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(72) Inventor; and
(71) Applicant : **JOHNSON, Weston** [US/US]; 319 Business Lane, Suite 3000, Ashland, Virginia 23005 (US).

(74) Agent: **RONEY, Edward, M.**; Troutman Sanders LLP, Bank of America Plaza, 600 Peachtree Street NE, Suite 5200, Atlanta, Georgia 30308-2216 (US).

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Published:

— *with international search report (Art. 21(3))*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

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27 December 2013

(54) Title: ELECTROSTATIC MACHINE

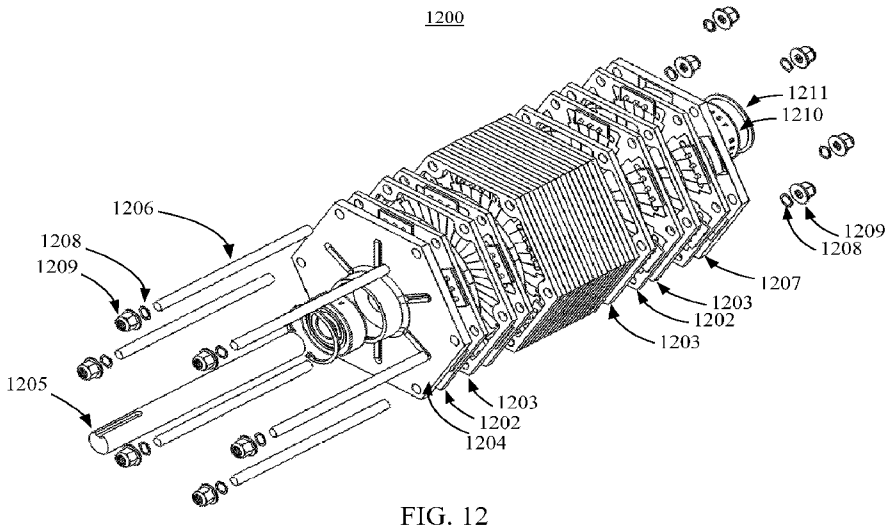

FIG. 12

(57) Abstract: Systems, devices, and methods for an electrostatic machine are provided. In one embodiment, an electrostatic machine may be configured to have an electric field motor, a rotor assembly and a motor drive, wherein the improvement may include generating at least three watts (3 W) of power with a product of a gap pressure (p_{gap}) and a gap distance (d_{gap}) of less than ninety megapascals-micrometer (90 MPa*um).

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2013/039601

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - H02K 1/14 (2013.01)
USPC - 310/166
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)
IPC(8) - B60K 7/00; B81B 5/00; F02B 63/04; H02N 1/00; H02K 1/14, 16/04 (2013.01)
USPC - 310/166, 179, 184, 268, 308, 309

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
CPC - F02B 63/044; H02K 16/00, 2201/03; H02N 1/004 (2013.01)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PatBase, Google Patents, Google Scholar

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X -- Y	US 6,353,276 B1 (GENDRON) 05 March 2002 (05.03.2002) entire document	1,2 ----- 10-72
X -- Y	US 4,997,521 A (HOWE et al) 05 March 1991 (05.03.1991) entire document	5 ----- 9-72
X -- Y	US 4,520,300 A (FRADELLA) 28 May 1985 (28.05.1985) entire document	7 -- 9
X --- Y	US 2011/0031844 A1 (POST) 10 February 2011 (10.02.2011) entire document	8 -- 11,13,28-30
Y	US 2009/0066298 A1 (POST) 12 March 2009 (12.03.2009) entire document	18,31-33
Y	US 5,289,066 A (CLARK) 22 February 1994 (22.02.1994) entire document	39-45,47-53
Y	US 6,191,510 B1 (LANDIN et al) 20 February 2001 (20.02.2001) entire document	56,57

☐ Further documents are listed in the continuation of Box C. ☐

* 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
21 October 2013	01 NOV 2013
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2013/039601

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 extra 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.:

1, 2, 5, 7-72

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/US2013/039601

Continuation of Box III.

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claims 1, 2 , drawn to an electrostatic machine having a product of a gap pressure (p gap) and a gap distance (dgap) of less than ninety megapascals-micrometer (90 MPa*um).
Group II, claims 3, 4, drawn to an electrostatic machine having a magnitude of a product of a gap pressure (p gap) and a gap distance (d gap) less than or equal to a magnitude of each of a height, a length and a width of the electrostatic machine multiplied by two hundred fifty (250).
Group III, claims 5, 9-72, drawn to an electrostatic machine having a plurality of petals and/or poles on each rotor member of the rotor assembly and each stator member of the electric field motor.
Group IV, claim 6, drawn to an electrostatic machine weighing less than eight (8) pounds.
Group V, claims 7-8, drawn to an electrostatic machine achieving at least eight-five percent (85%) efficiency.

The inventions listed as Groups I, II, III, IV and V do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical feature of the Group I invention: a product of a gap pressure (p gap) and a gap distance (dgap) of less than ninety megapascals-micrometer (90 MPa*um) as claimed therein is not present in the invention of Groups II, III, IV or V. The special technical feature of the Group II invention: a magnitude of a product of a gap pressure (p gap) and a gap distance (d gap) less than or equal to a magnitude of each of a height, a length and a width of the electrostatic machine multiplied by two hundred fifty (250) as claimed therein is not present in the invention of Groups I, III, IV or V. The special technical feature of the Group III invention: a plurality of petals and/or poles on each rotor member of the rotor assembly and each stator member of the electric field motor as claimed therein is not present in the invention of Groups I, II, IV or V. The special technical feature of the Group IV invention: weighing less than eight (8) pounds as claimed therein is not present in the invention of Groups I, II, III or V. The special technical feature of the Group V invention: achieving at least eight-five percent (85%) efficiency as claimed therein is not present in the invention of Groups I, II, III or IV.

Groups I, II, III, IV and V lack unity of invention because even though the inventions of these groups require the technical feature of an electrostatic machine having an electric field motor, a rotor assembly and a rotor assembly, using a product of a gap pressure and a gap distance to determine the operating ranges; this technical feature is not a special technical feature as it does not make a contribution over the prior art in view of US 4,997,521 A (HOWE et al) 05 March 1991 (05.03.1991) abstract; figures 1, 2A, 3B; column 2, lines 9-27; col. 4, lines 60-63; column 5, lines 34-43.

Groups I, II, III, IV and V lack unity of invention because even though the inventions of these groups require the technical feature of an electrostatic machine having an electric field motor, a rotor assembly and a rotor assembly generating at least 3W or 0.5 horsepower, this technical feature is not a special technical feature as it does not make a contribution over the prior art in view of US 2011/0031844 A1 (POST) 10 February 2011 (10.02.2011) abstract; para. [0009], [0024], [0025], [0054].

Since none of the special technical features of the Group I, II, III, IV or V inventions are found in more than one of the inventions, unity of invention is lacking.