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(54) **METHOD OF ENSURING SYNCHRONOUS PRESENTATION OF ADDITIONAL DATA WITH AUDIO DATA RECORDED ON A REWRITEABLE RECORDING MEDIUM**

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(57) **ABSTRACT**
The present invention relates to a method of recording additional data such as lyric and user input data to be in synchronization with audio data on a rewritable recording medium, and of reproducing them synchronously therefrom. The present recording method segmentizes additional information related with audio data recorded on a rewritable recording medium, records the information segments, and records synchronizing information, e.g., time length to keep up presentation of each information segment or start time to present each information segment, in connection with each information segment in order to present each information segment in synchronization with a corresponding part of the recorded audio data. The present invention ensures a user to enjoy a recorded song better through lyric text displayed in tune.

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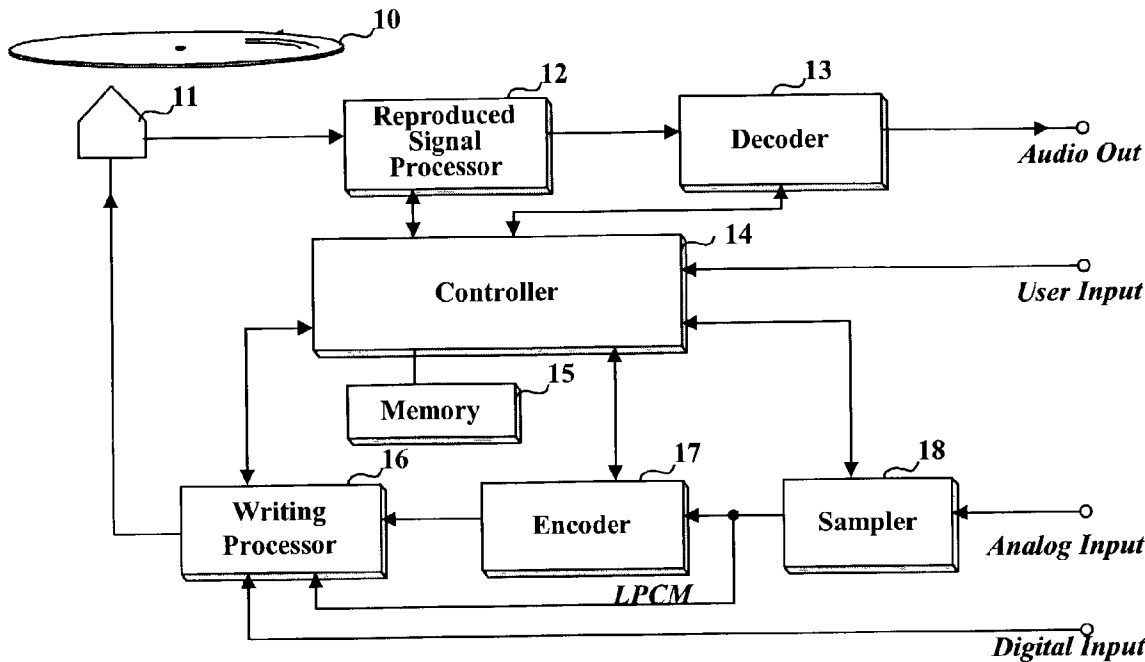


FIG. 1

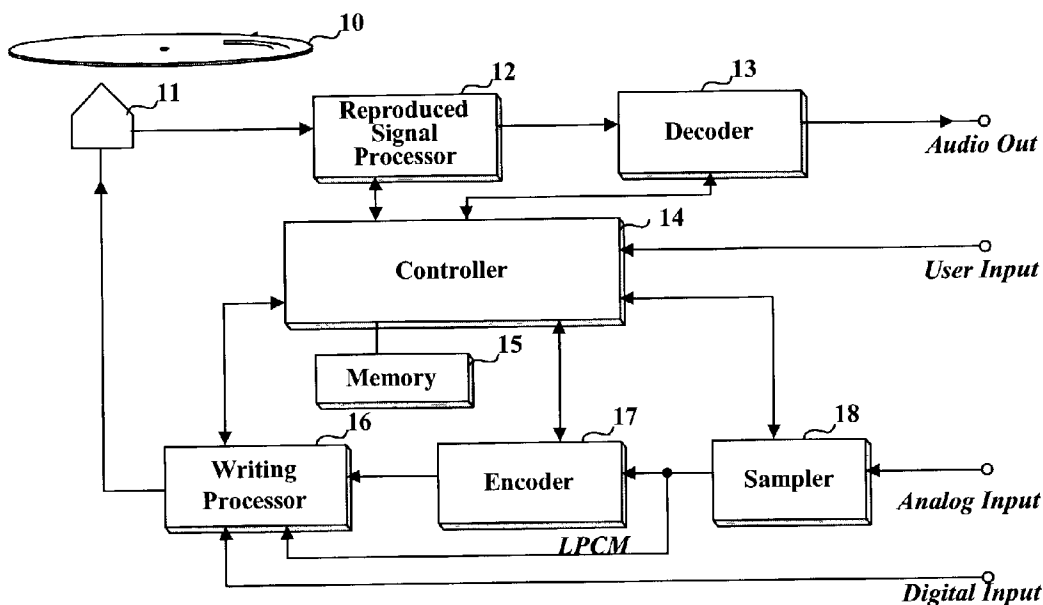


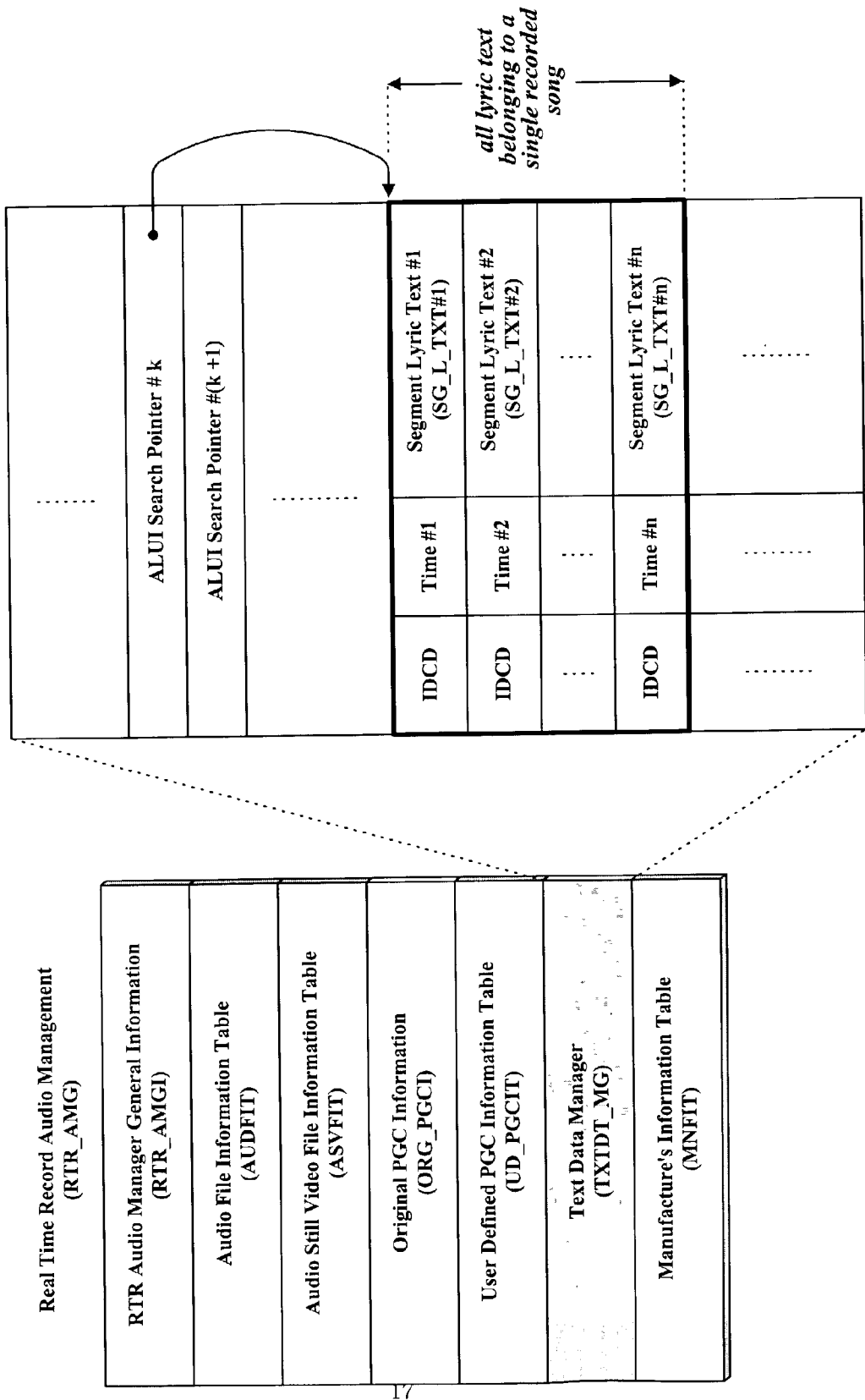
FIG. 2

*Real Time Record Audio Managemet
(RTR_AMG)*

RTR Audio Manager General Information (RTR_AMGI)
Audio File Information Table (AUDFIT)
Audio Still Video File Information Table (ASVFIT)
Original PGC Information (ORG_PGCI)
User Defined PGC Information Table (UD_PGCIT)
Text Data Manager (TXTDT_MG)
Manufacture's Information Table (MNFIT)

to contain lyrics of recorded songs

FIG. 3



Original Program Chain Information
(ORG_PGCI)

PGC General Information (PGC_GI)
PG Information #1 (PGI #1)
⋮
PG Information #m (PGI #m)
CI Search Pointer #1 (CI_SRP #1)
⋮
CI Search Pointer #n (CI_SRP #n)
Cell Information #1 (CI #1)
⋮
Cell Information #n (CI #n)

FIG. 4

C_TY	Cell Type
PB_INF	Playback Information
AOBI_SRPN	AOBI Search Pointer Number
ASVUI_SRPN	ASVUI Search Pointer Number
ALUI_SPRN	ALUI Search Pointer Number
ASV_DMD	Display Mode of ASV
C_EPI_Ns	Number of C_EPIs
C_A_S_PTM	Audio Start PTM of this Cell
C_A_E_PTM	Audio End PTM of this Cell

FIG. 5

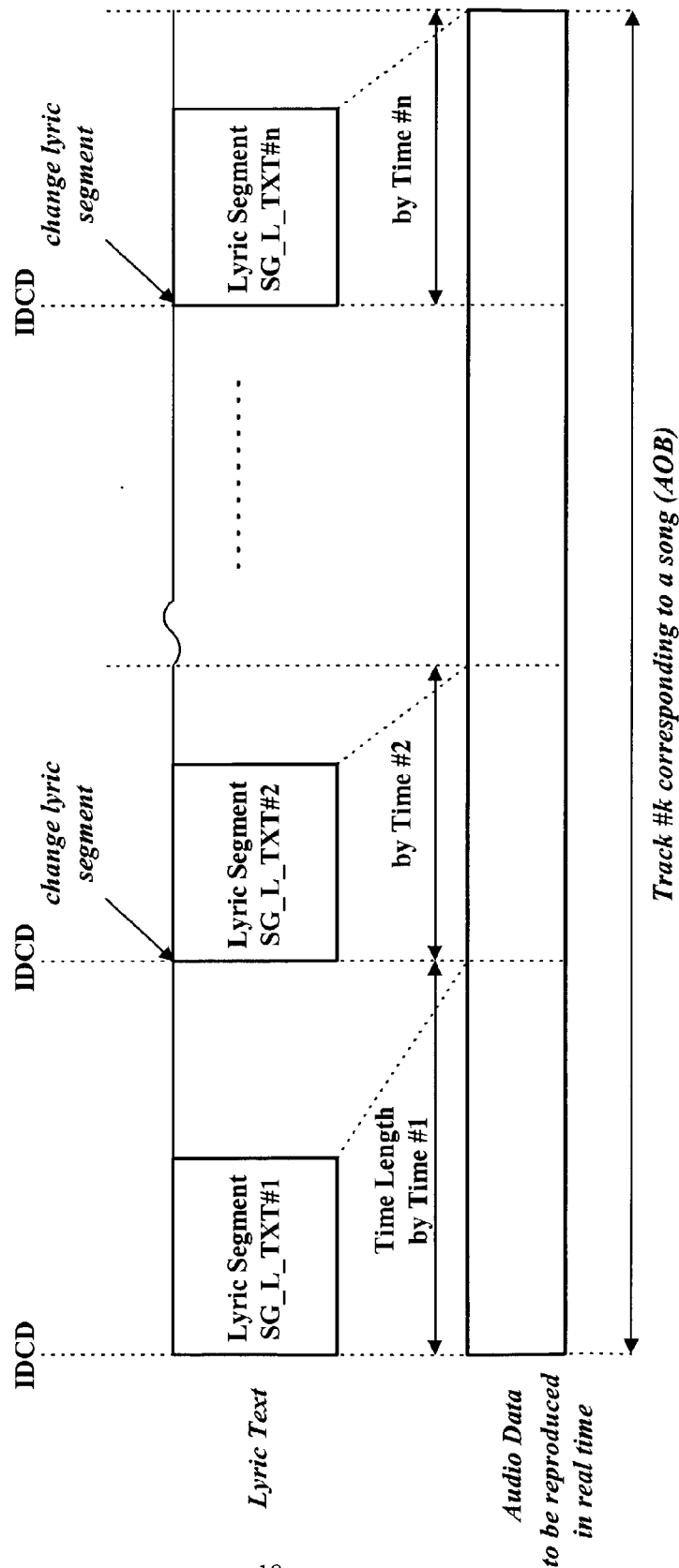


FIG. 6

Real Time Record Audio Management (RTR_AMG)

RTR Audio Manager General Information (RTR_AMGI)
Audio File Information Table (AUDFIT)
Audio Still Video File Information Table (ASVFIT)
Audio Still Video File Information Table (ASVFIT)
Audio Lyric File Information Table (ALFIT)
User Defined PGC Information Table (UD_PGCIT)
Text Data Manager (TXTDT_MG)
Manufacture's Information Table (MNFIT)

FIG. 7

Audio Lyric File Information Table (ALFIT)

Audio Lyric FIT Information (ALFITI)		ALFI_Ns	Number of ALFIs
		AL_1_Ns	Number of AL_Is
		ALFIT_EA	End Address of ALFIT
Audio Lyric File Information (ALFI)	ALFI Genaral Information (ALFI_GI)	CHRS	Charater Set
		ALUI_SRP_Ns	Number of ALUI_SRPs
		ALU_MG_EA	End Address of ALU_MG
	ALUI Search Pointer #1 (ALUI_SRP #1)	ALU_SA	Start Address of ALU
		ALU_SZ	Size of ALU
		L_ATR	Lyric Attribute
	ALUI Search Pointer #2 (ALUI_SRP #2)	ALU_SA	Start Address of ALU
		ALU_SZ	Size of ALU
		L_ATR	Lyric Attribute
	⋮	⋮	⋮
	ALUI Search Pointer #n (ALUI_SRP #n)	ALUI_SA	Start Address of ALU
		ALUI_SZ	Size of ALU
		L_ATR	Lyric Attribute

file of 'AR_Lyric.ARO'

ALU #1 (ALU #1)	IDCD	Time #1	SG_L_TXT#1		IDCD	Time# k	SG_L_TXT#k
ALU #2 (ALU #2)	IDCD	Time #1	SG_L_TXT#1		IDCD	Time# p	SG_L_TXT#p
	⋮	⋮	⋮	⋮	⋮	⋮	⋮
ALU #n (ALU #n)	IDCD	Time #1	SG_L_TXT#1		IDCD	Time# s	SG_L_TXT#s

METHOD OF ENSURING SYNCHRONOUS PRESENTATION OF ADDITIONAL DATA WITH AUDIO DATA RECORDED ON A REWRITEABLE RECORDING MEDIUM

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to a method of recording additional data such as lyric and user input data to be in synchronization with audio data on a rewritable recording medium, and of reproducing them synchronously therefrom.

[0003] 2. Description of the Related Art

[0004] A disk-type recording medium such as a Compact Disk (CD) can store high-quality digital audio data permanently, so that it is very popular recording medium in these days.

[0005] Recently, a Digital Versatile Disk (called 'DVD' hereinafter) has been developed as a new disk-type recording medium. ADVD can store much larger size than a CD, that is, high-quality moving pictures or audio data are recorded in a DVD for much longer time. Therefore, a DVD will be used widely in the near future.

[0006] There are three types in a DVD, DVD-ROM for read-only, DVD-R for write-once, and DVD-RAM or DVD-RW for rewritable. For a rewritable DVD, the standardization of data writing format is in progress.

[0007] FIG. 1 is a block diagram of an optical disk device that records/reproduces audio data to/from a recording medium.

[0008] The disk device configured as FIG. 1 comprises an optical pickup 11 reading signals recorded in a rewritable DVD 10 such as a DVD-RW and writing data streams processed into writable signals onto the rewritable DVD 10; a reproduced signal processor 12 restoring the read signals into compressed digital data; a decoder 13 decoding the compressed digital data to original data; a sampler 18 digitizing an inputted analog signal at a preset sampling rate; an encoder 17 encoding the digitized LPCM data into MPEG-, or AC3-formatted data; a writing processor 16 converting the encoded data from the encoder 17 or LPCM data from the sampler 18 into signals suitable to be written; a controller 14 controlling all elements to conduct user's command such as playback or record; and a memory 15 for storing data temporally.

[0009] If an analog signal is applied to the disk device of FIG. 1, the sampler 18 samples the analog signal at the preset sampling rate. Each sampled signal, which is LPCM data, is applied to the encoder 17 that encodes a block of sampled data into compressed data of pre-specified format, for example, MPEG format. The compressed data are then applied to the writing processor 16.

[0010] The writing processor 16 converts a series of the compressed data into binary signals which are written in mark/space patterns on the writable DVD 10. Already-compressed digital data from outside are directly processed by the writing processor 16 to be written onto the writable DVD 10.

[0011] After recording of audio data, navigation data for them are created and then recorded the writable DVD 10.

[0012] FIG. 2 shows the structure of RTR_AMG (Real Time Record Audio ManaGement) recorded as navigation data on a rewritable disk. The RTR_AMG includes RTR_AMGI (RTR Audio Manager General Information), AUDFIT (AUDio File Information Table), ASVFIT (Audio Still Video File Information Table), ORG_PGC (ORGiginal PGC (ProGram Chain) Information), UD_PGCIT (User Defined PGC Information Table), TXTDT_MG (TeXT DaTa ManaGer), and MNFIT (MaNuFacturer's Information Table).

[0013] The TXTDT_MG can include additional data of recorded songs such as lyrics. Therefore, when the controller 14 selects and reproduces a recorded song from the rewritable disk 10, it is able to present lyric text in characters on a screen by reading it from the TXTDT_MG.

[0014] Consequently, when a user selects a recorded song to play back from the rewritable DVD 10, he or she is able to view its lyric on a screen.

[0015] However, each of additional data such as a lyric included in the TXTDT_MG is linked with a recorded song wholly. In other words, a lyric in the TXTDT_MG can not have information to synchronize in detail with a recorded song. Therefore, it is impossible to display lyric data step by step at the same speed that the recorded song is reproduced from a rewritable DVD.

SUMMARY OF THE INVENTION

[0016] It is an object of the present invention to provide a synchronizing method that records additional data such as lyric data and user input data to be synchronized minutely with audio data on a rewritable recording medium.

[0017] It is another object of the present invention to provide another synchronizing method that reproduces synchronously audio data and additional data thereof that have been recorded with minutely-synchronizing information.

[0018] An audio data related information recording method in accordance with the present invention segmentizes additional information related with audio data recorded on a rewritable recording medium, records the information segments, and further records synchronizing information, e.g, time length to keep up presentation of each information segment or start time to present each information segment, in the vicinity of said each information segment in order to present each information segment in synchronization with a corresponding part of the recorded audio data.

[0019] An audio data related information reproducing method in accordance with the present invention reads sequentially a plurality of information segments constituting a piece of additional information related with audio data recorded on a rewritable recording medium, and makes presentation of each information segment based on synchronizing information, e.g, time length to keep up presentation of each information segment or start time to present each information segment, recorded in association with each information segment in order to present each information segment in synchronization with a corresponding part of the recorded audio data.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] The accompanying drawings, which are included to provide a further understanding of the invention, illustrate the preferred embodiments of the invention, and together with the description, serve to explain the principles of the present invention.

[0021] In the drawings:

[0022] FIG. 1 is a block diagram of an optical disk device that records/reproduces audio data to/from a recording medium;

[0023] FIG. 2 shows the structure of RTR_AMG (Real Time Record Audio ManaGement) recorded as navigation data on a rewritable disk;

[0024] FIG. 3 shows an RTR_AMG in which TXT-DT_MG (TeXT DaTa ManaGer) structured according to the present invention is included;

[0025] FIG. 4 shows CI (Cell Information) structured according to the present invention;

[0026] FIG. 5 illustrates continuous and synchrononous display of a series of lyric segments together with reproduced audio data;

[0027] FIG. 6 shows an RTR_AMG structured according to another embodiment of the present invention; and

[0028] FIG. 7 shows ALFIT (Audio Lyric File Information Table) structured according to another embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0029] In order that the invention may be fully understood, a preferred embodiment thereof will now be described with reference to the accompanying drawings.

[0030] In an audio data recording method in accordance with the present invention, lyric or user data related with a song recorded on a rewritable disk such as DVD-RW is segmentized into several units, first. Each segmentized unit is linked with each corresponding part of the recorded song through segment synchronizing information for the purpose of minute synchronization of song and additional data.

[0031] FIG. 3 shows an RTR_AMG in which TXT-DT_MG structured according to an embodiment of the present invention is included.

[0032] FIG. 3 is composed of RTR_AMGI, ASVFIT, ORG_PGCI, UD_PGCIT, TXTDT_MG, and MNFIT the same as FIG. 2. However, the TXTDT_MG in FIG. 3 is composed of respective ALUI (Audio Lyric Unit Information) search pointers and corresponding pieces of ALUI. Each ALUI includes lyric segments 'SG_L_TXT #i', which is segmentized lyric text, and their individual output-time related information 'Time #i'.

[0033] The output-time related information 'Time #i' is time-length, which a corresponding lyric segment is kept displayed for, or instant time when a corresponding lyric segment starts to be displayed. This time information is also used to differentiate a linked lyric segment from several lyric segments displayed altogether by different color or font for a specified duration.

[0034] Each lyric segment includes an ID code 'IDCD' as shown in FIG. 3. The ID code is used to indicate that each segmentized unit has output-time related information, that each segmentized unit includes lyric or user data, or that the output-time related information is duration or start time.

[0035] Each group of segmentized units is linked with a recorded song through each ALUI search pointer in TXT-DT_MG as shown in FIG. 3. For example, an ALUI search pointer linked with a recorded song points a start position of the first lyric segment of an associated segment group.

[0036] To link a recorded song with an ALUI search pointer, a piece of CI (Cell Information) related with an AOB (Audio OBject), which is corresponding to a single recorded song in general, is structured in the ORG_PGCI as FIG. 4.

[0037] Each CI includes an AOBI_SRPN (AOB Information SeaRch Pointer Number) for indexing information location of a related AOB (or song), an ASVUI_SRPN (ASVU (Audio Still Video Unit) Information SeaRch Pointer Number) for indexing information location of still video data linked with an AOB, and an ALUI search pointer number 'ALUI_SRPN' for indexing an ALUI search pointer in the TXTDT_MG that points a segment group containing a full lyric text related with an AOB.

[0038] Thus, if a song, namely, an AOB is chosen, the controller 14 reads the number written in ALUI_SRPN of CI associated with the selected AOB, and reads an address in ALUI search pointer indexed by the read number in the TXTDT_MG. The location of lyric text related with the selected song is found by this read address.

[0039] Then, lyric segments are retrieved sequentially from the addressed location by the reproduced signal processor 12. At this time, the controller 14 examines an ID code preceding each lyric segment. If the ID code is indicative of type of output-time related information, e.g., a time length for which the following lyric segment 'SG_L_TXT #i' is displayed, the controller 14 keeps outputting each lyric segment for a duration specified by the time length and changes current lyric segment with the next one after the time length expires. This operation continues until end of AOB or stop request.

[0040] FIG. 5 illustrates continuous and synchrononous display of a series of lyric segments together with reproduced audio data belonging to the selected AOB.

[0041] If the ID code is indicative of presentation start time of each lyric segment, the controller 14 outputs each lyric segment the moment an elapsed time after reproducing the chosen AOB (or song) becomes equal to the start time specified by field 'Time'. The currently-outputted lyric segment keeps being outputted until the next segment is outputted at its start time.

[0042] If the ID code is indicative of not the type of output-time related information but the type of additional information, e.g., user data, the controller 14 processes the segmentized additional information adequately for the designated type.

[0043] If the ID code indicates that there is no output-time related information in lyric segments, then the lyric segments are sequentially read out irrespective of time. This operation seems to a conventional lyric data displaying method.

[0044] The lyric segments related with a recorded song may be written in a file other than the RTR_AMG, instead of the TXTDT_MG.

[0045] FIG. 6 shows an RTR_AMG structured according to the another embodiment of the present invention. The RTR_AMG of FIG. 6 includes an ALFIT (Audio Lyric File Information Table) for storing in other file lyric data that are composed of segmentized information such as lyrics or user data of all recorded songs.

[0046] FIG. 7 shows the structure of the ALFIT. The ALFIT is composed of ALFITI (ALFIT Information) and ALFI. The ALFITI includes fields of 'ALFI_Ns' reserved for the number of audio lyric information files, 'AL_I_Ns' for the number of pieces of audio lyric information, and 'ALFIT_EA' for an end address of ALFIT.

[0047] The ALFI is composed of ALFI_GI (ALFI General Information) and a plurality of ALUI (Audio Lyric Unit Information) search pointers, each includes 'ALU_SA' for a start address of a lyric unit, 'ALU_SZ' for size of a lyric unit, and 'L_ATR' for attribute of a lyric.

[0048] The ALU_SA in each ALUI search pointer points location of a corresponding ALU (Audio Lyric Unit) in a lyric file named by 'AR_Lyric.ARO' that is not included in the RTR_AMG. Each ALU in the lyric file 'AR_Lyric.ARO' includes a lyric text associated with a single recorded song, and the lyric text is divided into several segments 'SG_L_TXT #i'. Each lyric segment also has output-time related information 'Time' and ID code 'IDCD' as described in the aforementioned embodiment.

[0049] According to this structure of the RTR_AMG, the ALUI search pointer number contained in CI indexes an ALUI search pointer pointing a lyric unit in the file 'AR_Lyric.ARO' associated with a recorded AOB, namely song.

[0050] Thus, if a song, namely, an AOB is chosen, the controller 14 reads the number written in ALUI_SPRN of CI associated with the selected AOB, and reads an address in ALUI search pointer contained in the field 'ALFI' indexed by the read number. The location of a lyric unit related with the selected song is found in the file 'AR_Lyric.ARO' by this read address.

[0051] Then, lyric segments are retrieved sequentially from the first segment 'SG_L_TXT #1' at the addressed location in the file 'AR_Lyric.ARO' by the reproduced signal processor 12. At this time, the controller 14 examines an ID code preceding each lyric segment.

[0052] If the ID code is indicative of the type of output-time related information, the controller 14 conducts continuous and synchronous display of a series of lyric segments together with reproduced audio data belonging to the selected AOB. In this lyric synchronous display operation, a just-displayed lyric segment can be differentiated by color or font from neighboring lyric segments displayed altogether.

[0053] The above-explained lyric data synchronizing method ensures minutely-synchronous lyric presentation with audio data, namely, song being reproduced in real time from a rewritable recording medium. Thus, a user is able to enjoy a reproduced song better through lyric text displayed in tune.

[0054] The detailed description of the invention has been directed to certain exemplary embodiments, various modifications of these embodiments, as well as alternative embodiments, will be suggested to those skilled in the art. The invention encompasses any modifications or alternative embodiments that fall within the scope of the claims.

What is claimed is:

1. An audio data related information recording method, comprising the steps of:

- (a) segmentizing additional information related with audio data recorded on a rewritable recording medium, and recording the information segments; and
- (b) recording synchronizing information in the vicinity of said each information segment, said synchronizing information being to present each information segment in synchronization with a corresponding part of the recorded audio data.

2. The method of claim 1, wherein said additional information is a lyric text or user data inputted in relation with the recorded audio data.

3. The method of claim 1, wherein said step (b) further adds a code to each information segment to indicate whether each information segment has said synchronizing information in its vicinity.

4. The method of claim 1, wherein said step (b) further adds a code to each information segment to indicate the type of said additional information.

5. The method of claim 1, wherein said step (b) further adds a code to each information segment to indicate the type of said synchronizing information.

6. The method of claim 1, wherein said segmentized additional information is recorded in management information for controlling reproduction of all of recorded audio data.

7. The method of claim 1, wherein said segmentized additional information is recorded in a file separated from management information file storing management information for controlling reproduction of all of recorded audio data.

8. The method of claim 1, wherein said synchronizing information is a time length to keep up presentation of each information segment.

9. The method of claim 1, wherein said synchronizing information is a start time to present each information segment.

10. An audio data related information recording method, comprising the steps of:

- (a) segmentizing additional information related with audio data recorded on a rewritable recording medium, and recording the information segments; and
- (b) recording synchronizing information in the vicinity of said each information segment, said synchronizing information being to present each information segment in synchronization with a corresponding part of the recorded audio data and in distinction from other information segments.

11. The method of claim 10, wherein said synchronizing information is a time length to keep up presentation of each information segment.

12. The method of claim 10, wherein said synchronizing information is a start time to present each information segment.

13. An audio data related information reproducing method, comprising the steps of:

- (a) reading sequentially a plurality of information segments constituting a piece of additional information related with audio data recorded on a rewritable recording medium; and

- (b) making presentation of each information segment based on individual time length recorded in association with each information segment.

14. An audio data related information reproducing method, comprising the steps of:

- (a) reading sequentially a plurality of information segments constituting a piece of additional information related with audio data recorded on a rewritable recording medium; and
- (b) making presentation of each information segment based on individual presentation start time recorded in association with each information segment.

15. An audio data related information reproducing method, comprising the steps of:

- (a) reading sequentially a plurality of information segments constituting a piece of additional information related with audio data recorded on a rewritable recording medium; and
- (b) making presentation of each information segment based on synchronizing information recorded in asso-

ciation with each information segment, said synchronizing information being to present each information segment in synchronization with a corresponding part of the recorded audio data.

16. An audio data related information reproducing method, comprising the steps of:

- (a) reading sequentially a plurality of information segments constituting a piece of additional information related with audio data recorded on a rewritable recording medium; and
- (b) making presentation of each information segment distinctively from other displayed information segments based on synchronizing information recorded in association with each information segment, said synchronizing information being to present each information segment in synchronization with a corresponding part of the recorded audio data.

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