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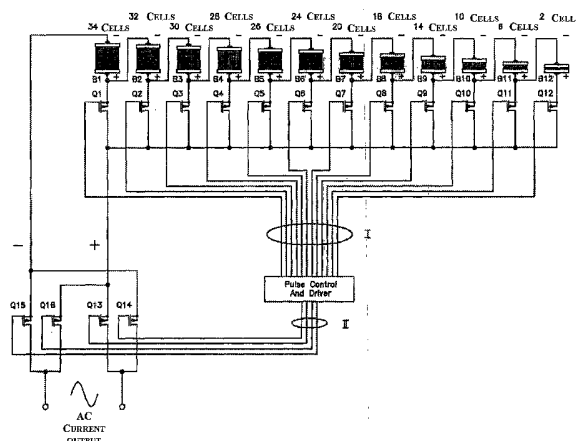
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(54) Title: TRASFORMERLESS STATIC VOLTAGE INVERTER FOR BATTERY SYSTEMS



(57) Abstract: A static inverter for a battery of elementary current sources or cells electrically in series and a number N of intermediate voltage taps along the chain of elementary DC current sources, wherein the number of elementary cells comprised between an intermediate tap and another intermediate tap adjacent to it or an end terminal of said chain is proportionate to the amplitude in the respective phase interval of a number N of discretization phases of the waveform of the AC voltage to be output in a quadrant; is implemented by arranging for: a number N of power switches (Q1-Q12) each connecting a respective intermediate tap and a first end terminal of a first polarity of said chain of elementary cells in series to a common circuit node of said first polarity; an output bridge stage constituted by at least four power switches (Q13-Q16) controlled in pairs for switching the current paths through the bridge stage, and a control circuit sequentially and cyclically turning on, in a continuous manner, one switch at the time of said N switches; each for a phase interval of $1/(4N)$ times the period of said AC output, and alternately turning on by pairs said four power switches of said output bridge stage at every half a period.



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INTERNATIONAL SEARCH REPORT

Internal Application No.

PCT/IT 02/00448

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H02M7/48 H02M7/537

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 H02J H02M H01M

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 3 100 851 A (ROSS JAMES A ET AL) 13 August 1963 (1963-08-13)	1,4,5,8
Y	column 3, line 33 -column 5, line 56; figures 1,2,5	12

X	US 4 680 690 A (DICKERSON ARTHUR F) 14 July 1987 (1987-07-14) abstract column 2, line 3 -column 2, line 60; figures 1-6,12,14 column 3, line 55 -column 5, line 59	1,4,5,8, 12

Y	GB 2 015 834 A (PHILIPS NV) 12 September 1979 (1979-09-12)	12
A	page 1, line 6 -page 5, line 34; figures 2-6	1-11

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

☒ Patent family members are listed in annex.

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	PATENT ABSTRACTS OF JAPAN vol. 2000, no. 15, 6 April 2001 (2001-04-06) & JP 2000 341964 A (SUMITOMO ELECTRIC IND LTD), 8 December 2000 (2000-12-08) abstract; figures 1-3 -----	1-12

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 3100851	A	13-08-1963	NONE	
US 4680690	A	14-07-1987	US 4591965 A AU 568957 B2 AU 4811585 A	27-05-1986 14-01-1988 24-04-1986
GB 2015834	A	12-09-1979	FR 2418977 A1 AU 520805 B2 AU 4464479 A DE 2907989 A1 IT 1111029 B JP 54126931 A SE 7901727 A US 4238820 A	28-09-1979 25-02-1982 06-09-1979 13-09-1979 13-01-1986 02-10-1979 03-09-1979 09-12-1980
JP 2000341964	A	08-12-2000	NONE	