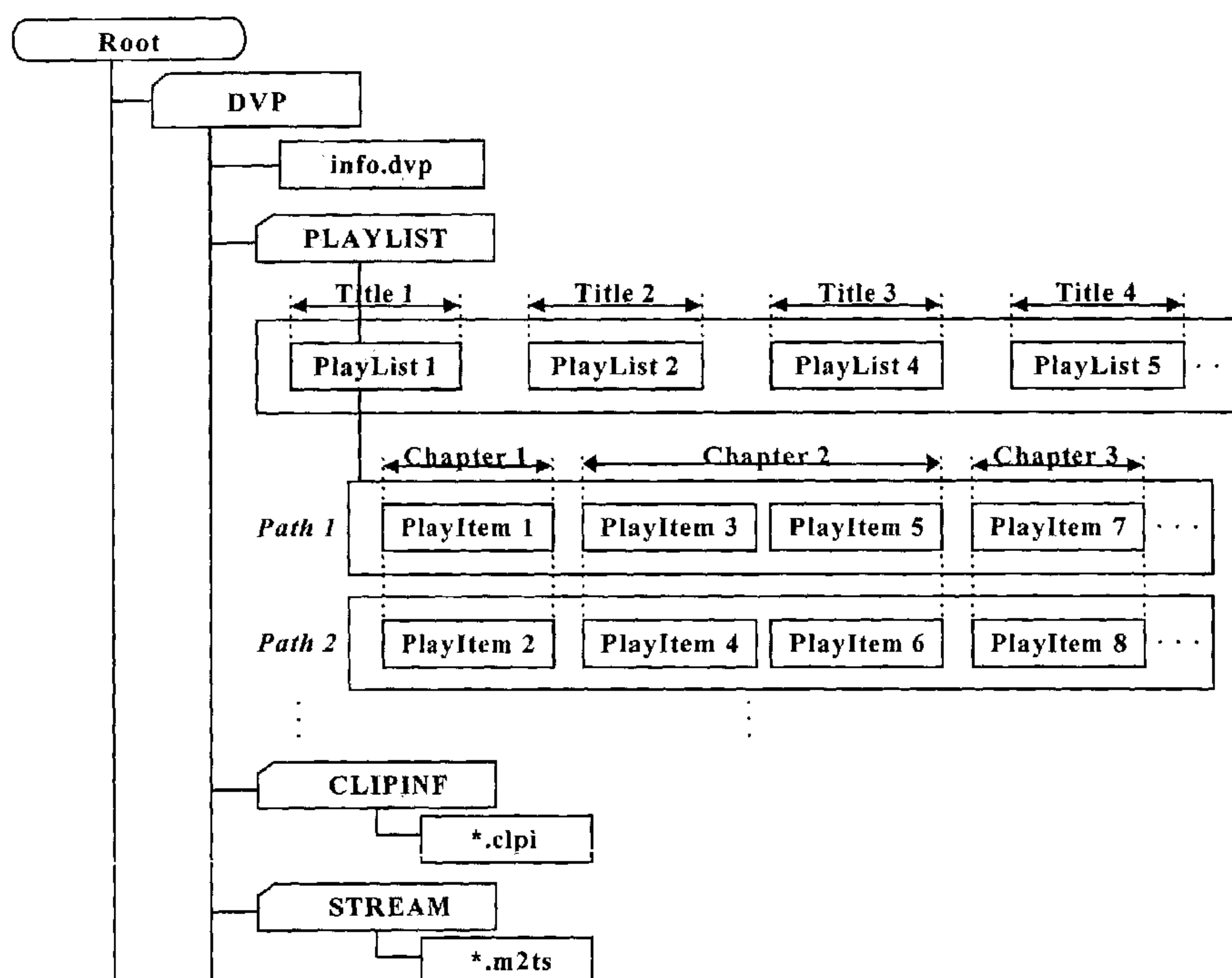




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(54) Title: RECORDING MEDIUM HAVING DATA STRUCTURE FOR MANAGING REPRODUCTION OF VIDEO DATA
RECORDED THEREON



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The data structure for managing reproduction of at least video data recorded on the recording medium includes a general information file area storing at least one general information file. The general information file includes at least one playlist identifier identifying a playlist file forming a title of video data recorded on the recording medium and title management information for managing reproduction of the video data by title. A playlist directory area stores at least one playlist directory, and each playlist directory includes at least one playlist file identified by a playlist identifier in the general information file. Each playlist file identifies at least one playitem, and each playitem identifies a clip of the video data.



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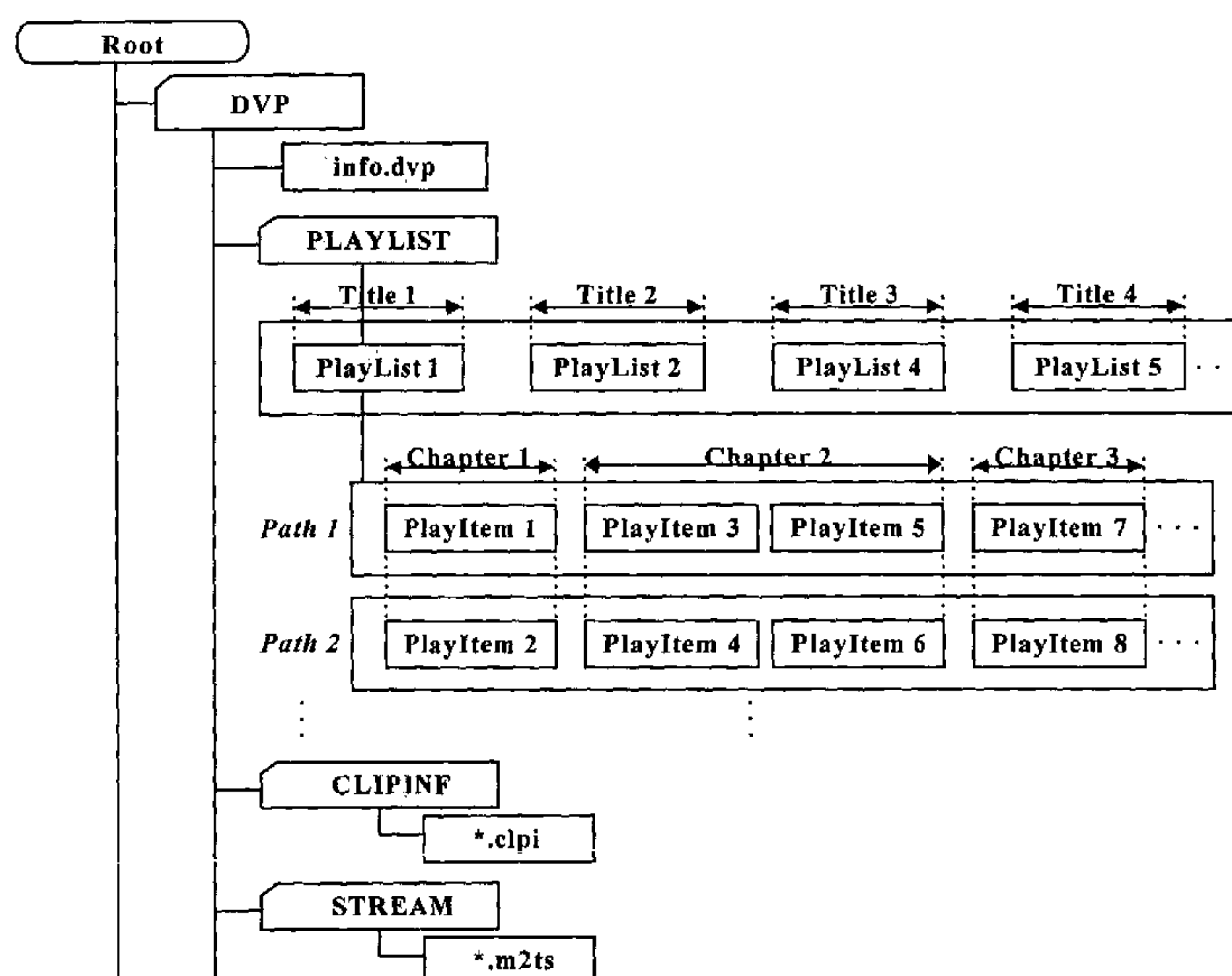
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(54) Title: RECORDING MEDIUM HAVING DATA STRUCTURE FOR MANAGING REPRODUCTION OF VIDEO DATA
RECORDED THEREON



(57) Abstract: The data structure for managing reproduction of at least video data recorded on the recording medium includes a general information file area storing at least one general information file. The general information file includes at least one playlist identifier identifying a playlist file forming a title of video data recorded on the recording medium and title management information for managing reproduction of the video data by title. A playlist directory area stores at least one playlist directory, and each playlist directory includes at least one playlist file identified by a playlist identifier in the general information file. Each playlist file identifies at least one playitem, and each playitem identifies a clip of the video data.

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DESCRIPTION

RECORDING MEDIUM HAVING DATA STRUCTURE FOR MANAGING REPRODUCTION OF VIDEO DATA RECORDED THEREON

5 1. TECHNICAL FIELD

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

10 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
15 available on the market in the near future. The Blu-ray Disc Rewritable (BD-RW) is one example of these new optical disks.

FIG. 1 illustrates the file structure of the BD-RW. The file structure or data structure provides for managing the reproduction of the video and audio data recorded on the BD-RW. As shown, the
20 data structure includes a root directory that contains at least one BDAV directory. The BDAV directory includes files such as 'info.bdav', 'menu.tidx', and 'mark.tidx', a PLAYLIST subdirectory in which playlist files (*.rpls and *.vpls) are stored, a CLIPINF subdirectory in which clip information files (*.clpi) are stored,
25 and a STREAM subdirectory in which MPEG2-formatted A/V stream clip files (*.m2ts) corresponding to the clip information files are stored. In addition to illustrating the data structure of the optical disk, FIG. 1 represents the areas of the optical disk. For example, the general information file info.dvr is stored in a

general information area or areas on the optical disk.

Because the BD-RW data structure and disk format as illustrated in FIG. 1 is well-known and readily available, only a brief overview of the file structure will be provided in this
5 disclosure.

As alluded to above, the STREAM directory includes MPEG2-formatted A/V stream files called clips. The STREAM directory may also include a special type of clip referred to as a bridge-clip A/V stream file. A bridge-clip is used for making seamless
10 connection between two or more presentation intervals selected in the clips, and generally have a small data size compared to the clips.

The CLIPINF directory includes a clip information file associated with each A/V stream file. The clip information file
15 indicates, among other things, the type of A/V stream associated therewith, number of source packets in the A/V stream associated therewith, and timing information of the source packets in the A/V stream associated therewith (e.g., on an arrival time basis (ATC) and/or a system time basis (STC)).

20 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 is referred to as a playitem. The playlist file, among other things,
25 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., ATC or STC basis). Expressed another way, the playlist file identifies playitems, each playitem points to a clip or portion thereof and identifies the clip
30 file associated with the clip.

A playlist directory may include real playlist (*.rpls) and virtual playlists (*.vpls). A real playlist can only use clips and not bridge-clips. Namely, the real playlist is considered as

referring to parts of clips, and therefore, conceptually considered equivalent in disk space to the referred to parts of the clips. A virtual playlist can use both clips and bridge-clips, and therefore, the conceptual considerations of a real playlist do not exist with
5 virtual playlists.

The info.bdav file is a general information file that provide general information for managing the reproduction of the A/V stream recorded on the optical disk. More specifically, the info.bdav file includes, among other things, a table of playlists that identifies
10 the files names of the playlist in the PLAYLIST directory of the same BDAV directory.

The menu.tidx, menu.tdt1 and menu.tdt2 files store information related to menu thumbnails. The mark.tidx, mark.tdt1 and mark.tdt2 files store information that relates to mark
15 thumbnails. Because these files are not particularly relevant to the present invention, they will not be discussed further.

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 video and audio data
20 recorded on the high-density read-only optical disk such as a BD-ROM is not yet available.

3. DISCLOSURE OF INVENTION

In the data structure according to the present invention, a general information file is recording in a general information file
25 area of the recording medium. The general information identifies playlists recorded on the recording medium and may include title management information for managing reproduction of the video data represented by the playlists by title. In one exemplary embodiment the title management information indicates which playlists belong
30 to which titles. In one exemplary embodiment, the title management information creates a one-to-one correspondence between titles and playlists.

In the data structure according to the present invention, the playlists may include chapter management information for managing reproduction of the titles by chapter. In one exemplary embodiment, the chapter management information includes a chapter entry flag
5 associated with each playitem in a playlist, where the chapter entry flag indicates whether the playitem begins a chapter. In another exemplary embodiment, the chapter management information includes a field of information in the playlist indicating the number of chapters and a time in the video data when each chapter begins.

10 The data structure according to the present invention may also include path management information in the playlists for managing reproduction of multiple reproduction path video data. In one exemplary embodiment, each playitem includes information identifying the paths to which the playitem belongs.

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

The present invention provides a recording medium having a file or data structure that permits managing the reproduction of
20 video data on a title, chapter, and or multiple reproduction path basis. Accordingly, the present invention provides a greater level of flexibility in the reproduction of video data than previously available.

4. BRIEF DESCRIPTION OF DRAWINGS

25 The above and other objects, 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 the prior art file or data structure of
30 a rewritable optical disk according to the Blu-ray Disc Rewritable (BD-RW) standard;

FIGs. 2 to 5 illustrate a first embodiment of a recording

medium having a data or file structure for managing reproduction of at least video data in accordance with the present invention;

FIG. 6 illustrates a schematic diagram of an embodiment of an optical disk recording and reproduction apparatus of the present invention;

FIGS. 7 to 9 illustrate a second embodiment of a recording medium having a data or file structure for managing reproduction of at least video data in accordance with the present invention; and

FIG. 10 illustrates an example of a recording medium having the data structure of FIG. 3 stored thereon.

5. MODES FOR CARRYING OUT THE INVENTION

In order that the invention may be fully understood, preferred 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) in accordance with the invention may have a file or data structure for managing reproduction of video and audio data as shown in FIG. 2. Many aspects of the data structure according to the present invention shown in FIG. 2 are similar to that of the BD-RW standard discussed with respect to Fig 1. As such these aspects will not be described in great detail.

As shown in FIG. 2, the root directory contains at least one DVP directory. The DVP directory includes a general information file 'info.dvp', a PLAYLIST directory in which playlist files (e.g., real (*.rpls) and virtual (*.vpls)) are stored, a CLIPINF directory in which clip information files (*.clpi) are stored, and a STREAM directory in which 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. The STREAM directory may also include a special type of clip referred to as a bridge-clip A/V stream file. A

bridge-clip is used for making seamless connection between two or more presentation intervals selected in the clips, and generally have a small data size compared to the clips.

The CLIPINF directory includes a clip information file
5 associated with each A/V stream file. The clip information file indicates, among other things, the type of A/V stream associated therewith, number of source packets in the A/V stream associated therewith, and timing information of the source packets in the A/V stream associated therewith (e.g., on an arrival time basis (ATC)
10 and/or a system time basis (STC)).

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
15 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., ATC or STC basis). Expressed another way, the playlist file identifies playitems, each
20 playitem points to a clip or portion thereof and identifies the clip file associated with the clip.

A playlist directory may include real playlist (*.rpls) and virtual playlists (*.vpls). A real playlist can only use clips and not bridge-clips. Namely, the real playlist is considered as
25 referring to parts of clips, and therefore, conceptually considered equivalent in disk space to the referred to parts of the clips. A virtual playlist can use both clips and bridge-clips, and therefore, the conceptual considerations of a real playlist do not exist with virtual playlists.

30 The info.dvp file is a general information file that provide general information for managing the reproduction of the A/V stream recorded on the optical disk. More specifically, the info.bdav file includes, among other things, a table of playlists that identifies

the files names of the playlist in the PLAYLIST directory of the same DVP directory. The info.dvp file will be discussed in greater detail below with respect to the embodiments of the present invention.

5 In addition to illustrating the data structure of the recording medium according to an embodiment of the present invention, FIG. 2 represents the areas of the recording medium. For example, the general information file is recorded in one or more general information areas, the playlist directory is recorded in
10 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. 10 illustrates an example of a recording medium having the data structure of FIG. 3 stored thereon. As shown, the recording medium includes a file system information area, a data
15 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 area have the general information file recorded in a general information file area thereof, and the PLAYLIST directory and playlist files
20 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
25 titles; for example, different movies represented by the video and 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.

As shown in FIG. 2, and as will be described in greater detail
30 below with respect to FIGs. 3-5, the general information file info.dvp includes title management information for managing reproduction of the video and audio data by title and the playlists include chapter management information for managing reproduction

of a title by chapters.

Because of the large storage capacity of the newer, high-density recording media such as BD-ROM optical disks, various versions of a title or portions of a title may be recorded, and
5 therefore, reproduced from the recording media. For example, video data representing different camera angles 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 recording
10 medium. Each version represents a different reproduction path, and the video data in these instances is referred to as multiple reproduction path video data. It will be appreciated that camera angle and parental control versions are but two examples of multiple reproduction path video data, and the present invention is
15 applicable to any type or combination of types of multiple reproduction path video data. As will be described in detail below with respect to FIGs. 2-5, in an embodiment of the present invention, each playlist file includes path management information for managing reproduction of multiple reproduction path video data
20 recorded on the recording medium.

According to a first embodiment of the present invention, as illustrated in FIG. 2, each title may be associated with a single playlist in the PLAYLIST directory and each chapter in a title may be linked with at least one playitem included in a playlist.

25 In the example of FIG. 2, the first and the second playitems among playitems included in the first playlist 'PlayList 1' refer to the first chapter, the third to the sixth playitems refer to the second chapter, and the seventh and the eight playitems refer to the third chapter. Also, FIG. 2 shows a first production path is
30 indicated by the odd playitems 'PlayItem 1, 3, 5, 7' and a second reproduction path is indicated by the even playitems 'PlayItem 2, 4, 6, 8'. This is merely an example, and is not limiting on the path structure permitted by the present invention.

FIG. 3 illustrates a portion of the general information file info.dvp according to an embodiment of the present invention in greater detail. As shown, the general information file info.dvp includes an information field called 'TableOfPlaylists'. The
5 playlist table 'TableOfPlaylists' indicates the length of the information field, and the number playlists in the DVP directory. For each playlist, the playlist table 'TableOfPlaylists' indicates the file name 'PlayList_file_name' of the playlist (which identifies the playlist) and title management information
10 associated with the playlist. Specifically, the title management information is a title entry flag 'Title_entry_flag', which indicates whether the playlist is the start of a title. In the exemplary embodiment of FIG. 2 where each title is associated with a single playlist, the title entry flag 'Title_entry_flag' is set
15 for each playlist. However, it will be understood that the present invention is not limited to this embodiment.

The title management information also includes a title entry table 'TitleEntryTable' forming a portion of the general information file 'info.dvp' as shown in FIG. 4. As shown, the title
20 entry table indicates the length of this information field, indicates the number of titles 'number_of_Titles', and for each title, indicates the filenames of the first playlist 'Entry_PlayList_file_name' associated with the title. In an alternate embodiment, the title entry table is written in a file
25 separate from the general information file 'info.dvp'.

The chapter management information, which is used for selectively referring to a chapter of each title, is written in a corresponding playlist file structured as shown in FIG. 5. FIG.
5 also shows an exemplary embodiment where path management
30 information, which is used for managing the reproduction of multiple reproduction path video data of a title, is written in the playlist file.

As shown, each playlist file indicates a length of the file,

and the number of playitems 'number_of_PlayItems' forming the playlist. For each playitem, a playitem information field is provided in the playlist file. Here each playitem is identified by the number of the playitem. As shown in FIG. 5, the playitem information field includes, in part, an indication of the field's length, a chapter entry flag 'Chapter_entry_flag' and a path number 'Path_number'. The chapter entry flag 'Chapter_entry_flag' provides chapter management information by indicating whether the associated playitem is the start of a chapter. The path number 'Path_number' provides the path management information by indicating the path or paths to which the associated playitem belongs.

FIG. 6 illustrates a schematic diagram of an embodiment of an optical disk recording and reproducing apparatus according to the present invention. As shown, an AV encoder 9 receives and encodes audio and video data. The AV encoder 9 outputs the encoded audio and video data along with coding information and stream attribute information. A multiplexer 8 multiplexes the encoded audio and video data based on the coding information and stream attribute information to create, for example, an MPEG-2 transport stream. A source packetizer 7 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. 6, 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 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 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 audio/video data being recorded on the optical disk. For example, based on information received via the user interface (e.g., instruction set saved on disk,
5 provided over an intranet or internet by a computer system, etc.) the controller 10 controls the drive 3 to record the data structure of FIGs. 2-5 on the optical disk.

During reproduction, the controller 10 controls the drive 3 to reproduce this data structure. Based on the information contain
10 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 audio/video source packets from the optical disk. For example, the user input may specify a
15 title, chapter, and/or path to reproduce. This user input may be specified, for example, via a menu based graphical user interface preprogrammed into the controller 10. Using the user input and the title management information, chapter management information and/or path management information reproduced from the optical disk,
20 the controller 10 controls the reproduction of the specified title, chapter and/or path.

For example, to select a particular title, the controller 10 determines from the title entry table the number of titles and requests the user to select one based on the number. As will be
25 appreciated, the general information file may be augmented to contain more meaningful information (such as a title name) for the titles recorded on the recording medium, and this information could be provided to the user in conjunction with the title selection request. Once a title is selected, the playlist file name for the
30 selected title is obtained from the title entry table and reproduction according to the identified playlist is performed.

To select a particular chapter, the chapter entry flag for each playitem is examined by the controller 10 to determine the

number of chapters and the user is queried on which chapter to reproduce. As with the title selection, the chapter management information may be augmented to provide more meaningful information regarding the chapters. Selection of a particular chapter is a
5 selection to begin reproduction at the associated playitem, and reproduction begins with the associated playitem.

To select a particular path, the path numbers for each playitem are examined by the controller 10 to determine the number of reproduction paths, and the user is requested which path to
10 reproduce. As with the title and chapter selections, the path management information may be augmented to provide more meaningful information regarding the reproduction path to reproduce. During reproduction, only those playitems having the selected path number as one of their path numbers are reproduced.

15 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 video and audio data. An AV decoder 6 decodes the encoded video and audio data to produce the original audio and
20 video 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
25 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. 6 has been described as a recording and reproducing
30 apparatus, it will be understood that only a recording or only a reproducing apparatus may be provided using those portions of FIG. 6 providing the recording or reproducing function.

FIGS. 7-9 illustrate a second embodiment of the data structure

according to the present invention. As shown in FIG. 7, the data structure of the second embodiment is the same as the data structure of the first embodiment, except for the chapter management information. FIG. 7 illustrates that the chapter management information indicates chapters through the use of chapter marks. As with FIG. 2, FIG. 7 also represents the areas of the recording medium, and FIG. 10 illustrates an exemplary embodiment of the recording medium including these areas.

In this embodiment, the playlist files include the chapter management information. FIG. 8 illustrates a portion of a playlist file including the chapter management information according to this embodiment. As shown, each playlist file includes a playlist mark 'PlayListsMark' information field. The playlist mark 'PlayListsMark' information field indicates a length of the information field and a number of the playlist marks 'number_of_PlayList_marks' in the playlist. For each playlist mark, the playlist mark 'PlayListsMark' information field indicates the mark type 'mark_type', the mark name length 'mark_name_length', the maker 'maker_ID', an indicator of the playitem on which the mark is placed 'ref_to_PlayItem_id', and a time stamp 'mark_time_stamp'.

The mark type indicates the type of mark. For example, when a mark indicates the beginning of a chapter, the mark type 'mark_type' identifies the associated mark as a chapter mark. The maker identifier 'maker_ID' identifies the manufacturer of the mark. The playitem indicator 'ref_to_PlayItem_id' indicates the Playitem_id value for a playitem on which the mark is placed. The time stamp 'mark_time_stamp' of the mark indicates a point where the mark is placed; namely, indicates a point on a time axis of the A/V stream of clips (e.g., ATC and/or STC basis) where the mark is placed. The 'duration' indicates the length of the mark that starts from the time stamp indicated by the 'mark_time_stamp'.

Because the playlist mark information field provides the

chapter management information, the chapter entry flag 'Chapter_entry_flag' of the first embodiment is not required. FIG. 9 illustrates a portion of the playlist file showing that the playitems of this embodiment do not include the chapter entry flag 'Chapter_entry_flag'. However, it will be understood that the chapter entry flag 'Chapter_entry_flag' could be provided.

The recording and reproducing apparatus of Fig 6 operates in the same manner with respect to the embodiment of FIGs. 7-9 as was described above with respect to FIGs. 2-5. However, with respect to the embodiment FIGs. 7-9, the chapter management information of FIG. 8 is recorded and used during reproduction to selectively begin reproduction at a particular chapter. Here, the controller determines the number of chapters in a title based on the number of playlist marks identified as chapter marks, queries the user to select a chapter, and begins reproduction of the video data at the point indicated by the time stamp associated with the chapter mark of the selected chapter.

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, 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 video data recorded on the recording medium, comprising:

5 a general information file area storing at least one general information file, the general information file including at least one playlist identifier identifying a playlist file forming a title of video data recorded on the recording medium and title management information for managing reproduction of the video data by title;
10 and

a playlist directory area storing at least one playlist directory, each playlist directory including at least one playlist file identified by a playlist identifier in the general information file, each playlist file identifying at least one playitem, each
15 playitem identifying a clip of the video data.

2. The recording medium of claim 1, wherein the title management information includes a title entry flag associated with each playlist identifier, the title entry flag indicating whether a playlist file identified by the associated playlist identifier
20 begins a title.

3. The recording medium of claim 2, wherein the title entry flags are set such that each title corresponds to one playlist file.

4. The recording medium of claim 2, wherein the title management information indicates which playlist files are
25 associated with each title.

5. The recording medium of claim 1, wherein the title management information indicates which playlist files are associated with each title.

6. The recording medium of claim 1, wherein each playlist file
30 includes path management information for managing reproduction of multiple reproduction path video data recorded on the recording

medium.

7. The recording medium of claim 6, wherein the path management information indicates a reproduction path to which each playitem identified by the playlist file belongs.

5 8. The recording medium of claim 6, wherein each playlist file includes chapter management information, the chapter management information for managing reproduction of the title by chapters.

9. The recording medium of claim 8, wherein the chapter management information includes a chapter entry flag associated
10 with each identified playitem indicating whether the identified playitem begins a chapter.

10. The recording medium of claim 8, wherein the chapter management information includes at least one playlist mark, each playlist mark including a chapter identifier indicating a chapter
15 associated with the playlist mark and a timestamp indicating a time in the multiple reproduction path video data when the chapter begins.

11. The recording medium of claim 1, wherein each playlist file includes chapter management information, the chapter
20 management information for managing reproduction of the title by chapters.

12. The recording medium of claim 11, wherein the chapter management information includes a chapter entry flag associated with each identified playitem indicating whether the identified
25 playitem begins a chapter.

13. The recording medium of claim 11, wherein the chapter management information includes at least one playlist mark, each playlist mark including a chapter identifier indicating a chapter associated with the playlist mark and a timestamp indicating a time
30 in the multiple reproduction path video data when the chapter begins.

14. A method of recording a data structure for managing reproduction of at least video data, comprising:

recording a general information file in a general information file area of a recording medium, the general information file including at least one playlist identifier identifying a playlist file forming a title of video data recorded on the recording medium
5 and title management information for managing reproduction of the video data by title; and

recording at least one playlist directory in a playlist directory area, each playlist directory including at least one playlist file identified by a playlist identifier in the general
10 information file, each playlist file identifying at least one playitem, each playitem identifying a clip of the video data.

15. A method of reproducing a data structure for managing reproduction of at least video data, comprising:

reproducing a general information file from a general
15 information file area of a recording medium, the general information file including at least one playlist identifier identifying a playlist file forming a title of video data recorded on the recording medium and title management information for managing reproduction of the video data by title; and

20 reproducing at least one playlist directory in a playlist directory area, each playlist directory including at least one playlist file identified by a playlist identifier in the general information file, each playlist file identifying at least one playitem, each playitem identifying a clip of the video data.

25 16. An apparatus for recording a data structure for managing reproduction of at least video data, comprising:

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

an encoder for encoding at least video data; and

30 a controller for controlling the driver to record the encoded video data on the recording medium, the controller for controlling the driver to record a general information file in a general information file area of the recording medium, the general

information file including at least one playlist identifier identifying a playlist file forming a title of video data recorded on the recording medium and title management information for managing reproduction of the video data by title; and

5 the controller for controlling the driver to record at least one playlist directory in a playlist directory area, each playlist directory including at least one playlist file identified by a playlist identifier in the general information file, each playlist file identifying at least one playitem, each playitem identifying
10 a clip of the video data.

17. An apparatus for reproducing a data structure for managing reproduction of at least video data, comprising:

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

15 a controller for controlling the driver to reproduce at least a portion of a general information file in a general information file area of the recording medium, the general information file including at least one playlist identifier identifying a playlist file forming a title of video data recorded on the recording medium
20 and title management information for managing reproduction of the video data by title; and

the controller controlling the driver to reproduce at least a portion of at least one playlist directory in a playlist directory area, each playlist directory including at least one playlist file
25 identified by a playlist identifier in the general information file, each playlist file identifying at least one playitem, each playitem identifying a clip of the video data.

18. A recording medium having a data structure for managing reproduction of at least video data recorded on the recording medium,
30 comprising:

a playlist area storing at least one playlist file forming a title, each playlist file identifying at least one playitem, each playitem identifying a clip of the video data, and each playlist

file including chapter management information, the chapter management information for managing reproduction of the title by chapters.

19. The recording medium of claim 18, wherein the chapter management information includes a chapter entry flag associated with each identified playitem indicating whether the identified playitem begins a chapter.

20. The recording medium of claim 18, wherein the chapter management information includes at least one playlist mark, each playlist mark including a chapter identifier indicating a chapter associated with the playlist mark and a timestamp indicating a time in the multiple reproduction path video data when the chapter begins.

21. The recording medium of claim 18, wherein each playlist file includes path management information for managing reproduction of multiple reproduction path video data recorded on the recording medium.

22. The recording medium of claim 21, wherein the path management information indicates a reproduction path to which each playitem identified by the playlist file belongs.

23. A method of recording a data structure for managing reproduction of at least video data, comprising:

recording at least one playlist file forming a title in a playlist area of a recording medium, each playlist file identifying at least one playitem, each playitem identifying a clip of the video data, and each playlist file including chapter management information, the chapter management information for managing reproduction of the title by chapters.

24. The method of claim 23, wherein the chapter management information includes a chapter entry flag associated with each identified playitem indicating whether the identified playitem begins a chapter.

25. The method of claim 23, wherein the chapter management

information includes at least one playlist mark, each playlist mark including a chapter identifier indicating a chapter associated with the playlist mark and a timestamp indicating a time in the multiple reproduction path video data when the chapter begins.

5 26. The method of claim 23, wherein each playlist file includes path management information for managing reproduction of multiple reproduction path video data recorded on the recording medium.

10 27. The method of claim 26, wherein the path management information indicates a reproduction path to which each playitem identified by the playlist file belongs.

28 A method of reproducing a data structure for managing reproduction of at least video data, comprising:

15 reproducing at least one playlist file forming a title from a playlist area of a recording medium, each playlist file identifying at least one playitem, each playitem identifying a clip of the video data, and each playlist file including chapter management information, the chapter management information for managing reproduction of the title by chapters.

20 29. The method of claim 28, wherein the chapter management information includes a chapter entry flag associated with each identified playitem indicating whether the identified playitem begins a chapter.

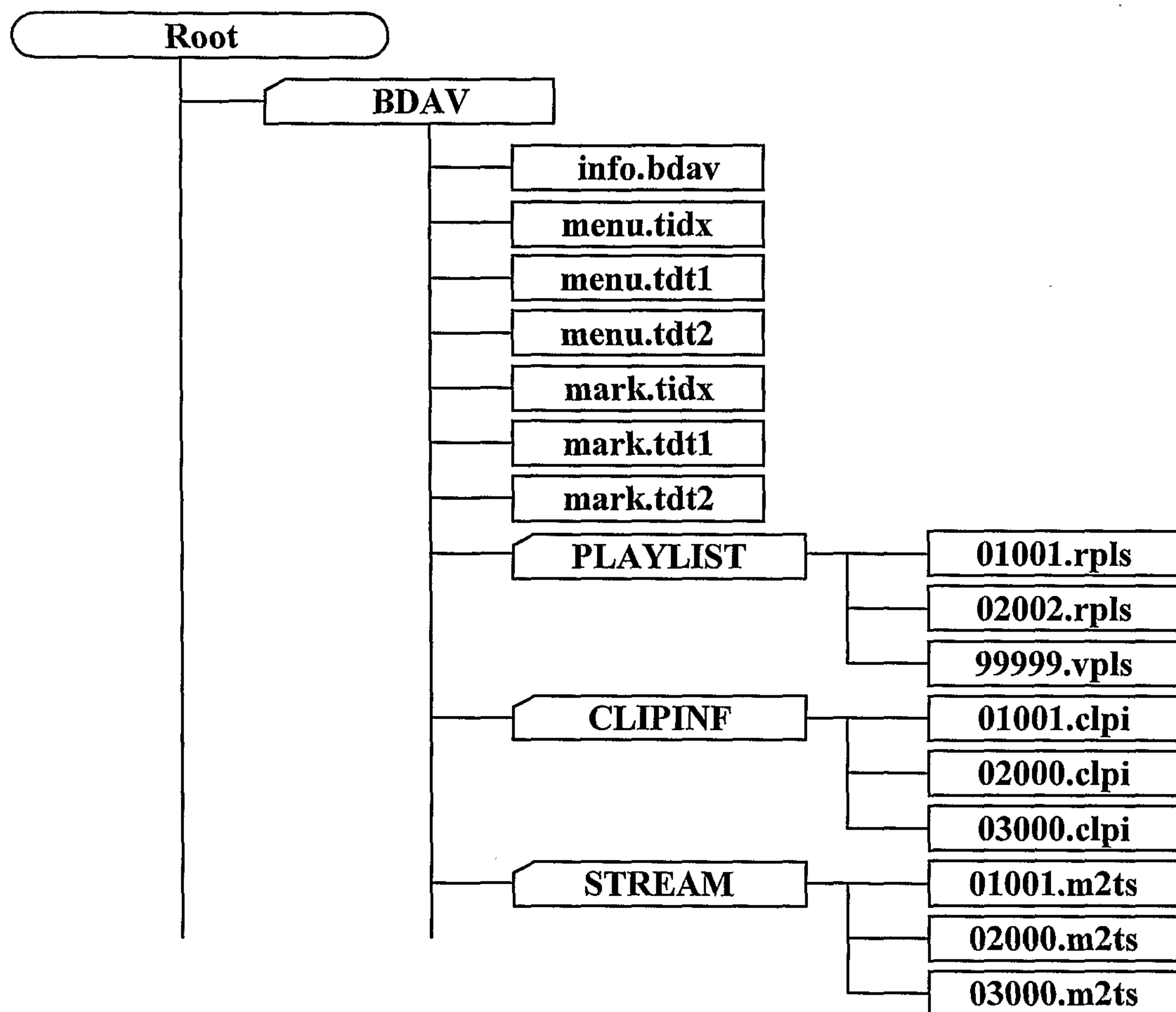
25 30. The method of claim 28, wherein the chapter management information includes at least one playlist mark, each playlist mark including a chapter identifier indicating a chapter associated with the playlist mark and a timestamp indicating a time in the multiple reproduction path video data when the chapter begins.

30 31. The method of claim 28, wherein each playlist file includes path management information for managing reproduction of multiple reproduction path video data recorded on the recording medium.

32. The method of claim 31, wherein the path management

information indicates a reproduction path to which each playitem identified by the playlist file belongs.

1/7

FIG. 1

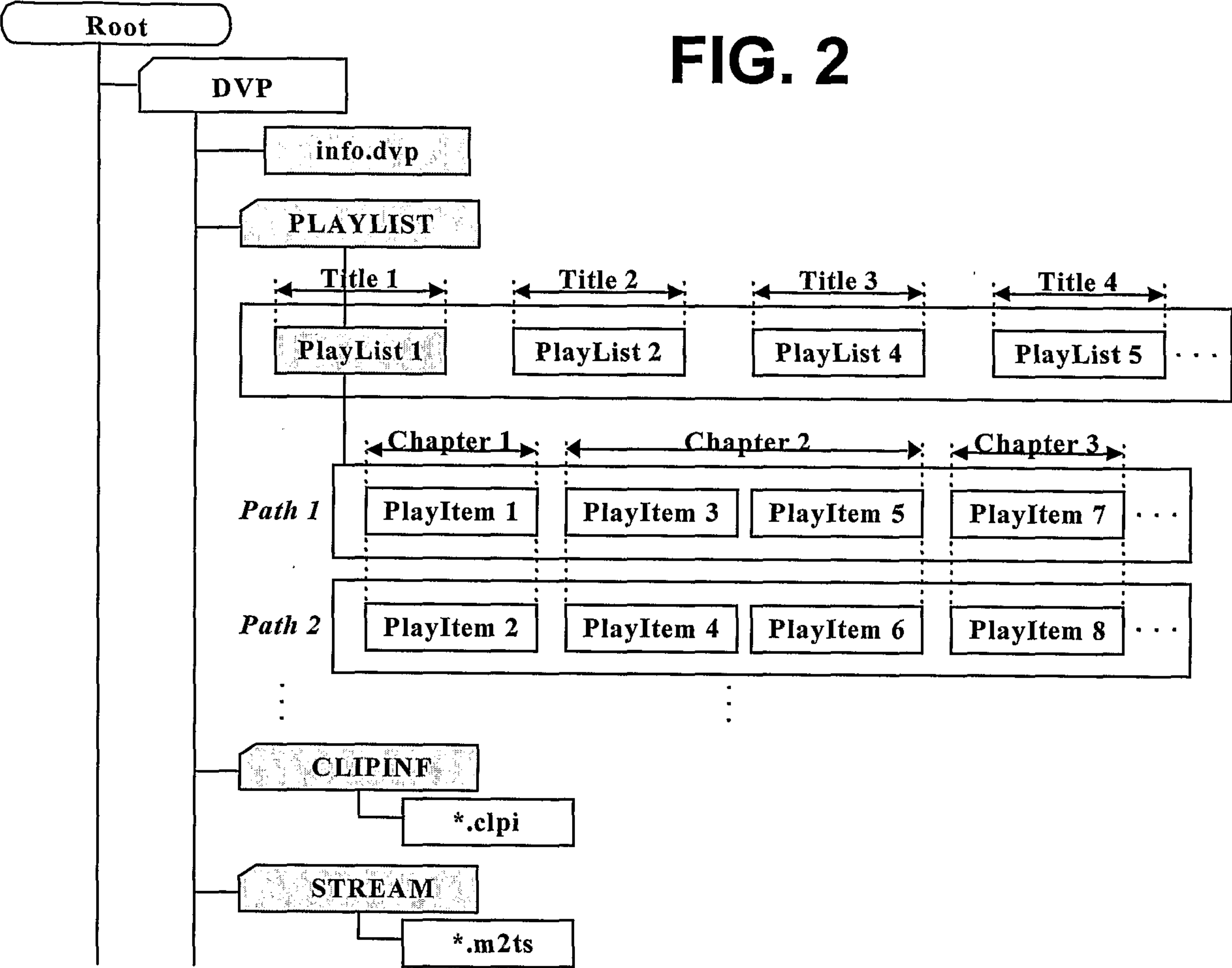


FIG. 3

info.dvp - syntax

info.dvp {
version_number
TableOfPlayLists_start_address
reserved_for_future_use
:
TableOfPlayLists(){
length
number_of_PlayLists
for(I=0; i<number_of_PlayLists; i++){
PlayList_file_name
Title_entry_flag
}
}
:

3/7

FIG. 4

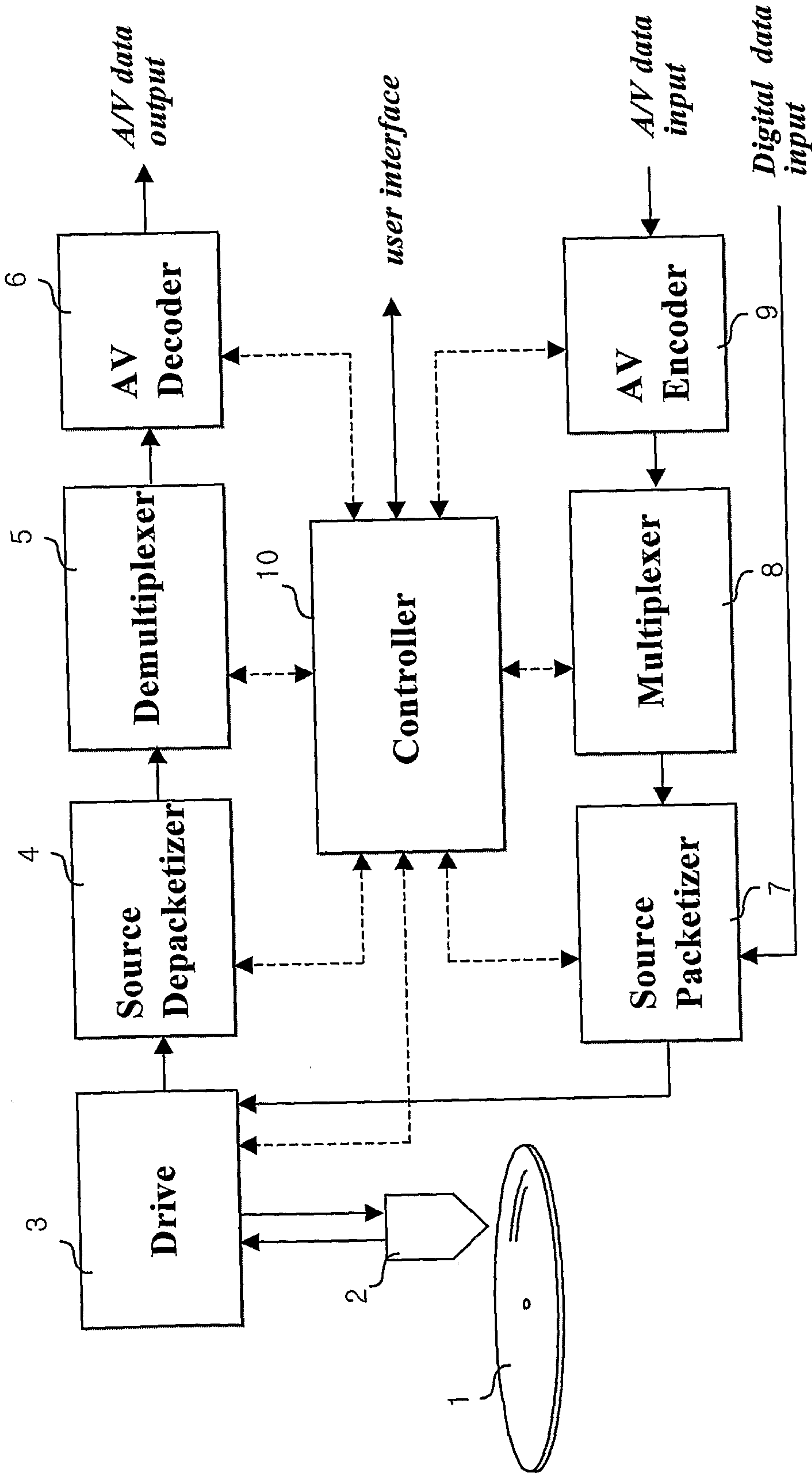
⋮
TitleEntryTable(){
length
number_of_Titles
for(I=0; i<number_of_Titles; i++){
Entry_PlayList_file_name
}
}
⋮

FIG. 5**.rpls - syntax*

xxxxx.rpls {
version_number
.....
PlayList(){
length
.....
number_of_PlayItems
for(i=0; i<number_of_Playitems; i++){
PlayItem()
⋮

PlayItem(){
length
....
Chapter_entry_flag
Path_number
....

FIG. 6



5/7

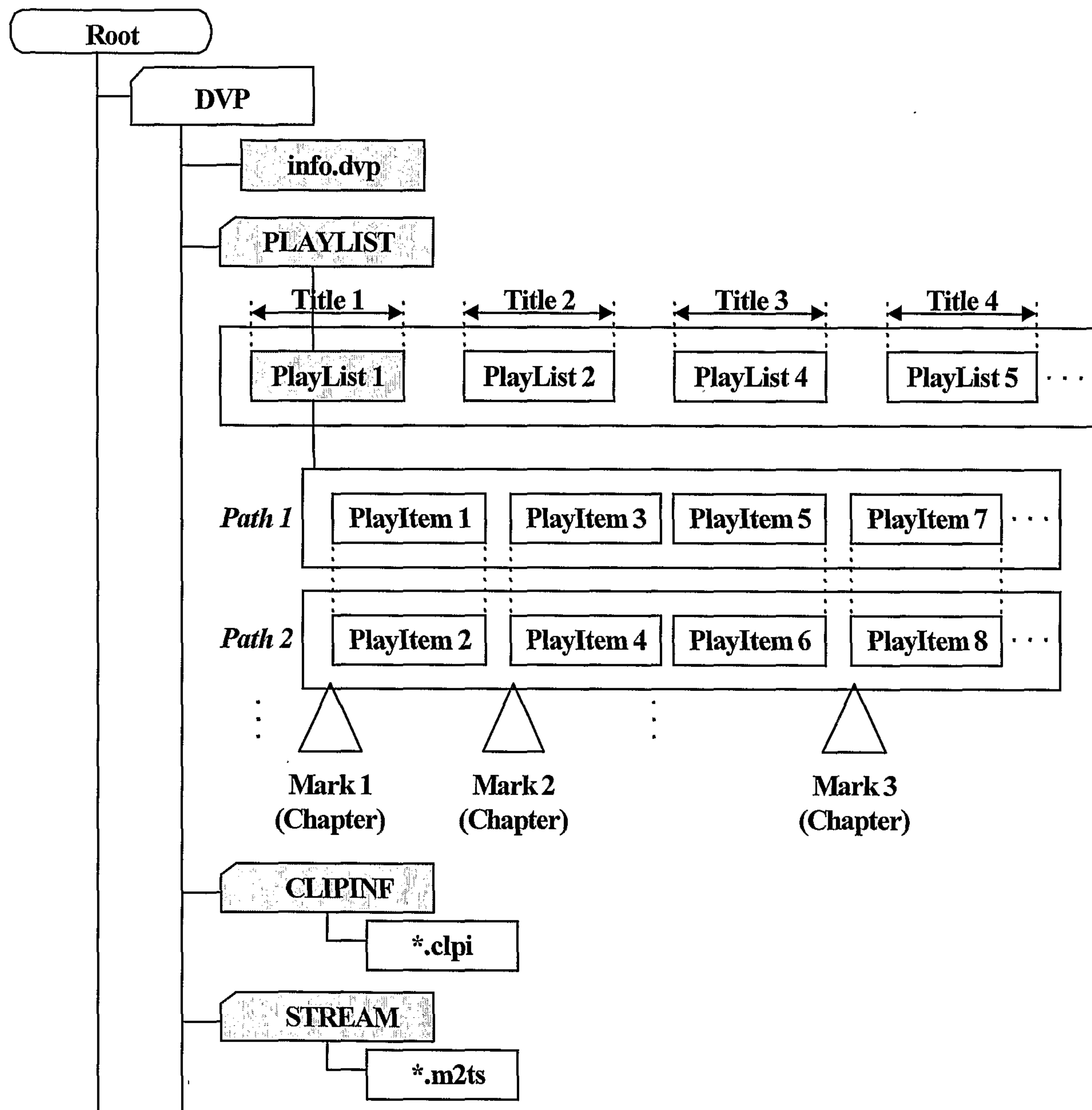
FIG. 7

FIG. 8**.rpls - syntax*

xxxxx.rpls {
version_number
.....
PlayListsMark(){
length
number_of_PlayList_marks
for(I=0; i<number_of_PlayList_marks; i++){
.....
mark_type
mark_ID
ref_to_PlayItem_id
mark_time_stamp
duration
.....
;

0x05 (Chapter-mark)

FIG. 9**.rpls - syntax*

xxxxx.rpls {
version_number
.....
Playlist(){
length
.....
number_of_PlayItems
for(i=0; i<number_of_Playitems; i++){
PlayItem()
;

PlayItem(){
length
....
Path_number
....

FIG. 10

