(51) International Patent Classification:
G06F 17/30 (2006.01)

(21) International Application Number:
PCT/US2007/020898

(22) International Filing Date:
27 September 2007 (27.09.2007)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
11/528,984 27 September 2006 (27.09.2006) US

(71) Applicant (for all designated States except US): NET¬
WORK APPLIANCE, INC. [US/US]; 495 East Java Drive, Sunnyvale, CA 94089 (US).

(72) Inventors; and


(54) Title: METHOD AND APPARATUS FOR DEFRAGMENTING A STORAGE DEVICE

(57) Abstract: A method in a storage system reads blocks having both physical addresses and logical addresses in the storage system from a first set of locations in non-volatile storage to a cache memory and determines the level of data fragmentation in the non-volatile storage. If the level of data fragmentation exceeds a threshold level, the cache memory is marked and the blocks are written to physically sequential locations with new physical addresses in the non-volatile storage at a data consistency point without changing the logical addresses of the blocks.
before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments.
## A. CLASSIFICATION OF SUBJECT MATTER

### INV.

G06F17/30

According to International Patent Classification (IPC) and both national classification and IPC.

### B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

### C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>the whole document</td>
<td>4-10, 13-19, 22-28</td>
</tr>
<tr>
<td>A</td>
<td>abstract; figures 3-7</td>
<td>1-3, 11, 12, 20, 21, 29-31</td>
</tr>
<tr>
<td></td>
<td>paragraph [0008] - paragraph [0042]</td>
<td></td>
</tr>
</tbody>
</table>

Further documents are listed in the continuation of Box C.

See patent family annex.

Special categories of cited documents:

- Document defining the general state of the art which is not considered to be of particular relevance
- Earlier document but published on or after the international filing date
- Document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- Document referring to oral disclosure, use, exhibition or other means
- Document published prior to the international filing date but later than the priority date claimed

Date of the actual completion of the international search: 27 May 2008

Date of mailing of the international search report: 03/06/2008

Name and mailing address of the ISA:

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epi nl,
Fax: (+31-70) 340-3016

Authorized officer:

Wienold, Norbert
### DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>WO 93/00635 A (ANAMARTIC LTD [GB]) 7 January 1993 (1993-01-07)</td>
<td>1-31</td>
</tr>
</tbody>
</table>
### INTERNATIONAL SEARCH REPORT

#### Information on patent family members

<table>
<thead>
<tr>
<th>Patent document cited in search report</th>
<th>Publication date</th>
<th>Patent family member(s)</th>
<th>Publication date</th>
</tr>
</thead>
<tbody>
<tr>
<td>US 2005228963 A1</td>
<td>13-10-2005</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td>US 2006149899 A1</td>
<td>06-07-2006</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td>WO 9300635 A</td>
<td>07-01-1993</td>
<td>NONE</td>
<td></td>
</tr>
</tbody>
</table>