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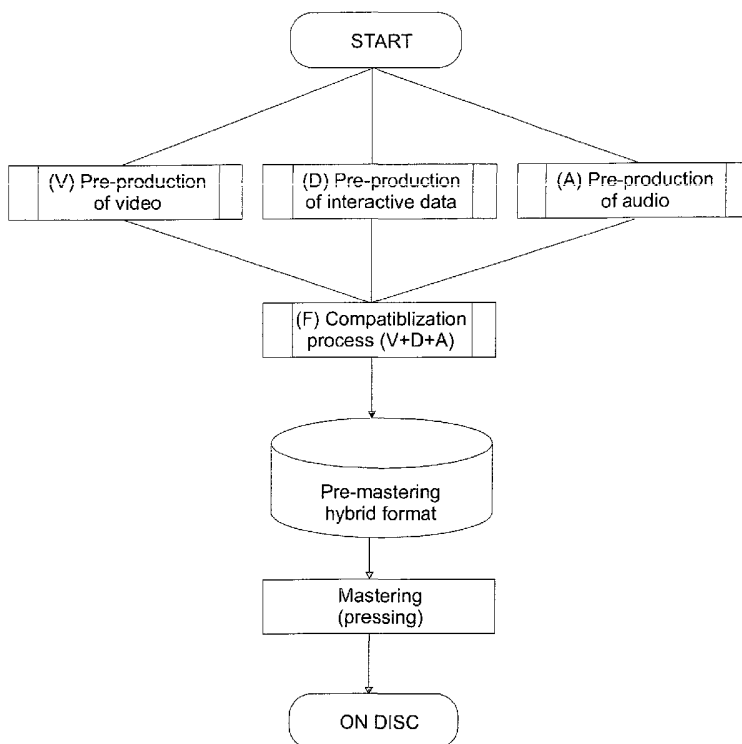
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(54) Title: MULTI-FORMAT PRE-PRODUCTION AND RECORDING OR HYBRID AUDIO, VIDEO AND INTERACTIVE DATA RECORDING PROCESS ON A SINGLE DIGITAL OPTICAL CARRIER



(57) Abstract: The present invention refers to a method for pre-production of audio, video and interactive data, that allows the recording of audio, video and interactive data in one single flat optic reading medium in plural recording formats, which may have the individual contents thereof played back in various apparatuses that perform digital optic readout of audio, video or data, which configures the resource of multiple format recording or hybrid recording of this product allowing the optical discs recorded using this technology to be played back in digital optic readout apparatuses of specific formats for audio, video or interactive data.

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**MULTI-FORMAT PRE-PRODUCTION AND RECORDING OR HYBRID  
AUDIO, VIDEO AND INTERACTIVE DATA RECORDING PROCESS ON A  
SINGLE DIGITAL OPTICAL CARRIER**

5 Field of the Invention

The present invention refers to a method for pre-production of audio, video and interactive data, allowing to record audio, video and interactive data in one sole optically readable flat medium using plural recording formats, whereof the individual contents may be played back in various apparatuses that perform digital optic readout of audio, video or data, which configures the multi-format or hybrid recording resource of this product allowing the optical discs recorded using this technology to be read in digital optic apparatuses of specific formats for audio, video or interactive data.

Prior Art

15 In the current market, there exist specific digital optic reading apparatuses for each type of information, where such information is presented in the form of audio, video or data. These apparatuses use media with different chemical and structural compositions, preventing the information content of these media to be fully shared by these reading apparatuses.

20 Therefore, there is a need of providing a medium that may solve the problem of the prior art, and such is the object of the present invention.

The Invention

25 Therefore, the present invention provides a method of pre-production and multi-format or hybrid recording of audio, video and interactive data in one sole flat digital optic readout medium, for the purpose of obtaining a flat optic medium containing audio, video and interactive data, recorded in multiple formats, allowing the various reading apparatuses existing in the market to identify the information compatible with their playback system and to execute the same;

Thus, there is provided a method of pre-production and multi-format recording or hybrid recording of audio, video and interactive data in one sole flat digital optic reading medium, characterized by comprising the steps of;

pre-production of the desired audio, such that the audio, originating from various sources, is captured by the computer, using a digital sound board, and is stored in a digitized audio file that is submitted to computer programs for audio treatment, in order to correct problems related to equalization, noise and other faults, there being generated the audio matrix in a file that will be used in the subsequent steps of the process, where the audio matrix in a file receives two distinct types of treatment, one intended to use the audio in a manner compatible with the CD-DA (Compact Disc Digital Audio) standard and the other being intended to render the same compatible to be multiplexed with its respective content in digital video.

pre-production of the desired video, such that the video is captured into the computer by means of a video capture board and is recorded in a digital video file of MPEG standard, there being performed the video editing, whereby will be applied all the editing effects such as the addition of captions, transitions and video filters, that will vary according to the scope of the final product, there being performed thereupon the multiplexing (joining) of the audio with content only in digital video, which will generate the file known as System MPEG;

pre-production of the interactive data such that, depending on the scope of the final product, there are stored in a format compatible with the CD-ROM (Compact Disc Read Only Memory) standard, the programs that allow the playback of the data relative to the pre-production of the desired audio and to the pre-production of the desired video, in addition to other application programs for data processing;

compatibilization of the video, the data and the audio, in order to make possible the creation of the ISO 9660 image in mixed mode type 2 (mixed

mode 2), which will allow the various playback apparatuses in the market (CD Player, DVD/VCD Player, DVD-ROM, D-ROM etc.), to identify the information compatible with their playback system and to execute the same;

pre-mastering in hybrid format in order to perform the “burn recording” of the ISO 9660 image generated in the step of compatibilization of the video, the data and the audio; and

mastering or pressing the CD in order to allow the reading thereof in CD Player and DVD/VCD Player type apparatuses.

As the final result of this process there are obtained interactive products with various applications among the entertainment, training, education and marketing fields.

#### Brief Description of the Drawings

The method according to the invention will be better understood by means of the description that follows with reference to the attached drawings, wherein:

Figure 1 illustrates a flow diagram type scheme of the invention steps for obtaining the medium that constitutes the object of the invention;

Figure 2 illustrates the audio pre-production of the method according to the present invention;

Figure 3 illustrates the video pre-production of the method according to the present invention; and

Figure 4 illustrates the interactive data pre-production of the method of the present invention.

#### Description of the Invention Relatively to the Figures

There will be described in the following the method of pre-production and multi-format recording or hybrid recording of audio, video and interactive data in one sole flat digital optic reading medium, for the purpose of obtaining a flat optic medium containing audio, video and interactive data, recorded in multiple formats.

As illustrated in Figure 1, in the method according to the invention there are used six distinct steps, to wit:

1. Audio pre-production;
2. Video pre-production;
- 5 3. Interactive data pre-production;
4. A process to obtain compatibility between the video, the data and the audio;
5. Pre-mastering in hybrid format, and
6. Mastering or pressing.

10 Step 1 – Audio pre-production

As illustrated in Figure 2, initially the audio intended to be used, originating from various sources, must be received by the computer, by means of a standard digital sound card of 24 bits or above, and must be stored in a file.

Subsequently, the digitized audio file is processed by computer  
15 programs for audio treatment, that will correct problems related to equalization, noise and other faults. At this stage there is generated the audio matrix in a file, which will be used in subsequent steps. At this point, the audio matrix in a file undergoes two distinct types of treatment, one intended for use of the audio to  
20 render the same compatible with the CD-DA (Compact Disc Digital Audio) standard, as shown in step 1.1 below, and another that will be used to render the same compatible with its respective content in digital video as shown in step 1.2 below.

Step 1.1 – Compatibilization with the CD-DA standard

The audio matrix in a file is processed by an audio treatment  
25 program, where its audio frequency is set to 44.100 Hz, its transfer rate (bit rate) is set to 128 Kb/s (kilobits per second) and its resolution is set to 16 bits.

Thereafter, the altered file is recorded in WAV format (Window Audio File Format), which will be used later in the step of compatibilization of the video, the data and the audio.

### Step 1.2 – Compatibilization for multiplexing with digital video

The audio matrix in a file is processed by an audio treatment program, where its channel format is defined in “joint stereo”, its audio frequency is set to 44.100 Hz, its transfer rate (bit rate) is set to 112 Kb/s (kilobits per second) and its resolution is set to 16 bits.

Thereafter, the altered file is recorded in WAV format (Windows Audio File Format) that will be subsequently used in step 2.

### Step 2 – Video pre-production (Figure 3)

The video should be captured into the computer by means of a professional vide capture board and should be recorded in a MPEG standard digital video file.

At this point there should be performed the video editing, whereby there should be applied all the editing effects such as the addition of captions, transitions and video filters, that will vary according to the scope of the final product.

Subsequently there is performed the multiplexing (joining) of the MPEG digital video file with the digital audio file obtained in step 1.2, which will generate the file known as System MPEG, which will have its GOP structure altered for optimization of its compression rate, allowing to record, in a 74-minute CD (Compact Disc), up to 128 minutes of video, which exceeds, for example, the storage capacities provided in standards such as the VCD (Video Compact Disc) and SVCD (Super Video Compact Disc). The alteration of the said GOP structure is described in step 2.1 below.

#### Step 2.1 – Alteration of the GOP (Group of Pictures) structure

of the System MPEG file

This specific process aims to obtain better video quality, however maintaining high video compression rates, which allows greater video storage (up to 128 minutes) in media with a physical limitation of a maximum of 74 minutes.

For this purpose, the System MPEG file should have the following initial characteristics:

System MPEG Version 1.0 (MPEG-1);

Video size: 352 X 240 pixels (video resolution measurement unit);

5 Screen proportion standard: 4:3 525 lines NTSC (National Television System Committee);

Video speed: 29.97 frames per second to obtain greater quality, or 23.976 frames per second to obtain greater compression;

Variable bit transfer rate: minimum of 300 Kb/s and maximum of 1,150 Kb/s.

10 Upon contemplating the technical requirements described above, there are performed the following alterations in the GOP structure of the digital video, as per the comparative tables below:

Comparative table of Quality X Compression

	I - Picture	P - Picture	B - Picture	Quality/compression
MPEG-1 Video Format	1	5	2	Standard / Standard
Video standard of desired medium 1	1	12	3	Good / Low
Video standard of desired medium 2	1	10	5	Medium / Medium
Video standard of desired medium 3	1	15	10	Low / Good

I-Picture = Intra coded frames; P-Picture = Predicted frames; B-Pictures = Bidirectional frames

15 Upon performance of the above described alterations, there is obtained a System MPEG-1 standard file, compatible with the specifications defined for the standard of the desired media.

Interactive data pre-production step – Pre-production of interactive data

20 This step is illustrated in Figure 4, and depending on the scope of the final product, the programs that allow the playback of the data relative to



steps 1 and 2 of the desired medium format, in addition to other data processing application programs, should be stored in a format compatible with the CD-ROM (Compact Disc Read Only Memory) standard.

Video, data and audio compatibilization step

5                    This step makes possible the creation of the ISO 9660 image in mixed mode 2, allowing the various playback devices in the market (CD Player, DVD/VCD Player, DVD-ROM, D-ROM etc.) to identify the information that is compatible with their playback system and to execute the same.

10                   For this compatibilization, it is necessary that the information referred in steps 1.1, 2 and 3 be applied within the ISO 9660 image in the form of individual tracks, provided in the following manner:

the first track will be mandatorily composed by the information related to the interactive data pre-production step (interactive data), following the guidelines defined in the ISO 9660 standard;

15                   from the second track onwards, there will be recorded the information relative to the desired video pre-production step, where each digital video file comprises an individual track. These tracks will be recorded using the RAW data standard (data organized in sectors of 2,352 bits);

20                   upon having recorded the video tracks, there will be recorded the information related to the compatibilization with the CD-DA standard of the audio pre-production step, where each digital audio file comprises an individual track, following the specifications defined for the Red Book (audio CD) format.

There is then recorded the generated ISO 9660 image, defined in the subsequent pre-mastering step in hybrid format of the ISO 9660 image.

25                   Step 5 – Pre-mastering in hybrid format of the ISO 9660 image

The purpose of this step is to perform the “burning recording” of the ISO 9660 image generated in the video, data and audio compatibilization step, using the following specifications:

Recording hardware specifications:

- Buffer underrun prevention;
- Automatic write speed calibration;
- Write multi session;
- Write disc-at-once;
- 5 ·Emulate disc-at-once;
- Set copy bit;
- Set pre-emphasis bit;
- Incremental packet writing;
- Write ISRC;
- 10 ·Read ISRC;
- Tray;
- Write UPC/EAN code;
- Read UPC/EAN code;
- Write CD-ROM;
- 15 ·Write CD-Audio;
- Write CD-XA;
- Write CD-I;
- Set audio pause length in TAO mode;
- Write RAW;
- 20 ·Write session at once;
- Write subchannel data;
- Write lead-in data;
- Write CD-Text discs;
- Write pregap data.
- 25 Specifications for recording the ISO 9660 image:  
Recording speed: 1X (150 Kbytes per second);  
Type of medium: CD-R 74 minutes, matte silver.

#### Step 6 – Mastering

The purpose of this step consists in performing the recording by

“pressing” of the CD, which will allow the same to be read in CD Player and DVD/VCD Player apparatuses.

This step is performed by companies specializing in this operation, which will reproduce the desired medium in a scale fit for commercialization.

5

CLAIMS

1. A method for pre-production and multi-format recording or hybrid recording of audio, video and interactive data in one sole flat digital optic readout medium, characterized by the fact of comprising the steps of:

5                   pre-production of the desired audio, such that the audio to be used, originating from various sources, is captured by the computer, using a digital sound board, and is stored in a digitized audio file that is submitted to computer audio treatment programs that will correct problems related to equalization , noise and other faults, there being generated the audio matrix in a  
10 file that will be used in the subsequent steps of the process, where the audio matrix in a file receives two distinct types of treatment, one of these being intended to use the audio for compatibilization with the CD-DA (Compact Disc Digital Audio) standard and the other being intended to render the same compatible to be multiplexed with its respective content in digital video.

15                   pre-production of the desired video, such that the video is captured into the computer by means of a video capture board and is recorded in a digital video file of MPEG standard, there being performed the video editing, whereby will be applied all the editing effects such as the addition of captions, transitions and video filters, that will vary according to the scope of the final  
20 product, there being performed thereupon the multiplexing (joining) of the MPEG digital video file with the digital audio file obtained in the compatibilization for multiplexing of the audio with content only in digital video, which will generate the file known as System MPEG;

                  pre-production of the interactive data such that, depending on the  
25 scope of the final product, there are stored in a format compatible with the CD-ROM (Compact Disc Read Only Memory) standard, the programs that allow the playback of the data related to the pre-production of the desired audio and pre-production of the desired video, in addition to other application programs for data processing;

compatibilization of the video, the data and the audio, in order to make possible the creation of the ISO 9660 image in mixed mode type 2 (mixed mode 2), which will allow the various player devices in the market (CD Player, DVD/VCD Player, DVD-ROM, D-ROM etc.), to identify the information compatible with their playback system and to execute the same;

pre-mastering in hybrid format in order to perform the “burn recording” of the ISO 9660 image generated in the step of compatibilization of the video, the data and the audio; and

mastering or pressing the CD in order to allow the reading thereof in CD Player and DVD/VCD Player apparatuses.

2. A method, according to Claim 1, characterized by the fact that in the step of audio pre-production, the compatibilization with the CD-DA standard is realized such that the audio matrix in the said file is processed by an audio treatment program, whereby its audio frequency is set to 44.100 Hz, its bit transfer rate (bit rate) is set to 128 Kb/s (kilobits per second) and its resolution is set to 16 bits, and whereupon the altered file is recorded in WAV format (Windows Audio File Format) in order to be subsequently used in the step of compatibilization of the video, the data and the audio.

3. A method, according to any one of Claims 1 or 2, characterized by the fact that in the audio pre-production step, the compatibilization for multiplexing with digital video is performed such that the audio matrix in the file is processed by an audio treatment program, whereby its channel format is defined to “joint stereo”, its audio frequency is defined to 44.100 Hz, its bit transfer rate (bit rate) is set to 112 Kb/s (Kilobits per second) and its resolution is set to 16 bits, and thereafter the altered file is recorded in WAV format (Windows Audio File Format) that will be subsequently used in the step of pre-production of the desired video.

4. A method, according to any one of Claims 1 to 3, characterized by the fact that in the video pre-production step, the file named

System MPEG will have its GOP structure altered to optimize its compression rate, enabling the recording, in a CD (Compact Disc) of 74 minutes, of up to 128 minutes of video, where the alteration of the GOP (Group of Pictures) structure of the System MPEG file is aimed at obtaining better video quality, however  
5 maintaining high video compression rates, which allows increased video storage (up to 128 minutes) in media with a physical limitation of up to 74 minutes, this being done in such manner that the System MPEG file should have the following initial characteristics: System MPEG version 1.0 (MPEG-1); video size: 352 X 240 pixels (video resolution measurement unit); screen proportion standard: 4:3  
10 525 lines NTSC (National Television System Committee); video speed: 29.97 frames per second obtaining better quality, or 23.976 frames per second obtaining greater compression; and variable transfer rate: minimum of 300 Kb/s and maximum of 1,150 Kb/s.

5. A method, according to any one of Claims 1 to 4,  
15 characterized by the fact that in the step of compatibilization of the video, the data and the audio, the compatibilization is realized such that the information relative to compatibilization with the CD-DA standard of the audio pre-production step and the information relative to the desired video pre-production step and relative to the step of interactive data pre-production is applied within  
20 the ISO 9660 image in the form of individual tracks, provided such that the first track will mandatorily be comprised by the information relative to the interactive data pre-production step (interactive data), following the specifications established in the ISO 9660 standard; from the second track onwards, there will be recorded the information relative to the desired video pre-production step,  
25 each digital video file constituting an individual track, and where these tracks will be recorded according to the RAW Data standard (data organized in sectors of 2,352 bits); upon there having been recorded the video tracks, there will be recorded the information relative to compatibilization with the CD-DA standard of the audio pre-production step, each digital audio file constituting an individual

track, following the specifications defined for the Red Book format (audio CD), thereupon being recorded the generated ISO 9660 image, in the hybrid format pre-mastering step.

6. A method, according to any one of Claims 1 to 5,  
5 characterized by the fact that the step of pre-mastering in hybrid format the “burning recording” of the ISO 9660 image generated in the step of compatibilization of the video, the data and the audio, is performed using the following recording hardware specifications: Buffer underrun prevention; Automatic write speed calibration; Write multi session; Write disc-at-once;  
10 Emulate disc-at-once; Set copy bit; Set pre-emphasis bit; Incremental packet writing; Write ISRC; Read ISRC; Tray; Write UPC/EAN code; Read UPC/EAN code; Write CD-ROM; Write CD-Audio; Write CD-XA; Write CD-I; Set audio pause length in TAO mode; Write RAW; Write session at once; Write subchannel data; Write lead-ing data; Write CD-Text discs; Write pregap data,  
15 and the following specifications for recording the ISO 9660 image: Recording speed: 1X (150 Kbytes per second); and type of media: CD-R 74 minutes, matte silver.

Fig. 1

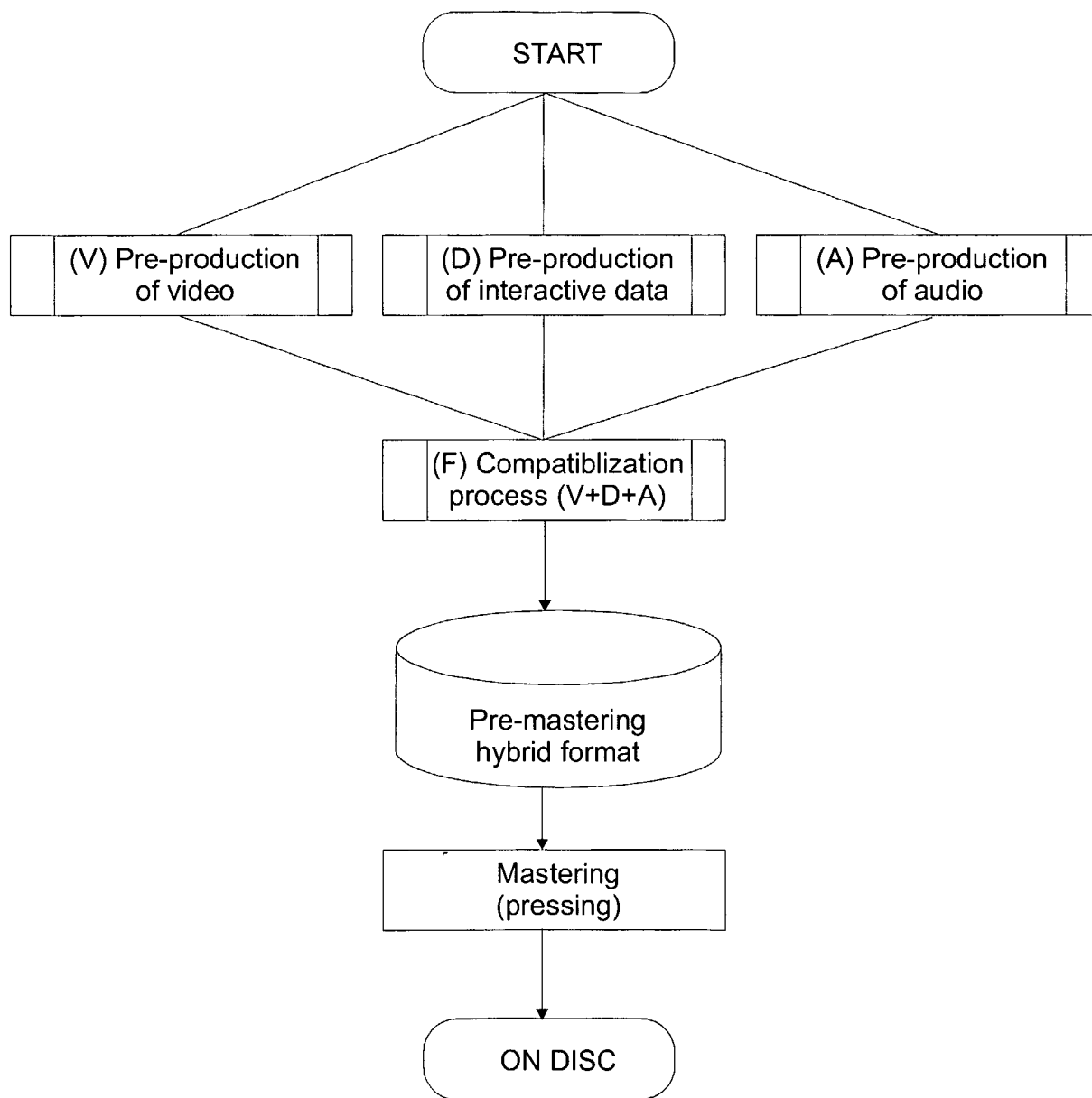
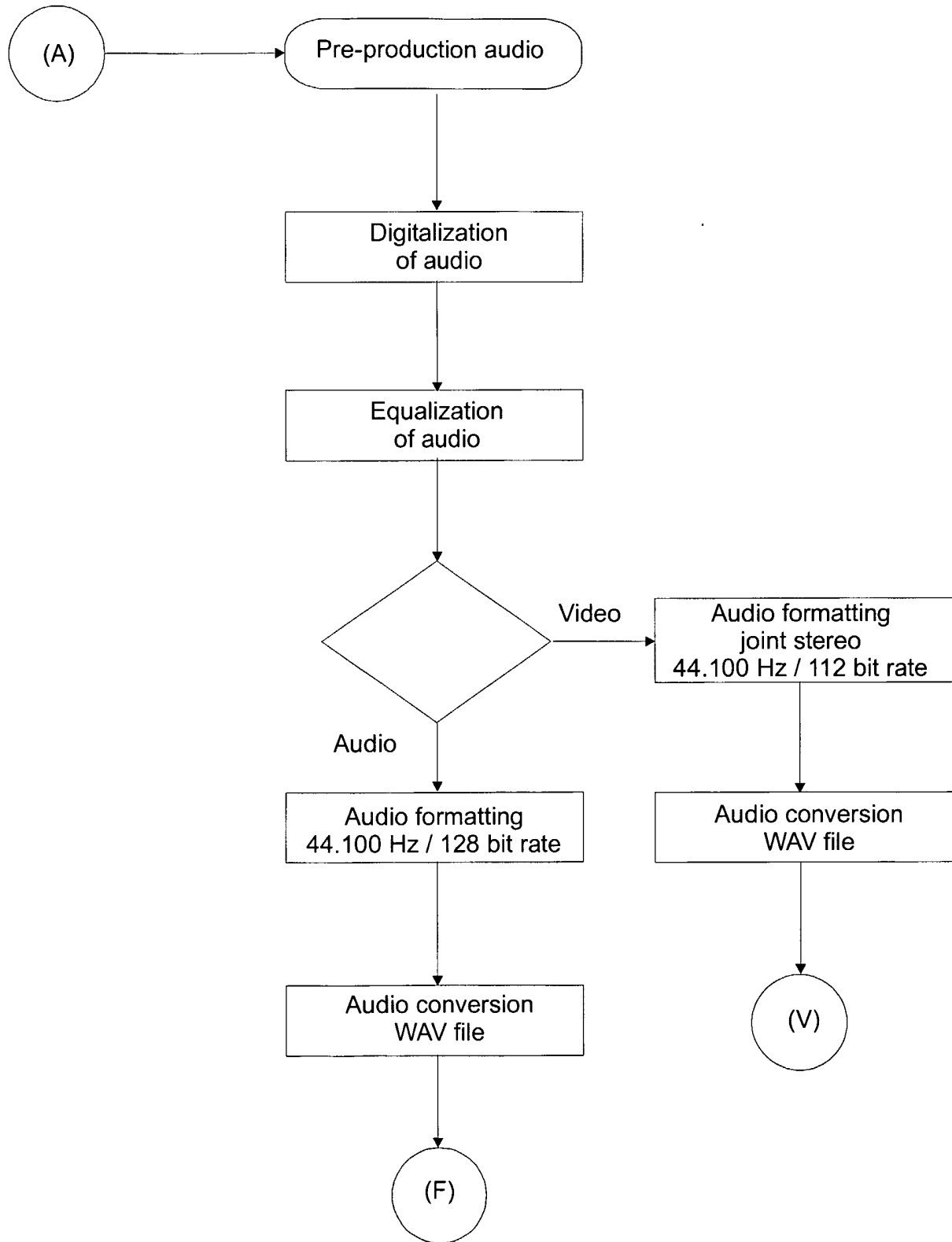




Fig. 2



**Fig. 3**

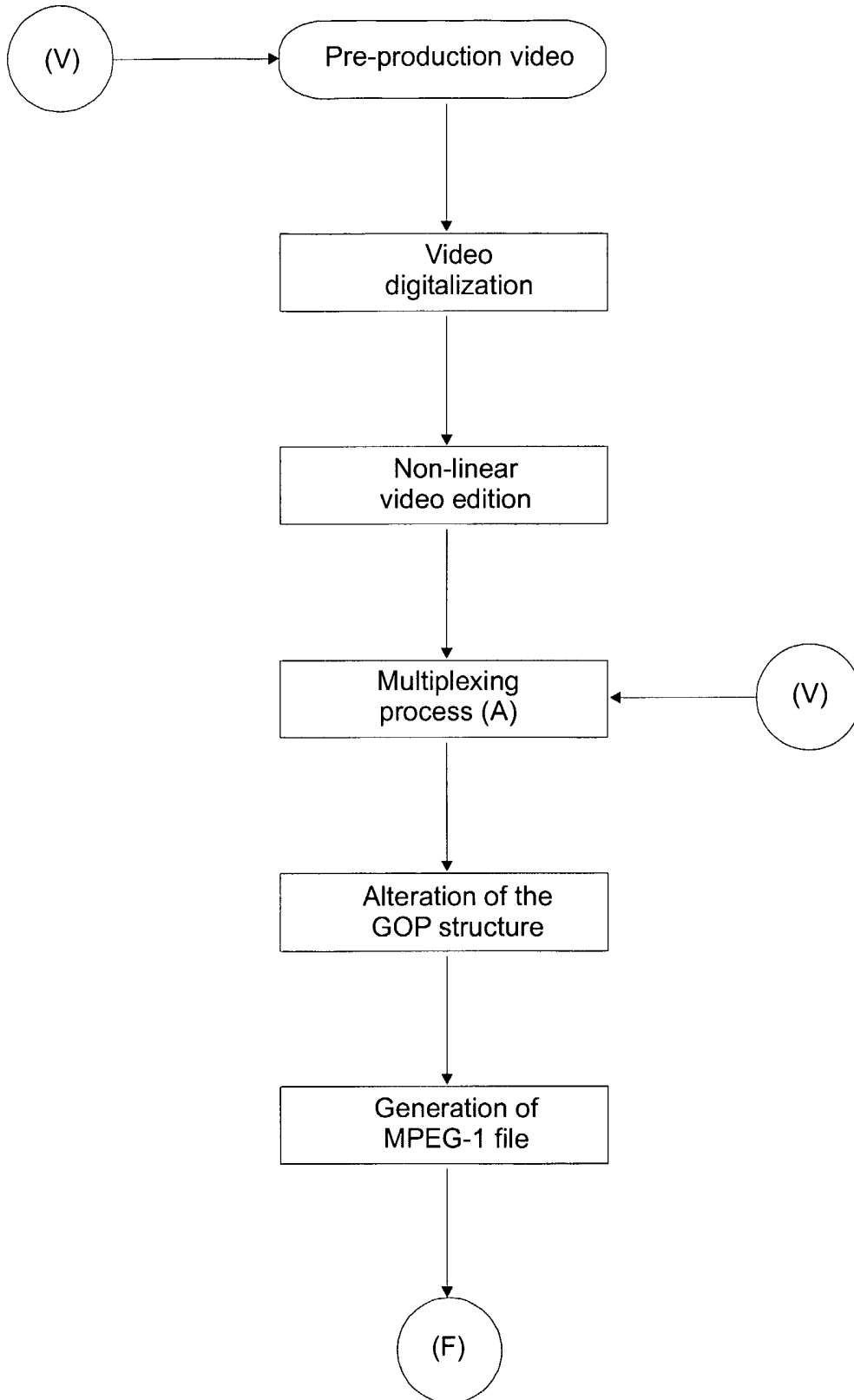
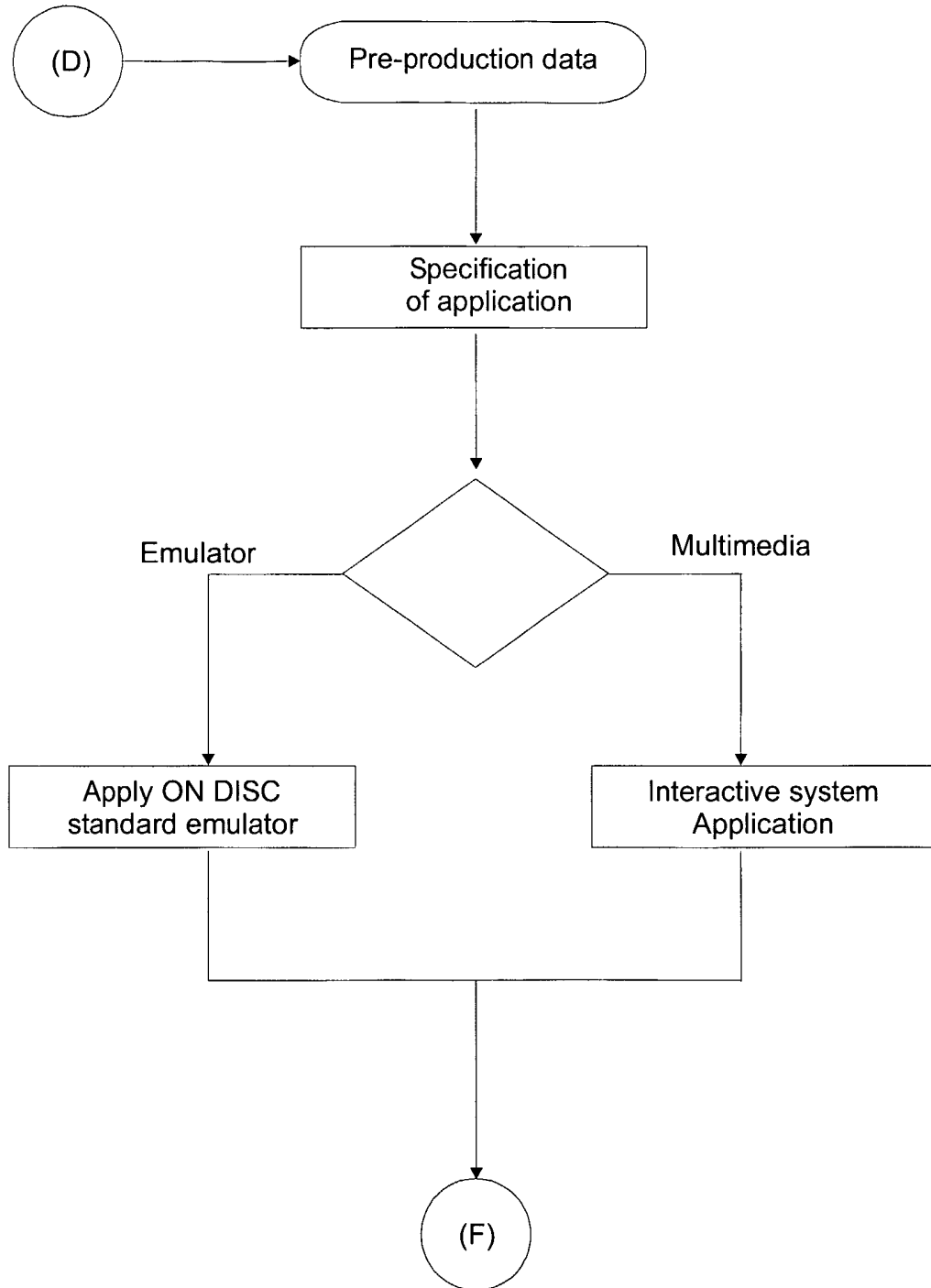


Fig. 4



## INTERNATIONAL SEARCH REPORT

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<b>A. CLASSIFICATION OF SUBJECT MATTER</b> IPC 7 G11B27/034 G11B20/12		
According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b>		
Minimum documentation searched (classification system followed by classification symbols) IPC 7 G11B		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practical, search terms used) EPO-Internal, WPI Data		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
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