

## Suction head for a dredger

### Background

- 5           The present invention relates to a suction head for a dredger, such a suction head having;
- an outlet for fluidly coupling the suction head with a suction tube for transport of dredge to the loading space of a floating dredger, and a
  - a sand inlet, which in use faces a sand bed to be sucked away, for taking in a flow
- 10           of dredge in the suction head, and which flow of dredge runs in a dredge flow direction at the sand inlet.

JP61028635 A discloses a suction head device for sludge dredging work. The device has a rotator with a screw blade provided along an opening in the bottom of the

15           body to permit dredging work with high sludge contents. This known device requires a high number of parts and is relatively complex for increase the sludge contents.

FR834639 (A) disclose a suction head for a trailing dredger. FR834639 aims to perform dredging of very permeable soils with a high concentration. Therefore, the draghead is traversed by a convergent nozzle directed towards the surface. The nozzle

20           is situated at the front of the draghead which is the leading edge of the draghead.

US2007130807 (A1) relates to dredge heads, for use with a dredging system. US2007130807 aims to provide a dredge heads having a moveable grate member, adapted and configured to selectively extend across the opening of the dredge head, as desired by a user. The movable grate member enables a user to clear the dredge head of

25           plugging masses or blockages without having to de-energize the dredge system pump. Also, the movable grate member enable a user to clear the dredge head of plugging masses or blockages without requiring the user to manually withdraw the plugging masses or blockages from the opening of the suction/dredge heads by using his or her hand.

**Summary of the invention**

The invention aims to provide a suction head for a dredger which head enables to operate the dredge at a high sludge content.

5 Another object of the invention is to improve a suction head for a dredger and partly solve at least one of the problems associated with known suction heads.

Yet another object of the invention is to provide an alternative suction head for a dredger.

10 According to a first aspect of the invention this is realized with a suction head for a dredger, the suction head comprising;

- an outlet for fluidly coupling the suction head with a suction tube for transport of dredge to the loading space of a floating dredger,
- a sand inlet, which in use faces a sand bed to be sucked away, for taking in a flow  
15 of dredge in the suction head, and which flow of dredge runs in a dredge flow direction at the sand inlet,
- a side inlet fluidly coupled with the sand inlet, wherein the side inlet and the outlet are arranged at opposite sides of the suction head for introducing a lateral flow from outside the suction head into the suction head locally at the sand  
20 inlet, which lateral flow runs substantially transverse relative to the dredge flow direction.

The lateral flow associated with the side inlet causes swirl in the suction head locally at the sand inlet and therefore enhances formation of a sand/water mixture  
25 which causes a higher sand share in the mixture when the mixture enters the outlet. This is beneficial in terms of operational costs. Less water is pumped as a transport medium which saves energy and also reduces the overflow losses. The higher sand share or high sludge content is also referred to as high density dredging.

The side inlet and the outlet being arranged at opposite sides of the suction head  
30 is beneficial in terms of effect of the side inlet because the lateral flow extends along the entire width of the suction head, which means the entire flow of dredge.

The side inlet means that the flow which enters there through has a component which is lateral relative to the dredge flow direction at the sand inlet. The side inlet is arranged at the side of the suction head relative to its direction of travel.

In contrast FR834639 (A) situates its nozzle at the front of the draghead which is the leading edge of the draghead. In addition, such a nozzle does not cause swirl for formation of a sand/water mixture with a higher sand share.

Both the “side” inlet, and the lateral flow originating from outside the suction head, explain that the lateral flow is different from the flow of dredge which is the main flow.

In an embodiment of the invention, the side inlet is transversely oriented relative to the sand inlet. This is optimal in terms of effect of the side inlet.

In an embodiment of the invention, the side inlet, in use, faces away from the sand bed to be sucked away for taking in relative clear water. This even more makes clear that the lateral flow is different from the flow of dredge which is the main flow.

In an embodiment of the invention, the sand inlet has a sand inlet cross sectional area and the side inlet has a side inlet cross sectional area, and the side inlet cross sectional area is relative small with respect to the sand inlet cross sectional area, preferably between 10-25% of the sand inlet cross sectional area. This makes clear that the lateral water intake flow is small compared with the flow of dredge which is the main flow.

In an embodiment of the invention, the side inlet changes over, preferably smoothly changes over, into the sand inlet. This enables a more simple configuration and manufacture of the suction head.

In an embodiment of the invention the sand inlet and the side inlet are integrally formed. This enables an even more simple configuration and manufacture of the suction head.

In an embodiment of the invention, the suction head comprises a number of side inlets.

In an embodiment of the invention, the suction head comprises a jet water device  
5 having a jet water outlet arranged for introducing a flow into a side inlet associated with the jet water outlet. This even more increases the effect of the lateral flow.

In an embodiment of the invention the jet water outlet is fluidly coupled with the side inlet associated with the jet water outlet.  
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In an embodiment of the invention, the suction head comprises a passive or active excavated layer height adjusting device. The layer adjusting device can be passive or active, wherein active means that the height of the excavated layer is a result of a set value and in case of a passive layer adjusting device, the excavated layer is a result of  
15 for example the weight of the suction head.

According to a further aspect of the invention this is realized with a dredging vessel, like a hopper, comprising a suction head according to the invention. The dredging vessel may use an outboard submersed dredge pump which is even more  
20 beneficial for high density dredging.

According to an even further aspect of the invention this is realized with a method for operating a suction head for a dredger, the suction head comprising;  
– an outlet for fluidly coupling the suction head with a suction tube for transport of  
25 dredge to the loading space of a floating dredge,  
– a sand inlet, which in use faces a sand bed to be sucked away, for taking in a flow of dredge in the suction head, and which flow of dredge runs in a dredge flow direction at the sand inlet,  
the method comprising the step;  
30 – introducing a lateral flow, relative to the dredge flow direction, in the suction head locally at the sand inlet.

The invention further relates to a device comprising one or more of the characterising features described in the description and/or shown in the attached drawings.

5 The invention further relates to a method comprising one or more of the characterising features described in the description and/or shown in the attached drawings.

The various aspects discussed in this patent can be combined in order to provide additional advantageous advantages.

## 10 **Description of the drawings**

The invention will be further elucidated referring to an preferred embodiment shown in the drawing wherein shown in:

15 Fig. 1 in perspective view a schematic drawing of a first embodiment of a suction head according to the invention;

fig. 2 in perspective view a further embodiment of a suction head according to the invention; and

fig. 3 another perspective view of a suction head according to fig. 2.

## 20 **Detailed description of embodiments**

The invention will further be elucidated referring to all figures 1-3. Fig. shows a suction head 1 for a dredger. Such a suction head 1 is dragged by a dredger along the sand bed 5 to be sucked away. The suction head 1 comprises an outlet 2 for fluidly  
25 coupling the suction head 1 with a suction tube 3 for transport of dredge to the loading space of a floating dredger, which loading space and dredger are not shown. The suction tube 3 usually extends in the dragging direction 24 of the suction head 1 as is shown here.

30 The suction head 1 comprises a sand inlet 4. In use, this inlet 4 in use faces a sand bed 5 to be sucked away. In fig. 1 the inlet 4 and the top face of the sand bed 5 coincide however this coinciding is not strictly required as is clear from fig. 2 and 3 wherein the inlet 4 and the top face of the sand bed 5 do not coincide however the inlet 4 still faces a sand bed 5 to be sucked away. The inlet 4 takes in a flow of dredge 6 in the suction

head 1. The flow of dredge 6 runs in a dredge flow direction 7 at the sand inlet 4 and then continuous through the suction head 1 to the outlet 2.

The suction head 1 comprises a side inlet 8 which is fluidly coupled with the sand inlet 4. The suction head 1 has one side inlet 8. The side inlet 8 and the outlet 2 are mutually arranged for introducing a lateral flow 9 from outside the suction head 1 into the suction head locally at the sand inlet 4. The lateral flow 9 has a lateral flow direction 12, at the sand inlet 4, which runs substantially transverse relative to the dredge flow direction 7 for causing swirl in the suction head 1 locally at the sand inlet 4. The side inlet 8 is transversely oriented relative to the sand inlet 4 which is optimal in terms of causing swirl in the suction head 1 locally at the sand inlet 4. During use, the side inlet 8 faces away from the sand bed 5 to be sucked away for taking in relative clear water, this clear water is however not strictly required for causing swirl in the suction head 1 locally at the sand inlet 4. The sand inlet 4 has a sand inlet cross sectional area 10 and the side inlet 8 has a side inlet cross sectional area 11. The side inlet cross sectional area 11 is relative small with respect to the sand inlet cross sectional area 10, here between 10-25% of the sand inlet cross sectional area 10. The sand inlet cross sectional area 10 is defined by frame members of the suction head 1, in fig. 2, 3 by frame members 17, 18, 19, where frame members 18, are an imaginary limitation. In fig. 1. the side inlet cross sectional area 11 is defined by side inlet frame members 13, 14, 15, 16. In fig. 2, 3 the side inlet cross sectional area 11 is defined by side inlet frame members 18, 21, where frame member 18 is an imaginary limitation. In fig. 2, 3 the side inlet 8 changes smoothly over into the sand inlet 4. In other words, the side inlet 8 and the sand inlet 4 share a common imaginary frame member 18. The sand inlet 4 and the side inlet 8 may be integrally formed. In fig. 1, the side inlet 8 and the outlet 2 are arranged at opposite sides of the suction head 1.

The suction head 1 may comprise a jet water device (not shown) having a jet water outlet arranged for introducing a flow into a side inlet 8 associated with the jet water outlet. The jet water outlet may be fluidly coupled with the side inlet 8 associated with the jet water outlet.

During use of the suction head 1, a lateral flow 9 is introduced at the sand inlet 4, relative to the dredge flow direction 7, in the suction head 1 locally at the sand inlet 4.

It will also be obvious after the above description and drawings are included to illustrate some embodiments of the invention, and not to limit the scope of protection. Starting from this disclosure, many more embodiments will be evident to a skilled  
5 person which are within the scope of protection and the essence of this invention and which are obvious combinations of prior art techniques and the disclosure of this patent.

**Claims**

1. Suction head (1) for a dredger, the suction head comprising;
- an outlet (2) for fluidly coupling the suction head with a suction tube (3) for transport of dredge to the loading space of a floating dredger,
  - a sand inlet (4), which in use faces a sand bed (5) to be sucked away, for taking in a flow of dredge (6) in the suction head, and which flow of dredge runs in a dredge flow direction (7) at the sand inlet,
  - a side inlet (8) fluidly coupled with the sand inlet, wherein the side inlet and the outlet are arranged at opposite sides of the suction head for introducing a lateral flow (9) from outside the suction head into the suction head locally at the sand inlet, which lateral flow runs substantially transverse relative to the dredge flow direction.
2. Suction head according to claim 1, wherein the side inlet is transversely oriented relative to the sand inlet.
3. Suction head according to a preceding claim, wherein the side inlet, in use, faces away from the sand bed to be sucked away for taking in relative clear water.
4. Suction head according to a preceding claim, wherein the sand inlet has a sand inlet cross sectional area (10) and the side inlet has a side inlet cross sectional area (11), and the side inlet cross sectional area is relative small with respect to the sand inlet cross sectional area, preferably between 10-25% of the sand inlet cross sectional area.
5. Suction head according to a preceding claim, wherein the side inlet changes over, preferably smoothly changes over, into the sand inlet.
6. Suction head according to a preceding claim, wherein the sand inlet and the side inlet are integrally formed.

7. Suction head according to a preceding claim, wherein the suction head comprises a number of side inlets.
8. Suction head according to a preceding claim, comprising a jet water device  
5 having a jet water outlet arranged for introducing a flow into a side inlet associated with the jet water outlet.
9. Suction head according to claim 8, wherein the jet water outlet is fluidly coupled with the side inlet associated with the jet water outlet.  
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10. Suction head according to a preceding claim, comprising a passive or active excavated layer height adjusting device.
11. Dredging vessel, like a hopper, comprising a suction head according to a  
15 preceding claim.
12. Method for operating a suction head for a dredger, the suction head comprising;  
– an outlet for fluidly coupling the suction head with a suction tube for transport of dredge to the loading space of a floating dredge,  
20 – a sand inlet, which in use faces a sand bed to be sucked away, for taking in a flow of dredge in the suction head, and which flow of dredge runs in a dredge flow direction at the sand inlet,  
the method comprising the step;  
– introducing a lateral flow, relative to the dredge flow direction, in the  
25 suction head locally at the sand inlet.