

The opinion in support of the decision being entered today  
was **not** written for publication in and  
is **not** binding precedent of the Board.

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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**Ex parte** THEODORE E. BRUNING III, RANDAL S. MARKS, JULIA A.  
HODGES, RYAN J. JOHNSON, BERT MARTENS, KAREN E. WORKMAN,  
SUSAN G. ELKINGTON, RICHARD F. LARY, JESSE YANDELL, STEPHEN  
SICOLA AND ROGER OAKY

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Appeal No. 2004-1190  
Application No. 09/286,160

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ON BRIEF

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Before RUGGIERO, MACDONALD and NAPPI, Administrative **Patent Judges**.  
NAPPI, **Administrative Patent Judge**.

**DECISION ON APPEAL**

This is a decision on the appeal under 35 U.S.C. § 134 from the  
examiner's rejection of claims 1 through 8 and 10 through 20. For the reasons  
stated *infra* we reverse the examiner's rejection of these claims.

### **The Invention**

The invention relates to a system for a redundant array of independent disks (RAID). See page 1 of appellants' specification. The system makes use of several back-end controllers each of which organizes and presents a group of disks as a RAID. The system also uses a front-end controller which stripes the RAID and presents the RAID as a large storage volume. The front-end controller uses one of the back-end controllers as a primary storage location and another back-end controller as a mirror to create a redundant storage location. See page 2 of appellants' specification.

Claim 1 is representative of the invention.

1. An apparatus for providing a virtual volume, the apparatus comprising:

a first plurality of disks;

a second plurality of back-end controllers coupled to the first plurality of disks for organizing and presenting the first plurality of disks as a third plurality of redundant arrays of disks; and

a front-end controller coupled to the second plurality of back-end controllers for generating mirror sets from at least one of the disks in a third plurality of redundant arrays of disks received from the second plurality of back-end controllers, striping at least one of the disks in the third plurality of redundant arrays of disks and presenting the striped arrays as a virtual volume.

### References

The references relied upon by the examiner are:

Khosrowpour	5,991,844	Nov. 23, 1999
Pinson	6,256,748	Jul. 3, 2001 (filed Feb. 12, 1999)
Bergsten	6,282,610	Aug. 28, 2001 (filed Jan. 15, 1999)
Griffith	6,330,687	Dec. 11, 2001 (filed Nov. 13, 1998)

Missiglia, Paul, "The RAID book, A Storage System Technology Handbook", 6<sup>th</sup> Edition, (February, 1997), pp. 6, 8, 10, 102, 151-157.

### Rejections at Issue

Claims 1, 2, 4 through 8, 11 through 16 and 18 through 20 stand rejected under 35 U.S.C. § 103 as being unpatentable over Massiglia in view of Khosrowpour.

Claims 3 and 17 stand rejected under 35 U.S.C. § 103 as being unpatentable over Massiglia in view of Khosrowpour and Griffith.

Claim 10 stands rejected under 35 U.S.C. § 103 as being unpatentable over Massiglia in view of Khosrowpour, Bergsten and Pinson.

### Opinion

We have carefully considered the subject matter on appeal, the rejections advanced by the examiner and the evidence of obviousness relied upon by the examiner as support for the rejections. We have, likewise, reviewed and taken into consideration, in reaching our decision, appellants' arguments set forth in the brief along with the examiner's rationale in support of the rejections and arguments in rebuttal set forth in the examiner's answer.

With full consideration being given to the subject matter on appeal, the examiner's rejections and the arguments of appellants and examiner, for the reasons stated *infra*, we reverse the examiner's rejection of claims 1 through 8 and 10 through 20 under 35 U.S.C. § 103.

Appellants argue on page 7 of the brief that the office action does not provide a proper motivation to combine the references, as the combination would produce an inoperative device. Further, applicant states:

In the present case, the proposed combination of the Massiglia and Khosrowpour teachings would be inoperable. Massiglia teaches a single controller that performs multiple types of RAID protection on a single array of physical disks. The Khosrowpour teaches the use of redundant RAID controllers to maintain data transfers in the event of a fault.

The combination of Massiglia and Khosrowpour suggested by the Office Action is presumed to be achieved by using the dual RAID controllers 140 and 200 to implement each of the layers in Massiglia (but, this is not clear from the explanation provided in the Office Action). However, each of the management layers in Massiglia performs different RAID functions and mappings. In contrast, the Khosrowpour controllers 140, 200 are essentially and necessarily identical in function and performance. Hence, if one were to combine these two references, the functionality provided by the front-end controller and back-end controllers

of claim 1 would not be suggested. Alternatively, if the Khosrowpour controllers 140, 200 were combined consistent with Massiglia, this combination would fail to provide the redundant, failover function taught as desirable by Khosrowpour.

In response, the examiner states, on page 14 of the answer:

The claim, for example claim 1, calls for a second plurality of back-end controllers coupled to the first plurality of disks of organizing and presenting the first plurality of disks as a third plurality of redundant arrays of disk. This feature is taught by Massiglia, refer to Figure 73, page 151; Figure 74, page 153- lower array management function(s)/ Mirroring Array Management Function(s)). The lower array management function organizes and presents the first plurality of disks as redundant arrays of disks (mirrored). Additionally, claim 1, requires a front-end controller coupled to the second plurality of back-end controllers for generating mirror sets from at least one of the disks in a third plurality of redundant arrays of disks received from the second plurality of back-end controllers, striping at least one of the disks in the third plurality of redundant arrays of disks and presenting the striped arrays as a virtual volume. Essentially, the claimed front-end controller performs mirroring and striping. The above rejection indicates that Massiglia teaches a front-end controller which performs striping but does not also provide mirroring. Khosrowpour is relied upon for teaching a controller which performs mirroring and striping. The above rejection indicates that the combination of Massiglia and Khosrowpour teaches the required elements for the front-end controller by modifying Massiglia's front-end controller, with the teachings of Khosrowpour, to also include the functionality of mirroring, based on the controller taught by Khosrowpour which performs mirroring and striping. (emphasis original)

We disagree with the appellants and find that the rejection does set forth proper motivation to combine the references, however, we agree with the appellants and find that the combination of the references do not teach the functionality of the front-end controller and back-end controllers as is claimed.

Claim 1 includes the limitations of a "a front-end controller coupled to the second plurality of back-end controllers for generating mirror sets from at least

one of the disks in a third plurality of redundant arrays of disks received from the second plurality of back-end controllers, striping at least one of the disks in the third plurality of redundant arrays of disks and presenting the striped arrays as a virtual volume.” Thus, we consider the scope of claim 1 to include that there is a front-end controller, which performs both functions of striping and generating a mirror, and that there are more than one back-end controller connected to the front-end controller. Independent claims 8, 13, 14 and 18 contain similar limitations. Independent claim 6 includes a similar limitation in that it claims a striping engine for striping and generating mirror sets from the disks associated with the back-end controllers.

We find that Massiglia teaches a RAID system where an array of disks is organized such that it is striped and mirrored. See figure 74, page 153. Massiglia teaches that a “Striping Array Management Function” performs the striping and a “Mirroring Array Management Function” performs the mirroring. In figure 74 one Striping Array Management Function receives data from two or more Mirroring Array Management Functions. Massiglia states on page 10 that “[a] disk array’s Array Management Function may execute either in the disk system or in the host computer(s).” Further, on page 156, Massiglia states “[o]ften, it is possible to use host-based striping to combine virtual disks presented by controller-based mirrored arrays into an array. Some vendors offer both striping and mirroring capability within their disk systems. Finally, some system vendors offer host-based software packages for both striping and

mirroring.” Thus, we find that Massiglia contemplates that the striping and mirroring can be performed by different devices (a host and controller), or they can be performed by the same device (either a host or the disk system). However, we do not find that Massiglia teaches the use of a front-end controller which performs both striping and generating a mirror, with more than one back-end controller connected to the front-end controller. That is, we do not find that Massiglia teaches that when one device performs both striping and mirroring, a plurality of back end controllers are also used.

We find that Khosrowpour teaches a redundant system that makes use of two RAID controllers. The second RAID controller is used if the first RAID controller fails. See column 1, lines 38-51. Khosrowpour also teaches that the RAID controllers perform both striping and mirroring. See column 5, lines 30-35. We find that the stated purpose of Khosrowpour, to improve reliability by providing redundant controllers, provides motivation to modify Massiglia to use redundant controllers. However, we do not find that the use of redundant controllers in Massiglia meets the claimed front-end controller, which performs both striping and generating a mirror, and which is connected to more than one back-end controllers. Thus, we do not find that the combination of the references teaches all of the limitations of the independent claims. Accordingly, we will not sustain the examiner’s rejection of claims 1, 2, 4 through 8, 11 through 16 and 18 through 20.

The examiner has rejected claims 3 and 17 over Massiglia in view of Khosrowpour and Griffith, and claim 10 over Massiglia, Khosrowpour, Bergsten and Pinson. The examiner has not asserted, nor do we find, that Griffith, Bergsten or Pinson teach or suggest the claimed front-end controller which performs both striping and generating a mirror, and which is connected to more than one back-end controller. Accordingly, we will not sustain the rejection of claims 3, 10 and 17 for the reasons stated above.

In view of the forgoing, we will not sustain the examiner's rejection of claims 1 through 8 and 10 through 20 under 35 U.S.C. § 103. The decision of the examiner is reversed.

**Reversed**

JOSEPH F. RUGGIERO	)	
Administrative Patent Judge	)	
	)	
	)	
	)	
ALLEN R. MACDONALD	)	BOARD OF PATENT
Administrative Patent Judge	)	APPEALS AND
	)	INTERFERENCES
	)	
	)	
ROBERT E. NAPPI	)	
Administrative Patent Judge	)	

RN/RWK

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