(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
16 July 2009 (16.07.2009)

PCT

(10) International Publication Number
WO 2009/087603 A1

(51) International Patent Classification:
*E21C 47/00* (2006.01) *E01H 1/04* (2006.01)
*A47L 11/22* (2006.01)

(21) International Application Number:
PCT/IB2009/050082

(22) International Filing Date: 9 January 2009 (09.01.2009)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2008/00493 11 January 2008 (11.01.2008) ZA

(71) Applicants and
(72) Inventors: **BRINK, Jacobus, PIeter, Daniël** [ZA/ZA]; 30 Union Road, 7441 Milnerton (ZA). **LE ROUX, Pieter, Willem** [ZA/ZA]; 30 Union Road, 7441 Milnerton (ZA).

(74) Agents: **GERNTHOLTZ, Richard, Otto, Paul** et al.; Dr Gerntholtz Inc, P.O. Box 8, 8000 Cape Town (ZA).

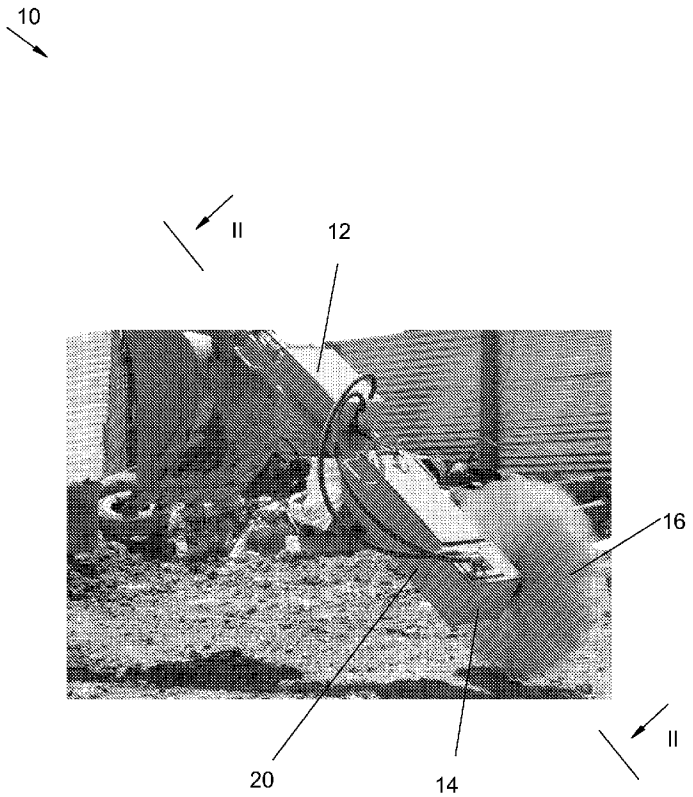
(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Published:**
— *with international search report*

(54) **Title:** SWEEPING ARRANGEMENT

FIG. 1




(57) **Abstract:** The invention discloses a sweeping arrangement, which includes a supporting arm connected to at least one pivoting member of a machine; a rotational support head supported by the supporting arm; a rotational brush supported by the rotational support head; electrical and/or hydraulic and/or pneumatic rotational means adapted to rotate the rotational brush; and central axis rotating means adapted to rotate the rotational support head about a central axis. The central axis rotating means includes an electrical ac motor and/or dc motor and/or gearbox and/or rotary actuators and/or hydraulics and/or pneumatics. The sweeping arrangement is adapted to apply and/or control downward pressure on the rotational brush.

WO 2009/087603 A1

# SWEEPING ARRANGEMENT

## FIELD OF INVENTION

The present invention relates to a sweeping arrangement.

More particularly, the present invention relates to a sweeping arrangement for mining purposes.

## BACKGROUND TO INVENTION

Various sweeping machines for sweeping sand and cleaning streets are known. In the prior art, such sweeper attachments generally have consisted of an arm member pivotally connected to the bucket pivot pin for pivotal movement in the same vertical plane as the bucket, a rotary brush mounted on the free end of the arm member, a motor supported on the arm member for rotating the brush and a latch for securing the arm member against the underside of the handle. The arm member is angularly displaceable between an upper, retracted inoperative position and a lower, extended operative position, relative to the handle of the machine.

For example, US Patent 5,373, 652 Olsson discloses a sweeping appliance for excavators of the type comprising a stick and a bucket carried by the stick via a transverse pivot pin, the appliance including a rotary brush arranged at a free end of a holder whose opposite end is articulated to the stick or the pivot pin to allow pivoting of the holder between a position remote from the stick, in which the brush can actively perform a sweeping operation, and an inactive position close to the stick. The holder is divided into at least two parts, of which an outer, brush-carrying part is rotatable relative to an inner part, more precisely by means of a rotary unit operating between the two parts, thereby permitting the brush to turn about an axis extending at right angles to the axis of rotation of the brush.

United States Patent 6,269,560 Pratt discloses a sweeping assembly for excavating machines and the like, namely a sweeping assembly for a machine having a handle generally comprising a first implement pivotally connectable to the handle; a strut assembly including a first arm member operatively

connectable to the handle, a second arm member and a spring device operatively interconnecting the first and second members, and means for yieldably biasing the second arm member into a predetermined position relative to the first arm member; and a second implement mounted on the second arm member.

United States Patent 6,830,412 Perez discloses a device for digging narrow trenches and laying prefabricated tongued and grooved components, namely a trencher comprising a cutting disc with a prefabricated tongued and grooved element feeder comprising a sweeper box with a U-shaped transverse cross section closed at the front by a rake, in such a way that earth cannot fall inside it, and powered drive wheels operably frictionally pushing prefabricated tongued and grooved elements in order to urge the elements together and to keep the different prefabricated tongued and grooved elements coupled together during their descent into the inside of the sweeper box. This produces a temporary plank mould for the trench, so that the lowering and laying of the prefabricated tongued and grooved elements inside the trench may be carried out automatically, safely, and in a working environment that is free of earth, thus enabling the correct linking of the elements.

The known sweeping machines unfortunately have various limitations in operation and use thereof.

It is an object of the invention to suggest a sweeping arrangement, which will assist in overcoming these problems.

**SUMMARY OF INVENTION**

According to the invention, a sweeping arrangement includes

(a) a supporting arm connected to at least one pivoting member of a machine;

(b) a rotational support head supported by the supporting arm;

(c) a rotational brush supported by the rotational support head;

(d) electrical and/or hydraulic and/or pneumatic rotational means adapted to rotate the rotational brush; and

(e) central axis rotating means adapted to rotate the rotational support head about a central axis.

Also according to the invention, a sweeping arrangement includes

(a) a supporting arm connected to at least one pivoting member of a machine and being adapted to apply and/or control downward pressure;

(b) a rotational brush supported by the supporting arm; and

(c) electrical and/or hydraulic and/or pneumatic rotational means adapted to rotate the rotational brush.

The central axis rotating means may utilise an electrical ac motor and/or dc motor and/or gearbox and/or rotary actuators and/or hydraulics and/or pneumatics.

The central axis rotating means may include locking means.

The arrangement may be adapted to apply and/or control downward pressure on the rotational brush.

The downward pressure may be applied by means of the pivoting member of the machine.

The rotational brush may be adapted to be rotated multi-directional and/or about 360 degrees.

The supporting arm may be extendable and/or telescopic.

The pivoting member may be a bucket.

The pivoting member may be a pivoting arm.

The machine may be an excavator and/or a front-loader and/or applicable carrier.

The sweeping arrangement may be adapted to be used for mining means.

The sweeping arrangement may include suction means.

The section means may be adapted to collect swept and/or unswept material.

The invention extends to any machine including a sweeping arrangement as described herein.

## BRIEF DESCRIPTION OF DRAWINGS

The invention will now be described by way of example with reference to the accompanying schematic drawings.

In the drawings there is shown in:

Figure 1: A perspective pictorial view of a sweeping arrangement according to the invention;

Figure 2: A sectional top view of the sweeping arrangement as seen from arrows II-II in Figure 1;

Figure 3: A sectional side view of the sweeping arrangement as seen from arrows III-III in Figure 1;

Figure 4: A close-up of the rotational brush, rotational support head and the central axis rotating means of the sweeping arrangement as shown in Figure 2;

Figure 5: A sectional side view of the sweeping arrangement as seen from arrows V-V in Figure 4; and

Figure 6: A side view of the rotational brush as shown in Figure 2.

## DETAILED DESCRIPTION OF DRAWINGS

Referring to the drawings, a sweeping arrangement in accordance with the invention, generally indicated by reference numeral 10, is shown.

A sweeping arrangement 10 according to the invention includes

(a) a supporting arm 12 connected to at least one pivoting member of a machine;

(b) a rotational support head 14 supported by the supporting arm 12;

(c) a rotational brush 16 supported by the rotational support head 12;

(d) hydraulic and/or pneumatic rotational means 18 adapted to rotate the rotational brush 16; and

(e) central axis rotating means 20 adapted to rotate the rotational support head 14 about a central axis.

The central axis rotating means 20 is operated by means of an electrical dc motor 22 and gearbox 24.

The central axis rotating means 20 includes locking means.

The sweeping arrangement 10 is adapted to apply downward pressure on the rotational brush 16. The downward pressure is applied by means of the pivoting member of the machine.

The rotational brush 16 is adapted to rotate 360 degrees.

The pivoting member of the machine can be a bucket, or a pivoting arm.

The machine can be an excavator (as shown in Figure 1) or a front-loader.

The sweeping arrangement 10 is adapted to be used for mining means.

The sweeping arrangement 10 if required includes suction means adapted to collect swept and unswept material.

## LIST OF REFERENCE NUMERALS

10 Sweeping arrangement

12 Supporting arm

14 Rotational support head

16 Rotational brush

18 Hydraulic and/or pneumatic rotational means

20 Central axis rotating means

22 Electrical dc motor

24 Gearbox

## PATENT CLAIMS

1. A sweeping arrangement, which includes

   (a) a supporting arm connected to at least one pivoting member of a machine;

   (b) a rotational support head supported by the supporting arm;

   (c) a rotational brush supported by the rotational support head;

   (d) electrical and/or hydraulic and/or pneumatic rotational means adapted to rotate the rotational brush; and

   (e) central axis rotating means adapted to rotate the rotational support head about a central axis.

2. A sweeping arrangement as claimed in claim 1, in which the central axis rotating means includes an electrical ac motor and/or dc motor and/or gearbox and/or rotary actuators and/or hydraulics and/or pneumatics.

3. A sweeping arrangement as claimed in claim 1 or claim 2, in which the central axis rotating means includes locking means.

4. A sweeping arrangement as claimed in any one of the preceding claims, which is adapted to apply and/or control downward pressure on the rotational brush.

5. A sweeping arrangement as claimed in claim 4, in which the downward pressure is applied by means of the pivoting member of the machine.

6. A sweeping arrangement as claimed in any one of the preceding claims, in which the rotational brush is adapted to be rotated multi-directional and/or about 360 degrees.

7. A sweeping arrangement as claimed in any one of the preceding claims, in which the supporting arm is extendable and/or telescopic.

8. A sweeping arrangement as claimed in any one of the preceding claims, in which the pivoting member is a bucket and/or pivoting arm.

9. A sweeping arrangement as claimed in any one of the preceding claims, in which the machine is an excavator and/or a front-loader and/or applicable carrier.

10. A sweeping arrangement as claimed in any one of the preceding claims, which is adapted to be used for mining means.

11. A sweeping arrangement as claimed in any one of the preceding claims, in which includes suction means.

12. A sweeping arrangement as claimed in claim 11, in which the suction means is adapted to collect swept and/or unswept materials.

13. A sweeping arrangement, which includes

(a) a supporting arm connected to at least one pivoting member of a machine and being adapted to apply and/or control downward pressure;

(b) a rotational brush supported by the supporting arm; and

(c) electrical and/or hydraulic and/or pneumatic rotational means adapted to rotate the rotational brush.

14. A sweeping arrangement as claimed in claim 13, in which the central axis rotating means utilises an electrical ac motor and/or dc motor and/or gearbox and/or rotary actuators and/or hydraulics and/or pneumatics.

15. A sweeping arrangement as claimed in claim 13 or claim 14, in which the central axis rotating means includes locking means.

16. A sweeping arrangement as claimed in any one of claims 13 to 15, which is adapted to apply and/or control downward pressure on the rotational brush.

17. A sweeping arrangement as claimed in claim 16, in which the downward pressure is applied by means of the pivoting member of the machine.

18. A sweeping arrangement as claimed in any one of claims 13 to 17, in which the rotational brush is adapted to be rotated multi-directional and/or about 360 degrees.

19. A sweeping arrangement as claimed in any one of claims 13 to 18, in which the supporting arm is extendable and/or telescopic.

20. A sweeping arrangement as claimed in any one of claims 13 to 19, in which the pivoting member is a bucket.

21. A sweeping arrangement as claimed in any one of claims 13 to 20, in which the pivoting member is a pivoting arm.

22. A sweeping arrangement as claimed in any one of claims 13 to 21, in which the machine is an excavator and/or a front-loader and/or applicable carrier.

23. A sweeping arrangement as claimed in any one of claims 13 to 22, which is adapted to be used for mining means.

24. A sweeping arrangement as claimed in any one of claims 13 to 23, in which includes suction means.

25. A sweeping arrangement as claimed in claim 24, in which the suction means is adapted to collect swept and/or unswept materials.

25. A sweeping arrangement substantially as hereinbefore described with reference to the accompanying drawings.

26. A machine including a sweeping arrangement substantially as hereinbefore described with reference to the accompanying drawings.

FIG. 1

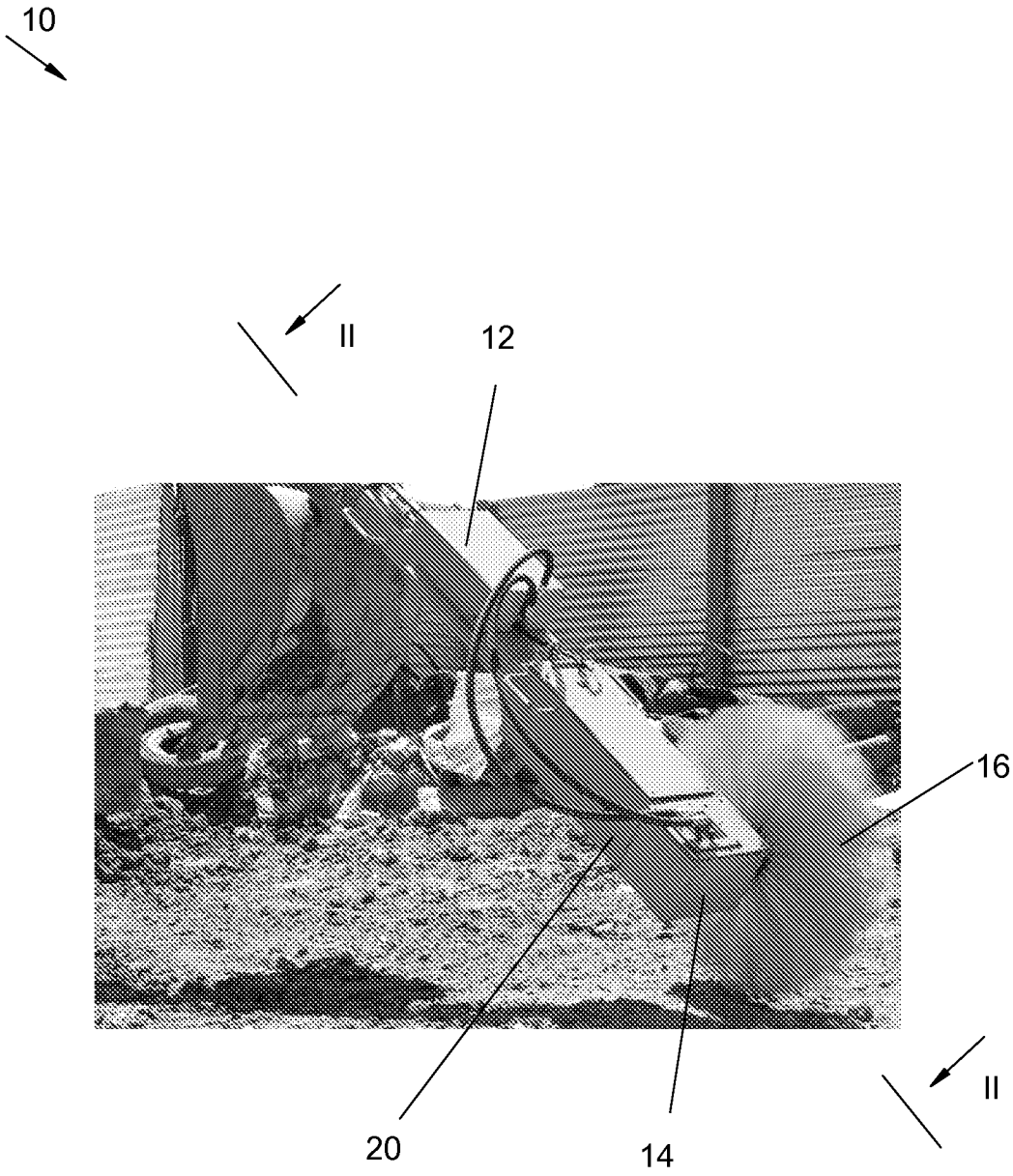


FIG. 2

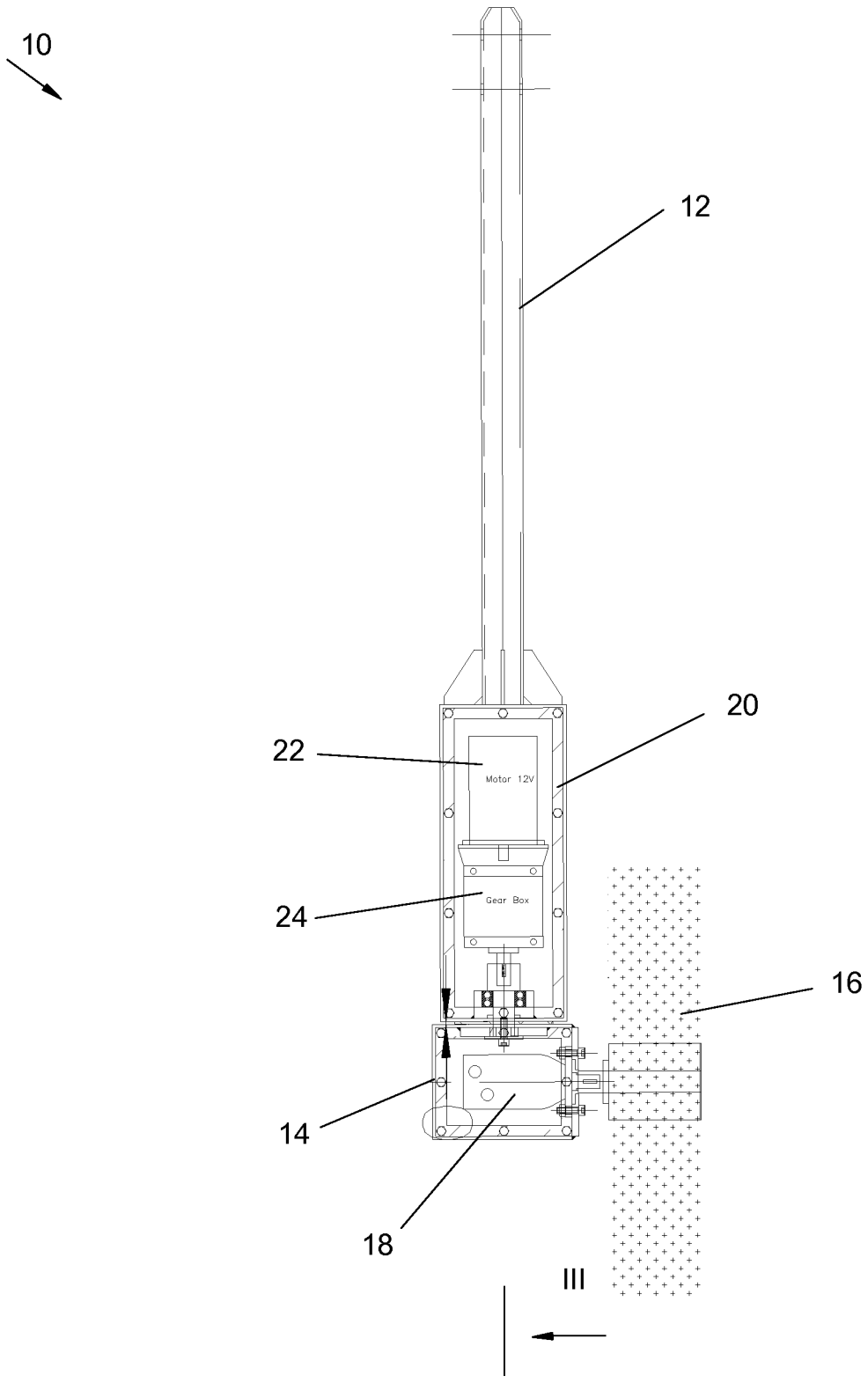


FIG. 3

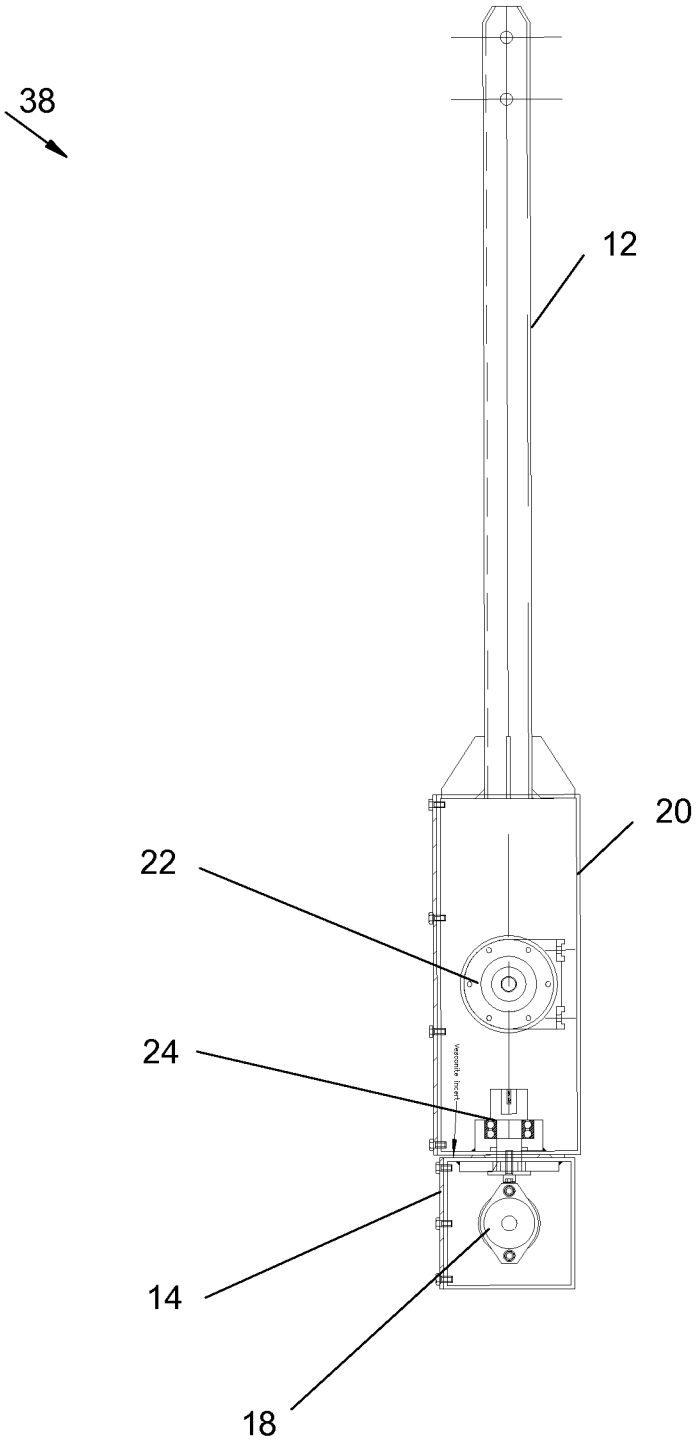


FIG. 4

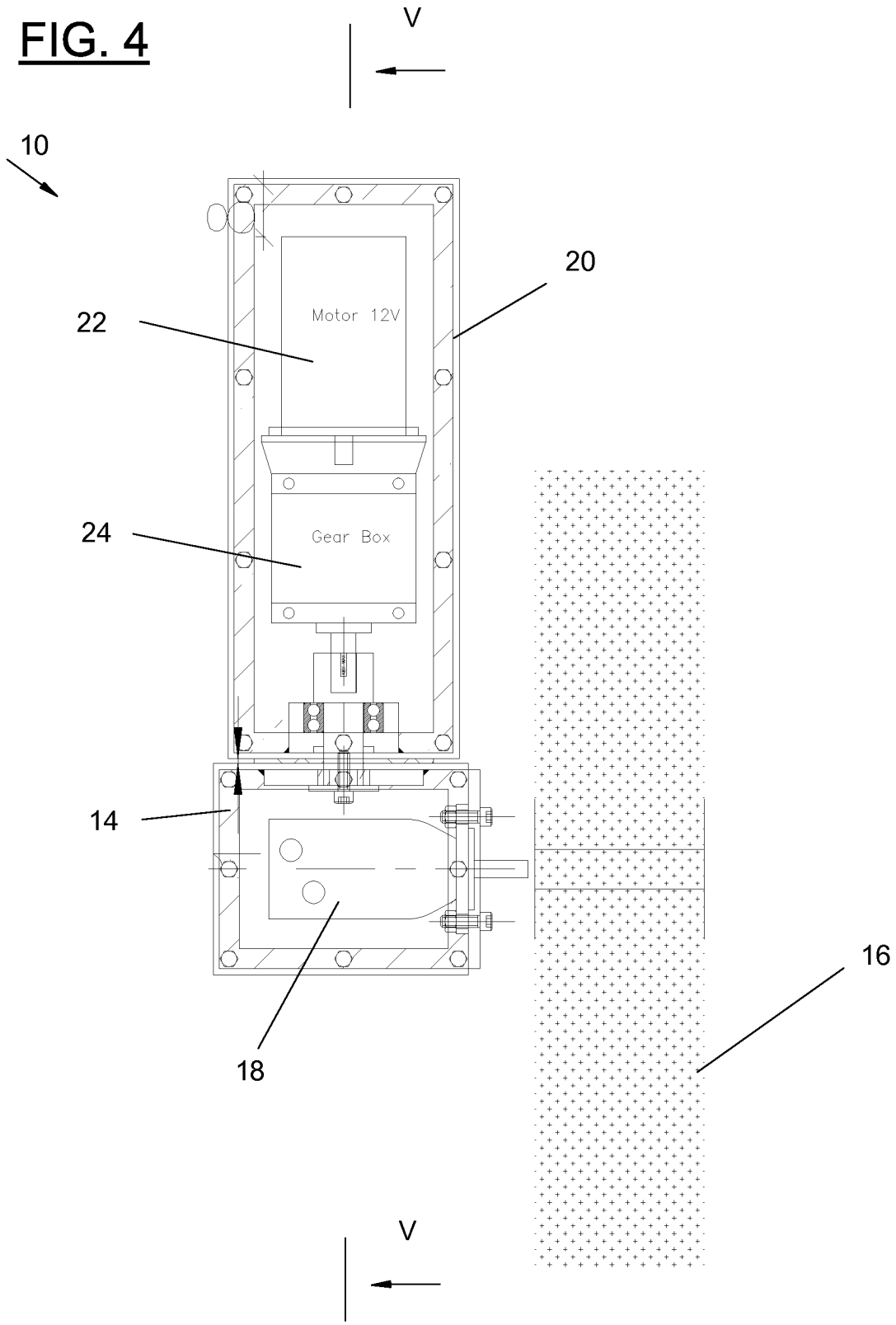


FIG. 5

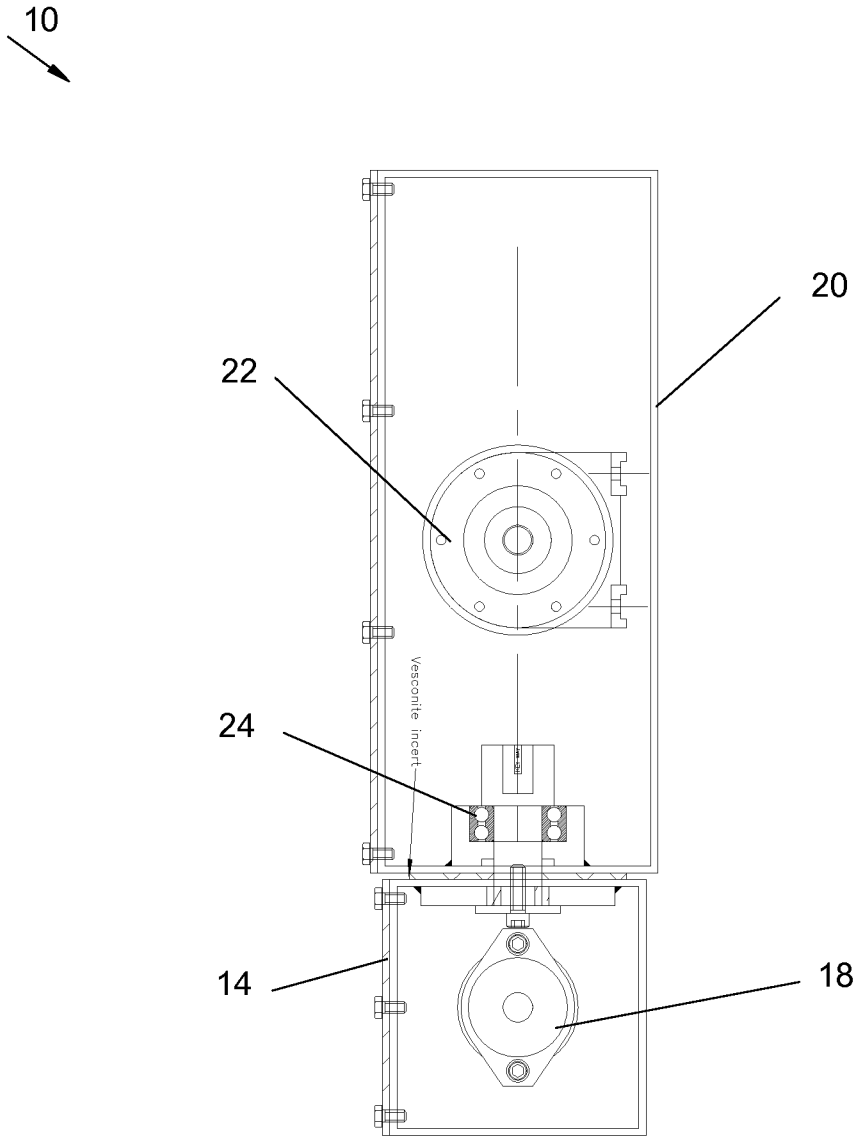
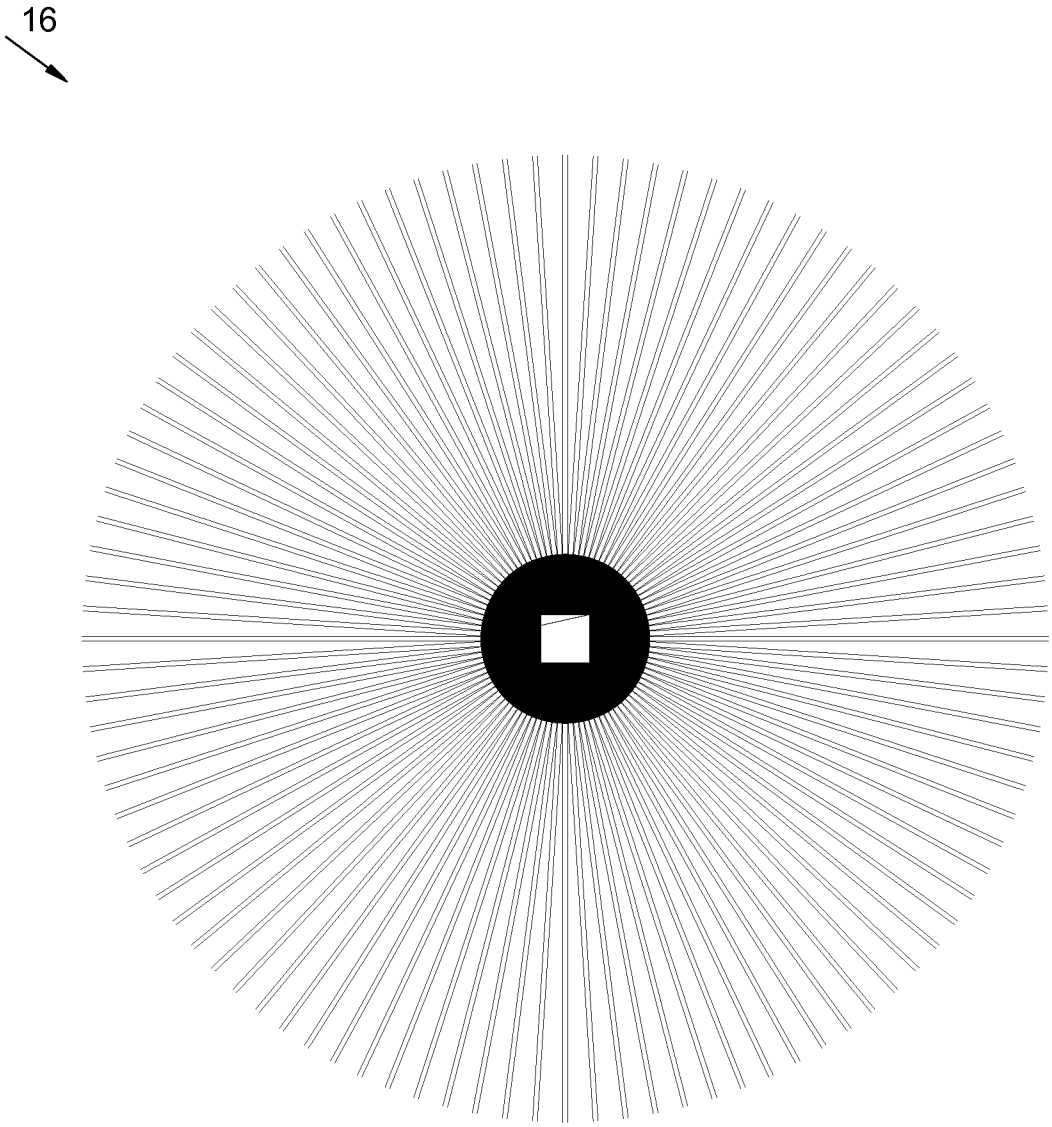


FIG. 6



# INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2009/050082

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl.

*E21C 47/00* (2006.01) *A47L 11/22* (2006.01) *E01H 1/04* (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPOQUE: EPODOC and WPI, /IC/EC E21C OR B08B1/04 OR A47L11 OR A46B13/00 OR A46B13/02 OR E21F5 OR E21F17 OR E02F3/76/LOW OR E02F3/88/LOW and keywords sweep+, (rota+) S (brush+), (rota+) 5d (boom+), lock+, suction+ and like words

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | US 5373652 A (OLSSON) 20 December 1994<br>column 3 lines 40-65, figures 1-3 | 1-25 |
| X | US 3105991 A (OBERG) 8 October 1963<br>column 1 lines 10-15, column 4 lines 35-43, column 5 lines 56-70 | 13-14, 16, 18, 22, 24 and 25 |
| X | US 6269560 B1 (PRATT) 7 August 2001<br>Abstract, figure 1, column 3 lines 34-35 | 13-14, 16-17, 19, 21-22 and 23 |
| X | EP 383379 B1 (VALK et al) 12 May 1993<br>Figures 1 and 3 | 1-2, 4, 6, 8-10, 13-14, 16, 18 and 21-23 |

[X] Further documents are listed in the continuation of Box C [X] See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 19 March 2009 | 03 APR 2009 |
| Name and mailing address of the ISA/AU<br>AUSTRALIAN PATENT OFFICE<br>PO BOX 200, WODEN ACT 2606, AUSTRALIA<br>E-mail address: pct@ipaustralia.gov.au<br>Facsimile No. +61 2 6283 7999 | Authorized officer<br>**SACHIN.MARWAHA**<br>AUSTRALIAN PATENT OFFICE<br>(ISO 9001 Quality Certified Service)<br>Telephone No : +61 2 6225 6136 |

# INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2009/050082

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| A | US 3161900 A (HORNSCHUCH et al) 22 December 1964<br>Figure 1, column 4 lines 20-40 | 1-25 |

# INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2009/050082

**Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☒ Claims Nos.: **26 and 27**
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

Claims 26 and 27 do not comply with Rule 6.2(a) because they rely on references to the drawings.

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

**Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

See Supplemental Sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☒ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

**Remark on Protest**

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

# INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2009/050082

**Supplemental Box**
(To be used when the space in any of Boxes I to IV is not sufficient)

**Continuation of Box No: Box III**

This International Application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept.

In assessing whether there is more than one invention claimed, I have given consideration to those features which can be considered to potentially distinguish the claimed combination of features from the prior art. Where different claims have different distinguishing features they define different inventions.

This International Searching Authority has found that there are different inventions as follows:

Invention I: Claims 1-12 are directed to a sweeping arrangement with a supporting arm connected to a pivoting member of a machine that supports a rotational support head to which a rotational brush is attached. It is considered that a rotational means adapted to rotate the brush and a central axis rotating means adapted to rotate the support head comprises a first distinguishing feature.

Invention II: Claims 13-25 are directed to a sweeping arrangement with a supporting arm connected to a pivoting member of a machine and supporting a rotational brush driven by rotational means. It is considered that the support arm adapted to apply or control downward pressure comprises a second distinguishing feature.

PCT Rule 13.2, first sentence, states that unity of invention is only fulfilled when there is a technical relationship among the claimed inventions involving one or more of the same or corresponding special technical features. PCT Rule 13.2, second sentence, defines a special technical feature as a feature which makes a contribution over the prior art.

The only feature common to all of the claims is the supporting arm connected to a pivoting member of a machine that supports a rotational brush driven by rotational means. However this concept is not novel in the light of:

US 5373652 A (OLSSON) 20 December 1994

The above document discloses a sweeping appliance with the supporting arm (item 16 - figure3) connected to a pivoting member (6) of an excavating machine that supports a rotational brush (13) driven using a hydraulic motor (33).

This means that the common feature can not constitute a special technical feature within the meaning of PCT Rule 13.2, second sentence, since it makes no contribution over the prior art.

Because the common feature does not satisfy the requirement for being a special technical feature it follows that it cannot provide the necessary technical relationship between the identified inventions. Therefore the claims do not satisfy the requirement of unity of invention *a posteriori*.

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
**PCT/IB2009/050082**

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

| Patent Document Cited in Search Report | | Patent Family Member | | | | | |
|---|---|---|---|---|---|---|---|
| US | 5373652 | AU | 11696/92 | CA | 2100172 | EP | 0566642 |
| | | FI | 933158 | NO | 932456 | SE | 9100069 |
| | | WO | 9212298 | | | | |
| GB | 3105991 | NONE | | | | | |
| US | 6269560 | NONE | | | | | |
| EP | 0383379 | NL | 8900372 | NL | 8900373 | | |
| US | 3161900 | NONE | | | | | |

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

END OF ANNEX