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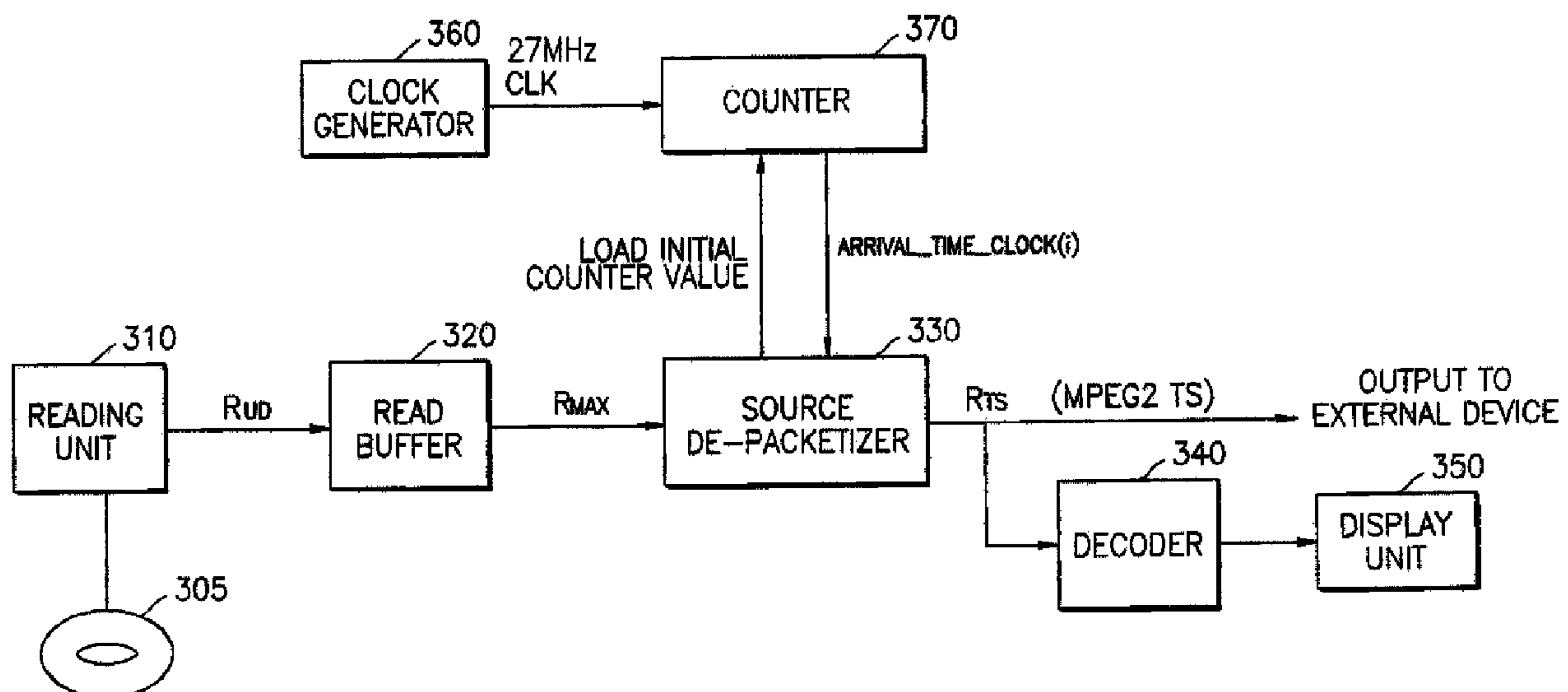
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(54) Titre : SUPPORT DE STOCKAGE DE DONNEES MULTIDIVISEES, ET LEURS METHODE ET DISPOSITIF DE REPRODUCTION

(54) Title: INFORMATION STORAGE MEDIUM STORING MULTI-ANGLE DATA AND METHOD AND APPARATUS FOR REPRODUCING THE MULTI-ANGLE DATA



(57) Abrégé/Abstract:

An apparatus and method for reproducing multi-angle data in a seamless manner, even during a change of angle, and an information storage medium on which the multi-angle data is recorded. AV data divided into clips, which are recording units, is recorded on the information storage medium. Additional information regarding jump points is recorded on a space of the information storage medium other than where the clips are recorded. The apparatus for reproducing the multi-angle data includes a reading unit which reads data from the information storage medium, and a reproducing unit which reproduces the data read by the reading unit by searching for and reproducing clips corresponding to the read data when the read data is multi-angle data, and, if there is an angle change command, reproducing clips for a new angle from a jump point of the clip for the new angle.

ABSTRACT OF THE DISCLOSURE

An apparatus and method for reproducing multi-angle data in a seamless manner, even during a change of angle, and an information storage medium on which the multi-angle data is recorded. AV data divided into clips, which are recording units, is recorded on the information storage medium. Additional information regarding jump points is recorded on a space of the information storage medium other than where the clips are recorded. The apparatus for reproducing the multi-angle data includes a reading unit which reads data from the information storage medium, and a reproducing unit which reproduces the data read by the reading unit by searching for and reproducing clips corresponding to the read data when the read data is multi-angle data, and, if there is an angle change command, reproducing clips for a new angle from a jump point of the clip for the new angle.

TITLE OF THE INVENTION

INFORMATION STORAGE MEDIUM STORING MULTI-ANGLE DATA AND METHOD AND APPARATUS FOR REPRODUCING THE MULTI-ANGLE DATA

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0002] The present invention relates to seamless reproduction of multi-angle data, and more particularly, to an apparatus and method for guaranteeing seamless reproduction of multi-angle data, even during a change of angle, and an information storage medium on which the multi-angle data is recorded.

2. Description of the Related Art

[0003] Data obtained by photographing a scene at various angles and encoding the result is called multi-angle data. While a viewer watches a scene by reproducing contents containing the multi-angle data, if the viewer wants to see the scene photographed at a different angle, the viewer inputs an angle change command to a reproducing apparatus. After receiving the

command, the reproducing apparatus reproduces data for a new angle. To guarantee seamless reproduction during angle change, the multi-angle data is stored using an interleaving method in which the multi-angle data is divided into units having a specified size and the units are recorded in an alternating fashion. To search for and reproduce data blocks for one angle in the interleaved multi-angle data, additional information for tracing data blocks by angles is recorded within a video bit stream.

[0004] Arrival time information, such as an arrival time stamp (ATS), is added to each angle data of the multi-angle data. When an angle data is reproduced, it is output and reproduced according to the ATS. In general, since an independent ATS is added to the angle data, seamless reproduction (i.e., without pause), cannot be ensured during change of angle.

BRIEF SUMMARY

[0005] The present invention provides an apparatus and method for continuously reproducing multi-angle data, even during a change of angle, and an information storage medium on which the multi-angle data is recorded.

[0006] According to an aspect of the present invention, there is provided an information storage medium on which AV data for a plurality of angles is recorded, including at least one clip, which is a recording unit of the AV data for an angle. The AV data have a plurality of jump points which are access points which enable jumping from the angle to a different angle, and AV data having the same jump points have the same presentation time information.

[0007] According to another aspect of the present invention, there is provided an information storage medium on which AV data for a plurality of angles is recorded, including at least one clip, which is a recording unit of the AV data for an angle. The AV data has a plurality of jump points which are access points which enable jumping from the angle to a different angle, the AV data have data which provides a reference time, and AV data having the same jump points have the same arrival time information as AV data that provides a reference time.

[0008] According to another aspect of the present invention, there is provided an information storage medium on which AV data for a plurality of angles is recorded, including at least one clip which is a recording unit of the AV data for an angle. The AV data has a plurality of jump points which are access points which enable jumping from the angle to a different angle, the AV data have data which provides a reference time and arrival time information of subsequent AV data, and AV data having the same jump points have arrival time information that is between arrival time information of AV data that provides a reference time and arrival time information of subsequent AV data.

[0009] According to still another aspect of the present invention, there is provided an apparatus for reproducing data from an information storage medium on which AV data divided into clips is recorded, and additional information regarding jump points is recorded separately from the clips. The apparatus includes: a reading unit which reads the AV data from the information storage medium; and a reproducing unit which reproduces the data read by the

reading unit by searching for and reproducing a clip corresponding to the read data and, when a command to change to a new angle is received, reproducing a clip for the new angle from a jump point of the clip for the new angle. Each clip has a plurality of jump points which are access points which enable jumping from the angle to a different angle, and the AV data having the same jump points have the same presentation time information.

[0010] According to yet another aspect of the present invention, there is provided a method of reproducing data from a storage medium on which AV data divided into clips is recorded, and additional information regarding jump points is recorded separately from the clips. The method includes: reading the AV data from the storage medium; reproducing the read data; and receiving a command to change from an angle to a new angle. The reproducing reproduces a clip corresponding to the read data and, when a command to change to a new angle is received, the reproducing reproduces a clip for the new angle from a jump point of the clip for the new angle. Each clip has a plurality of jump points which are access points which enable jumping from the angle to the new angle, and AV data having the same jump points have the same presentation time information.

[0011] According to another aspect of the present invention, there is provided a computer-readable recording medium on which a program code for causing a computer to perform a method of reproducing data from a storage medium on which AV data divided into clips is recorded, and additional information regarding jump points is recorded separately from

the clips. The method includes: reading the AV data from the storage medium; reproducing the read data; and receiving a command to change from an angle to a new angle. The reproducing reproduces a clip corresponding to the read data and, when a command to change to a new angle is received, the reproducing reproduces a clip for the new angle from a jump point of the clip for the new angle. Each clip has a plurality of jump points which are access points which enable jumping from the angle to the new angle, and AV data having the same jump points have the same presentation time information.

[0012] According to still another aspect of the present invention, there is provided a method of seamlessly reproducing multi-angle data including: completing reproduction of angle data for a first angle; changing the angle to be reproduced; and reproducing angle data for a second angle. The angle data have a plurality of jump points which are access points which enable jumping from the first angle to the second angle, and angle data having the same jump points have the same presentation time information.

[0013] Additional and/or other aspects and advantages of the present invention will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] These and/or other aspects and advantages of the present invention will become apparent and more readily appreciated from the following detailed description, taken in conjunction with the accompanying drawings of which:

FIG. 1 is a diagram of an angle block on which multi-angle data is recorded;

FIG. 2 is a diagram of angle data and used for explaining a process of receiving an angle change command, and jumping to another angle data;

FIG. 3 is a block diagram of an apparatus for reproducing a motion picture experts group (MPEG)-2 transport stream (TS) from a storage medium according to an embodiment of the present invention;

FIG. 4 is a diagram of clips for angles; and

FIG. 5 is a diagram illustrating a decoding process according to an arrival time clock (ATC) and a system time clock (STC) during seamless change of angle according to an embodiment of the present invention.

DETAILED DESCRIPTION OF EMBODIMENTS

[0015] Reference will now be made in detail to embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to the like elements throughout. The embodiments are described below in order to explain the present invention by referring to the figures.

[0016] FIG. 1 is a diagram of an angle block in which multi-angle data is stored.

[0017] Referring to FIG. 1, an angle block 100 is constructed such that a plurality of cells are arranged in parallel. These cells can be reproduced only one at a time by a user's selection.

The cells that form the angle block have the same reproduction time and correspond to a specific angle. If the cells, which are units of reproduction, form an angle block, data for a specific angle is divided into interleaved units (ILVUs) and recorded on video objects (VOBs), which are recording units, and cells, which are recording units, using the interleaving method.

[0018] FIG. 2 is a diagram of angle data and used for explaining a process of receiving an angle change command, and jumping to another angle data.

[0019] Each angle data comprises ILVUs. The maximum number of angles supported by a Digital Video Disc (DVD) is nine. Referring to FIG. 2, first angle data is AGL_C #1 210, second angle data is AGL_C #2 220, ... ninth angle data is AGL_C #9 230. To reproduce the first or ninth angle data while the second angle data AGL_C #2 220 is being reproduced, a jump is made to a pertinent ILVU of the first or ninth angle data. To seamlessly reproduce video data even if a user issues a command to change angles at a certain time during reproduction of an ILVU of the second angle data, it is necessary to complete reproduction of the currently reproduced ILVU of the second angle data and then jump to the desired ILVU of the first or ninth angle data.

[0020] FIG. 3 is a block diagram of an apparatus for reproducing a motion picture experts group (MPEG)-2 transport stream (TS) from a storage medium.

[0021] A reading unit 310 reads AV data from a storage medium 305 on which the AV data is stored in the form of an MPEG-2 TS. A read buffer 320 temporarily stores the data at a read data rate R_{ud} . A source de-packetizer 330 reads the data stored in the read buffer 320 at a read data rate R_{max} of the read buffer 320, removes an arrival time stamp (ATS) from the data, and outputs the data in the form of MPEG-2 TS packets. A decoder 340 decodes an MPEG-2 TS according to a presentation time stamp (PTS) contained in the MPEG-2 TS packets, and displays the result on a display unit 350.

[0022] The AV data recorded on the storage medium 305 is packet data formed by coding audio or video data and breaking it up into packets having a specified size according to a specified transmission method. For example, if the data is transmitted in the form of the MPEG-2 TS according to ISO/IEC 13818-1 standards, the specified size of the packets is 188 bytes. As a further example, if the data is transmitted using an asynchronous transfer mode (ATM) method, the specified size of the packets is 53 bytes. The packet data may be transmitted over, for example, a cable or a local area network (LAN).

[0023] When the packet data is transmitted in digital broadcasting, transmission time intervals between the packet data are not constant. That is, a transmitter transmits the packet data at appropriate time intervals considering a buffering state of a receiver, and the receiver decodes and displays the packet data immediately after receiving the packet data.

[0024] However, when the packet data is recorded on a storage medium, it is inefficient to store it at the transmission time intervals. Accordingly, transmission time information is added to the packet data. The inconstant time intervals at which the packet data is transmitted are important when the stored packet data is output to the decoder. This is because a buffer of the receiver overflows or underflows if the packet data is transmitted to the decoder regardless of the transmission time information. Accordingly, a transmission system is constructed such that the transmitter adjusts the time intervals between the packet data considering the state of the buffer in the receiver and transmits the packet data at the adjusted time intervals.

[0025] If the packet data is stored on the storage medium, not in the transmission system, it is necessary to add arrival time information to all the packets and output the packets to the reproducing apparatus according to the information. To this end, the reproducing apparatus includes a clock generator 360 which generates a clock of a specified frequency. The clock generator 360 generates clock signals at, by way of non-limiting example, 27MHz. The reproducing apparatus also includes a counter 370 which counts the clock signals, e.g., 27MHz clock signals, generated by the clock generator 360. The counter 370 receives an initial counter value from the source de-packetizer 330 to set an initial value, and then, counts the 27MHz clock signals and transmits arrival time information to the source de-packetizer 330.

[0026] FIG. 4 is a diagram of clips for angles.

[0027] Referring to FIG. 4, information about jump points is contained in clip information. Jump points located at the same positions have the same PTS value. To continuously (i.e., seamlessly) reproduce video data, even during a change of angle, the decoder 330 reads and decodes data for a desired angle having the same time as data for a current angle, with reference to the PTS value contained in the MPEG-2 TS, and displays the decoded data through the display unit 350.

[0028] The jump points have position information about data for a first angle for a second angle. Additional information regarding intervals and positions of the jump points is recorded in a separate space of the storage medium and is used for searching for a new position of data to be reproduced by performing a seamless reproduction process during a change of angle. Clips which should be reproduced at the same time have the same PTS value. Thus, arrival time information of packets input from the source de-packetizer to the decoder allows seamless reproduction of video data during a change of angle.

[0029] That is, to continuously reproduce AV data, even during a change of angle, ATC values as well as STC values are consistently maintained. When a user changes angles and a new clip is input from the read buffer to the source de-packetizer, the reproducing apparatus does not reset a counter for an arrival time clock with reference to a first ATS value of the newly read clip. If the counter is reset with reference to the first ATS value of the new clip, a

discontinuity occurs in the ATC and the MPEG-2 TS data input to a buffer in the decoder underflows or overflows, and seamless reproduction is not assured.

[0030] Accordingly, the packet data for angles in the packet data structure for seamless reproduction have appropriate ATS values, and even if the packet data is changed, the reproducing apparatus does not reset the counter and continuously operates according to a preset ATC.

[0031] A clip of data for one angle comprises several small ILVUs. In the case where there are clips for many angles of one scene, the clips are recorded in an interleaved manner. In this case, an ILVU is a unit of jumping, and a starting point of each ILVU is called a jump point. To reproduce a clip for one angle, a jump is made to an ILVU of the angle. The jump point is used to search for a subsequent ILVU after completion of reproduction of the current ILVU. The jump point is also used during a change of angle.

[0032] The jump point information about clips which are reproduced at the same time has the same PTS value and the same ATS value so as to prevent discontinuity. It is also possible that the jump point information has a value between the same ATS value and an ATS value of a subsequent jump point to achieve seamless reproduction.

[0033] FIG. 5 is a diagram illustrating a decoding process according to an ATC and an STC during a seamless change of angle.

[0034] Referring to FIG. 5, even though the angle is changed during AV data reproduction, a continuous decoding process is performed without causing discontinuity in the ATC and STC. That is, even when a new clip is input in the reproducing apparatus of FIG. 3, the counter is not reset with reference to ATS and STC values of the new clip. In order for the reproducing apparatus to continuously reproduce the video, the same jump points must have the same PTS values. To this end, an ATS value of a packet to which a jump needs to be made should be equal to an ATS value of a first TS packet, or a value between the ATS value of the first packet and the ATS value of the next jump point.

[0035] The present invention may be embodied in a general purpose digital computer by running a program from a computer-readable medium, including but not limited to storage media such as ROMs, RAMs, CD-ROMs, magnetic storage media, floppy discs, optical storage media, and carrier waves (e.g., transmission over the Internet). The computer-readable recording medium can be distributed among a network of computers, or made accessible to computers connected to the network, so that the method of the present invention may be stored as a computer-readable code and executed in a distributed computing environment.

[0036] As described above, the apparatus and method according to the present invention can seamlessly reproduce multi-angle data by first completing the reproduction of angle data photographed at one angle, changing the angle, and reproducing angle data photographed at the new angle.

[0037] Although a few embodiments of the present invention have been shown and described, the present invention is not limited to the described embodiments. Instead, it would be appreciated by those skilled in the art that changes may be made in these embodiments without departing from the principles and spirit of the invention, the scope of which is defined by the claims and their equivalents.

CLAIMS:

1. An information storage medium on which audio and/or video data for a plurality of angles is recorded, comprising:

at least one clip, which is a recording unit of the audio and/or video data for an angle,

wherein the audio and/or video data has a plurality of jump points which are access points which enable jumping from the angle to a different angle, the audio and/or video data having the same jump points have the same presentation time information and information regarding the plurality of jump points is recorded separately from the at least one clip.

2. The information storage medium of claim 1, wherein the audio and/or video data having the same jump points have the same arrival time information.

3. The information storage medium of claim 1, wherein the audio and/or video data having the same jump points have arrival time information that is between arrival time information of a first TS packet in the audio and/or video data having the same jump points and arrival time information of subsequent audio and/or video data having the next jump point.

4. The information storage medium of claim 2, wherein the arrival time information is an arrival time stamp value.

5. The information storage medium of claim 3, wherein the arrival time information is an arrival time stamp value.

6. An apparatus for reproducing data from an information storage medium on which audio and/or video data divided into clips is recorded, and additional information regarding jump points is recorded separately from the clips, comprising:

a reading unit which reads the audio and/or video data from the information storage medium; and

a reproducing unit which reproduces the data read by the reading unit by searching for and reproducing a clip corresponding to the read data and, when a command to change to a new angle is received, reproducing a clip for the new angle from a jump point of the clip for the new angle,

wherein each clip has a plurality of jump points which are access points which enable jumping from the angle to a different angle and the audio and/or video data having the same jump points have the same presentation time information.

7. The apparatus of claim 6, wherein the clips are recording units.

8. The apparatus of claim 6, wherein the audio and/or video data having the same jump points has the same arrival time information.

9. The apparatus of claim 6, wherein the audio and/or video data having the same jump points has arrival time information that is between arrival time information of a first TS packet in the audio and/or video data having the same jump points and arrival time information of subsequent audio and/or video data having the next jump point.

10. The apparatus of claim 8, wherein the arrival time information is an arrival time stamp value.

11. The apparatus of claim 6, wherein the reproducing unit maintains a counter value contained in the reproducing apparatus when the angle change command is received and audio and/or video data for the new angle is reproduced.

12. The apparatus of claim 6, further comprising:
a buffer which temporarily stores the read data read by the read unit;

a source de-packetizer which reads the data stored in the buffer, removes arrival time stamp information from the data, and outputs the data.

13. The apparatus of claim 12, further comprising:

a clock generator which generates a clock signal; and
 a counter which sets an initial counter value as an initial value,
 counts the clock signals, and transmits arrival time information to the source
 de-packetizer,
 wherein the source de-packetizer provides the initial counter value.

14. The apparatus of claim 6, wherein the audio and/or video data
 recorded on the storage medium is packet data formed by coding audio or video
 data and breaking up the audio or video data into packets having a specified size
 according to a specified transmission method.

15. The apparatus of claim 14, wherein the data is transmitted in an
 MPEG-2 transmission stream according to ISO/IEC 13818-1 standards and the
 specified size of the packets is 188 bytes.

16. The apparatus of claim 14, wherein, when the data is transmitted
 using an asynchronous transfer mode (ATM) method, the specified size of the
 packets is 53 bytes.

17. The apparatus of claim 6, wherein the data is transmitted over one
 of a cable and a local area network (LAN).

18. A method of reproducing data from a storage medium on which
 audio and/or video data divided into clips is recorded, and additional information
 regarding jump points is recorded separately from the clips, comprising:

reading the audio and/or video data from the storage medium;
 reproducing the read data; and

wherein the reproducing reproduces a clip corresponding to the
 read data and, when a command to change to the new angle is received, the
 reproducing reproduces a clip for the new angle from a jump point of the clip for
 the new angle, and

wherein each clip has a plurality of jump points which are access
 points which enable jumping from the angle to the new angle, the audio and/or
 video data having the same jump points have the same presentation time
 information.

19. The method of claim 18, wherein the audio and/or video data having the same jump points has the same arrival time information.

20. The method of claim 18, wherein the audio and/or video data having the same jump points has arrival time information that is between arrival time information of a first TS packet in the audio and/or video data having the same jump points and arrival time information of subsequent audio and/or video data having the next jump point.

21. The method of claim 18, wherein the arrival time information is an arrival time stamp value.

22. The method of claim 18, wherein the read data reproducing step maintains a counter value contained in a reproducing apparatus when the angle change command is received.

23. A computer-readable recording medium on which a program code for causing a computer to perform a method of reproducing data from a storage medium on which audio and/or video data divided into clips is recorded, and additional information regarding jump points is recorded separately from the clips, the method comprising:

reading the audio and/or video data from the storage medium;

reproducing the read data; and

receiving a command to change from an angle to a new angle,

wherein the reproducing reproduces a clip corresponding to the read data and, when a command to change to a new angle is received, the reproducing reproduces a clip for the new angle from a jump point of the clip for the new angle, and

wherein each clip has a plurality of jump points which are access points which enable jumping from the angle to the new angle, and the audio and/or video data having the same jump points have the same presentation time information.

FIG. 1

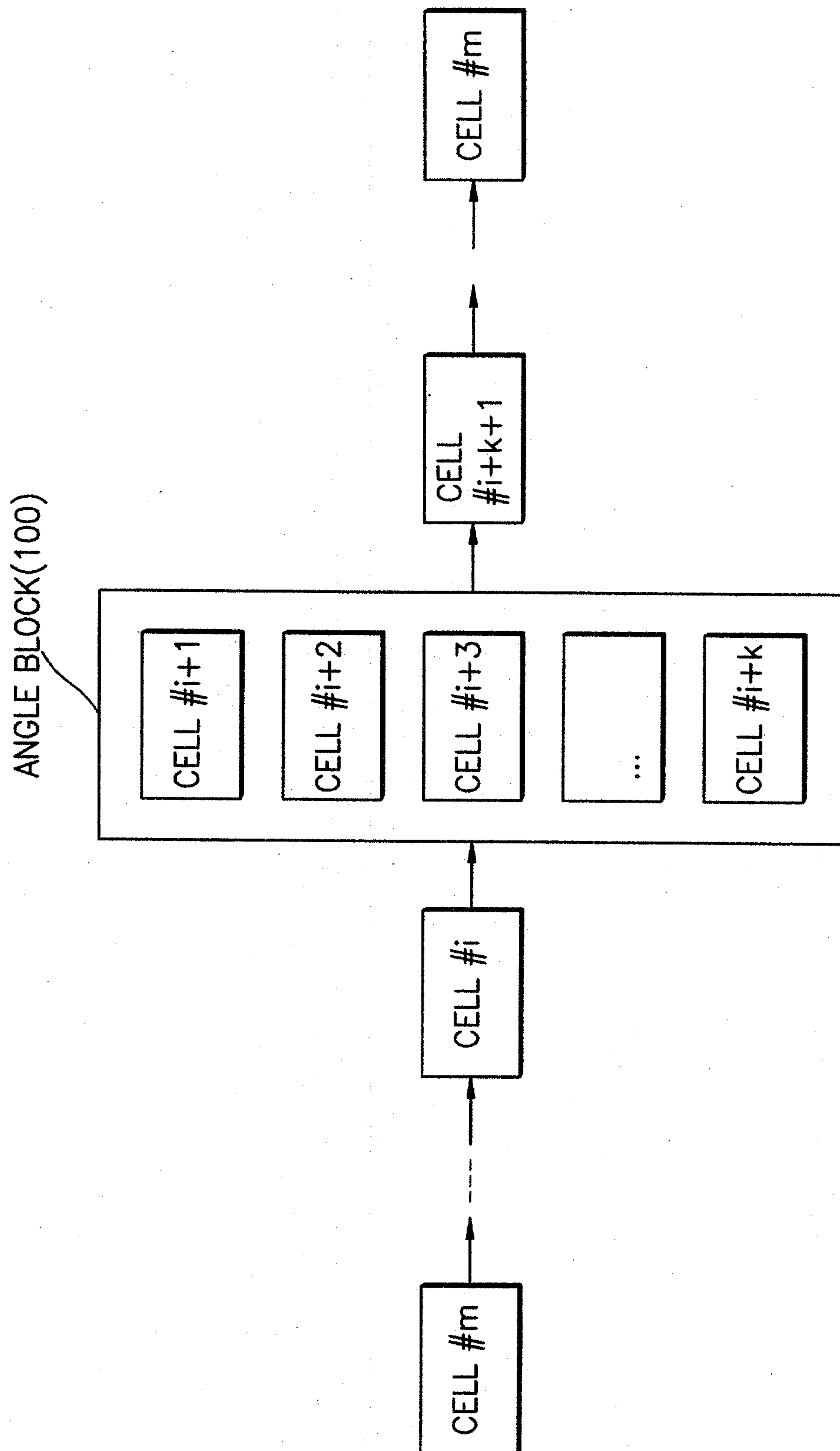


FIG. 2

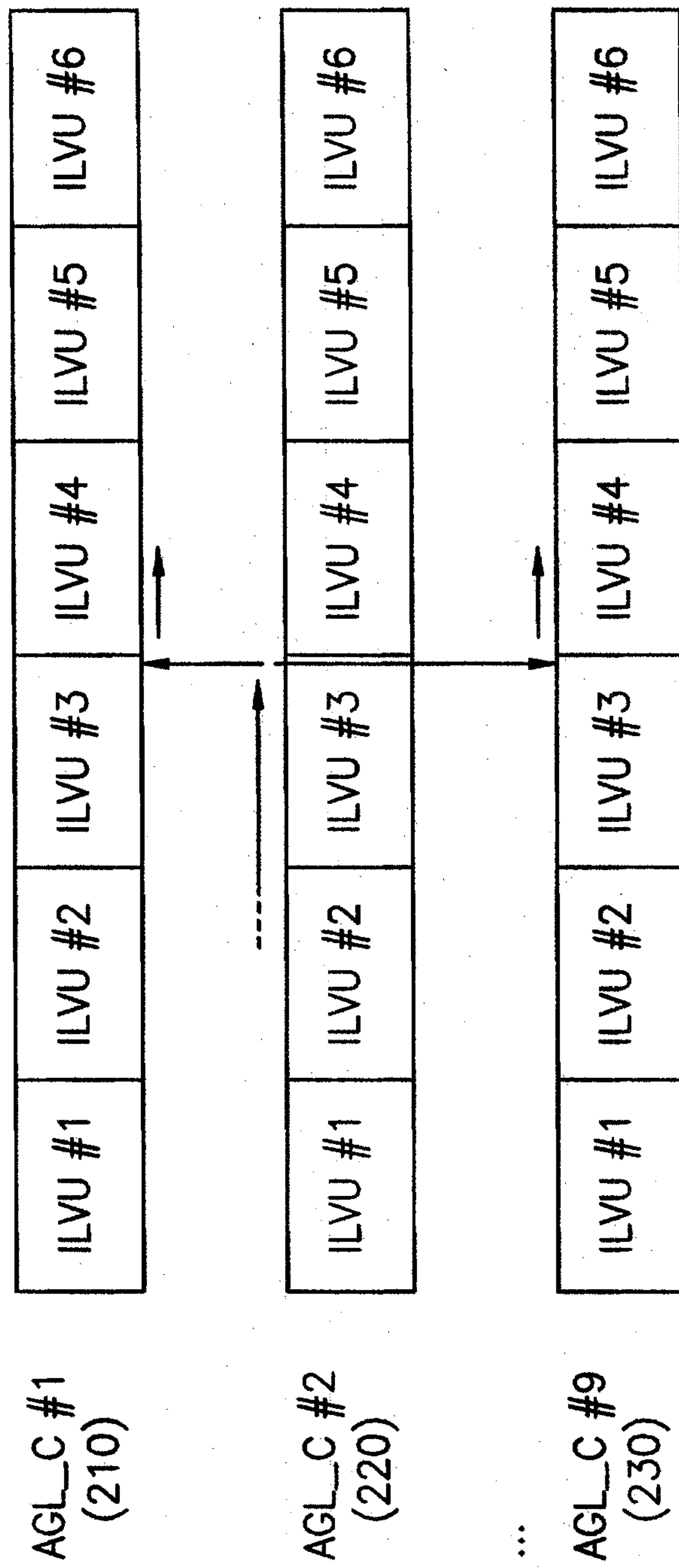


FIG. 3

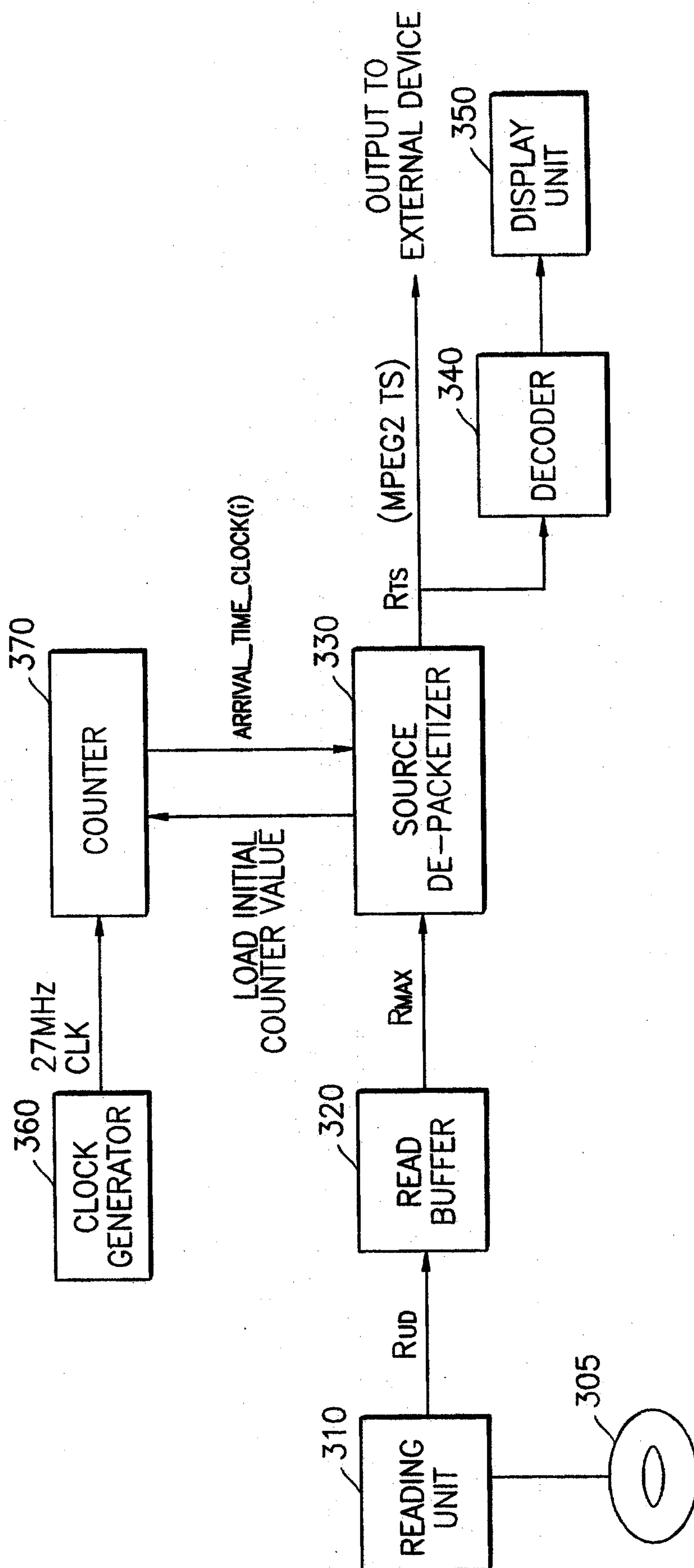


FIG. 4

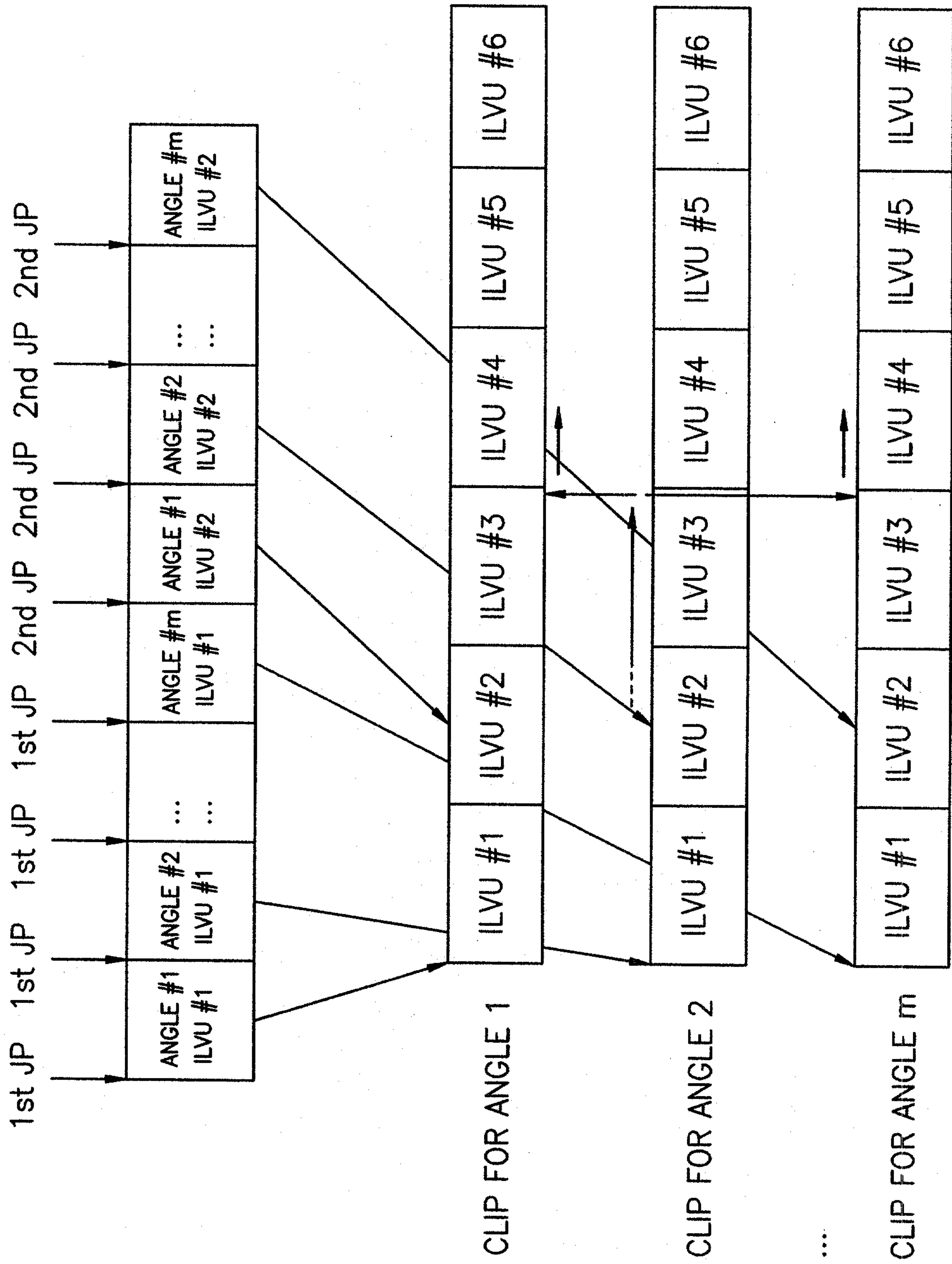


FIG. 5

