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(74)

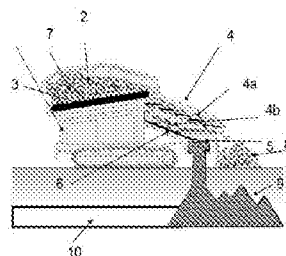
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(54)

Apparatus for backfilling a trench.

(57)

Apparatus for backfilling a trench and, more particularly, to apparatus for laying a pipeline bed layer in a trench and for laying a pipeline bedding layer once a pipeline is laid in the trench. The apparatus comprises a multi-deck screen vibrating unit (4). The upper deck screen (4a) comprises finger tines (31) or a grizzly arrangement (41).



Apparatus for backfilling a trench.

The present invention relates in general to apparatus for backfilling a trench and, more particularly, to apparatus for laying a pipeline bed layer in a trench and for laying a pipeline bedding layer once a pipeline is laid in the trench.

Such a device is known from United States Patent US5259699. The known apparatus comprises a feed hopper in which backfilling material can be supplied, a first feeder conveyor for conveying the material from the feeder hopper to a vibrating double decked screen unit, with the upper screen element being of a coarser mesh than the lower screen element. The double decked screen is vibrated.

A second longitudinally extendable and retractable bedding (fines) conveyor is situated beneath the vibrating screen and receives the fine particulate fraction of the original fill material which has passed through the lower screen element.

The extendable and retractable conveyor is translated by a suitable expansible drive means such as hydraulic cylinders, or the like, whose stroke length may be but is not required to be sufficient to traverse the width of the pipeline trench to be backfilled.

The material used for filling the trench may be for instance clay, if the trench is laid in an area in which the ground in which the pipeline is laid is of clay or clay-like.

Clay and especially wet clay is cloggy and tends to clogg up the screens.

It is an object of the invention to provide an improved apparatus for backfilling a trench.

The apparatus according to the invention is characterized in that the multi-decked vibrating screen unit comprises an upper deck with cascaded finger tines or a grizzly screen deck.

The vibrating finger tines or grizzly deck break up clay clumps, thereby preventing or reducing clogging up either the upper or lower deck screen.

In preferred embodiments the upper deck screen comprises at an end facing the first conveyor a grizzly structure and at an end remote from the feeding conveyor finger tines.

The part of the upper deck screen facing the feeder conveyor receives the heaviest material and hardest blows and shaping his part in the form of a grizzly reduces the risk of damage.

5 The feeding conveyor for feeding the material from the hopper to the vibrating screen unit may be a conveyor belt or a steel plate apron feeder.

Preferably a lower deck screen below the upper deck screen comprises a series of cascade bars, smaller in size and at a smaller distance to each other than the finger tines.

10 These and further aspects of the invention are described below and illustrated by means of the drawing:

The figures contained in the drawing show the following:

15 Fig. 1 shows a perspective front view of an apparatus according to the invention

Fig. 2 shows the apparatus of figure 1 in cross section

Fig. 3 shows an upper deck with finger tines

Fig. 4 shows an upper deck in a grizzly arrangement

Fig. 5 shows a lower deck with a cascade bar arrangement

20 Fig. 6 shows a steel plate apron feeder

Fig. 7 shows a selfcleaning bottom deck screen mesh

The figures are not drawn to scale; as a rule, like numerals denote like elements.

25 Figurer 1 illustrates an apparatus according to the invention.

There is a high demand for the laying of underground piping to transport liquids or gas. To lay a pipe of this type, an excavation is usually first made with a back hoe excavator with the excavated rocks and soil piled to one side of the excavation.

30 Once the trench for the laying of a pipeline has been excavated and water has been extracted, backfilling can commence as proper bedding needs to be put in place before the pipe can be laid.

The layers of back fill can be made of different materials and the main backfill itself can be composed of several layers of different materials. Fine soil is used close to the pipe so as not

to damage it and eliminate the risk of rock-to-pipe contact. It is crucial for all the backfill layers close to the pipe to be carefully installed as the soil settlement caused by the load of the main backfill could lead to excessive pressure on the pipe causing deformation. A properly backfilled pipeline trench can considerably extend a pipeline's lifespan.

- 5 The financial, environmental, social and logistical problems associated with the importation of selective bedding and backfill materials have contributed to the drive to reuse the excavated material with a positive impact on the cost of projects.

This process is known as padding and, in the past, was a time consuming and expensive stage of laying an underground pipeline.

- 10 The padding machine separates the fine material out of spoil which is piled alongside the trench excavation and transports it by conveyor into the excavation, thereby padding the pipeline.

The types of spoil generated during excavation depend on location, depth, and the method used and frequently includes wet sticky material, large boulders or large frozen lumps of soil. There has existed a long and unfilled need for a padding machine which is adaptable to various types of excavated material and is effective in demanding screening conditions.

The present invention aims to provide such an apparatus

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The apparatus 1 for backfilling a trench and, more particularly, to apparatus for laying a pipeline bed layer in a trench and for laying a pipeline cover layer once a pipeline is laid in the trench comprises a feed hopper 2. A first conveyor 3, which may be a conveyor belt or a steel plat apron, is provided for feeding the material to the multi-deck vibrating screen unit 4.

- 25 Below the vibrating screen unit 4 a second conveyor 5 is situated for bringing the material exiting the vibrating screen unit 4 to back fill the trench. The device is in this example self-propelled and provided with caterpillar tracks. The apparatus moves along a trench in which for instance a pipeline is provided. Material is provided in the feeder hopper and padding material is via the conveyor brought in the trench to cover the pipeline. The apparatus moves
30 along the trench.

The first conveyor or feeder 3 may be for example:

Belt feeder: This is a continuous flat, rubber conveyor belt between two drums and supported on idlers. They can be variable speed and are recognised as being highly accurate means of

controlling flow rates.

Apron feeder: This type of feeder is heavy duty, robust and designed to handle heavy shock loads and wet sticky materials.

- 5 The side conveyor 5 is preferably retractable and can fold up on both sides for transporting. A for example 800 mm wide belt is speed controlled, can extend on either side and is equipped with a hydraulic adjustable head deflector. These features facilitate adjusting the material flow and direction into the trench.
- 10 Fig.2 shows that the multi-deck vibrating screen unit comprises more than one, in this example two, screens decks, an upper deck screen 4a and at least one lower deck screen 4b. The material that passes the lowest deck screen 4b slides down the bottom side 6 of the unit 4. In embodiments there could be a third conveyor for these purposes in the unit. The material 7 that is fed into the hopper 2 is segregated into waste material 8 and filler material 9. Said filler
- 15 material 9 is via second conveyor 5 filled in the trench in which in this example a pipeline 10 is present. The pipeline 10 is covered with material 9. The apparatus is provided with vibrating means for vibrating the multi-deck vibration unit (4).

- Figure 3 shows a preferred embodiment of the upper deck screen of the apparatus according to the invention. In this embodiment the upper deck screen comprises finger tines 31. A
- 20 number of rows of finger tines 31 in a cascade arrangement are provided.

Finger bar screens operate as a linear or circular vibrating screen. The top deck finger tines are preferably made from high quality abrasion resistant material capable of taking the abuse other padding machines throw directly on the main screen deck.

- 25 This deck is designed to eliminate clogging and sift out hard, potentially damaging, large boulders and wet sticky clay.

This protects the lower screen deck from impact damage and greatly reduces the possibility of large/oversize boulders penetrating the screen cloth and contaminating the padding material with costly consequential damage to the pipe.

- 30 Finger tines form a large number of vibrating elements, compared to a grizzly arrangement as shown in figure 4, which vibrates more like a single entity. The multitude of vibrating elements formed by the vibrating finger tines have the beneficial effect of a fast break-up of material thrown on the upper deck screen. This is particularly advantageous when wet material, in particular wet clay is being used for padding.

Figure 4 shows an upper deck screen in a grizzly arrangement. A number of grizzly bars 41 is provided in a cascade arrangement. Grizzly Screens consist of parallel bars, are robust, vibrating, linear-motion and are designed for heavy-duty scalping, and the removal of finer product from the feed material.

Figure 5 shows a lower deck screen of an embodiment of the invention.

In this embodiment the lower deck screen is provided with a series of cascade bars 51, smaller in size and at smaller distance to each other than the finger tines 31. This is a preferred embodiment. The lower deck screen may alternatively be formed of a woven wire mesh; Woven wire mesh is versatile and is a good choice for applications that require precision and strength.

Figure 6 shows a steel plate apron feeder. In embodiments this is used for feeding the material from the hopper 2 to the vibrating screen unit 4.

Figure 7 shows a lower deck screen comprising a self cleaning bottom deck screen Mesh. This is particularly useful when the filling material is wet clay.

The combination of an upper deck comprising rows of finger tines as shown in figure 3 and a lower deck having cascaded bars 51 as shown in figure 5 is most efficient.

The invention is also related to a method of backfilling a trench and, more particularly, of laying a pipeline bed layer in a trench and in particular laying a pipeline covering layer once a pipeline is laid in the trench.

In said method material is fed into a feeding hopper, transported from the feeding hopper to a multi-deck vibrating unit, segregated in the multi-deck vibrating unit and filled in a trench, wherein segregation of the material in the multi-screen vibrating unit is performed using a multi-screen vibrating unit wherein the multiscreen vibrating unit is used comprising an upper screen comprising finger tines or a grizzly arrangement. In preferred embodiments an upper deck screen is used which has a grizzly arrangement close to the feeding conveyor, and finger tines further away from the feeding conveyor. In preferred embodiments a lower deck screen. Preferably said apparatus is a self-propelled apparatus.

It will be clear that the invention is not limited to the examples provided here. Any combination of features may be used.

Conclusies:

1. Apparaat (1) voor het vullen van een geul bevattende een laadbak (2), een vibratie eenheid (4) met twee of meer schermen, een eerste transportmiddel (2) om
5 materiaal van de laadbak (2) naar de vibratie eenheid (4) te brengen, en een tweede transportmiddel (5) om materiaal vanuit de vibratie eenheid (4) naar een te vullen geul te brengen, met het kenmerk, dat de vibratie eenheid (4) een bovenste scherm (4a) bevat dat vingerpunten (31) of een grizzly scherm (41) bevat.
2. Apparaat volgens conclusie 1, met het kenmerk, dat de het bovenste scherm (4a)
10 een grizzly opstelling bevat dichtbij het eerste transportmiddel (5) en vingerpunten verder weg van het eerste transportmiddel.
3. Apparaat volgens conclusie 1 of 2, met het kenmerk, dat de vibratie eenheid een onderscherm (4b) bevat dat een cascade opstelling met staven (51) bevat, waarbij
15 de staven kleiner zijn dan en op een kleinere afstand van elkaar zijn opgesteld dan de vingerpunten of de grizzly-delen van het bovenste scherm (4a).
4. Werkwijze voor het vullen van een geul waarbij materiaal (7) in een laadbak (2) wordt gebracht, vanuit de laadbak (2) naar een vibratie eenheid (4) met twee of
meer schermen wordt getransporteerd, in de vibratie eenheid (4) gescheiden wordt
20 en een vibratie eenheid wordt gebruikt bevattende een bovenste scherm (4a) dat vingerpunten of een grizzly scherm bevat, waarna het materiaal naar een geul wordt getransporteerd door een transportmiddel en daarin wordt aangebracht.
5. Werkwijze volgens conclusie 4, waarbij eerst in een geul een pijpleiding wordt gelegd en het afgescheiden materiaal op de pijpleiding wordt aangebracht.

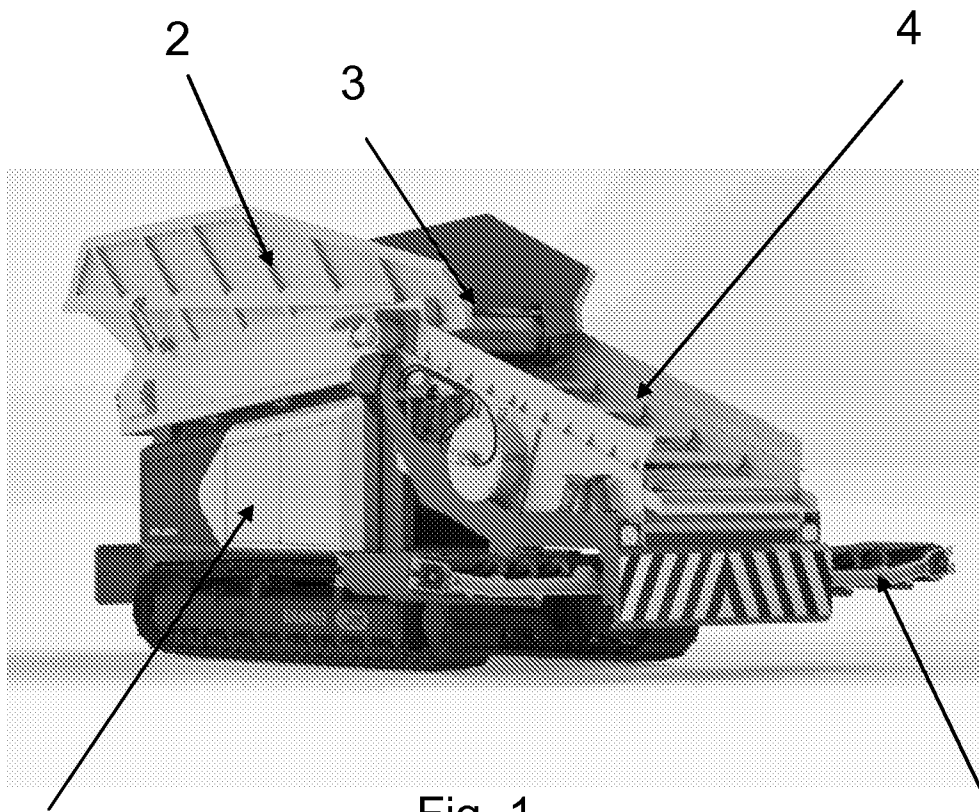


Fig. 1

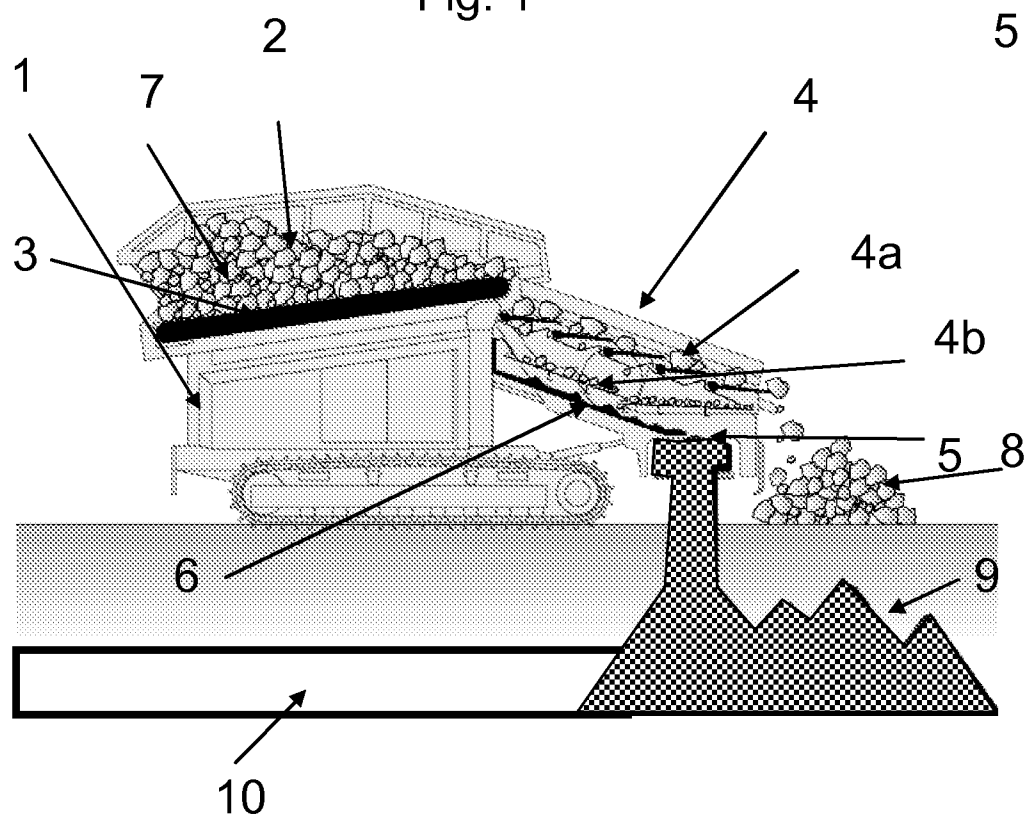


Fig. 2

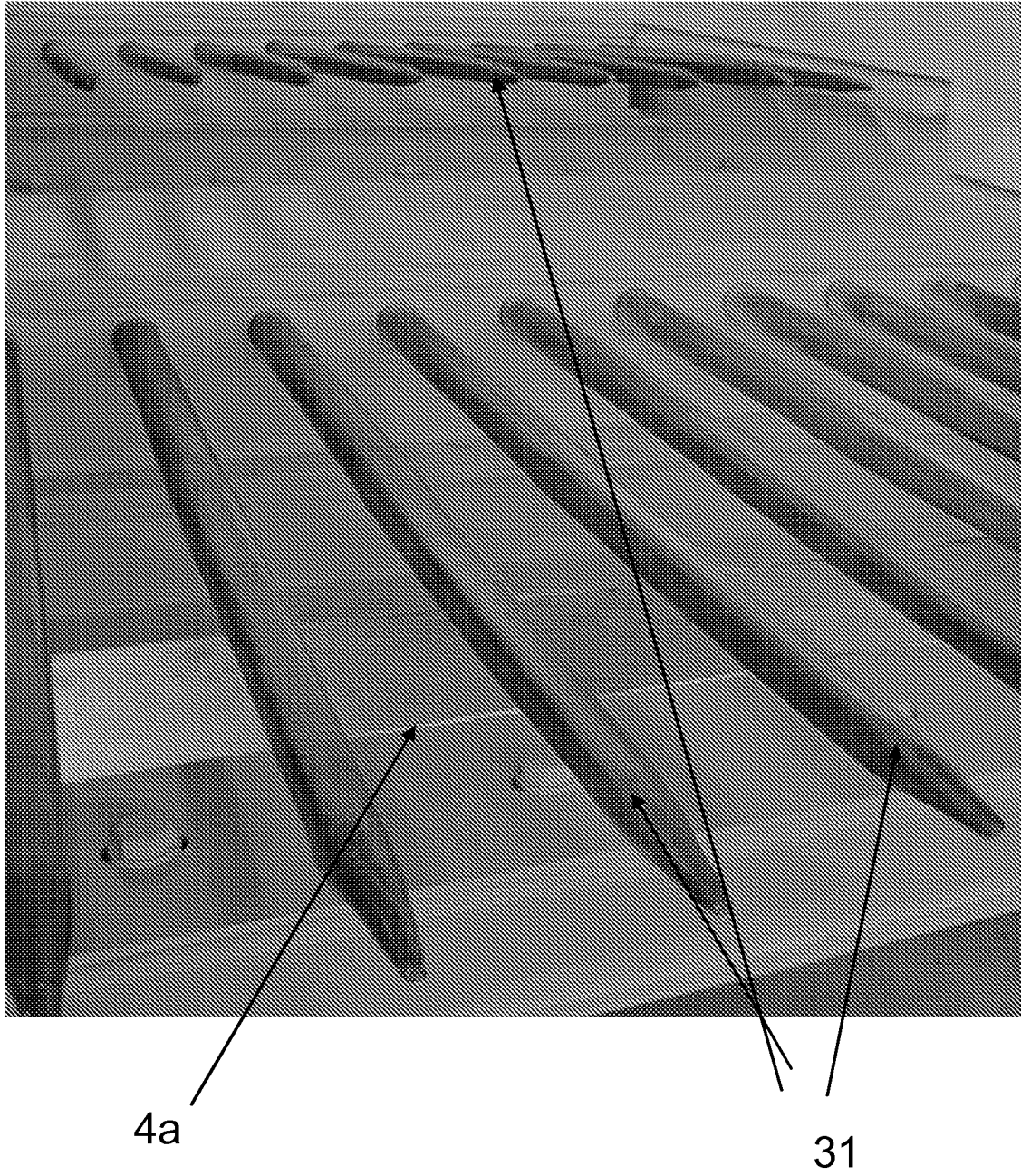


Fig. 3

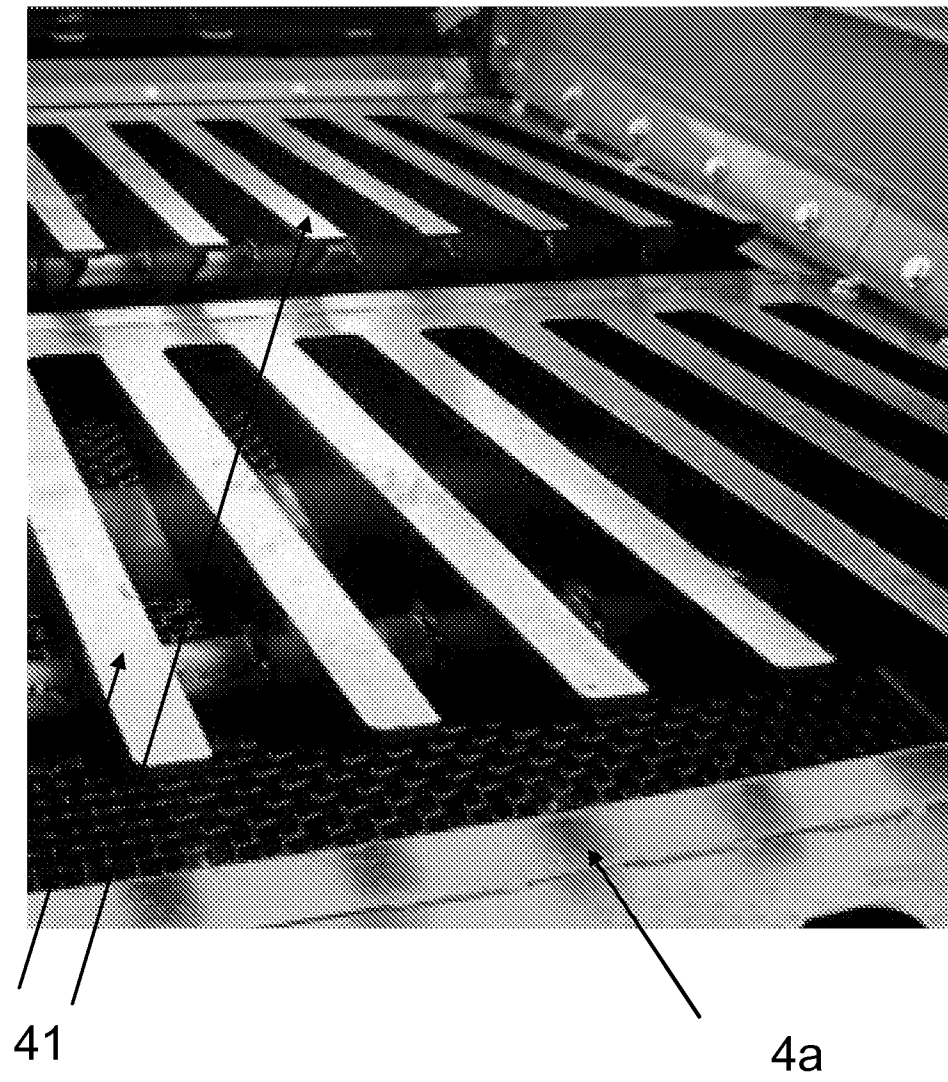
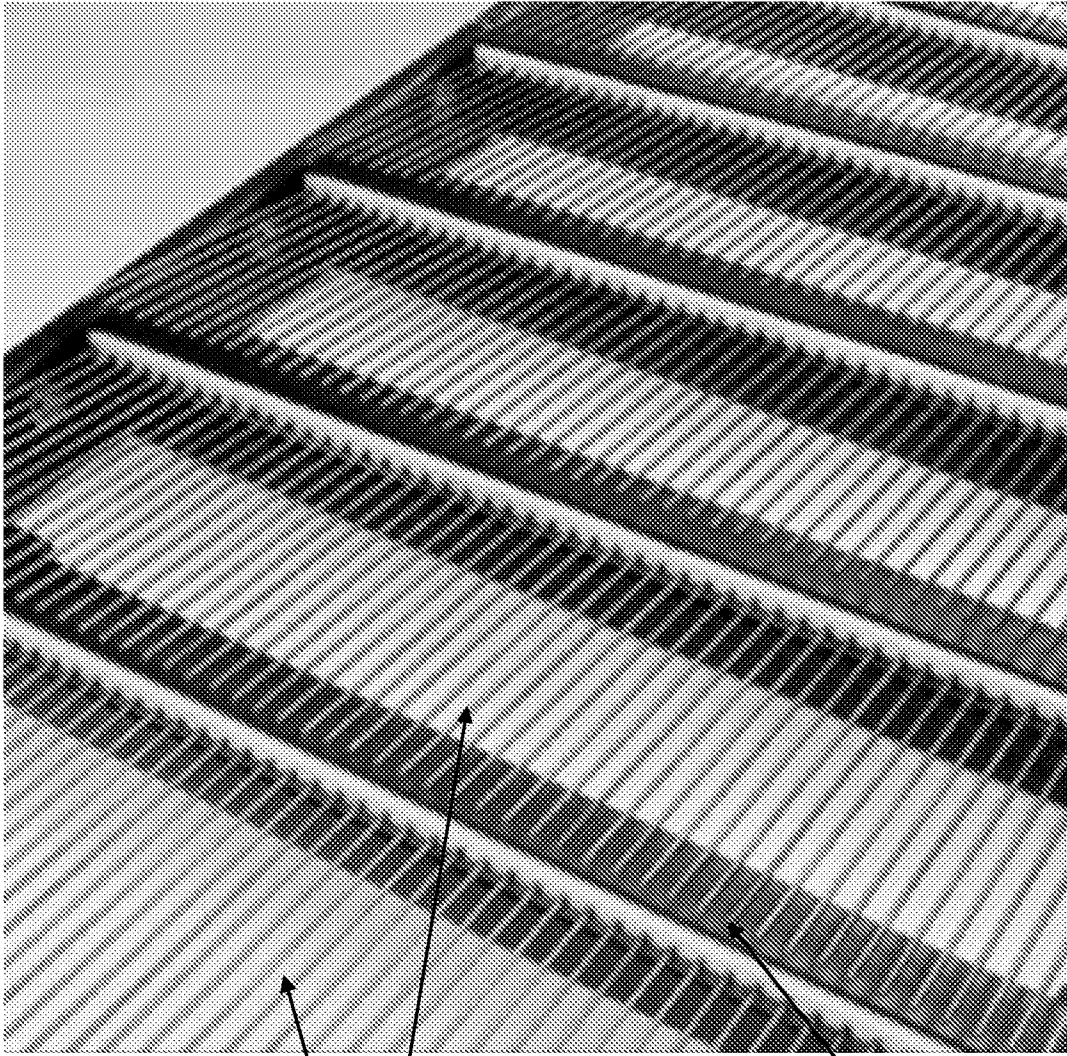


Fig. 4



51

Fig. 5

4b

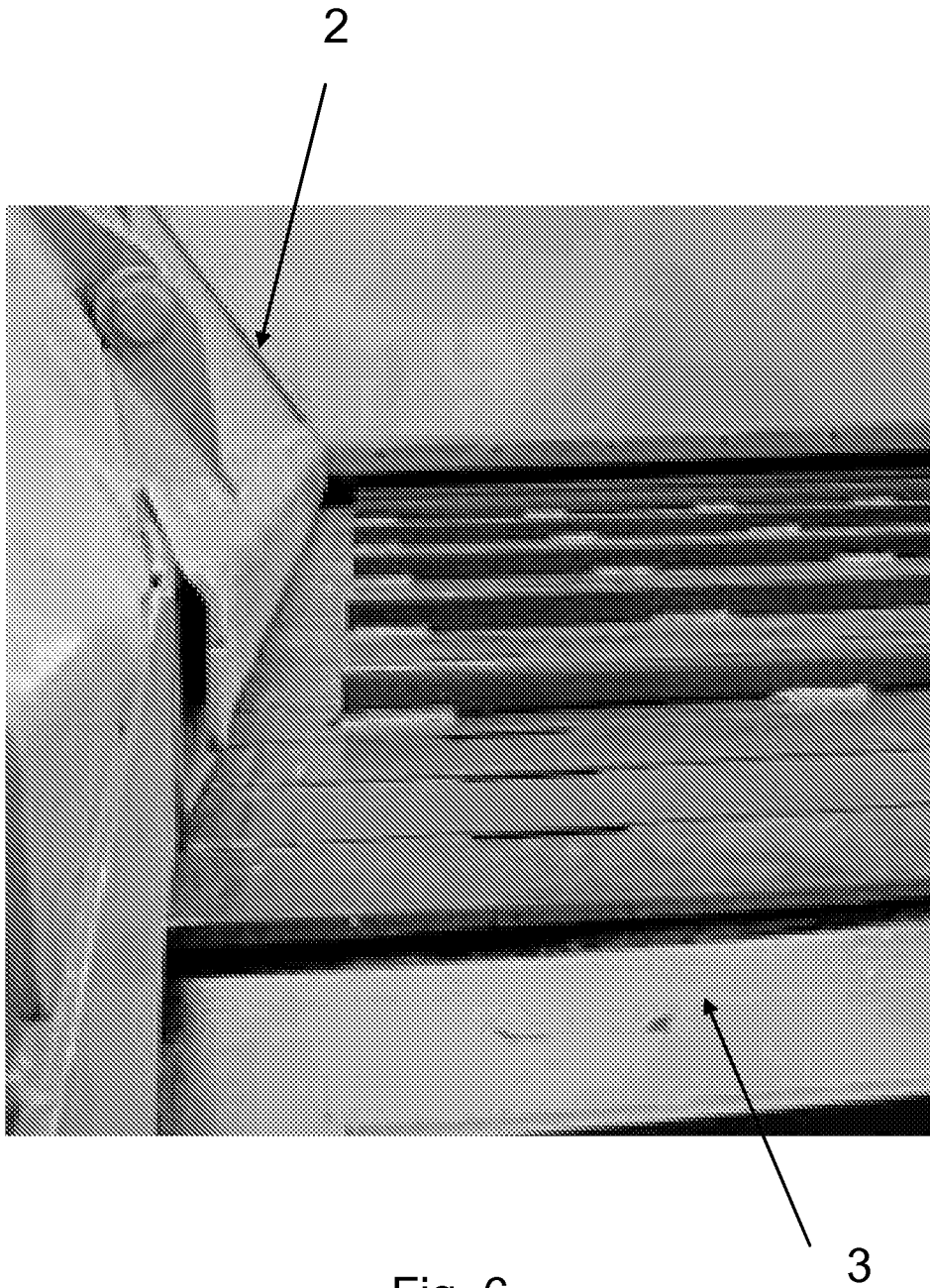
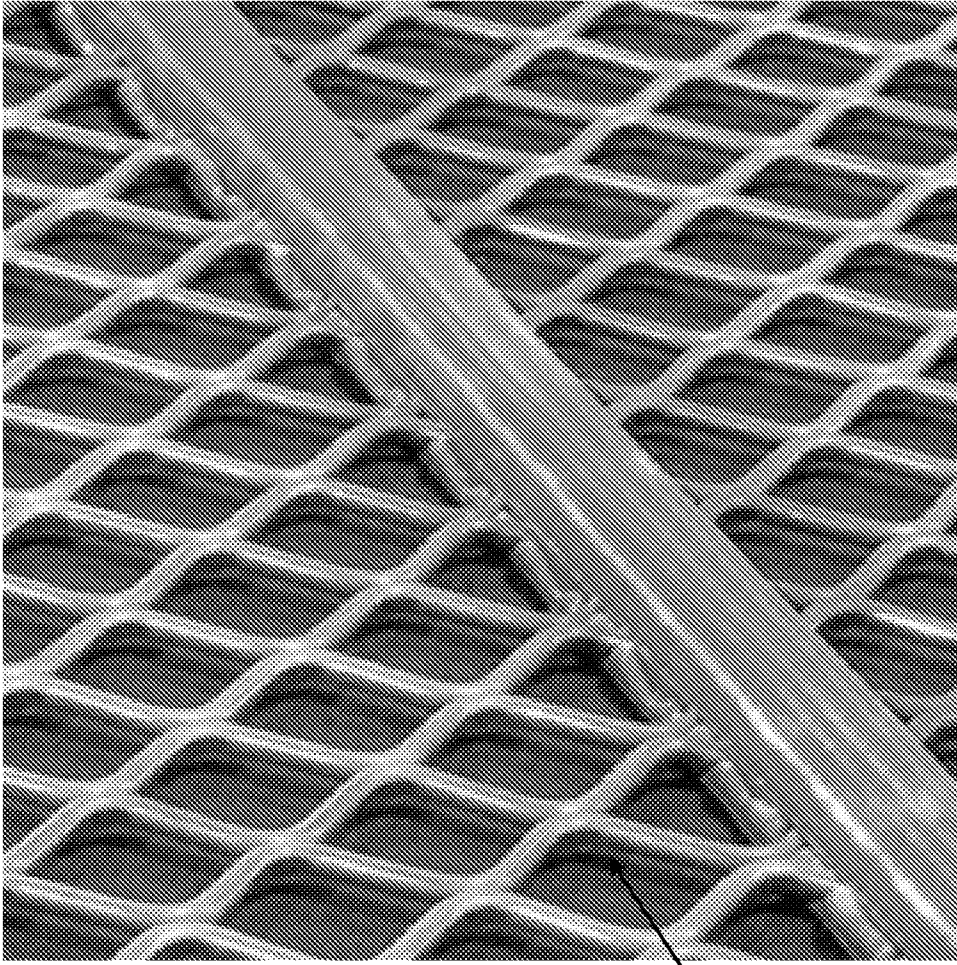


Fig. 6



4b

Fig. 7

Abstract:

Apparatus for backfilling a trench and, more particularly, to apparatus for laying a pipeline
bed layer in a trench and for laying a pipeline bedding layer once a pipeline is laid in the
5 trench. The apparatus comprises a multi-deck screen vibrating unit (4). The upper deck screen
(4a) comprises finger tines (31) or a grizzly arrangement (41).

Figure 2

SAMENWERKINGSVERDRAG (PCT)

RAPPORT BETREFFENDE NIEUWHEIDSONDERZOEK VAN INTERNATIONAAL TYPE

IDENTIFICATIE VAN DE NATIONALE AANVRAGE	KENMERK VAN DE AANVRAGER OF VAN DE GEMACHTIGDE
	XROK1
Nederlands aanvraag nr.	Indieningsdatum
2016528	31-03-2016
	Ingeroepen voorrangsdatum
Aanvrager (Naam)	
XROK Industries Ltd.	
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.
06-08-2016	SN67070
I. CLASSIFICATIE VAN HET ONDERWERP (bij toepassing van verschillende classificaties, alle classificatiesymbolen opgeven)	
Volgens de internationale classificatie (IPC)	
E02F5/00	
II. ONDERZOCHE GEBIEDEN VAN DE TECHNIEK	
Onderzochte minimumdocumentatie	
Classificatiesysteem	Classificatiesymbolen
IPC	E02F;F16L;B07B
Onderzochte andere documentatie dan de minimum documentatie, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen	
III.	☐
GEEN ONDERZOEK MOGELIJK VOOR BEPAALDE CONCLUSIES	
(opmerkingen op aanvullingsblad)	
IV.	☐
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 2016528

A. CLASSIFICATIE VAN HET ONDERWERP
INV. E02F5/22
ADD.

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 F16L B07B

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, WPI Data

C. VAN BELANG GEACHTE DOCUMENTEN

Categorie *	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
X	US 5 183 160 A (MCCLAIN RAY [US]) 2 februari 1993 (1993-02-02) * kolom 4 - kolom 6; figuren 5-7 *	1,3-5
X	GB 2 468 966 A (POWERSCREEN INT DISTRIBUTION [GB]) 29 september 2010 (2010-09-29) * bladzijde 5; figuren *	1-4
A,D	US 5 259 699 A (KLAMAR EDWARD J [US]) 9 november 1993 (1993-11-09) in de aanvraag genoemd * het gehele document *	1,4

☐ Verdere documenten worden vermeld in het vervolg van vak C.

☒ Leden van dezelfde octrooifamilie 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

"Z" lid van dezelfde octrooifamilie of overeenkomstige octrooipublicatie

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

24 november 2016

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

Laurer, Michael

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

Informatie over leden van dezelfde octrooifamilie

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

NL 2016528

In het rapport genoemd octrooigeschrift	Datum van publicatie	Overeenkomend(e) geschrift(en)	Datum van publicatie
US 5183160	A	02-02-1993	GEEN
GB 2468966	A	29-09-2010	GEEN
US 5259699	A	09-11-1993	GEEN

WRITTEN OPINION

File No. SN67070	Filing date (day/month/year) 31.03.2016	Priority date (day/month/year)	Application No. NL2016528
International Patent Classification (IPC) INV. E02F5/22			
Applicant XROK Industries Ltd.			

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 Laurer, Michael

WRITTEN OPINION

Application number

NL2016528

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
	No: Claims	1, 3-5
Inventive step	Yes: Claims	
	No: Claims	1-5
Industrial applicability	Yes: Claims	1-5
	No: Claims	

2. Citations and explanations

see separate sheet

WRITTEN OPINION

Application number

NL2016528

Box No. VII Certain defects in the application

see separate sheet

Box No. VIII Certain observations on the application

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement

1 Novelty and inventive step

Independent claim 1

- 1.1 In the terms of independent claim 1, US-A-5183160 (=D1) discloses een apparaat (*figures 5, 6 and 7*) voor het vullen van een geul (*D, figure 5*) bevattende een laadbak (*51, figure 7*), een vibratie eenheid (*50, 61, 63, 67*) met twee of meer schermen (*61 and 67 in figure 7*), een eerste transportmiddel (*inclined hopper walls 51 in figure 7*) om materiaal van de laadbak (*51*) naar de vibratie eenheid (*50, 61, 63, 67*) te brengen, en een tweede transportmiddel (*90, 110*) om materiaal vanuit de vibratie eenheid (*50, 61, 63, 67*) naar een te vullen geul (*D in figure 5*) te brengen (*see discharge end 115 in figure 5*), waarbij de vibratie eenheid (*50, 61, 63, 67*) een bovenste scherm (*61 in figure 7*) bevat dat een grizzly scherm (*61*) bevat.

All the claimed features of one alternative of claim 1 are known from D1.

Thus, the claimed subject-matter may not be regarded as novel.

- 1.2 GB-B-2468966 (=D2) shows the other alternative of independent claim 1 with a multi-deck screening device 10 in figure 1 clearly showing a finger or tine screen deck at 16 of figure 1 in the upper deck.

- 1.3 The features of the following claims do not contribute to novelty:

Claim 3:

D1 and D2 at least implicitly show a second deck with a vibrating screen 67 in figure 7 of D1 which may be a cascading finger screen as suggested and explicitly shown in D2 figures. D2 mentions a mobile multi-deck screener without explicitly stating which kind of screen is really utilised in the lower section. Implicitly one of the lower screens is regarded as the finger screen having a smaller mesh size than the upper screen.

- 1.4 The features of the following claim do not contribute to an inventive step:

Claim 2:

To place an impact resistant grizzly adjacent to the entry to the screening section 16 in figure 1 of D2 is a straightforward possibility for the skilled person starting from D2 and wishing to provide better impact resistance to the screening unit 16.

Independent claim 4

- 1.5 The disclosures of D1 and D2 also anticipate the claimed method of claim 4. Reference is made to the arguments held against claim 1.
- 1.6 The features of the following claims do not contribute to novelty:
Claim 5:
D1 figure 5 shows the claimed pipeline "P" which is placed in the ditch "D" before refilling.

Re Item VII

Certain defects in the application

- 2 Independent claim 1 is not in the two-part form, which in the present case would be appropriate, with those features known in combination from the prior art (D1) being placed in the preamble and the remaining features being included in the characterising part.
In the present case, the features, as outlined before, are known in combination from D1 and/or D2 belong in the preamble of such a claim.
- 3 The relevant background art disclosed in D1 and D2 is not mentioned in the description, nor is this document identified therein.

Re Item VIII

Certain observations on the application

- 4 In independent claim 1 the "upper deck screen" 4a ("bovenste scherm") is defined as being provided with "finger tines ("vingerpunten") or a "grizzly" as alternatives, wherein in claim 2 the upper deck screen comprises a grizzly and finger tines. Thus, the relation "and/or" ("en/of") would be better to convey the intended meaning in claim 1.