

SPECIFICATION

Divider for Dividing a Ship's Free Liquid Surface

5 This invention relates to a divider for dividing the free liquid surfaces of ships, especially of general cargo and bulk cargo ships.

General cargo and bulk cargo ships, especially of small tonnage, usually are equipped so as to be capable of carrying substantially only piece goods and bulk goods. Such ships cannot carry liquid cargo, for example oil. The reason for this is that the horizontal cross-sectional area of the holds relative to the ship is so great that a free liquid surface corresponding to said cross-sectional area would render the ship unstable. Ships of greater tonnage, especially those of the so-called OB (Oil and Bulk)-type are so constructed that the holds are provided with bulkheads, which are elongated into the holds, and with frames, so that the free liquid surface is much smaller than the horizontal cross-sectional area of the hold.

If the holds of ships of small tonnage were to be cut-off in a corresponding way, this would render the loading and unloading operations much more difficult or impossible and, besides, the hold volume would be reduced substantially.

The present invention solves the aforesaid problems, in that the divider according to the invention renders it possible to ship liquids, such as oil, on general cargo and bulk cargo ships, the holds of which are intended to carry goods other than liquids.

The present invention provides a divider for dividing the free liquid surface of a cargo during the shipment of liquids on ships, especially on general cargo and bulk cargo ships. The divider is removably fittable into a hatchway of a ship's hold and includes an assembly of laterally spaced apart webs capable, when fitted, of penetrating generally vertically a substantial distance into the hold along a generally longitudinal direction of the ship so as to divide the free surface of liquid loaded to a normal predetermined level in the hold into a plurality of regions in side by side relation. The divider preferably takes the form of an arrangement which consists of one or several units, each of which is defined by interconnected webs, which are preferably parallel upright metal sheets forming a plurality of parallel shieldings or a plurality of compartments located side by side, each unit being dimensioned so as to fit into a portion of a hatch or into the entire hatch, and each unit being adapted to be positioned in the hatch with the metal sheets being substantially in vertical upright position, so that the lower edge of the sheets is located beneath the upper surface of a liquid cargo, and the upper edge of the sheets is at or above the liquid surface. The units are conveniently rigidly secured to a hatch cover or hatch cover portion and in a particularly preferred embodiment the or each hatch cover portion is reversible so that the webs may assume an operative position in which they project downwardly to divide the free surface of the liquid

65 or an inoperative position in which they project upwardly away from the ship's hold.

Embodiments of the invention will now be described in greater detail with reference to the accompanying drawings, in which

70 Fig. 1 is a lateral view of a ship to which dividers in accordance with the invention are fitted,

Fig. 2 is a plan view of the ship of Fig. 1,

75 Fig. 3 shows a divider in accordance with the invention including a lifting and turning device in different positions,

Fig. 4 is a section along the line B—B in Fig. 2,

Fig. 5 is a section along the line A—A in Fig. 2.

80 In Figs. 1 and 2 a general cargo or bulk cargo ship 1 is shown, which has three holds 2, 3, 4 and three hatch covers 5, 6, 7, 8, 9, 10 attached to the hatches above the holds. Each hatch, thus, is covered by two hatch covers. At the hatch covers 85 5—10 shown in Figs. 1 and 2 arrangements according to the invention are provided.

The arrangements according to one embodiment comprise a number of interconnected webs which are parallel upright metal sheets 11, 12, these forming a rigid unit. The sheets 11, 12 have a thickness of, for example 1 to 2 cm, which is necessary to withstand the forces caused by splashing of the liquid cargo. The sheets 11, 12 are arranged so as to form a plurality of parallel shieldings or a plurality of compartments located side by side, as appears from the two left-hand hatch-covers 5, 6 in Fig. 2.

As can be seen from Fig. 2, the sheets 11, 12 form a checkered compartment network in which some extend longitudinally and others laterally of the ship. The sheets, of course, can be arranged to form a rhombic compartment or other suitable compartment shapes.

105 According to a preferred embodiment, the sheets 11, 12 form a number of rectangular compartments, the inside width x length of which preferably is substantially equal to 8x20 or 8x40 feet or corresponds to other dimensions of so-called international standard containers.

As can be seen from Figs. 1 and 2, the assembly of this embodiment is designed as an integral unit, which comprises a number of sheets 11, 12 and is intended to cover a portion of a hatch. Alternatively the units can be designed so as to cover the entire hatch.

115 The sheets 11, 12 when in use are intended to be positioned substantially vertically upright, so that their lower edge 13 is located below the upper surface, indicated in Fig. 1 by the level C, of a liquid cargo, and so that their upper edge 14 is located at or above the liquid surface.

The units comprising said interconnected metal sheets 11, 12 can be designed so as to be suspended from a frame 15 extending about every hatch. Hatch-covers 5—10 are then intended to be positioned over the unit on or at the frame 15 and to close the hold 2—4.

According to a preferred embodiment of the

invention, every unit is rigidly connected to or placed on one side of a hatch-cover 5—10, and the sheets 11, 12 preferably are welded on to project perpendicularly from one side of the hatch-cover. This embodiment is shown especially in Figs. 3, 4 and 5. A hatch-cover 5—10 with sheets 11, 12 on one side 16 preferably has a smooth opposed side 17.

According to a further embodiment, the hatch-cover 5—10 in this latter case is turnable. This carries with it the great advantage that the holds of the ship can be fully loaded with general cargo or bulk cargo by turning the hatch-covers so that the sheets 11, 12 are on the upward facing side of the hatch-covers 5—10, but on loading liquid cargo the hatch-covers 5—10 can be turned so that the sheets 11, 12 are on the downward facing side of the hatch-covers 11, 12.

In Fig. 1 the covers 5, 6 of the left-hand hold 2 are turned in the first-mentioned manner, and the covers 7—10 of the remaining holds 3, 4 are turned in the last mentioned manner.

In Fig. 3 the numeral 27 generally designates a device for lifting and turning the hatch-covers 5—10 according to the invention.

Fig. 3 shows only one hatch-cover 5 in a view in parallel with the fore-and-aft line. The turning device comprises two pairs of arms 18, which extend one on each side of the hatch-cover and are hingedly connected at one end 19 to the hull and at the other end by a joint 20 are hingedly connected to a hatch-cover 5.

The hatch-cover is provided at each of its four corners with wheels 21, 22, which are mounted on projecting arms 25. The wheels may be replaced by fixed shafts. The wheels 21, 22 run in grooves in the frame 15. Each arm 18 is operated by a hydraulic cylinder 23 disposed between the arm 18 and the hull 24.

When the hatch-cover 5 closes the entire hatch or a portion thereof, the axes of the two wheels 21 located at the turning centre of the arms, viz. the first pair of wheels, substantially coincide with the turning axle 27 of the arms 18. Beneath each wheel of the first wheel pair 21 a wheel-locking means is located which consists of a hydraulic cylinder 29, on the piston rod of which a means 30 is located for locking and lifting the wheels 21.

The wheel-locking means also serves as a stop means to prevent the wheel 21 from moving to the right in Fig. 1. A limit member 31 is provided to limit the vertical movement of the two wheels 22, which are located farthest away from the turning centre of the arms 18, viz. the second pair of wheels 22, when the hatch-cover is being turned as will be described below.

The mode of operation of the lifting and turning device is as follows. The description proceeds from a hatch-cover 5 according to Fig. 3 in its closing position and refers to the components shown in Fig. 3. The wheel 21 at said turning centre is released from the locking means 29, 30 and lifts, because the cylinder 23 lifts the arm 18, whereby the wheel 22 farthest away from the

turning centre of the arms 18 rolls in beneath the limit member 31 and thereby is prevented from being moved in the vertical direction. The cylinder 23 thereafter lifts the arm 18. The hatch-cover weight is so balanced that the portion located to the right of the joint 20 in Fig. 3 is slightly heavier than the portion located to the left, whereby the cover 5 is turned upward via the position 32 indicated by dash-dotted lines to the dash-dotted position 33 shown in Fig. 3.

The means 30 thereafter is moved by the cylinder 29 to such a position, that the wheel 22, which then is at said turning centre, is prevented from being transported in the horizontal direction, whereafter the cylinder 23 moves the arms 18 downward, whereby the wheel 21' uppermost in Fig. 3 will move along substantially an arc 34 in the direction of the arrow 35 downward to a position corresponding to the position for the wheel 22 in Fig. 3. For turning back the cover 5, the arms 18 are lifted while the means 29, 30 prevents the wheel at the turning centre of the arms 18 from moving in the horizontal direction. As in this case the cover 5 portion located to the right of the joint 20 has a lighter weight than the cover portion located to the left, the cover is lifted to the dash-dotted position 33. Thereafter the means 30 is moved down by the cylinder 29, so that the wheel located at said turning point runs down along a downward inclined plane 58 while simultaneously the arms 18 are lowered. The cover, thus, is lowered via the position 32 back to starting position.

It is, of course, possible by small alterations to turn the cover 5 every time in the same direction. In this case the cover a.o. must be balanced to equilibrium at the joint 20 between the arms 18 and the cover 5. When the cover is difficult to balance, the cover movement also may be controlled by coupling a control wire or the like for assisting the cover be moved to locking position. The turning of the cover 5 about its joint 20 on the arm 18 can be effected, instead of by the means 31, 22, 29, 30, 21, by a hydraulic cylinder or a corresponding device acting between the arm 18 and the cover 5.

In Fig. 4 two hatch-covers like the covers 5, 6 in Fig. 1 are shown with the sheets 11, 12 facing downward. Wheels corresponding to those shown in Fig. 3 are designated by the same numerals as in Fig. 3 with respect to the left-hand cover 5, while the wheels of the right-hand cover are designated by 35, 36. For reason of better clarity, the wheels in Figs. 4 and 5 are shown with a smaller diameter. In Fig. 5 the covers 5, 6 are shown according to Fig. 4, but with upward facing sheets 11, 12. The turning of the covers 5, 6 is carried out as described above. In Figs. 1, 4, 5 the numerals 37, 38 designate the walls of the frame 15, and 39 designates the upper edge thereof. Each cover, as shown in Figs. 4 and 5, is provided with sealings 40, 41, 42, 43 in two diagonally located corners, and each sealing is intended to seal against a metal strip 44, 45 on the frame 39. One of the covers 5 further is provided with a

sealing 46, 47 at each of its two vertical long sides 48, 49, of which sealings one is intended to abut one of two flanges 50, 51 projecting from the other one 6 of the covers. Hereby a sealed joint is formed between the covers by one of said sealings 47 and, respectively, 46 and one of said projecting flanges 50 and, respectively, 51, both when the sheets 11, 12 of the covers 15, 6 face downward and when they face upward.

10 Sealings along the sides of the covers 5, 6 in parallel with the fore-and-aft line are designed in the same way as the sealings 40, 43, 44, 45 between the covers and the deck 39.

The sealings 41, 42, 43, 44, 46, 47 preferably are made of rubber or another elastic material.

The arrows 52—57 in Figs. 4 and 5 indicate the initial direction of movement of the covers 5, 6 when they are to be turned as described above.

20 When the covers 5, 6 are located so that the initial direction of movement of their ends facing to each other is horizontal when the covers are to be turned, the said projecting flange 50 on one cover 6 abuts in horizontal direction the corresponding sealing 47 on the other cover 5.

25 When the covers 5, 6 are located so that the initial direction of movement of their ends facing to each other is vertical, the said projecting flange 51 on one cover 5 abuts in vertical direction the corresponding sealing 46 on the other cover 6.

30 The sealings described bring about a simple and efficient sealing between the hold and the free atmosphere.

The arrangement described apparently implies very great advantages, because ships intended to carry general cargo can be converted in an extremely simple manner so as to be capable to carry liquid products.

35 When the cargo, for example, is oil, the stability moment of a ship on which the present invention is utilized, is reduced only marginally compared with when the cargo is of general nature. Existing general cargo or bulk cargo ships, thus, can, with a divider in accordance with the invention, be equipped for carrying both liquid products and general or bulk cargo.

40 The construction of a divider in accordance with the invention may vary from that described with reference to the drawings. The aforesaid units, for example, can be adapted to be supported in the frame 15 as mentioned and be completely separate from the covers instead of being rigidly connected thereto. Whichever of these means of support is adopted, the units are supported above the level of the free surface of the liquid. This carries with it the advantage that there is no metal to metal contact in the vicinity of the liquid and this reduces the risk of explosion when carrying inflammable liquids.

The configuration formed by the metal sheets 11, 12, can also be varied substantially. The turning of covers with associated units of sheets and, respectively, the turning of covers without units of sheets can be carried out by turning devices other than that according to the preferred embodiment described above.

The sealings can be designed in a way different from that shown at the above embodiment.

Claims

1. A divider removably fittable into a hatchway of a ship's hold and including an assembly of laterally spaced apart webs capable, when fitted, of penetrating generally vertically a substantial distance into the hold along a generally longitudinal direction of the ship so as to divide the free surface of liquid loaded to a normal predetermined level in the hold into a plurality of regions in side by side relation.

2. A divider according to claim 1, wherein the webs are parallel metal sheets.

3. A divider according to claim 1 or claim 2, which additionally includes further webs which, when fitted, extend generally in a lateral direction of the ship so that the webs together define a plurality of generally rectangular compartments each containing a portion of the free liquid surface.

4. A divider according to claim 3, wherein the area of each said compartment is 8x20 or 8x40 ft.

5. A divider according to any one of the preceding claims, wherein, for use, the assembly is dropped into the hatchway.

6. A divider according to any one of the preceding claims, wherein the assembly of webs for a given hatchway is an integral unit.

7. A divider according to any one of claims 1 to 5 wherein the webs project away from a face of a hatch cover for the hatchway.

8. A divider according to claim 7, wherein the hatch cover comprises two hatch cover portions each having webs projecting away from a respective face thereof.

9. A divider according to claim 7 or claim 8, wherein the webs are rigidly secured to the hatch cover so as to project perpendicularly from the said face thereof.

10. A divider according to claim 9, wherein each of the hatch cover and webs are of metal and are secured to one another by welding.

11. A divider according to any one of claims 7 to 10, wherein the hatch cover, or when the hatch cover comprises two hatch cover portions, each hatch cover portion, is capable of being reversed either to present to the hold the said face thereof so that the webs extend generally vertically within the hold to effect division of the free surface of the liquid therein, or to present to the hold the opposite face so that the webs extend essentially vertically away from the hold.

12. A divider according to claim 11, which additionally includes a device for effecting the said reversal of the hatch cover or each hatch cover portion.

13. A divider according to claim 12, wherein the said device includes at least one arm capable of connection at one end to the hull and carrying, at its opposite end, the hatch cover or, when the hatch cover comprises two hatch cover portions, a said hatch cover portion,



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sealing 46, 47 at each of its two vertical long sides 48, 49, of which sealings one is intended to abut one of two flanges 50, 51 projecting from the other one 6 of the covers. Hereby, a sealed joint is formed between the covers by one of said sealings 47 and, respectively, 46 and one of said projecting flanges 50 and, respectively, 51, both when the sheets 11, 12 of the covers 15, 6 face downward and when they face upward.

Sealings along the sides of the covers 5, 6 in parallel with the fore-and-aft line are designed in the same way as the sealings 40, 43, 44, 45 between the covers and the deck 39.

The sealings 41, 42, 43, 44, 46, 47 preferably are made of rubber or another elastic material.

The arrows 52—57 in Figs. 4 and 5 indicate the initial direction of movement of the covers 5, 6 when they are to be turned as described above.

When the covers 5, 6 are located so that the initial direction of movement of their ends facing to each other is horizontal when the covers are to be turned, the said projecting flange 50 on one cover 6 abuts in horizontal direction the corresponding sealing 47 on the other cover 5.

When the covers 5, 6 are located so that the initial direction of movement of their ends facing to each other is vertical, the said projecting flange 51 on one cover 5 abuts in vertical direction the corresponding sealing 46 on the other cover 6.

The sealings described bring about a simple and efficient sealing between the hold and the free atmosphere.

The arrangement described apparently implies very great advantages, because ships intended to carry general cargo can be converted in an extremely simple manner so as to be capable to carry liquid products.

When the cargo, for example, is oil, the stability moment of a ship on which the present invention is utilized, is reduced only marginally compared with when the cargo is of general nature. Existing general cargo or bulk cargo ships, thus, can, with a divider in accordance with the invention, be equipped for carrying both liquid products and general or bulk cargo.

The construction of a divider in accordance with the invention may vary from that described with reference to the drawings. The aforesaid units, for example, can be adapted to be supported in the frame 15 as mentioned and be completely separate from the covers instead of being rigidly connected thereto. Whichever of these means of support is adopted, the units are supported above the level of the free surface of the liquid. This carries with it the advantage that there is no metal to metal contact in the vicinity of the liquid and this reduces the risk of explosion when carrying inflammable liquids.

The configuration formed by the metal sheets 11, 12, can also be varied substantially. The turning of covers with associated units of sheets and, respectively, the turning of covers without units of sheets can be carried out by turning devices other than that according to the preferred embodiment described above.

The sealings can be designed in a way different from that shown at the above embodiment.

Claims

1. A divider removably fittable into a hatchway of a ship's hold and including an assembly of laterally spaced apart webs capable, when fitted, of penetrating generally vertically a substantial distance into the hold along a generally longitudinal direction of the ship so as to divide the free surface of liquid loaded to a normal predetermined level in the hold into a plurality of regions in side by side relation.

2. A divider according to claim 1, wherein the webs are parallel metal sheets.

3. A divider according to claim 1 or claim 2, which additionally includes further webs which, when fitted, extend generally in a lateral direction of the ship so that the webs together define a plurality of generally rectangular compartments each containing a portion of the free liquid surface.

4. A divider according to claim 3, wherein the area of each said compartment is 8x20 or 8x40 ft.

5. A divider according to any one of the preceding claims, wherein, for use, the assembly is dropped into the hatchway.

6. A divider according to any one of the preceding claims, wherein the assembly of webs for a given hatchway is an integral unit.

7. A divider according to any one of claims 1 to 5 wherein the webs project away from a face of a hatch cover for the hatchway.

8. A divider according to claim 7, wherein the hatch cover comprises two hatch cover portions each having webs projecting away from a respective face thereof.

9. A divider according to claim 7 or claim 8, wherein the webs are rigidly secured to the hatch cover so as to project perpendicularly from the said face thereof.

10. A divider according to claim 9, wherein each of the hatch cover and webs are of metal and are secured to one another by welding.

11. A divider according to any one of claims 7 to 10, wherein the hatch cover, or when the hatch cover comprises two hatch cover portions, each hatch cover portion, is capable of being reversed either to present to the hold the said face thereof so that the webs extend generally vertically within the hold to effect division of the free surface of the liquid therein, or to present to the hold the opposite face so that the webs extend essentially vertically away from the hold.

12. A divider according to claim 11, which additionally includes a device for effecting the said reversal of the hatch cover or each hatch cover portion.

13. A divider according to claim 12, wherein the said device includes at least one arm capable of connection at one end to the hull and carrying, at its opposite end, the hatch cover or, when the hatch cover comprises two hatch cover portions, a said hatch cover portion.

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the said arm being capable, on connection to the hull, of pivotal movement relative to the hull so as to raise or lower the said opposite end of the arm and thereby raise or lower the hatch cover or hatch cover portion carried by the arm away from or towards a position covering the hold, and the said hatch cover or hatch cover portion being capable of pivotal movement relative to the arm through 180° when the hatch cover or hatch cover portion is away from the said position covering the hold to thereby effect the said reversal of the hatch cover or hatch cover portion relative to the hold.

14. A divider according to claim 13, wherein the said hatch cover or hatch cover portion is capable of said pivotal movement relative to the arm through 180° simultaneously with either (a) the said pivotal movement of the arm relative to the hull so as to raise the opposite end thereof or (b) the said pivotal movement of the arm relative to the hull so as to lower the opposite end thereof.

15. A divider according to claim 14, wherein during pivotal movement of the arm relative to the hull (a) so as to raise the opposite end of the arm and thereby raise the hatch cover or hatch cover portion away from a covering position in which the hatch cover or hatch cover portion covers the hold and presents to the hold the said face thereof so that the webs extend generally vertically within the hold, the hatch cover or hatch cover portion is capable of said pivotal movement relative to the arm through 180°, so that on subsequent pivotal movement of the arm relative to the hull (b) so as to lower the opposite end of the arm, the hatch cover or hatch cover portion is returned to the covering position covering the hold but in the reversed condition with the webs extending generally vertically away from the hold.

16. A divider according to claim 13, claim 14, or claim 15, wherein the device additionally includes a pair of rails each running adjacent a respective one of opposed lateral edge of the hatchway and two opposed pairs of wheels on the hatch cover (or on each hatch cover portion), one

of respective opposed wheels of each opposed pair of wheels being capable of running along one of respective said rails during said pivotal movement of the hatch cover (or hatch cover portions) relative to the arm until the hatch cover (or each hatch cover portion) assumes an essentially vertical raised condition.

17. A divider according to any one of claims 13 to 16, which includes a pair of said arms each disposed adjacent a lateral edge of the hatch cover, or when the hatch cover comprises two hatch cover portions, includes two pairs of said arms, each arm of each pair being disposed adjacent a respective lateral edge of each hatch cover portion.

18. A divider according to any one of claims 13 to 17, wherein the said pivotal movement of the or each arm relative to the hull so as to raise the hatch cover (or each hatch cover portion) is effected by means of a hydraulic pump.

19. A divider according to any one of claims 13 to 18 wherein the hatch cover (or each hatch cover portion) is pivotable relative to the or each arm at a or a respective pivot point essentially in a plane mid-way between opposite longitudinal ends of the hatch cover (or each hatch cover portion) and wherein the centre of gravity of the hatch cover lies in a plane spaced from the plane containing the or each pivot point to thereby assist pivotal movement of the hatch cover (or each hatch cover portion) relative to the or each arm.

20. A divider according to any one of claims 13 to 19, which additionally includes a locking arrangement capable of preventing pivotal movement of the hatch cover (or each hatch cover portion) either during the said pivotal movement of the arm relative to the hull so as to raise the opposite end of the arm or during the said pivotal movement of the arm relative to the hull so as to lower the opposite end of the arm.

21. A divider substantially as herein described and as illustrated with reference to the accompanying drawings.