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(73) Patenthaver: **Max Wild GmbH, Leutkircher Straße 22, 88450 Berkheim, Tyskland**

(72) Opfinder: **Schad, Josef, Ahornweg 10, 88459 Tannheim, Tyskland**

(74) Fuldmægtig i Danmark: **Plougmann Vingtoft A/S, Strandvejen 70, 2900 Hellerup, Danmark**

(54) Benævnelse: **FREMGANGSMÅDE TIL BEHANDLING OG GENANVENDELSE AF BORESLAM**

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WO-A1-2009/154468
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WO-A2-2007/109803
DE-A1- 19 745 766
US-A- 4 635 735
US-A- 4 942 929
US-A1- 2007 221 410
US-A1- 2010 193 249

PROCESS FOR THE TREATMENT AND RECYCLING OF DRILLING MUD

The invention relates to a method for the treatment and at least partial recycling of drilling mud arising in an earth drilling.

When making earth drillings (for example horizontal drillings or vertical drillings, such as, for example, drillings for thermal probes), drilling fluids are used which are pumped into the drill hole via the drill head. The drilling fluids are composed of various substances, the main component of which is usually water. Bentonite is usually used as an additive, and forms a suspension together with the water content. In addition, drilling fluids contain additional additives which are adapted to the subsoil to be drilled. The drilling fluids have the task of cooling and lubricating the drill head, as well as stabilising the resulting drill channel and removing the soil. To complete the drilling, the used drilling fluid is pumped out of the drill hole again and then contains material from the drill hole. The material from the drill hole can also include pollutants such as, for example, heavy metals or washed-out contaminated soil.

Up to now, drilling mud has been spread on agricultural land or stored entirely in landfills at great expense. Since the specific composition of the drilling mud is unknown, spreading on agricultural land is ultimately an incalculable risk.

From DE 197 45 766 A1, a mud treatment station for a tunnel boring machine is known, the strut tip of which consists of mud compacted by pressure.

US 4 635 735 A discloses an oil drilling device in which drilling mud is continuously examined for hydrocarbons by analysing gas deposits from the drilling mud. The aim of this is to locate oil and gas when drilling.

US 2010/193249 A1 discloses a closed circuit of the drilling fluid during production of a bore.

EP 2 530 237 A1 likewise describes a drilling method with a closed circuit, in which drilling mud is reused as far as possible at the location of the drilling machine.

The object of the present invention is therefore to propose a way of at least partially recycling the drilling mud arising during drilling work.

To achieve this object, the invention proposes a method according to claim 1, which is also explained in more detail in the description of the figures.

The approach according to the invention is not only limited to the method, as just specified, but also comprises a treatment plant for the treatment of drilling mud arising

from an earth drilling, wherein the treatment plant has at least one input bunker, at least one processing or separation stage for separating the soil or rock components from the drilling mud and a drilling fluid receptacle.

Furthermore, the approach according to the invention comprises a system for the treatment and at least partial recycling of drilling mud arising in an earth drilling, which is used in particular to carry out the method according to the invention, wherein the system has a treatment plant as just specified, a drilling device which catches the accumulating drilling mud in a collector, and a means of transport which serves to transport drilling fluid stored in the treatment plant to the drilling device at the location of the earth drilling, and to transport to the treatment plant drilling mud collected using the drilling device in the collector.

The invention proposes a third way of using the drilling mud. It is a complete recycling process, which is described by the method, the treatment plant and the system, for the treatment and at least partial recycling of the drilling mud arising in earth drillings. Several positive effects are in the foreground here:

First, the precious water is used several times in the described disposal process, which conserves this natural resource.

The recycling process also produces bentonite, which is either discharged as bulk material or, because it is dissolved in the water, is still in the drilling fluid receptacle after the recycling step. The proposal according to the invention therefore also reduces the consumption of bentonite since this additive is also used several times.

The drilling fluid receptacle is advantageously located at the treatment plant, which means that the transport vehicles used always travel loaded, once with prepared drilling fluid to the construction site, and on the way back with (polluted) drilling mud. The central treatment plant guarantees a high treatment quality. The treatment plant can be capacitively designed such that effective process control is possible, which is also the basis for an economically successful concept.

The separated soil or rock components are cleverly stored in the region of the treatment plant and can be reused there, for example, as building materials, for example in road construction and the like. Since the components have different particle sizes, mechanical separation with a plurality of screens and the like will be carried out; the resulting fractionation of the material is advantageous for the further use of these materials.

The central use of a treatment plant also allows complete documentation of the recovery of the drilling mud produced at the construction site and thus also ensures that this material is not spread on agricultural land, for example, and then, under certain circumstances, enters the food chain.

The system according to the invention also ensures that the drilling mud arising is actually disposed of by the construction site, since the data documentation means that it is known what amount of drilling fluid has been delivered to the site.

The proposal according to the invention combines an economically viable concept with a high standard of environmental protection in a simple and convincing manner.

Furthermore, the proposal advantageously provides that drilling mud delivered to the treatment plant is analysed and, depending on the analysis result, either a separation of the soil or rock components from the drilling mud, a separation of the soil or rock components from the drilling mud and a subsequent conditioning of the soil or rock components or a conditioning of the drilling mud and a subsequent disposal takes place.

Depending on the analysis provided on the input side, which is carried out in an analysis stage, the further processing, treatment or separation of the drilling mud then takes place. In a first variant it is provided that, if the analysis comes to an acceptable result, only one (for example mechanical) separation of the soil or rock components from the drilling mud takes place. If a substance is discovered during the analysis that rules out conventional treatment, there are generally at least two further variants for the further procedure. Often the harmful component can be separated in a non-volatile, i.e. suitable, manner, from the water, which makes up the majority of the drilling mud, and in a first variant a separation of the soil or rock components from the drilling mud, for example by means of a thermal separation step, is carried out, and the remaining soil or rock components with the pollutant are then conditioned.

Conditioning is understood to mean the addition of a binder and the treatment of the drilling mud to form a solid that cannot be washed out, for example a concrete, that is, under certain circumstances, an otherwise usable product. Alternatively, said solid can also be landfilled.

The analysis provided here takes place in an automated step, with attention being paid, for example, to common pollutants such as heavy metals, etc.

In terms of plant technology, this is preferably implemented in such a way that an analysis stage is provided in the conveying direction of the drilling mud before, in or after

the input bunker, and the drilling mud is fed to different processing or separation stages for treatment depending on the analysis result.

Usually the delivered drilling mud is stored in the input bunker, which constitutes a corresponding work supply for the treatment plant. It can be beneficial for the analysis to take place before filling the input bunker, for example in order to move the delivered load to another location after the analysis and to feed it there to the treatment plant. Alternatively, it is of course possible for the analysis or analysis stage to be provided in or after the input bunker, and then depending on the analysis result, the drilling mud is fed to one or the other treatment plant, so to speak in the flow.

It is provided that a conditioning is carried out by adding a binder, such as in particular cement, lime or a cement-lime mixture. Surprisingly, it has been found that this binder does not impair the setting of the drilling mud to form a product with the strength customary in concrete. This is all the more astonishing as the drilling mud contains bentonite, which binds a lot of moisture and also contains other additives the polymers, etc. A concrete produced in this way can no longer be washed out chemically, which in particular improves its suitability for landfill and storage, and also improves its further use, for example as a building material or additive in road construction, or as liquid soil in sewer construction, etc.

By varying the proportions of drilling mud, cement and/or lime, water and other additives, it is possible to influence the strength and density of the end product. With a larger proportion of cement, a stronger concrete is obtained; a concrete suitable for landfill is already obtained with a mass of 120-200 kg cement per ton of drilling mud. With such a conditioning of the drilling mud, no waste water is produced.

According to the invention, the use of cement, lime or a lime-cement mixture is also proposed for conditioning drilling mud, in particular containing bentonite and mixed with soil or rock components, arising in earth drilling. This proposal also achieves the object set at the outset, because it provides a means for reusing the drilling mud at least partially, for example as an additive or building material.

It is preferably proposed that approx. 5-25% [weight] cement, lime or a lime-cement mixture, based on the mass of the drilling mud, is used for conditioning the drilling mud.

In particular, for the proportion of cement, lime or a lime-cement mixture in the use according to the invention, an interval is specified which is described by an upper and lower limit.

The following values, for example, are provided as the lower limit: 5, 8, 10, 12, % [weight] based on the mass of the drilling mud.

The following values, for example, apply as the upper limit: 15, 18, 20, 22, 25% [weight] based on the mass of the drilling mud.

The disclosure of this application comprises the quantity of all intervals formed by all possible combinations of the aforementioned upper and lower limits.

The lime-cement mixture has the following mixing ratios.

The proportion of lime in the mixture is likewise described by an interval:

The following values are provided as the lower limit: 5, 10, 15, 25, 35, 40% [weight] based on the mass of the mixture.

The following values, for example, are provided as the upper limit: 30, 40, 50, 60, 65, 75, 85, 90% [weight] based on the mass of the mixture.

The proportion of cement in the mixture is likewise described by an interval:

The following values, for example, are provided as the lower limit: 5, 10, 15, 25, 35, 40% [weight] based on the mass of the mixture.

The following values, for example, are provided as the upper limit: 30, 40, 50, 60, 65, 75, 85, 90% [weight] based on the mass of the mixture.

The disclosure of this application comprises the quantity of all intervals defined by all possible combinations of the aforementioned upper and lower limits. According to the invention, the mixture can also have further components, which is why the two proportions do not necessarily have to total 100%. It is clear that the disclosure excludes such variants which in the sum of the individual components exceed 100%.

It is also provided that the drilling mud is separated by a thermal separation stage. This separation stage is relatively energy-intensive, but leads to a considerable reduction in material, i.e. reduction in mass, which is in particular advantageous for a subsequent landfilling. The thermal separation stage is also used if a pollutant has been found during the analysis provided on the input side which, for example, can only be isolated in a suitable manner by the thermal separation stage.

It is provided that the water evaporated in the thermal separation stage is condensed and the condensation heat released in the process is used to preheat the

drilling mud. By virtue of such a configuration, at least part of the energy used is recovered and the water is not lost, in particular because the condensed water from the thermal separation stage is advantageously fed to the drilling fluid receptacle.

In a further preferred embodiment it is provided that the composition of the drilling fluid is monitored in the drilling fluid receptacle and, if necessary, drilling fluid suspending agent is added in a controlled manner. Such a procedure guarantees that the drilling fluid stored is of a sufficient and also guaranteed quality. It cannot be ruled out that the treatment of the drilling mud may also result in the removal of drilling fluid suspending agent from the drilling mud or the liquid, which is then disadvantageous in the further use.

It is also provided that the drilling mud is separated mechanically, in particular by screening or centrifuging. Such a treatment is more cost-effective and is particularly suitable if no harmful pollutants have been found during the analysis.

According to the invention it is provided that during the separation of the soil or rock components from the drilling mud that have been discharged or rock components are stored. Storage within the meaning of the invention is considered to mean, for example, that mechanically or thermally separated components of the drilling mud are conditioned and landfilled.

An alternative to this within the meaning of the invention can be that mechanically or thermally separated components of the drilling mud are reused as building materials. This also describes a storage of the separate components.

In addition, the invention also comprises the fact that the separate components, sorted according to particle size and/or intended use, are stored as bulk material or packaged sacked goods or the like.

In this context, it is pointed out in particular that all the features and properties, and also procedures, described in relation to the treatment plant are also transferable by analogy with regard to the wording of the method or use according to the invention and are usable and considered to be also disclosed within the meaning of the invention. The same also applies in the opposite direction, that is, structural features, i.e. features according to the device, which are only mentioned in relation to the method or use can also be taken into account and claimed within the scope of the claims for the treatment plant or the system and are likewise part of the disclosure.

Furthermore, it is pointed out in particular that all the features and properties, and also procedures, described in relation to the treatment plant are also transferable by analogy with regard to the wording of the system according to the invention and are usable and considered to be also disclosed within the meaning of the invention. The same also applies in the opposite direction, that is, features which are only mentioned in relation to the system can also be taken into account and claimed within the scope of the claims for the treatment plant and are likewise part of the disclosure.

Furthermore, it is pointed out in particular that all the features and properties, and also procedures, described in relation to the system are also transferable by analogy with regard to the wording of the method or use according to the invention and are usable and considered to be also disclosed within the meaning of the invention.

Furthermore, it is pointed out in particular that all the features and properties, and also procedures, described in relation to the use are also transferable by analogy with regard to the wording of the method according to the invention and are usable and considered to be also disclosed within the meaning of the invention. The same also applies in the opposite direction, that is, features which are only mentioned in relation to the method and which describe the use can also be taken into account and claimed within the scope of the claims for the use and are likewise part of the disclosure.

In the drawing, the invention is illustrated schematically in particular in an exemplary embodiment, wherein:

Fig. 1 shows the method according to the invention in a schematic view

In the figure, elements that are the same or that correspond to one another are each designated by the same reference signs and are therefore not described again unless expedient. The disclosures contained in the entire description can be applied analogously to the same parts with the same reference signs or the same component names. The positional details chosen in the description, such as, for example, top, bottom, side, etc. also refer to the figure immediately described and illustrated and are to be transferred analogously to the new position in the event of a change in position. Furthermore, individual features or combinations of features from the different exemplary embodiments shown and described can also be independent or inventive solutions, or solutions according to the invention.

The entire circuit of the drilling fluid is shown schematically in Figure 1. The illustration begins with the filling of the storage container 23 on the drilling device 2 with

fresh drilling fluid, which has been delivered here by the means of transport 3, 3a. The fresh drilling fluid is then supplied from the storage container 23, as described, to the drilling device 2 via the line 21 for cooling and lubrication, during operation of the drilling device 2 (an exemplary horizontal drilling device). Used drilling fluid is caught as drilling mud via the line 22 in the collector 20 and collected there until the means of transport 3, 3b picks this up there, which is consequently the same means of transport 3, 3a that introduced the fresh drilling fluid into the storage container 23.

In the next step, the means of transport 3, 3c drives the drilling mud removed from the collector 2 to the input bunker 10 of the treatment plant 1. Before, in or after the input bunker 10 is located the analysis stage 11, in which an analysis of the delivered drilling mud is performed, and based on this analysis result it is decided how the delivered drilling mud is treated using the various separation stages 12, 12a, 12b, 12c. A discharge line 13 is therefore connected to the input bunker 10 at the output side, to which line the various separation stages 12, 12a, 12b, 12c can be connected by shut-off valves 14a, 14b, and 14c. It is also provided that an automatically operating analysis stage 11 acts on the respective shut-off valves 14a, 14b, and 14c by means of corresponding adjusting elements, and thus allows an automated flow of the drilling mud.

Along the discharge line 13 are located various separation stages 12, 12a, 12b, 12c, which are used according to the degree of pollution of the drilling mud supplied. For example, the first separation stage 12a is used for heavily polluted or contaminated drilling mud, second separation stage 12, 12 b in the direction of flow of the drilling mud in the discharge line 13 is used for less polluted or contaminated drilling mud, and the last separation stage 12, 12 c only provides a mechanically dominated separation of the soil and rock components from drilling mud that is not contaminated per se. The different concepts for the treatment or separation of the drilling mud supplied to the separation stages therefore also differ from one another.

The first separation stage 12, 12 a conditions the drilling mud in such a way that it can be stored in the landfill 4. The conditioning is carried out by adding binder over a filling region 15 at the separation stage 12a. The binder, for example lime, cement or a lime-cement mixture, leads to a concrete-like compound of the drilling mud, which can be landfilled, for example, since pollutants can no longer be washed out of said compound.

The second separation stage 12b is designed as a thermal separation stage and reduces the mass and volume of the drilling mud by evaporating the water in the drilling

mud. A water vapour cloud 16 is therefore also indicated here and the separation stage 12b comprises a heater 17. Instead of losing the evaporated water in a water vapour cloud 16, it is also provided that the evaporated water is condensed back in a heat exchanger and then fed via the line 18 to the drilling fluid receptacle 19.

The third separation stage 12c is also connected to the drilling fluid receptacle 19 via a line 100. This third separation stage 12c is designed as a mechanically acting separation stage. In the case of a mechanically acting separation stage 12c, mechanical concepts are used which, for example, use gravity, different masses or different particle sizes of the components for a division/separation. The separation stage 12c therefore comprises, for example, one or more components from the following group: vibrating screen, cyclone, screens, shakers, centrifuges (although this list is not exhaustive). Cleverly, this separation stage also comprises a plurality of components of the group described above arranged one behind the other. The reference sign 5 denotes a pile of rubble of the soil and rock components which accumulate as bulk material and are produced in this separation stage 12c. This material can be reused, for example, as building material in road construction or as an additive in other applications.

The drilling fluid receptacle 19 stores new, ready-mixed drilling fluid intended for use, which is then filled into the transport vehicle 3, 3d if necessary, in order to transport the fluid to the construction site where the drilling device 2 is located.

A mixer 101 is provided in the drilling fluid receptacle 19, which ensures homogenisation of the prepared drilling fluid. A sensor 102 is provided which monitors the quality of the drilling fluid stored and in particular monitors the proportion of drilling fluid suspending agent. If the proportion of drilling fluid suspending agent is too low, then the drilling fluid suspending agent is replenished from the supply 103. This can also be done automatically. The mixer 101 ensures an even distribution of the newly introduced drilling fluid suspending agent.

In this overview, a tank vehicle is seen and shown as the means of transport 3, but without limiting the invention, in particular the system according to the invention, thereto. It is clear that instead of a tank vehicle as means of transport 3, a container transporter is also provided which unloads or loads the corresponding containers at the construction site or the treatment plant 1.

Patentkrav

1. Fremgangsmåde omfattende følgende trin:

- fyldning af en lagerbeholder (23) på et boreudstyr (2) med frisk borevæske, som leveres via et transportmiddel (3, 3a);
- tilførsel af den friske borevæske fra lagerbeholderen (23) under drift af boreudstyret (2) via en ledning (21) til afkøling og smøring;
- opfangning og indsamling af brugt borevæske som boreslam i en samler (20) via en ledning (22), indtil transportmidlet (3, 3b) henter det der, hvilket er det samme transportmiddel (3, 3a), som før har fyldt den friske borevæske i lagerbeholderen (23);
- derefter overførsel af boreslammet fjernet fra samleren (2) til en indgangsbunker (10) i et behandlingsanlæg (1) ved hjælp af transportmidlet (3, 3c);
- udførelse af en analyse af det leverede boreslam i et analysetrin (11), som er placeret før, i eller efter indgangsbunkeren (10);
- bestemmelse af hvordan det leverede boreslam behandles ved hjælp af forskellige adskillelsestrin (12, 12a, 12b, 12c) baseret på analyseresultatet,
  - hvor en afløbsledning (13) er forbundet til indgangsbunkeren (10) ved udgangssiden, til hvilken ledning de forskellige adskillelsestrin (12, 12a, 12b, 12c) kan forbindes via spærreventiler (14a, 14b, og 14c),
  - hvor analysetrinnet (11) arbejder automatisk og påvirker de respektive spærreventiler (14a, 14b, og 14c) ved hjælp af tilsvarende tilpasningselementer, og således tillader en automatiseret strøm af boreslammet;
  - hvor de forskellige adskillelsestrin (12, 12a, 12b, 12c) er placeret langs afløbsledningen (13), hvilke adskillelsestrin anvendes svarende til forureningsgraden af det leverede boreslam,
    - hvor det første adskillelsestrin (12a) anvendes til stærkt forurenet eller kontamineret boreslam,
    - det andet adskillelsestrin (12, 12 b) i strømningsretningen af boreslammet i afløbsledningen (13) anvendes til mindre forurenet eller kontamineret boreslam, og

▪ det sidste adskillelsestrin (12,12 c) tilvejebringer kun en mekanisk domineret adskillelse af jord- og stenbestanddele fra boreslam, som i sig selv ikke er kontamineret,

▪ hvor de forskellige koncepter til behandling eller adskillelse af boreslam leveret til adskillelsestrinnene (12, 12a, 12b, 12c) adskiller sig fra hinanden;

◦ hvor det første adskillelsestrin (12, 12 a) konditionerer boreslammet på en sådan måde, at det kan lagres i et deponeringsanlæg (4), hvor konditioneringen udføres ved tilsætning af et bindemiddel over et fyldningsområde (15) i adskillelsestrinnet (12a), og bindemidlet fører til en betonlignende sammensætning af boreslammet, fra hvilken forurenende stoffer ikke længere kan vaskes ud;

◦ hvor det andet adskillelsestrin (12b) er udformet som et termisk adskillelsestrin og reducerer massen og volumenet af boreslammet ved fordampning af vandet i boreslammet, hvor adskillelsestrinnet (12b) omfatter en varmeinstallation (17), hvor det er tiltænkt, at fordampet vand kondenseres tilbage i en varmeveksler og derefter føres via en ledning (18) til en borevæskebeholder (19);

◦ hvor det tredje adskillelsestrin (12c) er forbundet til borevæske-beholderen (19) via en ledning (100) og er udformet som et mekanisk virkende adskillelsestrin, hvor jord- og stenbestanddele genereret i dette tredje adskillelsestrin (12c) danner en grusbunke (5) som bulkmateriale;

- tilvejebringelse af ny, færdigblandet borevæske beregnet til anvendelse med borevæskebeholderen (19), som derefter fyldes i transportkøretøjet (3, 3d), hvis det er nødvendigt, for at transportere væsken til anlægsområdet, hvor boreudstyret (2) er placeret, hvor en blander (101) er tilvejebragt i borevæskebeholderen (19), hvilken blander sikrer homogenisering af den forberedte borevæske, hvor en sensor (102) er tilvejebragt, som overvåger kvaliteten af den lagrede borevæske.

2. Fremgangsmåde ifølge krav 1, **kendetegnet ved, at** bindemidlet i det første adskillelsestrin (12 a) er kalk, cement eller en kalk-cement-blanding.

3. Fremgangsmåde ifølge et af kravene 1 eller 2, **kendetegnet ved, at** mindst et mekanisk koncept fra følgende gruppe anvendes i det mekanisk virkende tredje adskillelsestrin (12c): anvendelse af tyngdekraft, forskellige masser eller forskellige partikelstørrelser af bestanddelene til en opdeling/adskillelse.

4. Fremgangsmåde ifølge krav 3, **kendetegnet ved, at** det tredje adskillelsestrin (12 c) omfatter en eller flere komponenter fra følgende gruppe: rystesigte, cyklon, sigter, rystere, centrifuger.

5. Fremgangsmåde ifølge krav 4, **kendetegnet ved, at** det tredje adskillelsestrin (12 c) omfatter flere, efter hinanden indrettede komponenter fra gruppen beskrevet ovenfor.

6. Fremgangsmåde ifølge et af de foregående krav, **kendetegnet ved, at** materialet i grusbunken (5), forekommende som bulkmateriale, fra det tredje adskillelsestrin (12c) genanvendes som byggemateriale i anlæg af veje eller som tilslagsstof i andre anvendelsesmuligheder.

7. Fremgangsmåde ifølge et af de foregående krav, **kendetegnet ved, at** sensoren (102) overvåger andelen af borevæskesuspensionsmiddel, hvor, hvis andelen af borevæskesuspensionsmiddel er for lav, efterfyldes borevæskesuspensionsmidlet fra et lager (103), og blanderen (101) sikrer en ensartet fordeling af det nyligt indførte borevæskesuspensionsmiddel.

8. Behandlingsanlæg (1) til behandling af boreslam stammende fra en jordboring, hvor behandlingsanlægget (1) har mindst en indgangsbunker (10), mindst et bearbejdnings- og adskillelsestrin (12, 12a, 12b, 12c) til adskillelse af jord- og stenbestanddele fra boreslammet og en borevæskebeholder (19), hvor et analysetrin (11) er tilvejebragt i boreslammets transportretning før, i eller efter indgangsbunkeren (10), og boreslammet føres til forskellige bearbejdnings- og adskillelsestrin (12, 12a, 12b, 12c) til behandling afhængigt af analyseresultatet, **kendetegnet ved, at**

- et første adskillelsestrin (12, 12a) er tilvejebragt til konditionering af stærkt forurenet boreslam, og det første adskillelsestrin (12, 12a) har et påfyldningsområde (15) til tilsætning af et bindemiddel, hvor bindemidlet

især er kalk, cement eller en kalkcementblanding, og bindemidlet er beregnet til at omdanne boreslammet til en betonlignende sammensætning, og

- et andet adskillelsestrin (12b) er tilvejebragt, hvilket er udformet som et termisk adskillelsestrin og omfatter en varmeinstallation (17), hvor det andet adskillelsestrin (12b) er tilvejebragt til at fordampe vand i boreslammet, og

- et tredje adskillelsestrin (12c) er tilvejebragt, som er udformet som et mekanisk virkende adskillelsestrin, og som omfatter en eller flere komponenter fra følgende gruppe: rystesigte, cyklon, sigte, ryster, centrifuge, hvor det tredje adskillelsestrin (12c) er beregnet til at adskille jord- og stenbestanddele fra boreslam, som ikke i sig selv er kontamineret, og det tredje adskillelsestrin (12c) er forbundet med borevæskebeholderen (19) via en ledning (100).

9. System til behandling og mindst delvis genanvendelse af boreslam stammende fra en jordboring, som især anvendes til udførelse af fremgangsmåden ifølge et af kravene 1 til 7, hvor systemet omfatter et behandlingsanlæg (1) ifølge krav 8, et boreudstyr (2), som indsamler boreslammet i en samler (20), og et transportmiddel (3), som tjener til at transportere borevæsken lagret i behandlingsanlægget (1) til boreudstyret (2) ved placeringen af jordboringen, og, med boreudstyret (2), at transportere boreslam indsamlet i samleren (20) til behandlingsanlægget (1).

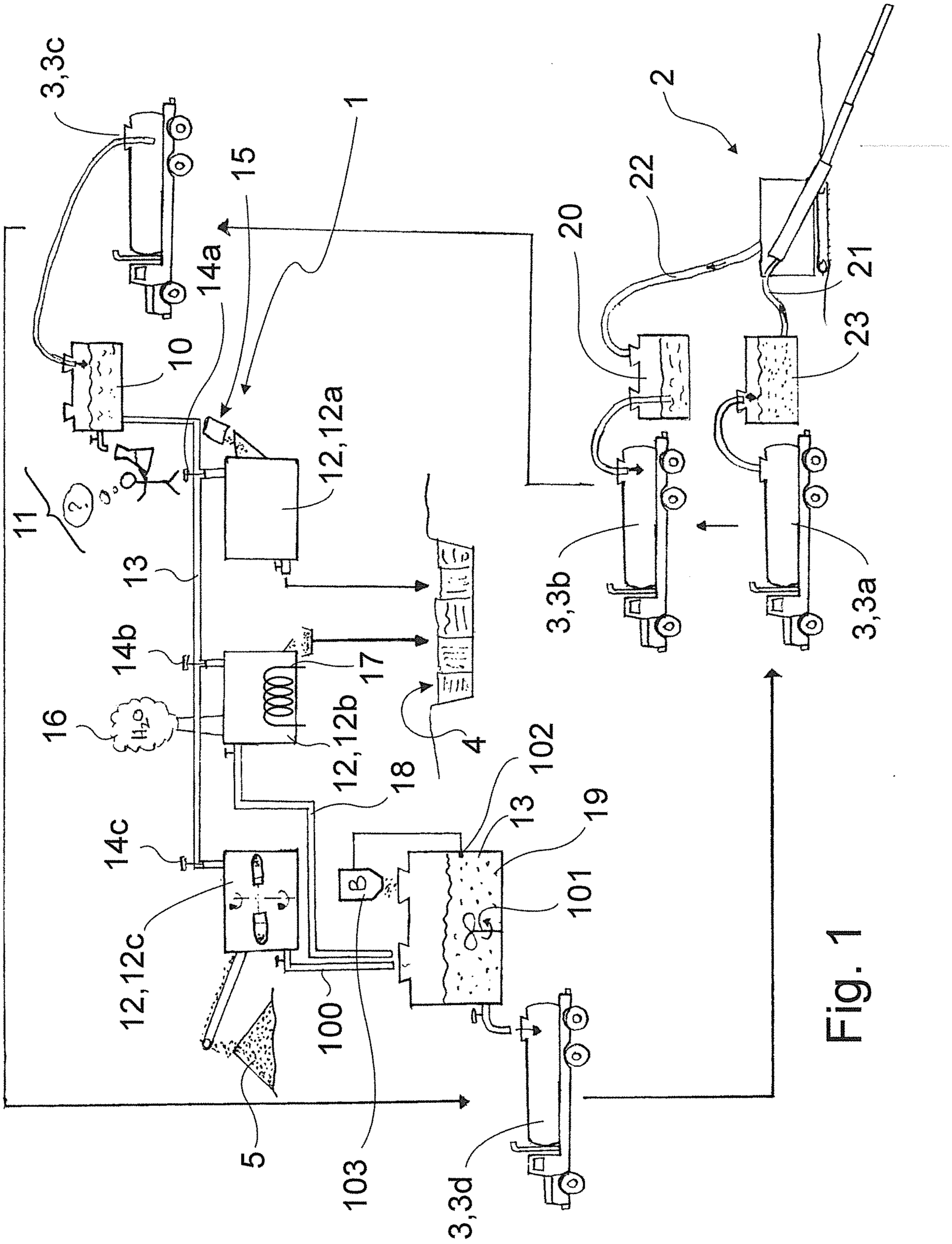
3,3c
15
1
14a
10
12,12a
11
13
14b
17
16
12,12b
18
14c
102
13
19
12,12c
101
100
5
103
3,3d
2
22
20
21
23
3,3b
3,3a
4

Fig. 1