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(54) LOADER FOR CLEANING LOW CLEARANCE CONFINED SPACES

(57) A loader (100, 200) comprising:
- a front loader assembly (101, 201) comprising a bucket (110, 210) pivotably mounted with a boom (120, 220),
- a back loader assembly comprising a body (155, 255) on which the boom (120, 220) is pivotably mounted, an undercarriage (165) with wheels or tracks (160, 260), an electric motor (172), a battery compartment (180, 280) and remote control means for controlling the movement of the loader,

wherein the boom is pivotably moveable between at least two positions including a lowered position and a raised position
and wherein the front loader assembly (101, 201) and the back loader assembly (110, 210) are substantially of the same height, when the boom is in the lowered position.

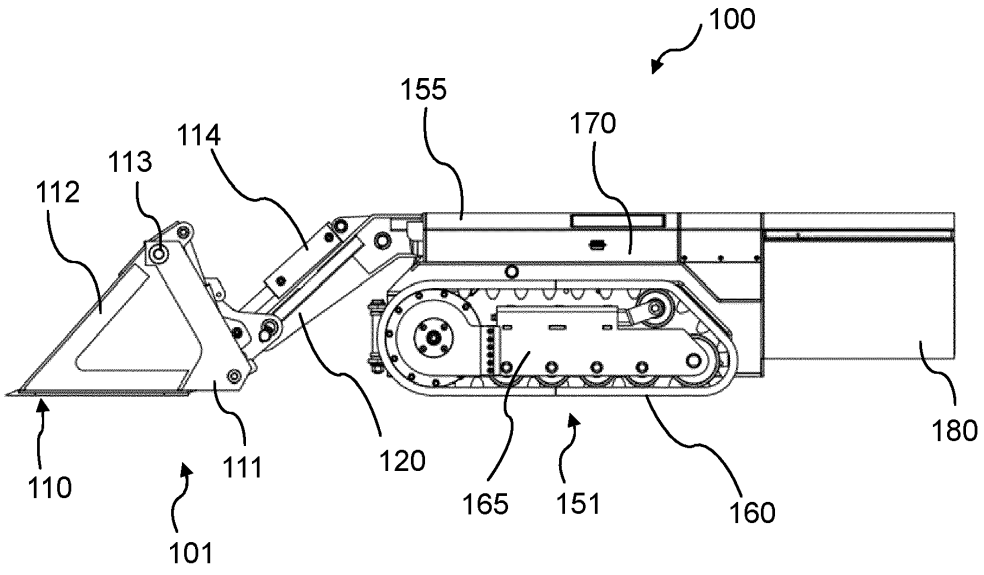

FIG 1

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Description

TECHNICAL FIELD OF THE INVENTION

[0001] The present invention concerns the technical field of small ancillary equipment for industrial plants such as electrolysis plants. More specifically, the present invention relates to a remote-controlled loader vehicle for collecting anode cover material spilled into the basement of an electrolytic cell (also called "pot") used for the Hall-Héroult process.

Prior art

[0002] The Hall-Héroult process is the only continuous industrial process for producing metallic aluminium from aluminium oxide. Aluminium oxide (Al_2O_3) is dissolved in molten cryolite (Na_3AlF_6), and the resulting mixture (typically at a temperature comprised between 940°C and 970°C) acts as a liquid electrolyte in an electrolytic cell. An electrolytic cell (also called "pot") used for the Hall-Héroult process typically comprises a steel shell (so-called pot shell), a lining (comprising refractory bricks protecting said steel shell, and cathode blocks usually made from graphite, anthracite or a mixture of both), and a plurality of anodes, usually made from carbon, that plunge into the liquid electrolyte contained in the volume defined by the cathode bottom and a side lining made from carbonaceous material.

[0003] Anodes and cathodes are connected to external busbars. An electrical current is passed through the cell, typically at a voltage between 3.5 V and 5 V, which electrochemically reduces the aluminium oxide, split in the electrolyte into aluminium ions and oxygen ions, then into aluminium at the cathode and carbon dioxide after reacting with the carbon at the anode. The resulting metallic aluminium is not miscible with the liquid electrolyte, has a higher density than the liquid electrolyte and will thus accumulate as a liquid metal pad on the cathode surface below the electrolyte from where it needs to be removed from time to time, usually by suction into a crucible (so-called "tapping" operation).

[0004] The carbon anodes used in the production of aluminium must be covered with a layer of particulate materials. This particulate material called anode cover material (ACM) fulfils several functions during electrolysis. The main functions of the anode cover material are the protection of anode carbon against air oxidation and partially against CO_2, the thermal insulation against heat losses from the top surface of the anode and prevention of air burning and the capturing of volatile fluorides like Sodium aluminium hydride ($NaAlF_4$) and Aluminium fluoride (AlF_3).

[0005] So-called Primary Anode Cover Material (PCAM) is used to cover the anode blocks after anode change in a pot. Typically, PCAM is a blend of solid blend of solid cryolitic melt and alumina which has been prepared with a particle size distribution ranging from very fine dust (< 45 μm) to small, medium or even coarse particles. Primary anode cover material is usually obtained from anode cover material reclaimed from spent anodes, mixed as needed with cavity cleaning material scooped from the liquid bath cavity after removal of the spent anode, bath scrap material recovered from a number of sources, such as floor sweepings and secondary alumina which has been used for the scrubbing of pot gas. In some cases, primary alumina or pure bath (material tapped or siphoned from the electrolytic melt of operational pots as excess bath and either directly transferred to other pots or allowed to solidify in moulds) can be added to the mix.

[0006] In addition to the use of anode cover material to cover the anode blocks after anode change in a pot, anode cover material may also be added during electrolysis operation to ensure the balance of bath content in the electrolytic reduction cell, i.e. the compensation of bath removal by adequate bath addition to maintain a consistent bath level.

[0007] During covering process, i.e. the addition of anode cover material in the pot, a spillage of particulate anode cover material may occur. Spillage may also occur when materials are recovered from the pot, especially during anode change, such as anode cover material and bath scrap material from spent anodes.

[0008] In a potline, the pots are elevated above floor level, mounted on steel racks which in turn are mounted on pillars and supports usually made in concrete. The space at ground level between the pillars and support, below the pots can be called basement or sub-basement. Busbars are usually present in the basement area. As a consequence, the basement clearance (i.e., the head space underneath the pot) is usually rather small, typically less than 100 cm, and often less than 90 cm. This clearance is designed such as to allow convective cooling of the busbars which carry very high currents.

[0009] The spillage of anode cover material occurs at the side of the pot and falls through metal grids (used as platforms at the foot of the pot) into the basement under the pot. Alumina, which is fed regularly to the pot, may also spill.

[0010] The spillage accumulated over time in the basement diminishes the cooling efficiency of the busbar electrically connected to the cathode of the pot, which are in the sub-basement. Therefore, said spillage must be removed regularly. However, this operation is rendered difficult by the narrow spaces in the basement which prevents operators to access the basement under the pot. In any case, due to high temperature and electrical hazard, the presence of humans underneath the pot is strictly undesirable when the pot is operating. This problem is usually solved by providing long-handheld rakes allowing the operators to reach under the pot from an access corridor at the sides of the pot. To avoid electrocution incidents, the handles of the rakes are made in an electrically isolating material such as wood.

OBJECTS OF THE INVENTION

[0011] The present invention is intended to overcome at least some of the above problems.

[0012] The invention described herein is a loader. A loader is a type of work vehicle, wheeled or mounted on tracks, that has a mounted bucket connected to the end of at least one boom (arm) and designed to scoop up loose material from the ground, such as dirt, gravel, or spilled anode cover material in the context of the invention, and move it from one place to another. Although the transported material may be lifted from the ground during transport, it may also be pushed across the ground.

[0013] Therefore, a principal object of the present invention concerns a loader comprising:

- a front loader assembly comprising a bucket pivotably mounted with a boom,
- a back loader assembly comprising a body on which the boom is pivotably mounted, an undercarriage with wheels or tracks, an electric motor, a battery compartment and remote control means for controlling the movement of the loader,

wherein the boom is pivotably moveable between at least two positions including a lowered position and a raised position
and wherein the front loader assembly and the back loader assembly are substantially of the same height, when the boom is in the lowered position.

[0014] For the purpose of this patent application, "height" means the height measured between the ground on which the loader rests under normal conditions of operation of the loader and the top of the part which height is being considered.

[0015] In the context of this patent application, "substantially the same height" means, when the height of two elements is compared, that the height of the first element is identical to within 10%, preferably within 5%, of the height of the second element.

[0016] In the context of the present patent application, "normal operating conditions" means that the tracks or wheels are on a substantially flat ground and in shape to operate.

[0017] In a preferred embodiment, the front loader assembly and the back loader assembly do not exceed 100 centimetres in height, preferably do not exceed 90 centimetres in height, preferably do not exceed 80 centimetres in height, more preferably do not exceed 70 centimetres in height, and most preferably do not exceed 65 centimetres in height.

[0018] Due to these arrangements, the loader according to the invention presents a low-profile remote-controlled loader allowing it to access confined spaces such as the basement of an electrolytic cell, that may be as low as 70 centimetres in height, in order to perform cleaning operations in an efficient way with lessened risk to the operators.

[0019] In a preferred embodiment, the back loader assembly comprises at least one motor compartment comprising a motor assembly,

the electric motor is mounted on said motor assembly,
and said motor assembly is pivotably mounted on the back loader assembly and arranged to pivot from a closed position where the electric motor is housed in the motor compartment and an open position where the electric motor is out of the motor compartment and accessible for servicing.

[0020] In a preferred embodiment, the back loader assembly comprises two motor compartments, arranged on opposite sides of the back loader assembly, each motor being in functional connection with the wheels or tracks of the side on which said motor is mounted.

[0021] Due to these arrangements, access to the electric motor and to any other elements housed in the motor compartments such as the gear box is facilitated.

[0022] In a preferred embodiment, the height of the back loader assembly is substantially the same, whether the motor assembly is positioned in an opened position or a closed position.

[0023] Due to these arrangements, the servicing of the electric motor is possible without removing the loader from the confined space it normally operates in. While the normal servicing of the loader is anticipated to take place outside of said confined space, the servicing of the electric motor may be necessary in unusual conditions, such as an engine failure during operation.

[0024] In a preferred embodiment, the motor assembly is pivotably mounted to the back loader by means of a hinge which axis of rotation is substantially vertical.

[0025] Due to these arrangements, the motor compartment rotates horizontally between the closed and open position. This allows the loader profile height to remain the same when the motor compartment is in the open and closed positions.

[0026] In a preferred embodiment, the hinge is mounted on the side of the back loader assembly.

[0027] In a preferred embodiment, the hinge is mounted on a front-end of the back loader assembly.

[0028] In a preferred embodiment, the body of the loader comprises a housing dimensioned to house at least part of the boom.

[0029] Due to these arrangements, the boom does not protrude above the body of the loader and therefor the height of the loader is lessened.

[0030] In a preferred embodiment, the bucket comprises a front bucket assembly pivotably mounted on a back bucket assembly and means for moving the bucket between an open position and a closed position. A bucket according to these arrangements may be referred to as a split bucket hereinunder.

[0031] Due to these arrangements, the unloading of the bucket by placing the boom in the raised position

above a container and moving the bucket in the open position is permitted. Furthermore, the use of the bucket to collect material collect material from the ground by opening the bucket and moving in reverse to accumulate material between the front bucket assembly and the back bucket assembly and then moving the bucket in the closed position.

[0032] In a preferred embodiment in addition to the above, the boom is curved or comprises a bent section so that the bucket sits nearer to the ground when the boom is in the lowered position.

[0033] In a preferred embodiment, the boom comprises at least three segments, wherein a first segment is pivotably mounted to the back loader assembly and substantially straight, a second segment is connected to first segment and angled, and a third segment is connected at one end to the second segment and pivotably connected at the other end to the bucket.

[0034] In a preferred embodiment, the battery compartment is an independent part of the main machine body, removable from the machine. Said main body and said battery compartment are advantageously designed such as to comprise attachment and release means designed such as to cooperate and designed such as to release the battery compartment upon a vertical lifting movement of said battery compartment. Said vertical lifting movement can have a small amplitude, preferably of less than about 10 cm, and more preferably less than about 6 cm. A forklift can be used for this vertical movement of said battery compartment.

[0035] For example, in an advantageous embodiment, the battery compartment comprises quick attachment and release elements such as guides or slots, designed such as to cooperate with corresponding attachment and release elements of the main machine body, to install and remove the battery compartment quickly. Said attachment and release elements are preferably designed such as to release the battery compartment upon a vertical lifting movement.

[0036] In a preferred embodiment, the bucket comprises at least one side-scrapper mounted on the side of the bucket and pivotably moveable between and extended position, where the side-scrapper is deployed and a retracted position where the side-scrapper is positioned along the side of the bucket. Preferably, two side scrappers are present, one mounted on either side of the bucket.

[0037] The side scrappers are extension of the bucket configured to extend the effective operating range of the bucket during cleaning operation, more specifically the width of the assembly comprising the bucket and the side scrapper is wider than the bucket alone. Thus the amount of loose material pushed across the ground by the loader during pushing operations is higher.

[0038] In a preferred embodiment, the loader comprises a plurality of spotlight to illuminate the space around the loader.

[0039] Due to these arrangements, the use of the robot in a poorly lit space or at night is allowed.

BRIEF SUMMARY OF THE DRAWINGS

[0040] Further advantages, purposes and particular features of the invention will be apparent from the following non-limiting description of at least one particular embodiment of the loader subject of the present invention, with reference to the drawings:

FIG. 1 is a left-side view showing a first embodiment of a loader according to the invention, the loader having a bucket, wherein the bucket is shown in a first position.

FIG. 2 is a top view showing the loader according to the first embodiment, wherein the bucket is shown in the first position.

FIG. 3 is a left-side view showing the loader according to the first embodiment, wherein the bucket is shown in a second position different from the first position.

FIG. 4 is a top view showing the loader according to the first embodiment, wherein the bucket is shown in the second position.

FIG. 5 is a front view showing the loader according to the first embodiment, wherein the bucket is shown in the second position.

FIG. 6 is a rear view showing the loader according to the first embodiment, wherein the bucket is shown in the second position.

FIG. 7 is a bottom view showing the loader according to the first embodiment, wherein the bucket is shown in the second position.

FIG. 8 is a left-side view showing the loader according to the first embodiment, wherein the bucket is shown in a third position different from the first and second positions.

FIG. 9 is a left-side view showing the loader according to the first embodiment, wherein the bucket is shown in a fourth position different from the first, second and third positions.

FIG. 10 is a top view showing a second embodiment of a loader according to the invention.

FIG. 11 is a right-side view showing the loader according to the second embodiment.

FIG. 12 is a bottom view showing the loader according to the second embodiment.

FIG. 13 is a rear view showing the loader according to the second embodiment.

FIG. 14 is a front view showing the loader according to the second embodiment.

FIG. 15 is a detailed view of part of the body of the loader according to the first embodiment, showing a charging socket.

FIG. 16 is a detailed view of part of the body of the loader according to the first embodiment,) showing a pivotably mounted motor assembly and an electric motor compartment.

FIG. 17 is a side view of an electrolytic cell during the cleaning operation of its basement by a loader according to the second embodiment of the invention.

FIG. 18 is a transverse sectional view of an electrolytic cell during the cleaning operation of its basement by a loader according to the second embodiment of the invention.

[0041] The reference numbers on the figures refer to:

10, 20 Loader
101, 201 front loader assembly
110, 210 bucket
111 back bucket assembly
112 front bucket assembly
113 Bucket hinge
114, 214 bucket cylinder
115 First split bucket cylinder
116 Second split bucket cylinder
120, 220 Boom
121 first segment of the boom
122 second segment of the boom
123 third segment of the boom
125 Hinge of the boom
128, 228 Boom cylinder
151, 251 Back loader assembly
155, 255 Loader body
158 Boom housing
160, 260 Track
165, 265 Undercarriage
170 Motor compartment
172 Motor
173 Gear Box
175 Motor assembly
176 Vertical axis of rotation of the motor assembly
177 Motion of the motor assembly
180, 280 Battery compartment
185 Charging socket
188 Power plug
291 left side-scrapper
292 right side scrapper
295 left side-scrapper support
296 right side-scrapper support
900 Electrolytic cell (Pot)
910 Cathode bottom of the pot
915 Cathode busbar
950 Basement
951 Basement floor
960 Support pillar
970 front wall
980, 990 Side Walls

DETAILLED DESCRIPTION OF THE INVENTION

[0042] This description is non-limiting, as each feature of one embodiment may be combined with any other feature of any other embodiment in an advantageous manner.

[0043] The loader described hereinafter is a basement cleaning machine designer to collect anode cover materiel and alumina fallen outside of the pot and through gratings around the electrolytic cell ("pots") which are needed to cool the potshells and the busbars by natural convection. The height of the remote-controlled vehicle is very low to be able to drive below the busbars between pots.

(1) First embodiment

[0044] According to a first embodiment of the present invention, illustrated from different angles and in different positions on figures 1 through 9, the loader 100 comprises a front loader assembly 101 and a back loader assembly 151.

[0045] The front loader assembly 101 comprises a bucket 100 for scraping, pushing and loading anode cover material as detailed in the description of figures 17 and 18, hereinafter. The bucket 100 is pivotably mounted to a boom 120. The boom 120 is in turn pivotably mounted on the body 155 of the back loader assembly 151.

[0046] During operation, the bucket 110 can be tilted up, as illustrated on figures 3 through 7, or tilted down, as show in figures 1 and 2, using a bucket cylinder 114 mounted between the boom 120 and the bucket 110. Such hydraulic cylinders are known as such.

[0047] In a preferred embodiment, the bucket 110 is a split bucket, also called open bucket, whereby the bucket 110 comprises a back bucket assembly 111 pivotably mounted on the boom 120 and a front bucket assembly 112 pivotably mounted on the back bucket assembly 111. The operation of the bucket is shown on figures 8 and 9 where the bucket 110 is respectively in a so-called opened position and in a so-called closed position. The bucket 110 in the open position allows to dump the material when the boom 120 is in a raised position. The bucket 110 in an open position may also enable the loader 100 to collect material from the ground by opening the bucket 110 and moving in reverse to accumulate material between the front bucket assembly 112

and the back bucket assembly 111 and then closing the bucket in a closed position.

[0048] The bucket 110 further comprises means for moving the bucket from an open position to a closed position. For example, the bucket 110 comprises a first split bucket cylinder 115 and a second split bucket cylinder 116, both cylinders being mounted between the front bucket assembly 112 and the back bucket assembly 111.

[0049] In an alternative embodiment (not shown), the bucket is formed in one piece.

[0050] Figures 1, 3, 8 and 9 also show the operation of the boom 120, pivotably mounted on the body 155 of the back loader assembly 151 by a hinge 125. The boom 120 is equipped with a boom cylinder 128 mounted between the boom and the body 155 of the loader 100, allowing the boom to be pivotably moved around the axel of the hinge to raise or lower the boom 120 and the bucket 110. On figures 1 and 3, the boom is shown in a lowered position with the boom cylinder 128 retracted and on figures 8 and 9 the boom 120 is shown raised, with the boom cylinder 128 extended.

[0051] In a preferred embodiment the boom is curved or comprises a bent section so that the bucket sits nearer to the ground when the boom is lowered. In other words, the boom is curved or bent in such a way that the end of the boom pivotably connected to the bucket is closer to the ground then the end of the boom pivotably connected to the body of the loader, when the boom is in a lowered position.

[0052] For example, as shown in figures 1 to 9, the boom 120 comprises at least a first segment 121, a second segment 122 and a third segment 122, wherein the first segment 121 is connected to the hinge 128 and substantially straight, the second segment is connected to first segment 121 and angled and a third segment 123 is connected at one end to the second segment 122 and pivotably connected at the other end to the bucket 110.

[0053] The back loader assembly 151 comprises an undercarriage with tracks 160. In other embodiments (notshown) the undercarriage may have wheels instead of tracks. The front loader assembly 101 further comprises a body 155 on top of the undercarriage.

[0054] In a preferred embodiment shown in figures 1 to 12, the body 155 of the loader 100 comprises a housing dimensioned to house at least part of the boom 120, when the boom is in a lowered position. The housing is formed by a cavity in the loader body 155 where one end of the boom is pivotably connected to the hinge 125 attached to the loader body 155. This configuration allows for a lower maximum height of the loader, compared to the height of a loader where the boom would sit on top of the loader body and protrude above it, thus increasing the height of the loader.

[0055] The back loader assembly further comprises an electric motor 172, a gear box 173, a battery compartment 180 and remote control means for controlling the movement of the loader, such as controlling the motor 172 and gear box 173, steering the tracks 160 (or wheels) as well as the movement of the boom 120, the opening and closing of the splitable bucket 110 and the lowering and raising of the bucket 110.

[0056] The battery compartment 180 is designed to hold a battery (not shown) for supplying the electric motor. In a preferred embodiment, the battery compartment is an independent part of the main machine body, removable from the machine. For example, the battery compartment comprises quick attachment and release elements such as guides or slots to install and remove the battery quickly. This feature allows to quickly replace a discharged battery with a spare loaded battery, in order to minimize the immobilisation time necessary to charge the battery.

[0057] In a preferred embodiment, the battery compartment 180 comprises grooves or slots compatible with the gripping tool of a pallet lifter. Thus, the battery compartment 180 can be easily removed by a pallet lifter. The back loader assembly may further comprise a charging socket for charging the battery in situ (without removing the battery). Such a charging port is preferably positioned on the body 155 of the loader 100. FIG. 15 illustrate such the charging socket 185 and a power plug 188. The power plug 188 is connected via a cable (not shown) to an electrical power source. For example, the charge is 150 Ampère in fast charging mode. In a particular embodiment, the battery is a Lithium-Ion battery having a 200 Ampère-Hour capacity.

[0058] In a preferred embodiment, the loader 100 comprises a plurality of spotlights to illuminate the space around the loader 100.

(2) Motor assembly and motor compartment

[0059] In a preferred variant of the first embodiment of the loader 100 the back loader assembly 151 comprises at least one motor compartment 170 housing a motor assembly 175. This variant is illustrated in figure 16. The loader may comprise two such motor compartments, one on each side of the loader 100, each motor compartment housing a motor assembly and a motor for actuating one of the two tracks or sets of wheels of the loader 100.

[0060] The motor assembly comprises supports for mounting at least the electric motor 172 and optionally other components such as the gear box or control means. The electric motor 172 is mounted on the motor assembly 175 and the motor assembly 175 is pivotably mounted on the back loader assembly 151 and arranged to pivot between a closed position where the electric motor is housed in the motor compartment 175, as shown in figure 1 for instance, and an open position where the electric motor 172 pivoted out of the motor compartment 175 and accessible for servicing, as shown in figure 18.

[0061] The motor assembly 175 is mounted on a hinge preferably at the forward end of the back loader assembly 151 and pivots about an axis substantially perpendicular to the front-to-rear and left-to-right axes of the loader. In other words, the motor assembly pivots about a substan-

tially vertical axis 176, as shown by the arrow 177 in figure 16, which illustrate the motion of the motor assembly 172 from an open to a closed position.

[0062] Thus, the motor assembly opens to the side of the loader 100 and the height of the loader and of the back loader assembly 151 is substantially the same, whether the motor assembly 175 is positioned in an open position or a closed position.

[0063] Furthermore, this arrangement allows to service and perform repairs on the motor and gearbox, as well as on any other elements in the motor compartment or hidden behind it. Advantageously, the loader 100 does not need to be raised to perform maintenance and repairs on the aforementioned parts of the loader 100.

[0064] In other embodiments, the motor assembly 175 is hingedly connected to the motor compartment 150 or to the body 155 or to the backloader assembly 151, the axis of said hinge being substantially vertical.

(3) Second embodiment

[0065] According to a second embodiment of the present invention, shown in figures 10 through 14, a loader 200 comprises a bucket 210 equipped with side-scrapers 292 and 291. In the preferred embodiment shown in figures 10 through 14, the side-scrappers are hingedly mounted on either side of the bucket 210.

[0066] The side scrappers 292 and 291 are extensions placed on either side of the bucket 210 configured to extend the effective operating range of the bucket 200 during cleaning operation. The side scrappers are substantially flat or curved elements, made of metal or plastic, preferably made of the same material as the bucket 200.

[0067] The side-scrappers 292 and 291 are attached to the bucket 210 by means of side-scrappers supports 295 and 296. The side-scrappers supports 295 and 296 are mounted to the sides of the bucket 210 on the one hand and mounted to the side-scrappers 292 and 291 on the other hand.

[0068] In a particular embodiment, the side-scrappers support comprise a hinged part, allowing the side-scrappers 292 and 291 to be positioned in an extended position, where the side-scrappers 292 and 291 are deployed as shown in the figures and a retracted position where the side-scrappers 292 and 291 are positioned along the side of the bucket 200. Advantageously, the side-scrappers support may comprise actuation means to pivot the side-scrappers automatically and/or remotely between the retracted and extended positions.

[0069] Other elements 211, 213, 214, 215, 216, 220, 228, 251, 255 and 265 of the loader 200 being similar to the respectively corresponding elements 111, 113, 114, 115, 116, 120, 128, 151, 155 and 165 of the loader 100 according to the first embodiment described hereabove, they are not described again here.

[0070] In a preferred variant of the second embodiment of the loader 200 the back loader assembly 251 comprises at least one motor compartment housing a motor assembly, similar to the variant of the first embodiment is illustrated in figure 16.

(4) Operation of a loader according to the invention

[0071] To further illustrate the use of a loader, 100 or 200, according to the invention, and FIG.17 and FIG.18 show a loader during a cleaning operation where FIG. 17 is a side view of an electrolytic cell 900 during the cleaning operation of its basement 950 by a loader 200 and FIG. 18 is a transverse sectional view of an electrolytic cell 900 during the cleaning operation of its basement by a loader 100.

[0072] As illustrated in FIG. 17 and FIG. 18, the basement 950 is a confined space limited below by the ground 951, above by the cathode bottom 910 of the electrolytic cell 900 and by bus bars 915 connected to said cathode bottom and on the sides by concrete side walls, 980 and 990, and concrete pillars 960. It should be noted that an access door (not shown) is present in the concrete wall 970, to allow access to the basement 950.

[0073] The remote-controlled loader according to the invention allows to access these confined spaces that may be as low as about 75 centimetres in height, thus facilitating the cleaning operation resulting in a more efficient cleaning with lessened risk to the operators.

Claims

1. A loader (100, 200) comprising:

- a front loader assembly (101, 201) comprising a bucket (110, 210) pivotably mounted with a boom (120, 220),
- a back loader assembly comprising a body (155, 255) on which the boom (120, 220) is pivotably mounted, an undercarriage (165) with wheels or tracks (160, 260), an electric motor (172), a battery compartment (180, 280) and remote control means for controlling the movement of the loader,

wherein the boom is pivotably moveable between at least two positions including a lowered position and a raised position

and wherein the front loader assembly (101, 201) and the back loader assembly (110, 210) are substantially of the same height, when the boom is in the lowered position.

2. A loader (100, 200) as claimed in claim 1, wherein the front loader assembly (101, 201) and the back loader assembly (110, 210) do not exceed 100 centimetres in height, preferably do not exceed 90 centimetres in height, preferably do not exceed 80 centimetres in height preferably do not exceed 70 centimetres in

height, most preferably do not exceed 65 centimetres in height.

3. A loader (100, 200) as claimed in claims 1 or 2, wherein the back loader assembly (151) comprises at least one motor compartment (170) and a motor assembly (175) wherein the electric motor (172) is mounted on the motor assembly (175) wherein the motor assembly (175) is pivotably mounted on the back loader assembly (151) and arranged to pivot from a closed position where the electric motor is housed in the motor compartment (170) and an open position where the electric motor (172) is out of the motor compartment (170) and accessible for servicing.

4. A loader (100, 200) as claimed in claim 3, wherein the height of the back loader assembly (151) is substantially the same, whether the motor assembly (175) is positioned in an opened position or in a closed position.

5. A loader (100, 200) as claimed in claim 3 or 4, wherein the motor assembly (175) is pivotably mounted to the back loader by means of a hinge which axis of rotation is substantially vertical.

6. A loader (100, 200) as claimed in claim 5, wherein the hinge is mounted on the side of the back loader assembly (151).

7. A loader (100, 200) as claimed in claim 5, wherein the hinge is mounted on a front end side of the back loader assembly (151).

8. A loader (100, 200) as claimed in any of the claims 1 to 7, wherein the body (155) of the loader 100 comprises a housing dimensioned to house at least part of the boom (120).

9. A loader (100, 200) as claimed in any of the claims 1 to 8, wherein the bucket comprises a front bucket assembly (112) pivotably mounted on a back bucket assembly (111) and means for moving the bucket between an open position and a closed position.

10. A loader (100, 200) as claimed in any of the claims 1 to 9, wherein the boom (120, 220) is curved or comprises a bent section so that the bucket sits nearer to the ground when the boom is in the lowered position.

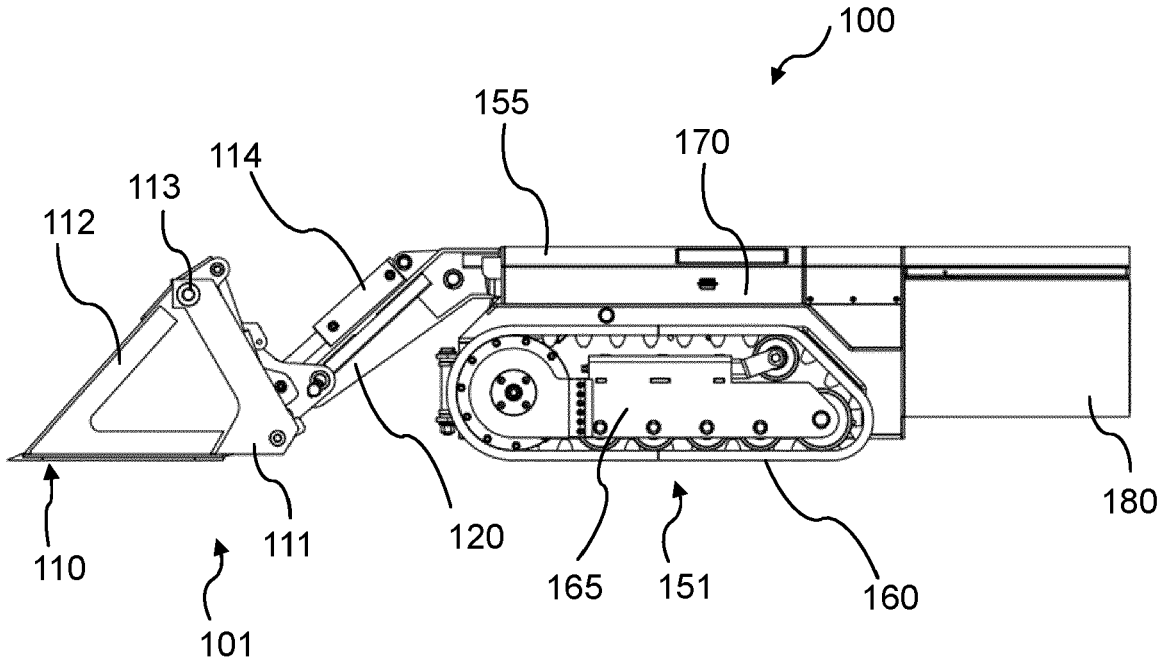
11. A loader (100, 200) as claimed in claim 10, wherein the boom (120, 220) comprises at least three segments, wherein a first segment (121) is pivotably mounted to the back loader assembly (151, 251) and substantially straight, a second segment is connected to first segment (121) and angled, and a third segment (123) is connected at one end to the second segment (122) and pivotably connected at the other end to the bucket (110).

12. A loader (100, 200) as claimed in any of the claims 1 to 11, wherein the battery compartment is an independent part of the main machine body, removable from the machine.

13. A loader (100,200) as claimed in claim 12, wherein said main machine body and said battery compartment comprise attachment and release elements designed such as to cooperate, and designed such as to release the battery compartment upon a vertical lifting movement of said battery compartment, and preferably designed such as said vertical lifting movement can have a small amplitude, preferably of less than about 10 cm, and more preferably less than about 6 cm.

14. A loader (100,200) as claimed in claim 1 to 13, wherein the bucket (210) comprises at least one side-scrapper (291, 292) mounted on the side of the bucket and pivotably moveable between and extended position, where the side-scrapper is deployed and a retracted position where the side-scrapper is positioned along the side of the bucket.

15. A loader (100, 200) as claimed in any of the claims 1 to 14, comprising a plurality of spotlights to illuminate the space around the loader.


100
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170
114
113
112
180
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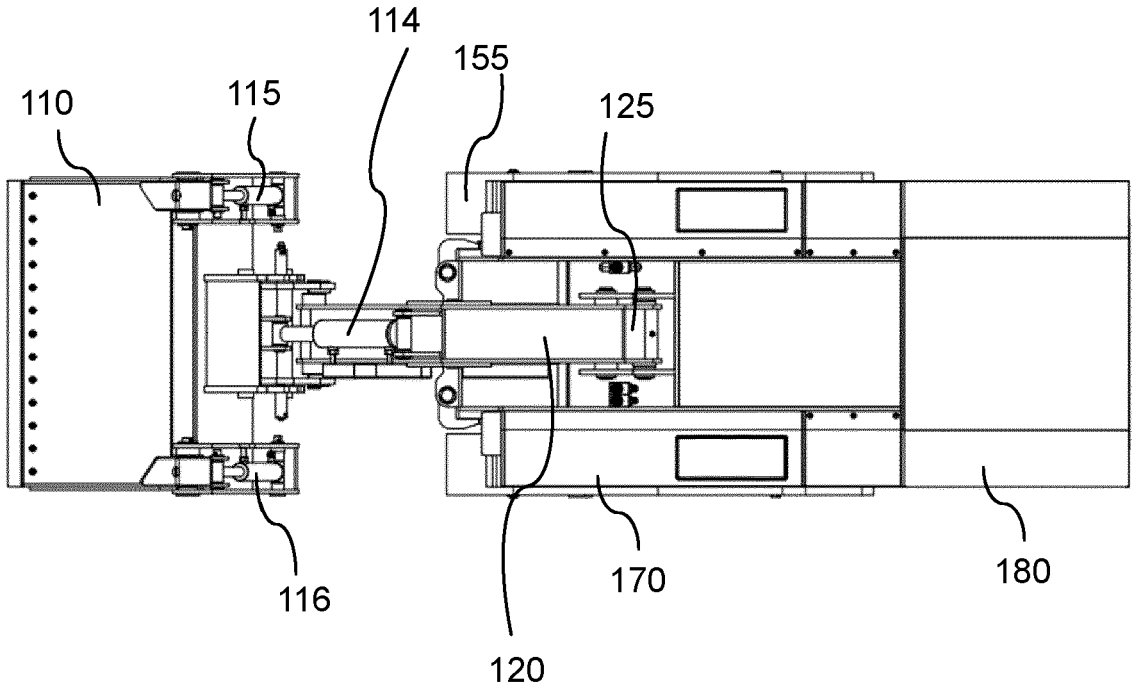
111
120
165
151
160
101

FIG 1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110
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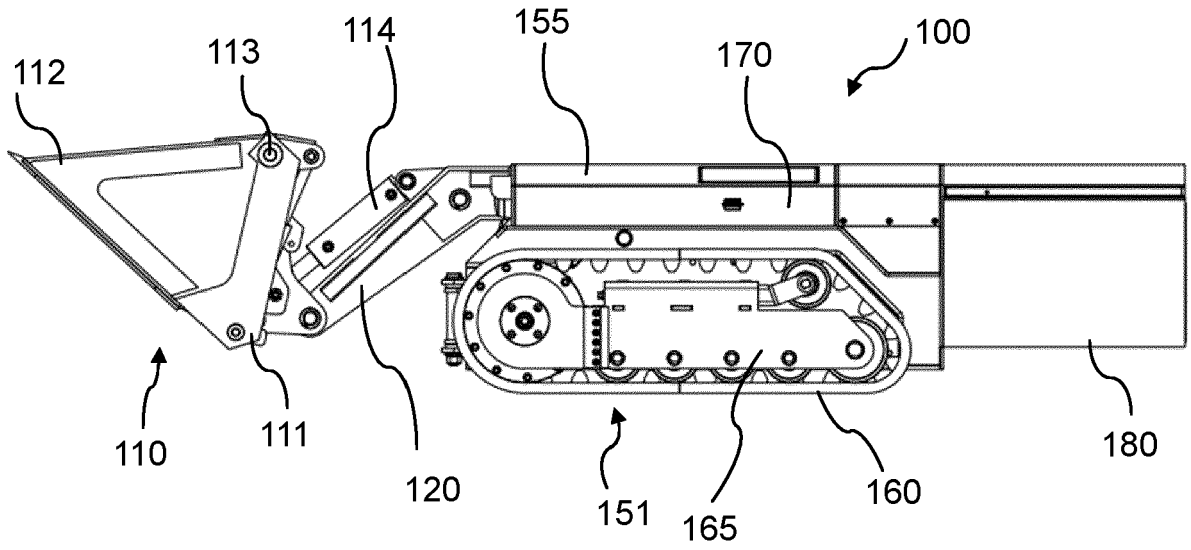
116
170
180
120

FIG 2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100
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151
165
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180

FIG 3

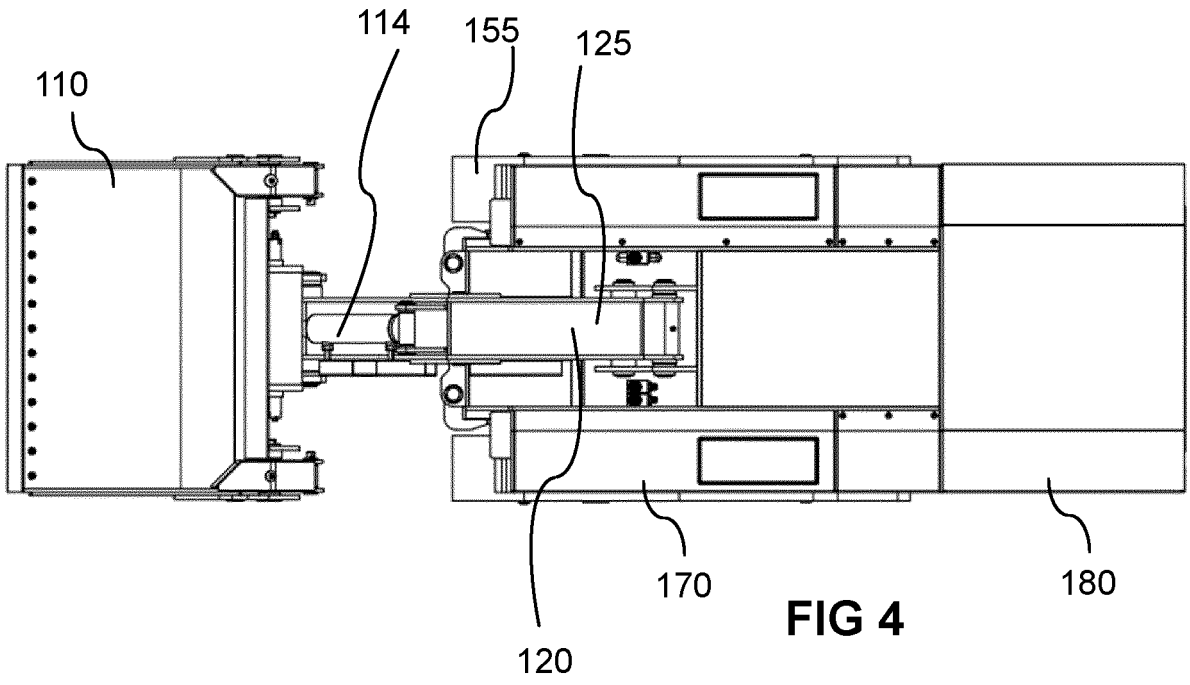
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FIG 4

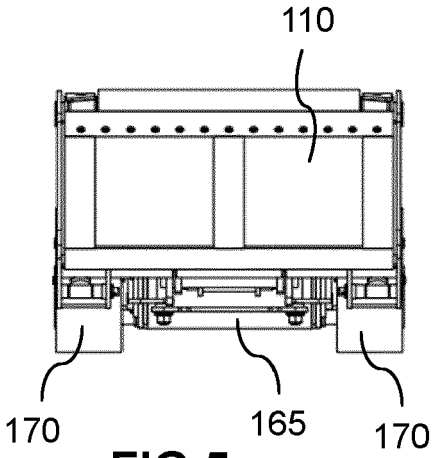


FIG 5

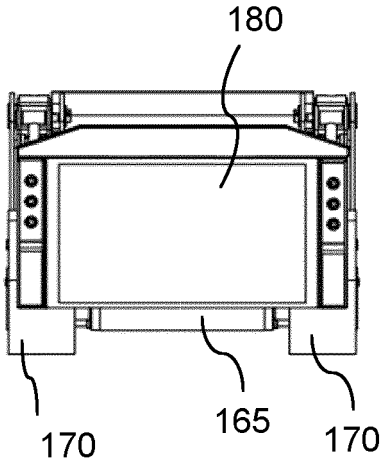


FIG 6

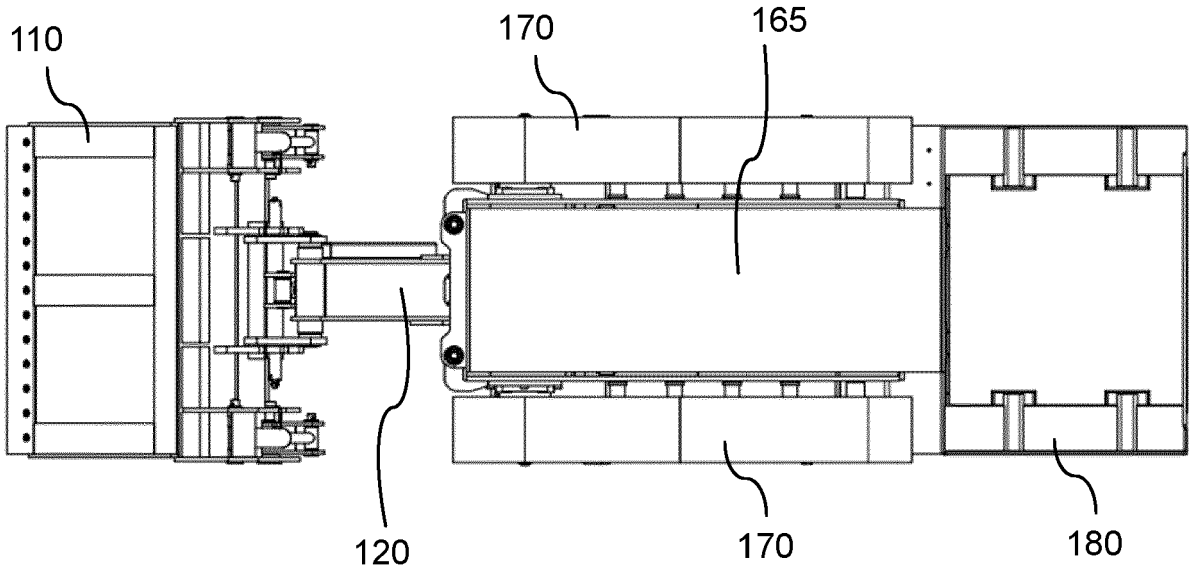
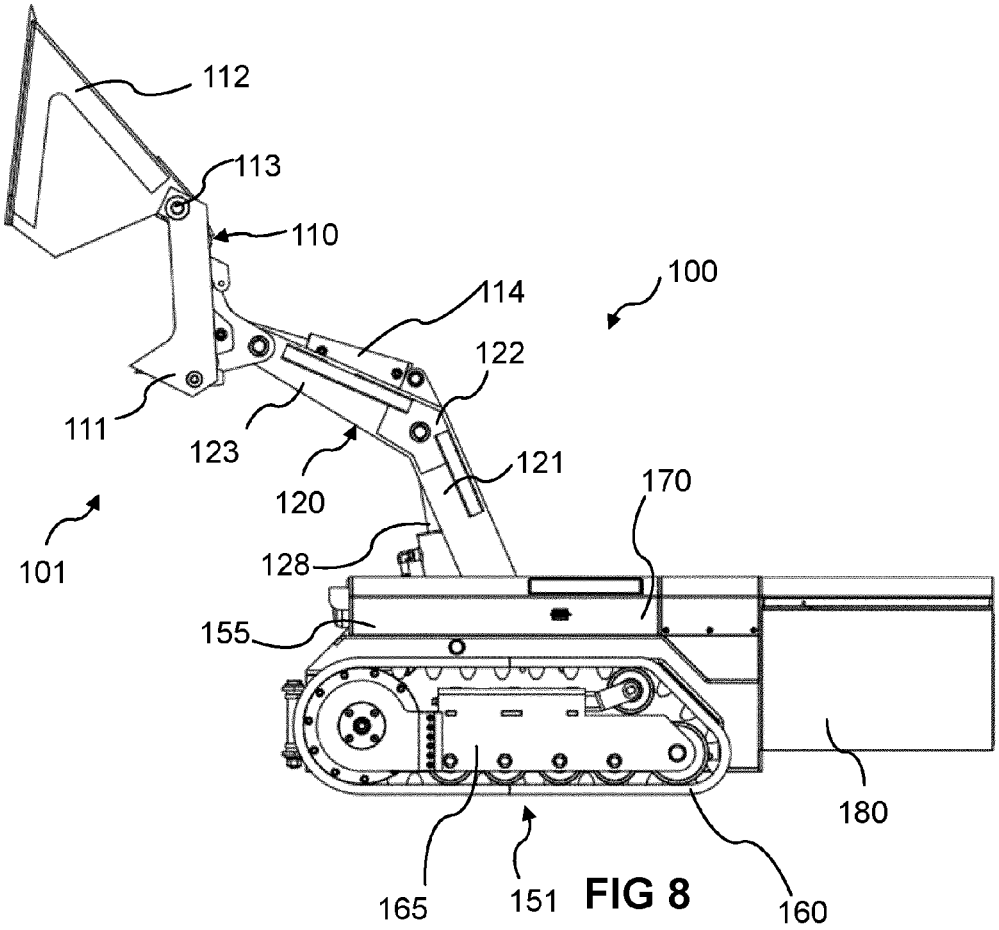


FIG 7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151
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FIG 8

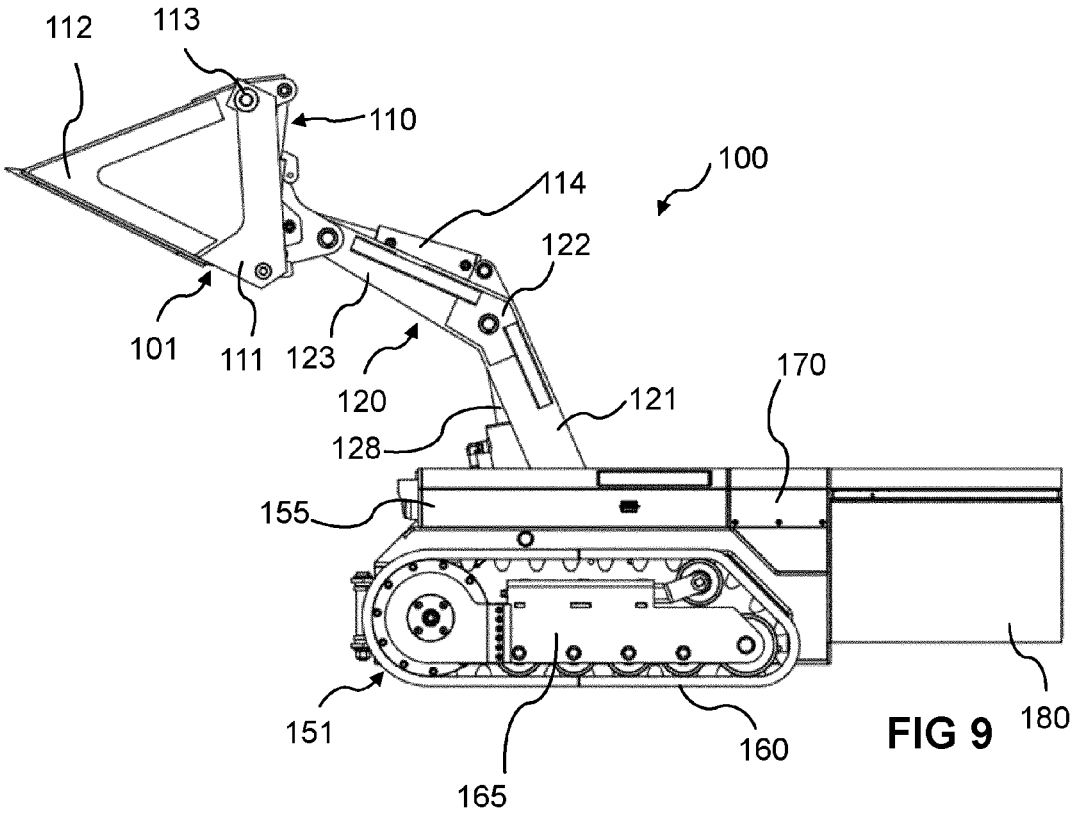
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FIG 9

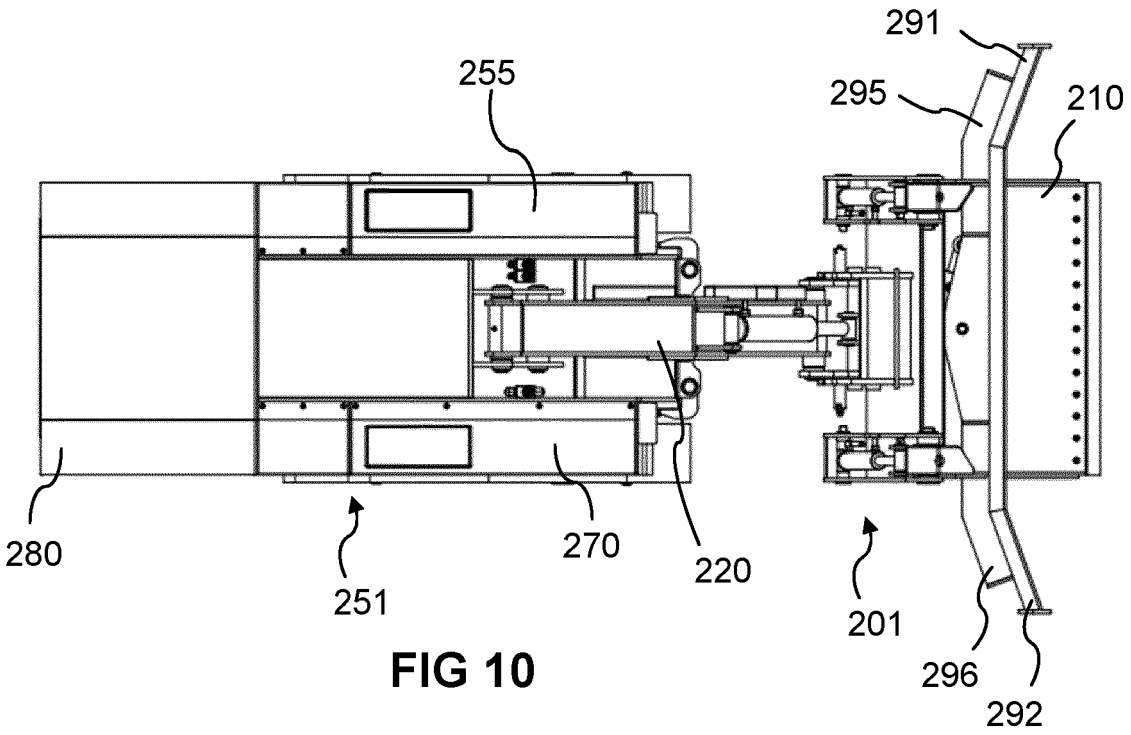
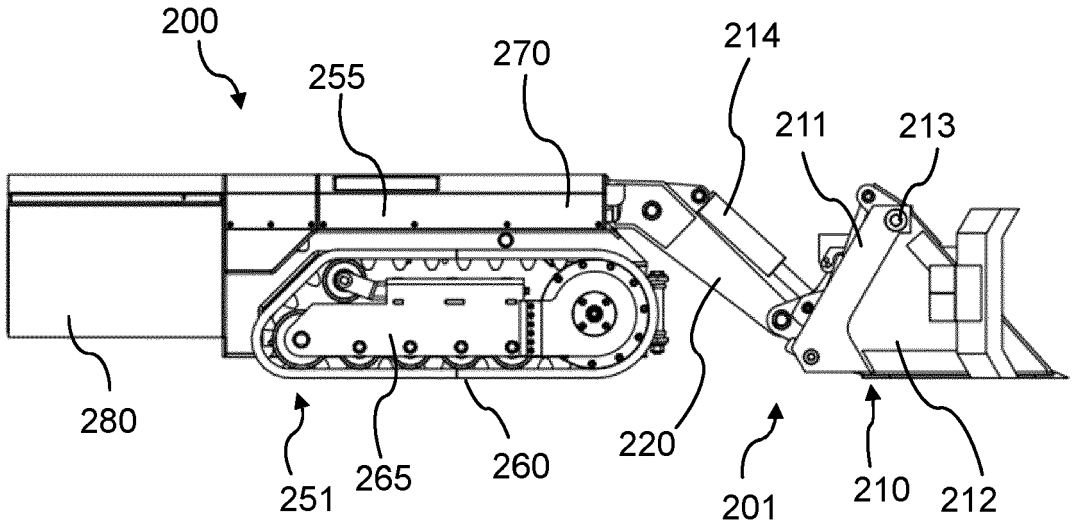

291
255
295
210
280
251
270
220
201
296
292

FIG 10


200
255
270
214
211
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251
265
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220
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210
212

FIG 11

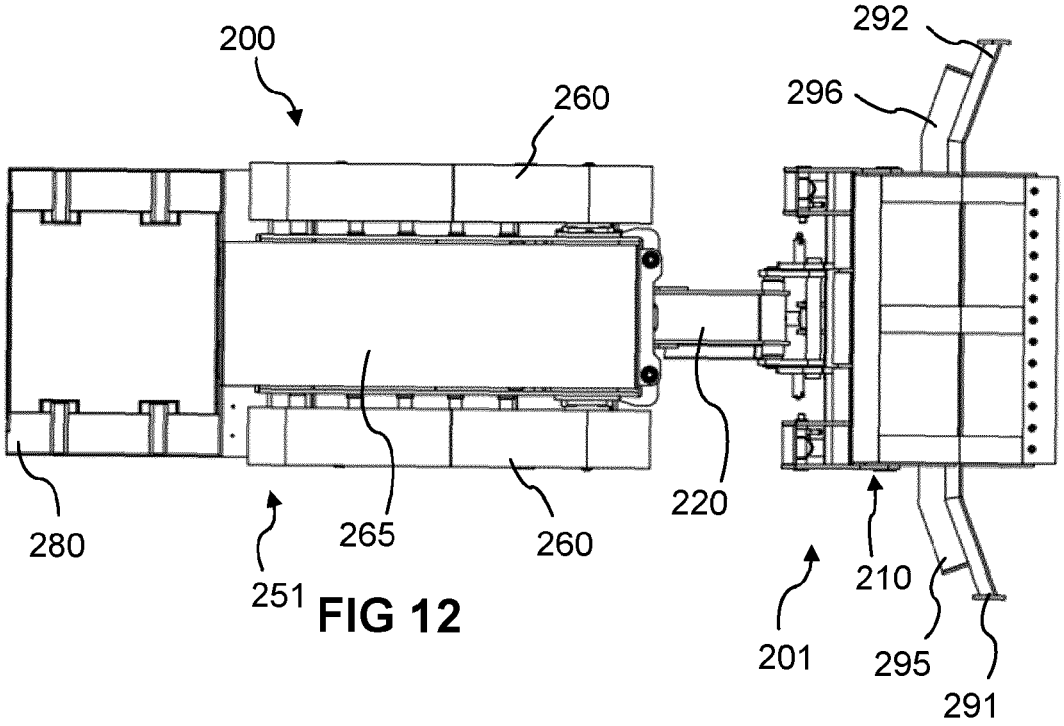


FIG 12

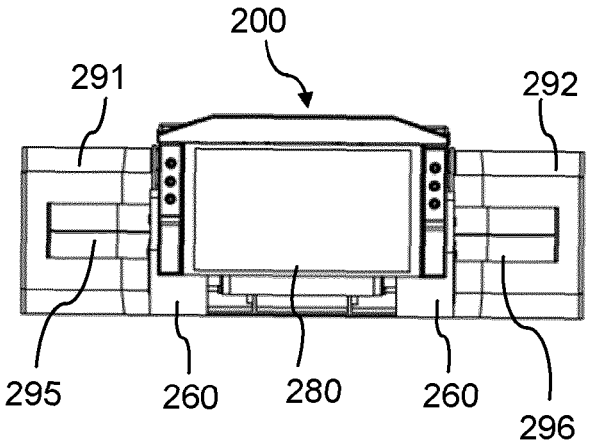


FIG 13

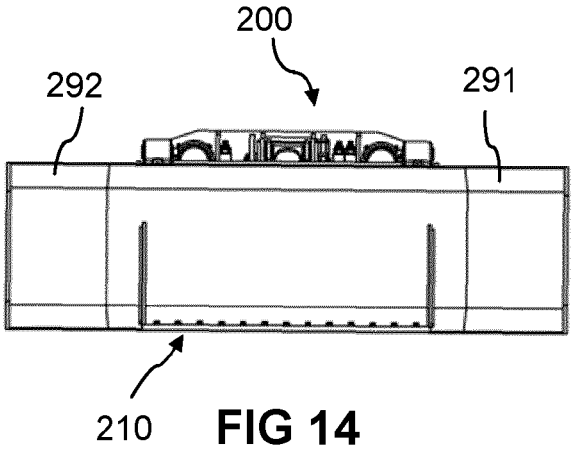
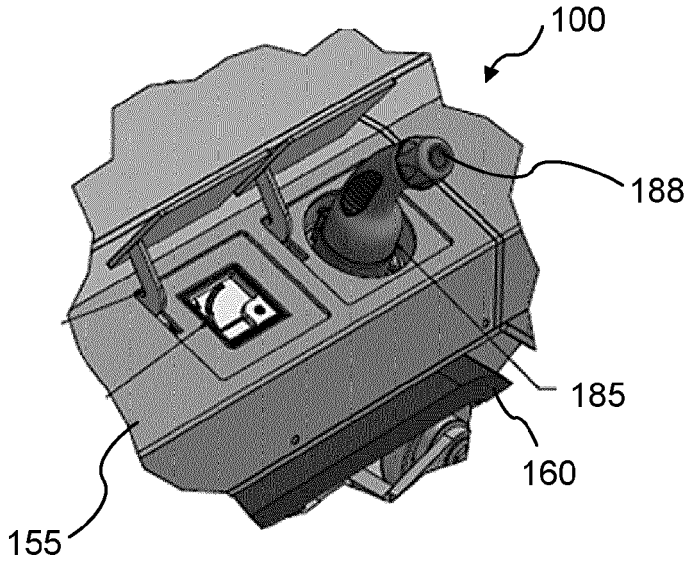


FIG 14


100
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185
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155

FIG 15

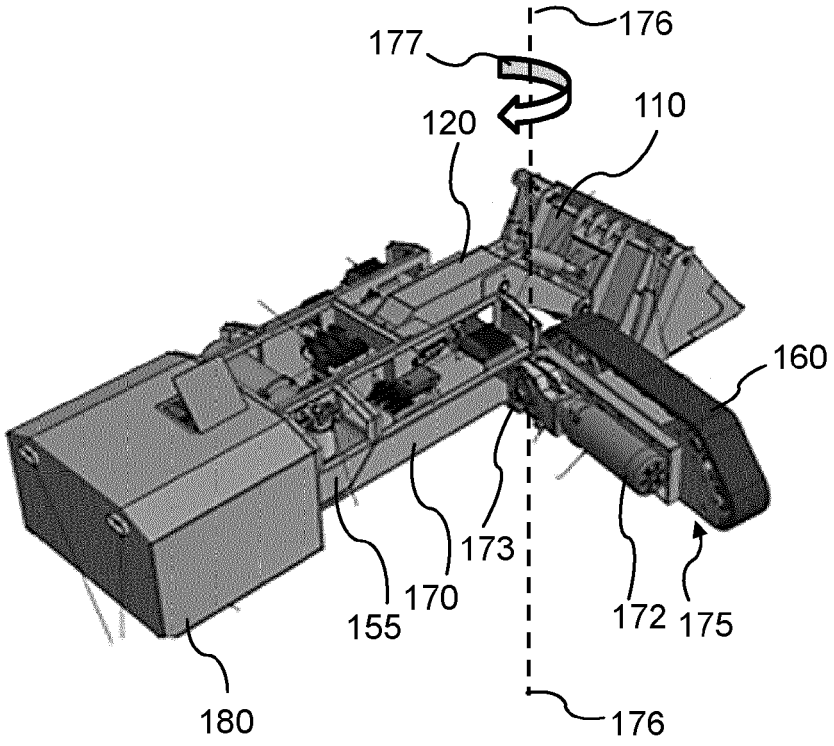
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FIG 16

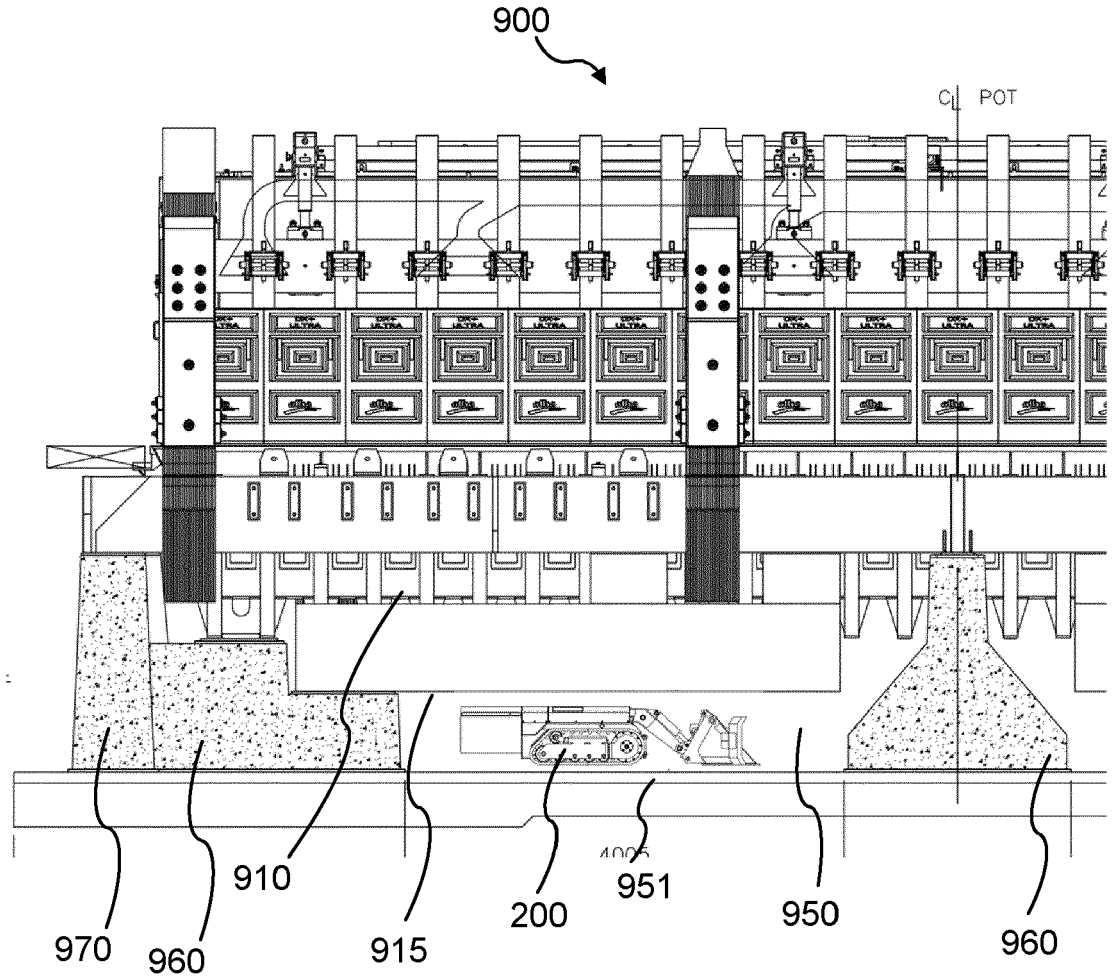

FIG 17

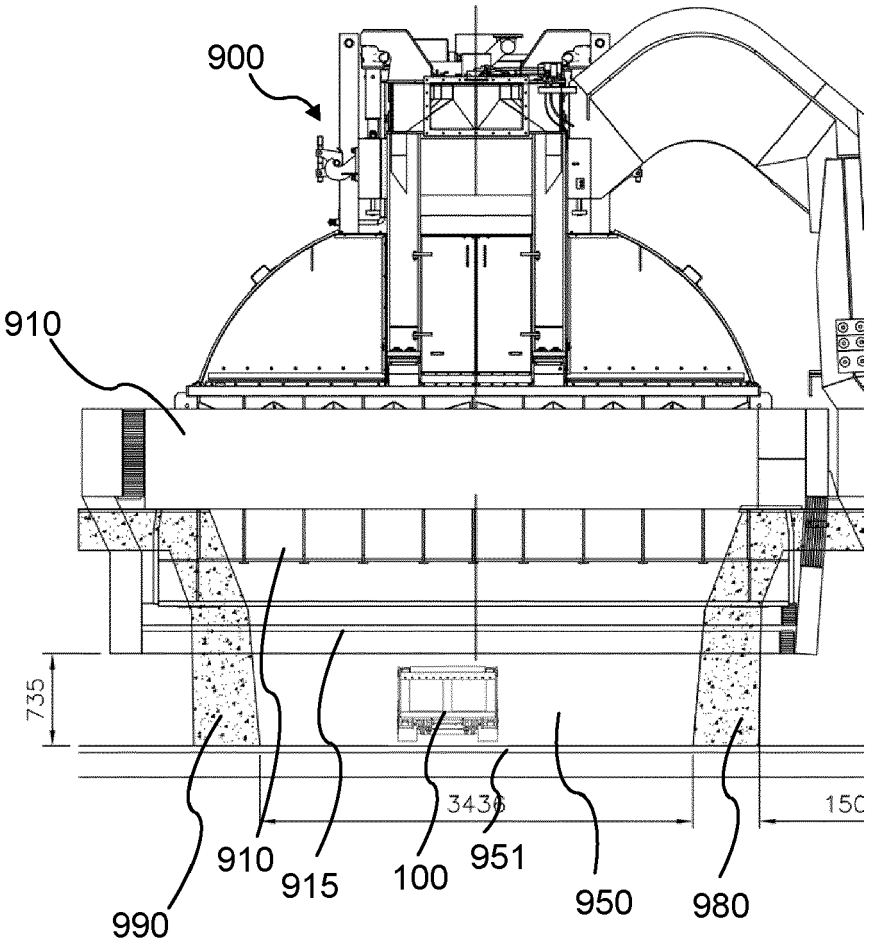

FIG 18

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EUROPEAN SEARCH REPORT

Application Number
EP 23 18 4503

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Y	* paragraph [0018] - paragraph [0023]; figures 1,2a,2b *	1,2,8,9, 14,15	E21F13/06
A	* paragraph [0029] - paragraph [0031] * * paragraph [0072]; figures 8a,8b,9a,9b * * paragraph [0089] *	3-7,13	
X	AU 2013 101 704 A4 (HOWARD JAMIE [AU]) 15 January 2015 (2015-01-15)	1,2,8-12	
Y	* paragraph [0006] - paragraph [0007]; figures 4,5,11 *	8-11,15	
A	* paragraph [0020] - paragraph [0023]; figure 1 *	3-7,13, 14	
X	WO 2012/061888 A1 (MORDEY JASON JAMES [AU]) 18 May 2012 (2012-05-18)	1,2,12, 14,15	
Y	* page 7, line 22 - page 8, line 2; figure 4 *	8-11,15	
A	* page 35, line 8 - page 36, line 5; figures 7-10 * * page 37, line 21 - page 39, line 4 * * page 16, line 17 - line 25 *	3-7,13	TECHNICAL FIELDS SEARCHED (IPC) E02F E21C E21F
Y	WO 2009/105803 A1 (MINPROVISE PTY LTD [AU]; TOWNSEND GRAHAM [AU]; KLUCK JOHN GERARD [AU]) 3 September 2009 (2009-09-03)	1,2,8,9, 15	
A	* page 6, line 14 - page 7, line 14; figures 1a,3 * * page 10, line 23 - line 26 *	3-7, 10-14	
Y	JP H08 92992 A (TOYO UMPANKI CO LTD; SANKYU KK) 9 April 1996 (1996-04-09)	1,2, 8-10,14, 15	
A	* the whole document *	3-7, 11-13	

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	24 January 2024	Clarke, Alister

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EUROPEAN SEARCH REPORT

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	24 January 2024	Clarke, Alister

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