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D E C I S I O N
of 25 July 2001

Case Number: T 0627/99 - 3.5.2

Application Number: 91310933.6

Publication Number: 0488679

IPC: G11B 33/02

Language of the proceedings: EN

Title of invention:

Storage disk module and storage disk device having a plurality
of storage disk modules

Applicant:

Fujitsu Limited

Opponent:

-

Headword:

-

Relevant legal provisions:

EPC Art. 56

Keyword:

"Inventive step (no)"

Decisions cited:

-

Catchword:

-



Case Number: T 0627/99 - 3.5.2

D E C I S I O N
of the Technical Board of Appeal 3.5.2
of 25 July 2001

Appellant: Fujitsu Limited
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Decision under appeal: Decision of the Examining Division of the
European Patent Office posted 19 January 1999
refusing European patent application
No. 92 310 933.6 pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: W. J. L. Wheeler
Members: R. G. O'Connell
B. J. Schachenmann

Summary of Facts and Submissions

I. This is an appeal from the refusal by the examining division of European patent application No. 91 310 933.6 on the grounds that the subject-matter of claims 1 of the main and auxiliary requests respectively did not involve an inventive step having regard to

D1: Patent Abstracts of Japan vol. 14, no. 283
(P-1063)(4226) 19 June 1990

and common general knowledge in the art as evidenced in

D2: US-A-4 901 200.

On appeal the refused auxiliary request was promoted to single request.

II. Claim 1 of this request reads as follows:

"1. A storage disk module comprising:

a frame (10);

a disk drive unit (20) having a storage disk, said disk drive unit being accommodated in the frame;

a circuit unit (31) for controlling said disk drive unit, said circuit unit being accommodated in the frame,

a power source (30) for supplying said disk drive unit and the circuit unit with energy, said power source being accommodated in the frame, and said disk drive

unit, said circuit unit and said power source being replaceably mounted side by side in the frame in a first direction perpendicular to a second direction in which said storage disk module is inserted into a locker; and

a back panel (40) formed in a back portion of the frame, said back panel electrically connecting said disk drive unit, said circuit unit and said power source to each other,

characterised in that:

the storage disk module comprises a single said disk drive unit (20) and is adapted to be replaceably mounted in the locker, allowing the storage disk module to be replaced by a new one in addition to allowing the disk drive unit (20), the circuit unit (31) or the power source (30) to be replaced with a new one; and in that

said frame (10) has an upper opening and a lower opening for cooling and in that said disk drive unit (20), said circuit unit (31) and said power source (30) are arranged side by side in said frame (10) in said first direction to define air flow passages in a third direction, perpendicular to the first and second directions, between said disk drive unit (20), said circuit unit (31) and said power source (30) through said upper and lower openings."

Claims 2 to 44 are dependent on claim 1.

III. Oral proceedings took place before the board on 25 July 2001.

IV. The appellant's arguments can be summarised as follows:

The inventive concept underlying claim 1 had two aspects, viz (i) two levels of replaceability of units and modules and (ii) cooling measures.

(i) Replaceability

The closest prior art D1 was not concerned with replaceability as such but it admittedly showed rails and grooves for disk drive units and circuit boards within the mounting unit and the mounting unit itself had slots for assembly purposes. There were two ways in which an attempt could be made to establish a correspondence between claim 1 and D1. On a first comparison basis, the storage disk module of claim 1 could be equated to the mounting unit 10 of D1. The two-part form of claim 1 was based on this equation and thus acknowledged that the first level of replaceability was disclosed in D1 in that the disk driving mechanism 1, power source circuit board 13 and electronic circuit board 12 depicted therein were slidably mounted in the mounting unit 10. However there was no disclosure in D1 that the mounting unit 10 was "replaceably mounted in the locker" within the meaning of claim 1.

In fact such replacement would be very inefficient as it was unlikely that four disk driving devices would all be faulty at the same time. Rather the skilled person would expect to replace individual disks within the existing mounting unit 10. Even though the mounting unit 10 showed mounting slots, indicating that it was to be mounted in a larger unit, this did not suggest that it was intended to be **replaceably mounted**, since

such mounting slots were also used in permanent installations. Hence the two-stage replacement was not obvious.

On the second comparison basis, the locker of claim 1 could be equated to the mounting unit 10 in D1. On that reading D1 had only one level of replacement and it was not obvious to provide a second.

(ii) Cooling

Proceeding on the first comparison basis as mentioned above, the claimed storage disk module was distinguished from D1 *inter alia* by the provision of upper and lower cooling openings. In D1, the various items mounted in the mounting unit 10 were clearly spaced apart with gaps in between. Although D1 was not concerned with cooling, it could be assumed that these gaps would provide adequate ventilation to the mounted components. Hence the problem of cooling did not arise. Even if one were to assume that the skilled person would somehow be motivated to provide additional cooling in the D1 mounting unit, it would not be obvious to provide upper and lower openings therein. Such openings would have to be aligned with the gaps between the disk drive units, the power source circuit board and the electronic circuit board. It would in fact be easier to provide such openings in the back of the mounting unit.

It was true that D2 at column 1, lines 19 to 23 referred to the generally known practice of cooling electrical components in a housing by providing ventilation openings in the housing bottom and in the housing top, but in a following passage at column 1,

lines 25 to 32 it was pointed out that if such a housing is inserted into a cabinet or rack in which further inserts are placed immediately above and below, the ventilation openings are covered thus reducing the effectiveness of the arrangement. This latter passage was also part of the common general knowledge in the art referred to in D2.

On the second comparison basis, starting from D1 would imply providing upper and lower cooling openings in the disk drive unit. The person skilled in the art would have no incentive to do this since the latter was thin and set in a mounting rail so that it would be difficult to accommodate such openings.

- V. The appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of claims 1 to 44 filed with the statement of grounds of appeal.

Reasons for the Decision

1. The appeal is admissible.
2. *Inventive step*
 - 2.1 The invention relates generally to external data storage systems for computers comprising arrays of magnetic or optical disk drive units; it addresses the general problems of replaceability and cooling in such arrays. Starting from the agreed closest prior art D1, the storage disk module specified in claim 1 solves the problems of (i) providing a second level of

replaceability, viz of the entire module when the latter was inserted in a locker and (ii) cooling the electronic components in the storage disk module. These are independent problems whose only interaction is that their solutions should be mutually compatible.

2.2 Replaceability

The appellant argues that arranging for the entire "mounting unit" to be replaceable was not obvious over D1 because the latter "mounting unit" contains a plurality of disk drive units which would be unlikely to fail simultaneously so that their total replacement would be uneconomical and therefore not suggested by D1. The board is not persuaded that an inventive step would be involved for the person skilled in the art in adapting the mounting unit of D1 to be replaceably mounted in a locker. Although it is true that such a second level of replaceability is not mentioned in D1, the D1 unit is designated as a "mounting unit" and has flanges with slots suitable to receive securing screws or bolts. As the appellant has pointed out, such a unit could be installed permanently. However, the board interprets the term "replaceably mounted" as meaning that replacement is **possible** non-destructively, without major effort and reasonably quickly. The fact that the unit 10 in D1 is designated as a "mounting unit" and has slotted flanges is, in the boards' judgement, indicative of a modular construction practice of the kind which is notorious in the electronic equipment art, eg the well-known 19-inch modular system mentioned at column 4, line 19 of D2. The said slotted flanges suffice to make the unit "adapted to be replaceably mounted" in a locker, rack or cabinet, even absent any explicit teaching in D1 that such replacement should be

effected. Hence, on the board's interpretation of claim 1 and D1, the feature of being adapted to enable second level replaceability belongs in the prior art portion of the claim, although the claimed storage disk module would still be distinguished from D1 *inter alia* by having only a single disk drive unit.

The board does not regard this latter distinction as anything other than a routine design choice determined by the size and cost of disk drive units available. When a large capacity drive is sufficiently cheap a storage disk module or mounting unit would naturally be equipped with one disk drive unit, whereas D1 reflects the different situation of small capacity relatively expensive separately replaceable disk drive units. These are typical provisioning considerations in the design and planning of electronic equipment assembly and do not involve an inventive step.

2.3 Cooling

Turning now to the cooling aspect specified in the last subparagraph of claim 1, the appellant has pointed out that D2, although relied on by the examining division in the decision under appeal as evidence that lower and upper cooling openings in equipment housings were standard practice in the art, itself mentioned in a closely following passage that this common practice leads to problems when such housings are stacked in a cabinet or rack as a result of interference between the openings reducing the effectiveness of the convective cooling. The board does not regard the examining division's argument as being undermined by this further comment in D2, since the problem of convective interference in a stack is not solved by the storage

disk module of claim 1; it is merely accepted. In fact D2, immediately following the passage cited by the appellant, points out that the stacking problem has the effect that "a stream of cooling air must be generated with the aid of fans to flow through the components and provide the necessary heat removal." This is also the preferred teaching of the present application as shown, eg by the fans 70 in the locker 60 of Figure 10 and reflected in claims 28 and 30.

2.4 The board therefore regards the refusal decision under appeal as well-founded and in particular not refuted by the arguments adduced on appeal.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

L. Martinuzzi

W. J .L. Wheeler