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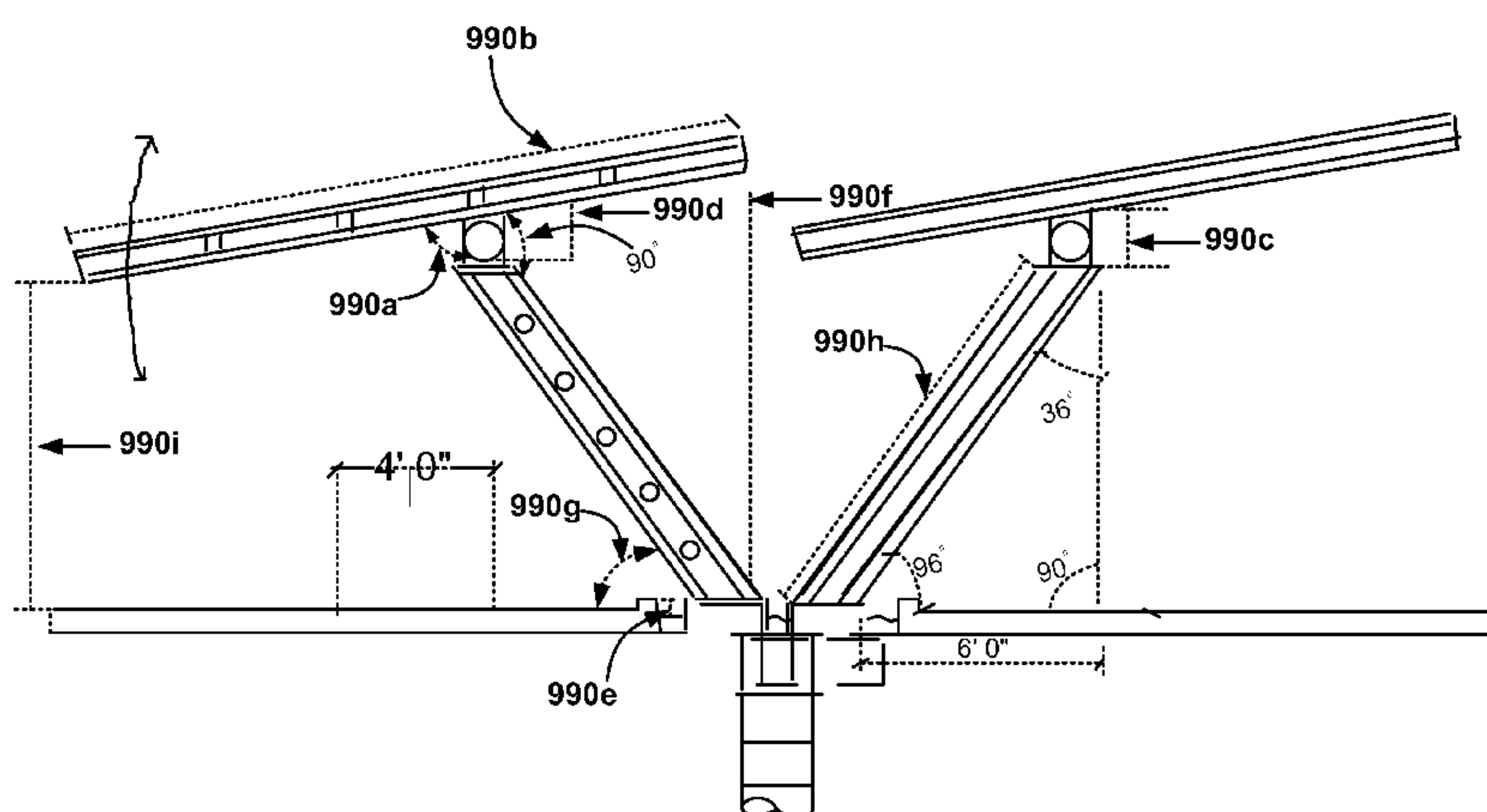
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(54) Title: COVERED PARKING STRUCTURE ADJUSTABLE SOLAR ENERGY COLLECTOR HOLDER AND PARKING
LOT THEREOF

Figure 9



(57) Abstract: A covered parking structure has a frame with first and second opposing surfaces. The surface has at least one solar energy collection panel therein. A device, removably connectable to the second opposing surface of the frame allows the frame to be adjusted in two or more axes relative to the vehicle parking lot. The structure also has a pedestal with first and second opposing ends. The first end of the pedestal is mountable in a surface of the vehicle parking lot at one end thereof, and in between, two adjacent vehicle spaces. The second end of the pedestal is mountable to the planar frame by the device for adjusting. The length of the pedestal makes an acute angle with the surface of the vehicle parking lot such that the pedestal does not interfere with the opening of doors of automobiles parked in the two adjacent vehicle spaces.

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COVERED PARKING STRUCTURE ADJUSTABLE SOLAR ENERGY COLLECTOR HOLDER AND PARKING LOT THEREOF

RELATED APPLICATIONS

5 This PCT Application claims the benefit of U.S. Provisional Application Serial No. 61/377,441, titled "Covered Parking Structure Adjustable Solar Energy Collector, Kit For Same, and Parking Lot Thereof," filed on August 26, 2010, which is incorporated herein by reference.

FIELD

10 The present application is related to solar energy, and is more particularly related to devices for collecting solar energy, and is most particularly related to a device for vehicle parking lot to hold a collector of solar energy.

BACKGROUND

15 Energy from the sun is a renewable energy source with no limitations on supply. Current tax and utility incentives fuel investment in the solar energy sector. Energy costs are the most expensive operational cost for many types of facilities. Utility rates are rising in the USA at seven to ten percent (7% - 10%) annually.

20 Devices that harvest solar energy are costly and, as low density energy collectors, take up a large foot print on an area of real estate. These devices, when mounted on buildings or other commercial or residential structures, cause structural problems (e.g., roof structural integrity problems).

25 Figure 1a shows a depiction of a prior art parking lot having a pair of parking spaces each covered by a holder for a solar energy collector. At reference numeral 100a, a vehicle is shown parked under one of two solar energy collectors used to cover a parking space. Each solar energy collector has a pedestal having opposing ends 102a, 104a. A holder for the solar energy collector is attached to the pedestal at 102a. The pedestal is connected to the parking lot surface at reference numeral 104a. As seen from prior art Figure 1A, a problem with the pedestal's design is that interference is caused by the position of the pedestal relative to the opening and closing of a door of a parked vehicle shown in one of the parking spaces.

30 Referring now to prior art Figure 1b, a parked vehicle is shown under a holder for a solar energy collector used to cover the parking spot of the parked vehicle. Reference numeral 100b shows two such solar energy collector holders for covering two parking spaces. A pedestal secures each holder for the solar energy collector, such as a solar panel. The pedestal in Figure 1b has opposing ends 102b, 104b. The holder for the solar energy collector, such as a solar panel, is attached to the pedestal at reference numeral 102b. Note that the periphery of the
35 holder for the solar energy collector is connected to the top end of the pedestal at reference

number 102b. The pedestal is connected to a surface of a parking lot at reference numeral 104b. A problem with the design shown at reference numeral 100b is that a large moment or torque develops between the pedestal and the holder, such as may be calculated by multiplying the force of wind on the holder by a distance between holder's attachment to the pedestal and the periphery
5 of the holder. As such, high wind conditions may threaten the integrity with which the pedestal secures the solar energy collector holder.

It would be an advantage in the prior art to solve the problem of a large torque to hold a solar energy collector above a parked parking lot surface, as well as provide such a parking lot cover to collect solar energy that does not interfere with the opening and closing of a car parked
10 underneath the solar energy collector, and would be robust in high wind conditions as to the integrity with which a solar energy collector holder shades a parking lot.

It would further be an advance in the relevant arts to harvest solar energy using devices that occupy a foot print of an area of commercial or residential real estate that does not cause structural problems, such roofing structural problems, while allowing automobiles to be parked
15 under such solar energy harvesting devices without interfering with the opening and closing of the doors thereof. It would further be an advantage to provide such devices with installation components such that, when the devices are installed, removed, and installed elsewhere, the devices will not be deemed, upon such installation, to be fixtures of the real estate where the installation is made.

20 BRIEF DESCRIPTION OF THE DRAWINGS

Implementations discussed herein will become more apparent from the detailed description set forth below when taken in conjunction with the drawings, in which like elements bear like reference numerals.

Figures 1a-1b depict prior art parking lot coverings.

25 Figures 2a-2b show orthogonal views of an exemplary implementation of a pair of solar energy collectors installed over a surface of a parking lot;

Figures 3a through 3d show different perspective views of an exemplary implementation of a pedestal mounted solar energy collector holder;

Figures 3f and 3f are respective top and bottom planar views of a pedestal, solar energy
30 collector holder and parking lot subsurface pedestal assembly seen in Figures 3a through 3e, with Figure 3e showing a solar panel for the collection of solar energy being held by the holder;

Figures 4a and 4b show orthogonal elevational views of an exemplary implementation of a mounted pedestal and solar energy collector holder assembly;

Figure 5 shows a side elevational view of an exemplary implementation of two energy collecting parking space covering assemblies;

Figure 6 shows a partial exploded perspective view of parts of an exemplary implementation of a covered parking structure with an adjustable holder for an solar energy collector;

Figure 7a shows a partial elevational view of an exemplary implementation of a covered parking structure with an adjustable holder for a solar energy collector in a folded position thereof, where the folded position is for shipping and/or transportation to an installation site of a parking lot;

Figure 7b shows another partial view of the structure seen in Figure 7a in an unfolded position thereof for use during the collection of solar energy, with folded position thereof partially shown in lighter weight lines.

Figures 8c and 8d show orthogonal elevational partial views of an exemplary implementation of a device that permits a holder for a solar energy collector to pivot about a top of a pedestal, with Figures 8a and 8b showing, respectively, bottom and top views of a trunnion, mounted on top of the pedestal, where the trunnion facilitates, at least in part, the pivot capability of the holder relative to the pedestal.

Figure 9 depicts a side elevational view of an exemplary implementation of two pedestal and solar energy collector holder assemblies that provide shade for two (2) automobiles while collecting solar energy incident on a parking lot on which the assemblies are removably installed.

DETAILED DESCRIPTION

Various implementations, seen and visually explained herein, pertain to a removably installed covered parking structure having a pedestal mounted adjustable holder for a solar energy collector, and a parking lot having a plurality of the removably installed covered parking structures. Each covered parking structure can be build from a kit that is transported, in a folded position thereof, to a parking lot for assembly and removable installation thereof. The kit can contain substantially all parts for building the covered parking structure. When the kit is shipped to the parking lot, the covered parking structure can be in the folded position thereof so as to minimize the packaged size of the kit.

In one implementation, a covered parking structure for a vehicle parking lot includes a planar frame having first and second opposing surfaces. The first surface has one or more solar energy collection panels therein. A structure, such as a knuckle seen in Figures 8a-8d, can be removably connected to the second opposing surface of the planar frame. The knuckle, when

mounted upon a top end of a pedestal, is for adjusting the attitude or orientation of the first opposing surface of the planar frame in two of more axes (e.g.; up to 3 axes) relative to the top end of the pedestal. The pedestal, for example as seen in Figures 5 and 9, has first and second opposing ends. The first end is mountable in a surface of the vehicle parking lot as shown in
5 Figures 5 and 9. The second end is mountable to the knuckle. The pedestal and planar frame will preferably have an acute angle therebetween by adjusting the mounting position using the knuckle as shown in Figures 5 and 9. The pedestal will preferably be mounted on a surface of a vehicle parking lot in between and at one end of two vehicle parking spaces, as shown in Figures 2a-2b, 5 and 9, whereby the planar frame will preferably substantially shade the two vehicle
10 parking spaces, and such that the planar frame will not substantially interfere with sunlight incident on adjacent pedestal and planar frame assemblies that respectively shade other such pairs of vehicle parking spaces.

In one implementation, a vehicle parking lot has a plurality of striped parking spaces. Each pair of adjacent striped parking spaces includes one (1) covered parking structure as shown
15 in the Figures. The top of each covered parking structure has a solar energy collector that is substantially oriented, given the geographic location of the parking lot, so as to be tilted toward the path of the sun's exposure on the parking lot for the majority of the calendar year. This orientation can be further adjusted by a meteorological weighing factor for the climate of the geographic location of the parking lot with respect to the tilt thereof toward the path of the sun's
20 exposure on the parking lot for the majority of the calendar year. Stated otherwise, the top of each covered parking structure can be adjusted so that, for the most part, during the calendar year, the optimal amount of sun light is harvested, given likely cloudy conditions that occur during the calendar year. As such, the panel need not be adjusted during the calendar year.

Each covered parking structure, after harvesting sun light that is transduced into
25 electricity, will include an insulated conductor to transmit the harvested electricity away from the covered parking structure. The electricity so harvested and transmitted can be sold or used.

As electricity prices rise, tax and utility incentives make desirable implementations of the covered parking structure disclosed herein. The efficiency of the harvest can be improved due to the capability of each parking structure being able to facilitate different orientations of the solar
30 collection panel with respect to the path of the sun. Shade during the day is provided by the structures that take up otherwise un-utilized air space. Lights, provided on the underside of each parking structure, can light the parking lot during the night without also lighting the night sky so as to comply with dark skies ordinances.

Beside parking lots, other otherwise unutilized air spaces can be used to harvest solar energy using implementations of the disclosed pedestal and solar energy collector holder assemblies, where such unused air spaces are those over walk ways and truck docks.

The structure can shipped to a installation site in a kit that contains substantially all of the parts to build each structure. The kit can take advantage of the structure's modular design that makes the structure easy to ship, unfold, and removably install. The structure can be made with a standardized design that is prefabricated for quality and consistent performance, thus making the structure permit-ready as supported by drawings. Each kit can be fabricated off site so as to cut design and installation time.

A variety of electrical devices can be in communication with, and/or powered by the solar energy collected by, the parking structure, such as advertising displays, electric automobile chargers, light emitting diode (LED) lighting for night time, and parking meter collection devices such as for contact or contactless payment of parking charges with payment cards and/or cellular telephones.

In sum, a prefabricated parking cover structure that integrates solar collection or Photovoltaic (PV) panels can assembled from a kit that easily shipped to any location for easy and removable installation at a parking lot. An exemplary installation may have 100 such structures is a parking lot of 200 parking spaces.

Referring now to the Figures, Figure 2a shows two solar energy collectors installed over a surface of a parking lot. Each solar energy collector provides cover for two adjacent parking spaces. Each solar energy collector is oriented relative to the horizon by way of an adjustment mechanism provided where holder for the solar energy collector is attached to a top end of a pedestal. The opposing or bottom end of each pedestal is attached to the surface of the parking lot. The adjustment mechanism between the pedestal and the holder for the solar energy collector is adjustable with respect to the horizon so as to maximize exposure to the rising and setting sun as well as to prevent substantial interference of sun rays from adjacent solar panels. A solar panel is mounted on each solar energy collector holder. Each pedestal, by way of its installation mount, will preferably be rotatable about a 360 degree axis that is perpendicular to the parking lot. Also by way of its installation mount, each pedestal will preferably be removable, after installation, from the parking lot surface. As such, the pedestal and its solar energy collector holder will not be deemed a fixture of the real estate of the parking lot where the assembly has been installed. Advantageously, the removability of each such assembly, by way of the pedestal's installation mount, may be deemed to be a tax advantage in that solar

energy collection in the parking lot will not be deemed to be a capital improvement by way of the addition of a fixed asset or fixture to the real estate.

Figure 2a shows two such pedestals and corresponding solar energy collector holders in a view that depicts the front of four parked cars. Figure 2b shows a different view of the four parked cars from a 90 degree difference with respect to Figure 2a. As such, only two of the four parked cars are illustrated in Figure 2b. Figure 2b demonstrates that the pedestal for each solar energy collector holder is at an acute angle with respect to the surface of the parking lot and a normal line to the parking lot. The angular orientation, as shown in the embodiment depicted in Figure 2b, demonstrates that neither parked car has an interference with the pedestal when opening or closing the doors thereof. Moreover, the height of each pedestal may be designed to provide adequate clearance of the height of vehicles that accommodate drivers with ambulatory disabilities, so as to thereby be compliant with regulations providing for accessibility to drivers having different levels of ambulatory capability (e.g., a vehicle height typical a driver who is confined to a wheel chair). By way of example, the pedestal can be designed so as to be compliant with regulations consistent with the Americans With Disabilities Act (ADA) which, at present, requires a clearance 8 feet and two inches.

Figure 2a is a side elevational view of two solar energy collector holder and pedestal assemblies, each pedestal being mounted in a surface of a parking lot, each such pedestal providing, with its solar energy collector holder, coverage for two parked cars. Similar to Figure 2a, Figure 2b is a 90 degree variation view of Figure 2a, where Figure 2b is a side elevational view of Figure 2A from an orthogonal perspective.

Figures 3a through 3d show different perspective views, and Figures 3e-3f show different planar views, of a pedestal mounted solar energy collector holder, where the pedestal is mounted to the solar energy collector holder substantially inside the periphery thereof. An exemplary implementation of an attachment mechanism between the pedestal and the solar energy collector holder is such that the holder can make a 360 degree rotation with respect to an axis perpendicular to the surface of the parking lot. The attachment mechanism also facilitates the orientation of the holder with respect to the pedestal, such that any peripheral edge of the holder can be raised or lowered with respect to the surface of the parking lot so that the distance between any edge of the holder and the parking lot can be at a prescribed distance therebetween. Stated otherwise, the orientation of the holder with respect to the pedestal can be changed in each of the x, y and z axis from a normal to the parking lot surface.

Figure 3a shows a perspective elevational view of the pedestal with the solar energy collector holder mounted thereon, and shows, below the parking lot surface of the opposing end

of the pedestal, a mounting column embedded within the parking lot surface where the pedestal attaches to the parking lot surface. Figure 3b is a perspective from a different view of Figure 3a, and similarly shows an elevational perspective view. Figure 3c, like Figures 3a and 3b, is an elevational perspective view of the holder, pedestal and parking lot connection assembly with the column beneath the parking lot surface into which the pedestal is mounted. Figure 3d is an inverse, (upside down) perspective view of the pedestal holder and subsurface parking lot pedestal seen in Figures 3a through 3c. Figure 3e is a top planner view of the assembly seen in Figures 3a-3d and Figure 3f. Reference numeral 304 designates a solar panel mounted in the holder to which the pedestal is secured. Reference numeral 302 denotes a portion of the parking lot surface into which the opposing end of the pedestal is mounted within a subsurface column as shown in Figures 3a through 3d.

Figure 3f is a bottom planner view of the pedestal, holder and parking lot subsurface column assembly seen in Figures 3a-3e. Reference numeral 306 shows the subsurface column into which the pedestal 308 is mounted. Figure 302 depicts a portion of the parking lot surface into which the column for the pedestal mount is embedded. Figure 304 is the holder to which the opposite end of pedestal 308 is connected via an adjustable attachment. Each embodiment in Figures 3a through 3f depicts alternative views of a parking lot covering used to hold a solar energy collector such that shade is provided for two parked cars, where the pedestal is mounted to the parking lot surface approximately where the front of each car is located, where the cars are parked in contiguous, parallel parking spaces, and where the pedestal does not interfere with the opening or closing of the doors of either of the two contiguous parallel parked cars.

Figure 3a shows that holder 304 is secured to pedestal 306 by a top attachment device 310b, which is secured to a lower attachment device, 312a. Attachment device 310b allows each peripheral edge of holder 304 to move up and down with respect to the parking lot surface as indicated by opposing arrows 310A. Lower attachment device 312a allows holder 304 to be rotated about axis 312b as indicated by the circular path 312c.

Pedestal 306 is secured to parking lot surface 302 by attachment device 308a. Attachment device 308a is secured to an embedded column 308b within parking lot surface 302. Attachment device 308a allows pedestal 306 to be rotated about axis 308c in a circular path indicated by reference numeral 308d.

Attachment device 308a allows pedestal 308 to be removably attached to parking lot surface 302 in a relatively low effort installation and uninstallation procedure. By way of example, attachment device 308a can be secured to parking lot surface 302 by way of bolts and nuts, where the bolts are embedded within, and project above, parking lot surface 302 via column

308B and nuts are secured to a threaded portion at the upper end of those bolts, and wherein the bolts can be oriented in a circular pattern such that the bolts are received through a phalange that is secured to the bolt via nuts that are threaded onto the bolts. The attachments seen in Figure 3a, including attachment devices 310b, 312a, and 308a, can be any suitable attachment device (or
5 devices) that performs all or some of the functions as described above.

Figures 4a and 4b show orthogonal elevational views of a mounted pedestal and holder assembly. The pedestals have corresponding portions 410a, 410b and 412a, 412b. The holders have corresponding portions 414a, 414b and 414, 416. One of the holders is shown with reference numeral 240 which denotes an edge.

10 Figure 5 shows a side elevational view of two exemplary implementations of energy collecting parking space covering assemblies. Each parking space cover is embedded within parking lot surface 534. The apparatus by which each parking space covering is secured to parking lot surface 534 is seen at reference numerals 516, 518 and 530. Each parking spot cover is secured to parking lot surface 534 via a pedestal. Pedestal 536a is secured to a solar energy
15 collector holder 540a by attachment mechanism 538a. Attachment mechanism 538a allows holder 540a to rotate the periphery thereof in the direction seen by arc 508. Similarly, pedestal 536b is attached to holder 540a by attachment mechanism 538b. The approximate top of each pedestal 536a, 536b is seen by phantom line 506, which is approximately 8 feet 2 inches from parking lot surface 534 as seen by dimensional line 528. The top of pedestal 536b makes a 36
20 degree angle with respect to a normal link to the parking lot surface 534 as seen by arc 526. Arc 524 shows a 90 degree angle to a normal line, which is approximately 6 feet from the mounting of the pedestal to parking lot surface 534 as indicated by dimensional line 522. Arc 520 shows an approximate 56 degree angle that the pedestal 536b makes with respect to parking lot surface 534. When sunlight is incident on holder 504b, a vehicle 540 is shown parked underneath holder
25 540b to receive the shade thereof.

Similar attachment devices as described for solar energy collector holder 540b are found with holder 540a on the left side of Figure 5.

Pedestals 536a, 536b can be I-beams or like structures which are sufficiently rigorous to withstand high winds, seismic incidences, and other severe natural and man made forces such
30 that the position of holders 540a, 540b are not moved without extreme forces. Moreover, pedestals 536a, 536b are preferably dimensioned and installed with respect to parking lot surface 534 such that there will be no interference between pedestals 536a, 536b and the respective door opening and closed positions of automobiles 532, 540. The geometries and proportions, such as

are seen in Figure 5, will preferably be sufficient for most automobile heights and sizes, while also being compliant with regulations providing for drivers having disabilities.

Figure 6 shows an exploded perspective view of parts of a holder for a solar energy collector and a solar energy collector. At reference numeral 600, a photovoltaic panel is seen at reference numeral 612. Reference numeral 614 shows a bolt, reference numeral 616 shows a 1/2 inch channel. Reference numeral 618 shows a 1/4 inch by 5 inch metal plate. Reference numeral 620 shows a 5/8 inch channel that is approximately 6 feet long. Reference numeral 622 shows an inverter used to form a portion of an electrical connection between the solar panel 612 and wiring attached thereto. Reference numeral 624 shows a 1/2 inch channel. Reference numeral 628 shows a pair of bolts. Reference numeral 630 shows a channel. Reference numeral 630 shows 1/4 by 8 inch metal fascia plate. Reference 632 shows a perforated metal plate. Reference 634 shows light emitting diode lighting, which is used to light the parking lot beneath solar panel 612. Reference numeral 610 shows a metal shell which may form a port of the pedestal to which the holder, seen at reference numeral 604, 602, is attached.

Figure 7a shows a partial view of a solar panel, holder for the solar panel, and pedestal in a folded position thereof, whereas Figure 7b shows a partial view in an unfolded position with the folded position seen in Figure 7a depicted by lighter weight lines. As shown, the holder for the solar panel can be folded for ease of movement to a parking lot where the assembly is to be installed.

Figures 8c and 8d show respective orthogonal elevational views of a device that permits a solar energy collector holder to pivot about a top of a pedestal, with Figures 8a and 8b showing, respectively, bottom and top views of a trunnion, mounted on the top of the pedestal, that facilitates, at least in part, the pivot capability of the holder relative to the pedestal.

Figure 9 depicts a side elevational view of two assemblies each having a pedestal and a holder. References numerals in Figure 9 are as follows:

An alpha angle 900a is the preferred most severe roof angle measured between the pedestal and the holder as tilted therebetween by a trunnion, which by way of example, can be about ten (10) degrees.

A length 900b is on the opposite side of the alpha angle 900a, and is the length from the center of the trunnion connection to edge of the holder, by way of example, ten point eight (10.8) feet.

A rise 900c is created by the alpha angle 900a, and is the distance risen as a result of the alpha angle 900a as shown in Figure 9, which is calculated as the sine of the alpha angle times

the length of the opposite the side of the alpha angle, or $900c = \sin(900a) * 900b$. By way of the example, 900c is approximately 1.88 feet by a calculation of $\sin(10 \text{ degrees}) * 10.8 \text{ feet}$.

A trunnion height 900d, as shown in Figure 9, is the height of the trunnion at the center point thereof, by way of example, one point five (1.5) feet.

5 An additional height 900e is shown in Figure 9 as being between the grade and the pedestal base, that is, the height that the pedestal is mounted above the grade which, by way of example, can be less than one (1) foot.

A pedestal height 900f, as shown in Figure 9, is a measure of a vertical height from a base plate upon which the pedestal is mounted to the top of the trunnion mounted to the top of the pedestal, which will preferably be a length that is calculated as $900f = (98/12) + 900c - 900d - 900e$. By way of the example, 900f is approximately 8.54 feet by a calculation of $(98/12) + 1.88 - 1.5 - 0$, which exceeds the current ADA requirement of 8.2 feet.

A pedestal angle 900g, shown in Figure 9, is taken relative to the grade, will preferably be between about 54 degrees to about 56 degrees.

15 A pedestal length 900h is the preferred minimum length of the pedestal, which will preferably be a length that is calculated as the pedestal height 900f divided by the sine of the pedestal angle 900g, which is represented as $900h = 900f / \sin(900g)$. By way of the example, 900h is approximately 10.3 feet by a calculation of $8.55 / \sin(56 \text{ degrees})$.

The height 900i is a measure of the grade to the lowest edge of the holder. Height 900i can vary based on installation location conditions, but will preferably be compliant with regulatory provisions, such as the Americans With Disability Act (ADA) requires a minimum height clearance of 8' 2".

As shown in Figure 9, each covered parking structure has a holder that has a substantially square periphery. The top of the pedestal is mounted to the holder approximately half way between two opposing sides of the square periphery as shown in Figures 2a and 4. The top of the pedestal is mounted to the holder approximately two thirds distance away from one of the other two opposing sides of the square periphery as shown in Figures 2b, 4, 5, and 9. The length of the pedestal, in combination with the mounting of the bottom of the pedestal between two adjacent parking spaces and the mounting of the top of the pedestal within the square periphery of the holder, as described above and shown in Figures 2a-2b, 4-5, and 9, allow the pedestal to avoid interference with the movement of outwardly swinging passenger and driver doors of automobiles that are parked in the two parking spots being shaded from incident sunlight by the covered parking structure. Moreover, high torque or moments are lessened in heightened wind

conditions by attachment of the pedestal to the holder considerably inside the periphery of the holder instead of at the periphery of the holder.

The covered parking structure seen in Figure 9 is seen with a first end of the pedestal being mounted to a surface of a vehicle parking lot, such as by removable fasteners that, with
5 their removal, allow the pedestal to be removed from the surface of the vehicle parking lot. These removable fasteners attach the pedestal to the surface of the vehicle parking lot in any of a plurality of positions such that the pedestal defines a substantially conical shape when swung in a continuous movement through the positions. The substantially conical shape has a bottom portion thereof that can corresponds to a circular mounting pattern in a mounting bracket that,
10 with the fasteners, secures the bottom of the pedestal to the surface of the vehicle parking lot. As such, the mounting bracket allows the pedestal to be mounted in different positions, whereby the top the pedestal can be pointing towards different areas of the vehicle parking lot.

The above description of the disclosed implementations is provided to enable any person of ordinary skill in the art to make or use the disclosure. Various modifications to these
15 implementations will be readily apparent to those of ordinary skill in the art, and the generic principles defined herein may be applied to other implementations without departing from the spirit or scope of the disclosure. Thus, the disclosure is not intended to be limited to the implementations shown herein but is to be accorded the widest scope consistent with the principles and novel features disclosed herein.

CLAIMS

What is claimed is:

1. A covered parking structure for a vehicle parking lot comprising:

5 a planar frame having first and second opposing surfaces, wherein the first surface has at least one solar energy collection panel therein;

means, removably connectable to the second opposing surface of the planar frame, for adjusting the first opposing surface of the planar frame in two or more axes relative to the vehicle parking lot; and

10 a pedestal having first and second opposing ends, wherein:

the first end of the pedestal being mountable in a surface of the vehicle parking lot at one end of, and in between, two adjacent vehicle spaces; and

the second end of the pedestal being mountable to the planar frame by the adjusting means; and

15 a length of the pedestal makes an acute angle with the surface of the vehicle parking lot such that the pedestal does not interfere with the opening of doors of automobiles parked in the two adjacent vehicle spaces.

2. The covered parking structure as defined in Claim 1, wherein the planar frame substantially provides shade from incident sunlight to the two adjacent vehicle spaces.

20 3. The covered parking structure as defined in Claim 1, wherein each of a plurality of peripheral edges on the planar frame is not less than about eight feet from the surface of the surface of the vehicle parking lot.

4. The covered parking structure as defined in Claim 1, wherein:
the planar frame has a substantially square periphery;

25 the second end of the pedestal is mounted to the planar frame:

approximately half way between two opposing sides of the square periphery; and

approximately two thirds distance away from one of the other two opposing sides.

5. A vehicle parking lot comprising a plurality of striped parking spaces, wherein each pair of adjacent said striped parking spaces:

30 corresponds to one of said two adjacent vehicle spaces; and

has the covered parking structure of Claim 1 mounted therein.

6. The parking lot as defined in Claim 5, wherein the first surface is substantially oriented, given the geographic location of the parking lot, so as to be tilted toward the path of the sun's exposure on the parking lot for the majority of the calendar year.

7. The parking lot as defined in Claim 6, wherein the orientation of the first surface is adjusted by a meteorological weighing factor for the climate of the geographic location of the parking lot with respect to the tilt thereof toward the path of the sun's exposure on the parking lot for the majority of the calendar year.

5 8. The parking lot as defined in Claim 5, wherein each said the covered parking structure further comprises means for transmitting away from the planar frame electricity being is harvested using the at least one solar energy collection panel.

9. The covered parking structure as defined in Claim 1, wherein the first end of the pedestal is mounted to the surface of the vehicle parking lot by removable fasteners that, with
10 their removal, allow the pedestal to be removed from the surface of the vehicle parking lot.

10. The covered parking structure as defined in Claim 9, wherein the removable fasteners attach the pedestal to the surface of the vehicle parking lot in any of a plurality of positions, whereby the pedestal defines a substantially conical shape when swung in a continuous movement through the positions.

15 11. The covered parking structure as defined in Claim 10, wherein the substantially conical shape has a bottom portion thereof that corresponds to a circular mounting pattern in a mounting bracket that, with the fasteners, secures the bottom of the pedestal to the surface of the vehicle parking lot.

12. A covered parking structure for a vehicle parking lot comprising:
20 a pedestal having first and second opposing ends;
a base mounting bracket installed on a parking surface in between and at one end of two contiguous parking spaces;

a holder for a planar solar collector, the holder having a substantially square periphery and both folded and unfolded positions thereof, wherein:

25 the folded position has opposing parallel inner surfaces; and
the unfolding position:

supports, on or near the inner surfaces, the planar solar collector for the collection of sun light; and

30 substantially shades the two contiguous parking spaces from incident sunlight;:

the first opposing end of the pedestal is removably attached to the base mounting bracket in any of a plurality of positions along a circular pattern about an axis perpendicular to the parking surface;

the second opposing end of the pedestal is removably attached to the holder by a device that permits the holder to pivot horizontally and vertically about the second opposing end of the pedestal;

the planar frame has a substantially square periphery;

5 the second end of the pedestal is mounted to the planar frame:

approximately half way between two opposing sides of the square periphery; and
approximately two thirds distance away from one of the other two opposing sides.

13. The covered parking structure as defined in Claim 12, wherein the holder substantially provides shade from incident sunlight to the two contiguous parking spaces.

10 14. The covered parking structure as defined in Claim 12, wherein each of a plurality of peripheral edges on the holder is not less than about eight feet from the surface of the surface of the vehicle parking lot.

15. A vehicle parking lot comprising:

a parking lot surface; and

15 a plurality of contiguous, striped, parallel parking space pairs each having a pedestal, a holder, and a base bracket removably attached to a surface of the parking lot in between and at one end of the pair of contiguous parking spaces wherein for each said pair of contiguous, striped, parallel parking spaces:

the pedestal has first and second opposing ends;

20 the first opposing end is removably attached to the base bracket;

the holder is removably attached to the second opposing end of the pedestal by a fixture permitting the holder to pivot in multiple axes about a contact point between the holder and the second opposing end;

the holder has folded and unfolded positions thereof;

25 the folded position has opposing parallel, proximal inner surfaces;

the unfolding position supports, on or near the inner surface thereof, a solar energy collector for the collection of sun light;

the unfolded position receives the solar energy collector;

the folded position is accomplished by removal of the solar energy collector;

30 the holder has a substantially square periphery;

the pedestal, wherein swept through a plurality of positions about an axis perpendicular that the pedestal is mountable to the base bracket, the pedestal defines a conical shape;

the solar energy collector in the holder has a lower surface area substantially the same as that of the surface of the pair of contiguous, striped, parallel parking space; and the second end of the pedestal is mounted to the planar frame:

approximately half way between two opposing sides of the square periphery; and

approximately two thirds distance away from one of the other two opposing sides.

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10
16. The vehicle parking lot as defined in Claim 15, wherein a top surface of the holder substantially oriented, given the geographic location of the vehicle parking lot, so as to be tilted toward the path of the sun's exposure on the parking lot for the majority of the calendar year.

17. The vehicle parking lot as defined in Claim 16, wherein the orientation of the top surface is adjusted by a meteorological weighing factor for the climate of the geographic location of the vehicle parking lot with respect to the tilt thereof toward the path of the sun's exposure on
15 the parking lot for the majority of the calendar year.

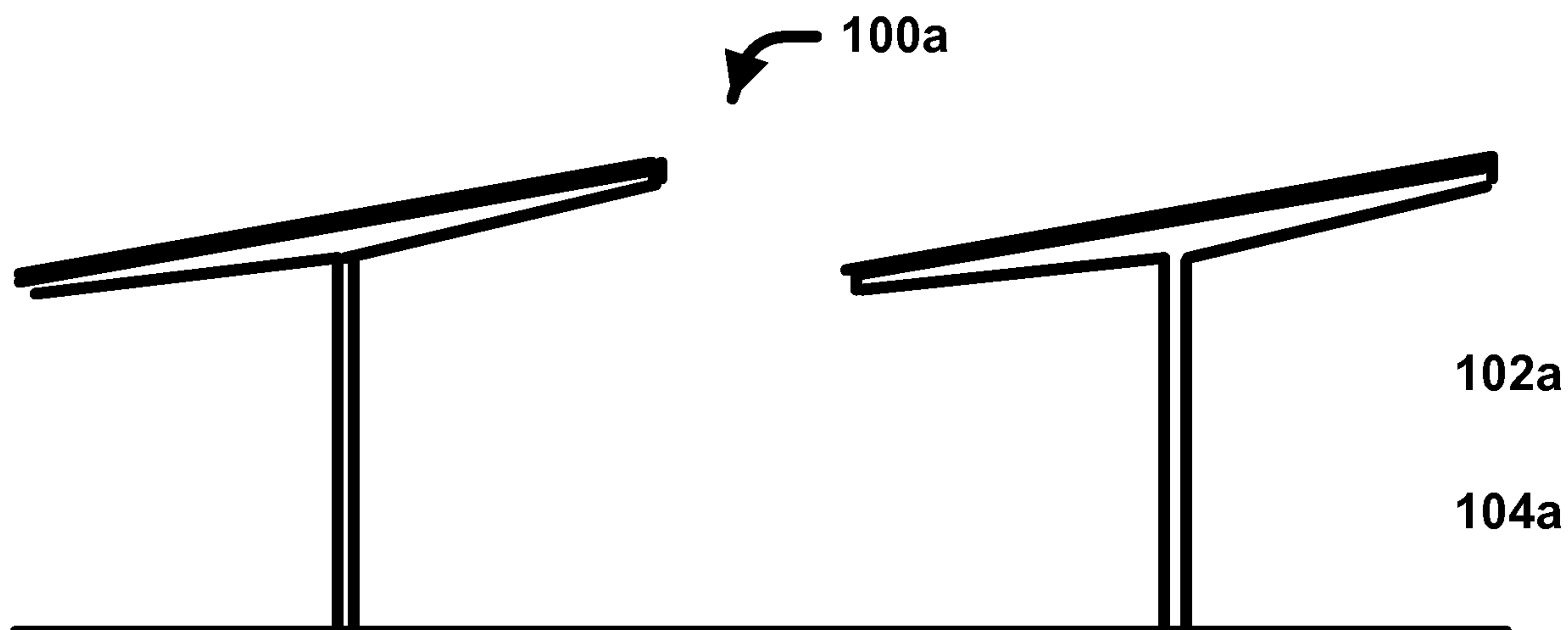


Figure 1a
Prior Art

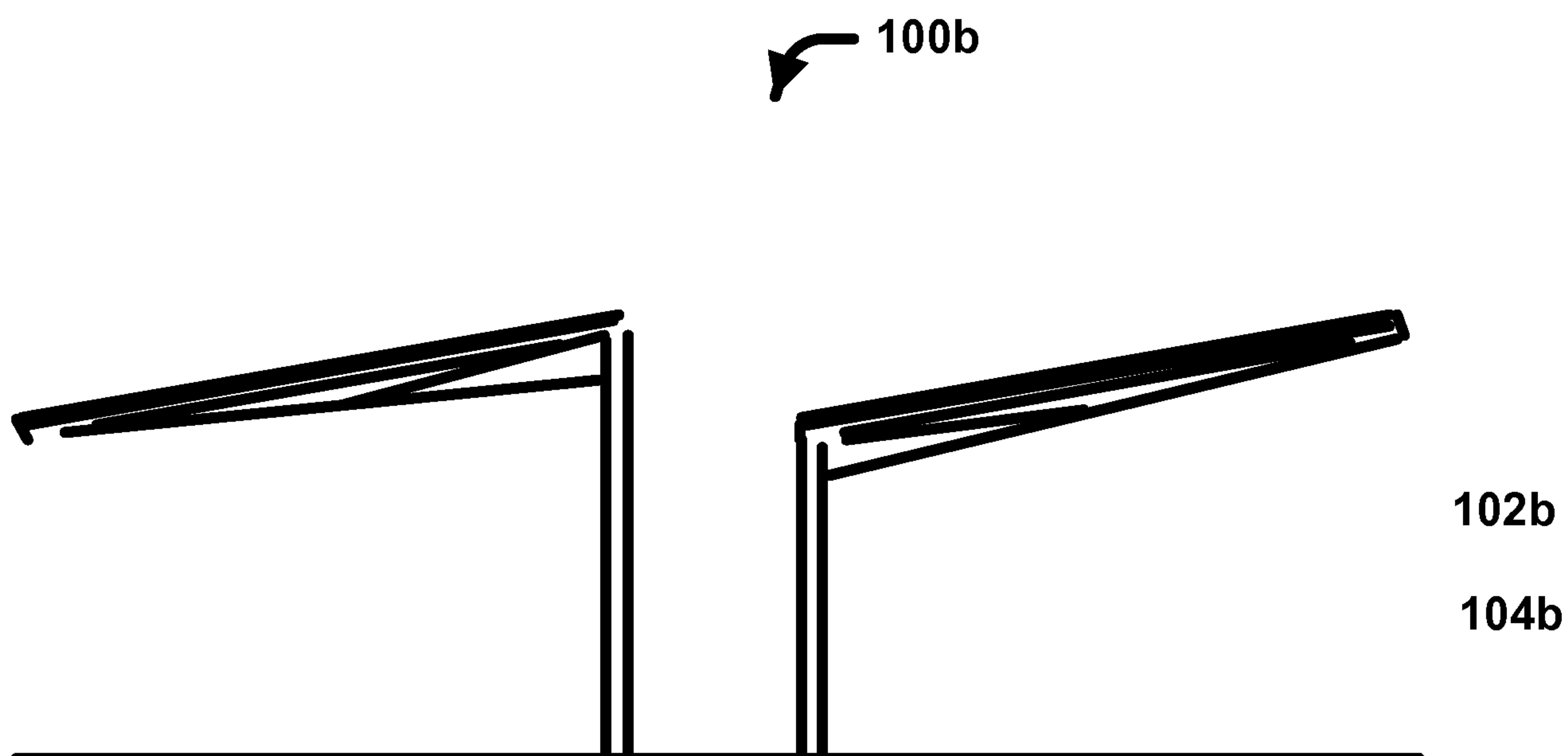


Figure 1b
Prior Art

Figure 2a

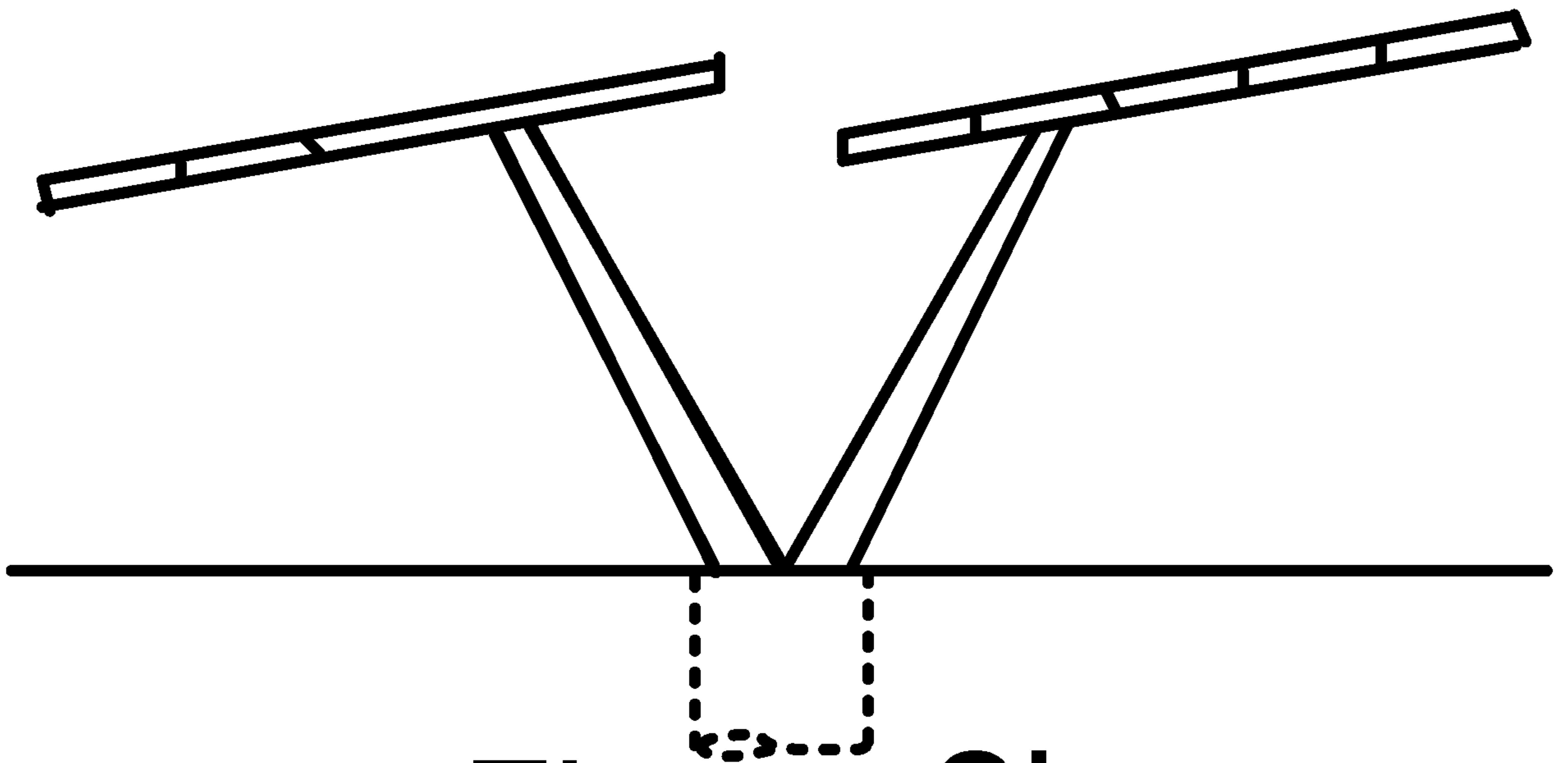
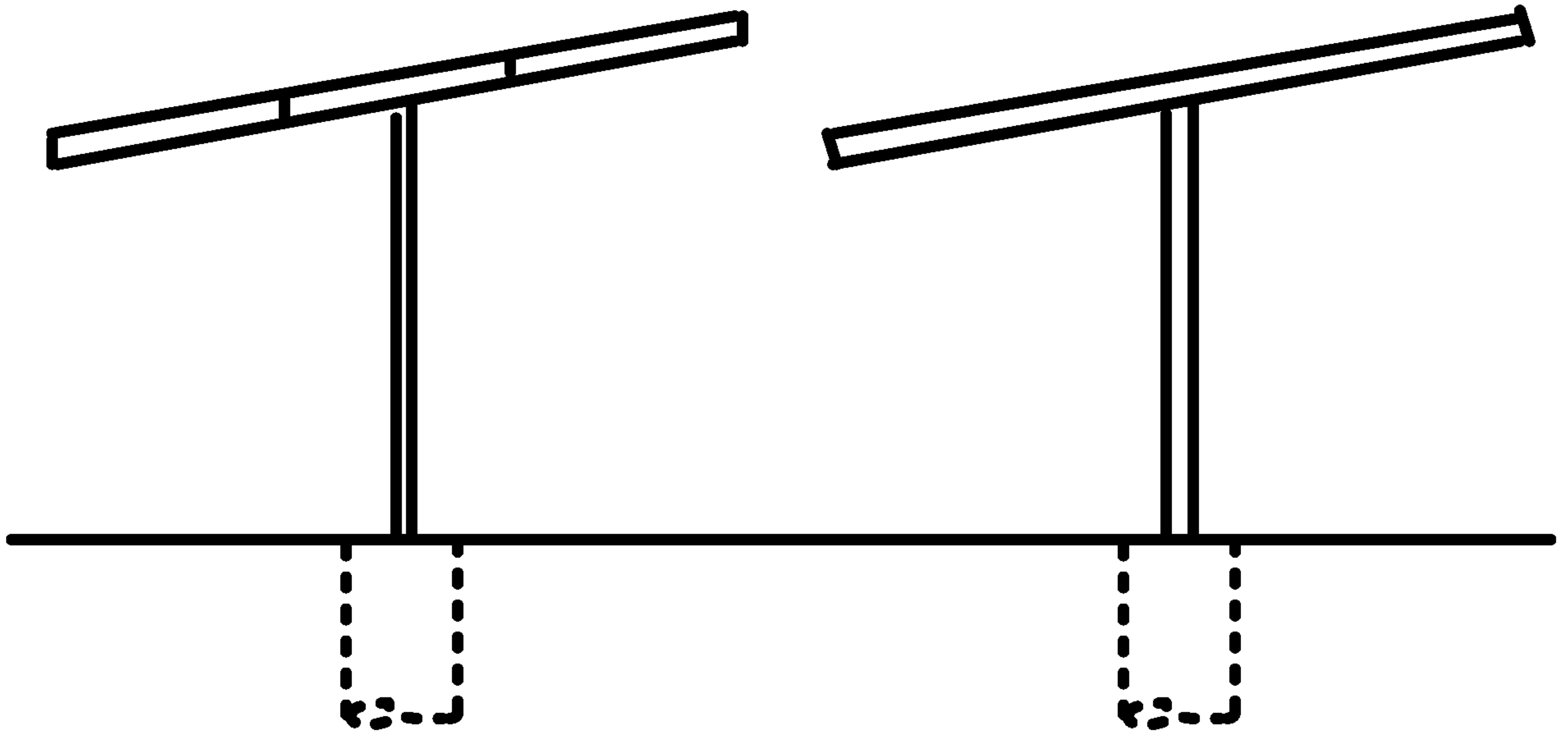


Figure 2b

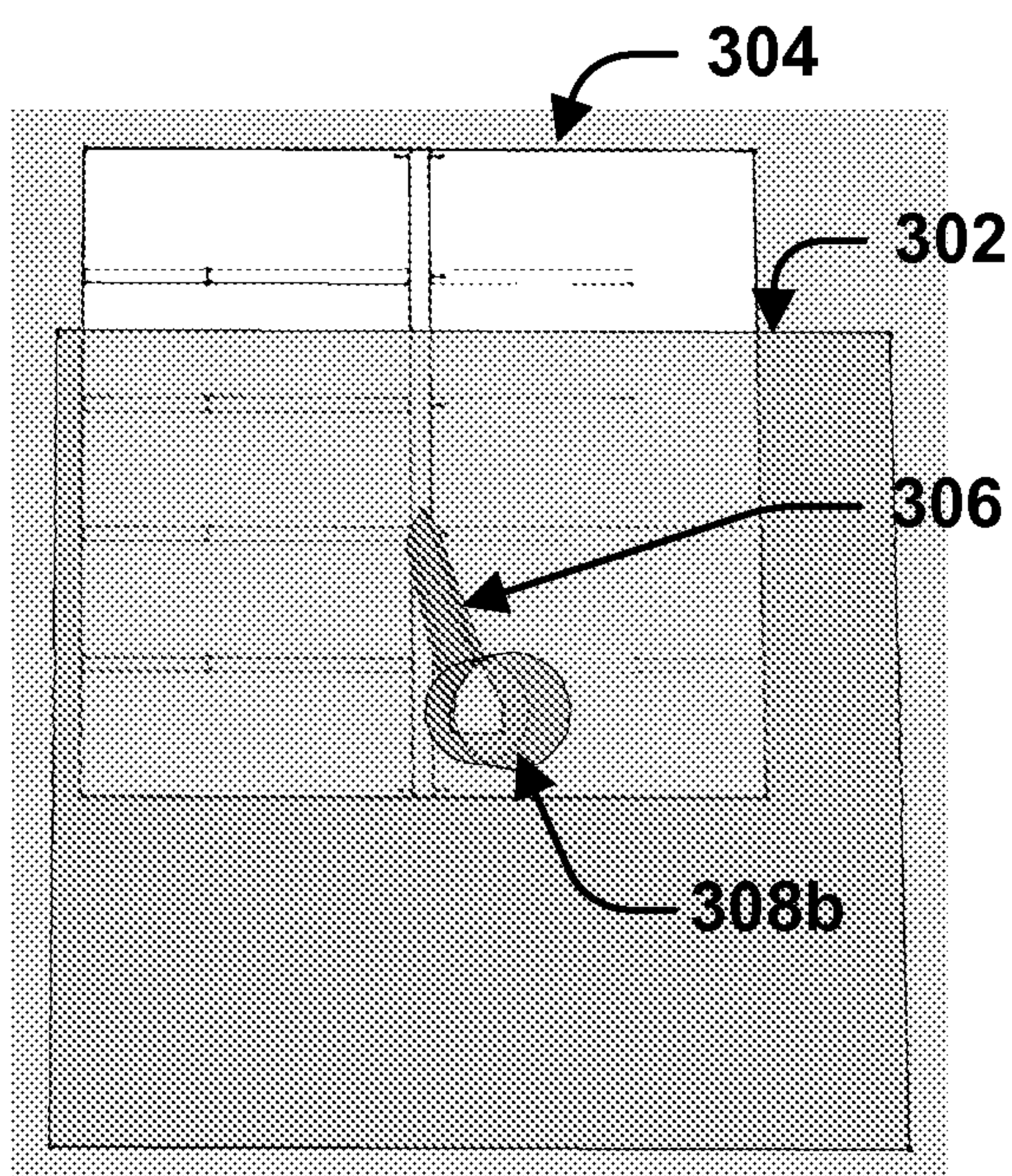
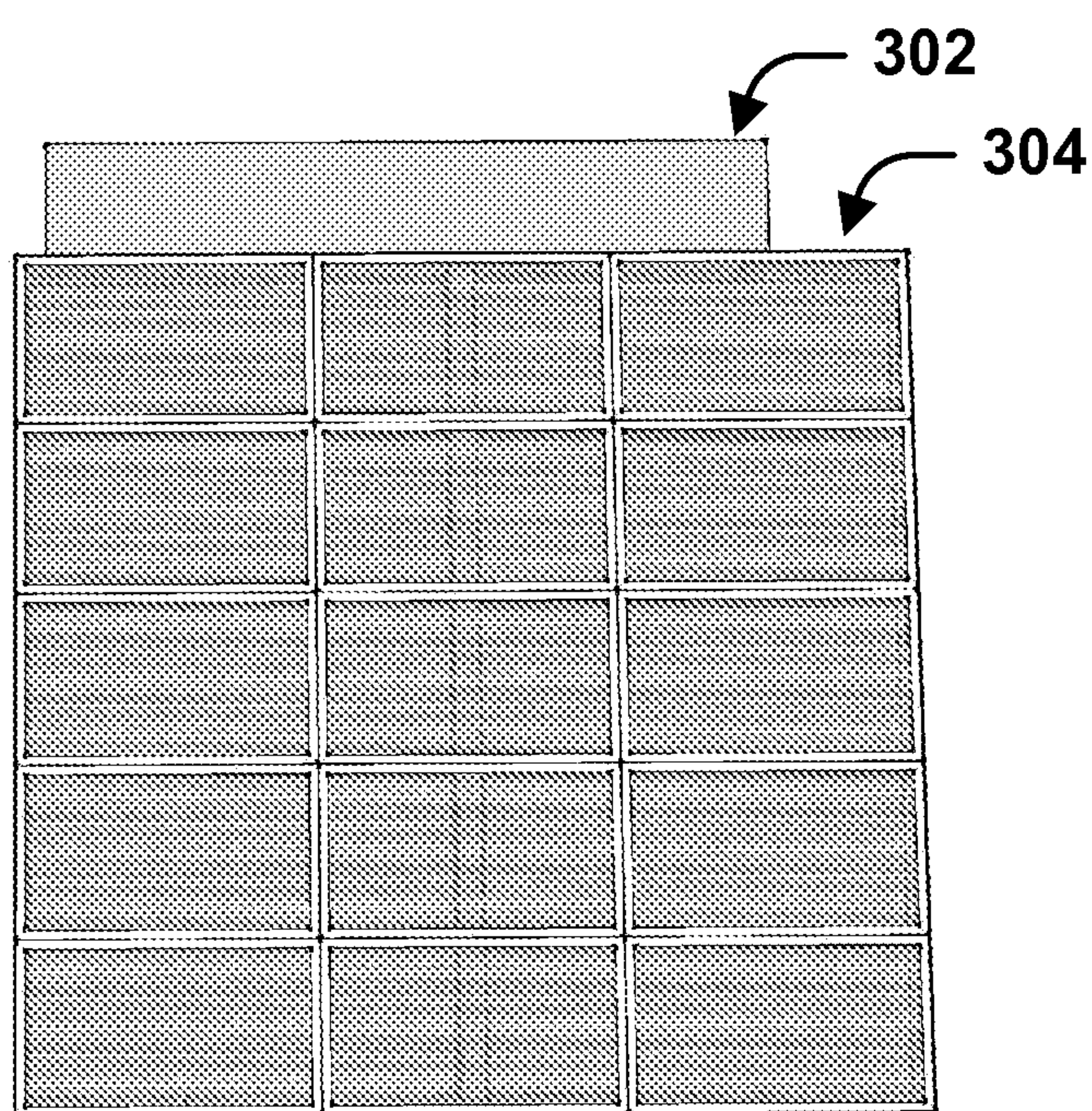
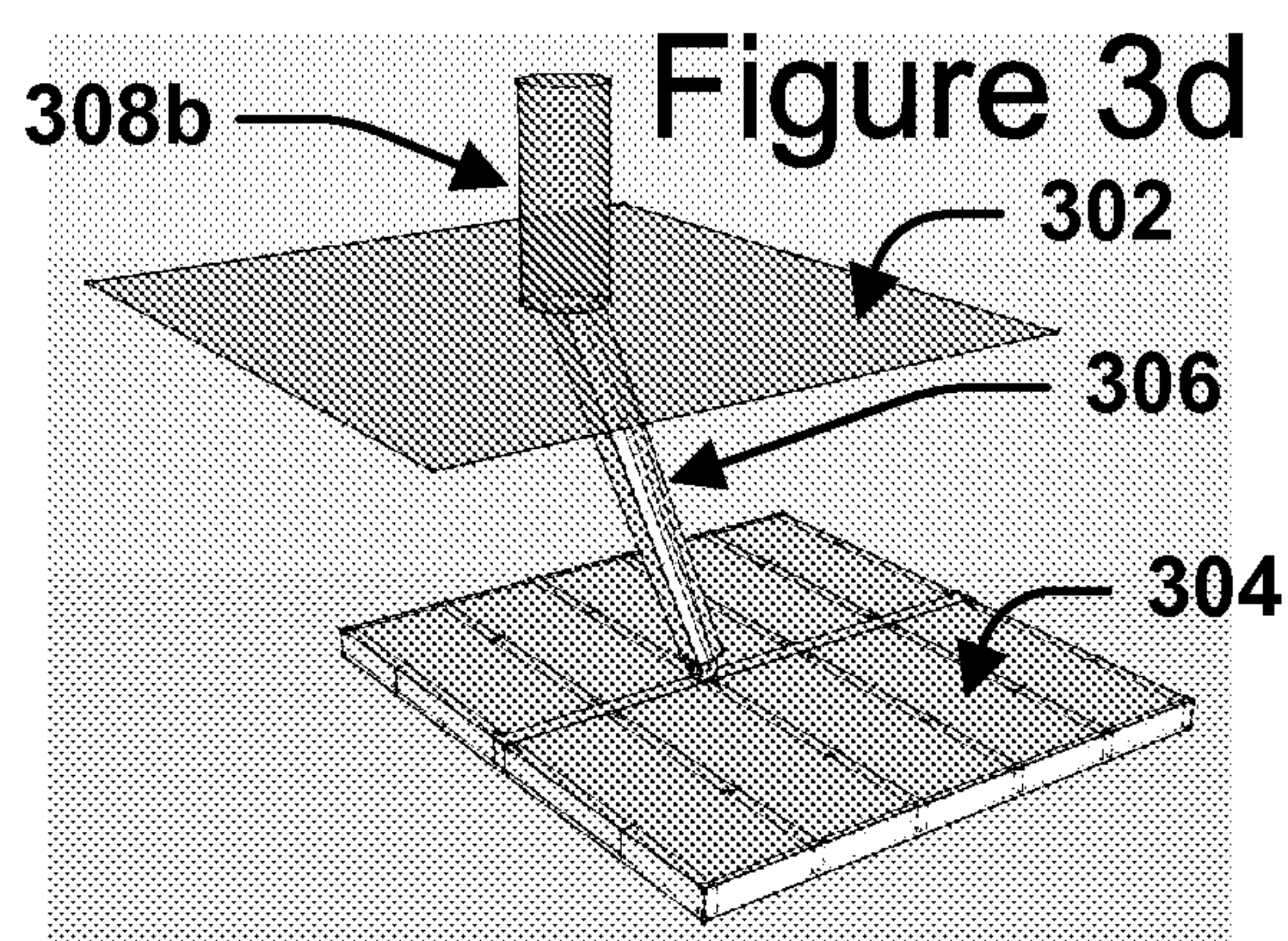
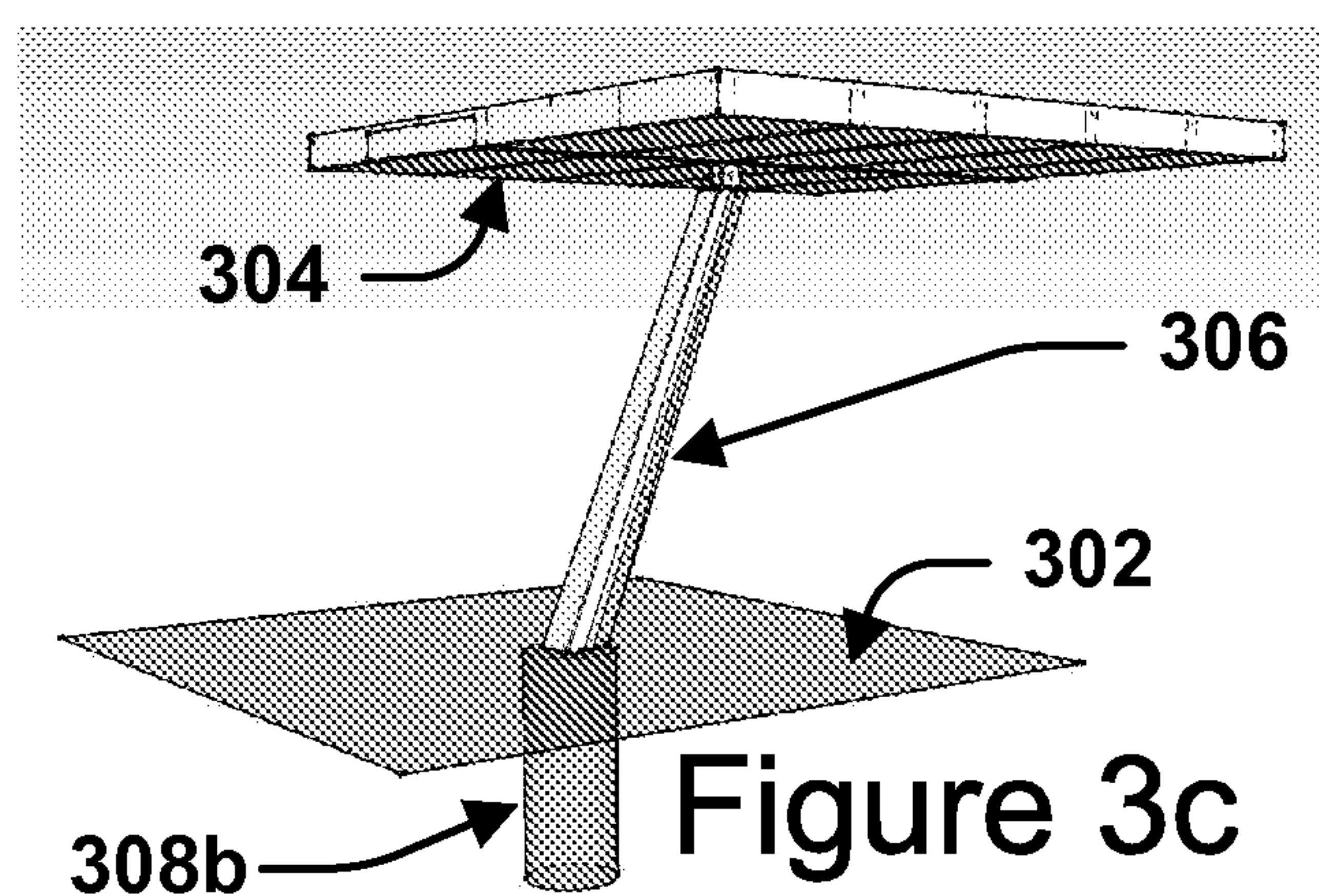
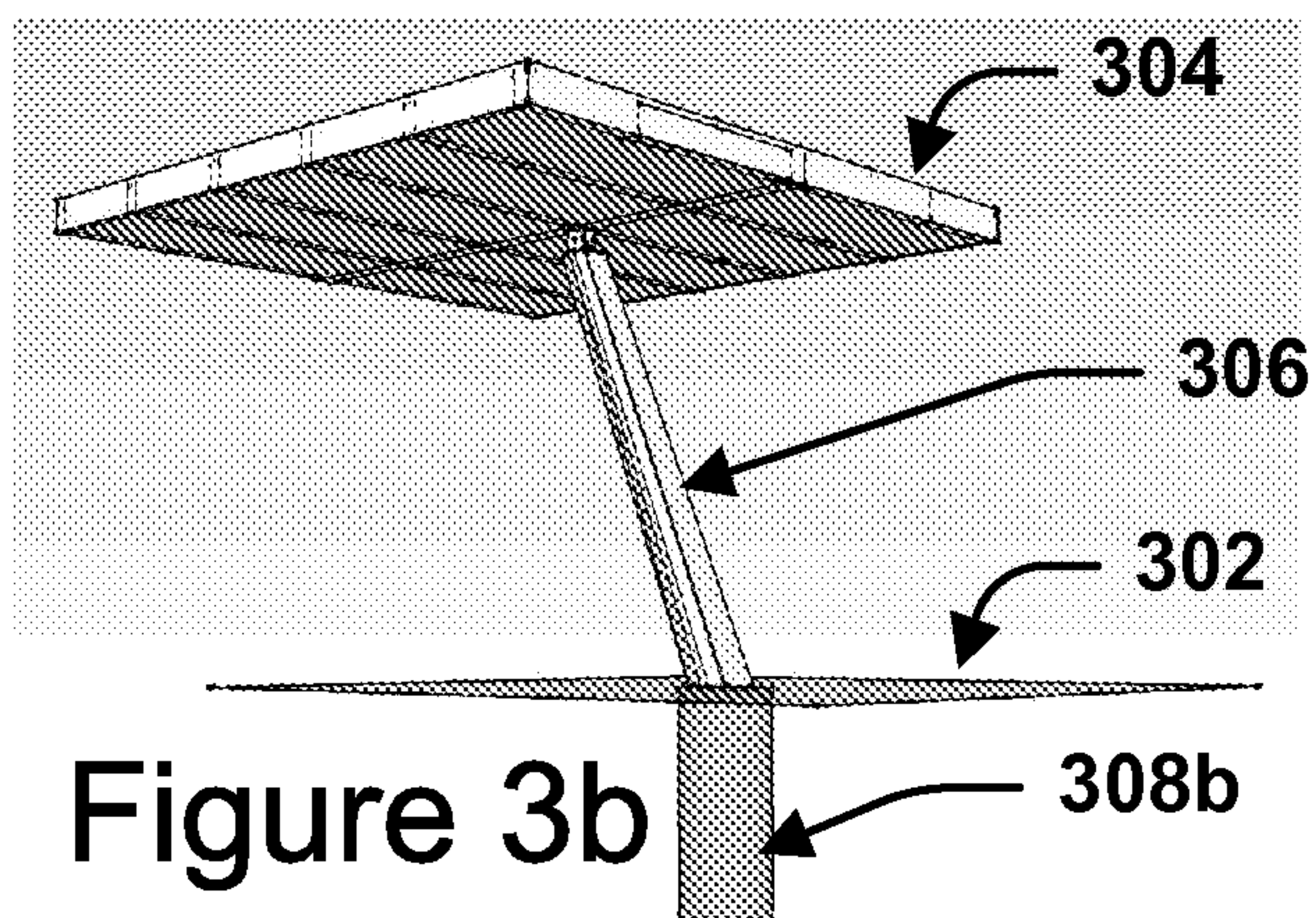
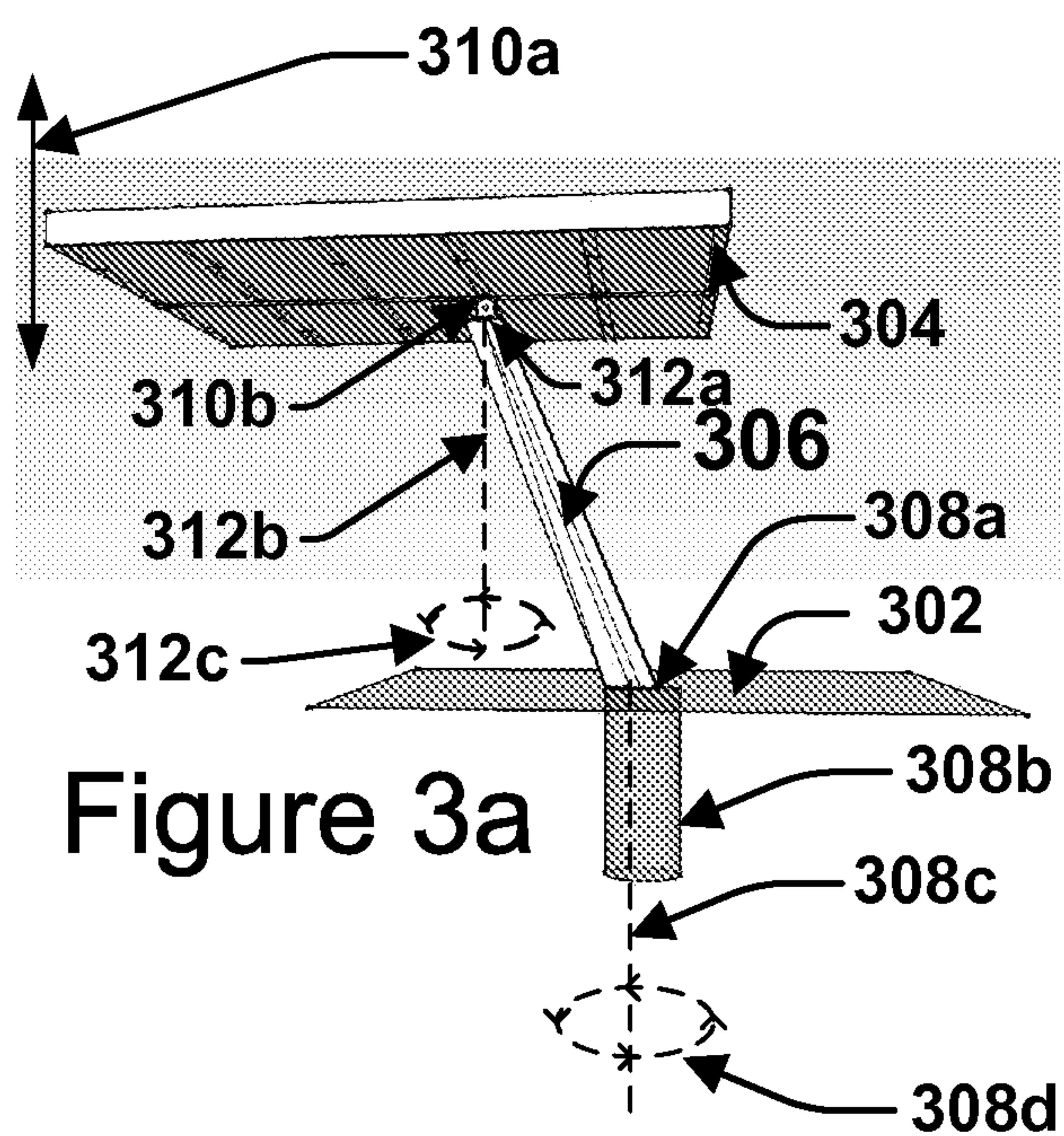
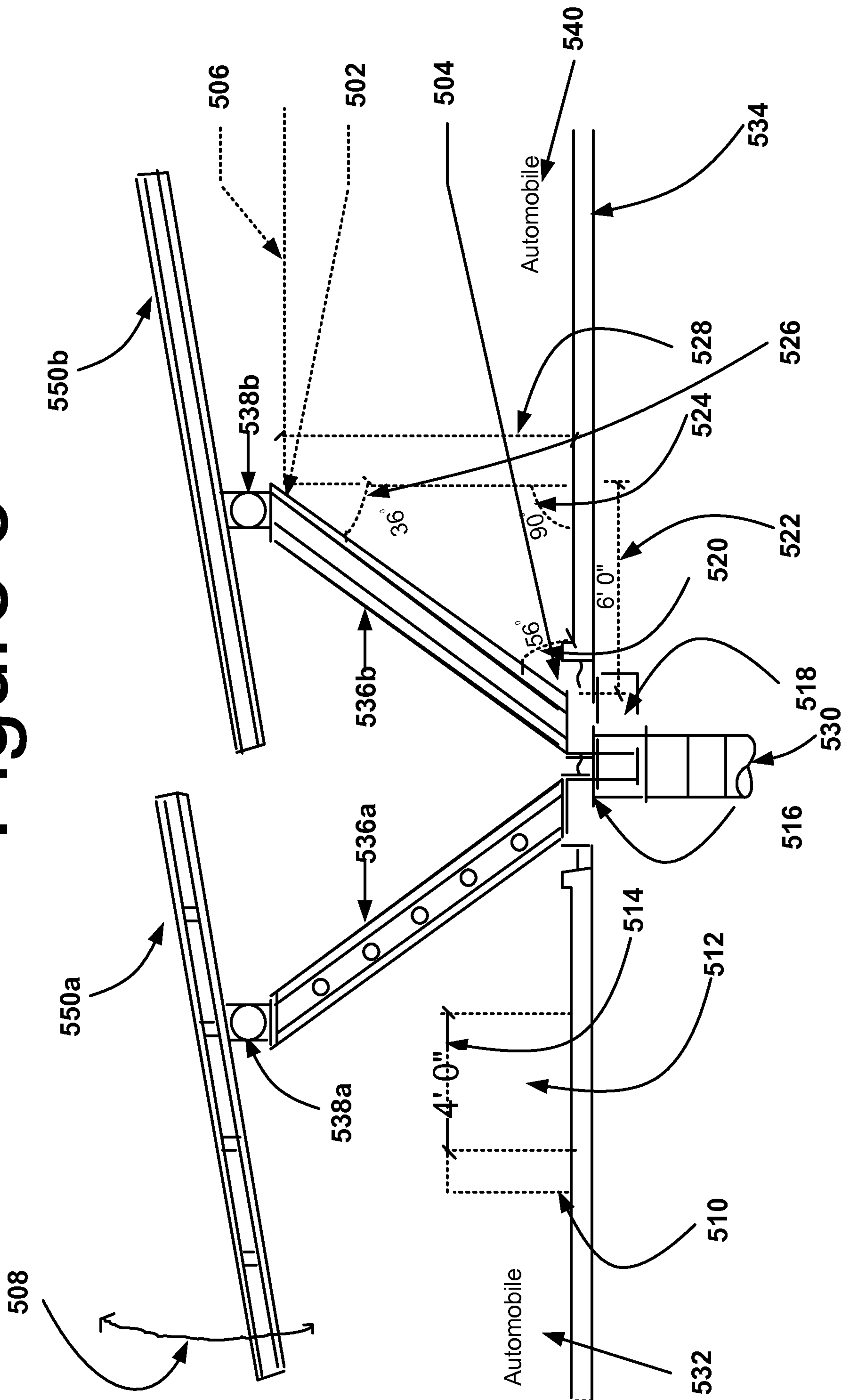


Figure 5



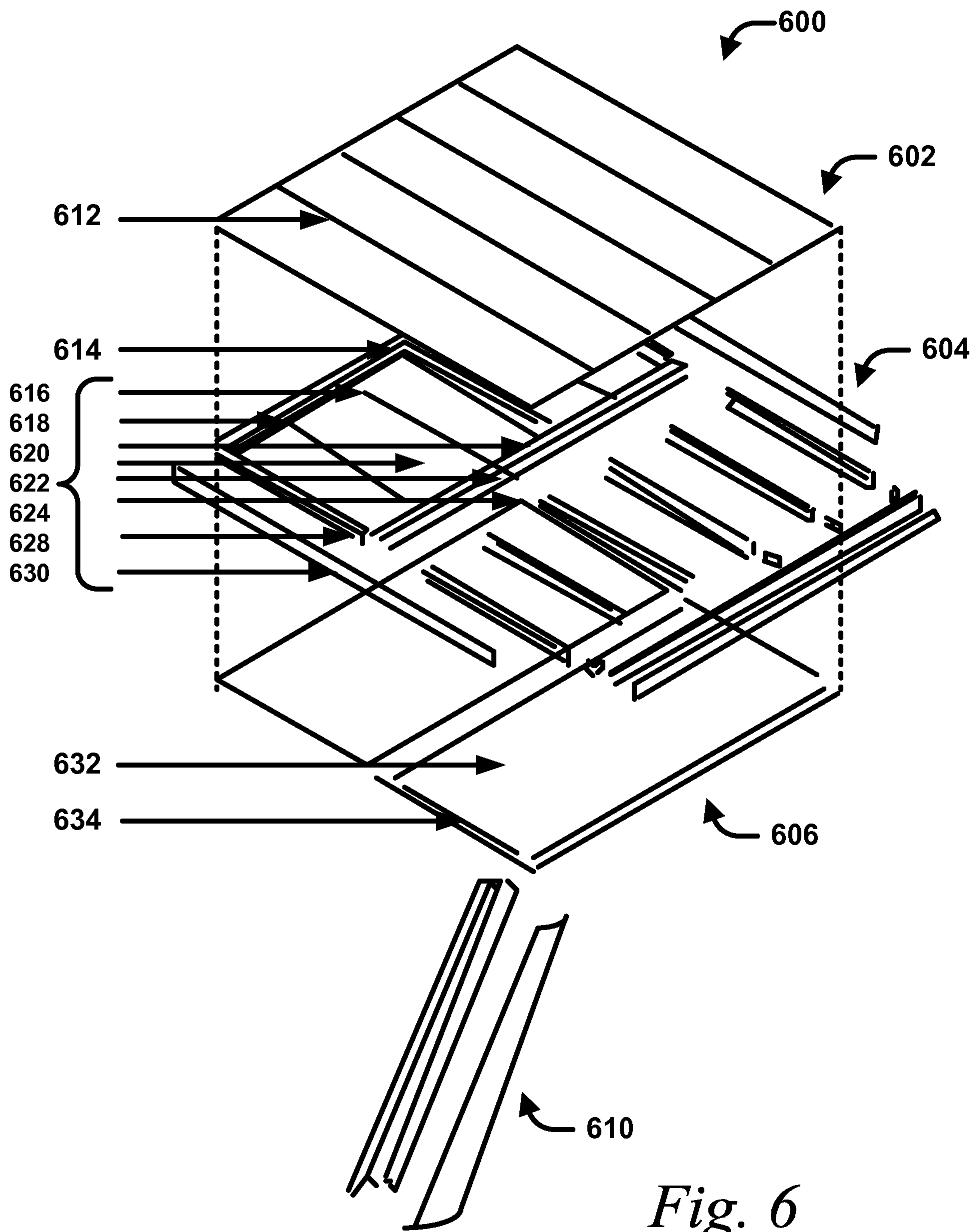


Figure 6

Figure 7a

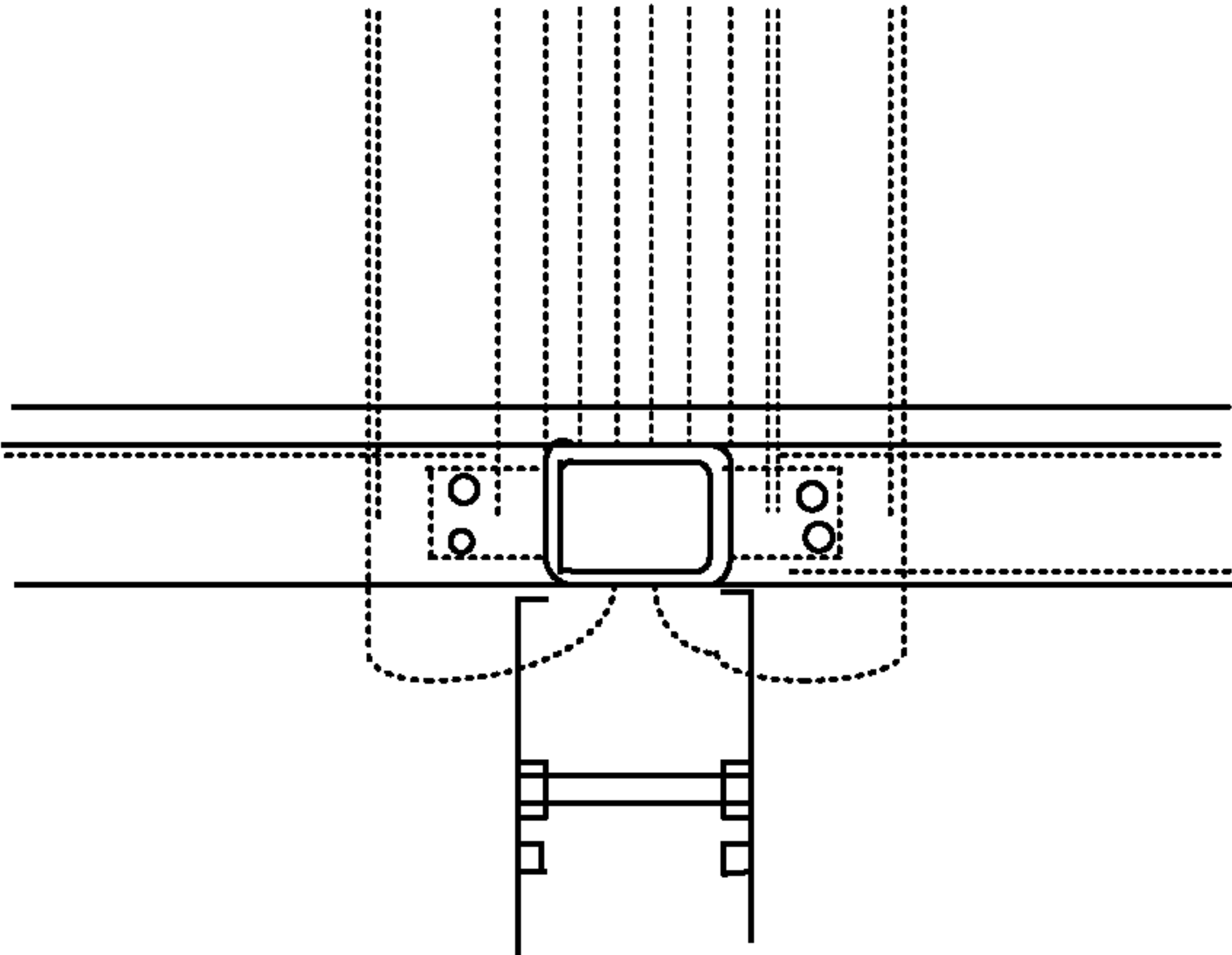
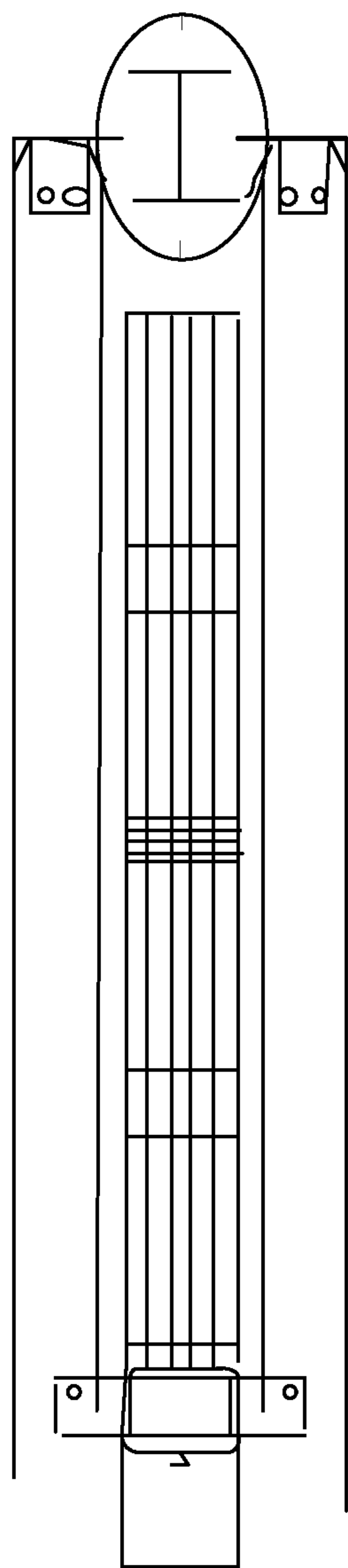


Figure 7b

Figure 8a

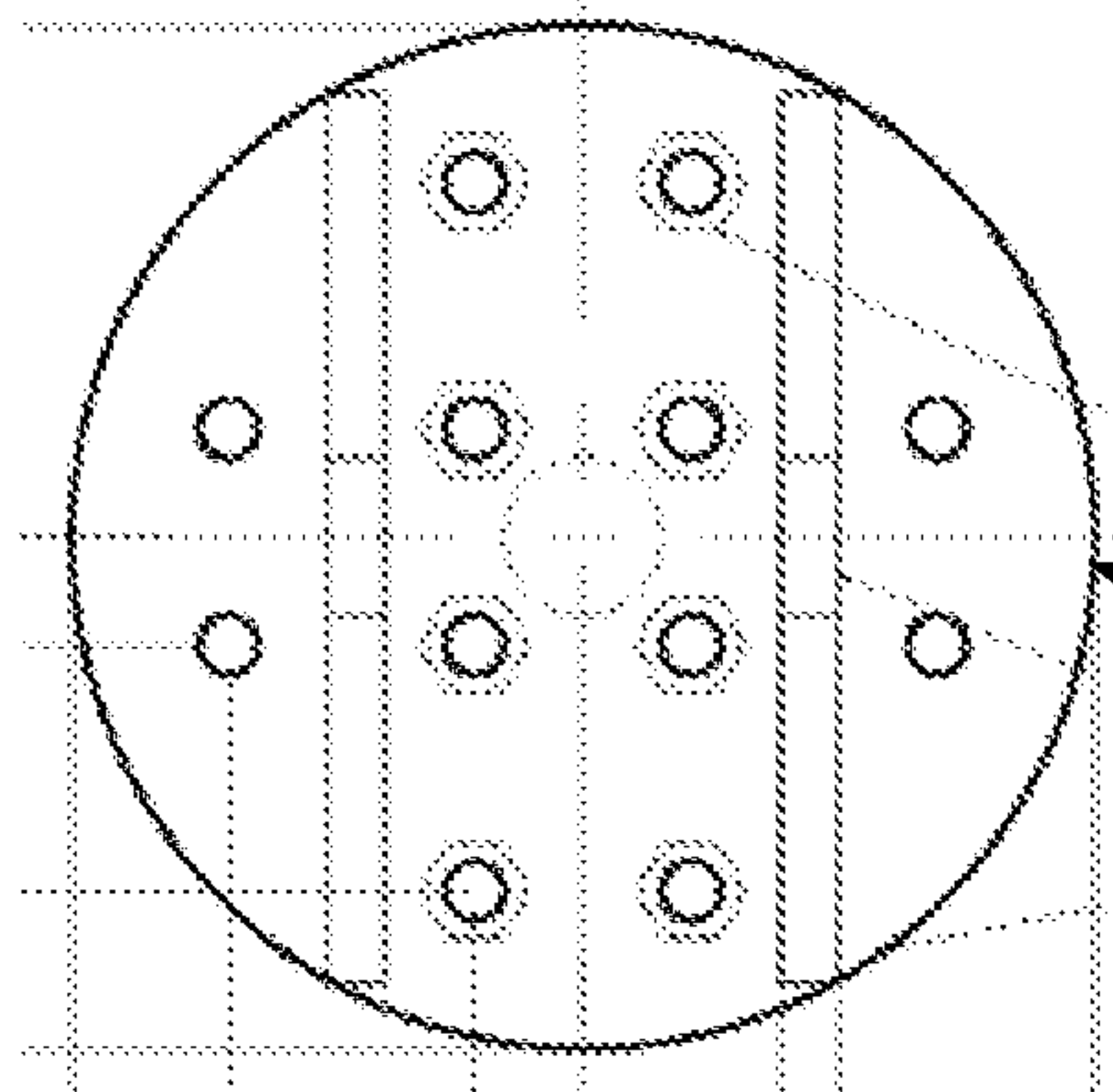


Figure 8b

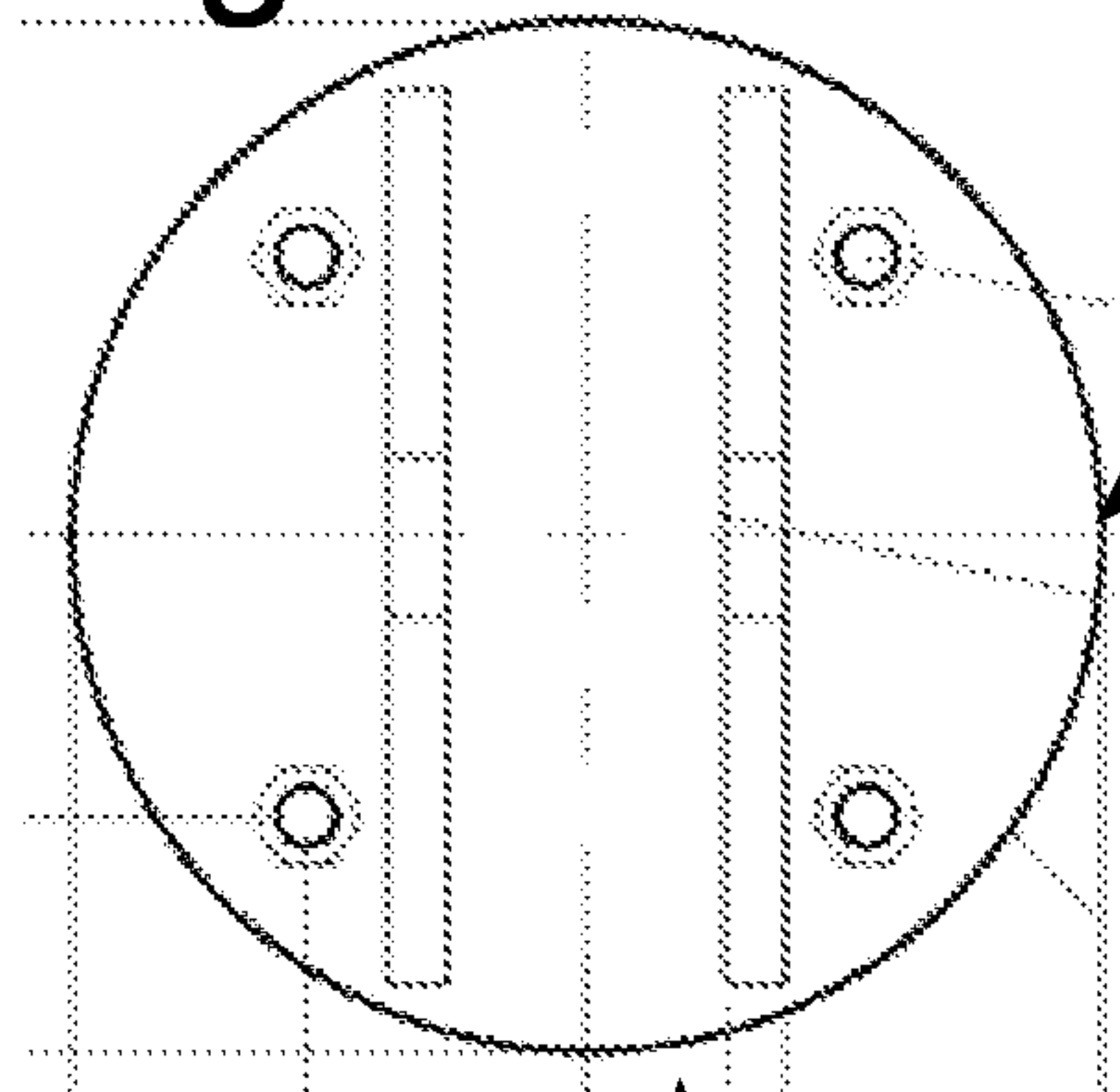


Figure 8c

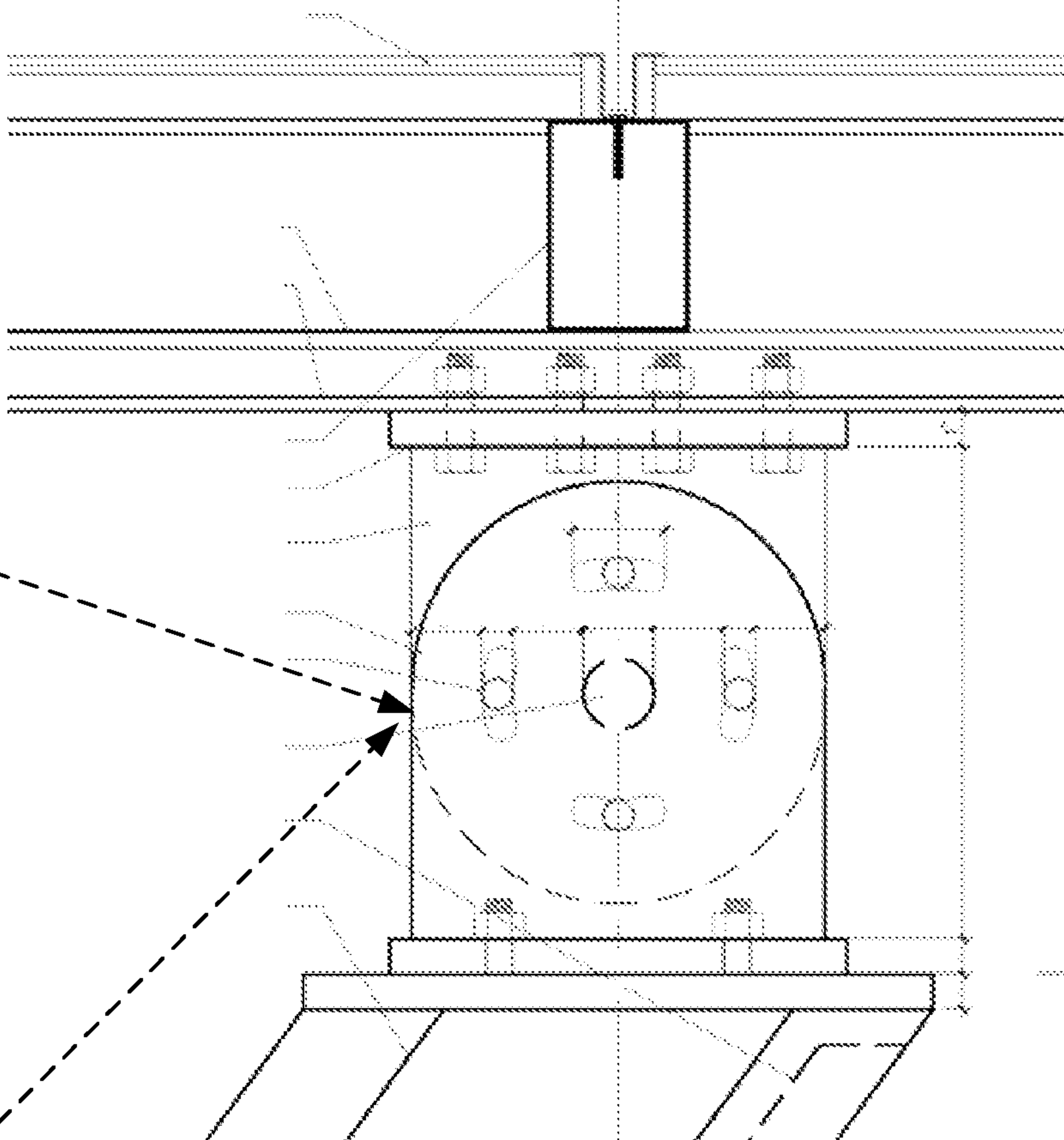


Figure 8d

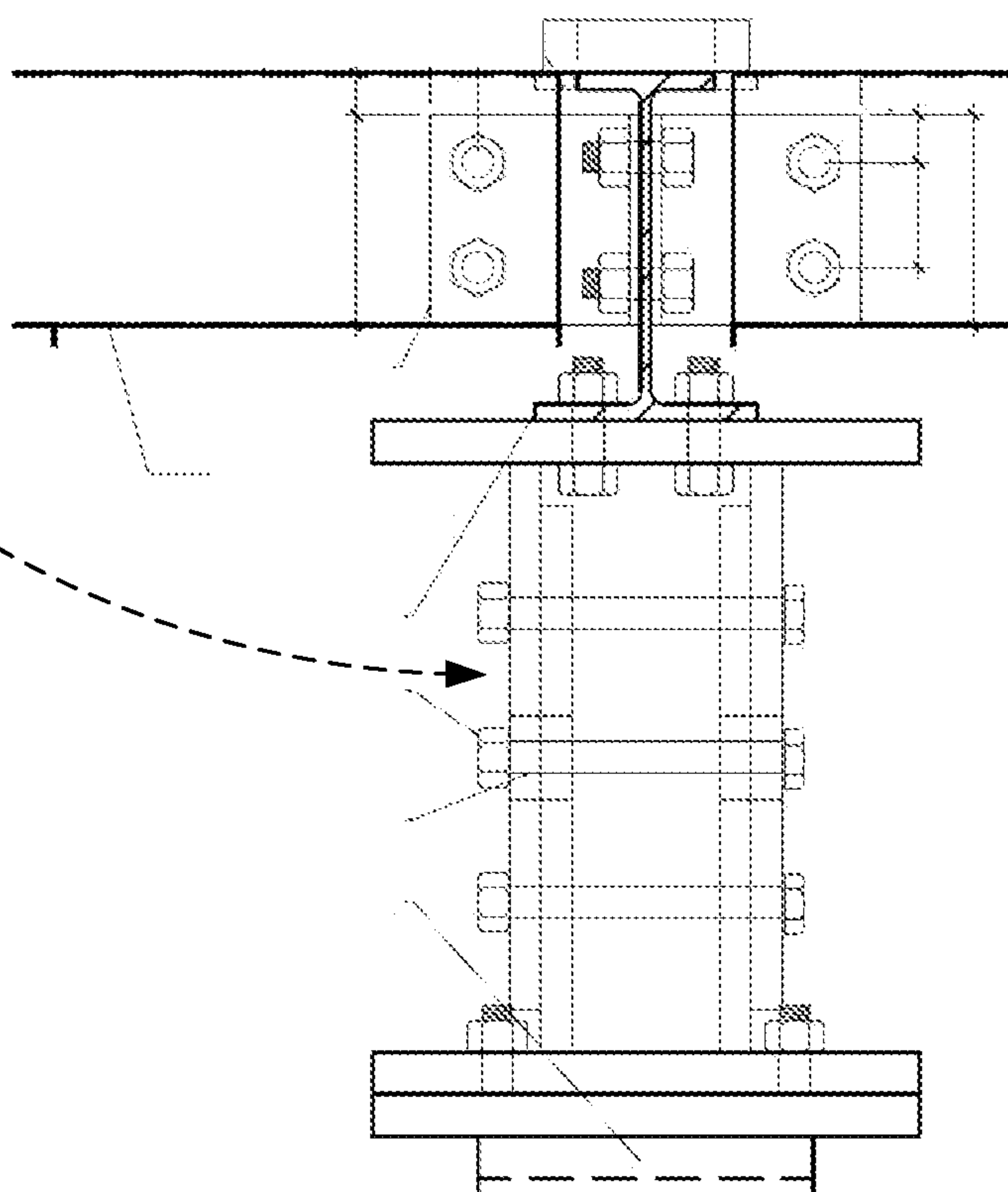


Figure 9

