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(72) Inventeur/Inventor:
BOUCHER, GILLES, CA

(73) Propriétaire/Owner:
TERMACO LTEE, CA

(74) Agent: BENOIT & COTE INC.

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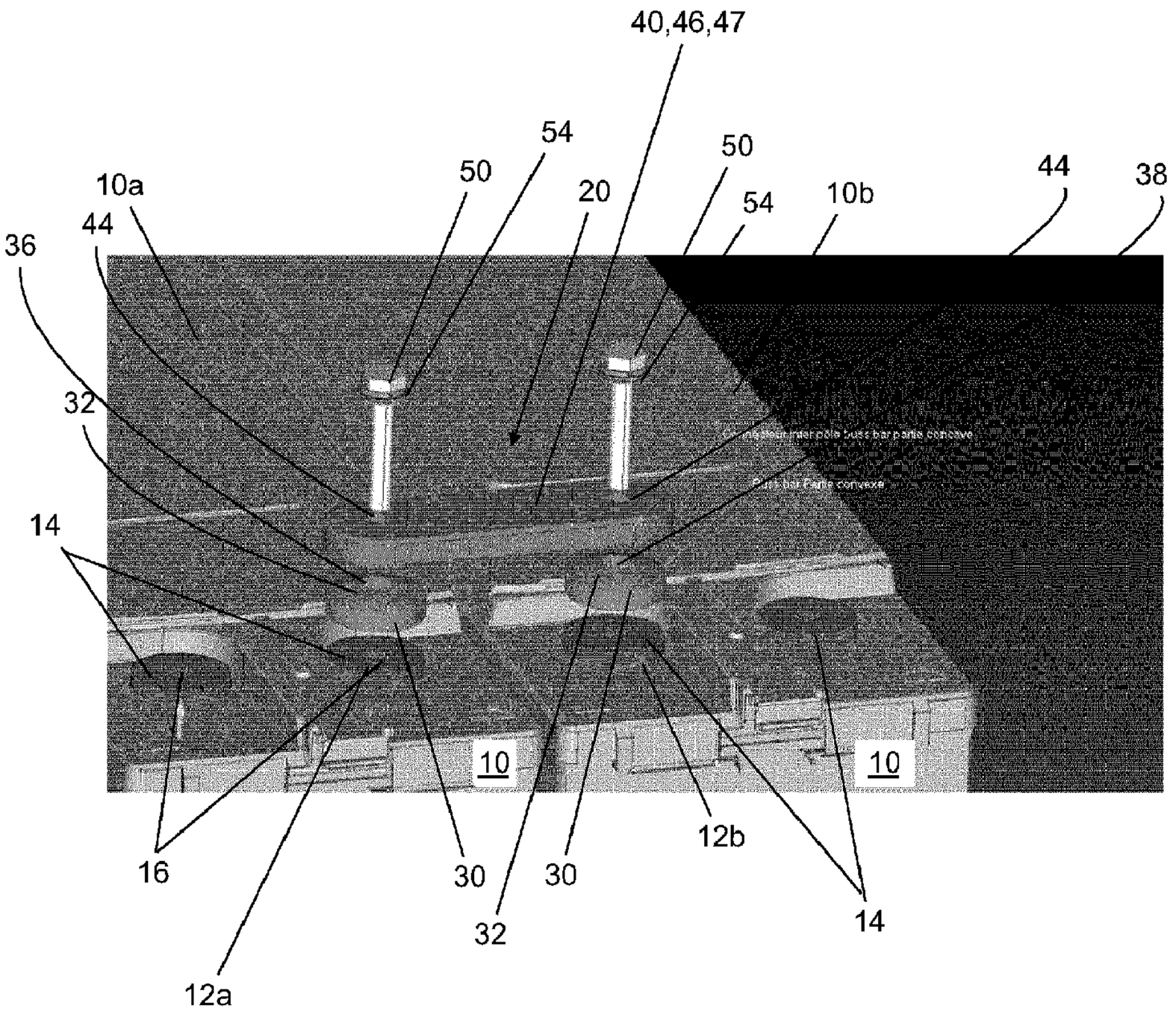

(57) Abrégé/Abstract:
A connector assembly for electrically connecting poles of two adjacent battery cell. The connector assembly comprises an electrically conductive bus bar having a first connection area and a second connection area distal from each other, electrically

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(57) Abrégé(suite)/Abstract(continued):
conductive pole- mating components having a pole-mating face and a bar-mating face, and fastening components for attaching the electrically conductive bus bar and one of the pole-mating components to one of the poles of the two adjacent battery cells. The pole-mating faces of the pole-mating components are adapted for mating the poles the battery cells. The bar- mating faces of the pole-mating components are adapted for mating with the connection areas. The bar-mating faces and the connection areas have complementary concave/convex arched shape for optimizing contact surface over a range of relative positioning of the two adjacent battery cells.

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(71) Applicant: **TERMACO LTEE** [CA/CA]; 325 boul. Industriel, Saint-Jean-sur-Richelieu, Québec J3B 7M3 (CA).

(72) Inventor: **BOUCHER, Gilles**; 139 avenue Stirling, LaSalle, Québec H8R 3P3 (CA).

(74) Agent: **BENOÎT & CÔTÉ INC.**; 560 Cremazie Boulevard East, suite 300, MONTRÉAL, Québec H2P 1E8 (CA).

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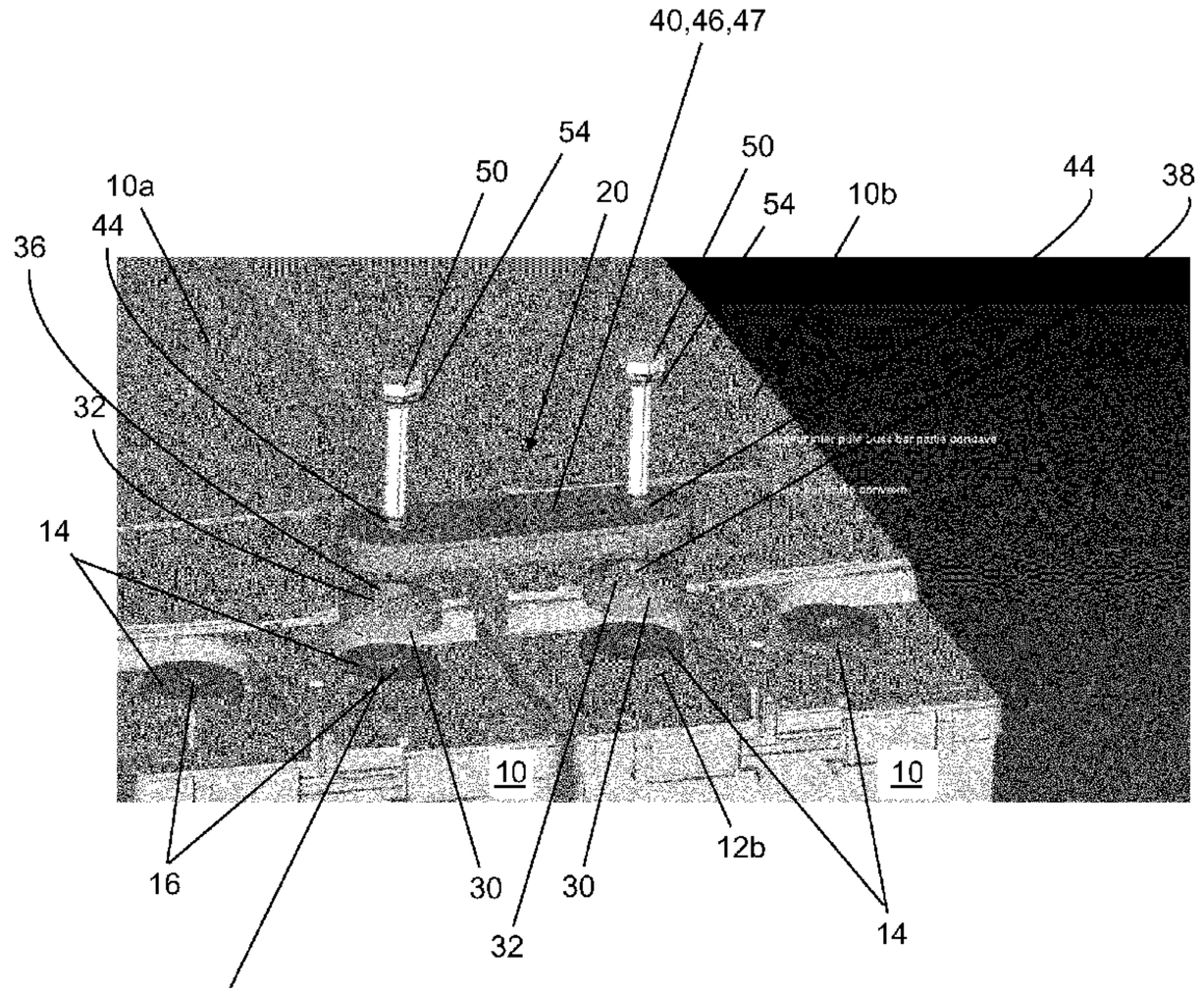

Figure 3

(57) Abstract: A connector assembly for electrically connecting poles of two adjacent battery cell. The connector assembly comprises an electrically conductive bus bar having a first connection area and a second connection area distal from each other, electrically conductive pole- mating components having a pole-mating face and a bar-mating face, and fastening components for attaching the electrically conductive bus bar and one of the pole-mating components to one of the poles of the two adjacent battery cells. The pole-mating faces of the pole-mating components are adapted for mating the poles the battery cells. The bar- mating faces of the pole-mating components are adapted for mating with the connection areas. The bar-mating faces and the connection areas have complementary concave/convex arched shape for optimizing contact surface over a range of relative positioning of the two adjacent battery cells.

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BATTERY CONNECTOR

CROSS-REFERENCE TO RELATED APPLICATION

[0001] – Intentionally left blank --

BACKGROUND

(a) Field

[0002] The subject matter disclosed generally relates to battery assemblies. More particularly, the subject matter disclosed relates to battery connectors.

(b) Related Prior Art

[0003] In the field of battery connectors, there exists a need for solutions to connect a series of battery cells in series. There is therefore a need to ensure the connections of the battery cells in different configurations, in order to ease the installation and maintenance of the stacks of battery cells, and to ensure the quality of the connection between the battery cells.

[0004] One particular challenge in the connection of battery cells in series consists in having them aligned in a precise position such as to ensure that the connecting component connecting the battery cells are providing the optimum connection, while ensuring a connection assembly that involves as few components as possible for keeping the cost of installation and maintenance low.

[0005] Some of the prior art efforts include US Patent 7,972,185 B2 that describes a connector for battery terminals featuring a connection member with protrusion to improve contact with fastening nuts; US Publication 2014/0030933 A1 that describes a connecting element with contact faces surfaced with cross-groove arrangement to improve electrical contact; US Publication 2006/0094289 A1 that describes a battery connector assembly comprising a connecting member comprising a cap-shaped component featuring a flange, with the connector slipped on the cap-shaped component until having the flange acting as an abutment; and a brochure called "DataSafe HX Front Terminal Batteries" that describes a connection assembly comprising L-shaped components that allows

maintenance of the battery cell connections from the front of the arrangement instead of the top.

[0006] None of prior art documents provide adequate solutions with regard to the quality of the contact between battery cells and the numbers of components involved therein.

SUMMARY

[0007] One general aspect includes a connector assembly for electrically connecting poles of two adjacent battery cells, the connector assembly including: - an electrically conductive bus bar having a first connection area and a second connection area distal from each other. The connector assembly also includes - electrically conductive pole-mating components having a pole-mating face and a bar-mating face, the pole-mating face adapted for mating with one of the poles of one of the two adjacent battery cells, and the bar-mating face for mating with one of the first connection area and the second connection area. The connector assembly also includes - fastening components each for attaching the electrically conductive bus bar and one of the pole-mating components to one of the poles of the two adjacent battery cells. The connector assembly also includes where the bar-mating face and the first and the second connection areas have complementary concave/convex arched shapes for optimizing a contact surface over a range of relative positioning of the two adjacent battery cells.

[0008] Implementations may include one or more of the following features. The connector assembly where the first connection area and the second connection area have a concave surface and the bar-mating face has a convex surface. The connector assembly where the concave surface has a diameter which is greater than a diameter of the convex surface. The connector assembly where the fastening components include a bolt passing through the electrically conductive bus bar and one of the pole-mating components to attach to one of the poles. The connector assembly where the fastening components include a resilient member maintaining a pressure over the electrically conductive bus bar over the range of relative positioning of the two adjacent battery cells. The connector assembly where at least one of the electrically conductive bus bar and the pole-mating components is made of a single material. The connector assembly where a radius of curvature of the

bar-mating face is about between 5 mm to 50 mm. The connector assembly where a ratio of a distance between a center of having the first connection area and a center of the second connection area to a radius of curvature the first connection area or a radius of curvature of the second connection area is about between seven (7) and fifteen (15). The connector assembly where the pole-mating components include a hole of a first minimum diameter and the electrically conductive bus bar includes holes of a second maximum diameter greater than the first minimum diameter. The connector assembly where the electrically conductive bus bar includes a body, where the body is straight between the first connection area and a second connection area. The electrically conductive bus bar where the electrical conductive bus bar is made of a single material. The electrically conductive bus bar further including holes passing through the first connection area and the second connection area. The electrically conductive bus bar where the body defines a straight line between the first connection area and the second connection area. The electrically conductive bus bar where a ratio of a distance between a center of having the first connection area and a center of the second connection area to a radius of curvature the first connection area or a radius of curvature of the second connection area is about between seven (7) and fifteen (15). The connector assembly where the pole-mating component and the bar-mating component are made of the same material. The connector assembly where the pole-mating component and the bar-mating component include a hole passing therethrough. The connector assembly where the pole-mating component and the bar-mating component contacting through their adaptive-mating faces define together a cylindrical shape.

[0009] One general aspect includes an electrically conductive bus bar for electrically connecting poles of two adjacent battery cells where the poles each have a mating face of a spheroid shape, the electrically conductive bus bar including: - a first connection area having a spheroid shape. The electrically conductive bus bar also includes - a second connection area having a spheroid shape distal from each other. The electrically conductive bus bar also includes - a body electrically connecting the first connection area to the second connection area. The electrically conductive bus bar also includes where the spheroid shapes of the first connection area and of the second connection area are complementary to the spheroid shapes of the mating faces of the poles of the two adjacent

battery cells for optimizing contact surface over a range of relative positioning of the two adjacent battery cells.

[0010] Implementations may include one or more of the following features. The electrically conductive bus bar where the electrical conductive bus bar is made of a single material. The electrically conductive bus bar further including holes passing through the first connection area and the second connection area. The electrically conductive bus bar where the body defines a straight line between the first connection area and the second connection area. The electrically conductive bus bar where a ratio of a distance between a center of having the first connection area and a center of the second connection area to a radius of curvature the first connection area or a radius of curvature of the second connection area is about between seven (7) and fifteen (15). The connector assembly where the pole-mating component and the bar-mating component are made of the same material. The connector assembly where the pole-mating component and the bar-mating component include a hole passing therethrough. The connector assembly where the pole-mating component and the bar-mating component contacting through their adaptive-mating faces define together a cylindrical shape.

[0011] One general aspect includes a connector assembly for electrically connecting a pole of a first battery cell to an electrically conductive bus bar connected to a pole of an adjacent battery cell, the connector assembly including: - an electrically conductive pole-mating component including a pole-mating face for mating with the pole of the first battery cell and a first adaptive-mating face. The connector assembly also includes - an electrically conductive bar-mating component including a bar-mating face for mating with the electrically conductive bus bar and a second adaptive-mating face. The connector assembly also includes where the first adaptive-mating face and the second adaptive-mating face have complementary concave/convex arched shapes for mating with each other and optimizing a contact surface over a range of positioning of the adjacent battery cell relative to the first battery cell.

[0012] Implementations may include one or more of the following features. The connector assembly where the pole-mating component and the bar-mating component are made of the same material. The connector assembly where the pole-mating component and

the bar-mating component include a hole passing therethrough. The connector assembly where the pole-mating component and the bar-mating component contacting through their adaptive-mating faces define together a cylindrical shape.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] Further features and advantages of the present disclosure will become apparent from the following detailed description, taken in combination with the appended drawings, in which:

[0014] Figs. 1a and 1b are perspective views of battery cells to be used in relation with embodiments of the present battery connector assembly;

[0015] Fig. 2 is a perspective top view of a connector assembly electrically connecting poles of two adjacent battery cells in accordance with an embodiment;

[0016] Fig. 3 is a top exploded view of the components of the connector assembly of Figure 2; and

[0017] Fig. 4 is a front exploded view of the components of the connector assembly of Figures 2 and 3;

[0018] Fig. 5 is a perspective exploded view of the components of a connector assembly according to an embodiment;

[0019] Fig. 6 is an exploded view of the components of the connector assembly of Fig. 5 according to a cutting plane passing through the center of the components;

[0020] Figs. 7a to 7c are respectively a perspective view, a top view and a side view of an embodiment of a pole-mating component;

[0021] Figs. 8a to 8e are respectively a top perspective view, a bottom perspective view, a front view, a side view and a bottom view of an embodiment of a bus bar;

[0022] Fig. 9 is a perspective exploded view of the components of a connector assembly according to an embodiment; and

[0023] Fig. 10 is an exploded view of the components of the connector assembly of Fig. 9 according to a cutting plane passing through the center of the components.

[0024] It will be noted that throughout the appended drawings, like features are identified by like reference numerals.

DETAILED DESCRIPTION

[0025] Referring now to the drawings, and more particularly to Figures 1a and 1b, battery cells **10** to be used in relation with the battery connector assembly are illustrated. The battery cells **10** presents two poles **12** located on the top side of the battery cells **10**.

[0026] Now referring to Figure 2, a battery connector assembly **20** is illustrated electrically connecting two adjacent battery cells **10** in a serial fashion. The connector assembly **20** connects one battery cell **10a** having a pole (or terminal) of positive polarity **12a** (hereinafter called positive pole **12a**) to a pole (or terminal) of negative polarity **12b** (hereinafter called negative pole **12b**) of the adjacent battery cell **10b**.

[0027] Further shown on Figures 3-4, the connector assembly **20** comprises a pair of electrically conductive pole-mating components **30**, an electrically conductive bus bar **40** and fastening components (detailed below).

[0028] Referring additionally to Figs. 7a-7c, each one of the pair of electrically conductive pole-mating components **30** has a pole-mating face **34**, a bar-mating face **32** and a hole **36** going through the electrically conductive pole-mating component **30**. The electrically conductive pole-mating components **30** are made of electrically conductive material and could be plated for preventing corrosion or improving conduction and reducing contact resistance.

[0029] Referring additionally to Figs. 8a-8e, the electrically conductive bus bar **40** has a body **46** having a top face **47** and a bottom face **48**, connection areas **42** (aka the first connection area and the second connection area or the first and the second connections areas) located at the bottom face **48** of the electrically conductive bus bar **40** and distant from each other, and bar holes **44** going through the body **46** into the connection areas **42** of the electrically conductive bus bar **40**. The electrically conductive bus bar **40** is made of

electrically conductive material. The conductive bus bar **40** is configured as a rounded-edge rectangular-section bar. One must understand that alternative shapes of conductive bus bars **40** may be used, having rounded portions or not, and having a more or less rigid connection portion electrically connecting the two connection areas **42**. Other alternatives include non-rounded, or a square edges conductive bus bar **40.**

[0030] The fastening components consist in a pair of bolts **50** with associated washers **54**. Examples of washer types include flat face washers**.** Selection of one type of washer versus another is a question of technical requirements, for example in transportation vehicles or static conditions.

[0031] When in function, the electrically conductive pole-mating components **30** electrically connect the poles **12a**, **12b** (respectively) to the electrically conductive bus bar **40**. The pole-mating face **34** is configured to mate with the pole top face **14** of the poles **12a**, **12b**. The pole-mating face **34** has a configuration complementing the configuration of the pole top face **14**, normally consisting in a flat surface, which optimizes the contact area between the pole-mating face **34** and the top faces of the poles **12a**, **12b** (respectively).

[0032] The bar-mating face **32** is configured to mate with a connection area **42** of the electrically conductive bus bar **40**. Thus, when installed, the electrically conductive pole-mating components **30** electrically connect the poles **12** of the adjacent battery cells **10** to the electrically conductive bus bar **40**.

[0033] The bar-mating faces **32** and the connection area **42** have complementary configurations/shapes; i.e., their surfaces are made to match each other. According to an embodiment, the bar-mating faces **32** have a convex arched shape (i.e., a convex surface) while the connection area **42** has a concave arched shape (i.e., a concave surface). The complementarity of the concave and convex arched shapes optimizes the contact area between the bar-mating face **32** and the connection area **42**. That optimization is intended to allow positions/alignment of the adjacent battery cells **10** which are non-ideal as movement of the adjacent battery cells **10** relative to each other after the installation without affecting the quality of the electric connection between them.

[0034] Furthermore, the diameter of the connection area **42** is designed to be slightly greater than the diameter of the bar-mating faces **32**, the difference in diameter ensuring optimal contact surface of the whole surface of the bar-mating face **32** with the connection area **42** regardless of the alignment of the battery cells **10**.

[0035] Accordingly, flexibility in the angular arrangement (in all directions) of the battery cells **10** is provided through the use of the present connection assembly **20**. Practically, having one battery cell **10** higher than the other, or not exactly aligned with the other will have a minimized effect on the quality of the electric connection between the poles **12a**, **12b** of the two adjacent battery cells **10**. The solutions thereby provide satisfactory electrical connections between the poles **12a**, **12b** of two adjacent battery cells **10** while providing multiple degrees of freedom in the relative movement and position of the two adjacent battery cells **10**.

[0036] More specifically, the poles **12a**, **12b** may be independently shifted regarding their ideal alignment without influencing the pole connection. In other words, the solution resolves installation problems such as one battery cell **10** being slightly in front of the other, one battery cell **10** being slightly higher than the other, and slight misalignment of a pole **12** on a battery cell **10** during fabrication. These problems are corrected while still having the battery cells **10** installed at a preset distance therebetween for heat dissipation.

[0037] Still referring to Figures 2 to 4, the electrically conductive bus bar **40**, through the connection areas **42** and its body **46** connecting the connection areas **42**, defines a connection between the electrically conductive pole-mating components **30**, thus between the poles **12a, 12b**.

[0038] The fastening components are configured for fastening the combination of an electrically conductive pole-mating component **30** and the electrically conductive bus bar **40** to each of the positive pole **12a** and negative pole **12b** of the connected adjacent battery cells **10a, 10b**. Fastening is performed by inserting each bolt **50**, through a bar hole **44** and the hole **36** of the electrically conductive pole-mating component **30**, into the pole hole **16** of the poles **12**. The bolt **50** and the associated washer **54** abut on the top face **47** of the electrically conductive bus bar **40**, ensuring a good contact between the connection

area **42** and the bar-mating face **32** of each of the electrically conductive pole-mating components **30**.

[0039] One must note that the mounting torque to be applied to the bolt **50** is selected in relation with the conductive contact and conductive material to provide an optimal pressure on the components and thus an optimal contact connection for conductivity.

[0040] Accordingly, the new connector assembly **20** provides an economical solution for easily connecting poles **12** of adjacent battery cells **10** without having to ensure overly the alignment of the battery cells **10**.

[0041] According to an embodiment, the arched shape is a spheroid (i.e., a spheroid shape), featuring exactly the same arc from the center perspective to the periphery of the arched-shape featuring component regardless of the orientation.

[0042] According to an embodiment, the holes **36** and **44** go through the center of the arched shapes. Accordingly, regardless the angular orientation of the battery cells **10** with respect to each other, the electric contact is maintained at the same quality level.

[0043] According to an embodiment, the bar holes **44** have a slightly conic shape or a diameter slightly greater than the diameter of the bolt **50**. According to an embodiment, the slightly conic holes **36** and **44** define diameters that increase with the elevation of the hole portion relative to the surface of the pole **12a**, **12b**. Accordingly, the orientation of the electrically conductive bus bar **40** may slightly vary from a horizontal configuration without affecting the fastening of the electrically conductive bus bar **40** on the electrically conductive pole-mating component **30.**

[0044] According to an embodiment, the washers **54** is a resilient member or comprises a resilient member portion featuring a resilient quality allowing the washers **54** to be compressed slightly at some angle relative to the horizontal when the conductive bus bar **40** is slightly misaligned. According to an embodiment (not illustrated), a spring or other resilient material is installed between the washer **54** and the head of the bolt **50** to maintain pressure over the washer **54** and accordingly the top face **47** of the conductive bus bar **40** regardless of misalignment.

[0045] According to alternative embodiments (not illustrated), alternative fastening components may be used, including additional washers, different washer configurations and alternative fastening solutions to the bolt **50** such as pins, clips, rivets, inserts, fasteners, etc.

[0046] According to embodiments, the fastening components may operate through the pole-mating component **30** and the conductive bus bar **40** such as using a bolt **50** as in the illustrated embodiment. According to other embodiments (not illustrated), the fastening components externally fasten the pole-mating component **30** and the conductive bus bar **40** to the pole **12a**, **12b** by, for example, using a clip cooperating with diametrically opposite locations at the base of the pole **12a**, **12b**, and extending over the top face **47** of the conductive bus bar **40**; the clip pushing the conductive bus bar **40** towards the pole **12a**, **12b**.

[0047] Regardless of the selected fastening solution, the fastening components allow slight misalignment and/or movement of the conductive bus bar **40** relative to the poles **12a**,**12b**.

[0048] According to alternative embodiments (not illustrated), the complementary convex/concave arched shapes may be inverted from the ones illustrated on Figures 3 and 4 and associated described embodiment, having the bar-mating face **32** featuring a concave arched shape while the connection area **42** of the electrically conductive bus bar **40** features a convex arched shape.

[0049] Now referring to Figs. 5 and 6, a connector assembly **60** according to another embodiment comprises an electrically conductive pole matting component **64** and an electrically conductive bar-matting component **66** connecting at one end to a first pole **62** (similar to poles **12a**, **12b**), and at the other end to an electrical bus bar **68**. The pole **62** and the bus bar **68** feature flat faces connecting to the connector assembly **60** through a pole-matting face and a bar-matting face. The components **64** and **66** feature complementary concave/convex arched shapes of adaptive matting faces for matting with each other. The components **64** and **66** combined together have a substantially cylindrical shape.

[0050] Now referring to Figs. 9 and 10, a connector assembly according to another embodiment comprises an electrical bus bar **40** (see also Fig. 8a-8e) connecting at each end to a pole **72** (similar to poles **12a**, **12b**). The pole **72** and the bus bar **40** feature complementary concave/convex arched shapes of adaptive matting faces for matting with each other.

[0051] According to embodiments, in order to encompass evolution in the field of battery cells and battery poles, available embodiments comprise fastening a component contacting a pole of a shape alternative to one of a circular shape, such as a rectangular shape, a square shape, an elliptical shape, and alternative regular and irregular shapes. Battery pole manufacturing may adopt a shape having an arched top surface (e.g., convex or concave), with a contacting component having a matching shape as herein described. Accordingly, the present development is adapted to respond to many developments in the field of battery cells while maintaining the present advantages.

[0052] The connector assembly **60** and the bus bar **68** attach to the pole **62** using a similar fashion as the previous embodiment. In the illustrated embodiment, the connector assembly **60**, the bus bar **68** and the pole **62** features holes for attachment using a bolt. As above, alternative fastening solutions are available.

[0053] According to embodiments, the electrically conducting components (pole-mating components **30, 64, 66** and the conductive bus bar **40, 68** may be made of a single material or a combination of materials comprising at least one electrically conductive material electrically connecting the connecting surfaces. According to an embodiment, the electrically conductive material is covered with non-conductive material on at least some of the non-connecting surfaces. According to an embodiment, the core of at least one of these components is made of non-conductive material covered (plated) with the electrically conductive material.

[0054] According to embodiments, the radius of curvature of the bar-mating face **32** is variable and optimized to equipment or battery current rating). According to an embodiment, the radius of curvature of the bar-mating face **32** is about between 5 mm to

50 mm. According to an embodiment, the radius of curvature of the bar-mating face **32** is about between 12 mm to 16 mm.

[0055] According to embodiments, the ratio of the distance between the centers of the bar holes **44** to the radius of curvature of the bar-mating face **32** or the connection areas **42** is variable according to the desired relative allowed misalignment or displacement between the two batteries or batteries and other components. It also allows optimal spacing between components considering misalignment. According to an embodiment, the ratio of the distance between the centers of the bar holes **44** to the radius of curvature of the bar-mating face **32** or the connection areas **42** is between about 7 and 15. According to an embodiment, the ratio of the distance between the centers of the bar holes **44** to the radius of curvature of the bar-mating face **32** or the connection areas **42** is between about 9 and 11. It is also contemplated that the radius of curvature each of the connection areas **42** on the same conductive bus bar **40** is different in order to adapt to poles **12a** and **12b** having differing shapes.

[0056] One must note that an advantage provided by embodiments relative to existing methods of connecting poles of neighbor battery cells **10** resides in the connector assembly preventing inducing tension or forces over the poles since allowing misalignment of the poles. Existing "rigid" battery connectors induce tension, compression, torque or force over misaligned poles that may shorten the life of the battery cells **10**.

[0057] One must also understand that the present connector assembly, since connecting poles on top of battery cells **10**, and not having to travel in front of the battery cells **10**, allows to measure voltages closer to the battery cells **10**, decreasing the potential sources of mismeasurements that increase as one measures farther from the desired object to be measured.

[0058] As a general note, directions such as "vertical" or "horizontal" are used for the purpose of intelligibility to describe orientation of parts. It will be understood that these terms refer to the perpendicularity of parts between them and to the usual orientation in which they are expected to be used. However, the poles **12a**, **12b** of the battery cells **10**

could be in other directions such as in front of the battery cells **10**, which implies that the terms “horizontal” and “vertical” would not have to same signification; these terms depending on the orientation references imposed by the locations of the poles **12a**, **12b**.

[0059] While preferred embodiments have been described above and illustrated in the accompanying drawings, it will be evident to those skilled in the art that modifications may be made without departing from this disclosure. Such modifications are considered as possible variants comprised in the scope of the disclosure.

File No. P3719PC00

1. A connector assembly for electrically connecting poles of two adjacent battery cells, the connector assembly comprising:
- an electrically conductive bus bar having a first connection area and a second connection area distal from each other;
- electrically conductive pole-mating components having a pole-mating face and a bar-mating face, the pole-mating face adapted for mating with one of the poles of one of the two adjacent battery cells, and the bar-mating face for mating with one of the first connection area and the second connection area; and
- fastening components each for attaching the electrically conductive bus bar and one of the pole-mating components to one of the poles of the two adjacent battery cells,
wherein the bar-mating face and the first and the second connection areas have complementary concave/convex arched shapes for optimizing a contact surface over a range of relative positioning of the two adjacent battery cells.

2. The connector assembly of claim 1, wherein the first connection area and the second connection area have a concave surface and the bar-mating face has a convex surface.

3. The connector assembly of claim 2, wherein the concave surface has a diameter which is greater than a diameter of the convex surface.

4. The connector assembly of claim 1, wherein the fastening components comprise a bolt passing through the electrically conductive bus bar and one of the pole-mating components to attach to one of the poles.

5. The connector assembly of claim 1, wherein the fastening components comprise a resilient member maintaining a pressure over the electrically conductive bus bar over the range of relative positioning of the two adjacent battery cells.

6. The connector assembly of claim 1, wherein at least one of the electrically conductive bus bar and the pole-mating components is made of a single material.

7. The connector assembly of claim 1, wherein a radius of curvature of the bar-mating face is about between 5 mm to 50 mm.

8. The connector assembly of claim 1, wherein a ratio of a distance between a center of having the first connection area and a center of the second connection area to a radius of curvature the first connection area or a radius of curvature of the second connection area is about between seven (7) and fifteen (15).

9. The connector assembly of claim 1, wherein the pole-mating components comprise a hole of a first minimum diameter and the electrically conductive bus bar comprises holes of a second maximum diameter greater than the first minimum diameter.

10. The connector assembly of claim 1, wherein the electrically conductive bus bar comprises a body, wherein the body is straight between the first connection area and a second connection area.

11. An electrically conductive bus bar for electrically connecting poles of two adjacent battery cells wherein the poles each have a mating face of a spheroid shape, the electrically conductive bus bar comprising:

a top face and a bottom face opposed to the top face, wherein the bottom face comprises:

- a first connection area having a spheroid shape;

- a second connection area having a spheroid shape distal from each other; and

- holes passing through the bus bar about the first connection area and the second connection area, each hole being for passage of a fastening component

attaching the electrically conductive bus bar to one of the poles of the two adjacent battery cells with the top face comprising an area about each of the holes for the fastening component to press against the bus bar towards the pole;
and
- a body electrically connecting the first connection area to the second connection area,
wherein the spheroid shapes of the first connection area and of the second connection area are complementary to the spheroid shapes of the mating faces of the poles of the two adjacent battery cells for optimizing contact surface over a range of relative positioning of the two adjacent battery cells.

12. The electrically conductive bus bar of claim 11, wherein the electrical conductive bus bar is made of a single material.

13. The electrically conductive bus bar of claim 11, wherein the holes have a first diameter and the fastening components have a second diameter, and wherein the first diameter is greater than the second diameter.

14. The electrically conductive bus bar of claim 11, wherein the body defines a straight line between the first connection area and the second connection area.

15. The electrically conductive bus bar of claim 11, wherein a ratio of a distance between a center of having the first connection area and a center of the second connection area to a radius of curvature the first connection area or a radius of curvature of the second connection area is about between seven (7) and fifteen (15).

16. A connector assembly for electrically connecting a pole of a first battery cell to an electrically conductive bus bar connected to a pole of an adjacent battery cell, the connector assembly comprising:

- an electrically conductive pole-mating component comprising a pole-mating face for mating with the pole of the first battery cell and a first adaptive-mating face; and
- an electrically conductive bar-mating component comprising a bar-mating face for mating with the electrically conductive bus bar and a second adaptive-mating face; and

wherein the first adaptive-mating face and the second adaptive-mating face have complementary concave/convex arched shapes for mating with each other and optimizing a contact surface over a range of positioning of the adjacent battery cell relative to the first battery cell.

17. The connector assembly of claim 16, wherein the pole-mating component and the bar-mating component are made of the same material.

18. The connector assembly of claim 16, wherein the pole-mating component and the bar-mating component comprise a hole passing therethrough.

19. The connector assembly of claim 16, wherein the pole-mating component and the bar-mating component contacting through their adaptive-mating faces define together a cylindrical shape.

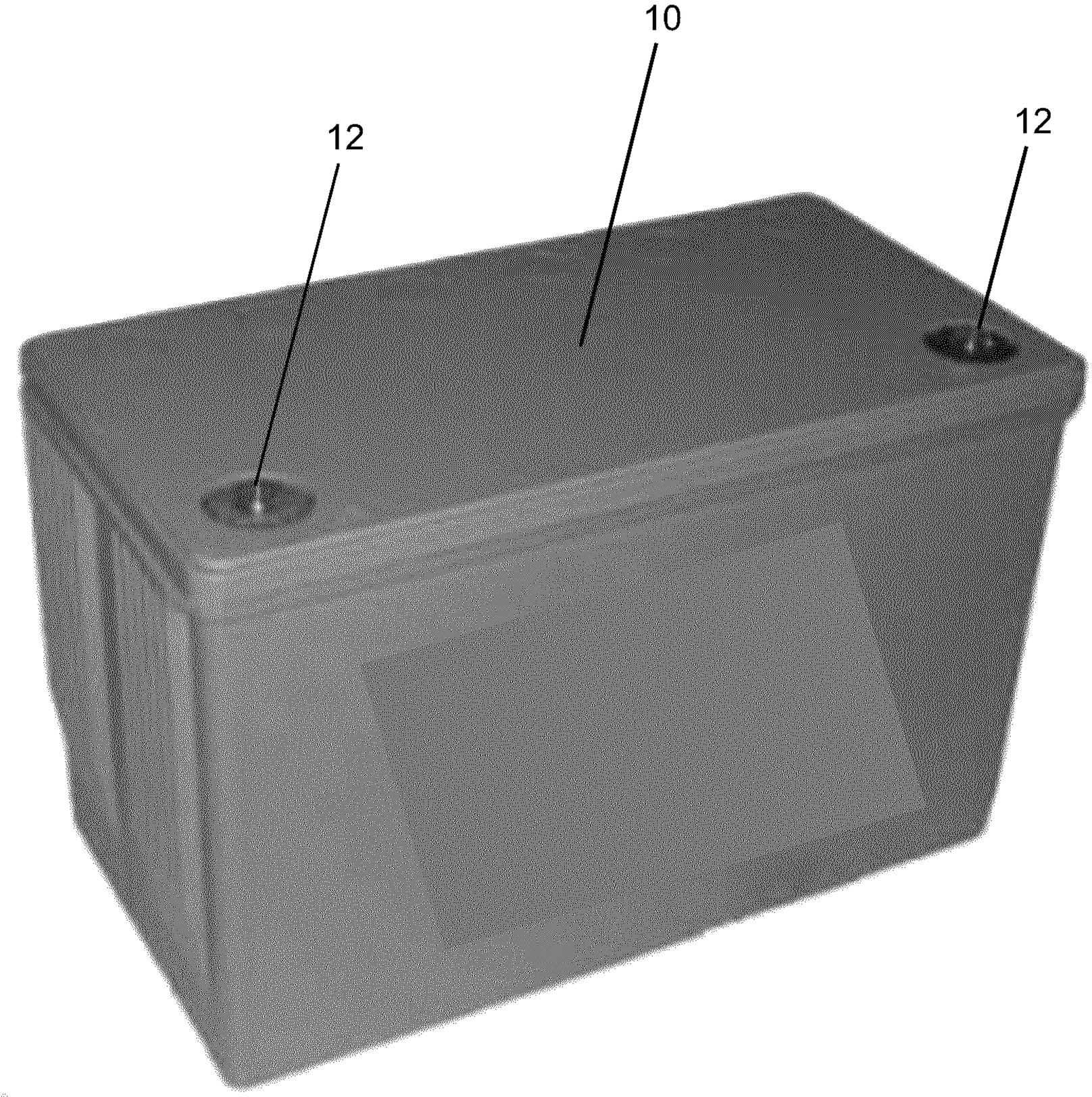


Figure 1a

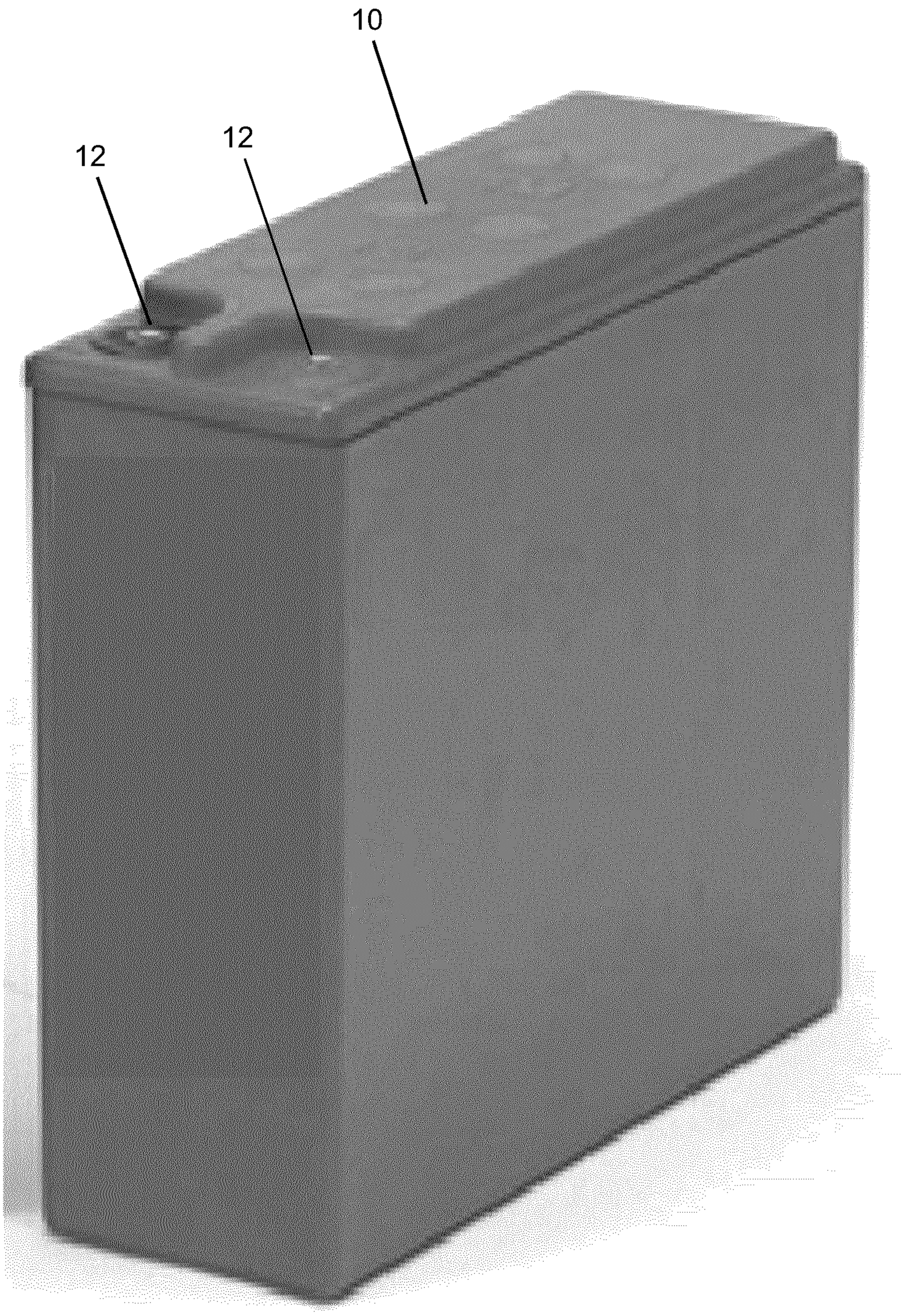


Figure 1b

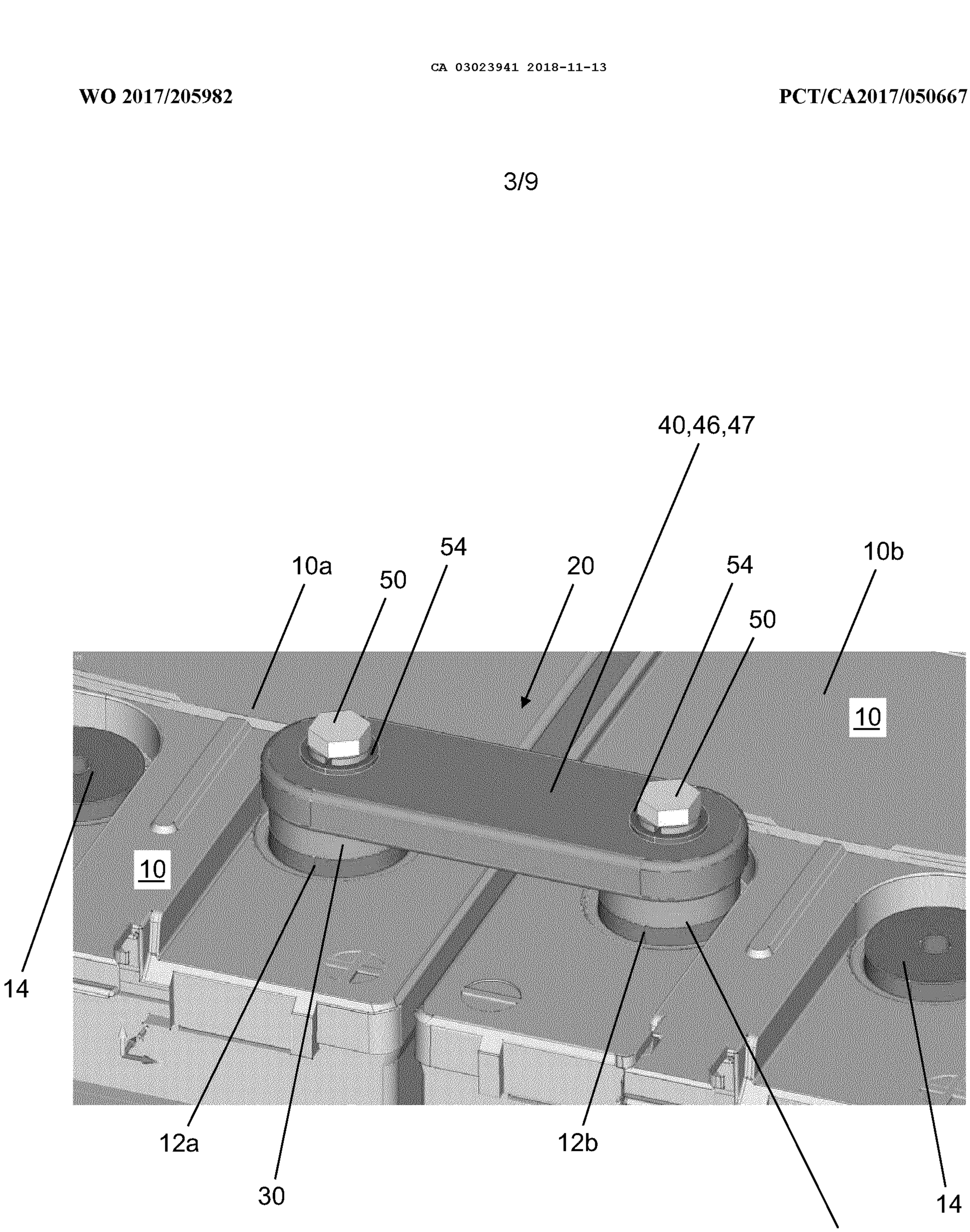
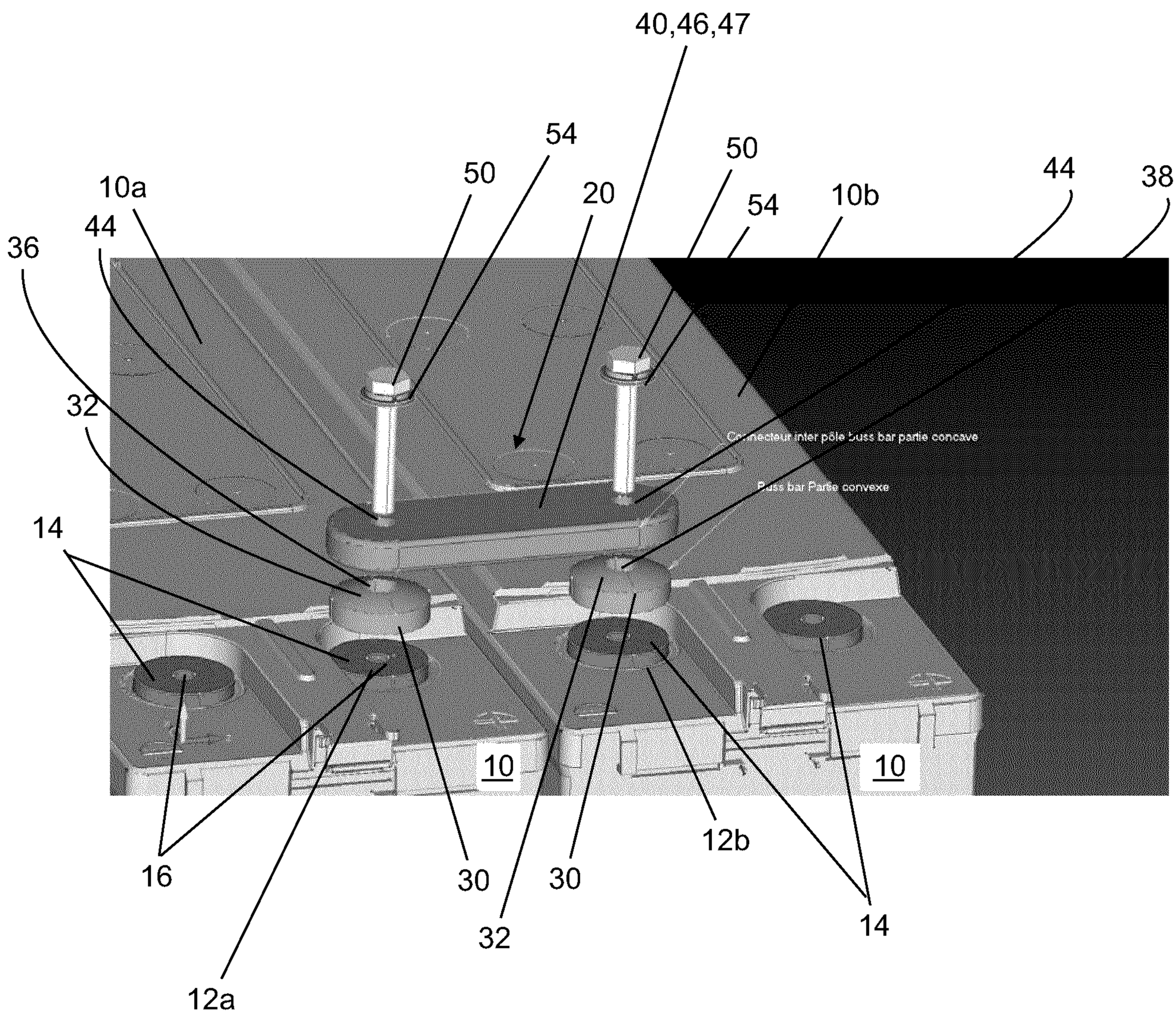


Figure 2


40,46,47
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Connecteur inter pôle buss bar partie concave
32
Buss bar Partie convexe
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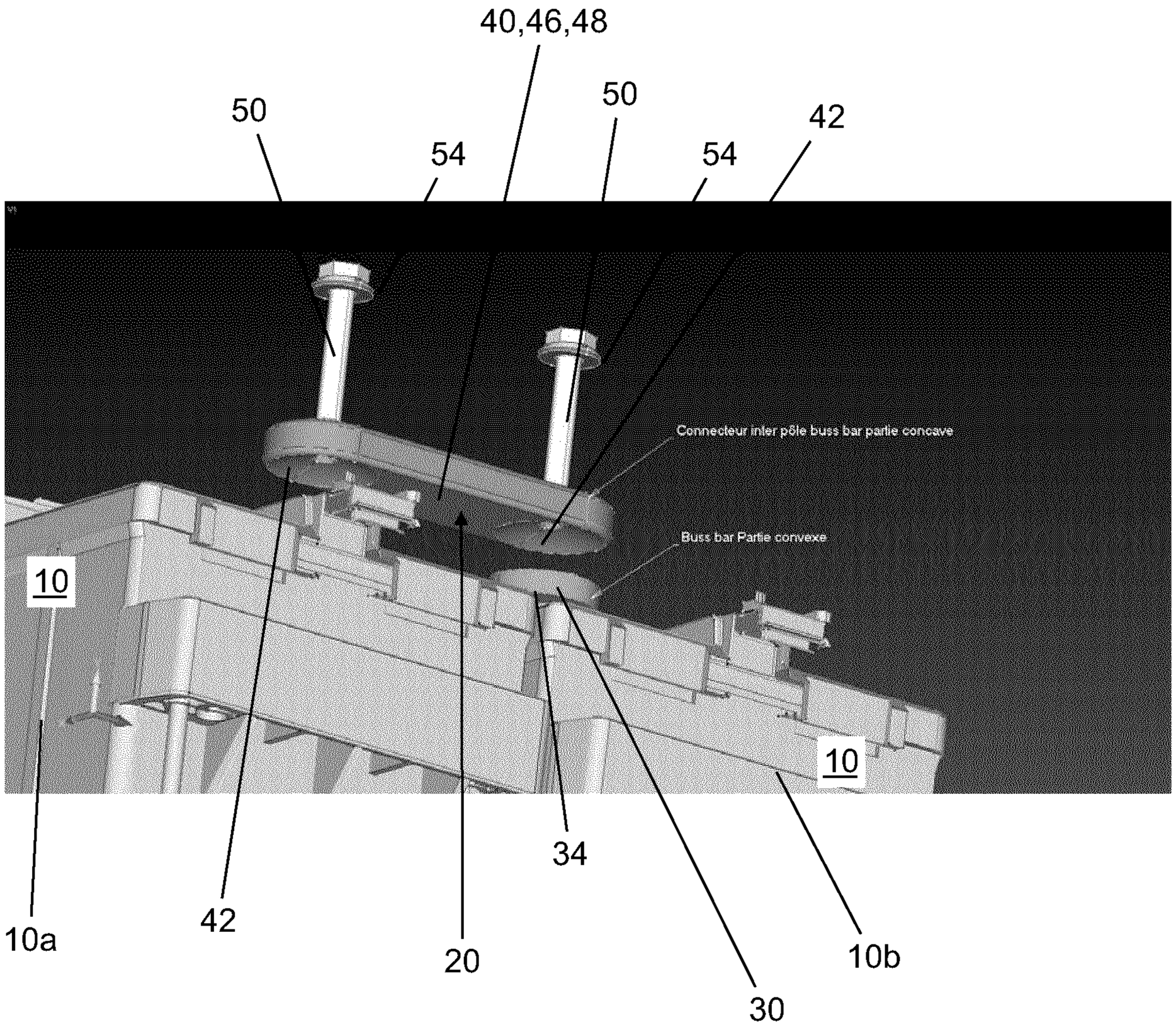
12a

Figure 3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Connecteur inter pôle buss bar partie concave
Buss bar Partie convexe
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Figure 4

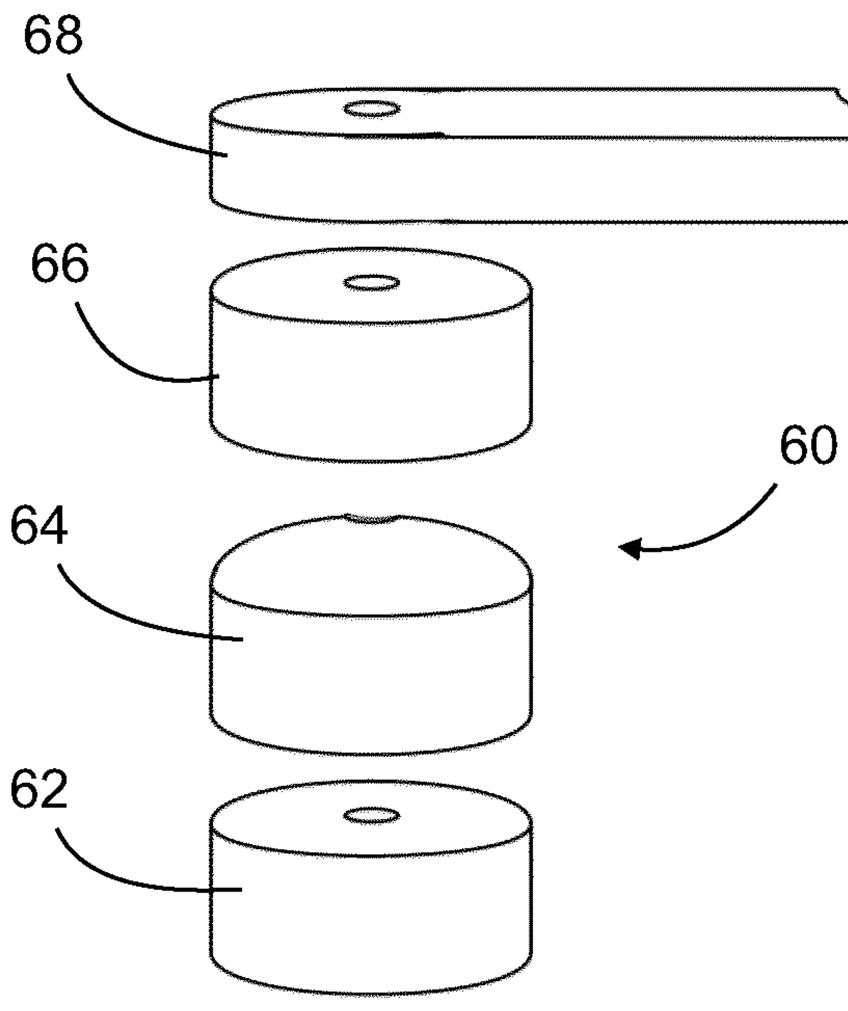


Figure 5

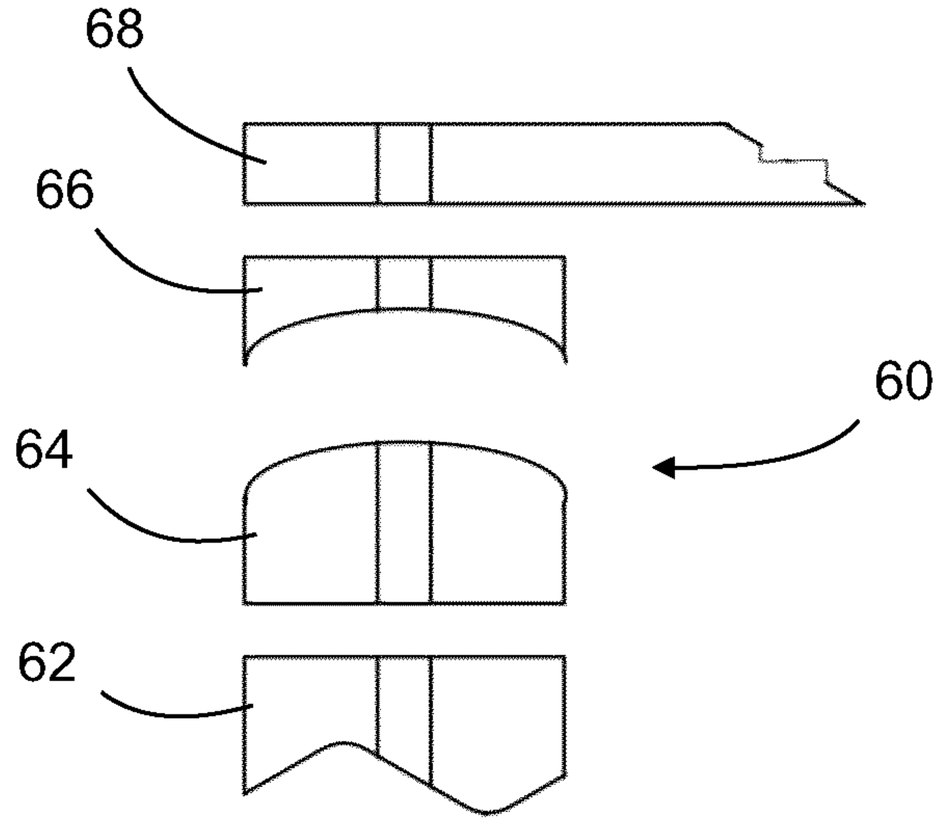


Figure 6

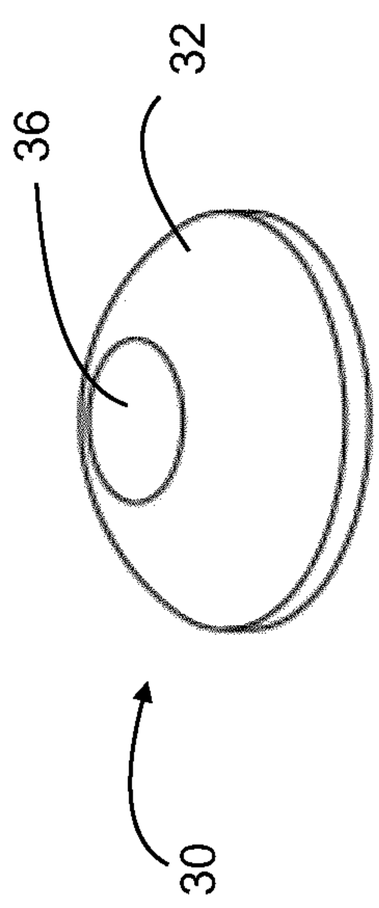


Figure 7a

Figure 7b

Figure 7c

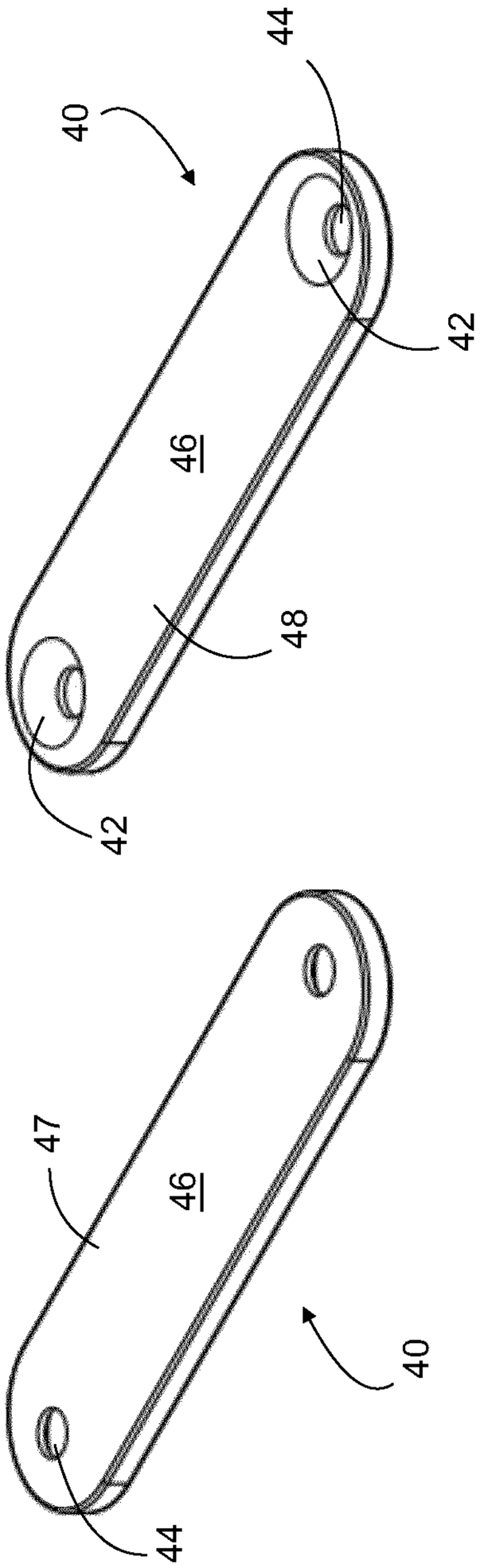


Figure 8a

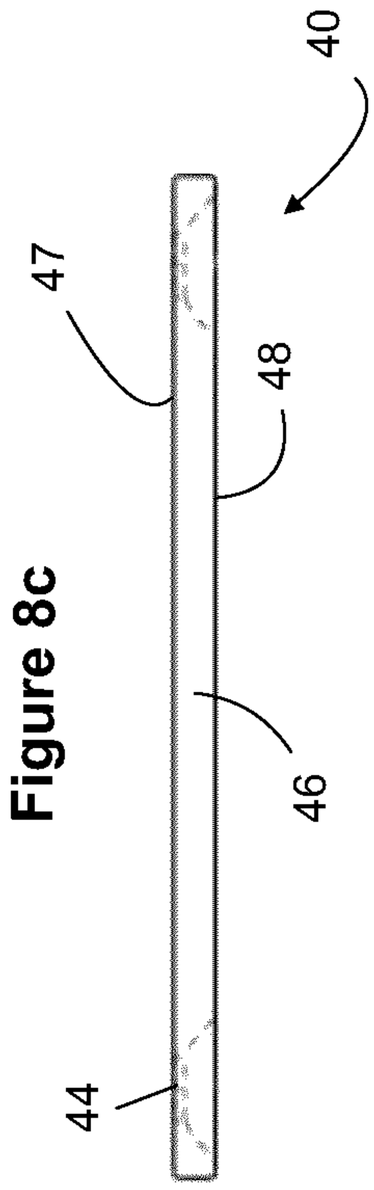


Figure 8c

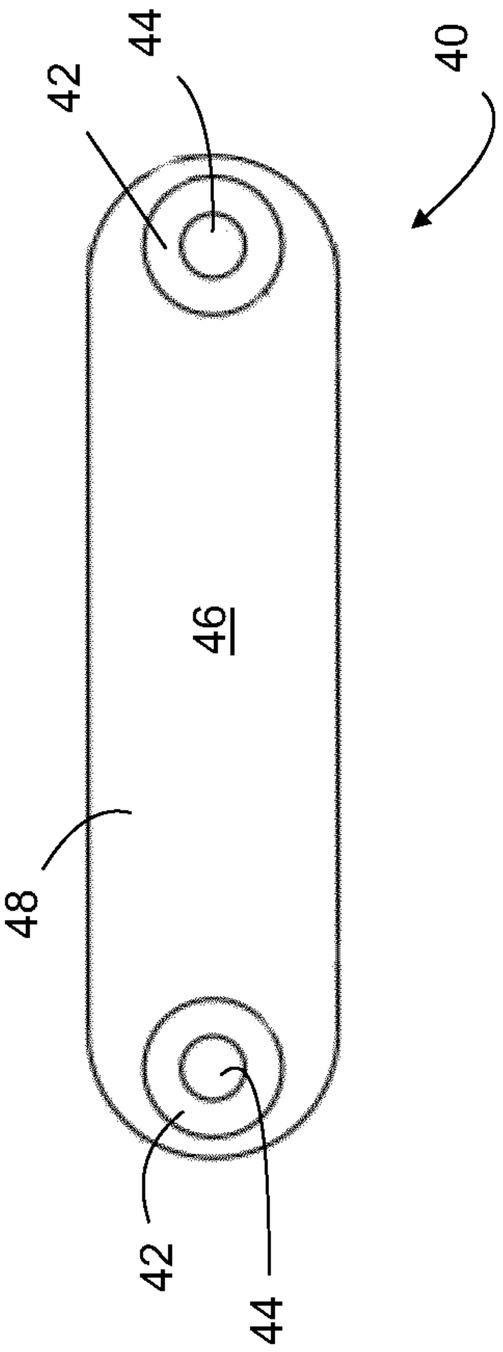


Figure 8e

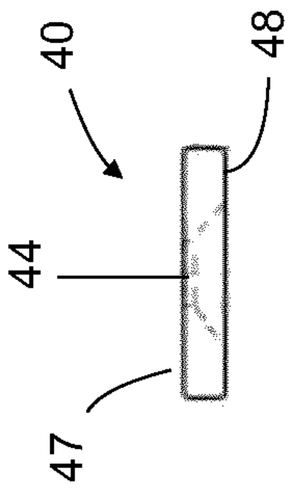


Figure 8d

Figure 8b

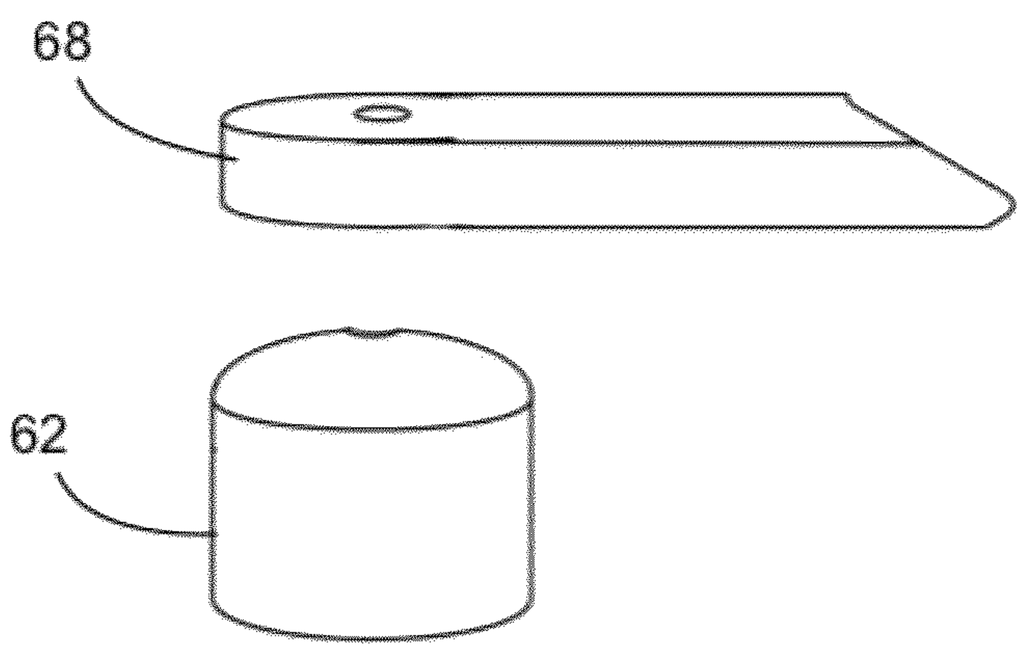


Figure 9

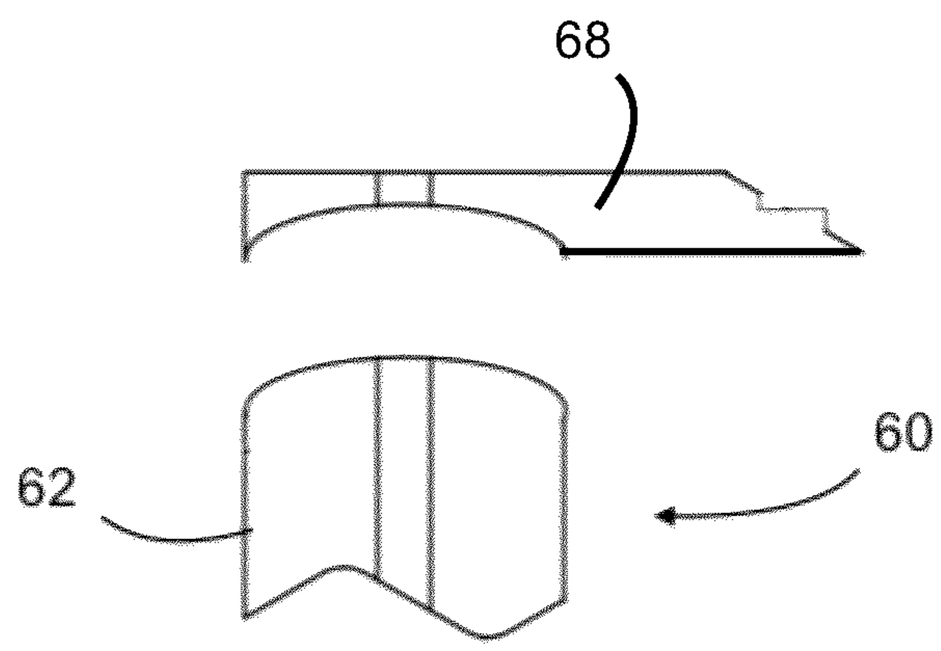
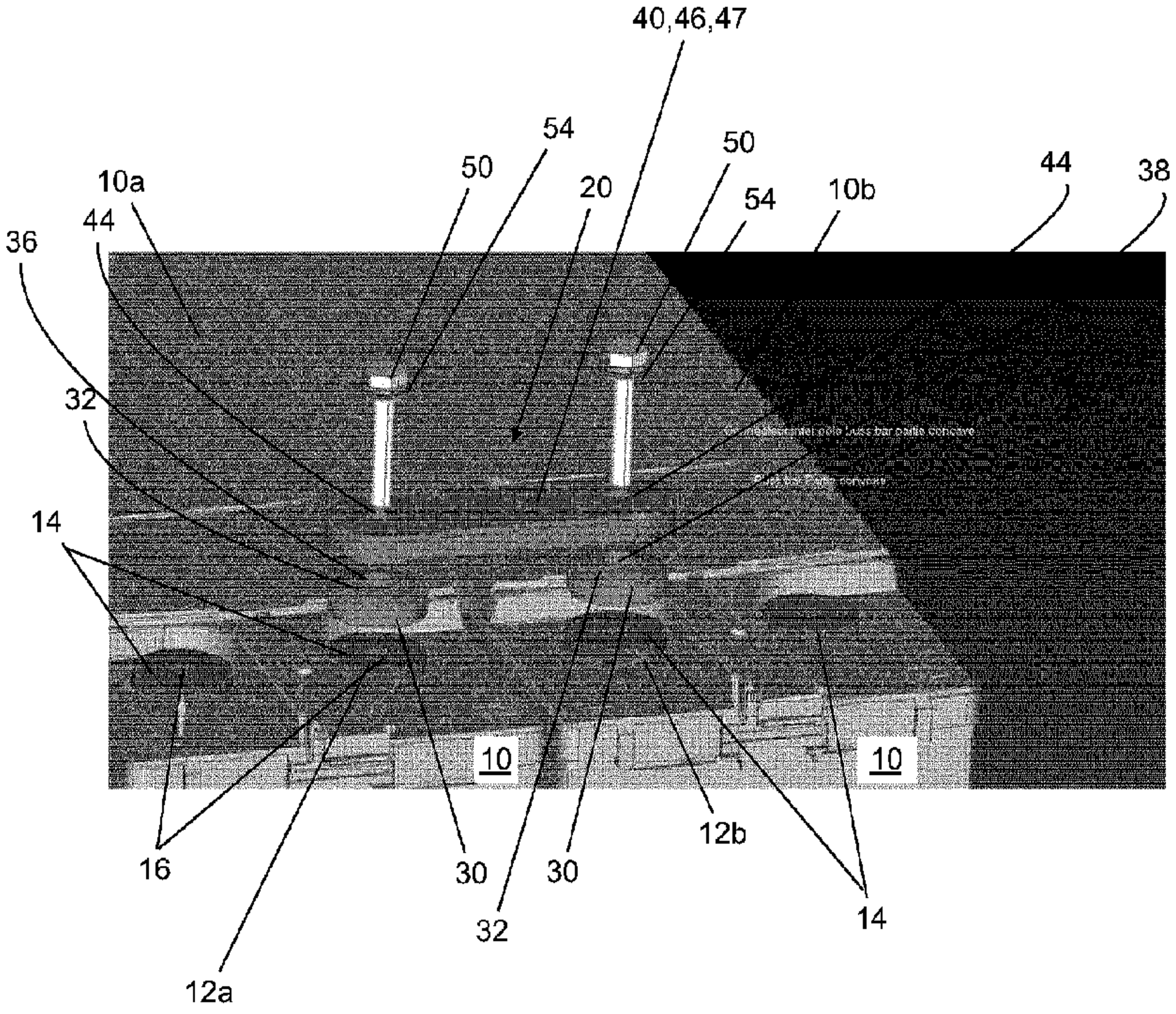


Figure 10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