Aug. 12, 1969 H. POT ET AL 3,460,692

PROCESS FOR FILLING THE HOLD OF A SHIP WITH SAND

Filed Dec. 5, 1966

2 Sheets-Sheet 1

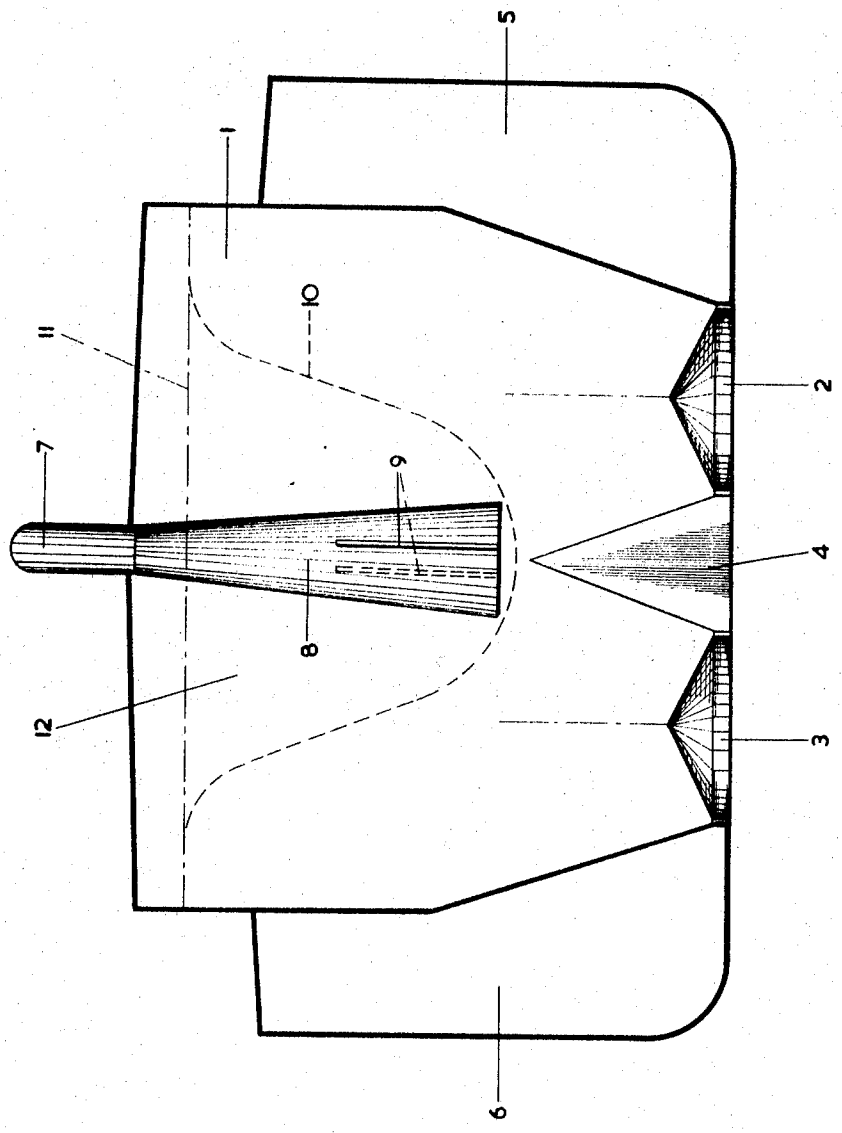

FIG. 1

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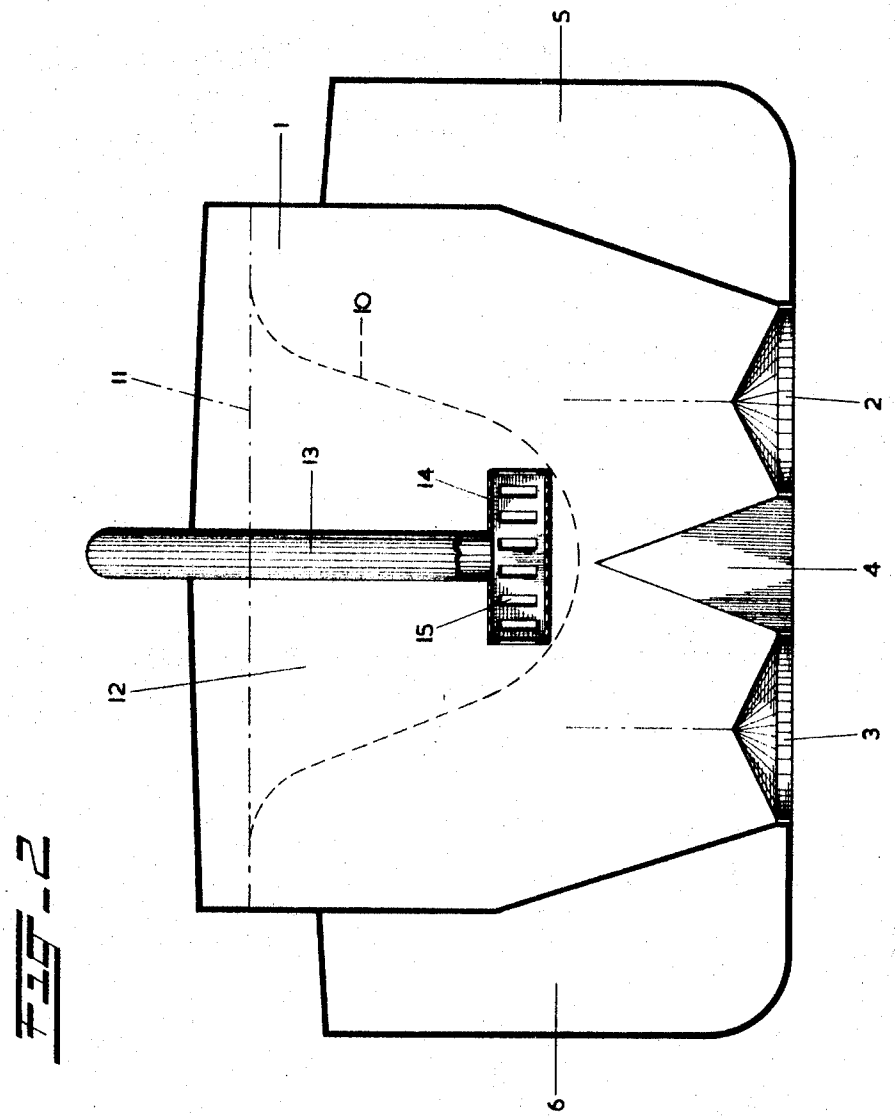

Fig. 2

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PROCESS FOR FILLING THE HOLD OF A SHIP WITH SAND

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U.S. Cl. 214—152
3 Claims

ABSTRACT OF THE DISCLOSURE

Sand entrained in water is fed to the hold of a ship, and this invention minimizes the quantity of sand which will overflow with the water. A filling conduit extends deep into the hold, and is enlarged at its lower end to prevent plugging with sand. Openings are provided through the side walls of the lower end of the filling conduit, for example vertical slots, in order to promote the flow of water when the filling is resumed after being stopped.

The invention relates to a process for filling the hold of a ship with sand from a sucked-up mixture of sand and water, which mixture is fed via a tube into the hold to be filled. The filling of, for instance, a hopper with sand has been effected for over fifty years by charging a mixture of sand and water by means of a pump via a tube into the hold to be filled, in which the sand must deposit from the mixture, while the superfluous water flows off again over an edge of the hold to be filled. In order to enable the sand to deposit, the mixture is usually supplied at one end of the hold to be filled and the water is discharged at the opposite end. The tube has its mouth near the upper edge of the hold to be filled.

In the handling of coarse sand few overflow losses occur and the output will be reasonable. If, however, fine sand is to be handled, great losses occur because a considerable portion of the fine sand disappears again along with the water flowing back over the edge. Near the supply site the mixture of sand and water has a higher specific gravity than the remaining liquid in the hold, which causes a downward stream with increasing velocity, which near the bottom bends to form a horizontal stream, which bends upwards near the opposite end of the hold and is then split up at the discharge edge into a stream flowing off over the edge and a stream returning along the upper surface to the supply site. The stream flowing over the edge contains high percentage of sand, as a result of which losses of 50%, for instance, may occur, in the case of fine sand, which means that 50% of the sand supplied is lost via the overflow. For normal sand, the loss is about 25% to 35%.

It is the object of the invention to furnish a process in which such losses do not occur any longer, or at least are reduced considerably, in consequence of which the filling of the hold with sand takes less time.

This object is achieved according to the invention by the feature that the mouth of the tube is placed at great depth in the hold. In its simplest form the invention, therefore, comprises the downward extension of the tube, so that the mixture of sand and water flows out of it near the bottom of the hold to be filled. One might expect that the outflow of the mixture will be impeded very soon by the sand depositing on the bottom and that complete sanding-up of the installation will take place. However, it

has been found that the filling process is not impeded. The sand from the mixture leaving the tube at first deposits to the side of the tube on the bottom, and as the sand level in the hold rises and consequently comes considerably above the mouth of the tube an upwardly widening conical zone with a high sand concentration forms around the tube, and this constantly moving mass does not impede the outflow of the mixture from the tube. Moreover the heavy liquid column in the tube will aid the pump in overcoming the counterpressure of the mass around the tube.

According to the invention the apparatus for carrying out the process may comprise a tube downwardly widening over the greater part of the section extending into the hold to be filled. Thus the outflow losses are reduced considerably and turbulence in the mass surrounding the tube is avoided as much as possible, for owing to the larger diameter of the tube at the mouth the outflow will be quiet. Moreover a sanding-up of the interior of the widening tube will thus readily be obviated, because the plug of sand is displaced towards a wider space.

According to the invention the tube, irrespective of its construction, may be provided in the downwardly directed part with openings in the wall, which openings may have the form of longitudinal slots. If the filling process is to be stopped for one reason or another, the sand outside and inside the downwardly directed tube will settle, and this may entail difficulties for restarting the filling process. If the tube is provided with openings, water will flow out of these openings as the process is restarted, as a result of which the sand around the tube is made to flow again, and thus the filling process can start again. Since such openings cause air to be sucked in as long as the openings are still above the liquid level, it is desirable according to the invention to make it possible for the openings to be obturated, which can be done effectively by covering the openings on the outside with flaps of resilient material, such as rubber, attached to the edge of the opening. These flaps do not impede the flow of water from the tube, but do prevent the entrance of air. If air can enter the tube via the openings, violent turbulence will result because the mixture of water and sand is detached from the wall of the tube and sucks in air; this turbulence adversely affects the smooth deposition of the sand.

According to the invention the tube extending downwards into the hold may comprise an expansion chamber at its lower end. This is a chamber with a large number of outlet openings, by means of which the mixture is distributed over a large area in a number of streams of considerably reduced velocity.

By means of the invention a considerable reduction of the overflow losses is achieved, while furthermore in the early stages of the charging process a lower lift will suffice, in consequence of the siphoning action of the downwardly directed tube. When using the methods of the prior art, about 65% to 75% of the sand remains in the hold, in the case of normal sand, or as little as 50% in the case of fine sand; but by the use of the present invention, this percentage can be raised to 95%.

The invention will now be elucidated more fully by reference to the drawing.

FIGURE 1 is a diagrammatical section of a hopper comprising the supply tube according to the invention.

FIGURE 2 shows a different embodiment.

This hopper comprises a hold **1** with trap doors **2** and **3** for the discharge of the sand and a keelson **4**. The numerals **5** and **6** designate the floating parts of the vessel. The supply pipe, directed towards the hold at **7**, which forms part of a suction pump not shown in the drawing, has a downwardly directed, conically widening part **8**, which ends just above the keelson **4**. The tube is directed

towards the top of the keelson **4** in order to fill the hold on either side of it uniformly. The position of the tube has no particular importance, the only important point is the place of the mouth. At **9** is shown longitudinal slots in the wall of the tube and which define laterally outwardly extending branches of the sand-water flow path. The broken line **10** shows how at a sand level **11** a zone **12** of high sand concentration is formed around the tube **8**. The outflow of the mixture from the tube is slowed down also by this in such a way that the sand is sufficiently enabled to deposit. This is of particular importance in the handling of fine sand, the individual grains of which are light.

The widening of the tube **8** shown in the drawing furthers the smooth outflow of the mixture from the tube.

The slots **9** are desirable with a view to the restarting of the process when it has been stopped for one reason or another. These slots may be obturated on the outside with a rubber strip (not shown).

In the embodiment shown in FIGURE 2, at the bottom of the tube **13** a rectangular box **14** is present, which may be larger in the direction of width and/or the longitudinal direction of the vessel than the width shown in FIGURE 2. The walls of this box **14** are provided with a large number of slots **15**, which are also present in the bottom and in the upper surface and which define laterally outwardly extending branches of the sand-water flow path.

What we claim is:

1. A process for filling the hold of a ship with sand, comprising positioning a rigid filling conduit in the hold with its lower end in the lower half of the hold, and feeding through said conduit a mixture of sand and water until sand is deposited in the hold to a level adjacent the top of the hold and the deposited sand surrounds and defines an upwardly widening conical zone that surrounds the conduit and that is filled with generally upwardly flowing mixture, the rigidity of the conduit maintaining the lower end of the conduit submerged in the mixture adjacent the apex of said conical zone.

2. A process for filling the hold of a ship with sand, comprising positioning a filling conduit in the hold with its lower end at great depth in the hold, feeding through said conduit a mixture of sand and water up to a level far above the lower end of said conduit, and feeding said mixture along a flow path through said conduit that is greatly enlarged in cross-sectional area at the lower end of said conduit as compared to an upper portion of said conduit thereby to reduce outflow losses of sand and turbulence in the sand and water surrounding the conduit.

3. A process for filling the hold of a ship with sand, comprising positioning a filling conduit in the hold with its lower end at great depth in the hold, feeding through said conduit a mixture of sand and water up to a level far above the lower end of said conduit, and feeding said mixture along a main flow path through said conduit that has a plurality of laterally outwardly extending branches adjacent the lower end of said conduit, discontinuing said feeding whereupon sand settles about said flow path branches and above the main outlet of the main flow path, and resuming said feeding whereby the flow of said mixture from the main outlet is facilitated by movement of the mixture through said branches.

References Cited

UNITED STATES PATENTS

1,127,137	2/1915	West.	
689,741	12/1901	McDougall.	
726,685	4/1903	Holbrook	214—14
1,508,521	9/1924	Kreuser	37—58
1,750,095	3/1930	Ewig.	
1,752,410	4/1930	Adams	214—14

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