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(54) **SYSTEM AND METHOD FOR PRODUCING STORAGE MEDIA IMAGES**

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(52) **U.S. Cl.**
USPC **707/756**

(58) **Field of Classification Search**
USPC 707/756
See application file for complete search history.

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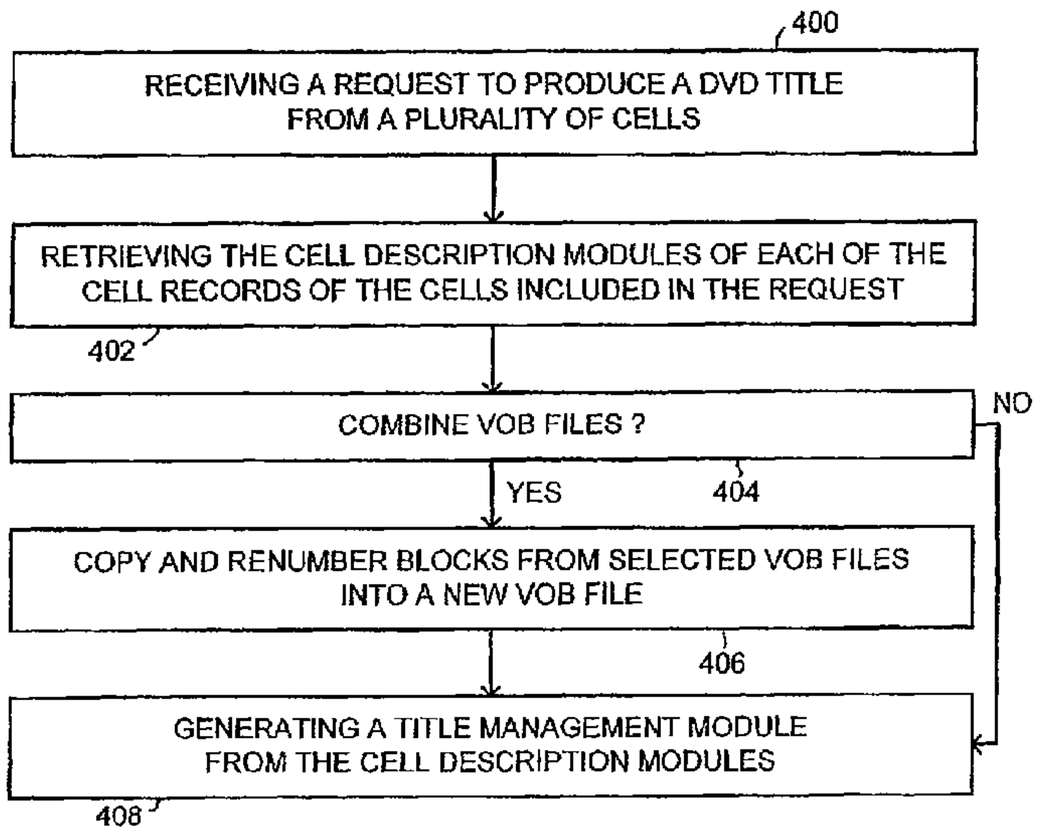
(57) **ABSTRACT**

A system for producing custom media images, the system including a media server which includes a title database and a creation server connected to the media server, the title database containing a plurality of title records, each title record including a title description file and a plurality of compiled title media files, the creation server receiving a request to produce a media image from a selection of titles respective of the title records, the creation server producing a set of media management files according to the title description file of each the selected title records, and generating a media image containing the media management files and a copy of the compiled title media files of each the selected title records.

9 Claims, 13 Drawing Sheets



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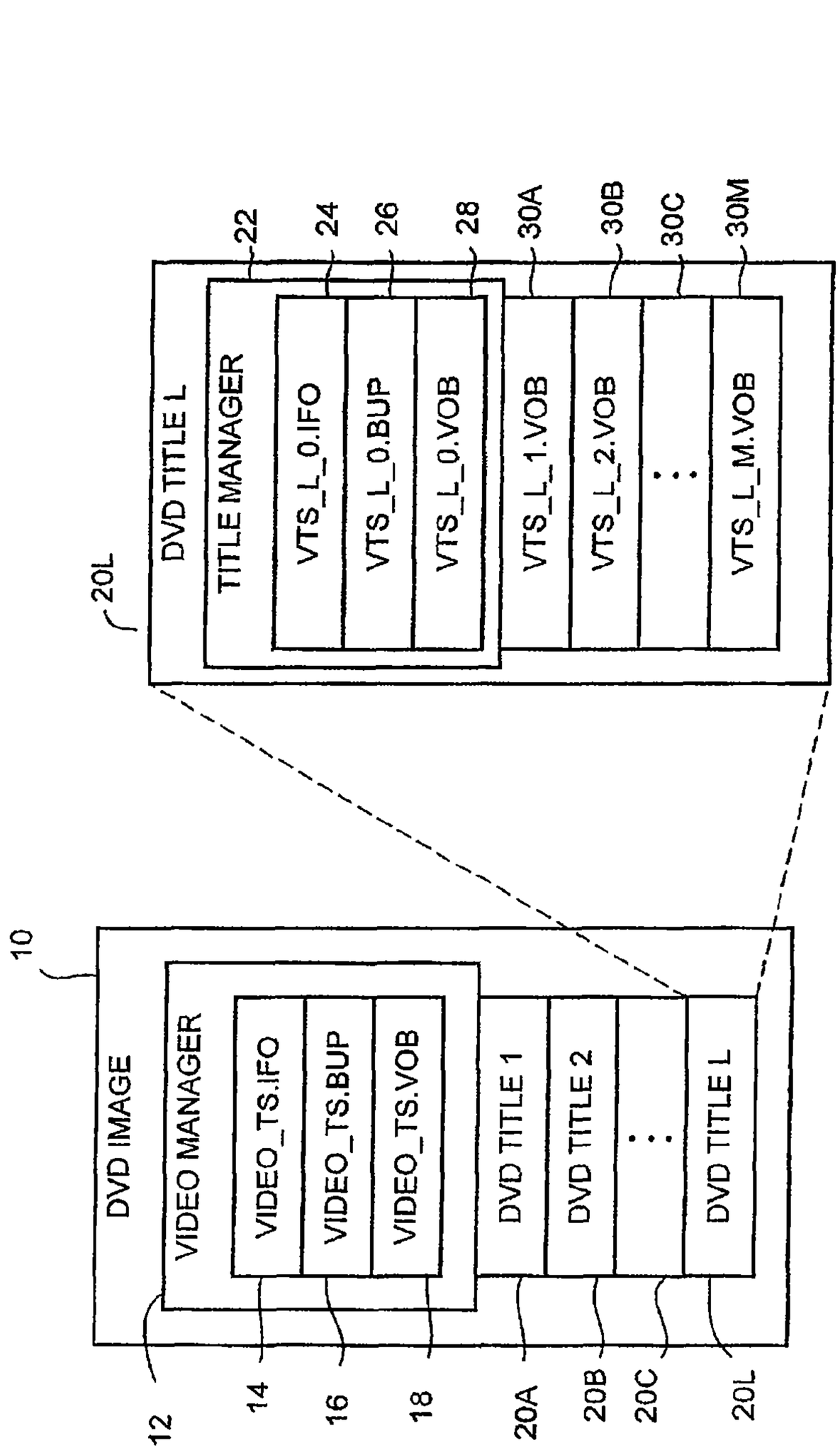


FIG. 1
PRIOR ART

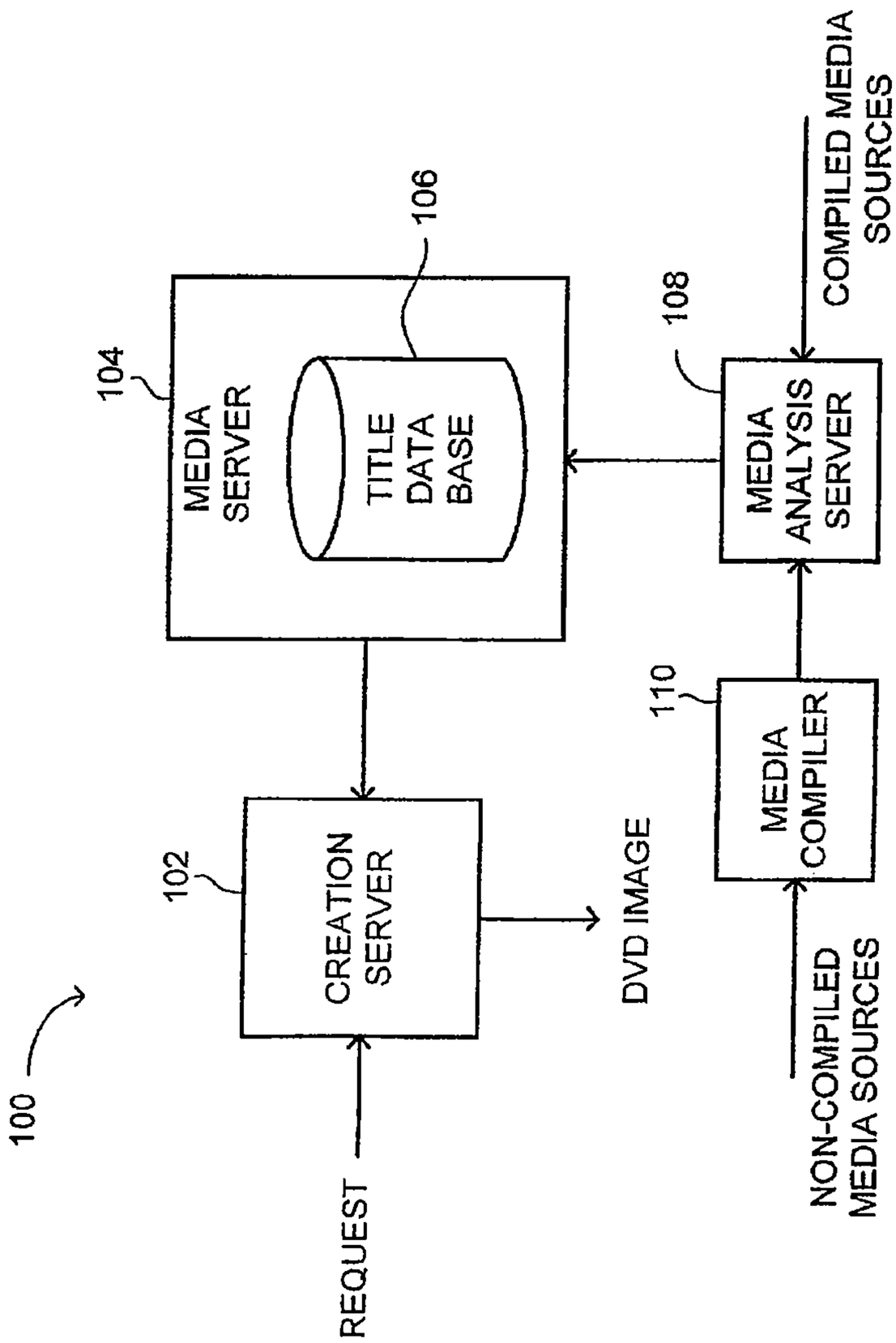

100
REQUEST
CREATION SERVER
102
DVD IMAGE
MEDIA SERVER
104
TITLE DATA BASE
106
MEDIA COMPILER
110
MEDIA ANALYSIS SERVER
108
NON-COMPILED MEDIA SOURCES
COMPILED MEDIA SOURCES

FIG. 2

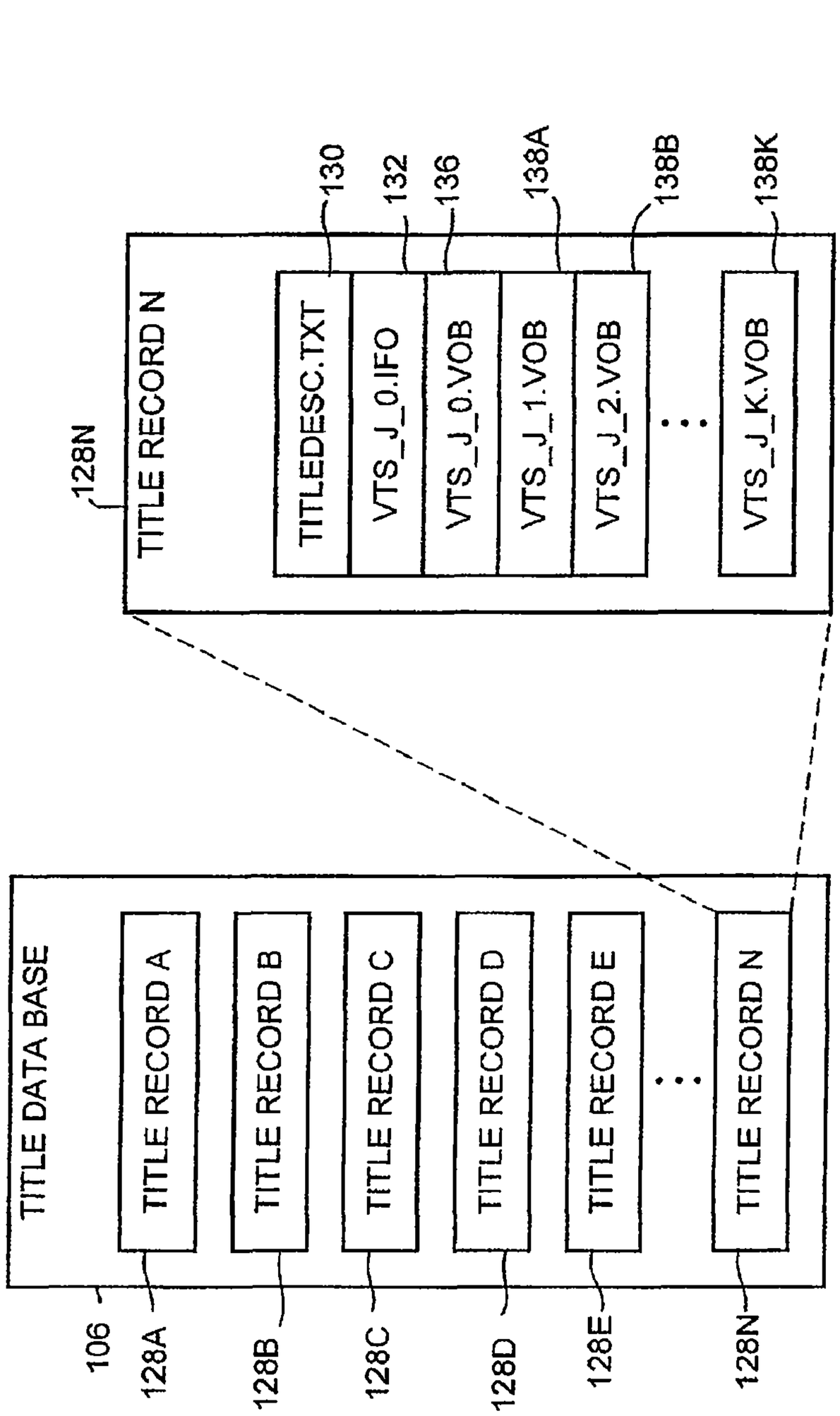

TITLE DATA BASE
106
TITLE RECORD A
128A
TITLE RECORD B
128B
TITLE RECORD C
128C
TITLE RECORD D
128D
TITLE RECORD E
128E
TITLE RECORD N
128N
TITLE RECORD N
128N
TITLEDESC.TXT
130
VTS_J_0.IFO
132
VTS_J_0.VOB
136
VTS_J_1.VOB
138A
VTS_J_2.VOB
138B
VTS_J_K.VOB
138K

FIG. 3

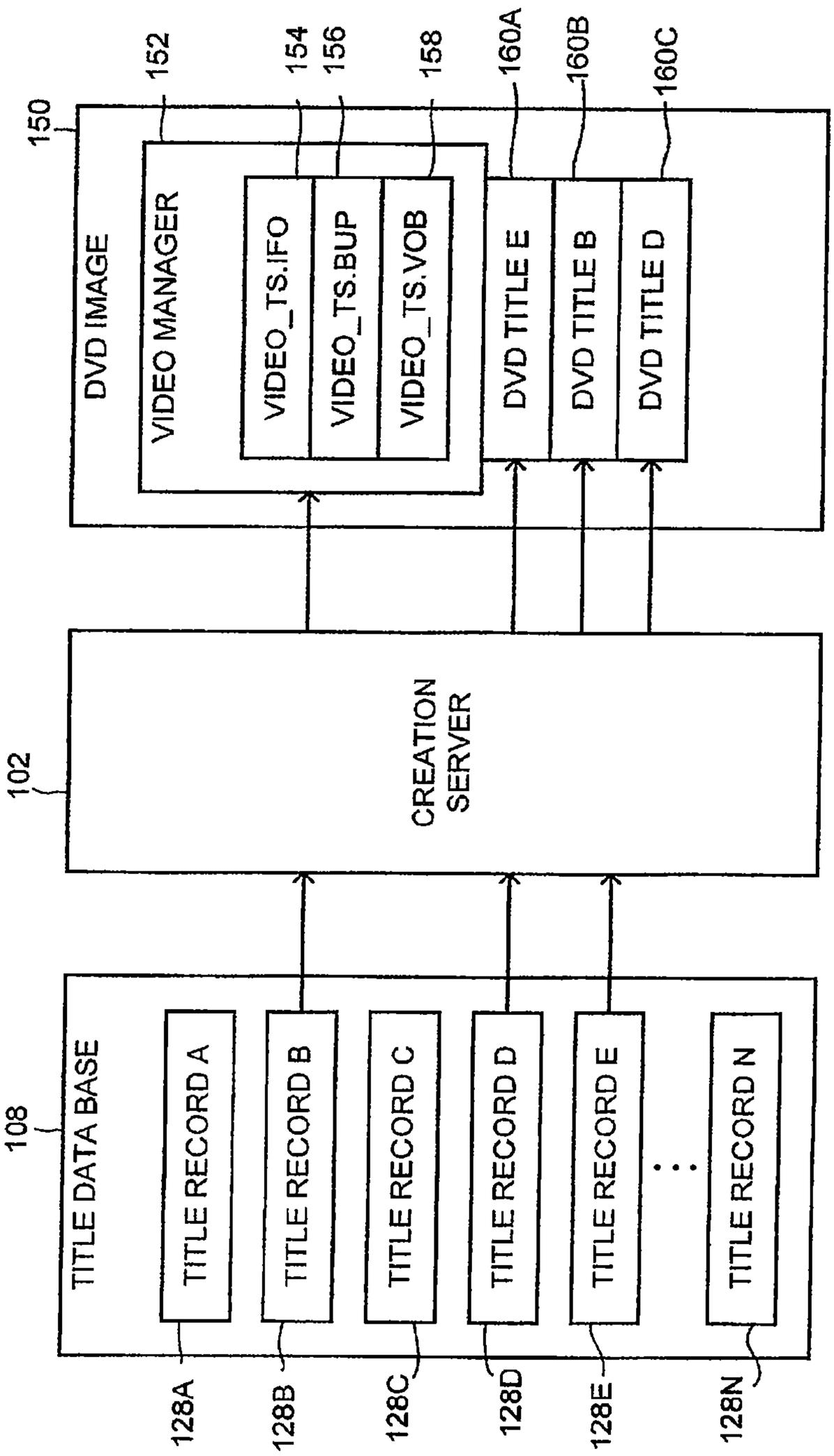

150
152
154
156
158
160A
160B
160C
DVD IMAGE
VIDEO MANAGER
VIDEO_TS.IFO
VIDEO_TS.BUP
VIDEO_TS.VOB
DVD TITLE E
DVD TITLE B
DVD TITLE D
102
CREATION SERVER
108
TITLE DATA BASE
TITLE RECORD A
TITLE RECORD B
TITLE RECORD C
TITLE RECORD D
TITLE RECORD E
TITLE RECORD N
128A
128B
128C
128D
128E
128N

FIG. 4

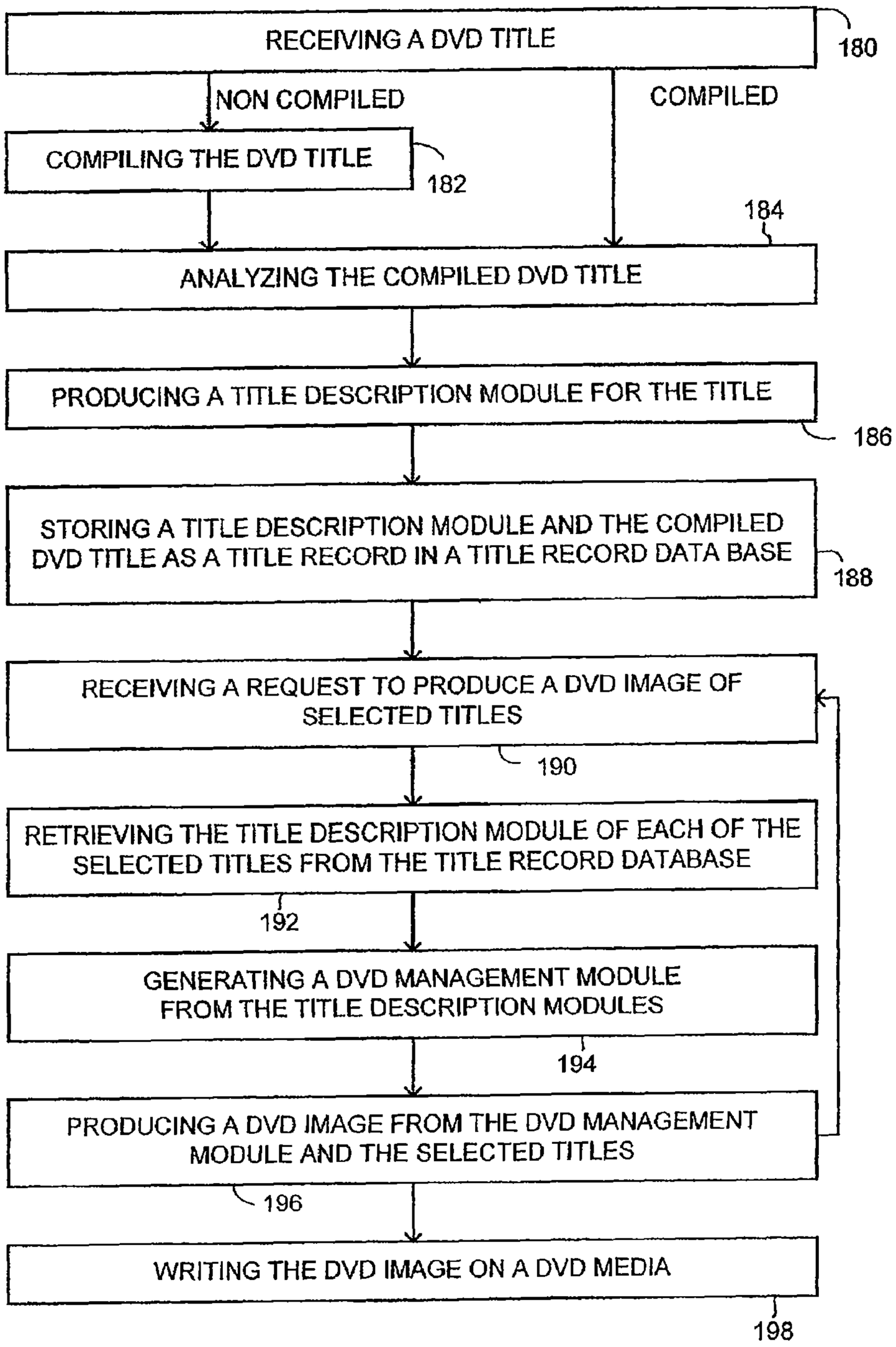

RECEIVING A DVD TITLE
180
NON COMPILED
COMPILED
COMPILING THE DVD TITLE
182
184
ANALYZING THE COMPILED DVD TITLE
PRODUCING A TITLE DESCRIPTION MODULE FOR THE TITLE
186
STORING A TITLE DESCRIPTION MODULE AND THE COMPILED DVD TITLE AS A TITLE RECORD IN A TITLE RECORD DATA BASE
188
RECEIVING A REQUEST TO PRODUCE A DVD IMAGE OF SELECTED TITLES
190
RETRIEVING THE TITLE DESCRIPTION MODULE OF EACH OF THE SELECTED TITLES FROM THE TITLE RECORD DATABASE
192
GENERATING A DVD MANAGEMENT MODULE FROM THE TITLE DESCRIPTION MODULES
194
PRODUCING A DVD IMAGE FROM THE DVD MANAGEMENT MODULE AND THE SELECTED TITLES
196
WRITING THE DVD IMAGE ON A DVD MEDIA
198

FIG. 5

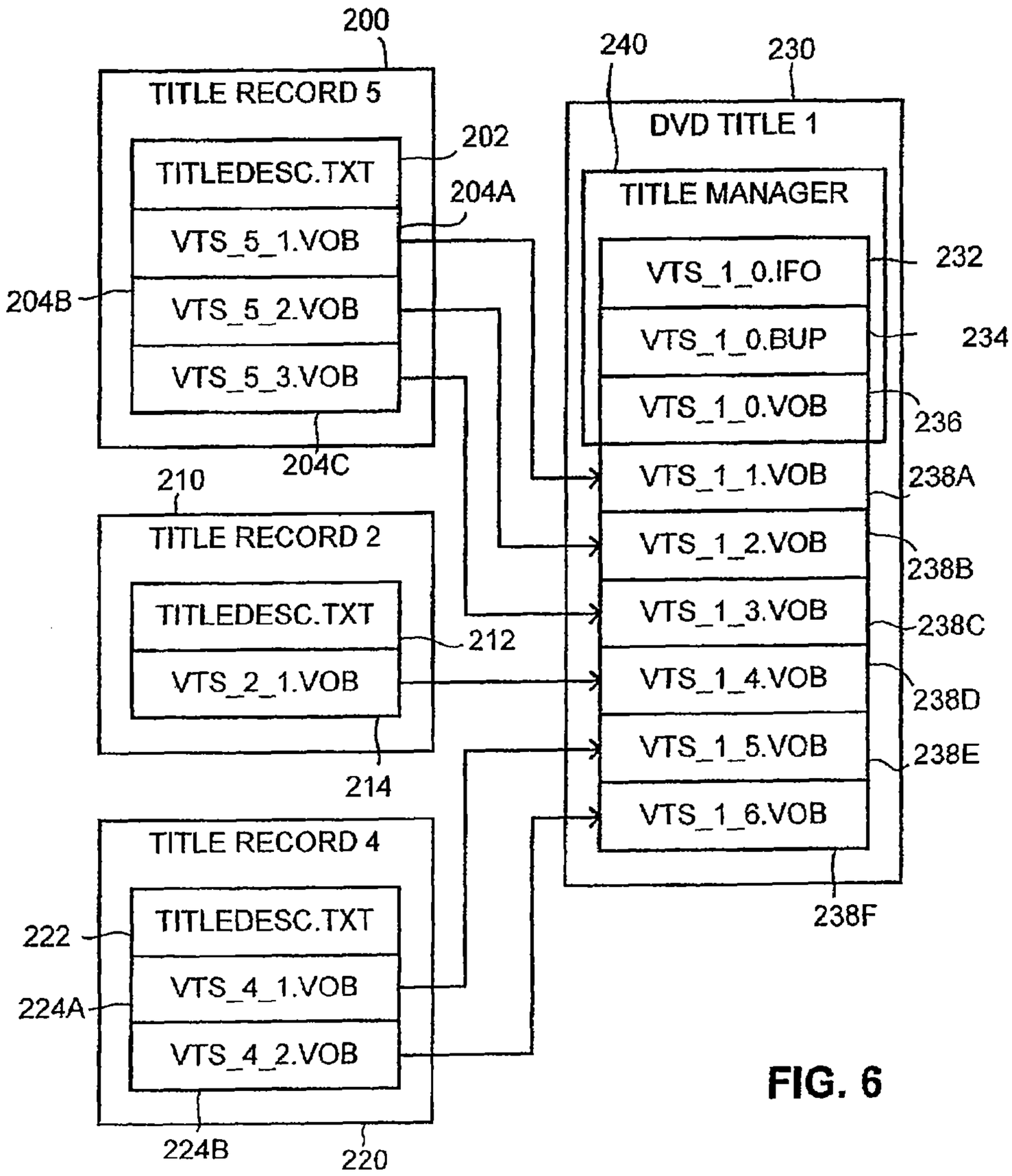

200
TITLE RECORD 5
TITLEDESC.TXT
202
VTS_5_1.VOB
204A
VTS_5_2.VOB
204B
VTS_5_3.VOB
204C
210
TITLE RECORD 2
TITLEDESC.TXT
212
VTS_2_1.VOB
214
TITLE RECORD 4
TITLEDESC.TXT
222
VTS_4_1.VOB
224A
VTS_4_2.VOB
224B
220
240
230
DVD TITLE 1
TITLE MANAGER
VTS_1_0.IFO
232
VTS_1_0.BUP
234
VTS_1_0.VOB
236
VTS_1_1.VOB
238A
VTS_1_2.VOB
238B
VTS_1_3.VOB
238C
VTS_1_4.VOB
238D
VTS_1_5.VOB
238E
VTS_1_6.VOB
238F

FIG. 6

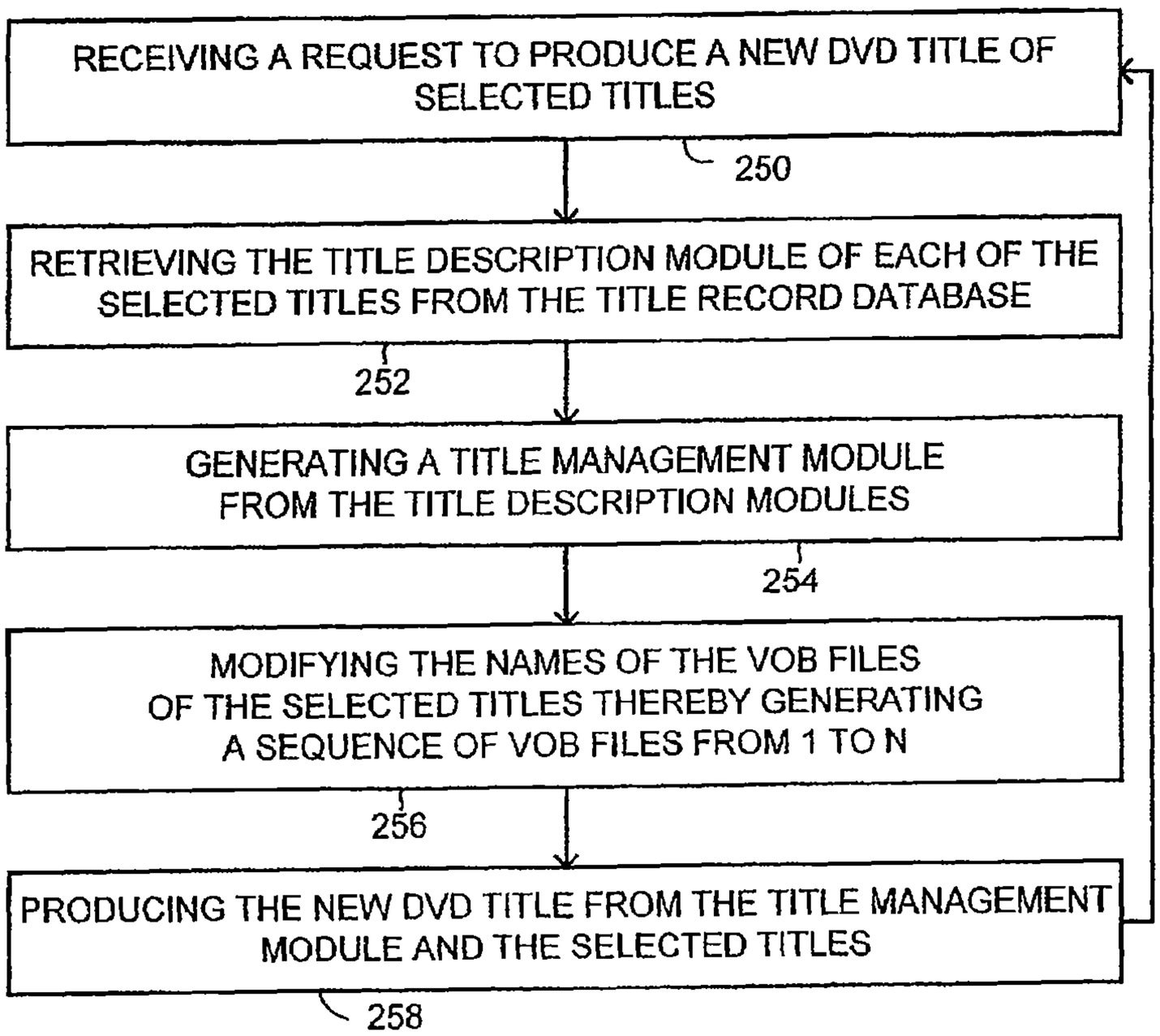
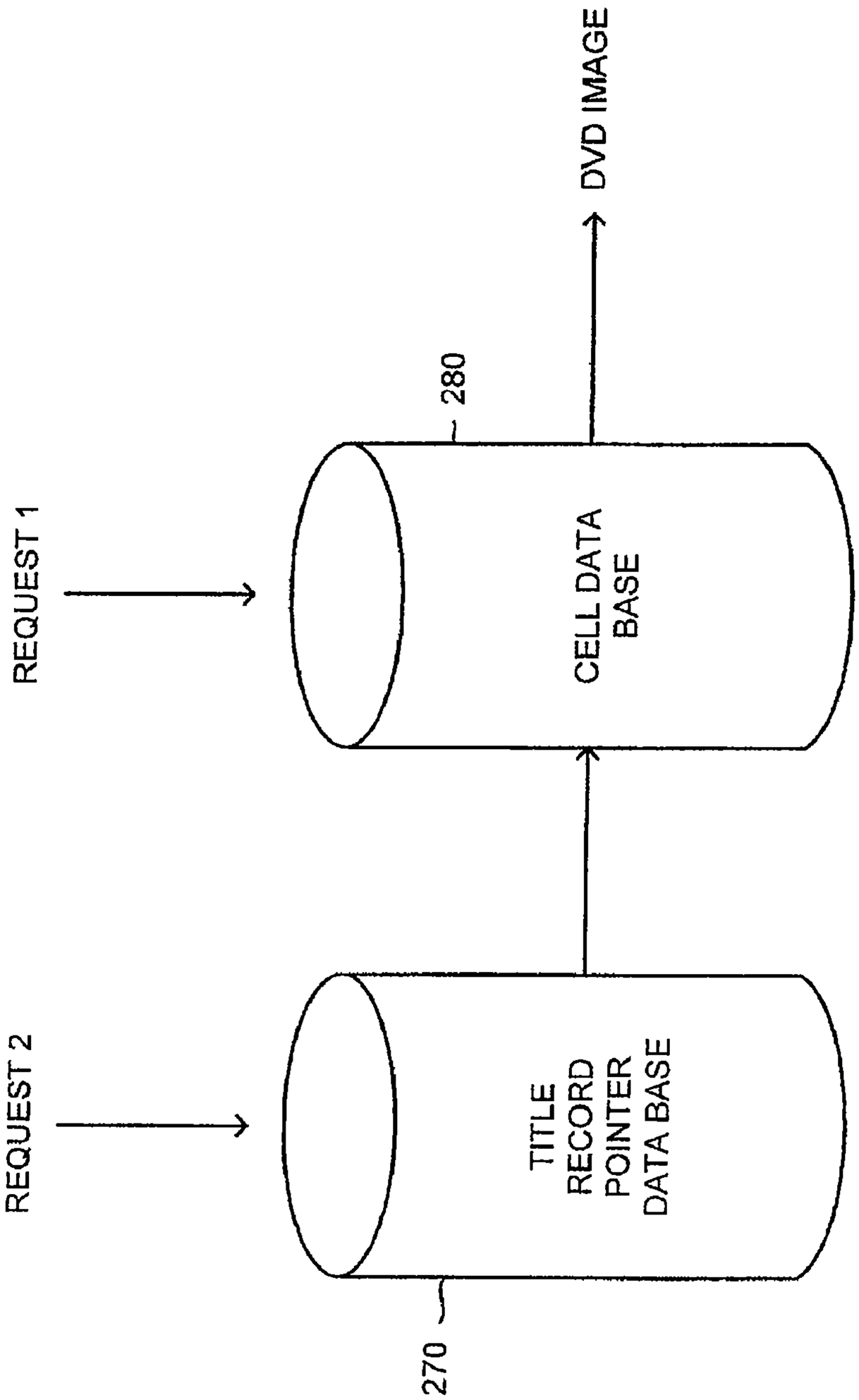

RECEIVING A REQUEST TO PRODUCE A NEW DVD TITLE OF SELECTED TITLES
250
RETRIEVING THE TITLE DESCRIPTION MODULE OF EACH OF THE SELECTED TITLES FROM THE TITLE RECORD DATABASE
252
GENERATING A TITLE MANAGEMENT MODULE FROM THE TITLE DESCRIPTION MODULES
254
MODIFYING THE NAMES OF THE VOB FILES OF THE SELECTED TITLES THEREBY GENERATING A SEQUENCE OF VOB FILES FROM 1 TO N
256
PRODUCING THE NEW DVD TITLE FROM THE TITLE MANAGEMENT MODULE AND THE SELECTED TITLES
258

FIG. 7

FIG. 8


REQUEST 1
280
CELL DATA BASE
DVD IMAGE
REQUEST 2
TITLE RECORD POINTER DATA BASE
270

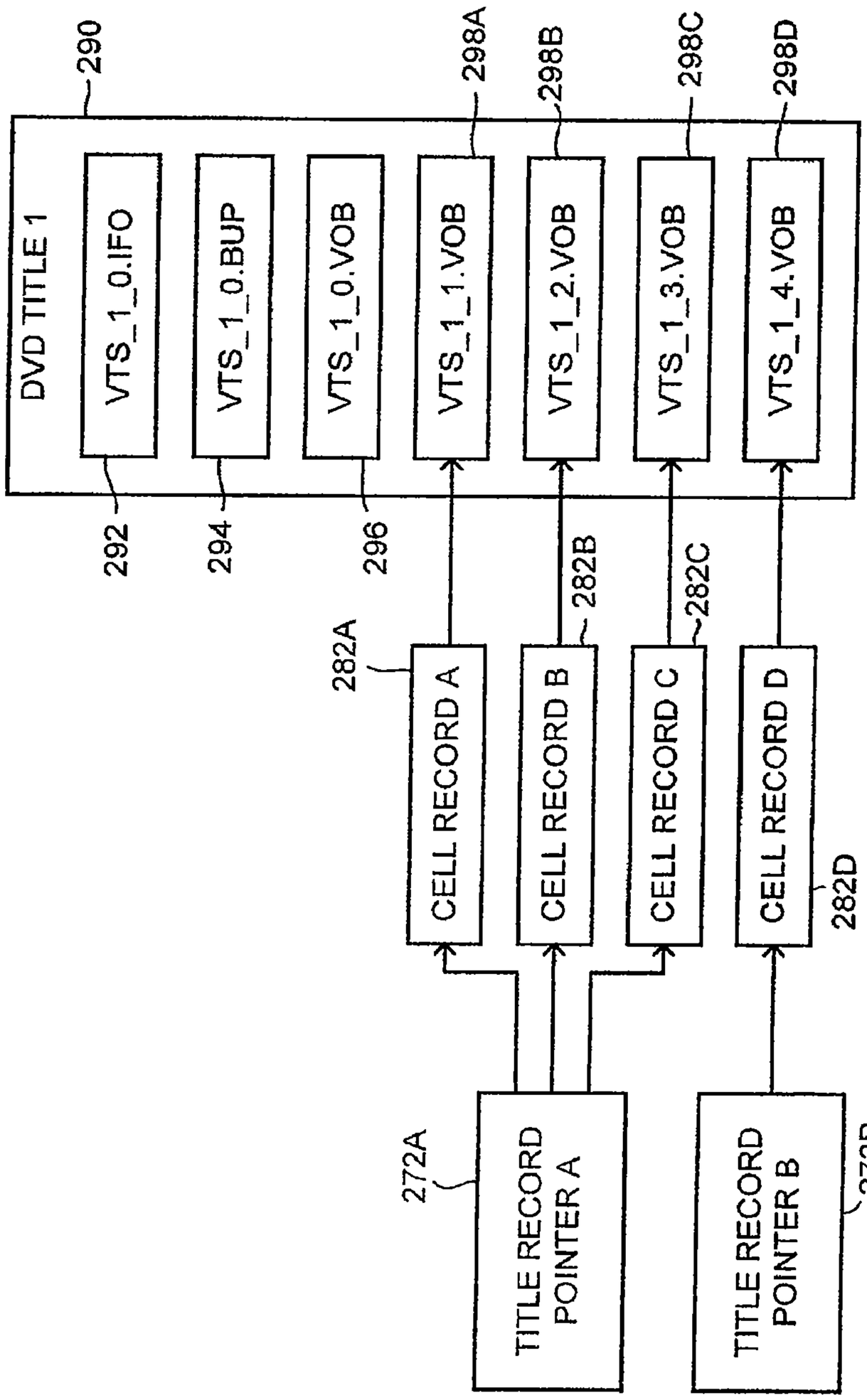

290
298A
298B
298C
298D
DVD TITLE 1
VTS_1_0.IFO
VTS_1_0.BUP
VTS_1_0.VOB
VTS_1_1.VOB
VTS_1_2.VOB
VTS_1_3.VOB
VTS_1_4.VOB
292
294
296
282A
282B
282C
282D
CELL RECORD A
CELL RECORD B
CELL RECORD C
CELL RECORD D
272A
272B
TITLE RECORD POINTER A
TITLE RECORD POINTER B

FIG. 9

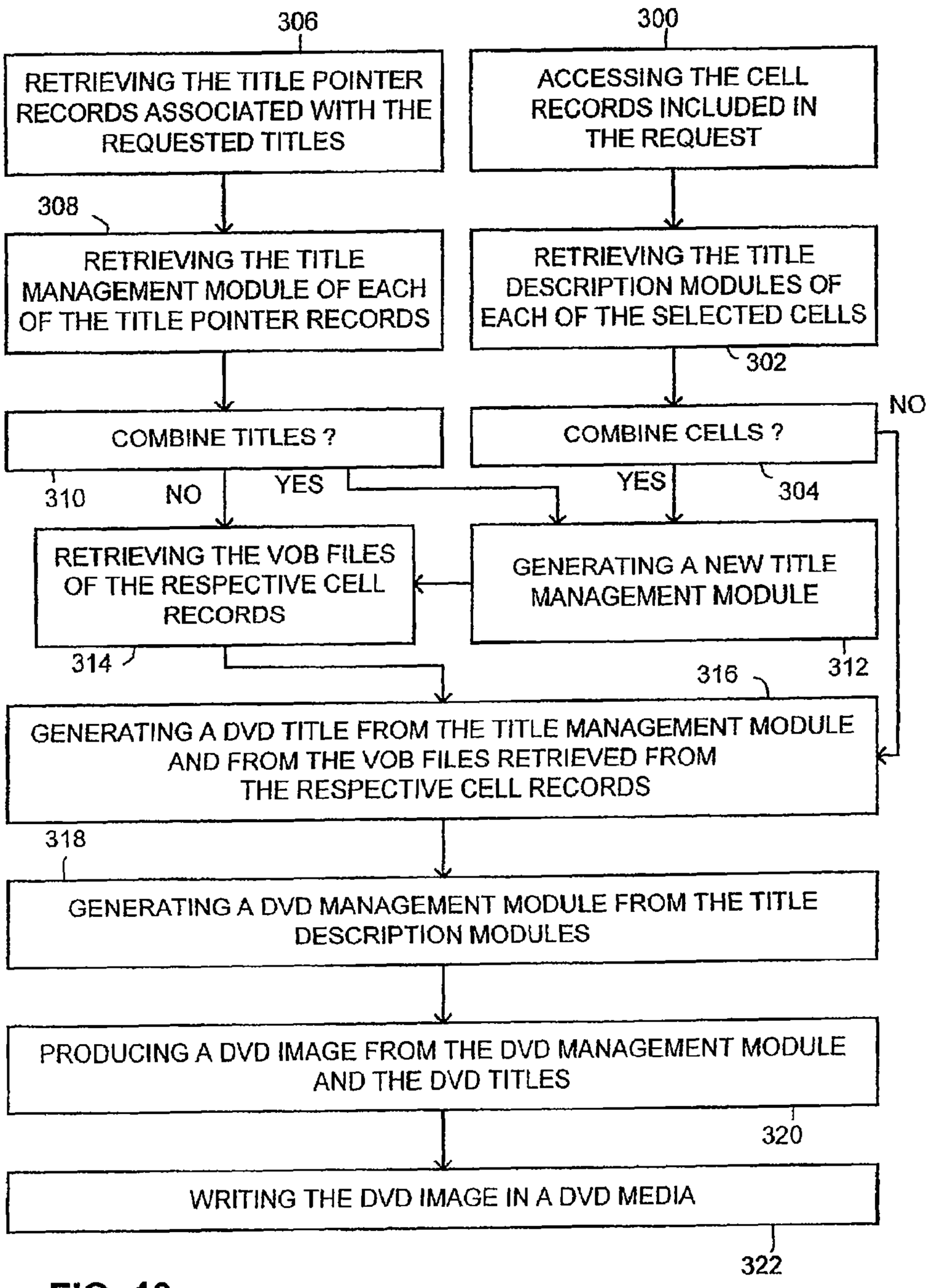

306
RETRIEVING THE TITLE POINTER RECORDS ASSOCIATED WITH THE REQUESTED TITLES
300
ACCESSING THE CELL RECORDS INCLUDED IN THE REQUEST
308
RETRIEVING THE TITLE MANAGEMENT MODULE OF EACH OF THE TITLE POINTER RECORDS
RETRIEVING THE TITLE DESCRIPTION MODULES OF EACH OF THE SELECTED CELLS
302
COMBINE TITLES ?
COMBINE CELLS ?
NO
310
NO
YES
YES
304
RETRIEVING THE VOB FILES OF THE RESPECTIVE CELL RECORDS
GENERATING A NEW TITLE MANAGEMENT MODULE
314
312
316
GENERATING A DVD TITLE FROM THE TITLE MANAGEMENT MODULE AND FROM THE VOB FILES RETRIEVED FROM THE RESPECTIVE CELL RECORDS
318
GENERATING A DVD MANAGEMENT MODULE FROM THE TITLE DESCRIPTION MODULES
PRODUCING A DVD IMAGE FROM THE DVD MANAGEMENT MODULE AND THE DVD TITLES
320
WRITING THE DVD IMAGE IN A DVD MEDIA
322

FIG. 10

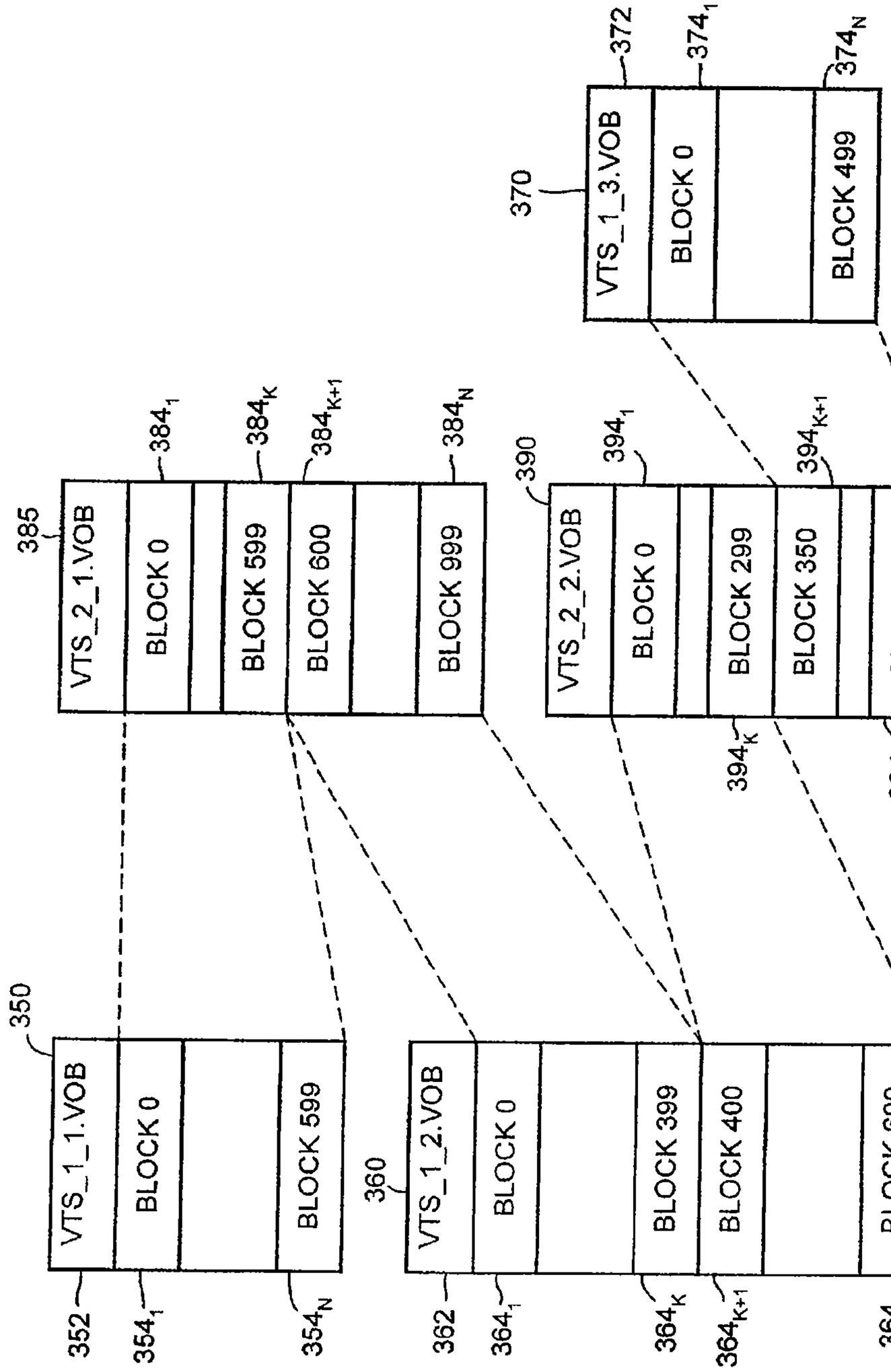

370
372
374_1
374_N
VTS_1_3.VOB
BLOCK 0
BLOCK 499
385
384_1
384_K
384_K+1
384_N
VTS_2_1.VOB
BLOCK 0
BLOCK 599
BLOCK 600
BLOCK 999
390
394_1
394_K+1
VTS_2_2.VOB
BLOCK 0
BLOCK 299
BLOCK 350
BLOCK 799
394_K
394_N
350
VTS_1_1.VOB
BLOCK 0
BLOCK 599
352
354_1
354_N
360
VTS_1_2.VOB
BLOCK 0
BLOCK 399
BLOCK 400
BLOCK 699
362
364_1
364_K
364_K+1
364_N

FIG. 11

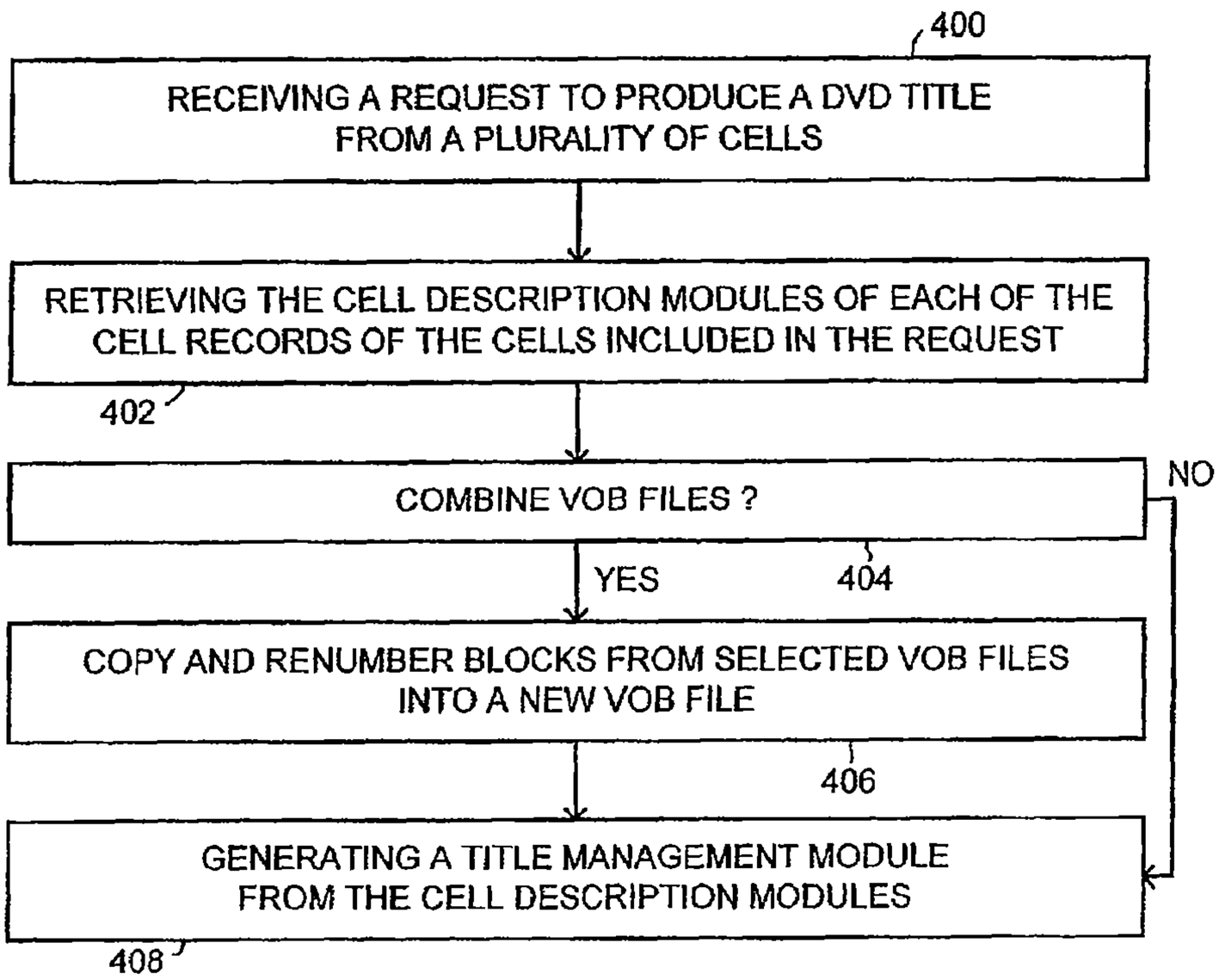

400
RECEIVING A REQUEST TO PRODUCE A DVD TITLE FROM A PLURALITY OF CELLS
RETRIEVING THE CELL DESCRIPTION MODULES OF EACH OF THE CELL RECORDS OF THE CELLS INCLUDED IN THE REQUEST
402
COMBINE VOB FILES ?
NO
YES
404
COPY AND RENUMBER BLOCKS FROM SELECTED VOB FILES INTO A NEW VOB FILE
406
GENERATING A TITLE MANAGEMENT MODULE FROM THE CELL DESCRIPTION MODULES
408

FIG. 12

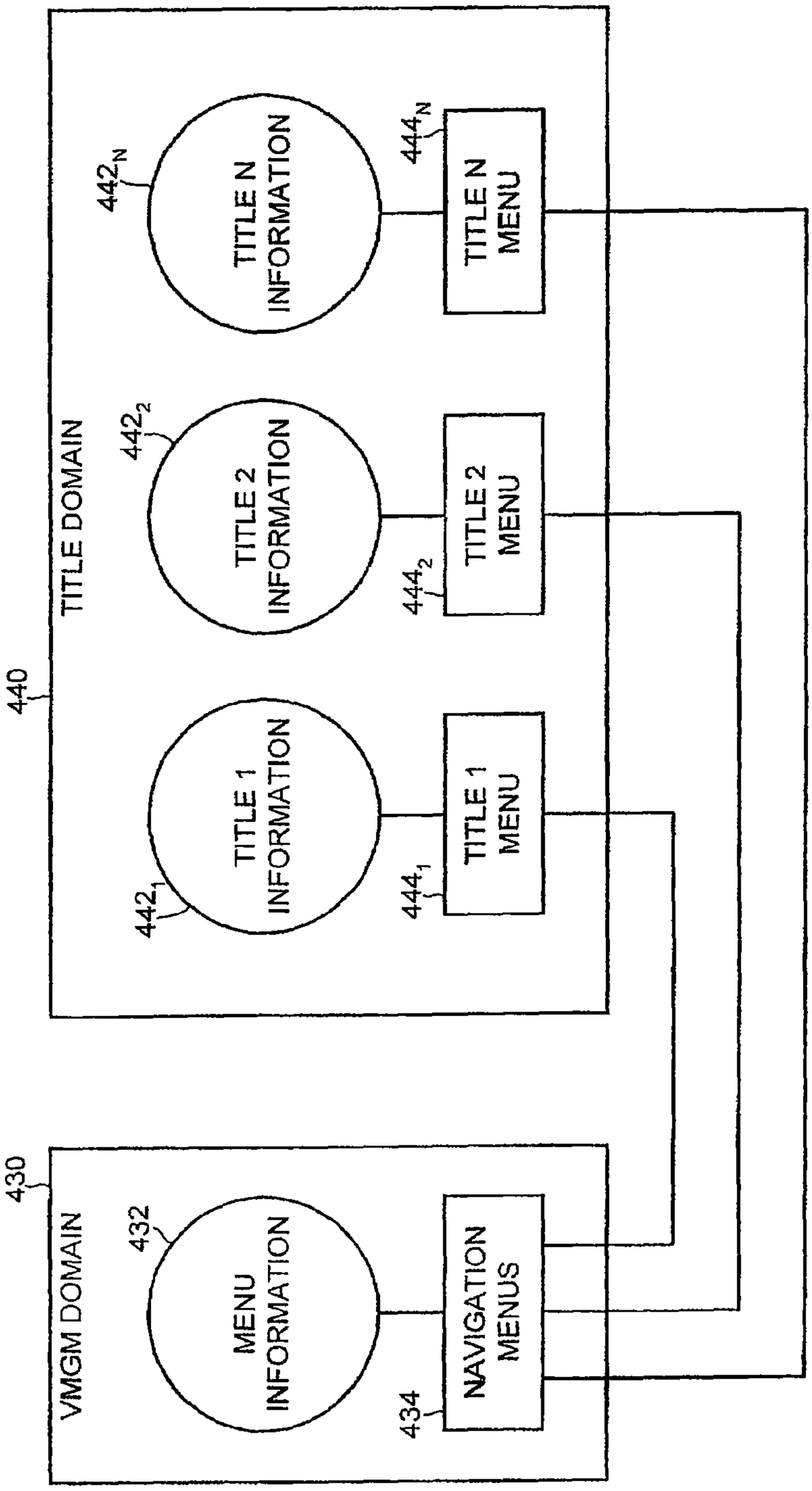

VMGM DOMAIN
430
MENU INFORMATION
432
NAVIGATION MENUS
434
TITLE DOMAIN
440
TITLE 1 INFORMATION
442 1
TITLE 1 MENU
444 1
TITLE 2 INFORMATION
442 2
TITLE 2 MENU
444 2
TITLE N INFORMATION
442 N
TITLE N MENU
444 N

FIG. 13

SYSTEM AND METHOD FOR PRODUCING STORAGE MEDIA IMAGES

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

FIELD OF THE INVENTION

The present invention relates to methods and systems for managing storage in general, and to methods and systems for managing media information and for producing storage media images, in particular.

BACKGROUND OF THE INVENTION

Methods and systems for managing information are known in the art. Data can be stored in non-volatile media such as ROM, magnetic storage devices such as diskettes and hard drives, optical storage devices such as the CD-ROM and the DVD-ROM, magneto-optic storage devices, and the like. Each of these storage devices may define a different format of storage thereon. For example UDF 1.5, ISO 9660.

A storage device can be used for different types of data and hence, may require different formats for each type of data. For example; Compact Disks were first designed for audio storage. Later, the CD-ROM format was added on the same physical specifications and enhanced the capabilities of the physical media to data applications.

A DVD-ROM used for multimedia data, requires that data would be printed thereon in a special format, which defines a plurality of data structures and modules. Reference is now made to FIG. **1**, which is a schematic illustration of a DVD image, generally referenced **10**, which is knows in the art. DVD image **10** includes a video manager (VMG) section **12** and a plurality of DVD titles **20**A, **20**B, **20**C and **20**L. Video manager section **12** includes a VIDEO_TS.IFO file **14**, a VIDEO_TS.BUP file **16** and a VIDEO_TS.VOB file **18**. VIDEO_TS.IFO file **14** includes file manager definitions relating to the DVD titles **20**A, **20**B, **20**C and **20**L such as the size and location of each DVD title within the DVD image **10**. VIDEO_TS.BUP file **16** includes a backup copy of VIDEO_TS.IFO file **14**. VIDEO_TS.VOB file **18** is a video file including a plurality of media streams (video, audio and others), which serve as a multimedia layer for presenting the manager definitions of VIDEO_TS.IFO file **14**. A DVD player playing the DVD image, first accesses the Video Manager section **12**, retrieves VIDEO_TS.IFO file **14** for the management definitions and plays VIDEO_TS.VOB file **18** as audio visual presentation thereof.

A DVD title such as DVD title **20**L includes a title manager section **22** and a plurality of VOB files **30**A, **30**B, **30**C and **30**M. VOB files **30**A, **30**B, **30**C and **30**M are used for storing a plurality of media cells, and are limited in size to 1 GB. A media cell is a logical media component, which is associated with a logical section of the DVD title, such as a scene, a clip, and the like. A VOB file can include a plurality of media cells (e.g., when the total volume of these media cells is less than 1 GB). It is noted that a cell can extend over more than one VOB file (e.g., when size of that media cell is greater than 1 GB). Each of the media cells in a title can include a plurality of media streams such as a video stream, a plurality of audio streams, data streams (e.g., sub-titles), and the like. The VOB files are divided into a plurality of blocks, each being of the size of 2K bytes.

Title manager section **22** includes a VTS_L__0.IFO file **24**, a VTS_L__0.BUP **26** and a VTS_L__0.VOB file **28**. VTS_L__0.IFO file **24** includes file management definitions relating to the VOB files **30**A, **30**B, **30**C and **30**M, with respect to the media cells stored therein, such as the location of each media cell (i.e., VOB file identification and location within that VOB file), and the like.

VTS_L__0.BUP file **26** is a backup file, which is copy of VTS_L__0.IFO file **24**. VTS_L__0.VOB file **28** is a video file including a plurality of media streams (video, audio and others), which serve as a multimedia layer for presenting the management definitions of VTS_L__0.IFO file **24**. A DVD player playing the DVD title **20**L of DVD image **10**, accesses the title manager section **22**, retrieves VTS_L__0.IFO file **24** for the management definitions of the title and plays VTS_L__0.VOB file **28** as audio visual presentation thereof.

The name format of titles related files includes an identification prefix (e.g., VTS), followed by a title number, followed by a sequential number, and ending with a suffix (e.g., IFO, BUP, VOB, and the like). For example, the file name $VTS_{13}3_{13}2$.VOB implies that this file is a title related file (VTS), embedding a plurality of multimedia sub-streams (VOB) of the third title (3), second in the VOB sequence of the film.

DVD image **10** can include up to 99 titles of media (e.g., each title can be a feature film). Conventional methods and systems for producing DVD-ROM media, receive media titles, analyze them, compile the titles into DVD format (i.e., create all of the VOB files, produce the above manager sections and determine the relations between them, and the like), produce a DVD image and then, print the image on DVD media. It will be appreciated by those skilled in the art that compilation of several GB of data into DVD format requires significant processing power as well as intermediate storage area.

DVD on demand defines a situation where a user provides an individual request for a selection of titles. A DVD production server retrieves the titles from a title repository, where they are commonly stored in digital format such as MPEG and compiles the titles into a DVD format image. The DVD production server then provides that image to a DVD writer, which in turn imprints that image on a DVD media. It is noted that compilation procedure of that DVD format image according to the request requires the same amount of resources, as would a DVD format image directed for mass production. Hence, the DVD production server is typically a high power server, characterized in high processing power, large volume of intermediate storage and a fast communication connection to the title storage repository and to the DVD writer.

It is noted that the compilation process of a conventional DVD title typically requires around several minutes, using state of the art DVD production servers.

U.S. Pat. No. 6,023,713 to Grimsrud et al., entitled "Optimized CD/DVD authoring employing block reallocation" is directed to a method for optimized CD/DVD authoring. At first, either a pre-final version of a CD/DVD having a first block allocation or a disk image of the pre-final version of the CD/DVD with the first block allocation, is created. Then, an alternate block allocation is generated. That alternate block allocation points to the first block allocation and yields improved overall access time for the content of the CD/DVD. Preferably, the alternate block allocation is based on the order of a selected subset or the entire content of the CD/DVD, which is accessed. A final version of the CD/DVD is then generated using the alternate block allocation.

U.S. Pat. No. 5,900,608 to Iida, entitled "Method of purchasing personal recording media, system for purchasing personal recording media, and media recorded with personal recording media purchasing program" is directed to a system for purchasing a personal recording media, and includes a first entering unit for entering an identification information in order to identify a customer, a unit connected to the first entering unit for identifying whether or not the customer is an authorized customer based on the entered identification information, a second entering unit connected to the identifying unit for entering at least one designated information by the customer when the customer is identified as an authorized customer in accordance with the identifying unit, a unit for storing a plurality of information, a unit connected to the second entering unit and the information storing unit for reading information associated with the designated information by retrieving the plurality of information in the information storing unit based on the designated information entered by the second entering unit, and a unit connected to the information reading unit for recording the information read from the information storing unit into a predetermined recording media.

U.S. Pat. No. 5,860,06 to Cook, entitled "Method and system for custom manufacture and delivery of a data product" is directed to a system for selling, manufacturing and distributing a custom digital data product from retail stores, over the Internet, over the telephone, or by electronic means (e.g., fax, e-mail, and the like). At first, the customer is provided (e.g., by electronic mail verification) order tracking information. After the customer selects a "set" of sound recordings or data from a library or catalog of such recordings or data and payment or credit is received or verified, an image of the "set" is assembled from a storage or "disk" farm. The image is preferably assembled at a manufacturing facility, e.g., a CD-ROM burner farm, where the product is then made. Every data object on the product may have a code associated therewith for later reference. The disk and burner farms communicate via a high-speed communications subsystem to facilitate continuous processing. Upon assembly and manufacture, the product is packaged and shipped. Throughout the manufacture and distribution, the customer may track the process by activating a hyperlink in one or more e-mail confirmation messages provided by the service provider, or by entering order/tracking numbers from retail terminals or by telephone, or the like.

SUMMARY OF THE PRESENT INVENTION

It is an object of the present invention to provide a novel method and system for producing DVD format images, which overcomes the disadvantages of the prior art.

In accordance with the present invention, there is thus provided a system for producing custom media images. The system includes a media server including a title database and a creation server connected to the media server. The title database contains a plurality of title records. Each title record includes a title description file and a plurality of compiled title media files. The creation server receives a request to produce a media image from a selection of titles respective of the title records. The creation server produces a set of media management files according to the title description file of each the selected title records, and generates a media image containing the media management files and a copy of the compiled title media files of each the selected title records.

In accordance with another aspect of the present invention, there is thus provided a method for producing a DVD image. The method includes the steps of receiving a request to produce a DVD image of selected titles, and retrieving a plurality of title description modules, each title description module being associated with a selected title. The method further includes the steps of generating a DVD management module from the title description module and producing a DVD image from the DVD management module and from compiled versions of the selected titles.

In accordance with a further aspect of the present invention, there is thus provided a method for producing a single DVD title from a plurality of DVD titles. The method includes the steps of modifying the title management section of the first DVD title, eliminating the title management section of each of the rest of the DVD titles and modifying the file numbers of the VOB files of each of the rest of the DVD titles to be in sequence with the VOB files of the first DVD title.

In accordance with another aspect of the present invention, there is thus provided a DVD database structure. The DVD database structure includes a cell database and a title record pointer database. The cell database includes a plurality of cell records. Each cell record includes a cell description section and a cell content section. The cell description section includes information relating to the cell content section. The title record pointer database includes a plurality of title pointer records. Each title pointer record includes a title description section and at least one pointer pointing to a specified cell record in the cell database.

In accordance with a further aspect of the present invention, there is thus provided a method for producing a DVD title from a plurality of selected DVD cell records. Each DVD cell record includes a cell description module and a cell content file. The method includes the steps of retrieving the cell description sections of each DVD cell record and generating at least one new DVD title management module from the cell description modules and from a cell management module.

In accordance with another aspect of the present invention, there is thus provided a method for producing a DVD image from a plurality of selected DVD cell records and a plurality of title pointer records. Each DVD cell record includes a title description module and a cell content file. Each title pointer record includes a title description module and pointers to at least one of the DVD cell records. The method includes the initial step of receiving a user request including at least one title pointer record or at least one cell record.

When the user request includes at least one title pointer record, the title management module of each title pointer record is retrieved, a new title management module is generated when certain ones of the selected titles are to be combined, and the cell content file of the respective DVD cell records associated with the selected title records is retrieved.

When the user request includes at least one DVD cell record, the title management module of each of the selected DVD cell record is retrieved, a new title management module is generated, and the cell content file of the respective DVD cell record associated with the selected title record is retrieved, when certain ones of the selected titles are to be combined.

The method further includes the steps of generating at least one DVD title from the title management module and from the retrieved cell content file, and generating a DVD management module from the title description module.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be understood and appreciated more fully from the following detailed description taken in conjunction with the drawings in which:

FIG. **1** is a schematic illustration of a DVD image, which is knows in the art;

FIG. **2** is a schematic illustration of a system, constructed and operative in accordance with a preferred embodiment of the present invention;

FIG. **3** is a schematic illustration of the title database of the system of FIG. **2**;

FIG. **4** is a schematic illustration of the flow of data in the system of FIG. **2**, while creating a DVD image;

FIG. **5** is an illustration of a method for operating the system of FIG. **2**, operative in accordance with another preferred embodiment of the present invention;

FIG. **6** is a schematic illustration of the flow of data in the system of FIG. **2** according to a further preferred embodiment of the present invention;

FIG. **7** is an illustration of a method for operating system **100** of FIG. **2**, for achieving the flow of FIG. **6**, operative in accordance with another preferred embodiment of the present invention;

FIG. **8** is an illustration of a database structure, constructed and operative in accordance with a further preferred embodiment of the present invention;

FIG. **9** is a schematic illustration of the flow of data in the system of FIG. **2**, according to another preferred embodiment of the present invention;

FIG. **10** is an illustration of a method for operating system **100** of FIG. **2**, for achieving the flow of FIG. **8**, operative in accordance with a further preferred embodiment of the present invention;

FIG. **11** is an illustration of a method for operating system **100** of FIG. **2**, for achieving the flow of FIG. **8**, operative in accordance with another preferred embodiment of the present invention;

FIG. **12** is an illustration of a method for operating system **100**, operative in accordance with a further preferred embodiment of the invention; and

FIG. **13** is a schematic illustration of a DVD menu hierarchy, according to DVD format.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

The present invention overcomes the disadvantages of the prior art, by providing a system and method for producing DVD format images, by dividing the image production process into two stages. The first stage is initial reception of a media title, preferably already compiled into DVD format (i.e., a non-compiled media title, is then compiled before initiating the first stage). The compiled media title is analyzed and stored in a database as a record, together with the results of the analysis.

In the second stage, when the title is included in a user request for producing a DVD format image, the title analysis is retrieved from title record and is used for producing video management sections required for DVD format. At the end of the second stage, the DVD management section and the already compiled DVD title are used to produce a DVD format image. Hence, the compiled title stored in the database, can be used again and again for producing different DVD images, without the need for compiling that title.

The following terms are used throughout the description using their attached abbreviations:

VOB-	Video Object, set of video, audio and additional information needed to synchronize the video.
VOBU-	This is part of Vob and the presentation time is between 0.4 seconds and 1.0 seconds.
RLBN-	relative block number. Block contains 2048 bytes.
VMGM_VOBS-	video object set of video menu manager.
TT_SRPT-	title search pointer table.
VMGM_PGCI_UT-	Video menu manager PCG unit table.
VTS_ATRT-	video title set attributes table (contains all attribute table together).
VMGM_C_ADT-	Video menu manager cell address table.
VTS_PTT_SRPT-	VTS part of title search pointer table.
NV PACK-	Navigation Pack. This group of bytes contains information about user operation on the play of the DVD and seamless play of the DVD.
VTSM-	video title set menu (i.e the menu of the video title set).
OC_LVOBU_SA-	temporal parameter used by the patent, and means output C_LVOBU_SA.
OC_LVOBU_EA-	temporal parameter used by the patent, and means output C_LVOBU_EA.
VTS_ATRT_SIZE-	size of VTS attribute table.
VMG_VOBS-	Video manager vob set file.
TT_SRPT-	Title search pointer table.
VTS_ATRT-	attribute table of a title. Contains general information about the title (video system, audio system etc.).
VMGM_C_ADT-	Video menu manager cell address table.
VMGM_VOBU_ADMAP_SA-	start address of video menu manager address map.
TT_SRP_Ns-	number of title search pointers.
TT_SRPT_EA-	end address of title search pointer table.
TT_PB_TY-	title playback time.
ANGLE_Ns-	number of angles.
VTS_PTT_SRPT#I-	VTS part of title search pointer table for title referred by index i.
PGC-	program chain. Navigation data to control the presentation of the video.
PGC SIZE-	size of PGC.
LU POINTER SIZE-	size of language unit pointer table.
VMGM_PGCI_UT-	video menu manager FOC information unit table.
VMGM_LU-	video menu manager language unit.
VMGM_PGCI_SRP-	search pointers to video menu manager program chain information.
VMGM_PGC-	video menu manager program chain.
VMGM_PGCI-	video menu manager program chain information.
PGC#i-	PGC related by index i.
VTS_ATR-	video title set attribute.
TTL_DESC#i-	a file created by us which contains description about the title, index i.
VTS_CAT-	video title set category Karaoke or normal video.
VTS_ATTRIBUTE-	see VTS_ATR.
VTS-	video title set (contains DVD title and its menu).
VTSI-	video title set information.
VTS_EA-	end address of VTSI.
VTS_CAT-	VTS category contains zone restrictions of the DVD.
VTS ATTRIBUTE-	contains information about the VTS its audio. video parameters, sub titles etc.
VTS_PTT_SRPT-	VTS part of title search pointer table.
VOB_EA-	end address of the VOB file.
C_LVOBU_SA-	start address of the last VOBU in the cell.
C_LVOBU_EA-	end address of the last VOBU in the cell.
VMGI-	Video manager general information.
VMGI_EA-	End address of the VMGI.
VMGM-	Video manager menu.
VMGM_VOBS_SA-	start address of video VMGM's video object set.
TT_SRPT SA-	Start address of title search pointer table.
PGCI-	program chain information.
VMGM_PGCI_UT_SA-	Video menu manages PCG unit table start address.
VMGM_PGCI_UT_EA-	Video menu manager PCG unit table end address.
VTS_ATRT_SA-	video title set attribute table start address.
VMGM_C_ADT_SA-	Video menu manager cell address table start address.

-continued

VMG_EA-	video manager end address.
PTT_Ns-	number of part of title (VTS title can contain part of titles).
C_LVOBU_SA-	start address of the first VOBU in the cell.
C_LVOBU_EA-	end address of the first VOBU in the cell.
VMGM_CP_EA-	video manager menu cell piece end address.
RLBN-	Relative block number, (block = 2048 bytes).
TT_PTL_ID_FLD-	parental ID field for a specific title.
VTSN-	Video Title Set Number.
VTS_TTN-	video title number (title set can contain several titles).
VTS_SA-	Video title set start address.
VMGM_LU_Ns-	video manager menu language unit number.
VMGM_LCD-	video manager menu language code.
VMGM_EXST-	video manager menu existence.
VMGM_LU_SA-	video manager language unit start address.
VMGM_PGCI_SRP_Ns-	number of search pointers to video menu manager program chain information.
VMGM_LU_EA-	video manager language unit end address.
VMGM PGC CAT-	video menu manager program chain category.
VMGM_PGCI_SA-	start address of video menu manager program chain general information table.
PGC-	program chain. Navigation data to control the presentation of the video.
VTS_Ns-	number of video title sets.
VTS_ATRT_EA-	end address of video title set attributes table (contains all attribute table together).
VTS_ATR_SA-	start address of specific video title set attribute table.
VTS_ATR_EA-	end address of specific video title set attribute table.
VTS_CAT-	video title set category.
VTS_ATRI-	video title set attribute table information.
VMGM_VOB_Ns-	number of video menu manager Vob units.
VMGM _C_ADT__EA-	Video menu manager cell address table end address.
VMGM_VOB_IDN-	video menu manager VOB ID number.
VMGM_C_IDN-	video manager cell ID number.
VMGM_CP_SA-	start address of first VOBU in cell.
VMGM_CP_EA-	end address of last VOBU in cell.
VMGM_VOBU_ADA MAP_EA-	end address of video manager menu video object unit address map
VMGM_VOBU_SA-	start address of VOB.

Reference is now made to FIGS. **2**, **3** and **4**. FIG. **2** is a schematic illustration of a system, generally referenced **100**, constructed and operative in accordance with a preferred embodiment of the present invention. FIG. **3** is a schematic illustration of a title database **106**, of FIG. **2**. FIG. **4** is a schematic illustration of the flow of data in system **100** of FIG. **2**, while creating a DVD image.

With reference to FIG. **2**, system **100** includes a creation server **102**, a media server **104**, a media analysis server **108** and a media compiler **110**. Creation server **102** is coupled to media server **104**. Media analysis server **108** is coupled to media compiler **110** and to media server **104**. Media server **104** includes a title database **106**.

Media analysis server **108** receives a plurality of compiled media sources, analyzes them, produces a media record (e.g., a title record, a cell record or a pointer record) and stores these media records in title database **106**. Each of the media records includes an informative section, which relates to the results of the analysis, and a copy of the analyzed media module. The example set forth in FIGS. **3** and **4** relates to a situation where the media modules are multimedia titles (i.e., include both audio and visual data).

System **100** can also operate on non-compiled media sources, which are received at the input of media compiler **110**. Media compiler **110** compiles a non-compiled media module (e.g., a title or a clip) into DVD format and provides the compiled media module to media analysis server **108**.

Creation server **102** receives a request to produce a DVD image from a plurality of titles available in title database **106**. Creation server **102** accesses title database **106**, retrieves the respective title records and produces a DVD image, as will be described herein below.

With reference to FIG. **3**, title database **106** includes a plurality of title records **128**A, **128**B, **128**C, **128**D, **128**E and **128**N. The structure of these title records N is unique to the disclosed technique. For example, title record **128**N includes a TITLEDESC.TXT file **130**, a VTS_J__0.IFO file **132**, a VTS_J__0.VOB file **136** and a plurality of files VTS_J$_{13}$1.VOB, VTS_J$_{13}$2.VOB and VTS_J_K.VOB, referenced **138**A, **138**B and **138**K, respectively. It is noted that VTS_J$_{13}$0.BUP file **134** is a mere backup copy of VTS_J$_{13}$0.IFO file **132** and hence is redundant. Accordingly, VTS_J$_{13}$0.BUP file **134** can always be restored from VTS_J$_{13}$0.IFO file **132** simply by copying it and renaming the copy file with a BUP suffix.

VTS_J__0.IFO file **132**, VTS_J__0.VOB file **136** and VOB files **138**A, **138**B and **138**K comprise a compiled DVD title. TITLEDESC.TXT file **130** contains the analysis results of that DVD title.

The following is a brief description of the structure of TITLEDESC.TXT file **130**. According to one aspect of the invention, a plurality of template VIDEO_TS.IFO files are created in advance, one for each number of title selections (i.e., a VIDEO_TS.IFO for a selection of a single title for the DVD image, a VIDEO_TS.IFO for a selection of two titles, a VIDEO_TS.IFO file for a selection of three titles, and the like). Each of these template VIDEO_TS.IFO files includes template menu (MENU_DESC) and template titles (TTL_DESC) as described in the following tables 1 and 2.

TABLE 1

(TTL_DESC)

Field name	Place in VTS_X_0_IFO	Size in bytes	Description
VTS_EA	12	4	Size of the Entire Title
VTS_CAT	34	4	Vts Category
VTS_ATTRIBUTE	256	768	Vts Attribute
VTS_PTT_SRPT	(200-204)×2048	2	Part of Titles number (Title can be a set of X part of titles).

TABLE 2

(MENU_DESC)

Field name	Size (bytes)	Description
VOB_EA	4	Size of VOB of the menu in RLBN (bn = 2048 bytes)
C_LVOBU_SA	4	Start address of the last VOBU in the menu cell
C_LVOBU_EA	4	End address of the last VOBU in the menu cell

The following parameters are required for modifying the VIDEO_TS.IFO file:

Number of titles, which are selected for the DVD image.

The order of the selected titles on the DVD image.

The path for each of the title directories.

The definitions of the menu files (VOB and MENU_DESC).

The identification of the template file, which is to be modified.

The modification of the template file is described in Table 3, as follows:

TABLE 3

Parameter	Pointer in VIDEO_TS file	Pointer size (bytes)	Description
VMGI_EA	28	4	End Address of VMGI
VMGM_VOBS_SA	192	4	Start address of VMG_VOBS
TT_SRPT_SA	196	4	Start Address of TT_SRPT
VMGM_PGCI_UT_SA	200	4	Start address of VMGM_PGCI_UT
VTS_ATRT_SA	208	4	Start address of VTS_ATRT
VMGM_C_ADT_SA	216	4	Start address of VMGM_C_ADT

The modifications are performed in the following blocks:

TABLE 4

(VMGI Block)

Modified Parameter	Pointer in VIDEO_TS file	Value
VMG_EA	(12)	VMGI_EA×MENU_DESC (VOB_EA)+24 bytes long

TABLE 5

(Title Search Block)

Modified Parameter	Pointer in VIDEO_TS file	Value
PTT_Ns of title i	(TT_SRPT_SA)+10+[12×[i−1]]	VTS_PTT_SRPT #i 2 bytes long
VMG_EA	(TT_SRPT_SA)+10+[12×[i−1]]	Menu Size + Previous Title size + 1 4 bytes long

Where the menu size is equal to the value of MENU_DESC (VOB_EA) and the previous title size is equal to the sum of all of the previous TTL_DESC(VTS_EA). ( ) denotes a pointer to a value.

TABLE 6

(Video Manager Menu PGCI Block)

Modified Parameter	Pointer in VIDEO_TS file	Value
C_LVOBU_SA	((VMGM_PGCI_UT_ SA+16+232+16))	MENU_DESC (C_LVOBU_SA) 2 bytes long
C_LVOBU_EA	((VMGM_PGCI_UT_ SA+16+232+20))	MENU_DESC (C_LVOBU_EA) 2 bytes long

Where (( )) denotes a pointer to a pointer to a value.

TABLE 7

(Video Title Set Attribute)

Modified Parameter	Pointer in VIDEO_TS file	Value
VTS_CAT#i	((VTS_ATRT_SA+8+4×[i−1])) +4	TTL_DESC#i (VTS CAT) 4 bytes long
VTS_ATRI#i	((VTS_ATRT_SA+ 8+ 4×[i−1])) +8	TTL_DESC#i (VTS_CAT) 4 bytes long

TABLE 8

(Video Manager Menu Cell Address)

Modified Parameter	Pointer in VIDEO_TS file	Value
VMGM_CP_EA	(VMGM_C_ADT_SA)+16	MENU_DESC (C_LVOBU_EA) 4 bytes long

With reference to FIG. **4**, creation server **102** receives a request to produce a DVD image, which includes the DVD titles B, D and E, respectively embedded in title records **128**B, **128**D and **128**E. The order of the titles in the final DVD image is to be DVD title E first, DVD title B second and finally DVD title D.

Creation server **102** accesses title database **106** (FIG. **2**) and retrieves the TITLEDESC.TXT files of DVD records **128**B, **128**D and **128**E. Creation server **102** processes the title analysis information stored in the TITLEDESC.TXT files and produces VIDEO_TS.IFO file **154** and VIDEO_TS.BUP file **156**, which is a copy thereof. VIDEO_TS.IFO file **154** includes DVD image management commands and information, which are used to receive instruction from a user and access each of the titles in the final DVD image. In addition, creation server **102** produces VIDEO_TS.VOB file **158**, according to predetermined rules and templates, which may take into consideration the nature of the requested DVD titles. For example, a selection of war movies may yield a VIDEO_TS.VOB file, which includes video representation of combat elements, and a selection of nature DVD titles may yield a VIDEO_TS.VOB file which includes video representation of wild life elements.

VIDEO_TS.IFO file **154** together with VIDEO_TS.BUP file **156** and VIDEO_TS.VOB file **158** form a DVD video manager section **152** of a later produced DVD image. Creation server **102** produces the final DVD image **150** from DVD video manager section **152** and from the selected DVD titles, as retrieved from the respective title records **128**B, **128**D and **128**E. DVD image **150** includes VIDEO_TS.IFO file **154**, VIDEO_TS.BUP file **156**, VIDEO_TS.VOB file **158** and DVD titles **160**A, **160**B and **160**C. DVD titles **160**A, **160**B and **160**C are respective copies of the DVD titles embedded in title records **128**B, **128**D and **128**E. It is noted that creation server **102** does not compile any of these titles in the process of producing DVD image **150**. The titles are merely attached to the final DVD image, after the video manager section **152**, which is produced according to preliminary analysis thereof.

Reference is now made to FIG. **5**, which is an illustration of a method for operating system **100** of FIG. **2**, operative in accordance with another preferred embodiment of the present

invention. In step **180**, a DVD title is received. With reference to FIG. **2**, a compiled DVD title is received directly to media analysis server **108** and a non-compiled DVD title is received at media compiler **110**, which compiles it to DVD title format (step **182**).

In step **184**, the compiled DVD title is analyzed. The analysis is directed at detecting various characteristics of the compiled DVD title, such as the internal file structure and the internal media cell structure in terms of size and displacement, the content of the DVD title, according to analysis of subtitle streams of voice analysis of the audio streams, and the like. With reference to FIG. **2**, media analysis server **108** analyzes the DVD title and produces a title description module (step **186**).

In step **188**, the title description module and the compiled DVD title are stored as a title record in title record database. The title record structure enables individual access to each of the title description modules and the compiled DVD titles. With reference to FIG. **2**, media analysis server **108** generates a title record from the title description module and the compiled DVD title and stores the title record in title database **106**.

In step **190**, a request to produce a DVD image of selected titles, is received. With reference to FIG. **2**, creation server **102** receives a request to produce a DVD image of titles, which are embedded in title records, and stored in title database **106**.

In step **192**, the title description module associated with each of the selected lilies is retrieved from the respective title record, in the title database. With reference to FIG. **2**, creation server **102** retrieves the TITLEDESC.TXT modules from each of the selected title records using a query, which is directed to media server **104**.

In step **194**, a DVD management module is generated from the retrieved title description modules. With reference to FIG. **4**, creation server **102**, produces video manager section **152** including VIDEO_TS.IFO file **154**, VlDEO_TS.BUP file **156** and VIDEO_TS.VOB file. **158**.

In step **196**, a DVD image is produced from the DVD management module and the selected titles. With reference to FIG. **4**, creation server **102** produces DVD image **150** from DVD manager section **152** and from titles **160**A, **160**B and **160**C, which are copies of the selected titles. It is noted that the creation server **102** can produce the DVD image directly in media server **104**, by storing DVD management module in media server **104**, together with copies of the selected DVD titles. This way, the copy procedure of the titles, which involves mass volumes of data, is performed within the media server and not over communication lines, which are typically slower than internal communication channels, within the media server.

In step **198**, the DVD image is printed onto a DVD media. With reference to FIG. **2**, creation server provides the DVD image to a DVD printing device (not shown). It is noted that the DVD printing device can be also coupled to the media server **104**, which stores the DVD image.

Reference is now made to FIG. **6**, which is a schematic illustration of the flow of data in system **100**, according to a further preferred embodiment of the present invention. According to this aspect of the invention, a plurality of titles is combined into a new title. In the example set forth in FIG. **6**, three DVD titles embedded in three DVD records **200**, **210** and **220** are combined into a new DVD title **230**.

DVD record **200** includes a TITLEDESC.TXT file **202** and three VOB files VTS_5_1.VOB, VTS_5_2.VOB and VTS_5_3.VOB, referenced **204**A, **204**B and **204**C, respectively. DVD record **210** includes a TITLEDESC.TXT file **212** and a single VOB file VTS_2_1.VOB, referenced **214**. DVD record **220** includes a TITLEDESC.TXT file **222** and two VOB files VTS_4_1.VOB and VTS_4_2.VOB, referenced **224**A and **224**B, respectively.

The new DVD title **230** includes a VTS_1_0.IFO file **232**, a VTS_1_0.BUP file **234**, a VTS_1_0.VOB file **236** and a plurality of VOB files VTS_1_1.VOB, VTS_1_2.VOB, VTS_1_3.VOB, VTS_1_4.VOB, VTS_1_5.VOB and VTS_1_6.VOB, referenced **238**A, **238**B, **238**C, **238**D, **238**E, and **238**F, respectively. VOB files **238**A, **238**B, **238**C, **238**D, **238**E, and **238**F are respective copies of VOB files **204**A, **204**B, **204**C, **214**, **224**A and **224**B.

Creation server **102** (FIG. **2**) produces files VTS_1_0.IFO file **232**, a VTS_1_0.BUP file **234** and VTS_1_0.VOB file **236** according to TTTLEDESC.TXT files **202**, **212** and **222**, respectively, thereby forming the title manager section **240** of the new DVD title. Creation server **102** further modifies the names of VOB files **204**A, **204**B, **204**C, **214**, **224**A and **224**B and attaches copies thereof thereafter. The modified VOB file names form a sequence. It is noted that the number of VOB files cannot exceed twelve. To qualify this limitation, creation server **102** can further combine VOB files, as shall further be described further below.

Reference is now made to FIG. **7**, which is an illustration of a method for operating system **100** of FIG. **2**, for achieving the flow of FIG. **6**, operative in accordance with another preferred embodiment of the present invention.

In step **250**, a request to produce a new DVD title of selected titles, is received. With reference to FIG. **2**, creation server **102** receives a request to produce a new DVD title from titles, which are embedded in title records, stored in title database **106**.

In step **252**, the title description module associated with each of the selected titles is retrieved from the respective title record, in the title database. With reference to FIG. **2**, creation server **102** retrieves the TITLEDESC.TXT modules from each of the selected title records using a query, which is directed to media server **104**.

In step **254**, a title management module is generated from the retrieved title description modules. With reference to FIGS. **2** and **6**, creation server **102**, produces title manager section **240** which includes VTS_1_0.IFO file **232**, VTS_1_0.BUP file **234** and VTS_1_0.VOB file **236**.

In step **256**, the names of the VOB files of the selected titles are modified so as to form a sequence of VOB files, starting at 1 to N (i.e., N is defined according to the total number of VOB files, which are not included in the title management sections of each of the selected titles). With reference to FIGS. **2** and **6**, creation server **102** forms copies of the VOB files of the selected titles and modifies their names to form a sequence for the new DVD title.

In step **258**, a new DVD title is produced from the newly generated title management module and the VOB files of the selected titles. With reference to FIG. **2** and **6**, creation server **102** produces new DVD title **230** from title manager section **240** and from VOB files **238**A, **238**B, **238**C, **238**D, **238**E, and **238**F, which are modified name copies of the VOB files of the selected titles. Similar to the method presented in FIG. **5**, here too, the creation server **102** can produce the new DVD title directly in media server **104**, by storing title management module in media server **104**, together with copies of the VOB files of the selected DVD titles.

This new DVD title can be now used for producing DVD images or storing in title database **106** together with a respective TITLEDESC.TXT file, as a title record.

According to another aspect of the invention, a DVD image is generated from a plurality of cells, which may or may not be associated with a DVD title. According to this aspect of the

invention, a new DVD title can be generated from a plurality of cells, without requiring a stage of compilation. Reference is now made to FIGS. **8** and **9**. FIG. **8** is a schematic illustration of a database structure, constructed and operative in accordance with a further preferred embodiment of the present invention. FIG. **9** is a schematic illustration in detail of the flow of data in a system **100** (FIG. **2**), operating on the database structure presented in FIG. **8**.

Cell database **280** includes a plurality of cell records, where each cell record includes a TITLEDESC.TXT file and at least one VOB file. Title record pointer database **270** includes a plurality of title pointer records, each pointing at at least one cell record within cell database **280**. Each of the title records includes a TITLEDESC.TXT file and at least one cell pointer.

For example, each scene in a title can be encapsulated within a cell record and stored in cell database **280**. The user can submit a request for a selection of scenes of a predetermined type (e.g., love scenes). In that case, the system shall produce a DVD image, which includes a plurality of love scenes. System **100** can arrange each cell record in the final DVD image, as an individual title, or it can combine a plurality of cell records into a new DVD title, as shall be described herein below.

Alternatively, the user can submit a request to produce a DVD image of a selected title. In that case, system **100** shall access title pointer database **270** and retrieve the respective title pointer record. System **100** retrieves cell records from cell database **280**, according to the pointers included in that title pointer record. Finally, system **100** produces a DVD image, which includes all of the cells associated with the requested title. It is noted that the title pointer record can further include title management files, which are respective of the entire title but have no relevance to each individual cell. Hence, system **100** can make use of these title management files, in the process of generating the final DVD image.

With reference to FIG. **9**, there is illustrated a case wherein the user submits a request for combining two titles. The title record pointers **272**A and **272**B are respective of these two requested titles. Title record pointer **272**A points to three cell records **282**A, **282**B and **282**C. Title record pointer **272**B points to a single cell record **282**D. System **100** (FIG. **2**) generates a DVD title **290**, which includes a VTS_1_0.IFO file **292**, a VTS_1_0.BUP **294** and a VTS_1_0.VOB file **296** and a plurality of VTS_1_i.VOB, files **298**A, **298**B, **298**C and **298**D. Each of the VTS_1_1.VOB, VTS_1_2.VOB, VTS_1_3.VOB and VTS_1_4. VOB files is retrieved from the respective cell record **282**A, **282**B **282**C and **282**D and renamed according to the place thereof in the sequence.

Reference is further made to FIG **10**, which is an illustration of a method for operating system **100**, operative in accordance with another preferred embodiment of the invention. In step **300** a plurality of cell records is accessed according to a received request. It is noted that the request can be received from a user or from an automatic system (e.g., according to predicted market needs). With reference to FIGS. **2** and **8**, system **100** accesses cell database **280** and accesses the respective cell records and retrieves the cell description modules of each of the selected cells (step **302**). In step **304**, the request is analyzed to determine if cells have to be combined. If so, then system **100** proceeds to step **312**. Otherwise, system **100** proceeds to step **316**.

In step **306** a plurality of title pointer records is accessed according to a received request. Again, the request can be received from a user or from an automatic system (e.g., according to predicted market needs). With reference to FIGS. **2** and **8**, system **100** accesses the respective title pointer records in title record pointer database **270** and retrieves the title management modules of each of the selected title pointer records (step **308**). In step **310**, the request is analyzed to determine if cells have to be combined. If so, then system **100** proceeds to step **312**. Otherwise, system **100** proceeds to step **314**.

In step **312**, a new title management module is generated according to information provided by earlier retrieved management modules. It is noted that cells can be combined on a block level, as shall be further described in conjunction with FIGS. **11** and **12**.

In step **314**, the VOB files of the respective cell records are retrieved. As mentioned above, the cell records are accessed according to a specific request or according to pointers included in a requested title pointer record.

In step **316**, a DVD title is generated from the title management module and from the retrieved VOB files. The title management module is either retrieved unchanged from a title pointer record, in the case that a title is requested as a whole, or generated as described in the above step **312**. Subsequently, a DVD management module is generated from the title description modules (step **318**), a DVD image is generated from DVD management modules and from the title description modules (step **320**) and is written on a DVD media (step **322**).

According to a further aspect of the invention, system **100** can combine or break apart VOB files. Reference is further made to FIG. **11**, which is an illustration of a VOB restructuring process, in accordance with a further preferred embodiment of the present invention. The files which are to be processed are VTS_1_1.VOB **350**, VTS_1_2.VOB **360** and VTS_1_3.VOB **370**.

System **100** (FIG. **2**) combines all of the six hundred blocks of VTS_1_1.VOB **350** and the first four hundred blocks of VTS_1_2.VOB **360** into a new VTS_2_1.VOB file **385**. All of the six hundred blocks $\mathbf{354}_1$-$\mathbf{354}_N$ of the VTS_1_1.VOB file **350** are placed as is, at the beginning of VTS_2_1.VOB **385** as $\mathbf{384}_1$-$\mathbf{384}_K$. The first four hundred blocks $\mathbf{364}_1$-$\mathbf{364}_K$ of the VTS_1_2.VOB file **360** are placed right after blocks $\mathbf{384}_1$-$\mathbf{384}_K$, as blocks $\mathbf{384}_{K+1}$-$\mathbf{384}_N$ and are renumbered front 600-999 to continue the sequence of blocks $\mathbf{384}_1$-$\mathbf{384}_K$. System **100** accesses each and every one or these blocks $\mathbf{364}_1$-$\mathbf{364}_K$ and updates its address according to its new location in the sequence of blocks. The resulting VTS_2_1.VOB file **385** includes one thousand blocks, which can be played seamlessly.

In addition, system **100** (FIG. **2**) combines the next thee hundred blocks of VTS_1_2.VOB **360** and all of the five hundred blocks of VTS_1_3.VOB **370** into a new VTS_2_2.VOB file **390**. System **100** places the next thee hundred blocks $\mathbf{364}_{K+1}$-$\mathbf{364}_N$ of VTS_1_2.VOB **360** at the beginning of VTS_2_2.VOB file **390**, as blocks $\mathbf{394}_1$-$\mathbf{394}_K$ and renumbers them to be from 0-299. System **100** places blocks $\mathbf{374}_1$-$\mathbf{374}_N$ right after blocks $\mathbf{394}_1$-$\mathbf{394}_K$, as blocks $\mathbf{394}_{K+1}$-$\mathbf{394}_N$ and renumbers them 350-799 to continue the sequence of blocks $\mathbf{394}_A$-$\mathbf{394}_K$. System **100** accesses each and every one of blocks $\mathbf{374}_1$-$\mathbf{374}_K$ and updates its address according to its new location in the sequence of blocks. The resulting VTS_2_2.VOB file includes eight hundred blocks, which can be played seamlessly.

Reference is further made to FIG. **12**, which is an illustration of a method for operating system **100**, operative in accordance with another preferred embodiment of the invention. In step **400**, a request to produce a DVD title from a plurality of cells is received. This request can be received specifically from a user or automatically during a title combining proce-

dure. In step **402**, the cell description modules of each of the cell records of the cells included in the request, are retrieved.

In step **404**, the request is analyzed to determine if VOB files are to be combined. If so, then system **100** proceeds to step **406**. Otherwise, system **100** proceeds from step **408**.

In step **406**, the blocks of the selected VOB files are copied and renumbered into a new VOB file, as detailed in FIG. **11**. In step **408**, a title management module is generated according to the cell description modules and the final structure of the new VOB files.

Reference is now made to FIG. **13**, which is a schematic illustration of a DVD menu hierarchy, according to DVD format. In general, the DVD image includes a VMGM domain **430** and a title domain **440**. The VMGM domain **430** is superior to the title domain **440** and is conventionally configured to play as the DVD media is inserted in the DVD player.

VMGM domain **430** includes a menu information section **432** and a navigation menus section **434**. Title domain **440** includes a plurality (N) of title information sections $\mathbf{442}_1$, $\mathbf{442}_2$ and $^{442}{}_N$ and a plurality of title menus $\mathbf{444}_1$, $\mathbf{444}_2$ and $\mathbf{444}_N$. Title information sections $\mathbf{442}_1$, $\mathbf{442}_2$ and $\mathbf{442}_N$ are respectively associated to title menus $\mathbf{444}_1$, $\mathbf{444}_2$ and $\mathbf{444}_N$.

Navigation menus section **434** includes a plurality of pointers, each pointing to a selected one of title menus $\mathbf{444}_1$, $\mathbf{444}_2$ and $\mathbf{444}_N$. Hence, navigation menus section **434** provides a navigate scheme to the user, to navigate between the different titles on the DVD media. Each of title menus $\mathbf{444}_1$, $\mathbf{444}_2$ and $\mathbf{444}_N$ is operative to navigate within its respective title as well as to return to navigation menus section **434**.

The following is a detailed description of a process for generating a multi-menu and multi-title DVD image. This process includes two phases. The first phase includes the making of one complete menu file from several templates. This file is used for navigating between the different titles in the DVD image. The second phase includes the making of an IFO file which describes the content of the DVD and provides the initial play commands, right at the insertion of the DVD disk into the DVD player. According to this aspect of the invention, the modifications are made in the files of the VMGM domain (video management section) **430** and not in the Title domain (title management sections) **440**. Hence, the creation server processes a small amount of data and files for the purpose of manufacturing a custom DVD. The creation server operates on an existing template VMGM domain, changes and modifies specific sections therein and finally produces a DVD video library.

The following is a detailed description of how the creation server modifies a template VOB file of the template VMGM domain. In general, each of the template VOB files which is needed for the creation of the custom menu is first changed according to the DVD title content, as stored in the title description file and then chained to one VOB file which includes all of the menu information.

The creation server receives as input the VOB files of all of the different menus, which are edited in advance with the menu video information. The creation server inserts the navigation commands to the menu and merges the respective pages to one VOB file that provides a visual representation of the menu. Accordingly, the creation server receives a VOB file #**1** respective of the menu of the first title, a VOB file #**2** respective of the menu of the second title and so on, until VOB file #n, respective of the menu of the last (n) title.

The creation server performs four stages as follows:

In the first stage, the creation server processes each of the input title menus, extracts the sub-pictures embedded therein and produces a respective stand alone VOB file. This VOB file may have a plurality of pages, wherein each page can include links to several DVD titles.

In the second stage, the creation server modifies buttons in the NV_PACK section of the VMGM template so that each of these buttons points to a selected one of the titles. The following is an example of such modifications—30 02 00 00 00 0X 00 00, thereby yielding a jump command to title #X. Alternatively, the modifications can be set as follows:

jump SS is set to a value "30 06",

vts_ttn is set to a value "00 01 0X"; and

the vtsm domain root menu is set to a value "83 00 00",

thereby yielding a jump command to the menu of title #X.

The addresses within the NV_PACK section, where these modifications should be introduced, are defined: (197+10i), where i=0, 1 . . . 31. The number of buttons can be set in the NV_PACK section, in address (**158**).

A presentation control information (PCI) table contains the navigation data to control the presentation of a VOB unit. A data search Information (DSI) table contains the navigation data to search and carry out Seamless playback of the VOB unit. The NV_PACK is a PACK of the VOB file (NV for navigation) the Pack contains two information tables, the PCI and the DSI. In the third stage, the creation server modifies the PCI, DSI tables in the NV_PACK section:

TABLE 9

pci_dsi Modification

Displacement from beginning of NV_PACK	Description
45	The start address of VOB in RLBN. (size 4 bytes)
1035	The start address of VOB in RLBN (size 4 bytes)
1055	The menu serial number (01 first 02 second etc..) (size 2 bytes)

In the fourth and final stage, the creation server chains all of the modified VOB files into one VOB file names Video_ts-.VOB.

The following is a detailed description of how the creation server changes and modifies the template IFO file of the template VMGM domain. The creation server produces a video_ts.IFO file from the titles that were custom selected by the user.

In general, for each number of title links and VMG links in the menu, the creation server has to come up with a plurality (n) of MENU_DESC modules and the same number (n) of page#i.VOB files. The following is a list of the input parameters, which the creation server receives as input for this purpose:

x title description modules,

n menu description

n page#i.vob files path

where x denotes the number of titles that the user selected and n denotes the number of menus.

TABLE 10

Menu Description

Field's Name	Size in bytes	Description
VOB_EA	4	Size of VOB of the menu in RLBN (BN = 2048 bytes)

TABLE 10-continued

Menu Description

Field's Name	Size in bytes	Description
C_LVOBU_SA	4	Start Address of last VOBU in Menu cell
C_LVOBU_EA	4	End Address of Last VOBU in Menu Cell

In general, the menu description is an array, containing the above fields in a sorted order, wherein

OC_LVOBU_SA[1]=C_LVOBU_SA[1]

OC_LVOBU_EA[1]=C_LVOBU_EA[1], for i=1 and

OC_LVOBU_SA[i]=C_LVOBU_EA[i−1]+1+C_VOBU_SA[i]

OC_LVOBU_EA[i]=C_LVOBU_EA[i−1]+1+C_LVOBU_EA[i],

For i>1.

Total menu size=OC_LVOBU_EA[n]+1

VMGM_SIZE=Ceil{[32+8*(n−1)+266*(n−1)]/2048}

VTS_ATTR_SIZE=Ceil{[8+4*n+776*n]/2048}

An IFO file is constructed of blocks, wherein each block contains 2048 bytes. The table below denotes which bytes in these blocks need to be changed, their offset and their values. A normal definition will be created and these parameters will be modified due to the custom items that were chosen.

The video management file named video_ts includes the video manager general information (VMGI) table, which contains general information on the VMG file:

TABLE 11

_VMGI_MAT

Parameters to modify:	Pointer in Video_ts file	Size of pointer in bytes	Value:
VMG_EA	12	4	(2+VMGM_SIZE+VTS_ATRT_SIZE+2)*2+Total menu size+0x0F
VMGI_EA	28	4	End address of VMGI: 2+VMGM_S1ZE+VTS_ATRT_SIZE+1
VMGM_VOBS_SA	192	4	Start address of VMG_VOBS:
TT_SRPT_SA	196	4	Start address of TT_SRPT: 00 00 00 01
VMGM_PGCI_UT_SA	200	4	Start address of VMGM_PGCI_UT: 00 00 00 02
VTS_ATRT_SA	208	4	Start address of VTS_ATRT: 2+VMGM_SIZE
VMGM_C_ADT_SA	216	4	Start address of VMGM_C_ADT: 2+VMGM_SIZE+VTS_ATRT_SIZE
VMGM_VOBU_ADMAP_SA	220	4	2+VMGM_SIZE+VTS_ATRT_SIZE+1

TABLE 12

TT_SRPT (Title search pointer block)

Parameter to modify	Delta from TT_SRPT	Number of bytes	value	Description
TT_SRP_Ns	0	2	x=number of titles	Number of title search pointers
Reserved	2	2	00 00	Reserved
TT_SRPT_EA	4	4	8+12*x−1	End address of TT_SRPT
TT_PB_TY	8+12*[i−1]	2	3C 01	
ANGLE_Ns	10+12*[i−1]	2	VTS_PTT_SRPT#i	Number of part of title
PTT_NS	12+12*[i−1]	2	00 01	
TT_PTL_ID_FLD	14+12*[i−1]	1	1	VTS number
VTSN	15+12*[i−1]	1	01	VTS title number
VTS_TTN	16+12*[i−1]	4	Menu size+previous titles' size+1	Start address of VTS
VTS_SA	16+12*[x−1]	2048 − TT_SRPT_EA	00	
Zeros staffing				

PGC Size=266

Lu pointer size=8

TABLE 13

VMGM_PGCI_UT

Parameter to modify	Delta from VMGM PGCI_UT:	Number of bytes	Value	Description
(Video manager menu program chain information table)				
VMGM_LU_Ns	0	2	00 01	Number of video manager menu language units
Reserved	2	2	00 00	Reserved
VMGM_PGCI_UT_EA	4	4	24 + (PGC Size + Lu pointer size)*n−1	End address of VMGM_PCiCI LIT
VMGM_LCD	8	2	65 6E	Video manager language code

TABLE 13-continued

VMGM_PGCI_UT				
Parameter to modify	Delta from VMGM PGCI_UT:	Number of bytes	Value	Description
Reserved	10	1	00	
VMGM_EXST	11	1	80	VMGM existence
VMGM_LU_SA	12	4	00 00 00 10	Start address of VMGM_LU
Same comment				
VMGM_PGCI_SRP_Ns	16	2	N	Number of VMGM_PGCI_SRPs
Reserved	18	2	00 00	
VMGM_LU_EA	20	4	VMGM_PGCI_UT_EA-16	End address of VMGM_LU
VMGM_PGC_CAT	24+8*(i−1)	4	First: 82 00 00 00 Other: 00 00 00 00	VMGM_PGC category
VMGM_PGCI_SA	28+8*(i−1)	4	8+8*n+PGC Size*(i−1)	Start address of VMGM_PGCI
Pgc#i	32+8*(n−1)+266*(i−1)	266	See *	
Zero padding	32+8*(n−1)+266*n	Ceil{[32+8*(n−1)+266*(n−1)]/2048}*2048−[32+8*(n−1)+266*(n−1)]	00	

The creation server modifies each of the program chain (pgc) the following places:

TABLE 14

Displacement	Description
246	Start address of first VODU in the cell
254	Start address of last VOBU in the cell

TABLE 14-continued

Displacement	Description
258	End address of last VOBU in the cell
262	Menu number in the flow of the menus (length 2).

TABLE 15

VTS_ATRT (Video title set attribute table)

Parameter to modify	Delta from VMGM_PGCI_UT:	Number of bytes	Value	Description
VTS_Ns	0	2	X	Number of VTSs
Reserved	2	2	00 00	
VTS_ATRT_EA	4	4	8+4*x+776*x−1	End address of VTS_ATTR
VTS_ATR_SA	8+4*(i−1)	4	8+4*x+776*(i−1)	
VTS_ATR_EA	8+4*n+776*(i−1)	4	00 00 03 07	End address of VTS_ATR
VTS_CAT	8+4*n+4+776*(i−1)	4	TTL_DESC#i (VTS_CAT)	Video title set category
VTS_ATR1	8+4*n+8+776(i−1)	768	TTL_DESC#i (VTS_ATTRIBUTE)	Video title set attribute table.
Zero padding	8+4 *n+776*n	Ceil{[8+4*n+776*n]/2048)*2048−{8+4*n+ 776*n}	00	

TABLE 16

VMGM_C_ADT(Video manager menu cell address table)

Parameter to modify	Delta from VMGM_ PGCI_UT:	Number of bytes	Value	Description
VMGM_VOB_Ns	0	2	n	Number of VOBs in the VMGM_VOBS
Reserved	2	2	00 00	
VMGM_C_ADT_EA	4	4	8+12*n−1	End address of VMGM_C_ADT
VMGM_VOB_IDN	8+12* (i−1)	2	VOB ID (00 01/00 02 . . .)	Vob id number
VMGM_C_IDN	10+12* (i−1)	1	01	Cell ID number
Reserved	11+12* (i−1)	1	00	
VMGM_CP_SA	12+12* (i−1)	4	Start address of vob	
VMGM_CP_A	16+12* (i−1)	4	End address of vob	
Zero padding	16+12*n	2048−(16+12*n)	00	

TABLE 17

VMGM_VOBU_ADMAP
(Video manager menu video object unit address map)

Parameter to modify	Delta from VMGM_ PGCI_UT:	Number of bytes	Value	Description
VMGM_ VOBU ADAMAP_ EA	0	4	4+4*n−1	End address of VMGM VOBU_ ADMAP
VMGM_ VOBU SA	4+4* (i−1)	4	Start address of vob	
Zero padding	4+4*n	2048−4+ 4*n	00	

Finally, the creation server produces the DVD video library (directory) by the name of Video_ts, which includes the above modified Video_Ts.ifo and Video_Ts.vob files, a Video_Ts-.bup, which is a backup copy of the Video_Ts.ifo file and all of the VTS files respective of the selected titles.

It will be appreciated by persons skilled in the art that the present invention is not limited to what has been particularly shown and described hereinabove. Rather the scope of the present invention is defined only by the claims, which follow.

The invention claimed is:

1. Method for producing a DVD image including at least video, comprising the steps of:

receiving a request to produce a DVD image of selected titles, each said selected titles being associated with a previously compiled **[**version thereof**]** *DVD title*, at least one of said selected **[**tiles**]** *titles* being a video title;

retrieving a plurality of title description modules, *wherein* each *title description module is* associated with a selected one of said selected titles *and contains analysis results of that title*;

generating a DVD management module from said title description modules by

modifying a DVD management module template, according to parameters extracted from said title description modules; and

producing a DVD image from said DVD management module and from said compiled versions of said selected titles

eliminating a title management section of all but a first of said selected titles;

modifying file numbers of VOB files of said all but the first of said selected titles to be in sequence with the VOB files of a first selected title; and

modifying the title management section of said first selected title, to be associated with the renumbered VOB files of said all but the first of said selected titles.

2. Method for producing a single DVD title from a plurality of DVD titles, comprising the steps of:

providing a plurality of *previously compiled* DVD titles;

retrieving a plurality of title description modules, wherein each title description module is associated with a selected one of said selected titles and contains analysis results of that title;

eliminating a title management section of all but a first of said *previously compiled* DVD titles;

modifying file numbers of the VOB files of said all but the first of said *previously compiled* DVD titles to be in sequence with the VOB files of the first *previously compiled* DVD title;

modifying the title management section of said first *previously compiled* DVD title, to be associated with both said first *previously compiled* DVD title and said all but the first of said *previously compiled* DVD titles in said provided *previously compiled* DVD titles.

3. The method according to claim **2**, further comprising the step of:

merging selected ones of said VOB files and altering internal block addresses in said merged VOB files, to be in sequence there between.

4. Method for producing a DVD image from a plurality of *previously compiled* selected DVD video cell records and a plurality of video title pointer records, each of said selected DVD video cell records including a title description module and at least one cell content files, each of said video title pointer records including a title description module and pointers to at least one of said selected DVD video cell records, the method comprising the steps of:

receiving a user request including one of at least one video title pointer record and at least one cell record;

performing steps a, b, and c when said user request includes at least one video title pointer record and performing

steps d, e, f and g when said user request includes at least one DVD video cell record:

a. retrieving the title management modules of each of said at least one video title pointer records;

b. generating a new title management module when certain ones of selected titles are to be combined; and

c. retrieving the cell content files of the respective ones of said selected DVD video cell records associated with said requested at least one video title pointer record;

d. retrieving the title management modules of each of selected DVD video cell records; **[**and**]**

e. generating a new title management module and retrieving the cell content files of said respective DVD video cell records, when certain ones of said selected titles are to be combined;

f. generating at least one DVD title from said new title management module and from the respective ones of said retrieved cell content files, by associating said title management module and said respective ones of said retrieved cell content files; **[**and**]**

g. generating a DVD management module from said title description modules, *wherein each title description module is associated with a previously compiled DVD title and contains analysis results of that title; and*

producing a DVD image from said DVD management module and from said generated DVD titles by eliminating a title management section of all but a first of the generated DVD titles, modifying file numbers of retrieved cell content files of the all but the first of the generated DVD titles to be in sequence with the retrieved cell content files of a first generated DVD title, and modifying the title management section of the first generated DVD title, to be associated with the renumbered retrieved cell content files of the all but the first of the generated DVD titles.

[5. The method according to claim **4**, further comprising the step of producing a DVD image from said DVD management module and from said generated DVD titles.**]**

6. The method according to claim **4**, further comprising the step of writing said DVD image on a DVD media.

7. A system, comprising:

a creation server configured to receive a request to produce a media image of selected previously compiled DVD titles at least one of the selected titles being a video title; and

a media server configured to store a plurality of title description modules in a title database, each of the plurality of title description modules associated with a respective one of the selected titles and containing analysis results of that title,

wherein the creation server further comprises,

retrieving the plurality of title description modules,

generating a management module from the title description modules, and

producing the media image from the management module and from the compiled versions of the selected titles by eliminating a title management section of all but a first of the selected titles, modifying file numbers of video object files of the all but the first of the selected titles to be in sequence with the video object files of a first selected title, and modifying the title management section of the first selected title, to be associated with the renumbered video object files of the all but the first of the selected titles.

8. A system, comprising:

a media server configured to receive a plurality of title description modules, where each title description module is associated with a compiled media source from a plurality of previously compiled media sources and contains analysis results of the compiled media source, wherein the media server stores a title description module for each of the plurality of title description modules as a plurality of title records in a title database; and

a creation server configured to receive a request to produce the media image of selected titles, each of the selected titles being associated with a compiled media source from the plurality of compiled media sources and having a title management section, at least one of the selected titles being a video title,

wherein the creation server further comprises,

retrieving each of the title description modules associated with each of the selected titles from the plurality of title records,

generating a management module based on the title description modules, and

producing the media image by modifying the management module according to parameters extracted from the title description modules, copying the plurality of complied media sources associated with each of the images of selected titles, and by eliminating a title management section of all but a first of the selected titles, modifying file numbers of video object files of the all but the first of the selected titles to be in sequence with the video object files of a first selected title, and modifying the title management section of the first selected title, to be associated with the renumbered video object files of the all but the first of the selected titles.

9. A computer-readable medium containing instructions that, when executed by a processor, causes the processor to:

provide a plurality of previously compiled DVD titles;

retrieve a plurality of title description modules, wherein each title description module is associated with one of said previously compiled DVD titles and contains analysis results of that title;

generate a DVD management nodule from said title description modules;

eliminate a title management section of all but a first of the previously compiled DVD titles;

modify file numbers of the VOB files of the all but the first previously compiled DVD titles to be in sequence with the VOB files of the first previously compiled DVD title; and

modify the title management section of the first previously compiled DVD title, to be associated with both the first previously compiled DVD title and the all but the first of the previously compiled DVD titles in the provided previously compiled DVD titles.

10. A method, comprising:

receiving a request to produce a DVD image of selected titles, each said selected titles being associated with a previously compiled DVD title, at least one of said selected titles being a video title;

retrieving a plurality of title description modules, wherein each title description module is associated with a selected one of said selected titles and contains analysis results of that title;

generating a DVD management module from said plurality of title description modules;

producing a DVD image from said DVD management module and from said compiled versions of said selected titles eliminating a title management section of all but a first of said selected titles;

modifying file numbers of VOB files of said all but the first of said selected titles to be in sequence with the VOB files of a first selected title; and

modifying the title management section of said first selected title, to be associated with the renumbered VOB files of said all but the first of said selected titles.

* * * * *