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61/445,095 22 February 2011 (22.02.2011) US(71) Applicant (for all designated States except US): **ABB TECHNOLOGY AG** [CH/CH]; Affolternstrasse 44, CH-8050 Zurich (CH).

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CA, CH, CL, 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, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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1 August 2013

(54) Title: DRY-TYPE NETWORK TRANSFORMER

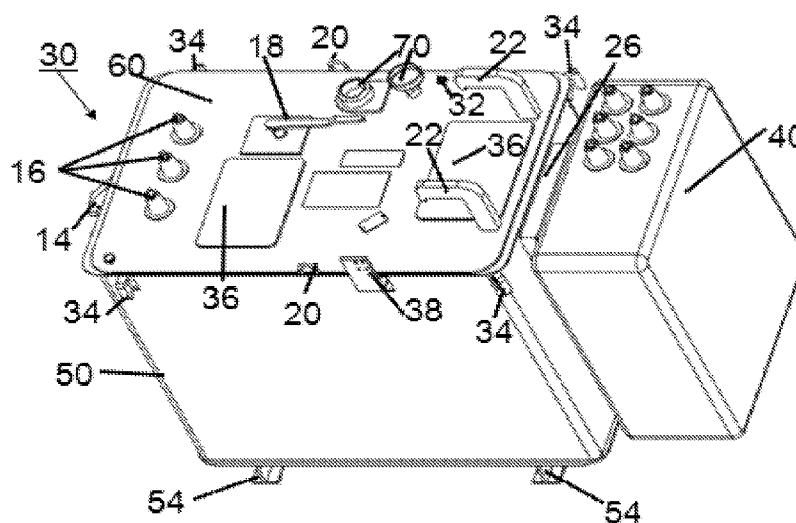


FIG. 2b

(57) Abstract: A dry-type network transformer has a core and coil windings insulated by a combustion-inhibiting gas. The combustion-inhibiting gas, core and coil windings are disposed within a hermetically-sealed enclosure. The combustion-inhibiting gas is air, an inert gas or a mixture of gases. The dry-type network transformer may be connected to a network protector. The network protector is further connected to a secondary network. The network protector prevents power from flowing from a secondary network to the primary side of the transformer. The dry-type network transformer is installed in a vault that is underground or at ground level. The dry-type network transformer may be suspended near the ceiling of the vault or installed at the base of the vault.



# INTERNATIONAL SEARCH REPORT

International application No

PCT/US2012/025808

**A. CLASSIFICATION OF SUBJECT MATTER**  
INV. H01F27/02  
ADD.

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)

H01F

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)

EP0-Internal, WPI Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category*   | Citation of document, with indication, where appropriate, of the relevant passages                                                                                                                                                                                                                   | Relevant to claim No.                               |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| X<br>Y<br>A | US 3 602 631 A (SHEPPARD HARRY R)<br>31 August 1971 (1971-08-31)<br>abstract; figure 2<br>column 2, line 25 - column 3, line 13<br>figures 3-5<br>column 1, lines 15-28<br>column 2, lines 57-73<br>column 3, lines 1-17,51-63<br>column 4, lines 1-4,28-37<br>column 5, lines 14-21<br>-----<br>-/- | 1,2,4,6,<br>7,16<br>3,5,<br>7-11,14,<br>15<br>12,13 |



Further documents are listed in the continuation of Box C.



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

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Name and mailing address of the ISA/

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## INTERNATIONAL SEARCH REPORT

International application No

PCT/US2012/025808

| C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT |                                                                                                                                                                                                                                                                                                                                                                                      |                        |
|------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| Category*                                            | Citation of document, with indication, where appropriate, of the relevant passages                                                                                                                                                                                                                                                                                                   | Relevant to claim No.  |
| Y                                                    | "Network Transformers",<br>Catalog Section 94-10; Network<br>Transformers,<br>9 April 2010 (2010-04-09), pages 1-7,<br>XP055056756,<br>Retrieved from the Internet:<br>URL: <a href="http://www.howard-ind.com/howardtransformers/Literature/NetworkTransformer.pdf">http://www.howard-ind.com/howardtransformers/Literature/NetworkTransformer.pdf</a><br>[retrieved on 2013-03-15] | 1-11,<br>14-16         |
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| A                                                    | CN 200 953 264 Y (SHANDONG DACHI ELECTRIC<br>CO LTD [CN])<br>26 September 2007 (2007-09-26)<br>figures 1-3<br>the whole document<br>-----                                                                                                                                                                                                                                            | 12,13                  |
|                                                      | -----<br>-/--                                                                                                                                                                                                                                                                                                                                                                        |                        |

# INTERNATIONAL SEARCH REPORT

International application No

PCT/US2012/025808

| C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT |                                                                                                                                                                                                                                                                                                                                                                                                   |                       |
|------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| Category*                                            | Citation of document, with indication, where appropriate, of the relevant passages                                                                                                                                                                                                                                                                                                                | Relevant to claim No. |
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| A                                                    | CA 2 713 566 A1 (BABCOCK & WILCOX POWER GENERAT [US])<br>20 February 2011 (2011-02-20)<br>paragraph [0030]; figures 3,4                                                                                                                                                                                                                                                                           | 13                    |
| Y                                                    | US 6 160 464 A (CLARKE PETER WILLIAM [US] ET AL) 12 December 2000 (2000-12-12)<br>figures 1-5<br>columns 1-5                                                                                                                                                                                                                                                                                      | 8-11,14,<br>15        |
| Y                                                    | CN 2 906 861 Y (ZHEJIANG GUANGTIAN TRANSFORMER [CN]) 30 May 2007 (2007-05-30)<br>figures 1-6<br>corresponding description                                                                                                                                                                                                                                                                         | 8-11,14,<br>15        |
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| Y                                                    | "Secondary Network Transformers",<br>20 September 2007 (2007-09-20), pages 1-6,<br>XP055062881,<br>Retrieved from the Internet:<br>URL:http://web.archive.org/web/20070920111212/http://www.uptegraff.com/pdf/publications/24.pdf<br>[retrieved on 2013-05-14]<br>pages 2,3                                                                                                                       | 14,15                 |
| A                                                    |                                                                                                                                                                                                                                                                                                                                                                                                   | 12,13                 |
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## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2012/025808

### 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 all searchable 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 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.

**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

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

1. claims: 1-6, 16

Network transformer according to claim 1, further specifying  
- the gas and gas pressure in the enclosure (claims 2, 3);  
or  
- the network protector and its mounting to the enclosure  
(claims 4-6).  
Method of manufacturing thereof (claim 16).  
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2. claim: 7

Network transformer according to claim 1, further specifying  
the material of the encapsulation of the hermetically-sealed  
enclosure.  
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3. claims: 8-11, 14, 15

Network transformer according to claim 1, further specifying  
the coil design and assembly.  
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4. claims: 12, 13

Network transformer according to claim 1, further specifying  
the suspension support of the enclosure.  
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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2012/025808

| Patent document<br>cited in search report |    | Publication<br>date | Patent family<br>member(s)                                                                | Publication<br>date                                                |
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| CN 201465737                              | U  | 12-05-2010          | NONE                                                                                      |                                                                    |