

VALVE DEVICE FOR REGULATING AN INLET OPENING TO A DISCHARGE
PIPE FOR FLUIDIZED SAND

This invention relates to a valve for regulating an inlet
opening to a discharge pipe for fluidized sand. More particu-
5 larly it concerns a valve for regulating the inlet opening to
a discharge pipe for fluidized sand wherein the valve, lo-
cated close to the tank top of the vessel, is operated by
means of at least one actuator located above the sand, and
wherein the at least one actuator is connected to the valve
10 by means of a lengthy connection.

Sand for filling large areas in connection with land reclama-
tion is often transported considerable distances by means of
bulk carriers. The sand is generally fluidized on loading to
be able to be pumped on board the vessel. It is also becoming
15 more common to fluidize the sand in a cargo hold before the
sand is discharged by means of a so-called slurry pump.

It is necessary to be able to open and close the discharge
pipe inlet to control the discharging operation. The dis-
charge pipe is located relatively far down in the cargo hold.
20 It has turned out to be difficult to arrange actuators for
the valves in this environment comprising sand and salt wa-
ter. It is known to place the actuators above the cargo of
sand and to connect these with the valve by means of such as
a chain. Valves according to prior art are often formed such
25 that the valve closing body has to displace the sand bearing

against the closing element surface area during the opening operation.

Known valves formed to be maneuvered in this manner have however a considerable drawback in that the overall height from the tank top up to the valve opening is relatively large, resulting in a not unessential amount of sand being left lying in the cargo hold after unloading is finished.

The object of the invention is to remedy or reduce at least one of the disadvantages of the prior art.

10 The object is achieved in accordance with the invention and by virtue of the features disclosed in the following description and in the subsequent claims.

There is provided a valve for regulating the inlet opening to a discharge pipe for fluidized sand in a vessel, as the valve located near the vessel tank top and having a valve course, is operated by means of at least one actuator located above the sand, and wherein the at least one actuator is connected to the valve by means of a lengthy connection, as the valve is characterized in that the valve closing body is constituted by a rotary plate rotatable about a rotation axis between a position wherein the valve course is closed and a position wherein the valve course is open.

A chain running through the sand cargo from the valve up to the actuator typically constitutes the lengthy object. The actuator is thus not exposed to the combination of sand and seawater, which contributes to a more reliable function and also easier maintenance access.

A closing body in the form of a rotary plate is chosen because the rotary plate relatively easily may be displaced in the sand surrounding the valve.

The closing body may be provided with a strainer corresponding with the valve course when the closing body is in the closed position. Liquid may thereby be drained via the valve without sand going along with the water.

- 5 The closing body may be provided with a first attachment coupled to a first actuator and a second attachment coupled to a second actuator, as the first attachment and the second attachment are located on opposing sides of the pivot axis.

10 This design makes it possible that both opening and closing of the valve may be carried out by tension in one of the lengthy bodies.

The edge portion of the closing body may be given an acute shape to make displacing in the sand easier.

15 It is practical that the closing body is rotatable in the vertical plane to make coupling of the closing body to the actuators simple and to be able to arrange the valve course as close to the tank top as possible. If desired the valve may be provided with a bend to further reduce the amount of sand left on the tank top after emptying.

20 A gasket sealing against the closing body may encircle the valve course. When the closing body is in the closed position, the gasket prevents unintentional inflow into the valve course.

25 The valve according to the invention makes possible fitting of it where the central axis of the valve course is closer to the tank top than the valve course diameter, ensuring a good emptying of the vessel cargo hold.

The valve housing may comprise at least one side plate constituting a guide for the closing body. The valve body is

thereby guided in a controlled path during opening and closing even if the valve body should be exposed to forces seeking to deflect the valve body sideways, for example by sand not fluidized.

- 5 The valve housing may comprise at least one side plate provided with a recess therethrough co-ordinate the valve course. Sand being between the side plates may be displaced out through the recess during the opening operation, reducing the necessary opening force.
- 10 The valve housing may comprise a base plate arranged on the tank top. The base plate may advantageously be attached to the tank top, for example by means of a bolted connection.

In the following is described an example of a preferred embodiment illustrated in the accompanying drawings, wherein:

- 15 Fig. 1 shows a cross-section through a vessel cargo hold where a discharge pipe is provided with valves according to the invention;
- Fig. 2 shows in a larger scale a side view of the valve wherein the closing body is in a closed position;
- 20 Fig. 3 shows a cross-section II-II in Fig. 2;
- Fig. 4 shows in a further larger scale a section A in Fig. 3; and
- Fig. 5 shows the same as Fig. 2, but wherein the closing body is in an open position.
- 25 In the drawings the reference numeral 1 indicates a valve covering an inlet opening 2 to a discharge pipe 4 for sand 6 in a vessel 8.

The vessel 8 is provided with *per se* known drain towers 10 and fluidizing plant 12 for the sand 6.

A first actuator 14 and a second actuator 16 for each valve 1 are arranged on a structure 18 over the sand 6 in the cargo
5 hold 20 of the vessel 8.

The actuators 14 and 16, which may be constituted by for example hydraulic cylinders, are connected to the valve 1 by means of lengthy connections 22 in the form of chains.

The valves 1 are arranged on the tank top 24 of the cargo
10 hold 20.

The valve 1 comprises a base plate 26 attached to the tank top 24 by means of a not shown bolt connection. A valve plate 28 attached to the base plate 26 rises vertically up from the base plate 26. In this embodiment a side plate 30 is arranged
15 on either side of the valve plate 26 with an interstice 32 between the valve plate 28 and each of the side plates 30. The interstice 32 is maintained by sleeves 33, see Fig. 3.

A through valve course 34 having a central axis 36 runs through the plates 28, 30. Co-ordinate the valve course 34 is
20 at least in the side plates 30 arranged through recesses 38.

In a vertical distance above the valve course 34 is arranged a through bolt bore 40 having a rotary axis 42. A closing body 44 is located in each of the interstices 32 and hinged to the valve 1 about the rotary axis 42 by means of a hinge
25 bolt 46.

The closing body 44 is designed with a first fastener 48 coupled to the first actuator 14 by means of the lengthy body 22, and a second fastener 50 coupled to the second actuator 16 by means of another lengthy body 22. The first fastener 48

and the second fastener 50 are on opposite sides of the rotary axis 42. One of the closing bodies 44 may be allocated a not shown strainer which when the closing body is in the closed position corresponds with the valve course 34.

5 The closing body 44 is given an acute shape 52 along its edge portion see Fig. 4, to be more easily rotated in the sand 6. In Figs. 3 and 4 the closing body 44 is shown in the closed and open positions respectively.

A gasket 54 encircling the valve course 34 is located in a
10 gasket groove 56 and seals against the closing body 44 when the closing body 44 is in the closed position.

When the valve 1 is to be opened, the first actuator 14 by means of the lengthy connection 22 pulls the first fastener 48 upward at the same time as the second actuator 16 lets the
15 second fastener be displaced downward.

The closing body 44 is thereby rotated about the rotating axis 42 to its open position see Fig. 5. Sand 6 being in the interstice 32 is displaced out through the recess 38 when the closing body 44 is rotated in the interstice 32. Sand may al-
20 so be displaced out between the sleeves 33 in the interstice 32.

Closing of the closing body 44 is performed in a corresponding manner, but in the opposite direction of rotation.

By activating the two closing bodies 44 individually, the
25 valve 1 may be open, closed or in a drainage position wherein liquid may flow through the not shown strainer, while sand is kept back.

P a t e n t c l a i m s

1. A valve device (1) for regulating an inlet opening (2) to a discharge pipe (4) for fluidized sand (6) in a vessel (8), as the valve (1) located near the vessel
5 (8) tank top (24) having a valve course (34) is operated by at least one actuator (14, 16) located above the sand (6), wherein the at least one actuator (14, 16) is coupled to the valve (1) by means of a lengthy connection (22), c h a r a c t e r i z e d i n t h a t
10 the valve (1) closing body (44) is constituted by a rotary plate rotatable about a rotation axis (42) between a position wherein the valve course (34) is closed and a position wherein the valve course (34) is open.
- 15 2. A valve device according to claim 1, c h a r a c - t e r i z e d i n t h a t the closing body (44) is provided with a strainer corresponding with the valve course (34).
- 20 3. A valve device according to claim 1, c h a r a c - t e r i z e d i n t h a t the closing body (44) is provided with a first fastener (48) coupled to a first actuator (14) and a second fastener (50) coupled to a second actuator (16, as the first fastener (48) and the second fastener (50) are located on opposing sides
25 of the rotary axis (42).
4. A valve device according to claim 1, c h a r a c - t e r i z e d i n t h a t the edge portion of the closing body (44) is given an acute shape.
5. A valve device according to claim 1, c h a r a c -
30 t e r i z e d i n t h a t the closing body (44) is rotatable in the vertical plane.

6. A valve device according to claim 1, c h a r a c -
t e r i z e d i n that the valve course (34) is en-
circled by a gasket (54) sealing against the closing
body (44).
- 5 7. A valve device according to claim 1, c h a r a c -
t e r i z e d i n that the central axis (36) of the
valve course (34) is closer to the tank top (24) than
the diameter of the valve course (34).
- 10 8. A valve device according to claim 1, c h a r a c -
t e r i z e d i n that the valve housing of the
valve (1) comprises at least one side plate (30) con-
stituting a guide for the closing body (44).
- 15 9. A valve device according to claim 1, c h a r a c -
t e r i z e d i n that the valve housing of the
valve (1) comprises at least one side plate (30) pro-
vided with a through recess (28) co-ordinate the valve
course (34).
- 20 10. A valve device according to claim 1, c h a r a c -
t e r i z e d i n that the valve housing of the
valve (1) comprises a base plate (26) arranged on the
tank top (24).