(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 001 087 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
25.05.2022 Bulletin 2022/21

(21) Application number: **21204524.9**

(22) Date of filing: **25.10.2021**

(51) International Patent Classification (IPC):
B63B 35/38 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
B63B 35/38; B63B 2221/24

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **26.10.2020 US 202017079813**
29.03.2021 US 202117215917

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(54) FLOATING CONSTRUCT

(57) This invention relates to the field of boat lifts and stabilizers for floating constructs. The invention provides a stabilizer for a floating construct, comprising: a modular cube; a modular cube stabilizer comprising a post that extends vertically above a top of the modular cube, the modular cube stabilizer comprising a blade that extends from an upper portion of the modular cube stabilizer, the blade extending generally horizontally beyond a side of the modular cube. The stabilizer may further comprise a pile guide comprising a blade that extends to a side of a collar of the pile guide, the collar constructed and arranged to receive a pile therethrough, wherein the blade of the collar is attached to the blade of the modular cube stabilizer.

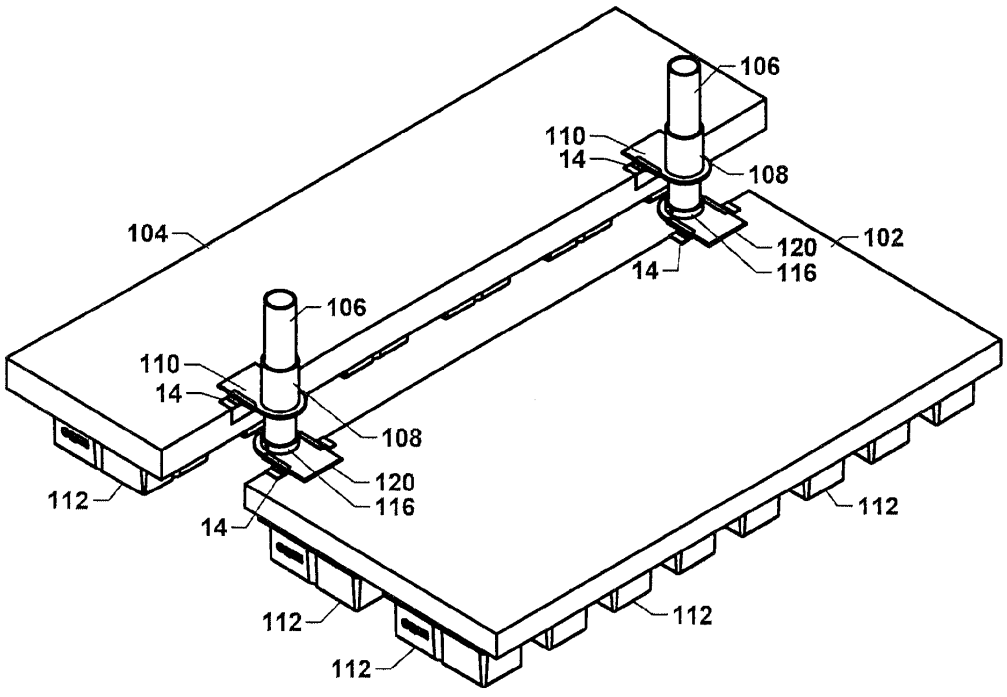

FIGURE 8

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Description

[0001] Boat lifts are used to store boats over water. There is a need for a boat lift that can be quickly constructed, and will float on top of water as water levels change due to tides, wave action and other causes. The floating construct allows for imprecise positioning of piles that hold the boat lift horizontally in place.

SUMMARY OF THE INVENTION

[0002] A boat lift in accordance with one aspect of the invention is attached to piles driven into the earth or to another object. The boat lift is held in horizontal position relative to piles or the object to which it is attached, but vertical movement of the boat lift relative to the object is permitted. The boat lift is connected to the piles by modular units or cube constructs that have a post extending there through. The post has a blade extending from it. The blades may be attached at an angle, according to the application, to pile guides that engage piles. The pile guides vertically traverse the piles, permitting the boat lift to move vertically relative to the object, but fixing the horizontal position of the boat lift. In accordance with various aspects of the present invention there are provided floating constructs and stabilizers therefor as set out in the claims hereinafter.

BRIEF DRAWING DESCRIPTION

[0003]

Figure 1 is a perspective view of the floating platform according to the invention.
Figure 2 is an elevation of the end the floating platform according to the invention.
Figure 3 is a top plan view of the floating platform.
Figure 4 is a side elevation of the floating platform.
Figure 5 is a perspective view of a guide post used with an embodiment of the invention.
Figure 6 is an elevation of the guide post shown in **Figure 5.**
Figure 7 is a perspective view of a bracket for receiving a blade of the guide post of **Figure 5.**
Figure 8 is a perspective view of another embodiment of the invention in which a guide post is mounted to a slidable mounting.
Figure 9 is an elevation of the embodiment of **Figure 8.**
Figure 10 is a top plan view of the embodiment of **Figure 8.**
Figure 11 is a side elevation of the embodiment of **Figure 8.**
Figure 12 demonstrates in isolation a guide post that is attached to and extends above the slidable mounting and is slidable relative to a guide that is slidably mounted to an object according to the embodiment of **Figure 8.**
Figure 13 is a perspective view of another embodiment of the invention in which a pile driven into the earth extends through pile guides associated with a floating platform and an object.
Figure 14 is an elevation of the embodiment of **Figure 13.**
Figure 15 is a top plan view of the embodiment of **Figure 13.**
Figure 16 is a side elevation of the embodiment of **Figure 13.**
Figure 17 demonstrates in isolation the pile driven into the earth extending above a guide that is slidably mounted to the object and is slidably mouthed to the floating platform according to the embodiment of **Figure 13.**
Figure 18 is a perspective view of another embodiment of the invention in which a guide post is attached to the floating platform and extends through the pile guide mounted to the object.
Figure 19 is an elevation of the embodiment of **Figure 18.**
Figure 20 is a top plan view of the embodiment of **Figure 18.**
Figure 21 is a side elevation of the embodiment of **Figure 18.**
Figure 22 demonstrates in isolation the guide post attached to the floating platform and the guide that is slidably mounted to an object according to the embodiment of **Figure 18.**
Figure 23 is a perspective view of an embodiment of a stabilizer for a modular cube for use with a floating platform comprising floating units.
Figure 24 is a perspective view of an embodiment of a stabilizer for a modular cube for use with a floating platform comprising floating units.
Figure 25 is a top plan view of the embodiment of a stabilizer for a modular cube for use with a floating platform comprising floating units of **Figure 23.**
Figure 26 is a pile guide useful with the stabilizer for a modular cube like that show in **Figures 23-25.**
Figure 27 is a partial view of the stabilizer of **Figures 24** and **25** shown in perspective.
Figure 28 is a perspective view of an embodiment of a stabilizer for a modular cube for use with a floating platform comprising floating units.
Figure 29 is a top plan view of the embodiment of a stabilizer for a modular cube for use with a floating platform comprising floating units of **Figure 28.**
Figure 30 is an elevation of the embodiment of a stabilizer for a modular cube for use with a floating platform comprising floating units of **Figure 28.**
Figure 31 is a perspective view of stabilizers for a modular cube used with a floating platform comprising a plurality of floating units.
Figure 32 is an elevation of stabilizers for a modular cube used with a floating platform comprising a plurality of floating units.

DESCRIPTION OF PREFERRED EMBODIMENTS

[0004] The floating platform comprises a floating platform **2.** The floating platform may be a floating dock or a raft or other platform that will float in water. The floating platform may be formed of wood, plastic or other materials that will float in water. As shown in the drawing figures, the floating platform is formed of a plurality of individual floating units **12** that are connected to form a rectangular floating platform. The floating platform as shown in **Figure 1** also has a generally level and planar top surface and can be used as a boat dock with the boat stored on top of the boat dock. The floating platform may be used as a staging area for tools and materials, or the floating platform may be used as a walkway, such as a catwalk. The floating platform may be formed in shapes other than a rectangular shape, and need not have a planar top surface.

[0005] Forming the floating platform **2** of individual floating units **12** allows the floating platform to be constructed in a desired shape and dimensions, and also allows quick assembly of the floating platform. The floating platform has particular utility as a temporary facility that can be quickly assembled. Further, the use of individual units to form the floating platform, or the use of other modular construction of the floating platform, allows for easy transportation of the floating platform which can be assembled on site, and without the necessity of special highway transportation.

[0006] The invention allows the floating platform **2** to be held in place relative to another object **4** without substantial horizontal movement of the floating platform. However, the floating platform according to the invention allows vertical movement of the floating platform relative to the object due to changes in water levels due to tides, weather, or wave action. The object may be in position relative to the earth, or the object may be another floating object. For example, the object could be a bulkhead fixed to the shore, or the object could be another floating platform or floating dock, or the additional object could be a vessel, such as a ship or a boat. Whether the object is fixed or floating, the floating platform construct of the invention allows vertical movement of the floating platform relative to the object while holding the floating platform substantially in position horizontally, although the horizontal positioning may be adjusted.

[0007] As shown in the embodiment of the drawings, guide posts **6,8** are used to connect the floating platform **2** to the object **4.** A preferred guide post is an elongated object that engages receptacles formed in and extending through the floating platform. The guide posts each comprise a horizontal blade **10** that extends from a side of the guide post and near a top of the guide post.

[0008] In a preferred embodiment, at least two brackets **14** are mounted to the object **4.** Each bracket has opposing members **22,24** that allow the blade **10** of a guide post **6,8** to slidably engage the bracket between the opposing members. The blade may be formed to a desired length, so that the floating platform **2** may be horizontally spaced from the object at a desired distance. With the blade being slidable within the brackets, this distance may be adjusted as desired by the user. After positioning the blades between the brackets, the distance of the floating platform to the object is adjusted and the blade is fixed to a position within the brackets such as by using one or more set screws to hold the blade and the guide post in a horizontal position relative to the object. The guide posts thereby hold the floating platform in a horizontal position relative to the object. The blades of the guide posts are positioned above the floating platform.

[0009] In one embodiment the brackets **14** are mounted under the object and/or under the floating platform. The blades of the pile guides slidably engage the brackets as described. Mounting the brackets and pile guides on a lower surface rather than a top surface of the object and/or floating platform removes and obstruction or tripping hazard from the top of the object and/or floating platform.

[0010] The guide posts **6,8** engage receptacles formed in and extending through the floating platform **2.** The guide posts are fixed in position relative to the object as described above, but the floating platform moves vertically relative to the guide posts as the floating platform floats in changing water levels. The fit of the guide posts within the receptacles is such that the receptacles, and therefore the floating platform, can traverse the guide posts in a vertical direction. The floating platform can move vertically independent of the object **4** to which the floating platform is attached. In this manner, if the object is fixed to the earth, changes in water levels do not submerge the floating platform. Similarly, if the floating platform is attached to a floating object, such as a large vessel, the floating object has less tendency to pull the floating platform under the water in the event of violent wave action.

[0011] The guide posts **6,8** may be formed to a length that is required by the application. For example, if the object **4** is fixed to the earth and the floating platform **2** is subject to two (2) meter tides, the guide posts may have a length of three (3) meters or more. In some applications it may be desirable to have a stop on the guide posts. The stop may be a pin inserted through a void **18** of the guide post so that the floating platform does not disengage from the guide post in the event of an extremely low water level due to tides, wave action or other causes.

[0012] The guide posts **6,8** may have a round cross section, and form an elongated cylindrical shape. If the guide posts are hollow, a cap may be placed over the top of the guide posts, so that the guide post may be used as a step for entering or leaving the floating platform **2.** The receptacles are formed as voids having a complementary shape to the guide posts so that the floating platform moves vertically the guide posts as water levels change. The guide posts and receptacles could have oth-

er complimentary shapes. The receptacles and guide posts are preferred to be formed of polyethylene, and particularly high-density polyethylene, which is extremely durable, corrosion resistant, and has low friction qualities that facilitate the movement required by the objects of the invention. Low density polyethylene may be used in other applications.

[0013] In a preferred embodiment, the guide posts have a specific gravity of less than 1.0 so that they float in water and provide buoyancy to retard deflection of the blade over time. In a specific embodiment the guide posts are hollow but are capped or otherwise sealed to prevent water intrusion into the center of the guide posts so as to provide buoyancy. The hollow guide posts may be made of materials having a specific gravity of less than 1.0. An example of such materials is polyethylene.

[0014] **Figures 8-12** show an additional embodiment of the invention. The floating platform **102** may be a floating dock or similar platform that will float in water. The floating platform may be formed of floating members. The floating platform may be formed of wood, plastic or other materials that will float in water. The floating platform may have a hard surface, such as a surface formed of wood planking. The floating platform as shown in **Figure 8** may have a generally level and planar top surface. The floating platform may be configured for use as a boat dock with the boat stored on top of the floating platform and out of the water, such as a v-shape for accommodating a boat hull. The floating platform may be used as a staging area for tools and materials, or the floating platform may be used as a walkway, such as a catwalk. The floating platform may be formed in shapes other than a rectangular shape, and may not have a planar top surface.

[0015] The invention allows the floating platform **102** to be held in place relative to another object **104** without substantial horizontal movement of the floating platform. However, the floating platform according to the invention allows vertical movement of the floating platform relative to the object due to changes in water levels due to tides, weather, or wave action. The object may be in a fixed position relative to the earth, or the object may be another floating object with floats **112.** For example, the object could be a bulkhead fixed to the shore, or the object could be another floating platform or floating dock, or the additional object could be a vessel, such as a ship or a boat. Whether the object is fixed or floating, the floating platform construct of the invention allows vertical movement of the floating platform relative to the object while holding the floating platform substantially in position horizontally, although the horizontal positioning may be adjusted.

[0016] At least two brackets **14** are mounted to the object **104.** Each bracket has opposing members that allow the blade **110** of a guide to slidably engage the bracket between the opposing members. The blade **110** may be formed to a desired length, so that the floating platform **102** may be horizontally spaced from the object at a desired distance. With the blade being slidable within the brackets, this distance may be adjusted as desired by the user. After positioning the blades between the brackets, the horizontal distance of the floating platform to the object is adjusted and the blade is fixed to a position within the brackets such as by using a set screw to hold the blade and the guide post in a horizontal position relative to the object. The guide posts thereby hold the floating platform in a position relative to the object.

[0017] Guide posts **106** engage a cylinder **108** that extends above the blade **110.** The blade, cylinder and bracket form a pile guide that limits horizontal movement of the guide posts and the floating platform **102** relative to the object **104.** In this embodiment, the guide posts are fixed to blades **120** that slide relative to brackets **14** attached to the floating platform. The guide posts may be mounted to the blades **120** by a collar **116** that holds the guide post in position. The blades **120** may be formed to a desired length and positioned within the brackets so that the floating platform **102** may be horizontally spaced from the object at a desired distance, just as the object **104** may be spaced at a desired distance from the guide posts and floating platform through the use of the slidable blades **110.** With the blades **120** being slidable within the brackets, this distance may be adjusted as desired by the user or installer. After positioning the blades between the brackets, the horizontal distance of the guide posts to the floating platform is adjusted and the blade is fixed to a position within the brackets, such as by using one or more set screws to hold the blade and the guide posts in the desired position.

[0018] In this embodiment the floating platform **102** is free to move vertically relative to the object **104** as the floating platform and/or the object floats in changing water levels. The fit of the guide posts **106** within the cylinder **108** is such that the guide posts, and therefore the floating platform, can move or slide vertically within the cylinder and move vertically relative to the object **104.** The cylinder and the guide posts may be formed in other geometric shapes, and could be square in cross section for example, and long as relative movement is provided as described. The floating platform can move vertically independently of the object **104** to which the floating platform is attached. In this manner, if the object is fixed to the earth, changes in water levels do not submerge the floating platform. Similarly, if the floating platform is attached to a floating object, such as a large vessel, the floating object has less tendency to pull the floating platform under the water in the event of violent wave action.

[0019] The guide posts **106** may be formed to a length that is required by the application. For example, if the object **104** is fixed to the earth and the floating platform **102** is subject to two (2) meter tides, the guide posts may have a length of three (3) meters or more. In some applications it may be desirable to have a stop on the guide posts. The stop may be a pin inserted through a void of the guide post so that the floating platform does not disengage from the cylinder **108** in the event of an extremely low water level due to tides, wave action or other causes.

[0020] The guide posts **106** may have a round cross

section, and form an elongated cylindrical shape. The cylinders **108** comprise voids having a complementary shape to the guide posts so that the floating platform moves vertically relative to the object **104** as water levels change. The guide posts and cylinders may have other complimentary shapes. The receptacles and guide posts are preferred to be formed of polyethylene, and particularly high-density polyethylene, which is extremely durable, corrosion resistant, and has low friction qualities that facilitate the movement required by the objects of the invention. Low density polyethylene may be used in other applications.

[0021] **Figures 13-17** show an embodiment that is similar to the embodiment of **Figures 8-12,** with the object **104,** floating platform **102** and associated components being the same as indicated by like reference numbers. In this embodiment, the guide posts are static piles **128** driven into the earth. The piles slidably engage pile guides **130** that are mounted to the floating member such as a floating dock and to pile guides **108** mounted to the object. In this embodiment the floating platform **102** moves vertically relative the piles **128** as the floating platform and/or the object floats in changing water levels. The fit of the piles within the pile guides is such that floating platform can move vertically relative to the fixed piles and move vertically relative to the object. The pile guides and the piles may be formed in desired geometric cross sections, and could be round or square in cross section for example, and long as relative movement is provided as described.

[0022] **Figures 18-22** show an embodiment that is similar to the embodiments of **Figures 8-17,** with the object **104,** floating platform **102** and associated components being the same as indicated by like reference numbers. In this embodiment, the guide posts **106** are mounted to the floating platform **102** such as by mounting **132,** and therefore move as the floating platform moves. The guide posts slidably engage pile guides **108** that are mounted to the object. In this embodiment the floating platform moves vertically relative to the object as the floating platform and/or the object floats in changing water levels. The fit of the guide posts within the pile guides is such that floating platform can move vertically relative to the object **104.** The pile guides and the guide posts may be formed in desired geometric cross sections, and could be round or square in cross section for example, and long as relative movement is provided as described.

[0023] **Figures 23-30** show devices for securing a boat lift formed of modular cubes, such as the boat lift shown in **Figures 32-33.** A modular cube **212** has a void extending through the modular cube. The void may be cylindrical in shape. The cube may be sealed and have a specific gravity of less than 1.0, so that it floats in water. The cube is constructed to be attached to other floating modular cubes **240** to form a floating boat lift. The cubes **212** and **240** could be of other geometric shapes as long as multiple units of cubes are connected to form the boat lift, which is connected to a floating dock, or piles, or a bulkhead or a similar fixed object.

[0024] The void in the cube **212** accepts a post **206** through the void. In a preferred embodiment, the post and cube **212** slide relative to each other. In most applications, the void in the cube **212** is cylindrical, and the post has a round cross section. A blade **210** extends from the post, preferably at or near the top of the post. The blade may extend from a cap **208.** The blade is relatively thin and wide relative to the thickness of the blade, with the wide part of the blade being positioned generally horizontally as shown in the drawing figures.

[0025] The blade **210** is attached to a blade **204** of a pile guide **214.** The pile guide blade **204** is typically relatively thin and wide relative to the thickness of the blade, with the wide part of the blade being positioned generally horizontally as shown in the drawing figures. The blade **210** of the post is connected to the pile guide blade **204** such as by bolting the blades together with fasteners **220.** The blades may be connected to each other at an angle desired by the installer, or as dictated by the location of preexisting piles **202.** Piles are typically driven into the ground, and alignment errors frequently arise, since driving the piles is an imprecise process. Providing a pile guide with a blade and a post with a blade permits the cube **212** to be offset from the pile **202** as needed by the installation limitations due to pile positioning.

[0026] The pile guide **214** is constructed to traverse pile **202** permitting vertical movement of the boat lift relative to the pile. The pile guide has a collar portion through which the pile extends. The collar substantially prevents horizontal movement of the boat lift, but permits vertical movement of the boat lift.

[0027] The post **206,** the blade **210,** the cap **208,** and the pile guide **214** are preferred to be formed of polyethylene, and more specifically medium density or high-density polyethylene. Polyethylene is resistant to corrosion, but is highly durable and resist tearing or breaking. The post **206** may have voids **18** formed like post 6 into which a lower stop may be incorporated, such as by inserting a pin through a void.

[0028] In the embodiment of the device shown in **Figures 28-30,** the blade **210** of the post **206** engages a bracket **222** that is mounted to a pile guide **214.** The opposing sides **230, 232** of the bracket each form a U shape that allows blade to **210** to slide between them. The sliding feature allows the cube **212** to be positioned horizontally as desired during construction of the boat lift. When the cube **212** is positioned as desired, the blade **210** is fixed relative to the bracket, such as by bolting or otherwise fastening the blade in position relative to blade **204.**

[0029] The bracket **222** allows the opposing sides **230,232** to pivot up to about 22.5° in either direction, for a total of about 45° of travel. Pivoting of the opposing sides of the bracket as demonstrated by **Figure 29** permits the cube **212** to be offset from the pile **202** as needed by the installation limitations due to pile positioning. After the cube is positioned as needed relative to the pile **202,**

the blade **210** is fixed in place such as by fastening the blade to the bracket with fasteners. The combination of pivoting and sliding of the blade **210** yields adjustability in positioning of the cube **210** and the boat lift relative to the piles.

[0030] **Figures 31-32** show a boat lift formed of modular cubes **240.** The boat lift is held in place by a plurality of piles **202** that are connected by the modular cubes **212** of **Figures 23-29,** and more specifically, by the construct shown in **Figures 27-30.** Typically, at least two modular cubes **212** are required per boat lift.

[0031] In another embodiment, blades **210** extending from posts **206** are attached to a fixed device, such as a bulkhead, or a floating object, such as a floating dock or vessel. The blade may be attached by fasteners, such as nuts and bolts, or other known fasteners. The posts extend through modular cubes **212** which are part of a dock such as the dock shown in Figure 31, but the blades are connected to another object as described in this paragraph rather than being connected to pile guides.

[0032] In yet another embodiment, piles extend through the voids in the modular cubes **212.** The post and blade construct is not used in this embodiment. The modular cubes **212** are connected to modular cubes to **240** form a dock like in **Figure 31.** The voids in the modular cubes **212** of this embodiment are constructed and arranged within the modular cubes **212** to accept piles **202** and permit vertical travel of the modular cubes and the dock relative to the piles, while limiting horizontal movement of the dock.

[0033] This invention relates to the field of boat lifts and/or stabilizers for floating constructs. A boat lift is attached to piles driven into the earth or to another object. The boat lift is held in horizontal position relative to piles or the object to which it is attached, but vertical movement of the boat lift relative to the object is permitted. The boat lift is connected to the piles by modular units or cube constructs that have a post extending there through. The post has a blade extending from it. The blades are attached at an angle, according to the application, to pile guides that engage piles. The pile guides vertically traverse the piles, permitting the boat lift to move vertically relative to the object, but fixing the horizontal position of the boat lift.

Claims

1. A stabilizer for a floating construct, comprising:

a modular cube;
a modular cube stabilizer comprising a post that extends vertically above a top of the modular cube, the modular cube stabilizer comprising a blade that extends from an upper portion of the modular cube stabilizer, the blade extending generally horizontally beyond a side of the modular cube.

2. A stabilizer for a floating construct as claimed in claim 1 further comprising a pile guide, the pile guide comprising a blade that extends to a side of a collar of the pile guide, the collar constructed and arranged to receive a pile therethrough, wherein the blade of the collar is attached to the blade of the modular cube stabilizer.

3. A stabilizer for a floating construct as claimed in claim 2 wherein the blade of the collar is attached to the blade of the modular cube stabilizer at an obtuse angle.

4. A stabilizer for a floating construct as claimed in claim 1 further comprising a pile guide, the pile guide comprising a bracket, the bracket comprising opposing members, a pile guide collar being constructed and arranged to receive a pile therethrough, wherein the blade of the modular cube stabilizer is positioned between the opposing members.

5. A stabilizer for a floating construct as claimed in claim 1 further comprising a pile guide, the pile guide comprising a blade that extends to a side of a collar of the pile guide, the pile guide comprising a bracket, the bracket comprising opposing members, wherein the blade of the modular cube stabilizer is positioned between the opposing members, the collar constructed and arranged to receive a pile therethrough.

6. A stabilizer for a floating construct as claimed in claim 1 further comprising a pile guide, the pile guide comprising a blade that extends to a side of a collar of the pile guide, the pile guide comprising a bracket, the bracket comprising opposing members, wherein the blade of the modular cube stabilizer is positioned between the opposing members and the blade of the pile guide is positioned at an obtuse angle to the blade of the modular cube.

7. A stabilizer for a floating construct as claimed in claim 1 further comprising a pile guide, wherein the modular cube is watertight.

8. A stabilizer for a floating construct as claimed in claim 7, wherein the modular cube has a specific gravity of less than 1.0.

9. A stabilizer for a floating construct as claimed in claim 1 further comprising a pile guide, wherein the modular cube is attached to a second modular cube.

10. A stabilizer for a floating construct as described in any preceding claim, wherein the modular cube stabilizer is formed of polyethylene.

11. A stabilizer for a floating construct as described in any preceding claim, wherein the modular cube sta-

bilizer and/or the pile guide is/are formed of polyethylene.

12. A stabilizer for a floating construct as described in any preceding claim, wherein the post of the modular cube stabilizer has a round cross-section.

13. A stabilizer for a floating construct, comprising:
a modular cube, the modular cube comprising a vertical void formed in the modular cube, the void extending though the modular cube constructed and arranged to receive a pile there through and constructed and arranged to permit vertical travel of the modular cube relative to the pile and restrict horizontal travel of the modular cube relative to the pile.

14. A stabilizer for a floating construct as described in Claim 13, wherein the modular cube is connected to another modular cube.

15. A stabilizer for a floating construct as described in claim 1, wherein the modular cube (212) comprises a vertical void formed in the modular cube, and the post (206) is positioned in the void of the modular cube and extends above a top of the modular cube.

16. A stabilizer for a floating construct as described in claim 1, further comprising a bracket (222) having opposing sides, wherein the blade (210) engages the bracket between the opposing sides, and the blade is retained within the bracket.

17. A stabilizer for a floating construct as described in claim 1, wherein the blade extends from the post and the blade is mounted to a fixed object.

18. A floating construct comprising one or more stabilizers in accordance with any of the preceding claims.

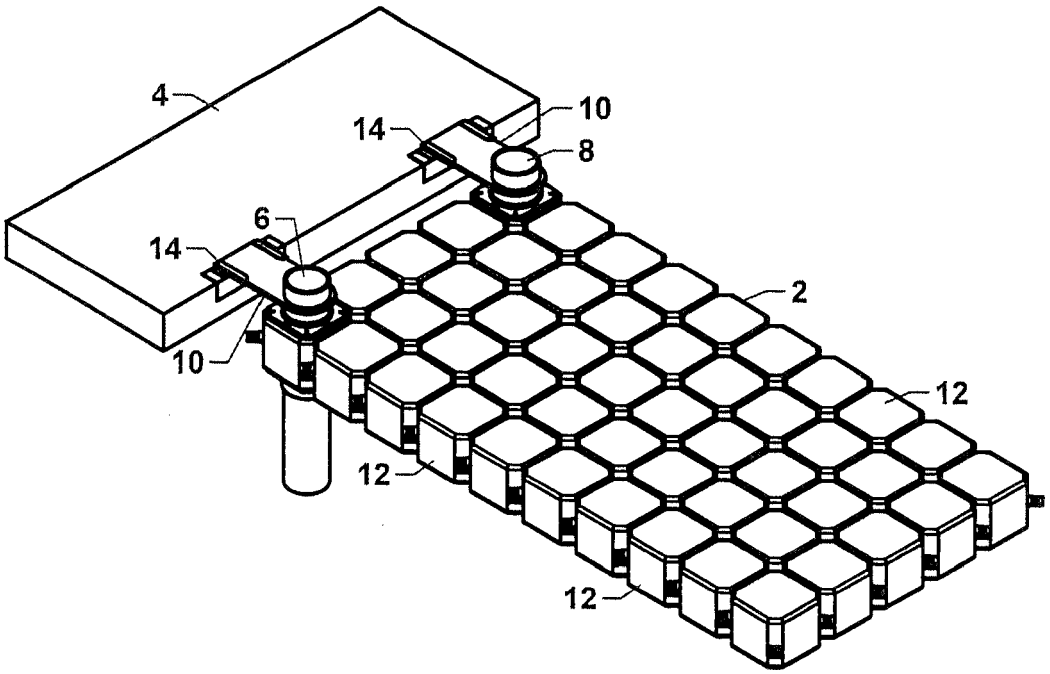


FIGURE 1

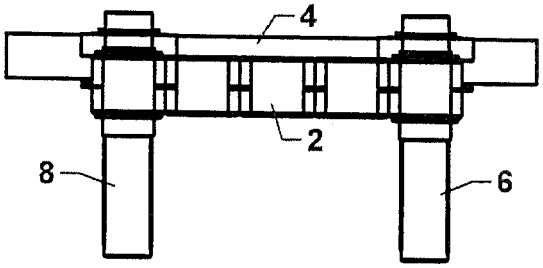


FIGURE 2

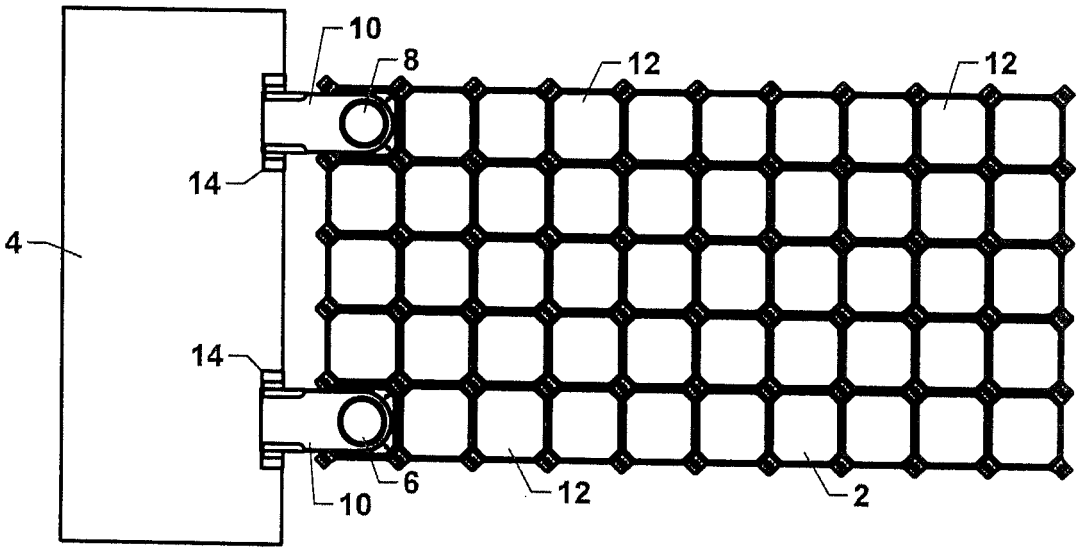


FIGURE 3

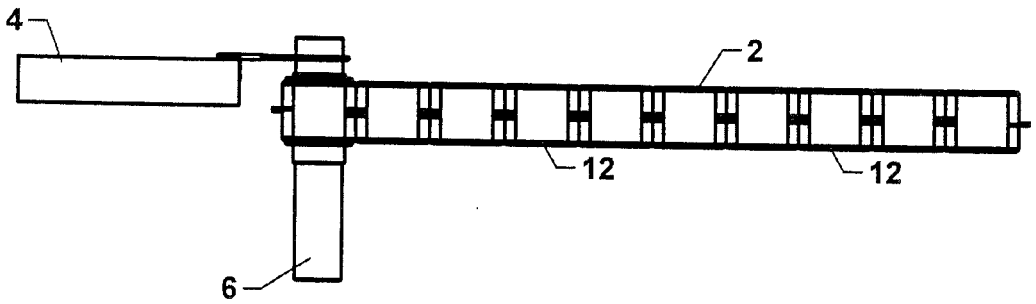


FIGURE 4

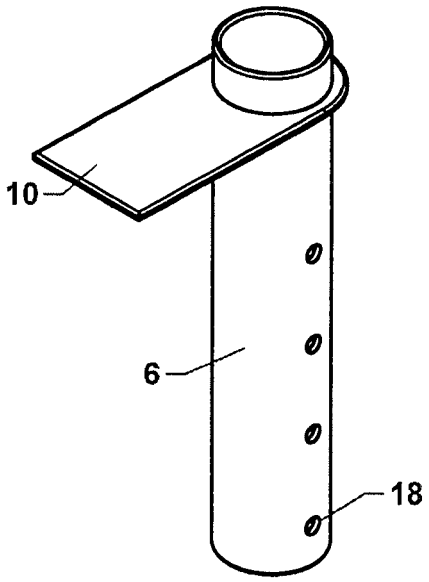


FIGURE 5

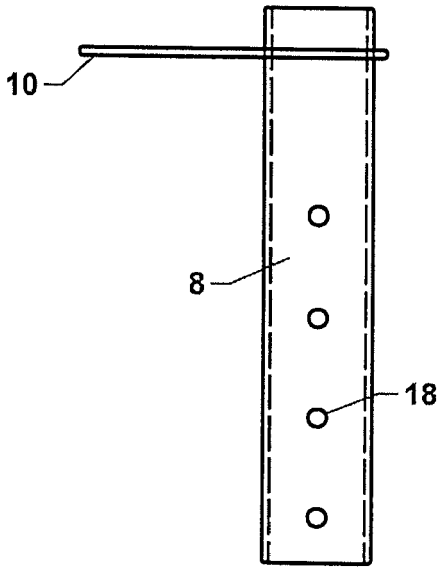


FIGURE 6

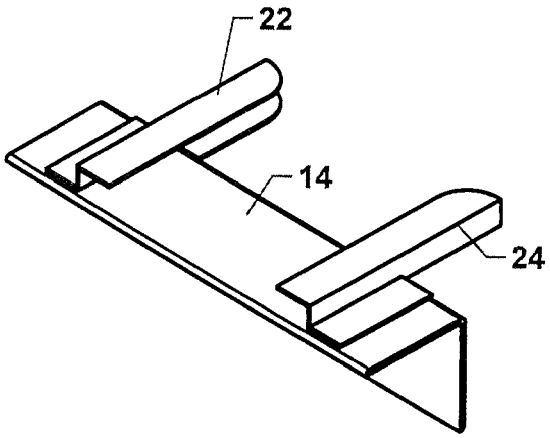
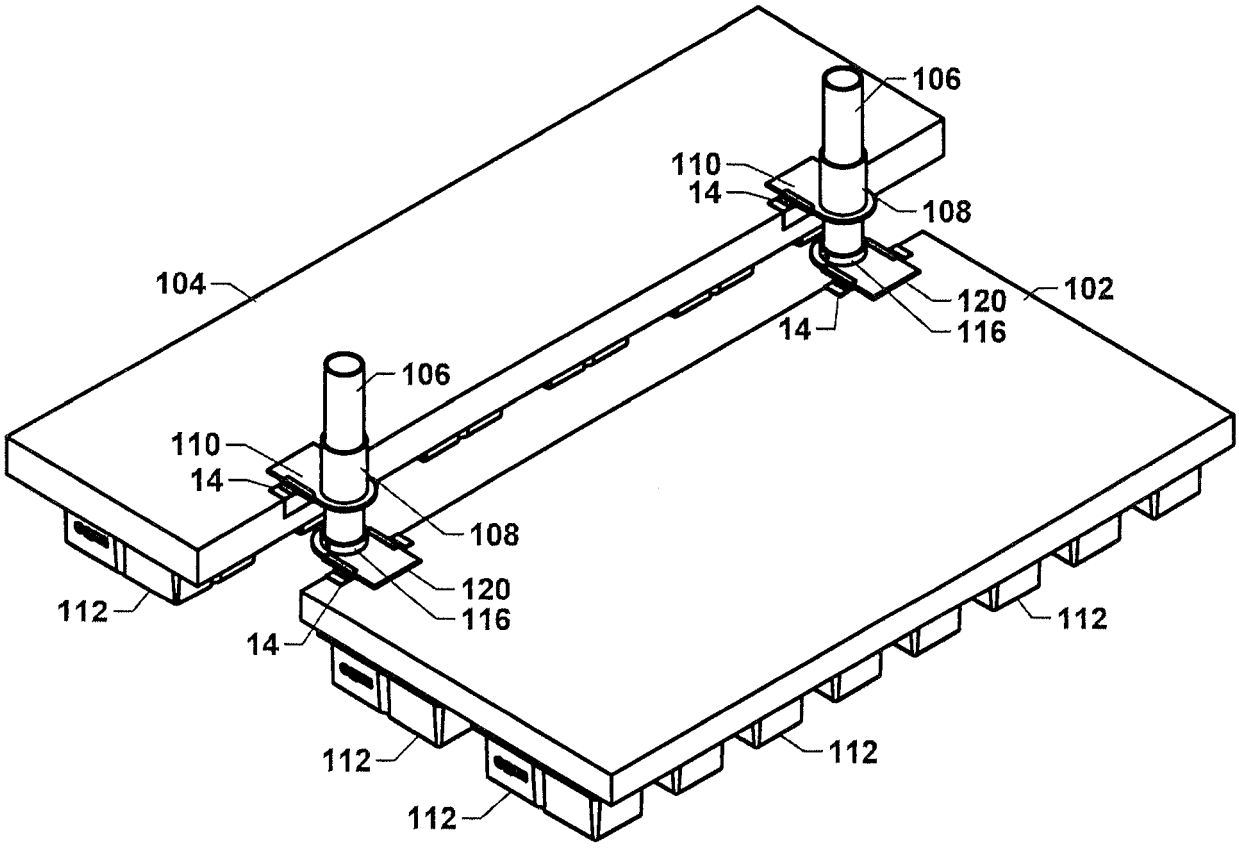


FIGURE 7



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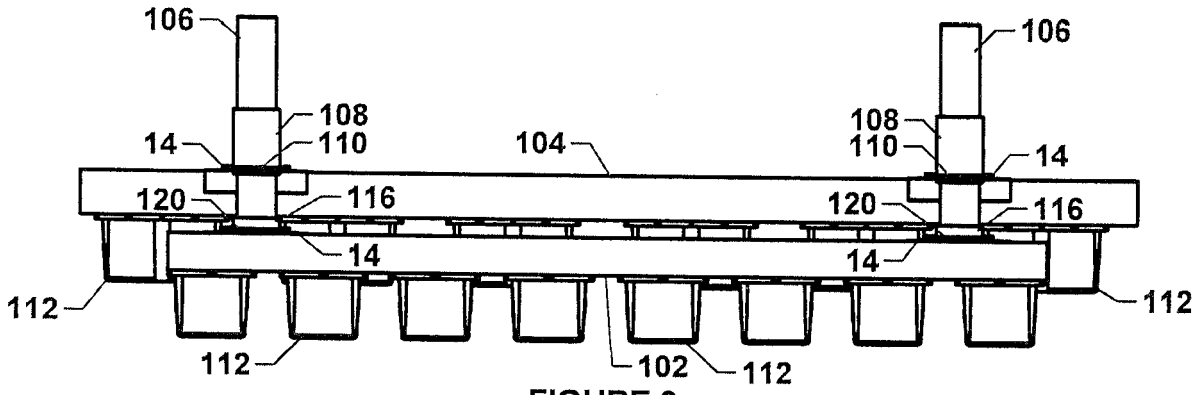

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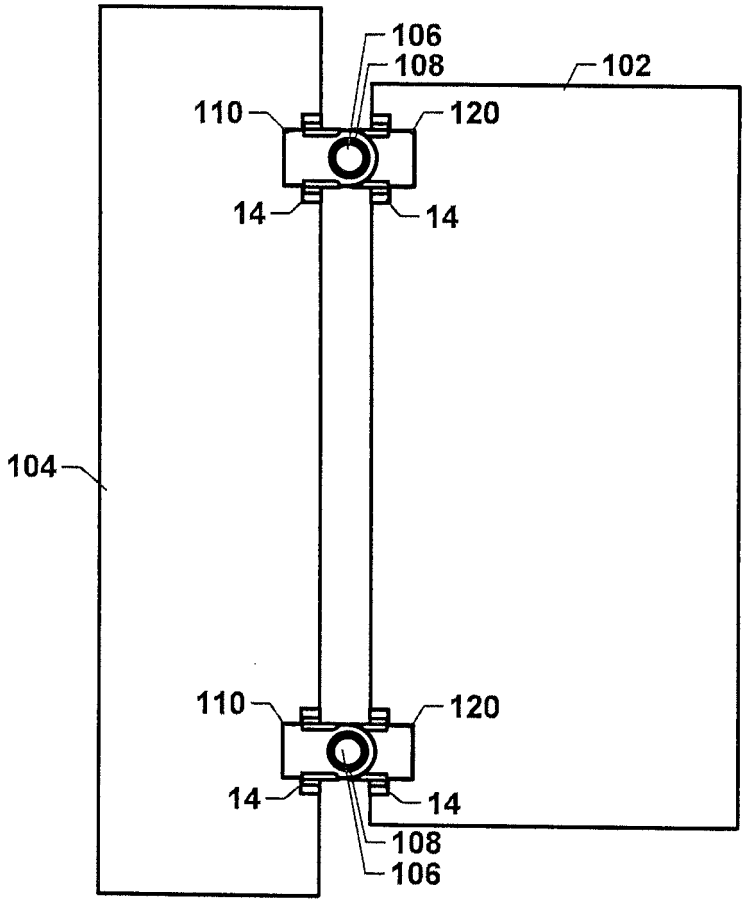
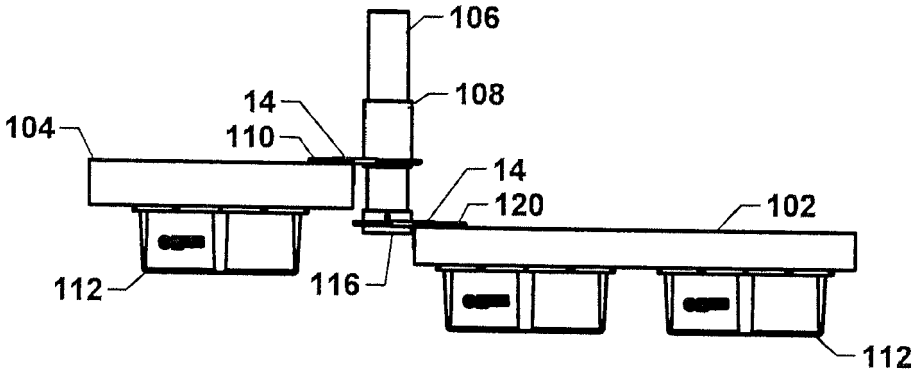


FIGURE 10



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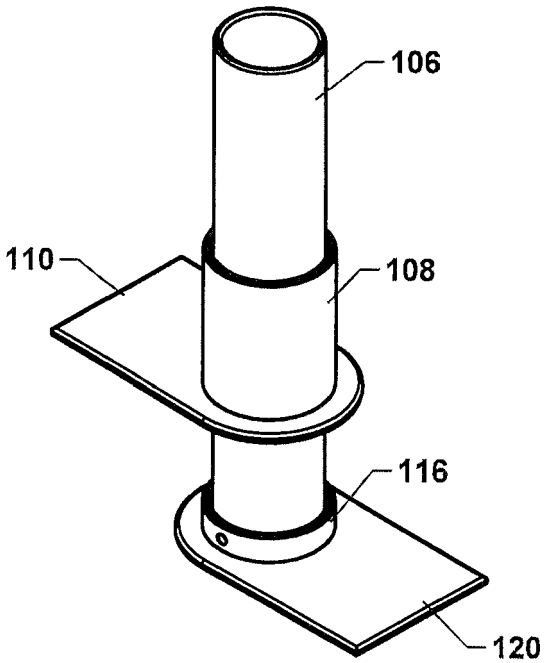

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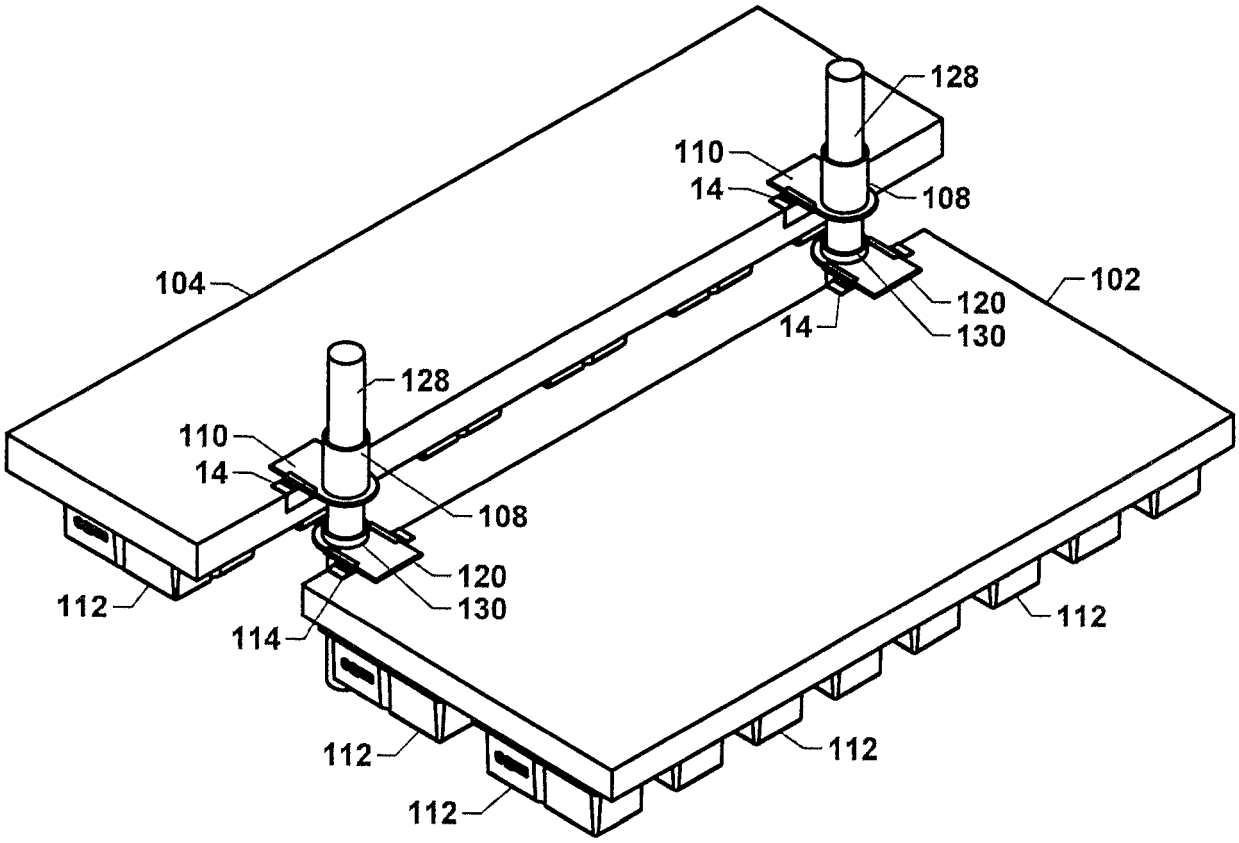

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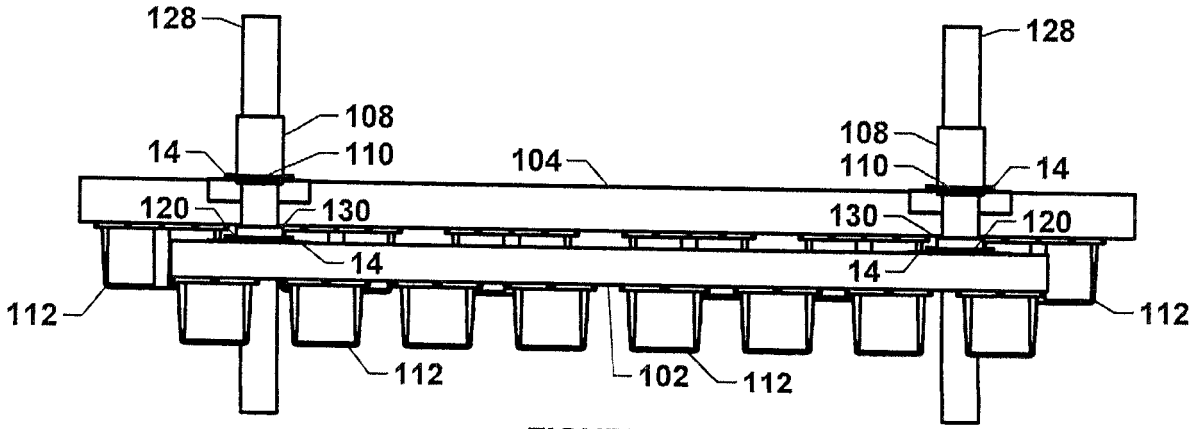


FIGURE 14

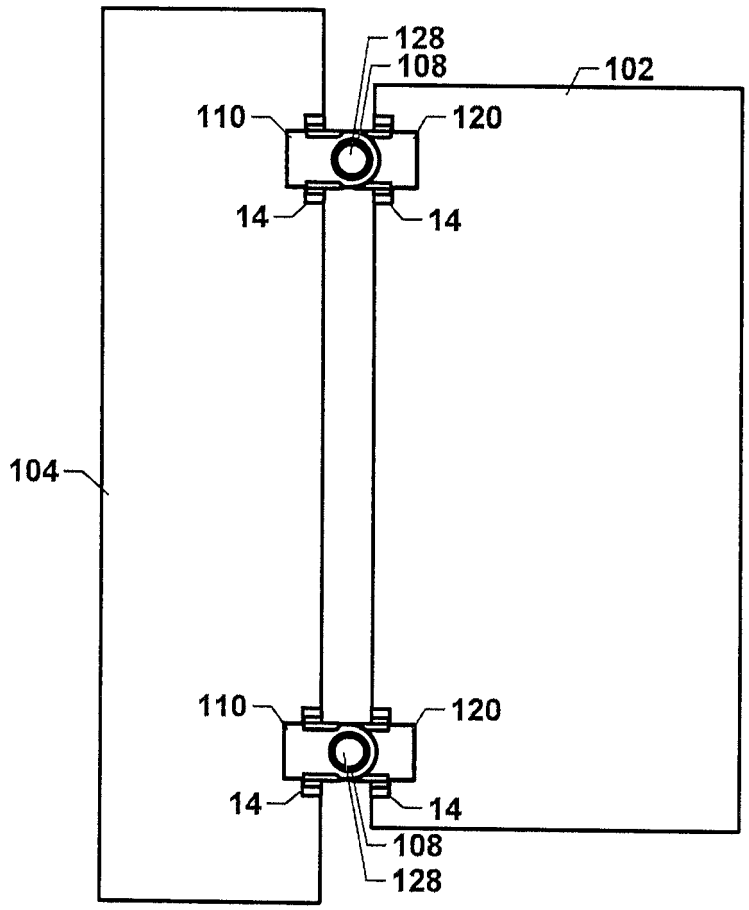


FIGURE 15

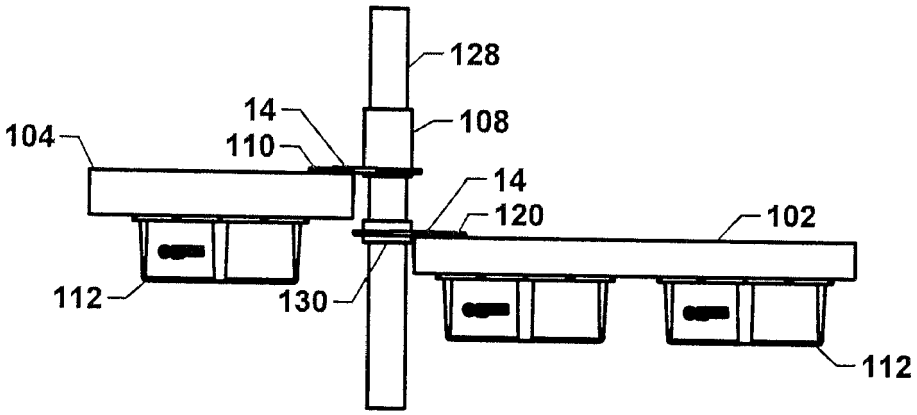


FIGURE 16

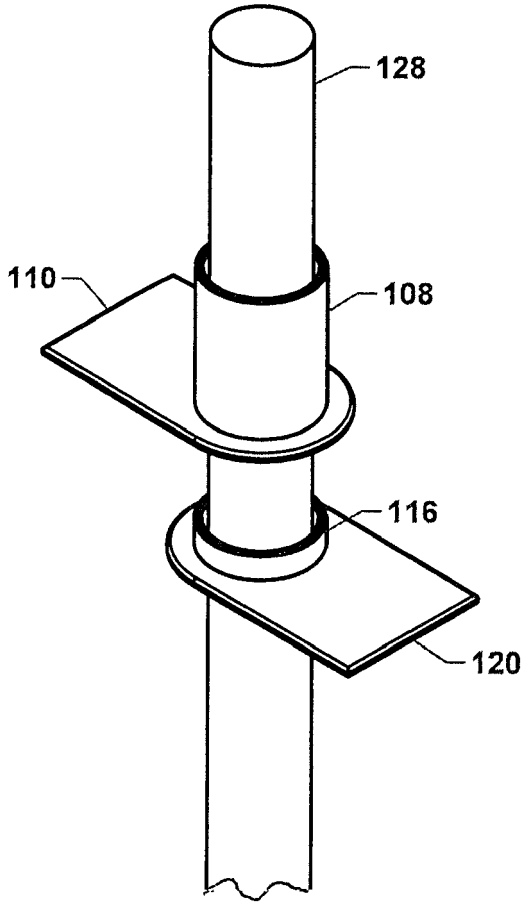
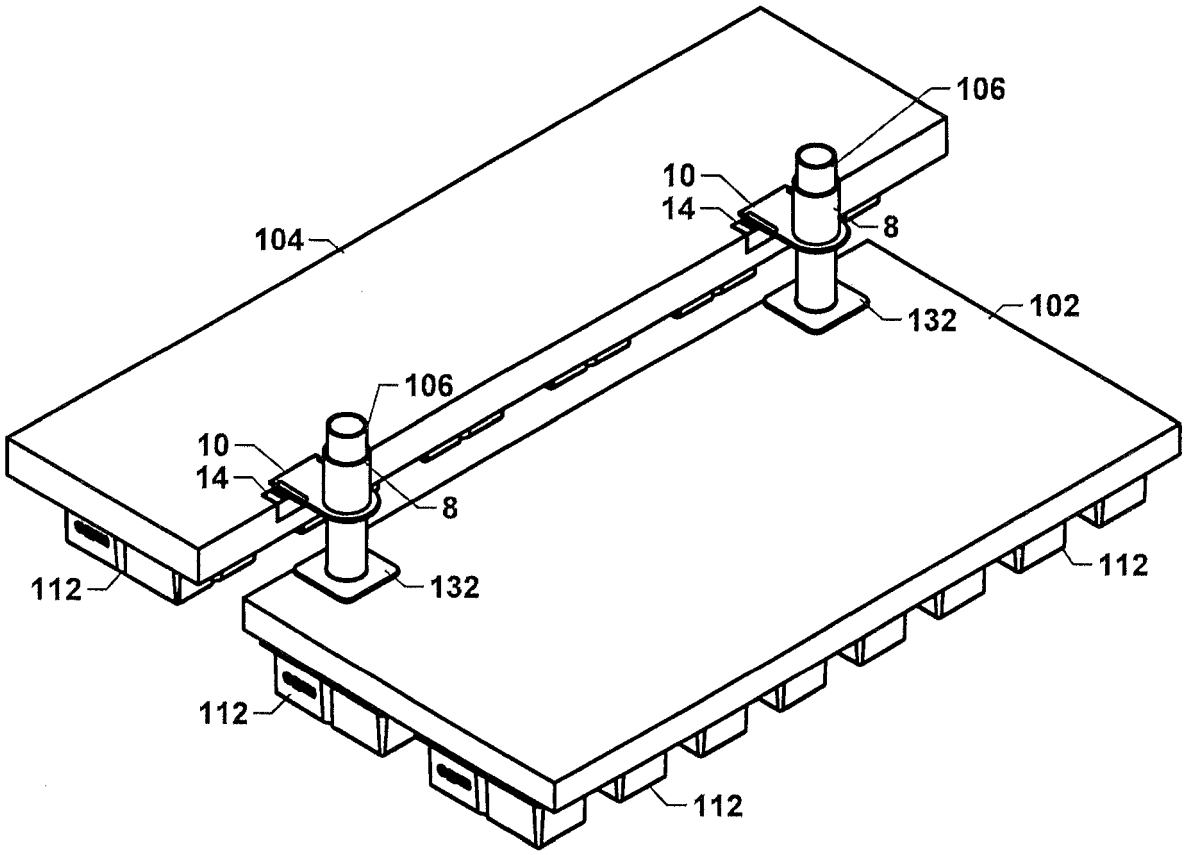


FIGURE 17



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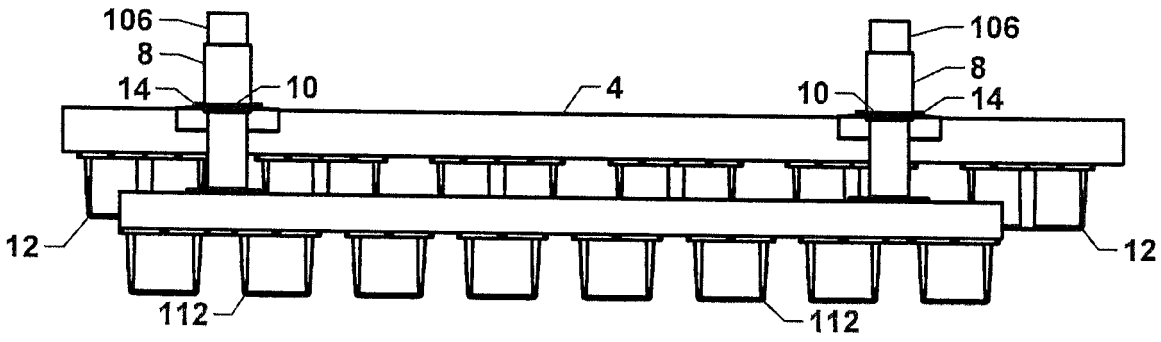

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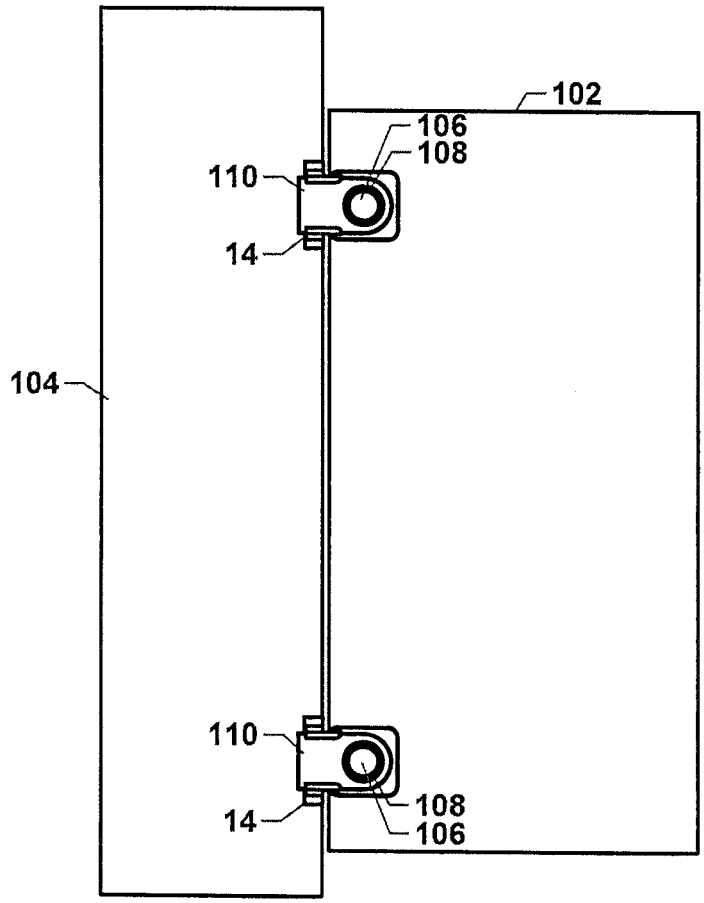

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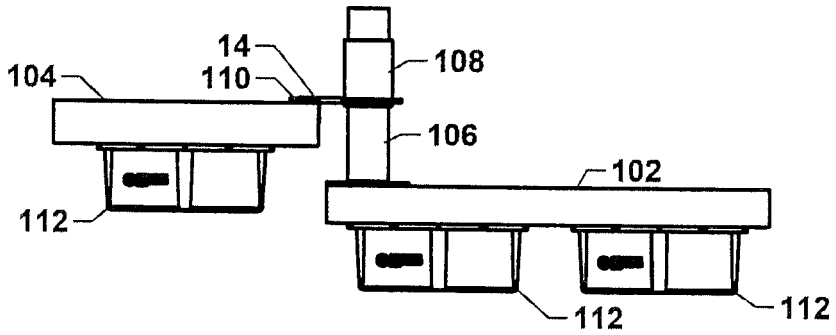


FIGURE 21

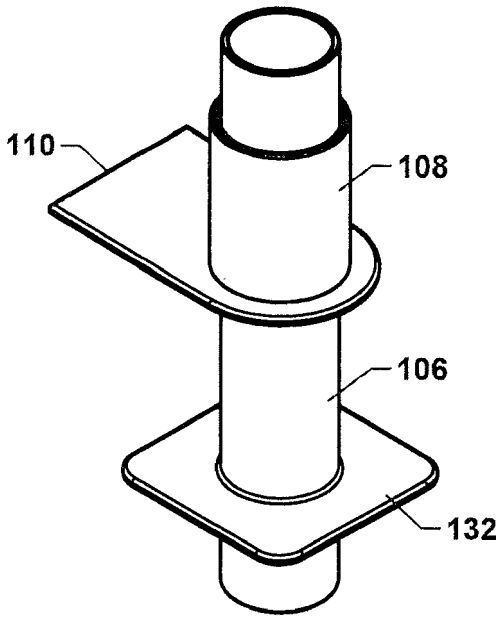


FIGURE 22

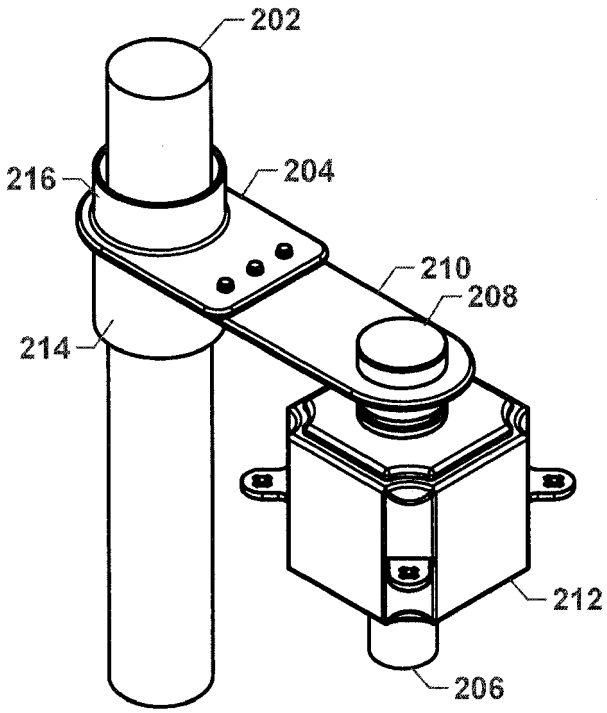
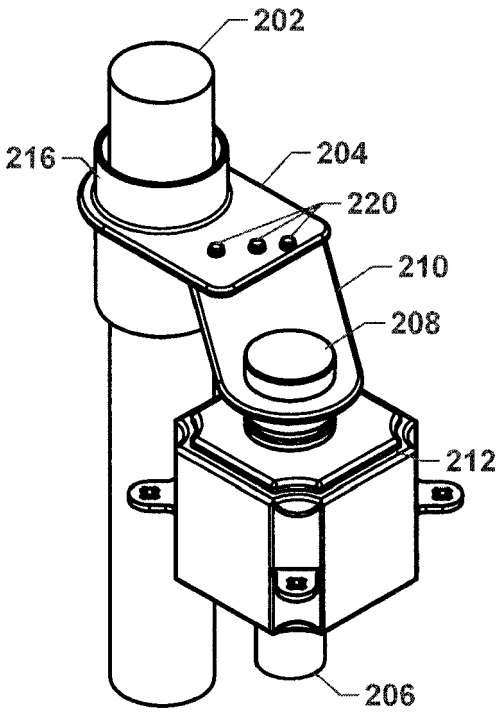


FIGURE 23



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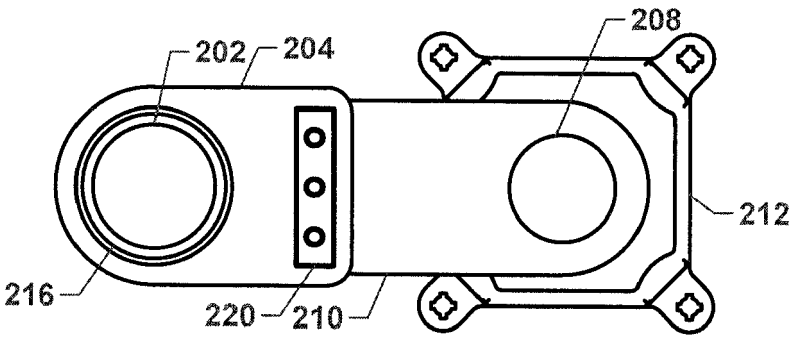

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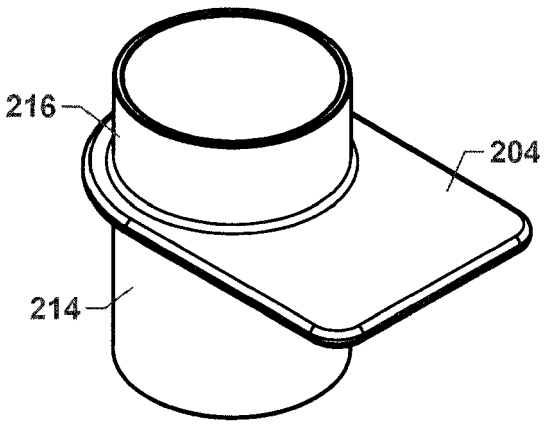

FIGURE 26

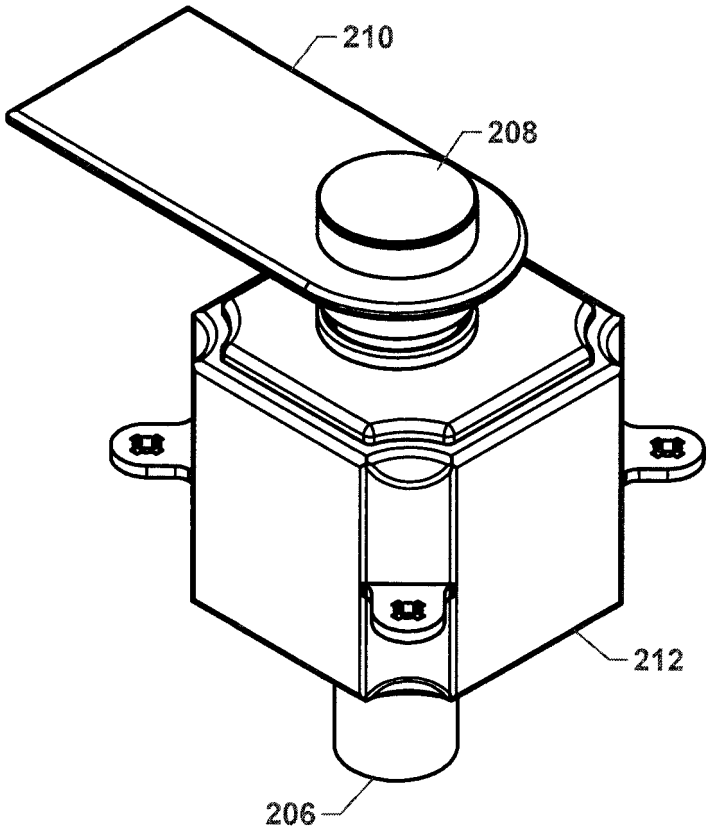

FIGURE 27

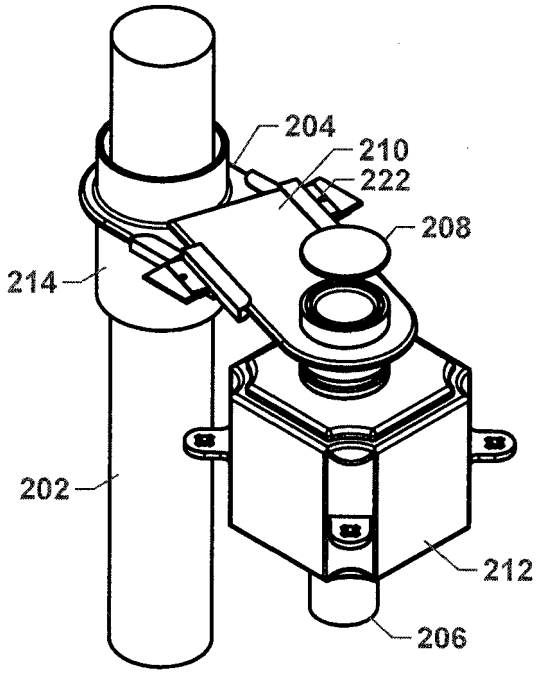

FIGURE 28

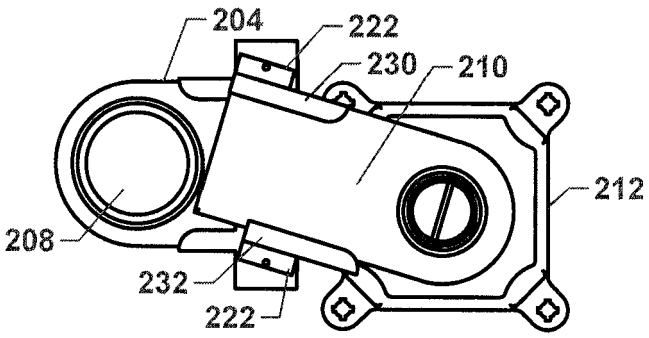

FIGURE 29

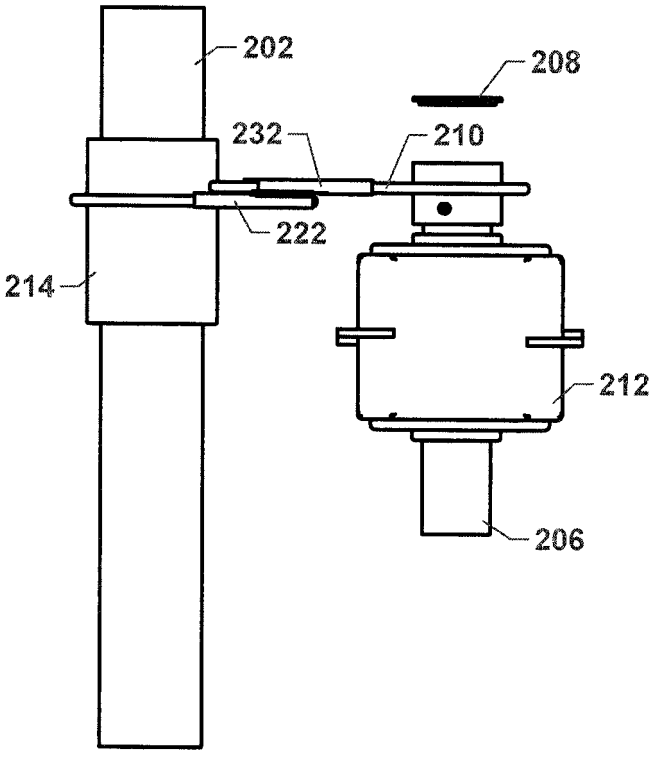

FIGURE 30

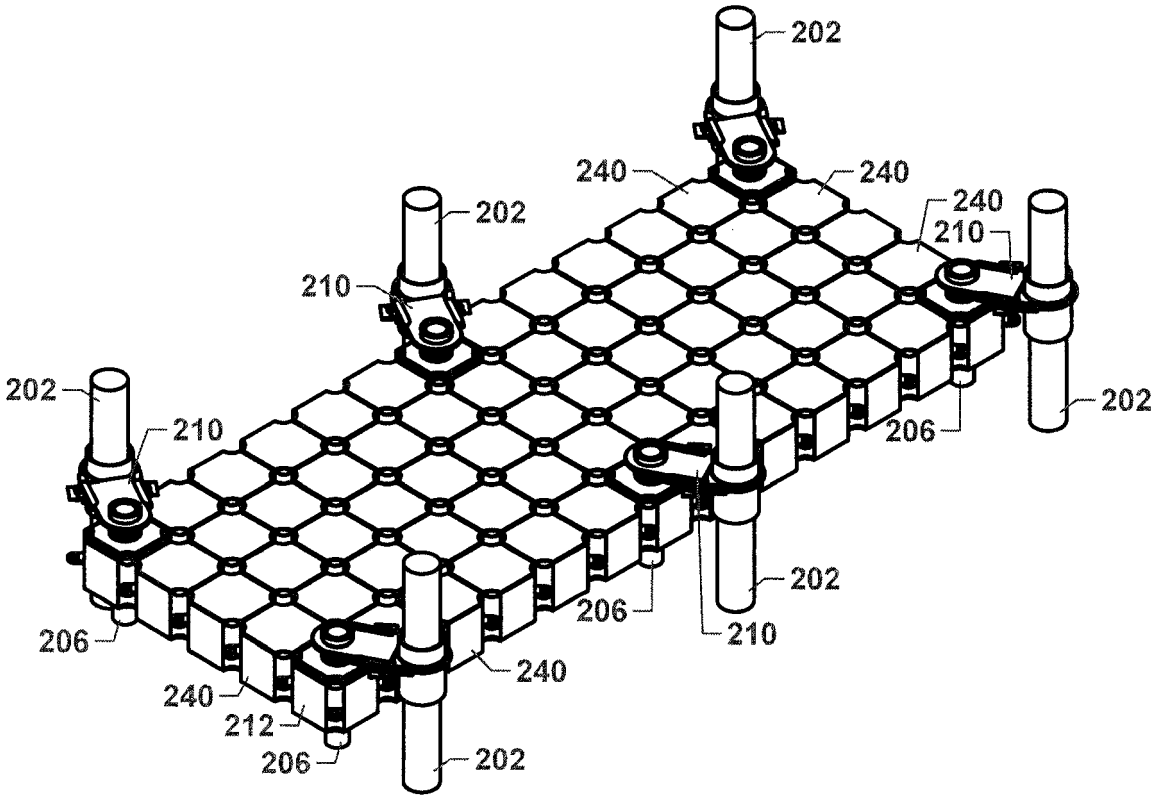

FIGURE 31

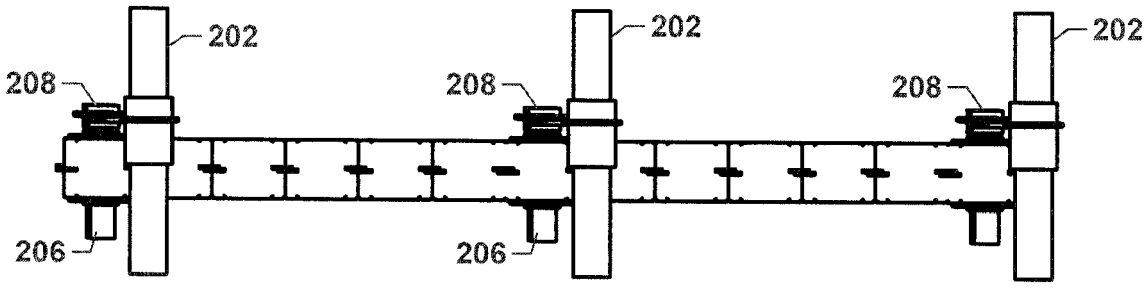

FIGURE 32

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EUROPEAN SEARCH REPORT

Application Number
EP 21 20 4524

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	13 April 2022	Schmitter, Thierry

CATEGORY OF CITED DOCUMENTS

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