

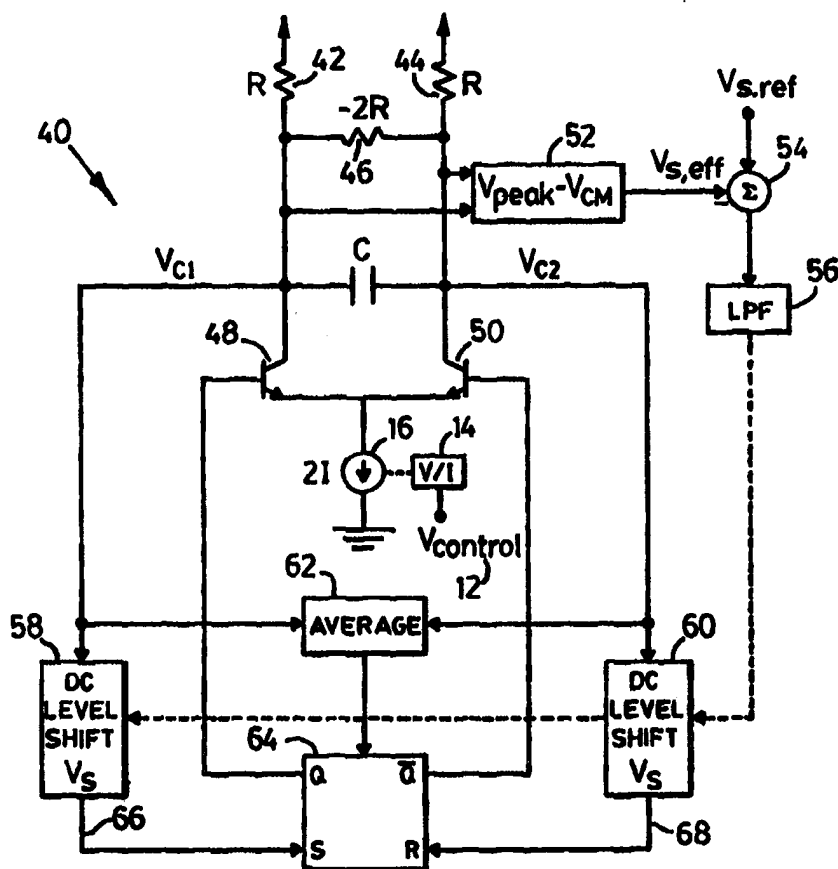
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : H03K 3/0231	A3	(11) International Publication Number: WO 98/45944 (43) International Publication Date: 15 October 1998 (15.10.98)
(21) International Application Number: PCT/CA98/00294 (22) International Filing Date: 1 April 1998 (01.04.98) (30) Priority Data: 2,201,697 3 April 1997 (03.04.97) CA (71) Applicant (for all designated States except US): GENNUM CORPORATION [CA/CA]; P.O. Box 489, Station A, Burlington, Ontario L7R 3Y3 (CA). (72) Inventors; and (75) Inventors/Applicants (for US only): SHAKIBA, Mohammad, Hossein [CA/CA]; Apartment 1716, 35 Charles Street West, Toronto, Ontario M4Y 1R6 (CA). HASHJANI, Tirdad, Sowlati [CA/CA]; 4430 Hawthorne Drive, Burlington, Ontario L7L 1G5 (CA). (74) Agent: BERESKIN & PARR; 40th floor, 40 King Street West, Toronto, Ontario M5H 3Y2 (CA).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> (88) Date of publication of the international search report: 7 January 1999 (07.01.99)

(54) Title: EXTENDED FREQUENCY RANGE RELAXATION OSCILLATOR WITH IMPROVED LINEARITY

(57) Abstract

A relaxation oscillator, such as a voltage controlled oscillator (VCO), with automatic swing control feedback which dynamically monitors the voltage swing across a capacitor and adjusts the oscillator threshold voltage, at which reversal of the polarity of the charging/discharging current occurs, to maintain the effective voltage swing at a constant level. The improved relaxation oscillator provides a very wide linear range of frequency variation versus control voltage (or current) and allows for the extendibility of linear operation to or near the maximum frequency that can be practically achieved by the oscillator circuitry.



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INTERNATIONAL SEARCH REPORT

International Application No

PCT/CA 98/00294

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 H03K3/0231

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 6 H03K

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.
A	EP 0 180 084 A (TOKYO SHIBAURA ELECTRIC CO) 7 May 1986 see page 1, line 10 - page 3, line 15; figure 1 ---	1,15
A	EP 0 753 934 A (SGS THOMSON MICROELECTRONICS) 15 January 1997 see column 4, line 56 - column 5, line 50; figure 1 ---	1,15
A	US 4 977 381 A (MAIN WILLIAM E) 11 December 1990 cited in the application see figure 2 --- -/--	1,15

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

° Special categories of cited documents :

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"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

21 September 1998

Date of mailing of the international search report

05.10.98

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

Ratajski, A

INTERNATIONAL SEARCH REPORT

International Application No

PCT/CA 98/00294

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 489 878 A (GILBERT BARRIE) 6 February 1996 see column 3, line 42 - column 6, line 3; figures 3,4,6 ---	20-22
A	US 3 296 556 A (R. A. SCHAEFER) 3 January 1967 see figure 1 -----	20

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA 98/00294

Box I Observations where certain claims were found unsearchable (Continuation of item 1 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 II Observations where unity of invention is lacking (Continuation of item 2 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 fee, this Authority did not invite payment of any additional fee.
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.:
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Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☒ 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. Claim : 1 to 19

Independent Claims 1 and 15, as well as dependent claims 2 to 14 and 16 to 19 define a relaxation oscillator wherein the voltage swing across a capacitance is maintained constant.

2. Claim : 20 to 22

Independent Claim 20, as well as dependent claims 21 and 22, define a relaxation oscillator wherein the current supply circuit comprises two resistances and a negative resistance.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/CA 98/00294

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US 3296556 A	03-01-1967	NONE	