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(54) AN AUGER HEAD AND A FLOATING BODY COMPRISING SAME

(57) The invention relates to an auger head for removing material from a water bottom, comprising a cylindrically shaped body for performing a rotary movement along the water bottom, said cylindrical body comprising a helically wound screw on its outer surface, said helically wound screw is embodied in two part form, a first screw part for transporting said material from a first end of said cylinder to an intermediate portion of said cylinder and a

second screw part for transporting said material from a second end of said cylinder to said intermediate portion of said cylinder upon performing the rotary movement along the water bottom in one direction, characterized in that the cylindrical body comprises an intermediate opening near said intermediate portion for removing said material through said cylindrical body and a discharge opening for removing said material from the cylindrical body.

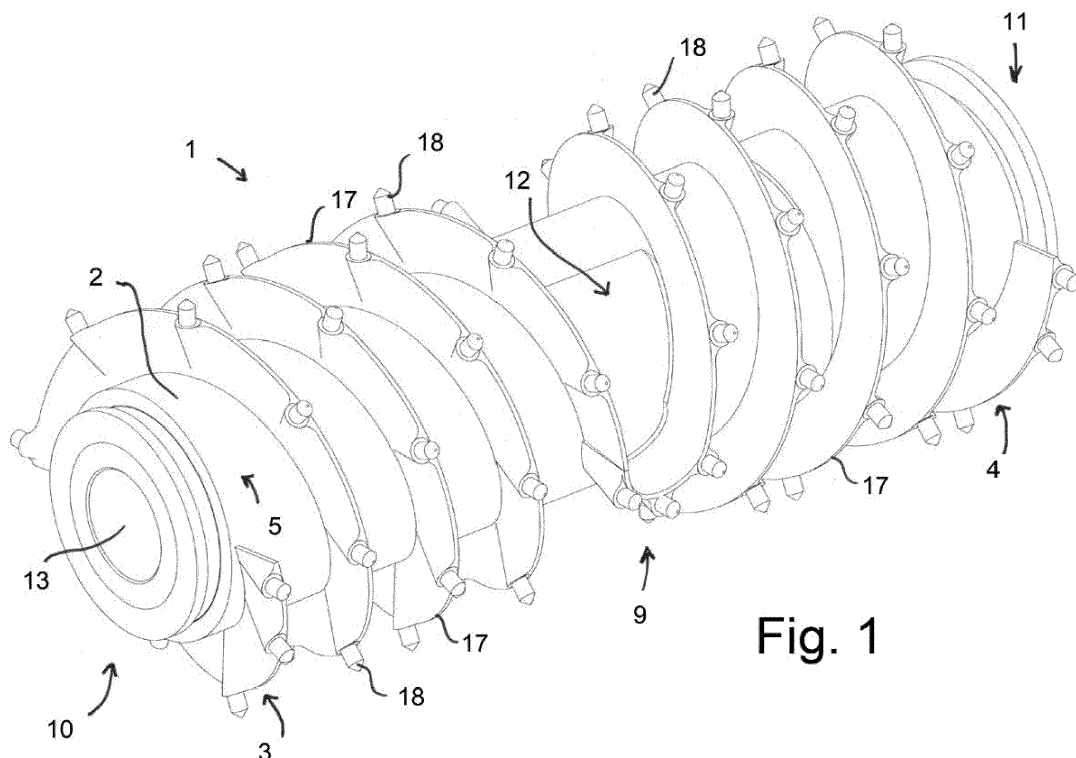


Fig. 1

EP 3 626 891 A1

Description

[0001] The present invention relates to an auger head according to the preamble of claim 1. The invention also relates to a floating body, for example a ship comprising the auger head according to the invention.

[0002] It is known in the art to remove material from a water bottom by means of an auger head. An auger head is a cylindrical body with a longitudinal axis, being the rotation axis of the cylindrical body. At the body's outer surface a helical screw part is provided, such that upon rotation of the body along a water bottom material is transported from ends of said body towards an intermediate portion. Material is then removed from said intermediate portion by means of a suction tube positioned at some distance from the auger head.

[0003] Such known auger head provides the disadvantage that only a small part of the material is actually removed from the water bottom. A large part of said material is swirled up by the rotary action of the auger head missing the entrance of the suction tube.

[0004] Another disadvantage of this known auger head is that it is a complex apparatus with a limited effectiveness.

[0005] The invention aims at providing an improved auger head of the kind mentioned in the preamble.

[0006] The invention further aims at providing an auger head that provides a better removal of material from the water bottom.

[0007] The invention also aims at providing an improved and easier to use auger head than an auger head according to the state of the art.

[0008] So as to obtain at least one of the above mentioned aims, the invention provides an auger head as mentioned in claim 1. This auger head has the advantage that removal of material from the water bottom is done securely, removing substantially all material that has been transported to the intermediate portion of the auger head.

[0009] It has also shown that the auger head according to the present invention can be rotated at a higher rotational speed than known auger heads. Even at higher rotational speeds, no swirling up of material is obtained and thus no material is left at the water bottom. Such synergistic effect is a surprising and advantageous effect, since less effort is required to remove said material. Also, due to the higher rotational speed, the force impact of the auger head against the water bottom is much higher providing an even more improved effectiveness.

[0010] The invention therefore relates to an auger head for removing material from a water bottom, comprising a cylindrically shaped body for performing a rotary movement along the water bottom, said cylindrical body comprising a helically wound screw on its outer surface, said helically wound screw is embodied in two part form, a first screw part for transporting said material from a first end of said cylinder to an intermediate portion of said cylinder and a second screw part for transporting said

material from a second end of said cylinder to said intermediate portion of said cylinder upon performing the rotary movement along the water bottom in one direction, characterized in that the cylindrical body comprises an intermediate opening near said intermediate portion for removing said material through said cylindrical body and a discharge opening for removing said material from the cylindrical body. The present auger head ensures an excellent removal of material from the water bottom, since the material is in a first step transported by means of the helical screw at the outside of the cylindrical body to an intermediate position thereof, usually but not necessarily to the center portion, and in a second but substantially continuous step the material enters the inside of the cylindrical body through said opening, such that the material can be removed through said cylindrical body and out of the cylindrical body through the discharge opening.

[0011] So as to obtain a targeted removal of said material, it is preferred that the auger head comprises a discharge tube connected to the discharge opening of said cylindrical body for transporting said material to a remote location. The advantage of the present embodiment is that the discharge tube is directly connected to the hollow inside of the cylindrical body collecting said material. Thus, no foreign material from around the end of the discharge tube will enter the discharge tube.

[0012] It is especially preferred that the auger head comprises a pump for actively removing and transporting said material. Since the pump is actively coupled to the intermediate opening in the cylinder, it will apply a vacuum action at said intermediate opening ensuring a continuous and effective removal of said material through said intermediate opening after said material has been transported towards the intermediate opening by means of the screw parts at the cylinder's outer surface.

[0013] So as to ensure a complete removal of material from the inside of the cylinder towards and into the discharge tube, said cylindrical body may optionally have an internal screw for internally transporting material from said intermediate opening near said intermediate portion towards a discharge opening at an end of said cylindrical body, i.e. towards the discharge tube.

[0014] As a result, preference is given to an auger head wherein a pump is connected to said discharge opening for removing said material from said cylindrical body, optionally with intermediate placement of a transport line such as a pipeline, a tube or a hose. Such embodiment is able to efficiently and completely transporting the material towards a remote location.

[0015] When the water bottom comprises solid material, it is preferred to grind or cut said material into smaller pieces. It then is preferred for the cylindrical body to be provided with teeth at its outer surface for cutting said water bottom.

[0016] Said cutting or grinding action is performed optimally, when the said teeth are connected to said helically wound screws, since in such embodiment the teeth with interact most efficiently with the water bottom.

[0017] An even most efficient action is obtained when said teeth are connected to the top part of said helically wound screws.

[0018] An easily applicable embodiment is obtained when said cylindrical body is rotatably coupled to a frame part at its two longitudinal ends. Such embodiment provides a strong and stable apparatus, easily withstanding forces that are encountered at water bottoms, especially water bottoms comprising large pieces of material like rocks and stones, but pieces of organic material as well.

[0019] When using an auger head according to the invention, a rotation device, also referred to as rotator, must be used for providing a rotary motion to the auger head. As a skilled person knows, the auger head has a cylindrical body with a longitudinal axis, said body rotating along said longitudinal axis. The rotation device preferably is a motor, for example an electric or hydraulic motor. Said rotation device directly interacts with said cylindrical body. Preferably, providing a compact embodiment, the invention relates to an auger head wherein at a first longitudinal end a rotator is provided for inducing a rotatable motion to said cylinder with respect to the frame part and at a second longitudinal end the discharge tube is connected for transporting said material from said cylindrical body to a remote location.

[0020] It is especially preferred that at least one of said rotator and said discharge tube is rigidly connected to said frame. For, such adds to the rigidity and strength of the complete construction of auger head and frame, including the rotator and tube connection.

[0021] According to a further embodiment, the invention relates to an auger head as mentioned above, operable from a ship.

[0022] Finally, the invention also relates to a ship, comprising an auger head according to the present invention, comprising a frame to which said auger head is rotatably connected.

[0023] Hereafter, the invention will be further described by means of a drawing. The drawing shows in:

Fig. 1 a perspective view of an auger head according to the invention,

Fig. 2 a front view of an auger head according to the invention,

Fig. 3 a sectional view of the auger head according to Fig. 2.

[0024] The same and similar parts and features have been denoted by the same reference numerals in the figures. However, for ease of understanding the figures, not all parts that are required for a practical embodiment have been shown in the figures.

[0025] Fig. 1 shows an auger head 1, comprising a substantially cylindrical body 2 with screw parts 3, 4 on its outer surface 5. The screw part 3 is wound oppositely with respect to screw part 4, such that upon rotation of the auger head along its longitudinal axis 6 (as shown in Fig. 2) in a suitable direction, material caught in between

two neighboring screw wall parts 7, 8 (see especially Fig. 2) is transferred to an intermediate portion 9 of the auger head 1. Substantially all material caught in between two neighboring screw part walls from between a first end 10 and a second end 11 of the auger head will be transferred towards said intermediate portion 9.

[0026] In the embodiment shown in the figures, the auger head 1 comprises a single intermediate portion, since two oppositely threaded screw parts are provided at the auger head's surface. Optionally, four, six, eight or any other even number of screw parts may be applied, yielding two, three, four et cetera intermediate portions, respectively. The advantage of an even number of screw parts is that there are always two screw parts working together, moving material towards an opening at a common intermediate portion in between said two screw parts.

[0027] In addition, a single pitch, a double pitch or even a triple or quadruple pitch may be applied. It is preferred that an opening is provided in the intermediate portion at the end of each pitch so as to obtain an optimum removal of material through said opening at the end of each of said pitches. The drawings show an embodiment with a double pitch and two screw parts.

[0028] Near the intermediate portion 9 an intermediate opening 12 is made in the body's surface, yielding entrance to the body's hollow inside. As a result, material that is transferred towards said intermediate opening 12 will be transferred into the body's hollow inside. At the first end 10 a discharge opening 13 is provided for removing said material from the body's hollow inside.

[0029] A discharge tube 14 may be connected to the said discharge opening 13 for transporting the material to a remote location.

[0030] Fig. 2 shows a front view of the auger head 1. The longitudinal axis 6 is shown in this figure.

[0031] Fig. 3 finally shows a sectional view of the auger head 1 according to the present invention. An optional screw 15 is provided in the body's hollow inside, assisting in transporting material towards end 10, after it has entered the auger head 1 through said intermediate opening 12. This screw 15 prevents lagging of material inside the auger head 1. As a matter of fact, since the cylindrical body undergoes a rotational movement with respect to a water bottom (or a like surface from which material has to be removed), the screw 15 may be static, in that no rotational movement is induced on said screw with respect to said water bottom.

[0032] At second end 11 a rotator 16 is provided for rotating the auger head 1 along its longitudinal axis 6. So as to be able to induce said movement, the rotator is coupled to a frame (not shown) that has a static position with respect to a water bottom or the like, as indicated above. The frame is preferably connected to a floating device when removing material from a water bottom. Most preferably, the frame is rotatably connected at both ends 10, 11 of the auger head 1.

[0033] The screw parts 3, 4 have a top part 17 at a

position away from the body's surface 5. At said top part 17, cutting teeth 18 are provided for cutting and destroying material at the water bottom.

[0034] The invention is not limited to the embodiments as mentioned above and as shown in the drawings. The invention is limited by the claims only.

[0035] The invention also relates to all combinations of features described here independently of each other.

Claims

1. An auger head for removing material from a water bottom, comprising a cylindrically shaped body for performing a rotary movement along the water bottom, said cylindrical body comprising a helically wound screw on its outer surface, said helically wound screw is embodied in two part form, a first screw part for transporting said material from a first end of said cylinder to an intermediate portion of said cylinder and a second screw part for transporting said material from a second end of said cylinder to said intermediate portion of said cylinder upon performing the rotary movement along the water bottom in one direction, **characterized in that** the cylindrical body comprises an intermediate opening near said intermediate portion for removing said material through said cylindrical body and a discharge opening for removing said material from the cylindrical body. 5
2. An auger head according to claim 1, comprising a discharge tube connected to the discharge opening of said cylindrical body for transporting said material to a remote location. 10
3. An auger head according to claim 1, comprising a pump for actively removing and transporting said material. 15
4. An auger head according to claim 1, wherein said cylindrical body has an internal screw for internally transporting material from said intermediate opening near said intermediate portion towards a discharge opening at an end of said cylindrical body. 20
5. An auger head according to claim 1, wherein a pump is connected to said discharge opening for removing said material from said cylindrical body, optionally with intermediate placement of a transport line such as a pipeline, a tube or a hose. 25
6. An auger head according to claim 1, wherein said cylindrical body is provided with teeth at its outer surface for cutting said 30
7. An auger head according to claim 6, wherein said teeth are connected to said helically wound screws. 35
8. An auger head according to claim 7, wherein said teeth are connected to the top part of said helically wound screws. 40
9. An auger head according to claim 1, wherein said cylindrical body is rotatably coupled to a frame part at its two longitudinal ends. 45
10. An auger head according to claim 1, wherein at a first longitudinal end a rotator is provided for inducing a rotatable motion to said cylinder with respect to the frame part and at a second longitudinal end a discharge tube is connected for transporting said material from said cylindrical body to a remote location. 50
11. An auger head according to claim 10, wherein at least one of said rotator and said discharge tube is rigidly connected to said frame. 55
12. An auger head according to claim 1, operable from a ship.
13. A floating body, comprising an auger head according to any of claims 1 to 12, comprising a frame to which said auger head is rotatably connected.

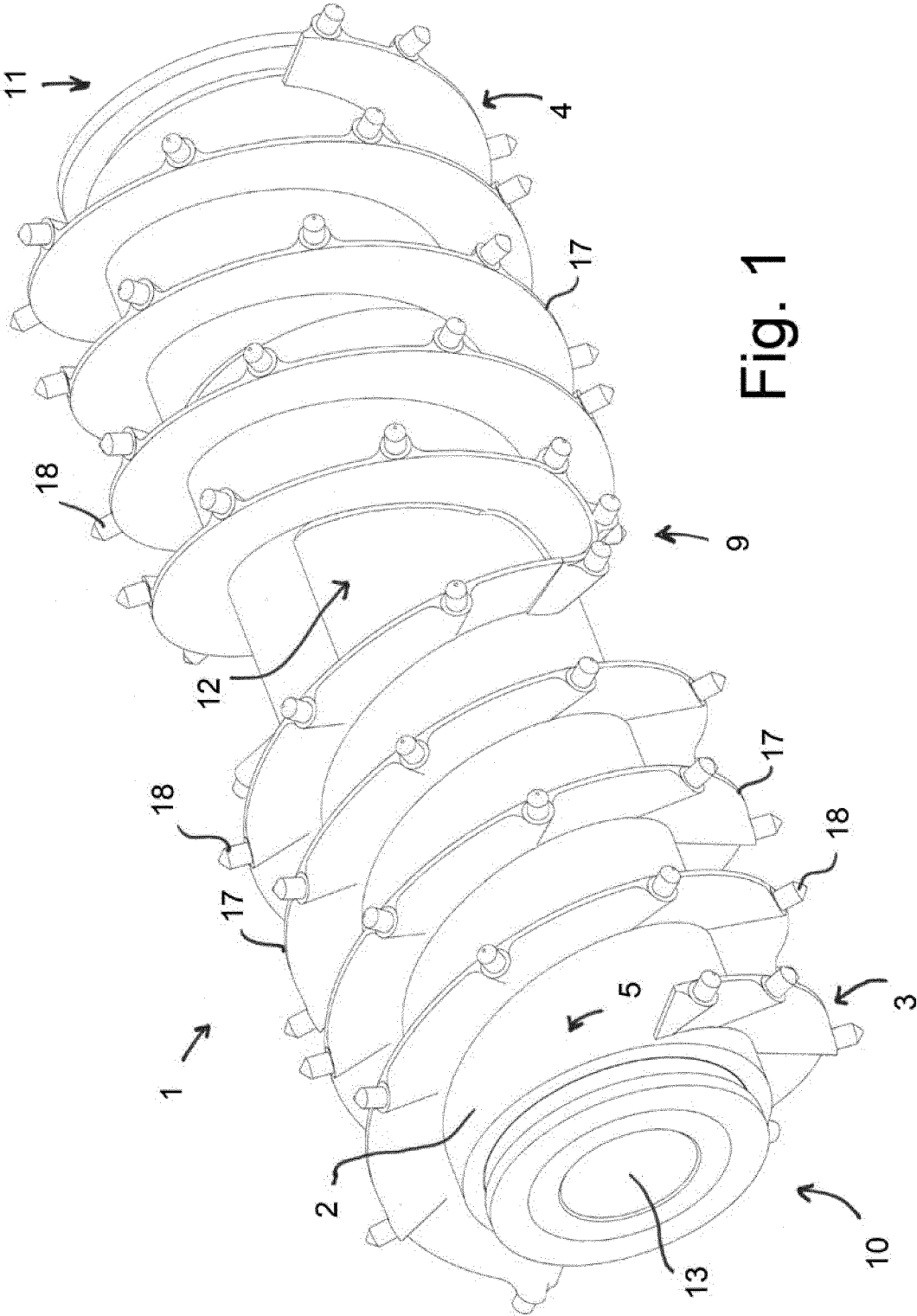


Fig. 1

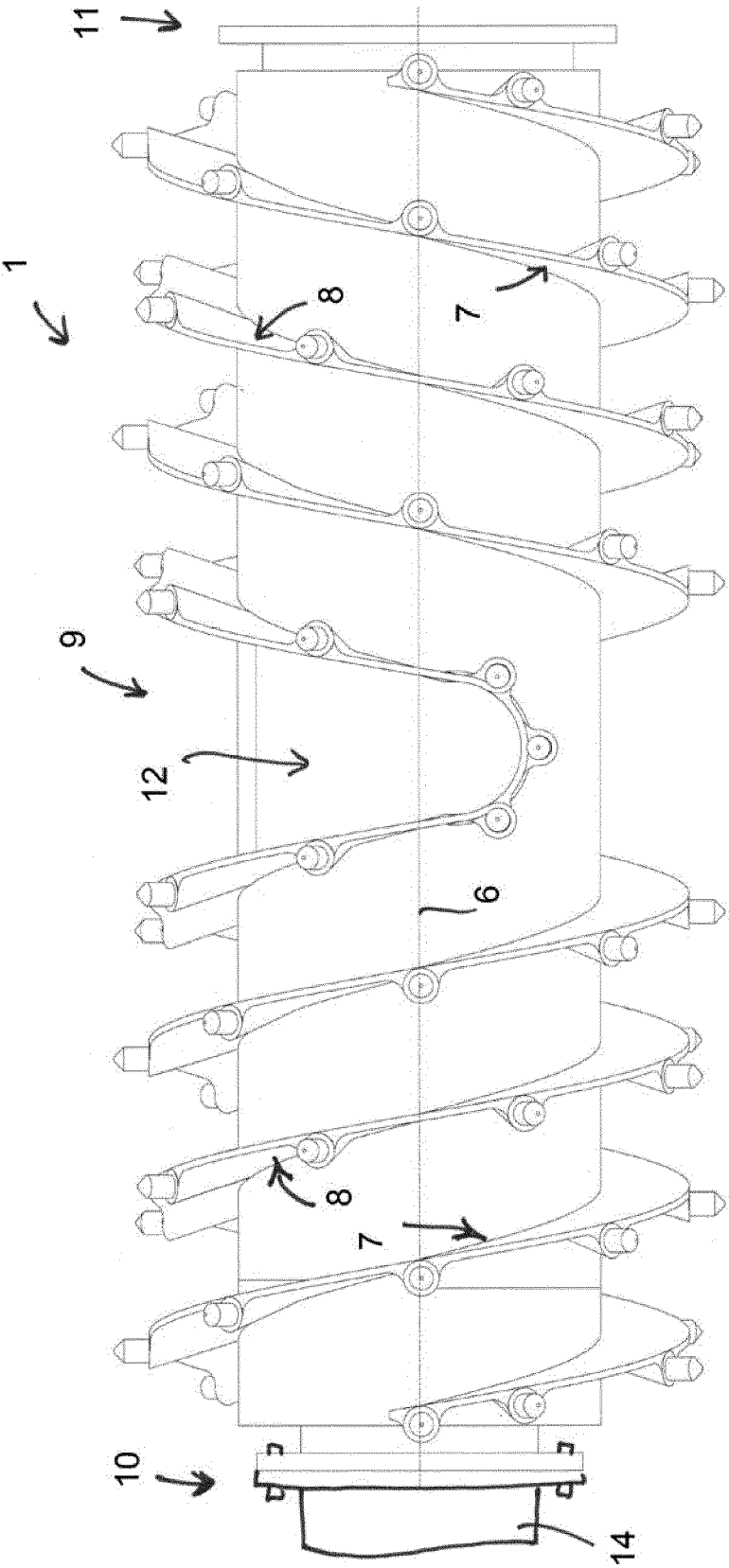


Fig. 2

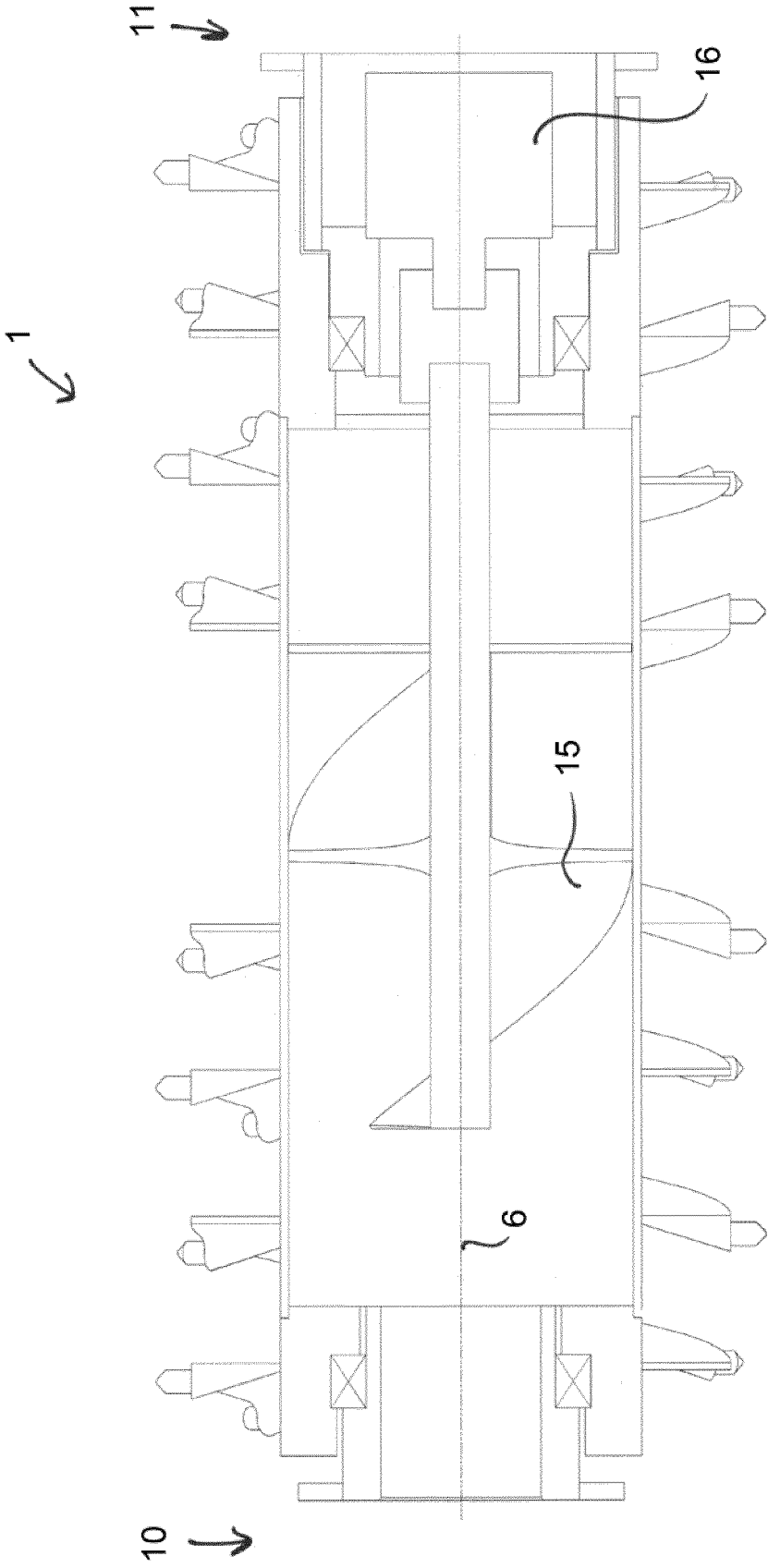


Fig. 3



EUROPEAN SEARCH REPORT

Application Number
EP 18 19 5503

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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)
X	NL 8 403 586 A (AD J VAN MILL HOLDING B V) 16 June 1986 (1986-06-16)	1-3,5-7,12	INV. E02F3/18
Y	* figures 1-2 *	4,8	E02F3/92 E02F5/08
X	WO 03/106255 A1 (PARK SUN SOON [KR]) 24 December 2003 (2003-12-24)	1-7,12	E02F3/24 E21C25/10 E21C50/00
Y	* figures 1-5 *	8	
X	US 4 037 874 A (WILLUMS JAN-OLAF) 26 July 1977 (1977-07-26)	1,6	
Y	* figure 1 *	4	
Y	US 4 040 667 A (TAX HANS ET AL) 9 August 1977 (1977-08-09)	4	
A	* figure 5 *	6	
A	US 6 318 005 B1 (ANDRE LEE [US]) 20 November 2001 (2001-11-20)	1	
Y	US 3 423 859 A (SWISHER GEORGE W JR ET AL) 28 January 1969 (1969-01-28)	8	TECHNICAL FIELDS SEARCHED (IPC)
Y	* figures 3,7,15-18 *	8	E02F E21C E21D G01F
Y	US 3 521 387 A (DEGELMAN NORBERT V) 21 July 1970 (1970-07-21)	8	
	* figures 3,6 *		
~~The present search report has been drawn up for all claims~~			
Place of search Munich		Date of completion of the search 3 June 2019	Examiner Pedersen, Henrik
CATEGORY OF CITED DOCUMENTS 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 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			

EPO FORM 1503 03.82 (P04C01)



Application Number

EP 18 19 5503

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:

1-8, 12

☐ 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

EP 18 19 5503

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: 1-5, 12

Claim 1 is not novel. As a result, the claims directly appendant on claim 1 are not linked through a common inventive concept (different and non corresponding potential special technical features with different resulting technical effects and/or solving different objective technical problems). This leads to a lack of unity a posteriori.

The following groups of invention has been identified:

Group I containing claims: 1-5

The potential special technical features of this group can be summarised as: conveying means (screws and pumps)

The technical effects associated with the above features are: material is transported

The objective technical problem solved by this invention could be formulated as: how to transport material?

1.1. claim: 12

Group IV containing claims: 12

The potential special technical features of this group can be summarised as: ship

The technical effects associated with the above features are: operation of auger head

The objective technical problem solved by this invention could be formulated as: how to operate an auger head?

2. claims: 6-8

Group II containing claims: 6 - 8

The potential special technical features of this group can be summarised as: teeth

The technical effects associated with the above features are: loosened material

The objective technical problem solved by this invention could be formulated as: how to loosen material?

3. claims: 9-11, 13

Group III containing claims: 9-11,13

The potential special technical features of this group can be summarised as: frame

The technical effects associated with the above features are: mounted auger head

The objective technical problem solved by this invention could be formulated as: how to mount an auger head?



**LACK OF UNITY OF INVENTION
SHEET B**

Application Number
EP 18 19 5503

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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:

Please note that all inventions mentioned under item 1, although not necessarily linked by a common inventive concept, could be searched without effort justifying an additional fee.

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

EP 18 19 5503

5 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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03-06-2019

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82