is deployed; powering down backplane connectors for replacement while other backplane connectors remained powered; removing the powered down backplane connectors with a connector removal tool; inserting a new set of backplane connectors in place of the removed, powered down backplane connectors with a connector insertion tool; and powering up the new set of backplane connectors.

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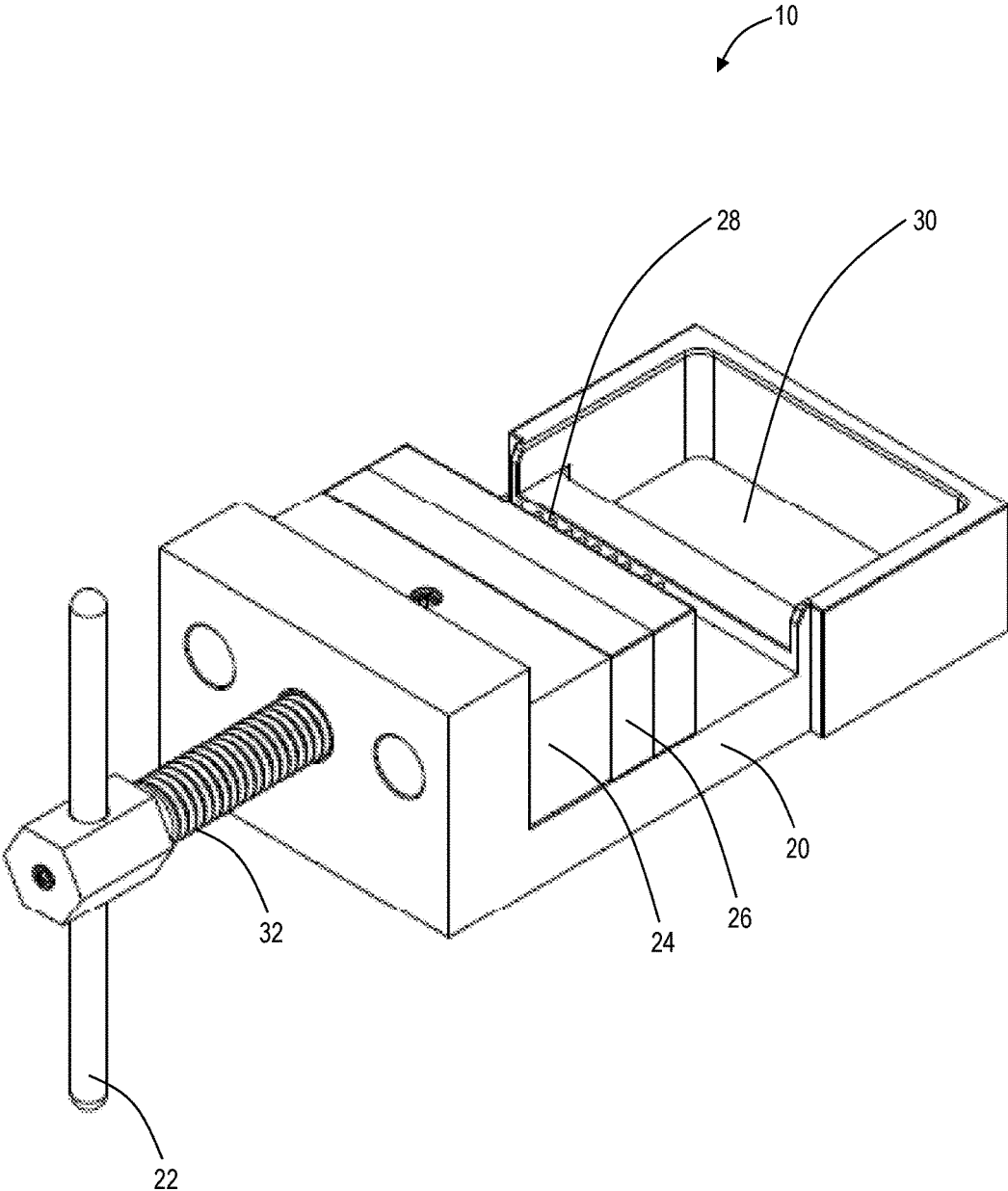


FIG. 1

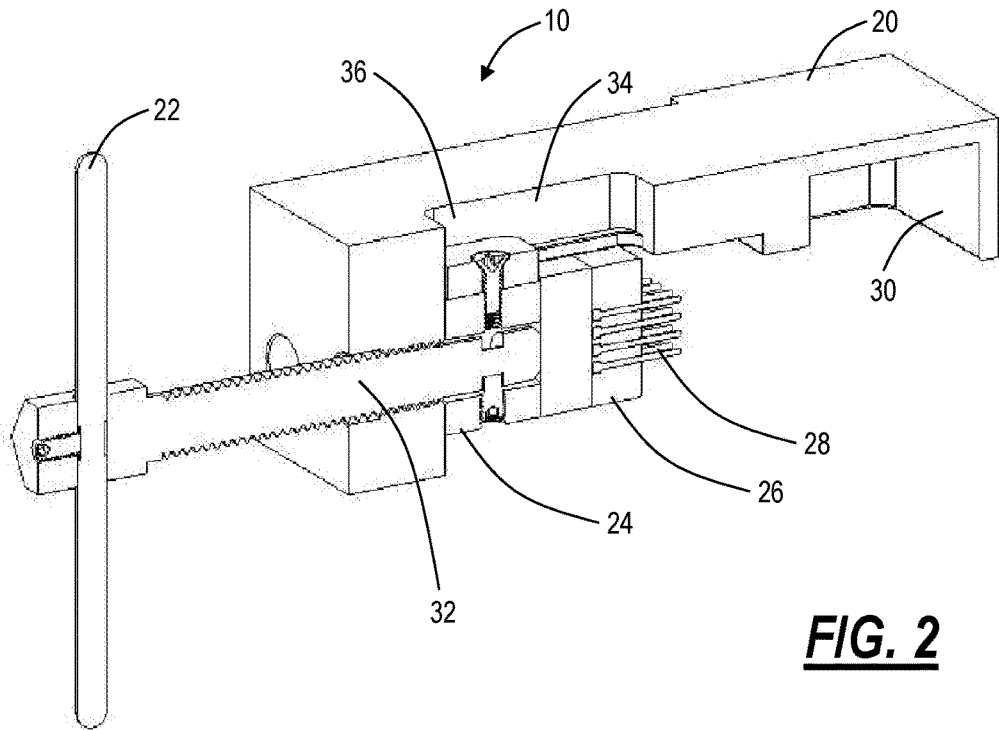


FIG. 2

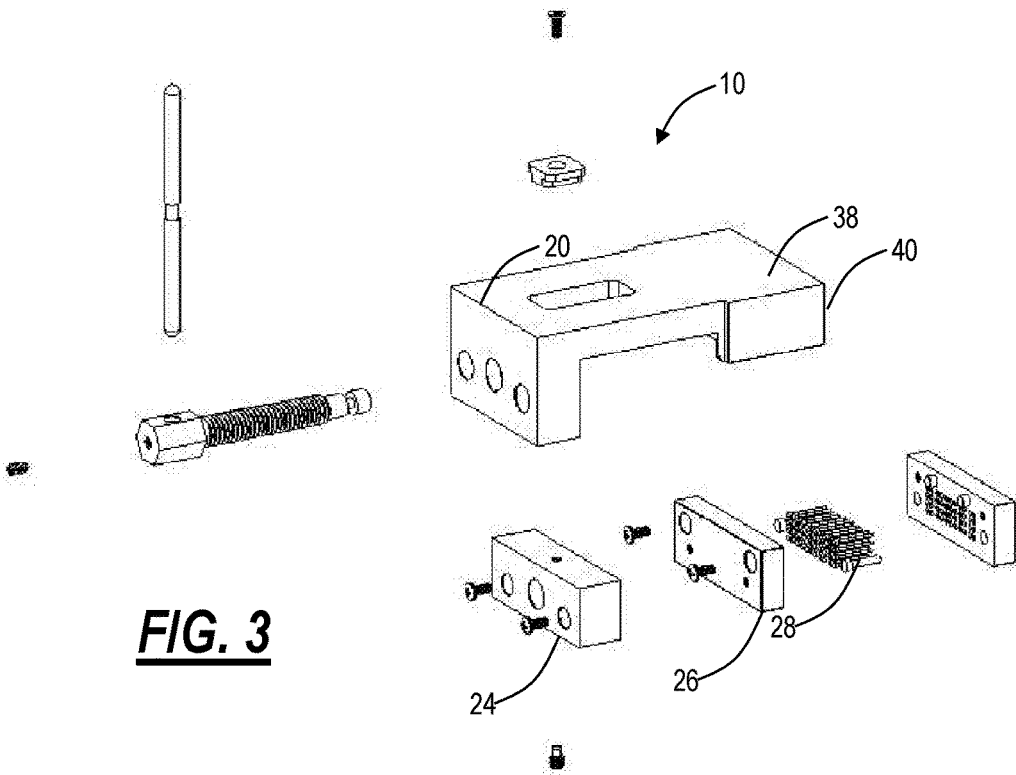


FIG. 3

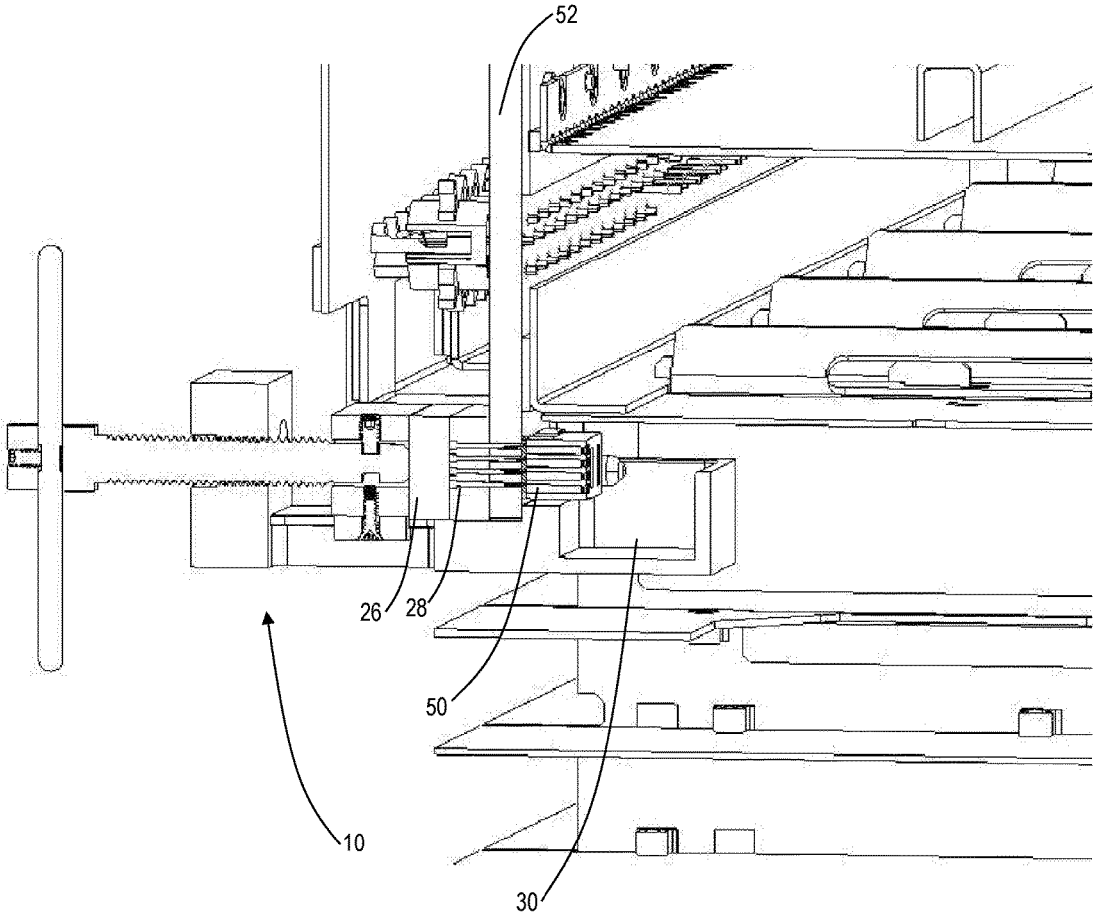


FIG. 4

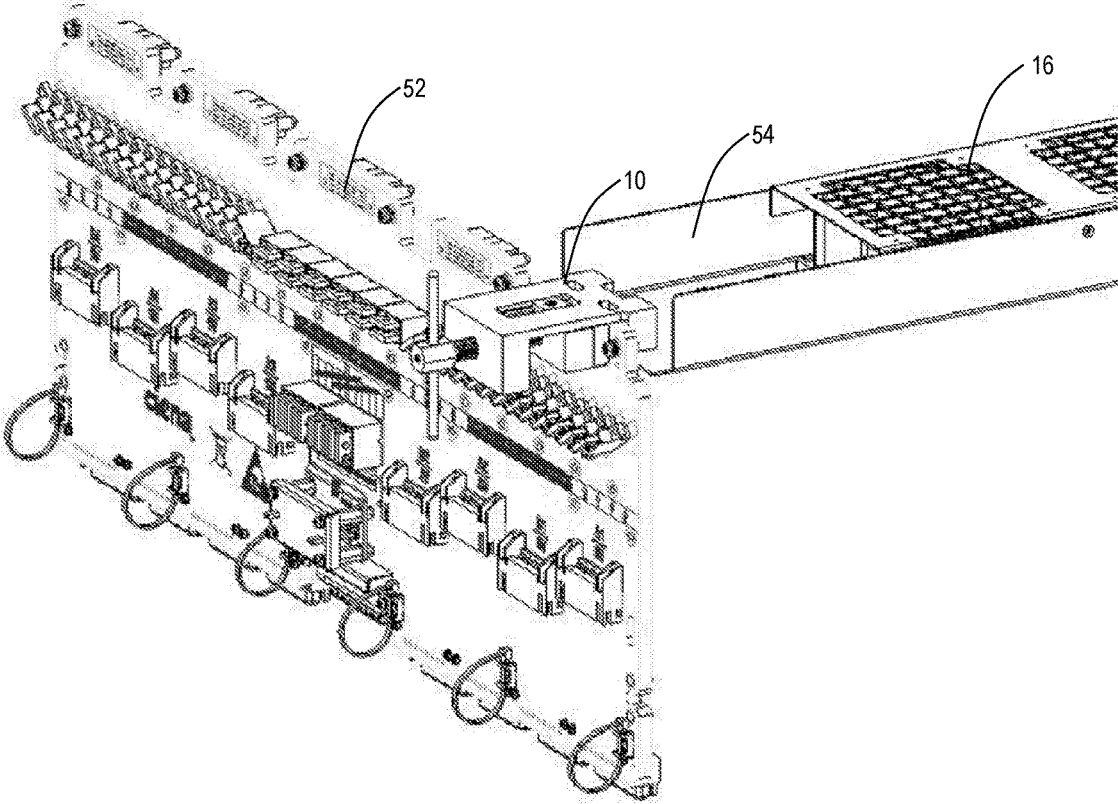


FIG. 5

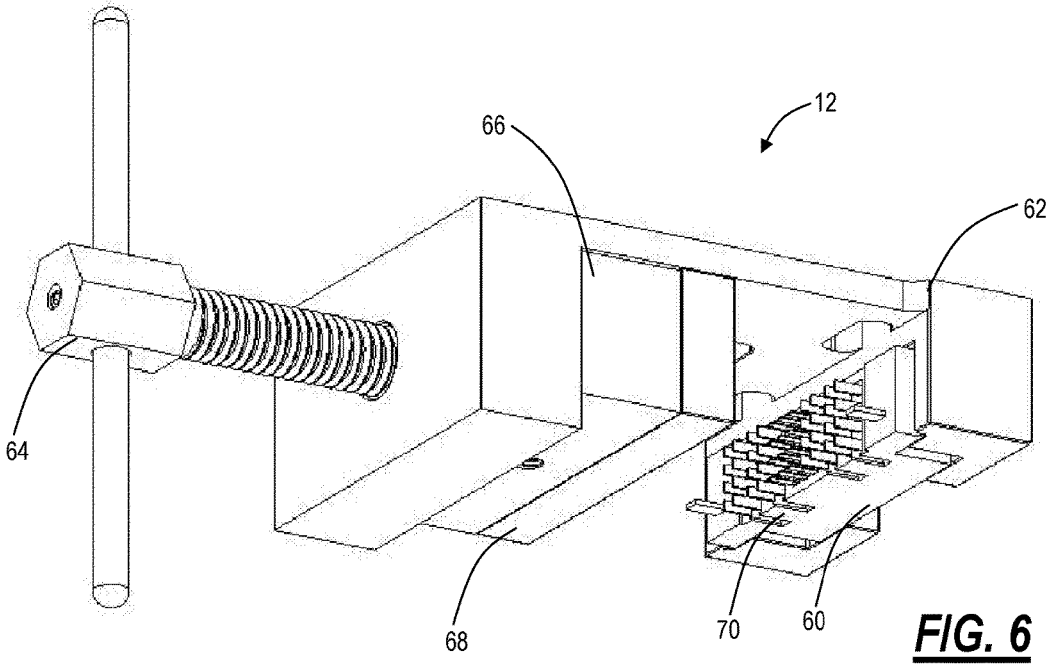


FIG. 6

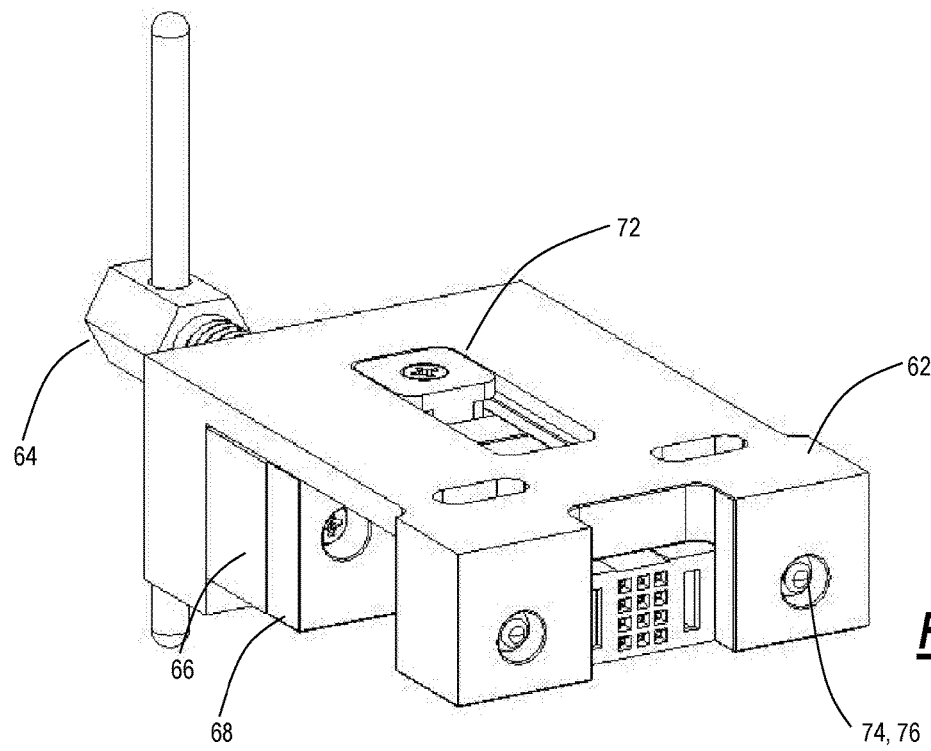


FIG. 7

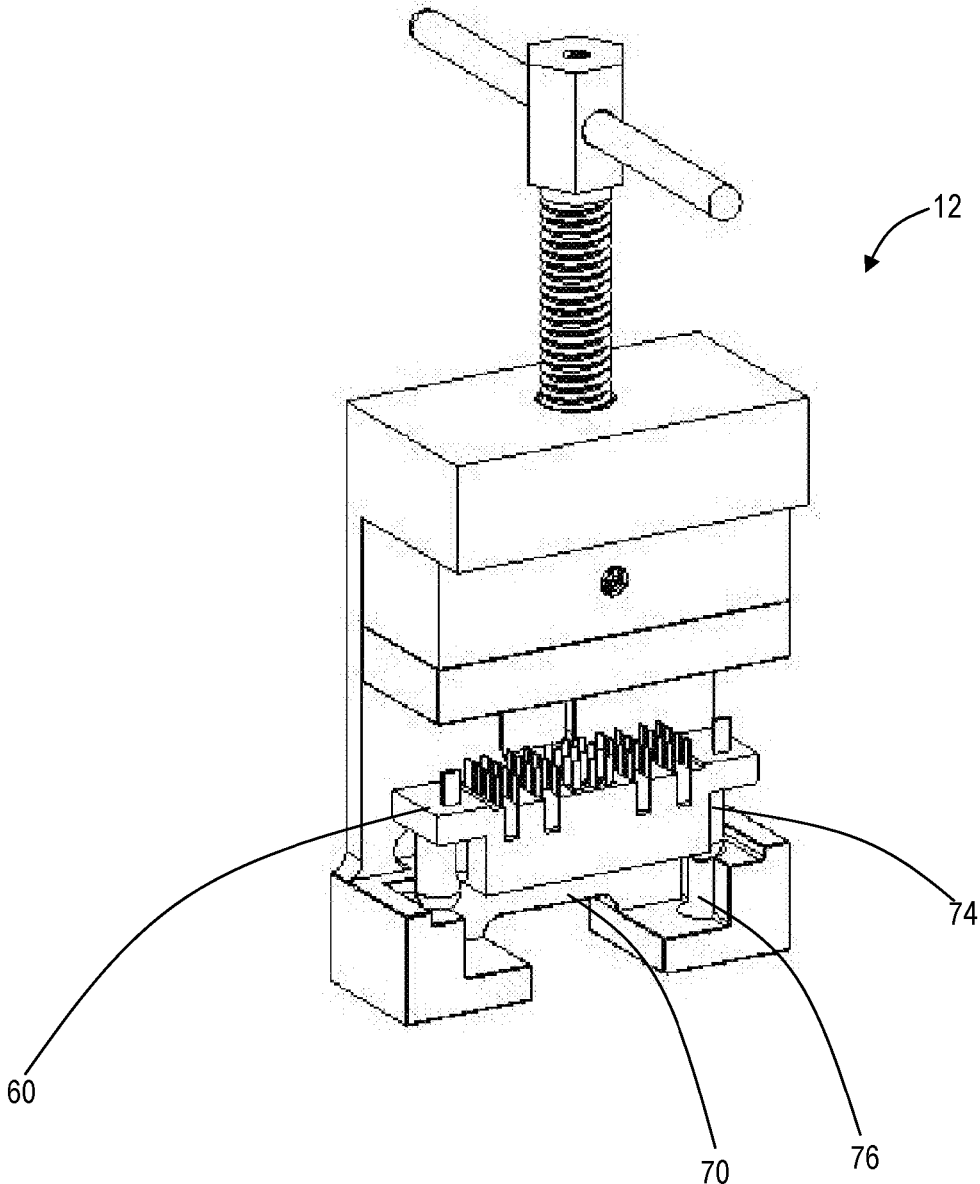


FIG. 8

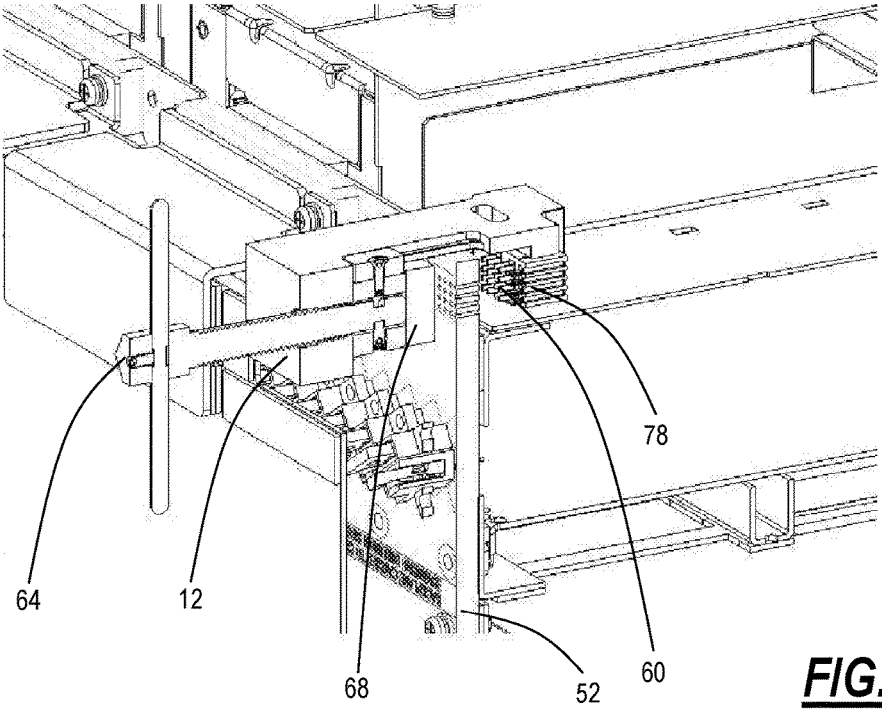


FIG. 9

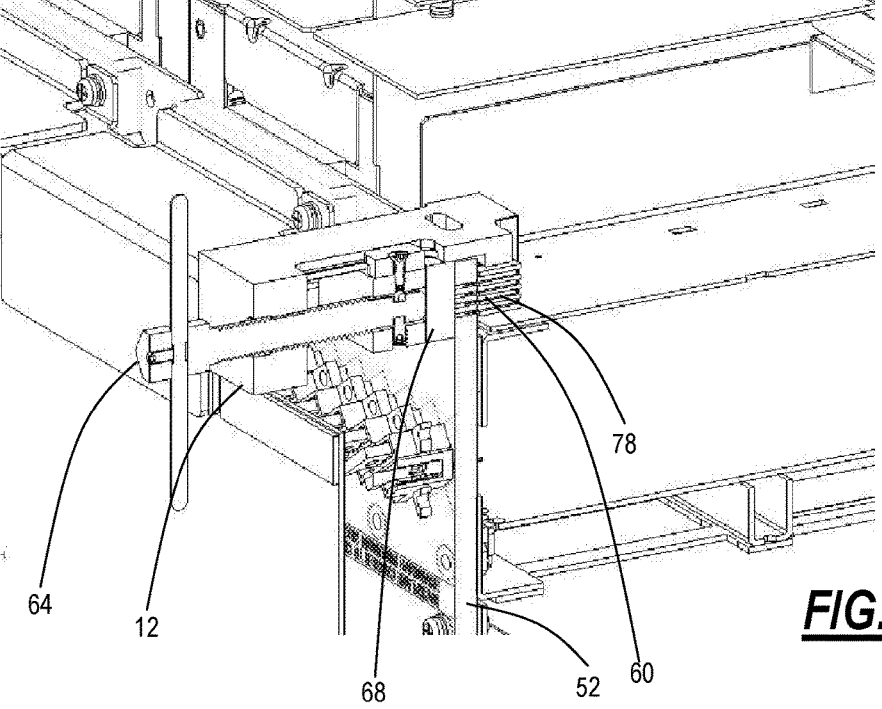


FIG. 10

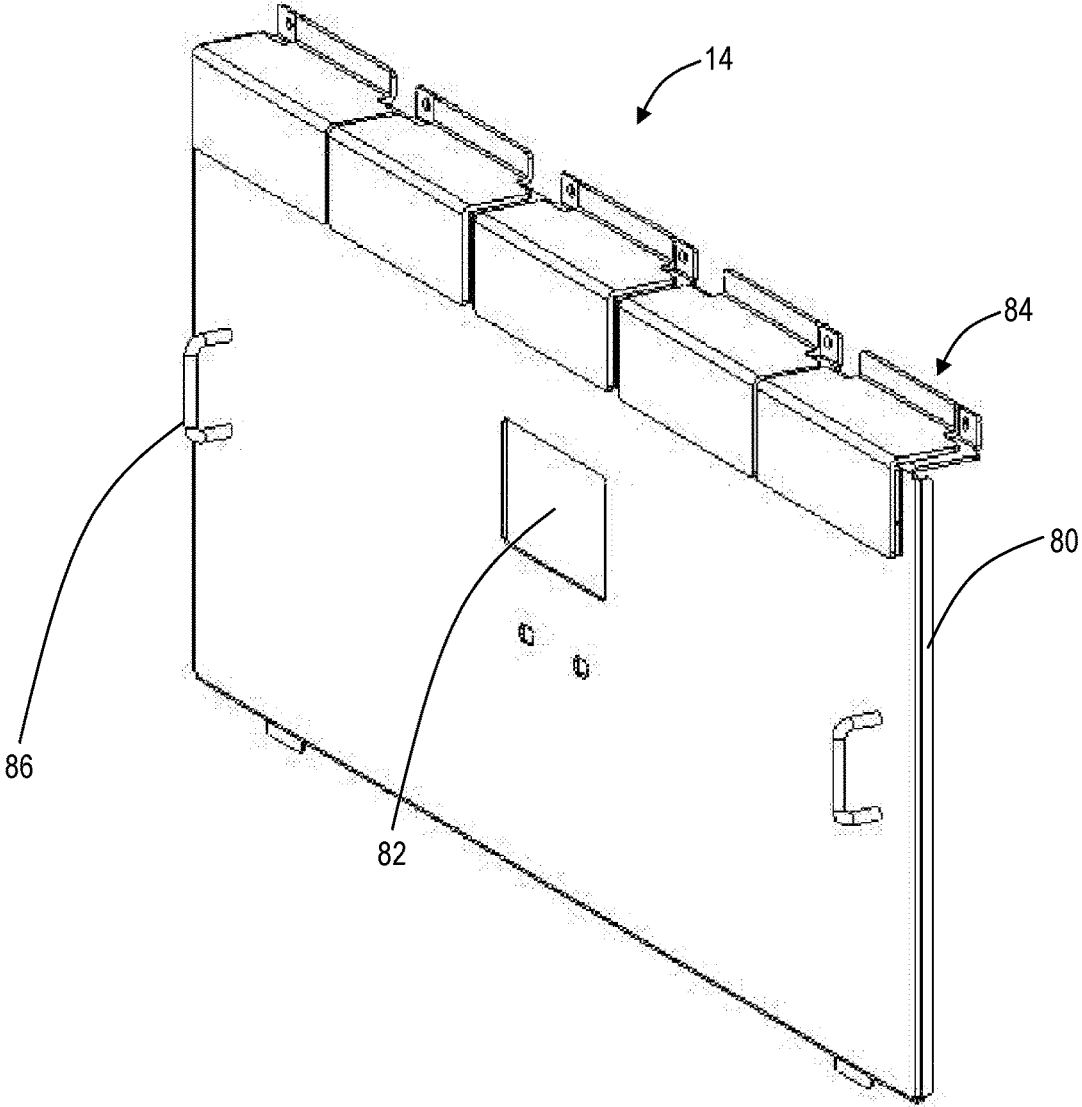


FIG. 11

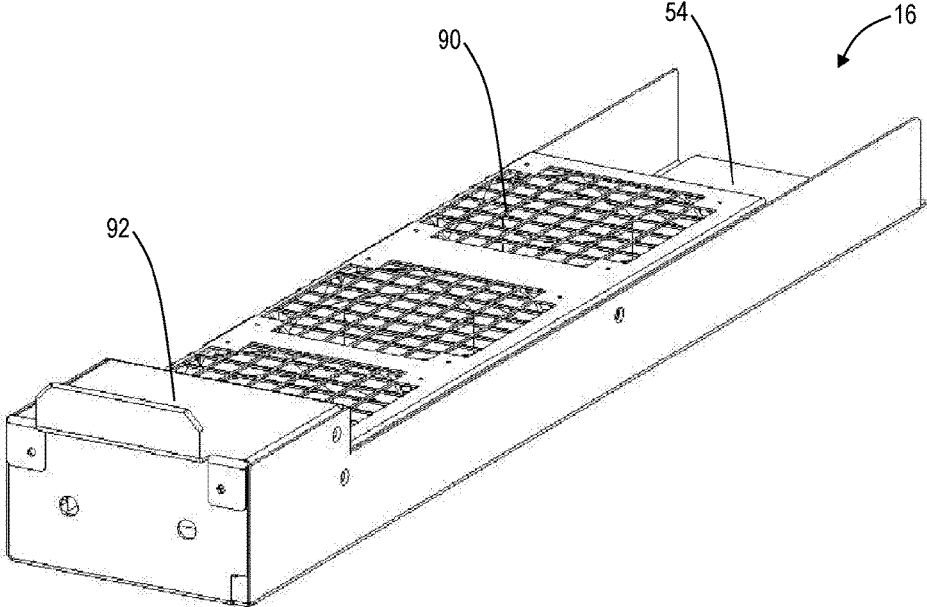


FIG. 12

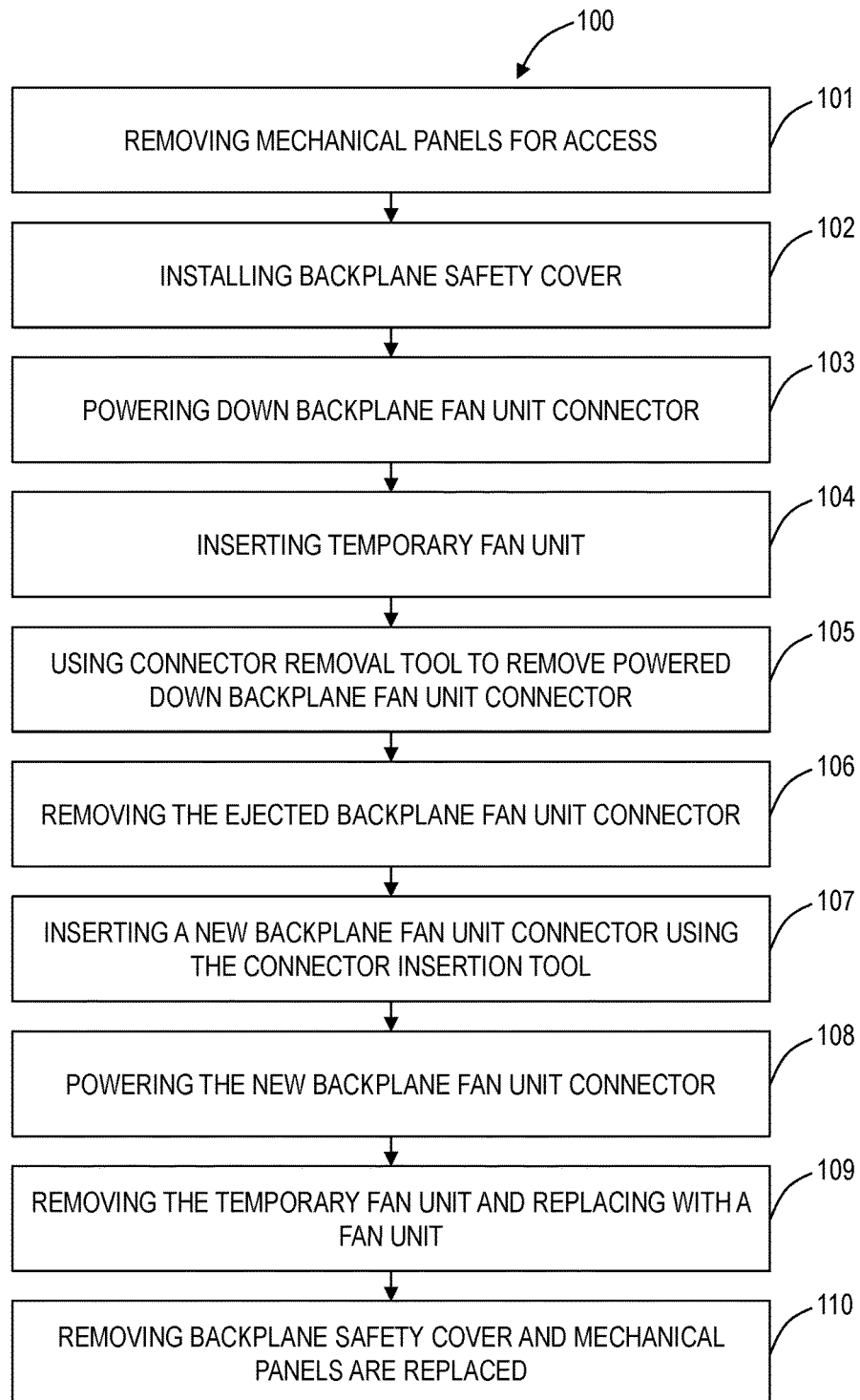


FIG. 13

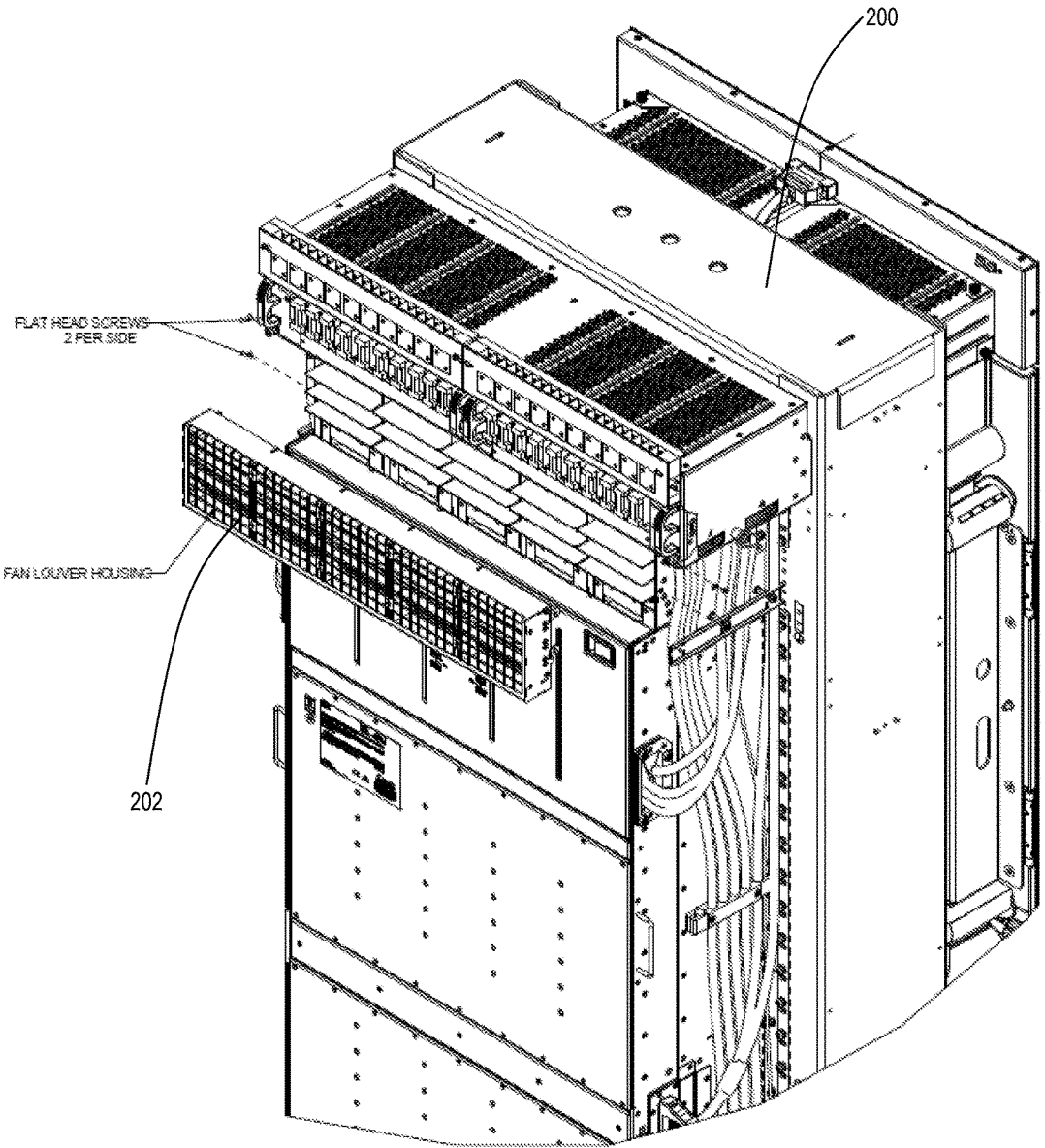


FIG. 14

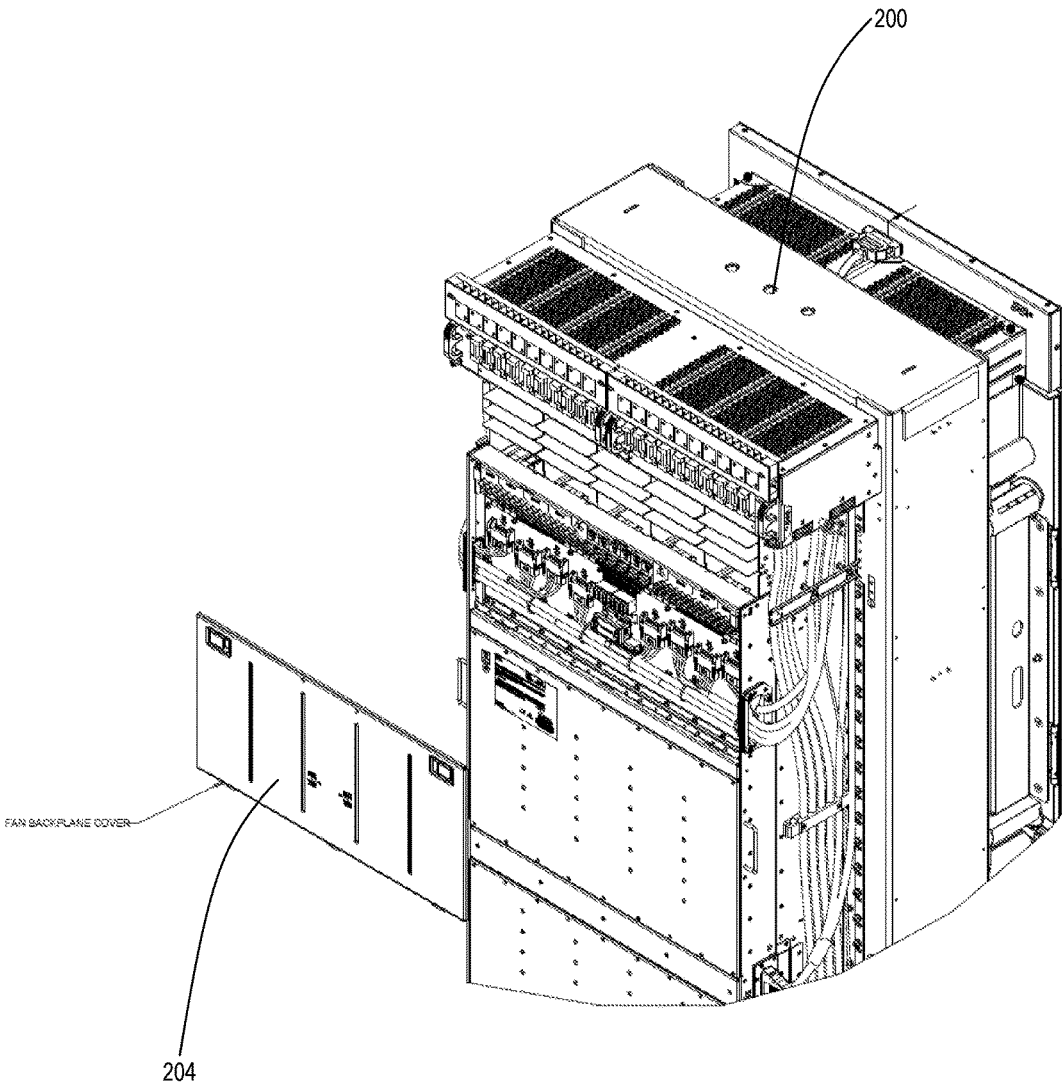


FIG. 15

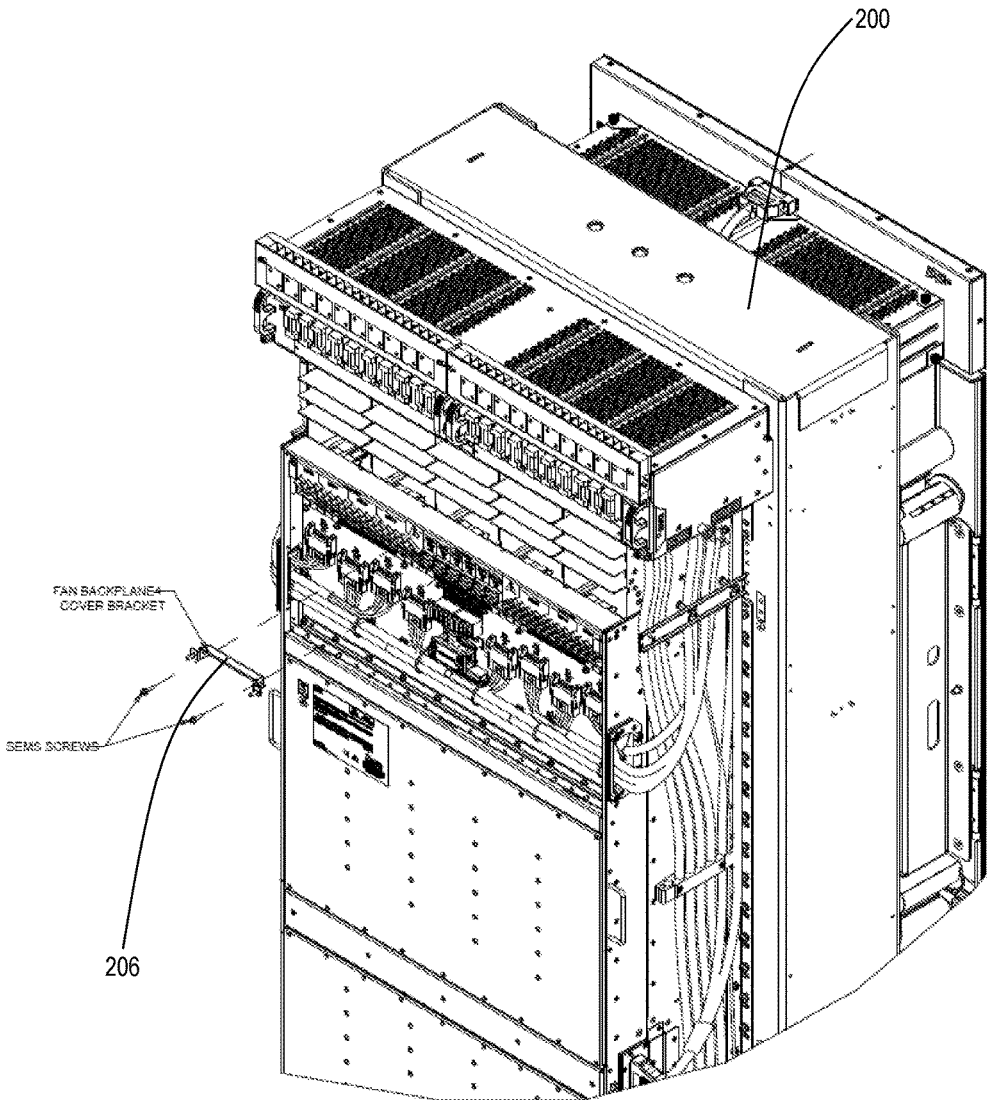


FIG. 16

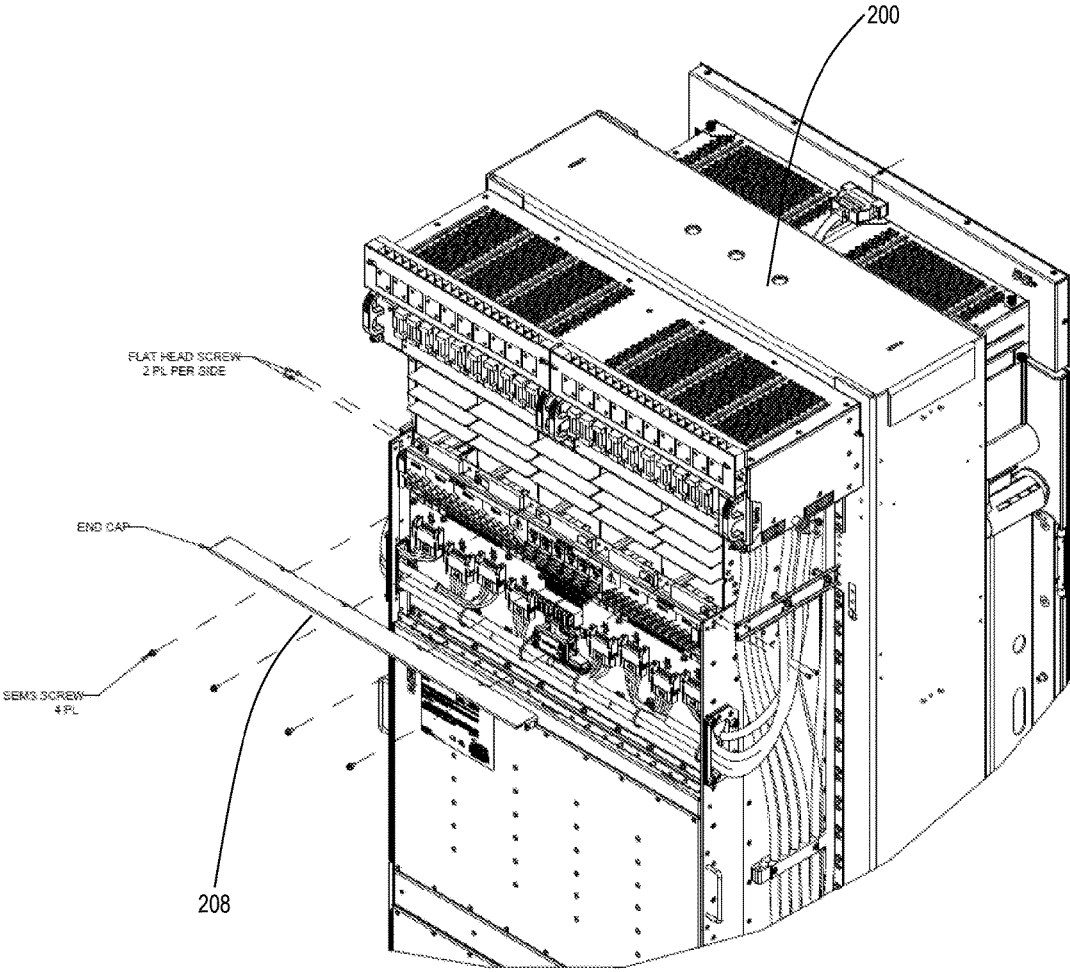


FIG. 17

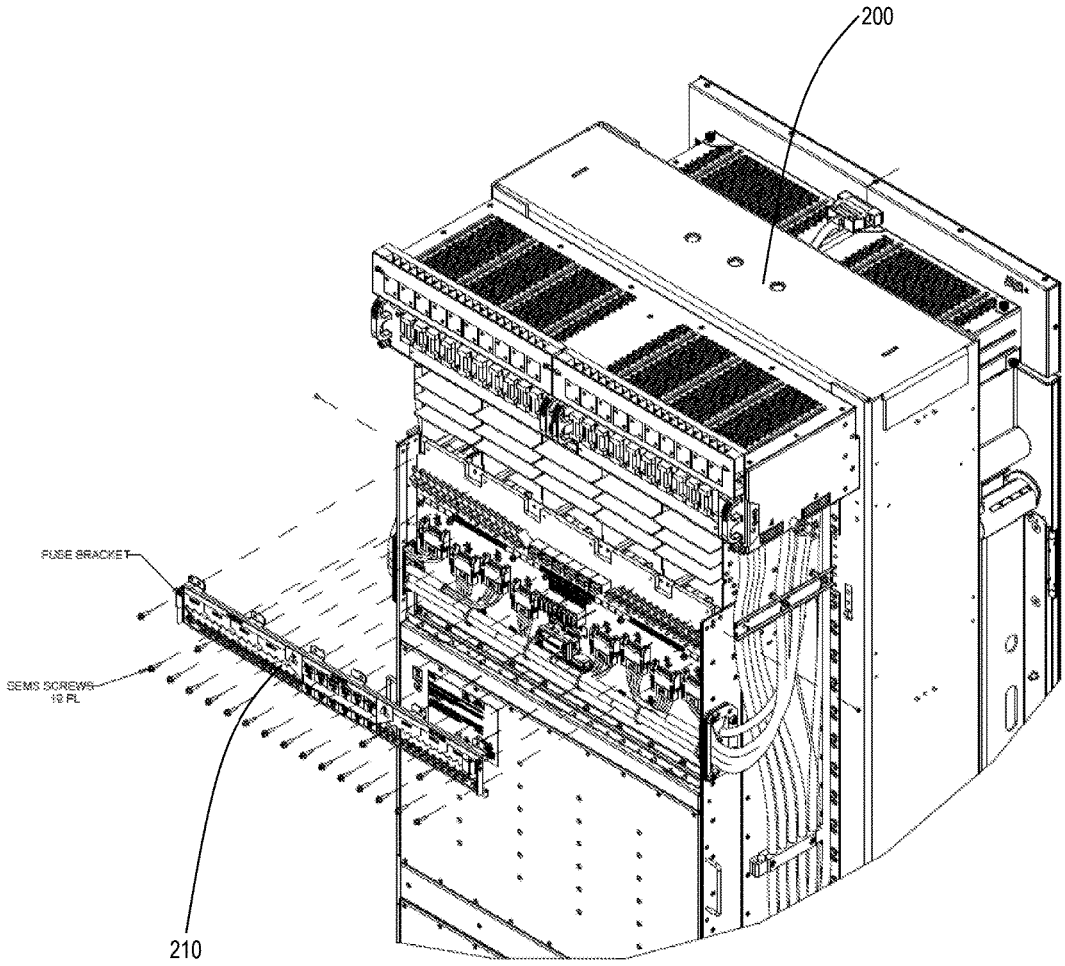


FIG. 18

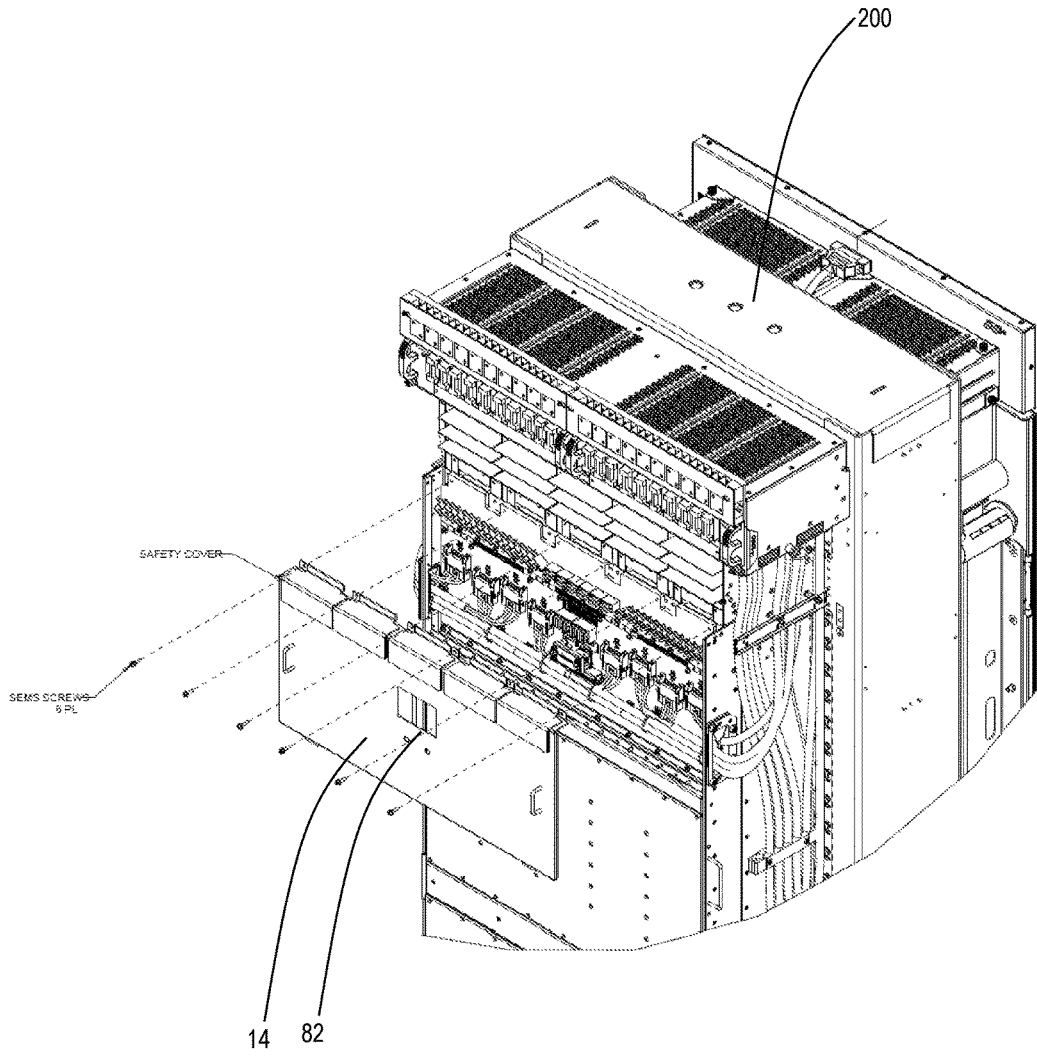


FIG. 19

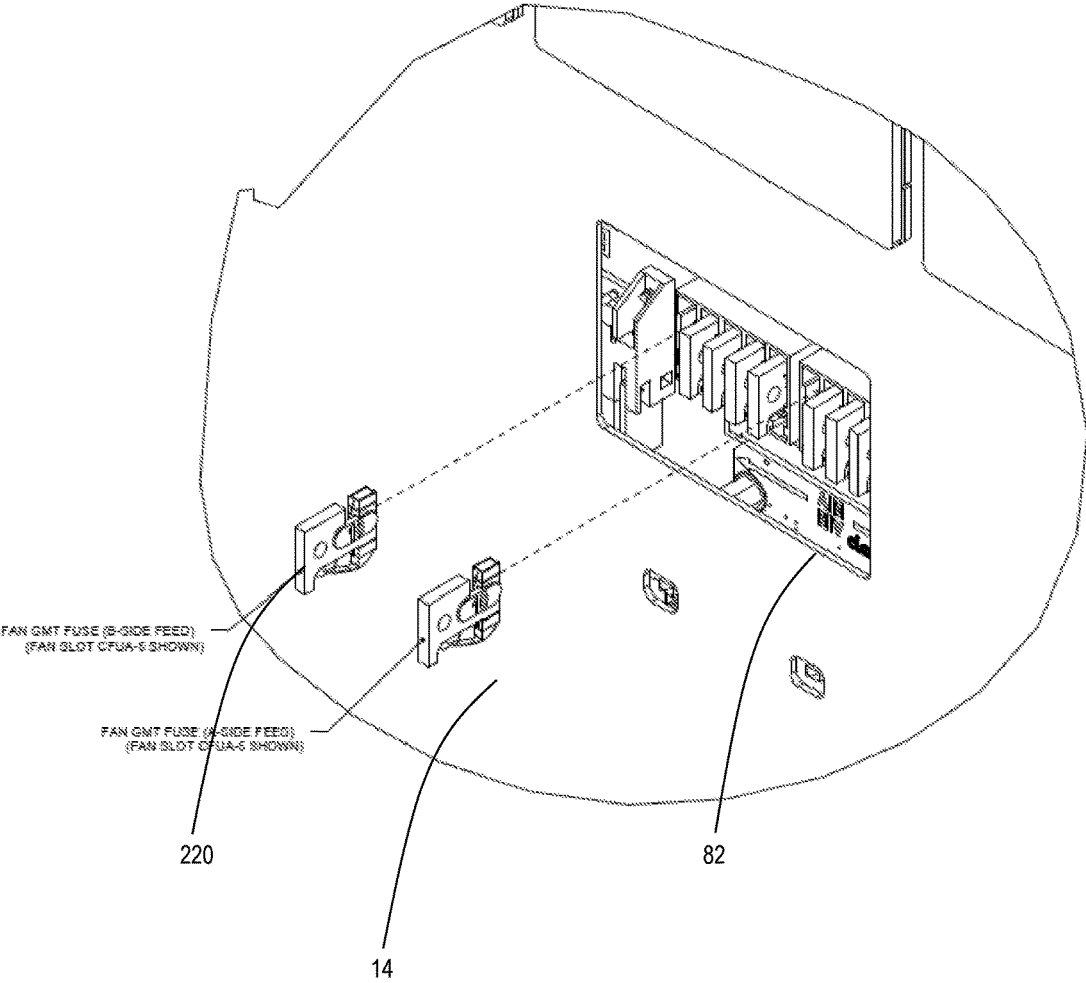


FIG. 20

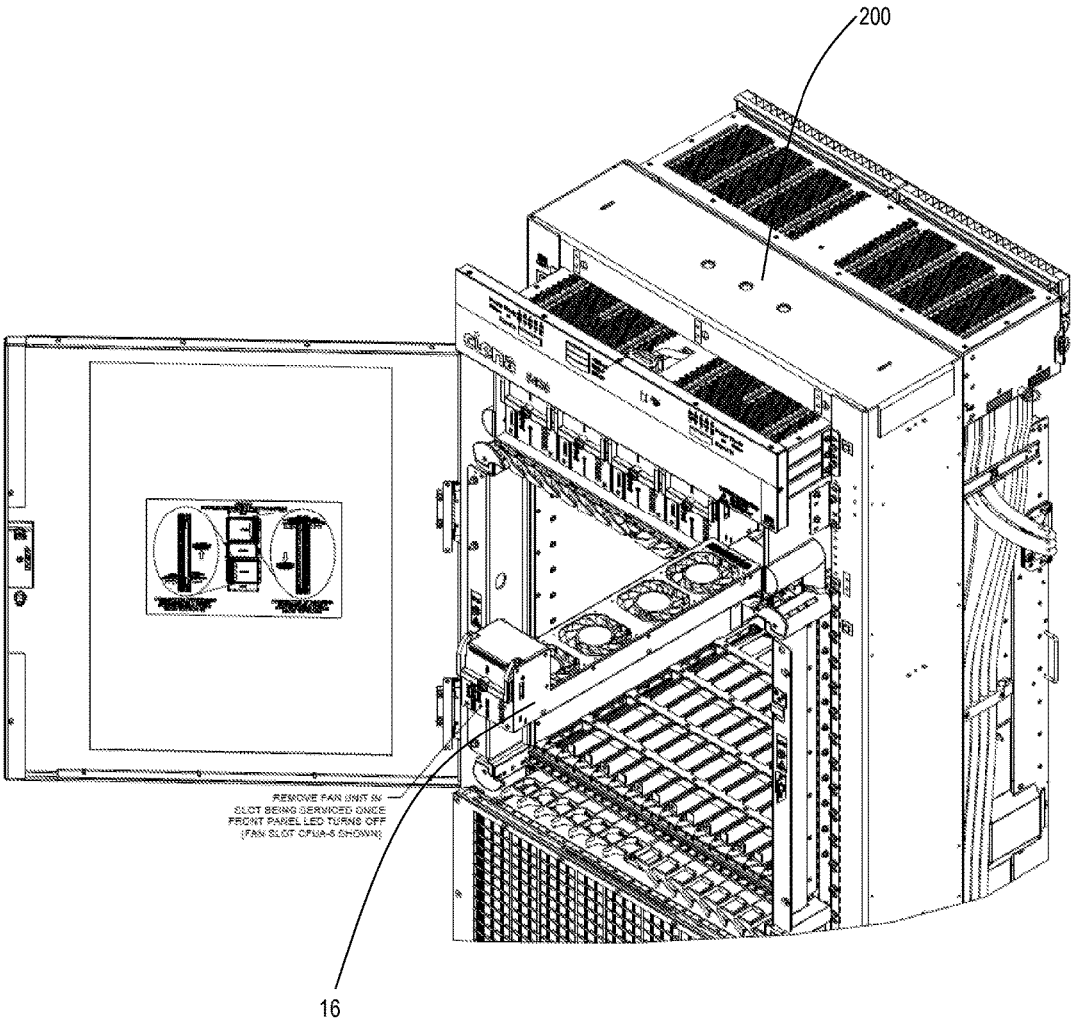


FIG. 21

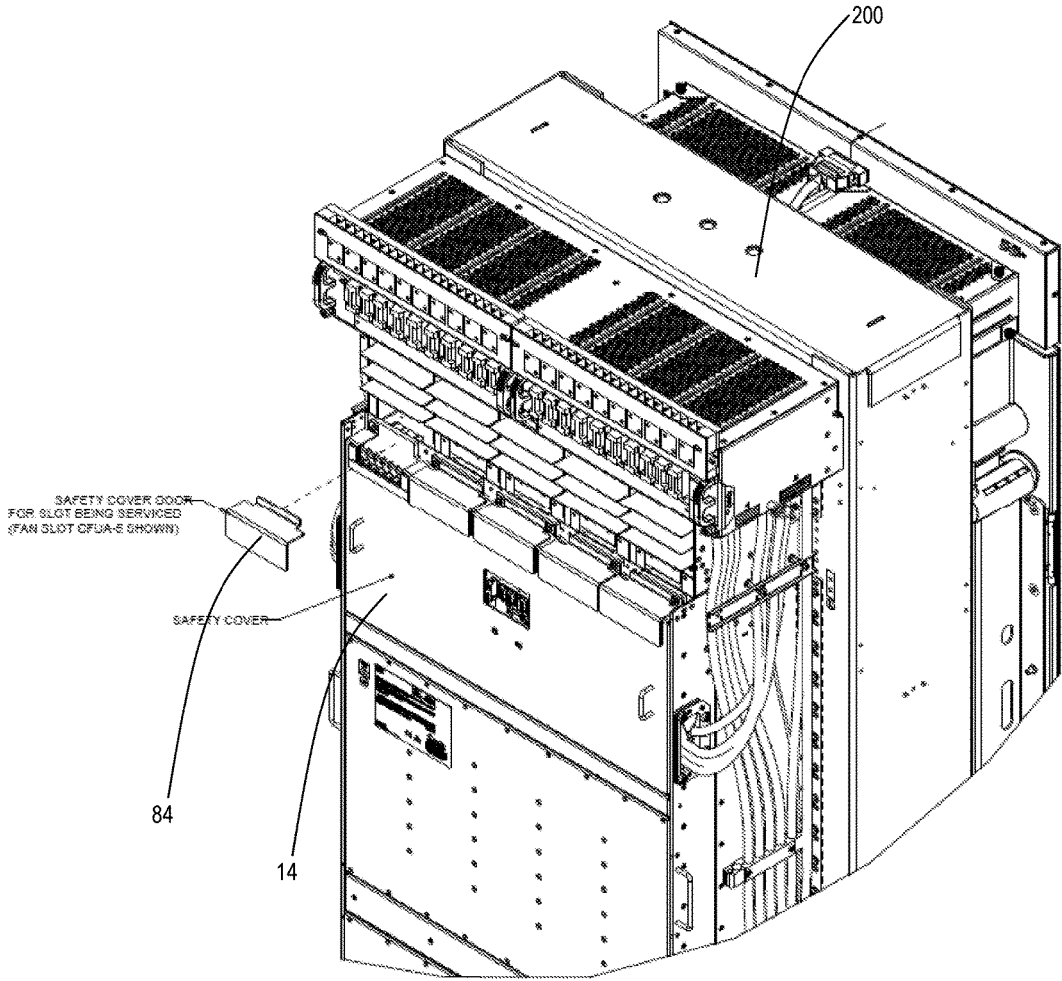


FIG. 22

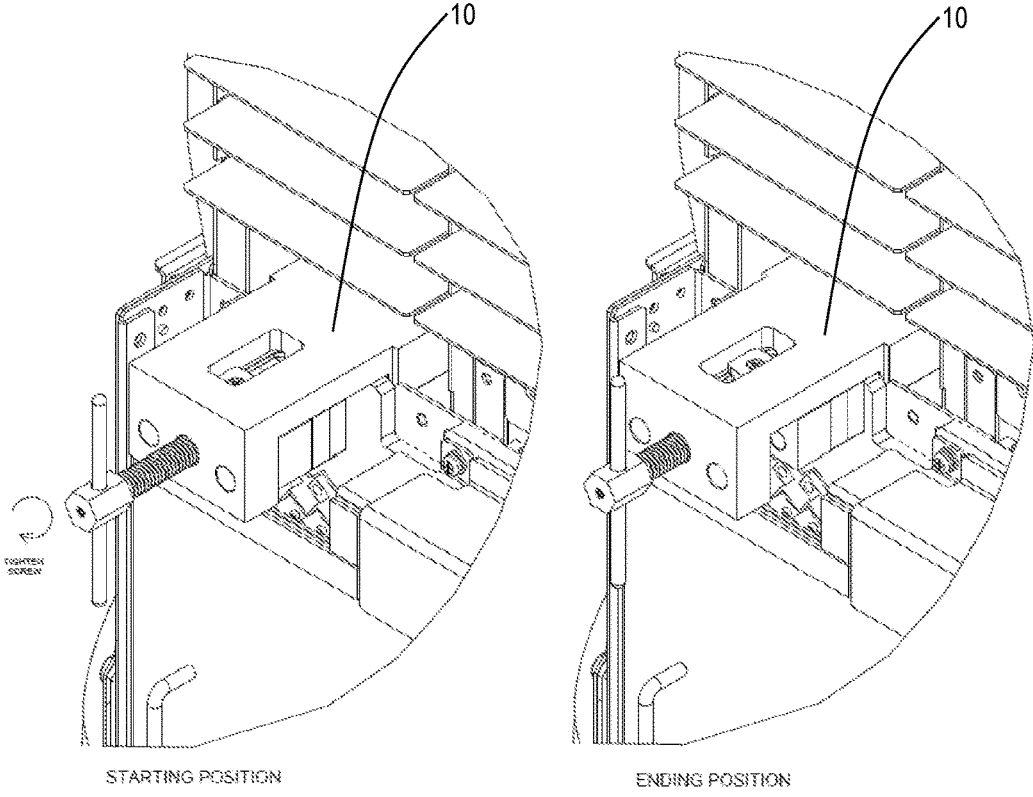


FIG. 23

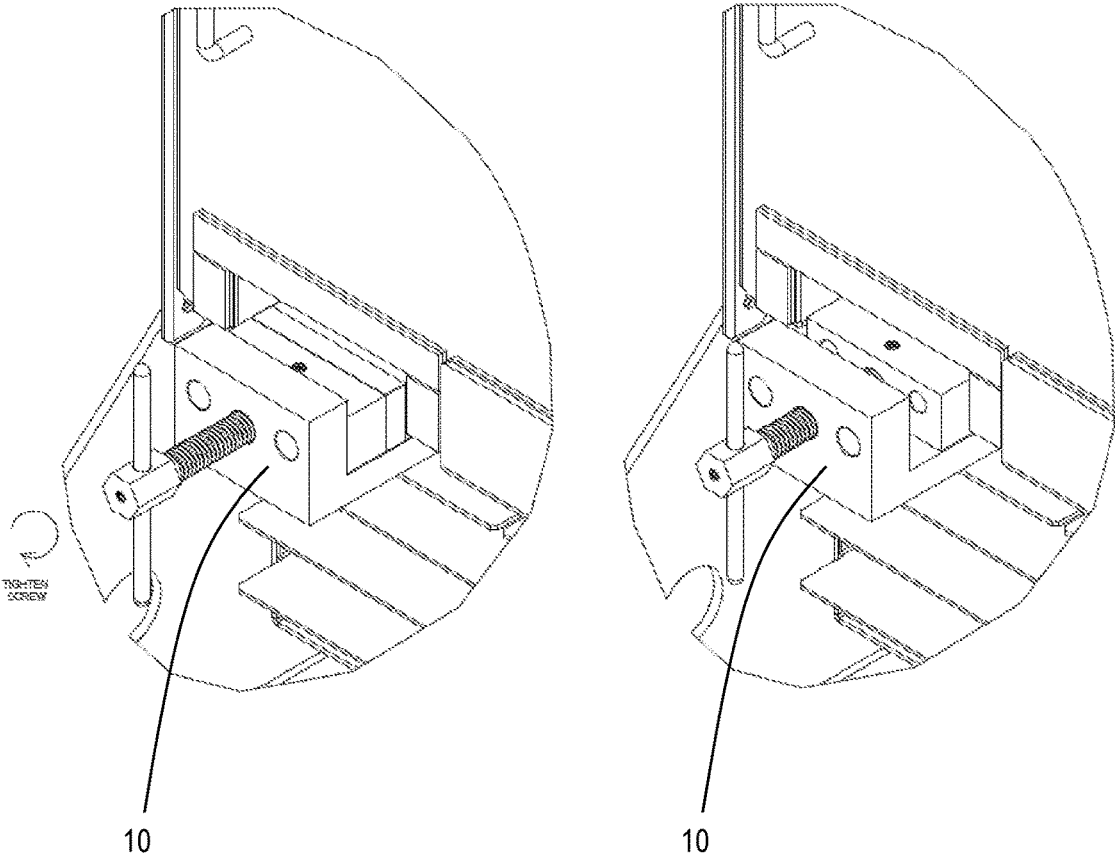


FIG. 24

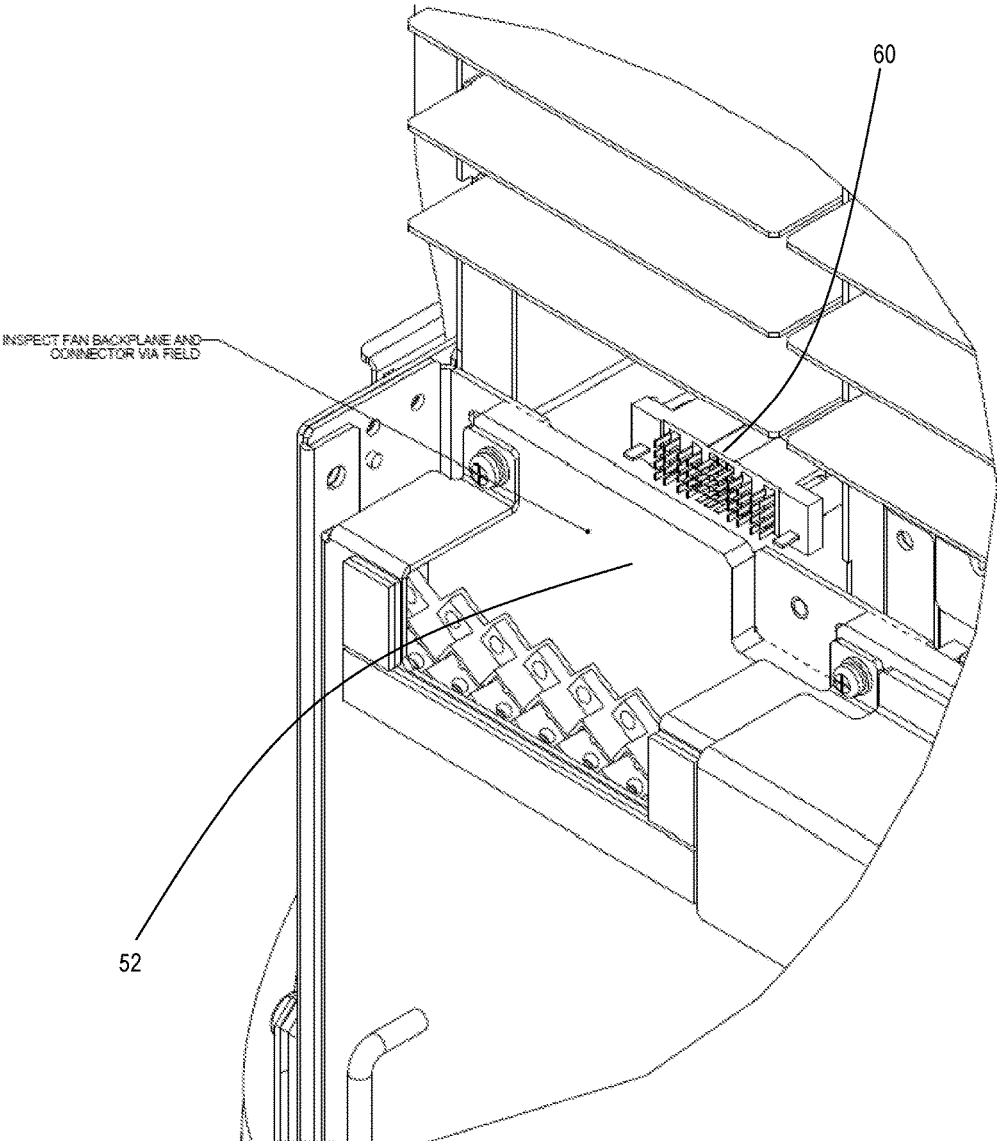


FIG. 25

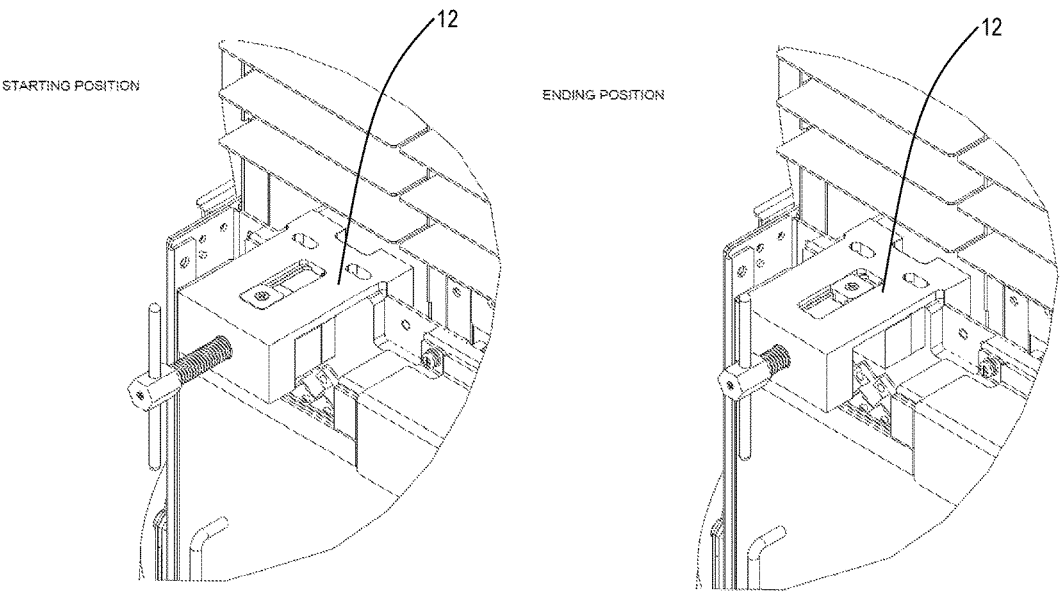


FIG. 26

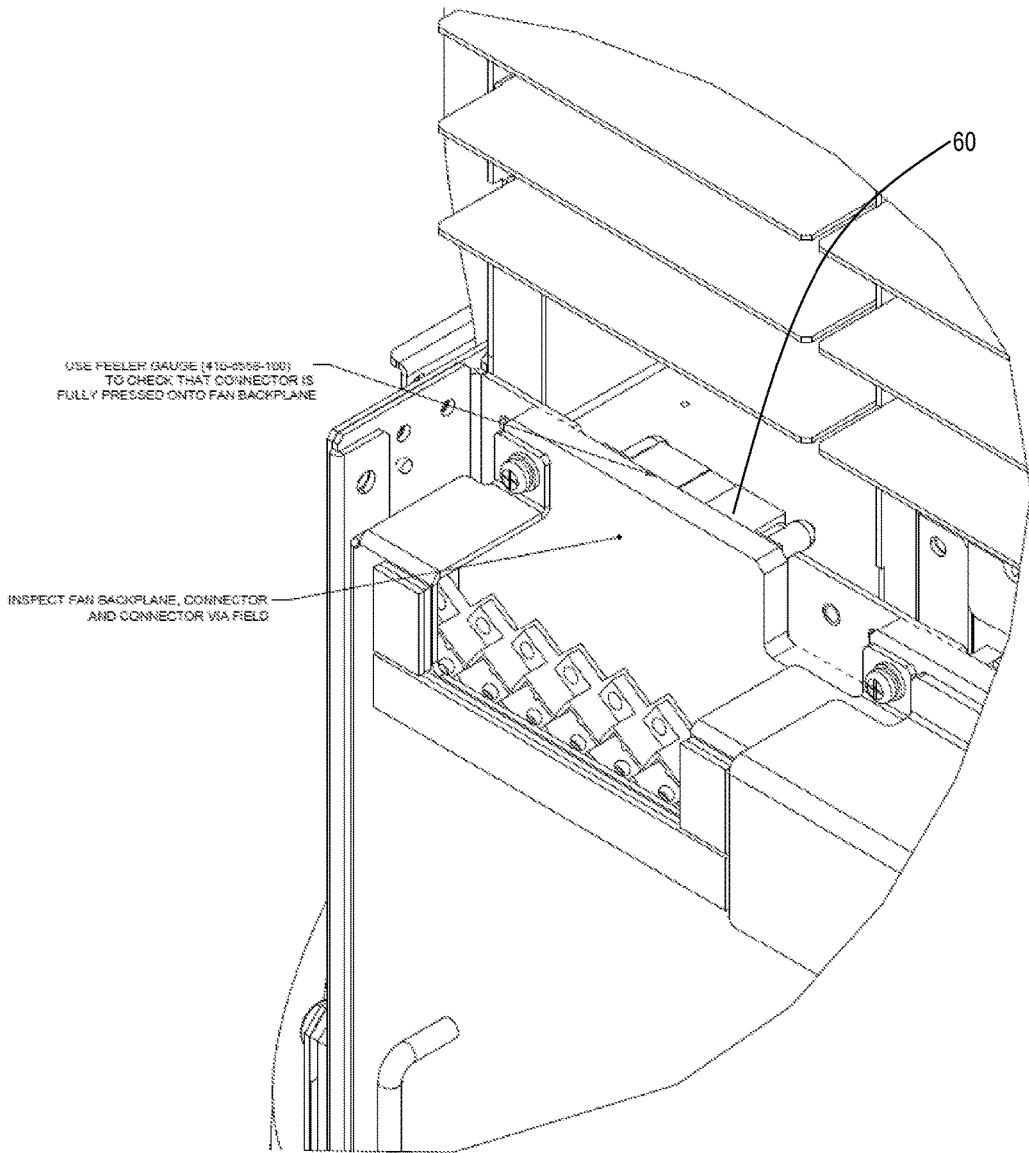


FIG. 27

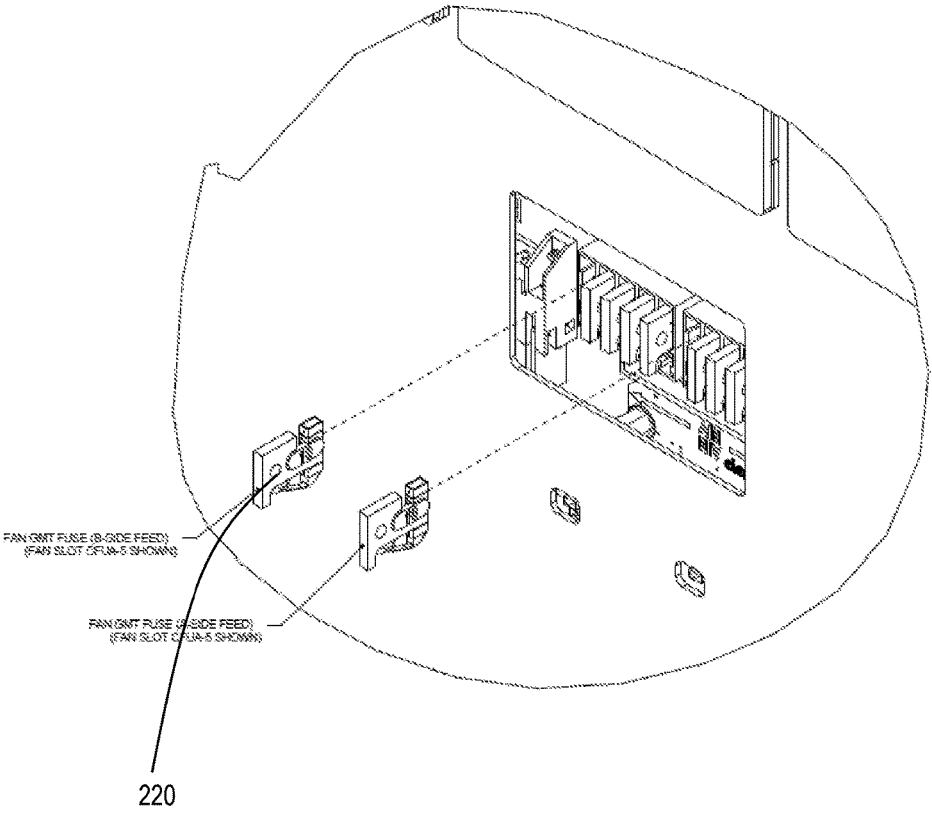


FIG. 28

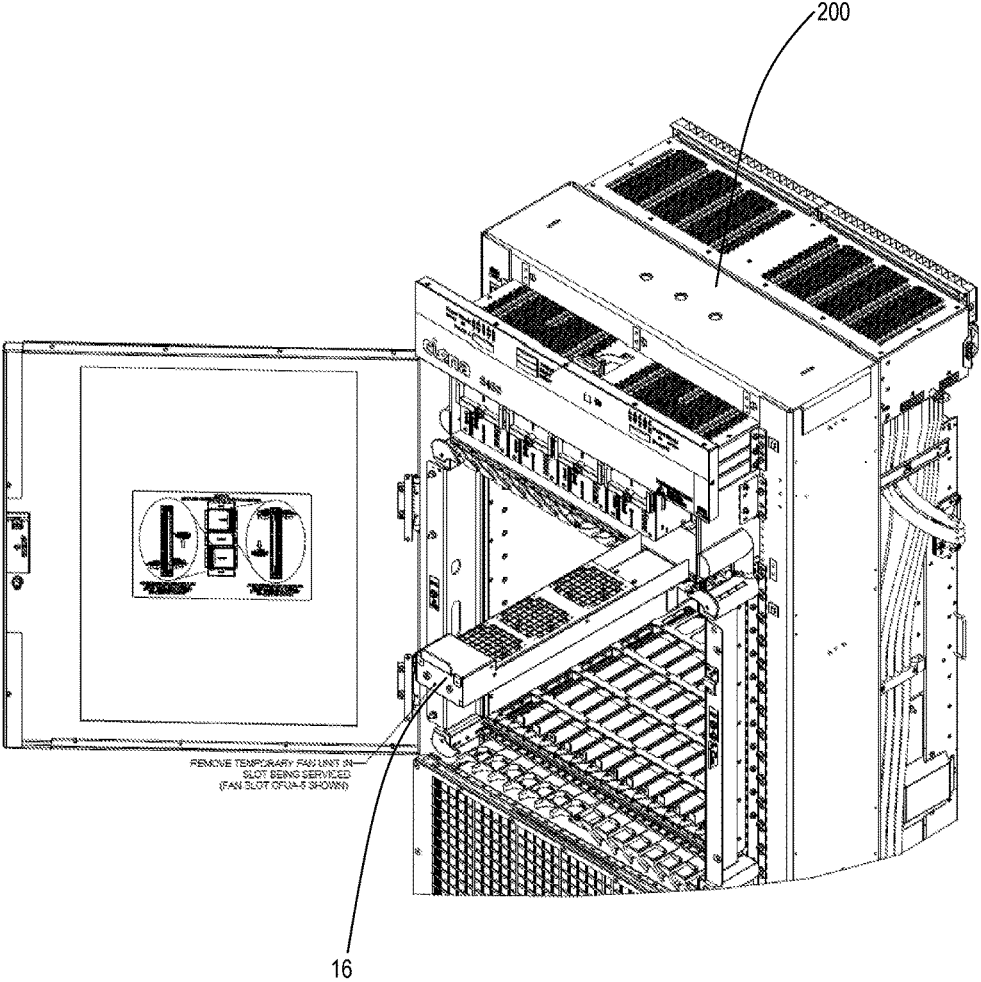


FIG. 29

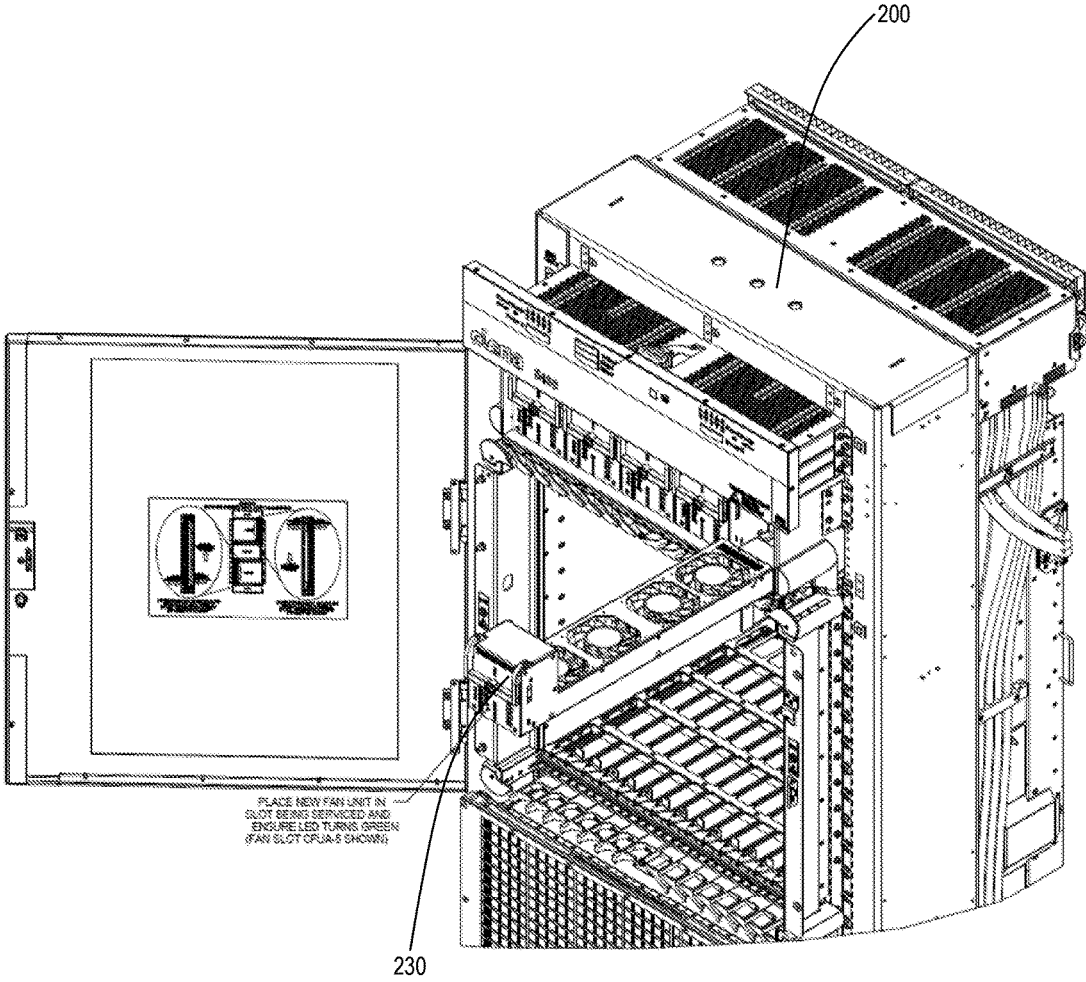


FIG. 30

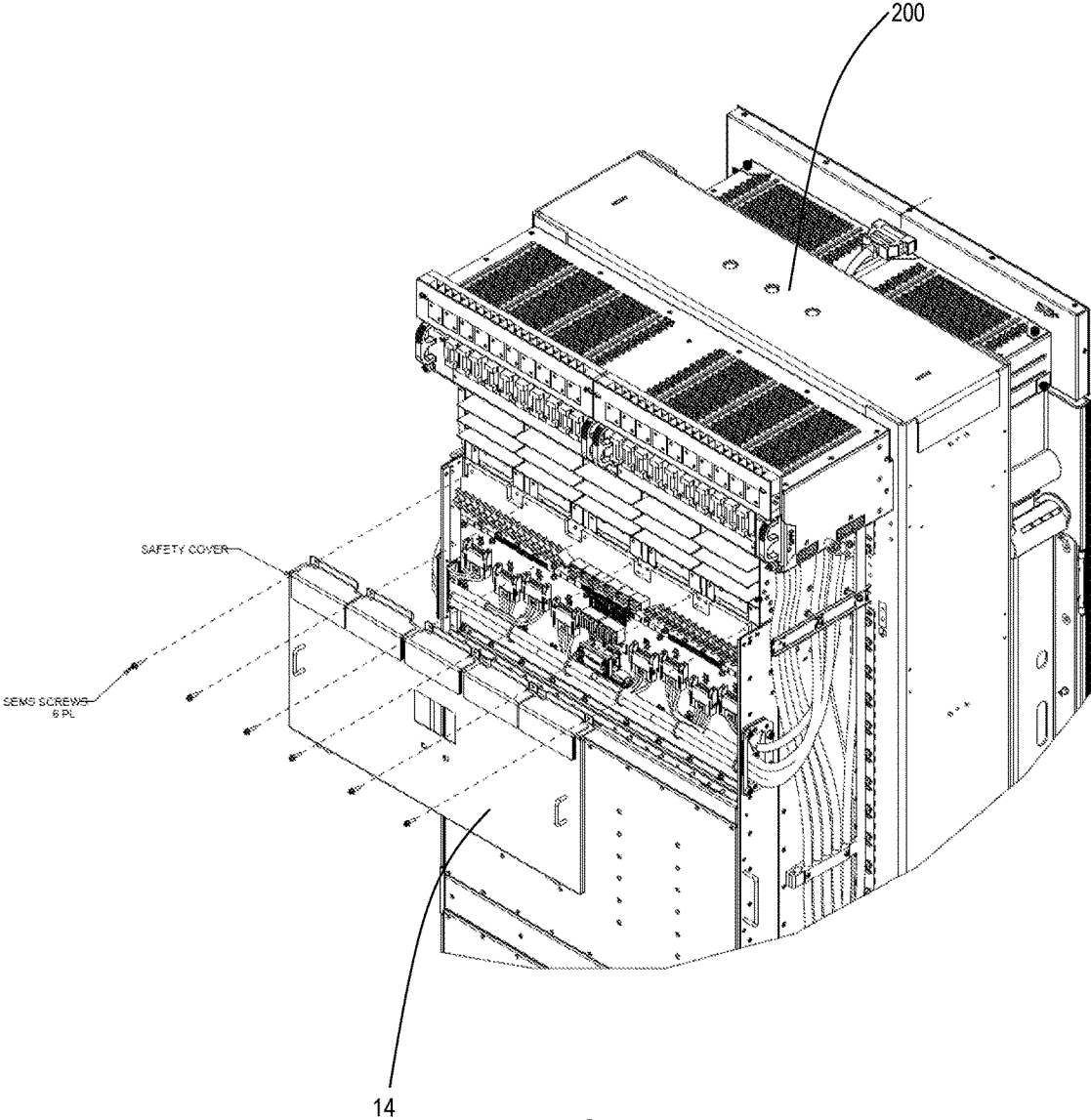


FIG. 31

CONNECTOR REPLACEMENT METHODS AND SYSTEMS IN A NETWORK ELEMENT CHASSIS

FIELD OF THE DISCLOSURE

[0001] The present disclosure generally relates to networking and computer hardware systems and methods. More particularly, the present disclosure relates to systems and methods for in-service connector replacement in a network element chassis.

BACKGROUND OF THE DISCLOSURE

[0002] Networking and computing hardware operates using a modular hardware structure where line cards, modules, blades, plug-ins, circuit packs, etc. (collectively “modules”) are selectively inserted into a chassis for the desired functionality. This connectivity in the chassis may be through a backplane, midplane, etc. (collectively “backplane”) with associated connectors. Conventionally, backplane connectors (“connectors”) are factory installed and not field replaceable. As network element systems increase in performance, functionality, speed, power, etc., situations arise where connectors are damaged due to wear, vibration, corrosion, bending, and the like. One particular situation for damaged connectors arises as a result of vibration induced connector damage that was discovered on the cooling fan units and associated backplane connectors. Such damage is anticipated to become more prevalent as module power and consequently fan speeds and vibrations increase. Conventionally, a connector issue in the field requires a new backplane which effectively requires a new chassis. Thus, connector replacement in-service or even in-field is currently not possible. It would be advantageous to provide in-field and/or in-service connector replacement to address the aforementioned connector issues.

BRIEF SUMMARY OF THE DISCLOSURE

[0003] In an exemplary embodiment, a connector replacement method in a network element chassis includes obtaining physical access to a backplane in the network element chassis, while the network element chassis is deployed; powering down backplane connectors for replacement while other backplane connectors remained powered; removing the powered down backplane connectors with a connector removal tool; inserting a new set of backplane connectors in place of the removed, powered down backplane connectors with a connector insertion tool; and powering up the new set of backplane connectors. The connector replacement method can further include installing a backplane safety cover over the physical access for protection of the backplane and the other backplane connectors during operation on the backplane connectors for replacement. The backplane safety cover can include an open portion for selective access to the backplane and one or more doors for selective access to the backplane connectors.

[0004] The connector removal tool can include a housing, a handle, a vise configured to move based on rotation of the handle, a push out block configured to move based on movement of the vise, and a plurality of pins on the push out block arranged based on the backplane connectors for replacement and configured to push out the backplane connectors for replacement based on movement of the push out block. The connector insertion tool can include a hous-

ing, a handle, a vise configured to move based on rotation of the handle, a push in block configured to move based on movement of the vise, and a connector block on the housing opposing the push in block. The connector removal tool and the connector insertion tool can be configured to operate on the powered down backplane connectors on one of a top portion of the backplane and a bottom portion of the backplane. The backplane connectors for replacement can be fan connectors, and the method can further include installing an externally powered temporary fan unit subsequent to powering down the backplane connectors for replacement, enabling cooling during the method while the network element chassis is in-service. The backplane connectors for replacement can be fan connectors, and wherein temporary cooling can be performed in the network element chassis while the backplane connectors for replacement are powered down.

[0005] In another exemplary embodiment, a toolkit for replacing connectors in a network element chassis includes a connector removal tool adapted to remove a set of backplane connectors from a backplane in the network element chassis in-service; a connector insertion tool adapted to insert a new set of backplane connectors into the backplane; and a backplane safety cover adapted to protect areas of the backplane which are not being operated on by the connector removal tool and the connector insertion tool. The backplane safety cover can include an open portion for selective access to the backplane and one or more doors for selective access to the backplane connectors.

[0006] The connector removal tool can include a housing, a handle, a vise configured to move based on rotation of the handle, a push out block configured to move based on movement of the vise, and a plurality of pins on the push out block arranged based on the backplane connectors for replacement and configured to push out the backplane connectors for replacement based on movement of the push out block. The connector insertion tool can include a housing, a handle, a vise configured to move based on rotation of the handle, a push in block configured to move based on movement of the vise, and a connector block on the housing opposing the push in block. The connector removal tool and the connector insertion tool can be configured to operate on the powered down backplane connectors on one of a top portion of the backplane and a bottom portion of the backplane. The connector removal tool can include a cavity for collecting the powered down backplane connectors. The backplane connectors for replacement can be fan connectors, and the toolkit can further include an externally powered temporary fan unit installed subsequent to powering down the backplane connectors for replacement, to enable cooling while the network element chassis is in-service. The backplane connectors for replacement can be fan connectors, and wherein temporary cooling can be performed in the network element chassis while the backplane connectors for replacement are powered down.

[0007] In a further exemplary embodiment, a backplane fan unit connector replacement method in a network element chassis includes obtaining physical access to a backplane in the network element chassis, while the network element chassis is deployed; powering down backplane connectors for replacement while other backplane connectors remained powered; installing an externally powered temporary fan unit subsequent to powering down the backplane connectors for replacement, enabling cooling during the method while

the network element chassis is in-service; removing the powered down backplane connectors with a connector removal tool; inserting a new set of backplane connectors in place of the removed, powered down backplane connectors with a connector insertion tool; and powering up the new set of backplane connectors. The backplane fan unit connector replacement method can further include installing a backplane safety cover over the physical access for protection of the backplane and the other backplane connectors during operation on the backplane connectors for replacement.

[0008] The connector removal tool can include a housing, a handle, a vise configured to move based on rotation of the handle, a push out block configured to move based on movement of the vise, and a plurality of pins on the push out block arranged based on the backplane connectors for replacement and configured to push out the backplane connectors for replacement based on movement of the push out block. The connector insertion tool can include a housing, a handle, a vise configured to move based on rotation of the handle, a push in block configured to move based on movement of the vise, and a connector block on the housing opposing the push in block.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The present disclosure is illustrated and described herein with reference to the various drawings, in which like reference numbers are used to denote like system components/method steps, as appropriate, and in which:

[0010] FIG. 1 is a perspective view of the connector removal tool for removing backplane connectors;

[0011] FIG. 2 is a cross-sectional view of the connector removal tool of FIG. 1;

[0012] FIG. 3 is an exploded part view of the connector removal tool of FIG. 1;

[0013] FIG. 4 is a perspective diagram of use of the connector removal tool of FIG. 1 to remove a connector block from a bottom portion of a backplane;

[0014] FIG. 5 is a perspective diagram of use of the connector removal tool of FIG. 1 to remove a connector block from a top portion of the backplane;

[0015] FIG. 6 is a perspective view of the connector insertion tool for inserting backplane connectors;

[0016] FIG. 7 is a perspective view of another side of the connector insertion tool of FIG. 6;

[0017] FIG. 8 is a close-up of a connector block which is inserted using the connector insertion tool of FIG. 6;

[0018] FIGS. 9 and 10 are perspective diagrams of use of the connector insertion tool of FIG. 6 to insert the connector block in the backplane;

[0019] FIG. 11 is a perspective diagram of a backplane safety cover, for protecting the backplane and protecting operators while using the connector removal tool of FIG. 1 and the connector insertion tool of FIG. 6;

[0020] FIG. 12 is a perspective diagram of a temporary fan unit, for providing cooling while connectors are replaced, in-service;

[0021] FIG. 13 is a flowchart of a connector replacement process, utilizing the connector removal tool of FIG. 1, the connector insertion tool of FIG. 6, the backplane safety cover of FIG. 11, and the temporary fan unit of FIG. 12; and

[0022] FIGS. 14-31 are perspective diagrams of an exemplary operation of the fan connector replacement process of FIG. 13 on an exemplary chassis.

DETAILED DESCRIPTION OF THE DISCLOSURE

[0023] Again, in various exemplary embodiments, the present disclosure relates to systems and methods for in-service connector replacement in a network element chassis. The systems and methods include tools and an associated methodology to replace damaged backplane connectors in the field and in-service. As described herein, in the field means the hardware (i.e., system, chassis, etc.) has been shipped to the end user and in-service means the system is in the field and also operational. In an exemplary embodiment, the systems and methods include replacing damaged backplane connectors used for powering cooling fan units while the chassis is operating. Through in-service performance, traffic on the chassis is unaffected. The various exemplary embodiments are described herein with reference to removal and insertion of connectors associated with cooling fan units, but those of ordinary skill in the art will recognize the systems and methods are contemplated with any connectors in-service. In an exemplary embodiment, the in-service replacement of connectors associated with cooling fans includes a temporary fan unit that provides cooling during the replacement procedure while the cooling fans are removed. Advantageously, the systems and methods allow the chassis to maintain live traffic while connector replacement is performed.

[0024] In various exemplary embodiments, the systems and methods utilize various mechanical tools and jigs such as a connector removal tool 10, a connector insertion tool 12, a backplane safety cover 14, and a temporary fan unit 16. The connector removal tool 10 is a jig which removes damaged connectors in-service, the connector insertion tool 12 inserts new connectors in-service, the backplane safety cover 14 can be placed over the remaining portion of a backplane which is not being worked on, and the temporary fan unit 16 is utilized in the specific embodiment associated with replacing cooling fan connectors. Each of the aforementioned tools and jigs is described as follows.

Connector Removal Tool

[0025] Referring to FIGS. 1-3, in an exemplary embodiment, various diagrams illustrate a connector removal tool 10 for removing backplane connectors. Specifically, FIG. 1 is a perspective view of the connector removal tool 10, FIG. 2 is a cross-sectional view of the connector removal tool 10, and FIG. 3 is an exploded part view of the connector removal tool 10. The connector removal tool 10 is configured to operate on the top, bottom, or sides of a Printed Circuit Board (PCB), backplane, etc. to remove backplane connectors. The connector removal tool 10 includes a housing 20, a rotatable handle 22, a vise 24, and a sliding pin push out block 26 with a plurality of pins 28. The plurality of pins 28 is arranged as required for pushing out corresponding pins in a backplane, Printed Circuit Board (PCB), etc. The housing 20 can include a cavity 30 where the removed connectors are collected.

[0026] In FIG. 1, the connector removal tool 10 is arranged to remove pins from a lower portion of the backplane. In an alternate embodiment, the connector removal tool 10 can be arranged to remove connectors on an upper portion of the backplane, with the cavity 30 flipped. Note that to remove connectors from an upper portion of the backplane, the connector removal tool 10 has to be reori-

ented (used upside down). Operationally, the handle **22** is rotated to turn a screw **32** which translates force to the vise **24** which in turn exerts a force on the sliding pin push out block **26** which in turn exerts a force on the pins **28** which push out corresponding connectors into the cavity **30**.

[0027] In FIG. 2, a cross-section of the connector removal tool **10** shows the vise **24** is coupled to a sliding block **34** which is slidingly connected to the housing **20** in a channel **36**. The sliding pin push out block **26** is also selectively insertable in the vise **24**. Particularly, the pins **28** are arranged as required, and different push out blocks **26** can have different pin arrangements as required such that the connector removal tool **10** can support different connector arrangements.

[0028] In FIG. 3, the exploded part view shows connectivity between the vise **24**, the push out block **26**, and the housing **20**. Also, the cavity **30** can be formed by plates **38**, **40** which slidingly engage the housing **20** for supporting the cavity **30** to capture the connectors in either an upper or lower portion arrangement, i.e., whether the connector removal tool **10** is used from a bottom or top of the backplane. Also, the plates **38**, **40** can be transparent allowing a camera to see through the plates **38**, **40** during operation. Alternatively, when the cavity **30** is upside down, use temporary fan unit **16** to capture removed connectors instead.

[0029] Referring to FIGS. 4 and 5, in exemplary embodiments, perspective diagrams illustrate the use of the connector removal tool **10** to remove connectors **50** from a bottom portion of a backplane **52** (FIG. 4) and from a top portion of the backplane **52** (FIG. 5). In FIG. 4, the connectors **50** are captured in the cavity **30**. In FIG. 5, the connectors **50** are captured in a catch basin **54** in the temporary fan unit **16**.

Connector Insertion Tool

[0030] Referring to FIGS. 6-8, various diagrams illustrate a connector insertion tool **12** for inserting backplane connectors. Specifically, FIG. 6 is a perspective view of the connector insertion tool **12**, FIG. 7 is a perspective view of another side of the connector insertion tool **12**, and FIG. 8 is a close-up of a connector block **60** which is inserted using the connector insertion tool **12**. The connector insertion tool **12** is similar to the connector removal tool **10**, providing the opposite functionality. The connector insertion tool **12** is configured to operate on the top, bottom, or sides of a Printed Circuit Board (PCB), backplane, etc. to insert the connector block **60**. In FIG. 6, the connector insertion tool **12** includes a housing **62**, a rotatable handle **64**, a vise **66**, and a sliding push in block **68**, and a cavity **70** in the housing **62** for holding the connector block **60**.

[0031] FIG. 7 shows a sliding block **72** that holds the vise **66** and the push in block **68** to the housing **62**. The connector block **60** can be held in the cavity **70** by inserts **74** which engage holes **76** in the housing **62**. FIG. 8 shows the connector block **60** inserted into the cavity **70**, with the inserts **74** engaging the holes **76**. Again, the connector insertion tool **12** can support different types of connector blocks **60** with varying pin arrangements.

[0032] Referring to FIGS. 9 and 10, in an exemplary embodiment, perspective diagrams illustrate the use of the connector insertion tool **12** to insert the connector block **60** in the backplane **52**. In FIG. 9, the connector insertion tool **12** aligns to holes **78** (vias) in the backplane **52**. In FIG. 10,

the handle **64** is rotated to push the push in block **68** forward via the vise **66** to engage the connector block **60** in the holes **78**.

Backplane Safety Cover

[0033] Referring to FIG. 11, in an exemplary embodiment, a perspective diagram illustrates a backplane safety cover **14**, for protecting the backplane **52** while using the connector removal tool **10** and the connector insertion tool **12**. Again, the tools **10**, **12** contemplate operation in-service on the backplane **52** to remove damaged connectors and insert the connector block **60**. Accordingly, the backplane safety cover **14** provides protection to the backplane **52** for areas not being addressed. In this example, the backplane **52** has connectors at the top. Accordingly, the backplane safety cover **14** includes a covered portion **80**, an open portion **82**, and various cover doors **84** that can open and close to provide access to specific portions of the backplane **52** for operation thereon. Further, the backplane safety cover **14** can include handles **86** as well. Note, the open portion **82** is an opening to provide access to fuses.

Temporary Fan Unit

[0034] Referring to FIG. 12, in an exemplary embodiment, a perspective diagram illustrates a temporary fan unit **16**, for providing cooling while fan connectors are replaced, in-service. In an exemplary embodiment, the connector removal tool **10** and the connector insertion tool **12** and the backplane safety cover **14** are used to replace damaged backplane connectors used for powering fan units while the chassis (or shelf) is kept live (in-service). By keeping the chassis (or shelf) live, any traffic that is being routed through it is unaffected. Accordingly, it is important to protect physically the backplane **52** during the procedure to remove and replace connectors, such as via the backplane safety cover **14**. Also, when removing a fan unit, it is important to continue to provide cooling while the procedure is performed. Accordingly, the temporary fan unit **16** can be used in place of the fan unit while the procedure is performed.

[0035] The temporary fan unit **16** includes cooling fans **90** in a housing **92**. The housing **92** is dimensioned to fit into a slot for the fan unit. However, the temporary fan unit **16** does not plug into the backplane **52**. Instead, the temporary fan unit **16** uses external power, such as from a power supply, power cable, etc. A rear portion of the housing **92** includes the catch basin **54** for capturing the connectors as well as open space for performing the procedure.

Fan Connector Replacement Process

[0036] Referring to FIG. 13, in an exemplary embodiment, a flowchart illustrates a connector replacement process **100**, utilizing the connector removal tool **10**, the connector insertion tool **12**, the backplane safety cover **14**, and the temporary fan unit **16**. The connector replacement process **100** includes removing mechanical panels for access (step **101**). For example, mechanical panels are removed to provide access to relevant fuses and to provide access to fan backplane connectors. The connector replacement process **100** includes installing the backplane safety cover **14** overtop of non-relevant electrical components to protect operators (step **102**). The connector replacement process **100** includes powering down the backplane fan unit connector where the connector is being replaced (while keeping all other equip-

ment operational) (step 103). Here, this can include removing a fuse associated with the backplane fan unit connector.

[0037] Next, the connector replacement process 100 includes inserting the temporary fan unit 16, to provide cooling to live circuit packs (step 104). The temporary fan unit 16 is externally powered and does not obscure access to backplane fan unit connector to be replaced. The connector replacement process 100 includes using the connector removal tool 10 to remove the powered down, backplane fan unit connector (step 105). This procedure accesses the backplane fan unit connector from the rear, but depending upon mechanical constraints, this could also be performed from the front of the backplane, as well as from either a top portion or a bottom portion of the backplane.

[0038] The connector replacement process 100 includes removing the ejected fan backplane fan unit connector (step 106). Again, the temporary fan unit 16 or the connector removal tool 10 has a trough to collect the ejected backplane fan unit connector. The connector replacement process 100 includes inserting a new backplane fan unit connector using the connector insertion tool 12 (step 107). The connector replacement process 100 includes powering the new backplane fan unit connector (step 108), such as, for example, replacing the fuse. The connector replacement process 100 includes removing the temporary fan unit 16 and replacing it with a fan unit that plugs into the new backplane fan unit connector (step 109). Finally, the backplane safety cover 14 is removed and mechanical panels are replaced (step 110), and the connector replacement process 100 is complete.

[0039] An exemplary operation of the connector replacement process 100 is now described on an exemplary chassis 200 in FIGS. 14-31.

[0040] FIGS. 14-18 illustrate exemplary steps associated with step 101, removing mechanical panels for access. FIG. 14 illustrates removing a fan louver housing 202 by removing screws. FIG. 15 illustrates removing a fan backplane cover 204. FIG. 16 illustrates removing a backplane cover bracket 206. FIG. 17 illustrates removing an end cap 208. FIG. 18 illustrates removing a fuse bracket 210.

[0041] FIG. 19 illustrates step 102, installing the backplane safety cover 14. Note, the backplane safety cover 14 can be screwed into the chassis 200. The open portion 82 can provide access to fuses in the chassis 200.

[0042] FIG. 20 illustrates step 103, powering down the backplane fan unit connector. Specifically, the open portion 82 provides access to fuses 220. The appropriate fuses 220 are removed to power down the backplane fan unit connector.

[0043] FIG. 21 illustrates step 104, inserting the temporary fan unit 16. Here, the temporary fan unit 16 is inserted on the front side of the chassis, in the fan unit slot associated with the backplane fan unit connector being operated on. The temporary fan unit 16 needs to be installed and powered on relatively soon after step 103 to ensure there is no overheating during the connector replacement process 100, while the chassis 200 is operational.

[0044] FIG. 22 illustrates removing the cover door 84 where the backplane fan unit connector being operated on is. FIGS. 23 and 24 illustrate step 105, using the connector removal tool 10 to remove the powered down backplane fan unit connector. Specifically, FIG. 23 illustrates using the connector removal tool 10 on the top of the chassis 200, and FIG. 24 illustrates using the connector removal tool 10 on the bottom of the chassis 200.

[0045] FIG. 25 illustrates the backplane 52 after the removal of the backplane connector block 60. The backplane 52 and connector vias can be inspected for signs of damage as a result of the connector removal process. Also, the ejected backplane connector block 60 can be removed, as in step 106.

[0046] FIG. 26 illustrates step 107, inserting the new backplane fan unit connector using the connector insertion tool 12. FIG. 27 illustrates the new backplane connector block 60 installed. FIG. 28 illustrates step 108, powering the new backplane fan unit connector, by reinstalling the fuses 220. FIGS. 29 and 30 illustrate step 109, removing the temporary fan unit 16 (FIG. 29) and replacing with a fan unit 230 (FIG. 30). Finally, FIG. 31 illustrates step 110, removing the backplane safety cover 14, as well as replacing all of the components in FIGS. 14-18.

[0047] Although the present disclosure has been illustrated and described herein with reference to preferred embodiments and specific examples thereof, it will be readily apparent to those of ordinary skill in the art that other embodiments and examples may perform similar functions and/or achieve like results. All such equivalent embodiments and examples are within the spirit and scope of the present disclosure, are contemplated thereby, and are intended to be covered by the following claims.

What is claimed is:

1. A connector replacement method in a network element chassis, the connector replacement method comprising:
 - obtaining physical access to a backplane in the network element chassis, while the network element chassis is deployed;
 - powering down backplane connectors for replacement while other backplane connectors remained powered;
 - removing the powered down backplane connectors with a connector removal tool;
 - inserting a new set of backplane connectors in place of the removed, powered down backplane connectors with a connector insertion tool; and
 - powering up the new set of backplane connectors.
2. The connector replacement method of claim 1, further comprising:
 - installing a backplane safety cover over the physical access for protection of the backplane and the other backplane connectors during operation on the backplane connectors for replacement.
3. The connector replacement method of claim 2, wherein the backplane safety cover comprises an open portion for selective access to the backplane and one or more doors for selective access to the backplane connectors.
4. The connector replacement method of claim 1, wherein the connector removal tool comprises
 - a housing,
 - a handle,
 - a vise configured to move based on rotation of the handle,
 - a push out block configured to move based on movement of the vise, and
 - a plurality of pins on the push out block arranged based on the backplane connectors for replacement and configured to push out the backplane connectors for replacement based on movement of the push out block.
5. The connector replacement method of claim 1, wherein the connector insertion tool comprises
 - a housing,
 - a handle,

- a vise configured to move based on rotation of the handle, a push in block configured to move based on movement of the vise, and
 a connector block on the housing opposing the push in block.
6. The connector replacement method of claim 1, wherein the connector removal tool and the connector insertion tool are configured to operate on the powered down backplane connectors on one of a top portion of the backplane and a bottom portion of the backplane.
7. The connector replacement method of claim 1, wherein the backplane connectors for replacement comprise fan connectors, and the method further comprising:
 installing an externally powered temporary fan unit subsequent to powering down the backplane connectors for replacement, enabling cooling during the method while the network element chassis is in-service.
8. The connector replacement method of claim 1, wherein the backplane connectors for replacement comprise fan connectors, and wherein temporary cooling is performed in the network element chassis while the backplane connectors for replacement are powered down.
9. A toolkit for replacing connectors in a network element chassis, the toolkit comprising:
 a connector removal tool adapted to remove a set of backplane connectors from a backplane in the network element chassis in-service;
 a connector insertion tool adapted to insert a new set of backplane connectors into the backplane; and
 a backplane safety cover adapted to protect areas of the backplane which are not being operated on by the connector removal tool and the connector insertion tool.
10. The toolkit of claim 9, wherein the backplane safety cover comprises an open portion for selective access to the backplane and one or more doors for selective access to the backplane connectors.
11. The toolkit of claim 9, wherein the connector removal tool comprises
 a housing,
 a handle,
 a vise configured to move based on rotation of the handle, a push out block configured to move based on movement of the vise, and
 a plurality of pins on the push out block arranged based on the backplane connectors for replacement and configured to push out the backplane connectors for replacement based on movement of the push out block.
12. The toolkit of claim 9, wherein the connector insertion tool comprises
 a housing,
 a handle,
 a vise configured to move based on rotation of the handle, a push in block configured to move based on movement of the vise, and
 a connector block on the housing opposing the push in block.
13. The toolkit of claim 9, wherein the connector removal tool and the connector insertion tool are configured to operate on the powered down backplane connectors on one of a top portion of the backplane and a bottom portion of the backplane.
14. The toolkit of claim 9, wherein the connector removal tool comprises a cavity for collecting the powered down backplane connectors.
15. The toolkit of claim 9, wherein the backplane connectors for replacement comprise fan connectors, and the toolkit further comprising:
 an externally powered temporary fan unit installed subsequent to powering down the backplane connectors for replacement, to enable cooling while the network element chassis is in-service.
16. The toolkit of claim 9, wherein the backplane connectors for replacement comprise fan connectors, and wherein temporary cooling is performed in the network element chassis while the backplane connectors for replacement are powered down.
17. A backplane fan unit connector replacement method in a network element chassis, the backplane fan unit connector replacement method comprising:
 obtaining physical access to a backplane in the network element chassis, while the network element chassis is deployed;
 powering down backplane connectors for replacement while other backplane connectors remained powered;
 installing an externally powered temporary fan unit subsequent to powering down the backplane connectors for replacement, enabling cooling during the method while the network element chassis is in-service;
 removing the powered down backplane connectors with a connector removal tool;
 inserting a new set of backplane connectors in place of the removed, powered down backplane connectors with a connector insertion tool; and
 powering up the new set of backplane connectors.
18. The backplane fan unit connector replacement method of claim 17, further comprising:
 installing a backplane safety cover over the physical access for protection of the backplane and the other backplane connectors during operation on the backplane connectors for replacement.
19. The backplane fan unit connector replacement method of claim 17, wherein the connector removal tool comprises
 a housing,
 a handle,
 a vise configured to move based on rotation of the handle, a push out block configured to move based on movement of the vise, and
 a plurality of pins on the push out block arranged based on the backplane connectors for replacement and configured to push out the backplane connectors for replacement based on movement of the push out block.
20. The backplane fan unit connector replacement method of claim 17, wherein the connector insertion tool comprises
 a housing,
 a handle,
 a vise configured to move based on rotation of the handle, a push in block configured to move based on movement of the vise, and
 a connector block on the housing opposing the push in block.