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D E C I S I O N
of 25 January 1994

Case Number: T 0910/91 - 3.4.1

Application Number: 84115020.4

Publication Number: 0149780

IPC: G09G 1/16

Language of the proceedings: EN

Title of invention:
Attribute hierarchy system

Applicant:
International Business Machines Corporation

Opponent:
-

Headword:
Hierarchy system/IBM

Relevant legal norms:
EPC Art. 56

Keyword:
"Inventive step (yes)"

Decisions cited:
-

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0910/91 - 3.4.1

D E C I S I O N
of the Technical Board of Appeal 3.4.1
of 25 January 1994

Appellant: International Business Machines Corporation
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Armonk, NY 10504 (US)

Representative: Vekemans, André
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Département de Propriété Intellectuelle
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Decision under appeal: **Decision of the Examining Division 063 of the European Patent Office dated 1 July 1991 refusing European patent application No. 84 115 020.4 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: G.D. Paterson
Members: H.J. Reich
Y.J.F. van Henden

Summary of Facts and Submissions

I. European patent application No. 84 115 020.4 (publication No. 0 149 780) was refused by a decision of the Examining Division. With regard to the essential subject-matter of the independent claims underlying this decision, attention is drawn to paragraph V below.

II. The reason given for the refusal was that the subject-matter of independent Claims 1 and 5, as filed on 2 April 1991, did not satisfy the requirements of Articles 52 and 56 EPC having regard to document:

D1: Wen C. Lin: "Microprocessors: Fundamentals & Applications" IEEE Press, New York, 1977, pages 15 to 19.

The Examining Division took the following view. Given the description of stacks and their characteristics in document D1, it is obvious to the person skilled in the art that such a stack solution can be used in a display system to solve the objective problem of respecifying an old attribute at the end of a field. The use of stacks for storing previously valid data is so well known in this field that a skilled person, when faced with the problem of keeping track of previously valid "attribute" data, would be driven to suggesting the provision of a stack in the display systems claimed. The claimed apparatuses therefore apply a well-known solution to a problem closely analogous to that of the prior art.

III. The Appellant lodged an appeal against the decision.

IV. In the grounds of appeal the Appellant requested that the contested decision be set aside and a patent be granted on the basis of the following documents:

Claims: 1 to 4 as filed on 31 October 1991,
5 to 7 as filed on 2 April 1991;

Description: pages 1, 3 to 9 according to
EP-A-0 149 780,
pages 2, 2a as filed on 2 April 1991;

Drawings: sheet 1/6 as filed on 2 April 1991,
sheets 2/6 to 6/6 according to
EP-A-0 149 780.

Independent Claims 1 and 5 read as follows:

"1. Display system having attribute commands for modifying appearances of displayed data by attributes, characterized in that it comprises:

a. a stack means (28, 30) for storing a plurality of attributes,

b. leveling means (34) for generating levels of attributes in said stacking means; and

c. command means (36, 38, 40) for generating command signals for moving said attributes through levels in said stack means whereby each of said command signals precede said levels of attributes.

5. Display system, having an attribute hierarchy comprising:

a. storage means (14) circuitry for character data;

b. buffering means (16) for said stored character data and bus means (18) for

transferring said character data to said buffering means;

c. storage means (12) for attributes;

d. signal generation means (20, 22) connected to said character storage means and said attribute storage means for generating a match signal, characterized in that it further comprises:

a. bus means (32) for transferring said attributes and connected to said attribute storage means;

b. register means (26) for registering command codes prior to said attributes and connected to said attribute bus means;

c. masking means (34) for each attribute and number of attribute, and connected to said attribute bus means;

d. decode means (36) for command decoding connected to said command register means and generating pop, push, and load signals;

e. processor means (38) for attribute processing and connected to said attribute masking means, and generating a stack select signal;

f. sequence means (40) for sequence controlling and connected between said decode means and said processor means, and generating load row buffer and load character signals;

g. stacking means (28, 30) for said attributes and connected to said attribute storage means through said attribute bus means, said stack means receiving said pop, push, and load signals;

h. means (28A, 30A) for evaluating each attribute load, and connected between said sequence means and said stacking means; and

i. buffering means (42, 44) for said stacked attributes."

Claims 2 to 4 are dependent on Claim 1 and Claims 6 and 7 are dependent on Claim 5.

V. In support of his request, the Appellant made essentially the following submissions:

In new Claim 1 the stack means are again put in the characterising part of Claim 1, as it is not found in the prior art relating to display systems. The objective problem underlying the application is to respecify an old attribute at the end of a field **in a video display for alphanumeric data**. This problem is solved by the use of an "n" position stack with hardware logic flow to store levels of attributes and generate command signals to move the levels. The claimed system provides handling and control of attribute hierarchy, reducing storage requirements including band-width and size and reduces the software required to manage the attributes. Document D1 only defines what a "stack" is and describes its application to the handling of **interruptions** in a microprocessor. An attribute hierarchy system as claimed in Claims 1 and 5 is not suggested by document D1.

Reasons for the Decision

1. The subject-matter of present Claims 1 to 7 corresponds to that of original Claims 1 to 7 respectively. The amendment of the description is in line with Rule 27(1)(b) EPC. The amendment of Figure 1A is supported by feature (d) of original claim 5. There is, therefore, no objection under Article 123(2) EPC to the current set of application documents.

2. None of the documents cited in the European Search Report discloses a display system which comprises stacking means for storing attributes. In the prior art device according to document US-A-4 317 114 (D2) a stack of memory maps stores a set of overlay images for superpositioning over a host image on a raster display. The conventional display devices described in the remaining ESR documents do not contain any stacking means. Thus, the subject-matter of Claims 1 and 5 is considered novel in the sense of Article 54 EPC.

3. *Inventive step*

3.1 A conventional display system "having attribute commands for modifying appearances of displayed data by attributes" according to the first part of Claim 1 is, for instance, disclosed in document "IBM-Technical Disclosure Bulletin", Vol. 24, No. 1B, June 1981, page 667 (D3). Document D3 discloses as well in the wording of Claim 5 a display system comprising:

"a. storage means circuitry for character data (inputting into display refresh buffer 11 of D3);

b. buffering means (11) for said stored character data and bus means for transferring said character data to said buffering means; and

c. storage means for attributes (inputting as well into display refresh buffer 11)".

In the conventional display system of document D3 for every character location (field) the data storing consists of the order of two bytes specifying the position, one byte specifying the character (i.e. the alphanumeric information) and one byte specifying the attribute (i.e. underline, blink, etc.). Register 14 transforms the series position of character and attribute code within the field data string into a parallel one in order to simultaneously influence character generator 15 and attribute table 16 of the display unit. At the end of the field the old attribute is respecified by a new byte loaded into register 14 from buffer 11 or from the central storage means for attributes.

Also in the conventional display system disclosed in document US-A-4 158 837 (D4) at the end of a field the old attribute is respecified by feeding the new byte of the next field data string into attribute register 114 from refresh RAM 60 or via controller processor 10 from control program storage 12. In document D4 under the control of a clocking circuit (78) subsequent field data storing, which consist each of a byte for a character and one byte for the attributes (Figure 3), are split into character data addressing character generator 64 and parallel attribute data addressing attribute register 114 by the first two bits of each byte, which act as a flag.

3.2 Starting from such a conventional display system, the objective problem underlying Claims 1 and 5 respectively is to reduce display storage requirements, the required software and the searching time for the valid attribute in the respecification step of an old attribute at the end of a field; see the original description page 1, paragraph 4 and page 2, lines 7 to 11.

3.3 This problem is solved in that the display system comprises:

a stack means for storing attributes (feature a. in Claim 1 or feature g. in Claim 5), levelling (masking) means for generating levels of attributes in said stacking means (feature b. in Claim 1 or characterising part feature c. in Claim 5), and command means for generating command signals for **moving** said attributes through levels in said stack means (feature c. in Claim 1 or characterising part features d., e., f. in Claim 5).

The invention thus stores levels of attributes in stack means and generates command signals to move the level data within the stack. It allows to specify loading of an attribute when entering a new attribute field in the following way: at the end of the field each attribute is pushed down into the stack. Thus, the previous attribute does not have to be respecified but a pop-up command to the stack restores the preceding attribute to its previous level; see the original description, page 2, lines 14 to 19.

3.4 The information about **stacks** and their characteristics in document D1 is mainly restricted to the following:

"The stack is used to save vital microprocessor information such as the address in the program counter,

while the subroutine is being executed. The information saved can then be used to resume operation of the main program once the subroutine has been executed. Stacks can also be used to nest subroutines, in which case one subroutine can call another and that one can call still another."; see document D1, page 17, right-hand column, last nine lines. Document D2 stores in each stack level 140n an overlay memory map. The n different levels are addressed **simultaneously** for processing the overlay image in synchronisation with the host map; see D2, column 2, lines 45 to 50. Hence, in the conventional use of stacks disclosed in the cited prior art, the information stored in each stack level is kept unchanged and not reorganised during the operation. The conventional uses of stacks never address a stack level in order to shift data from one stack level to another.

3.5 As follows from paragraph 3.4 above, the prior art does not suggest to move data from one stack level to another. For this reason, in the Board's view, it is not obvious to a skilled person to store the attribute data of a display system in levels of a stacking means and to create command means for moving the "attribute data through the stack level in order to reduce the technical requirements for the respecification step of an attribute in a display system.

3.6 From document "IBM-Technical Disclosure Bulletin", Vol. 21, No. 1, June 1978, pages 295 and 296 (D5) it is known to subdivide attributes into various classes: Screen attributes, which apply to the entire screen, row attributes which apply to the entire row, and field attributes which apply to certain fields within a row. Each of these classes of attributes emanates from a different source, i.e. from a different table in an area of a read/write memory. The attribute classes are never shifted from one source (table) to another. The

remaining ESR document US-A-4 418 343 (D6) is less relevant.

3.7 For the reasons set out in paragraphs 3.1 to 3.6, the subject-matter of independent Claims 1 and 5 is considered to involve an inventive step in the sense of Article 56 EPC.

4. Thus, Claims 1 and 5 are allowable under Article 52(1) EPC. Dependent Claims 2 to 4, 6 and 7 concern particular embodiments of the device claimed in Claims 1 or 5 respectively and are, therefore, likewise allowable.

Order

For these reasons, it is decided that:

1. The decision of the Examining Division is set aside.

2. The case is remitted to the first instance with the order to grant a patent on the basis of the following documents:

Claims: 1 to 4 as filed on 31 October 1991,
5 to 7 as filed on 2 April 1991;

Description: pages 1, 3 to 9 according to EP-A-0 149 780,
pages 2, 2a as filed on 2 April 1991;

Drawings: sheet 1/6 as filed on 2 April 1991,
sheets 2/6 to 6/6 according to
EP-A-0 149 780.

The Registrar: The Chairman:

M. Beer G.D. Paterson