

PHOTOVOLTAIC FLOATING ISLAND AND FLOATING BODY SYSTEM THEREOF

Technical Field

The present disclosure relates to the technical field of photovoltaic floating islands, in particular to a floating body system of a photovoltaic floating island and the photovoltaic floating island including the floating body system.

Background Art

In floating photovoltaic floating island technologies, there is a photovoltaic floating island technology by which a buoyancy is mainly provided by plastic buoys. The buoys are used as floating bodies, and supports are built on the buoys to support a photovoltaic panel at a certain angle, so that the photovoltaic panel is applied to a scene on water.

In the prior art, one photovoltaic panel is usually supported by one buoy. As the photovoltaic panel is made larger and heavier, requirements for the buoy are getting higher and higher. For a plastic buoy, since the wall thickness of the buoy is thinner than the overall size of the buoy, when the size of the buoy becomes larger and larger, the overall rigidity of the buoy will be lowered. In order to ensure functional requirements of work and operation, the overall rigidity and shape of the buoy still need to be guaranteed. For a large-sized buoy, especially a blow-molded buoy, in order to improve the rigidity and strength of the buoy, many concave and convex grooves or concave and convex marks will be added to the buoy to play a similar role as reinforcing ribs. These measures for improving the strength and the rigidity will increase the difficulty in forming a product, and result in the uneven wall thickness of the product. In addition, due to the existence of some large grooves or dents, the overall underwater drainage volume of the buoy will be reduced, thereby resulting in a decrease in the maximum buoyancy which can be provided by a unit plastic weight of a buoy and a decrease in the economic benefit of the buoy. In addition, a large-sized flat float has to be manufactured by using a large blowing mold, which increases the difficulty and quality control requirements of blow molding. During blow molding, more offcuts will be produced, and the production of the offcuts will cause electric energy consumption, which is also a waste of energy at a production stage.

Summary of the Invention

A technical problem to be solved by the present disclosure is to provide a floating body system of a photovoltaic floating island, which has higher economic efficiency and processing convenience to overcome the above-mentioned defects in the prior art. In order to solve the above-mentioned technical problem, the present disclosure adopts the following technical solution:

the present disclosure provides a floating body system of a photovoltaic floating island, including buoy assemblies, each of the buoy assemblies being used for supporting a single photovoltaic panel and including a plurality of supporting buoys arranged at intervals, and the single photovoltaic panel being jointly supported by the plurality of supporting buoys.

Preferably, the supporting buoys are columnar bodies hollow inside.

Preferably, the plurality of supporting buoys are arranged in a row in parallel and at intervals.

Preferably, the supporting buoys are provided with thickened enhancement areas, and the thickened enhancement areas are used for connecting the supports for supporting the photovoltaic panel.

Preferably, a plurality of buoy assemblies are provided, and the plurality of buoy assemblies are arranged in an array in a plurality of rows.

Preferably, the supporting buoys in two adjacent rows of buoy assemblies are spliced by a row of channel buoys or are connected in a one-to-one correspondence way.

Preferably, a plurality of rows of channel buoys are provided, and one or more rows of buoy assemblies are arranged between two adjacent rows of channel buoys.

Preferably, a row of channel buoys includes a plurality of channel buoys connected in sequence or arranged at intervals

Preferably, both of the supporting buoys and the channel buoys are provided with connecting lugs.

Preferably, when the connecting lugs on the adjacent supporting buoys are stacked or the connecting lugs on the supporting buoys and the channel buoys are stacked, the connecting lugs are connected by a big bolt and a big nut.

The present disclosure further provides a photovoltaic floating island, including photovoltaic panels, supports and the above-mentioned floating body system of the photovoltaic floating island, the supports being mounted on the supporting buoys of the buoy assemblies, and the photovoltaic panels being supported on the supports.

Compared with the prior art, the present disclosure has significant progresses:

Each of the buoy assemblies in the present disclosure includes the plurality of supporting buoys arranged at intervals, the single photovoltaic panel is jointly supported by the plurality of supporting buoys, and thus, a split-type buoy assembly is formed. Compared with a solution in the prior art that one photovoltaic panel is supported by one buoy, and the size of the buoy needs to be matched with the size of the photovoltaic panel, the present disclosure adopts a solution that the buoy for supporting the single photovoltaic panel is divided into a plurality of supporting buoys which are independent from each other, so that the size of a single supporting buoy is reduced; the single photovoltaic panel is jointly supported by the supporting buoys with smaller sizes, so that the maximum buoyancy which can be provided by the unit weight of the buoy can be effectively increased; a single supporting buoy may have a simple appearance shape, so that it is easy to achieve blow molding, few offcuts are produced, the size of a blowing mold is also small, and the supporting buoy has greater advantages in terms of an effective buoyancy load of a material, processibility as well as transportation and construction efficiencies. Therefore, the purposes of improving and optimizing the economic efficiency, processing convenience, transportation convenience and construction convenience of the floating body system of the photovoltaic floating island can be achieved.

Brief Description of the Drawings

Fig. 1 is a schematic main view of a first implementation of a buoy assembly in a floating body system of a photovoltaic floating island in an embodiment of the present disclosure;

Fig. 2 is a schematic top view of the buoy assembly shown in Fig. 1;

Fig. 3 is a schematic left view of the buoy assembly shown in Fig. 1;

Fig. 4 is a schematic main view of a second implementation of a buoy assembly in a floating body system of a photovoltaic floating island in an embodiment of the present disclosure;

Fig. 5 is a schematic top view of the buoy assembly shown in Fig. 4;

Fig. 6 is a schematic view of connection between each of supporting buoys and each of supports for supporting a photovoltaic panel in a floating body system of a photovoltaic floating island in an embodiment of the present disclosure;

Fig. 7 is a schematic local view of a floating body system of a photovoltaic floating island in an embodiment of the present disclosure;

Fig. 8 is a schematic view of a structure that supporting buoys are provided with connecting lugs in a floating body system of a photovoltaic floating island in an embodiment of the present disclosure;

Fig. 9 is a schematic view of a structure that channel buoys are provided with connecting lugs in a floating body system of a photovoltaic floating island in an embodiment of the present disclosure;

Fig. 10 is a schematic view of connection between a supporting buoy and each of two channel buoys in a floating body system of a photovoltaic floating island in an embodiment of the present disclosure;

Fig. 11 is a schematic view of a connecting structure of a connecting lug in a floating body system of a photovoltaic floating island in an embodiment of the present disclosure;

Fig. 12 is a schematic structural view of a first implementation of a floating body system of a photovoltaic floating island in an embodiment of the present disclosure;

Fig. 13 is a schematic structural view of a second implementation of a floating body system of a photovoltaic floating island in an embodiment of the present disclosure;
and

Fig. 14 is a schematic structural view of a third implementation of a floating body system of a photovoltaic floating island in an embodiment of the present disclosure.

Wherein reference numerals in the accompanying drawings are described as follows:

- 1 photovoltaic panel
- 2 supporting buoy
- 21 thickened enhancement area
- 3 support
- 4 channel buoy
- 5 connecting lug
- 6 big bolt
- 7 big nut.

Detailed Description of the Invention

Specific implementations of the present disclosure will be further described in detail below in conjunction with the accompanying drawings. These implementations are merely intended to describe the present disclosure, rather than to limit the present disclosure.

In the description of the present disclosure, it should be noted that directional or positional relationships indicated by terms such as “center”, “longitudinal”, “transverse”, “upper”, “lower”, “front”, “rear”, “left”, “right”, “vertical”, “horizontal”, “top”, “bottom”, “inner” and “outer” are directional or positional relationships based on the accompanying drawings, are merely intended to facilitate describing the present disclosure and simplifying the description, rather than to indicate or imply that the appointed device or element has to be located in a specific direction or structured and operated in the specific direction so as not to be understood as restrictions on the present disclosure. In addition, terms such as “first” and “second” are for descriptive purposes only, and cannot be understood as indicating or implying the relative importance.

In the description of the present disclosure, it should be noted that terms “mounted”, “connected” and “connection” should be understood in a broad sense unless clearly specified and defined otherwise, for example, “connection” may be fixed connection or detachable connection or integral connection, may be mechanical connection or electrical connection, may be direct connection or indirect connection through an intermediate medium, and may be internal connection of two elements. For those of ordinary skill in the art, specific meanings of the above-mentioned terms in the present disclosure may be understood according to specific situations.

In addition, in the description of the present disclosure, "a plurality of" means two or more unless it may be specifically defined otherwise.

As shown in Fig. 1 to Fig. 14, an embodiment of a floating body system of a photovoltaic floating island provided in the present disclosure is described.

Refer to Fig. 1 to Fig. 3, the floating body system of the photovoltaic floating island in the present embodiment includes buoy assemblies, each of the buoy assemblies is used for supporting a single photovoltaic panel 1 and includes a plurality of supporting buoys 2 arranged at intervals, the single photovoltaic panel 1 is jointly supported by the plurality of supporting buoys 2, and thus, a split-type buoy assembly is formed. Compared with a solution in the prior art that one photovoltaic panel is supported by one buoy, and the size of the buoy needs to be matched with the size of the photovoltaic panel, the present embodiment adopts a solution that the buoy for supporting the single photovoltaic panel is divided into a plurality of supporting buoys 2 which are independent from each other, so that the size of a single supporting buoy 2 is reduced; the single photovoltaic panel 1 is jointly supported by the supporting buoys 2 with smaller sizes, so that the maximum buoyancy which can be provided by the unit weight of the buoy can be effectively increased; a single supporting buoy 2 may have a simple appearance shape, so that it is easy to achieve blow molding, few offcuts are produced, the size of a blowing mold is also small, and the supporting buoy has greater advantages in terms of an effective buoyancy load of a material, processibility as well as transportation and construction efficiencies. Therefore, the purposes of improving and optimizing the economic efficiency, processing convenience, transportation convenience and construction convenience of the floating body system of the photovoltaic floating island can be achieved.

In the present embodiment, appearances of the supporting buoys 2 are preferably columnar bodies hollow inside and are optimally long columns. It should be noted that the long columns do not mean that shapes of cross sections of the supporting buoys 2 are completely consistent in an axial direction, but mean that the supporting buoys 2 approximately have columnar appearances as a whole, which does not exclude that corresponding local concave-convex structures are added to the surfaces of the supporting buoys 2 as required or the appearances of the cross sections of the supporting buoys 2 are adjusted locally as required. In addition, the shapes of the cross sections of the supporting buoys 2 are not limited to a square or a circle, and are determined according to a blow-molding process.

In the present embodiment, the number of the supporting buoys 2 in one buoy assembly is not limited and can be designed according to different usage scenes and functional requirements. For example, in one implementation, refer to Fig. 1 to Fig. 3,

one buoy assembly may be provided with two supporting buoys 2, and the single photovoltaic panel 1 may be jointly supported by the two supporting buoys 2; and in another implementation, refer to Fig. 4 and Fig. 5, one buoy assembly may be provided with three supporting buoys 2, and the single photovoltaic panel 1 may be jointly supported by the three supporting buoys 2.

Preferably, refer to Fig. 2 and Fig. 5, the plurality of supporting buoys 2 in one buoy assembly are arranged in a row in parallel and at intervals, so that the single photovoltaic panel 1 may be more stably supported by the buoy assembly. Preferably, the two supporting buoys 2 on head and tail ends of a row of the supporting buoys 2 are respectively located below two ends of the photovoltaic panel 1, and the remaining supporting buoys 2 are uniformly arranged between the two supporting buoys 2 on the head and tail ends.

In the present embodiment, refer to Fig. 1 and Fig. 4, each supporting buoy 2 in one buoy assembly is connected with a support 3; and refer to Fig. 3, the supports 3 are connected to the supporting buoys 2 on two ends of the supporting buoys 2 and form a height difference. Therefore, all the supports 3 jointly support the single photovoltaic panel 1 on the buoy assembly and enable the photovoltaic panel 1 to form a certain inclination angle relative to a water surface. The support 3 has been described in the prior art so as not to be repeated herein. Refer to Fig. 6, preferably, the supporting buoys 2 are provided with thickened enhancement areas 21, the thickened enhancement areas 21 protrude out of outer surfaces of the supporting buoys 2 and are used for connecting the supports 3 for supporting the photovoltaic panel 1, and the thickened enhancement areas 21 are arranged on two ends, where the supports 3 are mounted, of the supporting buoys 2. Therefore, acting points of the supports 3 on the supporting buoys 2 are provided through the thickened enhancement areas 21, so that the supporting strength can be enhanced. Shapes of the thickened enhancement areas 21 are not limited, for example, the thickened enhancement areas 21 may be shaped like reinforcing ribs protruding out of the outer surfaces of the supporting buoys 2.

The photovoltaic floating island usually includes a plurality of photovoltaic panels 1. In order to support the plurality of photovoltaic panels 1 in the photovoltaic floating island, refer to Fig. 7, the floating body system of the photovoltaic floating island in the present embodiment is provided with a plurality of buoy assemblies, the plurality of buoy assemblies are arranged in an array in a plurality of rows, and a plurality of buoy assemblies are arranged in sequence in each row of buoy assemblies. The number of the buoy assemblies is not smaller than the number of the photovoltaic

panels 1, and thus, each photovoltaic panel 1 is supported by one buoy assembly. Further, the supporting buoys 2 in two adjacent rows of buoy assemblies may be spliced by a row of channel buoys 4 or are connected in a one-to-one correspondence way. That is, a row of channel buoys 4 may be arranged between the supporting buoys 2 in the two adjacent rows of buoy assemblies, and the channel buoys 4 are spliced with the supporting buoys 2 adjacent at two sides to connect the buoy assemblies in the two adjacent rows into an overall structure; or it is also possible that no channel buoys 4 are arranged between the supporting buoys 2 in the two adjacent rows of buoy assemblies, but the supporting buoys 2 of two rows of buoy assemblies are directly connected in a one-to-one correspondence way, so that the two rows of buoy assemblies are connected into an overall structure. Therefore, the plurality of rows of buoy assemblies in the floating body system of the photovoltaic floating island in the present embodiment are connected into an overall structure to form a stable and reliable floating body system.

Preferably, refer to Fig. 8 and Fig. 9, both of the supporting buoys 2 and the channel buoys 4 are provided with connecting lugs 5; two rows of buoy assemblies can be connected by connecting the connecting lugs 5 on the supporting buoys 2 in the two adjacent rows of buoy assemblies, and the channel buoys 4 can be spliced with the supporting buoys 2 by connecting the connecting lugs 5 on the channel buoys 4 and the supporting buoys 2. When the channel buoys 4 are spliced with the supporting buoys 2, the channel buoys 4 are perpendicular to the supporting buoys 2. Refer to Fig. 8, preferably, an end surface of each of two ends of the supporting buoys 2 is provided with one connecting lug 5. Refer to Fig. 9, preferably, an end surface of each of two ends of the supporting buoys 2 is provided with two connecting lugs 5. Refer to Fig. 10, in one implementation, one connecting lug 5 on one supporting buoy 2 may be connected with one connecting lug 5 on two channel buoys 4, and one supporting buoy 2 is spliced with two channel buoys 4 by stacking and connecting three connecting lugs 5.

Refer to Fig. 11, in the present embodiment, the connecting lugs 5 are fixedly connected by a connecting structure. Preferably, through holes are reserved in the connecting lugs 5, the connecting structure may include a big bolt 6 and a big nut 7, during splicing, the connecting lugs 5 to be spliced are stacked and aligned to center the through holes in the connecting lugs 5, then, the big bolt 6 is connected to the big nut 7 after passing through the through holes in all the connecting lugs 5, the big nut 7 is tightened and fixed on the big bolt 6, preferably, the big nut 7 can be locked, and

thus, connection and fixation of all the connecting lugs 5 can be achieved, that is, connection and fixation between two supporting buoys 2 or the channel buoys 4 and the supporting buoys 2 are achieved.

In the present embodiment, refer to Fig. 12, Fig. 13 and Fig. 14, preferably, a plurality of rows of channel buoys 4 are provided, and one or more rows of buoy assemblies are arranged between two adjacent rows of channel buoys 4. That is, in one implementation, refer to Fig. 12, one row of channel buoys 4 may be arranged between every two adjacent rows of buoy assemblies, at the moment, all the supporting buoys 2 in the two adjacent rows of buoy assemblies are spliced by one row of channel buoys 4. In another implementation, refer to Fig. 13, one row of channel buoys 4 may be arranged every other multiple rows (such as three rows) of buoy assemblies, at the moment, the supporting buoys 2 in the two adjacent rows of buoy assemblies on two sides of each row of channel buoys 4 are spliced by the row of channel buoys 4, and other supporting buoys 2 in the two adjacent rows of buoy assemblies are directly connected in a one-to-one correspondence way.

In the present embodiment, refer to Fig. 12, Fig. 13 and Fig. 14, preferably, a row of channel buoys 4 may include a plurality of channel buoys 4 connected in sequence or arranged at intervals. That is, in one implementation, refer to Fig. 12 and Fig. 13, a row of channel buoys 4 includes a plurality of channel buoys 4 connected in sequence, at the moment, each of two ends of one supporting buoy 2 is connected to two channel buoys 4 at the same time. In another implementation, refer to Fig. 14, a row of channel buoys 4 includes a plurality of channel buoys 4 arranged at intervals, at the moment, the channel buoys 4 are hollowed, and each of two ends of one supporting buoy 2 is connected to one channel buoy 4. The arrangement way that the channel buoys 4 are connected in sequence and the hollowed arrangement way that the channel buoys 4 are arranged at intervals may be combined to be applied.

In the present embodiment, in addition to a role in connecting the buoy assemblies into a whole, the channel buoys 4 also play a role in providing operation and maintenance channels for the floating island, at the same time, they can also provide a space and a buoyancy for cable laying on the floating island, and therefore, the floating island wholly floats on the water surface to form a large-scale power generation capacity.

Of course, in the floating body system of the photovoltaic floating island in the present embodiment, the arrangement ways of the channel buoys 4 and the supporting buoys 2 are not limited to the above-mentioned arrangement ways shown in Fig. 12,

Fig. 13 and Fig. 14 and can be flexibly arranged and designed as actually required. In addition, the supports 3 and the photovoltaic panels 1 on a plurality of buoy assemblies can be removed to form channels or fix other relative devices and facilities.

Based on the above-mentioned floating body system of the photovoltaic floating island, the present embodiment further provides a photovoltaic floating island. The photovoltaic floating island in the present embodiment includes photovoltaic panels 1, supports 3 and the above-mentioned floating body system of the photovoltaic floating island in the present embodiment, the supports 3 are mounted on the supporting buoys 2 of the buoy assemblies, and the photovoltaic panels 1 are supported on the supports 3.

In the photovoltaic floating island in the present embodiment, a plurality of photovoltaic panels 1 are provided, correspondingly, the floating body system of the photovoltaic floating island is provided with a plurality of buoy assemblies, and the number of the buoy assemblies is not smaller than the number of the photovoltaic panels 1, so that each photovoltaic panel 1 is supported by one buoy assembly. The plurality of buoy assemblies are arranged in an array in a plurality of rows, the plurality of rows of buoy assemblies are interconnected to form an overall structure, and the supporting buoys 2 of the two adjacent rows of buoy assemblies may be spliced by one row of channel buoys 4 or connected in a one-to-one correspondence way. The supports 3 are connected to the supporting buoys 2 in the thickened enhancement areas 21 on two ends of the supporting buoys 2 and form a height difference, and in one buoy assembly, all the supports 3 on each of the supporting buoys 2 jointly support the single photovoltaic panel 1 on the buoy assembly and enable the photovoltaic panel 1 to form a certain inclination angle relative to a water surface. The supports 3 may be of existing support structures. During construction, firstly, the supports 3 and the photovoltaic panels 1 may be mounted and fixed to the supporting buoys 2 of the corresponding buoy assemblies, then, the plurality of buoy assemblies are arranged in a plurality of rows, a plurality of rows of channel buoys 4 are arranged in a plurality of rows of buoy assemblies, and the supporting buoys 2 of each row of buoy assemblies are connected or spliced into a whole by the channel buoys 4. The arrangement way of the channel buoys 4 and the supporting buoys 2 can be flexibly arranged and designed as actually required.

The above descriptions are merely preferred implementations of the present disclosure. It should be noted that those of ordinary skill in the art may also make several

improvements and substitutions without departing from the technical principle of the present disclosure, and these improvements and substitutions are also considered within the protection scope of the present disclosure.

CLAIMS

1. A floating body system of a photovoltaic floating island, comprising buoy assemblies, each of the buoy assemblies being used for supporting a single photovoltaic panel (1) and comprising a plurality of supporting buoys (2) arranged at intervals, and the single photovoltaic panel (1) being jointly supported by the plurality of supporting buoys (2).
2. The floating body system of the photovoltaic floating island according to claim 1, wherein the supporting buoys (2) are columnar bodies hollow inside.
3. The floating body system of the photovoltaic floating island according to claim 1, wherein the plurality of supporting buoys (2) are arranged in a row in parallel and at intervals.
4. The floating body system of the photovoltaic floating island according to claim 1, wherein the supporting buoys (2) are provided with thickened enhancement areas (21), and the thickened enhancement areas (21) are used for connecting the supports (3) for supporting the photovoltaic panel (1).
5. The floating body system of the photovoltaic floating island according to any one of claims 1 to 4, wherein a plurality of buoy assemblies are provided, and the plurality of buoy assemblies are arranged in an array in a plurality of rows.
6. The floating body system of the photovoltaic floating island according to claim 5, wherein the supporting buoys (2) in two adjacent rows of buoy assemblies are spliced by a row of channel buoys (4) or are connected in a one-to-one correspondence way.
7. The floating body system of the photovoltaic floating island according to claim 6, wherein a plurality of rows of channel buoys (4) are provided, and one or more rows of buoy assemblies are arranged between two adjacent rows of channel buoys (4).
8. The floating body system of the photovoltaic floating island according to claim 6, wherein a row of channel buoys (4) comprises a plurality of channel buoys (4) connected in sequence or arranged at intervals.

9. The floating body system of the photovoltaic floating island according to claim 6, wherein both of the supporting buoys (2) and the channel buoys (4) are provided with connecting lugs (5).

10. The floating body system of the photovoltaic floating island according to claim 9, wherein when the connecting lugs (5) on the adjacent supporting buoys (2) are stacked or the connecting lugs (5) on the supporting buoys (2) and the channel buoys (4) are stacked, the connecting lugs (5) are connected by a big bolt (6) and a big nut (7).

11. A photovoltaic floating island, comprising photovoltaic panels (1), supports (3) and the floating body system of the photovoltaic floating island according to any one of claims 1 to 10, the supports (3) being mounted on the supporting buoys (2) of the buoy assemblies, and the photovoltaic panels (1) being supported on the supports (3).