

[54] **DEVICE FOR DISCHARGING A HOPPER BARGE**

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[57] **ABSTRACT**

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A hopper barge with a plurality of discharge openings spaced apart longitudinally along its bottom has a valve for each opening, the valves being interconnected in a series for simultaneous movement lengthwise of the barge. The valves are actuated by wedges and abutments to move, when closing, first horizontally and then upwardly, and when opening, first downwardly and then horizontally. Hydraulic jacks at opposite ends of the series operate alternately so that the series is always in tension when moving. The discharge openings are bordered by resilient sealing strips that extend toward the valves and that are faced with a wear-resistant material.

[30] **Foreign Application Priority Data**

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[52] U.S. Cl..... **222/132, 222/561, 222/485**

[51] Int. Cl..... **B67d 5/60**

[58] Field of Search..... 222/132, 485, 559, 222/560, 561

[56] **References Cited**

UNITED STATES PATENTS

3,314,575 4/1967 Graham 222/485

6 Claims, 6 Drawing Figures

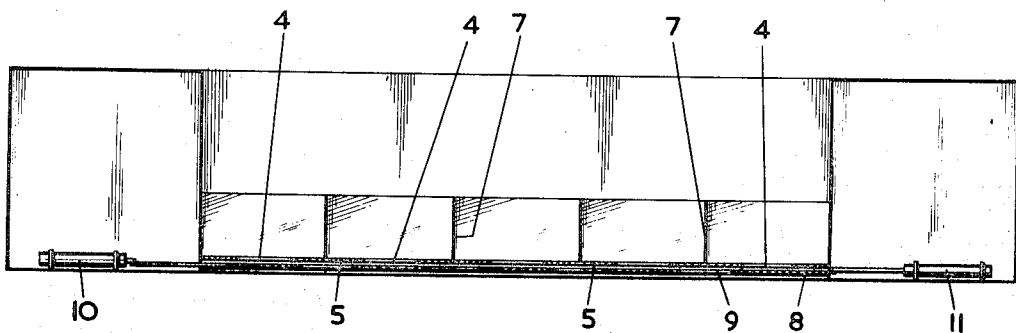


FIG. 1

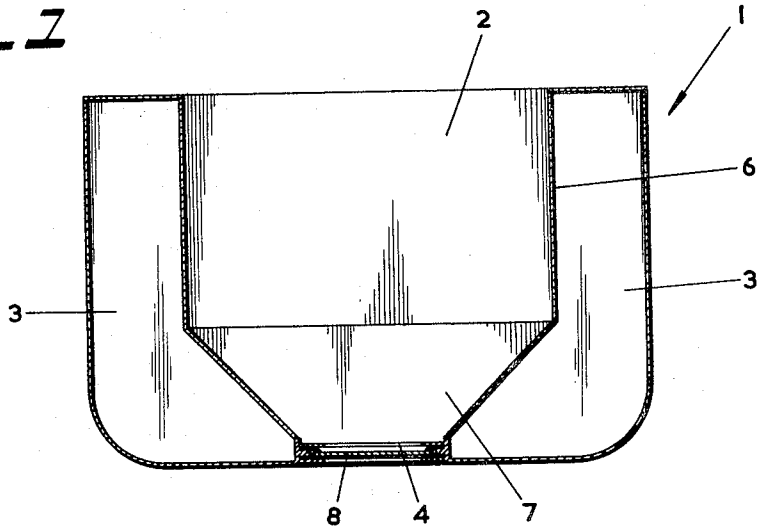


FIG. 2

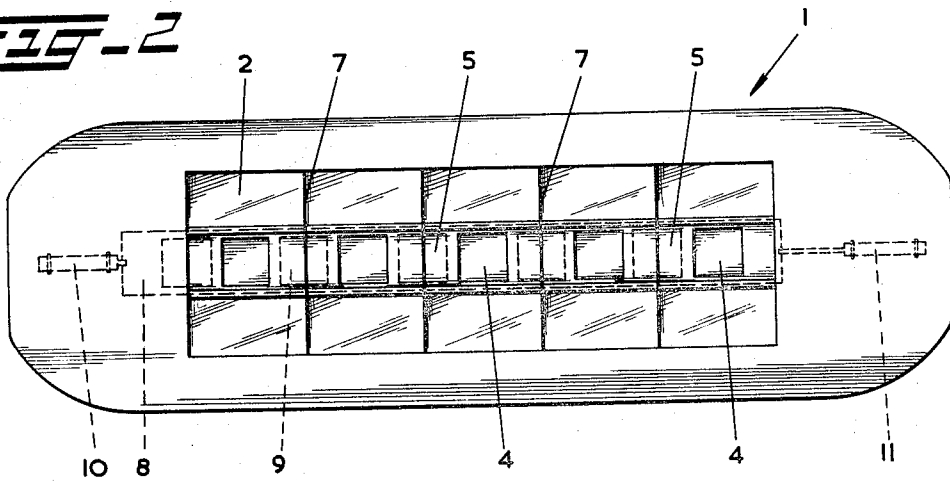


FIG. 3

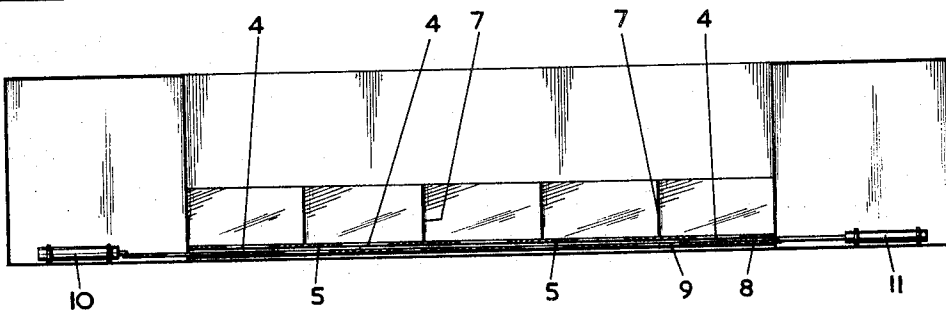


FIG. 4

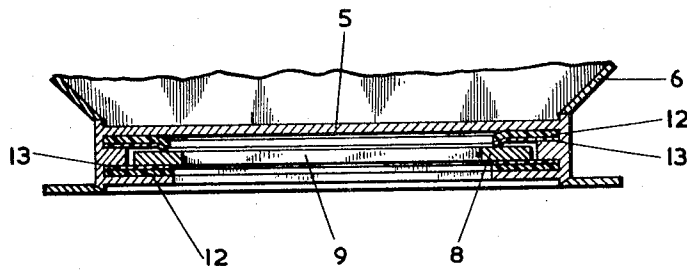


FIG. 5

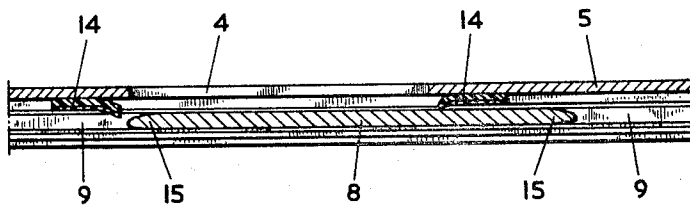
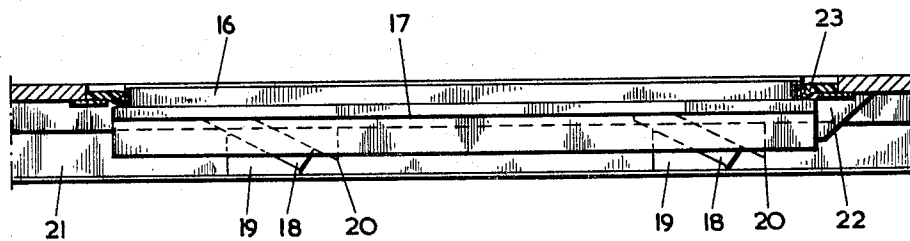


FIG. 6



DEVICE FOR DISCHARGING A HOPPER BARGE

The invention relates to a device for discharging a hopper barge, consisting of a plurality of spaced apart discharge openings, provided, in the bottom of the hopper, and of valves normally closing these openings, but capable of being shifted into the open position by means of a mechanism. A similar arrangement is known from the Dutch Patent Specification 112.379.

With this well-known device each of the valves, closing the discharge openings, is separately operated by its own mechanism, the direction in which the valves are shifted being transverse to the longitudinal direction of the barge. The disadvantage of this well-known arrangement is, that it is expensive.

According to the invention this disadvantage is eliminated, because that, in the device according to the invention, the valves are connected to each other in such a way as to form a series, in which they are jointly slidable in the longitudinal direction of the barge.

Preferably the valves are connected by at least two parallel spaced apart bars, extending and mounted for sliding motion in the longitudinal direction of the barge; protruding oblique strips being fixed to each of the valves, each of these strips being slidably received between two spaced apart parallel sloping surfaces of a wedge and a counterwedge respectively, both wedges being fixed to the slidable bars; an abutment being mounted for the closing valve near one of the transversely extending edges of each discharge opening. In this way the valves will be carried along in the horizontal direction when sliding the bars towards the abutments, and be pressed against the discharge openings in a vertical direction upon engaging the abutments, while, when sliding the bars in the opposite direction the valves are first released from the discharge openings and then displaced in the horizontal direction.

The valves and the slide bars can be formed on one elongated plate, which closes all discharge openings and which is slidably mounted in its longitudinal direction, as many openings being provided in this plate as there are discharge openings, which openings have essentially the same dimensions and form as the discharge openings, while these openings are covered by the flat parts in the bottom of the hopper, situated between and adjacent to the discharge openings, with the possibility to bring these openings simultaneously into alignment with the discharge openings by sliding the plate at least in one direction.

In this way all discharge openings can be simultaneously opened and closed again by at least one mechanism.

However, preferably two operating mechanisms are provided, one at each end of the series of valves, so that the series of valves is only subjected to tensile forces when sliding.

In order to obtain a good sealing, a strip of elastic material is fitted along each of the edges of the discharge openings, which strip has a free edge bent towards the valves.

The strips of elastic material along each of the longitudinal edges of the discharge openings may consist of one continuous strip. All the valves may be united to one plate, and the plate may be mounted at each of its longitudinal sides between these continuous strips and a second continuous strip of elastic material.

Advantageously the strips of elastic material are provided with a smooth coating that is resistant to wear and tear.

It is noted, that, in the device according to the invention, there is no risk, that material will be left on the flat parts, situated on both sides of the discharge openings, when unloading the hopper barge, as when the ship is moving, the material will be removed by the water that is flowing through these openings. Depending on the conditions the end discharge openings can be positioned close to one of the end bulkheads of the hopper.

The invention will now be described in further detail in connection with an embodiment of the invention while referring to the drawing in which

FIG. 1 is a cross-section of a hopper barge, provided with a discharge arrangement according to the invention.

FIG. 2 is a top view of the hopper barge, according to FIG. 1.

FIG. 3 is a longitudinal section of the hopper barge, according to FIG. 2.

FIG. 4 is a cross-section, on a larger scale, of a part of the bottom of the hopper, of the barge, according to FIG. 2.

FIG. 5 is a longitudinal section, on a larger scale, of the bottom of the hopper, according to FIG. 2.

FIG. 6 is a longitudinal section, on a larger scale, which shows a second embodiment of the discharge arrangement according to the invention.

The hopper barge 1, as shown in FIGS. 1-3, has a hopper 2, mounted inside an air box 3. In the bottom of the hopper 2, a number of discharge openings 4 are provided, which are separated from each other by the flat parts 5. The side walls of the hopper are sloping towards the discharge openings 4 near the bottom, while vertical partitions 7 are mounted between the discharge openings, which extend from the flat parts 5 to the points where the side walls 6 are sloping towards the discharge openings.

The discharge openings 4 are, according to a first embodiment, closed by an elongated plate 8, mounted for slidable movement in the longitudinal direction of the barge. In this plate as many openings 9 are provided as there are discharge openings, these openings 9 having the same form and size as the discharge openings 4. In the shown closing position of the plate 8 the openings 9 are entirely covered by the flat parts 5, which are situated adjacent to and between the discharge openings 4. At the extremities of the plate 8, operating mechanisms 10 and 11 are disposed, in the form of hydraulic jacks, by which the plate 8 can be shifted to and fro. Should the hopper, as shown in the drawing, be discharged, then the operating mechanism 11 is actuated, resulting in the plate 8 being pulled to the right until the openings 9 in the plate coincide with the discharge openings 4. After the hopper has been entirely discharged, the operating mechanism 10 is actuated and consequently the plate 8 is pulled to the left, until the discharge openings 4 are completely closed again. Thus the plate 8 will be only subjected to tensile forces when sliding, so that buckling is avoided.

The way the slide plate 8 is guided and sealed is shown in FIGS. 4 and 5. The slide plate 8 is received between an upper and a lower guiding means along its sides. Both guiding means consist of a strip of elastic material 12, which is coated with a smooth coating that is resistant to wear and tear 13, with which the strips

engage the plate 8. The strips, forming the upper guiding means, are bent towards the plate 8, so that it can resist the upward water pressure, acting on the plate 8 in closed position.

The sealing strips 14 are situated along the transversely extending edges of the discharge openings 4, which strips also consist of an elastic material, covered with a smooth coating, that is resistant to wear and tear. These strips are also bent towards to the plate 8. In order to achieve an easy gliding movement of the transverse edges of the openings 9 in the plate 8 along the strips 14, during the gliding movement of the plate 8, these transverse edges are somewhat chamfered, as shown in FIG. 5 by 15.

Finally a second embodiment of the discharge arrangement according to the invention is shown in FIG. 6, in a longitudinal section through one of the discharge openings. The discharge opening 16, which corresponds with one of the discharge openings 4 in FIGS. 1 - 3, is closed by a valve 17, which is provided with two oblique strips 18 on both sides, each strip being received between the sloping sides of a wedge 19 and a counterwedge 20. The series of wedges 19 and 20 are respectively fixed to two pulling rods 21 extending over the length of the hopper along the sides of the valves 17, and connected at their extremities to an operating mechanism, as shown in FIGS. 1-3 at 10 and 11. An abutment 22 is fitted near one of the transverse edges of each discharge opening 16, while a framing having a seal 23 is mounted around each of the discharge openings 16, against which the valve 17 is seated in its closing position.

In FIG. 6 the valve 17 is shown in its closing position. Should the hopper be discharged, then the pulling rods 21 are drawn to the left, and consequently the valve 17 is first moved downwardly and released from the seal 23, and then taken along in the horizontal direction by the counterwedge 20. In closing the discharge opening again, the pulling rods are drawn to the right, and consequently the valve 17 is first taken along in the horizontal direction, until it abuts the abutment 22, after which the valve is lifted by the wedge 19 and pressed against the sealing 23.

Although, in the shown embodiments, the discharge openings 4 are situated in the middle of each of the compartments of the hopper, separated by the walls 7, it is, however, also possible, to provide the discharge opening in the extreme left hand and/or right hand compartment, as shown in FIGS. 2 and 3, entirely adjacent to the extreme left and/or right wall of the hopper.

I claim:

1. In a hopper barge having a plurality of spaced-apart discharge openings in the bottom of the hopper,

and a plurality of valves normally closing said openings but being movable relative to the barge to open the openings; the improvement comprising means interconnecting the valves in a series that extends longitudinally of the barge, means for simultaneously moving said series longitudinally of the barge, inclined strips connected to each of the valves, wedges on opposite sides of said strips, fixed abutment means engageable with each valve when the valve reaches its closing position, and means for moving the wedges over the valves to move the valves downwardly and for then moving the valves horizontally during opening movement of the valves and for moving the valves horizontally and then upwardly when the valves contact the abutments during closing movement of the valves.

2. In a hopper barge having a plurality of spaced-apart discharge openings in the bottom of the hopper, and a plurality of valves normally closing said openings but being movable relative to the barge to open the openings; the improvement comprising means interconnecting the valves in a series that extends longitudinally of the barge, means for simultaneously moving said series longitudinally of the barge, and strips of elastic material bordering said discharge openings, said strips having free ends that are directed toward the valves.

3. A hopper barge as claimed in claim 2, said strips each comprising one continuous strip along all of the longitudinal edges of the discharge openings on each side of the hopper barge.

4. A hopper barge as claimed in claim 3, and a second continuous strip of elastic material disposed below and parallel to each of the first-mentioned strips, said series of valves being disposed between each pair of vertically superposed elastic strips at each of its edges.

5. A hopper barge as claimed in claim 2, said strips of elastic material having a covering of wear-resistant material on their sides adjacent said valves.

6. In a hopper barge having a plurality of spaced-apart discharge openings in the bottom of the hopper, and a plurality of valves normally closing said openings but being movable relative to the barge to open the openings; the improvement comprising means interconnecting the valves in a series that extends longitudinally of the barge, means for simultaneously moving said series longitudinally of the barge, and means moving said valves simultaneously horizontally and then upwardly into sealing relation with said openings upon movement of said series in a direction to close said valves and moving said valves simultaneously downwardly and then horizontally upon movement of said series in a direction to open said valves.

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