MONOMOORING SEA PLATFORM

Inventor: Vladimir Nastasic, San Donato Milanese, Italy

Assignee: Interconsult S.p.A., Milan, Italy

Filed: Feb. 4, 1972

Appl. No.: 223,566

Foreign Application Priority Data
Oct. 26, 1971 Italy 30325 A/71

U.S. Cl. 61/46, 61/48, 114/230, 141/357, 267/139
Int. Cl. B63b 21/00

Field of Search 61/46, 48, 63, 465; 114/230, 357; 9/8; 267/139, 140

References Cited
UNIVERSAL PATENTS
3,464,466 9/1969 Bryan 61/46.5 X

3,675,610 7/1972 Kohring 114/230

FOREIGN PATENTS OR APPLICATIONS
1,161,316 8/1969 Great Britain 61/48

Primary Examiner—Jacob Shapiro
Attorney—Richard P. Alberi

ABSTRACT

A sea platform comprising a metal structure anchored to ground and a head projecting from the sea surface and carried by the metal structure by a bearing, to the vertical axis of which the head is freely rotatable. The head comprises two annular bodies interconnected by resilient elements. The metal pipes extending from the inlets connectable to the hoses to the pipes upward extending from the ground are all enclosed within the periphery as defined by the rotatable head. Thus, the risks are substantially reduced of damaging the platform and pipes carried thereby by vessels moored to the platform or passing through adjacent thereto.

3 Claims, 2 Drawing Figures
MONOMOORING SEA PLATFORM

This invention relates to a monomooiring sea platform, and more particularly a sea platform having a rotable head and for unloading and loading liquids from and on vessels.

Many types of sea platforms are known as carried by metal structures anchored to ground, such structures being either of a rigid type (template or inclined piles) or of a resilient type (monopile or vertical multi-piles). These prior art sea platforms suffer from substantial disadvantages, of which one disadvantage is that they can be easily damaged by vessels which are moored thereat or by vessels passing through, since the platform heads are substantially rigidly restrained to the associated supporting structures.

Another disadvantage in the prior art sea platforms is that the hoop-reinforced or metal pipes thereof are mounted on an arm, frequently of a type mountable about a vertical axis, substantially projecting from the head periphery of each platform, whereby said pipes can be readily damaged by vessels with the risk of considerable liquid losses and sea contaminations.

It is the object of the present invention to provide a sea platform avoiding the aforementioned disadvantages and particularly comprising a head capable of being prefabricated and mounted, as a whole, on the metal structure anchored to ground, whereby to simplify both manufacture operations and platform mounting and to facilitate the maintenance thereof.

Another object of the invention is to provide a sea platform, in which the hoop-connected metal pipes are fully protected from the head structure, that is do not project therefrom, so as to avoid any risks in breaking the pipes and contaminating in case of collision from a vessel.

A further object is to provide a sea platform avoiding the risk in hose twisting around the platform structure.

These and still further objects are accomplished by a sea platform comprising a metal structure anchored to ground, partly projecting above the free water surface and carrying a head extending all about said projecting portion of the metal structure, the platform being characterized in that said head comprises an inner rigid annular body supporting an outer rigid annular body by a plurality of separate piles of resilient elements, in that said inner annular body is in turn carried by said structure through at least one bearing, about the axis of which the whole head can rotate, in that said inner annular body rigidly carries at least one bitt for vessel mooring and at least one pipe, of which one end is provided with at least one inlet connectable to a hose and the other end of which is connectable to a rotatable joint coxial with the axis of said bearing while the upper end of a ground elevating pipe is connectable to said joint.

For a better understanding of the platform structure and features, an embodiment thereof will now be described, as given by mere way of not limiting example.

FIG. 1 is a diagrammatic side view, partly sectioned along line 1—1 in FIG. 2, showing the upper end of the platform; and FIG. 2 is a plan view thereof.

The platform, as shown in the drawings, comprises a rigid metal structure including a plurality of inclined piles 1, the lower end of which (not shown in the drawing) is anchored to ground, and the upper end of which is attached to a rigid body 2 projecting above the sea surface. A vertical pipe 3 upwardly extends from ground and a rotatable joint 4 is mounted on the free end thereof.

A further disadvantage in the prior art platforms is that the hoop-reinforced or metal pipes thereof are mounted on an arm, frequently of a type mountable about a vertical axis, substantially projecting from the head periphery of each platform, whereby said pipes can be readily damaged by vessels with the risk of considerable liquid losses and sea contaminations.

It is the object of the present invention to provide a sea platform avoiding the aforementioned disadvantages and particularly comprising a head capable of being prefabricated and mounted, as a whole, on the metal structure anchored to ground, whereby to simplify both manufacture operations and platform mounting and to facilitate the maintenance thereof.

Another object of the invention is to provide a sea platform, in which the hoop-connected metal pipes are fully protected from the head structure, that is do not project therefrom, so as to avoid any risks in breaking the pipes and contaminating in case of collision from a vessel.

A further object is to provide a sea platform avoiding the risk in hose twisting around the platform structure.

These and still further objects are accomplished by a sea platform comprising a metal structure anchored to ground, partly projecting above the free water surface and carrying a head extending all about said projecting portion of the metal structure, the platform being characterized in that said head comprises an inner rigid annular body supporting an outer rigid annular body by a plurality of separate piles of resilient elements, in that said inner annular body is in turn carried by said structure through at least one bearing, about the axis of which the whole head can rotate, in that said inner annular body rigidly carries at least one bitt for vessel mooring and at least one pipe, of which one end is provided with at least one inlet connectable to a hose and the other end of which is connectable to a rotatable joint coxial with the axis of said bearing while the upper end of a ground elevating pipe is connectable to said joint.

For a better understanding of the platform structure and features, an embodiment thereof will now be described, as given by mere way of not limiting example.

FIG. 1 is a diagrammatic side view, partly sectioned along line 1—1 in FIG. 2, showing the upper end of the platform; and FIG. 2 is a plan view thereof.

The platform, as shown in the drawings, comprises a rigid metal structure including a plurality of inclined piles 1, the lower end of which (not shown in the drawing) is anchored to ground, and the upper end of which is attached to a rigid body 2 projecting above the sea surface. A vertical pipe 3 upwardly extends from ground and a rotatable joint 4 is mounted on the free end thereof.

This platform comprises a rotatable head, the essential constituent parts of which are an inner rigid annular body and an outer rigid annular body. The inner rigid annular body comprises a main body 5 in the form of a boxed ring, two secondary bodies 7 being rigidly restrained thereto by trestles 6, these secondary bodies 7 being ring-shaped and spaced apart from each other, as particularly shown in FIG. 1.

Said main body 5 is carried by the rigid platform structure through a bearing 8 resting on the rigid body 2 and on which also said body 5 bears, whereby the inner rigid annular body is freely rotatable about the vertical axis of the bearing.

The outer rigid annular body of the platform head comprises in turn a rigid ring body 9 which by means of trestles 10 is restrained to a plurality of boxed bodies 11.

From said two secondary bodies 7, which are spaced apart from each other and are of a same configuration, outwardly project extensions 12, piles of resilient elements extending therebetween and being secured thereto, at an intermediate location of each of which a boxed body 11 is positioned and restrained, as clearly shown in FIG. 1. The resilient elements making up the piles can essentially be of varying form and extent and are of a per se well known type, comprising rubber sandwich elements, such as Raykin, Kleber Colombes, Andre Rubber, etc. For example, each of the resilient elements in a pile comprise a cylindrical central rubber body 13, two projecting metal flanges being fast with the two ends thereof. The piles connecting the extensions 12 of the lower body 7 to the boxed body 11 and connecting the latter to the extension 12 of the upper body 7 are provided by clamping on each other the flanges 14 of the superimposed resilient elements, the end flanges 14 being directly attached to extensions 12 and boxed body 11, respectively.

From the drawing it can also be seen that a plurality of wooden blisters are attached throughout the periphery of ring body 9, a vessel mooring bit 16 projects from one of the extensions 12 for body 7 and a lighthouse 17 extends above the platform.

Rigid pipes 18 are fast with the rotatable platform head, one end of these pipes 18 being directly connect to the rotatable joint 4 and also to pipe 3, while the other end thereof is provided with orientable inlets 19 connectable with hoses 20 extending, for example, out of an oil tanker hull. It is important to note that both said inlets 19 and all of pipes 18 are positioned within the periphery of the rotatable platform head, and particularly within the periphery blisters 15, as shown either in FIG. 1 or in FIG. 2.
The platform, particularly adapted to be used for unloading crude oil from oil tankers to a submarine oil pipeline or to a submarine tank, and for loading various petrochemical products or other liquids from land tanks or submarine tanks to vessels, is significantly characterized in that all of said pipes 18, in the section thereof between ground erecting pipe 3 and associated inlet 19 connectable to hoses 20, are enclosed and protected between the outer and inner rigid annular bodies, whereby such pipes 18 cannot be damaged by vessels moored to the platform, or by vessels passing through, except in the extremely serious occurrence that such vessels should seriously damage also the platform, which is mostly unlikely: thus, the risk of contaminating the sea surface, as a result of any losses of the liquid in the pipes, is prevented.

Another important feature of the above described sea platform is that the sea platform head, that is the entire unit between the inner rigid annular body and the outer rigid annular body, can be prefabricated and completed and then superimposed and combined on the ground-anchored metal structure, thus substantially simplifying the operations for carrying out the platform, reducing the work times and also allowing a higher rapidity in assembling and easiness in platform maintenance since, by lifting through floats the rotating head above the sea level, a ready and easy replacement can be effected for those parts which are more liable to wear or breakages, such as bearing.

Finally, it should be noted that owing to the head being freely rotatable about a vertical axis, the platform can be damaged only when centrally collided by a vessel, whereas should the collision as transmitted by the vessel to the platform be offset, that is not directed to the platform axis of rotation, the vessel thrust to the rotatable head would cause said head to rotate about its vertical axis and at the same time would transmit a side thrust to the platform, the latter thrust being however of a somewhat reduced magnitude. To this end, it also is important to note that a possible vessel collision would substantially have no deleterious effect where the platform structure is of the resilient type, that is comprising a plurality of vertical piles or a single pile, and the collision force is mostly taken up and cushioned by the resilient element piles interconnecting the inner and outer rigid annular bodies. It is also important to note that a vessel collision against said blisters 15 would subject the resilient elements of said piles only to shear stresses and never to torsional stresses, as would be the case if said head should be inhibited to rotate. Thus, the highly dreading events of risk in collision by a vessel accomplishing a wrong mooring, collision of a platform-moored vessel moving in case of a sudden change in the stream or wind direction and bearing against the blisters with a quite reduced speed, collision by a vessel at a high speed in case of offset impact relative to the head axis of rotation, obviously where the energy being transmitted by the vessel does not exceed the energy absorbing capability of the resilient elements, are substantially relieved. Taking into account the quite substantial diameter of the head, the impact chances from a vessel with a movement direction coplanar to the bearing axis of rotation are undoubtedly minimized, thus further leading to excluding any possibilities of serious damages to the platform.

The above described platform is of a substantially simplified structure over similar known platform, since the connecting pipes 18 between the vertical pipe 3 and hoses 20 have not to be supported (as in normal cases) by rotatable mooring arms resting on the platform. Where pipes were supported by projecting rotatable arms, often there was also the disadvantage that under the wind and stream action the hoses for connection to vessels would wrap and twist about the platform structure (because of the resistance to rotation encountered by the rotatable arm) with accompanying evident deleterious results. In the platform according to the invention, as the head can very easily rotate on the bearing also under the action only of the wind and streams acting on the hoses, the latter will always take the wind and stream direction, thereby avoiding any risk in wrapping and twisting thereof about the platform structure while the vessel is moored.

It is apparent that the rotatable head can be carried by the ground-anchored structure through two or more bearings coaxial with one another, instead of a single bearing as shown in the drawings.

What I claim is:

1. A sea platform comprising: a metal structure anchored to ground, partly projecting above the free water surface and carrying a head extending all about said projecting portion of the metal structure, wherein said head comprises an inner rigid annular body supporting an outer rigid annular body by a plurality of separate piles of resilient elements, wherein said inner annular body is in turn carried by said structure through at least one bearing positioned in said head within said inner body, about the axis of which the whole head can freely rotate, wherein said inner annular body rigidly carries at least one bitt for vessel mooring and at least one pipe, of which one end is provided with at least one inlet connectable to a hose and the other end of which is connected to a rotatable joint coaxial with the axis of said bearing, while the upper end of a ground elevating pipe is connected to said joint.

2. A sea platform as claimed in claim 1, wherein said pipe is at its section between said rotatable joint and said inlet connectable to the hoses located between said outer and inner rigid bodies.

3. A sea platform as claimed in claim 1, wherein said outer annular body is restrained to said resilient elements at an intermediate location of each of the piles comprising said resilient elements.

* * * * *