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(54) **METHOD AND AN ARRANGEMENT FOR EARTH SEPARATION AND LOADING**

VERFAHREN UND VORRICHTUNG ZUR ABTRENNUNG UND LADUNG VON ERDE

PROCEDE ET AGENCEMENT D'ENLEVEMENT ET DE CHARGEMENT DE TERRE

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(56) References cited:
AU-B- 427 389 **CH-A- 464 094**
DE-A- 3 503 915 **US-A- 1 386 987**
US-A- 4 180 927

EP 0 914 525 B1

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Description

[0001] The method of earth separation and loading and the arrangement for application of this method may be utilised in various types of excavators and loaders, picking up crushed material, store in dumps and transferring it to means of transport of various types.

[0002] Known face-shovel excavators separate the output from the subsoil with an upward motion of the bucket and therefore lumps of soil, separated with bucket blades or teeth, drop inside the bucket. Emptying the bucket is accomplished in various ways. In single bucket excavators, the bucket, after filling, is lifted upwards and then the superstructure of the machine, together with the bucket, rotates in order to place the bucket above the designated means of transport. After opening the bottom flap of the bucket, the output is discharged, usually into an open body of a road vehicle. After another rotation of the excavator superstructure and lowering the bucket, the latter begins to move upwards, separating another portion of soil. In multi-bucket excavators buckets are mounted on the bucket wheel or circular chain and, after separation of appropriate amount of soil, lift the output to a considerable height and due to that, the output pours off onto continuous duty belt conveyor situated nearby, which subsequently transfers the output to the means of transport or to a dump. Single-bucket undershot excavators are mainly used to dig soil below the level, on which the excavator moves. In such case they also cut soil in an upward direction. These excavators are also used for cutting soil above the level, on which the excavator moves. Contrary to the previous cases the cutting is performed with an downward motion, whilst in the last part of the cycle, the bucket performs a scraping turn whereby it is filled with output. After lifting the bucket and rotating the excavator superstructure, the output is discharged onto the means of transport, due to another rotation of the bucket in relation to the extension arm.

[0003] The said single-bucket excavators feature two major flaws:

- high cut resistance /face-shovel excavators/,
- low productivity in relation to weight, due to cycle operation instead of continuous operation.

[0004] Multi-bucket excavators have the following flaws:

- high out resistance,
- high bucket wheel weight /or extension arm frame with chain/ resulting in excessive weight of the entire excavator.

[0005] The valid cutting theory has it that cut resistance depends, by large, on the soil category. In fact, as proved by research conducted by the author, this resistance depends, to a much larger extent, on the separation method, whereas the internal friction of the material being separated is decisive. The internal friction depends to a large extent, on the density of the material and the pressure, to which the separated layer is subjected. And therefore upward cut takes place under a high pressure of material, situated above the layer being cut, what results in excessive energy consumption. Rational soil separation should be accomplished at a minimum load of the layer being out. This can only be accomplished with a downward motion of the bucket. It is generally known that when digging trenches, side walls must be protected with formwork and struts, resisting horizontal outward pressure of soil, caused by internal pressure. Without these protections soil creep takes place, i.e. self separation of soil. In the case of downward cutting of soil of low cohesion /e.g. dry sand/, internal friction may be reduced so much that the material will become fluid. In such case it is enough to scrape fluid material onto suitable conveyor. Another disadvantage of upward cutting is imparting on the output an acceleration in a direction opposite to gravity which results in excessive energy consumption and practically restricts higher cutting speeds. One more disadvantage of this type of arrangements is reduced stability of the excavator. The overturning moment of the extension arm weight, bucket and output is increased by an overturning moment caused by the resistance of the soil being cut. More favourable cutting conditions exist in the case of single-bucket backhoe excavator digging soil above the level on which it is moving. But also in this case the excavator operates in cycles. Cutting is only a part of the cycle, followed by a break in cutting, necessary for rotation, subsequently in both directions, of the superstructure weight, exceeding several times the output weight and a break for loading the output on a means of transport.

[0006] The invention is directed to an excavation assembly according to the preamble of claims 2 and 12 and to a method for earth separation and loading. An excavating assembly in accordance with the preamble of claims 2 and 12 is known from US 4 180 927.

[0007] A conventional excavator is disclosed in AU 427389.

[0008] The purpose of the invention is to develop a method of soil cutting at a substantially lower energy consumption and different operating technique. The cutting method allots also to increase the cutting speed, what additionally results in increased productivity. The method of soil separation is defined by the steps of claim 1.

[0009] The arrangement for the application of the method is defined by the features of claim 2. Further embodiments are defined by the dependent claims 3 to 11. The variation of the arrangement for cutting earth below the level on which the arrangement is moving, is provided with a bucket wheel with several, preferably three buckets, located on an arm while the soil is cut with a downward motion of the buckets and the output is slip

upwards along the slip to the discharge height and then conveyed by means of conveyors to means of transport or dump.

[0010] The method of separation and loading earth onto means of transport and the arrangement for the application of this method - an excavator are shown on an example application in the figures, where in fig.1 a side view of the excavator is shown, in fig.2 - top view of the excavator, in fig.3 platform turning gear and loading conveyor turning gear are shown and in fig.4 - the top view of both said turning gears. The excavator consists of an undercarriage 1 e.g. on crawlers with a running gear and a turning gear and a rotary platform 2 with supporting structure 3. An extension arm 4 is mounted with an articulated joint to the front of the rotary platform, bearings 5 of bucket wheel 6 with a number, preferably three buckets 7 are located at the front of them with cutting blades 8, two side walls 9 and plate 10 situated at the centre of the bucket wheel. The bucket has no wall on the outside. Slip plate 11 is rotationally mounted to the bucket wheel shaft, by means of arms 12. The slip plate is secured against rotation by means of a screw joint with the extension arm. The slip plate consists of slip 13 located on the circumference of the bucket wheel and two side plates. The inside diameter of the slip is marginally larger than the outside diameter of the bucket wheel. The slip has a constant cross section, from the bottom to a chute 14, whereas above the chute, it has a hole, slightly wider than buckets. Below the chute belt conveyor I begins with ribbed belt 15. The bottom end of the supporting structure of the conveyor is mounted with an articulated joint to the slip plate and its top end mounted slidingly on rollers to supporting structure 3. Extension arm 4 is inclined by means of hydraulic cylinder 16 allowing lifting and lowering the bucket wheel. Apart from that this extension arm has its front part sliding in the rear part what allows for the movement of the bucket wheel, within definite limits, forwards and backwards. This movement is generated by hydraulic cylinder 17, mounted with an articulated joint to the front and rear part of extension arm 4. As already mentioned rotary platform 2 is mounted to undercarriage frame 1 by means of roller bearing 18, situated under the platform. Above the platform there is another roller bearing 19 allowing the rotation of loading conveyor II 20 in relation to the undercarriage. This conveyor is designed to load the output onto any means of transport. Conveyor 20 in its lower part is mounted with an articulated joint to the rotary frame of this conveyor and in its central part, by means of a link and hydraulic cylinder 21, to the rotary bearing on the top of supporting structure 3. Hydraulic cylinder 21 allows inclination of the loading conveyor in the vertical plane, according to the height of any means of transport, independent from the excavator. Turning gear of the excavator is shown in fig.3 and 4. This gear consists of hydraulic cylinder 22, vertical inner sleeve 23, linking the undercarriage supporting structure with the rotary structure of the loading conveyor or above rotary

bearing 19 and of appropriate articulated joints. Hydraulic cylinder 22 is connected with one joint to the undercarriage supporting structure and with the other end to the articulated joint of inner sleeve 23. The movement of hydraulic cylinder piston rod causes the rotary structure of loading conveyor to turn in one or other direction, within determined limits. Similarly, as shown in fig.3 and fig.4, hydraulic cylinder 24 is joined at one end, by means of an articulated joint, with the undercarriage supporting structure 1 and at the other end, also by means of an articulated joint, with rotary platform 2 what allows platform 2 to rotate, within definite limits in relation to undercarriage 1. At the end of the rotary platform an internal combustion engine is installed, driving all excavator mechanisms by means of an oil pump. This engine performs also the role of an additional counterweight for extension arm 4 and bucket wheel 6. Controls are located in cab 25, omitted for clarity sake from fig.i. The excavator is operated by two people. One operator controls the bucket wheel and conveyor I with ribbed belt; the other one controls the loading of independent means of transport.

[0011] The functioning of the excavator, where the method of earth separation and loading on means of transport has been applied, is as follows. After the excavator has arrived at the slope to be dug and after a means of transport has been arranged for loading, the operator of loading devices sets the outlet of loading conveyor 20 horizontally, above the open body of a vehicle, by means of hydraulic cylinder 22, and the outlet height by means of hydraulic cylinder 21, and then starts the loading conveyor. Then the other operator starts the turning gear of bucket wheel 6 and, as necessary, the thrust gear by means of hydraulic cylinder 17. The separation of earth commences and a subsequent bucket is filled by the earth moving downwards. The cut begins according to the slope height, approximately in the position, where in fig.1 is the top left bucket. In the position, where in the figure is the bottom bucket, the slip plate 11 begins to close the outer opening of the bucket, whilst the inner plate 10 pushes before it the output contained in the bucket. During the upward motion of the bottom bucket, the output in the bucket slides on the slip 13 to the height of chute 14. The discharge of the loosened output from the bucket commences from the position, where the top right bucket is in fig.1. In such situation, due to appropriate inclination of inner plate 10 and due to centrifugal force, the output slides along the chute and above it onto belt conveyor I with ribbed belt, which subsequently feeds it to loading conveyor 20 and the latter discharges the output onto any means of transport. Earth separation is accomplished as platform 2 rotates from one extreme position to another, by means of hydraulic cylinder 24. The operator has here at his disposal a thrust mechanism, which controls the thickness of the layer cut. The excavator, without the use of the running gear, out subsequent layers until the total movement of the thrust mechanism is exhausted, where the

bucket wheel is reversed by means of hydraulic cylinder 17 and the excavator moves forward by means of the running gear of the undercarriage.

[0012] The method of earth separation and loading onto means of transport, according to the invention, has a number of outstanding advantages in relation to methods commonly used. First of all cutting earth takes place with a out layer maximally relieved and thereby with very low friction of earth cut and with the utilisation of horizontal pressure, repelling extreme layers in the vertical zone of the slope. In some cases, with dry and loose soil, serious loss of internal friction may occur. Then so called fluidisation of crushed material occurs. This material flows down the slope /known self creep of trench walls/ and it is enough, without moving the excavator, to pump the material, like pumping liquids, at an extremely low energy consumption. Another advantage of the method according to the invention is the maximum utilisation of engine power for cutting soil. When one bucket completes the cutting process, the second bucket begins this process and the next one discharges, at the same time, a portion of separated soil onto conveyor. There is no loss of energy for accelerating a portion from rest to operating velocity, as the material accelerates due to gravity. This allows to increase twofold the cutting speed and thereby to increase the productivity of the excavator. With this method it is also avoided to generate rotational motion of large mass of the rotary platform, extension arm, bucket and output contained therein. Elimination of cycle operation of such excavators, combined with additional advantages, mentioned above, allows to mount, on the same undercarriage an excavator of eight times higher productivity. The stability of the excavator is thereby improved, as the overturning moment from the extension arm, buckets and output is balanced, by large, by the loading conveyor located on the other side of the undercarriage. Additionally, a substantial moment from the cutting reaction is replaced by a substantially smaller, and at the same time, stabilising moment from cutting reaction /due to opposite direction of the reaction/. In relation to multi-bucket excavators, the cutting system according to the invention, allows reduction in energy consumption for soil separation, substantial reduction in bucket wheel weight and in consequence counterweight and supporting structure weights. An additional advantage of soil separation method, according to the invention, is the use of thrust mechanism, allowing excavator operation when cutting non-homogeneous soil, containing considerable amount of rock what practically prevents the use of multi-bucket excavators. Elimination of full rotation of excavators simplifies to a large extent the turning gear.

In such case, a multi-step mechanical gear, driven by a simple hydraulic motor or a slow speed hydraulic motor, becomes superfluous. It is enough to use a simple hydraulic cylinder in lieu of such devices. Complex rotary columns, feeding oil under pressure to the running gear of both crawlers of the undercarriage are avoided, whilst

each crawler must have the capability to run in both directions.

5 Claims

1. Method for earth separation and loading, comprising the steps of:

separating earth by means of several buckets (7) mounted on a bucket wheel (6) by separating soil from subsoil via a downwardly directed motion of the buckets such that the separated output portion is not deflected by the respective bucket and is able to remain in contact with the circumferentially surrounding subsoil after being cut,

moving the buckets such that subsequently separated output portions are slid along a slip plate (11) to a height allowing - due to gravity and centrifugal force - to discharge subsequent portions onto an inclined first continuous duty conveyor (15) mounted together with the bucket wheel (6) on the rotary part (4) of an excavator,

transferring the output by the first conveyor (15) to a second continuous duty conveyor (10) mounted on the excavator undercarriage (2) with possibility of independent rotation, and

conveying the output by the second conveyor (10) to any means of road, rail or other means of transport or other continuous duty conveyors or to a dump.

2. An excavation assembly comprising:

an undercarriage (1) with running gear and rotary platform (2) on this undercarriage (1),

an extension arm (4) connected to the rotary platform (2) and having a bucket wheel (6), a slip plate (11), a chute (14) and an inclined first continuous duty conveyor (15),

several, preferably three buckets (7) on said bucket wheel (6),

each bucket (7) having cutting blades (8) one of which is located at the circumference of the bucket wheel (6), two sidewalls (9) and an inner plate (10) enabling the discharge of the output due to gravity and centrifugal force onto the first conveyor (15) after movement of the output along the slip plate (11) up to an appropriate height, and

a second continuous duty conveyor (20) mounted on the excavator undercarriage (1) with the possibility of an independent rotation,

characterized in that

each bucket (7) is open at the circumference of the bucket wheel (6) behind the one cutting blade (8).

3. Excavating assembly according to claim 2, further comprising a supporting structure (3) on the rotary platform (2) to hold and manipulate the extension arm (4) with the bucket wheel (6) and to move the bucket wheel (6) upwards and downwards by means of a hydraulic cylinder (16) and the extension arm (4).
4. Excavation assembly according to claim 2 or 3, wherein the front part of the extension arm (4) is arranged to slide into the rear part of the extension arm (4) such that the front part can be displaced linearly in forward and backward direction in relation to the rear part of the extension arm (4) by means of a hydraulic cylinder (17) to change the reach of the bucket wheel (6) while in operation.
5. Excavation assembly according to one of the claims 2 - 4, wherein the bucket wheel (6) comprises a hub rotatably attached to the front end of the arm (4) by means of a bearing (5) and six pairs of rods immovably fixing the buckets (7) to the hub, wherein the rods are parallel to the radius of the bucket wheel (6) and hold blades (8) of the buckets (7) and the rods hold the rear ends of the buckets (7).
6. Excavating assembly according to one of the claims 2 - 5, wherein each bucket (7) of the bucket wheel (6) includes an inner plate (10) perpendicular to the radius of the bucket wheel (6) and two triangular side plates forming the side walls (9) with their external edges forming parts of the circumference of the bucket wheel (6).
7. Excavating assembly according to one of the claims 2 - 6, wherein the slip plate (11) consists of a slip (13), two side walls and three pairs of arms (12) mounting the slip plate (11) immovably to the extension arm (4) and rotationally to the axis of the bucket wheel (6).
8. Excavating assembly according to one of the claims 2 - 7, wherein rotating means for the rotary platform (2) comprise a hydraulic cylinder (24) linking by means of two articulated joints at its ends the undercarriage (1) to the rotary platform (2) and a roller bearing (18) situated below the rotary platform (2).
9. Excavating assembly according to one of the claims

2 - 8, wherein the rotating means of the independently rotating second conveyor (20) comprises a roller bearing (19) situated above the rotary platform (2) and a horizontal hydraulic cylinder (22) connected with its one end to the supporting structure (3) of the undercarriage (1) by means of an articulated joint and with its other end to the extension bracket of the vertical large diameter inner sleeve (23) supporting the rotary platform (2) with the mounting frame of the second conveyor (20) by means of an articulated joint.

10. Excavating assembly according to one of the claims 2 - 9, wherein the first conveyor (15) is mounted with its bottom end by means of an articulated joint to the slip plate (11) and with its top end mounted slidingly on rollers to the supporting frame (3).
11. Excavating assembly according to one of the claims 2 - 10, wherein the second conveyor (20) in its lower part is mounted with an articulated joint to the rotary frame of this conveyor and in its central part, by means of a link and a hydraulic cylinder (21) is mounted to the rotary bearing on the top of the supporting frame (3), for inclining the second conveyor (20).

12. An excavation assembly comprising:

an undercarriage (1) with running gear and a rotary platform (2) on this undercarriage (1),

an extension arm (4) connected to the rotary platform (2) and having a bucket wheel (6), a chute (14) and an inclined first continuous duty conveyor (15),

several, preferably three buckets (7) on said bucket wheel (6), each bucket (7) having cutting blades (8) one of which is located at the circumference of the bucket wheel (6), two side walls (9) and an inner plate (10), and

a second continuous duty conveyor (20) mounted on the excavator undercarriage (1) with the possibility of an independent rotation,

characterized in that

each bucket (7) further comprises a swinging outer wall at the circumference of the bucket wheel (6) behind the one cutting blade (8), said swinging outer wall being openable by means of a cam or a buffer when the bucket in its upward motion reaches the upper level of the chute (14) to discharge the output due to gravity and centrifugal force onto the first continuous conveyor (15).

Patentansprüche

1. Verfahren zum Abtragen und Laden von Erde, das die folgenden Schritte umfasst:

Abtragen von Erde mittels mehrerer Schaufeln (7), die an einem Schaufelrad (6) angebracht sind, durch Abtragen von Boden von Unterboden über nach unten gerichtete Bewegung der Schaufeln, so dass der abgetragene Ausstoßabschnitt durch die jeweilige Schaufel nicht abgelenkt wird und mit dem ihn in Umfangsrichtung umgebenden Unterboden in Kontakt bleiben kann, nachdem er abgeschnitten wurde,

Bewegen der Schaufeln, so dass anschließend abgetragene Ausstoßabschnitte auf eine Gleitplatte (11) in einer Höhe geschoben werden, die es aufgrund von Schwerkraft und Zentrifugalkraft ermöglicht, folgende Abschnitte auf eine geneigte erste Dauerbetriebs-Fördereinrichtung (15) abzuleiten, die zusammen mit dem Schaufelrad (6) an dem Drehteil (4) eines Baggers angebracht ist,

Überführen des Ausstoßes durch die erste Fördereinrichtung (15) zu einer zweiten Dauerbetriebs-Fördereinrichtung (10), die an dem Bagger-Fahrwerk (1) unabhängig drehbar angebracht ist, und

Fördern des Ausstoßes durch die zweite Fördereinrichtung (10) auf eine beliebige Straßen-, Schienen- oder eine andere Transporteinrichtung oder andere Dauerbetriebs-Fördereinrichtungen oder eine Halde.

2. Bagger-Anordnung, die umfasst:

einen Unterbau (1) mit Fahrwerk und Drehplattform (2) auf diesem Unterbau (1),

einen Verlängerungsarm (4), der mit der Drehplattform (2) verbunden ist, und ein Schaufelrad (6), eine Gleitplatte (11), eine Rutsche (14) und eine geneigte erste Dauerbetriebs-Fördereinrichtung (15) aufweist,

mehrere, vorzugsweise drei Schaufeln (7) an dem Schaufelrad (6),

wobei jede Schaufel (7) Schneidmesser (8), von denen sich eines am Umfang des Schaufelrades (6) befindet, zwei Seitenwände (9) und eine innere Platte (10) aufweist, die das Ableiten des Ausstoßes aufgrund von Schwerkraft und Zentrifugalkraft auf die erste Fördereinrichtung (15) nach Bewe-

gung des Ausstoßes auf der Gleitplatte (11) bis in eine geeignete Höhe ermöglicht, und eine zweite Dauerbetriebs-Fördereinrichtung (20), die an dem Bagger-Unterbau (1) unabhängig drehbar angebracht ist,

dadurch gekennzeichnet, dass:

jede Schaufel (7) am Umfang des Schaufelrades (6) hinter dem einen Schneidmesser (8) offen ist.

3. Bagger-Anordnung nach Anspruch 2, die des Weiteren eine Tragestruktur (3) auf der Drehplattform (2) zum Halten und Manipulieren des Verlängerungsarms (4) mit dem Schaufelrad (6) und zum Bewegen des Schaufelrades (6) nach oben und nach unten mittels eines Hydraulikzylinders und des Verlängerungsarms (4) umfasst.

4. Bagger-Anordnung nach Anspruch 2 oder 3, wobei der vordere Teil des Verlängerungsarms (4) so eingerichtet ist, dass er in den hinteren Teil des Verlängerungsarms (4) gleitet, so dass der vordere Teil mittels eines Hydraulikzylinders in Beziehung zu dem hinteren Teil des Verlängerungsarms (4) vorwärts und rückwärts (17) verschoben werden kann, um die Reichweite des Schaufelrades (6) im Betrieb zu verändern.

5. Bagger-Anordnung nach einem der Ansprüche 2-4, wobei das Schaufelrad (6) eine Nabe, die mittels eines Lagers (5) drehbar an dem vorderen Ende des Arms (4) angebracht ist, und sechs Paare von Stangen umfasst, die die Schaufeln (7) unbeweglich an der Nabe befestigen, wobei die Stangen parallel zum Radius des Schaufelrades (6) sind und Messer (8) der Schaufeln (7) halten, und die Stangen die hinteren Enden der Schaufeln (7) halten.

6. Bagger-Anordnung nach einem der Ansprüche 2-5, wobei jede Schaufel (7) des Schaufelrades (6) eine innere Platte (10) senkrecht zum Radius des Schaufelrades (6) und zwei dreieckige Seitenplatten enthält, die die Seitenwände (9) bilden, wobei ihre äußeren Kanten Teile des Umfangs des Schaufelrades (6) bilden.

7. Bagger-Anordnung nach einem der Ansprüche 2-6, wobei die Gleitplatte (11) aus einer Gleitfläche (13), zwei Seitenwänden und drei Paaren von Armen (12) besteht, die die Gleitplatte (11) unbeweglich an dem Verlängerungsarm (4) und drehbar an der Achse des Schaufelrades (6) anbringen.

8. Bagger-Anordnung nach einem der Ansprüche 2-7, wobei die Dreheinrichtung für die Drehplattform (2) einen Hydraulikzylinder (24), der mittels zweier Gelenkverbindungen an seinem Ende den Unterbau

(1) mit der Drehplattform (2) verbindet, und ein Walzenlager (18) umfasst, das sich unter der Drehplattform (2) befindet.

9. Bagger-Anordnung nach einem der Ansprüche 2-8, wobei die Dreheinrichtung der sich unabhängig drehenden zweiten Fördereinrichtung (20) ein Walzenlager (19), das sich über der Drehplattform (2) befindet, sowie einen horizontalen Hydraulikzylinder (22) umfasst, der mit seinem einen Ende mittels einer Gelenkverbindung mit der Tragestruktur (3) des Unterbaus (1) verbunden ist und mit seinem anderen Ende mit der Verlängerungshalterung der vertikalen, großkalibrigen inneren Buchse (23), die mittels einer Gelenkverbindung die Drehplattform (2) mit dem Anbringungsgestell der zweiten Fördereinrichtung (20) trägt.

10. Bagger-Anordnung nach einem der Ansprüche 2-9, wobei die erste Fördereinrichtung (15) mit ihrem unteren Ende mittels einer Gelenkverbindung an der Gleitplatte (11) angebracht ist und mit ihrem oberen Ende gleitend auf Walzen an dem Tragegestell (3) angebracht ist.

11. Bagger-Anordnung nach einem der Ansprüche 2-10, wobei die zweite Fördereinrichtung (20) in ihrem unteren Teil mit einer Gelenkverbindung an dem Drehgestell dieser Fördereinrichtung angebracht ist und in ihrem mittleren Teil mittels eines Verbindungsgliedes und eines Hydraulikzylinders (21) an dem Drehlager an der Oberseite des Tragegestells (3) angebracht ist, um die zweite Fördereinrichtung (20) zu neigen.

12. Bagger-Anordnung, die umfasst:

einen Unterbau (1) mit Fahrwerk und einer Drehplattform (2) auf diesem Unterbau (1),

einen Verlängerungsarm (4), der mit der Drehplattform (2) verbunden ist, und ein Schaufelrad (6), eine Rutsche (14) und eine geneigte erste Dauerbetriebs-Fördereinrichtung (15) aufweist,

mehrere, vorzugsweise drei Schaufeln (7) an dem Schaufelrad (6), wobei jede Schaufel (7) Schneidmesser (8), von denen sich eines am Umfang des Schaufelrades (6) befindet, zwei Seitenwände (9) und eine innere Platte (10) aufweist, und

eine zweite Dauerbetriebs-Fördereinrichtung (20), die an dem Bagger-Unterbau (1) unabhängig drehbar angebracht ist,

dadurch gekennzeichnet, dass:

jede Schaufel (7) des Weiteren eine schwenkbare Außenwand am Umfang des Schaufelrades (6) hinter dem einen Schneidmesser (8) umfasst, wobei die schwenkbare Außenwand mittels eines Nokkens oder eines Puffers geöffnet werden kann, wenn die Schaufel bei ihrer Aufwärtsbewegung die obere Höhe der Rutsche (14) erreicht, um den Ausstoß aufgrund von Schwerkraft und Zentrifugalkraft auf die erste Dauer-Fördereinrichtung abzuleiten.

Revendications

1. Procédé pour la séparation et le chargement de terre, comprenant les étapes consistant à :

séparer de la terre au moyen de plusieurs godets (7) montés sur une roue à godets (6) en séparant le sol du sous-sol via un mouvement dirigé vers le bas des godets de sorte que la partie sortie séparée ne soit pas déviée par le godet respectif et puisse rester en contact avec le sous-sol environnant sur la circonférence après avoir été coupé,

déplacer les godets de sorte que des parties sorties séparées ultérieurement soient glissées le long d'une plaque de glissement (11) à une hauteur permettant - grâce à la gravité et à la force centrifuge - de décharger des parties ultérieures sur un premier moyen d'acheminement à fonctionnement continu incliné (15) monté conjointement avec la roue à godets (5) sur la partie rotative (4) d'un excavateur, transférer la sortie par le premier moyen de cheminement (15) vers un second moyen de cheminement à fonctionnement continu (10) monté sur le châssis de roulement (1) d'un excavateur avec la possibilité d'une rotation indépendante, et

acheminer la sortie par le second moyen d'acheminement (10) vers tout moyen de transport routier, ferroviaire ou autres moyens ou vers d'autres moyens d'acheminement à fonctionnement continu ou vers une décharge.

2. Ensemble d'excavation comprenant :

un châssis de roulement (1) avec un mécanisme de roulement et une plateforme rotative (2) sur ce châssis de roulement (1),
un bras d'extension (4) connecté à la plateforme rotative (2) et ayant une roue à godets (6),
une plaque de glissement (11), une glissière (14) et un premier moyen d'acheminement à fonctionnement continu incliné (15),
plusieurs, de préférence trois godets (7) sur ladite roue à godets (6) ,

chaque godet (7) ayant des lames de coupe (8) dont une est située sur la circonférence de la roue à godets (6), deux parois latérales (9) et une plaque interne (10) permettant la décharge de la sortie grâce à la gravité et à la force centrifuge sur le premier moyen d'acheminement (15) après le mouvement de la sortie le long de la plaque de glissement (11) jusqu'à une hauteur appropriée, et un second moyen d'acheminement à fonctionnement continu (20) monté sur le châssis de roulement (1) de l'excavateur avec la possibilité d'une rotation indépendante,

caractérisé en ce que

chaque godet (7) est ouvert au niveau de la circonférence de la roue à godets (6) derrière une lame de coupe (8).

3. Ensemble d'excavation selon la revendication 2, comprenant en outre une structure de support (3) sur la plateforme rotative (2) pour porter et manipuler le bras d'extension (4) avec la roue à godets (6) et pour déplacer la roue à godets (6) vers le haut et vers le bas au moyen d'un vérin hydraulique (16) et le bras d'extension.
4. Ensemble d'excavation selon la revendication 2 ou 3, dans lequel la partie avant du bras d'extension (4) est agencé de façon à coulisser à l'intérieur de la partie arrière du bras d'extension (4), de sorte que la partie avant puisse être déplacée de manière linéaire suivant une direction vers l'avant et vers l'arrière en rapport avec la partie arrière du bras d'extension (4) au moyen d'un vérin hydraulique (17) pour changer l'étendue de la roue à godets (6) en cours d'opération.
5. Ensemble d'excavation selon l'une quelconque des revendications 2 à 4, dans lequel la roue à godets (6) comprend un moyeu attaché de manière rotative à l'extrémité avant du bras (4) au moyen d'un support (5) et six paires de tiges fixant de manière immobile les godets (7) au moyeu, dans lequel les tiges sont parallèles au rayon de la roue à godets (6) et portent les lames (8) des godets (7) et les tiges portent les extrémités arrière des godets (7).
6. Ensemble d'excavation selon l'une quelconque des revendications 2 à 5, dans lequel chacun des godets (7) de la roue à godets (6) comprend une plaque interne (10) perpendiculaire au rayon de la roue à godets (6) et deux plaques latérales triangulaires formant les parois latérales (9) avec leurs bords extérieurs formant des parties de la circonférence de la roue à godets (6).
7. Ensemble d'excavation selon l'une quelconque des

revendications 2 à 6, dans lequel la plaque de glissement (11) consiste en une glissière (13), deux parois latérales et trois paires de bras (12) montant la plaque de glissement (11) de manière immobile au bras d'extension (4) et de manière rotative à l'axe de la roue à godets (6).

8. Ensemble d'excavation selon l'une quelconque des revendications 2 à 7, dans lequel les moyens de rotation de la plateforme rotative (2) comprennent un vérin hydraulique (24) reliant, au moyen de deux joints articulés à ses extrémités, le châssis de roulement (1) à la plateforme rotative (2), et un palier à rouleaux (18) situé au-dessous de la plateforme rotative (2).
9. Ensemble d'excavation selon l'une quelconque des revendications 2 à 8, dans lequel les moyens de rotation du second moyen d'acheminement tournant de manière indépendante (20) comprennent un palier à rouleaux (19) situé au-dessus de la plateforme rotative (2) et un vérin hydraulique horizontal (22) connecté par sa première extrémité à la structure de support (3) du châssis de roulement (1) au moyen d'un joint articulé et par son autre extrémité au crochet d'extension du manchon interne vertical à grand diamètre (23) supportant la plateforme rotative (2) avec le cadre de montage du second moyen d'acheminement (20) au moyen d'un joint articulé.
10. Ensemble d'excavation selon l'une quelconque des revendications 2 à 9, dans lequel le premier moyen d'acheminement (15) est monté avec son extrémité inférieure au moyen d'un joint articulé sur la plaque de glissement (11) et avec son extrémité supérieure montée de manière coulissante sur des rouleaux au cadre de support (3).
11. Ensemble d'excavation selon l'une quelconque des revendications 2 à 10, dans lequel le second moyen d'acheminement (20) est monté sur sa partie inférieure à l'aide d'un joint articulé au cadre rotatif de ce moyen d'acheminement et sur sa partie centrale, au moyen d'un lien et d'un vérin hydraulique (21) est monté au support rotatif au sommet du cadre de support (3), de façon à incliner le second moyen d'acheminement (20).

12. Ensemble d'excavation comprenant :

un châssis de roulement (1) avec un mécanisme de roulement et une plateforme rotative (2) sur ce châssis de roulement (1),
un bras d'extension (4) connecté à la plateforme rotative (2) et ayant une roue à godets (6), une glissière (14) et un premier moyen d'acheminement à fonctionnement continu incliné

(15),
 plusieurs, de préférence trois godets (7) sur la-
 dite roue à godets (6), chaque godet (7) ayant
 des lames de coupe (8) dont une est située sur
 la circonférence de la roue à godets (6), deux 5
 parois latérales (9) et une plaque interne (10),
 et
 un second moyen d'acheminement à fonction-
 nement continu (20) monté sur le châssis de
 roulement (1) de l'excavateur avec la possibilité 10
 d'une rotation indépendante,

caractérisé en ce que

chaque godet (7) comprend en outre une pa-
 roi externe oscillante au niveau de la circonférence 15
 de la roue à godets (6) derrière une lame de coupe
 (8), ladite paroi externe oscillante pouvant être
 ouverte au moyen d'une came ou d'un butoir quand
 le godet dans son mouvement vers le haut atteint
 le niveau supérieur de la glissière (14) pour déchar- 20
 ger la sortie grâce à la gravité et à la force centrifuge
 sur le premier moyen d'acheminement à fonction-
 nement continu (15).

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