



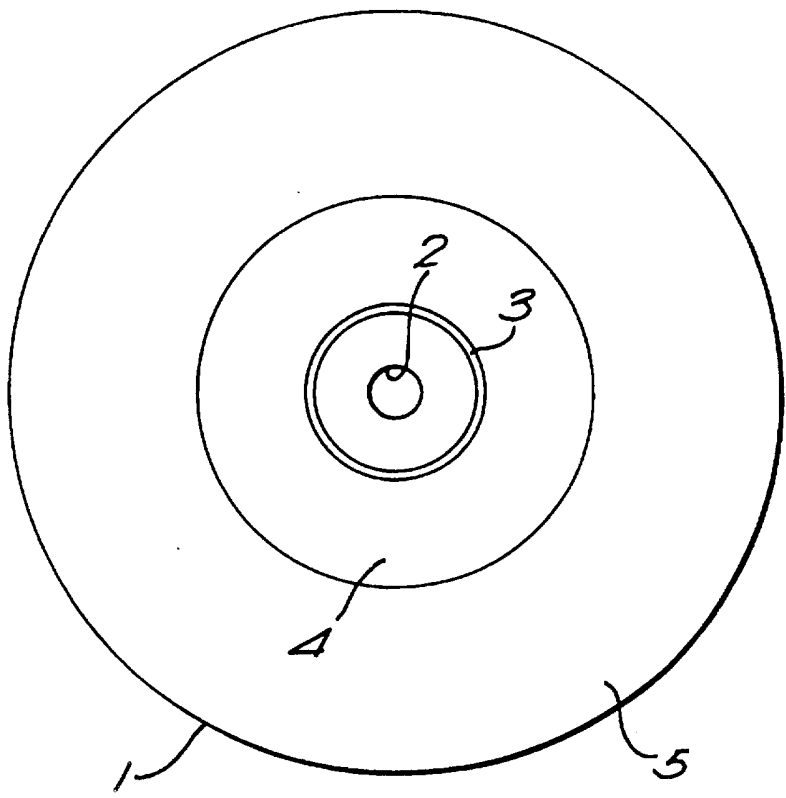
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<p>(21) International Application Number: PCT/GB96/03078 (22) International Filing Date: 12 December 1996 (12.12.96) (30) Priority Data: 9525319.1 12 December 1995 (12.12.95) GB (71) Applicant (for all designated States except US): MAIN SQUEEZE LIMITED [GB/GB]; 20 Bolton Street, London W1Y 7PA (GB). (72) Inventors; and (75) Inventors/Applicants (for US only): HEMMINGS, Jonathan, William, David [GB/GB]; 30 St. Olaf's Road, London SW6 7DL (GB). GORDON, Patrick, Anthony [GB/GB]; 430 St. Anne's Road, London N15 3JJ (GB). (74) Agent: COLGAN, Stephen, James; Carpmaels &amp; Ransford, 43 Bloomsbury Square, London WC1A 2RA (GB).</p>	<p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p><b>Published</b> With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</p>	

(54) Title: COMBINED AUDIO AND VIDEO DATA STORAGE

(57) Abstract

A data storage device is in the form of a compact disc (1), with audio data being stored in a first storage region (4), such that this data can be read using a standard audio CD player. Video data is stored in a further storage region (5) and is arranged to be read at 1.1469 megabits per second. The video data is stored using MPEG compression.



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COMBINED AUDIO AND VIDEO DATA STORAGE

The present invention relates to the storage of audio and video data in a data storage medium such as a compact disc, and finds particular application in the mastering of video singles and video LP CDs for the music industry.

Standard audio compact discs are known on which purely audio data and index data are stored.

10

In addition, video compact discs are known, both of the analog storage type, wherein video data is stored in an analog form within tracks in the disc, and also the digital storage type, wherein video data is stored in digital format, for use in personal computers equipped with a compact disc drive.

It has additionally been proposed to combine audio data and video data on a single compact disc of the standard audio type, with audio data being recorded in one portion thereof and video data in another portion. The audio data is recorded at the "Red book" sampling frequency of 44.1 kHz, at 16 bit resolution, and the video data is such as to produce an image at between 10 and 15 frames per second in a small window on a computer screen. The format proposed for this video data storage is known as "Quicktime".

However, using the "Quicktime" video data storage format, it is not possible to read full-screen video data at 25 frames per second, and the video data is normally restricted to 256 colours. There is additionally a problem of lip synchronisation.

The present inventors have attempted to encode video data on a standard audio CD using the VIDEO-CD ("White book") bit rate of 1.4112 megabits per second, VIDEO-CD being an industry standard. However, at this bit rate, or higher, the video image was found to pause periodically,

e.g. every five seconds, during the playback of the video data. The present inventors have additionally discovered that this problem no longer occurs if the video data is encoded at a bit rate less than this standard value of  
5 1.4112 megabits per second.

These problems are solved if "MPEG" (Motion Picture Experts Group) compression is used.

10 Consequently, in accordance with a first aspect of the present invention, there is provided a data storage device on which is stored an audio data sequence and a video data sequence, the video data sequence being formatted using MPEG  
compression.

15

MPEG is an industry standard for full-motion, full-screen digital video using 25 frames per second (with the PAL system) or 30 frames per second (with the NTSC system). MPEG can be compressed or encoded at selected bit rates  
20 depending on the desired quality and the capability of the paly-back hardware. The standard bit-rate for the VIDEO-CD system (the "White book" system) is 1.4112 megabits per second.

25 The present inventors have found that MPEG compression permits sufficiently high resolution, even when reading video data at a bit rate which is less than 1.4 megabits per second.

30 However, it has been found that a bit rate less than 0.754 megabits per second give rise to poor resolution, and an optimum bit rate of 1.1469 megabits per second has been found, which gives a resolution of 352 x 288 pixels, which is scalable up to full-screen resolution, and this does not  
35 suffer from the problem of the video image pausing.

In accordance with a second aspect of the present invention, there is provided a data storage device on which

is stored a first data sequence comprising audio data and a second data sequence comprising video data, the video data being encoded at a bit rate which is less than 1.4 megabits per second.

5

In accordance with a third aspect of the present invention, there is provided a process for mastering audio and video data on a storage medium, wherein the video data is encoded at a bit rate which is less than 1.4 megabits per  
10 second.

The present inventors have additionally found that in the proposed system in which both audio data and video data are stored at separate locations on a standard audio CD, in  
15 which the video data is read prior to the reading of the audio data, a highly audible "blip" sound is produced after reading the audio data. The origin of this undesirable sound is not at present understood. However, the inventors have discovered that, by reversing the order of storage of  
20 audio and video data, this problem no longer occurs.

Consequently, the audio data is preferably arranged to be read before the video data.

25 A preferred embodiment of the present invention will now be described with reference to the accompanying drawing which illustrates the regions of a compact disc in accordance with the preferred embodiment.

30 With reference to Figure 1, a compact disc 1 comprises a centre hole 2 which is used for centring the disc during playback and also for gripping the disc during storage in a cassette.

35 During playback, the disc is read by a laser beam, commencing with an index track 3 near the centre of the disc. The index track 3 contains information relating to the timing of the various tracks of data stored on the CD.

A first storage region 4 contains audio data and is such that the data can be read by a standard audio CD player.

5 A second storage area 5 is used to store video data using MPEG compression. The video data is read at a rate of 1.1469 megabits per second, which is equivalent to a CD data rate of 140 kilobytes per second. This video data is stored such that it can be read from a multi-media personal  
10 computer or an Apple Macintosh system, with CD-ROM drives and MPEG cards or chips.

Such an arrangement permits a frame rate of 25 frames per second, using a full screen on a standard PAL monitor or  
15 a video graphics adaptor. Furthermore, this format permits 16 million different colours, and additionally total lip synchronisation.

**CLAIMS:**

1. A data storage device on which is stored an audio data sequence and a video data sequence, the video data sequence  
5 being formatted using MPEG compression.
2. A data storage device on which is stored a first data sequence comprising audio data and a second data sequence comprising video data, the video data being encoded at a bit  
10 rate which is less than 1.4 megabits per second.
3. A data storage device as claimed in claim 2, wherein the video data bit rate is greater than 0.754 megabits per second.  
15
4. A data storage device as claimed in claim 2 or claim 3, wherein the video data is encoded at a bit rate of substantially 1.1469 megabits per second.
- 20 5. A data storage device as claimed in any preceding claim, wherein the video data is formatted using MPEG compression.
6. A data storage device as claimed in any preceding  
25 claim, wherein the audio data is arranged to be read before the video data.
7. A data storage device as claimed in any preceding claim, wherein the audio data bit rate is 224 kilobits per  
30 second.
8. A data storage device as claimed in any preceding claim, in the form of a compact disc.
- 35 9. A process for mastering audio and video data on a storage medium, wherein the video data is encoded at a bit rate which is less than 1.4 megabits per second.

10. A process as claimed in claim 9, wherein the video data bit rate is greater than 0.754 megabits per second.

11. A process as claimed in claim 9 or claim 10, wherein  
5 the video data bit rate is substantially 1.1469 megabits per second.

12. A process as claimed in any one of claims 9 to 11,  
10 wherein the video data is formatted using MPEG compression.

13. A process as claimed in any one of claims 9 to 12,  
wherein the audio data is arranged to be read before the  
video data.

15 14. A process as claimed in any one of claims 9 to 13,  
wherein the audio data bit rate is 224 kilobits per second.

15. A process as claimed in any one of claims 9 to 14,  
20 wherein the storage medium is a compact disc.



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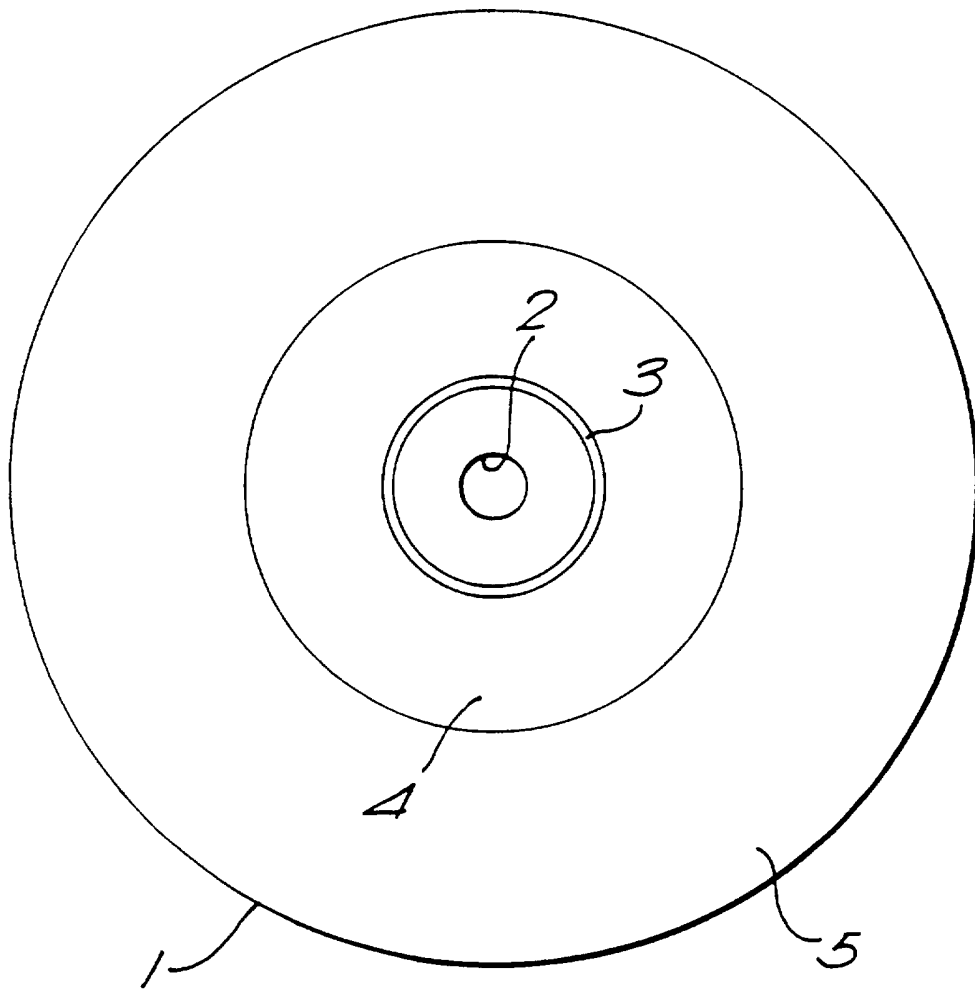


FIG. 1

# INTERNATIONAL SEARCH REPORT

International Application No  
PC/GB 96/03078

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 6 G11B20/12 H04N7/52

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

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
IPC 6 G11B H04N

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)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 095, no. 010, 30 November 1995 & JP 07 182789 A (NIPPON COLUMBIA CO LTD), 21 July 1995, see abstract	1,5,6,8
A	---	9,12,13, 15
X	EP 0 673 034 A (SONY CORP) 20 September 1995  see abstract see page 3, line 11 - line 16 see page 3, line 49 - page 4, line 5 see page 4, line 15 - line 28 see claim 1	1-3,5, 8-10,12, 15
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Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

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Date of the actual completion of the international search

15 April 1997

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# INTERNATIONAL SEARCH REPORT

International Application No  
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
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X A	EP 0 676 758 A (TOKYO SHIBAURA ELECTRIC CO) 11 October 1995 see abstract  see column 1, line 6 - line 55 see column 5, line 15 - line 47 ---	1,5,6,8  9,12,13, 15
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