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(54) **A FLOATING PLATFORM STABILIZING ARRANGEMENT**

EINRICHTUNG ZUR STABILISIERUNG EINER SCHWIMMENDEN PLATTFORM

DISPOSITIF STABILISATEUR POUR UNE PLATE-FORME FLOTTANTE

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**SE-B- 369 500** **US-A- 647 630**

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## Description

**[0001]** The present invention relates to a floating platform stabilizing arrangement, and more particularly, but not exclusively, to counterweight compensation which restricts movement of the platform from a state of equilibrium.

**[0002]** Floating platforms, such as bathing and boat jetties or like structures, are normally supported by buoyant bodies which are mounted at the outer edges or extremities of the jetties and which consist in low-density cellular plastic bodies or air-filled containers. Every load that is applied to a platform of this nature is counteracted by an increase in the buoyancy forces, this increase being proportional to the applied load and being generated as a result of an increase in the volume of that part of the buoyant body which is thereby submerged in the water.

**[0003]** When the load applied to such a platform structure is distributed asymmetrically, i.e. when a load is applied on or in the vicinity of an outer edge of the platform, the greatest part or the whole of the buoyancy increase must be generated by the buoyant body that is mounted at this edge of the platform, resulting in a positional change in the platform which prevails in relation to the submerged volume of the buoyant body. The buoyant body located at the opposite outer edge of the platform will herewith act as a platform pivot centre, which results in pronounced instability of the platform, this instability being amplified by the small intrinsic weight of the buoyant bodies and by the absence of angular momentum or inertia.

**[0004]** The inherent instability of such structures is a serious drawback when climbing into and out of boats, when running on bathing jetties, in the case of heavy swell or wave motion, etc.

**[0005]** Accordingly, it is an object of the present invention to provide an arrangement which will counteract this instability, by providing a counterweight compensation which limits movement of the platform from its state of equilibrium.

**[0006]** This object is realized with an arrangement according to the characterizing clause of Claim 1.

**[0007]** The invention will now be described in more detail with reference to the accompanying drawing, in which

Fig. 1 is a schematic illustration of a conventional floating jetty; and

Fig. 2 illustrates the inventive arrangement.

**[0008]** Fig. 1 illustrates schematically for comparison purposes a typical floating jetty or like structure carried by two buoyant cellular plastic blocks mounted at the outer edges of the jetty. Because of their small intrinsic weight, the buoyant blocks will float high in the water and are sensitive to surface movement of the water and

have a low or practically non-existent moment of inertia. When the jetty is loaded asymmetrically, the load is distributed between the buoyant blocks in proportions conversely to the distance between the loading point and respective buoyant blocks. Consequently, a load-applied to one outer edge of the jetty will be counteracted almost totally by the buoyant block located at this edge, and the block will be pressed downwards through a distance which is proportional to the volume of liquid displaced by the applied load. The construction is unable to balance rapid shifts in the points at which the load is applied, and floating jetties of this kind must therefore be considered unsteady and unstable.

**[0009]** Fig. 2 illustrates schematically and from one end an exemplifying embodiment of the inventive arrangement. A buoyant body 2 is mounted centrally beneath a platform 1. The buoyant body 2 extends preferably centrally along essentially the full length of the platform 1. Counterweights or containers 3, 4 are mounted on the underside of the platform 1 at its outer edges. The containers 3, 4 are weighted, preferably filled with water or some other ballast, to a weight which will impart thereto a weight/volume unit which is greater than that of air and preferably equal to or in the vicinity of that of the supporting medium in which the structure floats, and the buoyant body 2 is dimensioned to lift the load-free platform with the weighted containers to a position in which the volume of the containers 3, 4 is partially submerged in the supporting medium, preferably to half said volume. The containers or counterweights 3 and 4 are thus weightless when fully submerged, when ignoring the container walls, and when in a fully uplifted position have a weight of about 1 kg/dm<sup>3</sup> if the containers are completely filled with water.

**[0010]** The sectional configuration of the containers/counterweights 3, 4 is preferably such that a small change in the buoyancy state will result in a large change in the volume of that part of the body which lies submerged in the supporting medium or lifted therefrom, and may have a circular, elliptical, pointed triangular or rectangular configuration.

**[0011]** The cross-sectional shape of the centrally positioned buoyant body 2 may vary, although a rectangular cross-sectional shape is preferred.

**[0012]** It will be seen that a load applied to the platform above the container/counterweight 3 will cause the container/counterweight to be pressed down into the water, and that the centrally positioned buoyant body will result in corresponding lifting of the counterweight 4 out of the water. The platform endeavours to adopt a state of equilibrium, wherein the weight increase of the counterweight 4 and the weight decrease of the counterweight 3 will balance the load applied above the counterweight 3. Naturally, a change in the position of the respective counterweights 3 and 4 will advantageously result in a maximum decrease and increase of their respective weights.

**[0013]** It will also be seen that the net decrease and

the net increase in the weight of respective counterweights/containers 3, 4 will be equal to the weight of the displaced water volume and the restored water volume respectively. From the aspect of stability, it is also desirable that the counterweights will have a heavy weight in relation to the load applied to the platform, which increases the inertia as the position of the platform changes. When the counterweights are given a density, i.e. a weight per unit of volume, which is higher than the density of the supporting medium, a maximum net increase and a maximum net decrease of the weight cannot be obtained when the counterweights are lifted from and submerged in the supporting medium. It will be seen from this that the effect of the counterweights can be best utilized when the counterweights have a density which coincides with or lies in the vicinity of the density of the supporting medium.

**[0014]** Alternatively, the counterweights can be integrated with the platform 1, mounted on the outer edges thereof and having the form of bodies whose densities correspond to or lie in the vicinity of the density of the water.

**[0015]** Alternatively, the effect of the counterweights may be achieved by a division between weight and volume, such that the weight in the form of a high density body is integrated with the platform and concentrated on its outer edge, while the volume is obtained in the form of a low density buoyant body mounted on the outer edge of the platform.

**[0016]** When applying the embodiment of the invention in which the counterweights 3, 4 have the form of water-filled containers, it may be necessary to only partially fill the containers with water, so that the platform will have a desired floating depth. In this case, a lower moment of inertia is obtained, although the advantages afforded by the invention can still be utilized in part.

**[0017]** By constructing the platform 1 in the aforedescribed manner as a balanced surface provided with counterweights whose weight may be changed quickly with their position in the water, an asymmetrically applied load will be distributed in the surface/platform and act in the rotational centre of the surface, i.e. against the buoyant body 1. This means that the change in the position of the platform from a horizontal position in response to uneven loading of the platform will be significantly smaller than the change in the position of the conventional floating jetty with a corresponding unevenly distributed load.

**[0018]** Furthermore, the balancing counterweights or containers 3, 4 increase the moment of inertia of the platform, which further enhances stability of the platform when subjected to hastily-applied loads and as a result of wave movement.

**[0019]** Although the invention has been described on the basis of a schematically presented drawing, it will be readily understood by one skilled in this art that the illustrated embodiment can be modified with respect to the form of the buoyant block and counterweights. The

invention is therefore restricted solely by those embodiments which find expression in the inventive concept as defined in Claim 1.

## Claims

1. A floating platform stabilizing arrangement which includes a buoyant body (2) and at least two counterweights (3, 4) mounted on the outer edges of the platform, **characterized** in that the buoyant body (2) is a buoyant block (2) which is positioned centrally beneath the platform and the extension of which is limited to the axial centre part of the platform, preferably along the full length of the platform; in that the counterweights (3, 4) extend essentially along the full length of the outer platform edges beneath said platform and have the form of bodies which have a not-inconsiderable displacement and exhibit herefor a circular or elliptical cross-sectional shape for instance, and have a density which is greater than the density of air and preferably equal to the density of the supporting medium; and in that the buoyant body (2) is dimensioned such that when the platform is in a state of equilibrium, the platform will have a floating depth at which the counterweights (3, 4) are submerged essentially half-way in the supporting medium.
2. An arrangement according to Claim 1, **characterized** in that the supporting medium is water and in that the counterweights (3, 4) are comprised of containers which are filled at least partially and preferably completely with water.
3. An arrangement according to Claim 1, **characterized** in that the counterweights (3, 4) are comprised of containers which contain solid ballast having a mass which corresponds essentially to the weight of a counterweight that is filled at least partially and preferably completely with liquid.

## Patentansprüche

1. Einrichtung zur Stabilisierung einer schwimmenden Plattform, mit einem Auftriebskörper (2) und mindestens zwei an äusseren Rändern der Plattform angebrachten Gegengewichten (3,4), dadurch gekennzeichnet, dass der Auftriebskörper (2) ein Auftriebsblock (2) ist, der mittig unterhalb der Plattform angeordnet ist und dessen Ausdehnung auf den axialen Mittelteil der Plattform beschränkt ist, vorzugsweise entlang der gesamten Länge der Plattform; dadurch dass sich die Gegengewichte (3,4) im wesentlichen entlang der gesamten Länge der äusseren Plattformränder unterhalb der Plattform erstrecken und die Gestalt von Körpern haben,

die eine nicht-vernachlässigbare Verdrängung aufweisen und hierfür beispielsweise eine kreisförmige oder elliptische Querschnittsform aufweisen, und deren Dichte grösser als die Dichte von Luft und vorzugsweise gleich der Dichte des tragenden Mediums ist; und dadurch, dass der Auftriebskörper (2) so dimensioniert ist, dass die Plattform, wenn sie sich in einem Gleichgewichtszustand befindet, eine Schwimmtiefe aufweist, bei der die Gegengewichte (3,4) ungefähr halb in das tragende Medium eingetaucht sind.

2. Einrichtung nach Anspruch 1, dadurch gekennzeichnet, dass das tragende Medium Wasser ist, und dass die Gegengewichte (3,4) aus Behältern gebildet sind, die mindestens teilweise und vorzugsweise vollständig mit Wasser gefüllt sind.
3. Einrichtung nach Anspruch 1, dadurch gekennzeichnet, dass die Gegengewichte (3,4) aus Behältern gebildet sind, die einen festen Ballast mit einer Masse enthalten, die vorzugsweise ungefähr dem Gewicht eines mindestens teilweise und vorzugsweise vollständig mit Flüssigkeit gefüllten Gegengewichts entspricht.

complètement d'eau.

3. Un dispositif selon la revendication 1, caractérisé en ce que les contrepoids (3, 4) sont constitués de récipients contenant un ballaste solide ayant une masse correspondant sensiblement au poids d'un contrepoids rempli au moins partiellement et, de préférence, complètement par du liquide.

## Revendications

1. Un dispositif stabilisateur pour une plate-forme flottante, comprenant un corps de flottaison (2) et au moins deux contrepoids (3, 4), montés sur les bords extérieurs de la plate-forme, caractérisé en ce que le corps de flottaison (2) est un bloc de flottaison (3), qui est positionné centralement au-dessous de la plate-forme et dont l'extension est limitée à la partie centrale axiale de la plate-forme, de préférence sur la totalité de la longueur de la plate-forme; en ce que les contrepoids (3, 4) s'étendent sensiblement sur toute la longueur des bords extérieurs de la plate-forme, au-dessous de ladite plate-forme, et ont la forme de corps ayant un déplacement non négligeable et présentent à cette fin une forme de section transversale circulaire ou elliptique, par exemple, et ont une densité supérieure à la densité de l'air et, de préférence, égale à la densité du milieu support; et en ce que le corps de flottaison (2) est dimensionné de manière que, lorsque la plate-forme est à l'état d'équilibre, cette plate-forme va avoir une profondeur de flottaison à laquelle les contrepoids (3, 4) sont immergés sensiblement à mi-distance dans le milieu support.
2. Un dispositif selon la revendication 1, caractérisé en ce que le milieu support est de l'eau et en ce que les contrepoids (3, 4) sont constitués de récipients remplis au moins partiellement et, de préférence,

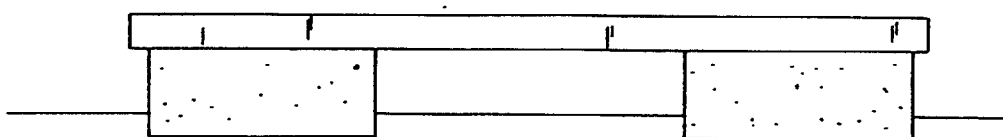


Fig. 1

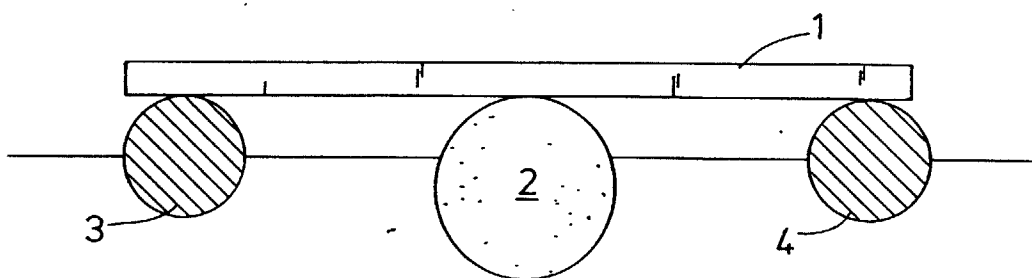


Fig. 2