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Suwon-si, Kyunggi-do 440-300 (KR). **SEO, Kang Soo**; 606-503, Chowon Hanyang Apt., 897-5, Pyoungan-dong, Dongan-gu, Anyang, Kyunggi-do 431-075 (KR). **UM, Soung Hyun**; 18-701, Samho Apt., Bisan-dong, Dongan-gu, Anyang, Kyunggi-do 431-050 (KR).

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(74) Agent: **PARK, Lae Bong**; 1Fl., Dongun Bldg., 413-4 Dogok 2-dong, Kangnam-gu, Seoul 135-272 (KR).

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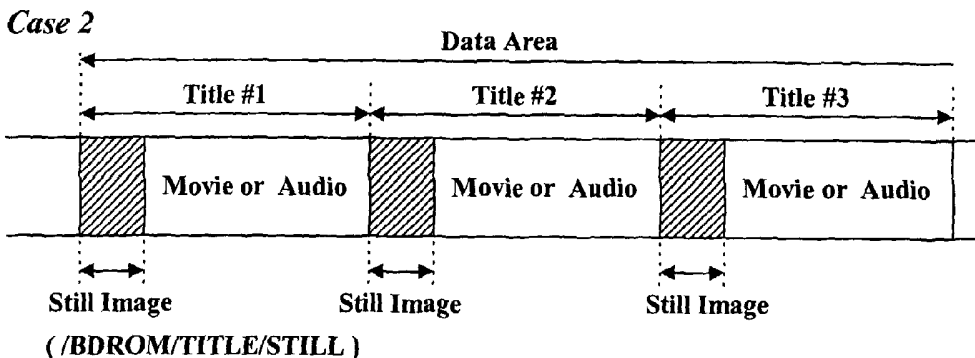
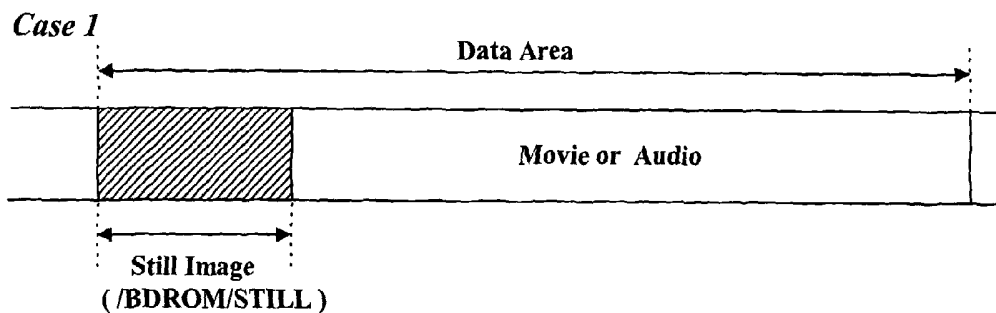
(71) Applicant: **LG ELECTRONICS INC.** [KR/KR]; 20, Yoido-dong, Youngdungpo-gu, Seoul 150-010 (KR).

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(72) Inventors: **KIM, Byung Jin**; 111-204, Hansol Chungu APT., 110, Jeongja-dong, Bundang-gu, Sungnam, Kyunggi-do 463-010 (KR). **PARK, Sung Wan**; 337-1403, Byuksan APT., Doogyun Maeul, Jungja-dong, Jangan-gu,

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(54) Title: RECORDING MEDIUM HAVING DATA STRUCTURE FOR MANAGING REPRODUCTION OF STILL IMAGES RECORDED THEREON AND RECORDING AND REPRODUCING METHODS AND APPARATUSES



(57) Abstract: The recording medium has an information file area that includes at least one information file. The information file is associated with a data file recorded on the recording medium, and the data file includes at least video data. The information file includes a type indicator indicating whether the video data in the data file is for at least one still image.

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DESCRIPTION

RECORDING MEDIUM HAVING DATA STRUCTURE FOR MANAGING REPRODUCTION OF STILL IMAGES RECORDED THEREON AND RECORDING AND REPRODUCING METHODS AND APPARATUSES

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1. TECHNICAL FIELD

The present invention relates to a recording medium having a data structure for managing reproduction of at least still images recorded thereon as well as methods and apparatuses for reproduction and recording.

2. BACKGROUND ART

The standardization of new high-density read only and rewritable optical disks capable of recording large amounts of high-quality video and audio data has been progressing rapidly and new optical disk related products are expected to be commercially available on the market in the near future. The Blu-ray Disc Rewritable (BD-RE) and Blu-ray Disk ROM (BD-ROM) are examples of these new optical disks.

The standardization for high-density read-only optical disks such as the Blu-ray ROM (BD-ROM) is still under way. An effective data structure for managing reproduction of still images recorded on the high-density read-only optical disk such as a BD-ROM is not yet available.

3. DISCLOSURE OF INVENTION

The recording medium according to the present invention includes a data structure for managing reproduction of at least still images recorded on the recording medium.

In one exemplary embodiment, an information file area of the

recording medium includes at least one information file. The information file is associated with a data file recorded on the recording medium, and the data file includes at least video data. The information file includes a type indicator indicating whether
5 the video data in the data file is for at least one still image.

In another exemplary embodiment, a data area stores the data file, and the data file includes video data representing at least one still image. Here, each still image in the data file is recorded as a packetized elementary stream packet.

10 In yet another exemplary embodiment, a data area stores the data file, the data file includes video data representing at least one still image, and the video data in the data file is recorded as one or more packetized elementary stream packets. In this embodiment, only one still image is represented by each packetized
15 elementary stream packet in the data file.

The present invention further provides apparatuses and methods for recording and reproducing the data structure according to the present invention.

4. BRIEF DESCRIPTION OF DRAWINGS

20 The above features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

Fig. 1 illustrates an exemplary embodiment of a recording
25 medium file or data structure according to the present invention;

Fig. 2 illustrates an example of a recording medium having the data structure of Fig. 1 stored thereon;

Fig. 3 illustrates a method of managing still images for a high-density recording medium in accordance with one embodiment
30 of the invention;

Figs. 4-7 illustrate further methods of recording and managing still image and still information files according to

embodiments of the present invention;

Figs. 8-11 illustrate further embodiments of file structures for a high-density recording medium according to the present invention;

5 Figs. 12-17 illustrate methods of recording still images and still information in accordance with additional embodiments of the present invention;

Fig. 18 illustrates a schematic diagram of an embodiment of an optical disk recording and reproduction apparatus of the present
10 invention; and

Figs. 19 and 20 illustrate methods of playback of still images for a high-density recording medium in accordance with embodiments of the invention.

5. MODES FOR CARRYING OUT THE INVENTION

15 In order that the invention may be fully understood, exemplary embodiments thereof will now be described with reference to the accompanying drawings.

A high-density optical disk, for example, a Blu-Ray ROM (BD-ROM), BD-RE, etc. in accordance with the invention may have
20 a file or data structure for managing reproduction of video and audio data as shown in Fig. 1. Some aspects of the data structure according to the present invention shown in Fig. 1 are the same as the well-known BD-RE standard, as such these aspects will not be described in great detail.

25 As shown in Fig. 1, the root directory contains at least one BD directory. The BD directory includes general files (not shown), a PLAYLIST directory in which playlist files (e.g., *.mpls) are stored, a CLIPINF directory in which clip information files (*.clpi) are stored, and a STREAM directory in which
30 MPEG2-formatted A/V stream clip files (*.m2ts), corresponding to the clip information files, are stored.

The STREAM directory includes MPEG2-formatted A/V stream

files called clips or clip files. The A/V stream includes source packets of video and audio data. For example, a source packet of video data includes a header and a transport packet. A source packet includes a source packet number, which is generally a sequentially
5 assigned number that serves as an address for accessing the source packet. Transport packets include a packet identifier (PID). The PID identifies the sequence of transport packets to which a transport packet belongs. Each transport packet in the sequence will have the same PID.

10 The CLIPINF directory includes a clip information file associated with each A/V stream file. The clip information file indicates, among other things, the type of A/V stream associated therewith, sequence information, program information and timing information. The sequence information describes the arrival time
15 basis (ATC) and system time basis (STC) sequences. For example, the sequence information indicates, among other things, the number of sequences, the beginning and ending time information for each sequence, the address of the first source packet in each sequence and the PID of the transport packets in each sequence. A sequence
20 of source packets in which the contents of a program is constant is called a program sequence. The program information indicates, among other things, the number of program sequences, the starting address for each program sequence, and the PID(s) of transport packets in a program sequence.

25 The timing information is referred to as characteristic point information (CPI). One form of CPI is the entry point (EP) map. The EP map maps a presentation time stamp (e.g., on an arrival time basis (ATC) and/or a system time basis (STC)) to a source packet address (i.e., source packet number). The presentation time stamp
30 (PTS) and the source packet number (SPN) are related to an entry point in the AV stream; namely, the PTS and its related SPN point to an entry point on the AV stream. The packet pointed to is often referred to as the entry point packet.

The PLAYLIST directory includes one or more playlist files. The concept of a playlist has been introduced to promote ease of editing/assembling clips for playback. A playlist file is a collection of playing intervals in the clips. Each playing interval
5 is referred to as a playitem. The playlist file, among other things, identifies each playitem forming the playlist, and each playitem, among other things, is a pair of IN-point and OUT-point that point to positions on a time axis of the clip (e.g., presentation time stamps on an ATC or STC basis). Expressed another way, the playlist
10 file identifies playitems, each playitem points to a clip or portion thereof and identifies the clip information file associated with the clip. The clip information file is used, among other things, to map the playitems to the clip of source packets.

The general information files (not shown) provide general
15 information for managing the reproduction of the A/V streams recorded on the optical disk.

In addition to illustrating the data structure of the recording medium according to an embodiment of the present invention, Fig. 1 represents the areas of the recording medium.
20 For example, the general information files are recorded in one or more general information areas, the playlist directory is recorded in one or more playlist directory areas, each playlist in a playlist directory is recorded in one or more playlist areas of the recording medium, etc. Fig. 2 illustrates an example of a recording medium
25 having the data structure of Fig. 1 stored thereon. As shown, the recording medium includes a file system information area, a data base area and an A/V stream area. The data base area includes a general information file and playlist information area and a clip information area. The general information file and playlist
30 information area have the general information files recorded in a general information file area thereof, and the PLAYLIST directory and playlist files recorded in a playlist information area thereof. The clip information area has the CLIPINFO directory and associated

clip information files recorded therein. The A/V stream area has the A/V streams for the various titles recorded therein.

Video and audio data are typically organized as individual titles; for example, different movies represented by the video and
5 audio data are organized as different titles. Furthermore, a title may be organized into individual chapters in much the same way a book is often organized into chapters.

Because of the large storage capacity of the newer, high-density recording media such as BD-ROM and BD-RE optical disks,
10 different titles, various versions of a title or portions of a title may be recorded, and therefore, reproduced from the recording media. For example, video data representing different camera angles may be recorded on the recording medium. As another example, versions of title or portions thereof associated with different languages
15 may be recorded on the recording medium. As a still further example, a director's version and a theatrical version of a title may be recorded on the recording medium. Or, an adult version, young adult version and young child version (i.e., different parental control versions) of a title or portions of a title may be recorded on the
20 recording medium. Each version, camera angle, etc. represents a different reproduction path, and the video data in these instances is referred to as multiple reproduction path video data.

Because of the large storage capacity of the newer, high-density recording media such as BD-ROM still images may be
25 recorded and reproduced in an organized and/or user interactive fashion, for example, as slideshows. The data structure for managing reproduction of still images for a high-density optical disk in accordance with embodiments of the present invention will be described along with methods and apparatuses according to
30 embodiments of the present invention for recording and reproducing still images.

Fig. 3 illustrates a method of managing still images for a high-density recording medium (e.g., high-density optical disk

such as a BD-ROM disk) in accordance with one embodiment of the invention. In this embodiment, a part of the data area on, for example, a BD-ROM is reserved exclusively for still images and one or more still images (e.g., MPEG I, JPEG, etc.) are recorded
5 in the still image recording area. Alternatively, a still image recording area is allocated to each of the titles recorded in the data area and still images pertaining to each title are recorded in the associated still image recording area.

As illustrated in Fig. 4, the still images (e.g., MPEG I,
10 JPEG, etc.) are stored in a still image file (Still*.tdat) and navigation information associated with the still image file is stored in a still information file (Still*.Info).

The still information file includes various information fields such as 'type_indicator', 'version_number', 'length', etc.
15 The 'type_indicator' field indicates that the information file is for managing still images and thus indicates that the data in the associated still image file includes data for one or more still images. The 'version_number' field indicates the syntax version of the still information file, and the 'length' field indicates
20 the size of the syntax data, which is the length of the information field subsequent to the 'length' field.

If the length is not zero, then the 'number_of_still_images' field indicates the number of still images stored in the still image file associated with the still information file and the
25 'tn_block_size' field indicates block size of a still image. As shown in Fig. 4, the still information file also includes fields of 'still_image_index', 'image_byte_size', 'horizontal_image_size', and 'vertical_image_size'. The function of each field is indicated in the name of the field, and
30 these fields correspond to each of the still images stored in the still image file.

When one or more still images are stored in a still image file (Still*.tdat) as mentioned above, each of the still images

is stored as a PES (packetized elementary stream) packet defined in the MPEG standards. As shown in Fig. 5, the payload of a PES packet comprises a plurality of source packets, each comprising a 4-byte TP (Transport Packet) extra header and a 188-byte MPEG2
5 TP.

The header of the MPEG2 transport packet includes still PID information for indicating that the packet delivers a still image. The still PID is given a value not previously used in standards for the recording medium (e.g., BD-RE for high-density optical
10 disks).

In the alternative embodiment shown in Fig. 6, still images are stored in separate still image files (Still001.tda, Still002.tdat, ...) and the navigation information associated with the still images is stored in a single still information file
15 (Still*.Info).

The still information file includes the fields of 'type_indicator', 'version_number', 'length', and 'number_of_still_images' mentioned above with reference to the embodiment of Fig. 4. For each still image, the still information
20 file also includes an 'image_file_name' field for storing the name of each image file as well as the fields of 'still_image_index', 'image_byte_size', 'horizontal_image_size', and 'vertical_image_size'.

Fig. 7 illustrates a method of managing still images for a
25 high-density recording medium according to another embodiment of the invention. In the embodiment shown in Fig. 7, each of the still images is stored in a still image file (Still001.tda, Still002.tdat, ...) and the navigation information associated with each of the still images is stored in a still information file
30 (Still001.Info, Still002.Info, ...). Each of the still information files includes the fields of 'type_indicator', 'version_number', 'length', 'image_byte_size', 'horizontal_image_size' and 'vertical_image_size' mentioned above with reference to Fig. 4.

Alternative file structures to that of Fig. 1 for effectively managing still images and still information files will now be described in detail. Fig. 8 illustrates a file structure of a high-density recording medium in accordance with one embodiment of the invention, wherein a plurality of still images are stored in a still image file (still.tdat) and navigation information for the still images is also stored in a still information file (still.info) as described before. The still image file and still information file can be placed in the root directory, for example, 'BD'.

The root directory 'BD' contains a plurality of title directories (TITLE001, TITLE002, ...) and each of the title directories contain subdirectories such as PLAYLIST, CLIPINF, and STREAM.

In a file structure shown in Fig. 9, both the still image file and the still information file are placed in the root directory 'BD' and TITLE, PLAYLIST, CLIPINF, and STREAM directories are placed in the root directory 'BD' as well.

In a file structure shown in Fig. 10, both the still image file and the still information file are placed in the STILL directory, which is a subdirectory of the root directory 'BD'. The root directory further contains a plurality of title directories (TITLE001, TITLE002, ...) each of which contains PLAYLIST, CLIPINF, and STREAM directories.

In a file structure shown in Fig. 11, both the still image file and the still information file are stored in the STILL directory, which is a subdirectory the root directory 'BD'. The root directory further contains TITLExxx, PLAYLIST, CLIPINF, and STREAM directories.

While the above-described embodiments have shown a single still image file and single still information file, it should be understood that the present invention is not limited to this file structure. Instead, a separate still image file may be provided

for each still image or a subset of still images and/or a separate still information file may be provided for each still image or subset of still images. Alternatively, some combination of these embodiment may be provided.

5 Fig. 12 illustrates a method of managing still images in accordance with another embodiment of the invention, wherein still images are intermittently inserted into each title, which includes movie video data or audio data. As shown, the title is recorded in the data area of a BD-ROM.

10 A still image (e.g., MPEG I, JPEG, etc.) recorded with movie video data in each title is stored as a PES (packetized elementary stream) packet. The header of a PES packet contains unique stream ID information for indicating that the data contained in the payload is a still image and a PTS (presentation time stamp)
15 indicative of the display timing of the still image.

The payload of a PES packet comprises a plurality of source packets, each comprising a 4-byte TP (transport packet) extra header and a 188-byte MPEG2 TP (transport packet). The TP extra header comprises 2-bit copy information and 30-bit still
20 information or packet arrival time stamp. In the case where the source packet corresponds to a still image, still information such as 'image start/end flag' is used instead of the packet arrival time stamp.

The header of an MPEG2 TP packet contains a still PID, which
25 is given a value not previously used in the recording medium standard of interest, for example, '0x1023' in BD-RE. In an embodiment shown in Fig. 13, the first source packet among source packets carrying a plurality of still images has the still information such as the image start/end and image size for the
30 still images

In an embodiment shown in Fig. 14, the first source packet among source packets carrying a still image has still information such as the image start/end and image size for the still image.

As shown in Fig. 15, the still information contains the fields of 'still_start_end_flag', 'image_start_end_flag', 'number_of_images', 'display_info', 'image_info', 'image_data_size', etc.

5 For example, if the 'still_start_end_flag' field is '0', it indicates the still image start position. If the field is '1', it indicates that the still image end position. The 'number_of_images' field indicates the number of still images to be displayed.

10 The 'image_info' field indicates the attributes of the still image to be displayed and the display properties. The 'display_info' field indicates the display timing, display sequence, display effect, and the display effect period of the still image. The 'image_data_size' indicates the size of the still
15 image.

In an embodiment shown in Fig. 16, the still information is contained in the TP extra packet of the first source packet (Source Packet #1). The TP extra packet of the other source packets contains information other than the still information.

20 In an embodiment shown in Fig. 17, instead of storing the still information in source packets, still display start information and still image start information are stored in playlist information and such information is associated with corresponding source packets.

25 An optical disk reproducing apparatus outputs movie data and still images or audio data and still images to, for example, a connected television set by referring to navigation information according to the present invention such as still information file. Fig. 18 illustrates a schematic diagram of an embodiment of an
30 optical disk recording and reproducing apparatus according to the present invention. As shown, an AV encoder 9 receives and encodes data (e.g., movie video and audio data, only audio data, and/or still image data). The AV encoder 9 outputs the encoded data along

with coding information and stream attribute information. A multiplexer 8 multiplexes the encoded data based on the coding information and stream attribute information to create, for example, an MPEG-2 transport stream. A source packetizer 7
5 packetizes the transport packets from the multiplexer 8 into source packets in accordance with the audio/video format of the optical disk. As shown in Fig. 18, the operations of the AV encoder 9, the multiplexer 8 and the source packetizer 7 are controlled by a controller 10. The controller 10 receives user input on the
10 recording operation, and provides control information to AV encoder 9, multiplexer 8 and the source packetizer 7. For example, the controller 10 instructs the AV encoder 9 on the type of encoding to perform, instructs the multiplexer 8 on the transport stream to create, and instructs the source packetizer 7 on the source
15 packet format. The controller 10 further controls a drive 3 to record the output from the source packetizer 7 on the optical disk.

The controller 10 also creates the navigation and management information for managing reproduction of the data being recorded on the optical disk. For example, based on information received
20 via the user interface (e.g., instruction set saved on disk, provided over an intranet or internet by a computer system, etc.) the controller 10 controls the drive 3 to record one or more of the data structures of Figs. 1-17 on the optical disk.

During reproduction, the controller 10 controls the drive 3
25 to reproduce this data structure. Based on the information contained therein, as well as user input received over the user interface (e.g., control buttons on the recording and reproducing apparatus or a remote associated with the apparatus), the controller 10 controls the drive 3 to reproduce the data from the
30 optical disk. For example, as discussed above with respect to the embodiments of the present invention, a still image or still images may be reproduced based on the navigation information provided in a still information file.

The reproduced source packets are received by a source depacketizer 4 and converted into a data stream (e.g., an MPEG-2 transport packet stream). A demultiplexer 5 demultiplexes the data stream into encoded data. An AV decoder 6 decodes the encoded data to produce the original data that was feed to the AV encoder 9. During reproduction, the controller 10 controls the operation of the source depacketizer 4, demultiplexer 5 and AV decoder 6. The controller 10 receives user input on the reproducing operation, and provides control information to AV decoder 6, demultiplexer 5 and the source packetizer 4. For example, the controller 10 instructs the AV decoder 9 on the type of decoding to perform, instructs the demultiplexer 5 on the transport stream to demultiplex, and instructs the source depacketizer 4 on the source packet format.

While Fig. 18 has been described as a recording and reproducing apparatus, it will be understood that only a recording or only a reproducing apparatus may be provided using those portions of Fig. 18 providing the recording or reproducing function.

In FIG. 19, the apparatus reads still images intermittently recorded in each title with movie video and audio and stores the still images in a temporary buffer. Then, the apparatus performs still operations using the still information recorded in various ways as described above.

In Fig. 20, the optical disk reproducing apparatus reads still images with movie video and audio recorded in each title and stores the still images in an internal temporary buffer of the VDP system . Then, the apparatus performs still operations by synchronizing the timings of still images and video or audio data using the display time of still images and presentation time of video or audio data.

As will be appreciated from the forgoing disclosure, the present invention provides a recording medium having a data

structure for managing still images recorded on a high-density recording medium (e.g., a high-density optical disk such as a BD-ROM). For example, the data structure allows for displaying movie video and still images or audio and still images in various
5 ways.

As apparent from the above description, the present invention provides methods and apparatuses for recording a data structure on a high density recording medium for managing still images recorded on the recording medium.

10 While the invention has been disclosed with respect to a limited number of embodiments, those skilled in the art, having the benefit of this disclosure, will appreciate numerous modifications and variations there from. For example, while described with respect to a Blu-ray ROM optical disk in several
15 instances, the present invention is not limited to this standard of optical disk or to optical disks. It is intended that all such modifications and variations fall within the spirit and scope of the invention.

CLAIMS

1. A recording medium having a data structure for managing reproduction of at least still images recorded on the recording medium, comprising:

5 an information file area including at least one information file, the information file associated with a data file recorded on the recording medium, the data file including at least video data, and the information file including a type indicator indicating whether the video data in the data file is for at least
10 one still image.

2. The recording medium of claim 1, wherein the information file further includes a length indicator indicating a length of the information file subsequent to the length indicator.

3. The recording medium of claim 1, further comprising:
15 a data area storing the data file.

4. The recording medium of claim 3, wherein each still image in the data file is recorded as a packetized elementary stream packet.

5. The recording medium of claim 4, wherein each packetized
20 elementary stream packet includes at least one source packet.

6. The recording medium of claim 5, wherein each source packet includes at least one transport packet.

7. The recording medium of claim 3, wherein the video data in the data file is recorded as one or more packetized elementary
25 stream packets.

8. The recording medium of claim 7, wherein only one still image is represented by each packetized elementary stream packet in the data file.

9. The recording medium of claim 3, wherein the video data
30 of the data file represents a still image and is recorded in the data area interleaved with other data.

10. The recording medium of claim 9, wherein the other data is at least one of movie data and audio data.

11. A recording medium having a data structure for managing reproduction of at least still images recorded on the recording
5 medium, comprising:

a data area storing the data file, the data file including video data representing at least one still image, and each still image in the data file is recorded as a packetized elementary stream packet.

10 12. The recording medium of claim 11, wherein each packetized elementary stream packet includes at least one source packet.

13. The recording medium of claim 12, wherein each source packet includes at least one transport packet.

14. The recording medium of claim 11, wherein the video data
15 of the data file is recorded in the data area interleaved with other data.

15. The recording medium of claim 4, wherein the other data is at least one of movie data and audio data.

16. A recording medium having a data structure for managing
20 reproduction of at least still images recorded on the recording medium, comprising:

a data area storing the data file, the data file including video data representing at least one still image, the video data in the data file being recorded as one or more packetized elementary
25 stream packets, and only one still image is represented by each packetized elementary stream packet in the data file.

17. A method of reproducing a data structure for managing reproduction of at least still images recorded on a recording medium, comprising:

30 reproducing at least one information file from the recording medium, the information file associated with a data file recorded on the recording medium, the data file including at least video data, and the information file including a type indicator

indicating whether the video data in the data file is for at least one still image.

18. An apparatus for reproducing a data structure for managing reproduction of at least still images recorded on a
5 recording medium, comprising:

a driver for driving an optical reproducing device to reproduce data recorded on the recording medium;

a controller for controlling the driver to reproduce at least one information file from the recording medium, the information
10 file associated with a data file recorded on the recording medium, the data file including at least video data, and the information file including a type indicator indicating whether the video data in the data file is for at least one still image.

19. A method of recording a data structure for managing
15 reproduction of at least still images recorded on a recording medium, comprising:

recording at least one information file on the recording medium, the information file associated with a data file recorded on the recording medium, the data file including at least video
20 data, and the information file including a type indicator indicating whether the video data in the data file is for at least one still image.

20. An apparatus for recording a data structure for managing reproduction of at least multiple reproduction path video data on
25 a recording medium, comprising:

a driver for driving an optical recording device to record data on the recording medium;

an encoder for encoding at least multiple reproduction path video data; and

30 a controller for controlling the driver to record at least one information file on the recording medium, the information file associated with a data file recorded on the recording medium, the data file including at least video data, and the information file

including a type indicator indicating whether the video data in the data file is for at least one still image.

FIG. 1

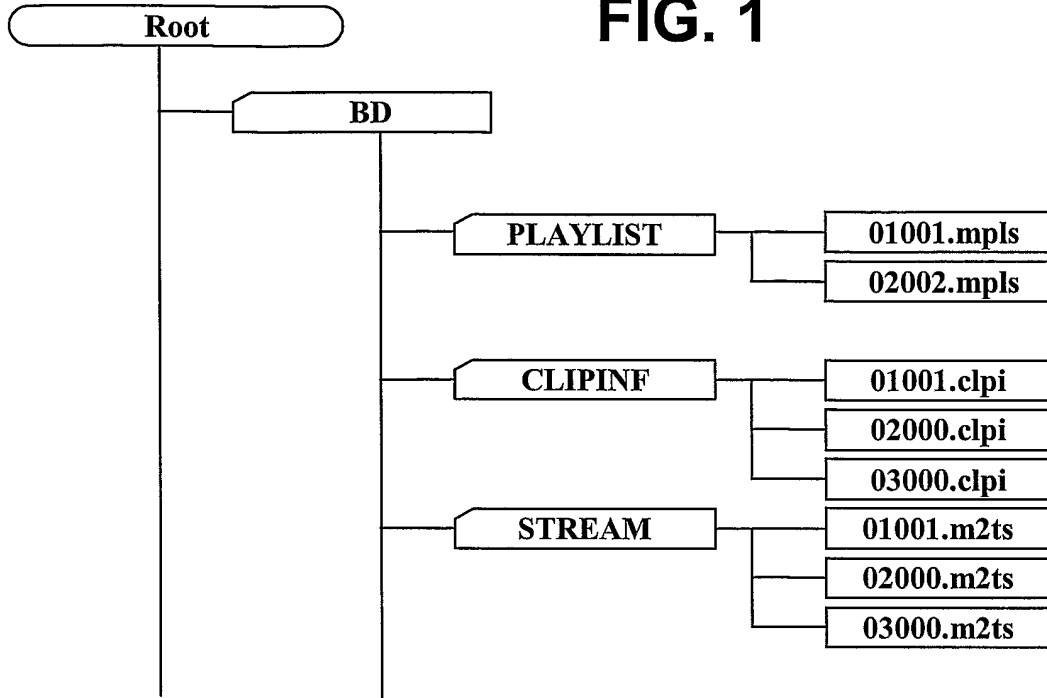


FIG. 2

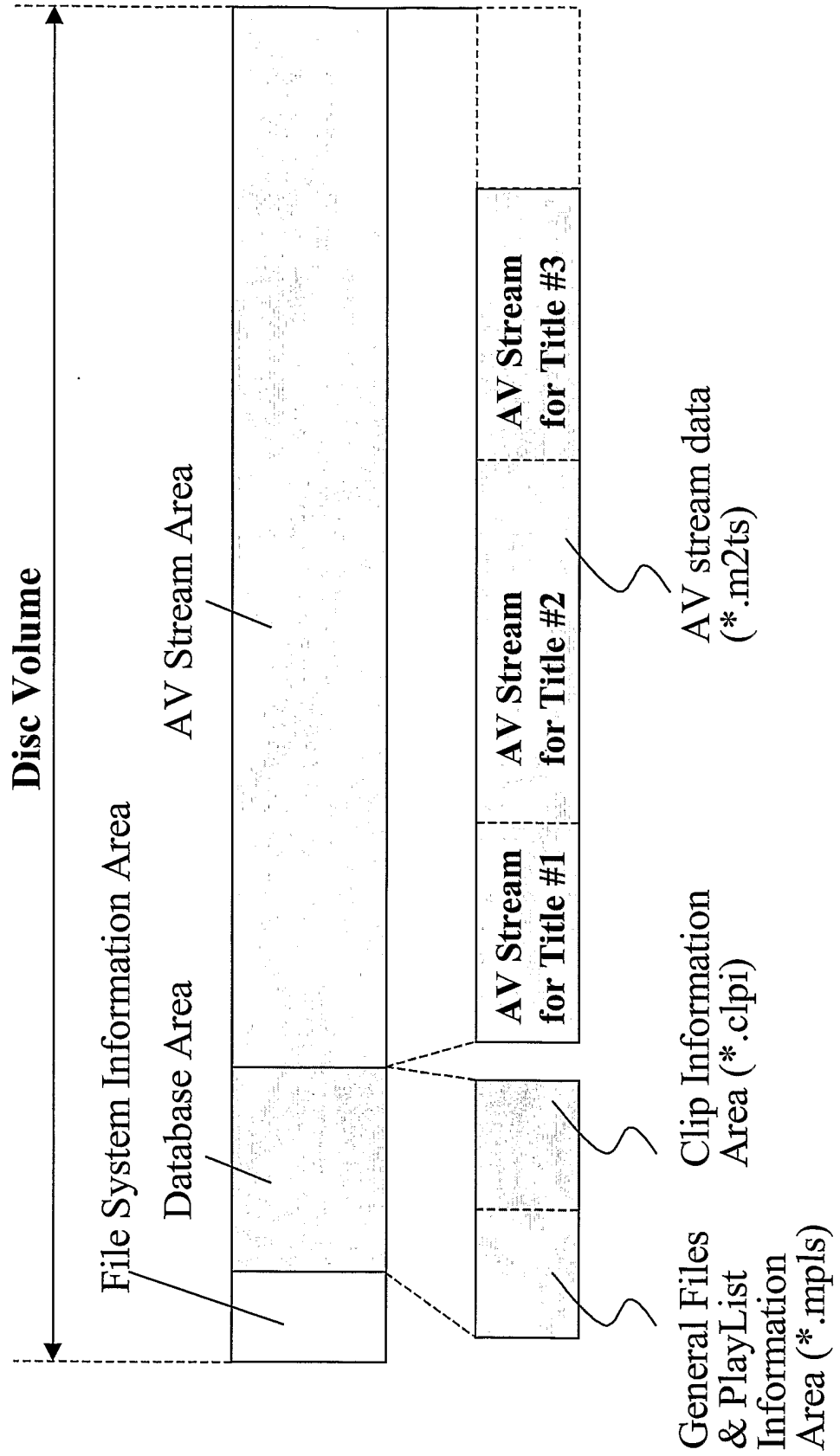


FIG. 3

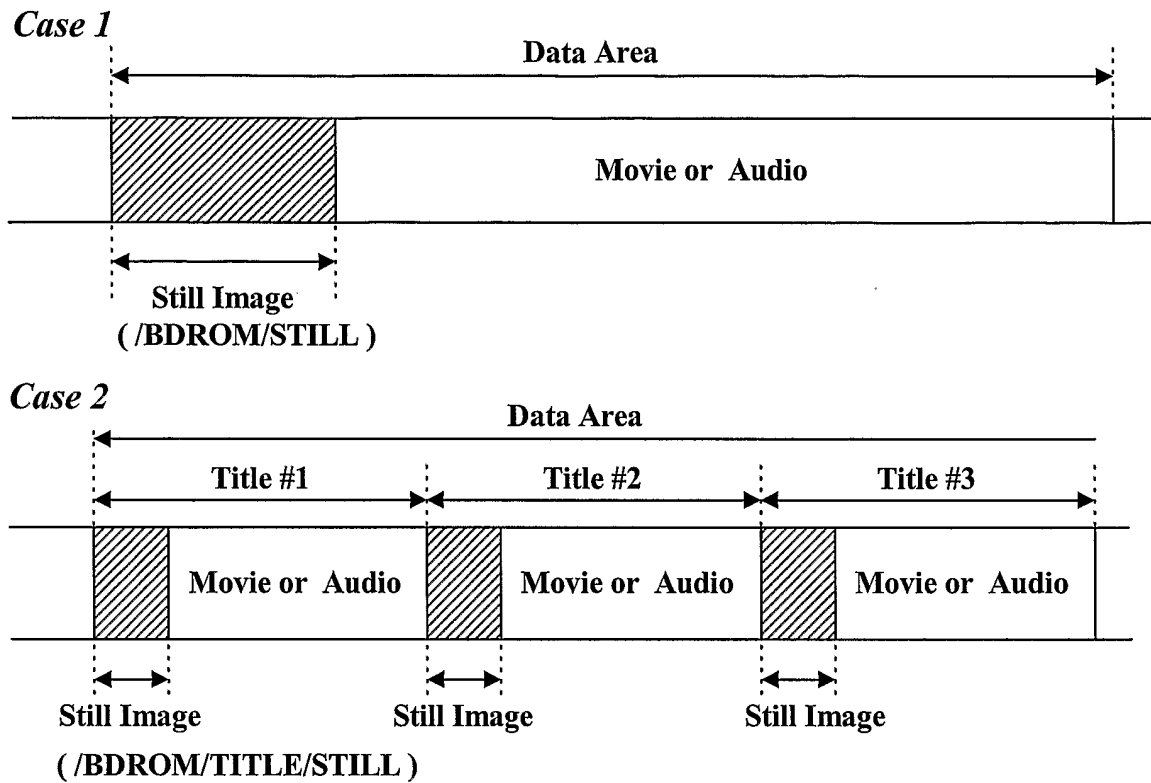
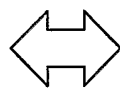
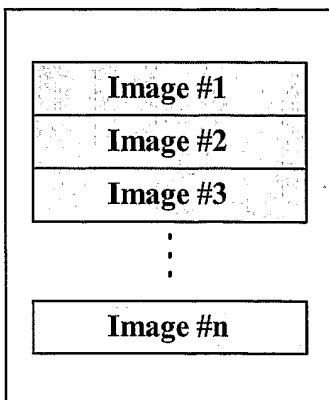


FIG. 4

Still*.tdat



Still*.info (){

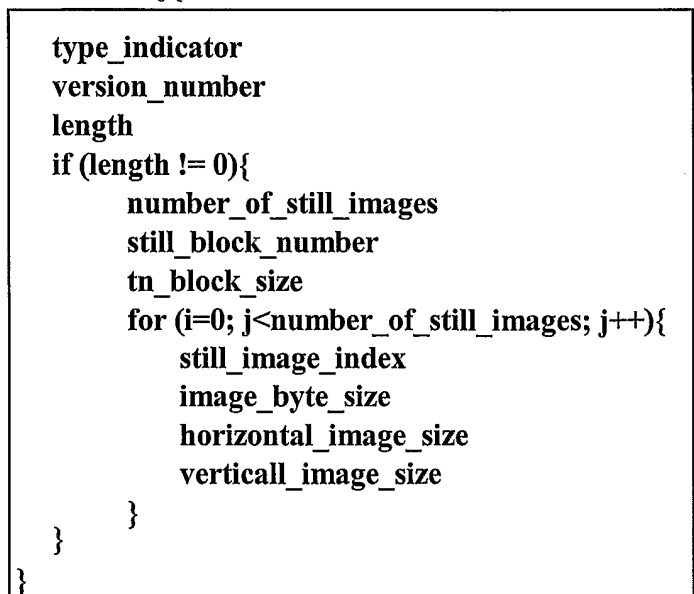


FIG. 5

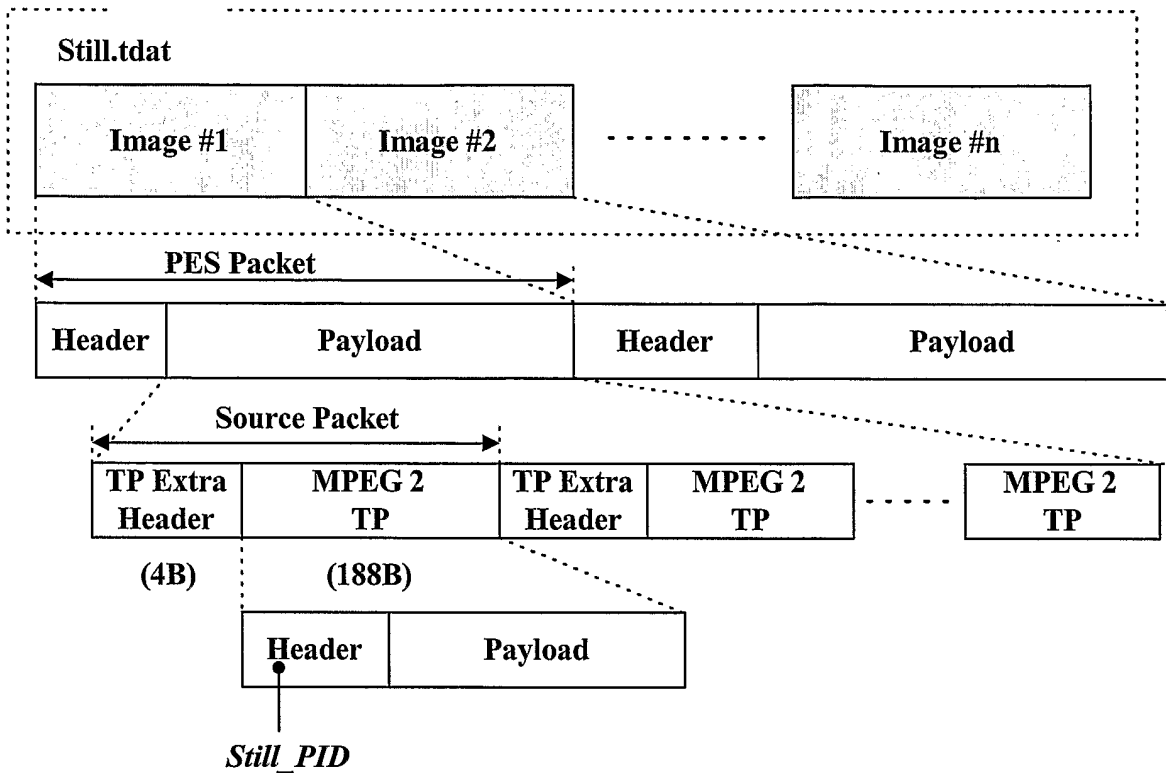


FIG. 6

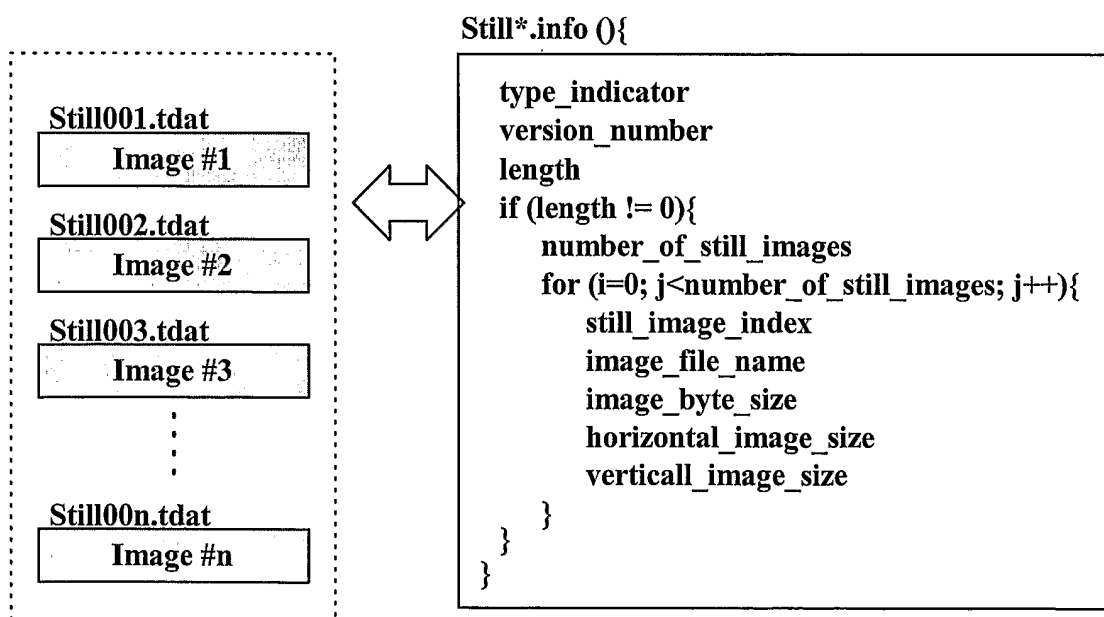


FIG. 7

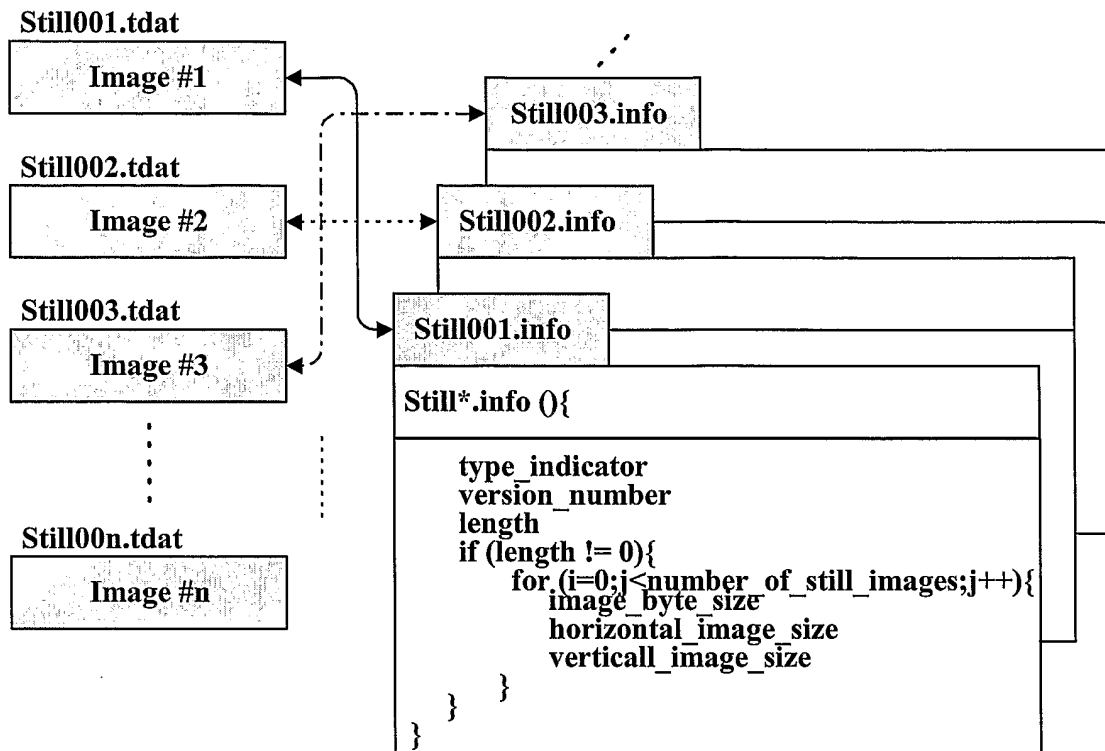
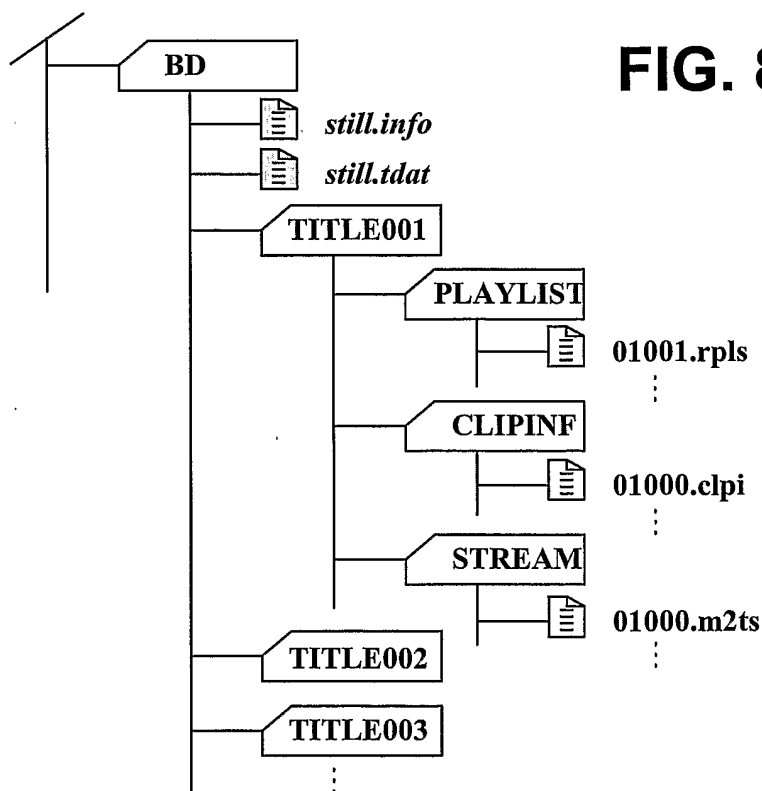


FIG. 8



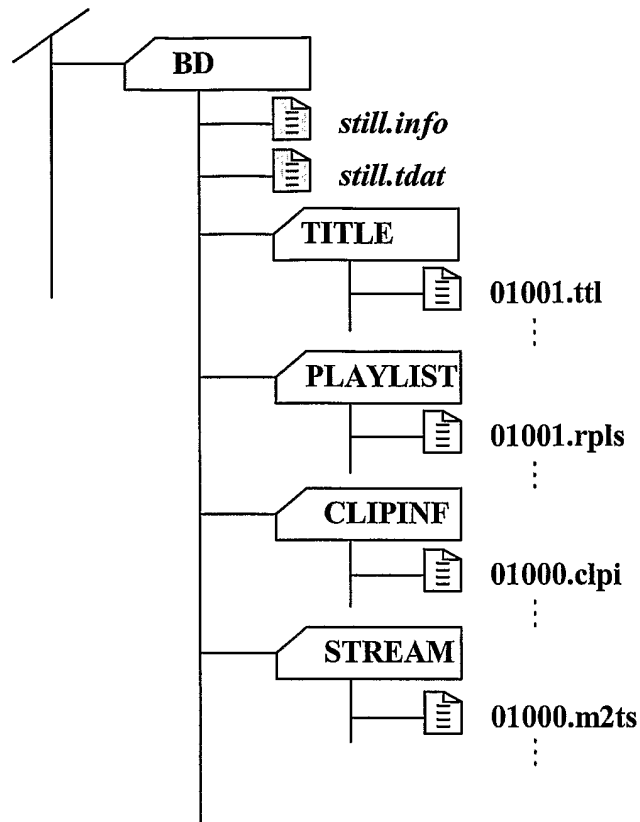


FIG. 9

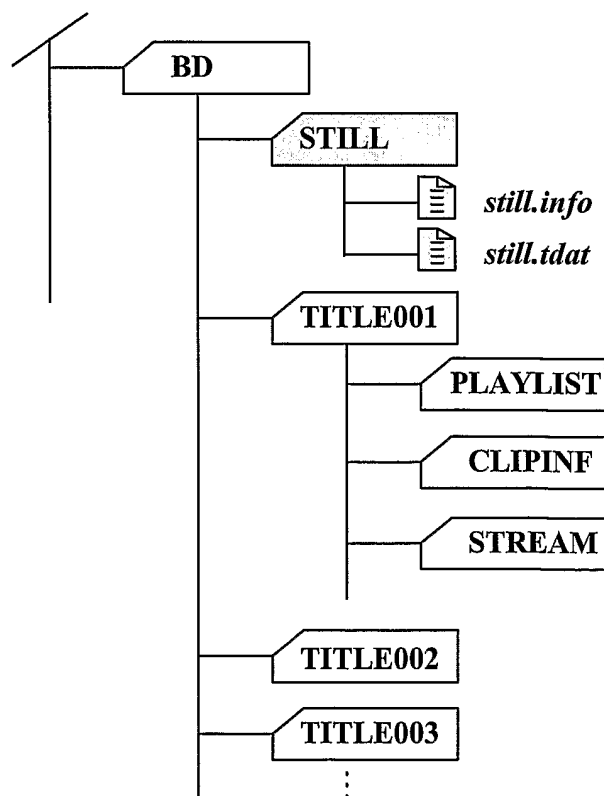


FIG. 10

FIG. 11

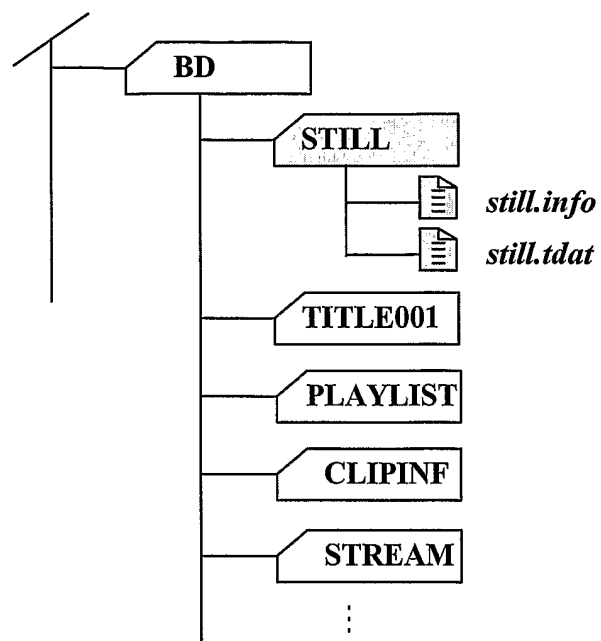


FIG. 12

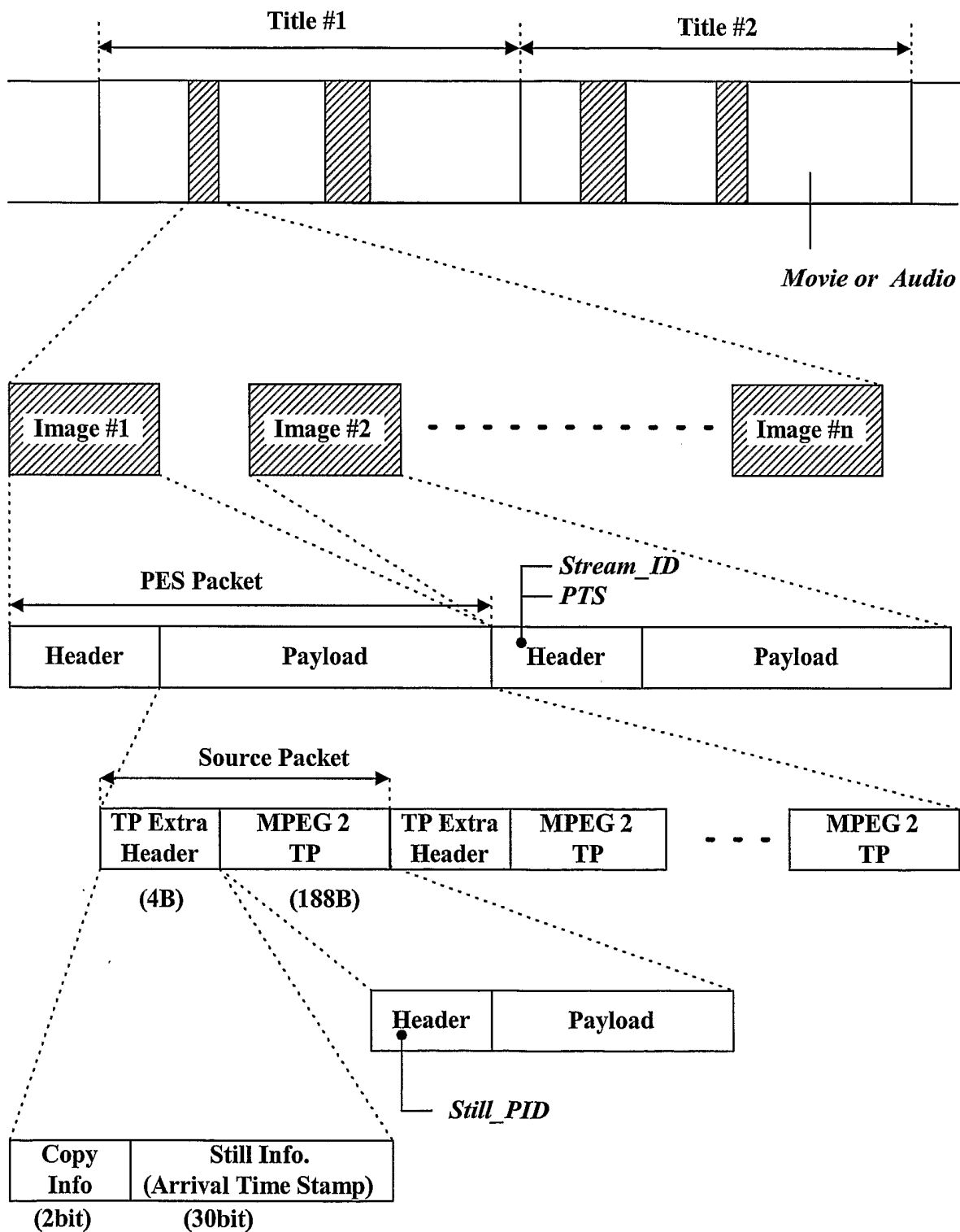


FIG. 13

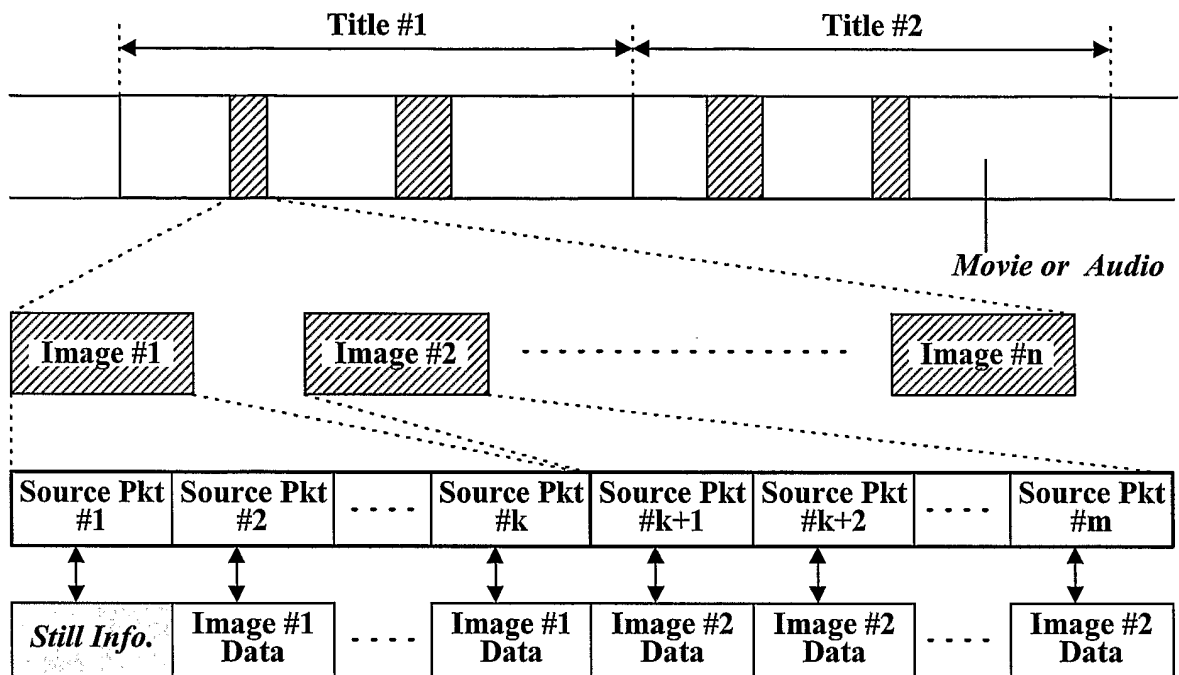
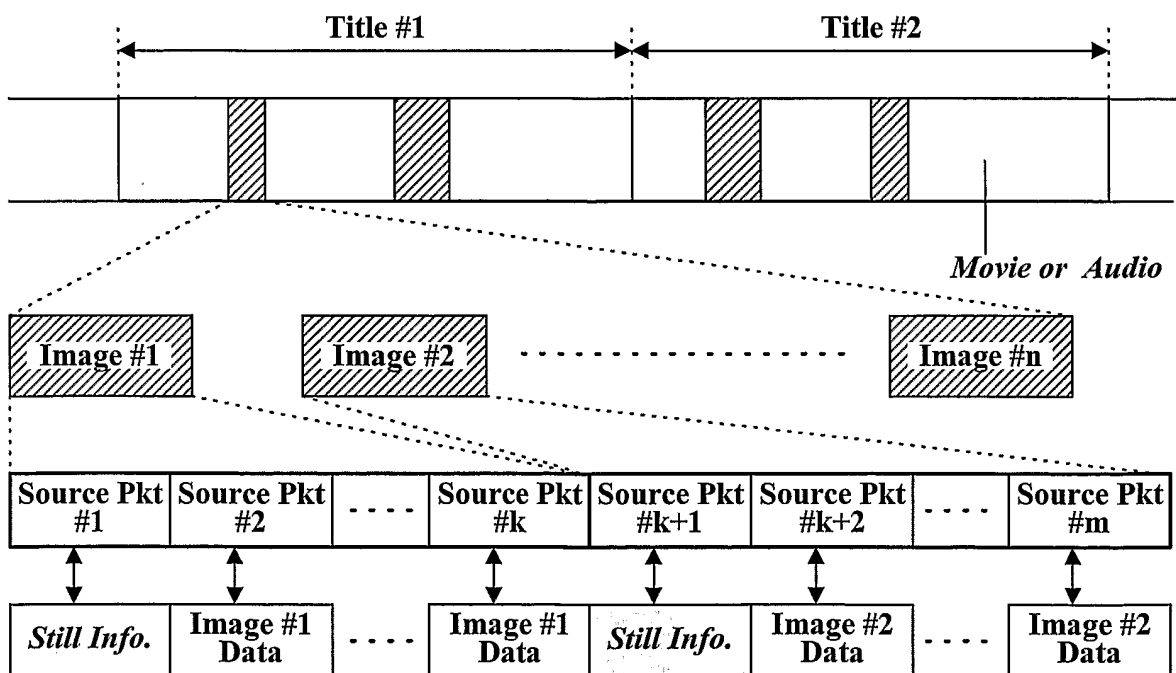


FIG. 14



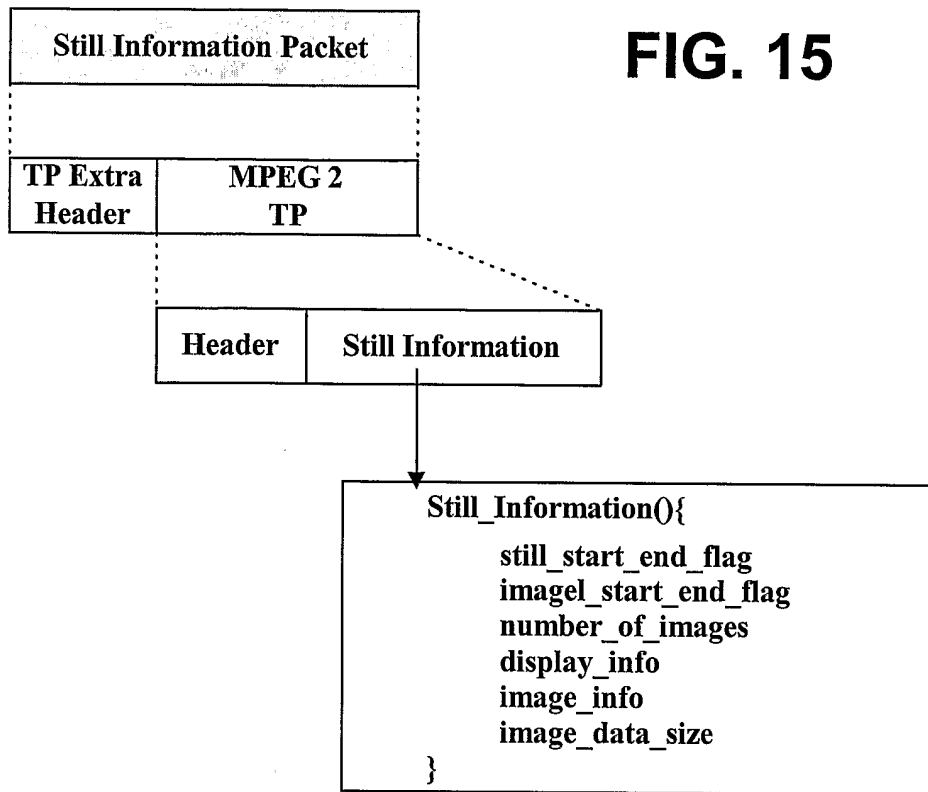


FIG. 16

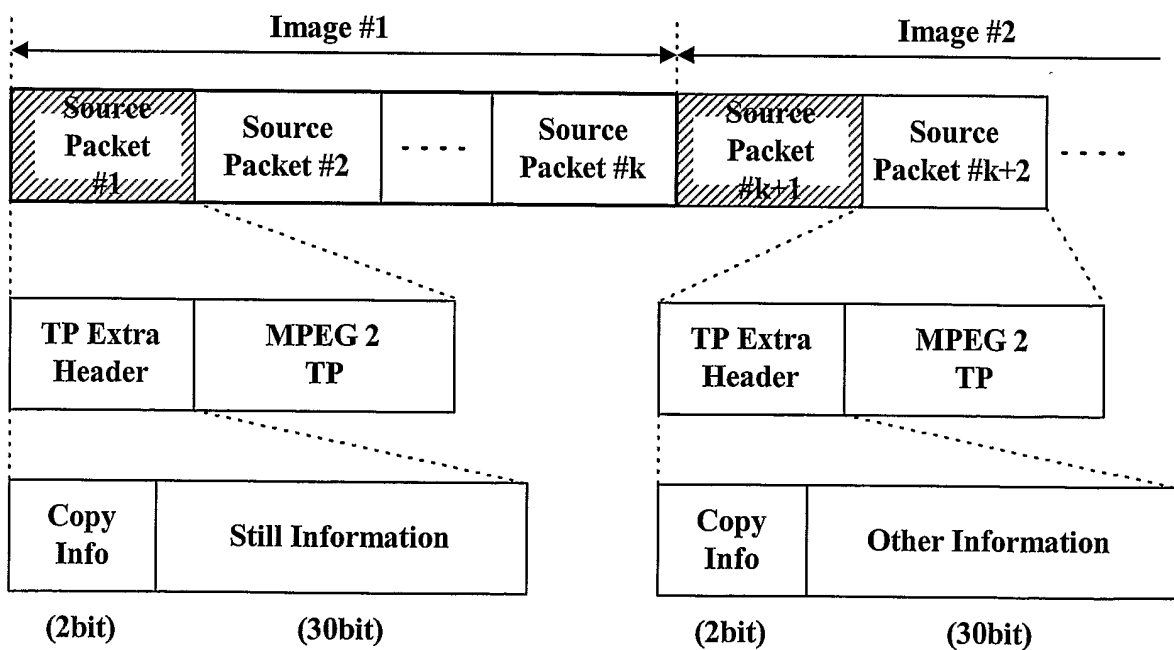


FIG. 17

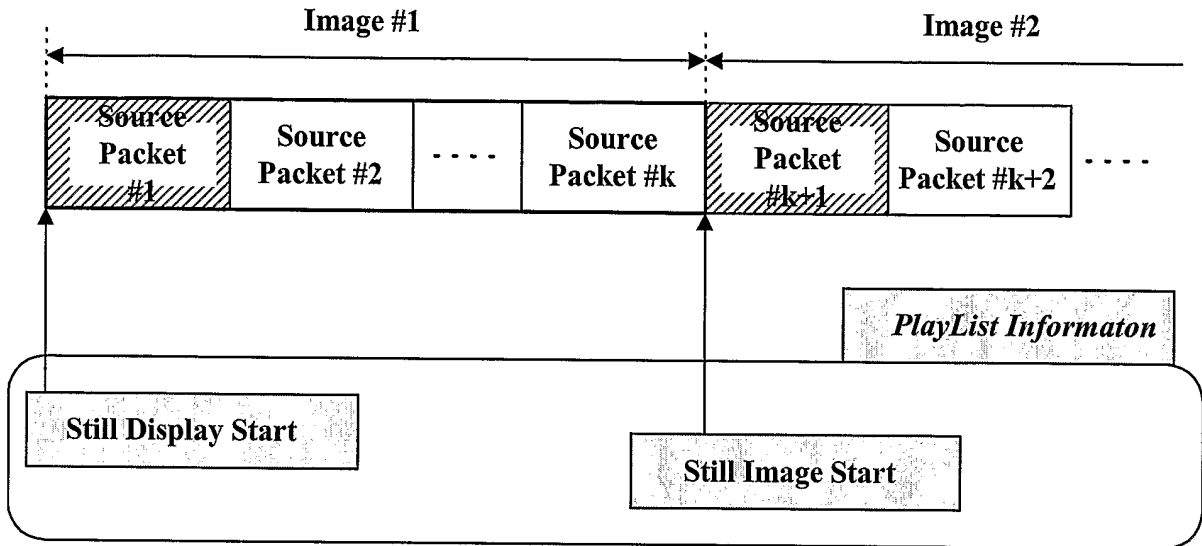


FIG. 18

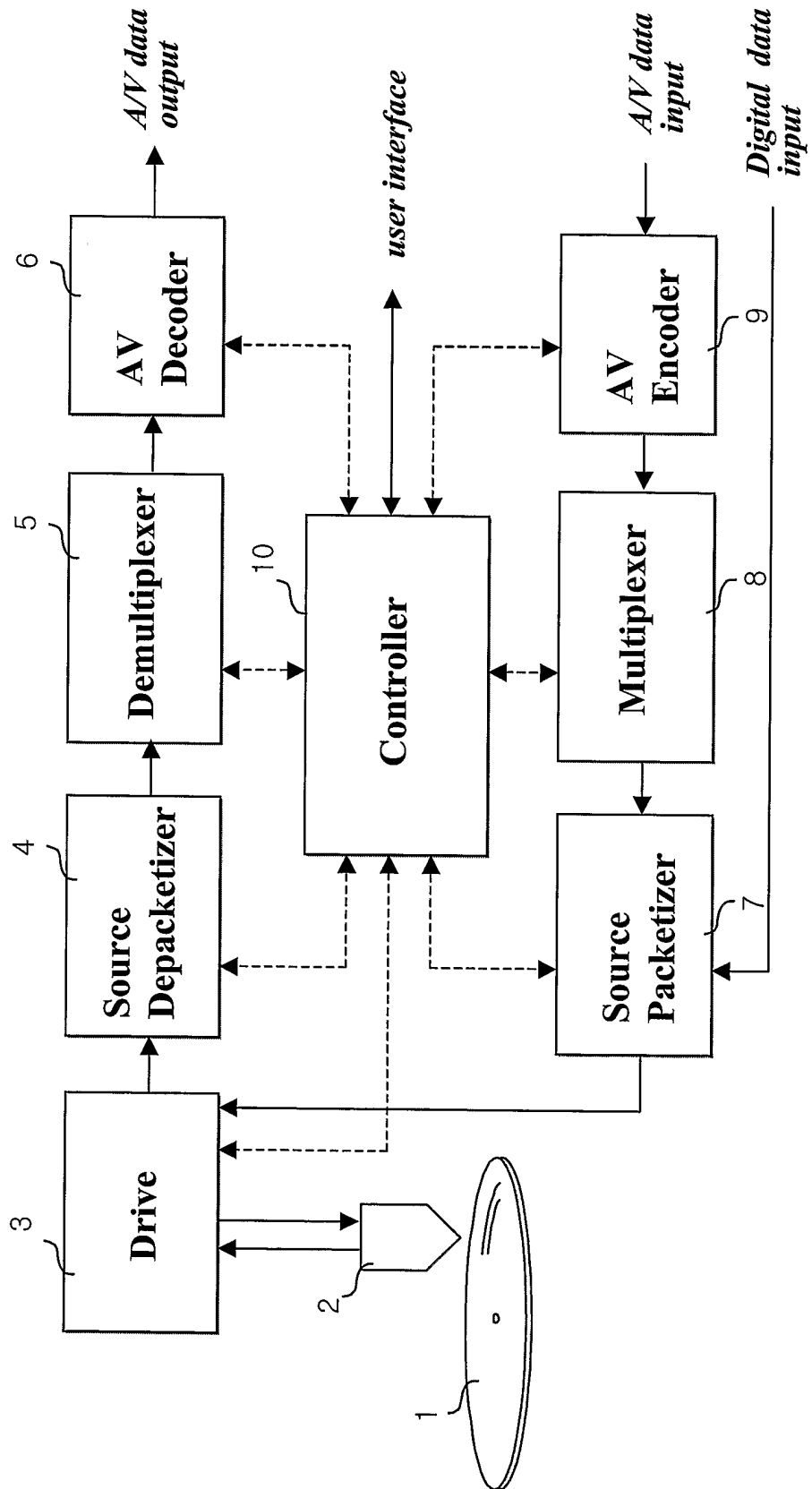


FIG. 19

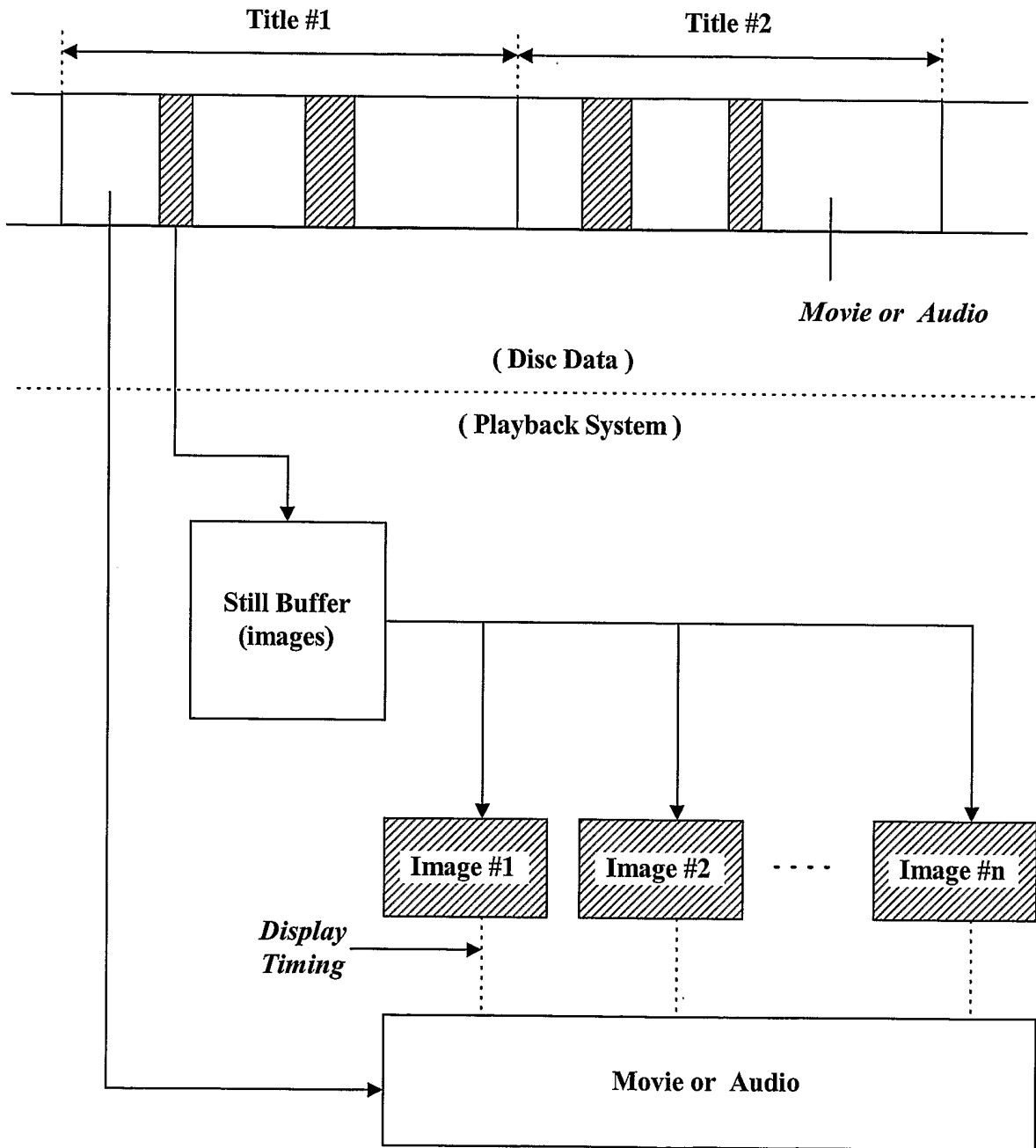
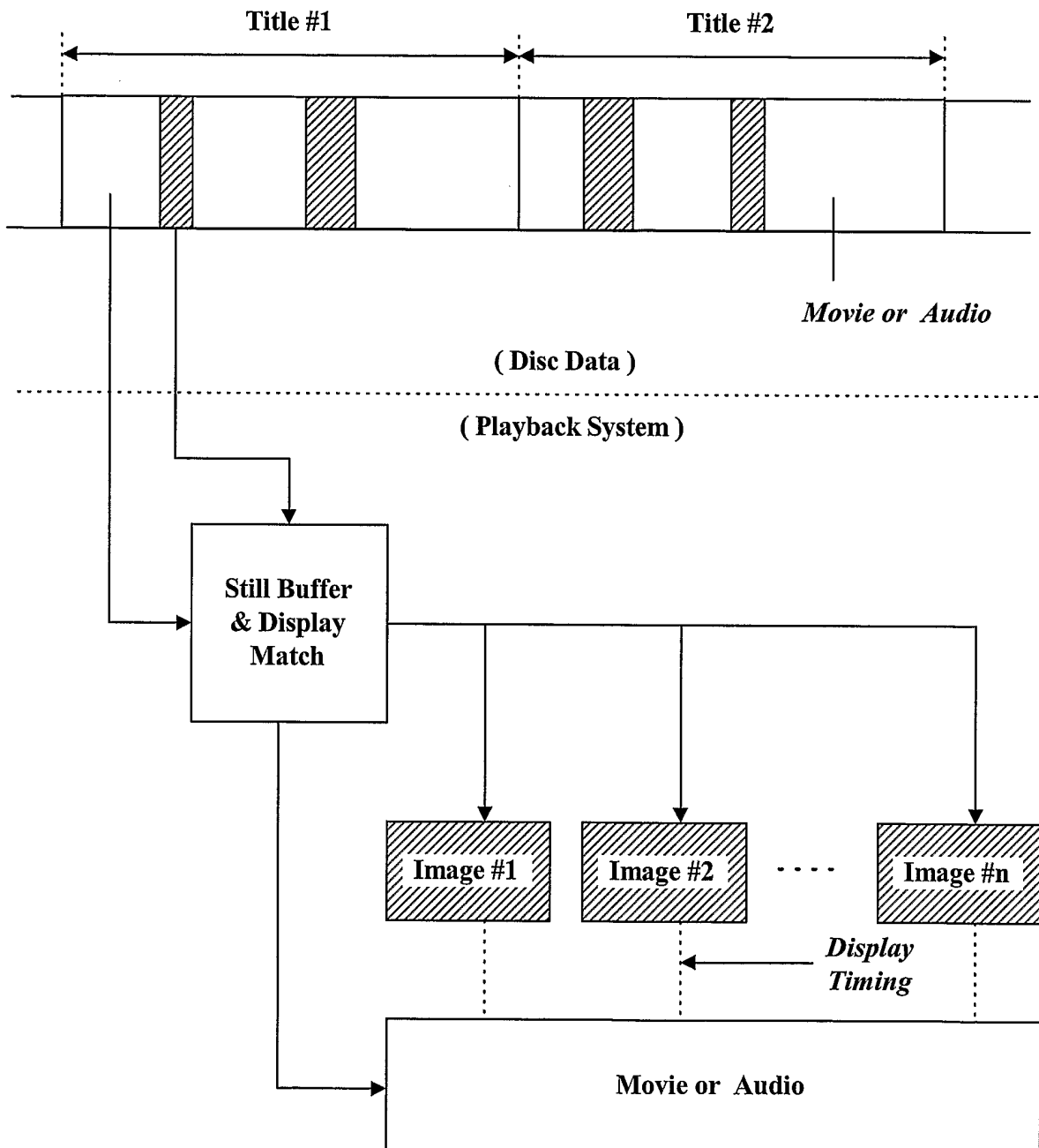


FIG. 20



INTERNATIONAL SEARCH REPORT

national application No.
PCT/KR03/01829

A. CLASSIFICATION OF SUBJECT MATTER
IPC7 G11B 20/10
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)
G11B 20/12 G11B 27/00 G11B 27/10 H04N 5/781 H04N 9/806

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean Patents and applications for inventions since 1975
Korean utility models and applications for utility models since 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
WPI, PAJ "still, imag*", navigat*, JPEG, MPEG, title, BD-ROM, BD-RW

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|-----------|---|-----------------------|
| A | JP 2001-167529 A (MATSUSHITA ELECTRIC IND CO., LTD.) 22 Jun. 2001 See the whole document | 1, 16, 17, 18, 19, 20 |
| A | WO1999-53694 A1 (MATSUSHITA ELECTRIC IND CO., LTD.) 21 Oct. 1999 See the whole document | 1, 16, 17, 18, 19, 20 |
| A | WO 2000-55857 A1 (MATSUSHITA ELECTRIC IND CO., LTD.) 21 Sep. 2000 See the whole document | 1, 16, 17, 18, 19, 20 |
| A | US 6493504 B1 (Hitachi, Ltd.) 10 Dec. 2002 See the whole document | 1, 16, 17, 18, 19, 20 |

Further documents are listed in the continuation of Box C. See patent family annex.

| | |
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| <p>* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed</p> | <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family</p> |
|---|---|

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| Date of the actual completion of the international search 28 NOVEMBER 2003 (28.11.2003) | Date of mailing of the international search report 28 NOVEMBER 2003 (28.11.2003) |
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|---|---|
| <p>Name and mailing address of the ISA/KR Korean Intellectual Property Office 920 Dunsan-dong, Seo-gu, Daejeon 302-701, Republic of Korea Facsimile No. 82-42-472-7140</p> | <p>Authorized officer KIM, Sae Young Telephone No. 82-42-481-5685</p> |
|---|---|

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/KR03/01829

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
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| JP 2001-167529 A | 22-06-2001 | US 6442337 B1 JP 2003-045154 A EP1300851 A2 | 27-08-2002 14-02-2003 04-09-2003 |
| WO1999-53694 A1 | 21-10-1999 | US 6122436 A1 KR 2001-0013565 A | 19-09-2000 26-02-2001 |
| WO 2000-55857 A1 | 21-09-2000 | US 6574419 B1 | 03-01-2003 |
| US 6493504 B1 | 10-12-2002 | EP 097894 A2 JP 2001-069460 A | 09-02-2000 16-03-2001 |