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(54) **DEVICE AND METHOD FOR DEPOSITING MATERIAL ONTO AN UNDERWATER BOTTOM**

(57) Described is a device for depositing material onto an underwater bottom. The device comprises a dredging vessel and a pump placed on the dredging vessel and connected via a throughfeed conduit to an inlet opening of a drag head movable over the underwater bottom. The drag head is bounded in a direction running transversely of the direction of movement by a first and a second outer side wall, wherein the inlet opening is situated

closer to the first side wall than the centre between the side walls, and wherein the outlet opening is provided in the second side wall of the drag head. The pump can maintain a transverse flow in the drag head from the inlet opening to the outlet opening of the drag head and to the underwater bottom. Material for depositing is entrained in the flow and deposited, preferably via the outlet opening, onto the underwater bottom in efficient manner.

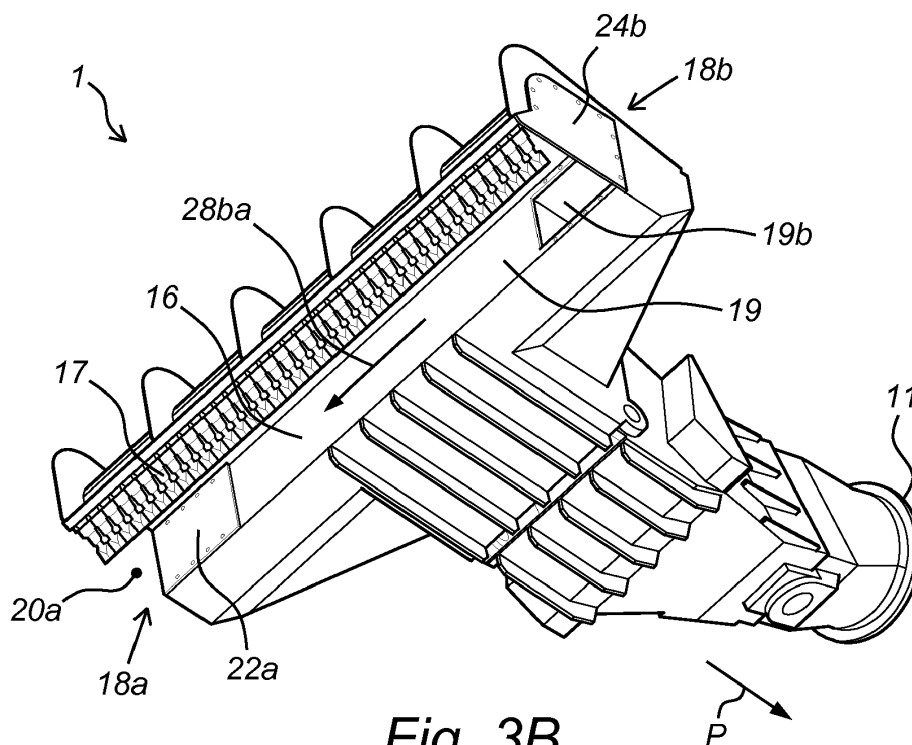


Fig. 3B

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Description

TECHNICAL FIELD OF THE INVENTION

[0001] The invention relates to a device for depositing material onto an underwater bottom while making use of a dredging vessel with drag head. The invention likewise relates to a drag head and method for depositing material onto an underwater bottom.

BACKGROUND OF THE INVENTION

[0002] Media such as for instance oil and gas are generally transported over large distances via pipelines. In order to avoid costly detours, such pipelines are often arranged on seabeds or bottoms of other waterways. This is because this makes it possible to bridge the shortest distance between two locations. In order to protect the pipelines over their length under water the lines can be laid in trenches. The trenches are formed in the underwater bottom and then, with the pipeline received therein, filled with material for depositing. The pipeline is hereby in fact buried in the material for depositing, which provides adequate protection.

[0003] The trenches can be formed by making use of a dredging device. Such a dredging device comprises a dredging vessel configured for movement in a direction of movement, a dredge pump placed on the dredging vessel and having a connection for a throughfeed conduit which connects a drag head to the dredge pump, and support means placed between the dredging vessel and the drag head for supporting the throughfeed conduit and determining the depth of the drag head. The drag head comprises a tube construction which can be connected to the throughfeed conduit and has side walls, an upper wall and a lower wall directed toward the bottom. Arranged at the rear (the downstream side relative to the direction of movement) of the tube construction is a visor which is provided on the bottom side of a throughflow opening and connected for pivoting around a horizontal axis to the tube construction, and can thus be rotated up and downward, for instance by a hydraulic piston. The visor is further provided with a toothed beam running transversely of the direction of movement and provided on the bottom side with cutting tools such as teeth for dislodging material for dredging from the bottom. A series of wear heel pieces, together forming a heel plate with which the drag head supports on the underwater bottom, can be arranged on the underside (the bottom side) of the tube construction, at the position of the connection to the visor. In order to form the trenches such a drag head is dragged forward over or in the bottom for dredging in the direction of the trench to be arranged, wherein the tube construction rests via the heel plate on the bottom and wherein the teeth dislodge the bottom and the dislodged bottom material is suctioned away via the throughfeed conduit, for instance to a bin present on the dredging vessel.

[0004] After arranging the pipeline in the thus formed trench, the trench with the pipeline received therein is filled with material for depositing. A spray pontoon can be used for this purpose, wherein the material for depositing is poured onto the trench via a floating conduit and pipe. Another known method consists of depositing the bottom material which is present in the bin onto the trench by (partially) opening the bottom plates of the bin while the dredging vessel moves forward in the direction of the trench.

[0005] The depositing of the (bottom) material according to the known method is imprecise and in some cases can have an efficiency of a maximum of 50%. This means that no more than half of the bottom material comes to lie at the desired position, i.e. in the trench. In such a case the dredging vessel has to dredge additional bottom material in the vicinity, which is of course time-consuming and expensive.

[0006] The trench further has to be filled such that the contour of the filling substantially matches the bottom contour of the immediate vicinity. This is because a filling which is too high, wherein a rise is thus formed, is subject to erosion, whereby the filling is gradually carried away with the current. The result is that the customer will pay for something which will be lost again in the short or long run. This is of course undesirable. Because of the desired level of protection, the minimum height of the filling above the pipeline, among other things, is further set. It is thus also important herein to be able to realize the height of the filling as precisely as possible.

[0007] In view of the above, it is important to deposit the material for depositing at the correct location as efficiently as possible, wherein the desired contour of the filling has to be achieved in the shortest possible time and with the lowest possible usage of material for depositing.

SUMMARY OF THE INVENTION

[0008] It is an object of the present invention to provide a device, drag head and method for depositing material onto an underwater bottom with an increased efficiency relative to the known device and method.

[0009] According to the invention, a device according to claim 1 is provided for this purpose. The invented device for depositing material onto an underwater bottom comprises a dredging vessel which is configured for movement in a direction of movement P and a pump placed on the dredging vessel and connected via a throughfeed conduit to an inlet opening of a drag head movable over the underwater bottom, wherein the drag head is bounded in a direction running transversely of the direction of movement by a first and a second outer side wall, the inlet opening is situated closer to the first side wall than the centre between the side walls, and the outlet opening is provided in the second side wall of the drag head, wherein the pump is configured to maintain a transverse flow in the drag head from the inlet opening

to the outlet opening of the drag head and to the underwater bottom, in which flow the material for depositing is entrained and is deposited, preferably via the outlet opening, onto the underwater bottom.

[0010] As a result of the above stated measures a flow is introduced on a first side of the drag head via the inlet opening into a space enclosed by the visor and the underwater bottom and is deflected in a direction running transversely of the direction of movement P (substantially corresponding to a dragging direction of the drag head) toward the second side wall, where the flow with entrained material for depositing leaves the drag head, preferably via the outlet opening, and finds its way (for instance in an arc) onto the underwater bottom or into a trench for filling. Use is thus made of the width of the drag head in order to direct the supplied material for depositing and give it the desired speed. The material for depositing can hereby be deposited on the underwater bottom with positional accuracy. The speed of forward movement of the dredging vessel (and the drag head), the flow rate with which the material for depositing is supplied to the outlet opening and the path of the drag head can here be adjusted to each other such that the desired depositing onto the underwater bottom of the material for depositing is achieved.

[0011] The centre between the side walls lies in a plane of symmetry of the drag head at a substantially equal, shortest distance from the two side walls of the drag head. According to the invention, the inlet opening which provides access to the space between visor and underwater bottom is situated somewhere between the first side wall and the plane of symmetry of the drag head.

[0012] In an embodiment of the invention a device is provided wherein the drag head comprises a feed opening for the material for depositing which is directed toward the bottom, and the pump is configured to carry the material for depositing from the underwater bottom to the outlet opening of the drag head. This embodiment is for instance readily applicable when the material for depositing is already situated on the underwater bottom, for instance as a result of a trench or channel being formed in the underwater bottom.

[0013] According to another embodiment of the invention, a device is provided wherein the pump is configured to carry the material for depositing from the dredging vessel, via the throughfeed conduit and to the inlet opening of the drag head. The material for depositing can for instance be supplied from a bin present on the dredging vessel.

[0014] The precision of the depositing is further improved by providing an embodiment of the device wherein the pump is configured to carry material for depositing via the outlet opening of the drag head to the underwater bottom with a controllable flow rate.

[0015] In an embodiment according to the invention a device is provided wherein the drag head comprises a second inlet opening situated closer to the second side wall than the centre between the side walls. The drag

head preferably also comprises a second outlet opening which is provided in the first side wall of the drag head. The side where the material for depositing optionally leaves the drag head can in this way be changed from the second side wall to the first side wall in simple manner. In such an embodiment the material for depositing is supplied to the second inlet opening and then moved from the second side wall in the direction of the first side wall, where the material for depositing leaves the drag head.

[0016] In order not to overly disrupt the transverse flow of the material for depositing in the space between the visor and the underwater bottom it is advantageous to characterize an embodiment of the device in that at least one of the inlet opening(s) and the outlet opening(s) can be closed. When the water flow and/or the material for depositing is supplied via the first inlet opening and discharged via the second outlet opening, it is advantageous to be able to close the second inlet opening as well as the first outlet opening situated on the side of the first inlet opening. When the water flow and/or the material for depositing is supplied via the second inlet opening and is discharged via the first outlet opening, it is advantageous to be able to close the first inlet opening as well as the second outlet opening situated on the side of the second inlet opening. It is also possible to leave both the first and the second inlet opening open and to guide the supplied water flow and/or the flow of material for depositing downstream of the two inlet openings, to the first or the second inlet opening, for instance by incorporating a valve in the flow duct.

[0017] The position of the first inlet opening can be chosen freely between the first side wall and the plane of symmetry of the two outer side walls, wherein placing the first inlet opening closer to the first side wall is preferred to an embodiment in which the first inlet opening is situated further from the first side wall.

[0018] In an embodiment of the device the (first) inlet opening is situated adjacently of the first side wall. This is understood to mean that the distance from a central point of the inlet opening to the first side wall is smaller than 50% of the distance between the first side wall and the plane of symmetry of the drag head in relation to the two side walls, preferably smaller than 25% and most preferably smaller than 10%.

[0019] In another embodiment of the invention the second inlet opening is situated adjacently of the second side wall. In this embodiment the distance from a central point of the inlet opening to the second side wall is smaller than 50% of the distance between the second side wall and the plane of symmetry of the drag head in relation to the two side walls, preferably smaller than 25% and most preferably smaller than 10%.

[0020] Another aspect of the invention relates to a drag head which is configured to be moved forward over an underwater bottom and to deposit material thereon, comprising an inlet opening for receiving a liquid and/or material for depositing and an outlet opening for carrying the material for depositing to the underwater bottom,

wherein the drag head is bounded in a direction running transversely of the direction of movement by a first and a second outer side wall, wherein the inlet opening is situated closer to the first side wall than the centre between the side walls, and wherein the outlet opening is provided in the second side wall of the drag head.

[0021] The drag head is preferably also configured to move forward over the underwater bottom and herein dislodge bottom material which is suctioned away via the throughflow opening of the drag head and the throughfeed conduit to a bin present on the dredging vessel by a pump present on the dredging vessel. With such an embodiment of the device it is possible to both dredge the trenches and protect the pipelines in the trenches by arranging material for depositing thereon. This can even be performed in alternating manner, wherein a formed part of a trench is first filled before a new part of the trench is formed.

[0022] The invention also relates to a method for depositing material onto an underwater bottom, wherein a device according to the invention is provided, wherein the drag head is moved forward over the underwater bottom by the forward movement of the dredging vessel in the direction of movement P, wherein the pump maintains a transverse flow in the drag head from the inlet opening of the drag head to the outlet opening of the drag head and to the underwater bottom, and wherein the material for depositing is introduced into the flow, whereby it is entrained in the flow and is deposited, preferably via the outlet opening, onto the underwater bottom.

[0023] An embodiment of the above stated method is characterized in that the pump carries material for depositing from the dredging vessel, via the throughfeed conduit and to the inlet opening of the drag head.

[0024] Another embodiment of the method has the feature that the drag head comprises a feed opening for the material for depositing which is directed toward the bottom, and the pump carries material for depositing from the underwater bottom to the outlet opening of the drag head.

[0025] In yet another embodiment of the method the pump carries material for depositing via the outlet opening of the drag head to the underwater bottom with a controllable flow rate. This further enhances the precision of the depositing.

[0026] A further embodiment of the invention is provided by a method wherein, prior to the material for depositing being carried to the underwater bottom, the drag head is moved forward over the underwater bottom and, with this, dislodges bottom material, which is suctioned away via the drag head and the throughfeed conduit to a bin present on the dredging vessel by the pump present on the dredging vessel. It is advantageous here for the suctioned-up bottom material to be used as material for depositing.

[0027] The embodiments of the invention described in this patent application can if desired be combined in any possible combination of these embodiments, and each

embodiment individually can form the subject matter of a divisional patent application.

BRIEF DESCRIPTION OF THE FIGURES

[0028] The invention will now be further elucidated with reference to the following figures and description of preferred embodiments, without the invention otherwise being limited thereto. In the figures:

figure 1 is a schematic side view of a device according to the invention;

figure 2A is a schematic perspective top view of a drag head according to an embodiment of the invention;

figure 2B is a schematic perspective bottom view of the drag head shown in figure 2A according to an embodiment of the invention;

figure 3A is a schematic perspective top view of a drag head according to another embodiment of the invention;

figure 3B is a schematic perspective rear view of the drag head shown in figure 3A with reducing means in open position;

figure 4A is a schematic perspective top view of a drag head according to an embodiment of the invention in use;

figure 4B is a schematic perspective top view of the drag head shown in figure 4A in use from a different viewpoint; and finally

figure 5 is a schematic side view of the drag head shown in figure 4B wherein an outgoing flow of material for depositing has been made visible.

DESCRIPTION OF EXEMPLARY EMBODIMENTS

[0029] Figure 1 shows a dredging vessel 8 which is provided with a motor (not shown in the drawing) for driving a propeller 2 via a propeller shaft for the purpose of propelling dredging vessel 8. Also present are devices (not shown in the drawings) for steering dredging vessel 8, such as a rudder and transversely placed propellers for facilitating manoeuvring.

[0030] A schematically shown pump 6 is arranged in dredging vessel 8. Arranged against a side wall of the dredging vessel is a throughfeed conduit 3, one end of which is connected to pump 6. In the present embodiment throughfeed conduit 3 comprises two members 3a and 3b which are connected to each other by means of a coupling allowing some relative angular displacement. The connection between upper member 3a of throughfeed conduit 3 and the vessel also allows angular displacement, both in the horizontal and in the vertical plane. For support of the movable end of upper member 3a of throughfeed conduit 3 this member is connected to a cable 4a, the other end of which is connected to a winch 5a. For support of the movable end of lower member 3b of throughfeed conduit 3 this member is likewise con-

nected to a cable 4b, the other end of which is connected to a winch 5b. It is thus possible using winches 5a, 5b to vary the height of throughfeed conduit 3. It will be apparent that, also subject to the depth of the underwater bottom, the number of members of throughfeed conduit 3 can be increased or decreased, with a corresponding adjustment of the number of cables 4 and winches 5. A drag head 1 according to the invention is arranged on the free end of second member 3b of throughfeed conduit 3.

[0031] Referring to figures 2A and 2B, an embodiment of drag head 1 is shown. Drag head 1 comprises a connecting part which can be connected to throughfeed conduit 3 and which comprises in the shown embodiment a fixed connecting part 13a and a movable connecting part 13b connected to fixed connecting part 13a for pivoting around a vertical shaft 14 by means of hydraulic cylinder 31. Fixed connecting part 13a can be fixedly attached to throughfeed conduit 3 with flange 11. Drag head 1 further comprises a visor 12 which is rotatable by means of hydraulic cylinder 21 relative to connecting part 13b around a shaft 15 running transversely of the dragging direction P and has an opening 16 directed toward the bottom for receiving dislodged bottom material. In the shown embodiment a lower edge of visor 12 comprises a series of cutting tools 17 for penetrating the bottom. Cutting tools 17 are per se known and can comprise any type of tooth. It is also possible to provide a cutting blade (not shown) instead of the series of cutting tools. The series of cutting tools can also be omitted. The series of cutting tools 17 extends along a line transversely of the dragging direction P. The cutting tools can for instance be mounted in usual manner on a toothed beam running transversely of the dragging direction P.

[0032] During dredging, drag head 1 is moved over the bottom in the direction of movement P of the dredging vessel, wherein teeth 17 penetrate the bottom to a determined depth and, with this, dislodge bottom material. The dislodged bottom material can be pumped up together with a quantity of water via throughflow opening 16 by pump 6, wherein throughfeed conduit 3 functions as suction conduit for the dredged bottom material. Owing to the pumping action of pump 6 an underpressure is thus maintained in visor 1 during dredging. The pumped-up bottom material can for instance be collected in a bin 7 of dredging vessel 8.

[0033] It is also possible to apply the device to deposit material onto an underwater bottom 9. Pump 6 is then switched from the suction mode to a blowing mode, wherein bottom material coming from for instance bin 7 is pumped via throughfeed conduit 3 in the direction of bottom 9 and is deposited onto underwater bottom 9. Throughfeed conduit 3 then functions as blow conduit for the bottom material.

[0034] With the invented device material can be poured in precise manner onto underwater bottom 9 and more specifically into a trench 90, in which a pipeline (not shown) is for instance arranged. A drag head 1 according

to the invention is bounded in a direction running transversely of the direction of movement P by a first outer side wall 18a and an opposite second outer side wall 18b. A closed front wall 19 of drag head 1 (on an upstream side of throughflow opening 16) is provided with an inlet opening 19a which is situated closer to first side wall 18a than the centre between the side walls (18a, 18b), and in the shown embodiment immediately adjacently of first side wall 18a. Pump 6 is configured to maintain a flow through throughfeed conduit 3 to inlet opening 19a, for instance a water flow, wherein the flow thus enters drag head 1 via inlet opening 19a. The required precision of the depositing is achieved inter alia by providing second side wall 18b with an outlet opening 20b which is directed toward the part of underwater bottom 9 on which the material for depositing is to be arranged. The flow entering via inlet opening 19a is then guided as according to arrow 28ab from the (closed) first side wall 18a to outlet opening 20b in a direction running transversely of the dragging direction P, wherein material for depositing 30 is drawn in by the flow via a feed opening of the drag head directed toward the bottom, is entrained by the flow and leaves drag head 1 in lateral direction.

[0035] In use drag head 1 is moved forward over underwater bottom 9 by the forward movement of the dredging vessel in the direction of movement P, wherein pump 6 carries material for depositing 30 to inlet opening 19a of drag head 1 and blows it via outlet opening 20b laterally in the direction of underwater bottom 9 or trench 90. This method is for instance illustrated in figure 5. The material for depositing 30 can here be carried with pump 6 from dredging vessel 8, via throughfeed conduit 3 and to inlet opening 19a of drag head 1. It is however also possible to carry accumulated material for depositing 30a, which is already present on underwater bottom 9, for instance adjacently of a trench 90, from underwater bottom 9 directly to outlet opening 20b of drag head 1 with pump 6. The material for depositing 30 is poured onto underwater bottom 9 in the desired pattern, for instance to fill trench 90 with deposited material for depositing 30b.

[0036] If desired, the transverse pouring direction 28ab can be reversed by the embodiment shown in figures 3A and 3B, in which the second side wall 18b is closed and an outlet opening 20a is arranged in first wall part 18a. An inlet opening 19b for material for depositing 30 which is arranged in front wall 19 is situated immediately adjacently of second side wall 18b. In order to facilitate switching of transverse pouring direction 28ab drag head 1 can if desired be provided with both a first inlet opening 19a and a second inlet opening 19b, wherein these can be closed with closing plates (22a, 22b). An inlet opening 19a is created by removing closing plate 22a, wherein it is preferred for proper operation to close inlet opening 19b with closing plate 22b. Only then is the transverse flow of material for depositing as according to arrow 28ab discharged unobstructed. The outlet openings (20a, 20b) can also take a closable form with closing plates (24a, 24b). In the embodiment shown in figures 2A and 2B

outlet opening 20b is situated in the second side wall, thus where closing plate 24b was removed. First side wall 18 is however closed, which can be achieved in simple manner by closing outlet opening 20a with closing plate 24a. As shown in figure 3B, a flow of material for depositing in a transverse direction as according to arrow 28ba, which is opposite to arrow 28ab, can be achieved by closing second outlet opening 20b and first inlet opening 19a with closing plates 24b and 22a and removing closing plates 24a and 22b, thereby forming a first outlet opening 20a and a second inlet opening 19b.

[0037] The speed at which drag head 1 is dragged over underwater bottom 9 can be chosen within wide limits. It is however advantageous for the speed of forward movement of drag head 1 to be adjusted to the flow rate of the outgoing flow of material for depositing 30. Pump 6 is configured for this purpose to carry the material for depositing 30 to one of the inlet openings (19a, 19b) of drag head 1 and to carry it via one of the corresponding outlet openings (20b, 20a) of drag head 1 to underwater bottom 9 with a controllable flow rate.

[0038] The invention is not limited to the above described exemplary embodiments, and modifications can be made thereto to the extent these fall within the scope of the appended claims.

Claims

1. Device for depositing material onto an underwater bottom, comprising:

- a dredging vessel which is configured for movement in a direction of movement P,
- a pump placed on the dredging vessel and connected via a throughfeed conduit to an inlet opening of a drag head movable over the underwater bottom, wherein the drag head is bounded in a direction running transversely of the direction of movement by a first and a second outer side wall, the inlet opening is situated closer to the first side wall than the centre between the side walls, and the outlet opening is provided in the second side wall of the drag head,
- wherein the pump is configured to maintain a transverse flow in the drag head from the inlet opening to the outlet opening of the drag head and to the underwater bottom, in which flow the material for depositing is entrained and is deposited onto the underwater bottom.

2. Device according to claim 1, wherein the material for depositing is deposited via the outlet opening onto the underwater bottom.
3. Device according to claim 1 or 2, wherein the drag head comprises a feed opening for the material for depositing which is directed toward the bottom, and

the pump is configured to carry the material for depositing from the underwater bottom to the outlet opening of the drag head.

4. Device according to any one of the claims 1-3, wherein the pump is configured to carry the material for depositing from the dredging vessel, via the throughfeed conduit and to the inlet opening of the drag head.
5. Device according to any one of the foregoing claims, wherein the pump is configured to carry the material for depositing via the outlet opening of the drag head to the underwater bottom with a controllable flow rate.
6. Device according to any one of the foregoing claims, wherein the drag head comprises a second inlet opening situated closer to the second side wall than the centre between the side walls.
7. Device according to any one of the foregoing claims, wherein the drag head comprises a second outlet opening which is provided in the first side wall of the drag head.
8. Device according to any one of the foregoing claims, wherein at least one of the inlet opening(s) and the outlet opening(s) can be closed.
9. Device according to any one of the foregoing claims, wherein the inlet opening is situated adjacently of the first side wall.
10. Device according to any one of the foregoing claims, wherein the second inlet opening is situated adjacently of the second side wall.
11. Drag head configured to be moved forward over an underwater bottom and to deposit material thereon, comprising an inlet opening for receiving a liquid and/or material for depositing and an outlet opening for carrying a liquid flow and/or the material for depositing to the underwater bottom, wherein the drag head is bounded in a direction running transversely of the direction of movement by a first and a second outer side wall, wherein the inlet opening is situated closer to the first side wall than the centre between the side walls, and wherein the outlet opening is provided in the second side wall of the drag head.
12. Method for depositing material onto an underwater bottom, wherein a device according to any one of the claims 1-10 is provided, wherein the drag head is moved forward over the underwater bottom by the forward movement of the dredging vessel in the direction of movement P, wherein the pump maintains a transverse flow in the drag head from the inlet

opening of the drag head to the outlet opening of the drag head and to the underwater bottom, and wherein the material for depositing is introduced into the flow, whereby it is entrained in the flow and is deposited, optionally via the outlet opening, onto the underwater bottom. 5

13. Method according to claim 12, wherein the drag head comprises a feed opening for the material for depositing which is directed toward the bottom, and the pump carries the material for depositing from the underwater bottom to the outlet opening of the drag head. 10
14. Method according to claim 12 or 13, wherein the pump carries the material for depositing from the dredging vessel, via the throughfeed conduit and to the inlet opening of the drag head. 15
15. Method according to any one of the claims 12-14, wherein the pump carries material for depositing via the outlet opening of the drag head to the underwater bottom with a controllable flow rate. 20
16. Method according to any one of the claims 12-15, wherein, prior to the material for depositing being carried to the underwater bottom, the drag head is moved forward over the underwater bottom and, with this, dislodges bottom material, which is suctioned away via the feed opening of the drag head and the throughfeed conduit to a bin present on the dredging vessel by the pump present on the dredging vessel. 25 30
17. Method according to claim 16, wherein the suctioned-up bottom material is used as material for depositing. 35

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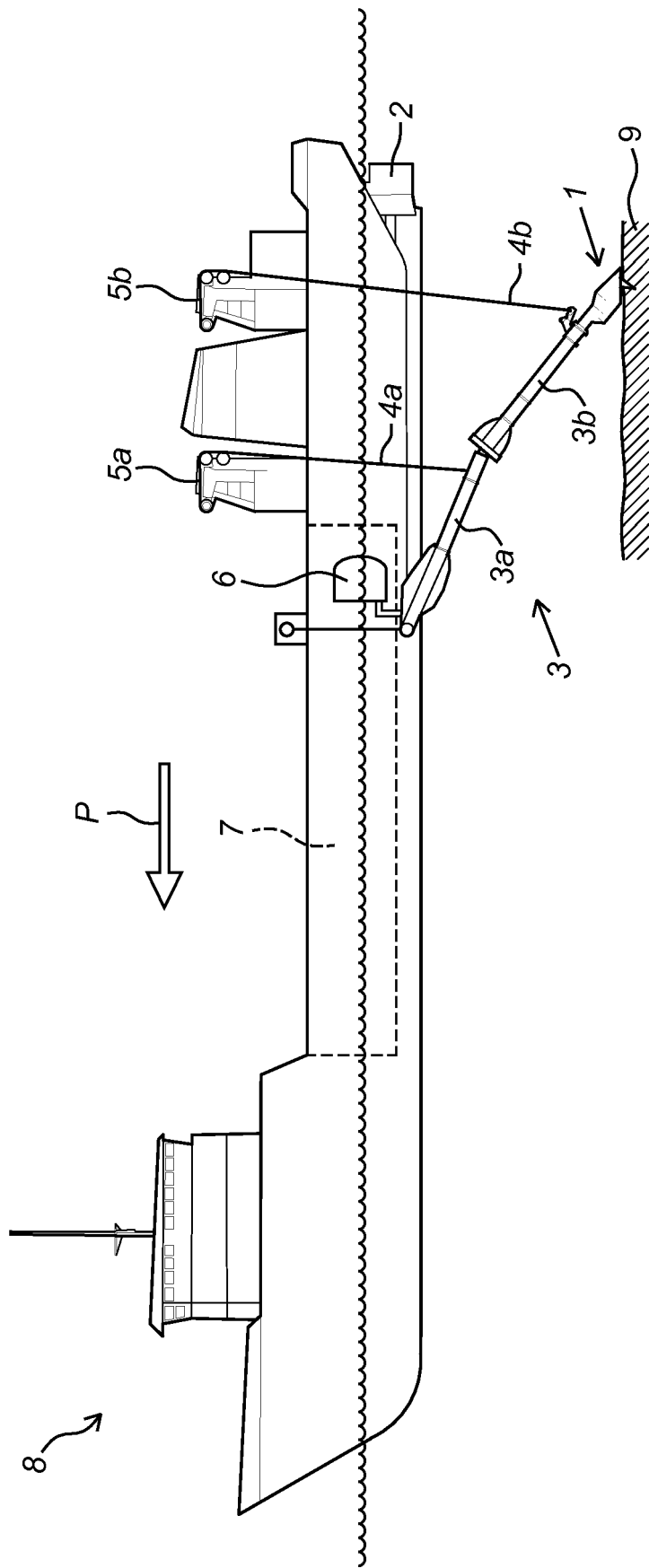
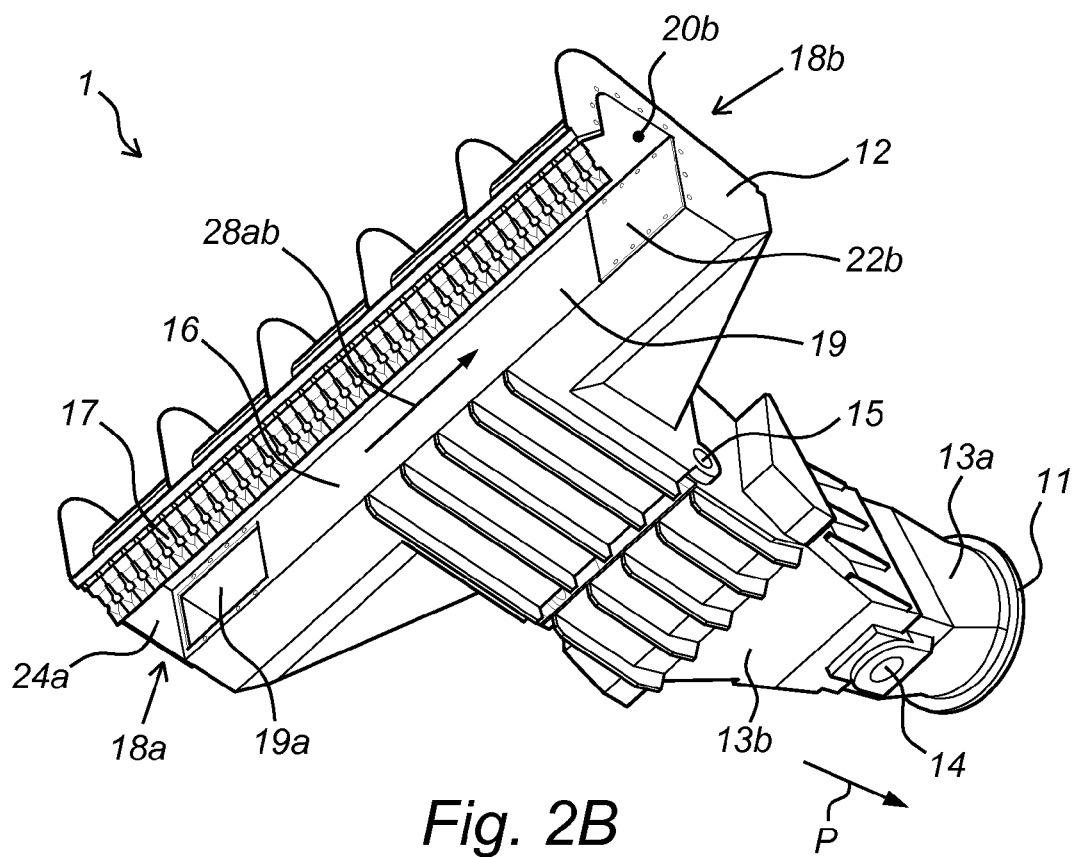
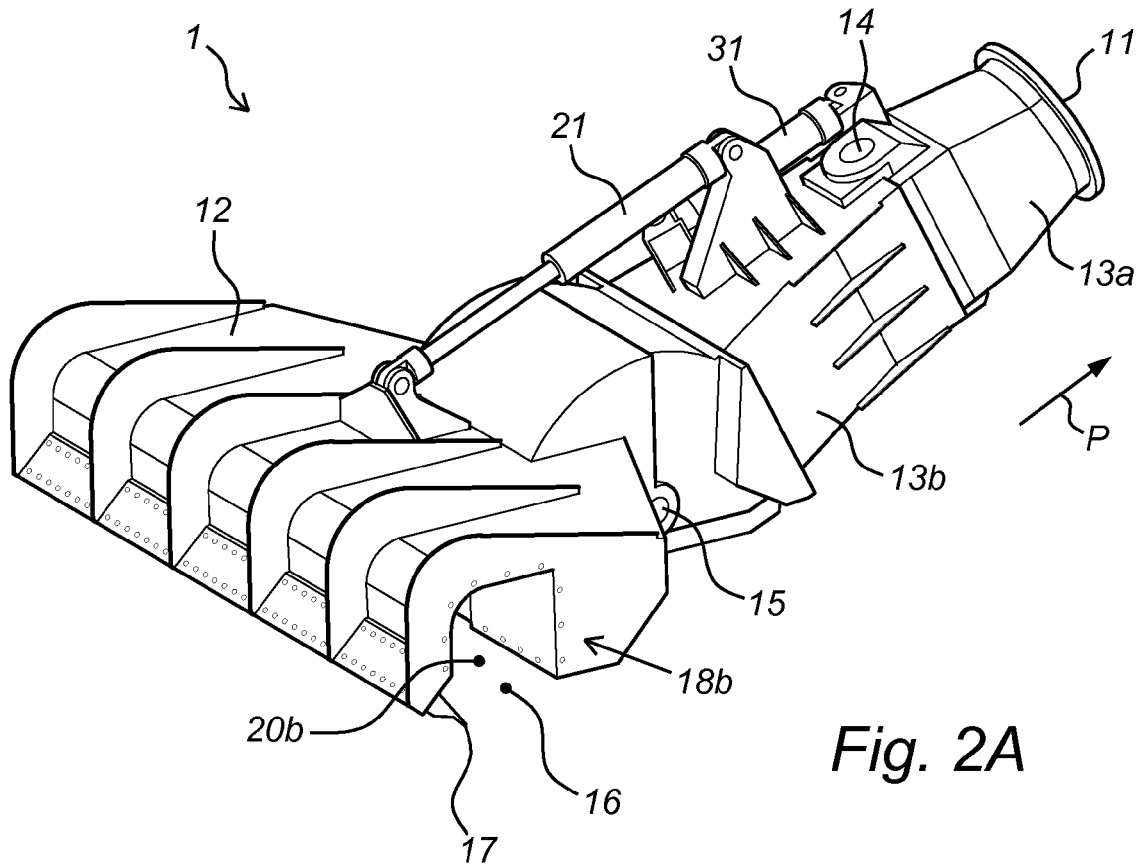
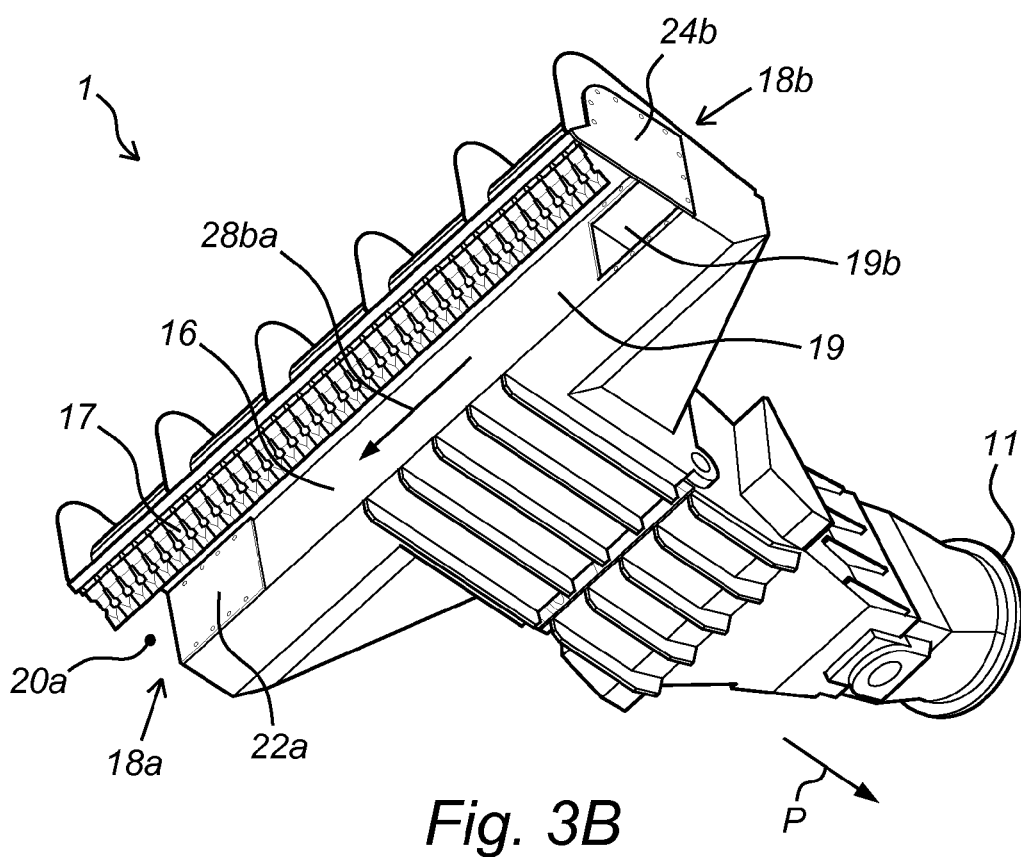
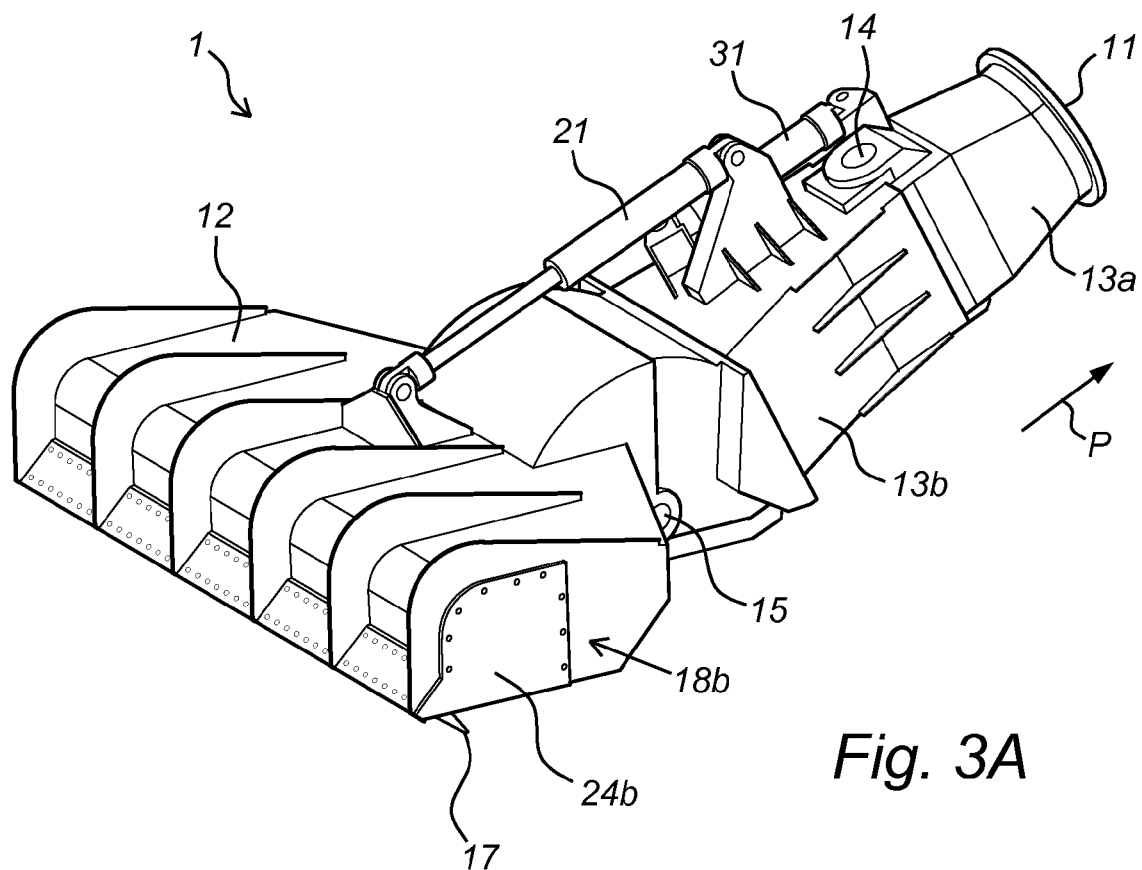


Fig. 1





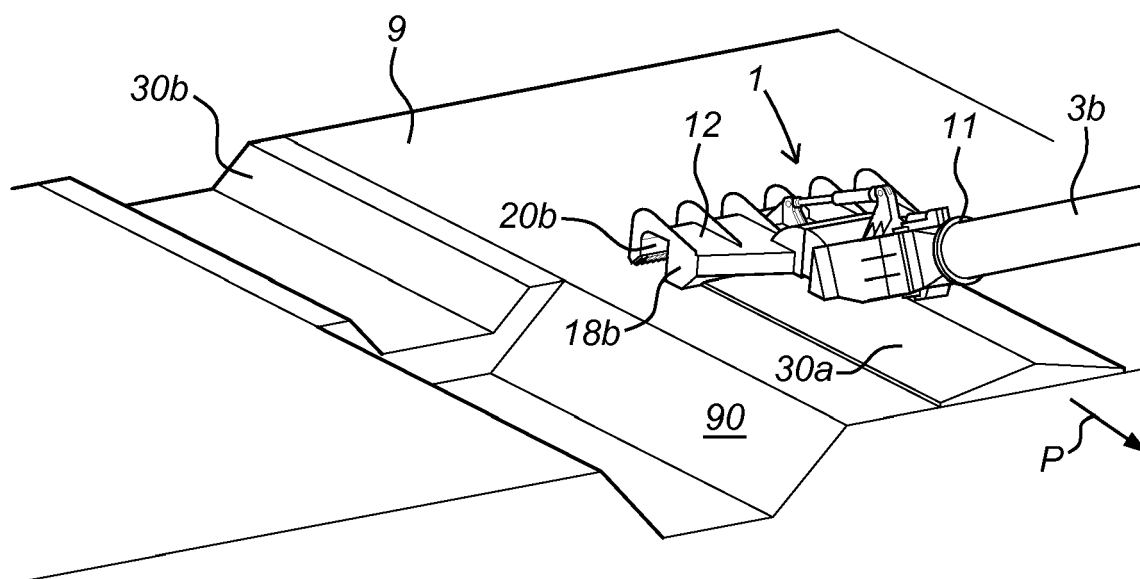


Fig. 4A

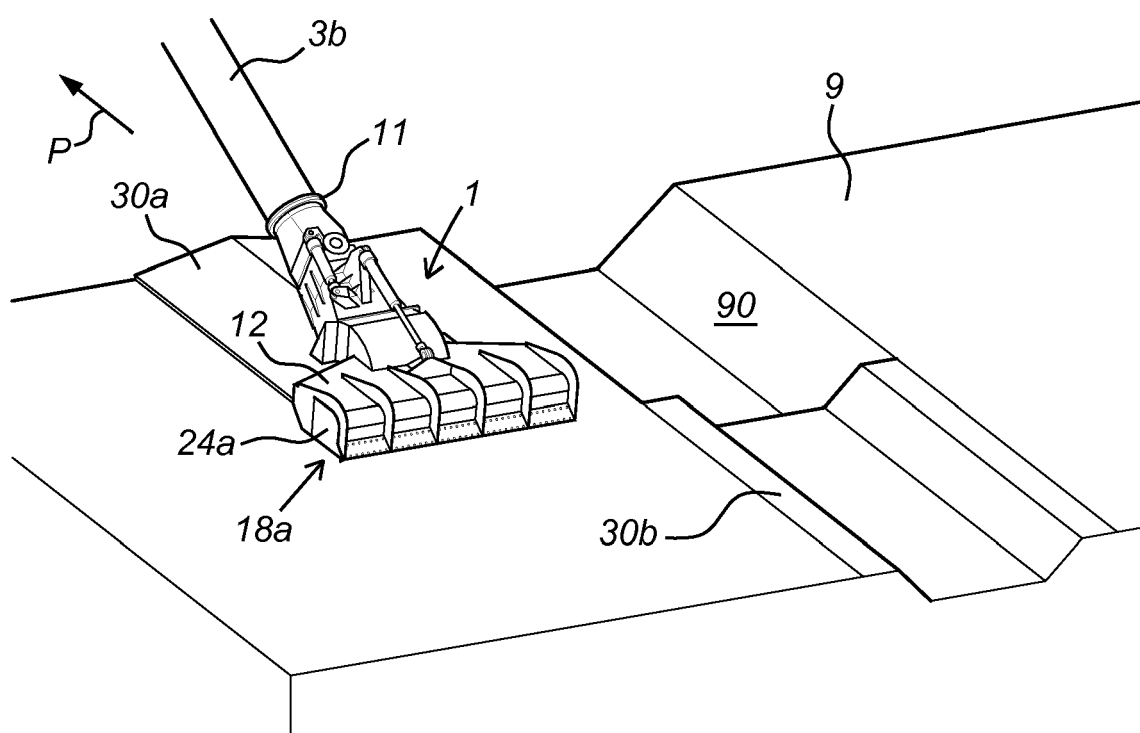


Fig. 4B

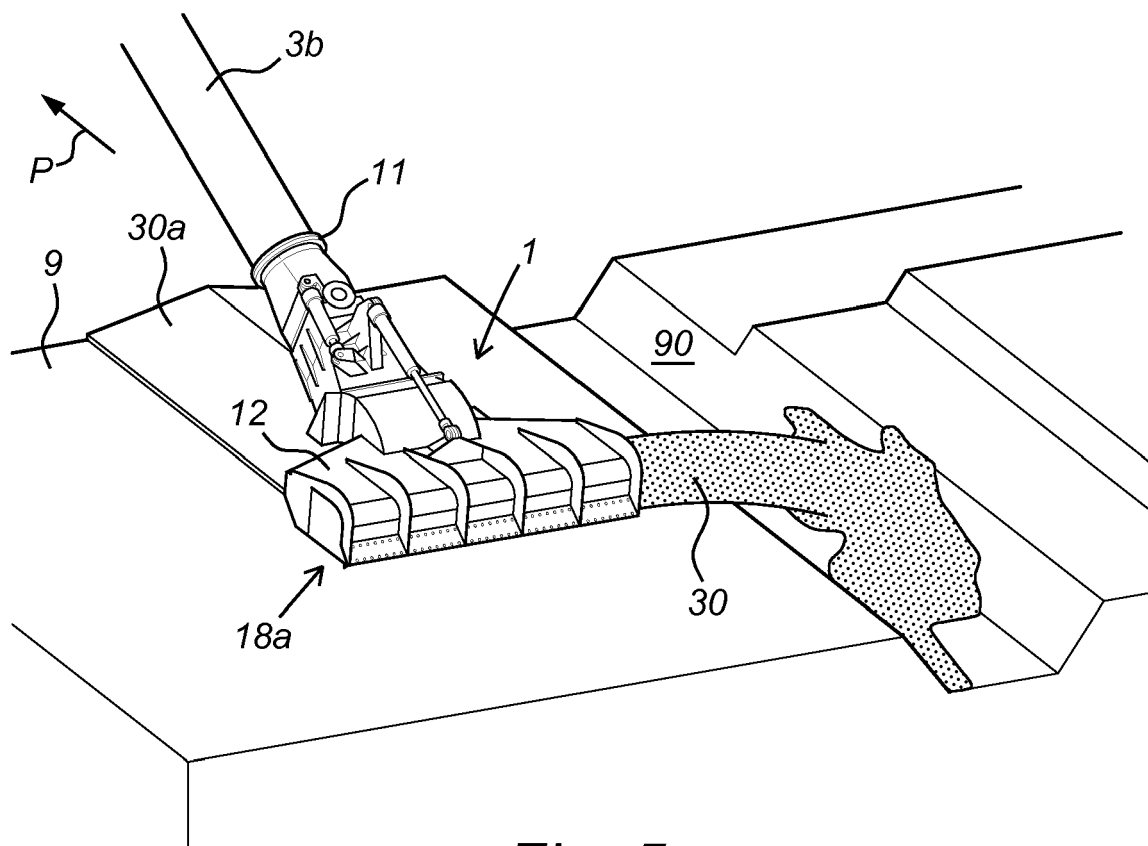


Fig. 5



EUROPEAN SEARCH REPORT

 Application Number
 EP 17 16 9913

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 4 400 115 A (BIANCALE PIERRE [FR] ET AL) 23 August 1983 (1983-08-23) * abstract; figures 1-9 * -----	1-17	INV. E02F3/88 E02F3/92 E02F5/10 E02F5/22 E02F5/12
A	NL 7 806 155 A (AKERS MEK VERKSTED AS) 8 December 1978 (1978-12-08) * abstract; figures 1,2 * -----	1-17	
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A	WO 2014/098600 A1 (IHC HOLLAND IE BV [NL]) 26 June 2014 (2014-06-26) * abstract; figures 1-4b * -----	1-17	
			TECHNICAL FIELDS SEARCHED (IPC)
			E02F B63B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 25 October 2017	Examiner Faymann, L
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