358

THE PATENTS ACT 1977

IN THE MATTER of Patent
Application No. 8715199
by Apple Computer Inc

DECISION

Application 8715199 was filed on 29 June 1987 by Apple Computer Inc claiming priority from a US application dated 30 October 1986. The application was searched in the usual way and published on 5 May 1988 with the number 2196764. During its substantive examination the examiner objected that the invention claimed was excluded from patentability by section 1(2)(c) of the Act in that it related to a program for a computer. Despite extensive negotiations, the applicants failed to persuade the examiner to withdraw his objection, and the matter came before me on 23 May 1991. Shortly before the hearing, Mr F Wombwell, a partner in the firm Potts, Kerr & Co, notified the comptroller on behalf of the applicants that the applicants would not be represented at the hearing. Mr Wombwell also stated that the applicants disagreed with the examiner's objection and that they maintained their arguments as submitted during the proceedings.

The present application is concerned with the storing and subsequent retrieval of data in a computer system, particularly on a floppy disc or a hard disc.

The problem of storing data on a disc in such a way that it can be retrieved is, of course, of long standing and the solution is well known and, in principle, very simple. The space available on the disc for storing data is divided into notional units, usually called allocation units and typically being of the order of 1k bytes in size (1k bytes represents the space to store 1024 text characters), each allocation unit is assigned a unique number, and when a file (ie a collection of characters) is stored an entry is made in an index of the name of the file (this having been provided by the user) and of the numbers of the allocation units in which successive parts of the file have been stored. A separate list is maintained showing for each allocation unit whether it is in use or is available for use. When a file is deleted from the disc, its name and its associated allocation unit numbers are deleted from the index and the list of available allocation units is updated.

Because of the large capacities of modern discs - 100M bytes (100 million bytes) being commonplace - and because of the correspondingly large number of files that are usually stored, it is usual, and this is the case in the present application, for the index of files to be divided into a plurality of sub-indexes, each such sub-index being given a name and being referred to as a directory. Moreover, it is also usual, and again this is the case with the present application, to arrange the directories hierarchically. Thus, each directory, in addition to including its own list of files and their allocation units, is also associated, in some way, with the directories that are immediately subordinate to it.

In one well known prior art system alluded to in the specification, each directory is itself formed as a file and is stored on the disc in the same way as ordinary files.

Each directory file includes firstly the names and allocation unit numbers of the files in the directory, and secondly the names and allocation unit numbers of the directories that are subordinate to it. The directory at the top of the hierarchy - known as the root directory - is stored at a fixed position on the disc, and each sub-directory is stored in whatever

space is available when it is created. Thus in this prior art system the root directory contains a list of files together with the numbers of their allocation units and also a list of directories depending from it together with the numbers of their allocation units. Similarly, each sub-directory contains a list of files and associated allocation units and a list of any sub-sub-directories depending from it and their allocation units, and so on.

For example a production department making bolts might establish a hierarchical directory structure as follows. The main or root directory is called 'bolts'. Depending from it, and named in it, are the names of three sub-directories, namely 'admin', 'sales', and 'production', and depending from the 'admin' directory are two directories named 'personnel' and 'finance'. In order to locate a specified file on the disc, a user must specify the sequence of directories that lead to it and the name of the file. Thus to locate a file named 'John', 'John' being a file in the 'personnel' directory, a user must specify 'bolts-admin-personnel-John', this being known as the complete path for the file. Once this path is specified, the computer effectively first looks at the entries in the 'bolts' directory to find the allocation units for the 'admin' directory. Next the 'admin' directory is examined to locate the allocation units for the 'personnel' directory. Then the 'personnel' directory is examined to locate the allocation units for the file 'John', and finally, the data in those allocation units is read.

Thus in this prior art system the hierarchical structure of directories and sub-directories that is presented by the system to a user is mirrored by the physical arrangement of the data stored on the disc. In the present application the hierarchical structure of directories as presented to the user is maintained - and it will be realised, of course, that a user is aware of no more than this - but the corresponding physical arrangement of the data is abandoned. Instead, according to the invention, a system of records is constructed and the records are stored in the computer in an arrangement known as a 'B-tree', a B-tree being

one of several well known methods of indexing or cataloging data in a computer.

As described a 'record' consists of a first part known as a 'key' and a second part for storing data. Two kinds of records are used, namely 'directory records' and 'file records'. Further, as described, each directory, in addition to having a name allocated to it by the user, also has an identity number (id number) allocated to it by the system. The contents of the two kinds of records are as follows:-

directory record

key: id of parent directory, name of directory
data: id of directory

file record

key: id of parent directory, name of file
data: numbers of allocation units where file is stored

Thus, as described, for each directory there is a corresponding directory record, and for each file a corresponding file record, and as already stated these records are arranged in a B-tree.

With the system described in order to locate the file bolts-admin-personnel-John of the above example, first a search of the B-tree on the key '1, bolts' (the number '1' being the id of the notional parent directory of a root directory) is made to find the id of the 'bolts' directory. With this id, say 29, a second search of the B-tree is made on the key '29, admin' to find the id of the 'admin' directory, say 37, then a search is made on the key '37, personnel' to find the id of the 'personnel' directory, say 65, and finally a search is made of the B-tree on the key '65, John' to find the numbers of the allocation units where the file John is stored. Clearly, this system requires that all directory and file names are unique.

The features of the system just described form the subject of the main claims, these being -

1. In a computer a hierarchical system to provide cataloging and retrieval of data stored on a storage device, said hierarchical filing system comprising:

a memory for storing a program for said cataloging and retrieval;

a processing means coupled to said memory to manipulate said program, and coupled to said storage device for cataloging and retrieving said data;

an organising means for organising said data on said storage device into a hypothetical catalog which has a root directory, a plurality of branching directories arranged at various subsequent levels from said root directory, wherein some of said branching directories branch from other of said branching directories; said branching directories being interconnected such that for each of said branching directories there is only a singular path from itself to said root directory, and wherein some of said branching directories have at least one file, each file corresponding to a representation of a predetermined portion of said stored data, said organising means being provided by said processing means and said program;

an assigning means for assigning a unique directory identification value to said root directory and each of said branching directories, and assigning an identification name to each of said files, root directory and branching directories, where each of said branching directories and files are each provided with a key comprised of its identification name and its next higher level directory identification value, said assigning means being provided by said processing means and said program;

a list forming means for forming a linear list of files and directory entries such that said file and directory entries are ordered by said keys, such that said root directory being the highest level and files being the lowest level; and said interconnection of each

of said singular path is provided by each file and branching directory identification name being associated with directory identification value of its next higher level, said list forming means being provided by said processing means and said program;

a structure forming means for forming a B-tree indexing structure having a beginning node, a plurality of indexing nodes and a plurality of terminating nodes, and wherein said linear list is stored in said terminating nodes of said B-tree indexing structure, said structure forming means being provided by said processing means and said program.

3. In a computer system where data is to be cataloged when stored into a memory device, a method performed by the computer system for providing a hierarchical filing system to catalog said data into a volume of said memory device for subsequent retrieval, comprising the steps of:

creating a root directory, a plurality of subdirectories and a plurality of files;

organizing said root directory, subdirectories and files into a hypothetical catalog wherein said a root directory is at a topmost level and said subdirectories are arranged at various subsequent levels from said root directory, some of said subdirectories branch from other of said subdirectories, but said subdirectories being interconnected such that for each of said subdirectories there is only a singular path from itself to said root directory, and wherein each of said files being interconnected to branch from a certain one of said subdirectories only, such that for each file there is only a singular path from itself to said root directory;

assigning a unique numerical directory identification value to said root directory and to each of said subdirectories in said volume;

assigning an identification name to said root directory and to each of said subdirectories and files, such that no two subdirectories branching from a root directory has a same name, no two subdirectories branching from another subdirectory has a same name, and no two files branching from one of said directories has a same name;

wherein each of said subdirectories and files are each provided with a key comprised of its identification name and its next higher level directory identification value;

forming a linear list of files and subdirectory entries such that said file and subdirectory entries are ordered by said keys, such that said root directory being the highest level and files being the lowest level; and said interconnection of each of said singular path is provided by each file and subdirectory identification name being associated with directory identification value of its next higher level;

forming a B-tree indexing structure having a beginning node, a plurality of indexing nodes, and a plurality of terminal nodes;

storing said linear list in said terminal nodes of said B-tree structure in alphanumerical order according to said numerical directory identification value;

assigning said identification name of a given file to a respective portion of said data;

storing said data;

placing memory location information in said files, wherein for each given file its memory location information locates its respective portion of said data stored in said memory device.

Other features are also described, such as an 'extents' B-tree, but these form the subject of appendent claims and I do not need to go into them.

The examiner took as his starting point two propositions of law, namely -

(a) for a claim to a conventional computer containing a novel program to be patentable a technical advance on the prior art in the form of a new result must be present, and

(b) a claim to a conventional computer containing a novel program that performs a mental act is not allowable irrespective of any technical advance on the prior art.

The first proposition follows from the decision of the Court of Appeal in the case of Merrill Lynch's Application [1989] RPC 561, and the second from that decision together with the decision of the Patents Court in the case of Wang's Application (to be reported). From the papers on file it appears to me that Mr Wombwell has not argued against these propositions and therefore, since I believe them to be correct, I propose to accept them as an accurate statement of the law that I have to apply.

The first question that I must consider is whether the invention claimed is a conventional computer running a novel program.

The specification is entitled 'Hierarchical File System'. It commences by stating that the invention relates to a method of storing and retrieving data using a computer, and it goes on to explain how the data is arranged and organised. No constructional features of a computer are specified, and indeed the only references to a computer are in the opening and closing paragraphs, the closing paragraph stating that the preferred embodiment is controlled by a combination of hardware and software in a computer system with the controlling routines being stored in a read only memory (ROM). Having read the specification very carefully, I can find no description in it other than a description of how the data that has to be maintained by the system in order that files can be stored and subsequently retrieved is itself arranged and stored, from which, I feel sure, a competent programmer could write the appropriate routines to put the system into practice.

In their first submissions to the examiner relevant to this point, the applicants stated (see Mr Wombwell's letter dated 10 October 1990) -

> "Accordingly, the applicants respectfully submit that the present invention relates to a computer when programmed to operate in a new way which is distinguished from the prior art and which achieves a desirable technical effect, having regard to what is known."

However, in their next submission (see Mr Wombwell's letter dated 6 February 1991) the applicants apparently took the view that -

> "it should be apparent that the invention resides not simply in a standard computer when programmed to operate in a new way, but rather to a new type of computer which is constructed in a particular way to process information according to the process specified, which process is itself embodied in the structure of the computer rather than simply by programming of a standard computer."

and when the examiner reported that he could find no basis in the specification for any suggestion that the invention related to a new type of computer constructed in a particular way the applicants responded (see Mr Wombwell's letter dated 1 March 1991) -

> "We believe that the computer set forth in the specification is, in fact a modified computer because it contains a modified B-tree along with the corresponding file extents B-tree. Specifically, the specification sets forth that "[r]eferring to Figure 5, a specialized B-tree expansion architecture as implemented in the preferred embodiment as shown" (see specification at p.3, lines 110-112). Further, the specification sets forth that the invention contains "a hypothetical catalog 90 ... named 'Volume'" (see specification at p.4 lines 33-37). Moreover, "the catalog B-tree's file record of a particular file contains information about the locations in the memory device where the file's data is stored.

The memory device is considered to be a sequentially numbered collection of blocks. A series of contiguous memory blocks is called an extent" (see specification at p.5, lines 97-103). These items are represented in the computer system in the very specific way as shown in detail in figures 4 through 9. A general purpose computer may not necessarily contain the data structures shown in figures 4 through 9.

The specification describes not just a general purpose computer, but a computer that contains the modified B-tree, extents tree and this cataloging structure. Each of these items is required to cause the computer to operate correctly for the purpose described in the application. The operations are performed by the computer on various data, such as documents or images which are stored as electrical impulses. It should be clear that the file extents B-tree is itself an image of data created as part of a technical process of the invention. These documents or images, under the language of Vicom are physical entities and thus their transformation achieves a technical result."

In the absence of any assistance from Mr Wombwell, who had not been instructed to appear at the hearing, I must admit to having some difficulty in following this argument, particularly since the file extents B-tree, to which the applicants appear to attach some importance, is not a feature of either of the two main claims. Nonetheless, I think that what the applicants have in mind are really two arguments namely -

(a) Because the data that the computer manipulates is stored as electrical impulses it follows that the invention does achieve a technical result, and

(b) Because the computer contains a B-tree it is a modified computer rather than a general purpose computer and therefore the invention is not a conventional computer containing a novel program.

I will leave argument (a) for the moment and consider argument (b). In argument (b) the applicants appear to be submitting that if one takes a general purpose computer and loads into it a B-tree then one no longer has a general purpose computer. I do not follow this argument. I can see that it could be argued that a B-tree is a peculiar data structure because each node of the tree has to contain address data indicating where in memory the nodes to which it is immediately related are stored, and that this intimate association of the tree and the memory should be regarded as producing a new structure. However, in my opinion any argument along these lines is unsound since no greater association of the B-tree with the memory is required than is required for any other data, for example a page of text. This is because if it were necessary to move a tree in memory, or to store a tree on disc and to reload it into memory, possibly at a different location, then in practice some scheme of relative addressing would be employed whereby the address data in the nodes of the tree would indicate the storage locations of related nodes relative to some datum, such as the storage location of the root node. It therefore seems to me that a B-tree is simply data and that all that one needs to know about it when it is stored in memory is, for example, the location of its root node, in the same way that all one needs to know about a page of text when it is stored in memory is where the text begins. Hence, in my opinion, the act of storing a B-tree in a computer does not change the structure of the computer for the purpose of the Act any more than the storing of any other data does. To conclude otherwise, it seems to me, would lead to the conclusion that the act of loading a new program into a general purpose computer produces a new, and hence patentable, computer, a proposition which the Court of Appeal rejected in the Merrill Lynch case.

Hence I reject the applicants' argument and I find that their invention is a conventional computer running a novel program.

Given this conclusion, it follows that the examiner's first argument stands or falls with whether or not the invention claimed achieves a

technical advance. Mr Wombwell, on behalf of the applicants, has submitted that it does, but the examiner has not been so persuaded.

Having read all of Mr Wombwell's letters it seems to me that only two arguments have been submitted by the applicants on the question of technical advance. The first argument (see Mr Wombwell's letter dated 6 February 1991) is that the computer provides "improved performance . . . thereby providing the required technical result". I do not accept this argument. There is little doubt that the invention originally claimed in the case of Vicom Systems Inc [1987] EPOR 74 gave rise to an improved performance in the speed of calculating convolution integrals, or that the programming technique originally claimed in the case of IBM/Indicating conditions [1990] EPOR 107 gave rise to an improved performance in requiring a smaller store, but in neither case did the improved performance save the original invention from rejection. Thus improved performance of itself - and I am prepared to accept that the present invention does give rise to improved performance - is not sufficient to impart to the invention the required technical attribute unless that improvement occurs in a technical field, such as the field of image enhancement as in the case of Vicom.

The second argument put forward by the applicants to show that a technical advance is achieved is the argument that I summarised at (a) above. This argument is essentially that put to the European Board of Appeal in the case of IBM/Abstracting documents [1990] EPOR 98. The Board commented -

> "13 Finally the Appellant submitted that the activity referred to in the claims would bring about a change in the physical environment in as much as a physical entity (the information stored as electric signals) is changed. This argument seems to refer to a consideration in this Board's decision in the case of T208/84 (Vicom, OJEPO 1987 14) more in particular paragraph 5 thereof. There it was stated that "... if a mathematical method is used in a technical process, that process is carried out on a

physical entity (which may be a material object but equally an image stored as an electric signal) by some technical means ... and provides as its result a certain change in that entity". It is clear from the context of the citation that the expression "physical entity" referred to a real thing i.e. an image, even if that thing was represented by an electric signal. The electric signals processed according to the present application are not of this kind but represent (part of) the information content of a document, which could be of any nature. The claimed activity does not bring about any change in the thing operated upon (i.e. the document to be abstracted) but derives therefrom a new information to be stored. Apart from that, it cannot be inferred from the citation in question that any manner of bringing about a change in a physical entity would ipso facto qualify as a technical process."

I believe that the same considerations apply to the present case, and whilst it is undoubtedly true that at a fundamental level the structure of a disc is changed when data is stored upon it, this change is not, in my opinion, of the type that would be regarded by the EPO Board of Appeal - and I am enjoined by the Court of Appeal in its decision in the case of Gale's Application (to be reported) to pay the greatest respect to the Board's decisions - as imparting to the invention the necessary technical attribute.

This conclusion, it seems to me, is supported by an earlier passage from the IBM/Abstracting documents decision, namely -

"8. For carrying out in practice an activity excluded as such under Article 52(2)(c) EPC some means may be used which themselves could be qualified as technical e.g. a computer controlled by appropriate software. A claim directed to an excluded activity but at the same time containing such technical features would not appear to be unallowable under all circumstances. However, the mere setting out, as in the present

case, of the sequence of steps necessary to perform the activity in terms of functions or functional means to be realised with the aid of conventional computer hardware elements does not import any technical considerations and can, therefore, neither lend a technical character to that activity nor to the claimed subject-matter considered as a whole, no more than solving a mathematical equation could be regarded as a technical activity when a conventional calculating machine is used and thereby overcome the exclusion from patentability."

by which I take the Board to mean that in the Board's opinion the technical content of a claim for an invention based upon a novel program cannot be enhanced merely by expressing the steps of an underlying method or algorithm in terms of functionally defined means of the type that would be found in a conventional general purpose computer. In other words, if an invention is argued to be patentable because it achieves a technical effect, then that effect must be over and above any technical effect present as a consequence of the use of functionally defined means of the type that are to be found in a conventional computer.

Hence in my opinion the applicants have not shown that their invention does achieve any technical advance and therefore it follows that for the purposes of the Act the invention is no more than a program for a computer and is excluded from patentability by section 1(2)(c).

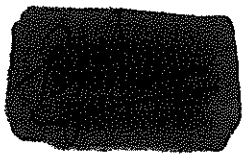
The examiner's second argument started with the premise that the invention as claimed performed a mental act. The applicants argued against this, and having considered their argument I have serious doubts whether the invention can be said to be performing a mental act and I therefore do not feel able to support the examiner on this argument.

None of the applicants' arguments has been addressed specifically to the appendent claims. However, I have read these claims and I am satisfied that they also are excluded from patentability by section 1(2)(c).

In conclusion I support the examiner's objection that the invention claimed is excluded from patentability by section 1(2)(c), and having read the specification I do not believe that it is possible to draft claims that would not be excluded. Since the application has now gone beyond its period for being put in order, it follows from section 20(1) that the application shall now be treated as having been refused by the comptroller at the end of that period, namely on 30 April 1991.

Any appeal from this decision should be lodged within a period of six weeks from the date of the decision as stated below.

Dated the 13TH day of June 1991



B J Phillips
Principal Examiner acting for the Comptroller

THE PATENT OFFICE