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(54) **Underwater exposition carrier**

(57) An underwater exposition carrier contains at least one display panel comprising a waterproof board, attached to a fastener comprising a frame in the form of a plane or spatial geometric shape whose edges are con-

nected by means of fittings. The frame edges comprise pipe (2) sections. The fittings comprise elbows (3.1), tees or crosses. Pipe (2) sections with the fittings comprise a watertight system filled with the air.

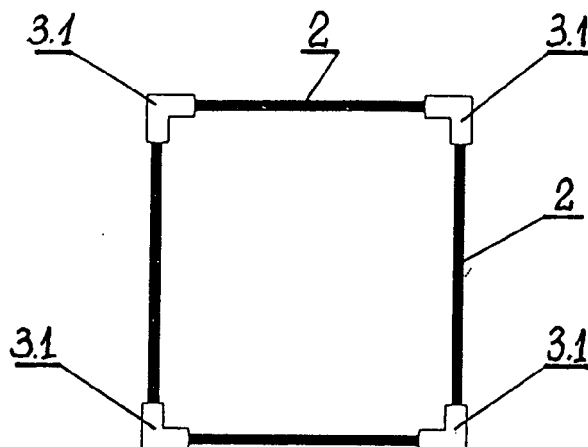


Fig. 1

Description

[0001] The subject of the invention is an underwater exposition carrier comprising a structure in the form of a flat frame to which single boards or boards combined into larger sets can be attached, containing on their surface images and/ or texts comprising information, advertising, exhibition or educational content. The carrier according to the invention is used in water reservoirs used for swimming purposes, especially in swimming pools.

[0002] The purpose of the invention is the development of the device which will enable the use of underwater areas of the swimming pool walls, in particular the swimming pool bottom, for exhibition, advertising or educational purposes. A swimming pool is a place used by many people, and the pool bottom and walls are unused areas that become monotonous after some time for the users, but are constantly watched during swimming. Thus, attempts have been made to use these areas of swimming pools for information, advertising, or even exhibition purposes.

[0003] In the solution known from the U.S. patent specification No. 5,549,950, a flexible waterproof appliqué directly mountable to the swimming pool wall is proposed. The appliqué according to this known solution is a waterproof sheet comprising a waterproof adhesive layer, and a waterproof release sheet. The flexible waterproof sheet has a flexible front surface and a flexible rear surface. The layer connecting the appliqué to the bearing wall, in this case the pool wall, is an adhesive layer in the form of an adhesive, such as glue. This layer entirely covers the flexible appliqué rear surface so that water in the swimming pool is prevented from coming between the said flexible appliqué and the swimming pool wall. The waterproof release sheet contains at least two slits which define at least one release sheet intermediate portion and at least two release sheet outer portions.

[0004] Another known solution for underwater advertising purposes is presented in the patent specification of the international application No. WO 97/05595. In this known solution an advertising medium mounted to side and end walls and to the bottom of the swimming pool is presented. The medium according to this known solution is a plastic element containing plug fasteners fixed to the surface of the walls or the bottom of the swimming pool. The element comprises a medium for announcements or advertisements, or comprises a projection screen for displaying announcements, images or advertisements. According to this known solution, a swimming pool has advertising media attached and arranged on side walls, front and rear walls and at the bottom, where a type of a grid equipped with many composite plug members is arranged at the bottom. According to this known solution, the advertising medium is fixed to this grid that can be composed of several separate elements. The advertising medium can have the form of a board cooperating with at least one lighting device. According to this known solution, the advertising medium can also cooperate with

sound devices. The advertising medium can be equipped with stress relieving grooves applied or made on its surface. This known solution also provides that connectors in the advertising medium are equipped with central grooves or holes. Each connector in this known solution contains transverse humps between which there are hollows and the said hollows cooperate with the bases of the said connectors. According to this known solution, the advertising medium can also comprise a board continuously or intermittently arranged around the swimming pool, or can comprise a display in the form of an LCD formed from light-emitting diodes or in the form of similar solutions. In this known solution advertising content can be formed apart from the advertising medium, in the form of a projection below or above the water level in the swimming pool. This known solution provides that the advertising medium can be composed of a greater number of basic panels combined in larger surfaces and the said larger surfaces consisting of single basic panels can be arranged or fixed to side walls or the bottom of the swimming pool.

[0005] However, in the case of swimming pools an essential element is sanitary requirements that must be rigorously observed, including the requirement of periodic cleaning of the installation, as well as the walls and bottom of the pool. This seems to be much more difficult in the case of known designs of boards or displays arranged and fixed on the walls and bottom of the pool, which removal from catches or unsticking for the time of cleaning the walls or the bottom is complicated especially for stuck elements. Cleaning swimming pools that offer public access is performed every day, but access to the surface of the walls and bottom is required, where cleaning is usually performed with the use of special underwater vacuum cleaners. Thus, the purpose of the invention is the development of an underwater exposition carrier enabling an easy change of information, advertising or exhibition boards, while offering easy and quick access to the entire surface of the walls and bottom of the pool during a normal cleaning schedule provided for this type of a structure.

[0006] The solution according to the invention is presented in claim No. 1 attached. According to the invention, an underwater exposition carrier contains at least one panel comprising a waterproof display board attached to a fastener. According to the invention, the exposition carrier is **characterised in that** the panel's fastener comprises a frame comprising a closed or open geometric shape whose edges are connected by means of fitting members. The said edges comprise parts of hollow sections, and the fitting members comprise fittings of the said sections. According to the invention, parts of the said hollow sections together with the fittings comprise a watertight system.

[0007] In the solution according to the invention, the frame can comprise more than one geometric shape, for example at least two closed or open geometric shapes. The edges of the said connected geometric shapes com-

prising parts of sections together with fittings comprise at least one watertight system. The said watertight system, which is generally flat, consists of more than one geometric shape described above. It can be composed of many such connected geometric shapes comprising one or more watertight system.

[0008] In a preferred version, the hollow sections comprising the edges of the said connected geometric shapes can comprise hydraulic pipes, and fittings, according to this solution, comprise hydraulic fitting members in the form of couplers, elbows, tees or crosses, depending on the needs of individual nodes connecting the pipes.

[0009] The presented watertight closed system, comprising the frame of the exposition carrier according to the invention, is filled with gas, in a preferred version of the invention it is filled with the air. In the basic solution according to the invention, the frame of the exposition carrier can comprise a plain geometric shape. However, this does not exclude the possibility of the exposition carrier frame also being a solid geometric shape, but the third dimension, i.e. the height of such a shape depends on the allowable reduction in water depth in a pool, where the carrier according to the invention is situated at the bottom.

[0010] On pipe sections comprising the said frame edges of the underwater exposition carrier, pipe covers fixing the boards are mounted rotationally. Each pipe cover contains at least two rows of holes on the upper flat surface. Each row of holes is used to attach the edge of one display board. According to this solution, each edge of the display board is attached to the frame pipe cover, thus it comprises, in shape, an equivalent of the geometric shape of the frame pipe system comprising one basic panel. The entire exposition carrier frame, according to the invention, can comprise a greater number of connected frame panels to form, for example, a honeycomb. The basic board panel is fixed on each of the said frame panels, and a greater number of the board panels is arranged in one larger exposition whole.

[0011] Therefore, each section of the frame pipe is equipped with a cover with a flat upper surface rotationally mounted on it. The term rotationally mounted means that such a longitudinal cover with a flat upper surface can be tilted without turning the frame pipe on which the cover is mounted. Owing to this the board can deflect together with the cover to which the edge of this board is fixed, for example when a swimmer bounces off the surface of this board towards the water surface, when the entire advertising carrier composed of single boards lies at the bottom of the pool.

Incidental deflection of the board causes the turn of the cover, but not the turn of the whole pipe on which the cover is mounted, which could otherwise lead to the leakage of the system of pipes and fittings of the frame. Each cover has an oblong shape with a flat upper surface and two peripheral support walls. The support walls fix each cover on the panel frame pipe rotationally, where the said

support walls have their bottom feet rounded. This enables to achieve the possibility of the described above slight turn of the cover on the frame pipe, with the possible deflection of the board as a result of incidental load, without causing a turn and a possible leakage of the pipe itself and the fittings of the underwater advertising carrier frame.

[0012] On the above-mentioned pipe fittings comprising the frame edges, fitting covers are mounted. The said fitting covers correspond in shape to the shapes of the above-mentioned fittings, i.e. an elbow, a tee or a cross, or a coupler. These covers, like pipe covers of the exposition carrier frame, contain at least two rows of holes on the upper flat surface. Each row of holes is designed for attaching the edge or the corner of one of the adjacent panels of the display board. Each fitting cover has a pair of support walls covering parts of this fitting and is mounted on it. These pairs of support walls are as high as support walls fixing covers on the frame pipes. Thus, the support walls of the frame pipe covers and the support walls of the fitting covers being based on the bottom of the pool, keep the entire frame of the exposition carrier together with the boards attached to the covers at a similar height from the bottom.

[0013] The invention provides that each pair of support walls of the fitting cover of the frame pipes is convergent. A distance of bottom edges of both support walls from each other in each pair of support walls at the base is smaller than the outer diameter of the fitting which is situated inside this cover. However, the upper flat wall of the fitting cover is wider than the outer diameter of the said fitting. All fitting covers are made of a layer of semi-rigid elastic plastic. The result is that the covers of all frame fittings can be pressed in the said fittings and then the support walls of these covers bear the entire frame of the underwater exposition carrier. Thus, the entire frame of the carrier loosely rests on the bottom horizontal edges of the support walls of fitting covers and on the bottom edges of the support walls of the carrier frame pipes according to the invention. Each pair of side support walls of each fitting cover holds each fitting between each other, owing to the said elastic form. At the same time, owing to the elasticity of these support walls, the cover can be easily removed from the fitting when there is a need to replace the fitting or a seal between the fitting and the pipe.

[0014] According to the invention, each panel of the display board contains around all edges a row of holes designed for fixing the said board to covers on the carrier frame pipes and to covers on fittings by means of separable fasteners, for example clips, false keys, or screws, preferably made of plastic.

[0015] The proposed solution enables it to use the surface of the swimming pool bottom as a display space for advertising, exhibition, decorative or educational nature, avoiding the disadvantages of the known solutions involving limited access to the surface of the pool bottom for periodic cleaning, which is necessary according to

sanitary requirements. The frame of the underwater carrier according to the invention comprises a watertight system of hollow sections and fittings that connect them. In the basic embodiment the sections and fittings comprise plastic hydraulic pipes and hydraulic fittings. Therefore, the proposed frame, filled with the air or other gas is underwater also a supporting member that significantly reduces the weight of the entire carrier together with the display panels attached, owing to the self-displacement of the frame itself. The carrier together with the boards can, for example, be arranged at the pool bottom in a deeper section. At the time of cleaning the pool bottom, it can be cleaned in the shallow part of the pool, and then, for example by means of grapnels the whole carrier without removing the display panels can be easily, due to its partial buoyancy, pulled along the bottom from the deep part to the shallow part of the pool. Then, it is possible to clean the bottom in the deep part of the pool and repull the carrier to the cleaned part of the deep part of the pool. Thus, the proposed design of the carrier according to the invention significantly facilitates the maintenance of hygiene in the pool, which is a top priority in publicly available pools.

[0016] The subject of the invention is presented in embodiments in the accompanying drawing, in which various figures illustrate:

- Fig. 1 - the frame of a single panel of the carrier,
- Fig. 2 - the frame according to Fig. 1a with pipe covers and fitting covers,
- Fig. 3 - the frame according to Fig. 1b with one board,
- Fig. 4 - the frame of a double panel of the carrier,
- Fig. 5 - the frame according to Fig. 2a with pipe covers and fitting covers,
- Fig. 6 - the frame according to Fig. 2b with two boards,
- Fig. 7 - the frame of a quadruple panel of the carrier,
- Fig. 8 - the frame according to Fig. 3a with pipe covers and fitting covers,
- Fig. 9 - the frame according to Fig. 3b with four boards,
- Fig. 10 - a top view of a quadruple spatial panel,
- Fig. 11 - a perspective view of a spatial panel according to Fig. 4a,
- Fig. 12 - a top view of a quadruple round spatial panel,
- Fig. 13 - a perspective view of a spatial panel according to Fig. 4c,
- Fig. 14 - a view of the frame internal pipe cover,
- Fig. 15 - a view of the frame edge pipe cover,
- Fig. 16 - a view of the spatial frame pipe cover,
- Fig. 17 - a view of the cross cover,
- Fig. 18 - a view of the elbow cover,
- Fig. 19 - a view of the tee cover,
- Fig. 20 - a view of a single panel of the board,
- Fig. 21 - a view of a single half-round panel of the board,
- Fig. 22 - a view of the place of contact of four panels

of the board,

Fig. 23 - a member connecting the board with the cover.

[0017] The underwater exposition carrier comprises a set containing at least one display panel comprising a waterproof board 1 attached to a fastener. As shown in Fig. 1 attached, the fastener comprises a frame comprising a rectangle-shape plane geometric shape which edges are connected by fittings. Other embodiments are not precluded, where the frame can be an open geometric shape. The said edges comprise pipe 2 sections, and the fittings in this embodiment comprise typical pipe fittings in the form of elbows 3.1. Pipe 2 sections with the fittings in the form of elbows 3.1 comprise a watertight closed system filled with the air. This does not preclude the use of hollow sections of a different cross-section shape than a circular section for the construction of the carrier frame, for example of a rectangular or triangular cross-section, or in the shape of any other polygon, with the use of elbows with a cross-section of such a polygon as fittings.

[0018] Fig. 4 shows another embodiment of the carrier frame comprising two connected plane geometric shapes in the form of two rectangles made of pipe 2 sections. Pipe 2 sections are connected waterproofly here by means of fittings in the form of elbows 3.1 and tees 3.2 and comprise one watertight closed system in this embodiment. This substantially flat watertight system consists of two plane shapes in the form of rectangles.

[0019] Fig. 7 shows in another embodiment that the carrier frame comprises four connected plane geometric shapes in the form of four rectangles of pipe 2 sections. Pipe 2 sections are connected waterproofly by means of fittings in the form of elbows 3.1, tees 3.2 and a cross 3.3 and the whole in this embodiment, like in the previous embodiments, comprises a watertight closed system. This substantially flat watertight closed system consists of four plane shapes in the form of rectangles. Further extension of the frame by adding more geometric shapes in subsequent embodiments of the carrier is possible without major limitations. However, in Fig. 10, 11, 12 and 13 other embodiments of the carrier frame as a three-dimensional structure are shown. However, the third dimension of the frame in these embodiments has a limitation in the form of the loss of usable depth of a swimming pool due to the height of the carrier. This utility aspect seems to prefer flat two-dimensional exposition carriers according to the invention. Another limitation is the need to use spatial carriers and fittings of special construction in these embodiments.

[0020] Fig. 2, Fig. 5 and Fig. 8 show that the components of the carrier frame, that is, pipe 2 sections are equipped with covers 4, and fittings are equipped with covers 5.1, 5.2, 5.3. These figures show that each pipe 2 section is equipped with a rotating cover 4, and each fitting in the form of an elbow 3.1 is equipped with an elbow cover 5.1. A fitting in the form of a tee 3.2 is

equipped with a tee cover 5.2, and a fitting in the form of a cross is equipped with a cross cover 5.3. Each cover 4 of the frame pipe 2 section contains at least two rows of holes 4.1 on the upper flat surface. Each row of holes 4.1 is used to attach the edge 1.1 of one display board 1. According to this embodiment, each edge 1.1 of the display board 1 is attached to the frame pipe 2 cover 4, so this board 1 is, in shape, an equivalent of the geometric shape comprising one basic panel of the carrier frame. The entire exposition carrier frame according to the invention can comprise a greater number of connected geometric shapes comprising the frame panels, connected, for example, in the shape of a honeycomb. A basic board 1 panel is attached to each of these basic frame panels, and more board 1 panels can be arranged in a larger exposition whole. Thus, each frame pipe 2 section is equipped with a rotationally mounted cover 4 with a flat upper surface 4.2. The term rotationally mounted means that such a longitudinal cover 4 with rows of holes 4.1 on the flat upper surface 4.2 can be tilted without turning the frame pipe 2 on which the cover 4 is mounted. Owing to this the board 1 can deflect together with the cover 4 to which the edge of this board 1 is fixed, for example when a swimmer bounces off the surface of this board 1 towards the water surface, when the entire advertising carrier composed of single boards 1 lies at the bottom of the pool. Deflection of the board 1 causes the turn of the cover 4 itself, and not the turn of the whole pipe 2 on which the cover 4 is mounted, which could otherwise lead to the leakage of the system of pipes 2 and fittings of the frame.

[0021] As shown in Fig. 14, Fig. 15 and Fig. 16, each cover 4 has an oblong shape with a flat upper surface 4.2 and two peripheral support walls 4.3. The support walls 4.3 fix each cover 4 rotationally on the panel frame pipe 2, where the said support walls 4.3 have their bottom feet 4.4 rounded. This enables it to achieve the described above slight turn of the cover 4 on the frame pipe 2, with the possible deflection of the board 1 as a result of incidental load, without causing a turn of the pipe 2 of the underwater advertising carrier frame which could lead after some time to a possible leakage of the carrier frame. On the above-mentioned pipe 2 fittings 3.1, 3.2, 3.3 comprising the frame edges, covers 5.1, 5.2, 5.3 are fixed. This is shown in Fig. 2, Fig. 5 and Fig. 8. Thus, an elbow cover 5.1 is fixed to the fitting in the form of an elbow 3.1, a tee cover 5.2 is fixed to the fitting in the form of a tee 3.2, and a cross cover 5.3 is fixed to the fitting in the form of a cross 3.3. The said covers 5.1, 5.2, 5.3 substantially correspond in shape to the shapes of the above-mentioned fittings. These covers, like pipe 2 covers 4 of the exposition carrier frame, contain at least two rows of holes 4.1 on the upper flat surface. Each row of holes 4.1 is designed for attaching the edge 1.1 or the corner of one of the adjacent panels of the display board 1. These rows of holes 4.1 are clearly shown in Fig. 2, 5, 8 and Fig. 14, Fig. 15 and Fig. 16.

[0022] Fitting covers have special design. Each elbow

3.1 cover 5.1, tee 3.2 cover 5.2 and cross 3.3 cover 5.3 has at least one pair of support walls 5.4 elastically covering this fitting 3.1, 3.2, 3.3 on which the cover 5.1, 5.2, 5.3 is mounted. These pairs of support walls 5.4 are as high as support walls 4.3 fixing the covers 4 to the frame pipes 2. Thus, the support walls 4.3 of the frame pipe 2 covers 4 and the support walls 5.4 of the fitting covers 5.1, 5.2, 5.3 being based on the bottom of the pool, keep the entire frame of the exposition carrier together with the boards 1 attached to the pipe covers and the fitting covers at a certain distance from the pool bottom.

[0023] Fig. 17, Fig. 18 and Fig. 19 show that each pair of support walls 5.4 of each cover 5.1, 5.2, 5.3 of the frame pipe 4 fitting is convergent. The term convergent should be understood that a distance of bottom edges of bottom feet 5.5 of both support walls 5.4 in each pair of support walls 5.4 at the base is smaller than the outer diameter of the fitting which is situated inside this cover 5.1, 5.2, 5.3. Typical hydraulic fittings in the form of elbows, tees and crosses are only schematically shown in Fig. 1, 4, 7 and 10, 11, 12, 13. However, the upper flat wall 5.6 of the fitting cover is wider than the outer diameter of the said fitting. All fitting covers in the form of elbow covers 5.1, tee covers 5.2 and cross covers 5.3 are made of semi-rigid elastic plastic, in this embodiment of hard PVC. The result is that an elbow cover 5.1, a tee cover 5.2 and a cross cover 5.3 can be pressed in the said fittings and then elastic convergent pairs of support walls 5.4 of these covers bear the said fittings, so they keep the entire frame of the underwater exposition carrier in a certain distance from the pool bottom. Thus, the entire frame loosely rests on the bottom horizontal feet 5.5 of the support walls of the fitting covers and on the bottom feet 4.4 of the support walls 4.3 of the carrier frame pipes 2 according to the invention. Each pair of support walls 5.4 of each cover, owing to the said form, keeps each fitting between this pair of support walls 5.4 in a certain distance from the pool bottom which is a further solution facilitating the movement of the entire exposition carrier along the pool bottom. At the same time, owing to the elasticity of these support walls 5.4, the cover 5.1, 5.2, 5.3 can be easily removed from the fitting, if needed.

[0024] Each panel of the display board 1 contains around all edges 1.1 a row of holes 1.2 designed for fixing the said board 1 to covers 4 on the carrier frame pipes 2 and to covers 5.1, 5.2, 5.3 on fittings in the form of elbows 3.1, tees 3.2 and crosses 3.3. The boards are shown in Fig. 20 and Fig. 21, as well as Fig. 3, Fig. 6 and Fig. 9. The rows of holes 1.2 are shown in boards 1. The board 1 is attached to the said pipe and fitting covers by means of known plastic connection screws 6. This is shown in Fig. 22 and Fig. 23. Other embodiments do not exclude the use of other connecting members, such as self-clinching studs.

[0025] Fig. 10 and Fig. 12 show further embodiments in the form of three-dimensional exposition carriers according to the invention. However, Fig. 12 and 13 show the embodiment of the exposition carrier, where the

frame pipes 2 comprise circle sectors and the entire panel is made as a circular panel. This type of an embodiment of a circular exposition carrier can also relate to a flat panel not containing the third dimension in the form of height.

Other embodiments do not exclude the construction of the carrier according to the invention equipped with rolls or wheels for further facilitation of the movement of the carrier along the pool bottom, which, however due to the carrying capacity of the frame itself filled with the air does not seem to be necessary.

[0026] The list of designations in the figures.

1. Display board.
- 1.1. Board edge.
- 1.2. Hole.
2. Carrier frame pipe.
- 3.1. Elbow.
- 3.2. Tee.
- 3.3. Cross.
4. Frame pipe cover.
- 4.1. Hole in the frame pipe cover.
- 4.2. Flat surface of the cover.
- 4.3. Support wall.
- 4.4. Bottom foot.
- 5.1. Elbow cover.
- 5.2. Tee cover.
- 5.3. Cross cover.
- 5.4. Support wall of the cover.
- 5.5. Bottom feet of the support wall.
- 5.6. Flat surface of the cover.
- 5.7. Hole in the fitting cover.
6. Connection screw.

Claims

1. Underwater exposition carrier containing at least one panel, where the panel comprises a waterproof display board attached to a fastener, where the fastener comprises a frame in the form of a geometric shape whose edges are connected by fitting members, **characterised in that** the edges comprise parts of hollow sections (2) filled with the gas, and the fitting members comprise the fittings of the said sections (2), wherein parts of the said hollow sections (2) with the fittings comprise a watertight system.
2. Underwater carrier, according to claim 1, **characterised in that** the hollow sections comprise pipes (2), and fittings comprise fitting members in the form of elbows (3.1) and/or tees (3.2) and/or crosses (3.3).
3. Underwater carrier, according to claim 1 or 2, **characterised in that** the carrier frame comprises at least two geometric shapes, whose edges in the form of parts of sections (2) with fittings (3.1, 3.2, 3.3) comprise at least one watertight system.

4. Underwater carrier, according to claim 1 or 2 or 3, **characterised in that** the watertight system is filled with the air.
5. Underwater carrier, according to claim 1 or 2 or 3 or 4, **characterised in that** the carrier frame comprises a plane geometric shape.
6. Underwater carrier, according to claim 1 or 2 or 3 or 4, **characterised in that** the carrier frame comprises a spatial geometric shape.
7. Underwater carrier, according to one of the claims from 1 to 6, **characterised in that** in the pipe (2) sections comprising the frame, covers (4) fixing the boards (1) are rotationally mounted, where each cover (4) contains in the upper flat surface (4.2) two rows of holes (4.1), each row of holes (4.1) for attaching the edge (1.1) of one of the adjacent display boards (1).
8. Underwater carrier, according to claim 7, **characterised in that** each peripheral support wall (4.3) of the cover (4) is mounted on the panel frame pipe (2), where the said support walls (4.3) of the covers (4) have their bottom feet (4.4) rounded.
9. Underwater carrier, according to one of the claims from 1 to 8, **characterised in that** the covers (5.1, 5.2, 5.3) are mounted on pipe (2) fittings (3.1, 3.2, 3.3) comprising the frame edges, where the said fitting covers contain at the upper flat surface (5.6) at least one hole (5.7) for fixing the edge (1.1) of at least one display board (1).
10. Underwater carrier, according to claim 9, **characterised in that** the fitting (3.1, 3.2, 3.3) covers (5.1, 5.2, 5.3) have pairs of support walls (5.4) higher than the outer diameter of the said fittings.
11. Underwater carrier, according to claim 10, **characterised in that** each pair of support walls (5.4) of the fitting (3.1, 3.2, 3.3) cover (5.1, 5.2, 5.3) is convergent towards the pool bottom, whereas the distance of the edges of both walls from each other in each pair of support walls (5.4) at the base is smaller than the outer diameter of the fitting which is situated inside this cover (5.1, 5.2, 5.3), whereas the fitting cover is made of elastic plastic.
12. Underwater carrier, according to one of the preceding claims from 1 to 11, **characterised in that** each board (1) contains around the edges (1.1) at least one row of holes (4.1) for fixing the board (1) to pipe covers (4) and to fitting (3.1, 3.2, 3.3) covers (5.1, 5.2, 5.3) by means of separable fasteners (6).

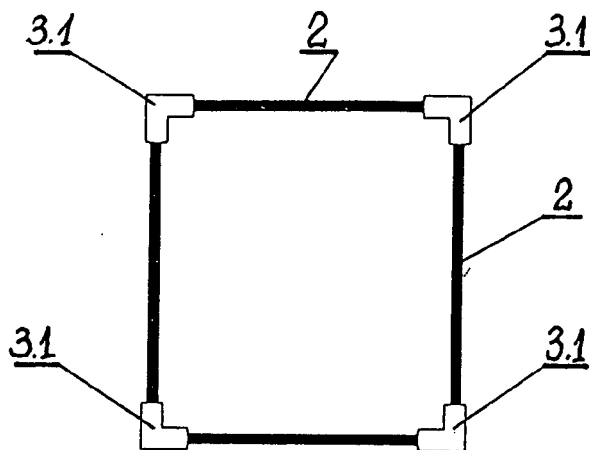


Fig. 1

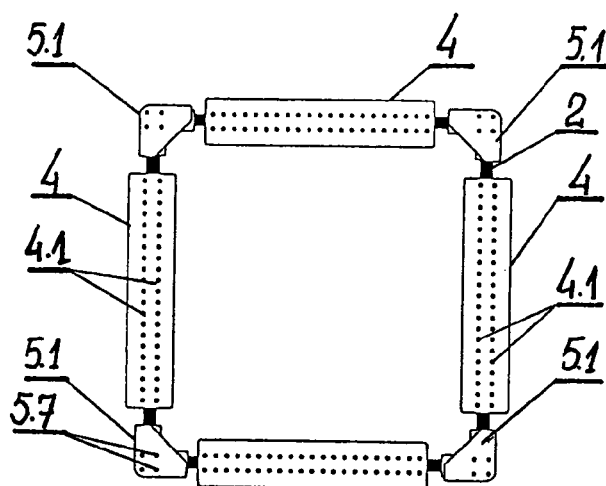


Fig. 2

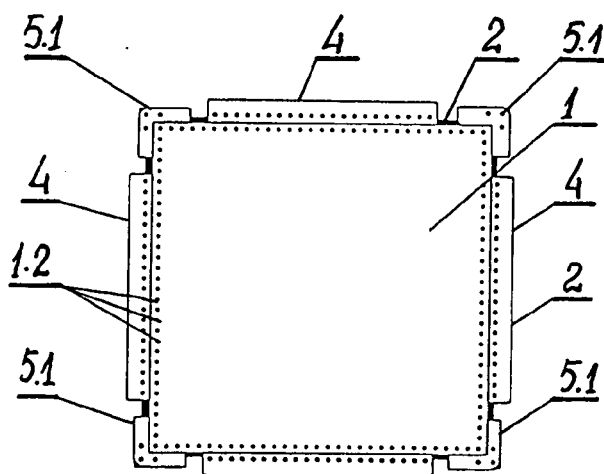


Fig. 3

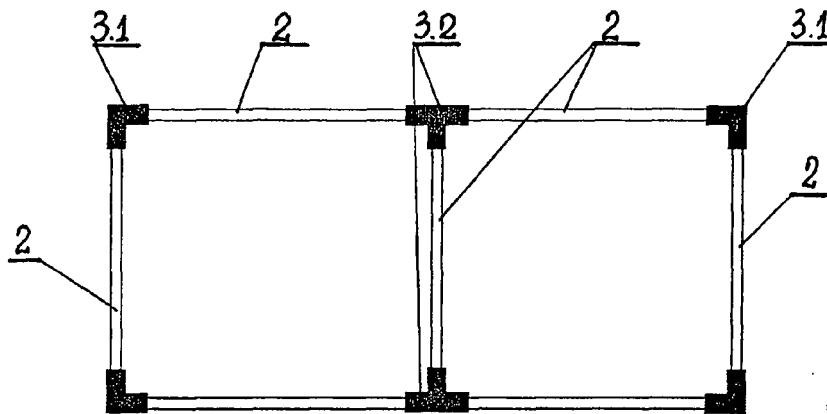


Fig. 4

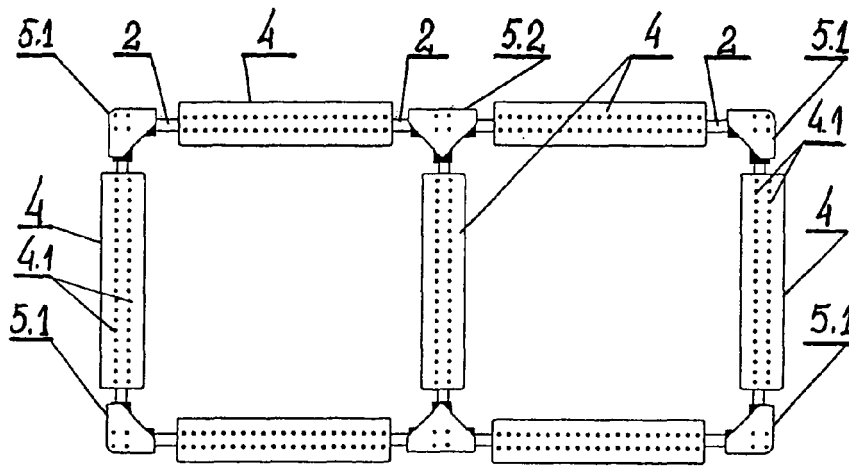


Fig. 5

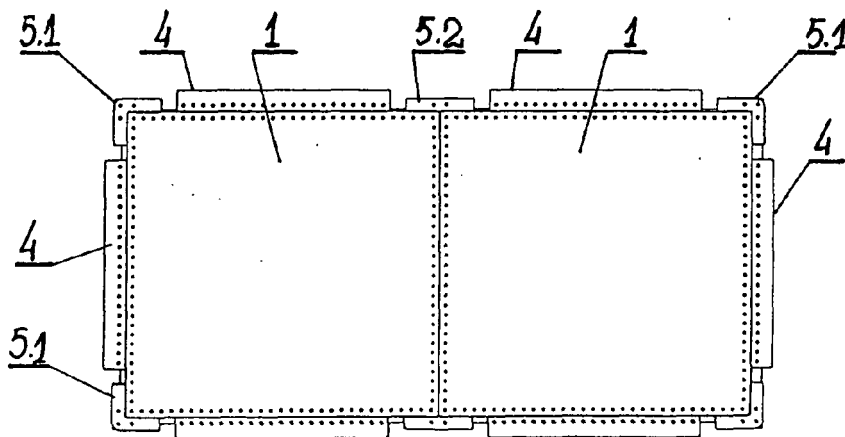


Fig. 6

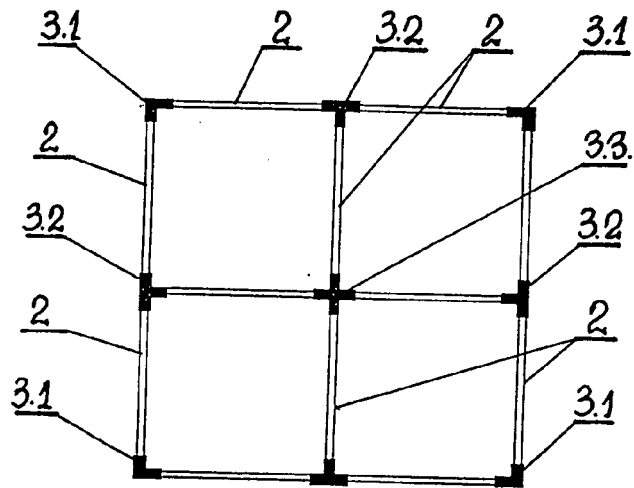


Fig. 7

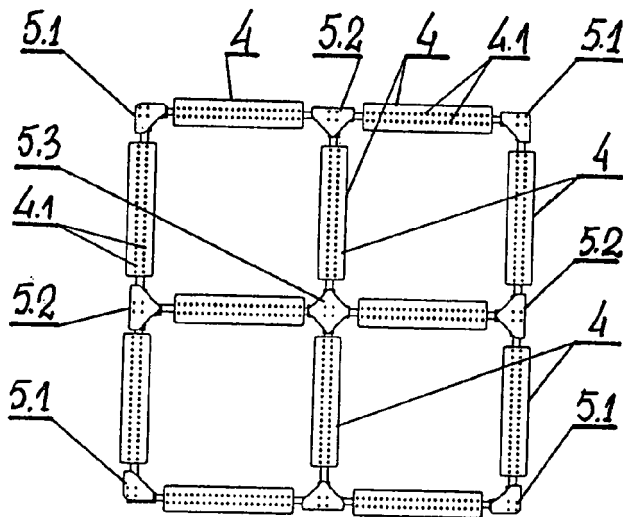


Fig. 8

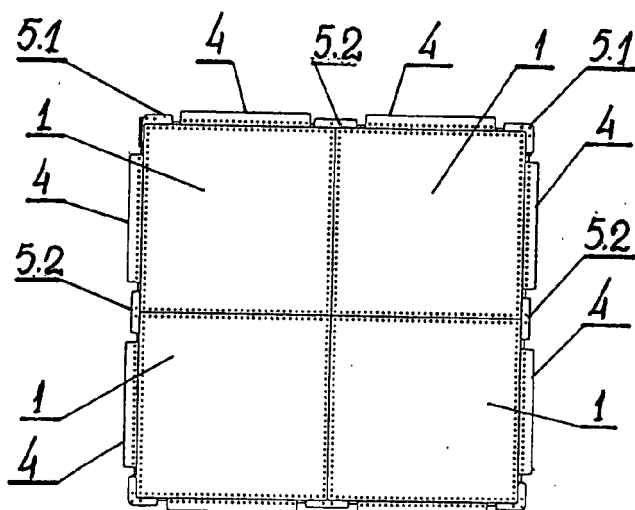


Fig. 9

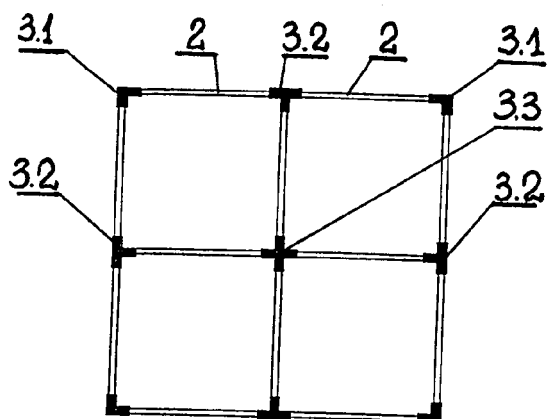


Fig. 10

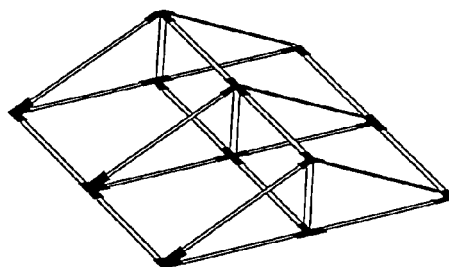


Fig. 11

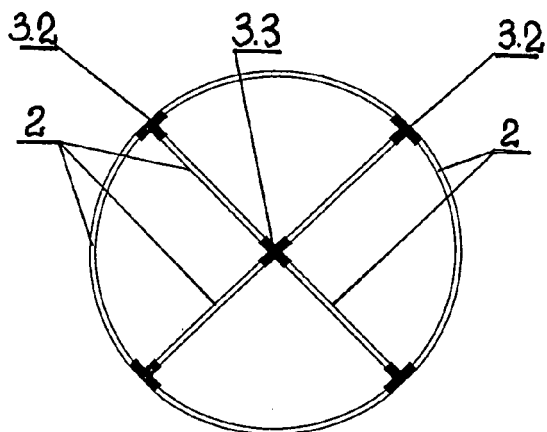


Fig. 12

Fig. 13



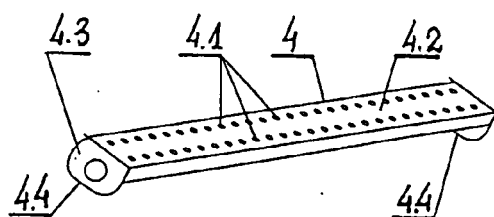


Fig. 14

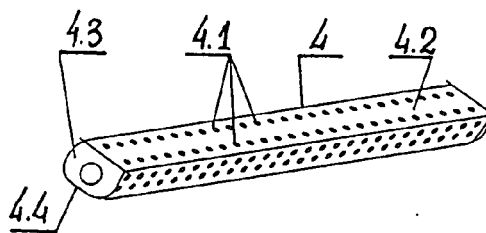


Fig. 15

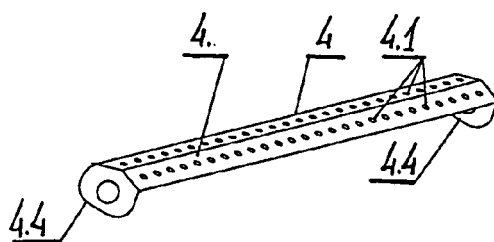


Fig. 16

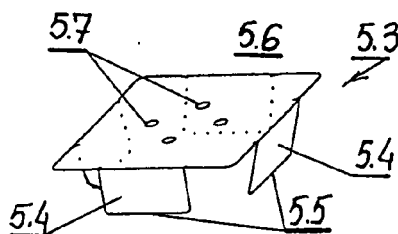


Fig. 17

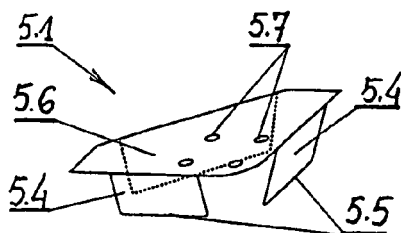


Fig. 18

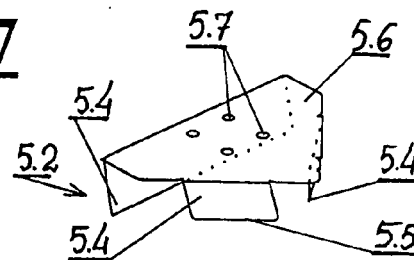


Fig. 19

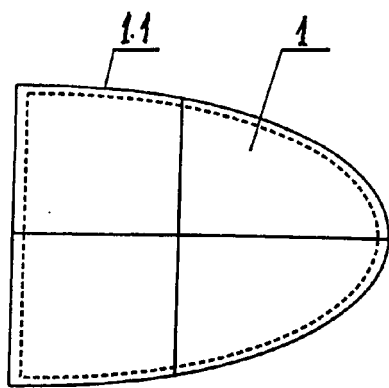


Fig. 21

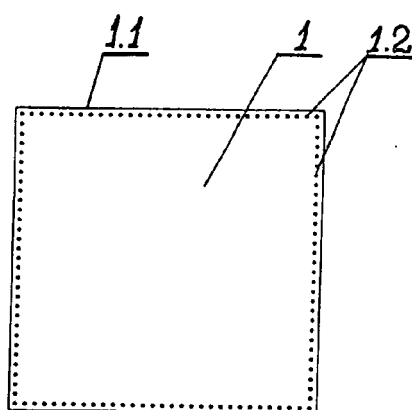


Fig. 20

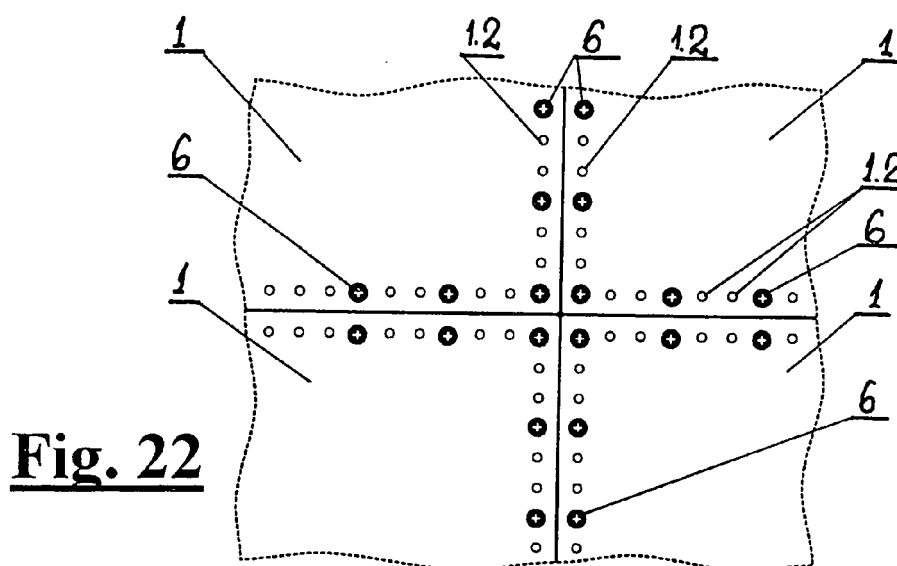


Fig. 22

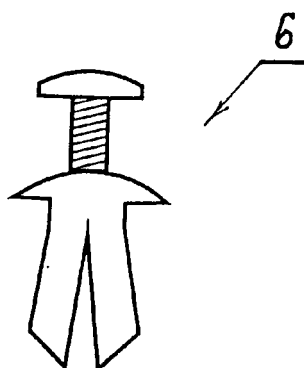


Fig. 23



EUROPEAN SEARCH REPORT

Application Number
EP 12 46 0022

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2007/074132 A1 (SCHREIBER CHRISTOPH [DE]) 5 July 2007 (2007-07-05) * page 1, line 1 - line 4 * * page 2, line 9 - line 17 * * page 7, line 10 - line 25 * * page 9, line 10 - line 25 * * page 10, line 3 - page 11, line 8 * * figures 1-6 * -----	1-12	INV. G09F19/22 G09F15/00
A,D	US 5 549 950 A (MUROLO DAVID [US]) 27 August 1996 (1996-08-27) * the whole document * -----	1-12	
A,D	WO 97/05595 A1 (MUTSCHLER FRIEDOLF [DE]) 13 February 1997 (1997-02-13) * the whole document * -----	1-12	
			TECHNICAL FIELDS SEARCHED (IPC)
			G09F E04H
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 27 August 2012	Examiner Pantoja Conde, Ana
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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The members are as contained in the European Patent Office EDP file on
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