(54) Title: SCHEDULING BETWEEN DIGITAL PROJECTION AND FILM PROJECTION
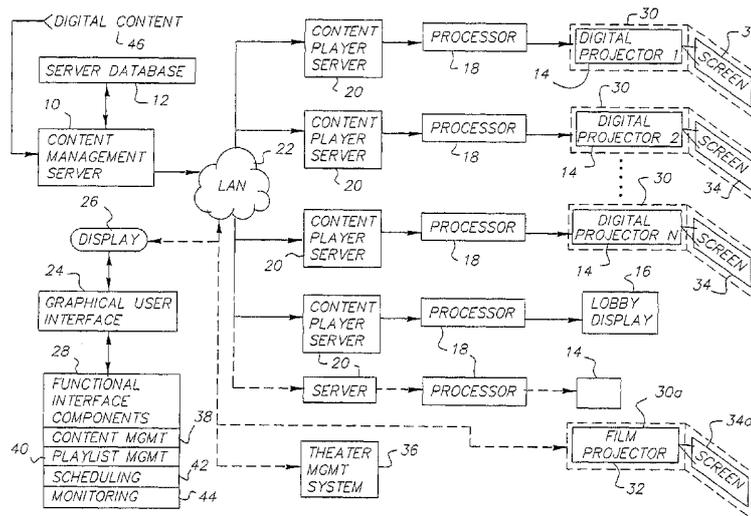
(57) Abstract: Method for scheduling a playlist in a multi-screen digital cinema theater, which includes: (a) generating and displaying a table of playlists currently available for scheduling; (b) generating and displaying a schedule table showing a schedule view for each screen as an elongated timeline bar representing a time dimension, wherein the elongated timeline bars for a plurality of the screens are arranged one adjacent the other relative to a displayed time axis to provide an overall perspective of the schedules for the screens of the theater; (c) selecting a playlist from the table of playlists and specifying a scheduled start time and a selected screen; and (d) updating the schedule table by inserting the selected playlist as an elongated element into the elongated timeline bar for the selected screen, whereby the updated schedule table is used to schedule the selected playlist for the selected screen.

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

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SCHEDULING BETWEEN DIGITAL PROJECTION AND FILM PROJECTION

FIELD OF THE INVENTION

5   This invention is related to the field of digital cinema, and more particularly to the preparation, scheduling and use of digitized motion picture information in a multi-theater environment.

BACKGROUND OF THE INVENTION

10   Today, motion pictures – from feature films, to film based commercials – are distributed and exhibited largely in the form of film. Studios produce film masters, and distributors produce film copies that are then distributed to theatres for exhibition. In the theatre, especially multi-screen 'cineplexes', incoming films need to be scheduled for exhibition. Specifically,

15   the theatre home office and the theatre manager determine the auditorium and show times for a particular film. A schedule is compiled, usually describing the theatre exhibition plan for 1-2 weeks, or until a new feature is acquired. Executing a schedule typically entails moving huge rolls of film from one projector station to another station; preparing the new feature showing by splicing

20   separate reels of film together, adding film trailers and 'rolling advertisements' to the beginning. Overall, it is a labor-intensive process.

          There have been attempts in the prior art to automate the control of movie display electronics in a film cinema system. For instance, in U. S. Patent No. 6,384,893 B1, which is entitled "Cinema Networking System" and was issued

25   May 7, 2002, such a system includes a cinema controller which receives as input, information regarding start times of movies and content of corresponding film reels. The information can be input a variety of ways. In one embodiment, the information is manually entered into a file or database for subsequent reference. The publication shows (Fig. 4) an entry form that may be displayed. In this

30   embodiment, an operator enters, either via a keyboard and/or by using a cursor control device, a description of the content of the film reels including the duration and film format of each segment. In addition, a film identifier, such as the title, is

supplied along with the times it is to be played in a particular projection room. Other embodiments are also contemplated. For example, the information may be received or downloaded from a remote centralized location. Alternately, the information may be retrievable from a web site maintained to contain such

5   information.

Over the last few years, the digitization of film has become very common for the purpose of integrating computer-generated special effects in scene content. Digitized content turns out to be much easier to handle, from the point of view of making copies, storing, distributing, and 'touching up'. A natural

10   outgrowth of digital special effects work is the attempt to carry the digitized content through postproduction, onto distribution and exhibition. Such a workflow is described in general as 'digital cinema'. Recent technological advances in storage, networking and projection equipment are making digital cinema a genuine possibility.

15   As described by S.A. Morley, in "Making Digital Cinema Actually Happen—What it Takes and Who's Going to Do It", SMPTE 140th Technical Conference, Pasadena, California, October 31, 1998, digital cinema provides an ability to extend presentation capabilities beyond just showing movies. More specifically, a simple graphical computer interface can make screen scheduling

20   easy, accurate and flexible for the theatre operator. Although no specific interface is described, Morley opines that by a simple drag-and-drop action on a PC in a theater manager's office, a movie can be scheduled to show at a certain time in a given auditorium and with a defined set of trailers and promotions, which can be changed at each show time.

25   Avica Technology Corp. markets a Digital Cinema Manager product that allows monitoring and control of storage server parameters by a theatre manager or engineering supervisor in a digital cinema environment. Security setting, playlist creation, content load-in and system maintenance functions can be accessed from local or network connections. Multiple servers

30   can be monitored and controlled from a single terminal. Conversely, multiple management terminals may access an individual server. The user interface provides creation of multi-event playlists including features, trailers and

promotions, and timeline based playlist management for a single auditorium at a time.

Whether automating the scheduling of film cinema or digital cinema systems, the prior art has come up short in providing a user-friendly

5   interface, particularly in a multi-screen cineplex environment. What is therefore needed is an approach that leverages the flexibility provided by digital cinema without adding unnecessary complexity in the scheduling task.

SUMMARY OF THE INVENTION

10   The present invention is directed to overcoming one or more of the problems set forth above. Briefly summarized, according to one aspect of the present invention, a method is described for scheduling a playlist from digital content supplied to a server in a multi-screen digital cinema theater, where the playlist includes components of the content stored in the server and represents a

15   digital entity that is subsequently projected in the digital cinema theater. The method includes the steps of: (a) generating and displaying a table of playlists currently available for scheduling, each playlist displayed along with its run time; (b) generating and displaying a schedule table showing a schedule view for each screen as an elongated timeline bar representing a time dimension, wherein the

20   elongated timeline bars for a plurality of the screens are arranged one adjacent the other relative to a displayed time axis to provide an overall perspective of the schedules for the screens of the theater; (c) selecting a playlist from the table of playlists and specifying a scheduled start time and a selected screen; and (d) updating the schedule table by inserting the selected playlist as an elongated

25   element into the elongated timeline bar for the selected screen, wherein the element starts at the scheduled start time and has a time dimension corresponding to the run time of the selected playlist, whereby the updated schedule table is used to schedule the selected playlist for the selected screen.

In a further aspect of the invention, a digital cinema system is

30   described for exhibiting digital content supplied in a coded form to a central content management server in a multi-screen digital cinema theatre having a plurality of auditoriums. The digital cinema system includes: a plurality of digital

projectors for projecting digital content in the plurality of auditoriums, each
projector including a decoder for decoding the digital content into a device-
dependent signal for projection; a plurality of content player servers, each one
devoted to a respective digital projector; and a local area network linking the

5   content player servers to the central content management server and to the digital
projectors, whereby each digital projector is a network-enabled device that can
communicate with any of the content player servers to display digital content. In
still a further aspect, the digital cinema system includes a cinema operating
system for generating and scheduling playlists, each playlist including

10   components of the content stored in the content management server and
representing a digital entity that is subsequently projected in the digital cinema.

By counting the creating of playlists as a precursor to scheduling,
there is the advantage that the need to physically handle, splice and set up large
lengths of film is obviated.

15   These and other aspects, objects, features and advantages of the
present invention will be more clearly understood and appreciated from a review
of the following detailed description of the preferred embodiments and appended
claims, and by reference to the accompanying drawings.

20   **BRIEF DESCRIPTION OF THE DRAWINGS**

FIG. 1 is a block diagram of an exhibition component of a digital
cinema system, showing in particular a cinema operating system in accordance
with the invention.

FIG. 2 is a pictorial illustration of a scheduling context screen from

25   a graphical user interface implemented by the cinema operating system shown in
Figure 1.

FIG. 3 is a pictorial illustration of the scheduling menus and
controls accessible through the menu bar of the scheduling context screen shown
in Figure 2.

30   FIG. 4 is a pictorial illustration of a window showing playlist
properties, which is accessible through the scheduling context screen shown in
Figure 2 and the menu controls shown in Figure 3.

FIG. 5 is a pictorial illustration of a dialog box for scheduling a playlist in the foreground of a schedule timeline shown in the scheduling context screen shown in Figure 2, which is accessible through the scheduling context screen shown in Figure 2 and the menu controls shown in Figure 3.

FIG. 6 is a pictorial illustration of a dialog box for scheduling a time block in a schedule timeline shown in the scheduling context screen shown in Figure 2, which is accessible through the scheduling context screen shown in Figure 2 and the menu controls shown in Figure 3.

FIG. 7 is a pictorial illustration of a dialog box for scheduling a playlist in the background of a schedule timeline shown in the scheduling context screen shown in Figure 2, which is accessible through the scheduling context screen shown in Figure 2 and the menu controls shown in Figure 3.

FIG. 8 is a pictorial illustration of a dialog box for scheduling a rolling ad in a schedule timeline shown in the scheduling context screen shown in Figure 2, which is accessible through the scheduling context screen shown in Figure 2 and the menu controls shown in Figure 3.

FIG. 9 is a pictorial illustration of a schedule view by month which is accessible through the scheduling context screen shown in Figure 2 and the menu controls shown in Figure 3.

FIG. 10 is a pictorial illustration of a window showing schedule item properties for a particular playlist on a particular day for a particular screen, which is accessible through the scheduling context screen shown in Figure 2 and the menu controls shown in Figure 3.

FIG. 11 is a pictorial illustration of the scheduling context screen shown in Figure 2, which is filled out to show the schedule properties on a particular day for the theater.

FIG. 12 is a block diagram of an exhibition component of a digital cinema system, showing in particular a further embodiment of a cinema operating system in accordance with a further aspect of the invention.

DETAILED DESCRIPTION OF THE INVENTION

Because digital image processing systems are well known, the present description will be directed in particular to attributes forming part of, or cooperating more directly with, a method and system in accordance with the present invention. Method and system attributes not specifically shown or described herein may be selected from those known in the art. In the following description, a preferred embodiment of the present invention would ordinarily be implemented as a software program, although those skilled in the art will readily recognize that the equivalent of such software may also be constructed in hardware. Given the method and system as described according to the invention in the following materials, software not specifically shown, suggested or described herein that is useful for implementation of the invention is conventional and within the ordinary skill in such arts. If the invention is implemented as a computer program, the program may be stored in a conventional computer readable storage medium, which may comprise, for example; magnetic storage media such as a magnetic disk (such as a floppy disk or a hard drive) or magnetic tape; optical storage media such as an optical disc, optical tape, or machine readable bar code; solid state electronic storage devices such as random access memory (RAM), or read only memory (ROM); or any other physical device or medium employed to store a computer program.

A digital cinema system comprises a digital mastering center for generating digital content, such as from a feature film, a distribution center for transmitting the digital content, and a digital exhibition center for projecting the content to audiences. The exhibition center will include, among its many parts, a projection system and a software application herein identified as the digital cinema operating system. The digital cinema operating system is a custom software solution that supports the loading, scheduling, control and playback of features, trailers and other pre-show content, such as slide shows and advertising, on multiple digital cinema screens. While not a specific part of this description, the digital cinema operating system will download decryption keys from studios to allow features to be played back on digital projectors, and also controls automated theatre operation such as lighting and sound systems. In the latter

connection, the digital cinema operating system will typically interface with existing, commercially-available control systems for such automated theatre operations.

Besides referring to the digital distribution and projection of first-run movies, digital cinema has also been used to refer to the digital distribution and projection of pre-show entertainment, including commercials, music videos and other content, ordinarily in connection with the showing of full-length feature motion picture films, perhaps with film trailers and the like. Thus, and as used herein in a preferred embodiment, the digital cinema operating system refers to an in-theater network to receive, schedule, distribute and project advertising and other pre-show content as a digital entity preceding and/or following a motion picture film feature, as well as to an in-theater network to receive, schedule, distribute and project full-length feature digital content, often with digital trailers, advertising and other pre-show, or inter-show content, where all of the digital entities are combined together as a single digital presentation. Furthermore, in another embodiment, as will be illustrated in Figure 12, the scheduling functionality of the digital cinema operating system may be shared with other components of the digital cinema system, such as a central digital cinema distribution facility or service, where it may be convenient to establish an association between certain digital content, such as between certain ad or trailer content and specific feature content.

The digital cinema system is comprised of hardware and software (the digital cinema operating system) that, when installed in a multi-screen cineplex, can provide sophisticated digital cinema functionality. Referring to Figure 1, the digital cinema system is comprised of:

- a high storage capacity content management server **10** having a server database **12** associated therewith;
- one or more high resolution digital projectors **14** and/or high resolution display screens **16**, each projector and/or screen connected to,
- one or more specialized decoding processors **18** for decoding compressed digital content that is downloaded from the content

management server **10** to one or more content player servers **20**,

each content player server **20** connected to,

- a local area network (LAN) **22** tying each of the content player

    servers **20** to the content management server **10**; and

- a cinema operating system graphical user interface **24** used to

    manage digital cinema content, schedule content, and in general

    control the various components of the system, wherein the user

    interface **24** interfaces with a high resolution display **26** to

    implement the functional interface components **28** of the cinema

    operating system.

As shown in Figure 1, the cinema operating system operates in a multi-screen
cineplex environment featuring both digital and film content shown in a plurality
of auditoriums **30**, each having a screen **34** that is positioned to receive a
projected image. More specifically, the digital projectors **14** are used in one or
more auditoriums **30** (three being shown) to project a digitally-obtained image
upon the screens **34** and a film projector **32** is used in at least one of the
auditoriums **30a** to project a film image upon a screen **34a**. In regard to film
projection, the cinema operating system may signal a projectionist at an
appropriate time to begin projection. Alternatively, actual control of the film
projector may be integrated into the cinema operating system through the user
interface **24**. Moreover, since digital content (such as ad content) may be played
before and/or after a motion picture film, the film auditorium **30a** may also
contain a digital projector **14** connected as shown in broken line to the LAN **22**
through a content player server **20** and a processor **18**. A theatre management
system **36** may also be integrated into the cinema operating system through the
user interface **24**, and it provides automated control of lighting and sound
systems, as well as integrating with a ticket sales and advertising system.

The illustrated LAN connection **22** may be implemented with any
suitable network architecture, such as Ethernet. In practice, the processors **18**
(which in one embodiment may be a processor board/card added to the content
player servers **20** instead of a separate component (**18**) as shown in Figure 1)
decode the image data into a device-dependent signal, such as RGB, suitable for

driving the projectors **14**. This means that the connection between the processors **18** and the projectors **14** is a dedicated off-network connection. If the decoder processor **(18)** is instead embedded into the projectors **14**, then the projectors **14** will become network devices capable of being driven directly off the LAN **22**. As

5   will be explained further in connection with Figure 12, having the projectors **14** as network devices has an added redundancy benefit since any given projector can be driven off any content server **20**, therefore providing automatic backup in case the content server for a particular auditorium should go down.

The user interface **24** of the cinema operating system is designed to

10   be operated by a theatre manager and/or a lead projectionist or other designated person, usually in the environment of their offices or workspaces, such as a projection booth or for that matter any place connectable to the LAN **22**. At the core of the cinema operating system are the functional interface components **28**, which in this embodiment include four functional components:

15   • a content management function **38**;

            • a playlist management function **40**;

            • a scheduling function **42**; and

            • an exhibition/playback monitoring function **44**.

Under the content management function **38**, the theatre manager or another

20   designated operator can load new digital content **46** to the central server **10**, and view, edit and delete the digital content stored in the server database **12**. Examples of content are rolling ads (commercials), trailers (feature film previews) and full features (feature films). Content generally comes, e.g., from a studio, an advertising provider or the like, and is intended to be exhibited for a contracted

25   period of time. Thereafter, the content is purged. While not a part of this invention, the digital content **46** would typically be received over a satellite connection, a terrestrial network, or physical media such as a DVD that is delivered to the theater office.

Another key use of content is for the creation of playlists. A

30   playlist is an ordered collection of one or more content files available from the content management server **10**, and represents the content package that is

scheduled into a particular auditorium at a particular time. In a totally digital
environment, a playlist is analogous to the final reel of film that a projectionist
prepares for exhibition, by splicing rolling ads and trailers to the main feature
film. In a mixed digital and film environment, the playlist is analogous to the

5   spliced film components comprising the rolling ads and perhaps the trailers that
are scheduled to precede the main feature film, or simply run between main
feature films as, e.g., a digitized slide show. Under the playlist management
function 40, the theatre manager create can create, edit and delete playlists.
Having content at their core, playlists also have a specific lifetime, after which

10   they are purged. Accordingly, each playlist represents the digital entity that is
subsequently projected, either through a projector in an auditorium 30, or on a
display 16, e.g., in the theatre lobby.

Once the playlists are created, the theater manager or another
designated person must schedule when and where the required playlists are

15   played. This is done in the scheduling function 42. The schedules for playlists to
be exhibited are also tied to the theatre management system 36, and specifically to
the theater's ticketing system, which also provides show times to newspapers and
other sources well in advance of the scheduled showings. In the cinema operating
system according to the preferred embodiment, the function of scheduling is to

20   program into the system the start time and the auditorium in which each playlist
will play. When the scheduled time arrives, the cinema operating system controls
the starting and playback of the content represented within the digital playlist.
Finally, a monitoring function 44 provides the theatre manager and projectionist a
means to view the current state of playlist playback. The monitor user interface is

25   similar to the scheduling user interface set to the present time, in that the theatre
manager can view the overall state of playback in the various auditoriums and on
the various displays tied to the cinema operating system.

Referring to Figure 2, the functional interface components (28) for
content management 38, playlist management 40 and the scheduling function 42

30   are represented by respective tabs 50, 52 and 54. Clicking on the schedule tab 54
brings up a scheduling function context screen 56, which specifies the workflow
and user interface of the scheduling function 42 according to the invention, and

provides access to the menus, controls and commands for the scheduling function 42. A menu bar 58 provides access to certain menus and controls for the scheduling function 42, as further shown in Figure 3, including alternative access to some of the controls and commands provided by the context screen 56.

5   The compact layout of the scheduling function context screen 56 provides a view of the 'free time' and schedules for all or some of the auditoriums 30 and displays 16 tied to the cinema operating system. The specifics of the scheduling function context screen 56 include a panel (toolbar) 60 of buttons, a table 72 of playlists currently in the content management server 10, a drop-menu

10   74 of predefined views that control what is displayed in the table 72, and a schedule table 76 that provides scheduling information and controls for each of the auditoriums 30 (and 30a) and displays 16 that exhibit digital content. The schedule table 76 shows, for each auditorium 30 (30a) and lobby display 16, an elongated timeline bar 78 arranged as shown in Figure 2 one adjacent the other in

15   relation to a time axis grid 80 to reveal the schedule for each auditorium 30 (30a) and lobby display 16, both individually and from the overall perspective of the whole cineplex theater. Furthermore, as will be noted in Figure 2, certain auditoriums, i.e., auditoriums 1, 2 and 3, are digital auditoriums, while auditorium 4 is a film auditorium.

20   The panel (toolbar) 60 of buttons, labeled with icons, identifies frequently used actions. As defined in the preferred embodiment, these buttons include: a magnify timeline button 62, a reduce timeline button 64, a month view button 66, a show playlist properties button 68 and a save schedules button 70. The theatre manager can use the magnify timeline button 62 and the reduce

25   timeline button 64 to control the granularity of the schedule view, that is, by adjusting magnification settings the time axis grid 80 is adjusted such that the view in the schedule table 76 encompasses all or some smaller portion of the exhibition schedule for the day. The show playlist properties button 68 acts upon a currently selected playlist to show further properties of the selected playlist.

30   The save schedules button 70 saves the results of the scheduling function into the server database 12. The month view button 66 presents the schedule view by month, as shown in Figure 9. A feature of this view is that a schedule for a

particular day in the month can be replicated for other days of the month by dragging the cursor **82** across the month until the desired days are highlighted, as shown by the shaded selection area **84**, then clicking on, or otherwise designating, the area (e.g., by a copy and paste operation). When thus invoked, as shown in

5   the example, the schedule for June 3 is replicated for June 4 – 6 and 10 – 13, and appears in the appropriate calendar blocks associated with these dates. The area **84a** represents a portion of the month where this feature was previously invoked. Figure 9 also shows that when the tool-tip of the cursor **82** is positioned over a particular day (June 17 in this example), a pop-up box **86** appears that reveals

10   further information about the schedule, including the beginning time of each playlist within the schedule for the day.

The drop-menu **74** of predefined views, which controls what is displayed in the playlist table **72**, includes several core views of the playlists available from the content management server **10**. These core views include, but

15   are not limited to, showing: All (playlists), Not Scheduled (playlists), Scheduled (playlists), Playlists with Ads, Playlists with Slideshows, Playlists with Features, Playlists with Live Events, and so on. (A "slideshow" is a series of digital still images that are repetitively displayed before and/or after the feature presentation and its associated ads and trailers. A "live event" is a live feed of a currently

20   happening event, such as a musical performance or a sporting event.) In the playlist table **72**, key attributes of the listed playlists are shown, such as playlist title, run time, and the starting and ending dates for the playlist engagement; other information can be had by selecting a particular playlist (as depicted by the broken line selection box **73** around the first playlist "Ad Pack-Week 23") and

25   applying the toolbar button **68** for showing playlist properties, which produces the playlist properties window shown in Figure 4. As shown therein, the selected playlist title "Ad Pack-Week 23" is comprised of five pieces of digital content, each shown with their content title, type, run time, rating and acquire date.

The schedule table **76** provides scheduling information and

30   controls for each of the auditoriums **30** (**30a**) and displays **16** that exhibit digital content. In the top left of the schedule table **76**, the date is shown for which schedules are being viewed and managed. A set of three controls **88a**, **88b** and

88c are used to change the day/date of the schedule view. The left arrow 88a changes the view to the previous day; the right arrow 88b changes the view to the next day, and the middle control 88c brings up a pop up calendar control (not shown) for the user to select a specific day to view. In the left column 90 of the

5   schedule table 76 are the names of the auditoriums (screens) 30 (30a) and displays 16 for which the theatre manager can develop a schedule. The names of the screens can be defined and changed by the theatre manager, thus providing for customization. By design, the screen names are also labeled by an index number, i.e., the numbers 1 to 7 as shown in Figure 2. Each of the screen names can be

10 selected; when one is selected, the month view button 66 can be invoked and the theatre manager can view five weeks of schedule information, set for the selected screen, as shown in Figure 9. The vertical control bar 92a to the left of each screen's timeline 78 includes icons 92b and 92c for showing (icon 92b) or 'collapsing' or hiding (icon 92c) the corresponding screen (e.g., in Figure 2,

15 screen 5 is shown as hidden). By hiding one or more timelines 78 this way, the theatre manager can visually bring normally separated timelines 78 closer together, to accommodate special scheduling tasks. The controls 92b and 92c are reversible; when clicked again, after hiding a timeline, the timeline is re-presented and the schedule can be worked on.

20   The timeline for each of the screens is represented by the narrow timeline bar 78, representing from left to right, the theatre day, i.e., the hours on the time axis grid 80 during which content can be exhibited in the theatre. Before a schedule is generated, the timeline 78 is represented by an open space 94, as shown for auditorium 2 in Figure 2 (which is closed). As a schedule is generated,

25 there are two types of scheduling elements that may reside in the timeline bar: one is referred to as a "block" and the other as a "time block". The block, e.g., the block 96 in the auditorium 3, represents a period of time in which a playlist is scheduled to play, while the time block, e.g., the block 98 in auditorium 4, represents a period of time that the schedule timeline is busy with some other

30 activity (typically a non-digital activity, such as film projection), during which a block should not be scheduled. (It should be understood that the use of a block is a matter of convenience and preferred usage and presentation; other elongated

timeline elements, such as a line, could be used instead.) The timeline is also
separated into a background and a foreground. The background represents any
time in the timeline that is available for scheduling; the foreground represents a
period of time within which a playlist is scheduled to override the background.

5   The representation of blocks varies, according to the way a playlist
is scheduled: a block **100** represents a background-scheduled playlist as a "block"
stretched across the entire timeline. A playlist scheduled in the background can
play repeatedly. A block **102** represents a playlist scheduled as a rolling ad. A
rolling ad playlist has the property of being attached to a feature playlist of a time
10   block. The consequence of this property is that if the feature playlist or time
block is rescheduled, the rolling ad is automatically rescheduled, so that it stands
to play before the feature playlist or time block. As mentioned before, the block
98 represents a time block, which is a period of time that the schedule timeline is
busy. An example of its use is to block off time that the digital projector does not
15   project content, allowing instead, the projection of film-based content. As shown
in Figure 11, scheduled playlists and time blocks are labeled for easy
identification, directly in the block, and in a tooltip tag **104** when the cursor **82**
hovers over the block. At the bottom of the screen is a status message line **106**. It
is used to feedback results of user actions, such as the rescheduling of a playlist,
20   the addition of a new playlist, and so forth.

The user interface shown in Figure 2 is used for several different
types of scheduling, including foreground scheduling, background scheduling,
time block scheduling, and rolling ad scheduling. Each type of scheduling will
now be discussed in more detail, further including the related matters of
25   scheduling by film booking number and adjusting the schedules.

Foreground scheduling. To schedule a playlist in the foreground,
the theatre manager selects an appropriate playlist from the playlist table **72**, and
selects either 'Add to Timeline' from the tools menu (Figure 2), or clicks the add
to timeline control button **108**. This initial action opens a dialog box for the
30   theatre manager to enter specific scheduling information, as shown in Figure 5.
After entering valid scheduling information, the schedule table **76** is updated,

showing the newly scheduled playlist as a timeline block **96**, on the specified screen's timeline.

    Background scheduling. To schedule a playlist in the background, the theatre manager selects an appropriate playlist from the playlist table **72** and

5 selects 'Schedule in Background' from the tools menu (Figure 2). This action opens a dialog box for the theatre manager to enter specific scheduling information, as shown in Figure 7. After entering valid scheduling information, the schedule table **76** is updated. If only one screen is specified in the scheduling dialog, then a new background block **100** appears in the timeline of that screen. If

10 more than one screen is specified in the scheduling dialog, then replicas of the background block **100** appear in timelines of the associated screens.

    Time Block scheduling: Scheduling a time block basically establishes in the cinema operating system that at the scheduled time and for the specified duration, the specified digital projector **14** tied to a particular screen, or

15 the specified digital monitor **16** will not play back content. One purpose for this functionality is to schedule a time block **98** that the digital projector/system will 'stand by', while, in parallel, a film content is played/projected. Tied to this use of time blocks, is the capability of switching between digital projection and film projection. This capability is based on "event tags", that are purposefully

20 integrated in playlists, in or between content items in the playlist. An example of an "event tag" is an automation cue integrated into a playlist to enable an audio format switch to occur between digital ad content and feature film content, such as from a lesser featured sound presentation to a surround sound Dolby™ presentation.

25   To schedule a time block **98**, the theatre manager selects 'Schedule Time Block' from the tools menu (Figure 2). This action opens a dialog box for the theatre manager to enter specific information, as shown in Figure 6. The dialog is designed such that the theatre manager can enter a series of time blocks to the schedule, for a given day, without closing and reopening the dialog box.

30 After clicking "Apply" in the dialog box, the schedule table **76** is updated, showing the newly scheduled time block **98** on the specified screens' timeline.

Rolling Ad Scheduling: Rolling ads as content can be embedded at the start of a feature (movie) playlist, and thus, be scheduled in a typical foreground process. In theatres that exhibit digital ads in combination with features on film, rolling ads are scheduled as stand alone playlists. The basic goal

5   of scheduling a stand-alone rolling ad is to ensure that it plays immediately before the start of a scheduled feature playlist or time block. The cinema operating system provides a means of automatically ensuring this type of scheduling. The theatre manager selects an appropriate rolling ad playlist from the playlist table **72** and selects 'Schedule Rolling Ad' from the tools menu (Figure 2). This action

10 opens a dialog box for the theatre manager to enter specific scheduling information, as shown in Figure 8. Note that the current schedule date (or in some cases, start time) input in the dialog box is the earliest date (time) that the selected rolling ad is to be scheduled. After entering valid scheduling information, the schedule table **76** is updated.

15   The scheduled rolling ad is automatically replicated and placed as a block **102** immediately before every feature-containing block and/or time block in the specified timelines. Being essentially attached to a time block or feature playlist, a rolling ad is automatically rescheduled if its corresponding time block or feature playlist schedule is adjusted. Besides rolling ads, any particular

20 playlist, e.g., a background playlist, can be associated with a feature (movie) playlist or attached to a time block, and automatically rescheduled if its corresponding time block or feature playlist schedule is adjusted.

Scheduling by a Unique Film Identification Number: A variation on the process of scheduling a rolling ad is to schedule by a unique film

25 identification number, e.g., a number similar to a film booking number (FBN). A film booking number is a unique number, assigned at the time the content is created in the theatre. This method of scheduling allows rolling ad exhibition to be targeted with particular features. To schedule by a unique film identification number, the theatre manager selects an appropriate rolling ad playlist from the

30 playlist table **72**, and selects 'Schedule Rolling Ad' from the tools menu (Figure 2).

Adjusting Schedules: The cinema operating system provides various ways to adjust the schedules of items. In general, blocks on a timeline can be individually selected and managed. The basic way to reschedule an item is to re-open the scheduling dialog box of a selected scheduled playlist, and enter

5   new parameters. Re-opening the scheduling dialog box is by double-clicking the scheduled playlist. Other ways of adjusting are sliding, stretching and dragging.

Figure 12 shows an alternative embodiment of the digital cinema system, where components similar to those shown in Figure 1 have similar reference characters and descriptions, and generally will not be further described

10   here. One exception is the LAN **22**, which is embodied here as a network switch **22'** specifically (but without limitation) for an Ethernet LAN application. In Figure 12, the digital content would typically be received from several digital sources, including from a satellite receiver **110**, over a terrestrial network **112**, or as physical media **114** such as a DVD that is delivered to the theater office. As

15   shown, the satellite network may handle both prerecorded digital content (including ads, trailers, slide shows, features (movies) and the like) received from any of the above sources, and live digital content from, e.g., live musical performances, live sporting events, and the like, that is received from the satellite receiver **110**.

20   Live digital content from the satellite receiver **110**, which may be in MPEG or any other suitable well-known data format, is split by an L band splitter **118** and decompressed by one or more high definition (HD) decoders **120** and transmitted to the projectors **14** in accordance with the Society for Motion Picture and Television Engineers (SMPTE) 292 protocol, which is a well-known

25   high definition standard for digital transmission. Note also that live event data can be streamed from the HD decoders **120** through the LAN network switch **22'**, from which it may be alternatively fed through the LAN to any of the projectors **14**. For satellite reception of live performances, the live digital content is routed through a conditional access stage **116**. The transmission protocols for the live

30   performances may prescribe an encrypted link that is decrypted in the conditional access stage **116** by a key provided over the LAN through the network switch **22'** from the local cinema operating system.

In the case of satellite reception of prerecorded digital content, the digital content is routed through (or bypasses) the conditional access stage 116 (which does not perform any data decryption) and the L band splitter 118 to an edge media router 122, which stores and forwards the digital content to the

5   content management server 10 and the archive 12 through the network switch 22'. Digital content from the terrestrial network 112 is routed through a firewall 124 into the network switch 22'. In addition, the Ethernet LAN connects with an auditorium system 126, which controls the lighting and other such functions in the theater, and optionally to an audio system 128, which provides the audio feed for

10   the auditoriums. As mentioned earlier, one of the things that is different here from Figure 1 is that the decoding processor identified as component 18 in Figure 1 is here embedded into the projectors 14, where the decoder processing performs both decompression and decryption of the prerecorded digital content data. If the decoder processor (18) is embedded into the projectors 14, then the projectors 14

15   become network devices capable of being driven directly off the Ethernet LAN 22. Having the projectors 14 as network devices has an added redundancy benefit since any given projector can be driven off any content server 20, therefore providing automatic backup in case the content server for a particular auditorium should go down.

20   Figure 12 also shows that a central digital cinema distribution facility or service 130 can provide content through a satellite link 132 to the satellite receiver 110, through a terrestrial link 134 (e.g., the Internet) to the terrestrial network 112, or through a transportation link 136 (e.g., UPS, FedEx, Postal Service, etc.) as physical media 114. In a further aspect of the invention,

25   some or all of the functional interface components 28 (see Figure 1) may be provided according to the invention by the central digital cinema distribution facility 130 through its own graphical user interface 138. In particular, playlists may be assembled at the central digital cinema distribution facility 130, where the associations between the playlists and the features and films necessary to create a

30   scheduling item may be established. More specifically, under the playlist management function 40, the facility can create, edit and delete specific playlists, especially playlists of the type (such as rolling ads) that are embedded at the start

of a feature (movie) playlist and which will later be scheduled at the cineplex in a
typical foreground process for a specific screen. For a film, such playlists could
be scheduled as stand alone playlists associated with a specific film by a unique
film identification number (e.g., in certain cases, the aforementioned FBN).

5   Besides alleviating the need for local cineplex scheduling of
certain content, e.g., rolling ads, the basic goal of such scheduling at the central
digital cinema distribution facility 130 is to tie a specific playlist to a specific
feature playlist or time block during which a feature film is projected, therefore
ensuring that the playlist runs immediately before the start of a subsequently

10   scheduled feature playlist or time block. This can be significant because the
distributor may want to ensure that a specific playlist (with, e.g., specific ad
content) should be tied to films/features having a specific rating, genre, or the
like. Furthermore, advertising may be rationed to a certain number of screens
(e.g., some ads to odd screens/other ads to even screens, in a cineplex) depending

15   on the advertising schedule received by the distributor, e.g., based on sliding
scales of advertising charges/revenues proportioned to the number of screens or
the number of "eyes" viewing the content. In these situations, scheduling items
established by the distributor may be carried as meta-data that is associated with
the digital content to the exhibition location, where scheduling for specific screens

20   will occur. For instance, the meta-data may be embedded into, or otherwise
carried with, the digital content signal over any of the several aforementioned
communication links, or the meta-data could be linked to specific feature/film
content by a unique identification number and transmitted separately, e.g., over
the Internet, through the terrestrial link 134 to the LAN 22.

25   The invention has been described with reference to a preferred
embodiment. However, it will be appreciated that variations and modifications
can be effected by a person of ordinary skill in the art without departing from the
scope of the invention.

PARTS LIST

10	content management server
12	server database
14	digital projector
16	display screen
18	decoding processor
20	content player server
22	local area network (LAN)
22'	network switch
24	graphical user interface
26	high resolution display
28	functional interface components
30	auditorium
30a	film auditorium
32	film projector
34	screen
36	theater management system
38	content management function
40	playlist management function
42	scheduling function
44	exhibition/playback monitoring function
46	digital content
50	content management tab
52	playlists management tab
54	schedules function tab
56	scheduling function context screen
58	menu bar
60	panel (toolbar) of buttons
62	magnify timeline button
64	reduce timeline button
66	month view button

68	show playlist properties button
70	save schedules button
72	playlist table
74	drop-menu
76	schedule table
78	elongated timeline bar
80	time grid
82	cursor
84	shaded selection area
84a	selected area
86	pop-up box
88a	left arrow
88b	right arrow
88c	middle control
90	left column
92a	vertical control bar
92b	show icon
92c	hide icon
94	open space
96	block
98	time block
100	background scheduled playlist block
102	rolling ad scheduled playlist block
104	tooltip tag
106	status message line
108	add to timeline button
110	satellite receiver
112	terrestrial network
114	physical media
116	conditional access stage
118	L band splitter
120	high definition decoders

122   edge media router

124   firewall

126   auditorium

128   audio system

130   central digital cinema distribution facility or service

132   satellite link

134   terrestrial link

136   transportation link

138   distribution facility user interface

CLAIMS:

               1.   A digital cinema system for exhibiting digital content supplied in a coded form to a central content management server in a multi-screen digital cinema theatre having a plurality of auditoriums, said system comprising:

               (a)   plurality of digital projectors for projecting digital content in the plurality of auditoriums, each projector including a decoder for decoding the digital content into a device-dependent signal for projection; wherein at least one of the plurality of auditoriums includes a film projection system for projecting a motion picture film during a reserved time when the auditorium's digital projector is inactive, and wherein the cinema operating system generates a playlist for scheduling digital projection of digital content in association with the motion picture film.

               (b)   a plurality of content player servers, each one devoted to a respective digital projector;

               (c)   a cinema operating system for generating and scheduling playlists, each said playlist including components of the content stored in the content management server and representing a digital entity that is subsequently projected in the digital cinema;

               (d)   a local area network linking the content player servers to the central content management server and to the digital projectors, whereby each digital projector is a network-enabled device that can communicate with any of the content player servers to display digital content associated with a selected playlist; and

               (e)   an event tag for switching between digital projection and film projection corresponding to a predetermined condition or cue.

               2.   The digital cinema system claimed in claim 1, wherein in step (e), switching between digital projection and film projection includes a cueing means for controlling the digital projector corresponding to a signal from the film projector.

3.   The digital cinema system claimed in claim 1, wherein a user interface includes a means for controlling the film projector.

4.   The digital cinema system claimed in claim 3, wherein the user interface includes a status message line that indicates operational scheduling of both film and digital projection systems.

5.   A computer program product comprising a graphical user interface for scheduling a playlist from digital content supplied to a server in a multi-screen digital cinema theater, said playlist including components of the content stored in the server and representing a digital entity that is subsequently projected in the digital cinema theater, said computer program product comprising: a computer readable storage medium having a computer program stored thereon for performing the steps of:

(a)   generating and displaying a table of playlists currently available for scheduling, each playlist displayed along with its run time;

(b)   generating and displaying a schedule table showing a schedule view for each screen as an elongated timeline bar representing a time dimension, wherein the elongated timeline bars for a plurality of the screens are arranged one adjacent the other relative to a displayed time axis to provide an overall perspective of the schedules for the screens of the theater;

(c)   enabling selection of a playlist from the table of playlists and specification of a scheduled start time and a selected screen;

(d)   updating the schedule table by inserting the selected playlist as an elongated element into the elongated timeline bar for the selected screen, wherein the element starts at the scheduled start time and has a time dimension corresponding to the run time of the selected playlist, whereby the updated schedule table is used to schedule the selected playlist for the selected screen; and

(e)   switching between projection of digital content and projection of feature content subject to a predetermined condition or cue.

6.   A method for generating and scheduling a playlist from digital content supplied to a server in a multi-screen cinema theater including one or more film projection sites, said playlist including components of the content stored in the server and representing a digital entity that is subsequently projected

5   in the projection sites, said method comprising the steps of:

(a)   generating playlists including digital content for use in the film projection sites;

(b)   generating and displaying a schedule table showing a schedule for each projection site as an elongated timeline bar representing a time

10   dimension, wherein the elongated timeline bar for each film projection site includes a reserved time for the projection of the film;

(c)   selecting a playlist and specifying a selected film projection site;

(d)   updating the schedule table by inserting the selected

15   playlist as an elongated block into the elongated timeline bar for the selected projection site, wherein the block for the playlist starts is automatically situated at the beginning of the reserved time for projection of the film; and

(e)   switching between projection of digital content and film projection subject to a predetermined condition or cue.
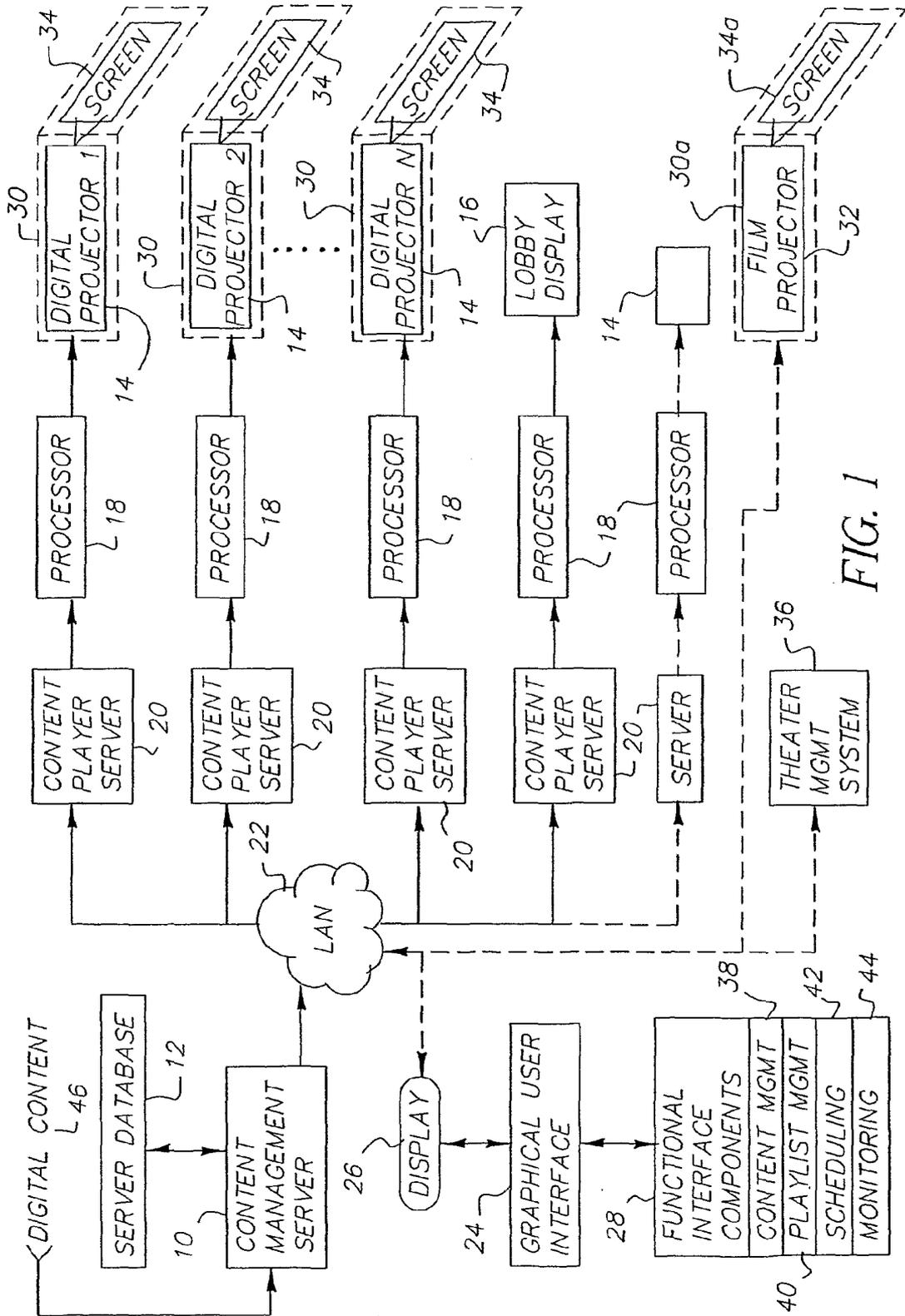
20

7.   A computer program product comprising a graphical user interface for generating and scheduling a playlist from digital content supplied to a server in a multi-screen cinema theater including one or more film projection sites, said playlist including components of the content stored in the server and

25   representing a digital entity that is subsequently projected in the projection sites, said computer program product comprising: a computer readable storage medium having a computer program stored thereon for performing the steps of:

(a)   generating playlists including digital content for use in the film projection sites;

30   (b)   generating and displaying a schedule table showing a schedule for each projection site as an elongated timeline bar representing a time

dimension, wherein the elongated timeline bar for each film projection site

includes a reserved time for the projection of the film;

        (c)   selecting a playlist and specifying a selected film projection

site;

5   (d)   updating the schedule table by inserting the selected

playlist as an elongated block into the elongated timeline bar for the selected

projection site, wherein the block for the playlist starts is automatically situated at

the beginning of the reserved time for projection of the film; and

        (e)   switching between digital projection and film projection

10   subject to a predetermined condition or cue.
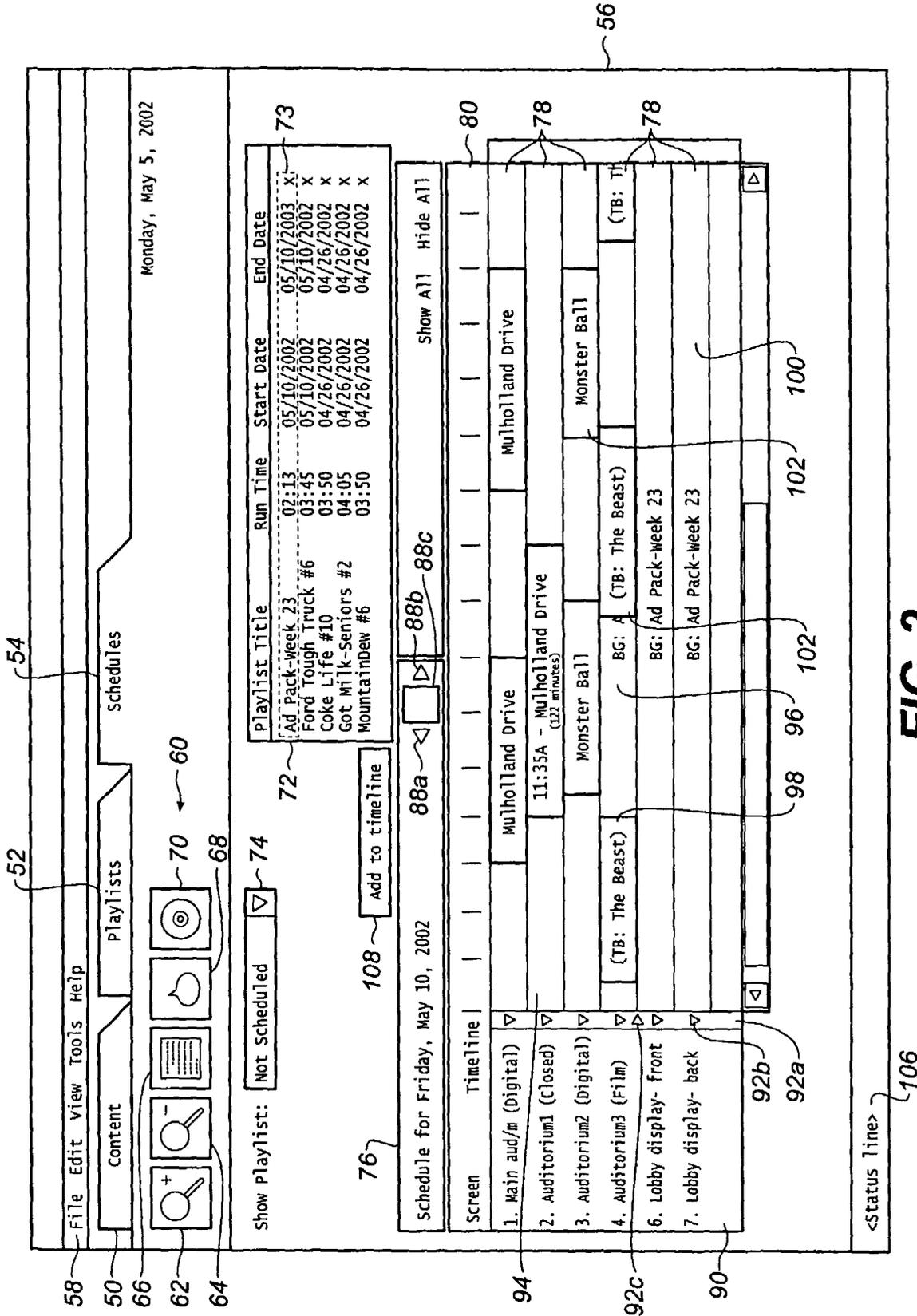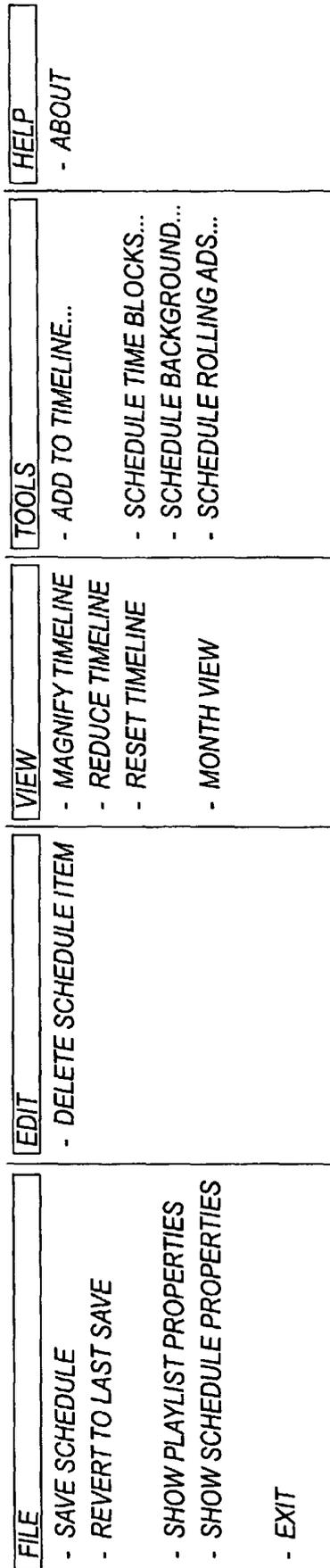
1/12

FIG. 1

FIG. 2

3/12

FILE
- SAVE SCHEDULE
- REVERT TO LAST SAVE

- SHOW PLAYLIST PROPERTIES
- SHOW SCHEDULE PROPERTIES

- EXIT

EDIT
- DELETE SCHEDULE ITEM

VIEW
- MAGNIFY TIMELINE
- REDUCE TIMELINE
- RESET TIMELINE

- MONTH VIEW

TOOLS
- ADD TO TIMELINE...

- SCHEDULE TIME BLOCKS...
- SCHEDULE BACKGROUND...
- SCHEDULE ROLLING ADS...

HELP
- ABOUT

FIG. 3

SUBSTITUTE SHEET (RULE 26)

Playlist Properties

Playlist Title: Ad Pack-Week 23

Content Title	Type	Run Time	Rating	Acquire Date
Ad Pack-80 slides	Slide Show	02:13:31	G	05/01/2002
Coke Ad #234N	Rolling Ads	02:35:01	G	05/01/2002
Chevrolet #167	Rolling Ads	03:08:15	G	04/28/2002
Ford #1245	Rolling Ads	02:58:45	G	04/28/2002
NCN Slideshow #12	Slide Show	11:30:12	G	05/01/2002

Close

FIG. 4

Add to Timeline

Schedule <playlist name>

Schedule Date: Monday, May 5, 2002

Start Time: <entered time hh:mm>

(Duration 100min)

Screen: *Select a screen* ▷

Apply to Schedule   Close

FIG. 5

Schedule Time Blocks

Schedule a Time Block for:

<day>, <date>

Film Title/Block Description:

The description will appear in the Schedules view.

Film Booking Number (optional):

Start time: <hh> : <mm> ○AM ◉PM

Run time: <minutes> minutes

Screen: *Select a screen*

Apply   Close

FIG. 6

Schedule in Background

Schedule playlist: *<playlist name>*

Start time: `<hh>` : `<mm>` ◉AM ○PM

End time: `<hh>` : `<mm>` ◉AM ○PM

Repeat schedule for: `<value>` days, beginning on

<current schedule date>

Add schedule to selected screens.

◁ ▷

☒ 1. Main aud/m (Digital)
☐ 2. Auditorium 1 (Closed)
☐ 3. Auditorium 2 (Digital)
☐ 4. Auditorium 3 (Film)
☐ 5. Auditorium 4 (Film)
☐ 6. Lobby display - front
☐ 7. Lobby display - back

Select All   Clear Selections

Schedule   Cancel

FIG. 7

Schedule Rolling Ads

Schedule playlist: *<playlist name>*

Repeat schedule for: [____] days, beginning on

<current schedule date>

Add schedule to selected screens.

- [X] 1. Main aud/m (Digital)
- [ ] 2. Auditorium 1 (Closed)
- [ ] 3. Auditorium 2 (Digital)
- [ ] 4. Auditorium 3 (Film)
- [ ] 5. Auditorium 4 (Film)
- [ ] 6. Lobby display - front
- [ ] 7. Lobby display - back

[Select All]

[Schedule] [Cancel]

FIG. 8
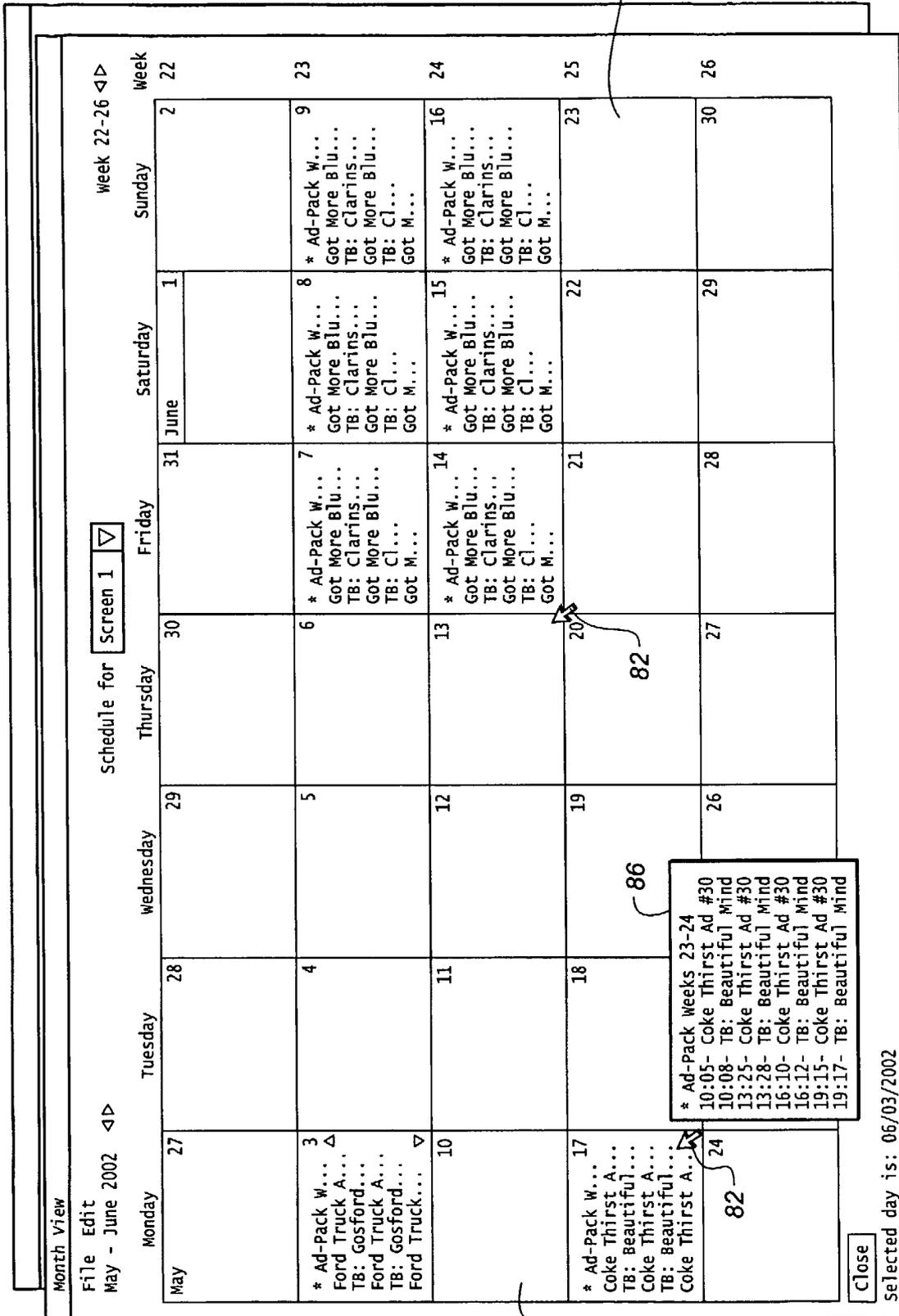
FIG. 9

Schedule Item Properties

Playlist Content: Ad Pack-week 23

Content Title	Type	Run Time	Rating	Acquire Date
Ad Pack-80 slides	Slide Show	02:13:31	G	05/01/2002
Coke Ad #234N	Rolling Ads	02:35:01	G	05/01/2002
Chevrolet #167	Rolling Ads	03:08:15	G	04/28/2002
Ford #1245	Rolling Ads	02:58:45	G	04/28/2002
NCN Slideshow #12	Slide Show	11:30:12	G	05/01/2002

Selected playlist schedule details:

Screen: 3. Auditorium2 (Digital)
Type: Background
Date: May 10, 2002
Start Time: 10:10 AM
Run Time: 10:34

[Close]

FIG. 10

FIG. 11

FIG. 12

INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
INV. G06Q90/00   H04N7/58

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G06F   H04N   G06Q

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 427 218 A (EASTMAN KODAK COMPANY) 9 June 2004 (2004-06-09) the whole document	1-7

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
18 April 2006	25/04/2006

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	PAVON

INTERNATIONAL SEARCH REPORT

Information on patent family members

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
EP 1427218	A	09-06-2004	CA	2446860 A1	04-06-2004
			JP	2004222245 A	05-08-2004
			US	2004109137 A1	10-06-2004
			US	2005076372 A1	07-04-2005
			US	2005055712 A1	10-03-2005
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