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(54) **COVER DEVICE FOR A LIQUID CONTAINER**

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(57) **ABSTRACT**

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The invention relates to a covering device for liquid tanks, in particular swimming pools, comprising a buoyant covering element comprising a continuous covering layer and a fluid chamber connected to the covering layer, a pumping being provided, which is designed to convey a liquid, in particular water, and/or a gas, in particular air, into the fluid chamber. The invention also relates to an assembly of a covering device according to the invention together with a liquid tank.

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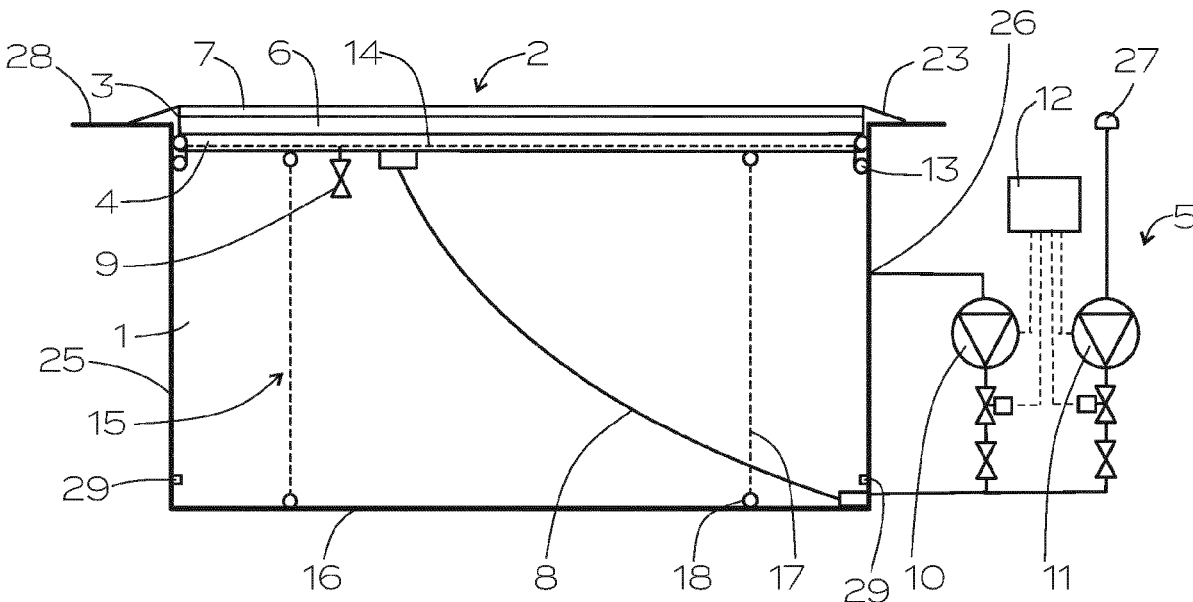


Fig.1

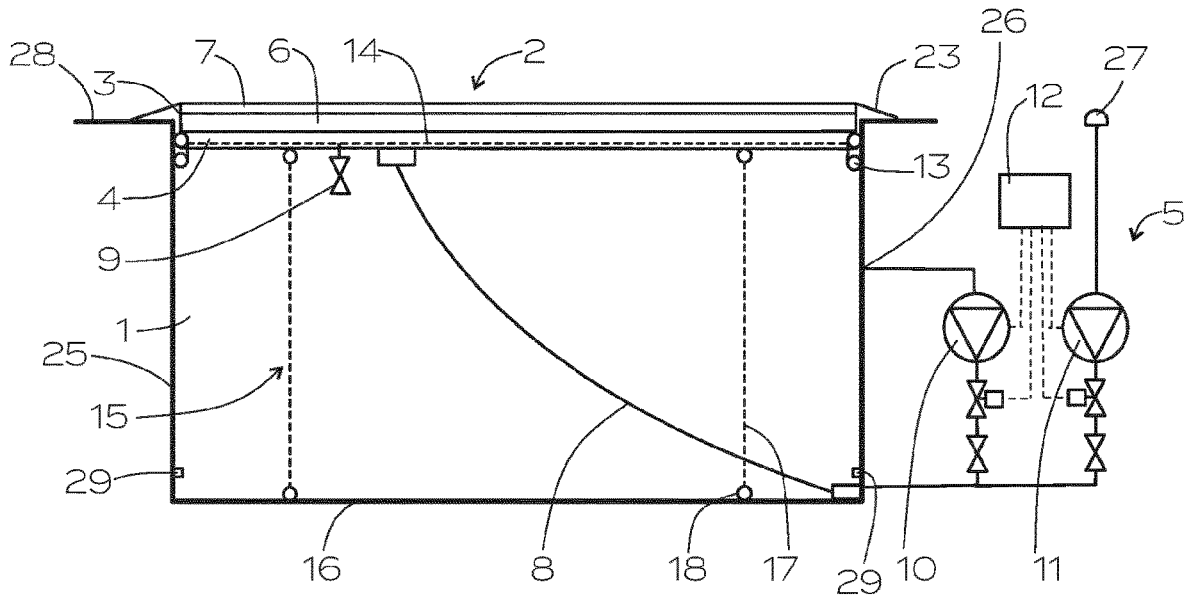


Fig.2

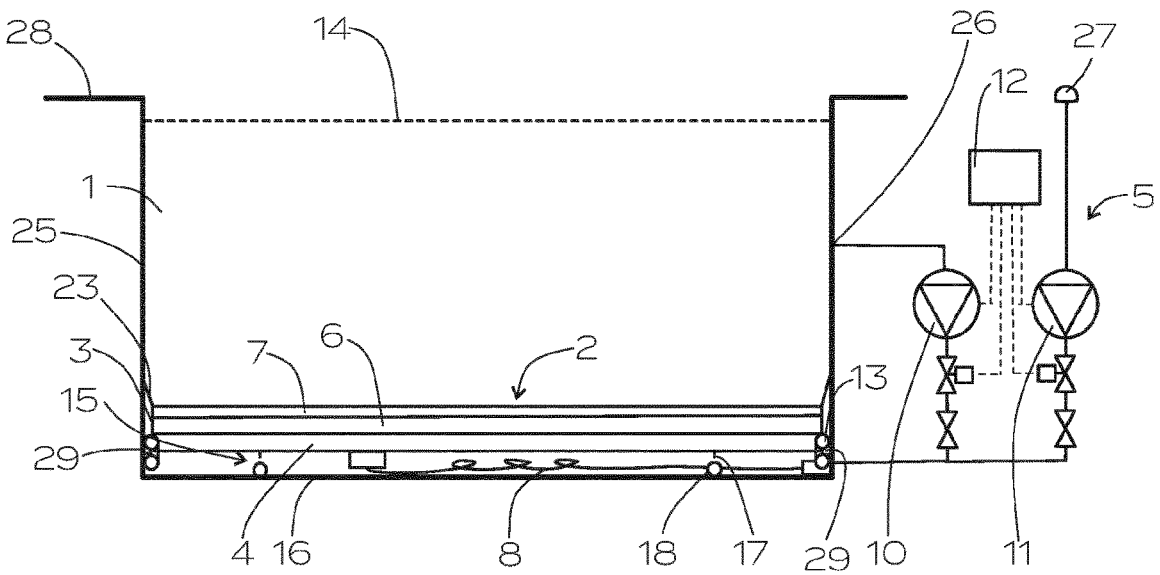


Fig.3

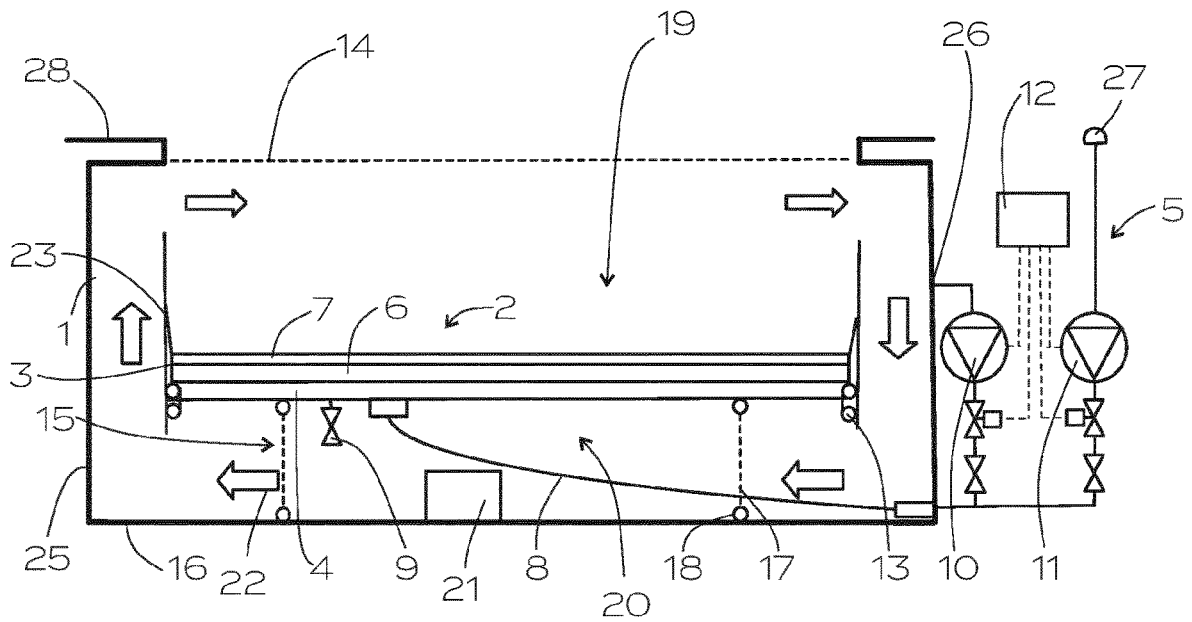


Fig.4

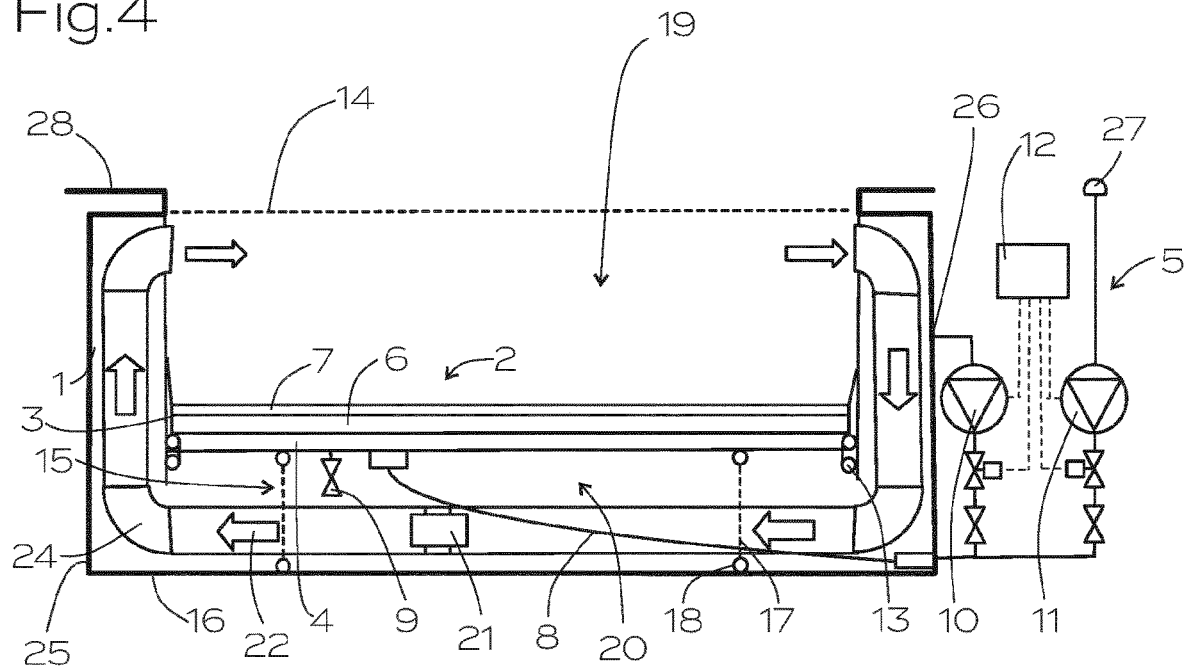


Fig.5

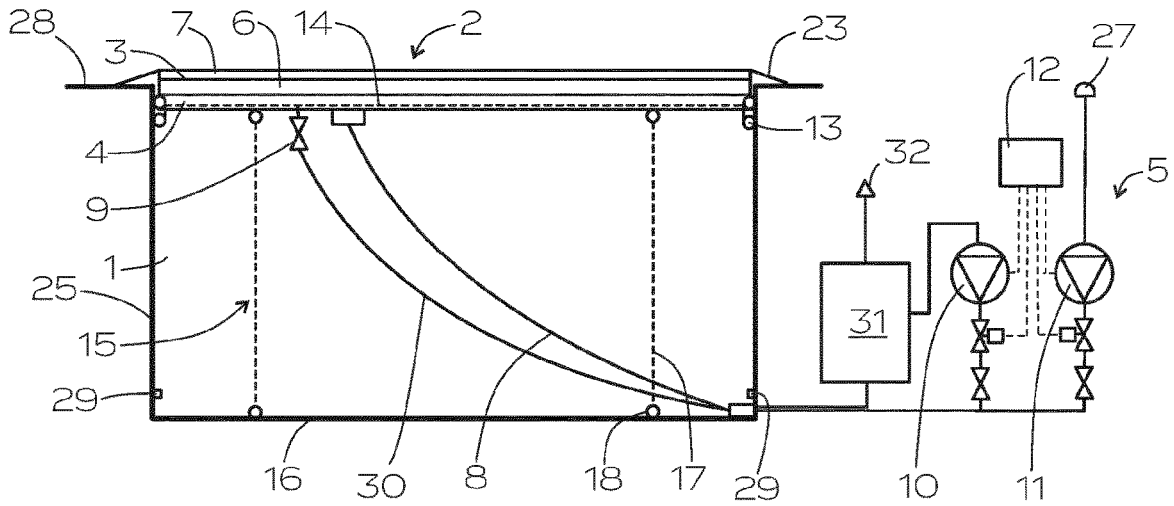
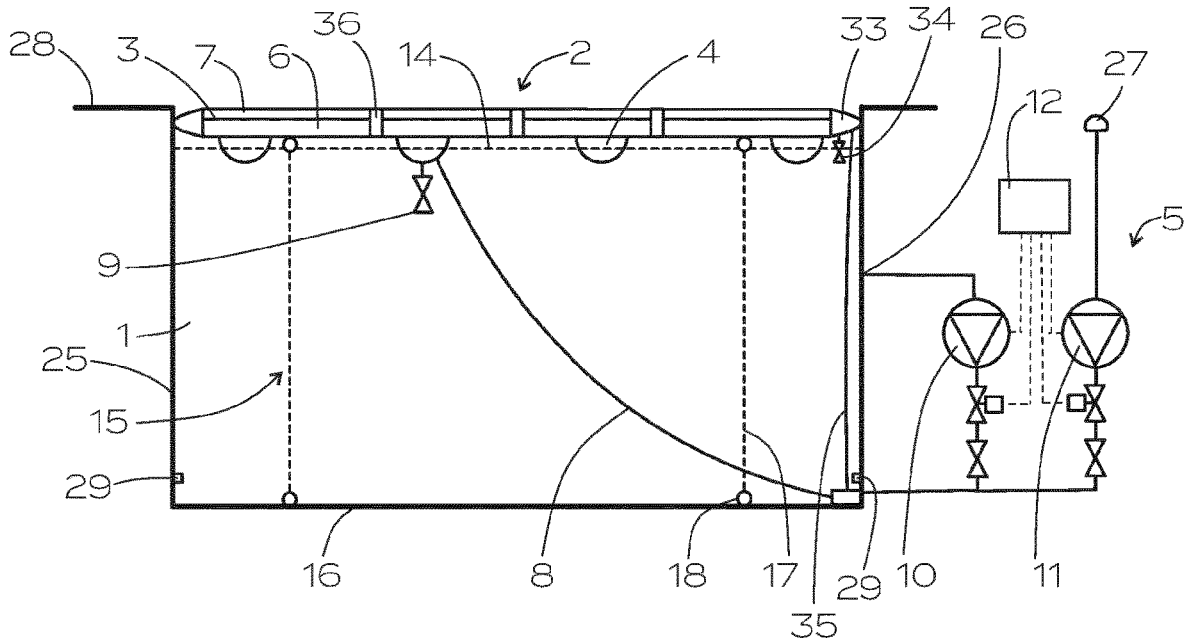
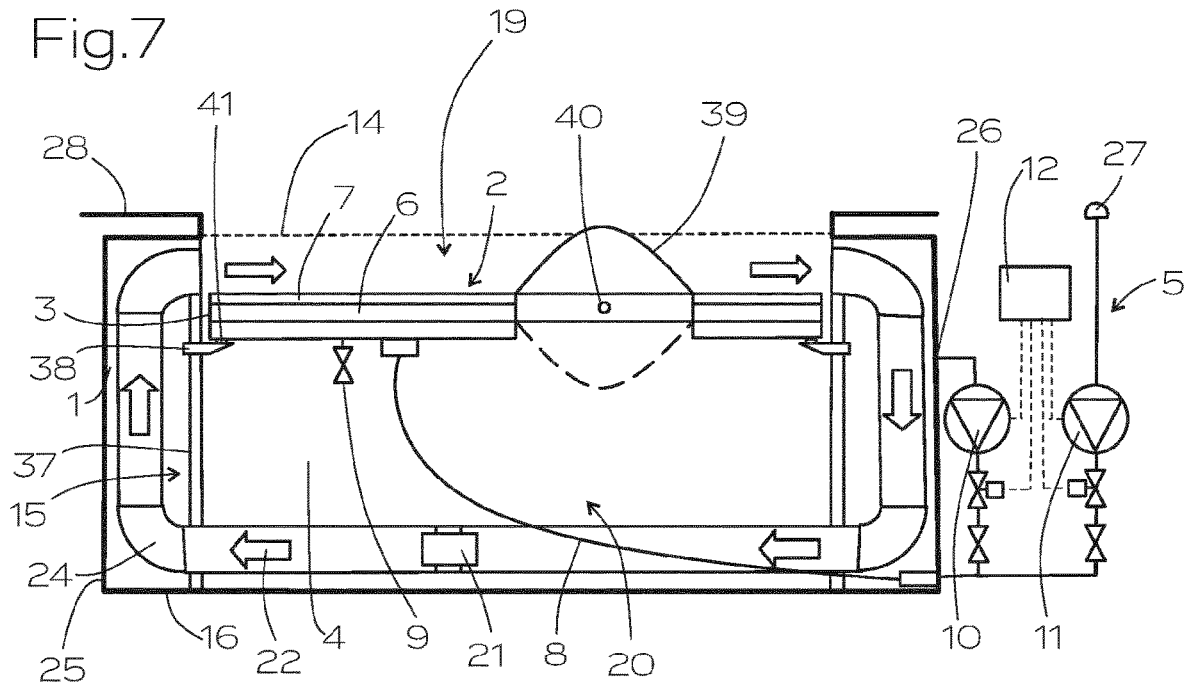


Fig.6





COVER DEVICE FOR A LIQUID CONTAINER

[0001] The invention relates to a cover device for liquid containers with the features of the preamble of the independent patent claim.

[0002] Liquid containers, such as swimming pools, with upwardly open liquid surfaces are susceptible to contamination of the contained liquid. In particular when placed in the open, leaves, insects and other unwanted objects can easily lead to contamination if no a suitable cover is provided.

[0003] Moreover, in case of swimming pools, which are often heated, the lack of a cover leads to unwanted heat loss and thereby to increased costs for heating on the one hand, and to increased evaporation of the water contained in the swimming pool on the other hand, making regular refilling necessary. The heat loss is especially high in particular at low external temperatures.

[0004] In order to avoid the above cited problems, cover devices for liquid containers, in particular for swimming pools, are known in the prior art. Such cover devices may be designed as rollable films, optionally with insulating air chambers, or as cover plates, for example.

[0005] However, the problem of such cover devices is that removing the cover before the use of the swimming pool is often cumbersome.

[0006] Furthermore, various devices are known that allow automatic lifting or lowering of covers by means of complex mechanical devices. However, such devices are often costly and require a lot of maintenance.

[0007] A common problem of the cover devices known in the prior art is that at temperatures below freezing the evaporating water condenses and the cover freezes to the poolside, making it impossible to lift the cover.

[0008] Further, cover devices known in the prior art can often only be implemented in existing swimming pools by putting in an increased amount of work. In particular in the case of swimming pools with a film, known mechanical lifting means cannot be used because a fixed connection to the bottom of the pool is not possible.

[0009] An object of the present invention is to overcome these and other drawbacks of the cover devices known in the prior art and to provide an improved cover device.

[0010] The object of the invention is solved by the characterizing features of the independent patent claim.

[0011] An inventive cover device for liquid containers, in particular for swimming pools, comprises a floatable cover element, the floatable cover element comprising a continuous cover layer and a fluid chamber, which is connected to the cover layer.

[0012] The invention is characterized in that a pump device is provided which is adapted to convey a liquid, in particular water, and/or a gas, such as air, into the fluid chamber.

[0013] Pumping liquid and/or gas into the fluid chamber of the cover element allows the average density of the cover element to be changed.

[0014] By increasing the average density to above the density of the liquid contained in the liquid container, the cover element sinks below the liquid level, which makes the liquid accessible from the outside. By lowering the cover element, it is no longer necessary to manually remove the cover element from the surface of the liquid.

[0015] The term “average density” in the context of the present invention refers to the density of a mixture, composite or an assembly of multiple individual materials or individual elements. The average density is calculated on the basis of the volume ratios of the individual materials or elements. For example, if 1 m³ of a porous insulation material with a density of about 0.5 g/cm³ is combined with 1 m³ of a concrete material with a density of about 2.3 g/cm³, the composite of insulation material and concrete material will have an average density of about 1.4 g/cm³. The connection of two or more materials or elements may be achieved in any way known to a person skilled in the art. The homogeneous mixing of the materials or elements is not essential. For example, in the above mentioned example, two plates of the respective materials may be connected to each other, for example surface-bonded, in order to form a composite with the described average density.

[0016] Optionally, it may be provided that the cover layer is substantially plane and comprises a substantially plane insulating layer and a weighting layer, which is arranged substantially plane-parallel to the insulating layer, wherein the cover layer preferably has an average density between 1.1 g/cm³ and 3.0 g/cm³, preferably between 1.2 g/cm³ and 2.0 g/cm³.

[0017] Particularly preferably, a plane cover layer may be used to cover the liquid container. On the one hand, the plane configuration enables a compact construction; on the other hand, it contacts the liquid surface in a completely flat manner. This is in particular advantageous to avoid condensation of liquid in cavities and associated heat loss.

[0018] Preferably, in the intended use of the device, the insulating layer is arranged below the weighting layer. The weighting layer may optionally be formed by concrete slabs, stone slabs, or the like. Optionally, the weighting layer may be stepped on.

[0019] Optionally, a reinforcing layer may be provided for stabilization. The reinforcing layer may, for example, be arranged between the weighting layer and the insulating layer. The reinforcing layer may also be arranged below the composite of the weighting layer and the insulating layer. The reinforcing layer may be made of a mechanically reinforcing material, for example wood, plastic or metal.

[0020] Optionally, it may be provided that the insulating layer is arranged between the weighting layer and the fluid chamber.

[0021] Optionally, it may be provided that the fluid chamber is designed as a cavity, preferably as a substantially plane cavity with a thickness of preferably 5 cm to 20 cm. The fluid chamber may be made of a metallic material. Inside the fluid chamber, reinforcing elements may be provided for reinforcement.

[0022] By designing the fluid chamber as a cavity, it can be easily filled with liquid and/or gas.

[0023] Optionally, it may be provided that the fluid chamber comprises a plurality of individual chambers separated from each other and separately pressurizable.

[0024] In this way, the average density of the cover element can be easily adjusted. For example, it can be empirically determined how many individual chambers must be filled with liquid to cause the cover element to sink to a certain depth.

[0025] The use of individual chambers can further prevent the cover element from sinking in the event of a leak. For this purpose, the cover device may be designed in such a

way that the cover element does not sink even if one, two or more individual chambers leak.

[0026] Such individual chambers may optionally be arranged at a distance from one another. Individual chambers may be designed in the form of tube-like bladders and can be made of a film material, for example.

[0027] Optionally, it may be provided that the fluid chamber is made of a flexible material such as a polyethylene film or the like or comprises such a material, so that its volume is variable under pressure.

[0028] This allows a simple construction of the fluid chamber. In this case, it may be provided that gas is exhausted from the fluid chamber to reduce its volume instead of filling the fluid chamber with liquid.

[0029] Optionally, it may be provided that the insulating layer has a thickness of preferably 5 cm to 20 cm and comprises or consists of polystyrene.

[0030] A suitable thickness of the insulating layer results in a sufficient insulating effect. Further, the insulating layer with a low density serves to reduce the average density of the cover layer. Preferably, the weighting layer has a higher density than the insulating layer.

[0031] Optionally, it may be provided that the fluid chamber is arranged on the cover layer in such a way that it substantially covers the full surface area. This enables a uniform lifting and lowering of the cover layer. As an alternative, the fluid chamber or the individual chambers of the fluid chamber, respectively, may also be distributed only partially and/or uniformly on the cover layer.

[0032] Optionally, it may be provided that the fluid chamber is connected to the pump device via a flexible tubing. The flexible tubing may be adapted to supply gas and/or liquid to the fluid chamber. The flexible properties of the tubing are advantageous to enable an adjustment to different positions of the cover element.

[0033] Optionally, it may be provided that the fluid chamber has a pressure relief valve for discharging water and/or air.

[0034] A pressure relief valve may be advantageous to prevent the fluid chamber from bursting due to excessive pressure. For example, the pressure relief valve can be designed to open at a pressure of more than 2 bar. The pressure relief valve may also be used in an advantageous manner to exchange liquid and gas in the fluid chamber. For example, with the pressure relief valve suitably positioned, liquid can be pumped into a gas-filled fluid chamber, whereupon the gas escapes via the pressure relief valve.

[0035] Optionally, it may be provided that the pump device comprises a water pump and an air pump, wherein a control device is provided to control the pump device.

[0036] Alternatively, only one pump may be provided which is adapted to convey gas and which is adapted to generate a positive pressure and a negative pressure. Filling of the fluid chamber with liquid can then be performed by generating a negative pressure and receiving liquid via a valve.

[0037] The control device may be adapted to control the pressure and/or the amount of liquid or gas supplied. Optionally, a pressure measuring device may be provided in the fluid chamber to measure the pressure in the fluid chamber. The pressure measuring device may be in communication with the control device.

[0038] Optionally, it may be determined empirically how much liquid must be delivered into the fluid chamber to

cause the cover element to sink. By means of these empirically determined values, the control device can control the supply of liquid and/or gas into the fluid chamber.

[0039] A depth measuring device may also be provided, which is designed to determine the depth at which the cover element is located at a particular time. The depth measuring device may comprise, for example, at least one light barrier. The light barrier may be arranged at least at a desired depth of the cover element. Alternatively, the depth measuring device may also comprise a distance measuring device. The depth measuring device may be connected to the control device to control the supply of gas and/or liquid to the fluid chamber in relation to the sinking depth of the cover element.

[0040] In the context of the present invention, "sinking depth" may be defined as the normal distance between the liquid surface and the surface of the cover element.

[0041] Optionally, sliding rollers may be provided on the outer edges of the cover element for sliding the cover element along the inner surface of the liquid container.

[0042] Optionally, cantilevered, preferably resilient, sealing elements may be provided on the outer edges of the cover element. The sealing elements may be formed, for example, by sealing lips completely surrounding the outer periphery of the cover element. The sealing element/s is/are designed in such a way that it/they protrude/s over the edge of the liquid container when the cover device is used as intended. This prevents heat from escaping or liquid from evaporating in the edge areas which may not be covered by the cover element.

[0043] Particularly in the case of swimming pools, the design with one or more sealing elements is advantageous, since it is to be avoided to leave water surfaces uncovered.

[0044] Optionally, the liquid container may be a liquid container with tapered wall elements. In this case, the sealing elements may act to compensate for the distance between the wall of the liquid container and the cover element.

[0045] Optionally, it may be provided that for filling the fluid chamber with liquid a filling medium is provided, which is circulated in a closed filling medium circuit. Optionally, a compensation chamber may be provided to accommodate the filling medium.

[0046] Optionally, a flexible hose may be arranged on the pressure relief valve of the fluid chamber, which is designed to return the filling medium to the pump device.

[0047] A separate circuit for the filling medium, wherein the filling medium does not come into contact with the liquid in the liquid container, prevents contamination of the liquid in the liquid container.

[0048] This is particularly advantageous for swimming pools, since undesirable bacterial growth can occur in the liquid contained in the fluid chamber. For hygienic reasons, the introduction of these bacteria into the water of the swimming pool should be avoided.

[0049] Optionally, it may be provided that a compensation chamber is arranged on the outer edges of the cover element, preferably surrounding the cover element, the compensation chamber being designed to at least partially fill a gap between a wall of the liquid container and the cover element. Optionally, the compensation chamber may be connected to the pump device. Optionally, the compensation chamber

may be made of a film material. Optionally, the compensation chamber may be composed of multiple separate sub-chambers.

[0050] Optionally, it may be provided that through-going opening holes are arranged in the cover element, through which liquid can pass when the cover element is lowered. In this way, improved lowering properties are achieved.

[0051] The invention further relates to an arrangement of a cover device according to the invention with a liquid-filled liquid container, in particular a swimming pool. According to the invention, it is provided that the cover element can be arranged or is arranged floating on the liquid surface in a first position, and that the cover element can be arranged or is arranged completely below the liquid surface in a second position.

[0052] In the second position, a liquid level is preferably provided above the cover element, allowing the liquid container to be used as intended. For example, considering the liquid container is a swimming pool, it may be provided that the surface of the cover element is at least 1 m, preferably at least 1.5 m or at least 2 m below the liquid surface. This may enable the use of the swimming pool without touching the cover element.

[0053] Optionally, it may be provided that the cover element is connected to the bottom of the liquid container via at least one holding means. Optionally, the holding means may comprise a connecting element and a winding engine.

[0054] The holding means may be used to hold the cover element at a certain depth. Optionally, the cover element may be lowered to the desired depth by increasing its average density. Then, the holding means can be adjusted by adjusting the length of the connecting means, whereupon the average density of the cover element can be reduced again by pumping in gas. While the cover element is held at the desired depth by the holding element, buoyancy is created, which allows the cover element to be loaded with weight. For example, suitable adjustment can allow the cover element to be stepped on below the liquid surface. In this case, the surface of the cover element can also be less than 1 m below the water surface. This may be particularly advantageous when the cover device is used in a swimming pool where a person is to learn to swim or in cases where standing on a solid surface is desired.

[0055] Optionally, the holding means may be designed as a holding means with fixed length to enable the cover element to be fixed in a certain position.

[0056] Optionally, it may be provided that the shape and size of the cover element substantially correspond to the shape and size of the liquid surface in the liquid container. By suitably adapting the size and shape of the cover element, the most efficient insulation effect is achieved.

[0057] Optionally, it may be provided that a first liquid area and a second liquid area are formed in the second position of the cover device, the cover element forming a separation between the first liquid area and the second liquid area.

[0058] A circulation pump may be provided that is adapted to generate a liquid flow that is opposite in the first liquid area and the second liquid area.

[0059] In this way, a counter-current pool may be realized in a particularly easy way. Such counter-current pools serve the purpose of being able to simulate a linear swimming

motion in a limited space. The relative movement of the liquid counteracts the swimming movement of the user.

[0060] The cover element can be used to delimit areas with countercurrent flow.

[0061] Optionally, it may be provided that the liquid flow extends within a flow channel at least in the second fluid area. A flow channel may be provided, at least in part, to enable more efficient maintenance of a liquid flow.

[0062] Optionally, it may be provided in all embodiments of the cover device that the cover element comprises a functional element. The functional element may be rotatable relative to the cover element. The functional element may in particular be designed as a water attraction, such as an underwater treadmill, a wave element, and the like. Advantageously, the functional element is used in combination with a circulating pump, which is adapted to generate a liquid flow in the liquid container.

[0063] The functional element may optionally comprise a rotating means, which is adapted to change the position of the functional element relative to the cover element. In particular, the rotating means may be adapted to change the functional element by about 180° relative to the cover element. In this way, the functional element may be moved to the upper side of the cover element when used, while it may be moved to the lower side of the cover element when not used.

[0064] The cover element may comprise multiple fluid chambers and/or the fluid chamber may have multiple separate sub-chambers.

[0065] In case a plane, continuous design of the weight load and/or of the fluid chamber is not possible, multiple fluid chambers may be provided. In particular, the fluid chambers may be arranged such that the lifting effect coincides with the center of gravity of the weight load.

[0066] When calculating the “average density” in the sense of the present invention, optionally provided additional components, such as functional elements, must be taken into account.

[0067] Optionally, a measuring device may be provided between the weighting layer and the fluid chamber. This measuring device may be in communication with a control unit to control the load capacity of the fluid chamber by supplying liquid and/or gas. This function is advantageous in particular when lifting the weight-loaded components above the liquid plane. The measuring device may also be arranged at optionally provided auxiliary lifting constructions, such as lifting spindle drives, scissor lifts or hydraulic cylinders.

[0068] The functional element may be driven by a drive unit, which may be arranged in the cover element.

[0069] In case a functional element is provided, the area in which the functional element is provided is preferably free of a fluid chamber.

[0070] Optionally, the holding means comprises a scissor lift, a hydraulic ram or a lifting spindle.

[0071] Optionally, it may be provided that the holding means comprises several lifting spindles or the like, which are adapted to lift the cover element.

[0072] Optionally, a pressure sensor may be provided on the holding means to measure the load of the holding means.

[0073] The pressure sensor/s may be connected to a control device, which is adapted to control the function of the pump device. Depending on the measurements of the pressure sensor/s it may be determined how much liquid or air the pump device introduces into the chamber.

[0074] Further features of the invention arise from the exemplary embodiments, the figures and the patent claims.

[0075] In the following, the invention is explained in detail with reference to three exemplary embodiments. The exemplary embodiments merely serve to illustrate the invention and are not intended to limit the claimed scope of protection in any way.

[0076] In the figures:

[0077] FIG. 1 shows a schematic view of a first exemplary embodiment of the present invention in a first position;

[0078] FIG. 2 shows a schematic view of the first exemplary embodiment of the present invention in a second position;

[0079] FIG. 3 shows a schematic view of a second exemplary embodiment of the present invention;

[0080] FIG. 4 shows a schematic view of a third exemplary embodiment of the present invention;

[0081] FIG. 5 shows a schematic view of a fourth exemplary embodiment of the present invention;

[0082] FIG. 6 shows a schematic view of a fifth exemplary embodiment of the present invention; and

[0083] FIG. 7 shows a schematic view of a sixth exemplary embodiment of the present invention.

[0084] All of the illustrated figures show variants of the cover device according to the invention in combination with a swimming pool 1 as a liquid container. Although the application in combination with a swimming pool 1 relates to a preferred embodiment of the invention, the cover device may also be used in combination with any other liquid container. For example, the liquid container may also be a storage and/or transport container for liquids. In a preferred case, the liquid is water without being limited thereto. It is up to a skilled person to adapt the properties of the cover device to the respective field of application.

[0085] FIG. 1 shows a schematic view of a first exemplary embodiment of the present invention in a first position. In the first position, the cover element 2 is arranged at least partially above the liquid surface 14. FIG. 2 shows a schematic view of the first exemplary embodiment of the present invention in a second position. In the second position, the cover element 2 is arranged completely below the liquid surface 14.

[0086] Since FIGS. 1 and 2 describe the same exemplary embodiment, the elements of the two figures are described together below for the sake of clarity. All the reference signs that are used in FIGS. 1 and 2 indicate the same elements.

[0087] In this exemplary embodiment, the cover element 2 is composed of three layers arranged plane-parallel to each other. The top layer in this view is the weighting layer 7. Directly below the weighting layer 7 is the insulating layer 6, below which in turn the fluid chamber 4 is arranged. The weighting layer 7 and the insulating layer 6 together form the cover layer 3.

[0088] In this exemplary embodiment, the swimming pool 1 has a rectangular free water surface with a size of about 250 cm×490 cm.

[0089] The cover layer 3 is adapted to the free water surface of the swimming pool 1 in shape and size and is therefore rectangular with a size of 240 cm×490 cm in this exemplary embodiment. When the cover layer 3 is placed centrally on the free water surface, a distance of 5 cm remains to each wall 25 of the swimming pool 1.

[0090] In this exemplary embodiment, the weighting layer 7 is made of square concrete slabs with a size of 30 cm×30

cm each. The insulating layer 6 is a full-surface plate of foamed polystyrene with a size of 240 cm×480 cm. The concrete slabs are arranged on the insulating layer 6 such that the latter is completely covered. To this end, 8×16 concrete slabs are used in this exemplary embodiment. The concrete slabs are connected to the insulating layer 6 with waterproof special glue.

[0091] In this exemplary embodiment, the concrete slabs with a thickness of about 5 cm each have a density of about 2.6 g/cm³. The polystyrene plate of the insulating layer 6 with a thickness of about 5 cm has a density of about 0.1 g/cm³. Therefore, the cover layer 3 has an average density of about 1.35 g/cm³; the density and the amount of glue are not included in this calculation, since they are negligible with respect to the other components of the cover layer 3. Thus, the density of the cover layer 3 is higher than the density of water at the temperature of the water in the swimming pool 1 (about 25° C., density: about 0.997 g/cm³).

[0092] In other exemplary embodiments, an additional reinforcing layer may be provided to stabilize the cover layer 3 mechanically. The reinforcing layer may be a part of the cover layer 3 and may be made of wood, plastic or metal, for example.

[0093] Below the cover layer 3, a fluid chamber 4 is arranged, which is formed as a single fluid chamber 4 in this exemplary embodiment.

[0094] The fluid chamber 4 is arranged on the cover layer 3 in such a way that it substantially covers the full surface area. The fluid chamber 4 is made of an aluminium sheet with a waterproof coating.

[0095] The fluid chamber 4 has a pressure chamber in its interior with a height of about 10 cm over its entire extension. Thus, the fluid chamber 4 has an internal volume of about 1100 L. The fluid chamber 4 is connected to the insulating layer 6 of the cover layer 3 via waterproof special glue.

[0096] The fluid chamber 4 is connected to the pump device 5 via a flexible tubing 8, which is arranged outside of the swimming pool 1. The pump device 5 comprises a water pump 10 and an air pump 11, both of which are controlled by a control device 12.

[0097] The fluid chamber 4 may be partially or completely filled with water and/or air via the pump device 5. Water is taken directly from the swimming pool 1 via an extraction opening 26, while air is obtained from the ambient air via an intake port 27.

[0098] When the fluid chamber 4 is completely filled with air, the cover element 2 has an average density of about 0.7 g/cm³. This calculation does not consider the mass of the aluminum sheet of the fluid chamber 4, which is negligible for a sheet thickness of about 1 mm (density of aluminum: about 2.7 g/cm³).

[0099] When the fluid chamber 4 is completely filled with air, the average density of the cover element 2 is thus smaller than that of water, which makes the cover element 2 float on the liquid surface 14. This corresponds to the first position, which is shown in FIG. 1.

[0100] When the fluid chamber 4 is completely filled with water, the cover element 2 has an average density of about 1.2 g/cm³, which lets it sink below the liquid surface 14. This corresponds to the second position, which is shown in FIG. 2.

[0101] To withstand filling with water and/or air, reinforcing elements are provided inside the fluid chamber 4, which are not shown in this view.

[0102] In this exemplary embodiment, the fluid chamber 4 is provided with a pressure relief valve 9 to avoid a positive pressure in the fluid chamber 4. Additionally, the pressure relief valve 9 may serve to discharge gas and/or liquid displaced from the fluid chamber 4 by the pump device 5. A plurality of pressure relief valves 9 may be provided, which may optionally be controlled by the control device 12, depending on whether the fluid chamber 4 is to be filled with gas or with liquid.

[0103] In an alternative exemplary embodiment, which is not shown, the pump device 5 may comprise only one air pump 11. In this case, the air pump 11 can also create a negative pressure. Then the liquid required to increase the average density of the cover element can be drawn in through the pressure relief valve 9.

[0104] On the edges of the cover element 2, sliding rollers 13 are provided in this exemplary embodiment to enable a sliding on the walls 25 of the swimming pool 1. On each side of the cover element 2, two sets of sliding rollers 13 are provided. Thus, a total of eight sets of sliding rollers 13 are provided. It is clear that any other number of sliding rollers 13, for example more sliding rollers 13, may be provided in case the swimming pool 1 has larger dimensions.

[0105] In this exemplary embodiment, the bottom 16 of the swimming pool 1 is connected to the cover element 2 via holding means 15. Four holding means 15 are provided (only two being visible in the illustrated view), wherein each holding means 15 comprises a winding engine 18 and a connecting element 17. In this exemplary embodiment, the connecting element 17 is formed as a rope. Alternatively, a chain, a belt or the like may also be provided as connecting element 17.

[0106] The holding means 15 serve to assist the lowering of the cover element 2 and to hold the cover element 2 in the second position.

[0107] Particularly preferably, the holding means 15 may be used when the fluid chamber 4 is refilled with gas after the cover element 2 has been lowered to the second position. Reducing the average density of the cover element to below the density of water creates a buoyancy force that is counteracted by the holding means 15. The buoyancy force allows the cover layer to be stepped on in the second position. Thus, by adjusting the sinking depth of the cover element 2, the apparent water depth can also be changed.

[0108] In the second position, the flexible tubing 8 is in a relaxed state below the cover element 2. Optionally, an elastic tubing 8 may be provided.

[0109] Protruding sealing elements 23 are provided on the edges of the cover element 2, which in this exemplary embodiment are made of an elastic plastic material. The sealing elements 23 are designed as sealing lips completely surrounding the outer circumference of the cover element 2. At least in the first position, the sealing elements 23 protrude over the edge 28 of the swimming pool and thus cover the free water surface of the swimming pool that is not covered by the cover layer 3. Upon lowering the cover element 2, the sealing elements 23 turn up and are pulled below the liquid surface 14 together with the cover element 2.

[0110] In this exemplary embodiment, the control device 12 is coupled to a light barrier 29. When the cover element 2 is to be moved from the first position into the second

position, water is pumped into the fluid chamber 4 until the light barrier 29 is interrupted. Then, the holding means 15 are adjusted via the control device 12 and air is pumped back into the fluid chamber 4. The holding effect of the holdings means 15 holds the cover element 2 in the second position.

[0111] When the cover element 2 is to be moved from the second position into the first position, the connecting elements 17 are unrolled from the winding engines 18 and the cover element 2 rises by itself by the buoyancy.

[0112] In an alternative exemplary embodiment, which is not shown, a depth measuring device may be connected to the control unit 12. The depth measuring device may determine the distance between the liquid surface 14 and the surface of the cover element 2 based on radar or ultrasound, for example. An adjustment device may then be provided on which the desired sinking depth of the cover element 2 can be set.

[0113] FIG. 3 shows a schematic view of a second exemplary embodiment of the present invention. The reference signs correspond to those elements which have already been explained in detail in relation to the first exemplary embodiment. FIG. 3 shows the second exemplary embodiment in a second position. In the second position, the cover element 2 is arranged completely below the liquid surface 14.

[0114] In the shown second position, the cover element 2 divides the swimming pool 1 into a first liquid area 19 and a second liquid area 20. In the second liquid area 20, a circulating pump is provided, which is adapted to create a liquid flow. The liquid flow 22 in the first liquid area 19 and in the second liquid area 20, indicated by arrows, is in opposite directions. Thus, the liquid is circulated. Thereby, a countercurrent is created in the first liquid area 19, allowing the swimming pool 1 to be used as a countercurrent pool. For a user, this can provide linear swimming within a limited span. When the flow rate is adapted to the swimming speed of the user, the user remains stationary despite his forward movement.

[0115] FIG. 4 shows a schematic view of a third exemplary embodiment of the present invention. The reference signs correspond to those elements which have already been explained in detail in relation to the first exemplary embodiment.

[0116] FIG. 4 shows the third exemplary embodiment in a second position. In the second position, the cover element 2 is arranged completely below the liquid surface 14.

[0117] As in the second exemplary embodiment, the third exemplary embodiment also provides a first liquid area 19 and a second liquid area 20, in which the liquid can be caused to flow in countercurrent. For this purpose, a circulating pump 21 is provided, which, in contrast to the second exemplary embodiment, is arranged in a flow channel 24. The flow channel 24 extends in the second liquid area and in the edge areas of the swimming pool 1. The liquid flow 22 exits the flow channel 24, enters the first liquid area 19 and is then drawn back into the flow channel 24.

[0118] FIG. 5 shows a fourth exemplary embodiment of the present invention, which substantially corresponds to the first exemplary embodiment. In FIG. 5, the cover device is illustrated in the first position. The difference to the first exemplary embodiment is that a flexible return line 30 is arranged on the pressure relief valve 9, which is configured for discharging gas and/or liquid from the fluid chamber 4. The return line 30 leads into a compensation chamber 31, in

which the filling medium can be stored. Excess gas is discharged via a compensation valve 32.

[0119] The exemplary embodiment shown in FIG. 5 has the advantage that the filling medium is circulated in a circuit closed off from the liquid in the swimming pool 1. Thereby, the water in the swimming pool 1 is not mixed with the filling medium. Optionally, any bacterial contaminations that may develop in the filling medium are thus prevented from entering the water of the swimming pool 1. Optionally, additives may be contained in the filling medium which inhibit or prevent the growth of bacteria, algae and other organisms.

[0120] FIG. 6 shows a schematic view of a fifth exemplary embodiment of the present invention, which substantially corresponds to the first exemplary embodiment. In contrast to the first exemplary embodiment, there are no sliding rollers 13. Instead of the sliding rollers 13, a compensation chamber 33, which closes the gap between the cover element 2 and the wall 25 of the swimming pool, is arranged on the outer edges of the cover element 2.

[0121] The compensation chamber 33 is in the form of a film tube, which is designed to surround the cover element 2. The compensation chamber 33 is connected to the pump unit 5 via a second tubing 35 and may be filled with gas via the latter to adjust the volume of the compensation chamber 33. A second pressure relief valve 34 is provided to discharge gas.

[0122] The fifth exemplary embodiment has no sealing element 23, since the liquid in the swimming pool 1 is sealed against the outer atmosphere via the compensation chamber 33, which in the intended use of the cover device rests flush against the wall 25 of the swimming pool 1.

[0123] Another difference between the fifth exemplary embodiment and the first exemplary embodiment is that no full-surface fluid chamber 4 is arranged on the cover element 2. Instead, in this exemplary embodiment, the fluid chamber 4 is designed as film tube, which extends in strips on the side of the cover element 2 facing the liquid. The fluid chamber 4 can be filled with gas and/or liquid via the pump device 5. The function is analogous to the above described exemplary embodiments.

[0124] In addition, the cover element 2 shown in the fifth exemplary embodiment has opening holes 36, which extend through the cover layer 3 and the insulating layer 6. This allows fluid to pass through when the cover element 2 is lowered, facilitating the lowering.

[0125] FIG. 7 shows a schematic view of a sixth exemplary embodiment of the present invention, which substantially corresponds to the third exemplary embodiment.

[0126] In contrast to the third exemplary embodiment, the holding means 15 in this exemplary embodiment comprises four lifting spindles 37, which are configured to lift the cover element 1 via trolleys 38.

[0127] In this exemplary embodiment, the lifting spindles 37 are actuated by a single drive motor, whose operating power is transmitted to the spindles 37 via drive shafts (not shown).

[0128] Additionally, a functional element 39, which is formed as a wave element, is formed in the cover element 2 of the sixth exemplary embodiment. The functional element 39 may be moved from a first position into a second position via an axis of rotation 40. The first position is shown in FIG. 7 in solid lines, while the second position is indicated with

broken lines. Between the two positions, the functional element 39 is rotated by about 180°.

[0129] In the first position, the functional element 39 can act as standing wave, in case the liquid flow 22 streams against it, and may thus be used for surfing, for example

[0130] In the second position, the functional element 39 is on the underside of the cover element 2 and the cover element 2 has a continuously flat plane on its surface.

[0131] A drive device (not shown) arranged in the cover element 2 is provided to move the functional element 39 between the two positions.

[0132] A pressure sensor 41 is arranged on the trolley 38, which measures the pressure that the cover element 2 exerts on the trolley 38. The pressure sensor 41 is connected to a control device, which controls the pump device depending on the measured pressure. Thereby, the pressure exerted on the trolley 38 can be regulated by controlling the buoyancy of the cover device 2.

List of reference signs

1	Swimming pool
2	Cover element
3	Cover layer
4	Fluid chamber
5	Pump device
6	Insulating layer
7	Weighting layer
8	Tubing
9	Pressure relief valve
10	Water pump
11	Air pump
12	Control device
13	Slide roller
14	Liquid surface
15	Holding means
16	Bottom
17	Connecting element
18	Winding engine
19	First liquid area
20	Second liquid area
21	Circulating pump
22	Liquid flow
23	Sealing element
24	Flow channel
25	Wall
26	Extraction opening
27	Intake port
28	Edge
29	Light barrier
30	Return line
31	Compensation chamber
32	Compensation valve
33	Compensation chamber
34	Second pressure relief valve
35	Second tubing
36	Opening hole
37	Lifting spindle
38	Trolley
39	Functional element
40	Axis of rotation
41	Pressure sensor

What is claimed is:

1. A cover device for liquid containers, in particular for swimming pools (1), comprising a floatable cover element (2), wherein the cover element (2) comprises a continuous cover layer (3) and a fluid chamber (4), which is connected to the cover layer (3), characterized in that a pump device (5)

is provided, which is configured to convey a liquid, in particular water, and/or a gas, in particular air, into the fluid chamber (4).

2. The cover device according to claim 1, characterized in that the cover layer (3) is substantially plane and comprises a substantially plane insulating layer (6) and a weighting layer (7), which is arranged substantially plane-parallel to the insulating layer (6), wherein the cover layer (3) preferably has an average density between 1.1 g/cm³ and 3.0 g/cm³, preferably between 1.2 g/cm³ and 2.0 g/cm³.

3. The cover device according to claim 1, characterized in that the fluid chamber (4) is designed as a cavity, preferably as a substantially plane cavity with a thickness of preferably 5 cm to 20 cm.

4. The cover device according to claim 1, characterized in that the fluid chamber (4) is made of a flexible material, such as a polyethylene film or the like, or comprises such a material, so that its volume is variable under pressure.

5. The cover device according to claim 1, characterized in that the fluid chamber (4) is connected to the pump device (5) via a flexible tubing (8).

6. The cover device according to claim 1, characterized in that the fluid chamber (4) has a pressure relief valve (9) to discharge water and/or air.

7. The cover device according to claim 1, characterized in that the pump device (5) comprises a water pump (10) and an air pump (11), wherein a control device (12) is provided to control the pump device (5).

8. The cover device according to claim 1, characterized in that slide rollers (13) are provided on the outer edges of the cover element (2) to slide the cover element (2) along the inner surface of the liquid container (1).

9. The cover device according to claim 1, characterized in that cantilevering, preferably resilient, sealing elements (23) are provided on the outer edges of the cover element (2).

10. The cover device according to claim 1, characterized in that a filling medium is provided to fill the fluid chamber (4) with a liquid, the filling medium being circulated in a filling medium circuit.

11. The cover device according to claim 1, characterized in that a compensation chamber (33), which preferably surrounds the cover element (2), is arranged on the outer edges of the cover element (2) and is designed to at least partially fill a gap between a wall (25) of the liquid container and the cover element (2).

12. The cover device according to claim 1, characterized in that the cover element (2) comprises a rotatable functional element (39), in particular a water attraction.

13. The cover device according to claim 12, characterized in that the functional element (39) comprises a rotating means, which is configured to change the position of the functional element (39) relative to the cover element (2) in particular by about 180°.

14. An arrangement of a cover device according to claim 1 with a liquid-filled liquid container, in particular with a swimming pool (1), characterized

in that the cover element (2) can be or is arranged floating on the liquid surface (14) in a first position, and

in that the cover element (2) can be or is arranged completely below the liquid surface (14) in a second position.

15. The arrangement according to claim 14, characterized in that the cover element (2) is connected to the bottom (16) of the liquid container via at least one holding means (15).

16. The arrangement according to claim 15, characterized in that the holding means (15) comprises a connecting element (17) and a winding engine (18).

17. The arrangement according to claim 1, characterized in that, in the second position of the cover device, a first liquid area (19) and a second liquid area (20) are formed, wherein the cover element (2) forms a separation between the first liquid area (19) and the second liquid area (20), and in that a circulating pump (21) is provided, which is adapted to generate a liquid flow (22) which runs in opposite directions in the first liquid area (19) and in the second liquid area (20), the liquid flow (22) preferably running within a flow channel (24) at least in the second liquid area (20).

18. The arrangement according to claim 1, characterized in that the holding means (15) comprises lifting spindles (37), hydraulic rams and/or scissor lifts adapted to lift the cover element (2).

19. The arrangement according to claim 1, characterized in that at least one pressure sensor (41) is provided on the holding means (15) to measure the pressure load of the holding means (15), the pressure sensor optionally being connected to a control device, which is adapted to control the function of the pump device (5).

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