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(54) SYSTEM FOR DRY TRANSFER OF BOATS FROM AT LEAST ONE WATER SURFACE

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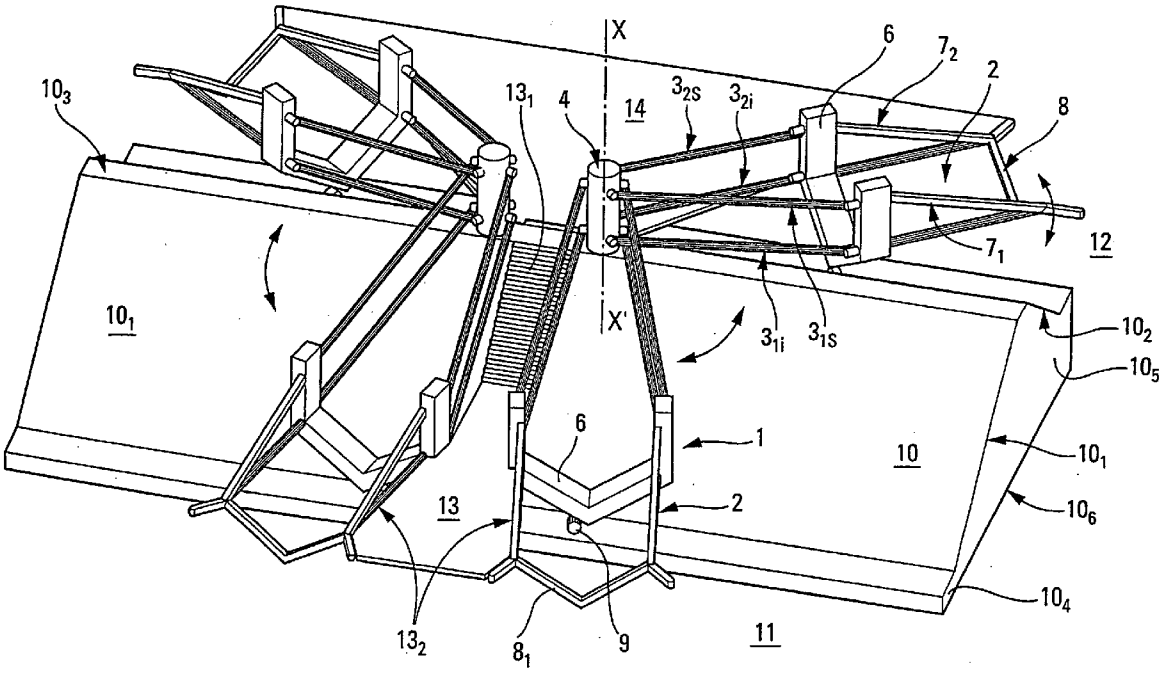
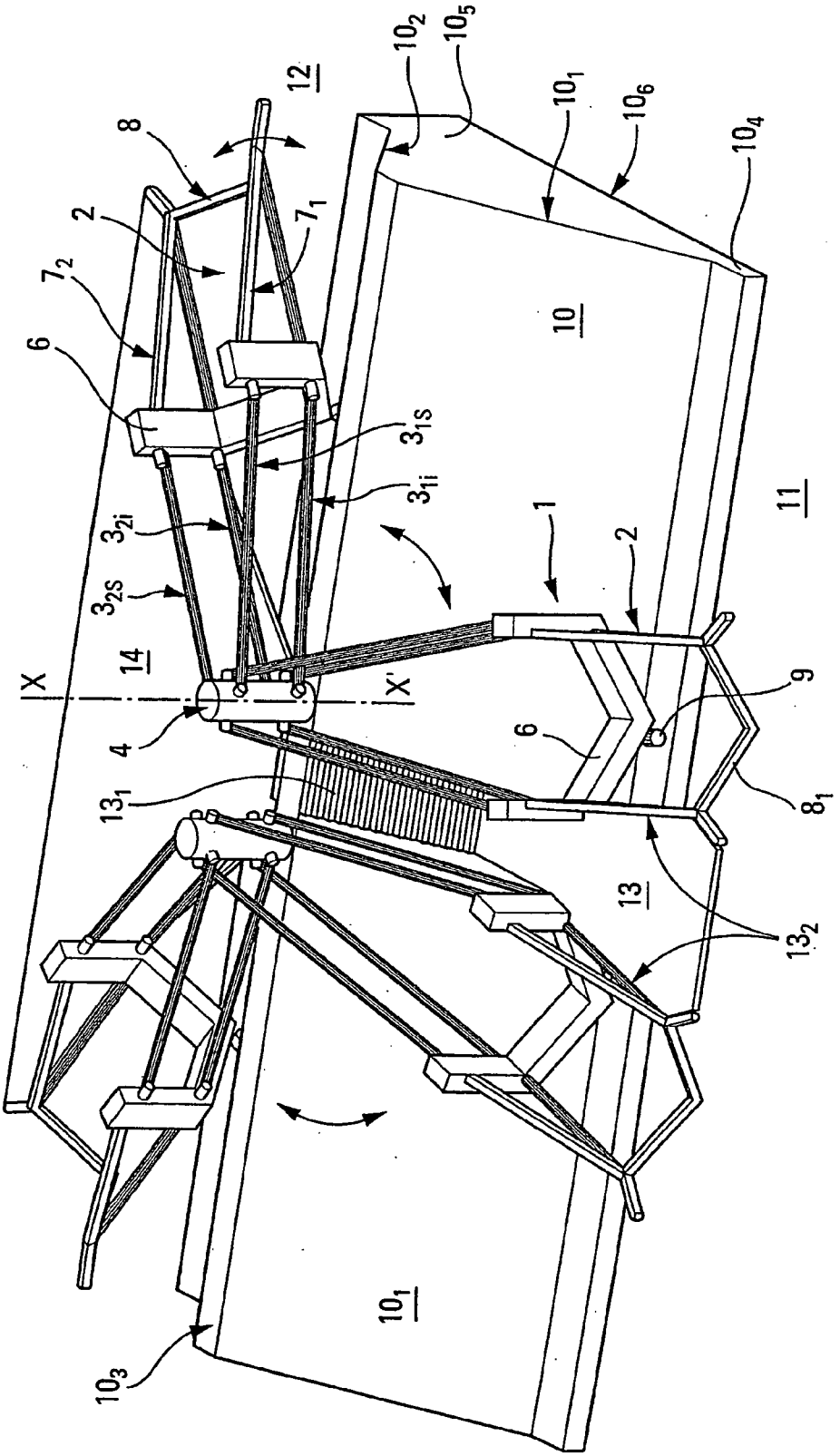
(57) **ABSTRACT**

A boat transfer system (**1**) includes a launching cradle (**2**) and a conveyor (**5**) supporting it and intended to be installed along a continuous and non-vertical linear profile of any structure (**10**) abutting at least one water body (**11**), which boat transfer system is capable of immersing the launching cradle (**2**) under the surface of the water body, removing it from the water, and moving it out of the water so as to enable it to pass over the structure (**10**); it therefore includes a frame (**4**) intended to be attached to the structure (**10**) and rotating about a vertical axis (X, X'), and a set of arms (**3**) connecting the frame (**4**) to the launching cradle (**2**) and holding it in the horizontal position regardless of its position in rotation about the frame (**4**) and with a height corresponding to the track of the conveyer (**3**).




12
10_2
10_5
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1
2
11
3_{2i}
3_{2S}
X
14
X'
9
6
4
13_1
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13
13_2
10_1
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Fig. 1

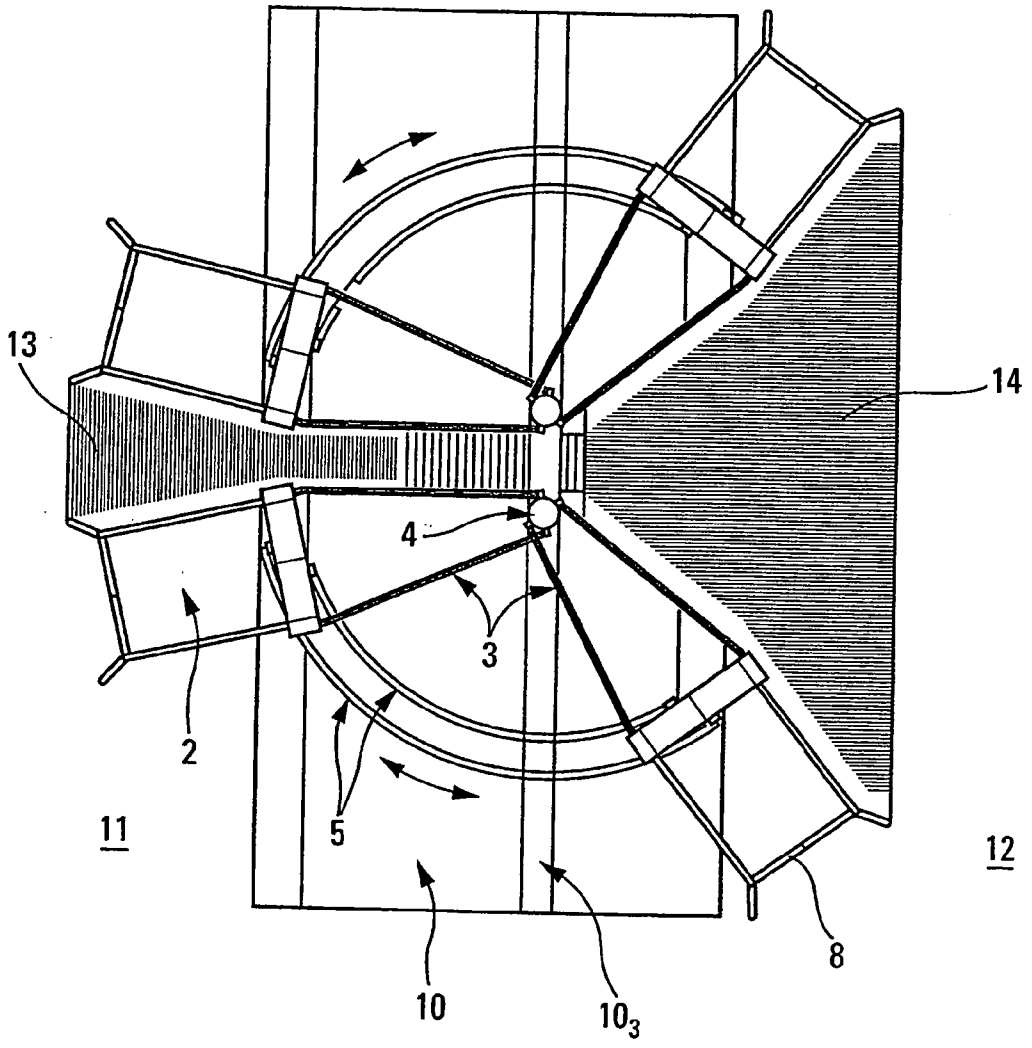

Fig. 2

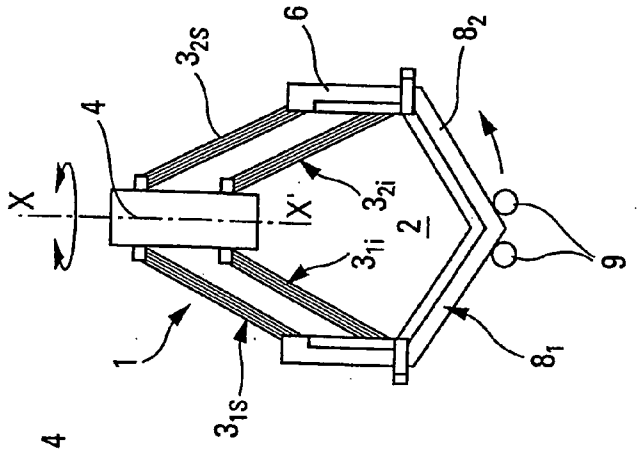

Fig. 3C

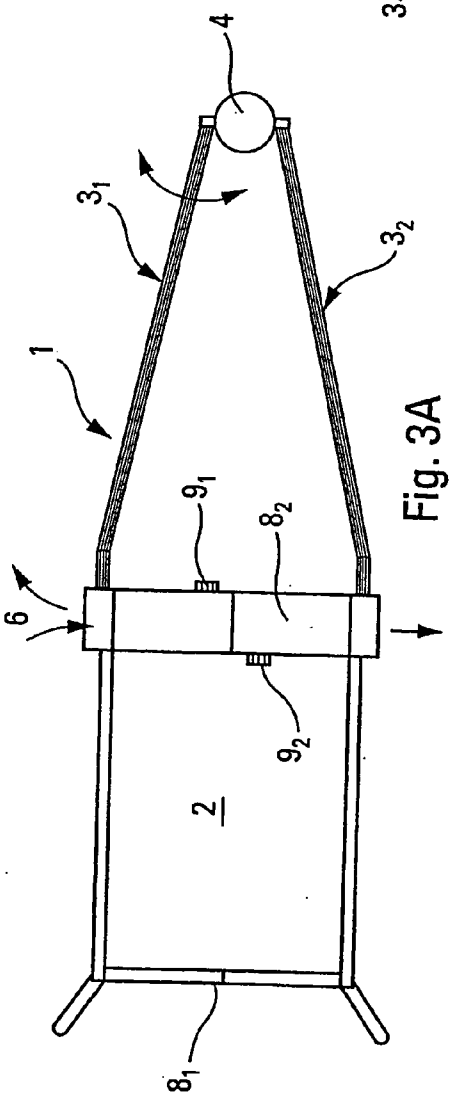

Fig. 3A

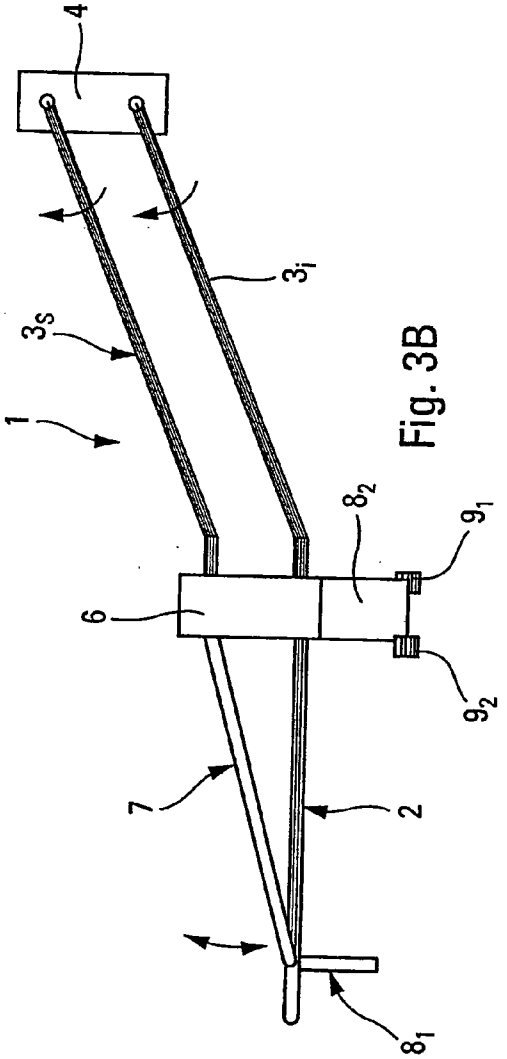

Fig. 3B

SYSTEM FOR DRY TRANSFER OF BOATS FROM AT LEAST ONE WATER SURFACE

[0001] This invention relates to a system for the dry transfer of boats from at least one water surface, but intended more specifically for transferring them between two water surfaces of different and possibly variable levels, separated by a structure.

[0002] The technical sector of the invention is the field of lifting apparatuses or mechanisms for boats, of which there are numerous constructions that may have been the subject, in some cases, of patent applications, such as FR 2 057 321, published on May 21, 1971, describing a transfer, and in particular locking, system for moving a boat from a first level to a different level by means of a trough pivoting above the lower level and about a horizontal transverse axis, which trough has one end that is open and another end that is raised.

[0003] It is also possible to cite patent application FR 2 041 848, published on Feb. 5, 1971, which describes a dry boat transfer system for barges and other boats, enabling them to be moved from one waterway to another, unconnected, waterway, by means of a vehicle capable of receiving the boat, and which penetrates one of the lock chambers provided in the waterways to be connected.

[0004] There are also systems for lifting or raising by means of a portal, which moves above the boats so that they can be removed from the water and then moved them, outside of the water, to another storage location or to another point where they are placed in the water, but such systems require particular mobility features, as do the other boat transfer systems of the type described above, as well as a skilled "pilot" technician; moreover, they stand very high and are unattractive.

[0005] No system, to the inventor's knowledge, thus solves the transfer problem so as, on the one hand, to be adapted to a pre-existing structure abutting a water body, without significant leveling work modifying this structure, when each side of the surface profile thereof is linearly continuous and inclined (i.e. having no vertical portion, each tangent at any point on the curve representing a cross-section of this profile forming an angle preferably between 0 and 60°, and the overall average slope of the structure being on the order of 25 to 40°, and even 27 to 30°, like most known civil engineering structures), and, on the other hand, to satisfy the specific case of boat "port-garages" along the shoreline.

[0006] Indeed, the shoreline law, in France in particular, and the urban planning regulations in force, protect the shoreline by limiting the creation of new ports or the enlargement of existing ones, thus requiring, in order to respond the increased demand for "garages" particularly for leisure boats, authorization for ground parking lots on unconstructible ground, where this possibility of storage is still tolerated. However, these dry ports create "second rank" recreational boaters, because their access to the sea is inconvenient, expensive and dependent on organization and a time schedule; this has the consequence, among other things, of impeding the marine industry, contributing to the aging of the park, and increasing the congestion of floating ports with boats of which the essential value is their ring.

[0007] The problem presented is therefore that of being capable, on the one hand, of crossing over the pre-existing structures, or constructing, without any major modification to the form thereof if their profile is linearly continuous and inclined, and, on the other hand, of providing an alternative to dry ports by using closed water surfaces not communicating with the waterway that would enable access thereto, such as an estuary, the sea itself or any canal or river leading to it, and located at water levels different from that of their access waterway.

[0008] Such water bodies or basins, which can be in fresh water or seawater, can then be located several hundred meters from the shore, constructed on land between the coast +2 or +3 NGF (French vertical reference), without reaching the alluvial sheet, and isolated therefrom with a water level located above that of their access waterway: the depth, between 1.8 and 2 meters, for example, of the basin makes it possible to create, without producing actual quays, a port capable of receiving around one hundred units per hectare; however, it is necessary to be capable of crossing over the dyke that separates these basins from the access waterway, without creating locks.

[0009] A solution to the stated problem is a boat transfer system including a launching cradle and a conveyor supporting it, intended to be installed along a continuous linear profile, of which all of the portions are either horizontal or inclined, of any structure, and pre-existing or to be constructed (corresponding to the dividing dyke above), lining (abutting) a water body (such as the closed "port-garage" type) and of which the transverse cross-section has a general trapezoidal shape, which boat transfer system is capable of immersing said launching cradle under the surface of the water body, removing it from the water, and moving it outside of the water; according to the invention, said boat transfer system includes a frame intended to be attached to this structure and rotating about a vertical axis X, X', and a set of arms connecting said frame to the launching cradle and holding it in the horizontal position regardless of its position in rotation about the frame and with a height corresponding to the track of the conveyor.

[0010] The general trapezoidal profile of the structure preferably consists of a series of inclined and horizontal planes, with the transverse cross-section of its surface portion including a first straight segment inclined between the water body and its apex, and a second, very short, straight horizontal segment representing said apex of the structure which, under certain conditions, road vehicles can access; however, this profile can also consist of a series of inclined planes separated by horizontal steps, or any other surface or curve generally having a slope, to which a conveyor can be connected, on which conveyor a launching cradle can move.

[0011] To satisfy the problem of closed basins in which a boat transfer system is intended to be installed on a structure separating two water bodies capable of being at different and even variable levels, the conveyor is capable of carrying the launching cradle from one water body to the other, regardless of the respective water levels.

[0012] In a preferred embodiment of the invention, the conveyor consists of at least two rails, the tracks of which are almost concentric and equidistant; they follow (with close relative height adjustments so that the rails enable the horizontal launching cradle to be held on the conveyor) the curves of intersections between the profile of the structure and two pseudo spherical and concentric housings, of which the centers are located on the axis X, X'; the vertical projection, in a horizontal plane, of these tracks are cycloid

curves; in the case of a profile consisting, on each side of the structure, of continuous inclined planes, said tracks are then arcs of circles located in said planes, which are also those of the movement of the launching cradle.

[0013] At least one wheel secured to the launching cradle is in contact with each of said rails; at least two wheels associated with two different rails are preferably arranged in the same horizontal plane, i.e. at the same level, but mutually offset in this plane with respect to the direction of movement of the launching cradle so as to prevent excessive torsion stress capable of resulting from the transverse rotation movement and the impossibility of perfectly directing the load; said wheels are mutually connected by a chassis (truck), which can pivot only horizontally so as to follow the track in an ascending and descending spiral of the two rails that are thus continuously, under these wheels, at the same level, offset by the distance between the axles of these wheels.

[0014] The result is a new type of boat transfer system satisfying the stated problem, without any notable modification of the continuous linear profile of the dyke or the structure to be crossed, except of course for some civil engineering installation work, which system according to the invention can be used to simply remove a boat from the water and move it, outside of the water, over the structure.

[0015] The boat transfer system according to the invention makes it possible to continuously perform the transfer, without the assistance of a "pilot-technician", since the owner of each boat or any operator can use this boat transfer system, which can be controlled easily according to the description and the method described below; it thus makes it possible to successfully create intermediate solutions between the conventional port and the dry port, consisting of closed "port-garage" basins, and thus to promote this type of port located in unconstructible areas, protected from high water and sanding without reducing the flood plain; located close to the sea and accessible at any time, isolated from unconfined water and ensuring the quality of the water in the basin, they provide protection from maritime or fluvial influences, offering integration at the site (no or few concrete blocks, no construction), facilitating access by vehicles, with parking on the grounds, as well as possibilities for boat maintenance, and so on.

[0016] Other advantages of this invention can be cited, but those cited above already provide enough proof of the novelty and benefit of the invention. The description below and the appended drawings relate to an example of an embodiment of the invention, but are non-limiting; other embodiments are possible within the scope of this invention.

[0017] FIG. **1** shows a general perspective view of a double boat transfer system according to the invention and each arranged in two positions of placement in the water on two water bodies of different heights, on each side of the dividing dyke.

[0018] FIG. **2** shows a top view of the same double boat transfer system as FIG. **1**.

[0019] FIG. **3** shows three views, of the top, the profile and the surface of the rotating portion of a boat transfer system around its frame secured to the structure or the dyke.

[0020] FIGS. **1** and **2** show, by way of example, a structure or dyke **10** separating two water bodies **11**, **12** and of which the profile consists of two inclined planes $\mathbf{10}_1$, $\mathbf{10}_2$, of which the largest $\mathbf{10}_1$ measures, for example, on the order of 8 m, connected to their upper portion by a horizontal plane $\mathbf{10}_3$; its transverse cross-section, perpendicular to these planes, forms a trapezium of which the upper base $\mathbf{10}_3$ is then necessarily narrow so as to enable, on each side thereof, the downward pivoting of the arms **3** of the boat transfer system as described below, and the lower base $\mathbf{10}_6$ consists of a footing $\mathbf{10}_4$, $\mathbf{10}_5$ capable of going beyond each side of the inclined planes $\mathbf{10}_1$, $\mathbf{10}_2$ so as to form ledges (the vertical portions thereof do not form part of the definition of the actual profile of the structure as described in this description), the bottom portion of the inclined plane $\mathbf{10}_2$, corresponding to the higher water level, can be truncated, and the ledge $\mathbf{10}_5$ thus obtained can indeed also be higher than that $\mathbf{10}_4$ of the lowest water body.

[0021] The slopes of the two inclined planes $\mathbf{10}_1$, $\mathbf{10}_2$ are preferably identical, on the order of 27 to 30°, but are capable of being up to 45°.

[0022] The boat transfer system **1** according to the invention includes a launching cradle **2** and a conveyer **5** supporting it and intended to be installed along the continuous linear profile, of which all of the portions are therefore either horizontal or inclined, of the structure **10** abutting at least one water body **11**, and, as shown in the appended figures, in fact two water bodies **11** and **12**, wherein water body **11** is lower than water body **12**, which can be that of a "port-garage".

[0023] Said boat transfer system **1** is capable of immersing said launching cradle **2** under the surface of each water body, removing it from the water and moving it, out of the water, over said structure **10**; for this purpose, it includes:

[0024] a frame **4** intended to be attached to the upper portion $\mathbf{10}_3$ of this structure **10** and rotating about a vertical axis X, X';

[0025] a set of arms **3** having a length corresponding to that of the dimension of the largest inclined plane of the structure, for example on the order of 8 m as indicated above, and connecting said frame **4** to the launching cradle **2**; said arms **3** holding it in the horizontal position regardless of its position of rotation about the frame **4** and with a height corresponding to the track of the conveyor **3**; according to the embodiment shown in the appended figures, four arms **3** connect, two-by-two, respectively $\mathbf{3}_{1s}$, $\mathbf{3}_{1i}$ and $\mathbf{3}_{2s}$, $\mathbf{3}_{2i}$, the two longitudinal sides of the launching cradle **2** to the frame **4**, which arms are pivoted at each of their ends, and each pair $\mathbf{3}_1$, $\mathbf{3}_2$ of arms arranged in a vertical plane forms a deformable parallelogram;

[0026] two rails constituting said conveyor **5**, and the tracks of which follow, with close relative height adjustments, the curves of intersections between the profile of the structure of two pseudo spherical and concentric housings (of which one has a radius corresponding approximately to the length of the arms **3**, adjusted by the height of the launching cradle **2**) and of which the centers are located on the axis X, X', and with each of which at least one wheel **9** secured to the launching cradle **2** is in contact; these rails are concentric, equidistant and at the same level at points offset by the distance (which can be, for example, 1.5 m for the structure size given above) between the corresponding wheel axles **9** separated from the lower portion of the cross member $\mathbf{8}_2$ described below, so as to allow it to pass through;

[0027] two wheels $\mathbf{9}_1$, $\mathbf{9}_2$ at least associated with two different rails being arranged in the same horizontal plane (FIG. **3**B) but mutually offset (FIG. **3**A) with respect to the direction of movement of the launching cradle **2**; they are

mutually connected by an adjustable and horizontally pivoting chassis (truck) (not shown in the appended figures);

[0028] said launching cradle **2**, which can have any known shape, and which, for example, consists of two cross members **8**, for example, in a "V" shape with an angle between 120 and 126° so as, on the one hand, to best engage the shell shape of the boats, and, on the other hand, to match the slope of the structure **10**, each cross member **8** being capable of having rollers and/or flexible systems such as water-filled cushions so as to gently handle the shell of the boats intended to come into contact with it; at least the cross member $\mathbf{8}_1$ farthest from the connecting frame **6** (which includes another cross member $\mathbf{8}_2$), between the launching cradle **2** and the driving arms **3**, with which one end of the boat shell is intended to come into contact, either on the side of its stem or on the side of its stern, can be raised so as to lift said end of the boat; this raising movement of the cross member $\mathbf{8}_1$ can be produced by upper support jacks (diagrammatically shown in the appended figures) **7** of the launching cradle **2** connecting the distal end thereof to the upper portion of the frame **6** that also supports the wheels **9** under the cross member $\mathbf{8}_2$.

[0029] The cross-member jacks **7** enable the launching cradle to be lowered in the unloading phase, and its lifting (for example by 5°) in the loading phase thus makes it possible to successfully load the drive wheels **9** so as to support their adherence, and to prevent any backward sliding of the boat.

[0030] The conveyor **5** preferably consists of rails, of which the bearing surface receiving the support wheels **9** of the launching cradle **2** is comparable with those of said wheels **9**, which are drive wheels, so that these surfaces enable the adherence and the movement of said wheels **9**; said rail surfaces can be, for example, toothed or simply rough, on which said support wheels **9** of the launching cradle **2** mesh or adhere; said drive wheels **9**, arranged in a staggered pattern, can be driven by hydraulic motors.

[0031] Owing to the deformability of the parallelograms formed by the support arms **3** pivoted at their end and the possibility of interrupting the rotation of the assembly, or not, when the launching cradle is brought to a level of the profile **10** of the structure compatible with that of the water body, so as to enable a boat to pass over its cross members **8**, said conveyor **5** is thus capable of enabling said boat to be transferred from one water body to the other, regardless of the respective water levels; the level of the upper water body **12** can be stationary, capable of corresponding to closed, non-communicating "port-garage" water bodies, while that of the other, lower, water body **11** can be variable since it can correspond to the access channel communicating with the sea, therefore subject to variations.

[0032] To be capable of accessing the boat (not shown in the appended figures) or disembarking therefrom when it is loaded into the launching cradle **2**, the boat transfer system according to the invention comprises at least one access platform **13** extending at least between a surface portion of the structure **10**, such as, preferably, its upper portion $\mathbf{10}_3$, and the surface of the corresponding water body; this platform can comprise an access by a bridge or a stairway $\mathbf{13}_1$, and its lateral sides $\mathbf{13}_2$ are designed so that they are almost parallel to those of the launching cradle **2** when it is in the position for recovery or placement of a boat on said water body.

[0033] Said platform **13** is floating and vertically mobile so as to follow the variations in level of the water body, in particular in the example of the appended figures on the side of the lower, variable, water body **11**; if the rotating launching cradle is then stopped when the support cross members **8** enable the boat to be disengaged by floating, the corresponding position of the launching cradle will be dependent on the level of the water body, and will be at a substantial distance from the platform **13**; the latter can then be mounted, on the side of the access bridge $\mathbf{13}_1$, so as to slide over a vertical guide pole about which it can pivot so as to enable the launching cradle **2** to reach it.

[0034] The access platform **14** on the side of the upper, stationary, water body **12**, can also then be stationary; this platform has a much wider surface than that on the side of the lower water body, as shown in FIG. **2**, since the amplitude of the movement (in rotation and in height) of the launching cradle **3** is of course smaller on the side of the higher water body than on the side of the lower water body.

[0035] The entire motorization of this boat transfer system, aside from the wheels **9** themselves, as well as the lifting of the cross member $\mathbf{8}_1$, can be hydraulic and easily controlled by any operator, such as the owner or any seaman of the boat that is to be transferred.

[0036] To do this:

[0037] with the launching cradle **2** positioned close to one of the access platforms **13**, and therefore immersed under the corresponding water body, the pilot of the boat engages it on at least the cross member $\mathbf{8}_1$, then that $\mathbf{8}_2$ of the frame **6**; once the boat has been positioned and stopped, the pilot and any other passenger can disembark from the boat using the platform **13**;

[0038] mounted at the apex $\mathbf{10}_3$ of the structure owing to the bridge $\mathbf{13}_1$ for accessing the platform **13**, the pilot actuates the control of the boat transfer system from any case intended for this purpose, placed, for example, near the rotating frame **4**;

[0039] the latter first pivots the boat by raising the cross member $\mathbf{8}_1$ so that it cannot slide outside of the launching cradle **2** during the movement, then drives the frame **4** in rotation by means of the drive wheels **9**, which mesh with the rails of the conveyor **5** so as to rise above the structure **10**;

[0040] with the arms **3** holding the launching cradle in the same position, it thus passes over the upper portion $\mathbf{10}_3$ of the structure, then is lowered on the other side toward the other water body until it is positioned on the side of the other platform **14**, from which the pilot can re-embark when the cross member $\mathbf{8}_1$ has pivoted again so as to release the boat;

[0041] and so on with another boat; if the two launching cradles are arranged on the opposite side of the dyke **10** with respect to that where a boat that is to cross over it is arriving, its pilot docks the platform so as to be capable of using it to access the apex of the dyke; he can then actuate the launching cradle located, of course, on the other side of the platforms than where he docked, so that the corresponding launching cradle is positioned on the side where the boat is waiting; the pilot then re-embarks and performs the aforementioned maneuver.

[0042] It is clear that with a single launching cradle the operation would be identical; however, the production of double boat transfer systems of course makes it possible to transfer boats at a faster rate.

1. Boat transfer system (1) including a launching cradle (2) and a conveyor (5) supporting it and intended to be installed along a continuous linear profile, of which all of the parts are either horizontal or inclined, of any structure (10) lining at least one water body (11), which boat transfer system is capable of immersing said launching cradle (2) under the surface of the water body, removing it from the water, and moving it out of the water, characterized in that it includes a frame (4) intended to be attached to said structure (10) and rotating about a vertical axis (X, X'), and a set of arms (3) connecting said frame (4) to the launching cradle (2) and holding it in the horizontal position regardless of its position in rotation about the frame (4) and with a height corresponding to the track of the conveyer (3).

2. Boat transfer system (1) according to claim 1 intended to be installed on a structure (10) separating two water bodies, characterized in that the conveyor (5) is capable of carrying the launching cradle (2) from one water body to the other, regardless of the respective water levels.

3. Boat transfer system (1) according to claim 1, characterized in that the conveyor (5) consists of at least two rails, of which the tracks follow, with close relative height adjustments, the curves of intersections between the profile of the structure and two pseudo spherical and concentric housings, of which the centers are located on the axis (X, X'), and with each of which at least one wheel (9) secured to the launching cradle (2) is in contact, two wheels at least associated with two different rails being arranged so as to be mutually offset with respect to the direction of movement of the launching cradle.

4. Boat transfer system (1) according to claim 3, characterized in that the two wheels (9) are arranged in the same horizontal plane and mutually connected by a horizontally-pivoting chassis.

5. Boat transfer system (1) according to claim 1, characterized in that the conveyor (5) consists of rails, of which the bearing surface receiving the support wheels (9) of the launching cradle (2) is compatible with those of said wheels (9), which are drive wheels, so that said surfaces allow for the adherence and movement of said wheels (9).

6. Boat transfer system (1) according to claim 5, characterized in that the wheels (9) arranged in a staggered pattern are driven by hydraulic motors.

7. Boat transfer system (1) according to claim 1, characterized in that at least one of the cross members (8) of the launching cradle (2), on which a portion of the shell of the boat is intended to come into contact, can be raised so as to lift said portion of the boat.

8. Boat transfer system (1) according to claim 1, characterized in that it comprises at least one access platform (13) extending at least between a surface portion of the structure (10) and the surface of the water body, and its lateral sides are arranged so as to be almost parallel to those of the launching cradle (2) when the latter is in the position for recovery or placement of the boat on said water body.

9. Boat transfer system (1) according to claim 8, characterized in that said platform (13) is vertically mobile so as to follow the variations in the level of the water body.

10. Boat transfer system (1) according to claim 1, characterized in that it comprises four arms (3) connecting, two-by-two, the two longitudinal sides of the launching cradle (2) to the frame (4), which arms are pivoted at each of their ends, and each pair arranged in a vertical plane forms a deformable parallelogram.

11. Boat transfer system (1) according to claim 2, characterized in that the conveyor (5) consists of at least two rails, of which the tracks follow, with close relative height adjustments, the curves of intersections between the profile of the structure and two pseudo spherical and concentric housings, of which the centers are located on the axis (X, X'), and with each of which at least one wheel (9) secured to the launching cradle (2) is in contact, two wheels at least associated with two different rails being arranged so as to be mutually offset with respect to the direction of movement of the launching cradle.

12. Boat transfer system (1) according to claim 11, characterized in that the two wheels (9) are arranged in the same horizontal plane and mutually connected by a horizontally-pivoting chassis.

* * * * *