BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

Publication in the Official Journal ~~Yes~~ / No

File Number: T 649/91 - 3.5.1

Application No.: 85 306 822.9

Publication No.: 0 192 875

Title of invention: Bi-directional amplifier

Classification: H03K 5/02

D E C I S I O N
of 16 January 1992

Applicant: XILINX Inc.

Headword:

EPC Article 56

Keyword: "Inventive step (no)"
"Decision on basis of documents on file"

Headnote

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number : T 649/91 - 3.5.1

D E C I S I O N
of the Technical Board of Appeal 3.5.1
of 16 January 1992

Appellant : XILINX Inc.
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Decision under appeal : Decision of Examining Division 068 of the European Patent Office dated 30 January 1991 refusing European patent application No. 85 306 822.9 pursuant to Article 97(1) EPC.

Composition of the Board :

Chairman : P.K.J. van den Berg
Members : A.S. Clelland
M. Schar

Summary of Facts and Submissions

I. European patent application No. 85 306 822.9 (publication No. 0 192 875) was refused by decision of the Examining Division dated 30 January 1991.

II. The reason for the refusal was that the subject-matter of Claims 1 to 12 filed on 25 April 1990 with a submission dated 24 April 1990 lacked an inventive step having regard to the following documents (using the Examining Division's notation):

D1: DE-A-1 917 272
D3: U. Tietze et al. "Halbleiter-Schaltungstechnik", 5th Edition, Springer Verlag, 1980, pp. 570-572.

III. An appeal against this decision was received on 30 March 1991. The Appellant (Applicant) requested cancellation of the decision in its entirety and with a Statement of Grounds of Appeal received 26 May 1991 filed revised sets of claims constituting a main request and first and second auxiliary requests.

IV. The main request is based on the following documents:-

Claims: Claims 1 to 13 as filed on 26 May 1991;

Description: Pages 2, 3 and 5 to 14 as originally filed, pages 1 and 4 as filed on 17 November 1990;

Drawings: Sheets 1 to 9 as originally filed.

V. The first and second auxiliary requests are based on the above description and drawings, together with Claims 1 to 12 and 1 to 10 respectively as filed on 26 May 1991.

VI. In a communication of the Board pursuant to Article 11(2) of the Rules of Procedure of the Boards of Appeal, dated 23 October 1991, the Rapporteur on behalf of the Board explained why the Board had serious doubts as to the patentability of the subject-matter of the claims of the main and auxiliary requests. Only the second auxiliary request was discussed in detail because Claim 1 of this request included all the features of Claim 1 of the main and first auxiliary requests; the negative opinion on this request in consequence gave rise to the same view on the other requests.

VII. In a letter received by telefax on 3 January 1992 the Appellant's representative stated that no response was being made to the communication other than to ask for a final decision to be made on the basis of the documents on the file as it stood.

VIII. Claim 1 of the main request reads as follows:

"A bi-directional amplifier comprising:

an amplifier (64) having an input lead (61) and an output lead (62), an input signal on the input lead generating an output signal from the amplifier (64) on the output lead;

first means (P1', P2', T1,T2) for selectively passing a first input signal on a first terminal (A') to the input lead (61) and for passing the output signal on the output lead (62) to a second terminal (B');

second means (P3', P4', T3, T4) for selectively passing a second input signal on the second terminal (B') to the input lead (61) and for passing the output signal on the output lead (62) to the first terminal (A'), characterised by programmable means for switching between said first and second means."

IX. Claim 1 of the first auxiliary request adds to the above claim that the programmable means comprises a storage element having a signal Q and the complement thereof $\overline{Q}$ as output signals.

X. Claim 1 of the second auxiliary request reads as follows:-

"A bi-directional amplifier comprising:

an amplifier (64) having an input lead (61) and an output lead (62), an input signal on the input lead generating an output signal from the amplifier (64) on the output lead;

first means (P1', P2', T1, T2) for selectively passing a first input signal on a first terminal (A') to the input lead (61) and for passing the output signal on the output lead (62) to a second terminal (B');

second means (P3', P4', T3, T4) for selectively passing a second input signal on the second terminal (B') to the input lead (61) and for passing the output signal on the output lead (62) to the first terminal (A'),

characterised in that the first means for selectively passing the signals comprises first control means for controlling the passage of the first input signal on the first terminal to the input lead and fourth control means (P2', T2) for controlling the passage of the output signal on the output lead to the second terminal, and wherein the second means for selectively passing the signals comprises second control means (P3', T3) for controlling the passage of a second input signal on the second terminal to the input lead and third control means (P4', T4) for controlling the passage of the output signal on the output lead to the first terminal and in that programmable means is provided for switching between the first (P1', P2', T1, T2) and second P3', P4', T3, T4) means and which programmable means comprises means for

selectively programming the first, second, third and fourth control means such that for a first program selection of the first and fourth control means permit the passage of the first input signal and the output signal respectively, and the second and third control means block the passage of the second input signal and the output signal, respectively, and for a second program selection the second and third control means permit the passage of the second input signal and the output signal respectively, and the first and fourth control means block the passage of the first input signal and the output signal respectively, wherein the programmable means comprises a storage element having a signal Q and a complement thereof $\overline{Q}$ as output signals."

Reasons for the Decision

1. The appeal is admissible.

2. The only issue in the present appeal is whether the subject-matter of Claim 1 of the main request or of the first and second auxiliary requests involves an inventive step.

3. Main Request

3.1 The present application is, according to the description at page 2, lines 28 to 30, directed to overcoming a drawback of a known bidirectional amplifier discussed in connection with Figure 1 of the application, namely the need for two buffer amplifiers. This is in accordance with page 2, lines 31 to 33, overcome by means of a programmable bidirectional buffer amplifier employing a single buffer amplifier, the programming being by means of

two signals Q and $\overline{Q}$ each of which controls the state of two pass transistors or CMOS transmission gates.

3.2 Despite the extensive discussions of network topology in conjunction with Figures 3 to 5, only Figures 6 to 8 appear to describe the invention. In each of these figures a two-part control signal comprising complementary signals, Q and $\overline{Q}$ in Figures 6 and 8, is used to control the switches and thereby determine the direction of amplification.

3.3 The single most relevant prior art document is D1. This document shows at Figure 2 a telephone line amplifier or repeater in which an amplifier (V) provides bidirectional amplification by the use of a pair of synchronised double-pole double-throw switches (u), the switching rate apparently being chosen to be above the Nyquist sampling rate so that full bidirectional amplification within the system bandwidth is achieved. The first and second means of Claim 1 can thus be found in D1. The d.c. blocking capacitors C and voltage dependent impedance Z are said at page 2, lines 21 to 25 to be optional. The features of the preamble of Claim 1 are thus known from D1.

3.4 The skilled man, seeking a solution to the drawback of the Figure 1 arrangement outlined in point 3.1 above, would take the disclosure of D1 as a starting-point for the solution to his problem. Although D1 relates to a telephone system - in which voltages of the order of ±60V occur - the problem is one of amplifier configuration and not amplifier type, so that the skilled man would not be technically prejudiced against taking D1 into consideration. It is in any case noted that Claim 1 is not restricted to any particular use for the claimed amplifier.

3.5 D1 does not refer to programmable means for switching between the first and second means. It does however disclose at page 2, lines 10 and 11 that the switching frequency can be varied, whilst according to lines 11 and 12 of the same page the sampling times for respective directions of amplification can also be varied. D1 thus embraces the use of switches operable to differing switching patterns, depending on which direction of amplification is desired, but does not disclose the controller which enables this. It is in this connection noted that the expression "programmable means" cannot be taken to imply that in the context of the invention the switches can be controlled individually. There is no suggestion in the application as originally filed that such a form of control is envisaged.

3.6 Even if D1 does not itself disclose "programmable means" it would lead the skilled man to provide a controller to enable switching as suggested in the above-quoted passages. One manner of providing such control is known from D3. This disclosure, being a textbook, can fairly be said to represent common general knowledge in the microprocessor art and would appear relevant to the closely related field of programmable or configurable logic arrays. It shows at Figure 21.36 the use of a PIA in the well-known 6800 microprocessor series and hence that at the priority date of the present application it was common general knowledge to use programmable means for switching in accordance with different "programme selections" so as to pass data in one of two directions along common input/output lines. The direction of data transfer through the device and along a pair of signal lines can selectively be reversed, see Figure 21.38. The skilled man, given the teaching of D1 as to amplifier configuration, would without the exercise of invention make use of the common general knowledge as exemplified

by D3 to provide a controller giving "programmable" control of the switching.

3.7 The subject-matter of Claim 1 of the main request thus lacks an inventive step.

4. First Auxiliary Request

4.1 Claim 1 of this request differs from that the main request only in that the programmable means comprises a storage element having a signal Q and the complement thereof $\overline{Q}$ as output signals.

4.2 Since only two - complementary - signals are ever required to switch between the first and second means, the obvious manner to generate the signals is by means of a flip-flop as required by the additional feature.

4.3 The subject-matter of Claim 1 of the first auxiliary request thus also lacks an inventive step.

5. Second auxiliary request

5.1 In integrated circuitry, particularly in CMOS, it is common general knowledge to implement the crossover switch function by means of two series connected single-pole switches operated by complementary control signals. In implementing the D1 amplifier configuration for the control of input/output lines as disclosed in D3 by means of CMOS circuitry the skilled man could therefore be expected to make use of complementarily operated switch pairs. This arrangement would require first to fourth control means and means for selectively operating these control means in the manner specified in the claim.

5.2 The subject-matter of Claim 1 of the second auxiliary request thus also lacks an inventive step.

6. In the Statement of Grounds of Appeal the Appellant's representative attaches considerable importance to the switching of the direction of transmission in an irregular and arbitrary way. This is arguably also known from D1 (see paragraph 3.5 above) but is in any case common general knowledge as evidenced by D3.

7. Accordingly the Board finds that, for the reasons set out above, the subject-matter of the only independent claim of the main and the first and second auxiliary requests, in each case Claim 1, lacks an inventive step. No other requests having been made, it follows that the appeal must be dismissed.

Order

For these reasons, it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

M. Beer P.K.J. van den Berg