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Datasheet for the decision
of 17 June 2014

Case Number:	T 2252/09 - 3.5.07
Application Number:	05010672.3
Publication Number:	1605454
IPC:	G11B19/00
Language of the proceedings:	EN

Title of invention:
Multi-disk drive with high power and low power disk drivers

Applicant:
Marvell World Trade Ltd.

Headword:
Multi-disk drive/MARVELL

Relevant legal provisions:
EPC Art. 56, 84

Keyword:
Inventive step - main request (no)
Claims - clarity - auxiliary request (yes)
Remittal to the department of first instance - (yes)

Decisions cited:

Catchword:

Case Number: **T 2252/09 - 3.5.07**

D E C I S I O N
of Technical Board of Appeal 3.5.07
of 17 June 2014

Appellant: (Applicant)	Marvell World Trade Ltd. Parker House, Wildey Business Park, Wildey Road St. Michael (BB)
Representative:	Grünecker, Kinkeldey, Stockmair & Schwanhäusser Leopoldstrasse 4 80802 München (DE)
Decision under appeal:	Decision of the Examining Division of the European Patent Office posted on 8 July 2009 refusing European patent application No. 05010672.3 pursuant to Article 97(2) EPC.

Composition of the Board:

Chairman	R. Moufang
Members:	M. Rognoni
	R. de Man

Summary of Facts and Submissions

I.   The applicant (appellant) appealed against the decision
      of the Examining Division to refuse European patent
      application no. 05010672.3.

II.   In the decision under appeal, the Examining Division
      held, *inter alia*, that the subject-matter of claim 1
      according to the main request filed with letter dated
      22 July 2008 lacked an inventive step with respect to
      the following prior art:

      D1: US-B1-6 628 469.

      Furthermore, the Examining Division found that the
      auxiliary requests 1 to 3 filed with letter dated
      24 April 2009 did not comply with the provisions of
      Articles 83 and 84 EPC.

      As to the auxiliary requests 4 and 5 filed at the oral
      proceedings, the Examining Division considered that
      auxiliary request 4 did not comply with Article 56 EPC
      whereas auxiliary request 5 did not comply with the
      provisions of Article 83 in combination with Rule 42(1)
      (c) EPC. Moreover, the subject-matter of claim 1 of the
      latter request also did not comply with Article 56 EPC.

III. In the statement of grounds of appeal, the appellant
      requested to set aside the decision of the Examining
      Division and to grant a patent on the basis of the main
      request considered in the contested decision.
      Furthermore, the appellant declared that, if the Board
      did not allow the main request, it was intended to
      maintain the auxiliary requests refused at the oral
      proceedings before the Examining Division, *"as
      necessary and appropriate"*.

IV.   In a communication dated 20 December 2013 summoning the
        appellant to oral proceedings, the Board drew the
        appellant's attention to the following document:

        D2: US-A-2003/0196031.

        According to the Board's preliminary opinion, the
        subject-matter of claim 1 of the main request did not
        involve an inventive step with regard to D1 in
        combination with the teaching of D2.

        Furthermore, the Board saw no reason to allow any of
        the auxiliary requests on file since the appellant had
        not submitted any arguments in their support.

V.   In reply to the Board's communication, the appellant
        filed, with letter dated 16 May 2014, new auxiliary
        requests 1 to 4 based on auxiliary requests 1, 2 and 4
        refused by the contested decision. Furthermore, the
        appellant declared its intention not to maintain "the
        remaining requests" in view of the new prior art and of
        the objections raised in the summons to oral
        proceedings.

VI.   On 17 June 2014, oral proceedings before the Board were
        held as scheduled. During the oral proceedings, the
        appellant filed, *inter alia*, a new auxiliary request 4,
        replacing the pending auxiliary request 4, and
        auxiliary requests 5 and 6. Moreover, the appellant
        withdrew auxiliary requests 1 to 3.

VII.   The appellant requested that the decision under appeal
        be set aside and that a patent be granted on the basis
        of the main request filed with letter dated
        22 July 2008 or, in the alternative, on the basis of

one of the auxiliary requests 4 to 6 as filed during
the oral proceedings.

VIII.   Claim 1 according to the main request reads as follows:

"A multi-disk drive system, comprising:

a high power disk drive, HPDD, (644) including one or
more platters, wherein said one or more platters have a
diameter that is greater than 1.8";

a low power disk drive, LPDD, (648) including one or
more platters, wherein said one or more platters have a
diameter that is less than or equal to 1.8", and

a drive control module (650) that collectively controls
data access to said LPDD and said HPDD;

wherein said HPDD, said LPDD, and said drive control
module perform as a unitary disk drive relative to a
host,

wherein said drive control module determines available
space on said LPDD, and

wherein said drive control module stores data in at
least one of said HPDD and said LPDD based on said
determination of available space."

Claim 1 according to the auxiliary request 4 reads as
follows:

"A multi-disk drive system, comprising:

a high power disk drive, HPDD, (644) including one or
more platters, wherein said one or more platters have a
diameter that is greater than 1.8";

a low power disk drive, LPDD, (648) including one or
more platters, wherein said one or more platters have a
diameter that is less than or equal to 1.8",

a drive control module (650) that collectively controls
data access to said LPDD and said HPDD, wherein said
HPDD, said LPDD, and said drive control module perform
as a unitary disk drive relative to a host; and

a host control module (651) that provides an interface
between the drive control module and the host,

wherein said drive control module comprises:

    a hard drive controller, HDC, (653) that
    communicates with said host control module,

    a drive processor (657) that communicates with
    said HDC,

    a buffer (656) that communicates with said HDC and
    buffers data,

    a first spindle/voice coil motor, VCM, driver
    (662; 672) that communicates with said HDC and
    said HPDD,

    a first read/write channel circuit (664; 674) that
    communicates with said HDC and said HPDD, and

    a direct interface (680), connected to said HDC,
    for providing an external connection to said LPDD,

wherein said drive control module determines available
space on said LPDD,

wherein said drive control module stores said data in
at least one of said HPDD and said LPDD based on said
determination of available space, and

wherein said host control module and said drive control
module are implemented by a system on chip, SOC."

Claim 2 to 8 of the auxiliary request 4 are dependent
on claim 1.

The auxiliary requests 5 and 6 are not relevant to the
Board's decision.

IX.   The appellant argued essentially as follows:

Document D1 related to a multi-disk drive system which
comprised a high power disk drive (HPDD), a low power
disk drive (LPDD) and a controller which interfaced
with the host. It was specified in column 8, lines 41
to 47, that the operating system was required for
partitioning the information stored on the disk drive
units, and then suggested that any number of suitable
algorithms could be used for this purpose. There was,
however, no indication in document D1 that these
algorithms might be used not by the operating system,
but by the controller 24.

As document D1 disclosed only one possibility, namely
that the operating system of the host partitioned the
information to be stored in the hard disk drive (HDD)
system, it provided a clear technical teaching to the

skilled person that the host computer had to be
responsible for performing such task.

On the contrary, claim 1 of the main request specified
that the drive control module of the multi-disk drive
system, which together with the HPDD and the LPDD
performed as a unitary disk drive relative to the host,
determined the storage space available on the LPDD and,
based on this determination, stored the data in the
HPDD or LPDD subsystem.

A skilled person would understand that the
distinguishing features of claim 1 referred to above
had the effect that the host could communicate with a
single disk drive, instead of having to partition the
data and send them to several HDD subsystems, because
the HPDD, the LPDD and the drive control module
performed as a unitary disk drive relative to the host.

In view of the closest prior art document D1, it was
the object of the present invention to improve the
known multi-disk drive system so as to reduce
complexity, improve performance and decrease power
consumption.

Since D1 explicitly required that the operating system
of the host was responsible for partitioning the data
to be stored between the HPDD and the LPDD, it would
only be obvious to a person skilled in the art, wishing
to improve the system of D1, to follow the same
approach and look for improved algorithms which the
operating system of the host could use to partition the
stored data.

As to document D2, it was not relevant to the present
invention because it related to a hard disk drive with

a solid-state memory that was used as a buffer, and not
to a multi-disk drive system comprising high-power and
low-power subsystems. Hence, the skilled person would
not derive from this document any teaching that could
be applied to a multi-disk drive system as disclosed in
document D1.

In summary, the subject-matter of claim 1 according to
the main request involved an inventive step with
respect to the relevant prior art.

Claim 1 according to the auxiliary request 4 was based
on the multi-disk drive system shown in Figure 17 of
the application. Its wording was clear and it did not
contain any subject-matter extending beyond the content
of the application as filed (Articles 84 and 123(2)
EPC). As none of the cited documents disclosed or
suggested all the features recited in claim 1, its
subject-matter also fulfilled the requirements of
Article 56 EPC.

Reasons for the Decision

1.   The appeal is admissible.

Main request

2.   Claim 1 of the main request relates to a *"multi-disk
        drive system"* which comprises the following features:

        (a) a <u>high power disk drive</u>, HPDD, including one or
            more platters, wherein said one or more platters
            have a diameter that is greater than 1.8";

(b) a <u>low power disk drive</u>, LPDD, including one or
    more platters, wherein said one or more platters
    have a diameter that is less than or equal to
    1.8", and

(c) <u>a drive control module</u> that collectively controls
    data access to said LPDD and said HPDD;

(d) wherein said HPDD, said LPDD, and said drive
    control module perform as a unitary disk drive
    relative to a host,

(e) wherein said drive control module determines
    available space on said LPDD, and

(f) wherein said drive control module stores data in
    at least one of said HPDD and said LPDD based on
    said determination of available space.

3.   According to the decision of the Examining Division,
     the multi-disk drive system disclosed in document D1
     comprised features (a) to (d) recited in claim 1.
     Starting from document D1, the problem to be solved
     could be regarded as how to make the control of the
     disk drive independent of an operating system.

     As it was common practice and well known in the art
     that functions could be implemented in software and
     hardware, the Examining Division concluded that it
     would be obvious to a person skilled in the art to
     implement an algorithm, as taught in document D1 (col.
     8, lines 54 to 60), in a dedicated controller which
     would then perform the functions specified in features
     (e) and (f).

Hence, in the opinion of the Examining Division, the subject-matter of claim 1 did not involve an inventive step within the meaning of Article 56 EPC.

3.1   In the appellant's view, document D1 specified that the operating system (OS) of the host system was required for partitioning the information stored in the disk unit between the HPDD and LPDD subsystems and thus taught away from a multi-disk drive system according to claim 1 in which the drive control module of the multi-disk drive system determined the available space on the LPDD and partitioned data between the LPDD and the HPDD in accordance with the determination of available space.

4.   Document D1 relates to a low power consuming disk drive unit comprising, as an integrated unit, multiple HDD subsystems of different power requirements and functions. The smaller/more efficient HDD subsystem is typically used to store the most commonly accessed data (cf. D1, column 2, lines 35 - 48).

4.1   As specified in column 5, lines 7 to 25, the HDD subsystem 50 has a smaller diameter than the disk platter of the HDD subsystem 55. The smaller size of the platter primarily accounts for the lower power consumption of the HDD subsystem 50 as compared to the HDD subsystem 55. The smaller diameter platter may be 0,5 to 0,75 inches in diameter while the larger disk platter may be 2,5 to 3,5 inches in diameter. The amount of power needed to start and rotate the smaller disk platter is less than the power required by the larger platter.

4.2   The multi-disk drive system known from document D1 further comprises a controller 24 (see Figures 4A and

4B) which provides the functions required for interfacing with an external host/system and for controlling the HDD subsystems (D1, column 6, lines 60 - 66).

In particular (see D1, column 7, lines 11 - 27), "*the controller 24 provides the interface between the mechanical aspects of the invention and the external electrical host/system 42. The controller 24 interfaces with the external host/system 42 and provides control signals from the host/system 42 to the HDD subsystem through controller bus 24A that controls, among other features, the spindle 6, 16 [...] and the actuator 12, 22 [...] of the HDD subsystems 50 and 55 respectively. [...] The controller 24 also provides the interface with the external host/system 42 for the communication of data from the external host/system 42 to the read-write heads 24 so that the data may be read-written from and to the disk platter(s) of the multiple HDD subsystems*".

4.3   From the above it follows that document D1 discloses a multi-disk drive system which comprise features (a) to (d) recited in claim 1 of the main request.

5.   The essential difference between the known multi-disk drive system and the subject-matter of claim 1 is that according to the latter the drive control module, and not the OS of the host system, is responsible for partitioning the stored data between the LPDD and the HPDD (see features (e) and (f) of claim 1).

5.1   As a consequence, the claimed multi-disk drive system performs as a truly unitary system not only with respect to the functions required to control the disk-drive subsystems, but also with respect to the data

partitioning which is no longer performed by the host's OS. The claimed multi-disk drive system thus does not require any modification of the OS or any dedicated software to be run on the host system.

5.2   Starting from the multi-disk drive system known from D1, a problem solved by the claimed invention can be seen in providing a multi-disk drive system which behaves as a unitary storage system fully compatible with the operating system of the host computer.

5.3   As argued by the appellant, document D1 specifies that the OS of the host system is required for partitioning the stored data between the low power and high power disk drive subsystems. However, in the opinion of the Board, this does not imply that document D1 teaches away from the present invention.

5.4   Apart from the functions attributed to the drive control module (*i.e.* drive controller 24) in column 6, lines 60 - 66, document D1 explicitly hints at the possibility that the controller 24 may contain sufficient logic for the transfer of information between HDD subsystems (see column 8, lines 9 - 12). In addition, document D1 also teaches that any *"number of suitable algorithms could be used"* to partition the information, and foresees an embodiment with *"an automated algorithm"* which *"detects when the smaller/ more efficient HDD subsystem is reaching its storage capacity limit, and automatically writes additional data to the larger/less efficient HDD subsystem [...]"* (see column 8, lines 47 - 60).

In the Board's view, it is obvious to a skilled person that this kind of *"automated algorithm"* need not be added to the operating system or run by the host

system, but can be effectively performed by a dedicated unit of the multi-disk drive system. This has the evident advantage of freeing the host processor from additional routine tasks and of rendering the drive system compatible with existing operating systems since for its operation no modification of the host's OS is required.

The skilled reader of document D1 would not be prejudiced against such a modification of the known multi-disk drive system, as it is not incompatible with the teaching of D1, which indeed foresees the possibility of attributing to the controller functions relating to the transfer of data between the drive subsystems, for instance for the purpose of disk caching (see D1, column 8, lines 9 - 18).

5.5   Furthermore, the advantages of integrating a drive control module into a storage system comprising two storage units (for instance a HDD and a RAM), so that the control module manages the storage of data in both storage units and the storage system performs as a truly unitary disk drive device relative to the host, are known in the art, as shown in D2 (see paragraph [0037]).

5.6   In summary, the Board considers that the subject-matter of claim 1 does not involve an inventive step with respect to the teaching of document D1 and to the skilled person's general knowledge (Article 56 EPC).

Auxiliary request 4

6.   Claim 1 according to the auxiliary request 4 is directed to the embodiment of the invention shown in Figure 17 and described in paragraph [00112] of the

original application. It differs from claim 1 of the
main request essentially in that it further comprises
*"a host control module (651) that provides an interface
between the drive control module and the host",* recites
components of the *"drive control module",* in particular
"a direct interface" connected to a hard drive
controller (HDC) for providing an external connection
to the LPDD, and specifies that *"said host control
module and said drive control module are implemented by
a system on chip, SOC".*

In the exercise of its discretion under Article 12(4)
RPBA, the Board has decided to admit the auxiliary
request 4 into the appeal proceedings as it constitutes
a promising attempt on the part of the appellant to
overcome outstanding objections against the grant of a
patent.

6.1   As pointed out by the appellant, implementing the host
control module and the drive control module on a single
chip would contribute to a reduction in the power
consumption of the multi-disk drive system.

Furthermore, the appellant has convincingly argued that
the particular asymmetric configuration of the drive
control module with an interface providing an external
connection to the LPDD would increase the flexibility
of the multi-disk drive system in the sense that the
LPDD could be easily replaced.

6.2   The Board is satisfied that claim 1 fulfils the
requirements of Article 84 EPC and that its subject-
matter does not extend beyond the content of the
application as originally filed (Article 123(2) EPC).

7.   As to the question of inventive step, the Board notes
        that claim 1 according to the auxiliary request 4
        covers aspects of the invention, such as the particular
        configuration of the drive control module, which do not
        appear to have been investigated during the first
        instance proceedings and thus require further attention
        on the part of the Examining Division.

7.1   Under these circumstances, the Board considers it
        appropriate to make use of its powers under Article
        111(1) EPC and remit the case to the department of
        first instance for further prosecution.

7.2   Under these circumstances there is no need to consider
        the auxiliary requests 5 and 6.

Order

For these reasons it is decided that:

1.   The decision under appeal is set aside.

2.   The case is remitted to the department of first
        instance for further prosecution.

The Registrar: The Chairman:

I. Aperribay   R. Moufang

Decision electronically authenticated