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(54) Device and method for dredging bed material under water

(57) The invention relates to a device and method for dredging bed material under water. The device (1) comprises a vessel (4) which can be anchored to an underwater bed (2) and has a ladder (8) which can be positioned downwards at an angle (6) into the body of water (7) from the vessel (4) and which is provided with a cutting tool (10) at its free end, the cutting tool (10) comprising a number of excavating elements (103, 105) arranged around a common rotation axis (101). The cutting tool (10) comprises a passage (106) for dug-up bed material which adjoins an inlet end of a discharge means (13) for the dug-up bed material, which discharge means (13) comprises a carrier (13) for the bed material which is driven by means of a mechanical drive, which carrier comprises two conveyor belts which rotate in opposite directions of rotation across each other at the same time. The invention makes it possible to dig up underwater beds while preventing sediment spill.

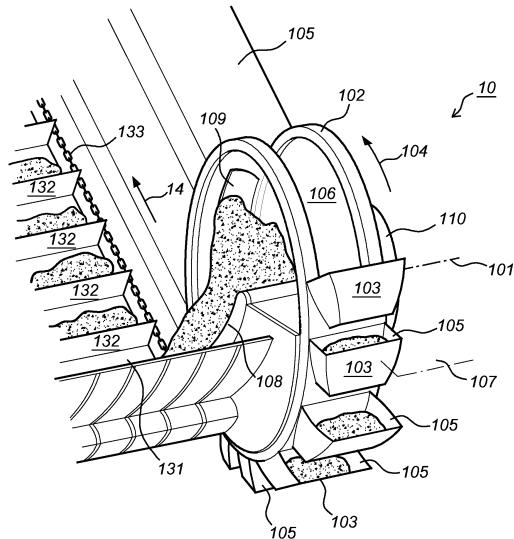


Fig. 3



EUROPEAN SEARCH REPORT

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The present search report has been drawn up for all claims			
3	Place of search Munich	Date of completion of the search 16 January 2014	Examiner Laurer, Michael
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			



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The present search report has been drawn up for all claims			
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CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
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Application Number

EP 13 17 5430

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (IPC)
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3	Place of search Munich	Date of completion of the search 16 January 2014	Examiner Laurer, Michael
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
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Application Number

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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

- All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.
- Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

1-5, 8, 10-13

None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).



LACK OF UNITY OF INVENTION
SHEET B

Application Number
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The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1, 2, 8, 13

are directed to the known dredging device of claim 1 wherein the rotating cutting tool is defined as a cutter-wheel rotating about a horizontal axis and provided with a series of radially disposed excavating buckets having a frontwardly oriented inlet-opening, and wherein the cutting wheel further comprises an aperture for conveying excavated material to the inlet opening of the "first" conveying means disposed on the ladder (claim 2) or wherein the cutting tool comprises two cutting tools arranged on either side of the ladder (claim 8). The technical effect associated to these potential special features is an improved excavation capacity for the dredging device. The objective technical problem to be solved may be formulated as: Improving soil shifting capacity of such a dredging device.

2. claims: 3, 10

are directed to the known dredging device of claim 1 wherein the carrier of the conveying means comprises a covering (claim 3) or the "first" conveying means is more or less integrated into the ladder (claim 10). The thereto associated technical effects are a separation of the conveyor means with respect to the surrounding water body. The objective technical problem to solve may be formulated as: Avoiding dissolving of the conveyed soil with the surrounding water.

3. claims: 4, 5

are directed to the known dredging device of claim 1 wherein pumping means with a suction pipe are foreseen wherein the pipe extends between the vessel and the inlet portion of the conveying means (claim 4) or the conveying means are provided at one side with scraping means (claim 5). The thereto associated technical effects are the prevention of adhesion of the conveyed material. The objective technical problem to solve may be formulated as: Avoiding clogging of the conveying device.

4. claims: 6, 7, 9

are directed to the known dredging device of claim 1 wherein the mechanical driving means for the conveying means comprises an endless chain which is provided with the carrier and which loops around two wheels wherein one of the wheels is driven (claim 6) or wherein the carrier comprises



LACK OF UNITY OF INVENTION
SHEET B

Application Number
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The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

a conveyor belt (claims 7) or a series of mechanically driven buckets (claim 9). The thereto associated technical effect is a solid appropriate conveying means. The objective technical problem to solve may be formulated as: Provide the known dredging device with an adapted conveying means.

5. claims: 11, 12

are directed to the known dredging device of claim 1 wherein a second discharge means is provided on the deck of the vessel downstream of the outlet of the first discharge means. The thereto associated technical effects are a further transport of the conveyed material on deck of the vessel. The objective technical problem to solve may be formulated as: Improve transport of the dredged material on deck of the vessel.

6. claims: 14-16

are directed to the known method of claim 13 wherein the motion of the vessel during dredging is further defined. The thereto associated technical effects are: An adapted drive and motion patterns of the vessel enable an adapted excavation of soil from the sea bottom. The objective technical problem to solve may be formulated as: Improve ecological dredging performance.

ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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