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(54) **MODULAR PLATFORM SYSTEM**

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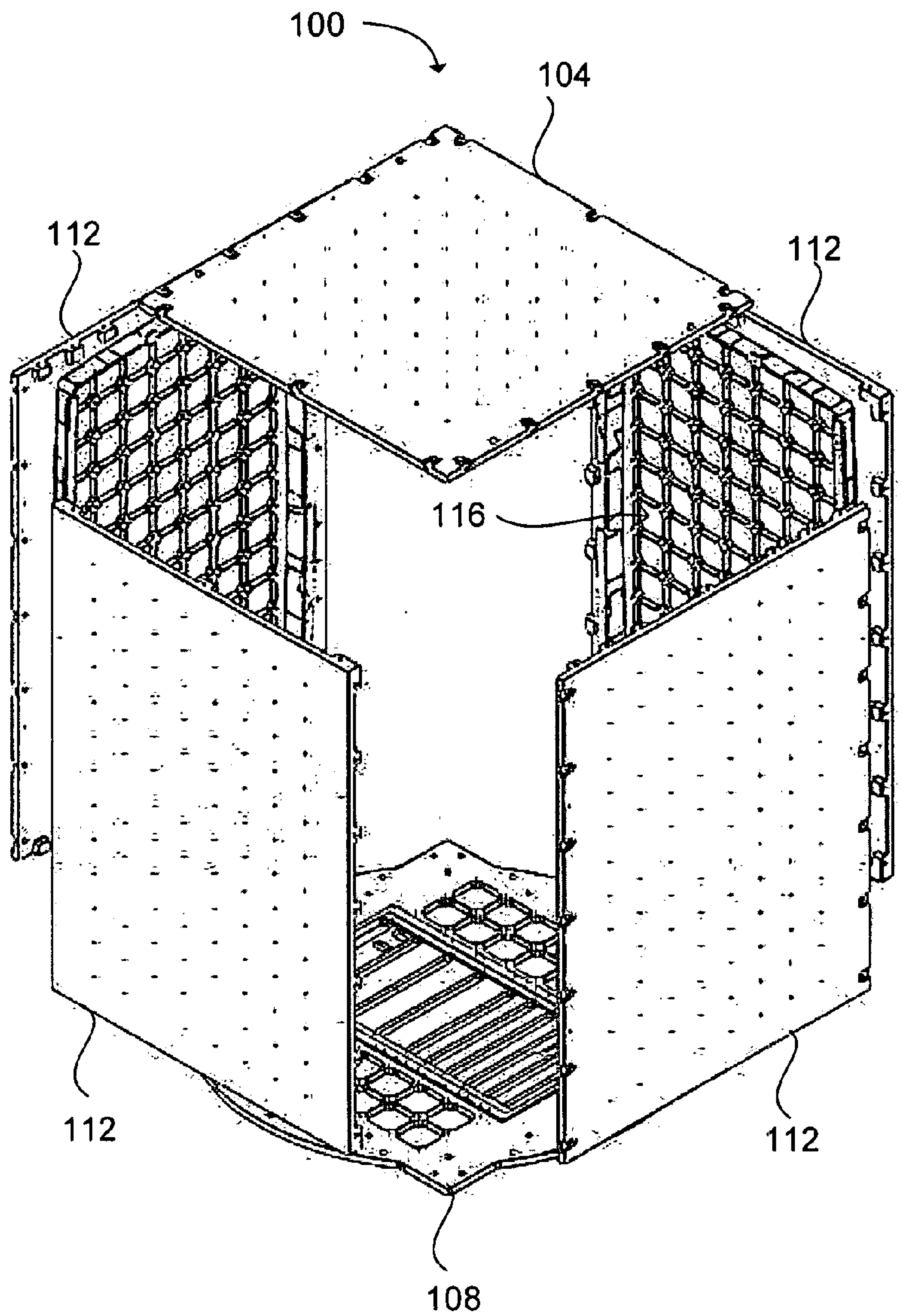
(52) **U.S. Cl.** **52/265**

(57) **ABSTRACT**

A system and methods are disclosed for a modular platform configured to carry small payloads into orbit. The system comprises a prefabricated module comprising a plurality of panels. An orthogrid pattern can be located on an inner side of one or more of the panels. The orthogrid pattern can comprise an array of orthogonal recessed areas surrounded by an orthogrid wall. The system can include a bolt pattern comprising an attachment location placed near each corner of each recessed area. A torquer coil can be integrated into one or more of the panels.



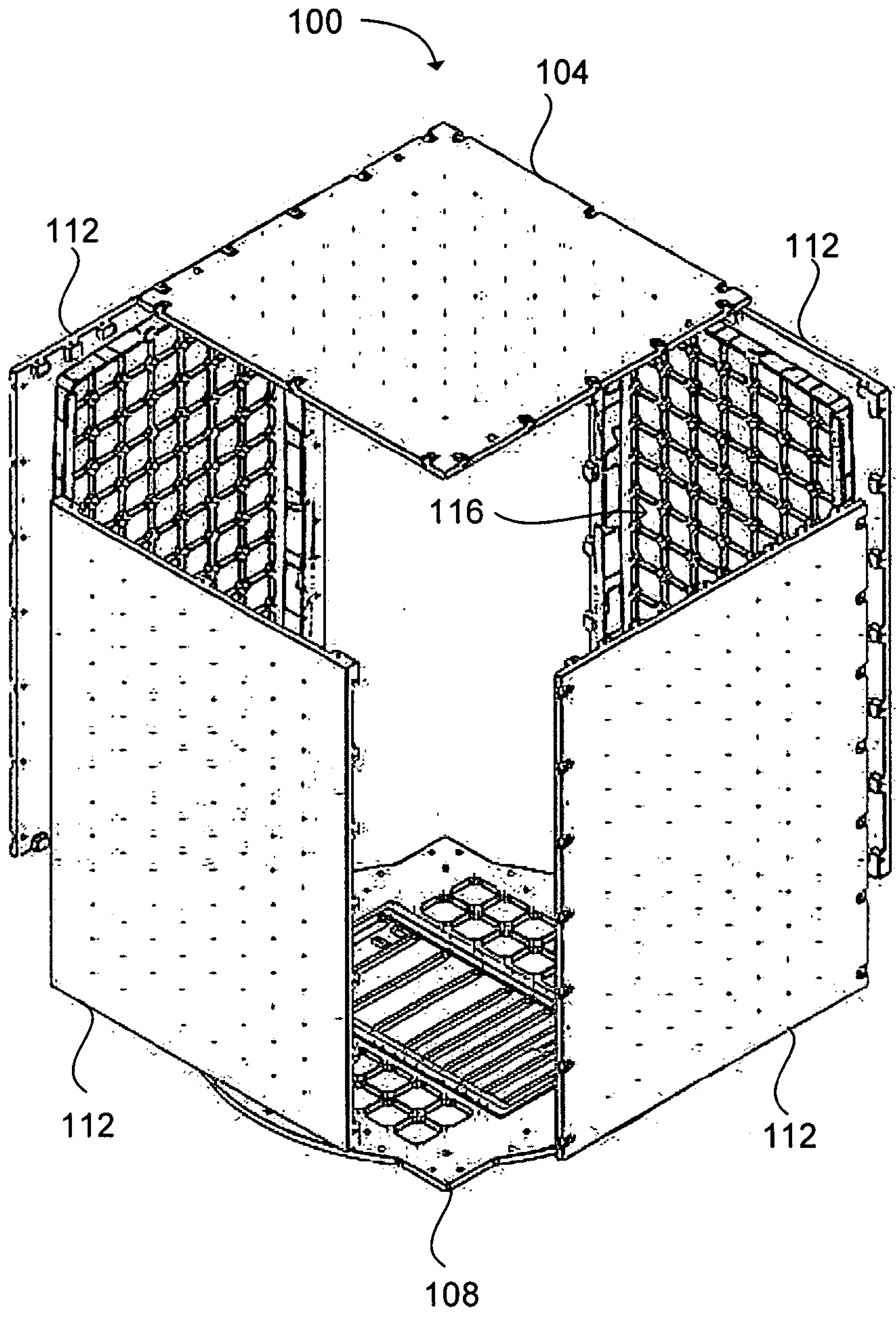


FIG. 1

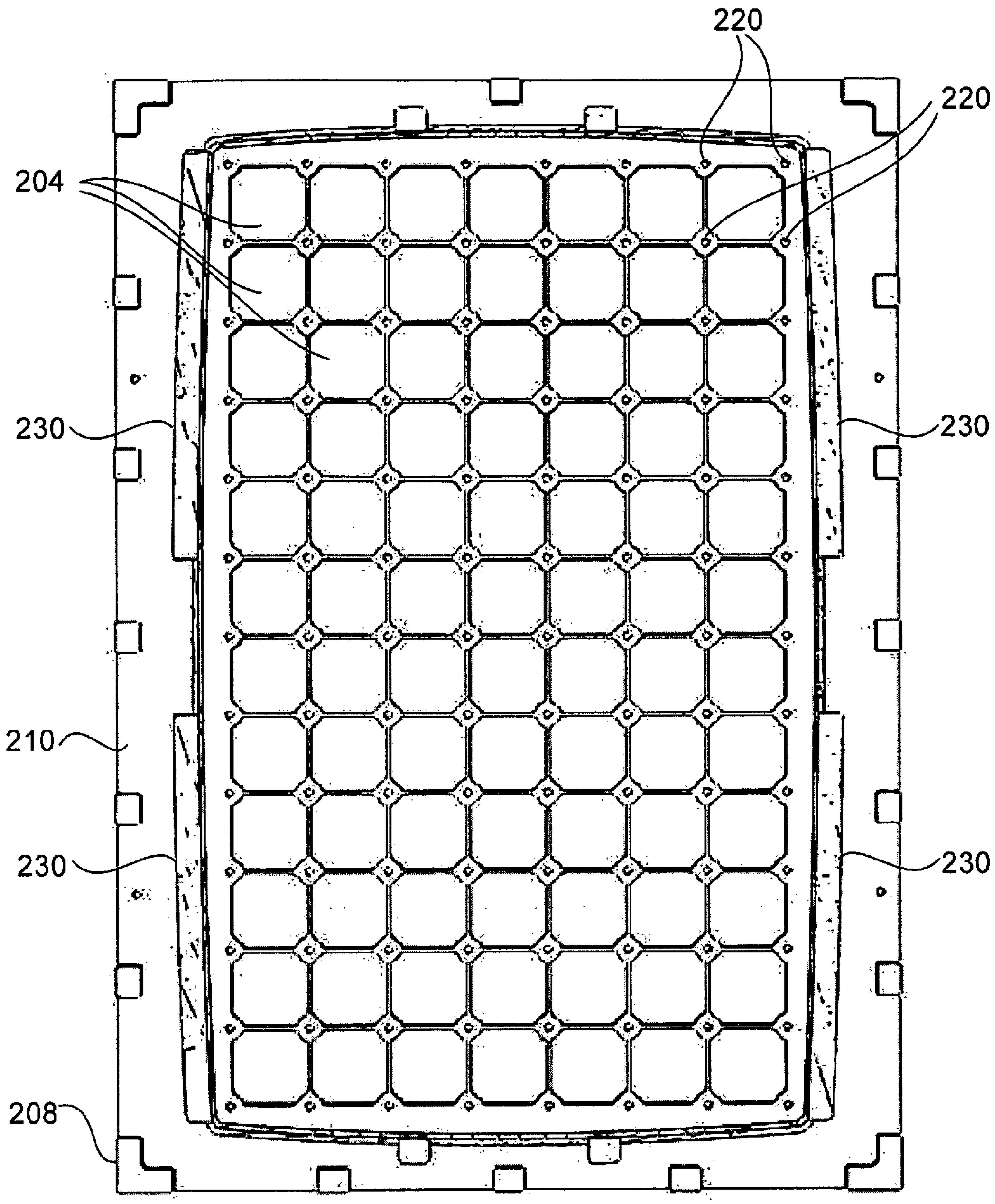


FIG. 2a

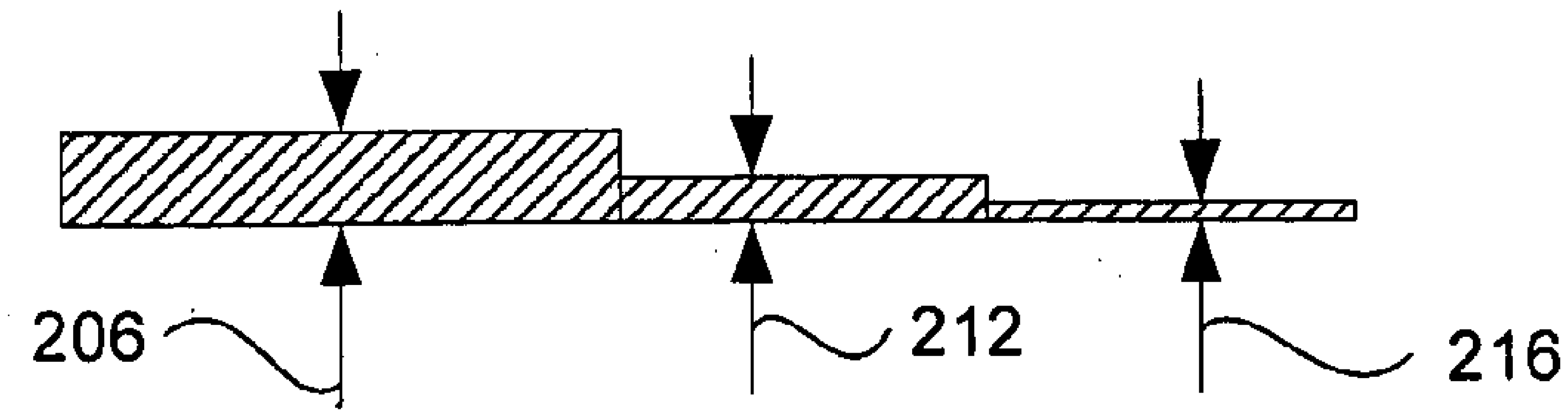


FIG. 2b

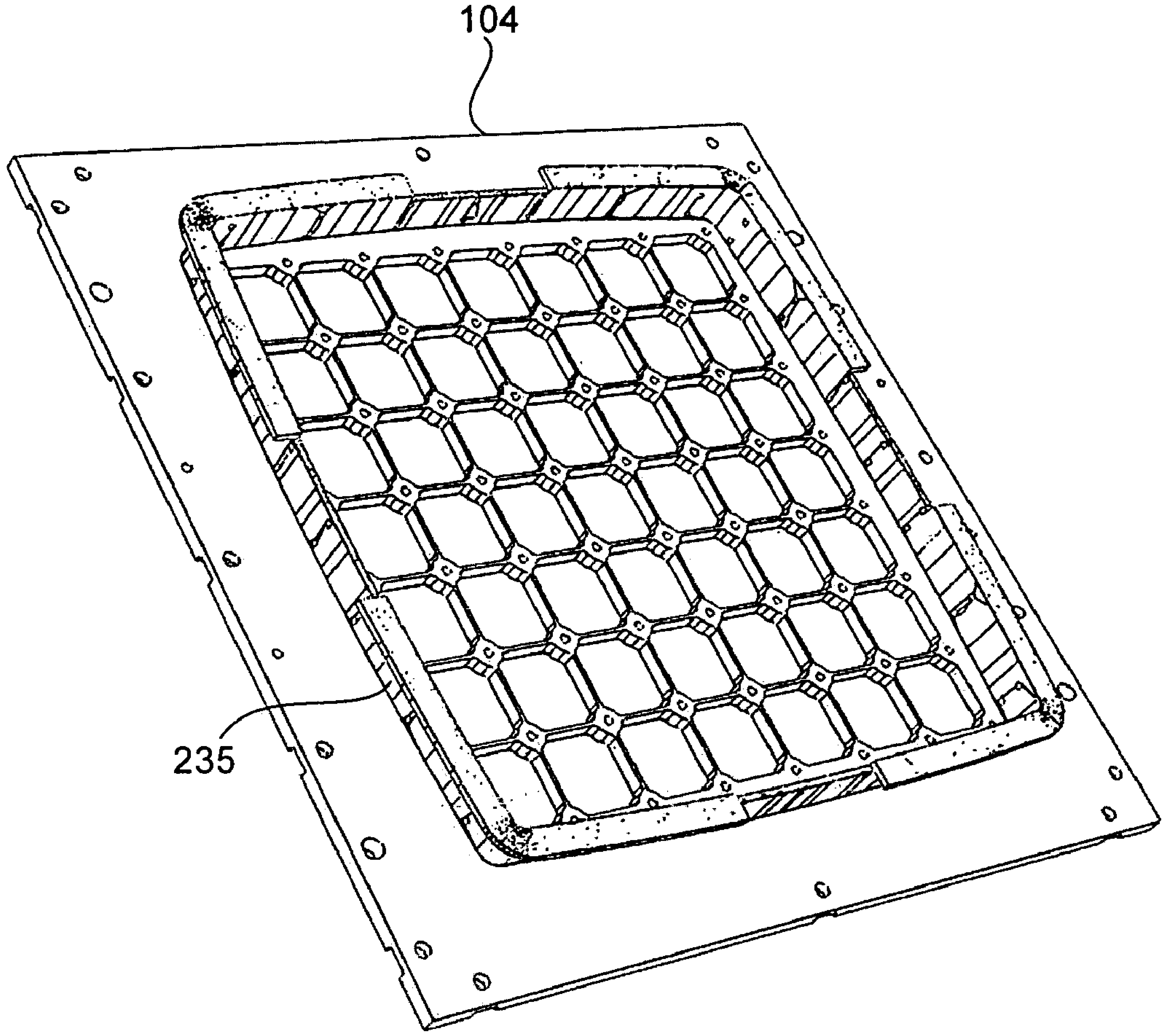


FIG. 2c

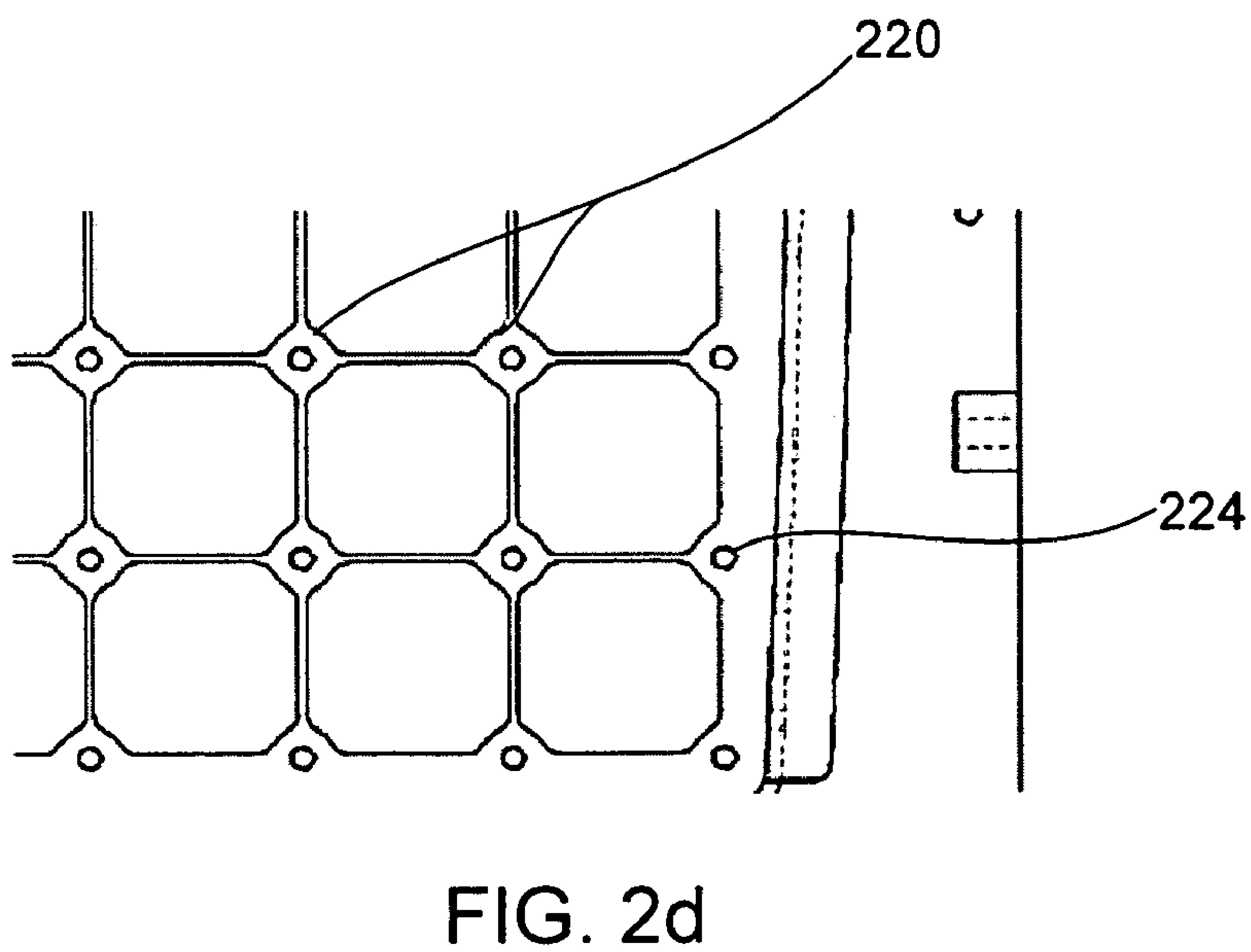


FIG. 2d

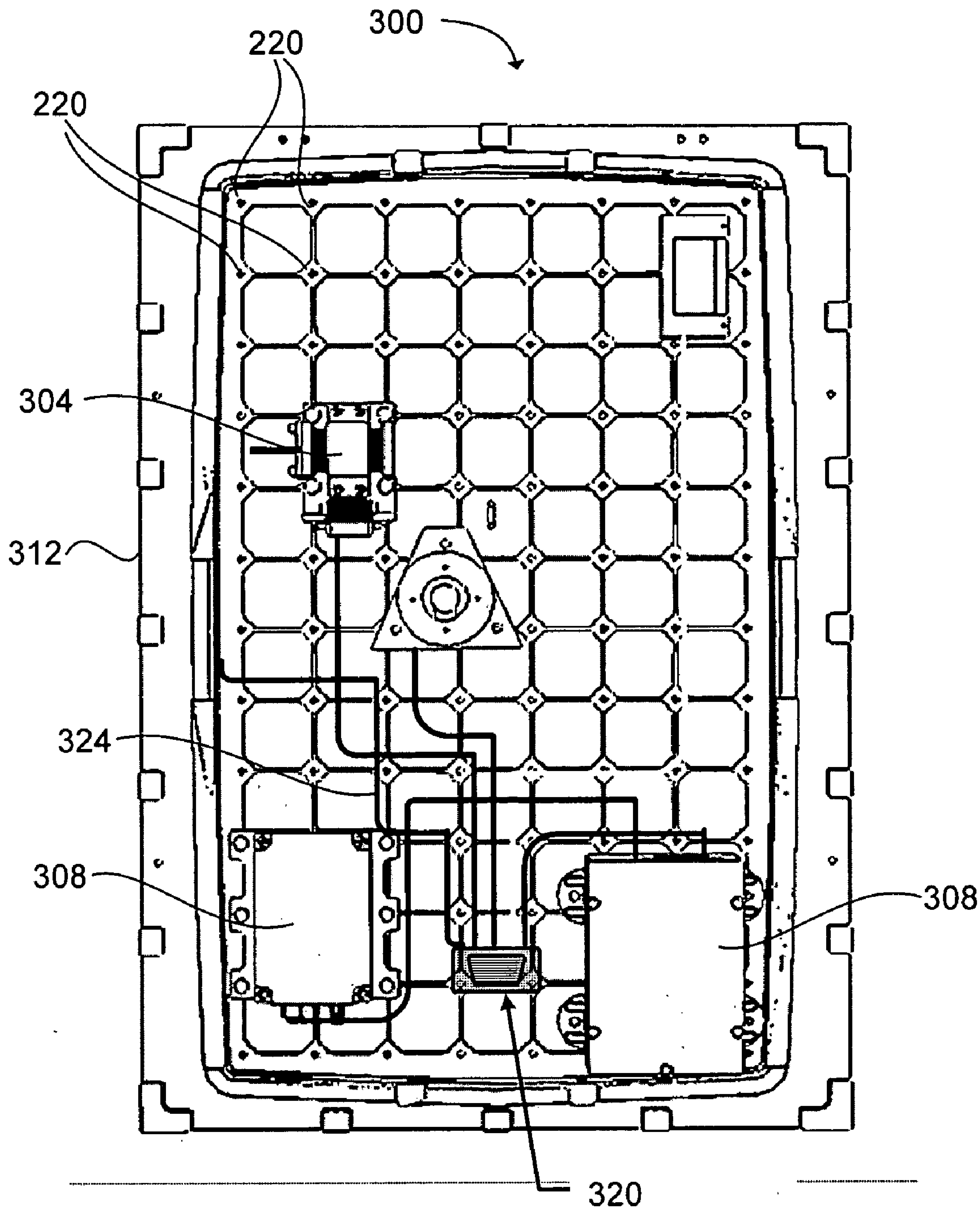


FIG. 3

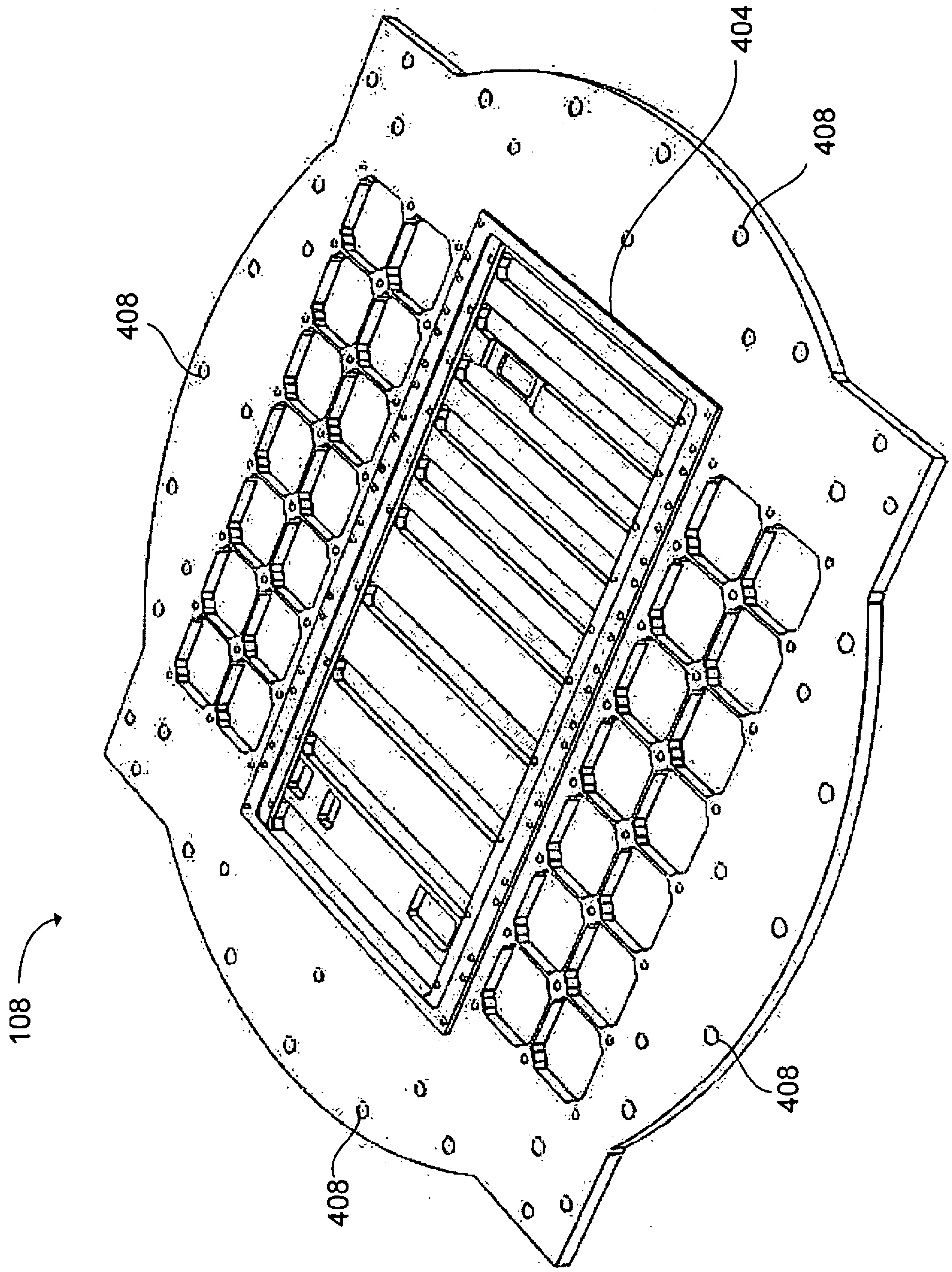


FIG. 4

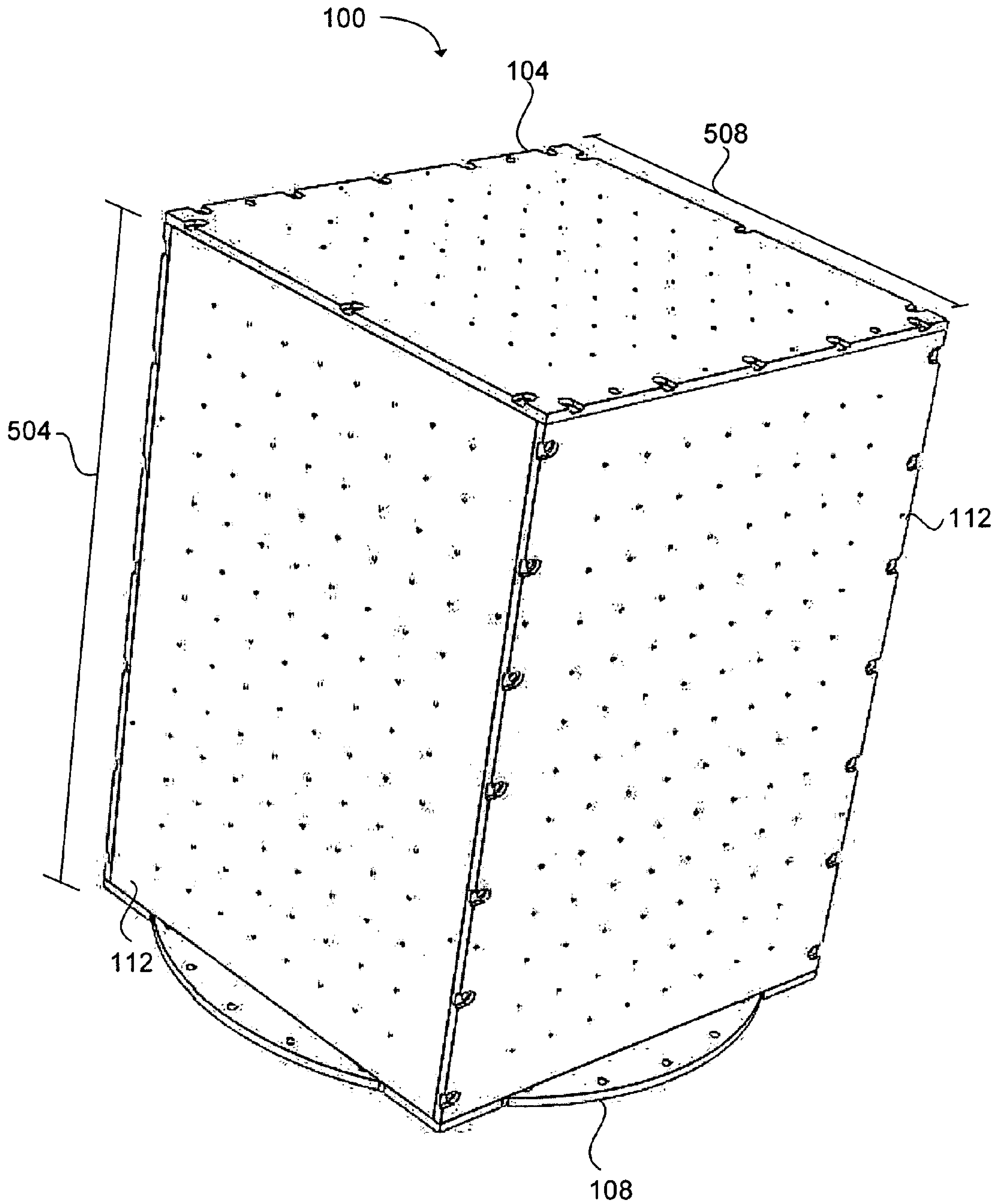


FIG. 5

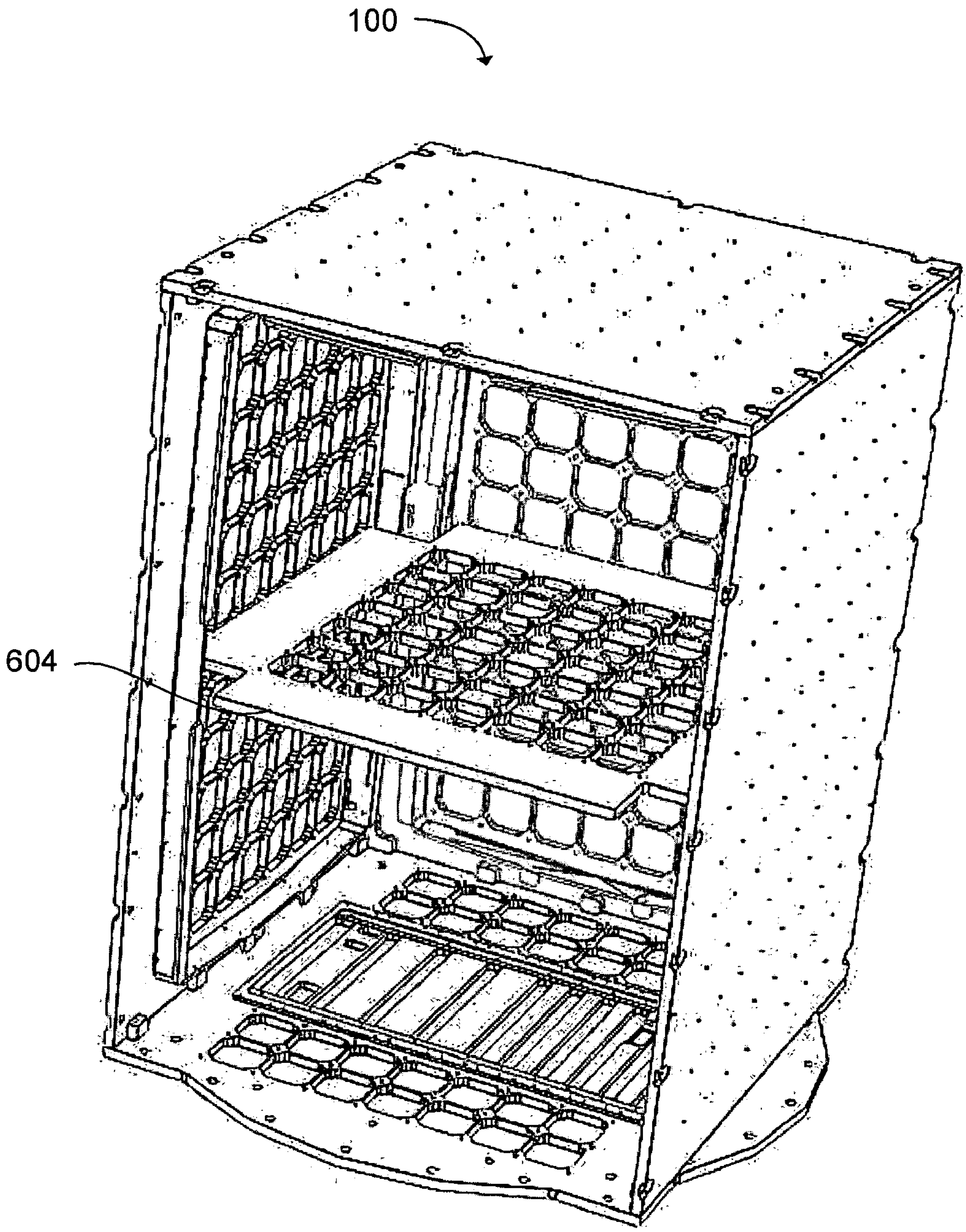


FIG. 6a

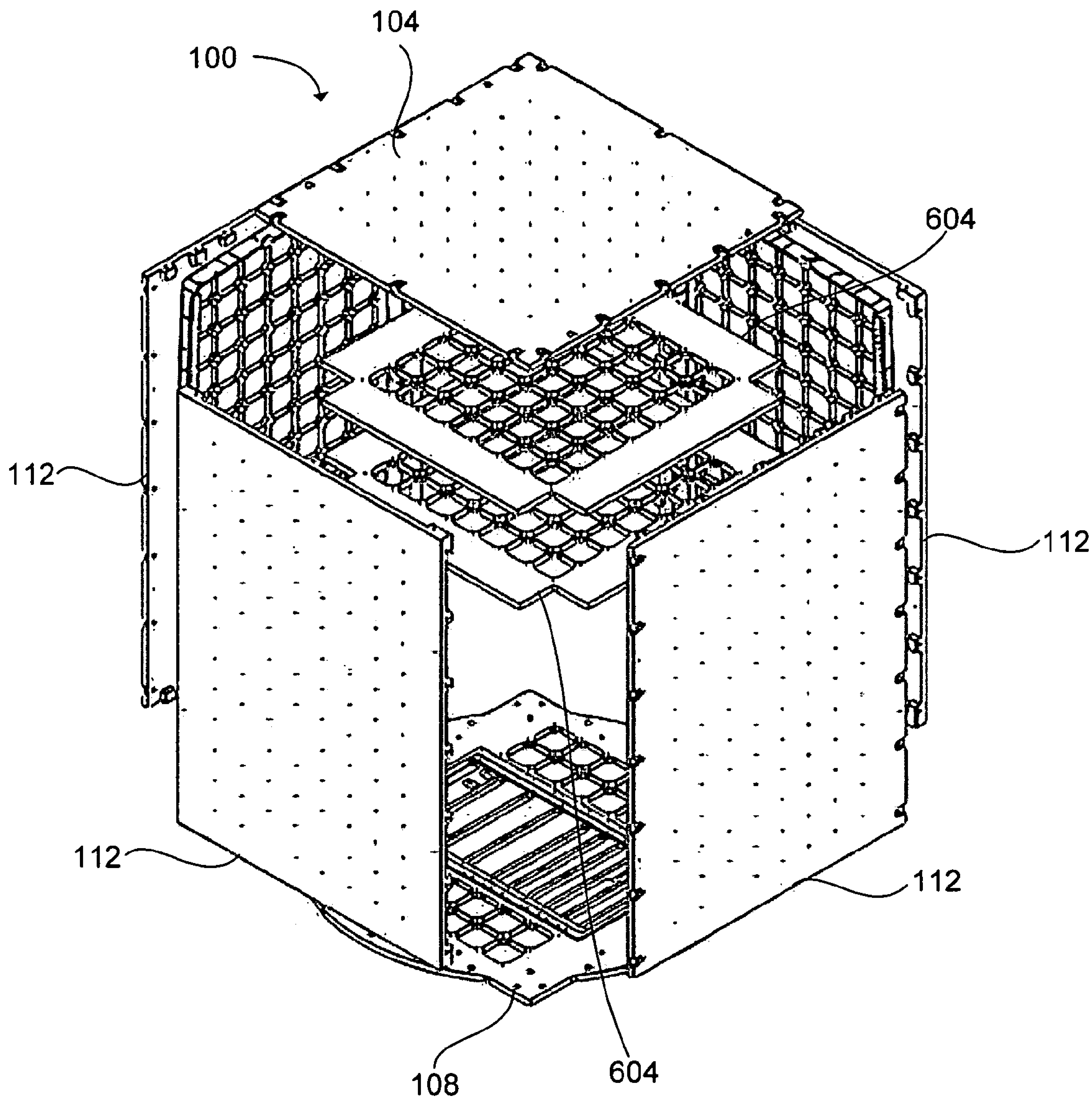


FIG. 6b

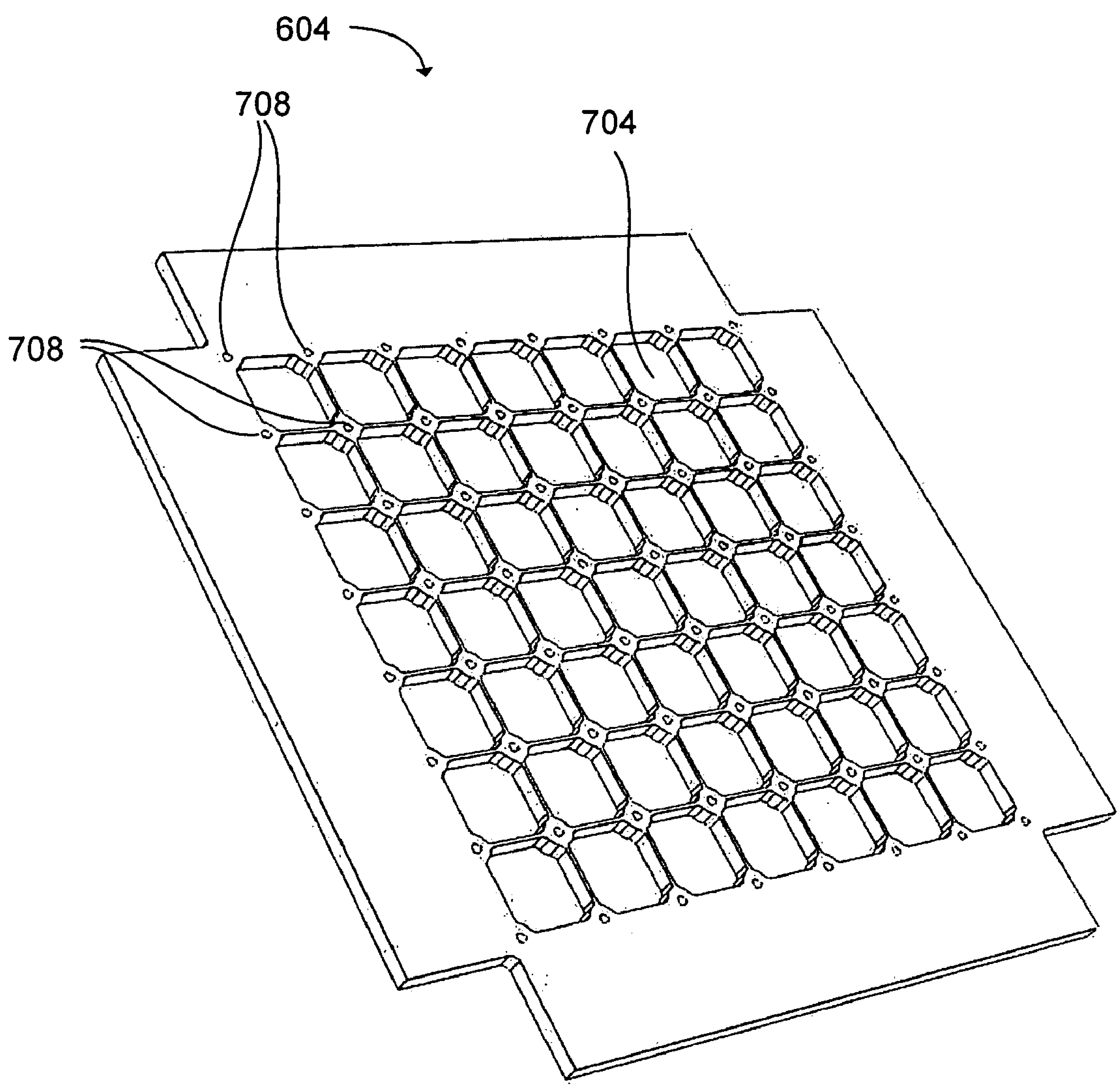


FIG. 7

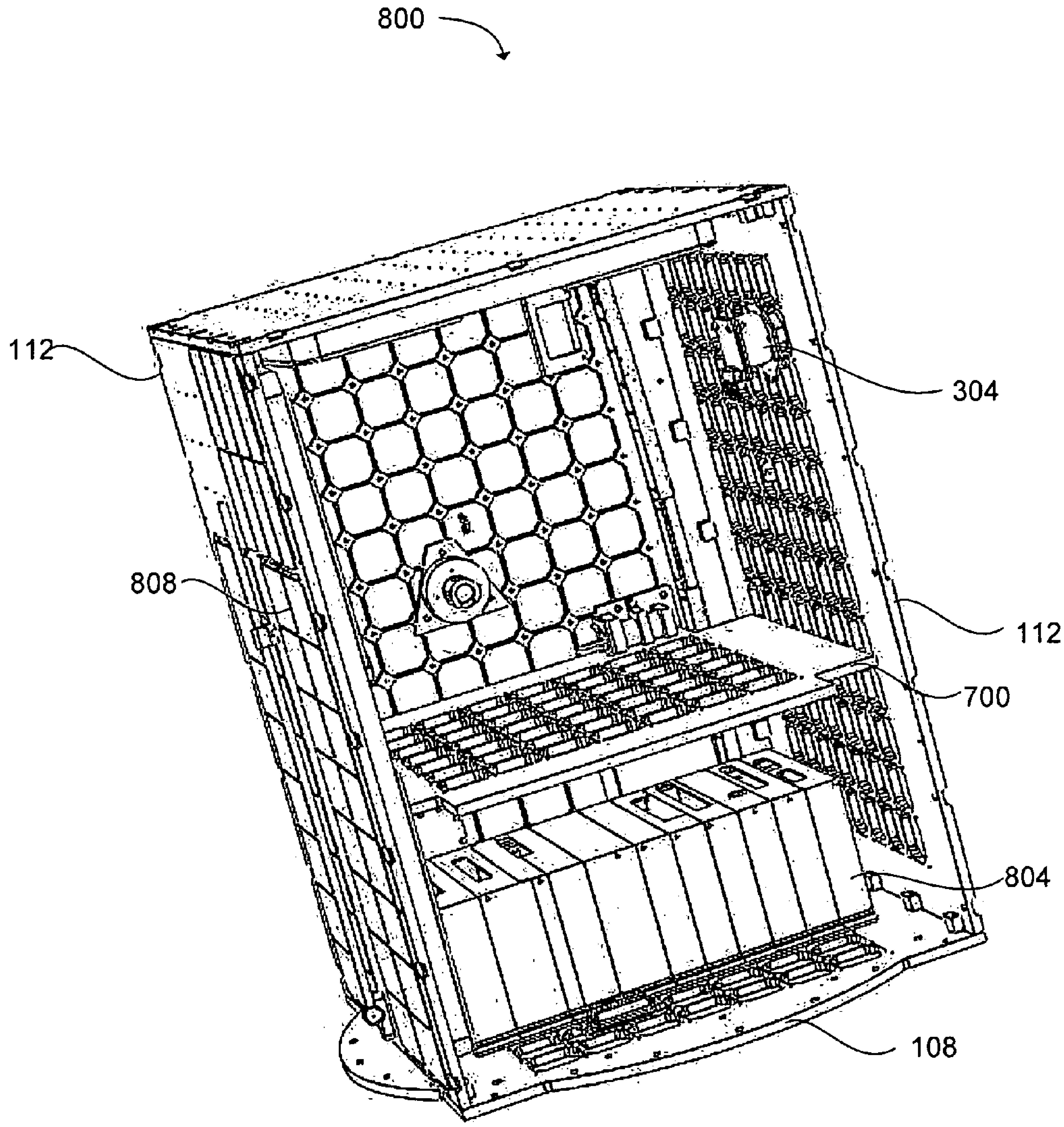


FIG. 8

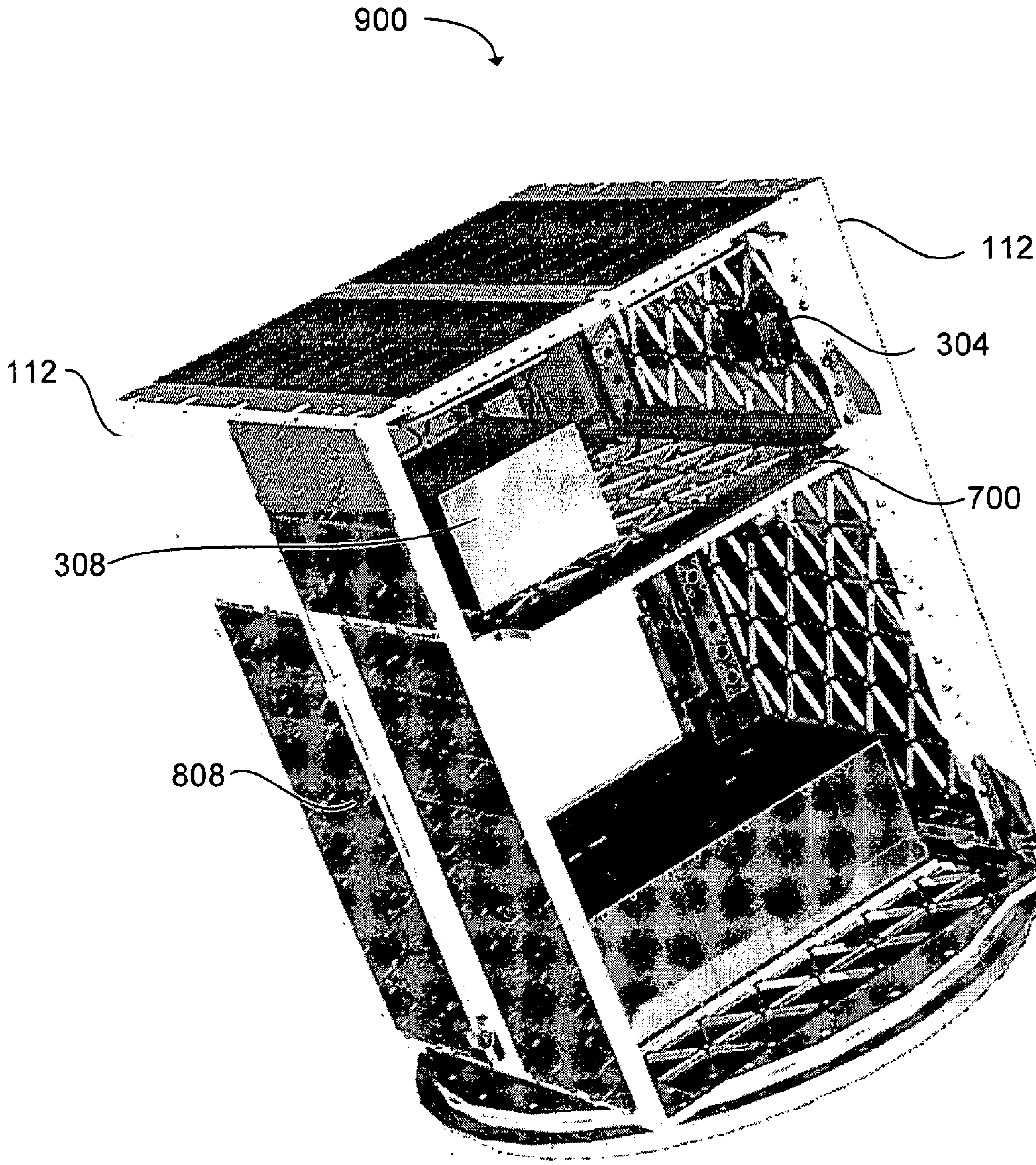


FIG. 9

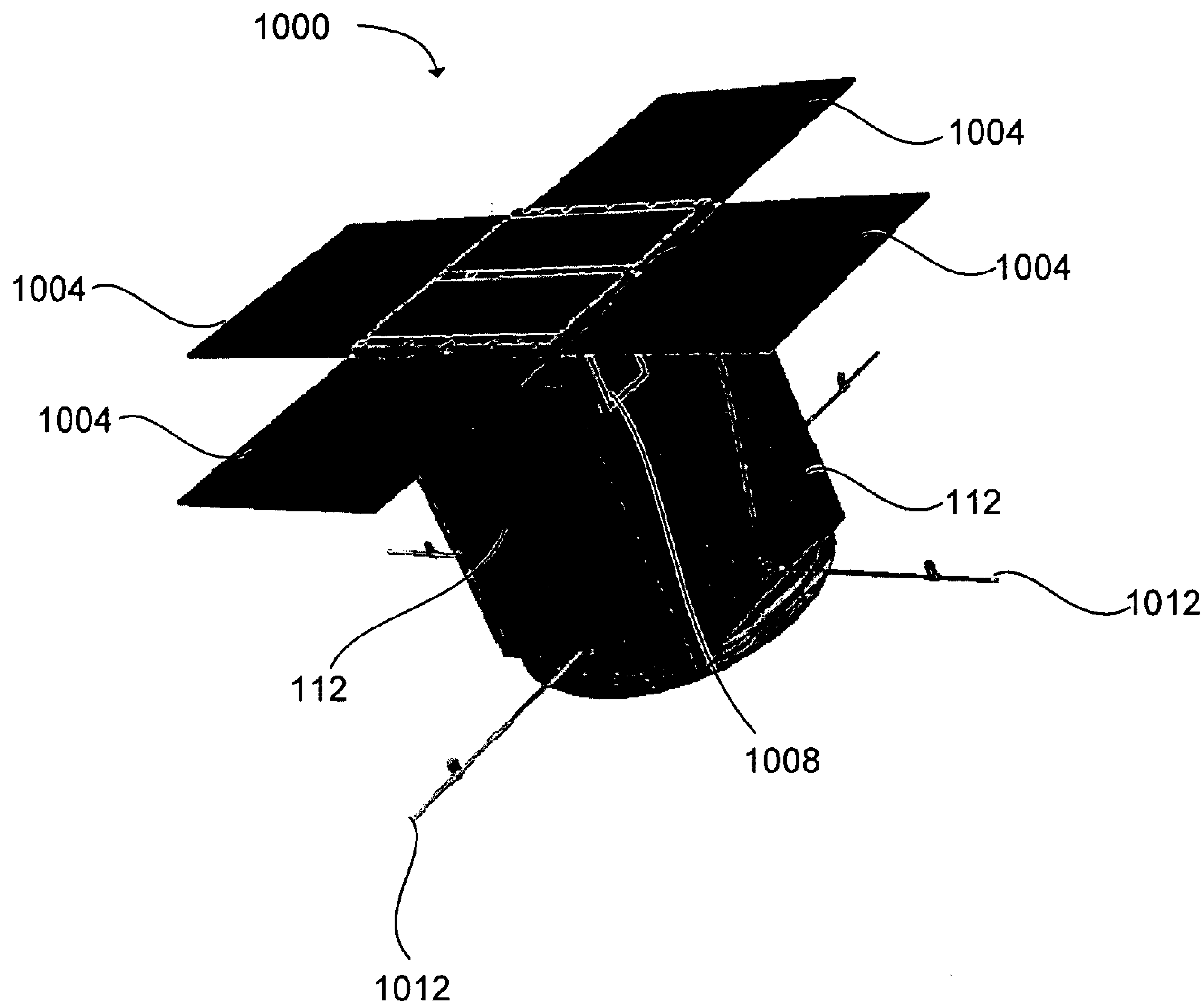


FIG. 10

MODULAR PLATFORM SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS AND CLAIM OF PRIORITY

[0001] Priority of U.S. Provisional patent application Ser. No. 60/602,283 filed on Aug. 16, 2004 is claimed.

FEDERAL RESEARCH STATEMENT

[0002] This invention was made with support from the United States Government, and the United States Government may have certain rights in this invention pursuant to DOD AFRL 03-4131.

BACKGROUND OF THE INVENTION

[0003] 1. Field of the Invention

[0004] The present invention relates generally to satellite design. More particularly, the present invention relates to modular design for small satellite fabrication and construction.

[0005] 2. Related Art

[0006] In the last 15 years small satellites have opened a window through which the aerospace industry can rapidly access low earth orbit at a fraction of the cost required by large spacecrafts. The cost to place any size object in space, however, can still be exorbitant. The harsh environment of space typically requires that every component used to build a satellite be thoroughly tested on Earth before the satellite is launched to provide the greatest probability that the satellite will function properly in space. The costs for construction and testing can quickly add up.

[0007] Most satellites are designed based upon the specific mission that they will perform. This approach works well for unique programs with large budgets. Fixed budget and low cost programs, however, can require that the design and testing of satellite components be reduced.

SUMMARY OF THE INVENTION

[0008] A system and methods are disclosed for a modular platform configured to carry small payloads into orbit. The system comprises a prefabricated module comprising a plurality of panels. An orthogrid pattern can be located on an inner side of one or more of the panels. The orthogrid pattern can comprise an array of orthogonal recessed areas surrounded by an orthogrid wall. The system can include a bolt pattern comprising an attachment location placed near each corner of each recessed area. A torquer coil can be integrated into one or more of the panels.

[0009] Additional features and advantages of the invention will be apparent from the detailed description which follows, taken in conjunction with the accompanying drawings, which together illustrate, by way of example, features of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] **FIG. 1** is an exploded view of a modular platform system in accordance with an embodiment of the present invention;

[0011] **FIG. 2***a* is an embodiment of a side panel of the modular platform system in accordance with the present invention;

[0012] **FIG. 2***b* is an illustration showing different thicknesses of panels used within the modular platform, in accordance with an embodiment of the present invention;

[0013] **FIG. 2***c* is a perspective view of a top panel having a torquer coil in accordance with an embodiment of the present invention;

[0014] **FIG. 2***d* is an embodiment of the present invention illustrating a panel having an orthogrid with a plurality of attachment locations having uniform helicoils;

[0015] **FIG. 3** is a side panel having components, modules, and wiring coupled to the attachment locations in accordance with an embodiment of the present invention;

[0016] **FIG. 4** is an embodiment of the present invention illustrating a bottom panel having an integrated backplane to hold electronic brackets and a machined circular bolt pattern for direct connection to an external separation system;

[0017] **FIG. 5** is an illustration showing an embodiment of the modular platform having a rectangular shape in accordance with the present invention;

[0018] **FIG. 6***a* is an embodiment illustrating the modular platform system having an inner deck for placement of components with a high mass or high cantilever configuration in accordance with the present invention;

[0019] **FIG. 6***b* is an exploded view of the modular platform system having a plurality of decks in accordance with an embodiment of the invention;

[0020] **FIG. 7** is an illustration of an orthogrid deck having an array of through-holes and attachment locations;

[0021] **FIG. 8** is an illustration of the modular platform system having an internal light configuration, in accordance with an embodiment of the present invention;

[0022] **FIG. 9** is an illustration of the modular platform system having an internal heavy configuration, in accordance with an embodiment of the present invention; and

[0023] **FIG. 10** is an illustration of the modular platform system having an external deployable configuration, in accordance with an embodiment of the present invention.

DETAILED DESCRIPTION

[0024] Reference will now be made to the exemplary embodiments illustrated in the drawings, and specific language will be used herein to describe the same. It will nevertheless be understood that no limitation of the scope of the invention is thereby intended. Alterations and further modifications of the inventive features illustrated herein, and additional applications of the principles of the inventions as illustrated herein, which would occur to one skilled in the relevant art and having possession of this disclosure, are to be considered within the scope of the invention.

[0025] One method for reducing the cost of design and test of a satellite is to create standards. Standardized modules can be thoroughly designed and tested for the rigors of space, allowing them to be available as off the shelf components. Engineers can select standardized modules and their respective parts that have been proven to be reliable. The necessary infrastructure, manufacturing, and documentation can be minimized.

[0026] A design and construction standard for small satellites, including micro, nano, and pico-satellites is needed to reduce the cost of manufacturing and testing these satellites. Prefabricated modules that can be used to house components for such satellites are greatly desired. As illustrated in **FIG. 1**, and in accordance with one exemplary embodiment of the present invention, a system, indicated generally at **100**, is shown for a modular platform structure. The modular platform structure has a modular design comprising a top panel **104**, a bottom panel **108**, and four side panels **112**. The panels may each be comprised of a plurality of panels. For example, each side panel may be comprised of two separate pieces. The various panels can be connected together to form a rectangular or other geometrically configured enclosure capable of carrying objects into space. In one embodiment, the panels can be connected together using bolts, screws, rivets, adhesive, or any other type of fastener capable of coupling the panels together.

[0027] The panels can be formed to couple and support mechanical and electrical satellite components such as payload components, communications components, power and power management components, propulsion components, attitude determination components, data gathering and processing components, etc. In the present invention, satellite components can refer to both individual electrical and mechanical components (i.e. circuit chips, resistors, capacitors, inductors, etc.) and modules (i.e. transmitters, receivers, detectors, etc.). The panels can be formed in such a way as to maximize the allowable space for the satellite components to be housed within the enclosure formed by the panels. The panels can be configured to allow the satellite components to be attached using standardized attachment means such as screws, bolts, rivets, or other attachment means. The panels will be discussed in more details below.

[0028] The panels can be joined using various connectors such as screws or bolts. The panels may be formed of metal or composite materials. Each of the panels can have an orthogrid pattern **116** on an inner side. The orthogrid pattern can be made up of a plurality of substantially quadrilateral areas coincident to one another. The quadrilateral areas can include a recessed area. The recessed area can be milled from the panel to form the orthogrid pattern comprising an array of recessed areas **204**, as shown in **FIG. 2***a*.

[0029] The recessed areas may also be formed using die stamping or plastic forming techniques. Each of the recessed areas can be substantially square. The recessed areas can each have four attachment locations **220**. The attachment locations can be placed at each of the four corners of each recessed area. In one embodiment, the attachment locations of one recessed area can be shared with the attachment locations of adjoining recessed areas. Thus, four adjoining recessed areas may have a total of nine attachment locations. The positioning of the attachment locations on the panels is designed to substantially optimize the number of satellite components that can be securely carried within the enclosure.

[0030] The recessed areas **204** can be formed as a closed grid pattern machined into each panel. In one embodiment, the panels can have at least three different thicknesses, as shown in **FIGS. 2***a* and **2***b*. An outer edge of each panel can have a first thickness **206** which is sufficiently thick to enable the outer edge to be used as a structure joint **208**. A predetermined distance from the edge, each panel can have a box attachment area **210**. The box attachment area can have a second thickness **212**. The box attachment area can be recessed to have a thickness less than the structure joint. The box attachment area can also be used to add hinges, release mechanisms or components where custom holes must be tapped. The box attachment area can be modified based on mission or instruments requirements.

[0031] The box attachment area can also act as a wall for the array of recessed areas **204**, referred to as an orthogrid, to form an orthogrid wall. Each recessed area can have a third thickness **216**, recessed below the orthogrid wall. In one embodiment, the third thickness can be less than 0.05 inches. The array of recessed areas in the orthogrid can reduce the weight of each panel. The attachment locations **220** located in the corner of each recessed area can have a surface of substantially similar thickness to the box attachment area and orthogrid wall **212**. The attachment locations can have an area sufficient to be drilled to have a mounting hole **224** placed within each attachment location, as shown in **FIG. 2***d.*

[0032] Each of the mounting holes **224** can be tapped to have a substantially similar thread size. Alternatively, a helicoil having a substantially similar thread size can be placed within each of the mounting holes. The substantially similar thread size can reduce the number of fasteners used to attach components to the inside of the panels. In one embodiment, a single fastener size can be used to attach components. Using a single fastener size can reduce the amount of tooling necessary for assembly of the modular platform **100**. It can also reduce the time spent selecting and testing numerous fasteners capable of being used in space.

[0033] Referring again to **FIG. 2***a,* a torquer coil **230** can be integrated into one or more of the panels. A torquer coil can be used to orient a satellite in a predetermined position by taking advantage of the magnetic field of the Earth. In one embodiment, the torquer coil can be carried by an integrated panel support located in one or more of the panels **104**, **108**, or **112**. The panel support can be formed in an L-shape profile. The support can be either extruded or machined. The torquer coil can comprise a plurality of windings of a conductive wire. A profile view of a top panel **104** having a torquer coil support **235** is shown in **FIG. 2***c.* The profile view shows the area where the torquer coil wire can be wound around the torquer coil support to generate the magnetic field. A voltage can be applied, inducing a current to flow through the windings. A magnetic field can be created from the flow of the current through the windings, with magnetic field lines in a direction orthogonal to the windings. The magnetic field created by the torquer coil can interact with the Earth's magnetic field, enabling the satellite to be oriented in a predetermined direction. The modular platform **100** (**FIG. 1**) can be configured with one, two, or even three panels having integrated torquer coils. In one embodiment, a modular platform placed as a satellite orbiting the Earth can have three panels with integrated torquer coils, with the torquer coils placed such that the modular platform can be rotated independently about 3 orthogonal axes.

[0034] Referring to **FIG. 3**, the attachment locations **220** can be used to couple components **304** and modules **308** (satellite components) to the panels of the modular platform structure **100** (**FIG. 1**). Each of the attachment locations **220** can contain mounting holes **224** (**FIG. 2*d***) that can either be tapped or have helicoils attached. The helicoil can be formed from a substantially rigid material, allowing the components and modules to be tightly coupled to the panels in the modular platform structure. The components and modules can be pre-assembled and pre-tested. The components and modules can then be fastened to a panel **312** and electrically connected together via harnessing to form a panel sub-system **300**.

[**0035**] The panel sub-system **300**, as shown in **FIG. 3**, can then be run through a variety of testing. Testing may include mechanical tests, electrical tests, functional tests, and environment tests, including vibrational tests, and thermal tests. Panel sub-systems can be tested individually before being placed together in the modular platform. If a panel sub-system fails a test, the individual panel and its components and modules can be re-tested without causing other panel sub-systems, modules, or components within the modular platform to be re-tested. Placing components on panel sub-systems can increase the speed of testing by allowing different panel sub-systems to be tested in parallel. Thermal, electrical, and vibrational wear on the modular platform system can be reduced by testing each panel sub-system independently. Once each panel sub-system is known to be functioning properly, they can be installed in the modular platform and tested as a system. This can reduce the amount of testing and increase the speed with which a satellite can be manufactured.

[**0036**] Each panel sub-system **300** can contain one or more intra-module connectors **320**. Electrical wiring and cabling **324** from the components **304** and modules **308** on each panel sub-system can be routed to the intra-module connector. A harness attachment (not shown) can be connected to the attachment locations **220** to enable placement of electrical wiring and cabling. Tape and glue typically do not work well in the extremes of outer space, due to extreme temperatures and outgassing of glues in the vacuum of space. Therefore, it can be advantageous to use the harness attachment to secure wiring and cabling to the attachment locations. A standard threaded pattern can be used for the harness attachment. Wiring the components and modules to the intra-module connector can enable the panel sub-system to be quickly assembled and tested with other sub-systems.

[**0037**] One exemplary panel of the modular platform system can comprise an integrated backplane **404**, as shown in **FIG. 4**. The integrated backplane can be used to attach a computer system. For example, a flight computer can be attached to the integrated backplane. The integrated backplane can act as a heat sink to enable heat form a computer system to be efficiently transferred to the environment external to the modular platform. In one embodiment, an integrated backplane can be machined out of the bottom panel **108** and used to house the flight computer.

[**0038**] One panel of the modular platform **100** (**FIG. 1**) can be configured to be coupled to an external separation system. The separation system can separate the modular platform from a launch vehicle or rocket once they arrive at a predetermined location in space. In one embodiment, the bottom panel **108** can be configured to be coupled to the separation system. An exterior side of the bottom panel can be machined to connect directly to the separation system. For example, **FIG. 4** shows the circular bottom panel having a bolt pattern **408** directly machined out of the bottom panel, or base plate. The base plate can be directly connected to the separation system. The base plate can be milled differently for the needs of different separation systems.

[**0039**] In another embodiment, as shown in **FIG. 5**, the top panel **104**, bottom panel **108**, and four side panels **112** can be assembled to form the modular platform **100** configured in the shape of a rectangular box, with the four side panels having a greater length **504** than the top and bottom panel's length **508**. Although other geometric configurations are contemplated, a rectangular configuration of the modular platform can be advantageous over other configurations such as a hexagonal shape since most of the modules designed to be mounted within the modular platform have a rectangular footprint.

[**0040**] The orthogrid and attachment locations make it possible to attach components and wiring at a plurality of positions on the panels of the modular platform. In some instances, one or more decks **604** can be positioned within the modular platform **100** to secure components having a high mass or high cantilever configuration, as shown in **FIG. 6*a***. A high cantilever configuration can occur when an object, such as a beam, is connected to one or two sides. External movements of the modular platform can cause the beam to vibrate. Depending upon the beam's mass, stiffness, length, and other factors, the beam may resonate at its natural frequency, causing substantial vibrational energy to be produced within the modular platform. Such vibrational energy can structurally weaken the modular platform and interfere with the integrity and/or operation of components and modules within the modular platform.

[**0041**] The one or more decks **604** can be installed within the modular platform to minimize vibrations and allow components having a comparatively greater mass to be attached more securely. Each deck can also increase stiffness to the overall modular platform **100**. Each deck can be configured to be coupled to two or more orthogrid panels. The deck can be coupled to the orthogrid panel using connectors such as screws, bolts, rivets, or any other type of connector capable of securely mounting a deck to the attachment locations on the orthogrid panel. In one embodiment, the deck can be coupled to the two or more orthogrid panels using the attachment locations **220** (**FIG. 3**).

[**0042**] A deck can contain electrical wire or cables used to connect components on the deck to one or more intra-module connectors. The deck can be electrically connected to the platform via the intra-module connector. The decks can allow more components to be installed within the modular platform and increase surface area perpendicular to a launch axis. This can significantly reduce the strain of heavy components caused by the forces that can occur as the modular platform is launched from Earth into space.

[**0043**] For example, an exploded view of the modular platform **100** is shown in **FIG. 6*b***. In this example embodiment, two decks **604** are located within the platform. The decks can be coupled to the side panels **112** to reduce vibrations and increase the amount of surface area within the platform. The decks can be positioned between the top panel **104** and the bottom panel **108** in such a way that desired components can be attached to the decks between the top and bottom panels.

[0044] In one embodiment, each deck **604** can be comprised of an array of through-holes **704** to form an orthogrid deck, as shown in **FIG. 7**. Each through-hole can have substantially similar dimensions to the recessed areas **204** (**FIG. 2***a*) in the orthogrid in the panels. In other words, the orthogrid deck does not contain a skin, the orthogrid is machined through. The orthogrid deck can have a plurality of deck attachment locations **708** arrayed in a pattern similar to the panel attachment locations **220** (**FIG. 2***a*) in the orthogrid panels. The deck attachment location can be located at the corner of each through-hole. The deck attachment locations can be threaded or have a helicoil attached to enable substantially similar thread size as the mounting holes **224** of **FIG. 2***d* to enable similar connectors to be used in the orthogrid decks.

[0045] Similar to the panels, one or more decks can also be used to enable simpler testing of components and modules. The components and modules may need to be placed near each other for testing purposes. Also, components and modules (not shown) can be connected to one or more decks **604** while they are external to the modular platform **100** (**FIG. 1**) to form a deck sub-system. The deck sub-system can then be placed through a variety of testing. Testing may include electrical tests, functional tests, and environmental tests, including vibrational tests, and thermal tests. Deck sub-systems can be tested individually before being placed in the modular platform. If a deck sub-system fails a test, an individual deck can be re-tested without causing other sub-systems, modules, or components within the modular platform to be re-tested. Placing components on deck sub-systems can increase the speed of testing by allowing different sub-systems to be tested in parallel. Thermal, electrical, and vibrational wear on the modular platform system can be reduced by testing each deck sub-system independently. Once each deck sub-system is known to be functioning properly, they can be installed in the modular platform and tested with the rest of the system.

[0046] Several different configurations are possible for the modular platform. One embodiment can comprise a light internal component configuration **800** of the modular system, as shown in **FIG. 8**. This can be a simple configuration in terms of packaging and manufacturing. Components **304** and modules can be mounted on an interior side of a panel, typically a side panel **112**. A computing system comprising a common electronic enclosure box **804** can be connected to the bottom panel **108**. The wiring from the components and modules on each of the side panels can be connected to the common electronic enclosure box through the intra-module connector **320** (**FIG. 3**) located on each side panel **112**.

[0047] Solar panels **808**, patch antennae, or other substantially flat accessories can be body mounted to the external side of the panels. Body mounting can reduce complexity by eliminating the need for deployable panels or hinges. The solar panels, patch antennae, and/or other accessories can be connected to the internal wiring by creating through-holes in one or more of the panels. Vented and self-locking fasteners can be used to attach external devices to the panels. The panel can be configured to have an attachment area outside the orthogrid. The attachment area can have a thickness greater than the recessed area. This can enable the attachment area to be used to attach non-standard devices to the modular platform system. Larger through-holes can be machined in a recessed area **204** (**FIG. 2***a*) and substantially transparent windows formed of plastic or glass can be placed over the through-hole to cover the through-hole and allow optical sensors, cameras, or other instruments to be located within the modular system. The glass may be formed using silica, alumina (i.e. transparent aluminum), or any other element capable of forming a substantially transparent medium to form window(s) within a top, bottom, or side panel. A deck **700** can be attached to two, three or more side panels **112** to add increased stiffness to the internal light configuration.

[0048] Another embodiment can include a heavy internal component configuration **900** of the modular platform system, as shown in **FIG. 9**. As the panel-mounted configuration has its limits in terms of mass and components with a high cantilever beam characteristic, the need to enlarge the surface area perpendicular to the main axis, or launch axis, can be accomplished by adding decking capability. As previously discussed, each deck **700** can be pre-assembled with components **304** and modules **308**, pre-harnessed, tested separately, and then integrated into the rest of the modular platform system, in this case the internal heavy configuration. An additional deck can be added to create further surface area on which components and modules can be added. As with the internal light configuration **800** (**FIG. 8**), solar panels **808**, patch antennae or other accessories can be body mounted directly to the external sides of the panels.

[0049] A further embodiment can comprise an externally deployable module configuration **1000**, as shown in **FIG. 10**. In this configuration, deployable modules, such as deployable solar cells **1004**, deployable antennae **1012**, or other appendages can be added. The deployable solar cells can be used to improve an orbit average power when greater electrical consumption is needed. Deployable antennae can be used to obtain greater gain and/or transmission power for sending and receiving high data rate signals. The deployable surfaces can comprise closed isogrid or thin honeycomb panels, each coupled with a hinge and release mechanism to a panel, such as a side panel **112**.

[0050] Each deployable module can first be assembled on its respective panel or module and pre-tested with all the components attached to the same module. Other external devices such as one or more patch antennae **1008** can be body mounted to an exterior side of a panel. Windows can be placed in one or more recessed area **204** (**FIG. 2***a*) to enable sensors, camera, or other instruments to be placed within the modular platform. The deployable surfaces can also be used to carry antennae or other objects. The angle of the deployable surfaces with respect to the side panels **112** can be optimized depending upon the needs of the device coupled to each deployable surface.

[0051] Constructing a small satellite using panels having an orthogrid pattern with a plurality of attachment locations can allow the satellite to be quickly designed and constructed. The orthogrid pattern enables a greater number of satellite components to be included within a required volume. In one embodiment, the attachment locations can reduce the types of connectors used to attach satellite components and decks to the modular platform system. This can further reduce the costs of construction and test. Use of individual panels and decks can enable panel sub-systems to be constructed and tested. The required time and money can be reduced by testing the sub-systems individually and then coupling them together to form the modular platform system.

[0052] It is to be understood that the above-referenced arrangements are only illustrative of the application for the principles of the present invention. Numerous modifications and alternative arrangements can be devised without departing from the spirit and scope of the present invention. While the present invention has been shown in the drawings and fully described above with particularity and detail in connection with what is presently deemed to be the most practical and preferred embodiment(s) of the invention, it will be apparent to those of ordinary skill in the art that numerous modifications can be made without departing from the principles and concepts of the invention as set forth herein.

1. A modular platform system for constructing satellites configured to carry small payloads into orbit, comprising:

a prefabricated module comprising a plurality of panels;

at least one panel of the plurality of panels having an orthogrid pattern located on an inner side, the orthogrid pattern comprising an array of orthogonal recessed areas surrounded by an orthogrid wall; and

at least one attachment location formed in the panel, wherein the attachment location is configured to facilitate the mounting of a satellite component to the at least one panel to form a panel sub-system.

2. The modular platform system of claim 1, further comprising a torquer coil integrated into one or more of the panels.

3. The modular platform system of claim 2, wherein the integrated torquer coil is carried by an integrated panel support.

4. The modular platform system of claim 2, wherein the integrated torquer coil is located in a first panel and a second panel, wherein the first and second panels are substantially orthogonal.

5. The modular platform system of claim 2, wherein the integrated torquer coil is located in a first panel, a second panel, and a third panel, wherein the first, second and third panels are substantially orthogonal.

6. The modular platform system of claim 1, wherein the at least one attachment location is formed in the orthogrid wall of the at least one panel.

7. The modular platform system of claim 1, wherein the at least one attachment location further comprises a bolt pattern placed near each corner of each recessed area.

8. The modular platform system of claim 1, further comprising a substantially uniform thread size for each of the at least one attachment locations.

9. The modular platform system of claim 1, wherein the satellite component is configured to be coupled to the at least one attachment locations.

10. The modular platform system of claim 1, wherein the satellite component is configured to be coupled to at least four attachment locations.

11. The modular platform system of claim 1, wherein a through-hole may be milled in at least a portion of the array of orthogonal recessed areas.

12. The modular platform system of claim 11, wherein the through-hole is configured to attach an external component.

13. The modular platform system of claim 11, wherein the through-hole is configured to be covered by a transparent material to allow an optical sensor to be placed within the modular platform system and receive information external to the modular platform system.

14. The modular platform system of claim 13, wherein the transparent material is selected from a group consisting of silica glass, alumina glass, and plastic.

15. The modular platform system of claim 1, further comprising a deck configured to be placed within the modular platform system in a direction orthogonal to a launch vector, the deck having an orthogrid pattern comprising an array of orthogonal through-holes.

16. The modular platform system of claim 15, wherein the deck includes at least one attachment location substantially similar to the attachment location formed in the at least one panel.

17. The modular platform system of claim 15, wherein the deck is configured to carry satellite components selected from the group consisting of an electrical component, a mechanical component, and a module.

18. The modular platform system of claim 17, wherein the deck is further configured to undergo testing while separate from the modular platform system, wherein the testing performed is selected from the group consisting of mechanical testing, electrical testing, environmental testing and functional testing.

19. The modular platform system of claim 15, wherein the deck is coupled to at least three panels of the modular platform system, with the deck configured to increase stiffness of the modular platform system.

20. The modular platform system of claim 1, further comprising at least two decks, each deck being coupled to at least three panels of the modular platform system, the decks being configured to carry a satellite component.

21. The modular platform system of claim 1, further comprising a standard threaded pattern for a harness attachment.

22. The modular platform system of claim 1, wherein the panel comprises an integrated backplane configured to carry a computing device.

23. The modular platform system of claim 1, wherein the panel is configured to connect to an external separation device.

24. The modular platform system of claim 22, wherein the panel comprises an integrated bolt pattern, and wherein the integrated backplane and the integrated bolt pattern are integrated on the same panel.

25. The modular platform system of claim 1, wherein the panel is configured to have an attachment area outside the orthogrid, the attachment area having a thickness greater than a thickness of each of the plurality of orthogonal recessed areas, wherein the attachment area can be used to attach non-standard devices to the modular platform system.

26. The modular platform system of claim 25, further comprising vented fasteners used to attach non-standard devices to the attachment area on the at least one panel of the modular platform system.

27. The modular platform system of claim 1, wherein the plurality of panels include six panels in the form of four side panels, a top panel, and a bottom panel.

28. The modular platform system of claim 27, wherein the modular platform system has a rectangular configuration comprised of the four side panels having a length greater than a length of the top and bottom panels.

29. The modular platform system of claim 1, further comprising at least one external component coupled to an external side of panel.

30. The modular platform system of claim 29, wherein the at least one external component includes external components selected from the group consisting of a solar panel, a patch antenna, an optical sensor, and an external appendage.

31. The modular platform system of claim 1, further comprising a deployable surface coupled to an external side of the at least one panel, the deployable surface configured to deploy an attached device away from the modular platform system once the system is in orbit.

32. The modular platform system of claim 31, wherein the deployable surface is configured to support at least one solar panel.

33. The modular platform system of claim 31, wherein the deployable surface is configured to support at least one antenna.

34. The modular platform system of claim 1, wherein the plurality of panels is configured to be coupled together to form a rectangular box.

35. A modular platform system for constructing satellites configured to carry small payloads into orbit, comprising:

a prefabricated module comprising six panels;

at least one of the panels having an orthogrid pattern located on an inner side, the orthogrid pattern comprising an array of orthogonal recessed areas surrounded by an orthogrid wall;

at least one attachment location formed in the orthogrid pattern; and

a torquer coil integrated into at least one of said six panels.

36. A method for constructing modular satellite panels configured to carry a payload into orbit using a modular platform system, the method comprising:

fabricating a plurality of panels to form a module;

forming an orthogrid pattern on an inner side of at least one panel, the orthogrid pattern comprising an array of orthogonal recessed areas surrounded by an orthogrid wall; and

forming at least one attachment location in at least one panel of the plurality of panels, the attachment location configured to facilitate the mounting of a satellite component to the panel to form a panel sub-system.

37. A method for constructing satellites configured to carry small payloads into orbit using a modular platform system, comprising:

fabricating a plurality of panels to form a module;

forming an orthogrid pattern on an inner side of at least one panel, the orthogrid pattern comprising an array of orthogonal recessed areas surrounded by an orthogrid wall;

forming at least one attachment location in at least one panel of the plurality of panels; and

mounting at least one satellite component to at least one of said six panels using the attachment location to form a panel sub-system.

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