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(54) **An underwater lifting platform for a pool**

(57) An underwater lifting platform for water show, the lifting platform is disposed in a pool, the pool comprises a water zone (2) above the bottom (1) of the pool for water storage and a foundation pit (3) below the bottom of the pool for accessing by a personnel for maintenance and apparatus installation, and the lifting platform comprises a power mechanism (4) disposed in the foundation pit, a stage mechanism (5) disposed in the water zone (2) and a lifting rod (6) connecting the drive mechanism (4) with the platform structure (5) through the bottom of the pool.

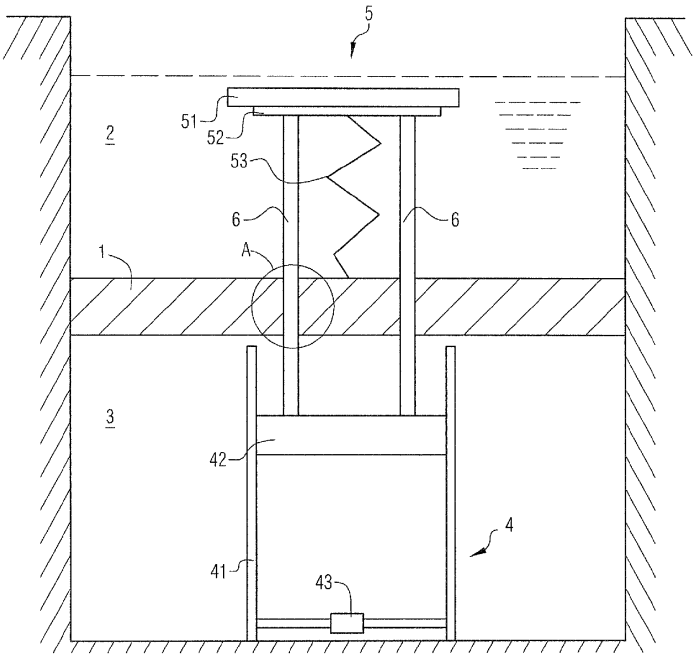

Figure 1

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Description

TECHNICAL FIELD

[0001] The present invention relates to a lifting platform, and particularly relates to an underwater lifting platform for water show.

[0002] It relates to an underwater lifting platform as described in the preamble of claim 1.

BACKGROUND ART

[0003] Modem shows require coordination of scenes and shows, as well as fast changes and movement of the cues and scenes. Thus, when performing a water show, it is needed that an underwater lifting platform moves underwater props into the vision of the audiences, or the underwater lifting platform rises above the water according to requirement of the show, in order to provide a show stage above the water for the performers.

[0004] So far, for underwater lifting platforms which are available domestically and overseas, the transmission mechanism thereof is usually disposed in water, and is configured to be driven hydraulically. The following potential risks lie in such configuration:

1. There may be situations that hydraulic oil leaks into the water and pollutes the water, which will in turn suspend the show;
2. Since the transmission mechanism of the existing lifting systems is disposed in water, there is a problem of utilizing electricity in water; even if the drive mechanism of some lifting systems is disposed outside of water, it is short of a perfect water-electricity isolation system; when the drive mechanism transmits power to the transmission mechanism in water, there is a potential risk of water being charged when the water-electricity isolation fails;
3. Since the drive mechanism is disposed in water, there are problems of leakage of lubricating medium and rust protection of materials. If the lubricating medium is leaked, the water will be polluted; and if rust protection of materials is not well accomplished, the transmission member will rust and degrade in structural strength, which brings potential safety risks and requires repairing, resulting in suspension of the show.

SUMMARY OF THE INVENTION

[0005] The present invention provides an underwater lifting platform for water show, which may mitigate and avoid the above mentioned problems.

[0006] In order to solve the above problems, the present invention provides an underwater lifting platform for water show according to claim 1.

[0007] Other characteristics of the invention are mentioned in claims 2 to 6.

[0008] In the underwater lifting platform for water show as provided by the present invention, with both of the drive component and the transmission component disposed in the dry foundation pit below the pool, the drive and transmission components are prevented from water, thereby water pollution due to the leakage of hydraulic oil into the water and the potential safety risks of water being charged due to electric leakage when using electricity in water are eliminated. Further, in the underwater lifting platform for water show as provided by the present invention, power is transmitted between the dry foundation pit and water zone of the pool through the lifting rod with a simple structure, thereby the problems of leakage of lubricating medium and rust protection of materials when the transmission mechanism is disposed in water are avoided.

DETAILED DESCRIPTION OF THE DRAWINGS

[0009] It is intended that the accompanying figures are descriptions and explanations illustrative of the present invention, and do not impose any limitations to the scope of the present invention.

- Figure 1 is a schematic view showing the structure of the underwater lifting platform for water show, according to an embodiment of the present invention;
- Figure 2 is a partially enlarged schematic sectional view of zone A of the lifting platform shown in Figure 1;
- Figure 3 is a partially enlarged schematic sectional view of the first sliding sleeve of the lifting platform shown in Figure 2;
- Figure 4 is a partially enlarged schematic sectional view of the second sliding sleeve of the lifting platform shown in Figure 2.

[0010] For better understanding the technical features, objectives and effects of the present invention, embodiments of the present invention are illustrated with reference to the figures, in which like components are designated by like reference numerals.

[0011] The structure and principle of the underwater lifting platform for water show according to the present invention are illustrated in detail with reference to the figures.

[0012] Figure 1 is a schematic view showing the structure of the underwater lifting platform for water show, according to an embodiment of the present invention. Referring to Figure 1, the present invention provides an underwater lifting platform for water show, the lifting platform is disposed in a pool, the pool comprises a water zone 2 above the bottom 1 of the pool for water storage and a foundation pit 3 below the bottom 1 of the pool for accessing by a personnel for maintenance and apparatus installation, and the lifting platform comprises a power mechanism 4 disposed in the foundation pit, a stage mechanism 5 disposed in the water zone and a lifting rod

6 connecting the drive mechanism 4 with the platform structure 5 through the bottom of the pool;

[0013] The platform structure 5 comprises a stage body 51, a supporting frame 52 connected to the stage body 51 and a guiding device 53 connected with the supporting frame 52 and the bottom 1 of the pool respectively;

[0014] The drive mechanism 4 comprises a guiding steel rack 41 fixed on the bottom of the foundation pit 3, a guiding frame 42 which is connected with the guiding steel rack 41 and can move upwards and downwards along the guiding steel rack 41, and a driving motor 43 connected with the guiding frame 42;

[0015] The bottom 1 of the pool is provided with a hollow through-hole, the through-hole is provided with a sliding sleeve, and the lifting rod 6 is connected with the supporting frame 52 and the guiding frame 42 respectively through the sliding sleeve.

[0016] With the drive mechanism 4 of the lifting platform disposed in the dry foundation pit 3 below the pool, the drive and transmission components are prevented from water, thereby water pollution due to the leakage of hydraulic oil into the water and the potential safety risks of water being charged due to electric leakage when using electricity in water are eliminated. The lifting rod 6 can be stainless steel tube and power is transmitted between the dry foundation pit 3 and water zone 2 of the pool through the stainless steel tube lifting rod with a simple structure, thereby the problems of leakage of lubricating medium and rust protection of materials when the transmission mechanism is disposed in water are avoided.

[0017] When performing a show, the stage body 51 rises above the water to carry performers and props. The supporting frame 52 provides structural strength support for the stage body 51. When there is no ongoing show, the supporting frame 52 and the stage body 51 may be lowered to the bottom 1 of the pool by lowering the lifting rod 6, thereby space occupation of the water zone 2 is decreased, without affecting applications of the pool as swimming pool or diving pool. The guiding device 53 may be one or more groups of foldable metal frames, for ensuring that there is no lateral displacement of the supporting frame 52 and the stage body 51 during lifting and use.

[0018] With the driving motor 43, the guiding frame 42 may be moved upwards and downwards along the guiding steel rack 41, thereby the lifting rod 6 is capable of bringing the supporting frame 52 and the stage body 51 up and down. The driving motor 43 may be installed at a site chosen flexibly, and may be fixed at the bottom of the foundation pit, or may be fixed on the guiding steel rack 41. The driving motor 43 may be connected to the guiding frame 42 through components such as a brake, a commutation reducer, driving shaft and so on, to drive the guiding frame 42.

[0019] The guiding steel rack 41 may be further provided with a counterweight device connected with the guiding frame 42, such that driving requirement of the guiding frame 42 may be fulfilled with a driving motor 43 having relatively low power.

[0020] Figure 2 is a partially enlarged schematic sectional view of zone A of the lifting platform shown in Figure 1; Figure 3 is a partially enlarged schematic sectional view of the first sliding sleeve of the lifting platform shown in Figure 2; and Figure 4 is a partially enlarged schematic sectional view of the second sliding sleeve of the lifting platform shown in Figure 2. Referring to Figs. 2-4, in a preferred embodiment, the sliding sleeve comprises a first sliding sleeve 7 disposed in the water zone and a second sliding sleeve 8 disposed in the foundation pit, the first sliding sleeve 7 is connected to an upper surface of the bottom 1 of the pool with a first sealing assembly 9, and the second sliding sleeve 8 is connected to an lower surface of the bottom 1 of the pool with a second sealing assembly 10;

[0021] The first sealing assembly 9 comprises a first base 91, a first supporting member 92 and a first positioning member 93 sequentially connected by bolts, and the first base 91 is fixedly connected to the upper surface of the bottom 1 of the pool by bolts;

[0022] The first sliding sleeve 7 comprises a first sliding sleeve cover 71, a first stopper member 72, a first sealing gasket 73 sequentially connected by bolts, the first sliding sleeve cover 71 is fixedly connected with the first positioning member 93 by bolts, and a first sealing member 74 is disposed between the first sliding sleeve cover 71 and the lifting rod 6;

[0023] The second sealing assembly 10 comprises a second base 101, a second supporting member 102 and a second positioning member 103 sequentially connected by bolts, and the second base 101 is fixedly connected with a lower surface of the bottom 1 of the pool by bolts; the second sealing assembly 10 further comprises a position adjusting member 104, and the second position adjusting member 104 is connected through clamping by the second positioning member 103 and the second supporting member 102;

[0024] The second sliding sleeve 8 comprises a second sliding sleeve cover 81, a second stopper member 82 sequentially connected by bolts, the second sliding sleeve cover 81 is fixedly connected with the position adjusting member 104 by bolts, and a second sealing member 83 is disposed between the second sliding sleeve cover 81 and the lifting rod 6.

[0025] The sliding sleeve comprises a first sliding sleeve 7 disposed in the water zone and a second sliding sleeve 8 disposed in the foundation pit, the first sliding sleeve 7 is connected to the upper surface of the bottom 1 of the pool through a first sealing assembly 9, and the second sliding sleeve 8 is connected to the lower surface of the bottom 1 of the pool through a second sealing assembly 10; as such, when maintaining the lifting platform, the respective sliding sleeve or sealing assembly may be replaced without draining of water inside the pool, which greatly saves the cost of repair and maintenance.

[0026] The inner diameter of the first base 91 and the second base 101 is the same as the diameter of the through-hole of the bottom 1 of the pool. As a base for mounting the corresponding sliding sleeves or sealing assembly, the first base 91 and the second base 101 may fixedly connected with the bottom 1 of the pool by bolts distributed uniformly around the circumference.

[0027] The first supporting member 92 and the second supporting member 102 are used to adjust the installation position of the respective sliding sleeves, such that the respective sliding sleeves are at convenient position for handling when performing assembling operations.

[0028] While the diameter of the through-hole of the bottom 1 of the pool remains unchanged, with use of the first positioning member 93 and the second positioning member 103, the lifting rod 6 and corresponding sliding sleeves with different diameters may be installed at the bottom 1 of the pool.

[0029] The first sliding sleeve cover 71 and the second sliding sleeve cover 81 press the first sealing member 74 and the second sealing member 83 against the lifting rod 6, such that water in the water zone 2 would not leak to the foundation pit 3 during rise and fall of the lifting rod 6. The first stopper member 72 and the second stopper member 82 coordinate with the first sliding sleeve cover 71 and the second sliding sleeve cover 81 respectively to limit the stroke of the first sealing member 74 and the second sealing member 83, so as to avoid a situation that the first sliding sleeve cover 71 and the second sliding sleeve cover 81 deviate from their operation position and cause leakage of water from water zone 2 to the foundation pit 3.

[0030] The first sealing gasket 73 is disposed above the first stopper member 72. Under the gravity of water, the first sealing gasket 73 is more capable of preventing water of the water zone 2 from leaking to the junction of the first sliding sleeve 7 and the lifting rod 6.

[0031] The second sealing assembly 10 further comprises a position adjusting member 104, and the position adjusting member 104 is connected through clamping by the second positioning member 103 and the second supporting member 102; when maintaining the lifting platform, the position of the position adjusting member 104 may be adjusted flexibly by adjusting the position of the second positioning member 103, so that the perpendicularity of the lifting rod 6 may be adjusted.

[0032] In a preferred embodiment, referring to Figure 2, a sleeve 61 is disposed between the first sealing assembly 9 and the second sealing assembly 10 and sleeved at the outer side of the lifting rod 6, the first sliding sleeve cover 71 and the second sliding sleeve cover 81. The sleeve 61 may be a bellows made of metal or plastic. When water of the water zone 2 leaks from the junction of the first sliding sleeve 7 and the lifting rod 6, the sleeve 61 may collect the leaked water and drain it through the junction of the second sliding sleeve 8 and the lifting rod 6, so as to avoid infiltration and permeation of water into the respective junctions of the second sealing assembly 10.

[0033] In a preferred embodiment, referring to Figures 2, 4, the second sliding sleeve cover 81 is provided with a water diverting port 811 for diverting water, which leads to a position underneath the second sealing member 83. When water of the water zone 2 leaks from the junction of the first sliding sleeve 7 and the lifting rod 6, the leaked water will then leak from the junction of the second sliding sleeve 8 and the lifting rod 6, that is, will leak from the junction of the second sealing member 83 and the lifting rod 6. The water diverting port 811 may divert the water leaked from the junction of the second sealing member 83 and the lifting rod 6 out of the second sliding sleeve 8. Further, a water diverting connector 84 may be installed at the water diverting port 811, such that the leaked water may be collected through a pipe and diverted to a sump pit for water storage that is away from the drive mechanism 4 in the foundation pit 3, so as to avoid the potential safety risks such as electric leakage and corrosion of the drive mechanism 4, caused by water.

[0034] In a preferred embodiment, as shown in Figure 2, a positioning block 105 is disposed on the second base 101, and a positioning bolt 106 is disposed on the positioning block 105 for pressing against the second positioning member 103. Since the position adjusting member 104 is connected through clamping by the second positioning member 103 and the second supporting member 102, it is convenient to adjust the position of the second positioning member 103 through the positioning bolt 106, and further to adjust the position of the position adjusting member 104, so as to adjust the perpendicularity of the lifting rod 6.

[0035] In a preferred embodiment, as shown in Figures 2-4, at least two sealing rings 62 are disposed between the first sliding sleeve cover 71 and the lifting rod 6, at least one sealing ring 62 is disposed between the first stopper member 72 and the lifting rod 6, and at least two sealing rings 62 are disposed between the second sliding sleeve cover 81 and the lifting rod 6. As such, the tightness between the first sliding sleeve 7, the second sliding sleeve 8 and the lifting rod 6 is further enhanced, and leakage of water from the water zone 2 to the foundation pit 3 during rise and fall of the lifting rod 6 is mitigated.

[0036] In the underwater lifting platform for water show as provided by the present invention, with both of the drive component and the transmission component disposed in the dry foundation pit below the pool, the drive and transmission components are prevented from water, thereby water pollution due to the leakage of hydraulic oil into the water and the potential safety risks of water being charged due to electric leakage when using electricity in water are eliminated. Further, in the underwater lifting platform for water show as provided by the present invention, power is transmitted between the dry foundation pit and water zone of the pool through the lifting rod with a simple structure, thereby the problems of leakage of lubricating medium and rust protection of materials in the event that the transmission mechanism is disposed

in water are avoided.

[0037] It is to be understood by a skilled person in the art that, although the present invention is described in a manner of a number of embodiments, it is not necessary that each of the embodiments contains only one independent technical solution. The manner of illustrating as recited in the Description is for clarity only. The Description should be interpreted as a whole by a skilled person, and the scope of the claimed invention should be interpreted in a manner that the technical solutions involved in respective embodiments can be combined with each other as different embodiments.

[0038] The above descriptions are only exemplary specific embodiments of the present invention, and are not intended to limit the scope of the present invention. Any equivalent variations, modifications and combinations made by a skilled person, without departing from the idea and principle of the present invention, are within the scope of the claimed invention.

Claims

1. An underwater lifting platform for water show, the lifting platform being disposed in a pool, wherein: the pool comprises a water zone (2) above the bottom (1) of the pool for water storage and a foundation pit (3) below the bottom of the pool for accessing by a personnel for maintenance and apparatus installation, and the lifting platform comprises a power mechanism (4) disposed in the foundation pit, a stage mechanism (5) disposed in the water zone (2) and a lifting rod (6) connecting the drive mechanism (4) with the platform structure (5) through the bottom (1) of the pool;
the platform structure comprises a stage body (51), a supporting frame (52) connected to the stage body (51) and a guiding device (53) connected with the supporting frame (52) and the bottom (1) of the pool respectively;
the drive mechanism (4) comprises a guiding steel rack (41) fixed on the bottom of the foundation pit (3), a guiding frame (42) which is connected with the guiding steel rack (41) and can move upwards and downwards along the guiding steel rack (41), and a driving motor (43) connected with the guiding frame (42);
the bottom (1) of the pool is provided with a hollow through-hole, the hollow through-hole is provided with a sliding sleeve, and the lifting rod (6) is connected with the supporting frame (52) and the guiding frame (42)respectively through the sliding sleeve.

2. The lifting platform as recited in Claim 1, wherein the sliding sleeve comprises a first sliding sleeve (7) disposed in the water zone and a second sliding sleeve (8) disposed in the foundation pit, the first sliding sleeve (7) is connected to an upper surface of the bottom (1) of the pool with a first sealing assembly (9), and the second sliding sleeve (8) is connected to an lower surface of the bottom (1) of the pool with a second sealing assembly (10);
the first sealing assembly (9) comprises a first base (91), a first supporting member (92) and a first positioning member (93) sequentially connected by bolts, and the first base (91) is fixedly connected to the upper surface of the bottom (1) of the pool by bolts;
the first sliding sleeve (7) comprises a first sliding sleeve cover (71), a first stopper member (72), a first sealing gasket (73) sequentially connected by bolts, the first sliding sleeve cover (71) is fixedly connected with the first positioning member (93) by bolts, and a first sealing member is disposed between the first sliding sleeve cover and the lifting rod;
the second sealing (10) assembly comprises a second base (101), a second supporting member (102) and a second positioning member (103) sequentially connected by bolts, and the second base (101) is fixedly connected with a lower surface of the bottom (1) of the pool by bolts; the second sealing assembly further comprises a position adjusting member (104), and the second position adjusting member (104) is connected through clamping by the second positioning member (103) and the second supporting member (102);
the second sliding sleeve (8) comprises a second sliding sleeve cover (81), a second stopper member (82) sequentially connected by bolts, the second sliding sleeve cover (81) is fixedly connected with the position adjusting member (104) by bolts, and a second sealing member (83) is disposed between the second sliding sleeve cover (81) and the lifting rod (6).

3. The lifting platform as recited in Claim 2, wherein a sleeve (61) is disposed between the first sealing assembly (9) and the second sealing assembly (10) and sleeved at the outer side of the lifting rod (6), the first sliding sleeve cover (71) and the second sliding sleeve cover (81).

4. The lifting platform as recited in Claim 2, wherein the second sliding sleeve cover (81) is provided with a water diverting port (811) for diverting water, which leads to a water outlet underneath the second sealing member (83).

5. The lifting platform as recited in Claim 2, wherein a positioning block (105) is disposed on the second base (101) and a positioning bolt (106) is disposed on the positioning block (105) for pressing against the second positioning member (103).

6. The lifting platform as recited in Claim 2, wherein at

least two sealing (62) rings are disposed between the first sliding sleeve cover (71) and the lifting rod (6), at least one sealing ring (62) is disposed between the first stopper member (72) and the lifting rod (6), and at least two sealing rings (62) are disposed between the second sliding sleeve cover (81) and the lifting rod (6).

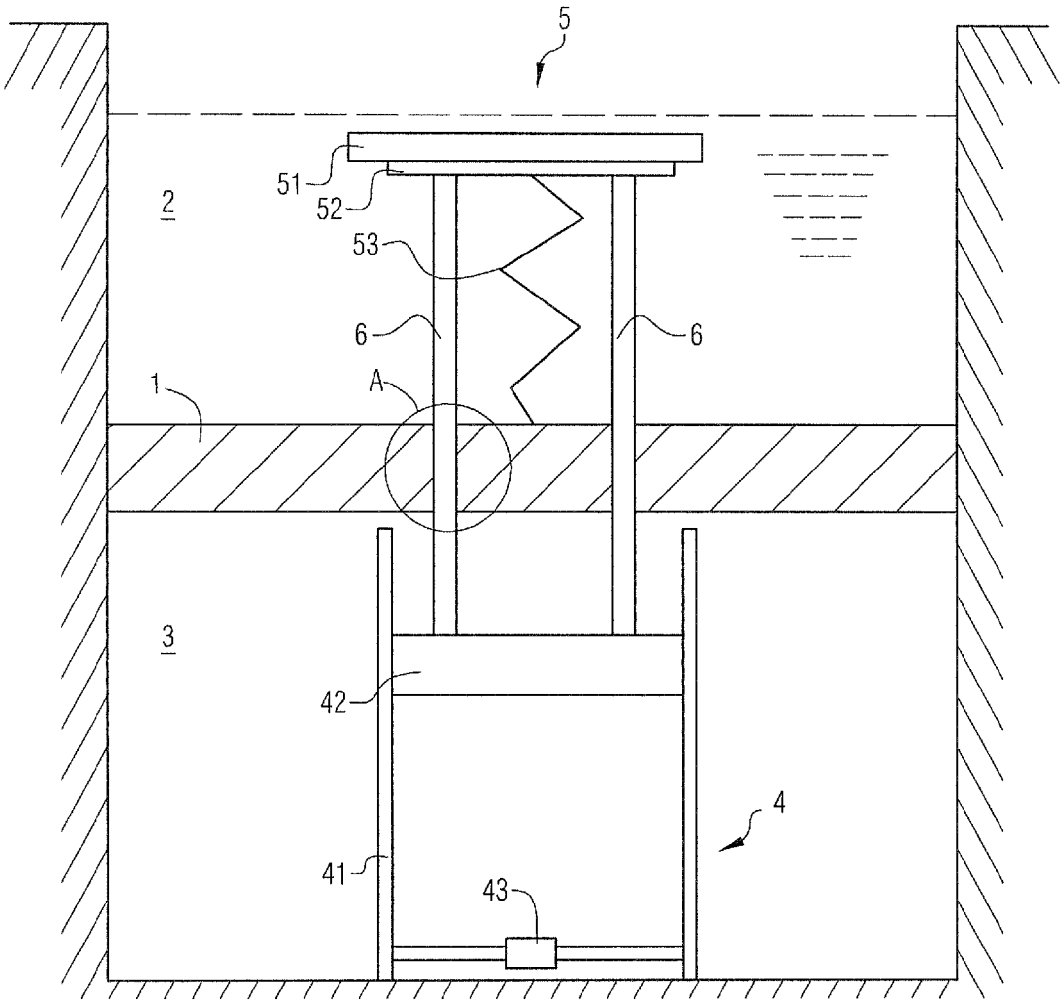

Figure 1

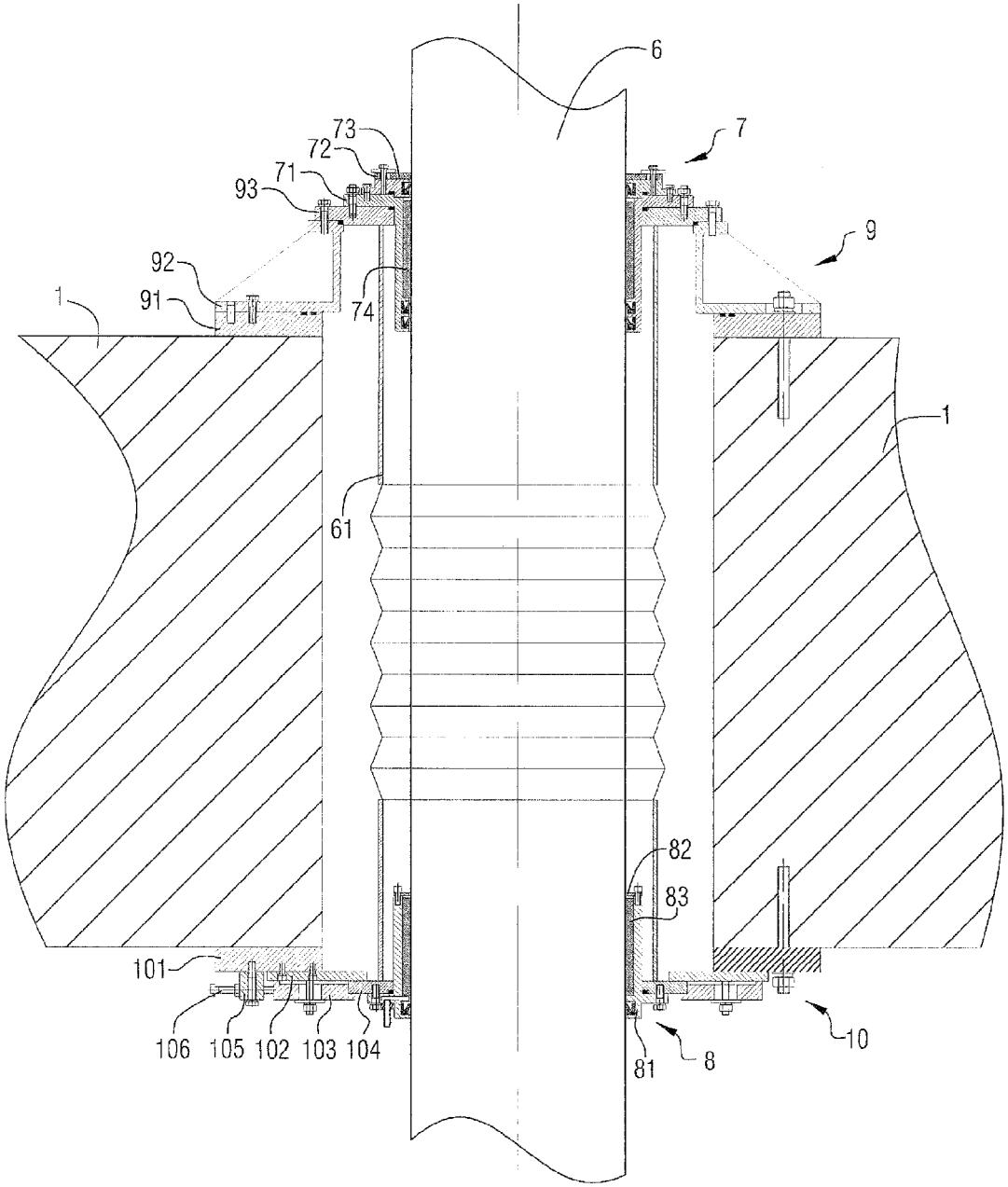

Figure 2

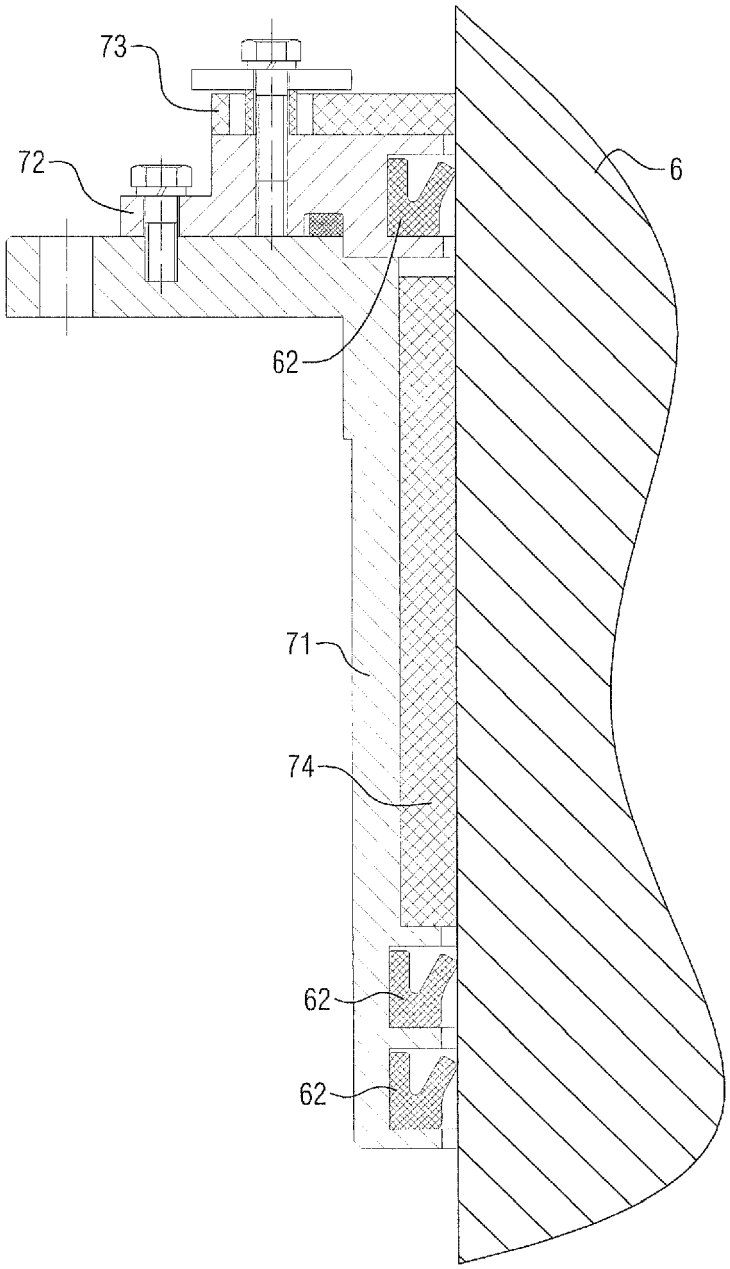

Figure 3

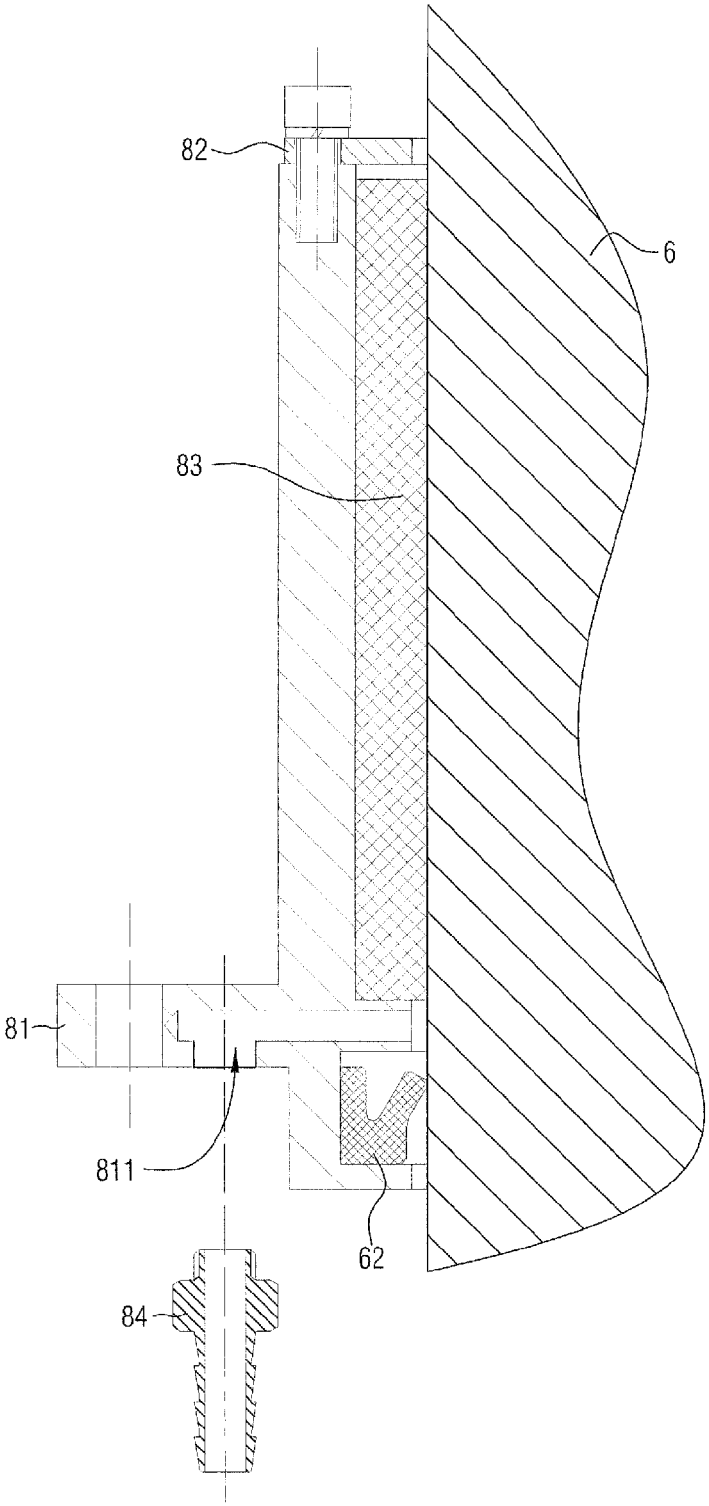

Figure 4