

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
30 May 2003 (30.05.2003)

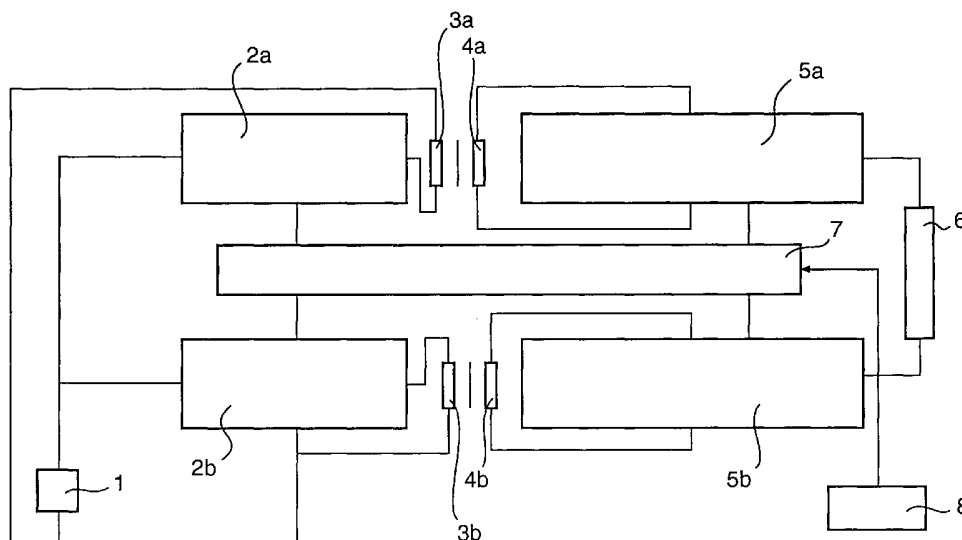
PCT

(10) International Publication Number
WO 2003/044932 A3

- (51) International Patent Classification⁷: **H03F 1/02**, 3/217, H02M 3/158
- (21) International Application Number: PCT/IB2002/004773
- (22) International Filing Date: 12 November 2002 (12.11.2002)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data: 01204503.5 23 November 2001 (23.11.2001) EP
- (71) Applicant (for all designated States except US): **KONINKLIJKE PHILIPS ELECTRONICS N.V.** [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).
- (72) Inventor; and
- (75) Inventor/Applicant (for US only): **JONKMAN, Rudi** [NL/NL]; Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).
- (74) Agent: **DEGUELLE, Wilhelmus, H., G.**; Philips Intellectual Property & Standards, Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).
- (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- Published:
— with international search report

[Continued on next page]

(54) Title: SWITCHED MODE POWER AMPLIFIER



(57) Abstract: A digital switched-mode power amplifier including a dc power source (1) and two dc-to-dc converters arranged in a parallel configuration and arranged to operate in a switched-mode operation is disclosed. Each converter comprises a primary side (2a, 2b) with first switching means and a secondary side (5a, 5b) with second switching means. The primary sides (2a, 2b) are connected to said dc power source (1) and the secondary sides (5a, 5b) are connected to opposite ends of a load (6). Furthermore, each converter is provided with a transformer to obtain dc-isolation between said primary side (2a, 2b) and said secondary side (5a, 5b). The transformer comprises a primary winding (3a, 3b) arranged at the primary side (2a, 2b) and a secondary winding (4a, 4b) arranged on the secondary side (5a, 5b). Moreover, control means (7) comprising primary (10) and secondary control means (12) are arranged to operate the dc-to-dc converters in a complementary manner and to use power control to affect the switching cycle of each converter.



— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(88) Date of publication of the international search report:

8 April 2004

INTERNATIONAL SEARCH REPORT

Internat application No
PCT/IB-02/04773

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H03F1/02 H03F3/217 H02M3/158

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 7 H03F H02M

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, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 294 957 B1 (LUU KY THOAI) 25 September 2001 (2001-09-25)	1
A		2-9
Y	column 5, line 19 -column 6, line 31; figures 4,5	10,11
Y	US 3 984 799 A (WESTER GENE W ET AL) 5 October 1976 (1976-10-05) column 2, line 45 -column 3, line 36; figures 1,4,5 column 4, line 33-56	10,11
A	US 5 506 493 A (STENGEL ROBERT E) 9 April 1996 (1996-04-09) column 2, line 20 -column 7, line 20; figures 2-4	1-11
	--- -/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in 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

28 January 2004

Date of mailing of the international search report

09/02/2004

Name and mailing address of the ISA

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

Authorized officer

Fedi, G

INTERNATIONAL SEARCH REPORT

Internat. Application No.
PCT/IB 02/04773

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 5 453 717 A (GERFAULT BERTRAND) 26 September 1995 (1995-09-26) column 2, line 6 -column 3, line 15; figure 1 -----	1-11

INTERNATIONAL SEARCH REPORT

International Application No
PCT/IB 02/04773

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 6294957	B1	25-09-2001	FR 2804257 A1 JP 2001267856 A	27-07-2001 28-09-2001
US 3984799	A	05-10-1976	US B533734 I5	27-01-1976
US 5506493	A	09-04-1996	US 5422317 A US 5442317 A AU 5667194 A WO 9411799 A1	06-06-1995 15-08-1995 08-06-1994 26-05-1994
US 5453717	A	26-09-1995	FR 2712126 A1 CA 2134934 A1 DE 69418279 D1 DE 69418279 T2 EP 0652636 A1	12-05-1995 06-05-1995 10-06-1999 25-11-1999 10-05-1995