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(12) # EUROPEAN PATENT SPECIFICATION

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(54) **Bilge shore for shoring a ship in a dock.**

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Description

The invention relates to a bilge shore for supporting a ship against tilting motion when resting on keel blocks in a dock, comprising a substructure placeable on a dock floor, a superstructure spaced from the substructure and moveable relative to the substructure both in a vertical direction and in a direction at an angle thereto, and at least one elastomeric member mounted between the substructure and the superstructure for pressing the superstructure upwards against the underside of the ship in a supporting manner, in which the elastomeric member produces a spring force suitable for supporting the ship and keeping it in a balanced position even when the ship tilts through an angle relative to the vertical.

Such a bilge shore is known from British patent 838,073. To ensure a proper pressing contact between the top of the superstructure and the keel of a ship to be docked, the substructure of the prior bilge shore is divided into two parts which can be displaced relative to each other by means of a wedge. The height of the substructure is adjusted by inserting the wedge to a greater or lesser extent therein.

A drawback inherent in this prior bilge shore is that, prior to the docking of the ship, first the height of the superstructure relative to the dock floor has to be adjusted by means of the wedge in connection with the bilge rise of the ship. The elastomeric members are provided merely to permit alignment of a top plate of the superstructure with the ship's bottom.

Moreover, as such an adjustment of the height of the prior bilge shore cannot be executed by remote control, the dock will have to be pumped dry prior to a ship docking operation. Consequently, a correct adjustment of the height is an extremely time-consuming and expensive procedure.

U.S. Patent 2,390,300 discloses a shock absorber for merely absorbing and damping the rolling movement of a ship to be docked in open sea prior to this ship being made to rest on keel blocks. This shock absorber is fully unsuitable for supporting the docked ship as it is not capable of exerting any supporting power.

It is an object of the invention to provide a specifically resilient bilge shore lacking the above drawbacks.

To this end, the bilge shore according to the invention is provided with a biasing device connecting the movable superstructure with the substructure so as to preload the elastomeric member, there being provided no further means for adjusting the height of the superstructure.

When further ensuring that the bilge shores according to the invention in unloaded condition are higher than the keel blocks, i.e. no ship rests on the bilge shores yet, the ship to be docked during the pumping out or during the lifting of the dock, will first touch the bilge shores and subsequently bed down on the keel blocks. During this procedure first the resilient bilge shores are compressed until the weight of the ship is taken up by the keel blocks.

According to the invention it is of relevance as a matter of fact that first the bilge shores are compressed in order to provide a certain amount of spring pressure at a given compression of the elastomeric members, in order to maintain the equilibrium of the ship after it rests on the keel blocks relatively to its longitudinal axis. This feature fixes the minimum height of compressed bilge shores, so that also the maximum height of the bilge shores with unloaded elastomeric members is fixed, i.e. is considerably higher than the height of the keel blocks. By now applying a bias to the elastomeric members, with the aid of the biasing device, the height of the bilge shore is restricted, while the required maximum spring pressure in compressed state of the bilge shores is not altered. This result has the advantage that a ship of larger draft can be docked, for the height of the bilge shores is a measure for the admissible draft during the docking. By using said elastomeric members the bilge shore according to the application will be operating substantially without failure and hence will not cause damage.

When during docking, e.g. by pumping over ballast from starboard to port, the weight distribution of the ship is changed, the ship will further compress the resilient bilge shores placed on port side due to the larger weight on port side. This compression causes on port side a larger and on starboard side a smaller counter-pressure of the resilient bilge shores, so that a new equilibrium condition is produced. By providing according to a preferred embodiment of the invention a stop element for the superstructure, the compression is blocked at a maximum permissible magnitude, so as to prevent the ship from heeling over in an unacceptable manner in case a change in weight takes place that is larger than the maximum spring pressure.

Some embodiments of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 shows an arrangement in a dock of the resilient bilge shores arranged on either side of the keel blocks, while in the rest position the superstructure of the bilge shores project above the keel blocks;

Fig. 2 shows a ship resting on the bilge shores and keel blocks, which ship may roll within given limits by the resilient bilge shores;

Fig. 3 is a diagrammatic view of a first embodiment of a bilge shore;

Figs. 4 and 5 are diagrammatic views of a bilge shore the top surface of the superstructure of which rests against the underside of a flat ship, a ship with rise of floor, respectively;

Fig. 6 shows a second embodiment of a bilge shore;

Fig. 7 shows a third embodiment of a bilge shore.

Fig. 1 shows a diagrammatic arrangement of a dock 1 on the bottom of which there are arranged keel blocks 2 with on either side thereof compressible bilge shores 3. The bilge shores are designed in such a manner that they project above the keel blocks in initial position along e.g. a distance d.

When, after the docking of the ship 4, the dock is pumped out or in case of a floating dock, the dock is lifted, the bottom of the ship will first come to rest on the bilge shores, which subsequently are compressed to such extent until the ship comes to rest on the keel blocks. The compressible bilge shores 3 are designed in such a manner that, after having being compressed along the distance d, they provide a sufficient spring pressure for maintaining the ship in equilibrium relative to the keel blocks. This spring pressure is normally so large that the bilge shores are capable of also resisting within certain limits a rolling S (Fig. 2) of the ship relatively to its longitudinal axis, as a result of e.g. a displacement of a weight from starboard to port and vice versa.

Three embodiments of a bilge shore will now be described in more detail, with reference to Figs. 3—7.

The embodiment indicated in Fig. 3 shows a bilge shore 3 comprising a substructure 5 to be placed on a dock bottom, a movable superstructure 6 in the form of e.g. a beam which is adapted to rest against the underside of a ship, and a resilient construction 7 in the form of elastomeric members connecting the superstructure to the substructure in order to move the superstructure up and down substantially in the vertical plane relatively to the substructure.

For limiting the height of said bilge shore and to ensure that the spring pressure provides a sufficient counter-pressure along a relatively short compression distance d, see Fig. 1, there is provided a biasing device comprising a plurality of vertical supporting beams 8 the one ends of which are attached to the substructure 5, while the other ends thereof are provided with a vertical guide slot 9 extending in axial direction of the supporting beam, through which slot extends the one end of a horizontally positioned cam 10 which is attached with its other end to the upper beam 6. The top end of the guide slot 9 defines the extent of the bias in the elastomeric members 7. The bias can be made adjustable by e.g. mounting the vertical supporting beams 8 slidable in vertical direction on the substructure 5.

In order to minimize the damage to a ship to be docked, the top of the beam 6 is provided with a layer of flexible material 11, e.g. rubber. This beam 6 can also be placed at an angle relative to the horizontal in order to support flat ships and ships having a rise of floor, as diagrammatically shown in Fig. 4 and Fig. 5, respectively.

As already indicated in the above, the resilient construction is capable of resisting rollings S within certain limits. To prevent the ship from exerting an excessive pressure on the elastomeric members 7, due to an excessive list of the ship, the bilge shore is provided with a stop 12 on which the top beam 6 comes to rest after the maximum permissible compression has been reached. It is clear that the length of the guide slot 9 is such that this extends to beyond the stop 12.

Fig. 6 show a second embodiment of a bilge shore 3, provided with a substructure 13 in the form of a block, e.g. a block of concrete, a box-shaped superstructure 14 which is telescopically slidable relatively to the block 13, and a resilient construction 15 in the form of an elastomeric fender which is mounted in the box-shaped superstructure and rests on the block 13.

For adjusting a bias in the fender 15, the block 13 comprises a slotted hole 16 through which extends a pin 17 coupled to the box-shaped structure 14. The place of the slotted hole is decisive for the bias in the fender 15. By providing a stop pin 18 in the block 13, the compression can be limited to a maximum permissible compression value.

On the box-shaped structure 14 there are provided a plurality of rubber strips 19 for protecting the underside of a ship to be docked.

The bilge shore shown in Fig. 7 is substantially identical to the embodiment shown in Fig. 3, on the understanding that this employs as biasing device a chain 22 coupled between the substructure 20 and the superstructure 21 for biasing the elastomeric members 23. Furthermore, a stop 24 is present for limiting the compression of the superstructure 21. Likewise for preventing damage to the underside of a ship to be docked, a layer of flexible material 25 is applied to the superstructure 21.

Various alterations can be made without departing from the scope of the invention.

For instance, it is possible to construct the elastomeric members in such a manner that the spring graph, at a given compression, obtains rather suddenly a higher value. In this case, the stops 12, 18 and 24 are not necessary.

Claims

1. A bilge shore for supporting a ship (4) against tilting motion (5) when resting on keel blocks (2) in a dock, comprising a substructure (20) placeable on a dock floor, a superstructure (21) spaced from said substructure and moveable relative to said substructure both in a vertical direction and in a direction at an angle thereto, and at least one elastomeric member (7, 15, 23) mounted between said substructure and said superstructure for pressing said superstructure upwards against the underside of said ship in a supporting manner, in which said elastomeric member produces a spring force suitable for supporting said ship and keeping it in a balanced position even when said ship tilts through an angle relative to the vertical, characterized by a biasing device (22) connecting said moveable superstructure (21) with said substructure (20) so as to preload said elastomeric member (7, 15, 23), there being provided no further means for adjusting the height of said superstructure.

2. A bilge shore according to claim 1, characterized in that there is provided a stop (12; 18; 24) between said substructure (20) and said superstructure (21) for limiting the maximum compression of said elastomeric member (7, 15, 23) as caused by the force exerted by said ship on said superstructure into the direction of said substructure.

Patentansprüche

1. Bilgestütze zum Halten eines Schiffes (4) gegen eine Kippbewegung (8), wenn es auf Kielblöcken (2) in einem Dock steht, bestehend aus einem Unterbau (20) auf dem Dockboden und einem Oberbau, im Abstand von dem Unterbau und relativ zu diesem Unterbau bewegbar, und zwar sowohl in vertikaler Richtung wie unter einem Winkel dazu und aus wenigstens einem elastomeren Teil (7, 15, 23) zwischen dem Unter- und dem Oberbau zum Pressen des Oberbaues nach oben gegen die Unterseite des Schiffes zur Abstützung, wobei das elastomere Teil eine Federkraft erzeugt, die geeignet ist, das Schiff zu tragen und auszubalancieren, wenn das Schiff um einen Winkel zur Vertikalen kippt, dadurch gekennzeichnet, daß eine eine Vorspannung erzeugende Einrichtung (22) vorgesehen ist, die den beweglichen Oberbau (21) mit dem Unterbau (20) derart verbindet, daß eine Vorlast auf das elastomere Teil wirkt, wobei keine weiteren Mittel zur Justierung der Höhe des Oberbaues vorgesehen sind.

2. Bilgestütze nach Anspruch 1, dadurch gekennzeichnet, daß ein Anschlag (12, 18, 24) zwischen dem Unterbau (20) und dem Oberbau (21) zur Begrenzung der maximalen Kompression des elastomeren Teils (7, 15, 23), wie sie durch das Gewicht des Schiffes auf den Oberbau in Richtung auf den Unterbau ausgeübt wird.

Revendications

1. Tin pour de soutènement d'un navire (4) contre un mouvement de basculement (S) lorsqu'il repose sur des tins de quille (2) dans un dock, comprenant une infrastructure (20) apte à être placée sur le fond d'un dock, une superstructure (21) espacée de ladite infrastructure et mobile par rapport à ladite infrastructure, à la fois dans une direction verticale et dans une direction faisant un angle avec celle-ci, et au moins un organe élastomère (7, 15, 23) disposé entre ladite infrastructure et ladite superstructure pour presser ladite superstructure vers le haut contre le dessous dudit navire de manière à le supporter, dans lequel ledit organe élastomère produit un effort de ressort apte à supporter ledit navire et à le maintenir dans une position d'éequilibre même lorsque ledit navire penche en faisant un angle avec la verticale, caractérisé par un dispositif (22) de décalage reliant ladite superstructure (21) à ladite infrastructure (20) de manière à précharger ledit organe élastomère (7, 15, 23), aucun autre moyen n'étant prévu pour ajuster la hauteur de ladite superstructure.

2. Tin selon la revendication 1, caractérisé en ce qu'il est prévu un butoir (12, 18, 24) entre ladite infrastructure (20) et ladite superstructure (21) pour limiter la compression maximum dudit organe élastomère (7, 15, 23) provoquée par l'effort exercé par ledit navire sur ladite superstructure dans la direction de ladite infrastructure.

FIG.1

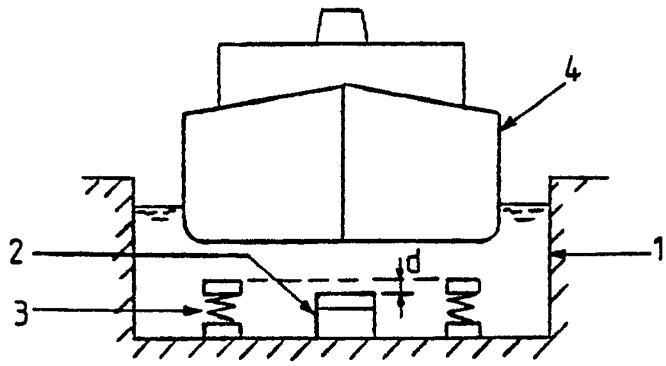

FIG. 2

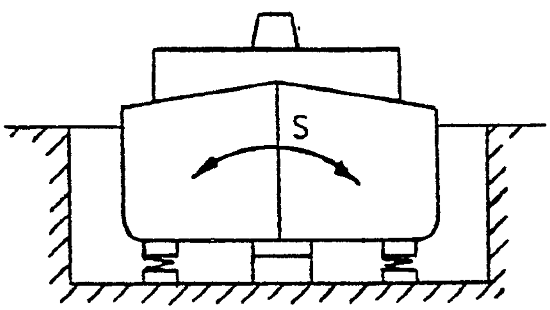

FIG. 3

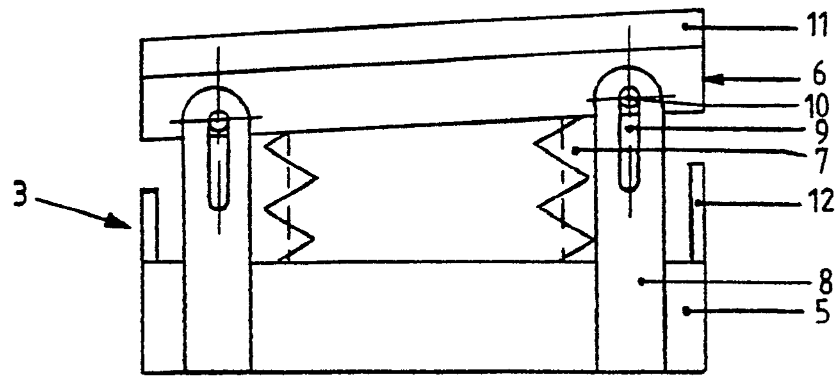

FIG. 4

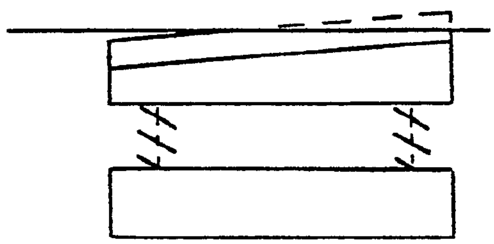

FIG. 5

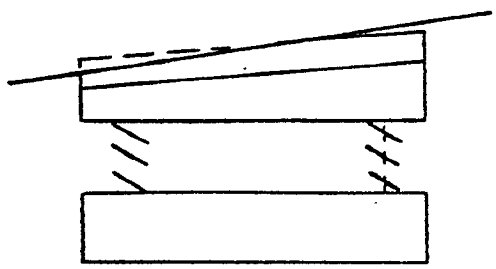

FIG. 6

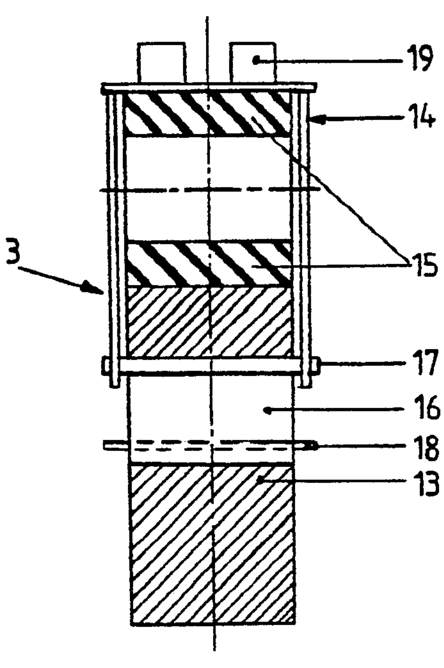

FIG. 7