

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
27 February 2003 (27.02.2003)

PCT

(10) International Publication Number
WO 2003/017085 A3

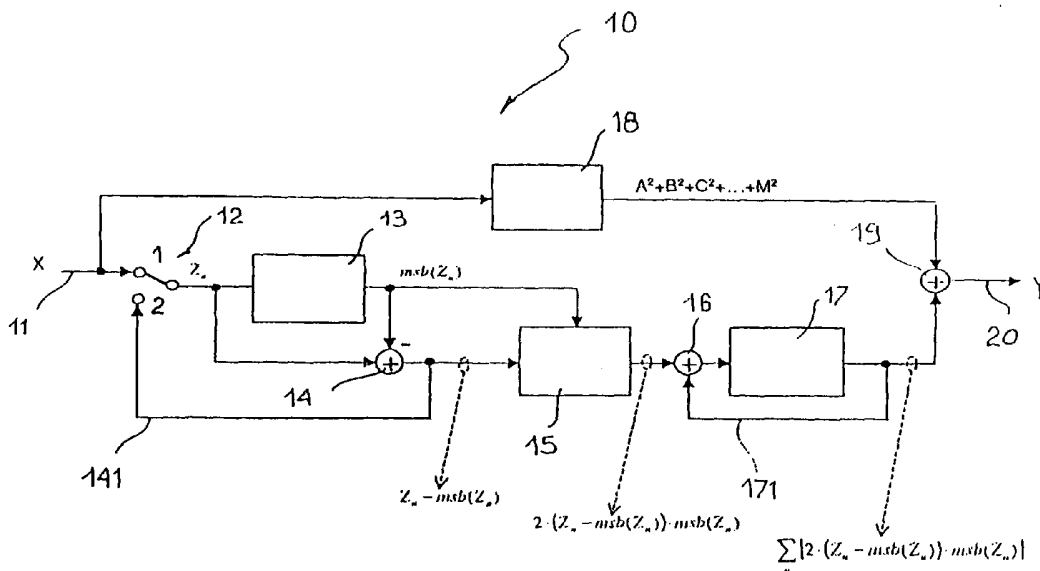
- (51) International Patent Classification⁷: **G06F 7/552**
- (21) International Application Number: PCT/IT2002/000539
- (22) International Filing Date: 14 August 2002 (14.08.2002)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data: TO2001A000818 17 August 2001 (17.08.2001) IT
- (71) Applicant (for all designated States except US): **TELECOM ITALIA S.P.A.** [IT/IT]; Piazza degli Affari, 2, I-20123 Milano (IT).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **ETTORRE, Donato** [IT/IT]; Telecom Italia S.P.A., Via G. Reiss Romoli, 274, I-10148 Torino (IT). **MELIS, Bruno** [IT/IT]; Telecom Italia S.P.A., Via G. Reiss Romoli, 274, I-10148 Torino (IT). **RUSCITTO, Alfredo** [IT/IT]; Telecom Italia S.P.A., Via G. Reiss Romoli, 274, I-10148 Torino (IT).
- (74) Agents: **GIANNESI, Pier Giovanni et al.**; Pirelli S.P.A., Viale Sarca, 222, I-20126 Milano (IT).
- (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, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, 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).

Declarations under Rule 4.17:

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA,

[Continued on next page]

(54) Title: POWER RAISING CIRCUIT



(57) Abstract: An iterative power raising circuit, such as a squarer (10) comprises a module (13, 14) able to subdivide the respective input signal (Z_n) into a first part ($msb(Z_n)$) that is the power of 2 immediately lower than or equal to the input signal and a second part ($Z_n - msb(Z_n)$) corresponding to the difference between the respective input signal and the first part. A first component of the output signal is determined as the summation of squares of powers of 2 implemented by inserting zeros between the adjacent bits of the input binary signal (X). A shifter module (15) generates an additional component of the output signal through shift operations that implement multiplication operations for numbers that are powers of 2. The circuit operates according to a general iterative scheme and the number of steps in the iteration scheme is selectively controllable in order selectively to vary the precision with which the output value (Y) is calculated.

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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, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZM, ZW, 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)

— of inventorship (Rule 4.17(iv)) for US only

Published:

— with international search report

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

8 April 2004

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.

INTERNATIONAL SEARCH REPORT

Internal	Application No
PCT/IT 02/00539	

A. CLASSIFICATION OF SUBJECT MATTER IPC 7 G06F7/552				
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 G06F				
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)				
C. DOCUMENTS CONSIDERED TO BE RELEVANT				
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.		
X	STRANDBERG R H ET AL: "EFFICIENT REALIZATION OF SQUARING CIRCUIT AND RECIPROCAL USED IN DAPTIVE SAMPLE RATE NOTCH FILTERS" JOURNAL OF VLSI SIGNAL PROCESSING SYSTEMS FOR SIGNAL. IMAGE, AND VIDEO TECHNOLOGY, KLUWER ACADEMIC PUBLISHERS, DORDRECHT, NL, vol. 14, no. 3, 1 December 1996 (1996-12-01), pages 303-308, XP000636618 ISSN: 0922-5773	12, 19		
A	--- Formulae 16 and 17	1, 3, 13, 15		
A	--- US 3 780 278 A (WAY J) 18 December 1973 (1973-12-18) abstract --- -/--	1, 13		
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"><input checked="" type="checkbox"/> Further documents are listed in the continuation of box C.</td> <td style="width: 50%; border: none;"><input checked="" type="checkbox"/> Patent family members are listed in annex.</td> </tr> </table>			<input checked="" type="checkbox"/> Further documents are listed in the continuation of box C.	<input checked="" type="checkbox"/> Patent family members are listed in annex.
<input checked="" type="checkbox"/> Further documents are listed in the continuation of box C.	<input checked="" type="checkbox"/> Patent family members are listed in annex.			
° Special categories of cited documents :				
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"> *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 </td> <td style="width: 50%; border: none;"> *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 </td> </tr> </table>			*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
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 <div style="text-align: center; font-weight: bold;">24 October 2003</div>		Date of mailing of the international search report <div style="text-align: center; font-weight: bold;">06/11/2003</div>		
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 <div style="text-align: center; font-weight: bold;">Cohen, B</div>		

INTERNATIONAL SEARCH REPORT

International Application No
PCT/IT 02/00539

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>PATENT ABSTRACTS OF JAPAN vol. 010, no. 022 (P-424), 28 January 1986 (1986-01-28) & JP 60 175142 A (FUJITSU KK), 9 September 1985 (1985-09-09) abstract</p> <p>-----</p>	1, 13

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/IT 02/00539

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 3780278	A	18-12-1973	DE 2211445 A1	21-09-1972
			FR 2129558 A5	27-10-1972
			GB 1390052 A	09-04-1975
			JP 48103250 A	25-12-1973
<hr/>				
JP 60175142	A	09-09-1985	NONE	
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