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Octrooicentrum
Nederland

11

2010542

12 C OCTROOI

21 Aanvraagnummer: **2010542**

51 Int.Cl.:
E02F 3/413 (2006.01)

22 Aanvraag ingediend: **28.03.2013**

43 Aanvraag gepubliceerd:
-

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47 Octrooi verleend:
30.09.2014

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45 Octrooischrift uitgegeven:
08.10.2014

74 Gemachtigde:
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54 **Transplantation of a benthic soil layer.**

57 The invention relates to a dredger with a benthic soil grab, wherein the benthic soil grab comprises a straight front plate, two straight side plates and a straight back plate that together form a rectangular pickup chamber, wherein at the bottom the front plate comprises a first cutting edge, the side plates each comprise a second cutting edge and the back plate comprises a third cutting edge, wherein the cutting edges bound an access opening to the pickup chamber, and wherein the benthic soil grab comprises a visor cutter comprising a closing plate with a fourth cutting edge that is connected with the back plate by means of a hinge to open and close the access opening, wherein the benthic soil grab is lowered into the benthic soil with the front plate, the side plate and the back plate oriented vertically.

NL C 2010542

Dit octrooi is verleend ongeacht het bijgevoegde resultaat van het onderzoek naar de stand van de techniek en schriftelijke opinie. Het octrooischrift komt overeen met de oorspronkelijk ingediende stukken.

NLP192650

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Transplantation of a benthic soil layer

BACKGROUND

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The invention relates to a method and device for transplantation of a benthic soil layer of an under water soil. The benthic soil layer of an under water soil comprises living organisms, both flora and fauna. An example thereof is soil rooted under water vegetation, such as sea grass.

Under water vegetation forms the basis of an aquatic ecosystem, where fish and other aquatic life reproduces. In nowadays dredging projects the conservation of the aquatic ecosystem during and after the dredging operations forms an important aspect. Up until now the under water vegetation is preserved on an ad hoc basis, wherein scuba divers harvest a portion of the under water vegetation only before the actual dredging operations start, where after the under water vegetation is implanted again when the dredging operations are finished. There is a growing need to transplant the under water vegetation on a large scale in an orderly manner.

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SUMMARY OF THE INVENTION

According to a first aspect, the invention provides a method for transplantation of a benthic soil layer of an under water soil by means of a dredger with a benthic soil grab, wherein the benthic soil grab comprises a straight front plate, two straight side plates and a straight back plate that together form a rectangular pickup chamber, wherein at the bottom side front plate comprises a first cutting edge, the side plates each comprise second cutting edge and the back plate comprises a third cutting edge, wherein the cutting edges bound an access opening to the pickup chamber, and wherein the benthic soil grab comprises a visor cutter comprising a closing plate with a fourth cutting edge that is connected with the back plate by means of a hinge to open and close the access opening, wherein in the closed position of the visor cutter the fourth cutting edge extends along the first cutting edge and the closing plate closes off the access opening, and wherein in the open position the fourth cutting edge extends along third cutting edge and the closing plate extends at the opposite outer side of the back plate, wherein the method comprises at a harvesting area lowering the benthic soil grab under water to the benthic soil layer, lowering the vegetation grab with the visor cutter in its open position and with its front plate, the side plates and the back plate oriented vertically into the benthic soil layer whereby a portion of the benthic soil layer is inserted into the pickup chamber, and bringing the visor cutter to its closed position whereby the portion of the inserted benthic soil layer is separated from the soil.

In the method according to the invention a rectangular portion of the upper benthic soil layer is separated from the soil, wherein for example entangled roots of the vegetation inside separated portion remain undisturbed. The rectangular portion forms a practical block that can be shipped to an implant area or temporary storage area. In this manner the entire benthic soil layer can be transplanted on a large scale.

In an embodiment the portions of the benthic soil layer are picked up from the soil in parallel rows, wherein the benthic soil grab leaves the soil behind at a lower level than the adjacent row to be picked up, wherein the benthic soil grab is lowered into the benthic soil layer with the closing plate of the visor cutter above the soil with the lower level. The position of the closing plate ensures that the first and second cutting edges can be lowered deep enough to harvest the entire benthic soil layer.

In an embodiment the portions of the benthic soil layer are picked up from the soil in parallel rows, wherein the front plate of the vegetation grab leaves the soil behind with a vertical cutting face on the adjacent row to be picked up, wherein the benthic soil grab is lowered into the ground with the back plate aligned with the vertical cutting face. Due to the alignment the parallel rows are harvested in an efficient manner.

In an embodiment the inserted portion of the benthic soil layer is lifted by the benthic soil grab and placed on a floating barge above the water line.

In an alternative embodiment the inserted portion of the benthic soil layer is lifted by the benthic soil grab and placed on a submerged barge below the water line. By bringing the barge to the harvesting place, the displacements of the portions of the benthic soil layer between picking up and placing back again can be minimized.

In an embodiment the inserted portion of the benthic soil layer is lifted by the benthic soil grab and placed on a carrier, wherein at an implant area the carrier with multiple portions of the benthic soil layer is lowered onto the soil and left behind. The portions of the benthic soil are then placed on the soil at the implant area in large groups.

In a practical embodiment the carrier is placed on a floating barge, which can be shipped over large distances in the case that the implant area is far remote from the

harvesting area.

In an embodiment the carrier is slid from the barge via a slide that extends between the barge and the soil.

5 In an embodiment the carrier is made of biodegradable material, which gradually dissolves whereby the roots can set into the soil below.

In an embodiment thereof the carrier comprises a willow mat.

10 In an alternative embodiment the carrier comprises a geo textile, which can give long term stability, for example at the base of a dyke.

In an embodiment the carrier is provided with buoyancy bodies that can be filled with water or air, 15 wherein at the harvesting area the carrier is submerged to the soil. In this manner the same carrier can be used to receive the portions of the benthic soil layer at the harvesting area and to ship them to the implant area.

In an embodiment the carrier is provided with 20 buoyancy bodies that can be filled with water or air, wherein at the implant area the carrier is submerged to the soil. In this manner the same carrier can be used to ship the portions of the benthic soil layer to the implant area and to implant them there.

25 In an embodiment the portion of the benthic soil layer forms a cohesive portion, which can be handled easily.

In particular, the benthic soil layer comprises soil rooted under water vegetation, wherein the portion of the benthic soil layer forms a clod. The clod forms a 30 cohesive unit due to the entangled roots of the under water vegetation.

According to a second aspect, the invention provides a with a benthic soil grab, wherein the vegetation grab comprises a straight front plate, two straight side 35 plates and a straight back plate that together form a rectangular pickup chamber, wherein at the bottom side the front plate comprises a first cutting edge, the side plates

each comprise a second cutting edge and the back plate comprises a third cutting edge, wherein the cutting edges bound an access opening to the pickup chamber, and wherein the benthic soil grab comprises a visor cutter comprising a closing plate with a fourth cutting edge that is connected with the back plate by means of a hinge to open and close the access opening, wherein in the closed position of the visor cutter the fourth cutting edge extends along the first cutting edge and the closing plate closes off the access opening, and wherein in the open position the fourth cutting edge extends along the third cutting edge and the closing plate extends at the opposite outer side of the back plate.

In an embodiment the closing plate is curved with a constant radius with respect to the hinge, wherein in the closed position the second cutting edges extend along the closing plate. This ensures that the portion of the benthic soil is cut all around from the surrounding soil.

In an embodiment dredger is a backhoe dredger comprising a body and a backhoe arm that is pivotally connected with the body, wherein the benthic soil grab is connected to the end of the backhoe arm with the front plate facing the body.

The various aspects and features described and shown in the specification can be applied, individually, wherever possible. These individual aspects, in particular the aspects and features described in the attached dependent claims, can be made subject of divisional patent applications.

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BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be elucidated on the basis of an exemplary embodiment shown in the attached drawings, in which:

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Figure 1A-1E subsequent steps of taking out and shipping from an underwater soil separate sea grass clods

comprising the fertile soil fraction surrounding the roots of the sea grass by means of a benthic soil grab according to the invention;

Figures 2A and 2B a side view and an isometric view of the benthic soil grab according to figures 1A-1E;

Figures 3A and 3B an alternative method for taking out a sea grass clod with the fertile soil fraction with the benthic soil grab according to the invention;

Figures 4A-4C illustrate an alternative method of implanting earlier taken sea grass clods on an underwater soil, and details of a willow mat used therein according to the invention;

Figures 5A and 5B illustrate an alternative method of shipping and implanting of sea grass clods according to the invention; and

Figures 6A and 6B illustrate an alternative method of taking out and shipping sea grass clods according to the invention.

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DETAILED DESCRIPTION OF THE INVENTION

Figure 1A-1E show subsequent steps of taking out sea grass clods 3 from a harvesting area with a benthic soil grab 20 according to the invention. The benthic soil grab 20 is connected to the end of a backhoe arm 21 of a not shown floating backhoe dredger.

As schematically shown in figure 1A, the clods 3 originate from an underwater soil 1. The water 8 can be salt water or fresh water. The underwater soil 1 comprises on top a benthic soil layer, in this embodiment a fertile top layer 2 with sea grass 10 or any other useful soil rooted under water vegetation. The sea grass 10 comprises roots 11 that are firmly anchored and entangled in the fertile top layer 2. In order to let the sea grass 10 survive transplantation, it is essential that the roots 11 and the fertile soil fraction surrounding the entangled roots 11 are taken out

unperturbed.

As shown in figures 2A and 2B the steel benthic soil grab 20 comprises a straight, rectangular top plate 24, and a straight, rectangular front plate 25, two straight side plates 26 and a straight, rectangular back plate 27 that are connected to each other by welding to define a hollow, rectangular pick up chamber 28 with an open lower side. The lower edges of the front plate 25, the side plates 26 and the back plate 27 are bevelled to form downwardly directed cutting edges 29, 30, 31 along the opening of the pick up chamber 28.

The benthic soil grab 20 comprises multiple supports 35 for two hinges 36 that extend above the top plate 24. A visor cutter 40 is connected to the hinges 36 to be opened and closed in direction A. The visor cutter 40 comprises two straight side plates 41 and a curved bottom plate 42. The bottom plate 42 is its free side bevelled to form a cutting edge 43. The curvature of the bottom plate 42 is cylindrical whereby the distance between the bottom plate 42 and the cutting edge 31 of the back plate 27 remains constant and small when the visor cutter 40 is opened and closed. The lower side of the two side plates 27 follows at its cutting edges 30 the curvature of the bottom plate 42 to keep the distance between its cutting edges 29 and the bottom plate 42 constant.

The visor cutter 40 is provided with a back beam 44 and multiple supports 45 on the back beam 44 that are hingeably connected with hydraulic cylinders 47. At the opposite side the hydraulic cylinders 47 are hingeably connected with supports 46 on the top plate 24 and the back plate 27. By activation of the hydraulic cylinders 47 the visor cutter 40 can be moved in direction A from an open position as shown in figure 2A and 2B, wherein the cutting edge 43 of the visor cutter 40 extends along the cutting edge 31 of the back plate 27, and a closed position wherein the cutting edge 43 of the visor cutter 40 meets the cutting edge 29 of the front plate 25.

Figures 1A-1E show subsequent steps of taking out sea grass clods 3 from the underwater soil 1. The sea grass clods 3 are subsequently taken out from parallel rows 60-63 of the soil 1. In figure 1A is shown that a first row 60 and a second row 61 have already been harvested and that the third row 62 is to be harvested next.

The benthic soil grab 20 is thereto positioned straight above the first clod 2 of the third row 62 with the visor cutter 40 fully opened in direction A. The visor cutter 40 is located above the space that is left behind by harvesting the second row 61, wherein the back plate 27 is aligned with the vertical cutting face 5 that was left there. Subsequently, the benthic soil grab 20 penetrates the soil 1 in vertical direction B, wherein the cutting edges 29, 30 of the front plate 25 and the side plates 26 cut into the fertile top layer 2. The vertical orientation of the front plate 25, the side plates 26 and the back plate 27 is set and maintained by means of an inclinometer on the sea grass grab 20 that gives feed back to the operator of the backhoe dredger. In this manner the entangled roots 11 are cut only at the circumference of the clod 2 and the sea grass clod 2 enters the pick up chamber 28. At the level of the entangled roots the clod 2 behaves as a peaty soil 11.

The benthic soil grab 20 is pushed downwards in vertical direction B until the vertical cutting face 5 is located fully inside the pick up chamber 28, which is shown in figure 1B. The penetration depth into the soil 1 is about 1 meter. As the visor cutter 40 is positioned above the space that is left behind by harvesting the second row 61, the benthic soil grab 20 is freely moved downwards despite the projecting position of the visor cutter 40. The operator of the backhoe dredger will notify that the benthic soil grab 20 has reached sufficient penetration depth when the opened visor cutter 40 hits the transition from the vertical cutting face 5 and the curved cutting face 4 of the previous row 61.

Subsequently the visor cutter 40 is fully closed

in direction B as shown in figure 1C, wherein the fertile top layer 2 is cut below the roots 11 of the sea grass 10 by the cutting edge 43. The sea grass clod 2 is then fully separated from the soil 1 without disturbing the entangled roots 11 inside the sea grass clod 2. Finally the benthic soil grab 20 lifts the sea grass clod 3 as shown in figure 1D, where after the sea grass clod 3 is put on a floating barge 50. The cutting and raising of subsequent sea grass clods 3 is repeated until the barge 50 is fully loaded.

In one embodiment of the method, the barge 50 is subsequently shipped to the remote implant area. At the implant area the individual sea grass clods 3 can be picked up again with the benthic soil grab 20 and implanted on the under water soil 1. Alternatively, the sea grass clods 3 are lifted individually or in groups with a deck crane of a working vessel and implanted on the under water soil 1.

Figures 3A and 3B show an alternative method for taking out a sea grass clods 3 with the benthic soil grab 20 according to the invention. In this method, the barge 50 is submergible. The barge 50 is submerged to rests on the soil 1 where the first row 60 and second row 61 of the soil 1 have already been harvested, close to the third row 62 to be harvested. In this manner the benthic soil grab 20 can efficiently release the grass clods 3 close to the location where they have been taken out. After loading the barge 50 with the sea clods 30, it is raised again and shipped to the remote implant area. At the implant area, the grass clods 3 can be picked up as described here before, or the barge 50 is submerged again to reduce the distance between the stock of grass clods 3 and the position where they are implanted.

A further method of harvesting and implanting sea grass clods 3 according to the invention is illustrated in figures 4A-4C. Figure 4A show the floating barge 50 as described here before. The sea grass clods 3 are placed in groups on a willow mat 70 which is shown in figures 4B and 4C.

The willow mat 70 comprises multiple parallel and

spaced apart first elongated bundles 71 of willow branches and perpendicularly thereon multiple parallel and spaced apart second elongated bundles 72 of willow branches. Above the second bundles 72 extend multiple dense layers 73 of willow branches which extend perpendicular to each other to form a stable supporting layer 76. Above the supporting layer 76 the willow mat 70 comprises multiple parallel and spaced apart third elongated bundles 74 of willow branches and perpendicularly thereon multiple parallel and spaced apart fourth elongated bundles 75 of willow branches. The first bundles 71 and the second bundles 72, and the third bundles 74 and fourth bundles 65 are interconnected to each other with biodegradable ropes, and the supporting layer 76 is sandwiched there between by biodegradable ropes stitched through the supporting layer 76.

The willow mat 70 or multiple willow mats 70 are placed on the barge 50 and the sea grass clods 3 are placed by the sea grass grab 20 on the supporting layer 76 in the matrix of the third bundles 74 and fourth bundles 75. Subsequently the barge 50 is shipped to the implant area as shown in figure 4A. At the implant area a slide to the soil 1 is formed by means of parallel pipes 51. The willow mats 60 are subsequently slid downwards in direction C from the barge 50 under the weight of the sea grass clods 3, wherein the willow mats 70 are installed against each other onto the soil 1.

Figures 5A and 5B illustrate an alternative method of taking out, shipping and implanting of sea grass clods 3 with the sea grass grab 20 according to the invention. In this method, the willow mat 70 is provided with additional floating bodies 77 that enable the willow mat 60 to temporally float on the water while carrying the weight of the sea grass clods 3. As shown in figure 5A, sea grass clods 3 are placed on the floating willow mat 70 at the harvesting area to be shipped to the implant area. Alternatively, earlier picked up sea grass clods 3 are placed on the floating willow mat 70 at the implant area.

Subsequently the floating bodies 77 are filled with water to allow the willow mat 70 with the sea grass clods 3 to sink in downward direction D to the soil 1 as shown in figure 5B.

5 Figures 6A and 6B show an alternative method of taking out and shipping sea grass clods 3 with the sea grass grab 20 according to the invention. In this method the willow mat 70 with the additional floating bodies 67 is firstly sunk to the soil 1, where after the sea grass clods 3 are picked up and installed as a group on the willow mat 10 70 under water. Subsequently the floating bodies 77 are filled with air whereby the willow mat raises to the water surface. The floating willow mat 70 can be shipped to the implant area to be sunk as described before.

15 In above embodiments a willow mat 70 is used to carry the sea grass clods 3. Alternatively, a biodegradable geo textile is used, or a bundled combination of geo textile and branches is used.

20 It is to be understood that the above description is included to illustrate the operation of the preferred embodiments and is not meant to limit the scope of the invention. From the above discussion, many variations will be apparent to one skilled in the art that would yet be encompassed by the spirit and scope of the present invention.

C O N C L U S I E S

1. Werkwijze voor transplantatie van een benthische bodemlaag van een onder water gelegen bodemlaag door middel van een baggerinrichting met een bethische bodemgrijper, waarbij de benthische bodemgrijper een rechte
5 voorplaat, twee rechte zijplaten en een rechte achterplaat omvat die samen een rechthoekige oppakkamer vormen, waarbij aan de bodemzijde de voorplaat een eerste snijrand omvat, de zijplaten elk een tweede snijrand omvatten en de achterplaat een derde snijrand omvat, waarbij de snijranden een
10 toegangsopening naar de oppakkamer begrenzen, en waarbij de benthische bodemgrijper een viziersnijder omvat, omvattend een sluitlaat met een vierde snijrand die door middel van een scharnier aan de achterplaat is gekoppeld om de toegangsopening te openen en te sluiten, waarbij in de
15 gesloten positie van de viziersnijder de vierde snijrand zich langs de eerste snijrand uitstrekt en de sluitplaat de toegangsopening afsluit, en waarin in de open positie de vierde snijrand zich langs de derde snijrand uitstrekt en de sluitplaat zich aan de tegengestelde buitenzijde van de
20 achterplaat uitstrekt, waarbij de werkwijze omvat het in een wingebied onder water omlaag brengen van de benthische bodemgrijper naar de benthische bodemlaag, het omlaag brengen van de benthische bodemgrijper met de viziersnijder in zijn open positie en met zijn voorplaat, de zijplaten en
25 de achterplaat verticaal gericht in de bethische bodemlaag omlaag brengen waardoor een portie van de benthische bodemlaag in de oppakkamer wordt gebracht, en het naar zijn gesloten positie brengen van de viziersnijder waardoor de portie van de ingebrachte benthische bodemlaag wordt
30 gescheiden van de bodem.

2. Werkwijze volgens conclusie 1, waarbij de porties van de benthische bodemlaag in parallelle rijen van

de bodem worden opgepakt, waarbij de benthische bodemgrijper de bodem op een lager niveau achterlaat dan de aangrenzende rij die nog moet worden opgepakt, waarbij de benthische bodemgrijper omlaag wordt gebracht in de benthische bodemlaag met de sluitplaat van de viziersnijder boven de bodem met het lagere niveau.

3. Werkwijze volgens conclusie 1 of 2, waarbij de porties van de benthische bodemlaag in parallelle rijen van de bodem worden opgepakt, waarbij de voorplaat van de benthische bodemgrijper de bodem met een verticaal snijvlak aan de aangrenzende op te pakken rij achterlaat, waarbij de benthische bodemgrijper omlaag wordt gebracht in de benthische bodemlaag met de achterplaat uitgelijnd met het verticale snijvlak.

4. Werkwijze volgens een der voorgaande conclusies, waarbij de ingebrachte portie van de benthische bodemlaag door de benthische bodemgrijper omhoog wordt gebracht en op een drijvende bak boven de waterlijn wordt geplaatst.

5. Werkwijze volgens een der voorgaande conclusies, waarbij de ingebrachte portie van de benthische bodemlaag door de benthische bodemgrijper omhoog wordt gebracht en onder de waterlijn op een afgezonken bak wordt geplaatst.

6. Werkwijze volgens een der voorgaande conclusies, waarbij de ingebrachte portie van de benthische bodemlaag door de benthische bodemgrijper omhoog wordt gebracht en op een drager wordt geplaatst, waarbij in een implantatiegebied de drager met meerdere porties van de benthische bodemlaag naar de bodem omlaag wordt gebracht en wordt achtergelaten.

7. Werkwijze volgens conclusie 6, waarbij de drager op een drijvende bak wordt geplaatst.

8. Werkwijze volgens conclusie 7, waarbij de drager van de bak wordt gegleden via een glijbaan die zich tussen de bak en de bodem uitstrekt.

9. Werkwijze volgens een der conclusies 6-8,

waarbij de drager is vervaardigd van een biologisch afbreekbaar materiaal.

10. Werkwijze volgens een der conclusies 6-9, waarbij de drager een mat van wilgentenen omvat.

5 11. Werkwijze volgens een der conclusies 6-10, waarbij de drager een geotextiel omvat.

12. Werkwijze volgens een der conclusies 6-11, waarbij de drager is voorzien van drijfflichamen die met water of lucht kunnen worden gevuld, waarbij de drager in
10 het wingebied naar de bodem wordt afgezonken.

13. Werkwijze volgens een der conclusies 6-11, waarbij de drager is voorzien van drijfflichamen die met water of lucht kunnen worden gevuld, waarbij de drager in het implantatiegebied naar de bodem wordt afgezonken.

15 14. Werkwijze volgens een der voorgaande conclusies, waarbij de portie van de benthische bodemlaag een samenhangende portie vormt.

15. Werkwijze volgens een der voorgaande conclusies, waarbij de benthische bodemlaag gewortelde onder
20 water vegetatie omvat, waarbij de portie van de benthische bodemlaag een kluit vormt.

16. Baggerinrichting met een benthische bodemgrijper, waarbij de benthische bodemgrijper een rechte voorplaat, twee rechte zijplaten en een rechte achterplaat
25 omvat die samen een rechthoekige oppakkamer vormen, waarbij aan de bodemzijde de voorplaat een eerste snijrand omvat, de zijplaten elk een tweede snijrand omvatten en de achterplaat een derde snijrand omvat, waarbij de snijranden een toegangsopening naar de oppakkamer begrenzen, en waarbij de
30 benthische bodemgrijper een viziersnijder omvat, omvattend een sluitlaat met een vierde snijrand die door middel van een scharnier aan de achterplaat is gekoppeld om de toegangsopening te openen en te sluiten, waarbij in de gesloten positie van de viziersnijder de vierde snijrand
35 zich langs de eerste snijrand uitstrekt en de sluitplaat de toegangsopening afsluit, en waarin in de open positie de vierde snijrand zich langs de derde snijrand uitstrekt en de

sluitplaat zich aan de tegengestelde buitenzijde van de achterplaat uitstrekt.

17. Baggerinrichting volgens conclusie 16, waarbij de sluitplaat ten opzichte van het scharnier met een
5 constante radius is gekromd, waarbij de tweede snijranden zich in de gesloten positie langs de sluitplaat uitstrekken.

18. Baggerinrichting volgens conclusie 16 of 17, waarbij de baggerinrichting een backhoe is met een body en een backhoe arm die scharnierend met de body is gekoppeld,
10 waarbij de benthische bodemgrijper is gekoppeld met het eind van de backhoe arm met de voorplaat naar de body gericht.

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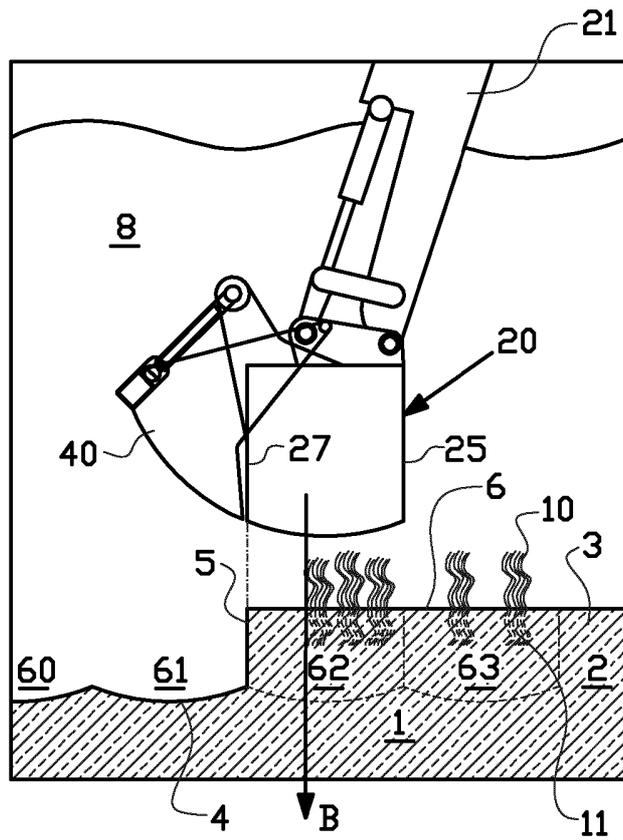


FIG. 1A

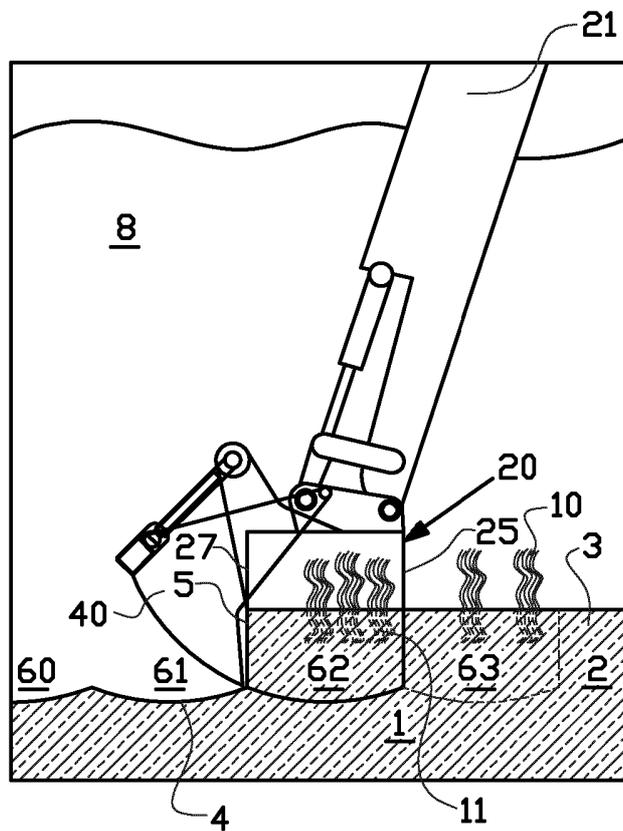


FIG. 1B

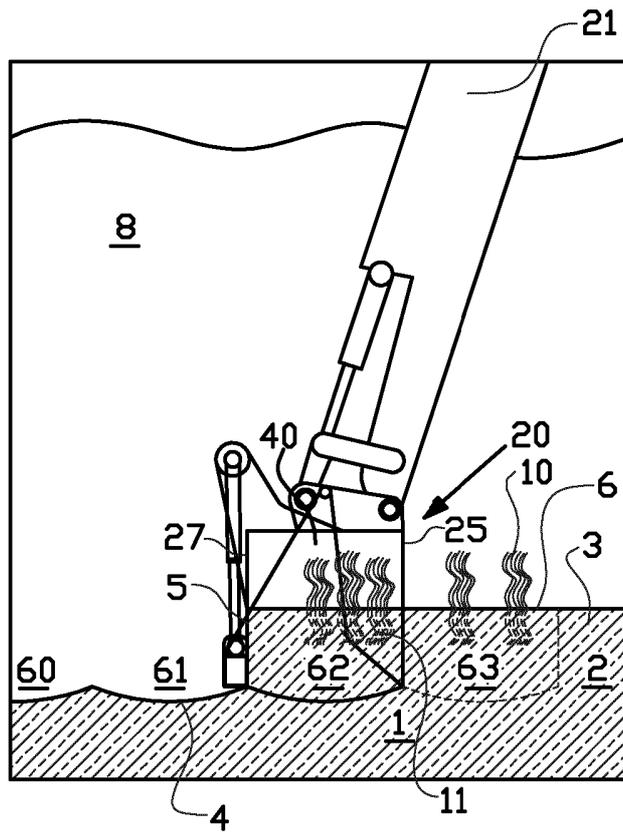


FIG. 1C

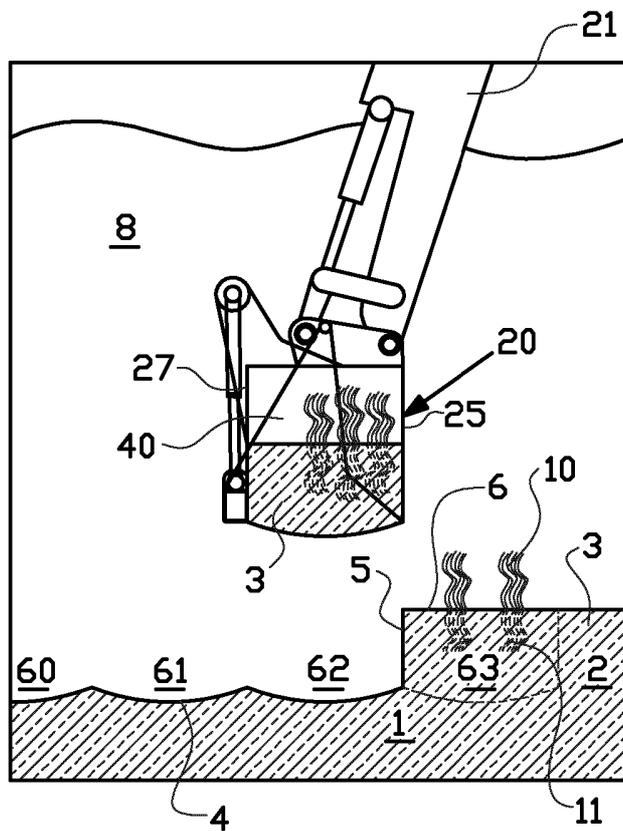


FIG. 1D

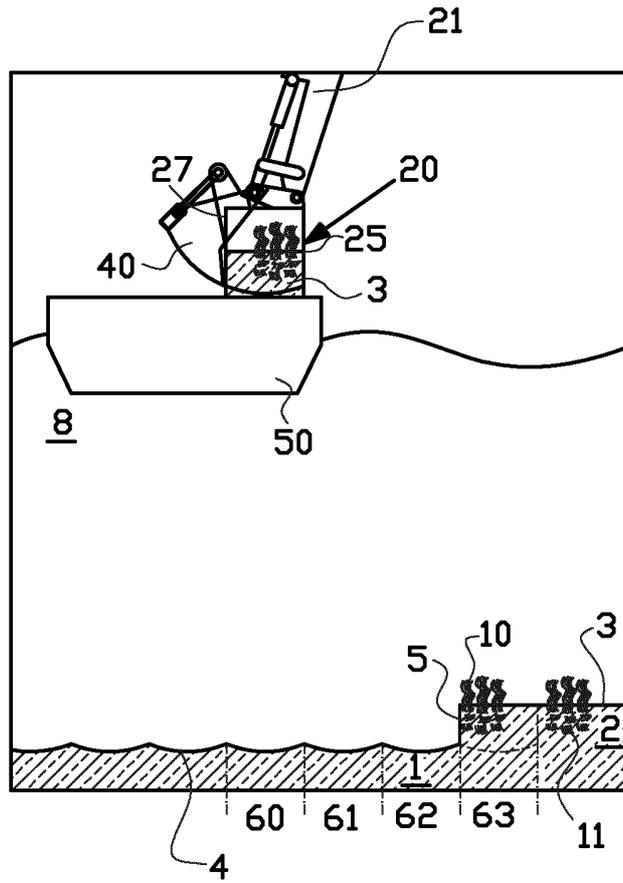


FIG. 1E

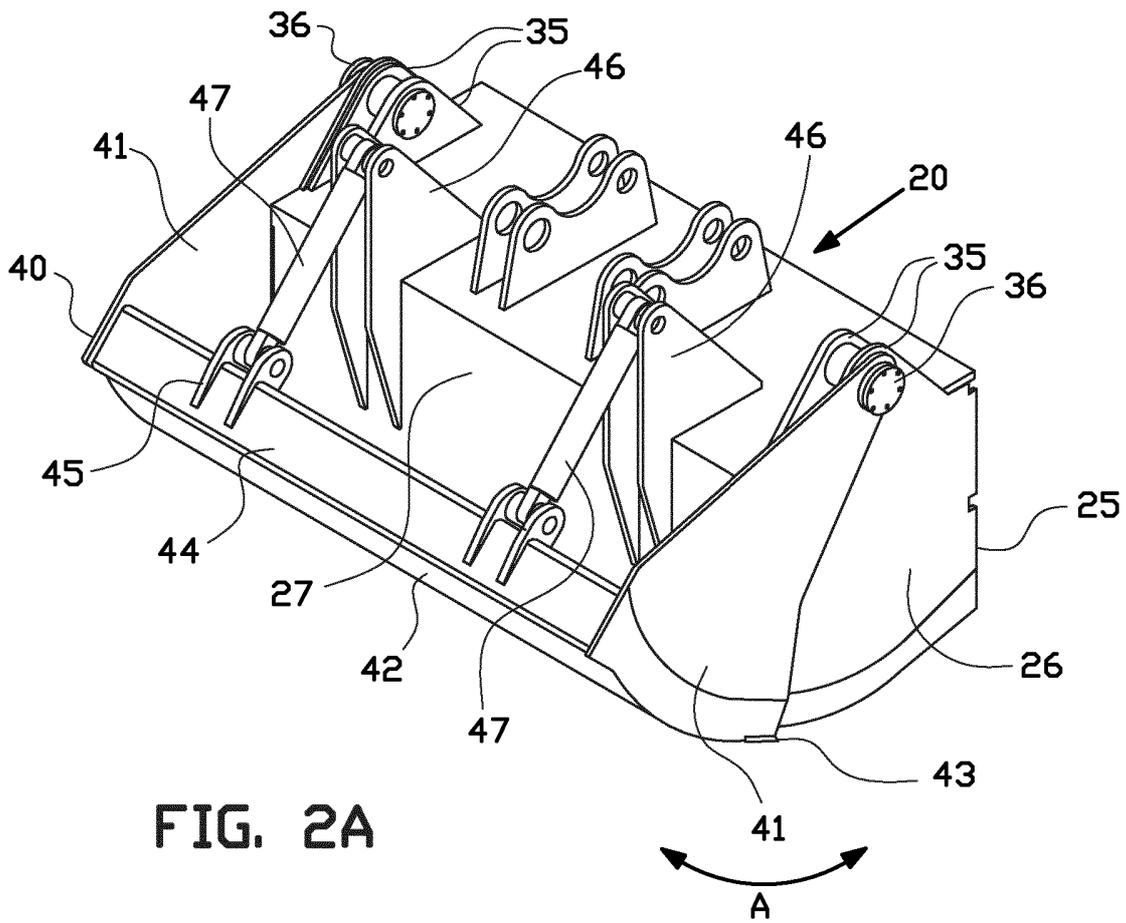


FIG. 2A

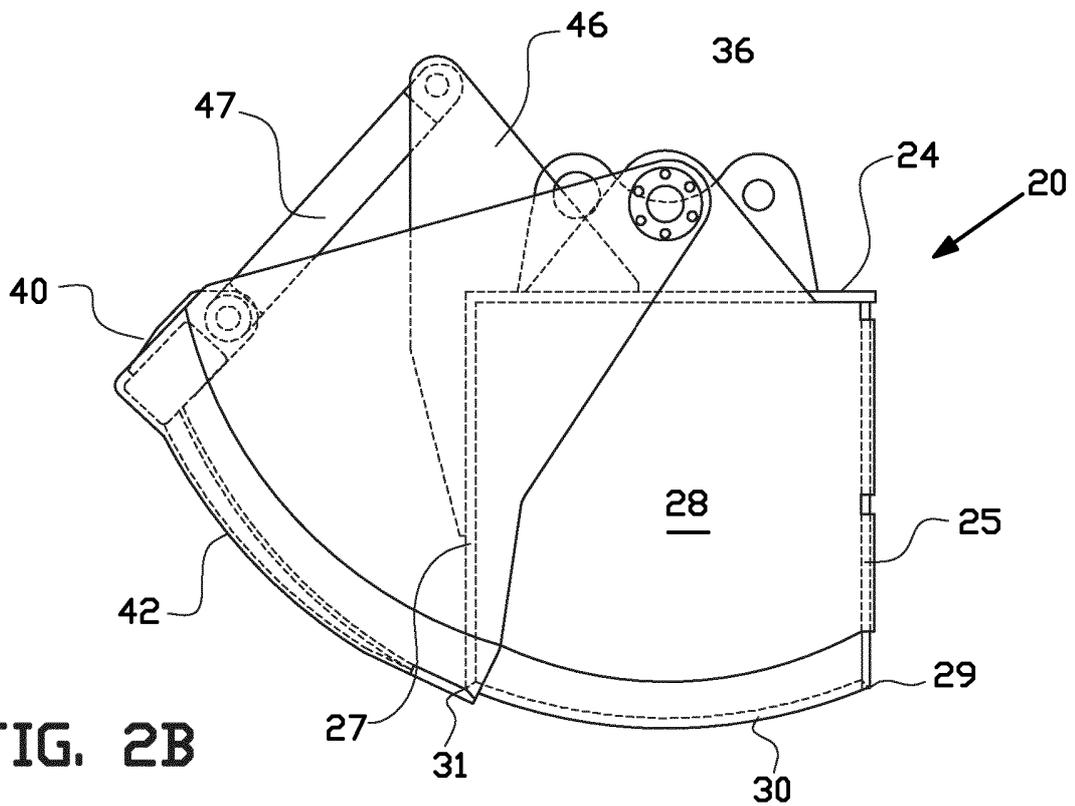


FIG. 2B

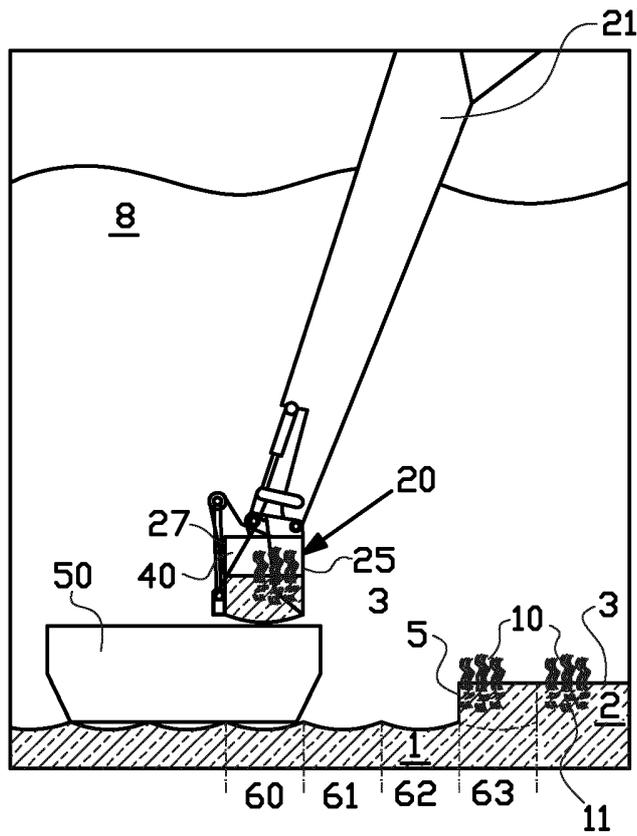


FIG. 3A

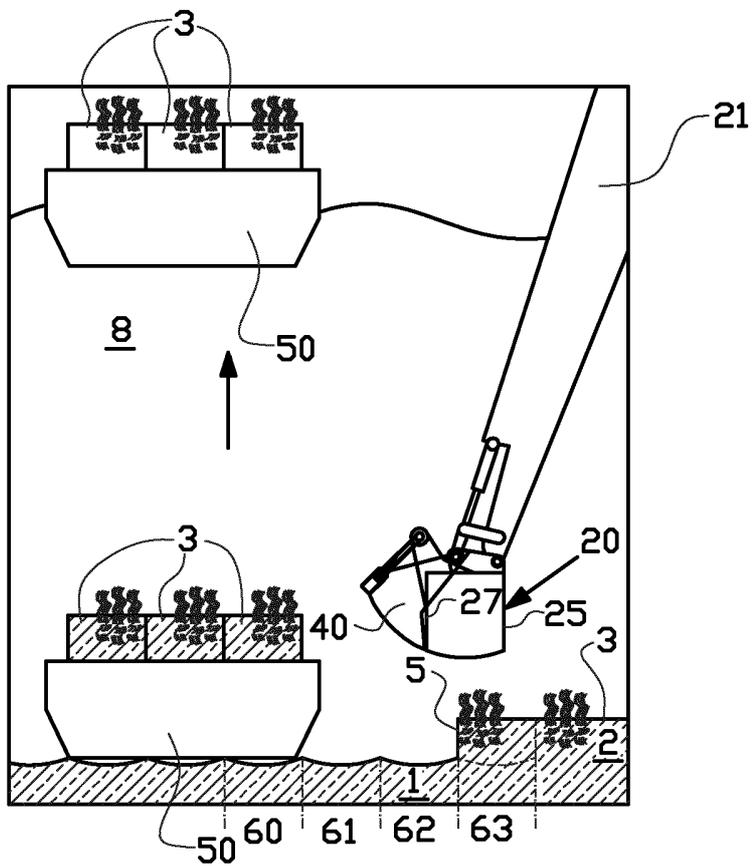


FIG. 3B

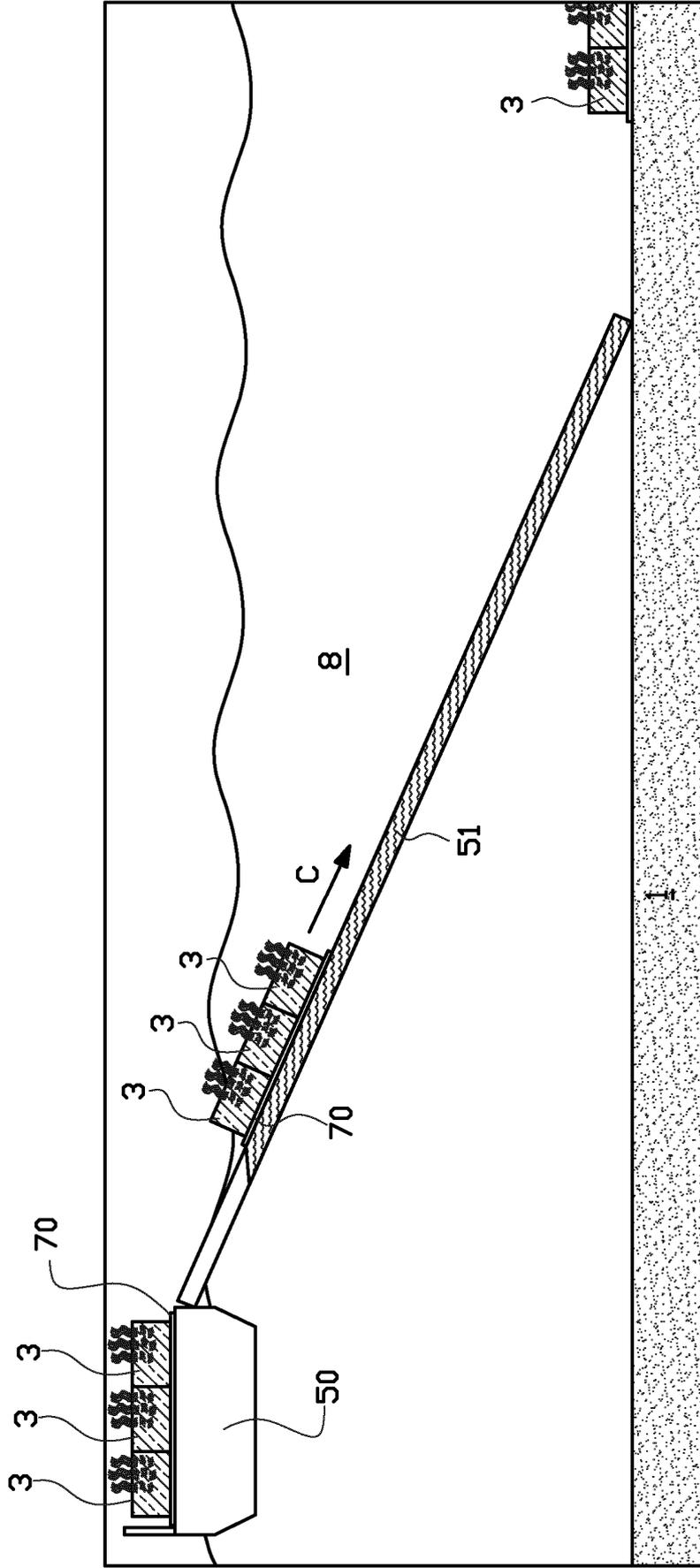


FIG. 4A

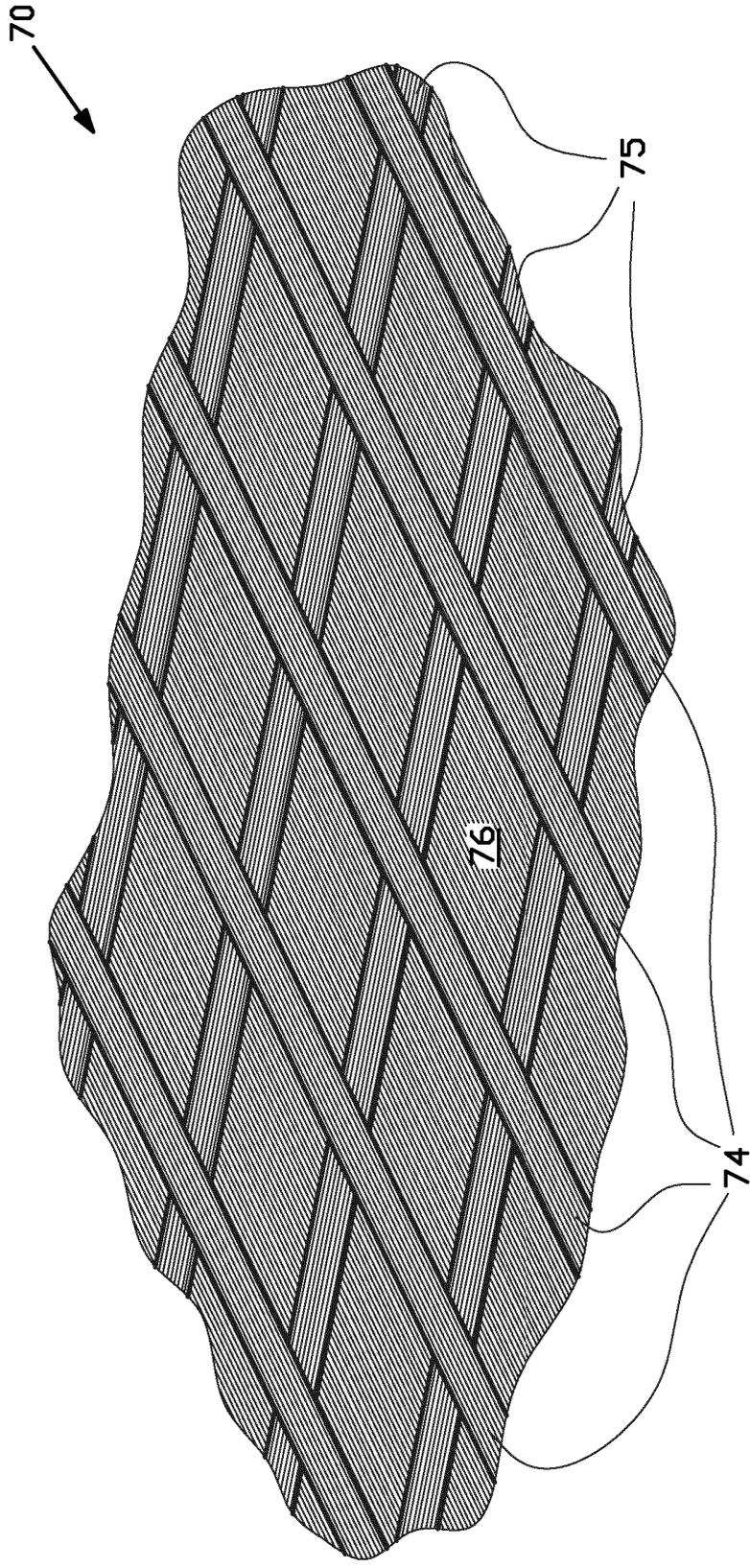


FIG. 4B

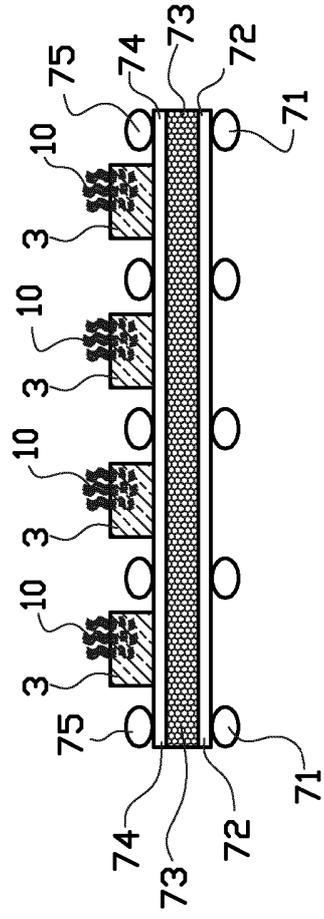


FIG. 4C

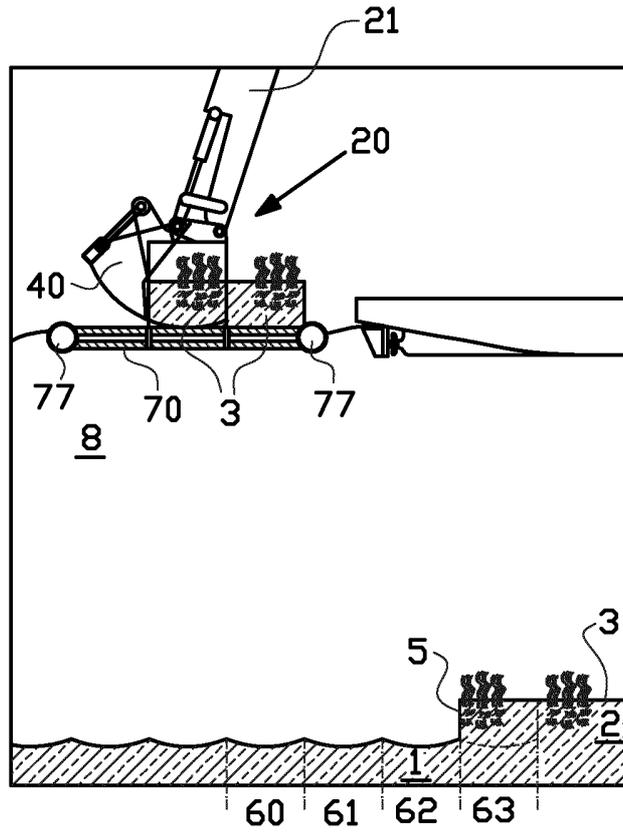


FIG. 5A

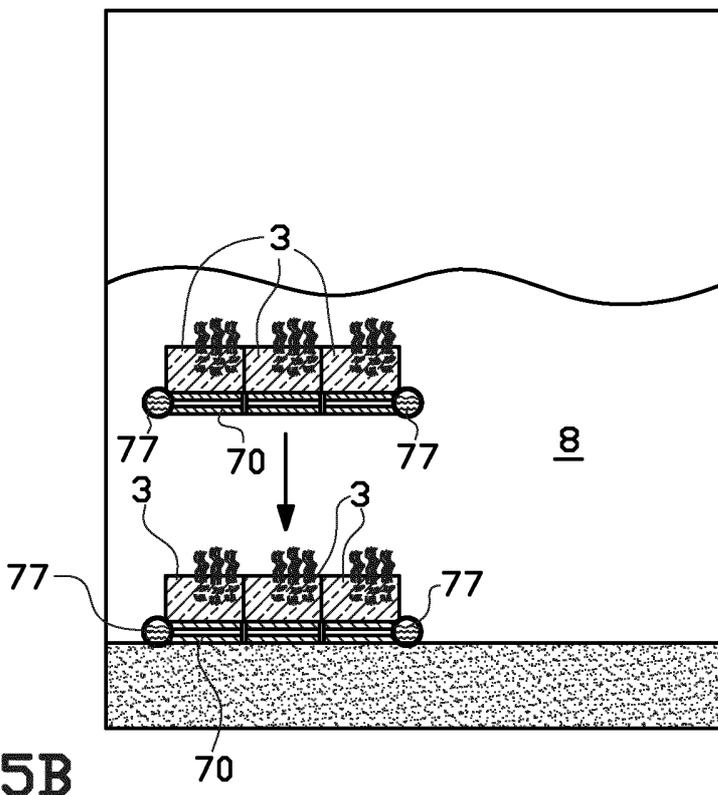


FIG. 5B

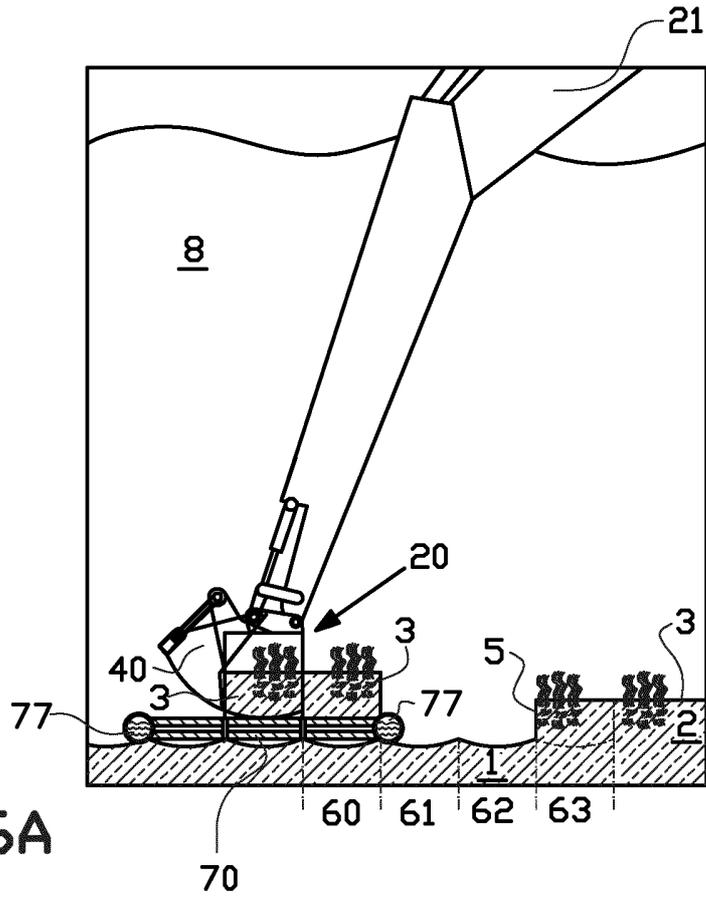


FIG. 6A

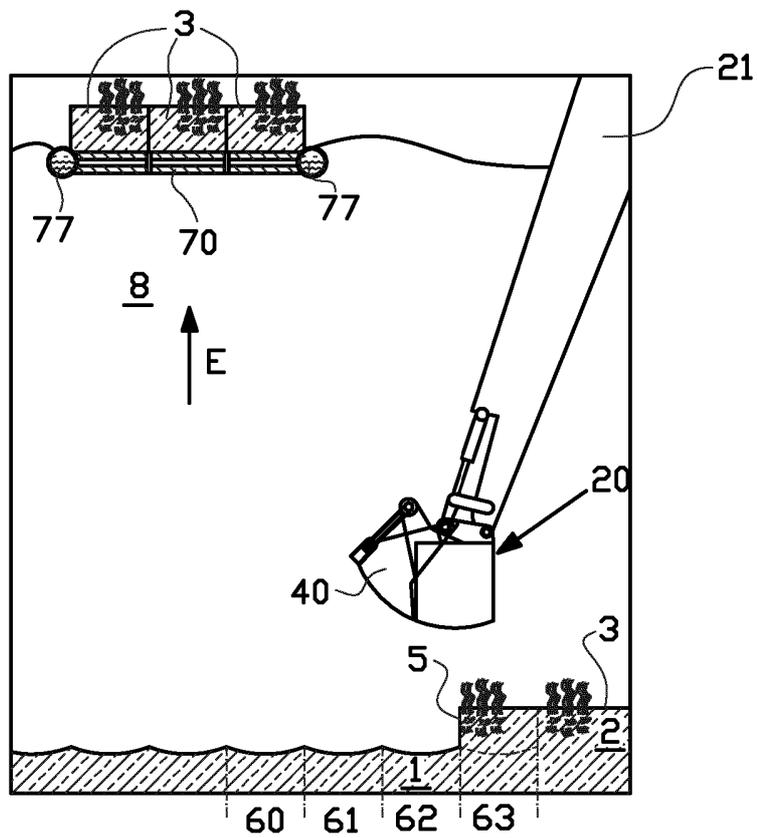


FIG. 6B

SAMENWERKINGSVERDRAG (PCT)

RAPPORT BETREFFENDE NIEUWHEIDSONDERZOEK VAN INTERNATIONAAL TYPE

IDENTIFICATIE VAN DE NATIONALE AANVRAGE	KENMERK VAN DE AANVRAGER OF VAN DE GEMACHTIGDE		
	NLP192650		
Nederlands aanvraag nr.	Indieningsdatum		
2010542	28-03-2013		
	Ingeroepen voorrangsdatum		
Aanvrager (Naam)			
Baggermaatschappij Boskalis B.V.			
Datum van het verzoek voor een onderzoek van internationaal type	Door de Instantie voor Internationaal Onderzoek aan het verzoek voor een onderzoek van internationaal type toegekend nr.		
18-05-2013	SN 60053		
I. CLASSIFICATIE VAN HET ONDERWERP (bij toepassing van verschillende classificaties, alle classificatiesymbolen opgeven)			
Volgens de internationale classificatie (IPC)			
E02F3/413			
II. ONDERZOCHE GEBIEDEN VAN DE TECHNIEK			
Onderzochte minimumdocumentatie			
Classificatiesysteem	Classificatiesymbolen		
IPC	E02F	B66C	E02B
Onderzochte andere documentatie dan de minimum documentatie, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen			
III.	<input type="checkbox"/>	GEEN ONDERZOEK MOGELIJK VOOR BEPAALDE CONCLUSIES (opmerkingen op aanvullingsblad)	
IV.	<input type="checkbox"/>	GEBREK AAN EENHEID VAN UITVINDING (opmerkingen op aanvullingsblad)	

**ONDERZOEKSRAPPORT BETREFFENDE HET
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Nummer van het verzoek om een onderzoek naar
de stand van de techniek
NL 2010542

A. CLASSIFICATIE VAN HET ONDERWERP

INV. E02F3/413
ADD. E02B3/02 B66C3/02

Volgens de Internationale Classificatie van octrooien (IPC) of zowel volgens de nationale classificatie als volgens de IPC.

B. ONDERZOCHE GEBIEDEN VAN DE TECHNIEK

Onderzochte minimum documentatie (classificatie gevolgd door classificatiesymbolen)
E02F B66C E02B

Onderzochte andere documentatie dan de minimum documentatie, voor dergelijke documenten, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen

Tijdens het onderzoek geraadpleegde elektronische gegevensbestanden (naam van de gegevensbestanden en, waar uitvoerbaar, gebruikte trefwoorden)

EPO-Internal

C. VAN BELANG GEACHTE DOCUMENTEN

Categorie °	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
X	US 3 949 497 A (CRUMP BEN L) 13 april 1976 (1976-04-13) * het gehele document *	1-16
A	US 5 540 005 A (LYNCH ROBERT P [US]) 30 juli 1996 (1996-07-30) * figuren 1-3 *	1,16
A	US 2003/019131 A1 (ANDERSON JAMES F [US]) 30 januari 2003 (2003-01-30) * samenvatting *	1

Verdere documenten worden vermeld in het vervolg van vak C.

Leden van dezelfde octroofamilie zijn vermeld in een bijlage

° Speciale categorieën van aangehaalde documenten

"A" niet tot de categorie X of Y behorende literatuur die de stand van de techniek beschrijft

"D" in de octrooiaanvraag vermeld

"E" eerdere octrooi(aanvraag), gepubliceerd op of na de indieningsdatum, waarin dezelfde uitvinding wordt beschreven

"L" om andere redenen vermelde literatuur

"O" niet-schriftelijke stand van de techniek

"P" tussen de voorrangsdatum en de indieningsdatum gepubliceerde literatuur

"T" na de indieningsdatum of de voorrangsdatum gepubliceerde literatuur die niet bezwarend is voor de octrooiaanvraag, maar wordt vermeld ter verheldering van de theorie of het principe dat ten grondslag ligt aan de uitvinding

"X" de conclusie wordt als niet nieuw of niet inventief beschouwd ten opzichte van deze literatuur

"Y" de conclusie wordt als niet inventief beschouwd ten opzichte van de combinatie van deze literatuur met andere geciteerde literatuur van dezelfde categorie, waarbij de combinatie voor de vakman voor de hand liggend wordt geacht

"&" lid van dezelfde octroofamilie of overeenkomstige octrooipublicatie

Datum waarop het onderzoek naar de stand van de techniek van internationaal type werd voltooid

14 november 2013

Verzenddatum van het rapport van het onderzoek naar de stand van de techniek van internationaal type

Naam en adres van de instantie

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

De bevoegde ambtenaar

Flygare, Esa

**ONDERZOEKSRAPPORT BETREFFENDE HET
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Informatie over leden van dezelfde octroofamilie

Nummer van het verzoek om een onderzoek naar
de stand van de techniek

NL 2010542

In het rapport genoemd octrooigescrift	Datum van publicatie	Overeenkomend(e) geschrift(en)	Datum van publicatie
US 3949497	A	13-04-1976	GEEN

US 5540005	A	30-07-1996	GEEN

US 2003019131	A1	30-01-2003	GEEN



OCTROOICENTRUM NEDERLAND

WRITTEN OPINION

File No. SN60053	Filing date (day/month/year) 28.03.2013	Priority date (day/month/year)	Application No. NL2010542
International Patent Classification (IPC) INV. E02F3/413 ADD. E02B3/02 B66C3/02			
Applicant Baggermaatschappij Boskalis B.V.			

This opinion contains indications relating to the following items:

- Box No. I Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the application
- Box No. VIII Certain observations on the application

Examiner Flygare, Esa

WRITTEN OPINION

Application number
NL2010542

Box No. I Basis of this opinion

1. This opinion has been established on the basis of the latest set of claims filed before the start of the search.
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 - a sequence listing
 - table(s) related to the sequence listing
 - b. format of material:
 - on paper
 - in electronic form
 - c. time of filing/furnishing:
 - contained in the application as filed.
 - filed together with the application in electronic form.
 - furnished subsequently for the purposes of search.
3. In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty	Yes: Claims	2-15, 17, 18
	No: Claims	1, 16
Inventive step	Yes: Claims	17, 18
	No: Claims	1-16
Industrial applicability	Yes: Claims	1-18
	No: Claims	

2. Citations and explanations

see separate sheet

WRITTEN OPINION

Application number
NL2010542

Box No. VIII Certain observations on the application

see separate sheet

Re item VIII

- 1 The present application does not fulfill the requirements of Clarity.
- 1.1 In claim 1, the feature "...cutter comprising a closing plate with a fourth cutting edge that is connected with the back plate by means of a hinge..." does not match with the filed figures 2A and 2B. The closing plate is not hingedly connected to the back plate. There is merely a hinged connection to the side plates disclosed. Even if there are hydraulic cylinders with stiffening plates linking the closing plate with the back plate, the hinged connection is at side plates.
- 1.2 For claim 16, see the objection above.
- 1.3 Claim 8 is dependent on claim 7 and claims the tray. It is not clear if a "submersed tray" (see claim 5) or a "floating tray" is concerned. Should a "submersed tray" be meant then the dependency of claims 5, 6, 7 and 8 should be reviewed.

Re item V

- 1 Reference is made to the following document:
D1: US 3 949 497 A
- 2 The present application does not meet the criteria of patentability, because the subject-matter of claims **1 and 16** does not involve an inventive step.
 - 2.1 Independent claim 16
 - 2.1.1 Document **D1** discloses a device for benthic dredge. The device comprises a hollow body 1 (thereby discloses the straight front, back and side walls of claim 1). The bottom edges of these straight walls function as cutting edges when the body 1 is in used driven into seabed. D1 also discloses a closure plate (2, 3) which plate is hingedly connected to the side walls (see item VIII above). However, this plate is not able to close the access opening formed by the bottom edges of the plates. Therefore, the cutting edge of the closure plate (2, 3) cannot extend along the first cutting edge in the sense of claim 1.
 - 2.1.2 Concerning any surprising effect of the features of claim 1 and advantages achieved by these features, also **D1** cuts out rectangular portions of seabed for easy storage. The straight plates, cutting edges and the movable closure

plates with the cutting edges provide for easy, proportioned cutting out of seabed with flora roots. The present application provides the same advantages but uses practically speaking instead of two closure plates only one closure plate. It is considered that this is only a minor technical modification to the structure of D1, without any inventive action and any surprising effects.

Therefore, the subject matter of claim **16** does not involve an inventive step.

2.2 Independent claim 1

2.2.1 For the reasons stated above for claim **16**, the subject matter of claim **1** does also not involve an inventive step because **D1** explicitly also discloses a method for transplanting a benthic bottom layer (col. 1, lines 4-7).

2.3 Dependent claims 17 and 18

2.3.1 The additional features of claim **17** are novel and involve an inventive step over D1. One curved closure plate, flush on edges with the front, back and side walls is not proposed by the presently searched/cited prior art. Also, the features of claim 17 cannot be seen as minor modification to D1.

Claim **18** depending on claim 17 were also allowable as far as Novelty and Inventive Step are considered.

2.4 Dependent claims 2 to 15

2.4.1 It is clear that claimed method should be specifically adapted for the device according to claim 17. Should the features of claim 17 be readable from method claim 1, were the subject matter of claim 1 also allowable.

At present, however, it is not clear which of the dependent claims **2 to 15** would form basis for an allowable method claim. In particular claims 1-5, 14 and 15 seems to be obvious for the skilled person.