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(54) **BATTERY CHARGING SYSTEM**

Publication Classification

(71) Applicant: **Black & Decker Inc.**, New Britain, CT (US)

(72) Inventors: **Matthew J. VELDERMAN**, Baltimore, MD (US); **Oleksiy SERGYEYENKO**, Baldwin, MD (US); **Sean BAILEY**, Baltimore, MD (US); **Steven J. PHILLIPS**, Ellicott City, MD (US); **Daniel J. WHITE**, Baltimore, MD (US); **Thomas DELMONT**, Clarksville, MD (US); **Andrew E. Seman, JR.**, Pylesville, MD (US); **Julian Olyansky**, Festerville, PA (US); **Shalin Chikhalkar**, Towson, MD (US)

(51) **Int. Cl.**

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A47F 3/00 (2006.01)

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H02J 7/00 (2006.01)

H02S 99/00 (2014.01)

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(52) **U.S. Cl.**

CPC *A47F 5/0853* (2013.01); *A47F 5/0846* (2013.01); *B25H 3/04* (2013.01); *H05K 7/1457* (2013.01); *H05K 7/1459* (2013.01); *H05K 7/183* (2013.01); *A47F 3/001* (2013.01); *A47F 11/10* (2013.01); *H02J 7/0042* (2013.01); *H02S 99/00* (2013.01)

(21) Appl. No.: **19/186,239**

(22) Filed: **Apr. 22, 2025**

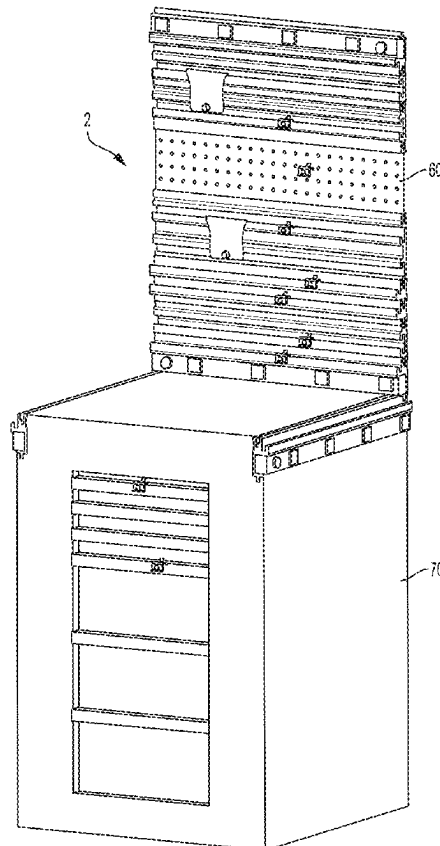
Related U.S. Application Data

(60) Division of application No. 18/219,996, filed on Jul. 10, 2023, now Pat. No. 12,295,507, which is a continuation of application No. 17/859,145, filed on Jul. 7, 2022, now Pat. No. 11,737,587, which is a continuation of application No. 17/150,295, filed on Jan. 15, 2021, now Pat. No. 11,406,203, which is a continuation of application No. 16/668,988, filed on Oct. 30, 2019, now Pat. No. 10,925,412.

(57)

ABSTRACT

A battery charging system including at least two conductors running parallel to one another, an AC/DC converter, the AC/DC converter configured to receive an AC input and to provide a DC output to the at least two conductors and a battery charger, the battery charger (1) including a battery pack receiving portion to receive a removable, rechargeable battery pack and (2) removably, electrically coupled to the at least two conductors to receive the DC output.



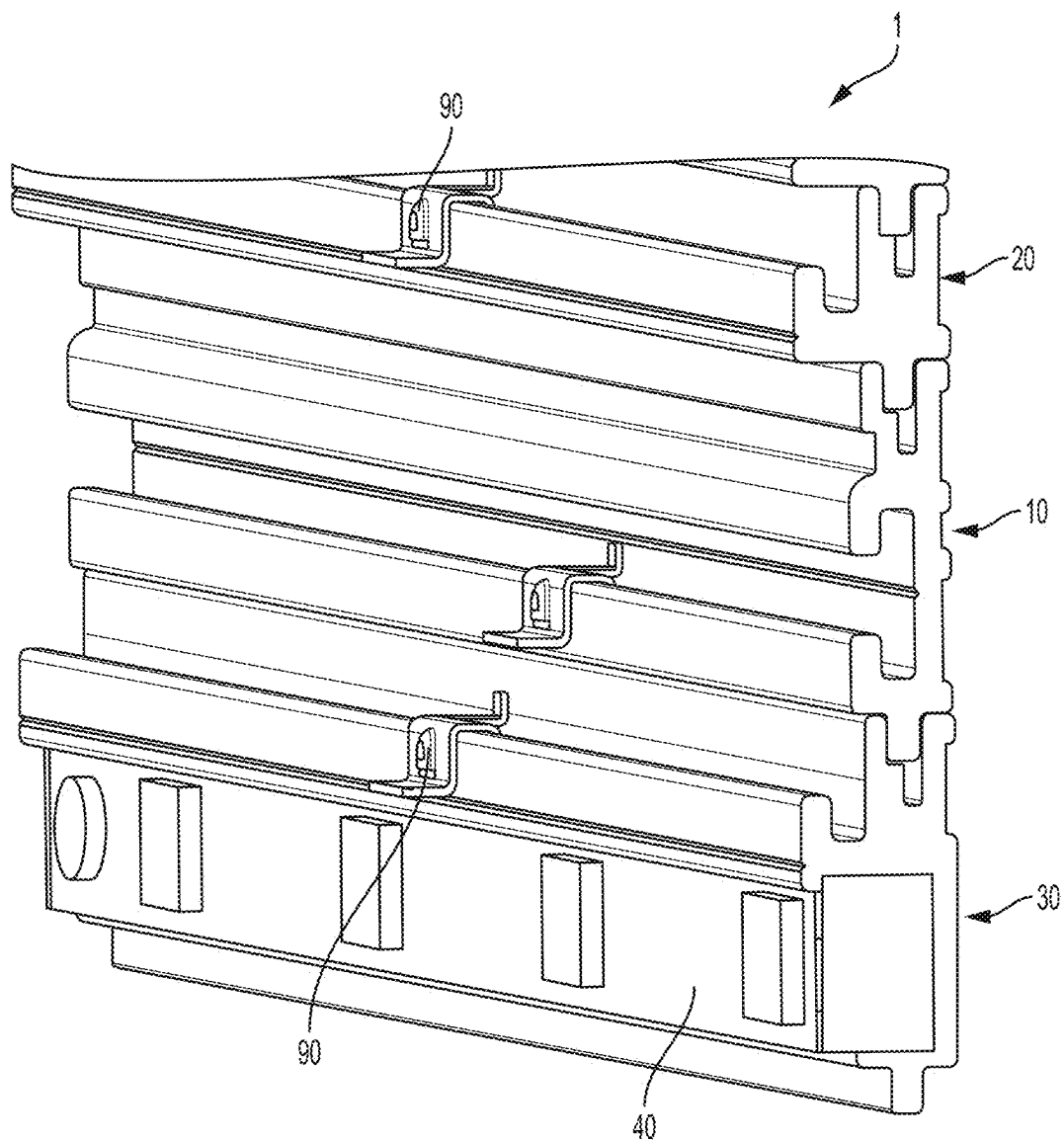


FIG. 1

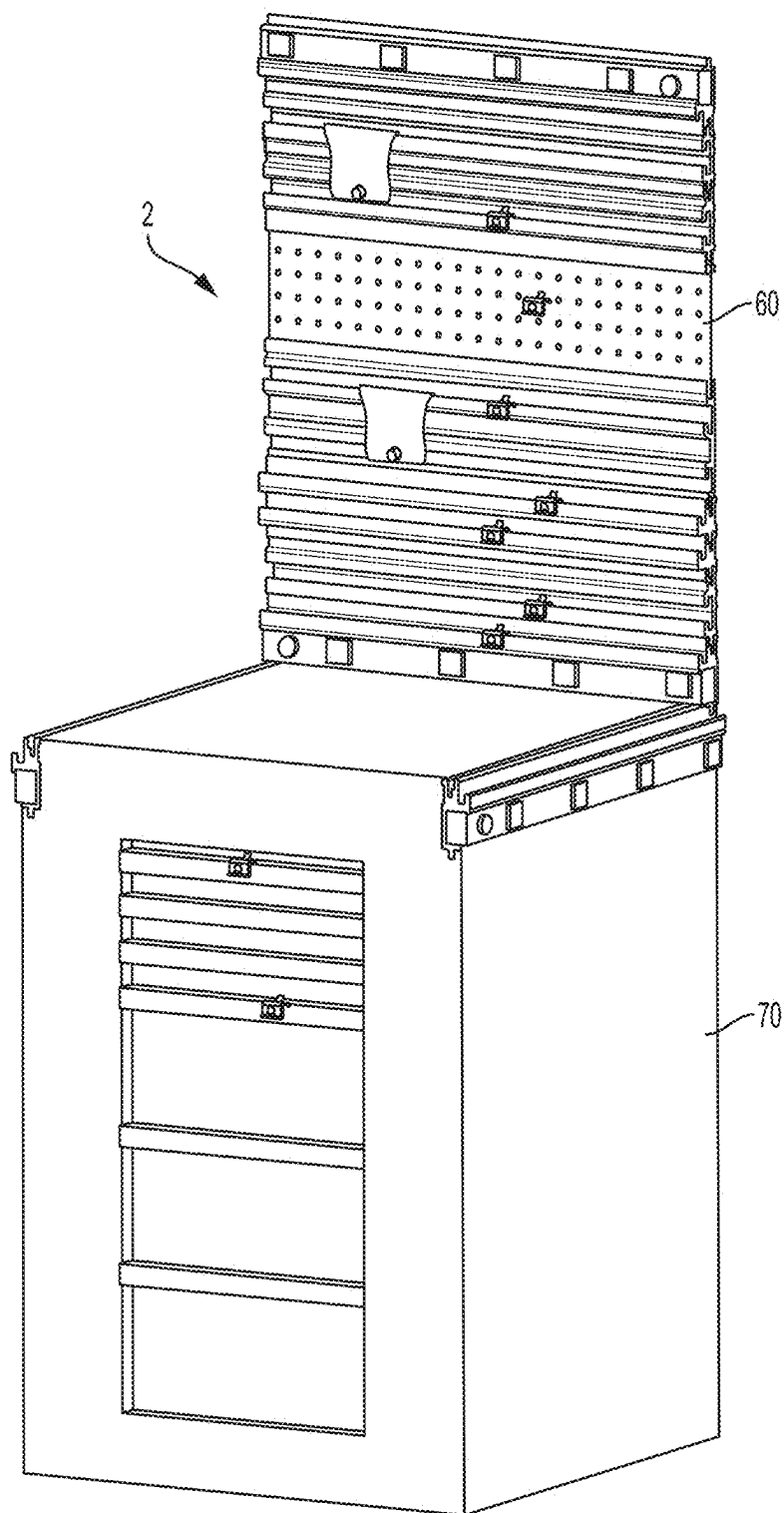


FIG. 2

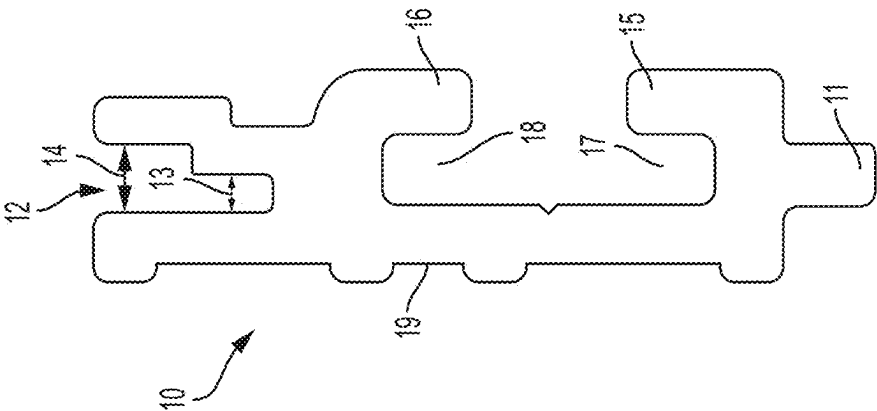


FIG. 3

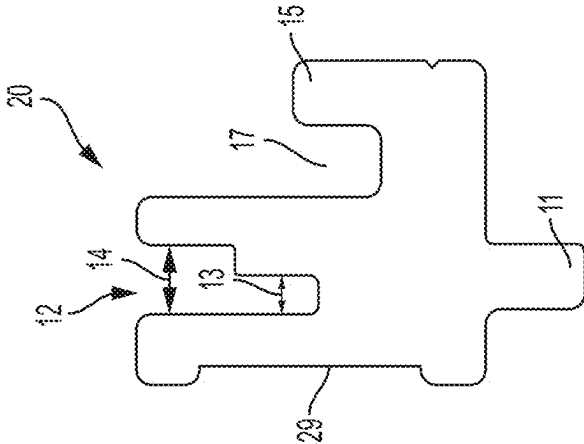


FIG. 4

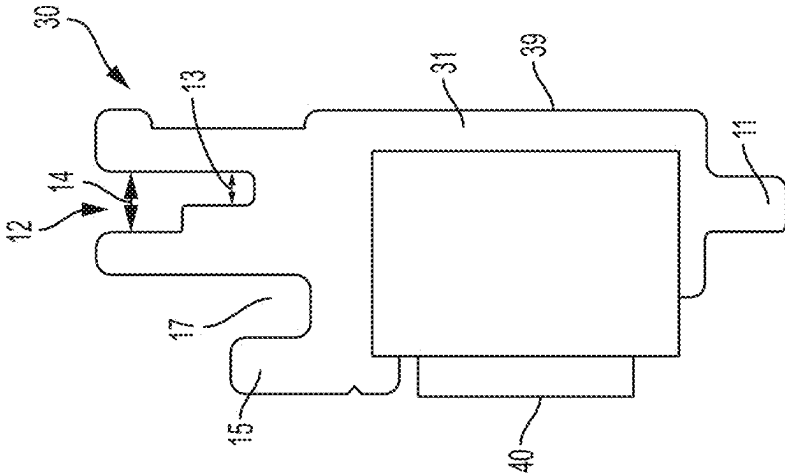
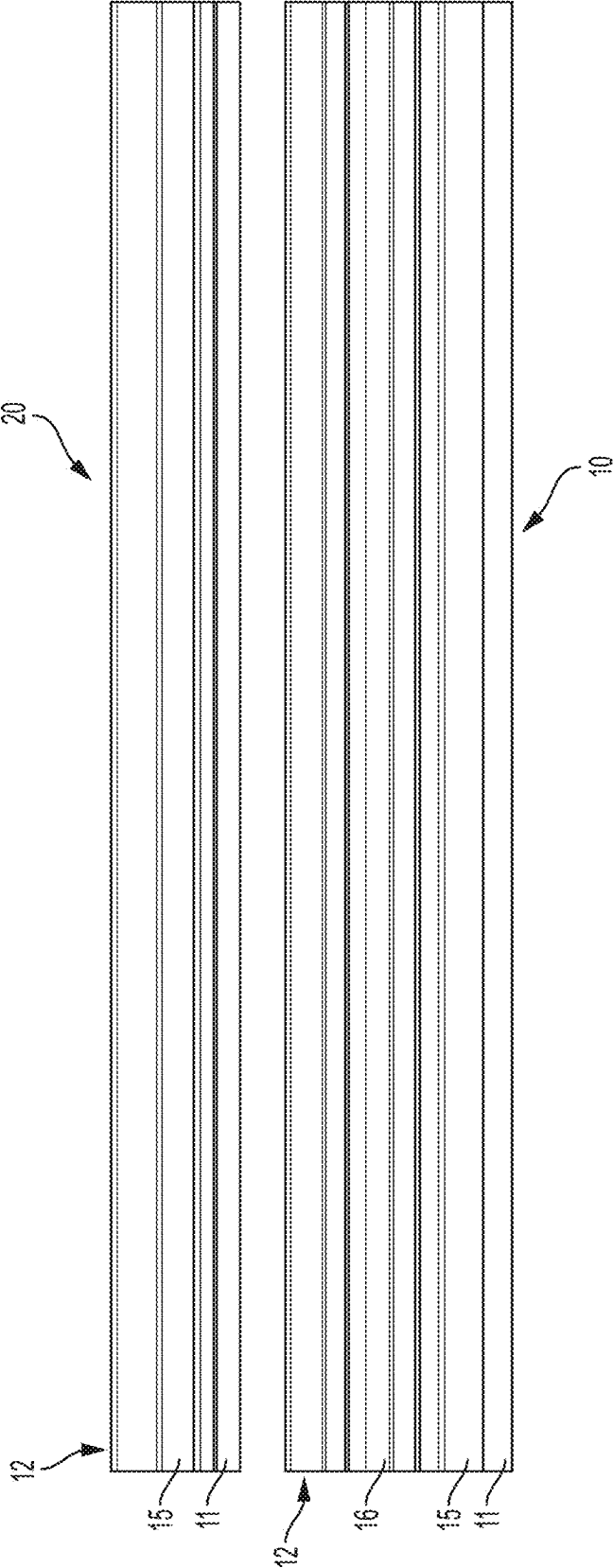


FIG. 5



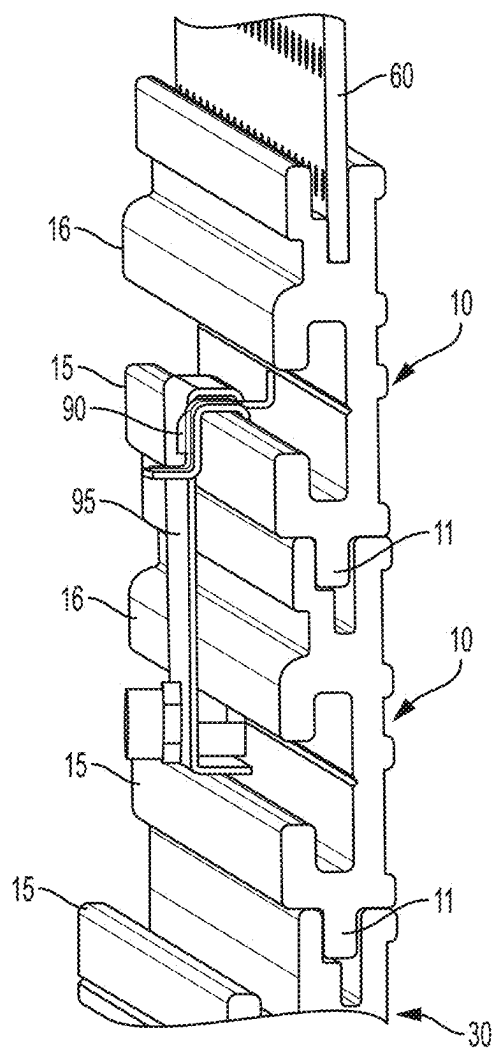


FIG. 7

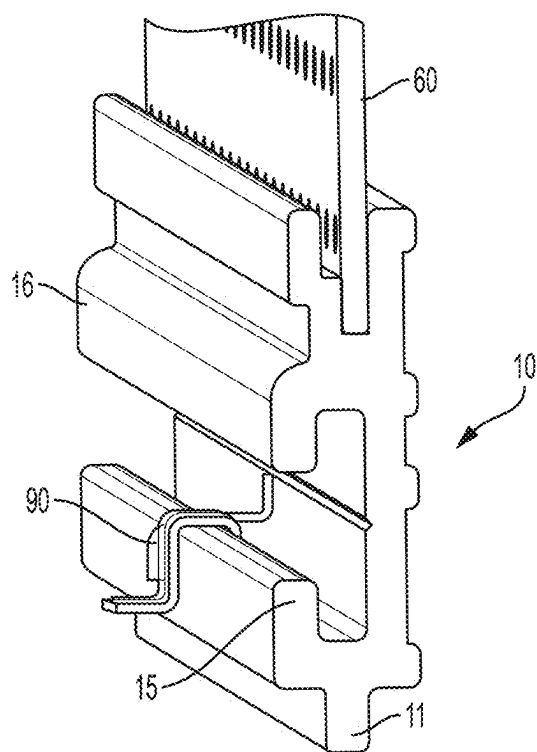


FIG. 8

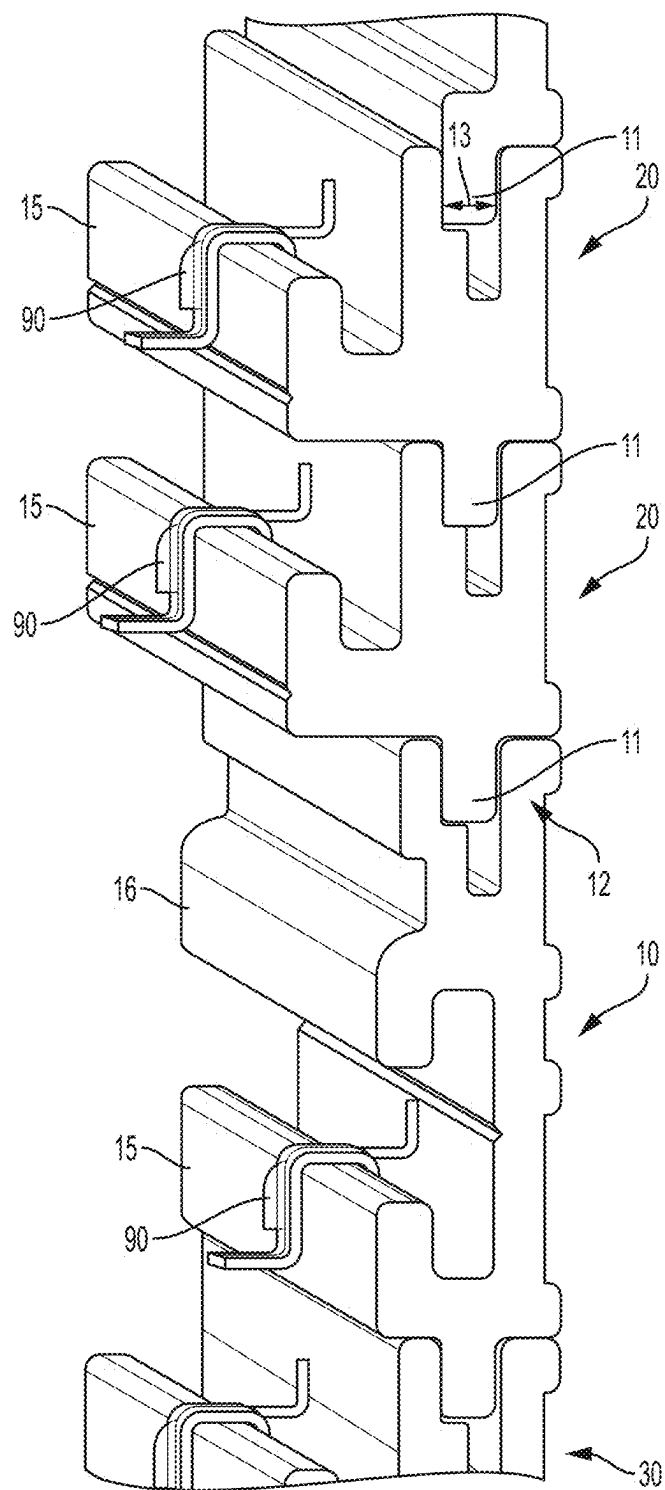


FIG. 9

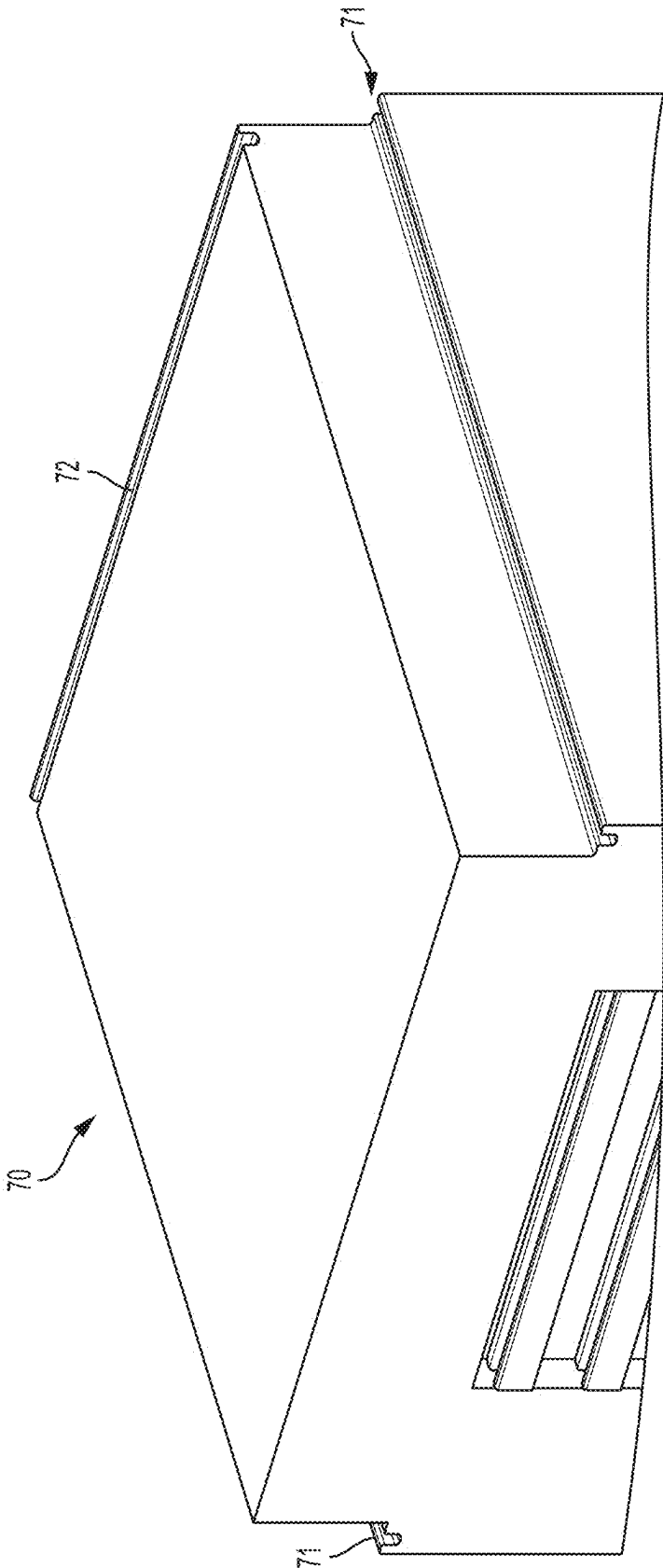


FIG. 10

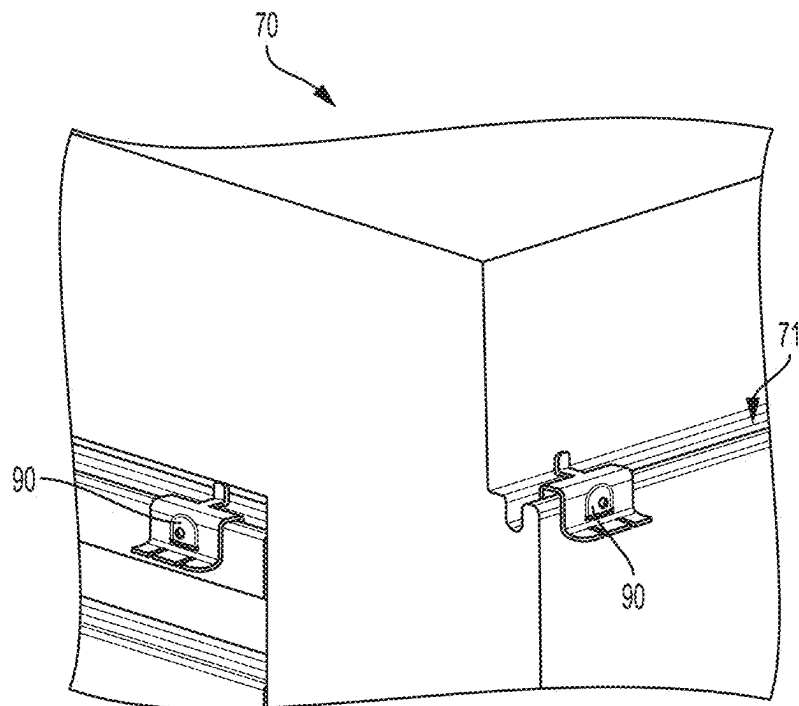


FIG. 11

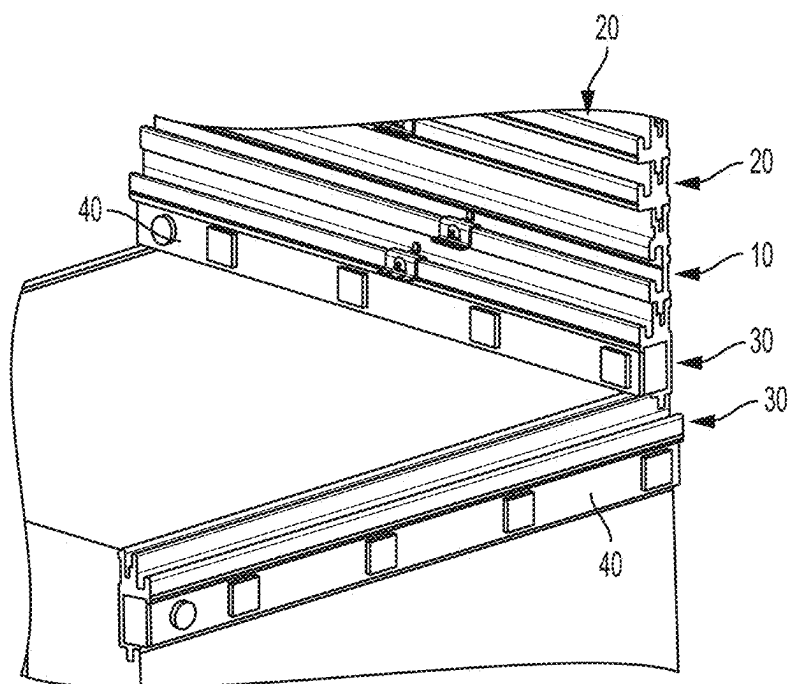


FIG. 12

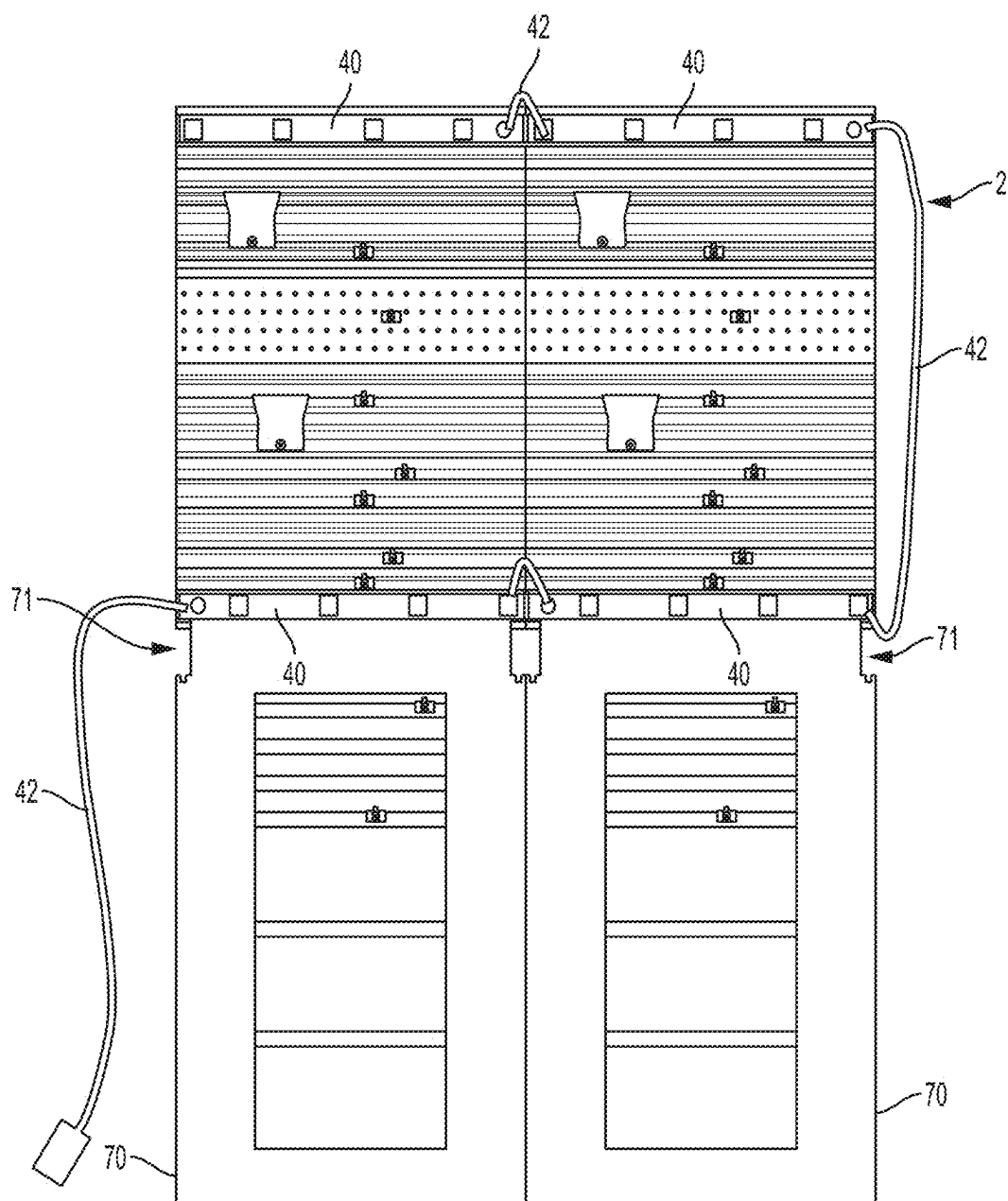


FIG. 13

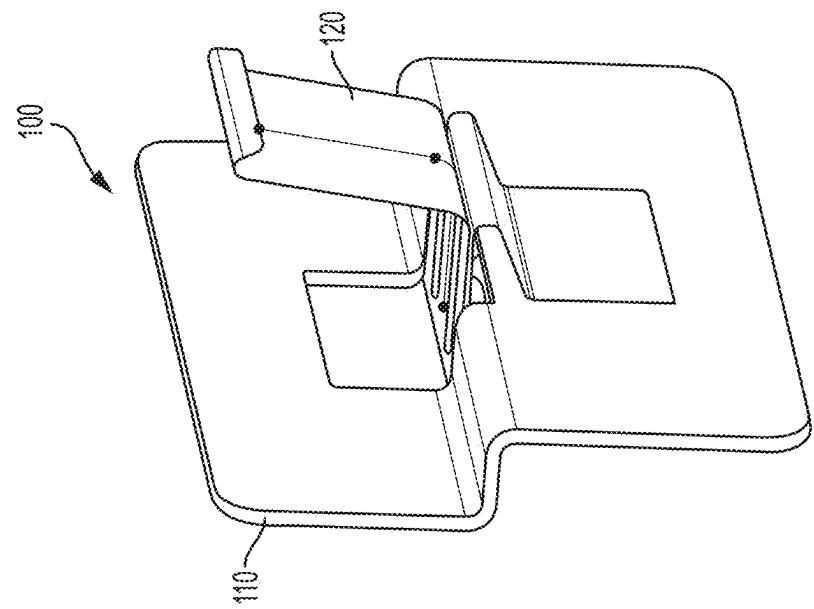


FIG. 15

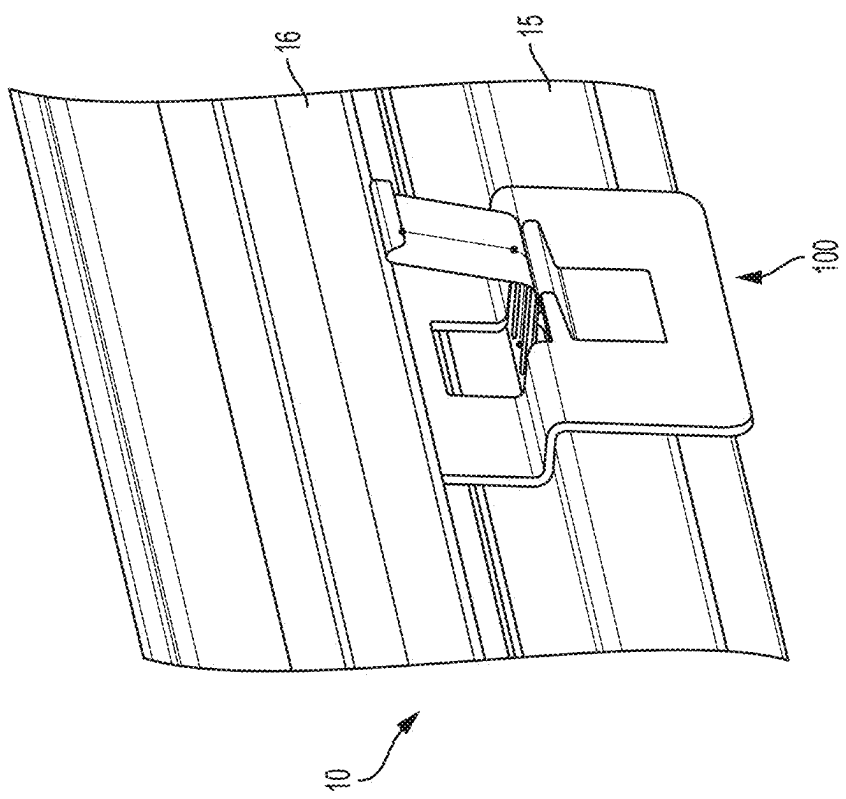


FIG. 14

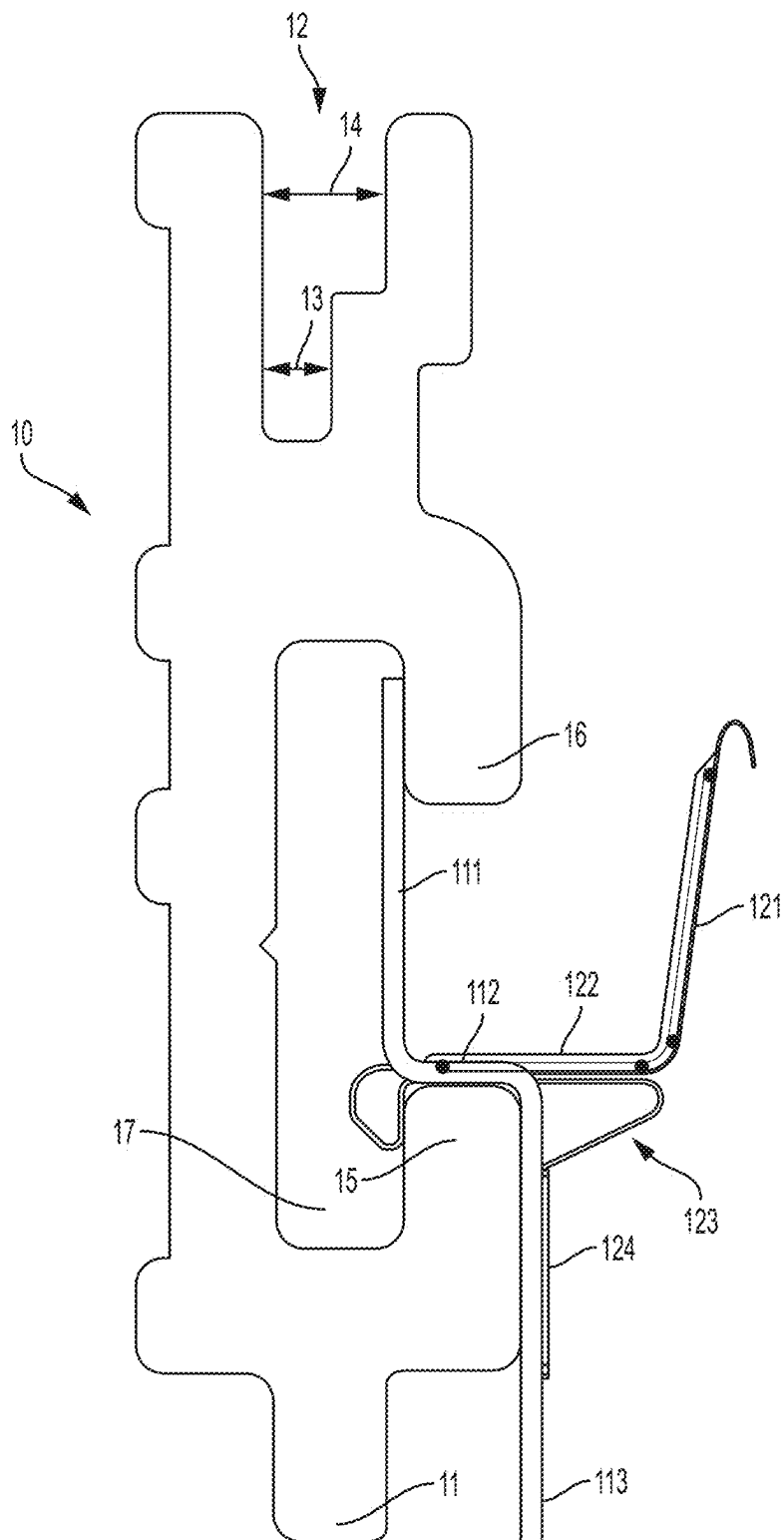
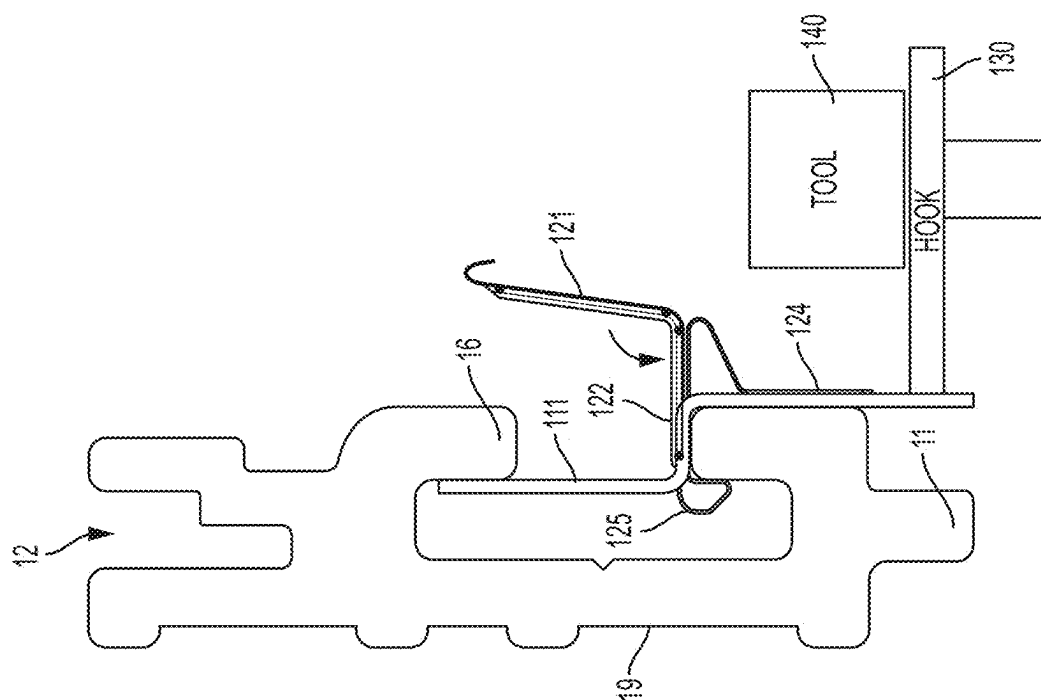
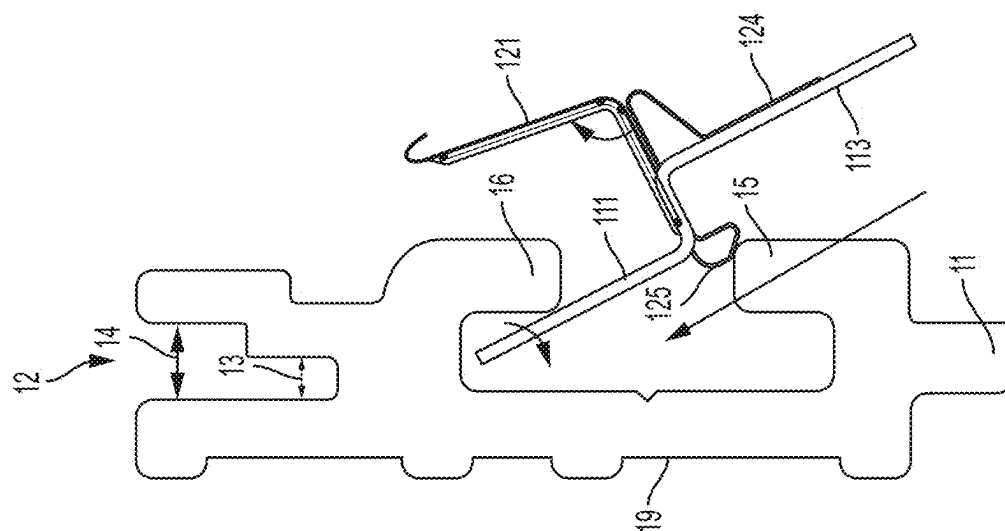


FIG. 16



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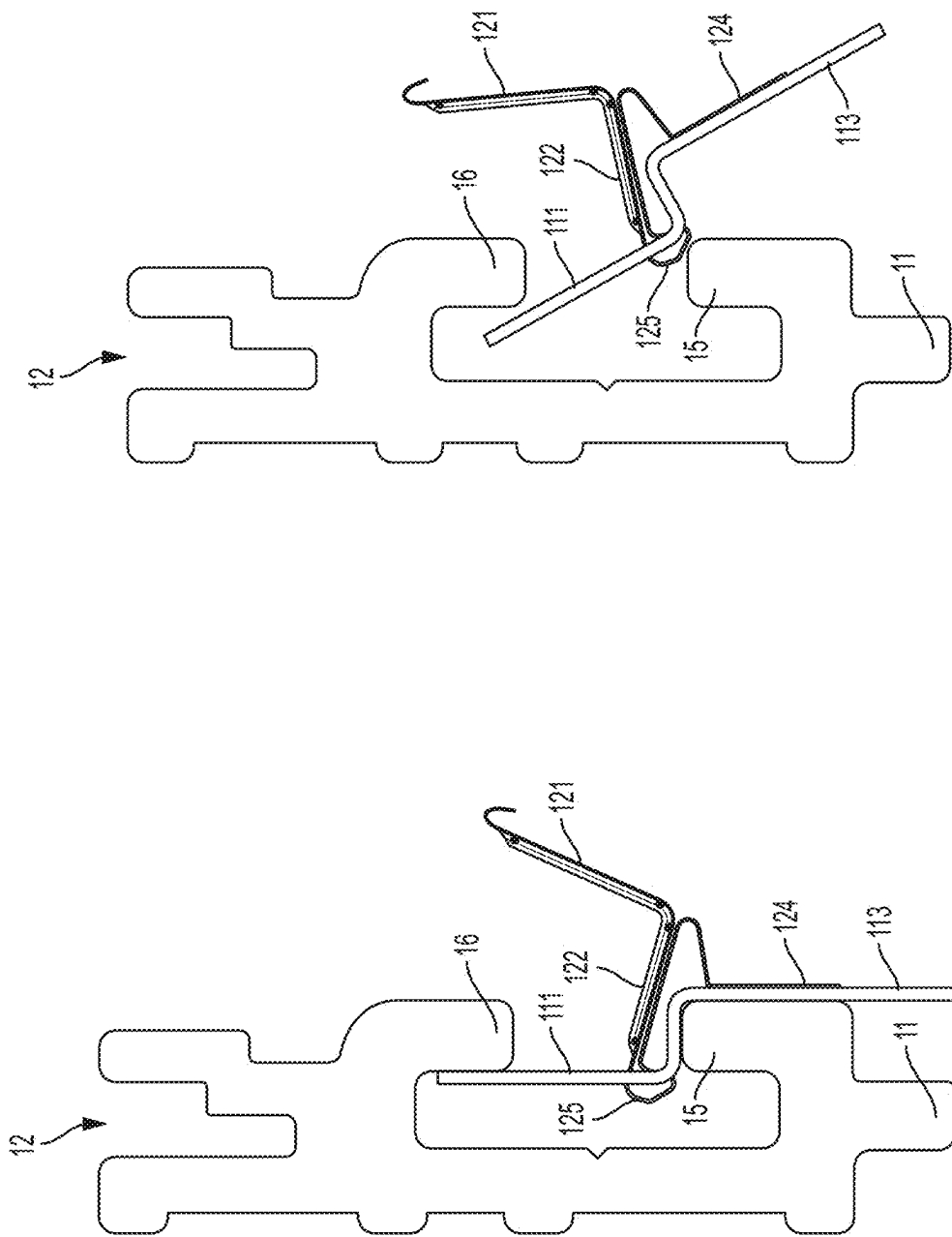


FIG. 20

FIG. 19

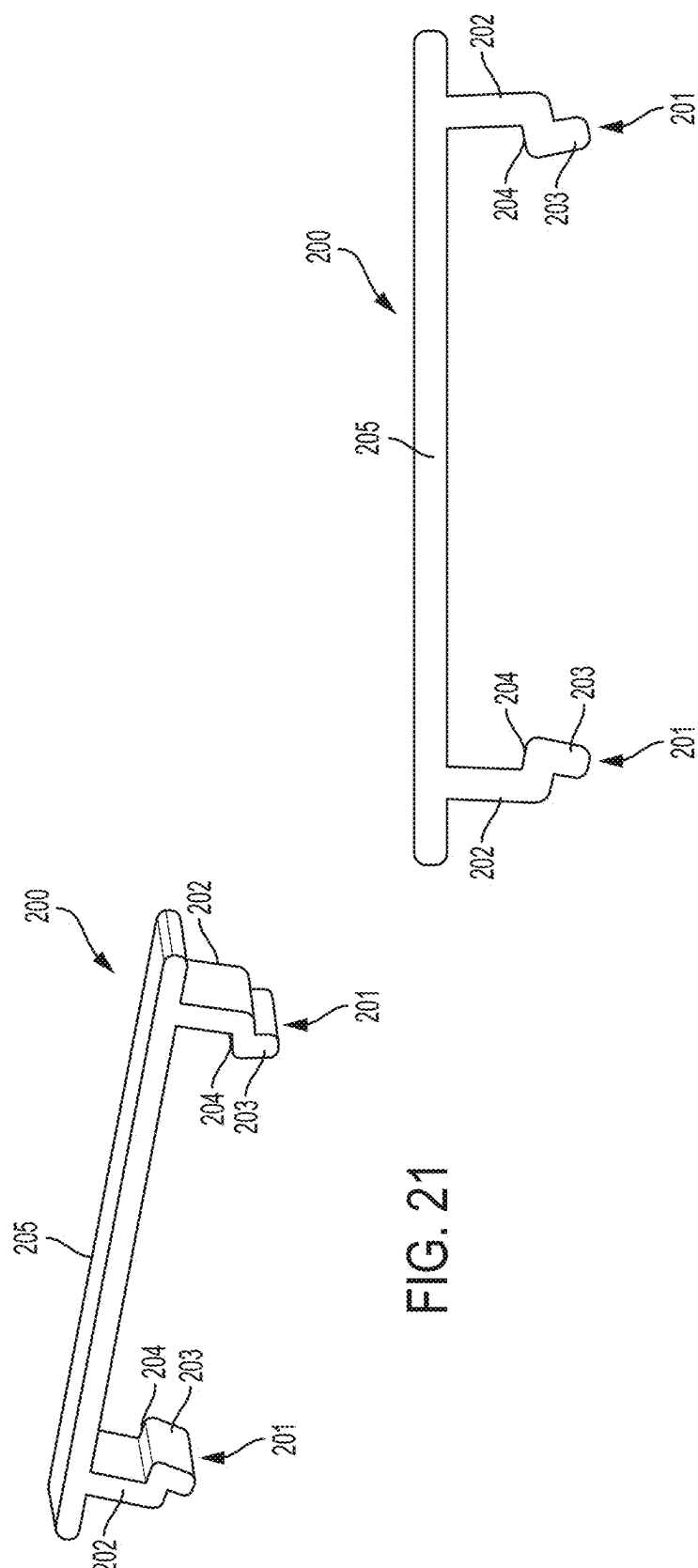


FIG. 22

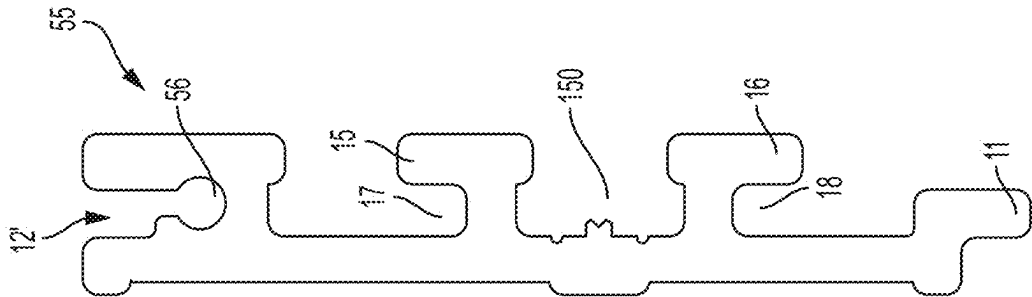


FIG. 23

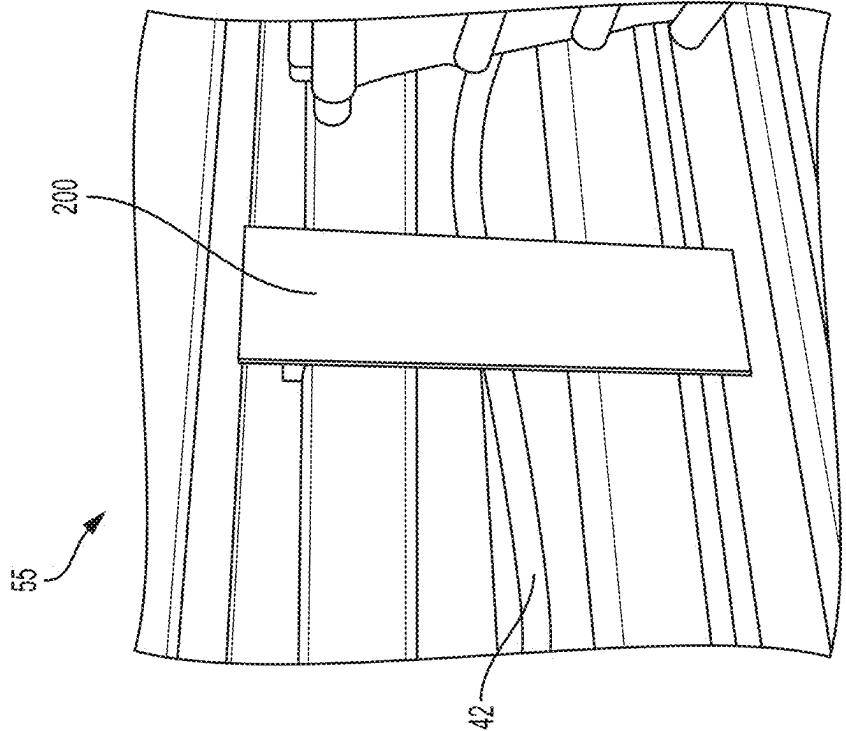


FIG. 24

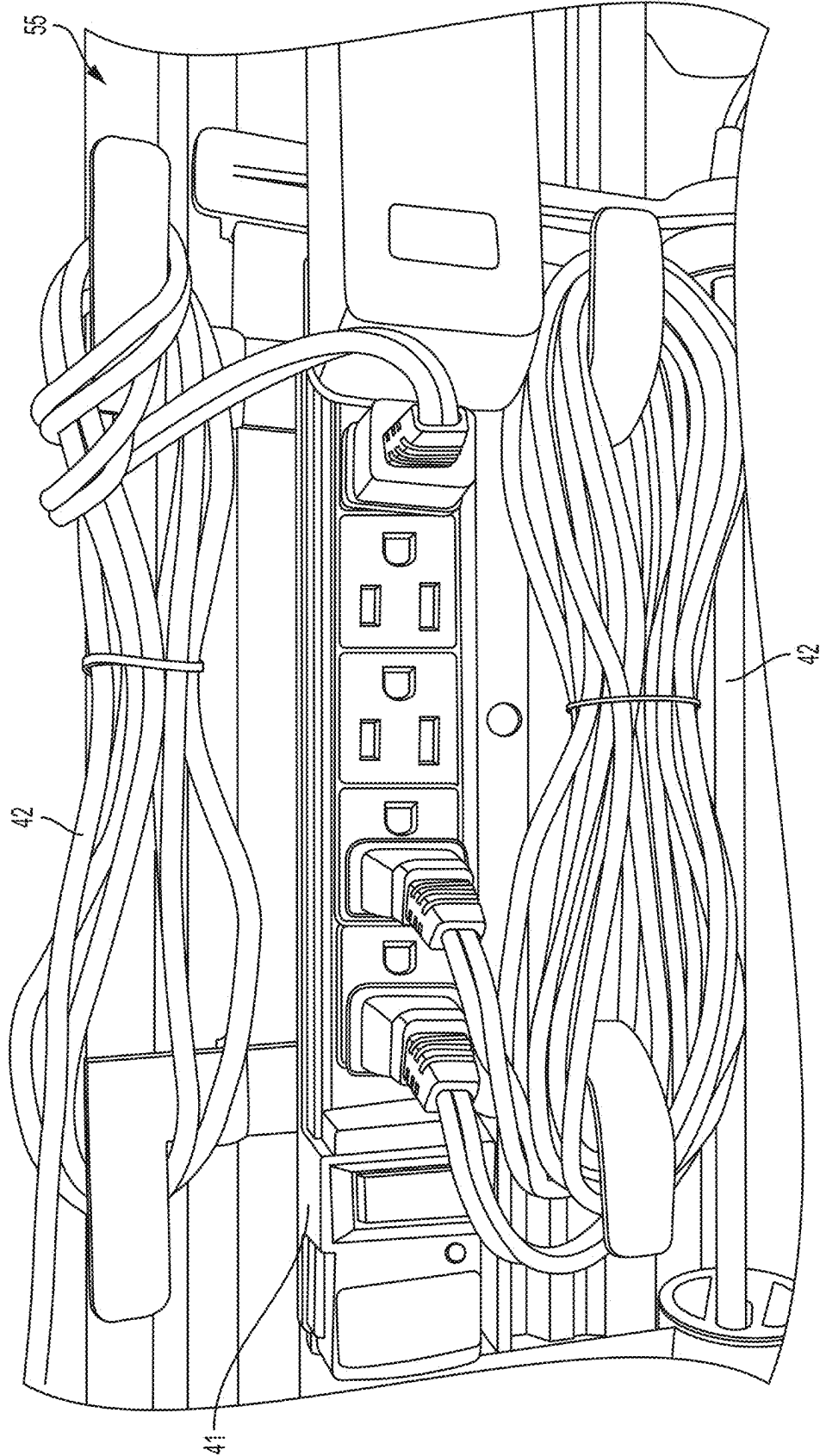


FIG. 25

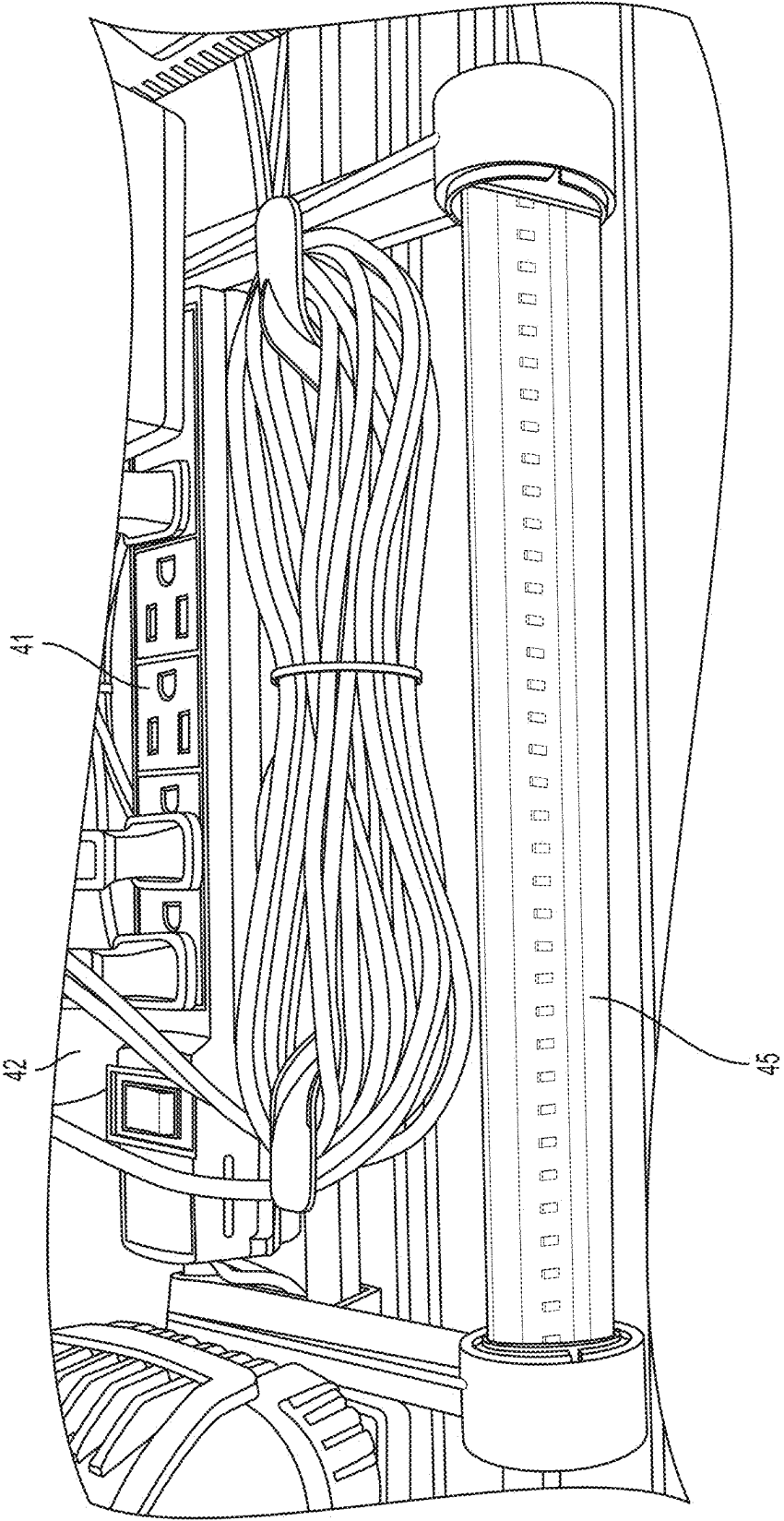


FIG. 26

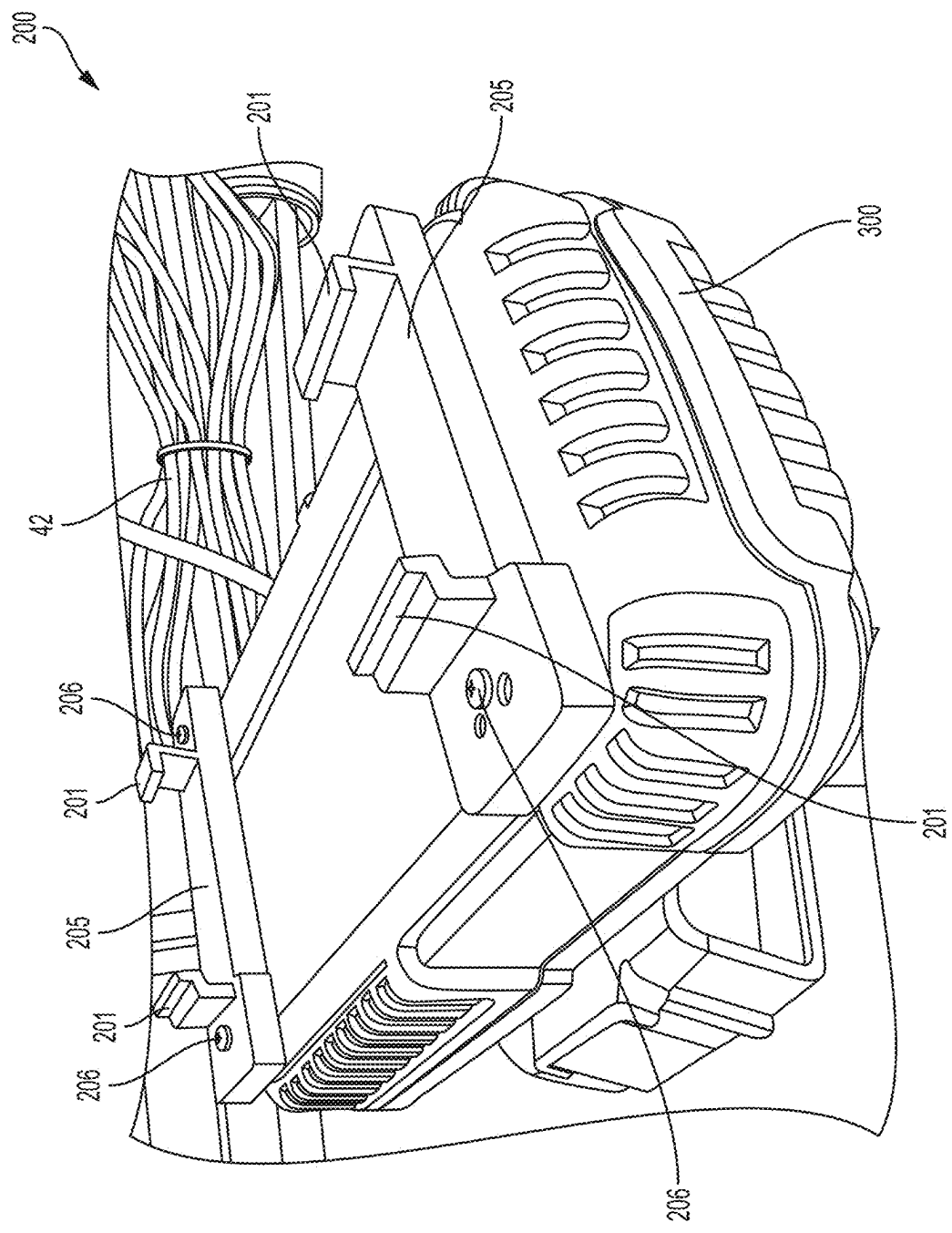


FIG. 27

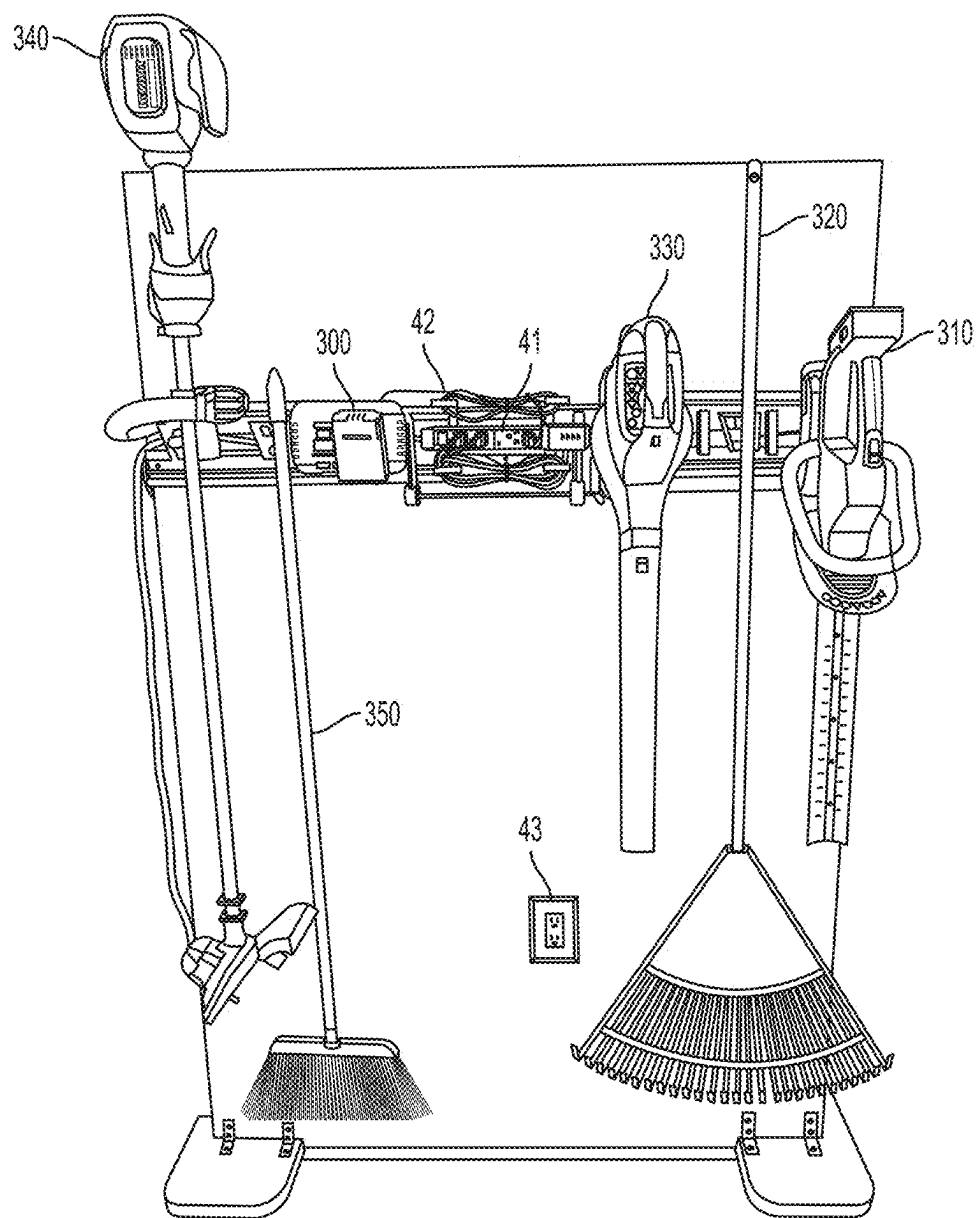


FIG. 28

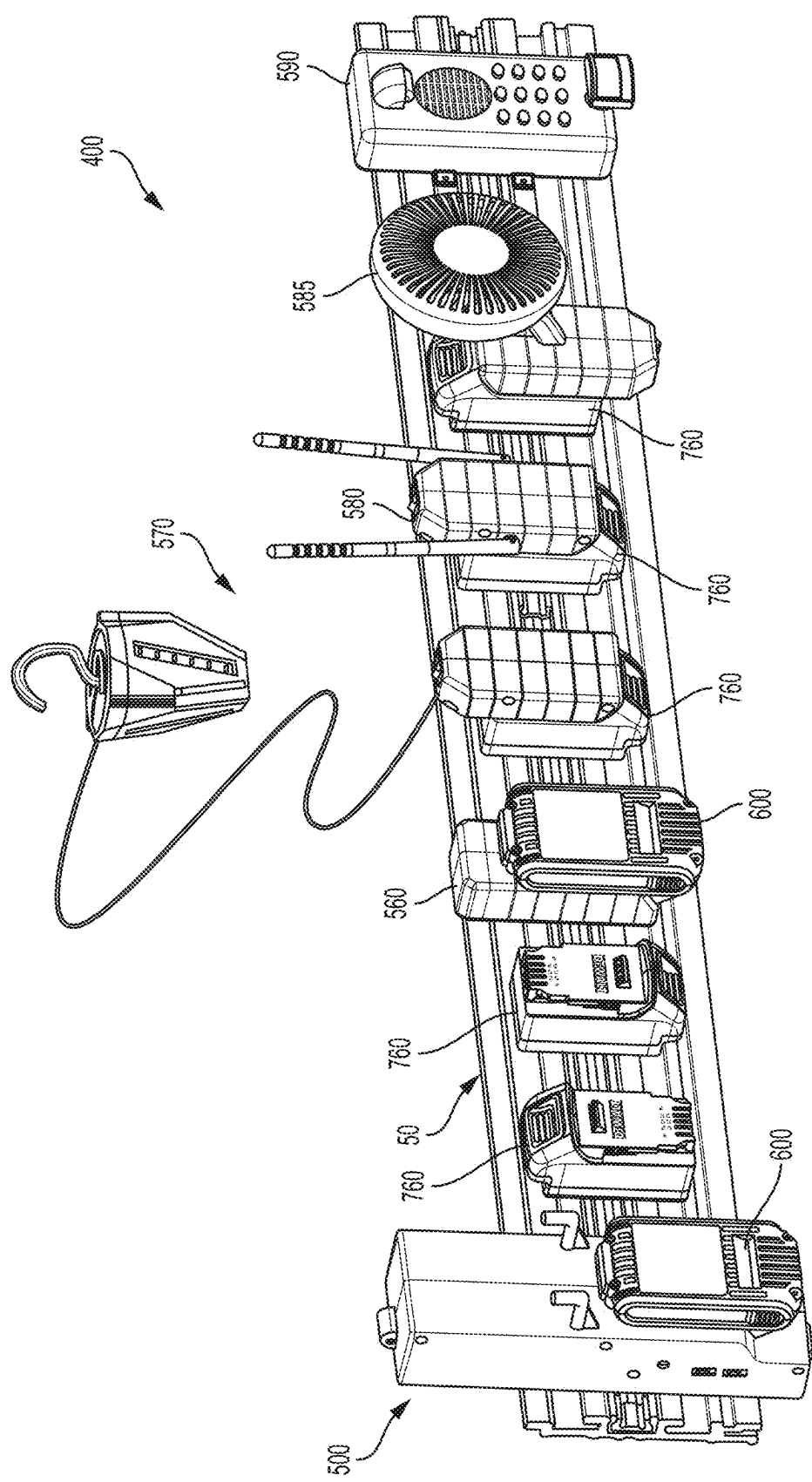


FIG. 29

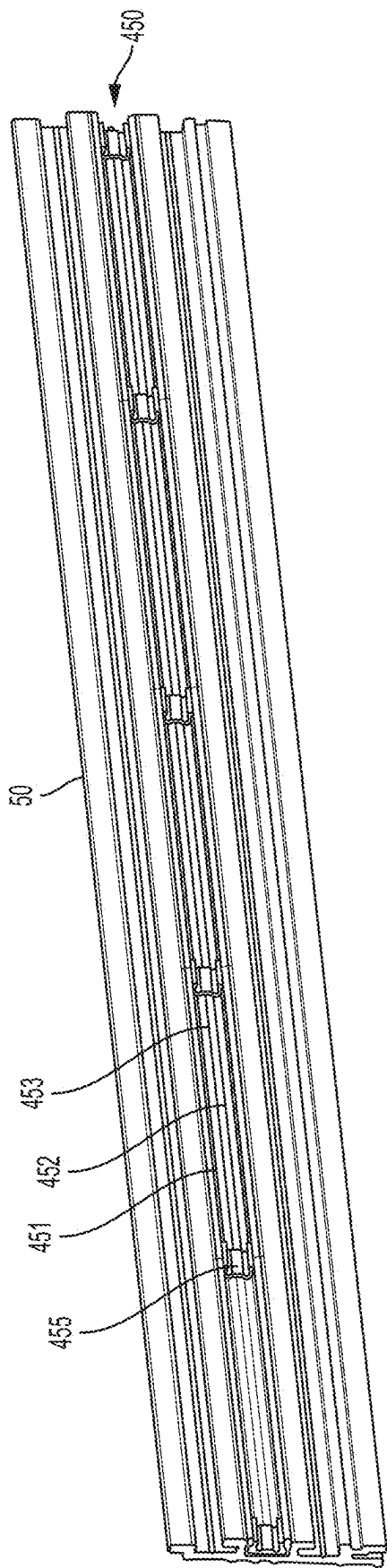


FIG. 30

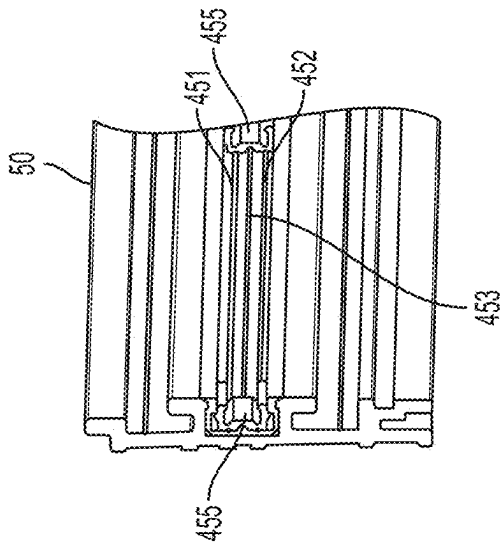


FIG. 31

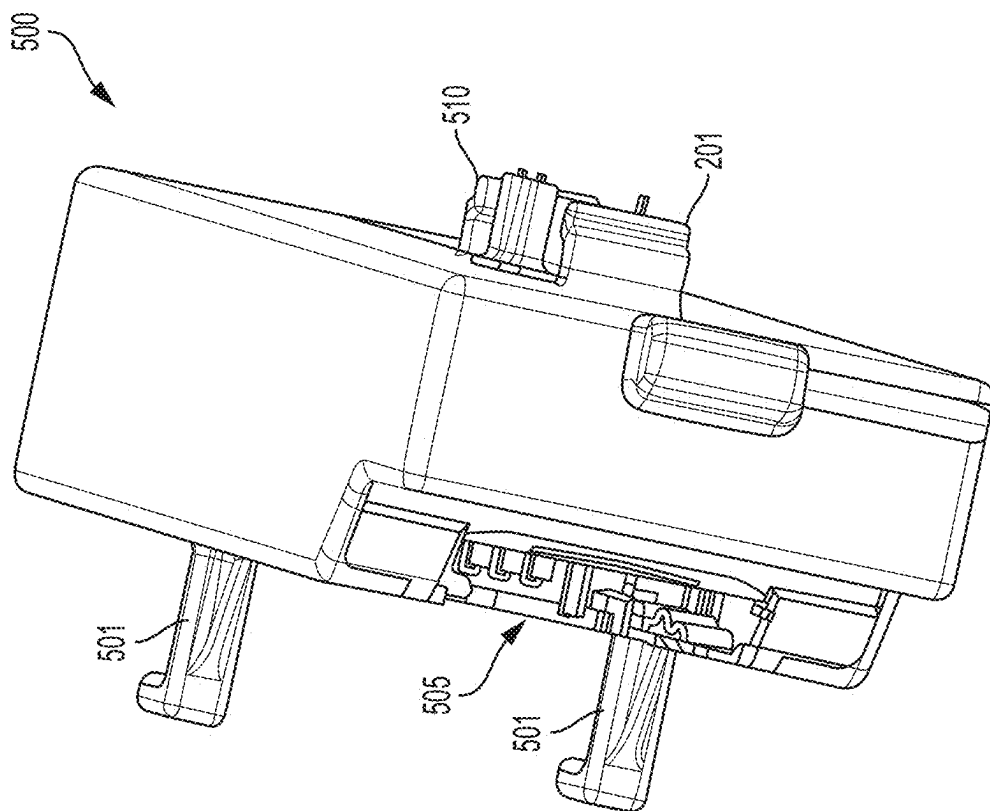


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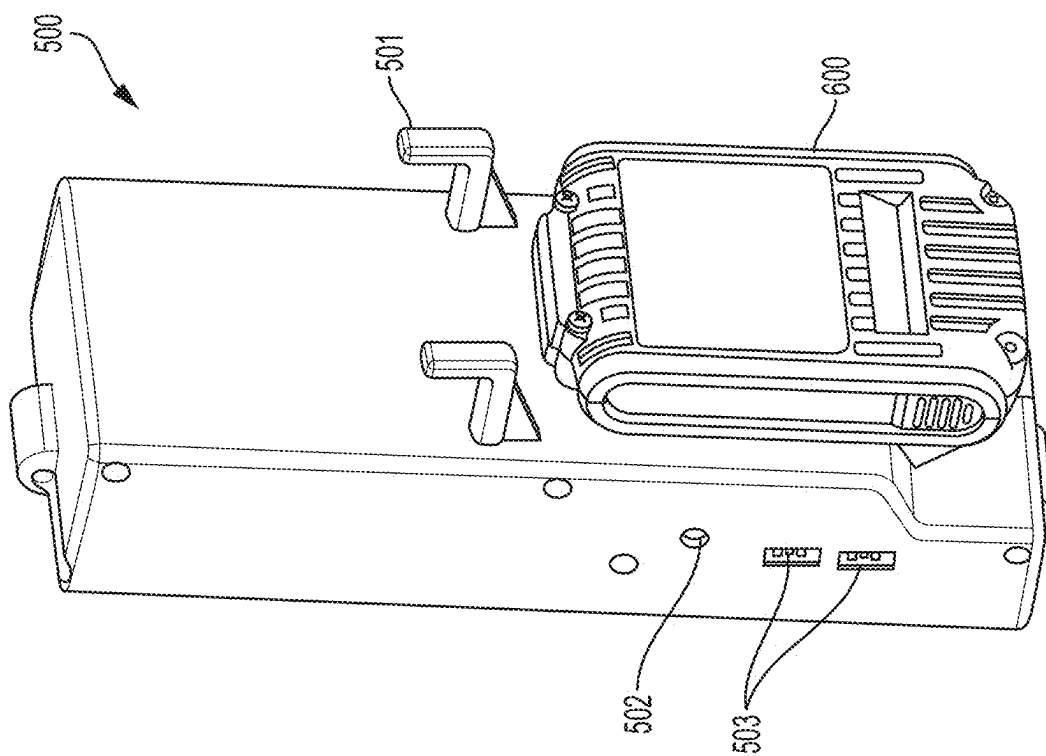


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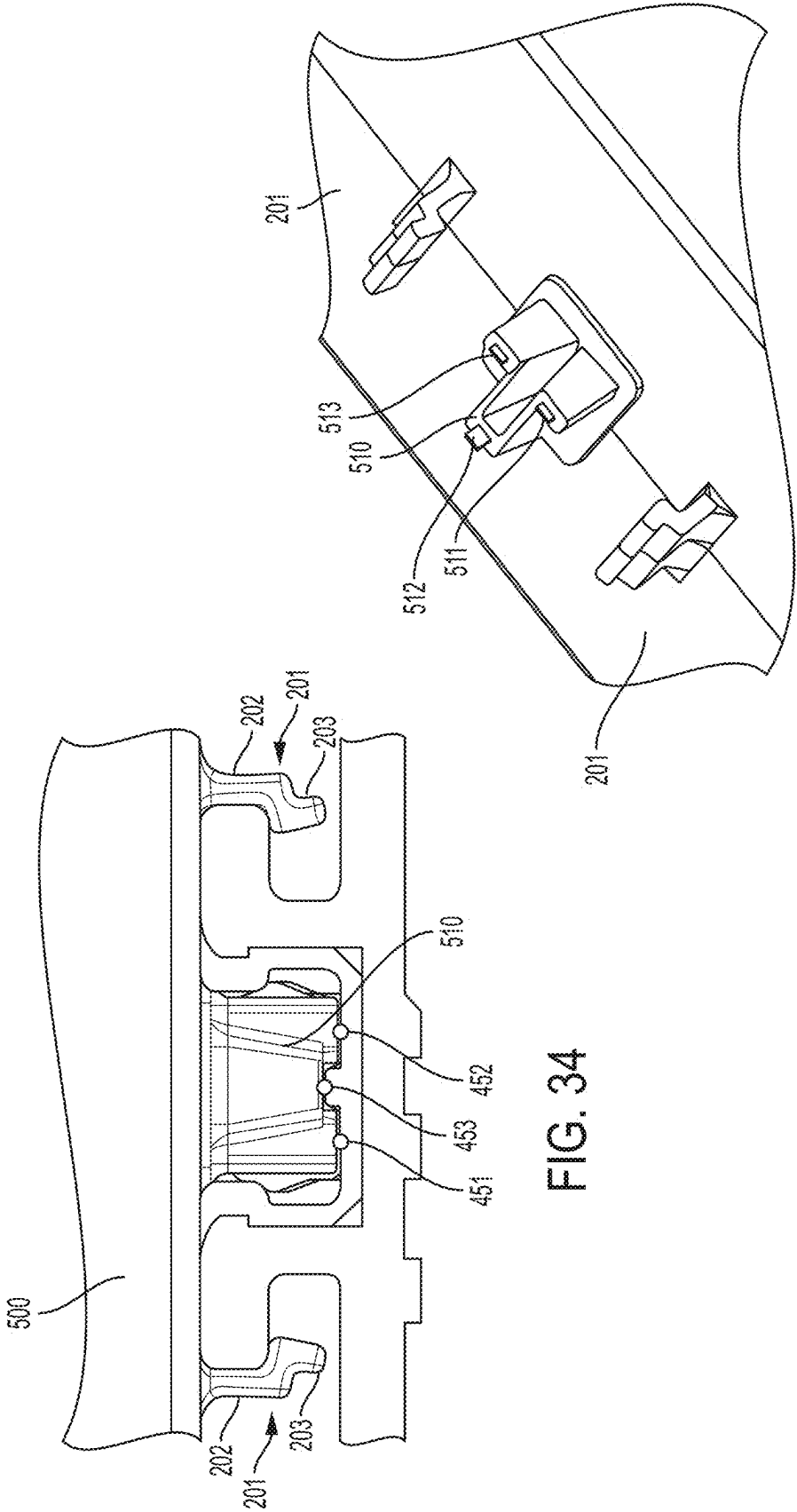


FIG. 34

FIG. 35

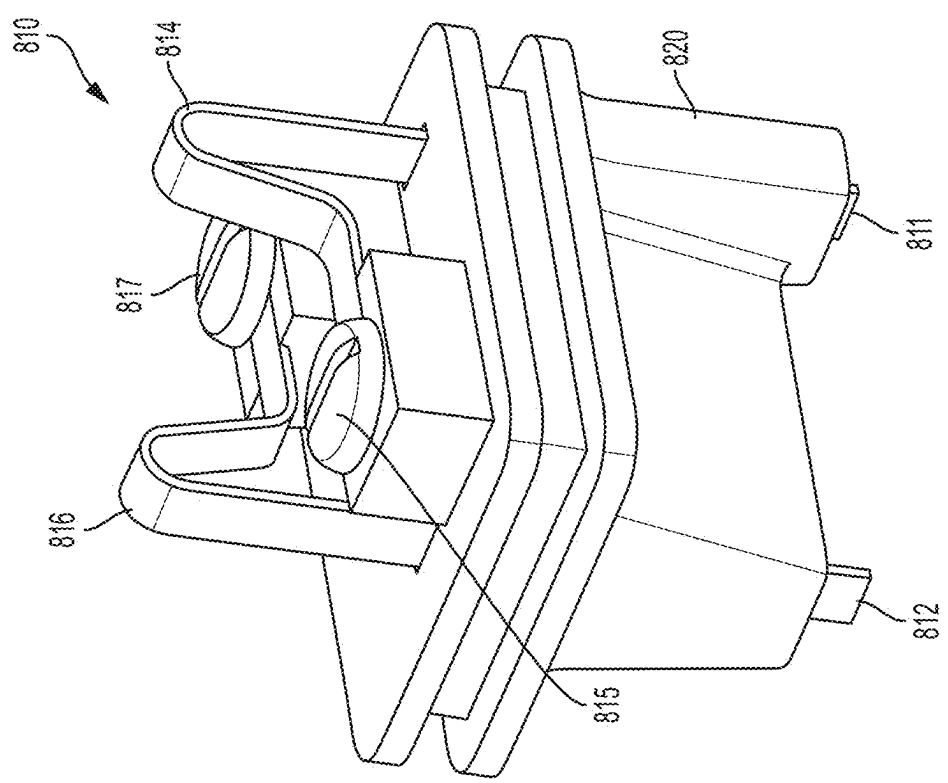


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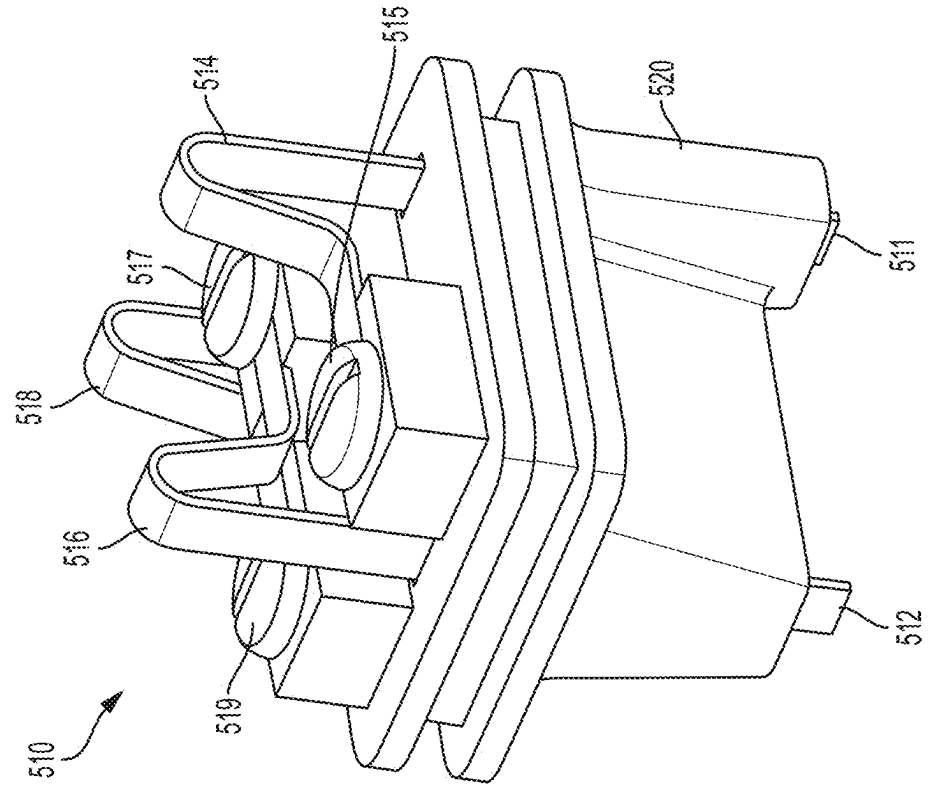


FIG. 36

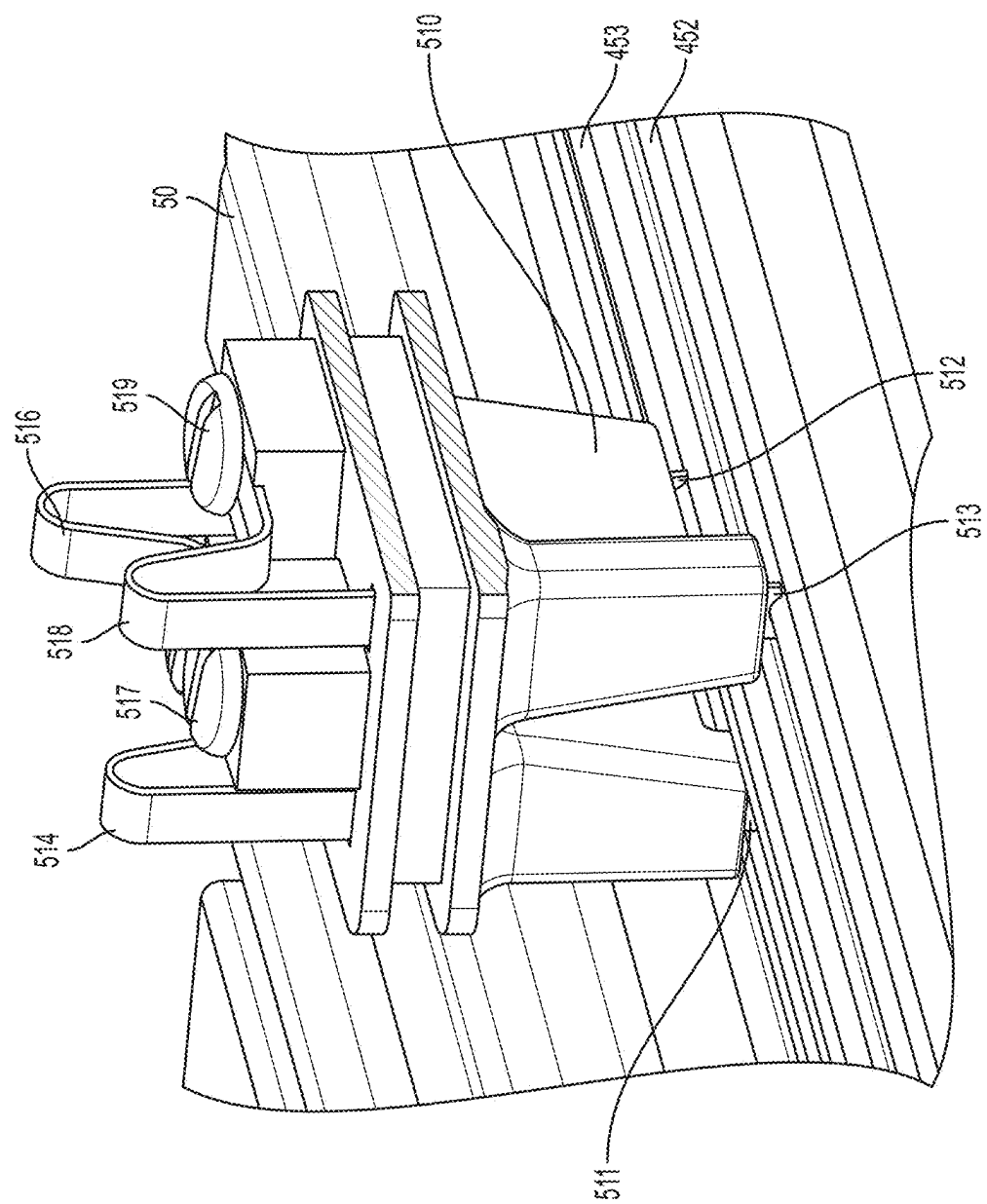


FIG. 38

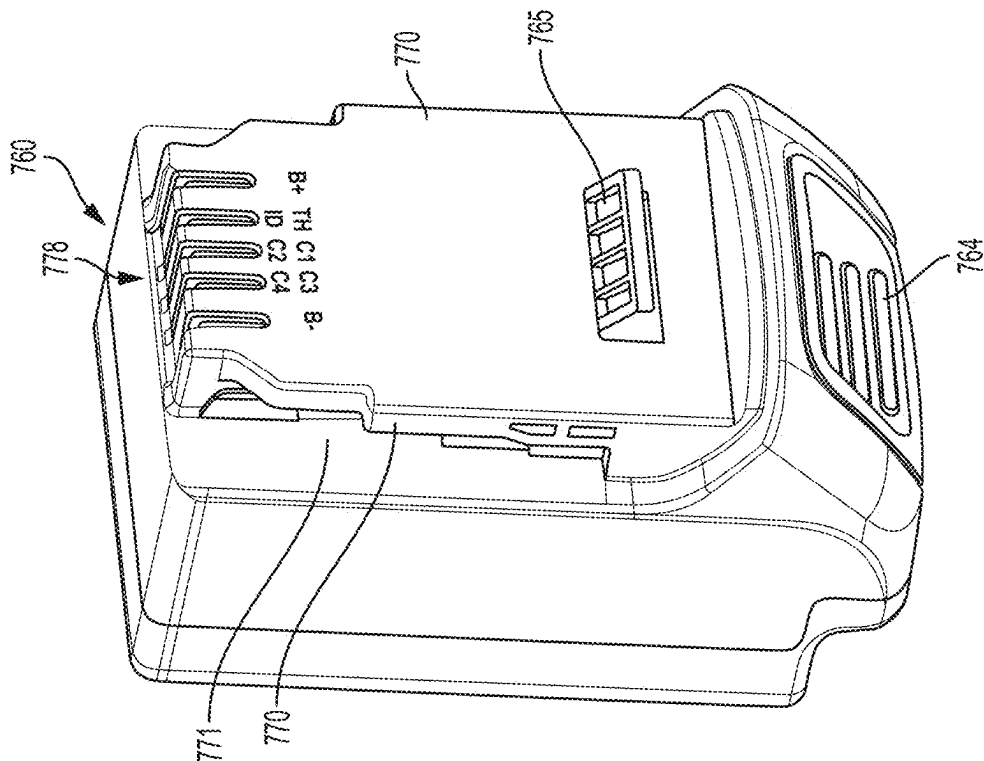


FIG. 39

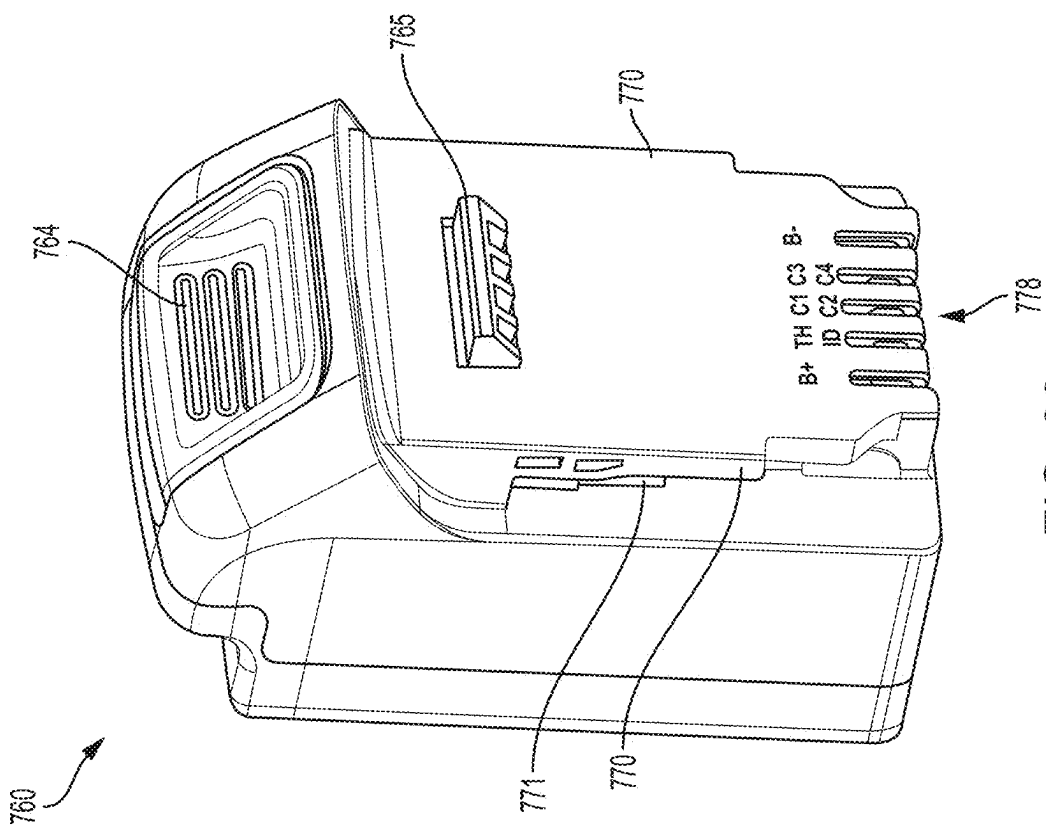


FIG. 40

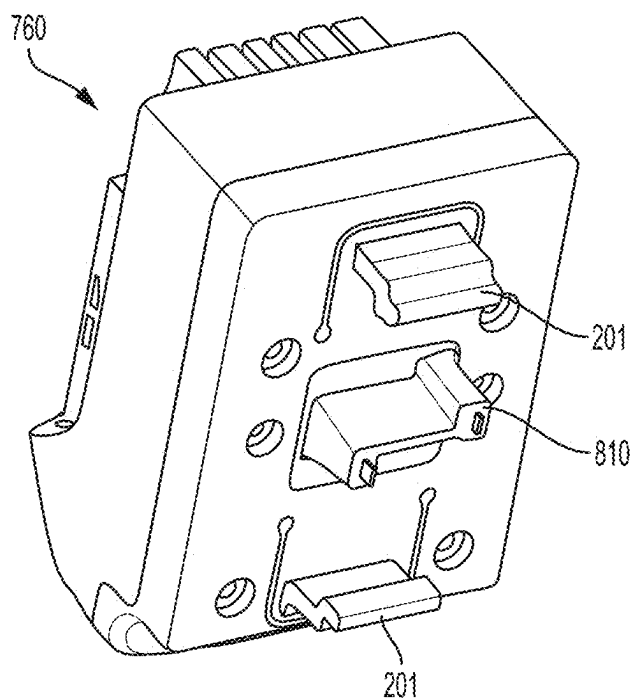


FIG. 41

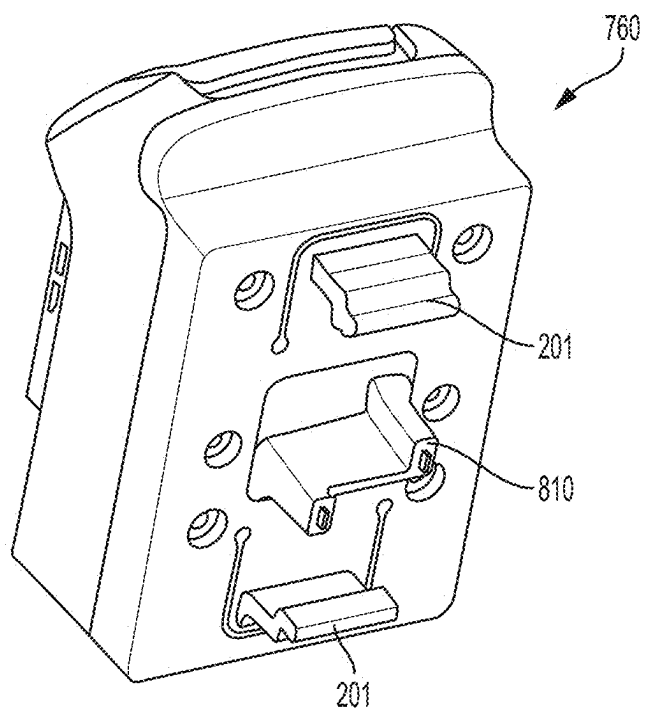


FIG. 42

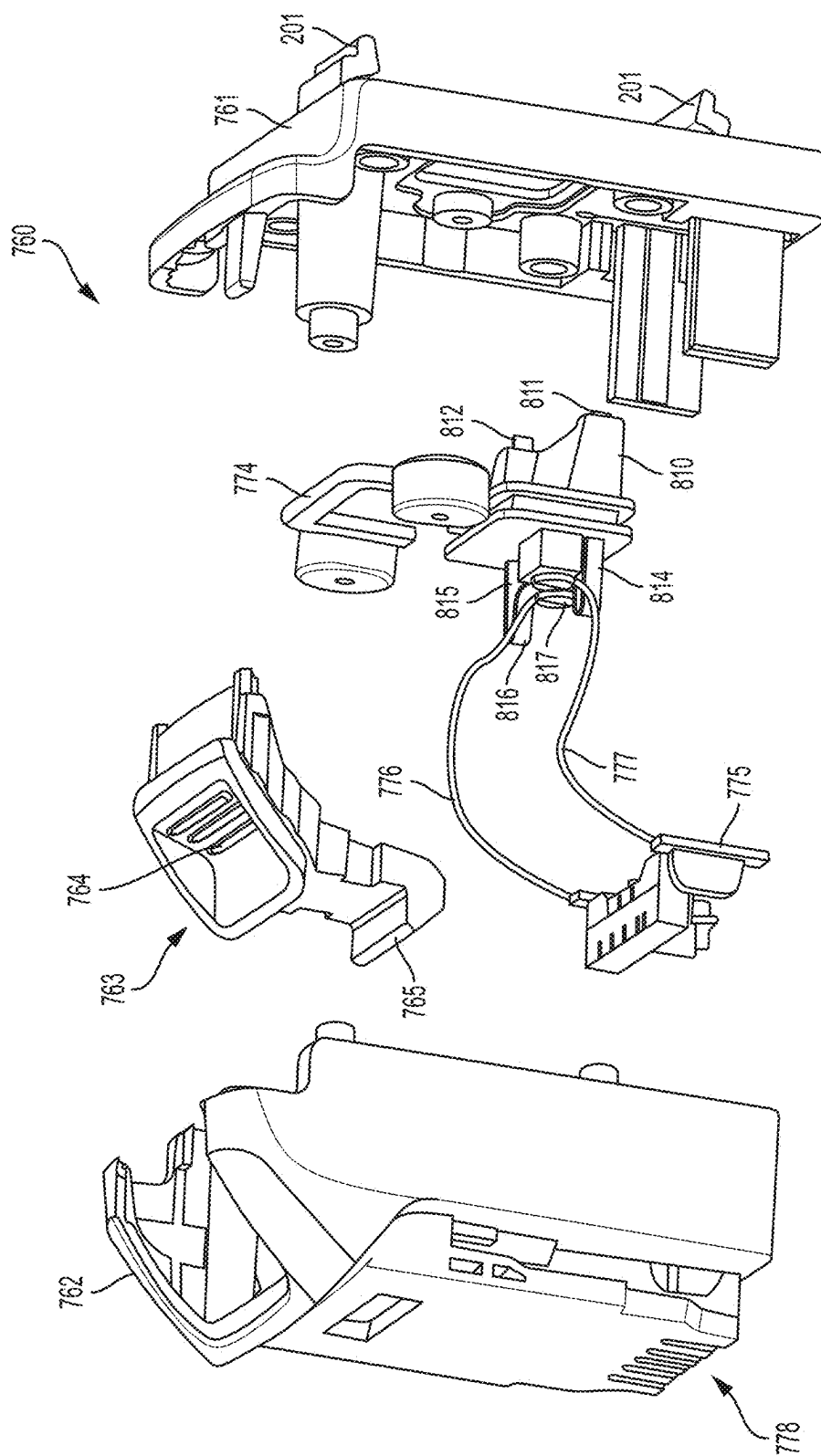


FIG. 43

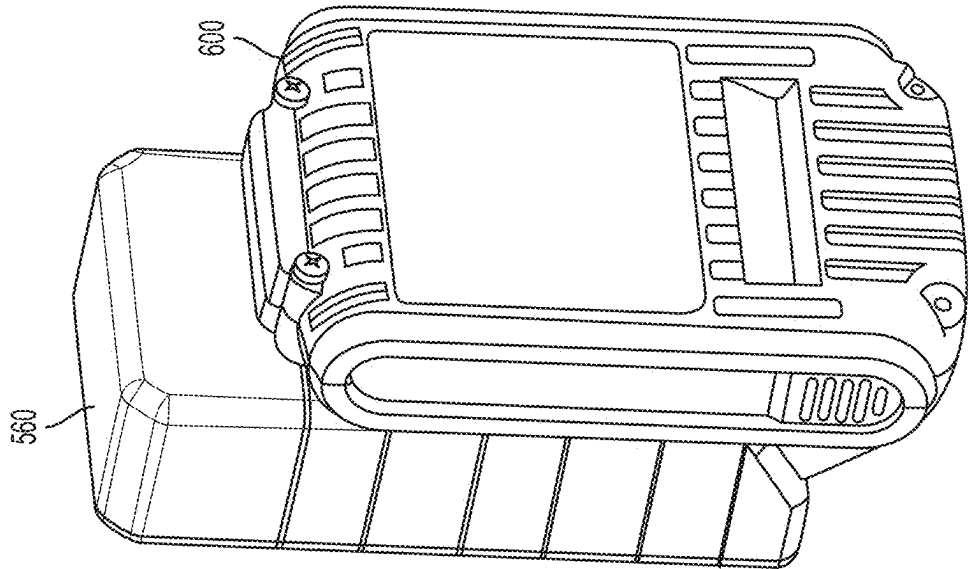


FIG. 45

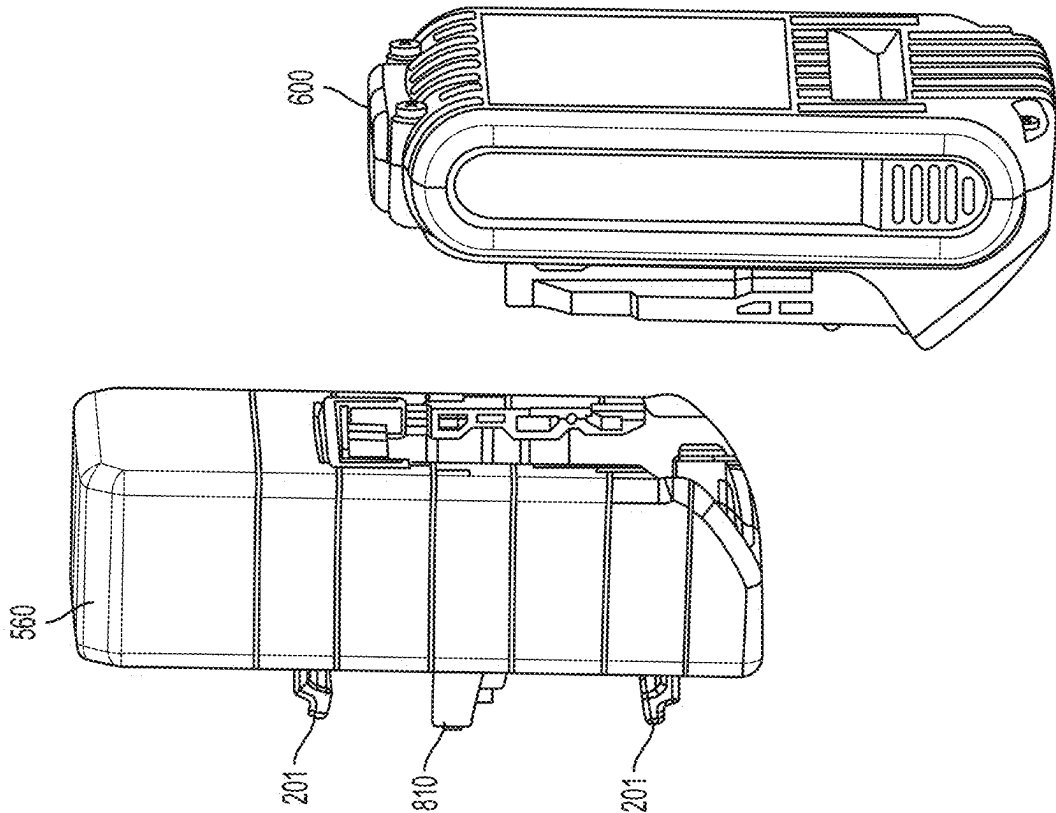


FIG. 44

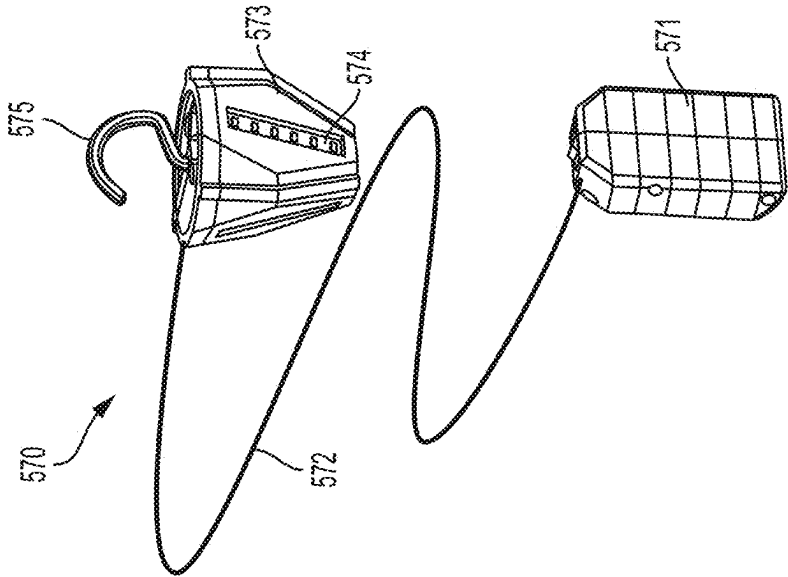


FIG. 46

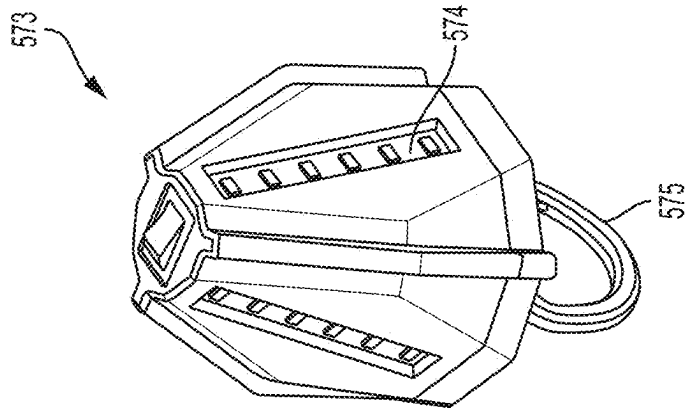


FIG. 47

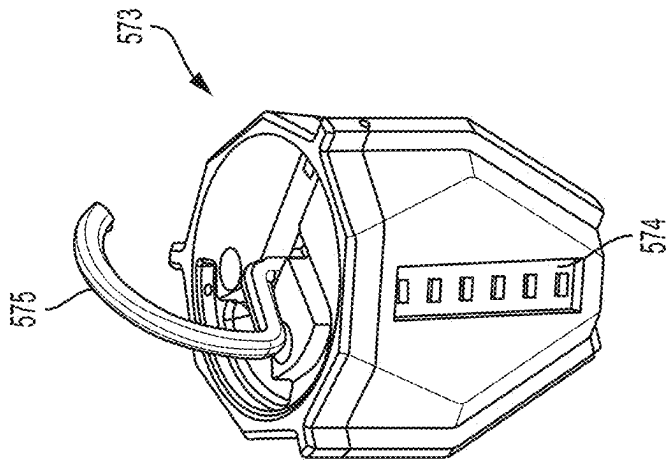


FIG. 48

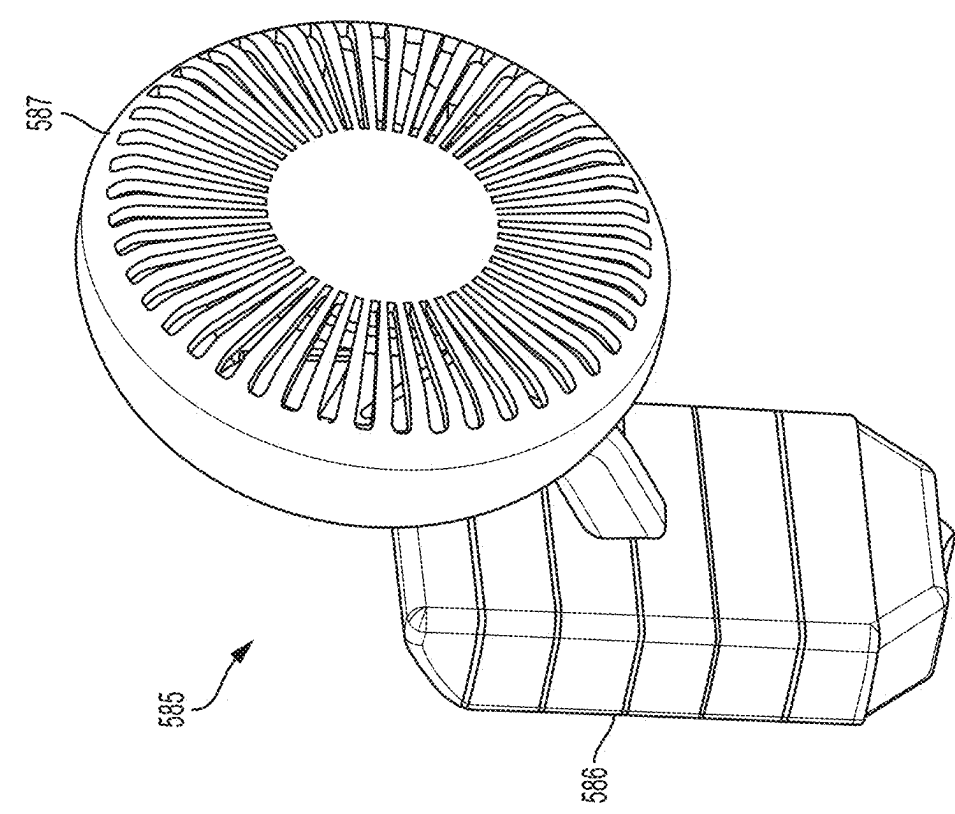


FIG. 50

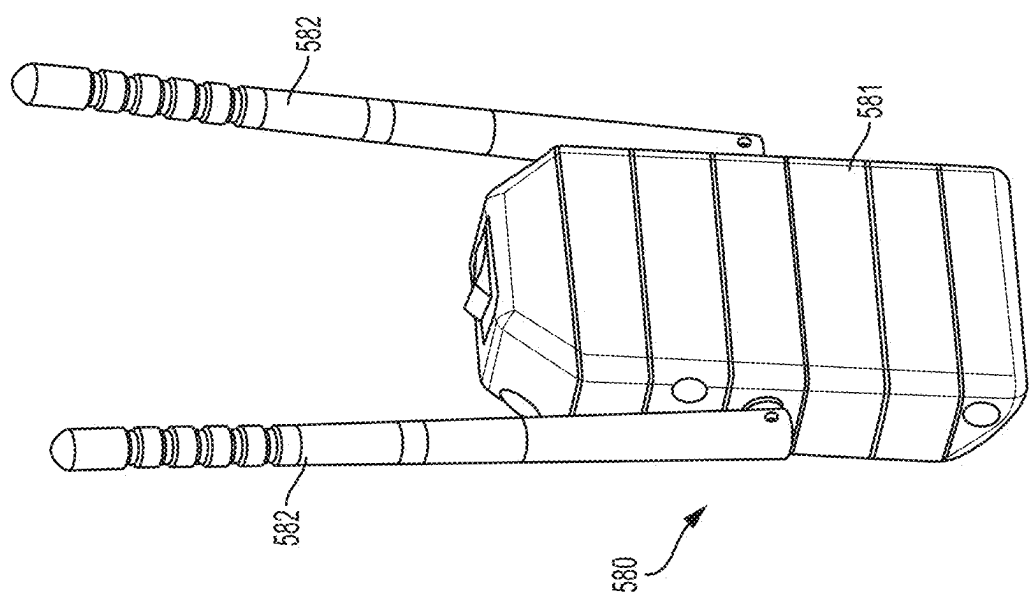


FIG. 49

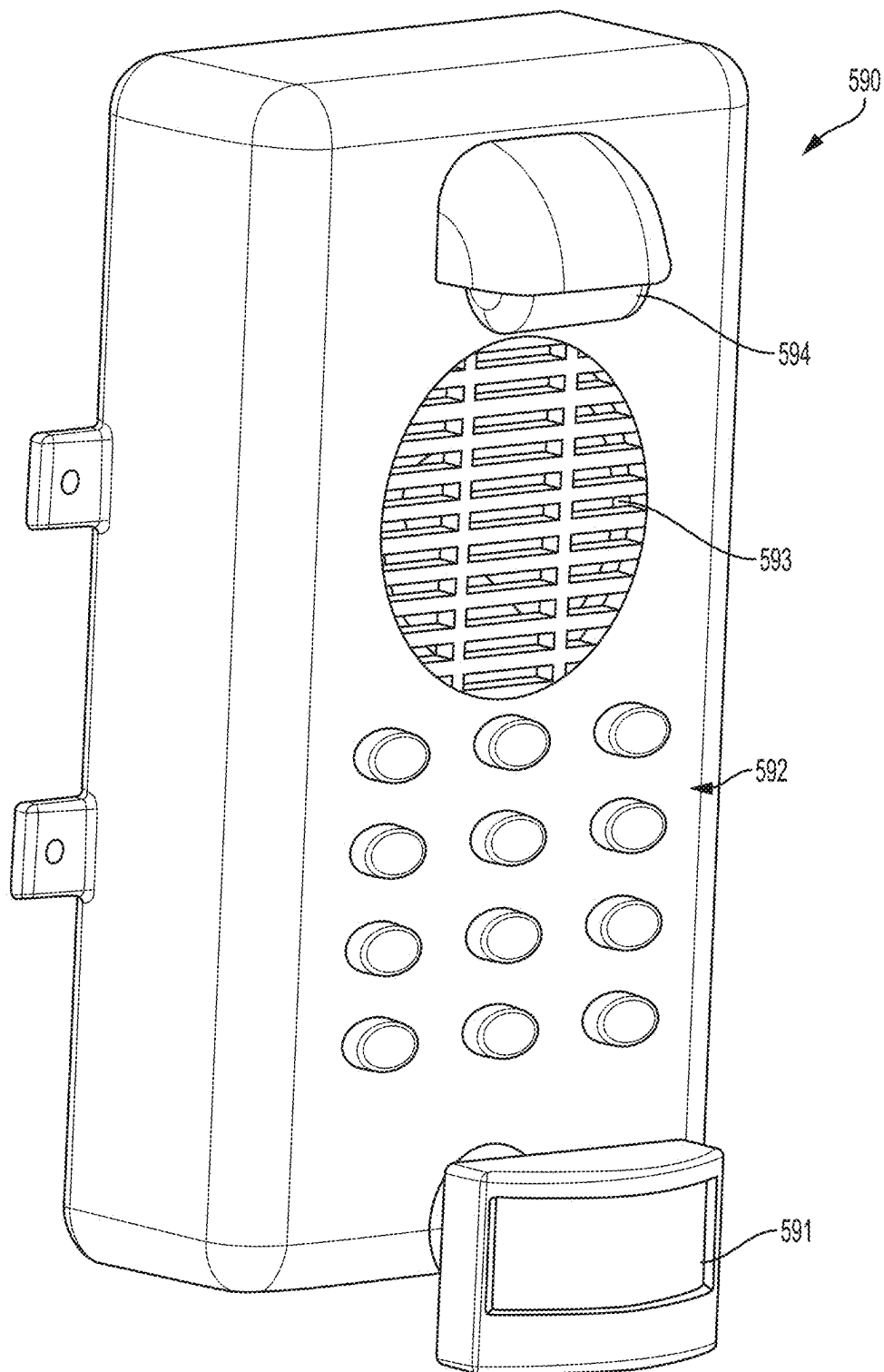


FIG. 51

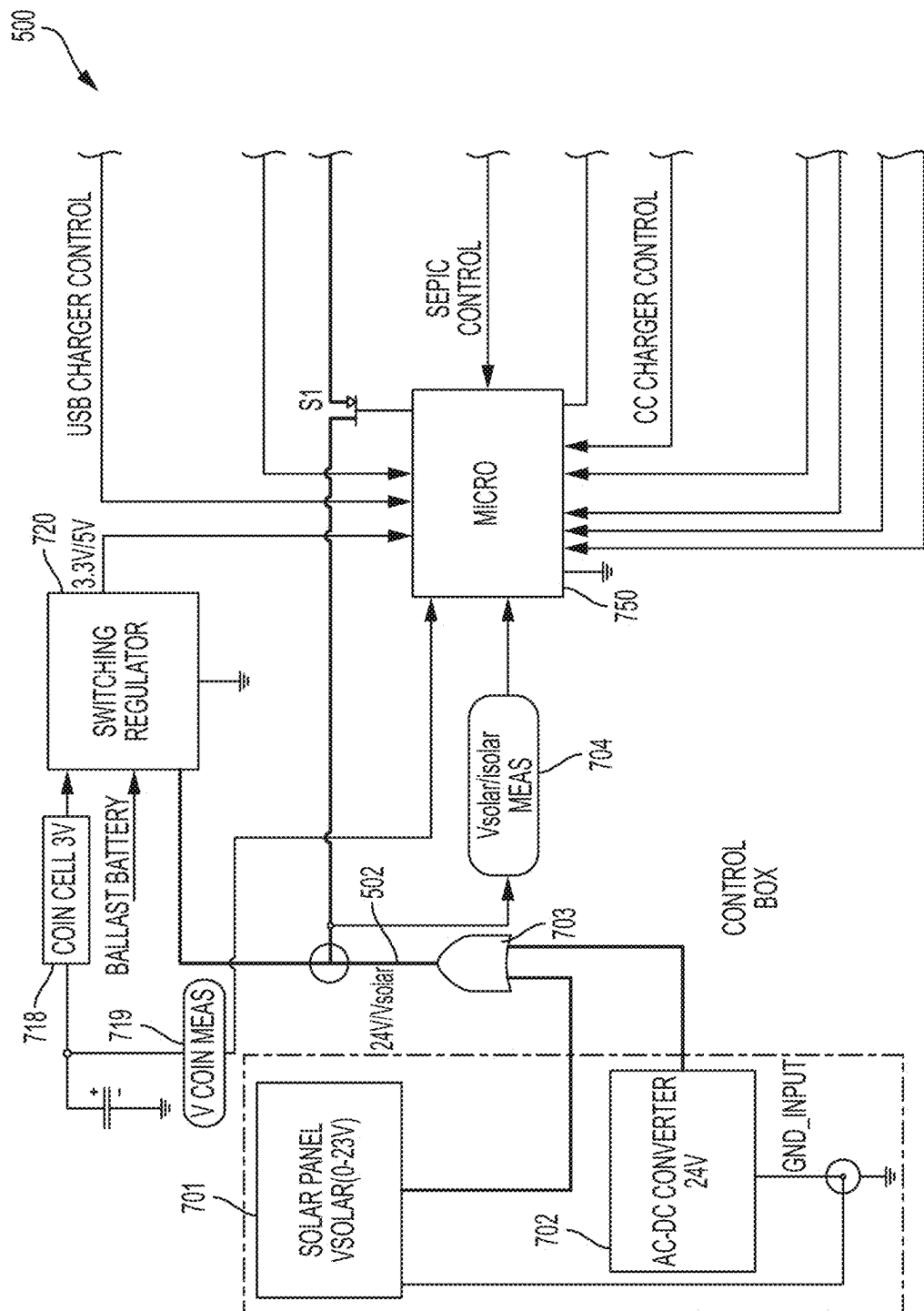


FIG. 52

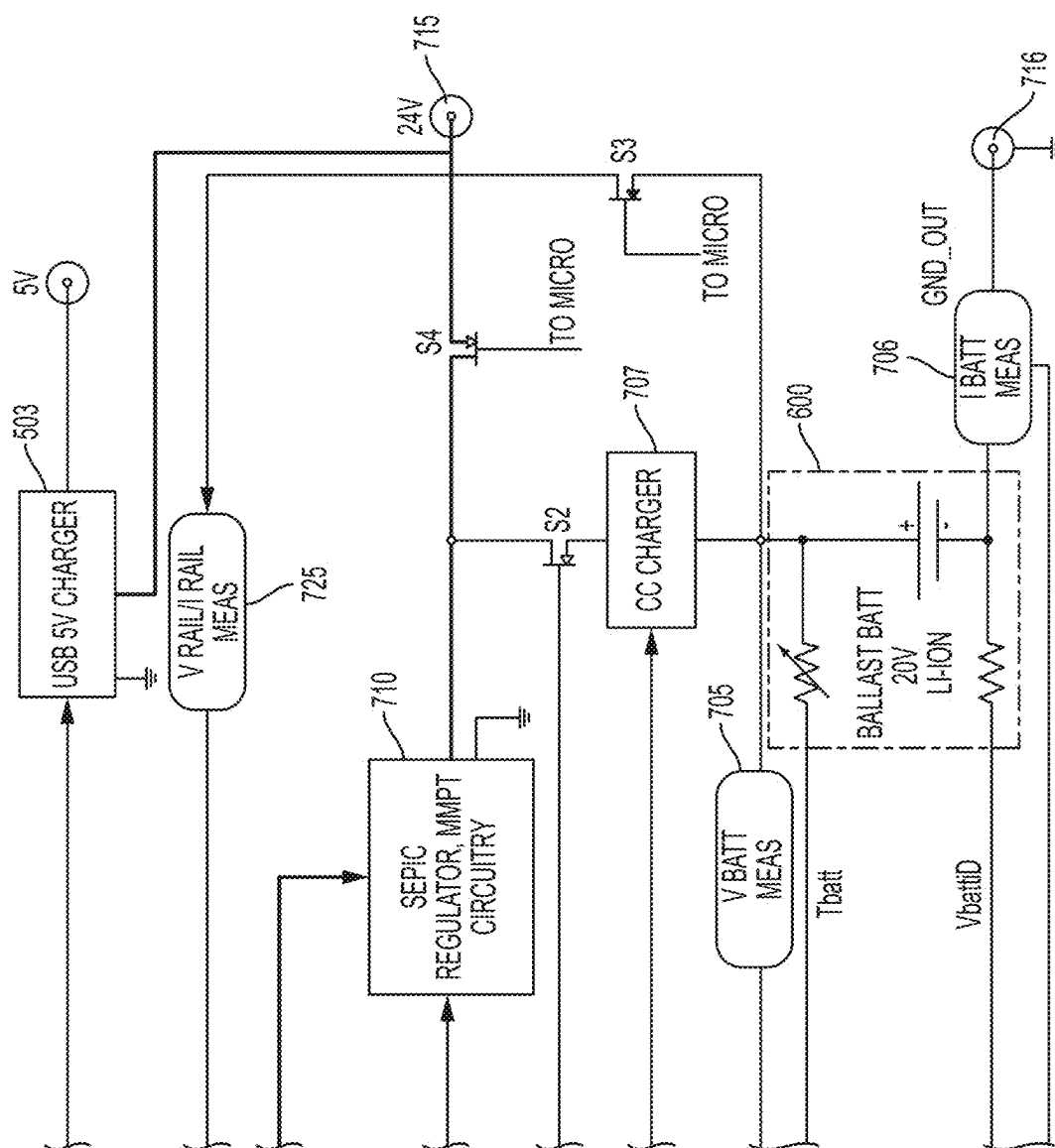


FIG. 52
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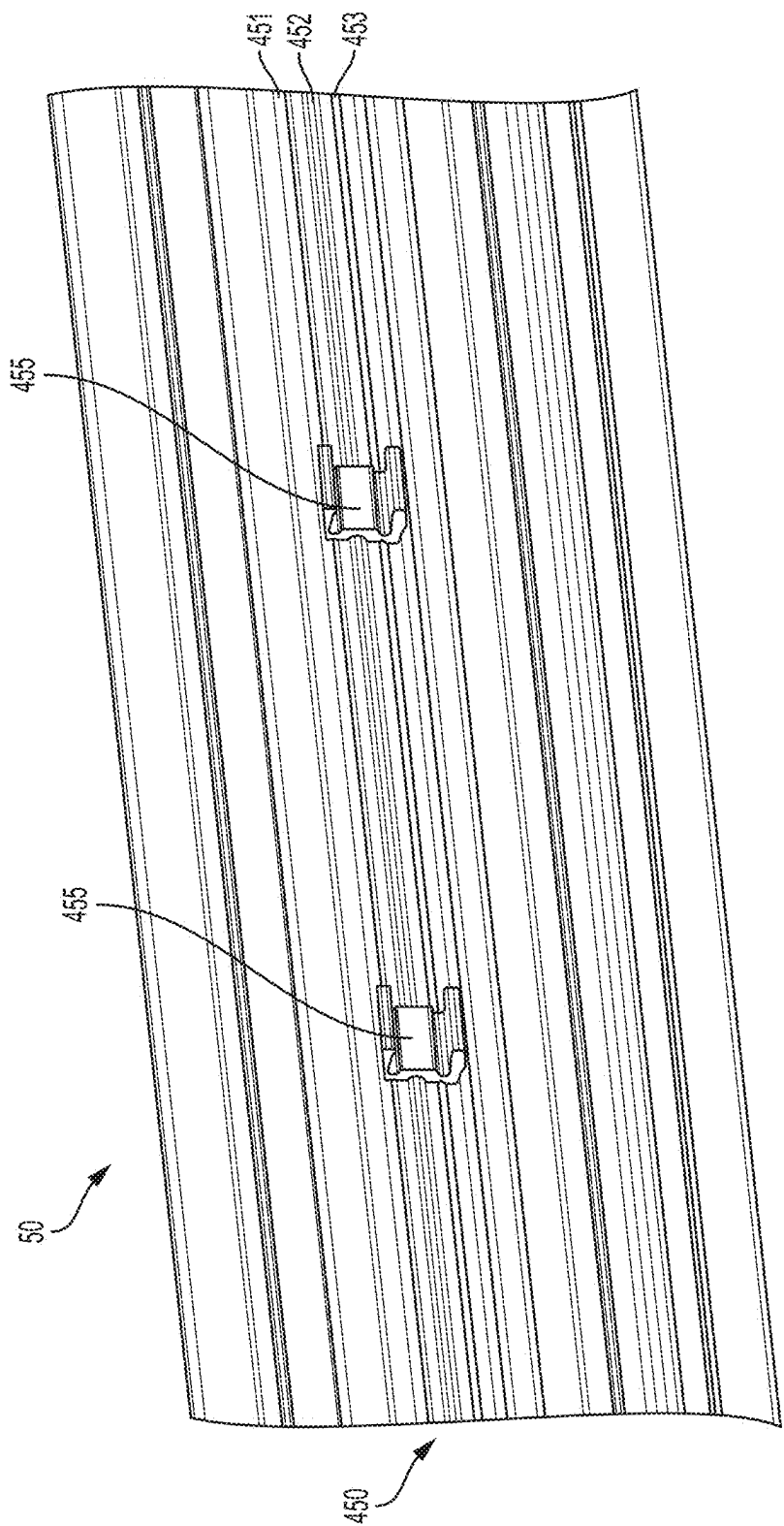


FIG. 53

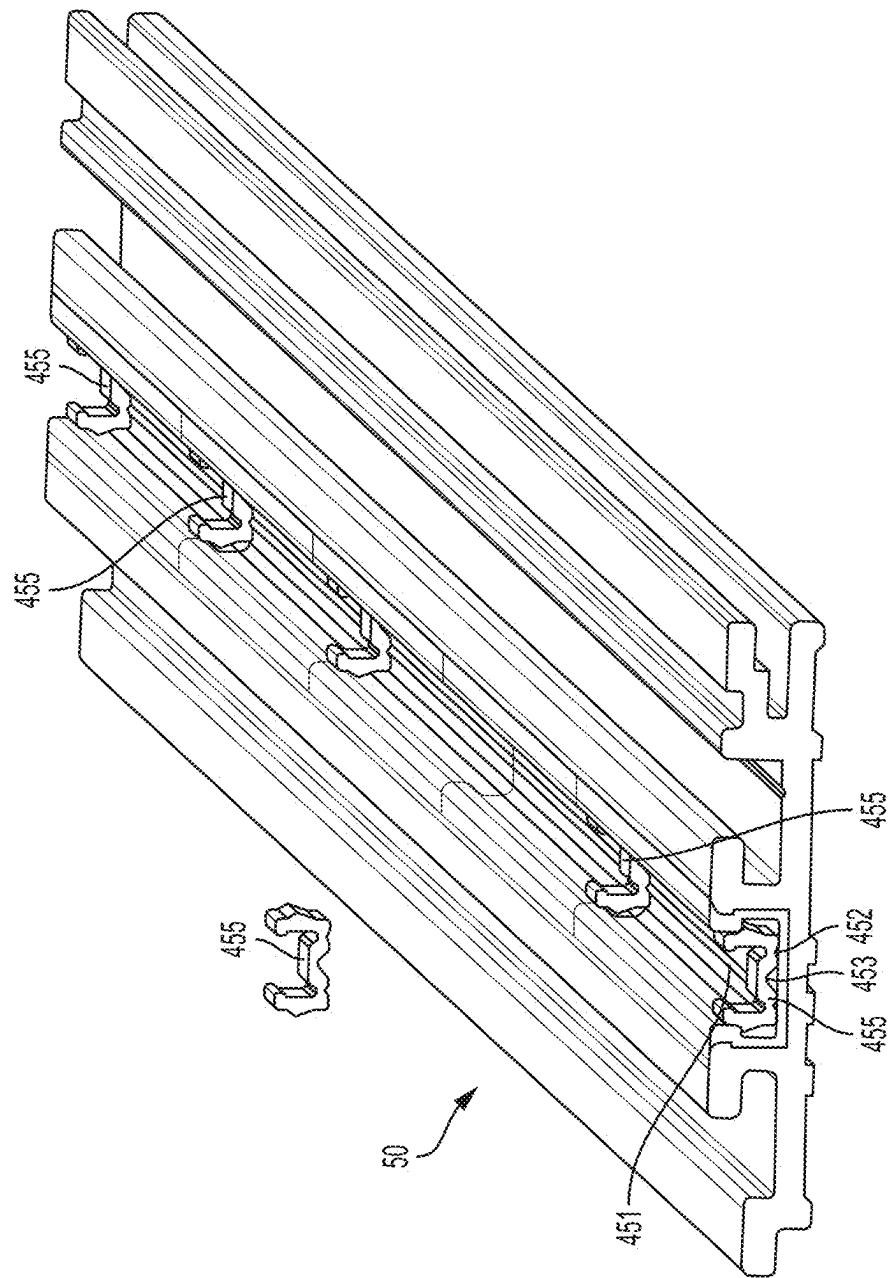


FIG. 54

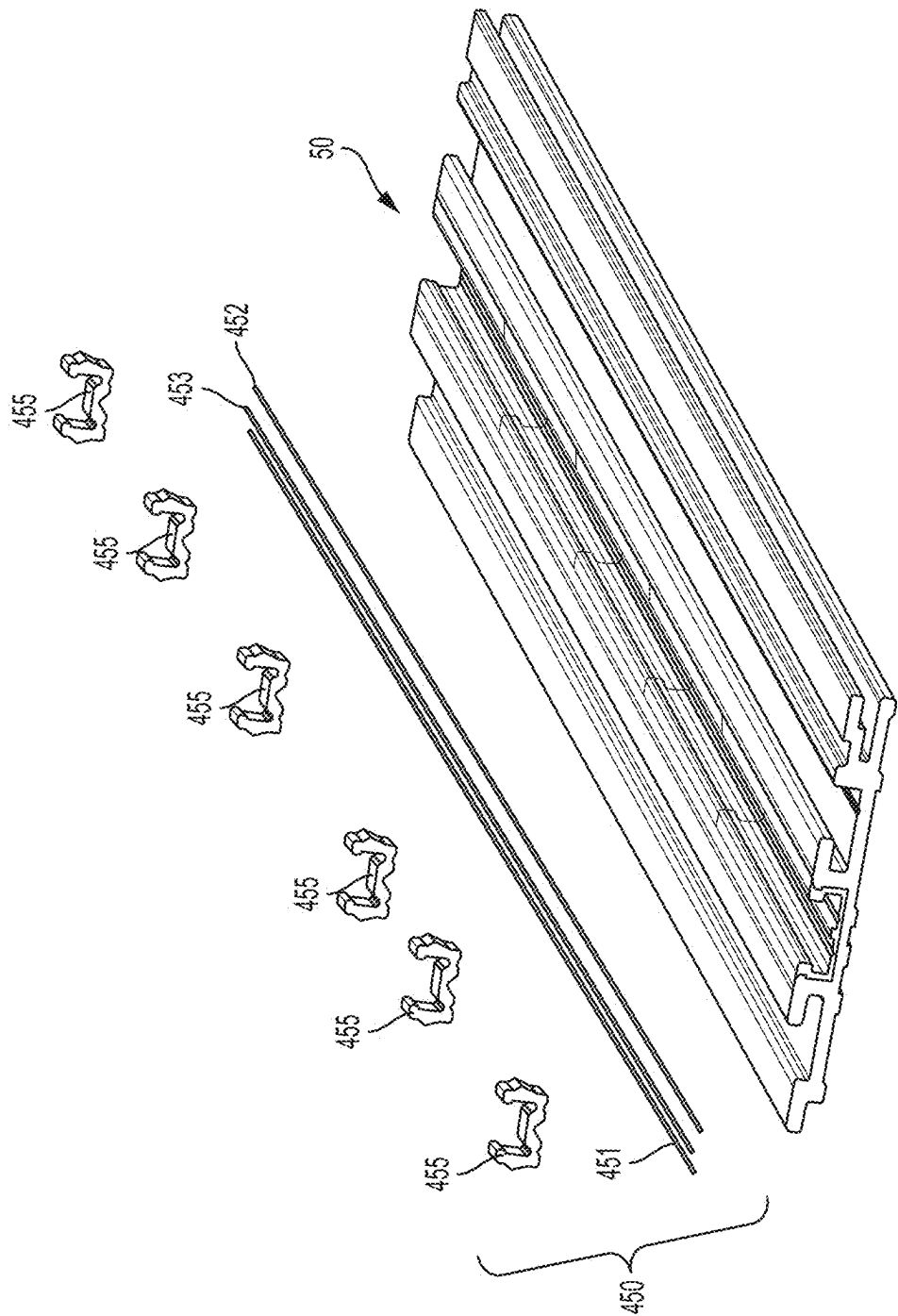


FIG. 55

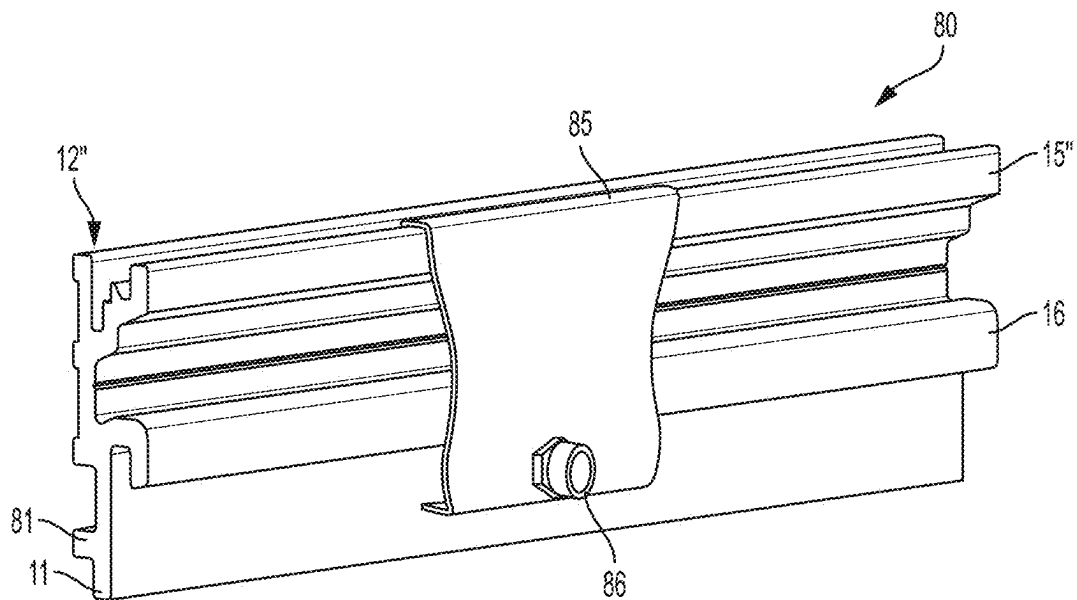


FIG. 56

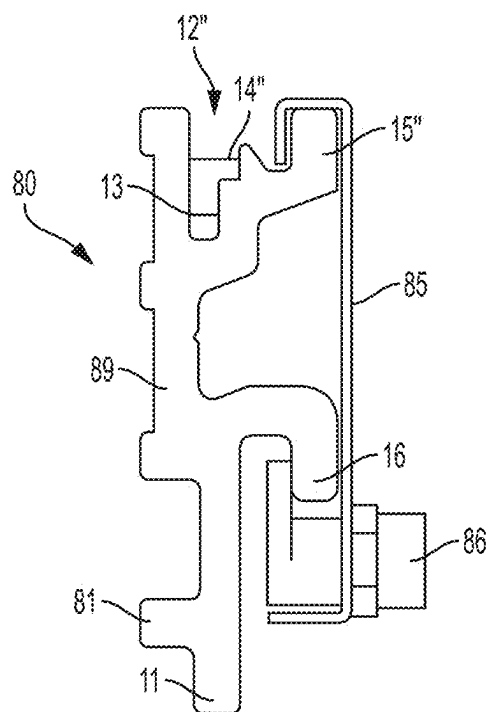


FIG. 57

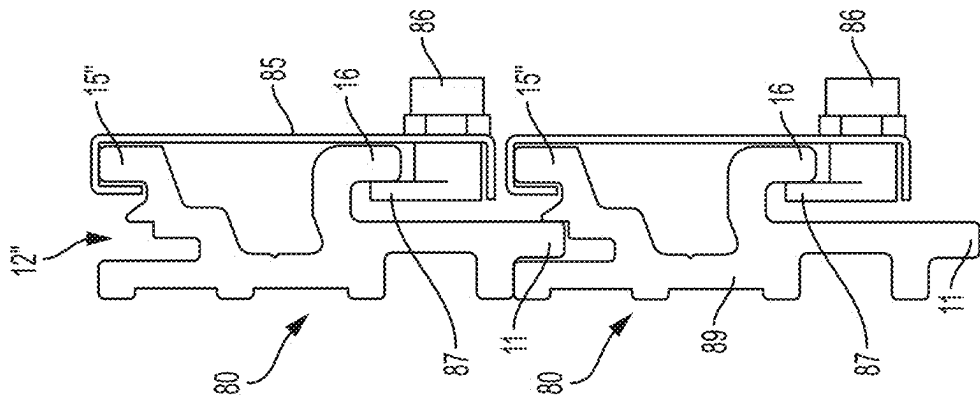
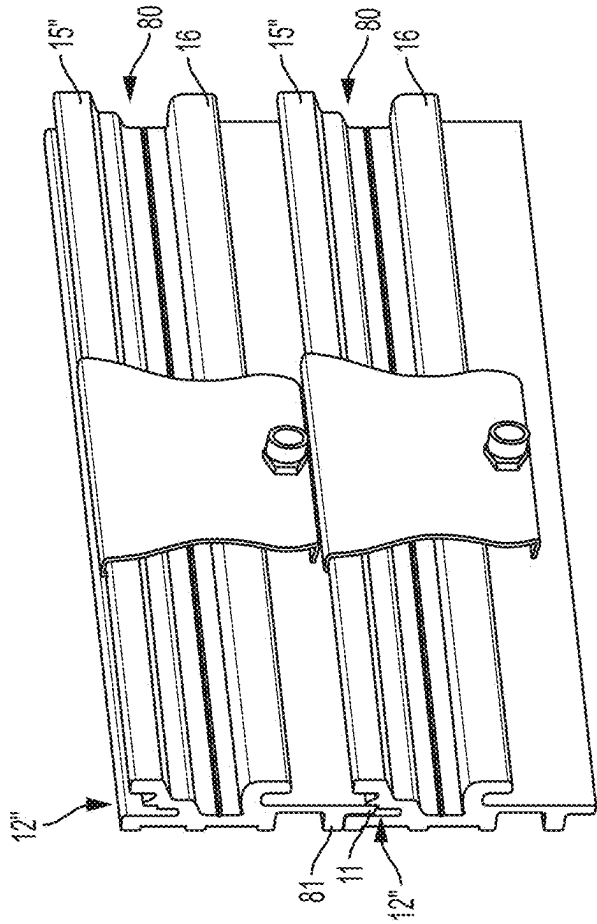


FIG. 58

FIG. 59



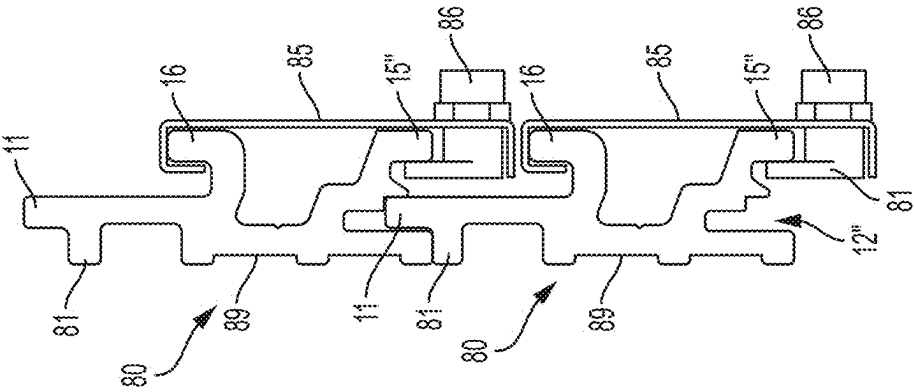
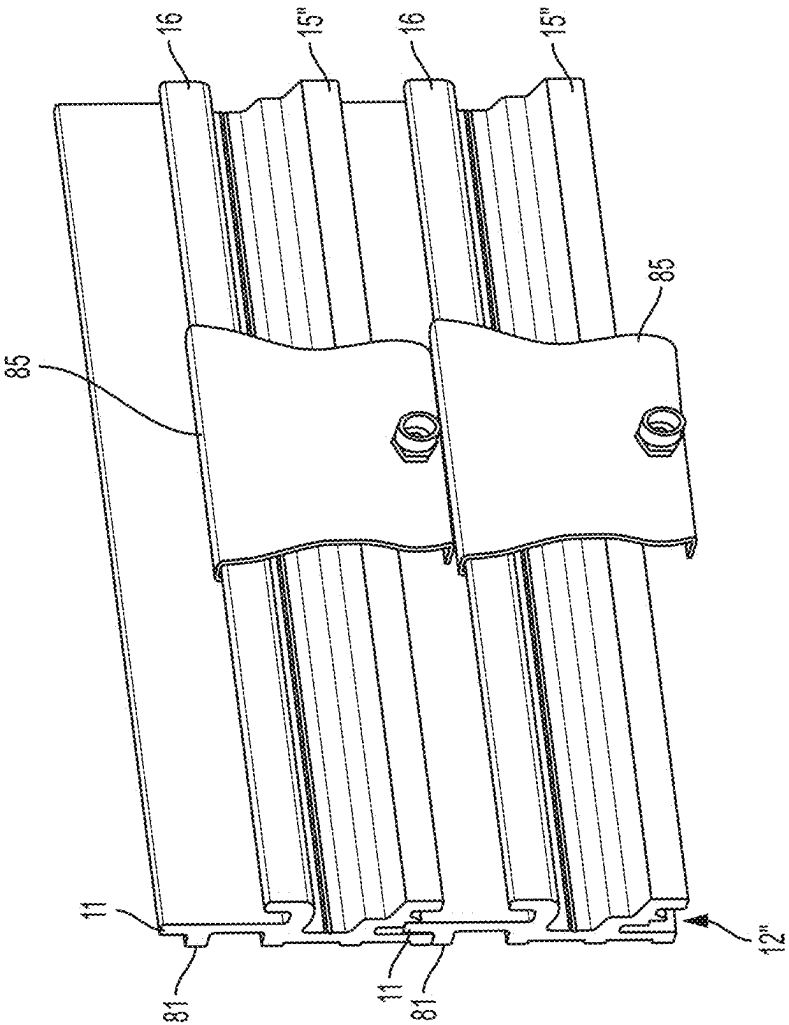


FIG. 60

FIG. 61



BATTERY CHARGING SYSTEM**CROSS-REFERENCE TO RELATED APPLICATION**

[0001] This application is a divisional of and claims priority to U.S. patent application Ser. No. 18/219,996, filed Jul. 10, 2023, and titled, “Wall Hanging System,” which in turn is a continuation of and claims priority to U.S. patent application Ser. No. 17/859,145, filed Jul. 7, 2022, and titled, “Wall Hanging System,” now U.S. Pat. No. 11,737,587 which in turn is a continuation of and claims priority to U.S. patent application Ser. No. 17/150,295, filed Jan. 15, 2021, and titled, “Wall Hanging System,” now U.S. Pat. No. 11,406,203 which in turn is a continuation of and claims priority to U.S. patent application Ser. No. 16/668,988, filed Oct. 30, 2019, and titled, “Wall Hanging System,” now U.S. Pat. No. 10,925,412 which in turn is a continuation of and claims priority to U.S. patent application Ser. No. 15/946,248, filed Apr. 5, 2018, and titled, “Wall Hanging System,” now U.S. Pat. No. 10,492,631 which in turn claims the benefit of priority under 35 U.S.C. § 119 (e) to U.S. Provisional Application Ser. No. 62/544,962 filed on Aug. 14, 2017, entitled “Wall Hanging System;” U.S. Provisional Application Ser. No. 62/540,210 filed on Aug. 2, 2017, entitled “Wall Hanging System;” and U.S. Provisional Application No. 62/532,077 filed on Jul. 13, 2017, entitled “Wall Hanging System,” all of which are incorporated by reference in their entirety.

FIELD OF THE INVENTION

[0002] The present application relates to a system for charging a battery pack.

BACKGROUND

[0003] It is desired to provide a battery charging system which may be hung on a wall.

SUMMARY

[0004] According to an aspect of an exemplary embodiment, there is a battery charging system. The battery charging system includes at least two conductors running parallel to one another, an AC/DC converter, the AC/DC converter configured to receive an AC input and to provide a DC output to the at least two conductors, and a battery charger, the battery charger (1) including a battery pack receiving portion to receive a removable, rechargeable battery pack and (2) removably, electrically coupled to the at least two conductors to receive the DC output.

[0005] The battery charging system may include a power receiving connector, the power receiving connector may be configured to removably, electrically couple the battery charger to the at least two conductors.

[0006] The power receiving connector may include a housing, a pair of pins projecting out of the housing. A first pin of the pair of pins may be configured to engage a first of the at least two conductors and a second pin of the pair of pins may be configured to engage a second of the at least two conductors.

[0007] The battery charging system may include a wall panel and wherein the at least two conductors are affixed to the wall panel.

[0008] The battery charger may be removably, mechanically coupled to the wall panel.

[0009] The battery charging system may include a power receiving connector, the power receiving connector may be configured to removably, mechanically couple the battery charger to the wall panel.

[0010] The battery charging system may include a series of clips holding the at least two conductors to the wall panel.

[0011] The at least two conductors may be held fixed between the series of clips and a surface of the wall panel.

[0012] The at least two conductors may run parallel to one another along a horizontal axis of a wall to which the at least two conductors are coupled and the at least two conductors may be vertically spaced from one another.

[0013] According to another aspect, there is a method for providing a battery charging system. The method may include providing at least two conductors running parallel to one another, providing an AC/DC converter, providing an AC input to the AC/DC converter, providing a DC output from the AC/DC converter to the at least two conductors, providing a battery charger, the battery charger including a battery pack receiving portion to receive a removable, rechargeable battery pack, and removably, electrically coupling the battery charger to the at least two conductors and providing the DC output to the battery charger.

[0014] The method may include providing a power receiving connector and removably, electrically coupling the power receiving connector to the at least two conductors.

[0015] The power receiving connector may include a housing and a pair of pins projecting out of the housing and the method may include engaging a first pin of the pair of pins with a first of the at least two conductors and a second pin of the pair of pins with a second of the at least two conductors.

[0016] The method may include providing a wall panel and affixing the at least two conductors to the wall panel.

[0017] The method may include removably, mechanically coupling the battery charger to the wall panel.

[0018] The method may include providing a power receiving connector and removably, mechanically coupling the battery charger to the wall panel with the power receiving connector.

[0019] The method may include providing a series of clips and holding the at least two conductors to the wall panel with the series of clips.

[0020] The at least two conductors may be held fixed between the series of clips and a surface of the wall panel.

[0021] The at least two conductors may run parallel to one another along a horizontal axis of a wall to which the at least two conductors are coupled and the at least two conductors may be vertically spaced from one another.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] FIG. 1 is a perspective view of a wall hanging system according to an exemplary embodiment;

[0023] FIG. 2 is a perspective view of a wall hanging system and cabinet according to an exemplary embodiment;

[0024] FIG. 3 is a side view of a first wall panel according to an exemplary embodiment

[0025] FIG. 4 is a side view of a second wall panel according to an exemplary embodiment;

[0026] FIG. 5 is a side view of a third wall panel according to an exemplary embodiment;

[0027] FIG. 6 is a front view of first and second wall panels according to the exemplary embodiment;

[0028] FIG. 7 is a side perspective view of a wall panel and pegboard assembly according to the exemplary embodiment;

[0029] FIG. 8 is a side perspective view of a wall panel and pegboard assembly according to the exemplary embodiment;

[0030] FIG. 9 is a side perspective view of a wall panel and pegboard assembly according to the exemplary embodiment;

[0031] FIG. 10 is a top perspective view of a cabinet according to an exemplary embodiment;

[0032] FIG. 11 is a close up perspective view of the cabinet according to the exemplary embodiment;

[0033] FIG. 12 is a close up perspective view of a cabinet and wall panel assembly according to the exemplary embodiment;

[0034] FIG. 13 is a front view of a cabinet and wall panel assembly according to an exemplary embodiment;

[0035] FIG. 14 is a perspective view of a securing member and wall panel according to an exemplary embodiment;

[0036] FIG. 15 is a perspective view of the securing member according to the exemplary embodiment;

[0037] FIG. 16 is a side view of the securing member and a wall panel according to the exemplary embodiment;

[0038] FIG. 17 is another side view of the securing member and a wall panel according to the exemplary embodiment;

[0039] FIG. 18 is another side view of the securing member and a wall panel according to the exemplary embodiment;

[0040] FIG. 19 is another side view of the securing member and a wall panel according to the exemplary embodiment;

[0041] FIG. 20 is another side view of the securing member and a wall panel according to the exemplary embodiment;

[0042] FIG. 21 is a perspective view of a clip according to an exemplary embodiment;

[0043] FIG. 22 is a side view of the clip according to the exemplary embodiment;

[0044] FIG. 23 is a side view of a fourth panel according to an exemplary embodiment;

[0045] FIG. 24 is a perspective view of the clip and fourth panel according to the exemplary embodiment;

[0046] FIG. 25 is a front view of a power strip and wall panel assembly according to an exemplary embodiment;

[0047] FIG. 26 is a front view of a power strip and wall panel assembly according to an exemplary embodiment;

[0048] FIG. 27 is a perspective view of the clips attached to a battery charger according to an exemplary embodiment;

[0049] FIG. 28 is a front view of a wall panel assembly according to an exemplary embodiment;

[0050] FIG. 29 is a perspective view of a wall panel assembly system according to another exemplary embodiment;

[0051] FIG. 30 is a perspective view of the wall panel assembly of the exemplary embodiment;

[0052] FIG. 31 is a close-up perspective view of an end of the wall panel assembly system of the exemplary embodiment;

[0053] FIG. 32 is a perspective view of a control box according to the exemplary embodiment;

[0054] FIG. 33 is another perspective view of a control box according to the exemplary embodiment;

[0055] FIG. 34 is a side view of the control box and wall panel according to the exemplary embodiment;

[0056] FIG. 35 is a rear perspective view of a portion of the control box according to the exemplary embodiment;

[0057] FIG. 36 is a perspective view of a power supply connector according to the exemplary embodiment;

[0058] FIG. 37 is a perspective view of a power receiving connector according to the exemplary embodiment;

[0059] FIG. 38 is a perspective view of a power supply connector engaged with an insert on a wall panel according to the exemplary embodiment;

[0060] FIG. 39 is a perspective view of an attachment connector according to an exemplary embodiment in a first orientation;

[0061] FIG. 40 is a perspective view of the attachment connector according to an exemplary embodiment in a second orientation;

[0062] FIG. 41 is a rear perspective view of the attachment connector according to an exemplary embodiment in a first orientation;

[0063] FIG. 42 is a rear perspective view of the attachment connector according to an exemplary embodiment in a second orientation;

[0064] FIG. 43 is an exploded view of the attachment connector according to an exemplary embodiment;

[0065] FIG. 44 is a perspective view of a battery charger and battery pack according to an exemplary embodiment;

[0066] FIG. 45 is another perspective view of a battery charger and battery pack according to an exemplary embodiment;

[0067] FIG. 46 is a perspective view of a light according to an exemplary embodiment;

[0068] FIG. 47 is a perspective view of a lantern portion of the light according to an exemplary embodiment;

[0069] FIG. 48 is another perspective view of a lantern portion of the light according to an exemplary embodiment;

[0070] FIG. 49 is a perspective view of a Wi-Fi router according to an exemplary embodiment;

[0071] FIG. 50 is a perspective view of a fan according to an exemplary embodiment;

[0072] FIG. 51 is a perspective view of a security system according to an exemplary embodiment;

[0073] FIG. 52 is a schematic of the control box according to an exemplary embodiment;

[0074] FIG. 53 is a perspective view of a portion of the wall panel and insert according to an exemplary embodiment;

[0075] FIG. 54 is another perspective view of a portion of the wall panel and insert according to an exemplary embodiment;

[0076] FIG. 55 is another perspective view of a portion of the wall panel and insert according to an exemplary embodiment;

[0077] FIG. 56 is a perspective view of a wall panel and hook according to another exemplary embodiment;

[0078] FIG. 57 is a side view of the wall panel and hook according to the exemplary embodiment;

[0079] FIG. 58 is a perspective view of a wall panel and hook assembly according to the exemplary embodiment;

[0080] FIG. 59 is a side view of the wall panel and hook assembly according to the exemplary embodiment;

[0081] FIG. 60 is a perspective view of the wall panel and hook assembly according to the exemplary embodiment; and

[0082] FIG. 61 is a side view of the wall panel and hook assembly according to the exemplary embodiment.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

[0083] FIG. 1 illustrates a perspective view of a wall hanging assembly 1. The wall hanging assembly 1 includes a number of different panels of different design. Particularly, the wall hanging assembly 1 includes first panel 10, second panel 20 and third panel 30. As shown in FIG. 1, each of these panels 10, 20, 30 may be connected to other panels of the same or different type. The panels 10, 20, 30 may also be connected to a pegboard 60 and a cabinet 70, as shown in FIG. 2 and discussed in further depth below.

[0084] Details of the panels 10, 20 and 30 will be discussed with reference to FIGS. 3-9 and FIG. 1. FIG. 3 is a side view of the first panel 10, FIG. 4 is a side view of the second panel 20 and FIG. 5 is a side view of the third panel 30. Additionally, FIG. 6 illustrates front views of the first panel 10 and the second panel 20. FIGS. 7-9 illustrate various assemblies including the panels 10, 20, 30.

[0085] As shown in FIGS. 3-5, each of the panels 10, 20, 30 include a connector portion 11 at their lower end. Each of the panels also include a connector receiving portion 12. The connector receiving portions 12 are located at the top end of the panels 10, 20, 30. The connector portions 11 and the connector receiving portions 12 are sized and shaped so that the connector portions 11 fit into the connector receiving portions 12. This allows multiple panels to be connected together as shown in, for example, FIGS. 1 and 7-9.

[0086] The panels 10, 20, 30 can be connected to other panels of the same type or to panels of a different type. That is, a first panel 10 can be connected to one or more other first panels 10. The first panel 10 can also be connected to one or more of the second panels 20 and third panels 30. For example, FIG. 7 illustrates two first panels 10 being connected in sequence. FIG. 9 illustrates a first panel 10 being connected to a second panel 20 and a third panel 30. The panels 10, 20, 30 may also be connected to panels of the type shown in U.S. Pat. No. 8,528,871, which is hereby incorporated by reference.

[0087] The connector receiving portions 12 include two different width openings. The smaller width is a peg board opening 13 and the larger width is a panel opening 14. As shown in FIGS. 7 and 8, the peg board opening 13 has a width corresponding to a peg board 60 and can accommodate a peg board 60. The panel opening 14 has a width corresponding to the width of the panel connector portions 11.

[0088] With reference to FIG. 3, the first panel 10 includes a lower panel hook 15 and an upper panel hook 16. A space 17 is formed behind the lower panel hook 15 and a space 18 is formed behind the upper panel hook 16. As shown in FIG. 4, the second panel 20 is smaller than the first panel 10. The second panel 20 only includes a lower panel hook 15 and the corresponding space 17. The third panel 30, shown in FIG. 5, includes a lower panel hook 15 and the corresponding space 17. As with the second panel 20, the third panel 30 does not include an upper panel hook 16. As shown in FIGS. 1 and 5, for example, the third panel 30 includes a slot 31 for receiving a power strip 40. The power strip 40 includes a number of outlets for receiving plugs, as is well known. The power strip 40 may be a removable part which can be

inserted or removed from the slot 31 or it may be integral or fixedly connected in the third panel 30.

[0089] As shown in FIGS. 7-9, the panels can receive a hook 90 or 95. As shown in FIGS. 7-9, the hooks 90 fit over the lower panel hooks 15 of the panels. The hook 95 is an extended hook. As shown in FIG. 7, an upper end of hook 95 fits over a lower panel hook 15 and a lower end of the hook 95 fits under an upper panel hook 16.

[0090] Each of the panels have rear surfaces, as shown in FIGS. 3-5. The first panel 10 has a rear surface 19, the second panel 20 has a rear surface 29 and the third panel 30 has a rear surface 39. The rear surfaces are intended to abut against a wall. The panels 10, 20, 30 can be attached to walls through the use of a screw or other fastener or attachment means. Typically, the panels 10, 20, 30 would be screwed to a wall at a stud, however, other attachment means or locations are possible. For example, in an assembly with a cabinet 70, the wall panels may connect with the cabinet 70 and simply rest against a wall.

[0091] As shown in FIGS. 10-13, the cabinet 70 of the exemplary embodiment is configured to be integrated with the panels 10, 20, 30. The cabinet 70 has a pair of side receivers 71 and a rear slot 72. As shown in FIG. 11, the side receiver 71 has a cabinet hook 75 with the same dimensions as the lower panel hook 15, described above. The cabinet hook 75 can receive the hook 90, as shown. Additionally, as shown in FIG. 12, the side receiver 71 can also receive a panel, such as the third panel 30. This allows a power strip 40 to be attached to the cabinet 70. As also shown in FIGS. 12 and 13, the rear slot 72 is able to receive one or more panels 10, 20, 30. Accordingly, as shown in FIG. 13, a combination cabinet 70, wall panel and peg board system can be provided. As shown in FIG. 13, multiple power strips 40 may be plugged into one another so that only a single power strip 40 needs to be plugged into the wall.

[0092] FIGS. 14-20 illustrate a securing member 100 which can be used with the first panel 10 to hang a tool or other device on the wall. The securing member 100 is able to be secured to or removed from the panel 10 and a variety of different hooks may be secured to the securing member 100 to hold tools of various types. A tool holding hook 130 is shown in FIG. 18. In other embodiments, the multiple hooks, projections or other types of holders may be used with the securing member 100. The hooks, projections or other holders may be integrally formed with the securing member 100 or may be attached to the securing member 100 by any of a variety of means, such as an adhesive, welding or fasteners. The securing member 100 may also be attached directly to tools or other objects. For example, a light may be directly attached to the securing member 100 so that the light can be secured to one of the first panels 10.

[0093] FIG. 14 is a perspective view of the securing member 100 attached to a panel 10 and FIG. 15 illustrates the securing member 100 alone. The securing member 100 of the exemplary embodiment is made of two main parts. The first part is a panel abutting member 110. The panel abutting member 110 is relatively rigid and abuts portions of the panel 10. The second part is the latch member 120. The latch member 120 pivots and latches to the panel 10, as will be explained in further detail below.

[0094] The panel abutting member 110 includes an upper section 111, a central section 112 and a lower section 113. The latch member 120 includes a gripping member 121, a central member 112 a spring member 123 and a lower/

attachment member **124**. The spring member **123** includes a latching portion **125**, which latches over the lower channel hook **15**.

[0095] The latch member **120** is attached to the panel abutting member **110** at the panel abutting member lower section **113**. In particular, the attachment member **124** of the latch member **120** is attached to the lower section **113**. In the exemplary embodiment, the attachment member **124** is welded to the lower section **113** of the abutting member **110**. Other attachment methods including, but not limited to, adhesives, fasteners or crimping could also be used.

[0096] Operation of the securing member **100** can be seen in FIGS. 17-20. In FIG. 17, the securing member **100** is inserted into the panel **10**. As shown, the upper section **111** is inserted behind the upper panel hook **16** into the space **17** such that the latching portion **125** abuts against the lower panel hook **15**. The user then pushes the securing member **100** towards the rear **19** of the panel **10** (i.e., to the left in FIG. 17). The latching portion **125** is able to deflect and slides over the lower panel hook **15** until the securing member **100** reaches the position shown in FIG. 18.

[0097] FIG. 18 shows the securing member **100** in an attached position where it is attached to the panel **10** and including a hook **130** which holds a tool **140**. The tool may be a screwdriver, wrench, power tool or other tool, for example.

[0098] As shown in FIG. 18, the latching portion **125** wraps around a rear side of the lower panel hook **15**. Additionally, the central portion **112** of the abutting member **110** is on a top surface of the abutting member and the lower section **113** of the abutting member **110** is on the front side of the lower panel hook **15**. This sandwiches the lower panel hook **15** between the latching portion **125** and lower section **113**.

[0099] The upper section **111** of the abutting member **110** serves to further secure the securing member **100** to the panel **10**. As shown in FIG. 18, when the securing member **100** is inserted into the panel **10**, the upper section **111** contacts a rear side of the upper panel hook **16**. This secures the securing member **100** in a second direction and helps the securing member **100** resist being pulled away from the panel **10** by, for example, the force of the tool **140** being held.

[0100] FIGS. 19 and 20 illustrate the securing member **100** being removed from the panel **10**. As shown in FIG. 19, a user pulls on the gripping member **121**. That moves the latching portion **125** up above a top of the lower panel hook **15**. This unlocks the securing member **100** from the panel **10**. As shown in FIG. 20, the upper section **111** is pivoted inward, towards the rear **19** of the panel **10**, and the securing member **100** can be slid out in a downward and frontward direction.

[0101] FIGS. 21 and 22 illustrate a clip **200** for use with the panels. FIG. 21 is a perspective view of the clip **200** and FIG. 22 is a side view of the clip **200**. The clip **200** includes two leg members **201**. The leg members **201** are made up of a base portion **202** and a finger portion **203**. There is an abutting surface **204** at one end of the finger portion **203**, which secures the clip on a panel, as discussed in further detail below.

[0102] The leg members **201** are configured to fit over a lower panel hook **15** and an upper panel hook **16**. In particular, the leg member **201** at the upper end of the clip **200** fits over a lower panel hook **15** and the leg member **201**

at the lower end of the clip **200** fits over an upper panel hook **16**. This requires either that multiple of the panels **10**, **20**, **30** be configured together or that there be a different panel design. For example, a fourth panel **50**, shown in FIG. 23.

[0103] As shown in FIG. 23, the fourth panel **50** includes a lower panel hook **15** and an upper panel hook **16** as well as the accompanying spaces **17** and **18**. As shown, the panel hooks **15** and **16** are in different locations in the fourth panel **50**. The fourth panel **50** also includes a connector portion **11** which can be connected with another fourth panel **50** or other panels **10**, **20**, **30**. The fourth panel **50** includes a modified connector receiving portion **12'**. The modified connector receiving portion **12'** is still configured to receive connector portions **11** and peg board **60**. However, the peg board **60** is received forward of the location in the previously discussed connector receiving portion **12**. Additionally, the modified connector receiving portion **12'** includes a circular groove **56** which may receive a wire or the like. The fourth panel **55** also includes a central groove **150**.

[0104] FIGS. 24-27 show the clip **200** in use. One leg **201** of the clip **200** fits over a lower panel hook **15** and the other leg **201** of the clip **200** fits over the upper panel hook **16**. Legs **201** have some flexibility. The flexibility allows the legs **201** to snap over the panel hooks **15** and **16** and the abutting surface **204** to snap behind the panel hooks **15**, **16**. This secures the clip **200** in place on the fourth panel **55**. In order to remove the clip **200**, again the legs flex so that the abutting surfaces **204** travel over the panel hooks **15**, **16** and the clip **200** is removed from the panel **55**. The base **205** of the clip **200** may also have some flexibility to aid in the securing and removal of the clip **200** to the panel **55**.

[0105] As shown in FIG. 24, when the clip **200** is secured to the panel **55**, the clip **200** covers the central groove **150** at the location of the clip **200**. In particular, the clip base **205** covers the central groove **150**. This may be used to secure items in the central groove **150**, such as the power cord **42** shown in FIG. 24.

[0106] The clips **200** may be secured to items such as the power strip **41** shown in FIGS. 25 and 26, a battery charger **300**, as shown in FIG. 27, or other tools or items so that the items can be secured to the panel **55** (or an appropriate combination of panels **10**, **20**, **30**). As shown in FIG. 27, the clips **200** may be secured to an item such as a battery charger **300**. In FIG. 27, the clips are secured to the base of the battery charger **300** by screws **206**. Other fasteners or attachment methods may be used or the clips **200** could be integrally formed with the item. In some instances, only the legs **201** may be joined with or integrally formed with the item and the legs **201** will allow the item to snap onto the panel **55** or a combination of panels.

[0107] FIGS. 25 and 26 illustrate a second power strip **41**. The second power strip **41** has a number of outlets, like the first power strip **40** and also includes posts for wrapping power cords **42**. The power strip **41** may be attached to the panel **55** through the use of the clips **200**. As discussed above, the clips **200** may be attached to the power strip **41** in any of a number of ways and, in some instances, it may be suitable only to include the legs **21** of the clips **200**. The power strip **41** may include a light bar **45**, as shown in FIG. 26. The light bar **45** includes a number of light emitting diodes (LEDs) and serves as an illumination device. The light bar **45** may have a separate switch to turn on and off the LEDs or the LEDs may turn on with the power strip **42**.

[0108] In combination, the panel 55 and clips 200 described above, in combination with other clips and hooks, may be used to make the wall storage hanging arrangement of FIG. 28. As shown in FIG. 28, there is a battery charger 300, hedge trimmer 310, rake 320, blower-vac 330 and string trimmer 340 all hanging on the panel 55 along with the power strip 41. The power strip 41 may be plugged into a wall power outlet 43. Items that require power, such as the battery charger 300, may then be plugged into the power strip 41 to provide power to the battery charger 300. Additionally, as discussed above, power cords 42 may be routed through the central groove 150 and may be secured in the groove by clips 200.

[0109] FIGS. 29-51 illustrate another exemplary embodiment. Features of the exemplary embodiment of FIGS. 29-51 may be used with the exemplary embodiments shown in FIGS. 1-28.

[0110] FIGS. 29 and 30 are perspective view of a powered wall panel system 400. The powered wall panel system 400 includes the fourth wall panel 50 and an insert 450. The insert 450 includes three conductors 451, 452 and 453, which conduct power along the wall panel 50. As shown in FIG. 29, the panel 50 supports a power supply and control box 500. The power supply and control box 500 provides power to the insert 450. The insert 450 conducts power along the wall panel 50 to any of a variety accessories/attachments 550 shown thereon. The attachments include a battery charger 560, a light 570, a Wi-Fi router 580, a fan 585 and a security system 590. The attachments 550 may be able to directly connect to the wall panel 50 and the insert 450. For example, the battery charger 560 and the security system 590 each attach directly to the wall panel 50. Other attachments may be powered through an attachment connector 760, described in detail below.

[0111] FIGS. 30, 31 and 53-55 illustrate the mechanical features of the insert 450 with the panel 50. FIG. 30 is a perspective view of the wall panel 50 with the insert 450 attached to the panel 50. FIG. 31 is a perspective view of one end of the panel 50 with the insert 450. FIG. 53 is a close-up view of a central section of the panel 50 with the insert 450. FIG. 54 is an end perspective view of the panel 50 with the insert 450 with one of the clips 455 shown unassembled from the panel 50. FIG. 55 illustrates an end perspective view of the panel 50 with the insert 450 not assembled with the panel 50.

[0112] As noted above, the insert 450 includes three conductors 451, 452, 453. The three conductors 451, 452, 453 run parallel to one another along a horizontal axis of the wall panel 50, the wall panel 50 being configured to hang horizontally on a wall. The conductors 451, 452, 453 are vertically spaced apart from one another and do not contact one another. A series of clips 455 hold the conductors 451, 452, 453 in place along the wall panel 50. Additionally, the clips 455 are designed to fit into the groove 150 of the wall panel 50 and are held in place there. In this way, the insert 450 can be inserted into an existing panel. As shown, the conductors 451, 452, 453 are held fixed between the clips and a surface of the panel 50. In the exemplary embodiment, the conductors 451, 452, 453 are not secured to the clips 455 independently. That is, the conductors 451, 452, 453 are separate from the clips 455 before insertion and are held by being sandwiched between the clips 455 and the panel. The clips 455 are shaped to snap into and be secured by the wall panel 50. In other embodiments the conductors and clips

could be formed as one part, or the conductors could clip into the clips 455 or wall panel 50. Additionally, in other embodiments, conductors may be formed along with the wall panel, such that the conductors are not part of an insertable and removable insert.

[0113] The control box 500 is shown in further detail in FIGS. 32-35. As shown in FIG. 32, the control box 500 receives a battery pack 600. The control box 500 includes a battery pack receiving portion 505. The battery pack receiving portion 505 includes rails for guiding the battery pack 600 into place as well as electrical connectors for connecting with the battery pack 600. The battery pack 600 connected to the control box 500 serves as a ballast battery. The battery pack 600 may be a power tool battery pack that can be used to power a variety of power tools, such as drills, saws, sanders and the like. The battery pack receiving portion 505 may be the same as the receiving portion for power tools which the battery pack 600 may receive. The battery pack 600 may be one of the battery packs shown in U.S. Pat. No. 9,406,915.

[0114] The control box 500 includes a pair of hooks 501 on a front side. The hooks 501 may be used to hold a screwdriver, phone or other item. The control box 500 also includes an input jack 502 which receives a cord with a power input, such as an AC input or a DC input provided by solar panels, as will be discussed later. Also shown in FIG. 53, the control box 500 may include USB ports 503. The USB ports 503 can be used to charge or power phones or other devices from the power input through the jack 502 or the battery pack 600.

[0115] As shown in FIGS. 34 and 35, the control box 500 includes a pair of legs 201 on its rear side. The legs 201 are the same as the legs 201 described for the clip above. In this case, the legs 201 are integrated into the control box 500. In other embodiments, a separate clip 200 could be attached to the rear of the control box 500. The legs 201 include base portions 202, finger portions 203 and an abutting surface 204 and allow the control box 500 to latch onto the panel wall 50 in the manner shown in FIG. 34 and discussed above with respect to the legs 201.

[0116] As shown in FIGS. 33-35, the control box 500 has a power supply connector 510 which connects it to the conductors 451, 452 and 453. The power supply connector 510 is shown by itself in FIG. 36. As shown in FIGS. 34 and 35, part of the power supply connector 510 projects out of the rear of the control box 500. That portion includes three pins 511, 512 and 513. Pin 512 is a ground pin and pins 511 and 513 are positive pins. The three pins 511, 512, 513 contact the three conductors 451, 452, 453.

[0117] As shown in FIG. 36, the pins 511, 512, 513 are part of larger connectors 514, 516, 518. Specifically, pin 511 is an end of connector 514 which is attached with a screw 515 to the rest of the power supply connector 510. Pin 512 is part of connector 516 attached by a screw 517. Pin 513 (not shown in FIG. 36) is part of pin 518 attached by screw 519. The connectors 514, 516, 518 are made of metal and have elasticity such that they act as a spring. In particular, the pins 511, 512, 513 are biased downwardly towards the conductors 451, 452, 453 when the power supply connector 510 is on the wall panel 50 with the insert 450. The pins 511, 512, 513 may retract upwards into the housing 520 of the power supply connector 510 in response to being pressed on the conductors 451, 452, 453. That is, the pins 511, 512, 513 are able to move some and may be pressed upwardly when

the power supply connector **510** is in contact with the conductors **451**, **452**, **453**, as is shown in FIGS. **34** and **38**. In this way, the pins **511**, **512**, **513** are biased against the conductors **451**, **452**, **453** to provide good contact between the pins **511**, **512**, **513** and conductors **451**, **452**, **453**. The shape of the connectors **514**, **516**, **518** allows the pins to move in a generally linear fashion when they retract.

[0118] A schematic diagram of the control box **500** is shown in FIG. **52**. As shown in FIG. **32**, the control box **500** includes an input jack **502** for receiving power. In the schematic of FIG. **52**, the power comes from either solar panels **701** or AC power from an electric wall outlet which is converted to DC power with an AC/DC converter **702**. When a user has a wall outlet available, the user may simply run a plug from the wall outlet to the input jack **502**. The AC/DC converter **702** is housed in a block, as is well known, and converts the AC power from the electric wall outlet to **24V** DC power which is provided to the control box **500** at input jack **502**.

[0119] In other instances, solar power from solar panels **701** may be available. The user may choose to use the solar power instead of power from an electrical wall outlet or an electrical wall outlet may not be available. In this instance, a cord provides power from the solar panels **701** to the control box **500** through the input jack **502**. The solar panels **701** are a DC power source. Accordingly, there is no need for an AC/DC converter **702**, as there is when using power from an AC power source. In the exemplary embodiment, there is only one input jack **502** and only one power source is input to the control box **500** at one time. This is represented by the OR block **703** in the schematic of FIG. **52**.

[0120] Depending upon the number of solar panels and the weather, the solar panels **701** may provide power at different voltage and current levels. As discussed later, the system may operate differently under different power conditions. Accordingly, there is a solar voltage and current measuring circuit **704** which reads the voltage and current from the solar panel and provides that information to the microcontroller **750**.

[0121] The ballast battery **600** is also shown in FIG. **52**. The ballast battery **600** operates at a maximum initial battery voltage of **20** volts. As shown in FIG. **52**, the control box **500** includes a battery voltage measuring circuit **705** for measuring the voltage of the ballast battery **600** and a battery current measuring circuit **706** for measuring the current of the ballast battery **600**. The ballast battery **600** can output power to the system. Additionally, there is charge control circuitry **707** which allows the ballast battery **600** to charge.

[0122] The ballast battery **600** provides a ballast for the system. When the solar panels **701** are producing more power than is needed by the system, excess power can be stored in the ballast battery **600**. That is, the ballast battery **600** can be charged. In instances where the solar panels **701** provide insufficient power for the system, the ballast battery **600** can assist. When no power is provided through the input jack **502** by either an AC power source, solar power source or otherwise, the ballast battery **600** can itself provide DC power to the conductors **451**, **452**, **453** of the wall panel **50** with insert **450**. Typically, the AC power source provides sufficient power for the system that the ballast battery **600** is not needed to provide supplemental power. Additionally, the AC power source typically provides sufficient power to charge the ballast battery **600**. Accordingly, when the AC power source is inputted through the input jack **502**, typi-

cally the battery **600** charges. However, it is possible to utilize the AC power source in other ways. For example, the system may be designed to use the ballast battery **600** as a supplemental power source if the AC power source is insufficient. Additionally, AC power source may be used only for powering the insert **450**, and not charging the battery **600**, if there is sufficient load on the insert **450**.

[0123] The control box **500** also includes a SEPIC regulator **710**. As discussed, the power provided by the solar panels **701** is variable. On the other hand, the power provided to the conductors **451**, **452**, **453** needed to run the accessories **550** must be at least a certain voltage. For example, the accessories **550** such as the fan **585** and the light **570** may need **18V** or higher to operate, or operate effectively. Accordingly, if the solar panels **701** are producing power with a voltage of only **10V**, that is insufficient for running the accessories **550** on the wall panel **50** with insert **450**.

[0124] The SEPIC regulator **710** can adjust the power input from the solar panels **701** to adjust the voltage to a suitable level. For example, the SEPIC regulator **710** can adjust the power so that a voltage of **18V**, **20V**, **22V** or **24V** is provided, depending upon the particular need. Since power is the product of voltage and current, increasing the voltage decreases the amount of current that can be provided to the conductors **451**, **452**, **453** by the solar panels **701**. Conversely, decreasing the voltage, increases the amount of current that can be provided to the conductors **451**, **452**, **453**.

[0125] The schematic of FIG. **52** shows the output of power to the conductors **451**, **452**, **453** through the connectors **514**, **516**, **518** and pins **511**, **512**, **513**. In the exemplary embodiment, this connection is provided by wires which attach to the connectors **514**, **516**, **518** at the screws **515**, **517**, **519** and are held in place by the screws **515**, **517**, **519**. In particular, line **716** provides a ground feed and connects with connector **516** to provide a ground input at pin **512**, which makes conductor **453** a ground conductor. Line **715** outputs a positive voltage signal to pins **511** and **513** through connectors **514**, **518**, which make conductors **451** and **452** positive rails.

[0126] The control box **500** also includes a **3V** coin cell **718** and a measurement circuit **719** for measuring a voltage of the coin cell **718**. The coin cell **718** may be used to power the microcontroller **750**. Switching regulator **720** has inputs from the ballast battery **600**, coin cell **718** and either the solar panels **701** or the converted AC power source **702** and can provide power to the microprocessor **750** from any of the sources, as appropriate. The coin cell **718** can provide power when power from the ballast battery **600** or other power sources **701**, **702** are unavailable so that the microprocessor **750** can operate.

[0127] USB port **503** is also shown schematically in FIG. **52**. The USB port **503** outputs at **5V** to charge phones, tablets or the like when they are plugged into the port **503**.

[0128] Finally, the control box **500** includes a rail voltage and current measurement circuit **725** which measures the voltage and current on the conductors **451**, **452**, **453**.

[0129] The accessories which receive power through the conductors **451**, **452**, **453** use a power receiving connector **810**, shown in FIG. **37**. The power receiving connector **810** includes a housing **820**. A pair of pins **811** and **812** project out of the housing **820**. The pin **812** is a ground pin which is configured to engage the ground conductor **453**. The pin **811** is a positive pin which is configured to engage one of the

positive conductors **451**, **452**. As shown, the power receiving connector **810** includes only two pins. The pin **812** is located so as to always engage the ground conductor **453**. On the other hand, the pin **811** is located so that it can engage either of the positive conductors **451**, **452** depending upon the orientation of the connector **810**. This allows for different orientations of the connector **810** and, thus, the accessories **850**.

[0130] The pins **811** and **812** of the connector **810** have the same structure as the pins of the connector **510**. Pin **811** is an end of a connector **814** which is secured to the connector housing **820** with a screw **815**. Pin **812** is an end of a connector **816** which is secured to the connector housing **820** with screw **817**. The connectors **814** and **816** are made of metal and have elasticity such that they act as a spring. The pins **811**, **812** are biased downwardly towards the conductors **451**, **451**, **453** when the connector **810** is on the wall panel **50** with the insert **450**. The pins **811**, **812** may retract upwards into the housing **820** of the power supply connector **810** in response to being pressed on the conductors **451**, **452**, **453**. That is, the pins **811**, **812** are able to move some and may be pressed upwardly when the connector **810** is in contact with the conductors **451**, **452**, **453**. In this way, the pins **811**, **812** are biased against the conductors **453** and one of **451** and **452** to provide good contact between the pins **811**, **812** and selected conductors **451**, **452**, **453**. The shape of the connectors **814**, **816** allows the pins **811**, **812** to move in a generally linear fashion when they retract.

[0131] FIGS. 39-43 illustrate an attachment connector **760**. As shown in FIGS. 41 and 42, the attachment connector **760** includes a pair of clips **201**. The clips **201** slidably attach the connector **760** to the wall panel **50**, as has been discussed. The attachment connector **760** also includes the previously discussed power receiving connector **810**. As shown in FIGS. 41 and 42, part of the power receiving connector **810** projects out of the attachment connector **760** and the pins **811**, **812** project out of the connector **810** for engagement with the conductors **451**, **452**, **453**.

[0132] As shown in FIGS. 39 and 40, the attachment connector **760** includes a pair of rails **770** and slots **771** adjacent to the rails **770**. The slots **771** are configured to accept rails from various previously discussed attachments **550** to connect the attachments with the attachment connector **760**. The slots **771** and rails **770** are also configured so that they are identical to rails and slots of a power tool battery pack system, particularly, a power tool battery pack system including the battery pack **600**. In this way, various accessories **550** which can attach to the connector **760** and be provided with electric power through the connector **760** may also be attached directly to a battery pack and powered directly by the battery pack. The battery pack may be a battery pack **600**. Additionally, there may be other battery packs in the system.

[0133] FIG. 43 is an exploded view of the attachment connector **760**. As shown, the attachment connector **760** includes a bottom housing part **761** and a top housing part **762**. As shown in FIGS. 39, 40 and 43, the attachment connector **760** additionally has a latch **763** with a latch actuator **764** and a latching portion **765**. The latching portion **765** is configured to latch onto one of the accessories **550** when the accessory **550** is slid onto the rails **770**. The latching portion **765** thus secures the accessory **550** on the attachment connector **760**. The latch **763** projects out of the

top housing part **762** and is biased in a direction towards projecting out of the housing part **762** by a spring or other biasing member (not shown). When a user slides an attachment **550** onto the attachment connector **760**, the latch **763** depresses towards the inside of the connector housing and then snaps back after the attachment **550** reaches a fully engaged position to secure the accessory **550** in place. A user releases the attachment **550** by depressing the latch actuator **764** to depress the latching portion **765**.

[0134] A power receiving connector **810** is housed in the attachment connector **760**. An electrical connector **775** is attached to the power receiving connector **810** through wires **776** and **777**. The electrical connector **775** can be engaged through an electrical connector engagement portion **778**. Thus, electricity can be provided from the power receiving connector **810** out through the attachment connector **760** to an attachment **550**. A holding piece **774** helps to hold the receiving connector **810** in place.

[0135] As shown in FIG. 29, the attachment connector **760** is attachable to the panel **50** in two orientations. In one orientation, pin **811** engages the lower conductor **452** and in the second orientation the pin **811** engages upper conductor **541**. In either case, pin **812** engages the central ground conductor **450**.

[0136] As shown in FIGS. 44 and 45, similar to the control box **500**, the battery charger **560** receives a battery pack **600**. The battery charger **560** includes a battery pack receiving portion **505**. The battery pack receiving portion **505** includes rails for guiding the battery pack **600** into place as well as electrical connectors for connecting with the battery pack **600**. The battery pack **600** may be a power tool battery pack that can be used to power a variety of power tools, such as drills, saws, sanders and the like. The battery pack receiving portion **505** may be the same as the receiving portion for power tools which the battery pack **600** may power. The battery pack **600** may be one of the battery packs shown in U.S. Pat. No. 9,406,915.

[0137] As shown in FIG. 44, similar to the attachment connector **760**, the battery charger **560** includes a pair of clips **201**. The clips **201** slidably attach the battery charger **560** to the wall panel **50**, as has been discussed. The battery charger **560** also includes the previously discussed power receiving connector **810**. As shown in FIG. 44, part of the power receiving connector **810** projects out of the battery charger **560** and the pins **811**, **812** project out of the connector **810** for engagement with the conductors **451**, **452**, **453**.

[0138] Similar to the attachment connector **760**, as described above, the battery charger **560** shown in FIG. 44, is attachable to the panel **50** in two orientations. The light attachment **570** is shown in FIGS. 46-48. As shown in those

[0139] Figs., the light attachment **570** includes an engagement connector **571**. The engagement connector **571** is configured to engage an attachment connector **760**, as shown in FIG. 29. When attached to the attachment connector **760**, the light **570** is provided with power through the conductors **451**, **452**, **453**, through the previously discussed mechanisms. The engagement connector **571** is attached to a lantern **573**. The lantern **573** includes a number of LED panels **574** which includes light emitting diodes (LEDs). The lantern **573** also includes a hook **575** for hanging the lantern **573**. The engagement connector **571** could also be engaged with a battery pack such as battery pack **600** to provide power to the light **570** directly from the battery pack **600**.

[0140] The Wi-Fi router 580 is illustrated in FIG. 49. The Wi-Fi router 580 is configured so that the body 581 of the router 580 engages with the attachment connector 760 so that power is provided to the router 580. The router 580 includes a pair of antennae 582. As with the light attachment 570, the Wi-Fi router 580 may also be engaged with a battery pack such as battery pack 600 to provide power to the light 580 directly from the battery pack 600.

[0141] The fan 585 is shown in FIG. 50. The fan 585 has a body 586 which engages with the attachment connector 760 to provide power therethrough to the fan 585. The fan 585 also has an operating portion 587 which includes enclosed fan blades. The power supplied to the fan 585 powers a motor which rotates fan blades to produce airflow. The fan 585 may also be engaged with a battery pack such as battery pack 600 to provide power to the fan 585 directly from the battery pack 600.

[0142] The security system 590 is shown in FIG. 51. The security system 590 is provided to prevent theft from the wall panel 50. The security system 590 includes a pair of clips 200 and a power receiving connector 810 so that it engages directly onto the wall panel 50 rather than through the attachment connector 760. When the security system 590 is attached to the wall panel 50 via the clips 200 the connector 810 engages the conductors 451, 452, 453, as is previously discussed, to provide power to the security system 590. The security system 590 includes a motion detector 591, a key pad 592, a speaker 593 and a light 594. It may also include a back-up battery (not shown) so that the security system 590 can operate even if there is no power provided by the control box 500. A user may set the security system 590 so that it sounds an alarm via the speaker 593 if the motion detector 591 detects motion. The key pad 592 allows a user to enter a code to disable or enable the system 590. The light 594 may be used an additional alarm indication or for illuminating the key pad 592.

[0143] In the exemplary embodiment shown in FIG. 29, the battery charger 560 and the security system 590 are connected directly to the conductors of the insert 450 and the light 570, Wi-Fi router 580 and fan 590 are connected through the attachment connector 760. In other embodiments, the different attachments could be directly connected or connected through the attachment connector 760. For example, in another exemplary embodiment a light could be configured to attached directly to the conductors 451, 452, 453. The light may have a similar design to the light 570 or be a different type of light. Similarly, there may be a security system which attaches to the wall panel 50 and conductors 451, 452, 453 through an attachment connector 760. There may also be additional attachments 550. For example, there may be attachments which provide a USB or standard electrical outlet. There could be a clock attachment or a heater attachment. All of these attachments 550 may be configured to be attached directly or through an attachment connector 760.

[0144] FIGS. 56-61 illustrate a fifth wall panel 80. The fifth wall panel 80 may work with any of the other wall panels 10, 20, 30, 50. FIGS. 56 and 57 illustrate a perspective view of the fifth wall panel 80 with a hook 85 and latch member 86. FIGS. 58-61 illustrate various views of the wall panel 80 and hook 85.

[0145] The wall panel 80 includes a connector portion 11. The connector portion 11 is able to fit into the connector receiving portions 12, 12' previously described in order to

connect the wall panel 80 with the various other wall panels. The connector portion 11 also allows the wall panel 80 to connect with other wall panels 80 of the same type, as is shown in FIGS. 58-61.

[0146] The fifth wall panel 80 also includes a modified connector receiving portion 12". The connector receiving portion 12" is configured to accept both peg boards 60 and the connector portion 11, as with the other connector receiving portions. As shown, the connector receiving portion 12" has a peg board opening 13 for receiving a peg board 60 and a panel opening 14" for receiving the connector portions 11.

[0147] The fifth wall panel 80 includes a rear side 89 which can be placed against a wall. On the front side the fifth wall panel 80 includes an upper panel hook 16 and a modified lower panel hook 15". These panel hooks 15" and 16 allow for a hook 85 to be attached to the fifth wall panel 80. The other various hooks described previously may also be attached to the fifth wall panel 80. The hook 85 includes a latch member 86 with a latch projection 87. The latch member 86, along with the latch projection 87, is rotatable to move from a locking position shown in FIG. 54 to an unlocked position (not shown). In the unlocked position, the latch projection 87 is rotated ninety degrees or more so that it does not overlap with the panel hook 16. The hook 85 and latch member 86 may be similar to the brackets and retaining members of U.S. Pat. No. 8,528,871, which is incorporated by reference.

[0148] As shown in FIG. 57, the panel hook 15" overlaps with the connector receiving portion 12" in a horizontal plane when the fifth wall panel 80 is vertical (e.g., rear surface 89 placed against a vertical wall). In particular, it overlaps with the panel opening 14". When a connector portion 11 is in the panel opening 14", as shown in FIG. 59, the panel hook 15" overlaps with the connector portion 11. This provides for a compact design with the features of multiple hooks 15", a connector portion 11, and a connector receiving portion 12".

[0149] The wall panel 80 also includes a spacing projection 81. The spacing projection 81 is adjacent to the connector portion 11 and projects generally perpendicularly to the connector portion 11. The spacing projection 81 is on the rear side 89 of the panel 80 and abuts a wall when the wall panel 80 is placed against a vertical wall. As shown in FIG. 59, the spacing projection 81 also serves to abut a portion of an adjacent wall panel 80 when multiple wall panels 80 are connected to one another.

[0150] As shown in FIGS. 58 and 59, more than one fifth wall panel 80 may be engaged to form a wall panel assembly. Additionally, multiple hooks 85 may be used in the assembly. As shown in FIG. 60, the fifth wall panels 80 may be flipped so that the connector portions 11 are at the bottom of the wall panels 80, as shown in FIGS. 58 and 59, or at the top of the wall panels 80, as shown in FIGS. 60 and 61.

[0151] While the invention has been described by way of exemplary embodiments, it is understood that the words which have been used herein are words of description, rather than words of limitation. Changes may be made within the purview of the appended claims, without departing from the scope and spirit of the invention in its broader aspects.

What is claimed is:

1. A battery charging system, comprising:
at least two conductors running parallel to one another;

an AC/DC converter, the AC/DC converter configured to receive an AC input and to provide a DC output to the at least two conductors; and

a battery charger, the battery charger (1) including a battery pack receiving portion to receive a removable, rechargeable battery pack and (2) removably, electrically coupled to the at least two conductors to receive the DC output.

2. The battery charging system, as recited in claim 1, further comprising a power receiving connector, the power receiving connector configured to removably, electrically couple the battery charger to the at least two conductors.

3. The battery charging system, as recited in claim 2, wherein the power receiving connector includes a housing, a pair of pins projecting out of the housing, a first pin of the pair of pins configured to engage a first of the at least two conductors and a second pin of the pair of pins configured to engage a second of the at least two conductors.

4. The battery charging system, as recited in claim 1, further comprising a wall panel and wherein the at least two conductors are affixed to the wall panel.

5. The battery charging system, as recited in claim 4, wherein the battery charger is removably, mechanically coupled to the wall panel.

6. The battery charging system, as recited in claim 5, further comprising a power receiving connector, the power receiving connector configured to removably, mechanically couple the battery charger to the wall panel.

7. The battery charging system, as recited in claim 4, further comprising a series of clips holding the at least two conductors to the wall panel.

8. The battery charging system, as recited in claim 7, wherein the at least two conductors are held fixed between the series of clips and a surface of the wall panel.

9. The battery charging system, as recited in claim 1, wherein the at least two conductors run parallel to one another along a horizontal axis of a wall to which the at least two conductors are coupled and the at least two conductors are vertically spaced from one another.

10. A method of providing a battery charging system, comprising:

providing at least two conductors running parallel to one another;

providing an AC/DC converter;

providing an AC input to the AC/DC converter;

providing a DC output from the AC/DC converter to the at least two conductors;

providing a battery charger, the battery charger including a battery pack receiving portion to receive a removable, rechargeable battery pack; and

removably, electrically coupling the battery charger to the at least two conductors and providing the DC output to the battery charger.

11. The method, as recited in claim 10, further comprising providing a power receiving connector and removably, electrically coupling the power receiving connector to the at least two conductors.

12. The method, as recited in claim 11, wherein the power receiving connector includes a housing and a pair of pins projecting out of the housing and engaging a first pin of the pair of pins with a first of the at least two conductors and a second pin of the pair of pins with a second of the at least two conductors.

13. The method, as recited in claim 12, further comprising providing a wall panel and affixing the at least two conductors to the wall panel.

14. The method, as recited in claim 13, further comprising removably, mechanically coupling the battery charger to the wall panel.

15. The method, as recited in claim 14, further comprising providing a power receiving connector and removably, mechanically coupling the battery charger to the wall panel with the power receiving connector.

16. The method, as recited in claim 13, further comprising providing a series of clips and holding the at least two conductors to the wall panel with the series of clips.

17. The method, as recited in claim 16, wherein the at least two conductors are held fixed between the series of clips and a surface of the wall panel.

18. The method, as recited in claim 10, wherein the at least two conductors are run parallel to one another along a horizontal axis of a wall to which the at least two conductors are coupled and the at least two conductors are vertically spaced from one another.

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