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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
4 December 2008 (04.12.2008)

PCT

(10) International Publication Number
WO 2008/146072 A1

(51) International Patent Classification:
A47L 9/28 (2006.01)

(21) International Application Number:
PCT/IB2007/001411

(22) International Filing Date: 30 May 2007 (30.05.2007)

(25) Filing Language: Italian

(26) Publication Language: English

(71) Applicant *(for all designated States except US)*: **SOTECO SPA** [IT/IT]; Via Enrico Fermi, 2, I-26022 Castelverde (CR) (IT).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: **RAINERI, Pierluigi** [IT/IT]; c/o Soteco SPA, Via Enrico Fermi, 2, I-26022 Castelverde (CR) (IT). **RONCHI, Domenico** [IT/IT]; c/o Soteco SPA, Via Enrico Fermi, 2, I-26022 Castelverde (CR) (IT).

(74) Agent: **CRUGNOLA, Pietro**; Luppi Crugnola & Partners S.R.L., Viale Corassori, 54, I-41100 Modena (IT).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, 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, 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, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declaration under Rule 4.17:
— *as to the identity of the inventor (Rule 4.17(i))*

Published:
— *with international search report*

(54) Title: CLEANING MACHINE

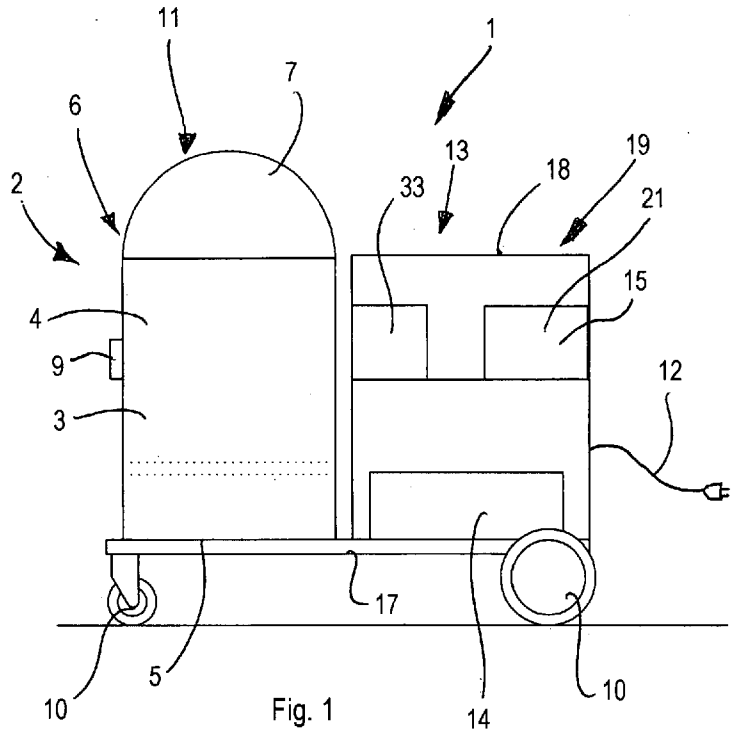

Fig. 1

(57) Abstract: A cleaning machine (1) comprises electric motor means (11) connectable to a mains power supply dispensing alternating current and electricity supplying means (13, 14, 15, 20, 23), said electric motor means (11) being alternatively suppliable by said mains power supply or by said electricity supplying means (13, 14, 15, 20, 23).

WO 2008/146072 A1

Cleaning machine

The invention relates to a cleaning machine.

A cleaning machine is known comprising a containing body for receiving waste materials, for example detritus, dust, liquids, that are removed from a surface to be cleaned. The cleaning machine further comprises an electric motor that is supplied by an external mains power supply.

The electric motor generates a vacuum that is such as to suck and convey the waste materials inside the containing body through a suction conduit. The cleaning machine comprises an electricity supply cable, an end of which is connected to the electric motor. The electricity supply cable can be connected to the mains power supply in such a way as to supply the electric motor with alternating current at 220/230 V and 50 Hz.

A drawback of the known cleaning machine is that it does not allow cleaning operations to be conducted if the mains power supply is interrupted. In this case it is necessary to wait for the mains power supply to be restored in order to resume and terminate the current cleaning operations.

Another drawback of the known cleaning machine is that it is not able to operate in places that are not served by the external mains power supply.

An object of the invention is to improve known cleaning machines.

Another object of the invention is to provide a cleaning machine that is able to operate even if the external mains power supply is interrupted.

A further object of the invention is to provide a cleaning machine that is also able to operate in places that are not connected to the external mains power supply.

According to the invention, there is provided a cleaning machine, comprising electric motor means connectable to a mains power supply dispensing alternating current, characterised in that it further comprises electricity supplying means, said electric motor means being

alternatively suppliable by said mains power supply or by said electricity supplying means.

In an embodiment of the cleaning machine, the electricity supplying means comprises battery means which can dispense direct current, for example at 12 V, or at 24 V, and inverter means that is able to transform this direct current into alternating current, for example at 220/230 V and 50 Hz.

The battery means can be recharged by electric power supplied by the mains power supply when the cleaning machine is connected to the latter.

As an alternative, or in addition, to the battery means and to the inverter means, the electricity supplying means may comprise internal-combustion electric-generating means.

The cleaning machine may be, for example, a vacuum cleaner or an electric broom.

Owing to the invention, it is possible to obtain a cleaning machine that is able to perform cleaning operations even if the mains power supply is interrupted. In this case, it is not therefore necessary to wait for the mains power supply to be restored and it is possible to continue cleaning operations. The cleaning machine according to the invention is able to operate without interruptions, owing to the electricity supplying means that ensures continuous dispensing of power to the electric motor means.

Further, the cleaning machine according to the invention is also able to operate even in places that are very far from mains power supply sockets connected to the mains power supply.

The invention can be better understood and implemented with reference to the attached drawings, which show an embodiment thereof by way of non-limiting example, in which:

Figure 1 is a schematic side view of a cleaning machine;

Figure 2 is a schematic front view of the cleaning machine in Figure 1;

Figure 3 is an operating diagram of an electricity supplying system of the cleaning machine in Figure 1.

Figures 1 and 2 show a cleaning machine 1, for example a vacuum cleaner, provided with a first casing 2 that includes a containing body 3, configured for internally receiving, through a conduit (not shown), waste materials, such as detritus, dust, liquids, and dirt in general that are sucked or brushed from a surface.

The containing body 3 comprises a side wall 4 and a bottom wall 5.

The bottom wall 5 and the side wall 4 together define a containing cavity inside which the waste materials are poured that are removed by the cleaning machine 1.

The cleaning machine 1 is provided with a connecting element 9 that is used to connect in a removable manner a suction conduit (not shown) to the containing body 3. The waste materials that are removed by the cleaning machine 1 from a surface to be cleaned are made to flow to the containing body 3 through the suction conduit.

There are provided wheels 10 that are connected to a base 17 of the cleaning machine 1 that enable the latter to be moved easily.

The containing body 3 is closed, at an end 6 opposite the bottom wall 5, by a lid element 7 that internally closes an electric motor 11 that is suppliable by alternating current. Alternatively, the electric motor may be provided inside the containing body 3.

The electric motor 11 is configured in such a way as to drive removing means that removes the waste materials from the surface to be cleaned.

The electric motor 11 is suppliable with alternating current at 220/230 Volts and 50 Hz and is able to generate a vacuum such as to suck and convey the waste materials inside the containing body 3.

The cleaning machine 1 comprises a second casing 18 inside which there is housed an electricity supplying system 19

(shown schematically in Figure 3) to supply the electric motor 11 with power.

The electricity supplying system 19 comprises an electric cable 12 that may be removably connected to a mains power supply socket to draw electric power to be supplied to the electric motor 11.

The electricity supplying system 19 further comprises an electricity supply source 13 inside the cleaning machine that is able to supply, for a certain period, the electric motor 11 even if the mains power supply is not available or if the cleaning machine 1 has to operate in zones far from the mains power supply socket.

The electricity supply source 13 comprises a battery 14, or a plurality of batteries, able to dispense direct current having, for example, voltage equal to 12 V, or equal to 24 V. The electricity supply source 13 further comprises an inverter device 15 that is connected to the battery 14. The inverter device 15 receives direct current dispensed by the battery 14 to transform it into alternating current, for example having voltage equal to 220-230 V and frequency equal to 50 Hz.

In this way, the inverter device 15 enables an alternating current to be obtained that is suitable for supplying the electric motor 11. The inverter device 15 is provided with an indicating panel 21, positioned on the external surface of the second casing 18, that provides information on the operating status of the inverter device 15.

The inverter device 15 is connected by a switch 20, which may be automatic, to the electric motor 11. The switch 20 acts in such a way as to disconnect or connect operationally the inverter device 15 from or to the electric motor 11, depending on whether the electric motor 11 requires electric power from the battery 14. In other words, the switch 20 permits switching - in particular automatic switching - from a supply mode in which the electric motor 11 is supplied by the mains power supply to a further supply mode in which the

electric motor 11 is supplied by the battery 14 and the inverter device 15, and vice versa. In this way, the cleaning machine 1 can operate without sudden interruptions even in the event of possible problems with the mains power supply, such as blackout, voltage drops, etc.

The switch 20 is in turn connected to a master switch 22 to which the electric cable 12 is connected. The master switch 22 acts in such a way as to connect selectively the cleaning machine 1 to the mains power supply socket.

There is further provided a battery-charger device 23. The battery-charger device 23 is interposed between the battery 14 and the master switch 22. The battery-charger device 23 is used to recharge the battery 14 by using the mains power supply.

In an embodiment of the cleaning machine 1, the supply source 13 comprises, alternatively to the battery 14 and to the inverter device 15, an internal-combustion electric generator. The internal-combustion electric generator comprises an endothermic engine and an electric alternator. The electric alternator, driven by a rotating shaft of the engine, is able to produce electric power. In particular, the electric alternator is able to produce alternating current, for example having voltage equal to 220-230 V and frequency equal to 50 Hz. Similarly to what is disclosed with reference to the battery 14 and to the inverter device 15, the switch 20 enables switching - in particular automatic switching - from a supply mode in which the electric motor 11 is supplied by the mains power supply to a further supply mode in which the electric motor 11 is supplied by the internal-combustion electric generator. In this way, the internal-combustion electric generator can supply the electric motor 11 in the event of power cuts or non-availability of the mains power supply.

In an embodiment of the cleaning machine 1, the supply source 13 comprises both the internal-combustion electric generator and the battery 14 and the inverter device 15. It

is possible to choose selectively whether, in the event of the unavailability of the mains power supply, it is desired to supply the electric motor 11 using the internal-combustion electric generator or using the battery 14 and the inverter device 15. In particular, the internal-combustion electric generator, can be activated, for example automatically, when the battery 14 is exhausted and is no longer able to supply power to the electric motor 11.

The supply source 13 that is thus configured enables the cleaning machine 1 to operate for a long period without a supply of power from the mains power supply.

The supply source 13 may be activated rapidly as soon as the mains power supply is interrupted, in such a way that the cleaning machine 1 can operate continuously without cleaning operations being interrupted. Once the mains power supply has been restored, the electricity supply source 13 is deactivated in such a way that the electric motor 11 is supplied with the power taken from the mains power supply. In particular, the electricity supply source 13 is deactivated automatically by the switch 20.

Further, if it is desired to use the cleaning machine 1 in zones that are far from mains power supply sockets or which are devoid of mains power supply sockets it is possible to supply the electric motor 11 by selectively activating the electricity supply source 13.

The battery 14 may be recharged by using the power of the mains power supply whilst the cleaning machine 1 is in use, or when the cleaning machine 1 is not in use and has been put back in place.

CLAIMS

1. Cleaning machine, comprising electric motor means (11) connectable to a mains power supply dispensing alternating current, characterised in that it further comprises electricity supplying means (13, 14, 15, 20, 23), said electric motor means (11) being alternatively suppliable by said mains power supply or by said electricity supplying means (13, 14, 15, 20, 23).

2. Cleaning machine according to claim 1, wherein said electricity supplying means (13, 14, 15, 20, 23) is distinct from said mains power supply.

3. Cleaning machine according to claim 1, or 2, wherein said electricity supplying means comprises battery means (14) arranged for dispensing direct current.

4. Cleaning machine according to claim 3, wherein said direct current has voltage equal to 12 V, or equal to 24 V.

5. Cleaning machine according to any preceding claim, wherein said electricity supplying means comprises inverter means (15).

6. Cleaning machine according to claim 5, as appended to claim 3, or 4, wherein said inverter means (15) is connected to said battery means (14) for transforming said direct current into an alternating current to be supplied to said electric motor means (11).

7. Cleaning machine according to claim 6, wherein said alternating current has voltage equal to approximately 220-230 V and frequency equal to 50 Hz.

8. Cleaning machine according to any one of claims 5 to 7, and further comprising an indicating panel (21) arranged for supplying information on an operating status of said inverter means (15).

9. Cleaning machine according to any preceding claim, wherein said electricity supplying means (13) comprises internal-combustion electric generating means.

10. Cleaning machine according to claim 9, wherein said internal-combustion electric generating means comprises an internal combustion engine associated with electric alternator means able to produce alternating current.

11. Cleaning machine according to claim 10, wherein said alternating current has voltage equal to approximately 220-230 V and frequency equal to 50 Hz.

12. Cleaning machine according to any preceding claim, and further comprising switch means (20) connected to said electricity supplying means (13, 14, 15, 20, 23) and to said electric motor means (11).

13. Cleaning machine according to claim 12, wherein said switch means (20) is configured for operationally disconnecting said electricity supplying means (13, 14, 15, 20, 23) from, or connecting said electricity supplying means (13, 14, 15, 20, 23) to, said electric motor means (11).

14. Cleaning machine according to claim 12, or 13, as claim 12 is appended to any one of claims 5 to 8, or to any one of claims 9 to 11 as appended to any one of claims 5 to 8, wherein said switch means (20) is configured for operationally disconnecting said inverter means (15) from, or connecting said inverter means (15) to, said electric motor means (11).

15. Cleaning machine according to any one of claims 12 to 14 as claim 12 is appended to any one of claims 9 to 11, wherein said switch means (20) is configured for operationally disconnecting said internal-combustion electric generating means from, or connecting said internal-combustion electric generating means to, said electric motor means (11).

16. Cleaning machine according to any one of claims 12 to 15, wherein said switch means comprises an automatic switch (20) which switches automatically from a first supply mode, in which said electric motor means (11) is supplied by said mains power supply, to a second supply

mode, in which said electric motor means (11) is supplied by said electricity supplying means (13, 14, 15, 20, 23), and vice versa.

17. Cleaning machine according to any preceding claim, and further comprising master switch means (22) which selectively connects said cleaning machine (1) to said mains power supply.

18. Cleaning machine according to claim 17 as appended to any one of claims 12 to 16, wherein said master switch means (22) is connected to said switch means (20).

19. Cleaning machine according to claim 3, or 4, or according to any one of claims 5 to 18 as appended to claim 3, or 4, wherein said electricity supplying means (13, 14, 15, 20, 23) comprises a battery-charger device (23) arranged for charging said battery means (14) with electric power supplied by said mains power supply.

20. Cleaning machine according to claim 19 as appended to claim 17, or 18, wherein said battery-charger device (23) is operationally interposed between said battery means (14) and said master switch means (22).

21. Cleaning machine according to any preceding claim, and further comprising casing means (2) provided with a containing body (3) suitable for receiving waste materials removed by said cleaning machine (1).

22. Cleaning machine according to claim 21, and further comprising a lid element (7) that is associable with said casing means (2) and housing said electric motor means (11).

23. Cleaning machine according to claim 21, or 22, and further comprising supporting means (17) supporting said casing means (2) and said electricity supplying means (13, 14, 15, 20, 23).

24. Cleaning machine according to any preceding claim and further comprising wheel means (10) that enables said cleaning machine (1) to be moved.

25. Cleaning machine according to claim 24 as appended to claim 23, wherein said wheel means (10) is rotatably connected to said supporting means (17).

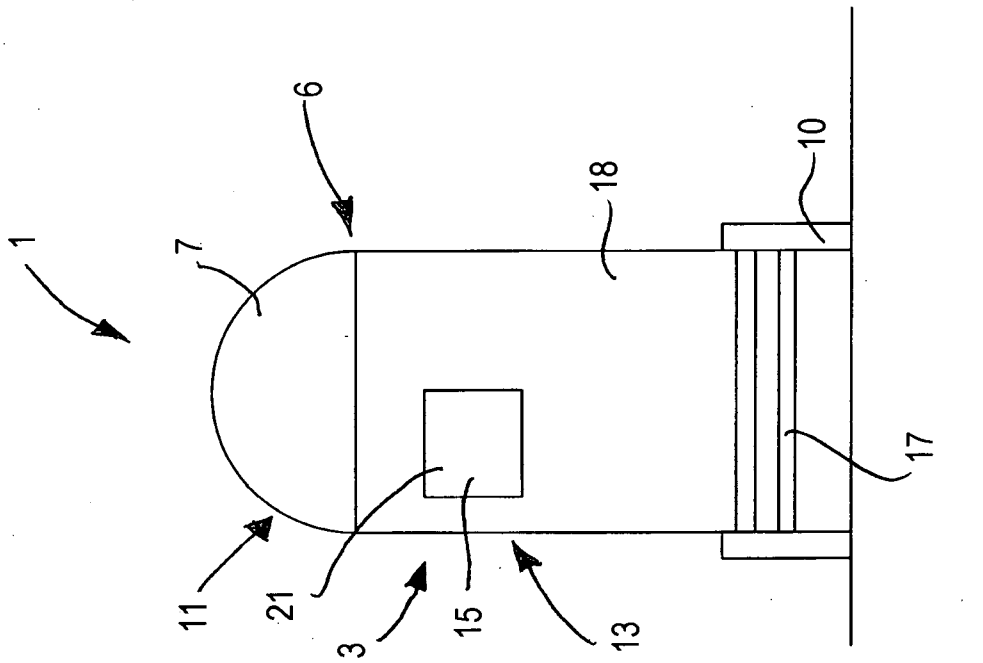
1
7
6
18
10
17
11
21
3
15
13

Fig. 2

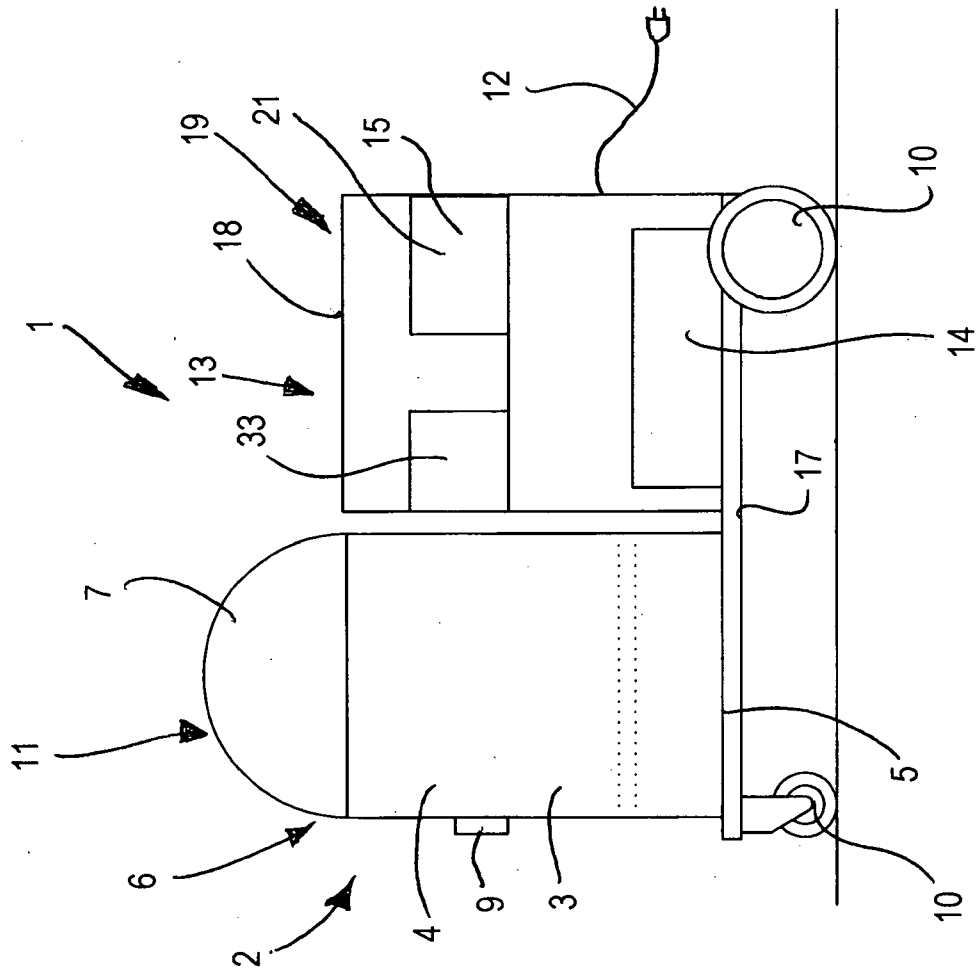
1
19
21
15
12
18
13
33
10
14
17
7
11
6
2
4
9
3
5
10

Fig. 1

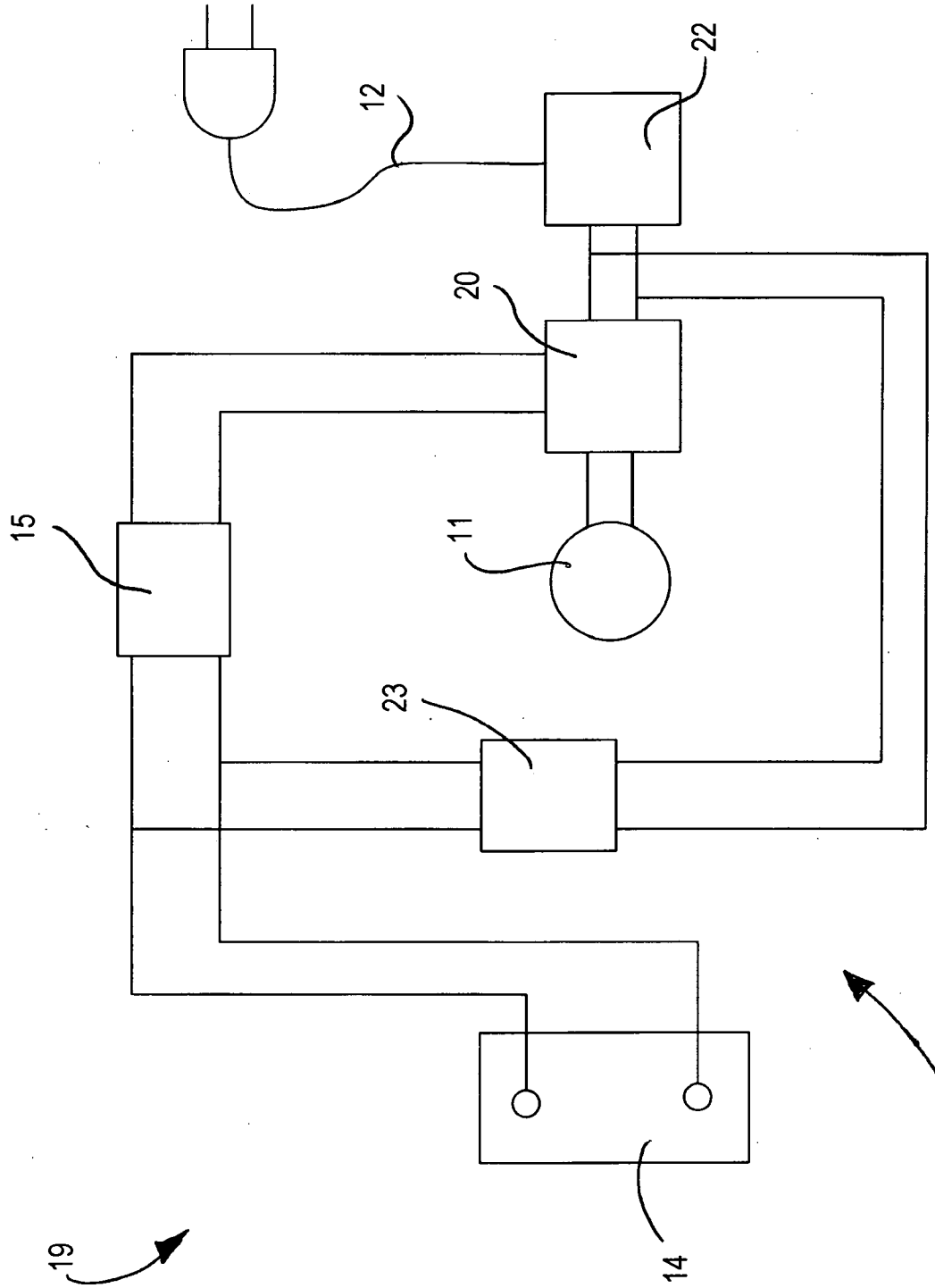

Fig. 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2007/001411

A. CLASSIFICATION OF SUBJECT MATTER
INV. A47L9/28

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)
A47L

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 practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 764 020 A (KAERCHER GMBH & CO KG ALFRED [DE]) 21 March 2007 (2007-03-21) paragraphs [0009] - [0011], [0016], [0017], [0021] - [0026]; figures	1-7, 12-14, 16,21-25
Y		8
Y	US 5 534 762 A (KIM JI-HYUN [KR]) 9 July 1996 (1996-07-09) column 5, lines 15-26; claims; figures.	8
X	US 4 210 978 A (JOHNSON RICHARD C [US] ET AL) 8 July 1980 (1980-07-08) column 3, lines 1-27; figures 1,2 columns 7-8	1-7, 12-14, 16,21-25
	-/--	

[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 document 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
14 February 2008	28/05/2008

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Lopez Vega, Javier

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2007/001411

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 2002/046437 A1 (BAILEY KEVIN [CA] ET AL) 25 April 2002 (2002-04-25) paragraph [0034]; figures	8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2007/001411

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.:
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:

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 additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers allsearchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an 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 reportcovers 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.:

see annex

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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-8, 12-14, 16, 21-25

   Cleaning machine with indicating panel for the inverter means

   ---

2. claims: 9-11, 15

   Cleaning machine with internal-combustion electric generating means

   ---

3. claims: 17-18

   Cleaning machine with master switch means

   ---

4. claims: 19-20

   Cleaning machine with a battery-charger device

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2007/001411

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1764020 A	21-03-2007	DE 102005045309 A1	22-03-2007
US 5534762 A	09-07-1996	JP 3014282 B2 JP 7163500 A	28-02-2000 27-06-1995
US 4210978 A	08-07-1980	AU 4279678 A	28-06-1979
US 2002046437 A1	25-04-2002	US 2003101531 A1	05-06-2003