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KOJRO(10) **Pub. No.: US 2009/0075740 A1**(43) **Pub. Date: Mar. 19, 2009**(54) **UNDERWATER AND MIDAIR OBSERVATION**
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RONALD E. GREIGG**GREIGG & GREIGG P.L.L.C.****1423 POWHATAN STREET, UNIT ONE****ALEXANDRIA, VA 22314 (US)**(51) **Int. Cl.**
A63G 27/00 (2006.01)(52) **U.S. Cl.** **472/45**(57) **ABSTRACT**

In an underwater and midair observation apparatus, a casing made of a substantially transparent material and the upper part of which is open, is arranged from the underwater to the water surface whereby an observation wheel maybe operated in a state of being isolated from the water.

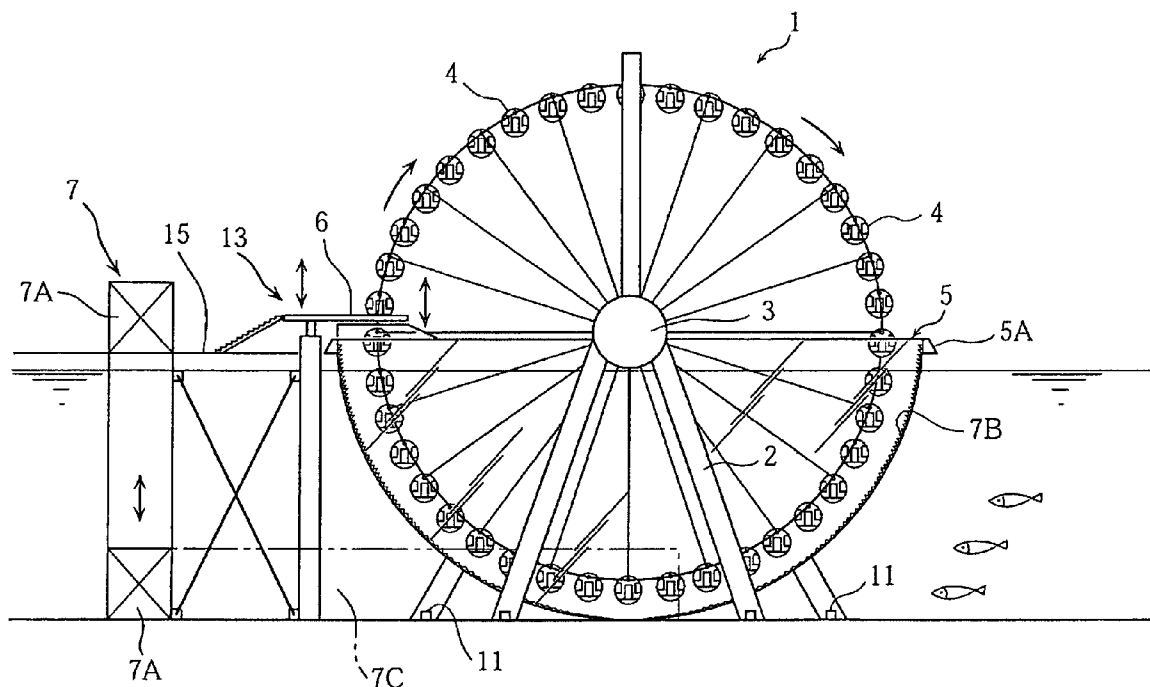
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Fig. 1

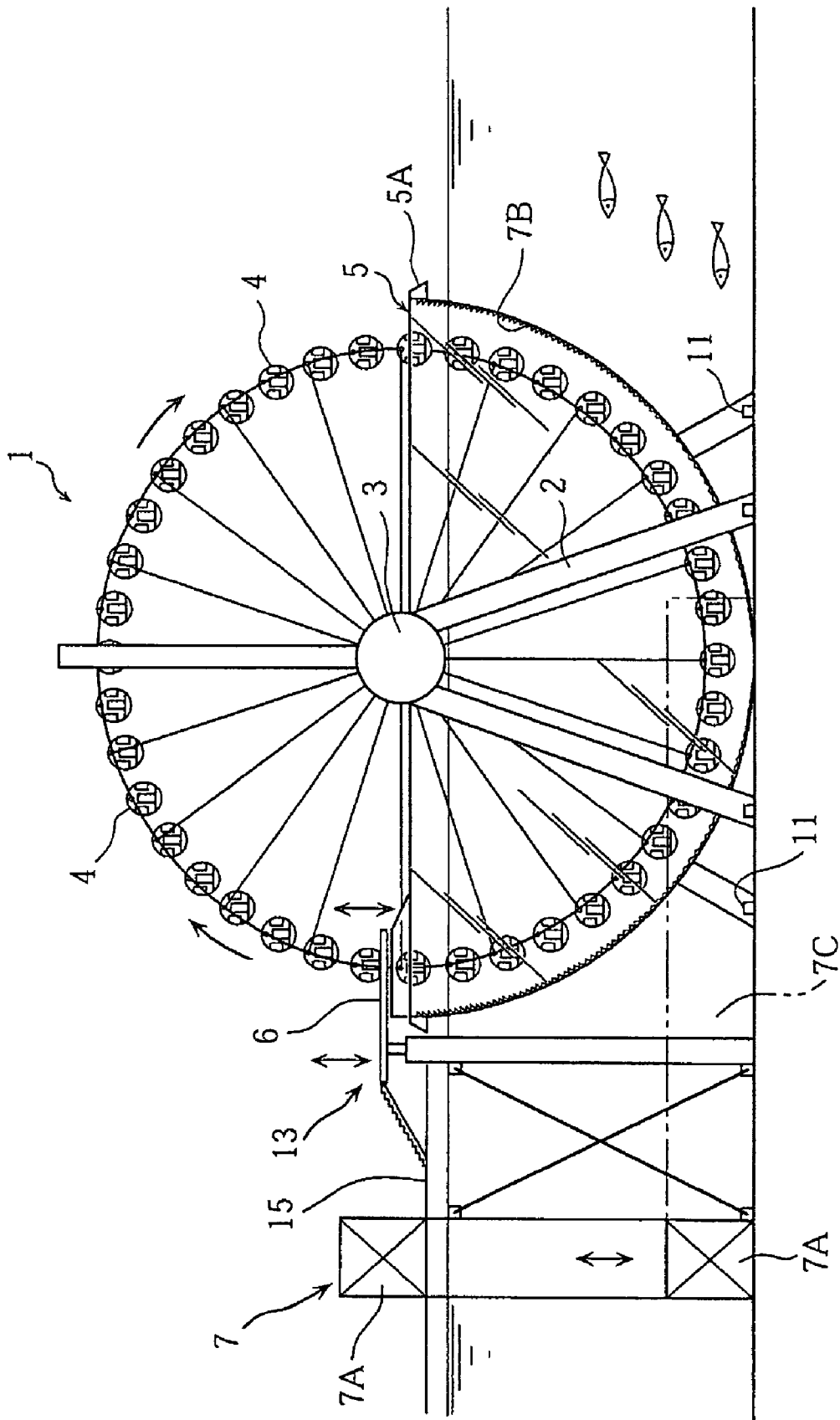


Fig. 2

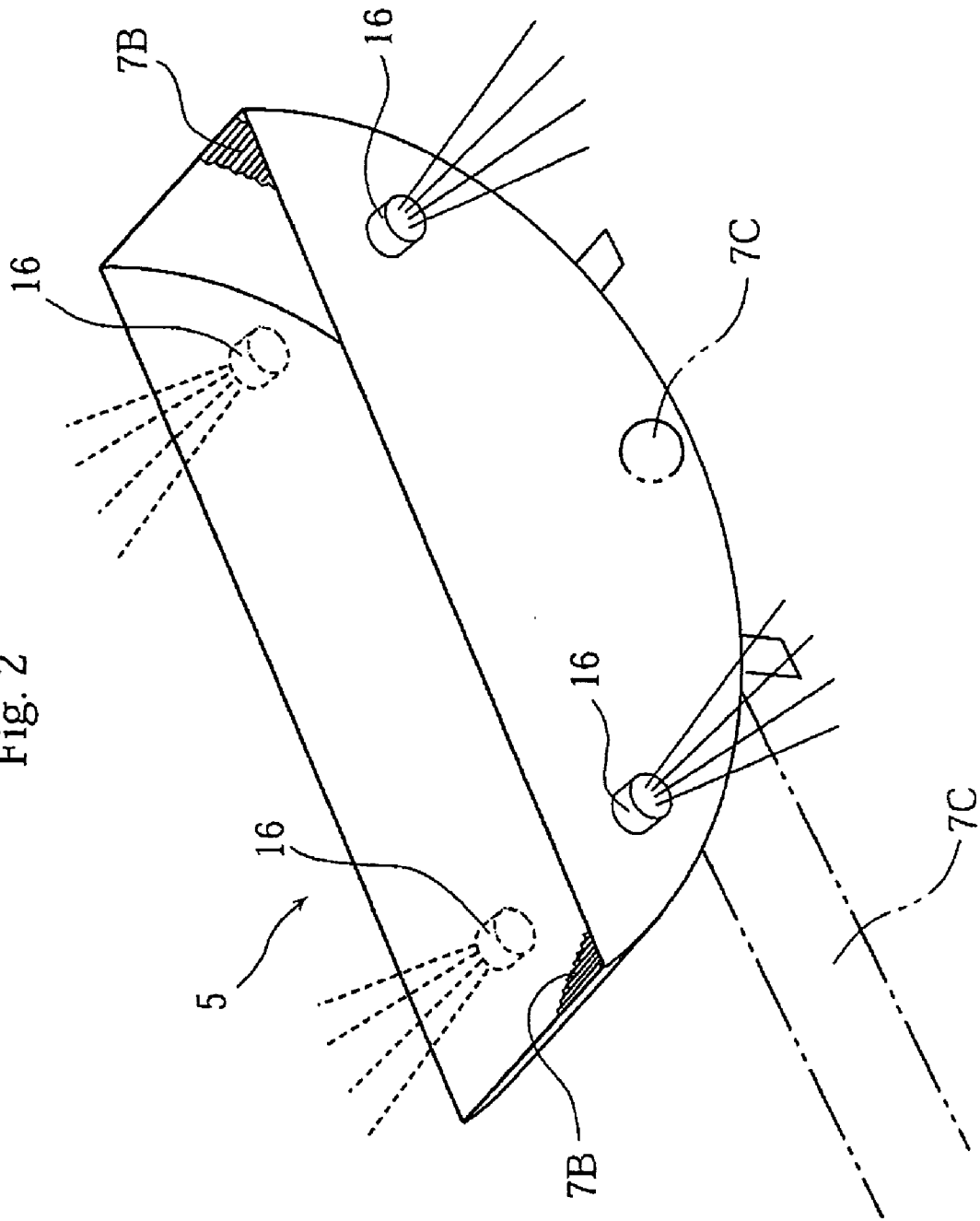


Fig. 3

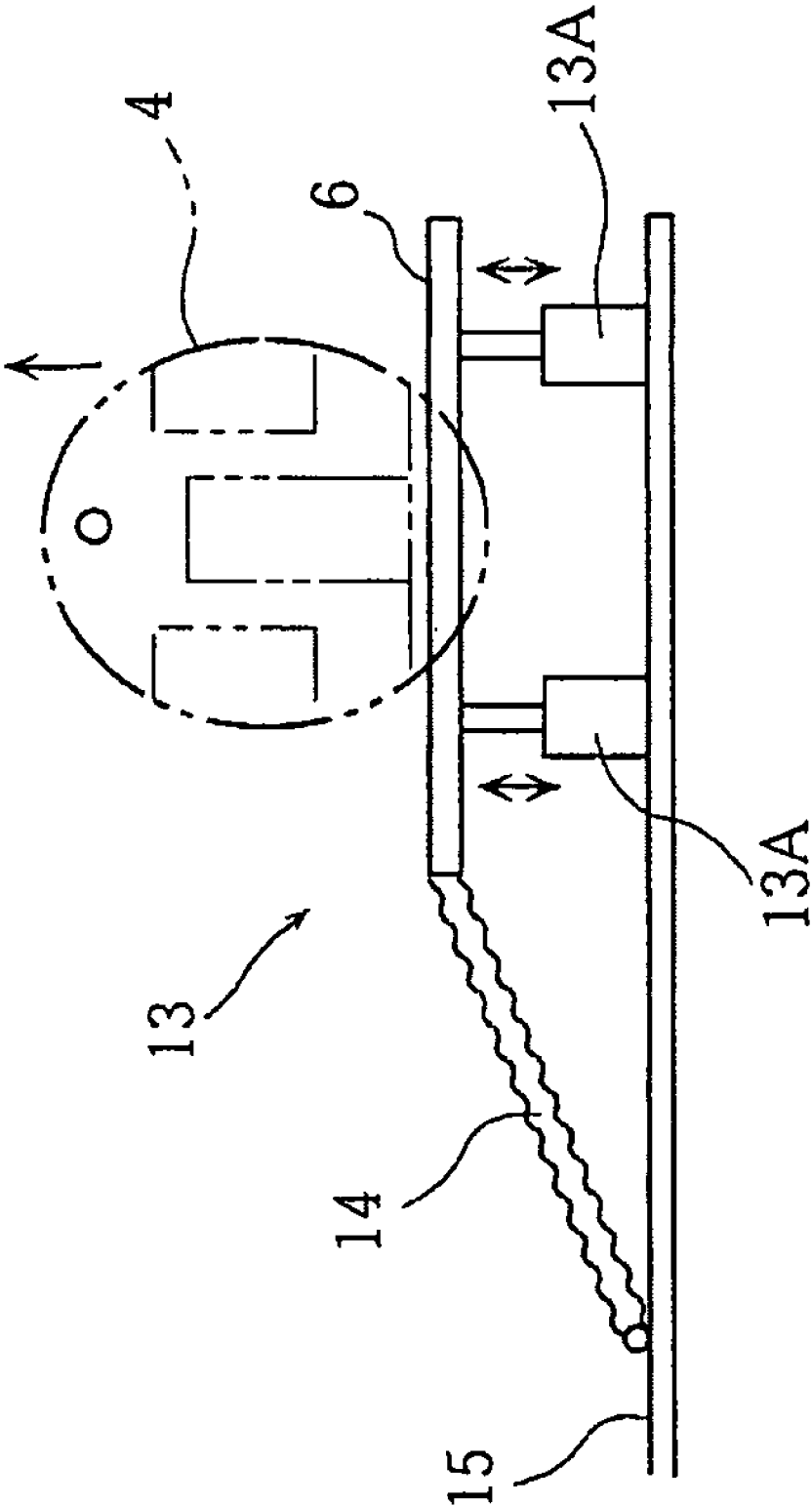
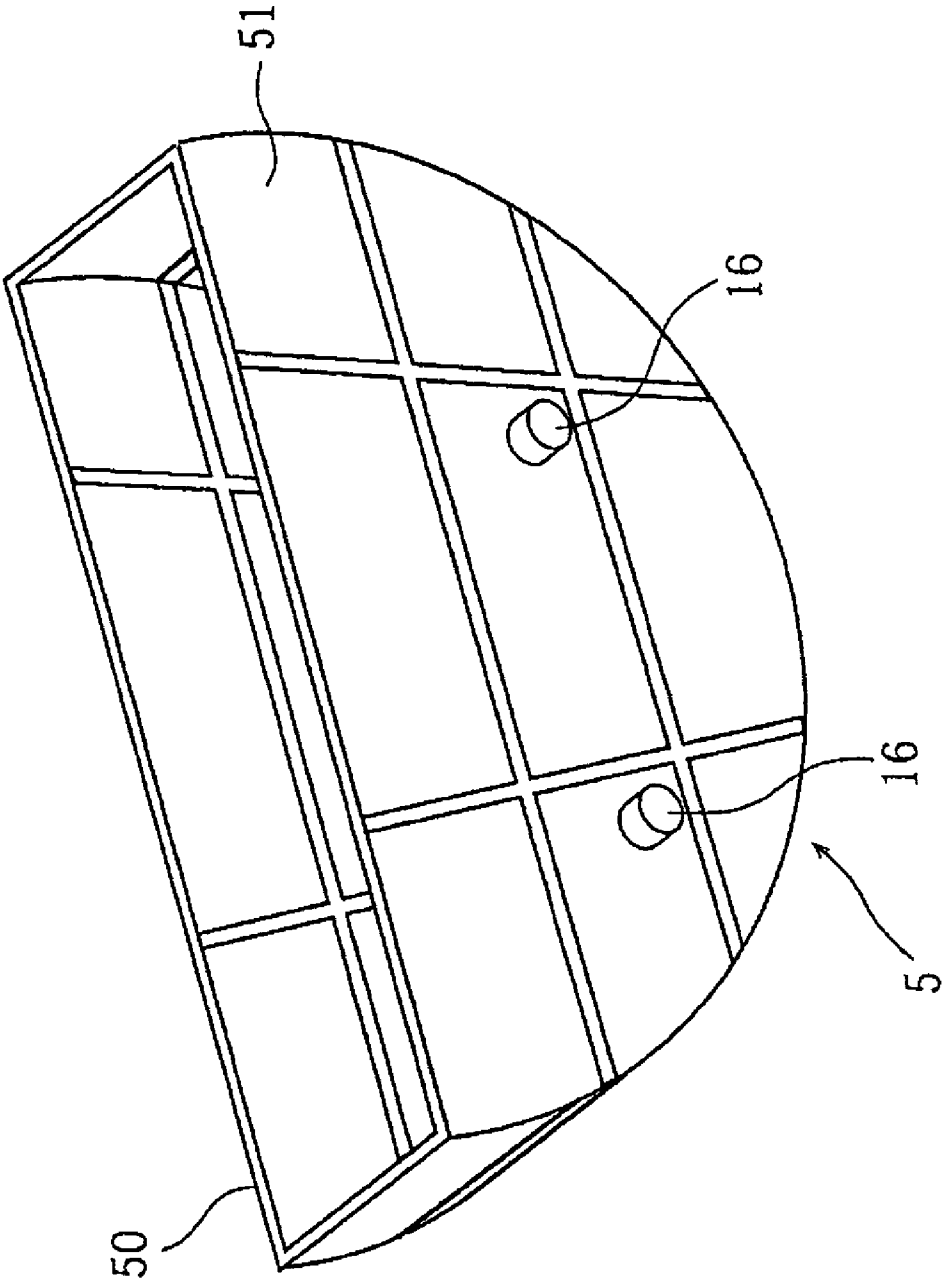


Fig. 4



UNDERWATER AND MIDAIR OBSERVATION APPARATUS

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application is based on Japanese Patent Applications 2006-283079 filed 19 Sep. 2006 and number not yet available filed 18 Sep. 2007, upon which priority is claimed.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to an observation wheel apparatus (Ferris wheel) installed in an amusement park, a theme park, a marine park, or the like. More particularly, the present invention relates to an underwater and mid-air observation apparatus in which part of the observation wheel moves underwater to enable an underwater viewing.

[0004] 2. Description of the Prior Art

[0005] The observation wheel including a number of gondolas moored to a large circular wheel is to enjoy a view from a high position. Various types of observation wheels of this kind are installed and operated, while an underwater observation wheel for enjoying the underwater view and the underwater and midair observation wheel for enjoying both of the midair view and the underwater view are suggested these days since it is good to be able to enjoy not only the midair view but also the underwater view (including marine animals) in a continuous manner. On the basis of this background, it is considered desirable to install an underwater observation wheel or the underwater and midair observation wheel in an artificial pond of the amusement park, the seaside of the marine park or the like.

[0006] One conventional underwater and midair observation wheel disclosed in Japanese Patent Publication H05-154256 employs a gondolas having a hermetically sealed structure which moves underwater. Japanese Patent Publication H07-75690 discloses the use of gondolas having an ordinary stricture similar to an ordinary midair observation wheel, but which are provided with a cover covering the whole movement locus of the gondolas.

[0007] In the above-mentioned observation wheel having the gondolas with the hermetically sealed structure it takes long time for the large-diameter wheel, which rotates comparatively slowly, to rotate 360 degrees and return to a position for getting on and off. Therefore it is necessary to provide a device for supplying oxygen while the gondolas move at least in the water. The device is expensive and high operating cost is incurred. Further, it is dangerous when the level of oxygen goes high.

[0008] In other form of conventional underwater and mid-air observation wheels, in which a cover is provided to cover the whole movement locus of the gondola, The gondolas move in a donut-shaped tube body. In this structure of having a donut-shaped tube body, there is the problem that a passage for evacuation cannot be secured easily, being disturbed by the gondolas when the observation wheel stops, for example due to an accident. Further, when the cover is damaged in the water and the water leaks into the cover, it is more dangerous since the inside of the tube-like body is immersed even when the passengers can get out of the gondolas. When moving in the air, since the gondolas move inside the tube body, the passengers are covered by both of the gondolas and the tube

body, which is made of a transparent material, they have a cooped-up feeling, and it is difficult to enjoy the liberating feeling.

SUMMARY OF THE INVENTION

[0009] An object of this invention is to provide an underwater and midair observation apparatus which eliminates the need for an airtight structure of the gondolas by installing a simply structured casing separately from the observation wheel, and enabling easy evacuation when the observation wheel is stopped by accident, power failure or the like.

[0010] To achieve the above-mentioned object, an underwater and midair observation apparatus of the present invention comprises an observation wheel **1**, a trough-like casing **5** with an open top made of a substantially transparent material and arranged from the underwater to the water surface so that the observation wheel **1** may be operated in a state of being isolated from the water.

[0011] Further, to achieve the above-mentioned object, an underwater and midair observation apparatus of the present invention comprises an observation wheel **1** rotating around a rotary axis **3** supporting legs **2** erected on the bottom of a water body to mount the observation wheel **1** for rotation around the rotary axis **3** so that substantially the lower half of the rotational trajectory of the observation wheel **1** maybe positioned under the water; and the casing **5** made of a substantially transparent material and covering the movement locus of gondolas **4** of the observation wheel **1** in a state that the upper part is open; said casing **5** being arranged from the underwater to the water surface, whereby the observation wheel **1** can be operated in a state of being isolated from the water.

[0012] The word “underwater” in the present invention means “under the naturally existing surface of a body of water like the sea, a lake, etc.” or “under the surface of an artificial lake, pond, pool, etc.”

[0013] The expression “state of being isolated from the water” in the present invention means the state that a part of the observation wheel (gondolas) exists below a level of the water surface but it is not in direct contact with the water.

[0014] The rotary axis **3** may either be uniaxial or biaxial. The observation wheel **1** may not have a shape of the large-diameter wheel but may be the one in which the gondolas rotate on an oblong trajectory by a conveyer system.

[0015] According to the present invention, the observation wheel apparatus enabling underwater and midair viewing can be provided inexpensively by arranging a simply structured substantially transparent casing from the underwater to the water surface separately from the observation wheel without making the gondolas airtight. In addition, there is an advantage of easy evacuation when the observation wheel stops by accident, since the upper part of the casing is open.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] Other features of the invention will be described more fully herein below, with reference to the drawings, in which:

[0017] FIG. **1** is a front elevation view of the underwater and midair observation apparatus of this invention,

[0018] FIG. **2** is a perspective view of the casing of the underwater and midair observation apparatus of this invention,

[0019] FIG. 3 is a simplified front view of the loading and unloading mechanism of the underwater and midair observation apparatus of this invention, and

[0020] FIG. 4 is a perspective view of an alternate embodiment of the casing of the midair observation apparatus of this invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0021] A preferred embodiment of an underwater and mid-air observation device of this invention is described in detail hereinafter based on the drawings.

[0022] The embodiment described here is an underwater and midair observation device intended to be installed on a shore of an artificial lake (regardless of whether the water is seawater or freshwater) constructed in an amusement park or a theme park.

[0023] The supporting legs 2 (frame steel structure) are erected in the bottom of the lake, and the observation wheel 1 rotating around the rotational axis 3, is mounted on the supporting legs 2 so that the substantially lower half of the rotational trajectory of the observation wheel 1 may be positioned below the water surface.

[0024] The observation wheel 1 is driven by an electric motor (not shown) as in the conventional observation wheel, and a number of gondolas 4 are pivotally connected to the large-diameter wheel in a hanging manner, and are rotated at a low speed. Since this structure is substantially the same as that of known observation wheel in general, detailed explanation is omitted here.

[0025] The casing 5, which is made of transparent material covering the movement locus of the gondolas 4 of the observation wheel 1 in a state that the upper part is open, is arranged to extend from the underwater to the water surface. In this embodiment, the casing 5 is fixed by connecting implements (bolts) 11 at a plurality of predetermined positions of the supporting legs 2. The gondolas 4 positioned below the rotary axis 3 of the observation wheel 1 move inside the casing 5 so that the wheel may be operated in the state in which gondolas are isolated from the water.

[0026] A plurality of pressure-resistant glass plates are used as a component material of the casing 5. The casing 5 is structured by assembling the plates of pressure-resistant glass, in this embodiment. Plates of reinforced plastic may also be used for the casing 5. The casing 5 may be fixed to the bottom of the lake by an anchor without being fixed to the supporting legs 2. In this case, when the casing is structured to have the size that covers not only the gondolas 4 but also the supporting leg 2, the supporting legs 2 themselves may also be isolated from the water, by which corrosion (by the seawater, in particular) is avoided.

[0027] As shown in FIG. 2, the casing 5 is structured to form a substantially semi-circular drum-shape. The substantially semi-circular shape here means a semi-circular arc at the position below the rotary axis 3 of the wheel of the observation wheel. However, it is sufficient as long as the casing 5 has the size covering the part of the wheel immersed under the water. So it may have the semi-circular shape of the size that also covers the part above the rotary axis 3. Therefore, the casing 5 may be formed as a rectangular box or other shape.

[0028] Further, part of the casing 5 constitutes the loading and unloading step 6. In other words, an upper edge of the opening part of the casing 5 is extended to face a boarding

passage or walkway arranged in an extending manner from the lake-side. In the upper opening part of the casing 5, the opening edge is bent from the inside to the outside at a predetermined height position higher than the water surface to form a splash blocking or shield part 5A, so that the splash may not enter into the casing 5 from the upper opening part from waves on the surface of the lake. In addition to forming a splash shield 5A at the upper opening part of the casing 5, the splash shield 5A may also be formed on an outer surface of the casing 5 at the position lower than the opening part of the casing 5 as a guard-shaped body.

[0029] An ascending and descending mechanism (ladder or steps) for evacuation 7 is provided inside the casing 5. The mechanism 7 may be used for ordinary boarding the gondolas 4, instead of a boarding ramp mechanism 13 which is referred to hereinafter. Here, an elevator 7A is placed near the casing 5. A lower boarding position of the elevator 7A is arranged near the bottom of the lake. The upper boarding position is arranged near the step 6 in a manner communicating with the inside of the casing 5 by the intermediary of a passage or tunnel 7C. Steps 7B are formed from the bottom side of the lake to the side of the upper opening part along the movement locus of the gondolas 4 and on the inside of the casing 5 facing boarding or access doors of the gondolas 4. It is preferable to provide a handrail along the steps 7B. The passengers who can go up the steps 7B evacuate to the upper opening part and the passengers who can not do so, get off to the bottom side of the lake and take the elevator 7A through the passage 7C of tunnel when they get out of the gondolas 4 upon an emergency stop. When the observation wheel has a very large diameter, the boarding position may be established in the middle of the elevator 7A. Therefore, at least either one of the elevator 7A or the steps 7B may serve as the evacuating ascending/descending mechanism 7.

[0030] A problem in this kind of underwater and midair observation device is how the passengers get on or off the gondolas 4. In other words, in a general observation wheel, since a predetermined period (6 to 10 seconds) for the horizontal movement in a direction of a tangential line of the wheel is assured at the lowest position, the passengers can get on or off the gondolas 4 easily during the substantially horizontal movement. However, when a half of the wheel is positioned under the water, passengers get on or off the gondolas 4 near a level of the water surface, where, in this case, the gondolas 4 are moving generally vertically (clockwise in a front view). Therefore, it is practically impossible for the passengers to get on or off the gondolas 4 while moving in a vertical direction.

[0031] To solve the problem, in this embodiment, a boarding mechanism 13 is provided in a manner that the boarding step 6 is moved up vertically in the rotational direction by a predetermined rotational angle by using a hydraulic cylinder 13A at a speed synchronous with the rotational speed of the observation wheel 1. The mounting or boarding step 6 is moved down to the original position quickly. The next passengers step on the boarding step 6 at the lowered position. When a target gondola 4 comes, the boarding step 6 is moved up by the hydraulic operation by a predetermined height distance at a speed synchronous with the rotational speed of the observation wheel 1. During the upward movement, there is no relative displacement between the gondola 4 and the passengers, and the boarding is facilitated. In the drawings, 14 shows an extensible slope connecting the boarding step 6 to an outside fixed passage 15, in which a number of floor

members are connected by a chain so that it may follow the ascending and descending of the boarding step 6.

[0032] The hydraulic cylinders 13A serving as part-of the boarding mechanism 13 may be replaced with a mechanical means using a screw shaft or the like.

[0033] Further, the casing 5 is provided with a lighting device 16 at a plurality of places for illumination in right and left directions, in other words, in the direction of an axis line of the rotary axis 3 of the observation wheel 1. The lighting devices 16 are for illuminating the bottom of the lake or the underwater, and are used when the observation wheel 1 is operated in early evenings, at nights and/or on cloudy days.

[0034] FIG. 4 shows an example of another form of the casing 5. The casing 5 comprises a steel frame 50 in the form of a grid, and substantially transparent reinforced glass plates 51 are fitted into the steel frame of grid 50. By arranging the steel frame 50, rigidity of the whole casing 5 is enhanced, a high water pressure can be borne, and an area of each of the reinforced glass plates 51 is made small according to the size of sections, so that it may be easier for the glass plates 51 to bear the water pressure. The number 16 shows the lighting devices.

[0035] Since the underwater and midair observation apparatus of this invention can be materialized easily by arranging the casing without modifying an existing observation wheel, it can be installed in various places like seashore, a lake-side, an artificial pond or the like, enabling materialization in a wide field.

[0036] It is preferable that a boarding step 6 is provided above the water to face the part of the observation wheel 1 where a component of vertical movement is large. The boarding step 6 is preferably structured to move up and down by a predetermined rotational angle in a direction substantially the same as the rotation at a speed synchronous with the rotational speed of the observation wheel 1.

[0037] In the state that the substantially lower half of the observation wheel 1 is positioned underwater, it is possible to get on and off the gondolas 4 at the lowest end position of the observation wheel (like the case of the conventional observation wheel), however, in this embodiment, the boarding step 6 is provided to move up and down at the position where the component of vertical movement is large, in other words, at the horizontal and lateral directional position of the rotary axis 3 of the observation wheel 1, whereby the passengers can get on and off the gondolas 4 above the water easier.

[0038] It is preferred to structure the casing 5 to form a substantially semi-circular d-shape, and to mount an ascending and descending mechanism for evacuation 7 on the casing 5.

[0039] Thus, by structuring the casing 5 to form the substantially semi-circular drum-shape, the whole is made small and the effect of the water pressure is minimized. Further, by arranging the ascending and descending mechanism for evacuation 7, the passengers of the gondolas positioned in the water can get out of the gondolas 4 and can evacuate to the ground by the evacuating ascending/descending mechanism 7 when the observation wheel 1 stops as by accident.

[0040] The ascending and descending mechanism for evacuation 7 may be a lift (an elevator), an escalator, steps, a ladder or the like.

[0041] Further, it is preferable that the casing 5 is provided with a plurality of lighting means (device) 16 for illuminating the underwater.

[0042] By mounting a plurality of lighting means (device) 16, the underwater can be sufficiently illuminated on cloudy days, in early evenings and at nights, so that the passengers can enjoy underwater observation.

1-5. (canceled)

6. An underwater and midair observation apparatus comprising;

an observation wheel, and

a casing with an open top made of a substantially transparent material and arranged from the underwater to the water surface whereby the observation wheel can be operated in a state of being isolated from the water.

7. An underwater and midair observation apparatus comprising;

an observation wheel having a plurality of gondolas thereon,

supporting legs erected on and projecting upwardly from the bottom of a body of water to mount the observation wheel so that substantially the lower half of a rotational trajectory of the observation wheel may be positioned below the water surface; and

an open-topped casing made of a substantially transparent material, the casing receiving and covering the movement locus of gondolas of the observation wheel; said casing being arranged from the underwater to the water surface, whereby the observation wheel can be operated with its lower portion projecting into the casing and isolated from the water.

8. The underwater and midair observation apparatus claimed in claim 6, further comprising a boarding platform at a position above the water and adjacent the observation wheel at a location where a component of vertical movement of the observation wheel is large, and means mounting the boarding platform for movement up and down by a predetermined rotational angle in the direction substantially the same as the rotation of the observation wheel at a speed synchronous with the rotational speed of the observation wheel.

9. The underwater and midair observation apparatus claimed in claim 7, further comprising a boarding platform at a position above the water and adjacent the observation wheel at a location where a component of vertical movement of the observation wheel is large, and means mounting the boarding platform for movement up and down by a predetermined rotational angle in the direction substantially the same as the rotation of the observation wheel at a speed synchronous with the rotational speed of the observation wheel.

10. The underwater and midair observation apparatus claimed in claim 6, wherein the casing is formed to have a semi-circular drum-shape, and the casing is provided with an ascending and descending mechanism for evacuation.

11. The underwater and midair observation apparatus claimed in claim 7, wherein the casing is formed to have a semi-circular drum-shape, and the casing is provided with an ascending and descending mechanism for evacuation.

12. The underwater and midair observation apparatus claimed in claim 8, wherein the casing is formed to have a semi-circular drum-shape, and the casing is provided with an ascending and descending mechanism for evacuation.

13. The underwater and midair observation apparatus claimed in claim 9, wherein the casing is formed to have a semi-circular drum-shape, and the casing is provided with an ascending and descending mechanism for evacuation.

14. The underwater and midair observation apparatus claimed in claim 6, wherein the casing further comprises a plurality of lighting means for illuminating the underwater.