POINT OF PURCHASE VIDEO DISTRIBUTION SYSTEM

BACKGROUND OF THE INVENTION

The present invention relates generally to audio-visual media broadcasting and advertising. More specifically, the invention relates to transmission systems for distributing point-of-purchase video advertising and related information to stores.

Commercial network television has been recognized as a powerful and efficient medium for broadcasting advertising messages to a large, widely disbursed audience. As a result, network television traditionally has garnered a major share of advertising budgets. However, due to a variety of factors, commercial television advertising revenues have been dropping over the past several years, a trend which is expected to continue. One major drawback of television advertising is network television's ability to do nothing more than deliver a large number of impressions to a large and relatively undifferentiated audience. Advertising dollars are ineffectively spent on messages that reach the wrong audiences under the wrong circumstances. Further, national network television is well suited only for the limited number of product categories which are truly national in scope and relatively impervious to regional and seasonal variation. Moreover, the cost of multiple regional campaigns will often equal or exceed that of a national program.

Point of purchase promotion accomplishes what in-home television cannot, in large part because it is directed not toward passive, unreceptive viewers, but rather toward consumers who are actively making choices and seeking information. Ample evidence demonstrates consumers in a shopping environment are much more susceptible to televised messages than otherwise.

While meeting with substantial success, prior point of purchase advertising systems have met with some

limitations. In some cases they are based on a static, print-oriented media comprised of signage or packing labels, with product messages lost in the clutter. On-site demonstrations or educational devices are often prohibitively expensive, take up valuable selling space and are limited to a store by store approach.

One known system of electronic point of purchase advertising utilizes silent electronic dot repeating message signs, similar to reader boards found in major airports and brokerage houses, in the high-traffic aisles of supermarkets. Such silent reader boards, with limited two-dimensional displays, do not have the effectiveness of television in catching and retaining viewer attention.

Another known variation on electronic point-of-purchase advertising utilizes electronic display screens such as liquid crystal displays on individual shopping carts which convey messages to the shopper. Such systems again do not have the effectiveness of television, and further require a great deal of maintenance down-time due to their susceptibility to damage.

Other known systems have used satellite-transmitted television to broadcast advertising into supermarkets. However, such systems are typically based on commercial network programming and have typically located television monitors only at checkout counters. Further, known satellite-based systems do not permit on-line selective customizing of promotional messages.

U.S. patent application Serial No. 07/926,664, incorporated herein by reference for all purposes, and PCT international application No. PCT/US93/07449, also incorporated herein by reference for all purposes, respond to the need for an effective and cost-efficient point-of-purchase promotional medium. These patent applications provide methods and apparatus for distributing and broadcasting a customized video program from a distribution center to a plurality of geographically dispersed receiving sites. These patent applications are pioneering in the field of audiovisual media broadcasting and the advertising field. A unique aspect of

these systems are their capability for on-line creation of audio-visual programs customized for individual retail chains, stores, or ultimately aisles within a store, as well as for particular geographic areas and times of day. Unique programs tailored to a particular demographic market are assembled on-line and broadcast simultaneously to a multitude of different locations. This feature eliminates the need for producing separate video programs on separate videotapes for each customized program desired, and requires little or no operational intervention of personnel at the store.

SUMMARY OF THE INVENTION

The present invention responds to the need for a more effective, cost-efficient point-of-purchase promotional scheme. The invention provides a method and apparatus for distributing and broadcasting a customized video program from a distribution center to a plurality of geographically dispersed receiving sites.

The present invention is a video media distribution network including (1) a distribution center which transmits video program segments to the receiving sites, (2) receivers which receive the segments, (3) a tracking system which tracks the product movement at the receiving sites, (4) a network management system which forms playlists for each of the receiving sites in response to inputs from a user, and (5) display units which display the playlists in the receiving sites. The user, located in the distribution center, has access to the product movement information.

In the preferred embodiment, entertainment-based commercial promotional programming in full motion video format is broadcast via a communication medium to the point of purchase in retail outlets nationwide. The signal is received at each retail store and later broadcast throughout the store by monitors, preferably located over the aisles and the major walls. The location of monitors and the volume level of the speakers are preferably designed to unobtrusively blend in with each stores decor and enhance its aesthetics while being easily visible to shoppers as they move through the aisles.

One aspect of the present invention is an advanced method of providing a "store and forward" feature. "Store and forward" occurs when the video program segments are stored in the receiving site and later forwarded to the display unit by the system's network management software when the segments are needed for a playlist. A playlist is a particular program sequence requested by a user who is located in the distribution center. Currently available transmission equipment cannot provide the required store and forward feature of the present invention. Thus, the present invention provides a new store and forward feature which allows for flexible access to the various video program segments (clips) at the receiving site.

The present invention is compatible with many different media of data transportation. Several different communication media between the distribution center and the receiving site can be implemented. These communication media may include one or more of a satellite with one channel, a dedicated communication channel, a dedicated optical fiber link and/or telephone connections. These communication media can also be used as a back up to one another, in conjunction with one another or alone in order to efficiently and cost-effectively transmit and assist in the transmission of the required video from the central site to the receiving sites.

In the preferred embodiment, the program segments (clips) are transmitted in digital signals. Therefore, only a single transponder of a satellite is required. Usually, the digital signals are compressed in the distribution center using advanced digital compression techniques.

The invention further affords communication between the system's technical operation center and the receiving computers in each retail location. This is particularly useful for product promotions and pricing changes, wherein a network advertiser offers a reduced price, coupon, two-for-one sale, or other such promotion. Additionally, purchase time, aisle where purchased, and cashier information can be tracked for monitoring product movement (sales of consumer goods) in each receiving site. The monitoring of product movement can

also be used to determine the effectiveness of the overall system and to refine the video distribution system.

Because of its ability to more efficiently tailor its commercial messages to particular chains, stores, times of day and geographic regions, the video distribution system of the present invention provides advertisers the capability to reach target audiences with customized messages. Further, such customized programming is assembled on-line at each receiving site, eliminating the need for preassembly of multiple unique programs, or the involvement of personnel at the receiving sites.

The distribution center includes an uplink technical operation center and an uplink earth station which utilize two-to-one redundancy in order to reduce system downtime. In addition, the receiver system can be a time division multiplex system which receives a digital data sent by the uplink control system. The data are stored in compressed form and then decoded/ converted such that it can be viewed and heard in the receiving sites (stores).

The network management system in the preferred embodiment schedules and sequences commercials and other programming segments comprised of digitized videos which are played in the receiving sites. A wheel concept is used to continually display commercials and other program segments in an efficient manner. The network management system determines what is displayed at the stores along with when it is to be displayed, and it also determines commercial placement in the various levels within retail organizations (produces a customized program).

The distributed audio system in the preferred embodiment provides audio control assistance to the display of the customized program by adjusting the level of audio in various areas of the retail store in response to the existing noise levels in various zones within the retail stores.

The receiving sites of the present invention are not limited to stores. The present invention could be used to distribute customized programs to many different types of receiving sites. For example, hospitals, schools, other

facilities open to the public, and/or other community gathering places could be receiving sites.

Moreover, the video segments distributed to the receiving sites could contain picture alone, audio alone, a combination of video and audio, and/or multi-media.

A further understanding of the nature and advantages of the invention may be realized by reference to the remaining portions of the specification and the drawings.

DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram of the distribution network system's compression uplink and downlink system.

Fig. 2 is a diagram of the distribution network system's technical operation center.

Fig. 3 is a diagram of the distribution network system's earth station.

Fig. 4 is a diagram of the distribution network system's receive system.

Fig. 5 is a diagram of a possible Windows menu setup for the Network Management Program.

Fig. 6 is a process flow chart of the system's Socket Management form.

Fig. 7 is a process flow chart of the system's Edit Playlist form.

Fig. 8 is a process flow chart of the system's Open Template form.

Fig. 9 is a process flow chart of the system's Edit Template form.

Fig. 10 is a process flow chart of the system's New Playlist form.

Fig. 11 is a process flow chart of the system's Modem form.

Fig. 12 is a process flow chart of the system's Serial Store Communications form.

Fig. 13 is a process flow chart of the system's Uplink form.

Fig. 14 is a block diagram of the distributed audio system.

Fig. 15 is a process flow chart for the control processor in the audio controller.

Fig. 16 is a block diagram of the audio controller in the distributed audio system.

Fig. 17 is a drawing of the loudspeaker for the distributed audio system in the preferred embodiment.

DESCRIPTION OF SPECIFIC EMBODIMENTS

The present invention provides a distribution network for transmitting real-time motion video, usually in the form of promotional advertisements, from a distribution center to a multitude of receiving sites, typically retail stores, dispersed over a wide geographic area. Video segments (clips) for programs are transmitted from the distribution center and received at the receiving sites. Television monitors located at selected points in the receiving sites display programs to an audience, which usually will include shoppers in the store. Importantly, the invention provides for customizing programs for particular target audiences or markets, such that the program played in one receiving site could be quite different from that played in another. Equally important is the invention's flexibility in on-line formation of customized programs without the need for preassembly of each unique program or operational involvement of personnel at the receiving sites.

After the clips have been received and stored in the receiving sites, the system's software scheme performs the on-line program formation automatically in order to form the playlists. In the preferred embodiment, users enter the desired playlists for each receiving site into the system from the technical operation center. The user may enter one set of playlists for many stores, may update playlists in a few stores, etc. For each individual receiving site, the software assembles the desired playlist with the clips stored in that receiving site, and then forwards the clips to monitors for display.

This advanced method of storing and forwarding clips is similar to the accessing of data files in a personal

computer. The store and forward feature allows for flexible access to various video clips. Each video clip is separately encoded and compressed such that it can be handled as a data file is handled in a personal computer. Currently available transmission equipment cannot provide the required store and forward feature because of the extensive access to the compressed data files needed at the local receiving sites.

In the preferred embodiment, as illustrated in Fig. 1, the distribution network includes a distribution center 100 (technical operation center 200, earth station 234 and network management 261) and a receiving site (receive system 254). Fig. 1 is a diagram of the video distribution system's compression uplink and downlink system. Clips are complied in technical operation center 200, prepared for distribution in earth station 234, and sent from earth station 234 to receive site 254 via one of the system's available media. Network management 261, which is coupled to technical operation center 200, contains the software which prepares the programs for display.

A. Communication Media

Several communication media are used in the preferred embodiment for sending clips and control data from earth station 234 to receive site 254. The media described below can be used (1) as a back up to one another, (2) in conjunction with one another, or (3) alone in order to efficiently and cost effectively transmit and assist in the transmission of the required video from the distribution site to the receiving sites. The available communication media for this system include: (1) satellite, (2) dedicated communication channel, and (3) dedicated optical fiber link (T1). In the preferred embodiment, only one satellite channel with a typical bandwidth (e.g., 36 MHz) is employed.

The dedicated communication channel involves a commercially available telephone line which is dedicated to the transmission of the video distribution network data. Commercially available modem products are sufficient connections for this communication medium. The dedicated

optical fiber link (T1) is a dedicated data line on optical fiber link (MCI and AT&T provide this type of commercial service).

Each mode of transmission through a different selected transmission medium results in a different transmission rate and a different transmission time. For example, the transmission rate of a 30 second video segment (clip) compressed at 8.3 Mbps and sent through satellite (half transponder) is 21.5 Mbps. In comparison, the same clip with the same compression has a transmission rate of 1.5 Mbps when sent through an optical fiber link (T1). For further comparison, the transmission rates and transmission times for a 30 second clip compressed at 8.3 Mbps and 1.2 Mbps, and sent through the described media are presented below:

Medium	Compression	Trans. Rate	Trans. Time
Half transponder	8.3 Mbps	21.5 Mbps	11.6 seconds
T1 circuit	8.3 Mbps	1.4 Mbps	2.6 minutes
Dial up	8.3 Mbps	56.0 Kbps	1 hr. 15 min.
Half transponder	1.2 Mbps	21.5 Mbps	1.7 seconds
T1 circuit	1.2 Mbps	1.5 Mbps	30 seconds
Dial up	1.2 Mbps	56.0 Kbps	11 minutes

B. Uplink Control System

1. Technical Operation Center

Fig. 2 is a diagram of the video distribution system's technical operation center. Technical operation center 200 arranges and prepares the clips along with control data which will be sent to the receiving sites from earth station 234. In the preferred embodiment, this system has a 2-to-1 redundancy such that channel 1, which travels through encoder 202, is replaced by channel N, which travels through encoder 204, if any difficulties arise. These two channels could be utilized together in order to prepare and send clips along with control data to earth station 234. Moreover, additional channels could be employed to work in unison with or as back-up to channel 1. In the preferred embodiment,

channel N is a stand-by unit. Thus, channel N is used, for example, when channel 1 is down.

Video, audio 1 and audio 2 (represented by V, A1 and A2) enter encoder 202 and are encoded from analog to digital signals. Video, audio 1 and audio 2 make up the program clips which are sent to the receiving sites. After the signals are encoded, they are then sent to channel personal computer ("PC") 206. Channel PC 206 decodes and compresses the signal and then sends the signal to digital storage 210 and/or primary MUX 214. Digital storage 210 houses the clips until they are needed, and MUX 214 multiplexes the signal sent by channel PC 206. Multiplexer control terminal ("MCT") 218 controls MUX 214 and contains the systems clock. The signal sent to MUX 214 is the signal which will ultimately be sent to the receiving sites. Thus, channel PC is directly controlled by the Network Management software which determines which clips are needed in the receive sites.

The signal then travels from MUX 214 into two alarm switchover units 220 and 222. Alarm switchover units 220 and 222 work in conjunction with PC 224 in order to ensure minimum system downtime by providing for data transport through several paths to DS-3 Interface 226 or DS-3 Interface 228. The DS-3 samples the received signal, detects where information is in the signal and preserves that information. The data next enters Northern Telecom OC-12 230, which transforms the signal into light such that the signal can travel through optical fiber. The signal is then sent from technical operation center 200 to earth station 234 through optical fiber.

Many different hardware configurations can be employed to achieve the signal transfer described in the above paragraphs. In the preferred embodiment, encoder 202 is, for example, a D5200 DSR MPEG-1 (Moving Picture Experts Groups) encoder commercially available from Scientific Atlanta. This unit, which is combined with the record, uplink, transport and decoder boards described below, supports a wide spectrum of digital storage, transmission and retrieval applications.

Channel PC 206 preferably contains a PC based satellite uplink board (D5320 Scientific Atlanta), a PC decoder board (D5101 HI-MEM Scientific Atlanta) and a PC record board (D5310 Scientific Atlanta). The PC based satellite uplink board is used to transfer compressed digital data to digital multiplexer 214 (D9100 Scientific Atlanta). The PC decoder board formats and transfers compressed digital video, audio, and closed captioned data to SCSI-2 (Small Computer Standard Interface) digital storage device 210. The PC decoder board also decodes the compressed audio and video data in real time from digital storage 210 or from an ISA (Industry Standard Architecture) bus at bit rates from 8.3 to 1.5 Mbps while maintaining the audio-video synchronization at all times. The PC's utilized in technical operation center 200 and in receive site 254 can be any IBM compatible 386 or 486 PC operating at, for example, 33 MHz. Channel PC 206 contains a PC uplink board which prepares the data for serialization.

The outgoing data from PC 206 may be stored in digital storage device 210. Digital storage 210 interfaces with a fast SCSI-2 drive. The storage device may be, for example, a Seagate Barracuda series hard disk. The primary MUX 214 is, for example, a time division multiplexer. According to one specific embodiment, the MUX 214 is a D9100 21.5 Mbs multiplexer from Scientific Atlanta. MCT 218 is a computer (PC) and software which controls the MUX and contains the systems clock. The MCT allows for the combining of video control data (used for the remote site) with the actual video footage.

Alarm switchover units 220 and 222 can be D9157 Alarm Switchover Units from Scientific Atlanta. When the primary MUX is down the alarm warns the operator and activates the stand-by components (channel N back-up MUX 216 etc.). Monitoring PC 224, which includes a PC transport board (D5330 Scientific Atlanta) and a PC decoder (D5101 HI-MEM Scientific Atlanta), controls which channel is being used as a primary or as a back-up. The monitoring PC also checks and monitors the data traveling through the alarm switchover unit for problems.

If a problem arises, PC 224 controls the switchover units such that the signal is sent via a different path. The monitoring PC in conjunction with the two alarm switchover units form a four-way system similar to a bus in a network. Thus, four different paths are available for data transport which results in little, if any, downtime in the system.

Next, under normal circumstances, the data enters primary DS-3 interface 226 which can be a D9700 DS-3 Interface that accepts two 21.5 Mbs inputs, such devices are available from Scientific Atlanta. As stated above, DS-3 226 samples the received signal at a rate of 21.5 Mbs and detects where information is in the signal and preserves the detected information.

OC-12 230 (consumer supplied TX) is a passive device with an opto-coupler which transforms the received modulated signal into light so that the signal can travel through optical fiber. As stated above, the signal is then sent from technical operation center 200 to earth station 234 through optical fiber.

2. Earth Station

Fig. 3 is a diagram of the video distribution system's earth station. In the preferred embodiment, earth station 234 is physically distanced from technical operation center 200. Devices DS-3 Interface 226 through DS-3 Interface 240 are only required if uplink earth station 234 is remotely located from technical operation center 200. The data enters earth station 234 and goes directly to Northern Telecom OC-12 customer supplied TX 236 where it is transformed back into the digital form it had before entering Northern Telecom OC-12 customer supplied TX 230. The information then, under normal conditions, enters primary DS-3 interface 238 which is the same device as primary DS-3 interface 226.

The data next enters primary QPSK Mod 242 which is a Quadrature Phase Shift key Modulator. This device Modulates the signal into the quadrature phase which results in a better signal-to-noise ratio than the normal PSK. The signal then

enters Ku-band upconverter ("U/C") 246 which changes the baseband signal entering the device into a Ku band frequency.

Various hardware configurations can be utilized to send data through the earth station. In the preferred embodiment, QPSK Mod 242 is a D9170 43.0 Mbs QPSK Modulator from Scientific Atlanta. U/C 246 is, for example, a 7795 Ku-Band Upconverter from Scientific Atlanta. U/C 246 includes a mainframe which is ovenized (for controlling the temperature) and a 10 MHz reference oscillator with a synthesizer which stops the frequency from drifting (phase locked). In addition, U/C 346 has a 70 MHz intermediate frequency, a 40 MHz bandwidth, +7 dBm output power, a 115 VAC input voltage characteristic and is 50/60 Hz.

The path of Channel N mimics the path of Channel 1. Therefore, Channel PC 208 is equivalent to Channel PC 206, digital storage 212 is equivalent to digital storage 210, backup MUX 216 is equivalent to primary MUX 214, backup DS-3 interfaces 228 and 240 are equivalent to primary DS-3 interfaces 226 and 238, backup QPSK Mod 244 is equivalent to primary QPSK Mod 242, and U/C 248 is equivalent to U/C 246. This 2-to-1 redundancy greatly reduces any system downtime.

The signal is then sent to TWTA 250 which is a traveling wave tube amplifier. This device is used to amplify the signal in the KU band frequency. Finally, the signal is uplinked through the KU uplink 252. Any of the above-described media can be used to send the signal from earth station 234 to the receiving site 254. In the preferred embodiment, KU uplink 252 is a satellite utilizing a typical bandwidth transponder, (e.g., 36 MHz).

C. Receiver System

Fig. 4 is a diagram of the video distribution system's receive system. In the preferred embodiment, receiving site 254 is a satellite receiver 256 time division multiplex system. Satellite receiver 256 can be a D9410 TDM Receiver from Scientific Atlanta. Receiver 256 is synchronized with the uplink's system clock and checks the timeframe of the incoming signal to see if it matches up with

the system clock. When a proper matching of the time slot in conjunction with the correct address assigned to the local site occurs, the received signal is demodulated and then sent to receiving PC 258 which contains a PC transport board (D5330 Scientific Atlanta) and a PC decoder board (D5101 HI-MEM Scientific Atlanta).

From receiving PC 258, the signal is sent to digital storage 260 and stored there in compressed form. Digital storage 260 can be any storage device which has a typical access time (e.g., 8 msec) and a typical amount of storage (e.g., 2 gigabytes). For example, a Seagate Barracuda series hard disk may be used for digital storage 260. The PC decoder within receiving PC 258 takes information from digital storage 260 and decodes/converts it into NTSC which is compatible with video V, and audio 1 A1 and audio 2 A2, for display on a monitor 259.

After being stored in digital storage 260, the clips are accessed as needed for display in the receive site. PC 258 works in conjunction with the network management software to provide the desired program for display.

D. Tracking System

In the preferred embodiment of the invention, a tracking system is utilized to track purchase time, aisle where purchased and cashier information for product movement (sales of consumer goods) in each receiving site 254. This PC based system is a user friendly database system which automatically collects data from the stores. The monitoring of product movement is used to determine the effectiveness of the overall system and to refine the system.

Usually stores already have scanning systems in place which collect all transactional data, or data of particular interest, during each business day. This data is then stored locally on, for example, an IBM 4680 computer (scanning system) connected to a PC with a Token Ring Network. The present invention utilizes the data collected by the scanning systems by building a database with this collected data at technical operation center 200.

In the preferred embodiment, the tracking system utilizes a Pentium based PC which runs a FoxPro database. This database/PC is, preferably, located in the distribution center and is connected to Network Management 261. The FoxPro database interfaces with Receiving PC 258 and downloads a full day of product movement information from each store. This downloading can be done through a modem (phone line). The FoxPro database then provides reports detailing product movement resulting from the video distribution network. In the preferred embodiment, the correlation between the actual product movement in the store and which program segments (clips) have been displayed in the store is determined by the network management software. This information is then utilized by users to determined if any modifications should be made to the system. The network management software allows the user located in the technical operation center to make quick modifications based on the actual product movement in each of the stores.

E. Network Management System

The network management system allows the user to create programs by scheduling and sequencing the clips comprised of digitized videos which are to be displayed in the retail stores. The network management system determines what is to be displayed at each of the retail stores along with when it is displayed. Moreover, the network management system monitors which clips are located in each receiving site and which additional clips are required in each receiving site to display the desired programs. This information is then used to determine which clips will be sent from the distribution center to each receiving site.

Playlists are lists of video clips that are to be displayed at each of the retail stores. A playlist is created for each store on a periodic basis (e.g., daily). If the playlist is unique to even the lower levels of the retail organizations, then a voluminous number of playlist combinations are developed. Thus, the number of playlists could number from the tens to thousands.

Receiving PC 258 contains the store and forward hardware which holds the available clips required by the playlist for displaying. Changes in the playlist after clips have been delivered to the stores is possible. The Network Management system makes sure desired new clips added to the playlist are accessible from the store and forward device before the insertion or deletion of clips related to a playlist alteration is allowed. In the preferred embodiment, modifications to the playlist (this includes "last minute" modifications) are made through a phone line which is connected to the store's local PC system via a commercially-available modem.

A "wheel" concept is used to handle the high volume of commercials and other programs which are displayed in the stores. A wheel is a cycle of time that represents the format of what will be shown on the televisions in the stores. For example, if the wheel cycle is three hours, then every three hours the display would repeat itself. The network management system provides the cycling needed for this wheel concept. Multiple wheels per day allow the system to establish playlists for the entire day. Additionally, the wheel format simplifies the contract, invoicing and billing required because these can be initially based on the original wheel(s) and later changed based on the actual number of plays. Rates may be set and sold by the wheels.

The software in the network management system interacts with channel PCs 206 and 208. In the preferred embodiment, the distribution center sends enough data to fill the downlink digital storage in a receiving site with approximately 2 gigabytes of information. Each receiving site has a store number or address, and each playlist is assigned one or more store numbers/addresses such that certain playlists are distributed to certain stores depending on the user's desired distribution.

Playlists are refreshed or replaced weekly such that different clip combinations can be used for different times on different days during particular weeks, or in any other planned time frame. A clip can contain various combinations

of news, facts, commercial information, product information, etc. The digital storage in each receiving site includes a local clip library which has all of the clips required to make up the combinations for the playlists in each store. Each individual program is a clip and clip numbers are assigned at the local receiving site (store). Each significant combination of clips are considered a program, and programs are numbered and identifiable on a global basis.

The network management system is really a trafficking system which keeps track of the all the clips at each local library. The network management system can change the combination of clips in any manner at any time. Management commands, such as the acknowledgement that a program/playlist transmission was received or the warning that specific clips in a playlist are not available, are sent with the playlists from the uplink center to the receiving site. The PC decoder within receiving PC 258 stores the commands for the playlist log in receiving PC 258.

The above-described technique utilized by network management system 261 allows a small amount of playlists to be used extensively and can also give emphasis to certain programs which are market specific in response to the demographics of the local area. This massive flexibility is extremely valuable because desired changes and additions can be quickly implemented. Moreover, information sent weekly from the uplink to the receiving site could be programmed to replace only stale or selected parts of the playlists or of the program clips (if desired). This saves in transmission costs and time along with memory space required at the receiving site.

F. Software

In the preferred embodiment, a software scheme is used for the Tracking System and the Network Management System (including software for databases and forms). The software described in this section is included in the attached Appendix. The core functionality of the software is to (1) generate playlists for the stores, (2) use the satellite to

send required information for the playlists and (3) communicate with the store for quick software updates, for program status and for emergency situations (e.g., a substitute playlist needs to be sent to a store before the next scheduled satellite uplink).

1. Network Management Software Databases

The Network Management software includes, for example, the following databases: Store Info Database, Playlist Database, Clip Library Database, Template Database, System Database, Equipment Database and Uplink Database. First, the Store Info Database has, for example, (1) a table of store site information (e.g., store ID, store name, street address, city, state, country, country code, area code, exchange, number, manager, modification information, modifying operator, data telephone, etc.), (2) a site disk contents table which lists all the clips located at that particular receiving site, and (3) the number and content of site playlist sockets (playlist sockets are places where a "wheel", as defined above, can be placed).

The Playlist Database has, for example, (1) a table of playlists names for the receiving sites which includes the playlist IDs along with the template IDs (a template works as the backbone of the playlist and is described in greater detail below), the playlist's create date, the creating operator, the playlist's modification date and the modifying operator, and (2) a contents table for each playlist that gives information on the clips (e.g., clip sequence number) included in each playlist.

The Clip Library Database has, for example, (1) a table of valid clip types which includes a clip description along with valid run times for each of the valid clip types, and (2) a video clip table which includes the clip number, the clip title, the clip type, the clip run time and the clip frequency rate.

The Template Database has, for example, (1) a table of playlist templates which includes the template ID, the creating operator, the date of creation, the finalizing

operator and the date of finalization, and (2) a template ID contents table which includes sequence numbers, clip type and clip duration.

The System Database has, for example, a table of system users which includes each operator's last name, first name, middle initial, security level, modification date and modifying operator. In the preferred embodiment, the users listed in this database are the individuals located in the technical operations center who control the content and sequencing of the video clips which are played in the receiving sites. This allows the clips to be organized and placed by someone in the technical operations center, rather than by individuals in the stores.

The Equipment Database has, for example, a table of system equipment which includes bar code information (e.g., equipment description, manufacturer, location and comments).

Finally, the Uplink Database has, for example, (1) a table of clip numbers to be sent to specific stores and (2) a table of playlist sockets (socket number and socket content) to be uploaded to specific stores. The information from this database is used to compile an uplink data file for broadcast to all receive sites.

2. Network Management Forms Software

Part of the system's software is divided into forms. These forms perform as subroutines would in a computer program. In the preferred embodiment, a Windows menu is utilized to walk the user through the various options and forms which are available. Fig. 5 is the diagram of a possible Windows menu setup for the Network Management Program. The user will initially see the following five available choices: FILE, EDIT, PLAYLISTS, UPLINK and MODEM. First, FILE allows the user to control the files which are open to that user. Each user has a security level which allows that user access to certain programs. User's with lower security levels will only be allowed to partially configure (i.e., edit rather than create) the playlists which will be played in the stores.

PLAYLISTS permits the user (depending on that user's security level) to edit a playlist with minor changes, or to create an entire playlist from scratch, or even to create a new template (all playlists are built upon playlist templates to ensure a proper playlist balance). The PLAYLISTS option loads the Socket Management Form 262 or 263 and gives the user access to certain parts of that form depending on the user's security level.

The software monitors which video clips are available at each receive site (Store Info Database) and which additional video clips are required to provide a desired playlist. When playlists or created or updated, the program determines which additional video clips are needed at the stores and sets a pending flag. The pending flag remains with these additional video clips until they are uplinked to the store which needs them. UPLINK loads the Uplink Form 295 which compiles the information (which includes the additional video clips) required at the receiving sites for the playlists.

MODEM loads the Modem Form 264 which gives the user elaborate modem communication with all the stores (allows user to update playlists and perform system maintenance).

Fig. 6 is a process flow chart of the system's Socket Management Form. Playlist sockets are places where a "wheel" can be placed. When the user selects the PLAYLISTS option, the program enters the Socket Management Form 262 or 263 (depending on the user's security level) and displays a list of all store sites, the list of sockets for store no. 1 (as a default) and a list of all the available playlists 265. The user can then move through the list of stores displaying the sockets for each store in the process. The Store Info Database and the Playlist Database provide the information needed for this display.

The user can then select from the available playlists to fill sockets of a particular store site 266. Each store site has its own number of sockets. For example, if a store is displaying 30 minute wheels of playlists for 18 hours (all the store's open hours), the store has 36 sockets

which must be filled with wheels of playlists. At this point, the user can also edit a playlist and/or create a new playlist depending on the user's security level. To edit a playlist, the Edit Playlist Form 267 is loaded.

Fig. 7 is a process flow chart of the system's Edit Playlist Form. When the user selects the Edit Playlist option, the program enters the Edit Playlist Form 267 and displays a list of the contents of the selected playlist, the contents of the template used to construct that playlist, and the contents of the system's clip library (the clips being segregated by clip type) 270. The Template Database, the Playlist Database and the Clip Library Database provide the information needed for this display. The template used to construct the playlist is the backbone of the playlist. The template predefines the order of certain types of selected video clips. For example, a template for a 30 minute wheel playlist may begin with a commercial clip, then a news clip, then a fact clip, then another commercial clip, etc. This ensures the balance of the playlist and avoids any undesired order of certain clip types (e.g., 8 commercials in a row).

At this point in the program, the user can revise the playlist 271. The level of revisions available to the user depends on the user's security level. For example, if a user has a lower security level, the user may not be able to change any of the commercials in a playlist. Additionally, without regard to the user's security level, all playlists must conform to their respective templates.

The user can then opt to create a new template or save the playlist 274. If the user decides to create a new template, the program warns the user that all existing entries in the playlist will be removed/erased 272. The program then loads Open Template Form 273 (described below). If the user decides to save the playlist 274, the program (1) makes the corresponding changes to the Playlist Database and (2) uses the Store Info Database to notify the Uplink Database of all the stores that will need to receive the updated playlist and the updating video clips (the pending flag, introduced above,

is also set at this time for additional video clips that need to be sent to stores).

Fig. 8 is a process flow chart of the system's Open Template Form. When the user selects the Open Template option, the program enters the Open Template Form 273 and displays a list of all the available playlist templates and a detail list with the video clip types located in the selected playlist template 275. The Template Database and the Clip Library Database provide the information needed for this display.

The user can then select the desired playlist template 276. This desired template can be edited or made into a new template. To edit the template, the program loads the Edit Template Form 279 (described below). Templates cannot be edited after they have been finalized (finalizing is described below). To make a new template, the user provides a new template name and the program adds the new template name along with an empty template to the Template Database 277. The user can then add to this empty template through the Edit Template Form 278.

Fig. 9 is a process flow chart of the system's Edit Template Form. When the user enters the Edit Template Form 278 or 279, the program displays the contents of the selected template and the possible clip types along with associated valid clip durations 281. The Template Database and the Clip Library Database provide the information needed for this display. The user then builds/modifies the selected template using selections from the possible clip types 282.

After the user is done building and modifying the template, the user can choose between saving or finalizing that template. If the user saves the template, the originally selected template is removed from the existing table in the Template Database and replaced with the newly created template 283. If the user finalizes the template, (1) the program informs the user that this is a one-way operation because the template can no longer be changed/edited, and (2) the template becomes usable (a playlist cannot be added to a template until the user has finalized the template) 284. In addition,

finalizing removes the selected template from the existing table in the Template Database and replaces the template with the newly finalized information (adding finalized data to the Template Database) 285. Finally, after a user has based a playlist on a template, the user cannot edit the template. If the user decides to change the template after a playlist has been based on it, the user must start with a new template (create a new template).

As stated above, while in the Socket Management Form, the user can edit a playlist and/or create a new playlist depending on the user's security level. To create a new playlist, the New Playlist Form 268 is loaded. Fig. 10 is a process flow chart of the system's New Playlist Form. After loading the New Playlist Form 268, the program loads the Open Template Form 273 and goes through that form as described above (see Fig. 8). When the user leaves the Open Template Form, the user returns to the New Playlist Form and is asked to input the name of the new playlist along with any comments the user may have 286. When the user is done, the Playlist Database is updated 287 and the Edit Playlist Form is loaded 267 (see Fig. 7). In sum, when creating a new playlist, the user gets an empty template to fill.

Fig. 11 is a process flow chart of the system's Modem Form. When the user selects MODEM (see Fig. 5), the program enters the Modem Form 264 and displays a list of all the receiving sites 288. The Store Info Database provides the information needed for this display. The user can then choose to connect to a receiving site 289. If the user decides to connect, the program enters Serial Store Communications Form 290 by dialing a phone, establishing a connection and loading store information.

Fig. 12 is a process flow chart of the system's Serial Store Communications Form. This Form begins by displaying the user's status and the information related to the downlink PC including uptime, error codes and log information 291. The user can then update playlist data or perform system maintenance 292. If the user decides to update, a new playlist is sent to the receiving site 293. The

user can only change the playlists in the connected store if all the new clips required for the change are already in that store.

If the user decides to perform maintenance, the user can send commands to (1) update the software, (2) get the list of what clips were actually displayed in the store and when they were displayed, (3) get transaction logs from the bar code information in the store (tells what has been sold in the store and when it was sold), and/or (4) reset/reboot the system causing the system to disconnect and reconnect in order to achieve a better connection, or clean up an otherwise unresolvable remote problem.

Fig. 13 is a process flow chart of the system's Uplink Form. When the user selects UPLINK (see Fig. 5), the program enters the Uplink Form 295 and displays all the store sites which will be affected by an uplink at that point in time 296. The Store Info Database and the Playlist Database provide the information needed for this display. At this point, the user can choose to compile the uplink 297. If the user decides to compile, the program compiles all the pending data in the Playlist Database into a file formatted for the uplink 298. In the preferred embodiment, the complied information is sent via satellite once a week at a predetermined and regular time (e.g., every Friday at midnight).

For a more detailed description of the above described software, please refer to the attached Appendix

G. Distributed Audio System

The audio system controller in the preferred embodiment adjusts the level of the audio in up to four zones in each retail store in response to varying noise levels in each zone. Using a multi-zone control scheme provides a more effective distribution of the audio part of the display. Approximately 20-25 speakers are located in each zone. In the preferred embodiment, these zones are laid out in rectangular shapes with an aspect ratio close to 1. The speakers are placed in a herringbone location pattern in order to cover a

large area in the retail store with the fewest number of speakers. In most stores, the room can be divided into quadrants. Distributed remotely, the system utilizes loudspeakers and noise monitoring microphones which may be, but are not necessarily, located on the display televisions.

The desired audio level is unobtrusive and yet still intelligible. Strategically placed noise detectors are used for determining the current volume levels because the acoustical environment in a retail store is far from homogeneous. The audio system measures the noise levels with these noise detectors and adjusts the volume of the audio based on this received information.

Fig. 14 is a block diagram of the distributed audio system 305. Audio controller 310 in audio system 305 is a cascade of an equalizer and an automatic level control (see Fig. 15), and the equalizer is a cascade of digital filters. The automatic level control monitors the sound in the room via microphones and adjusts the gain between program source and power amplifier in order to maintain a constant relation between signal and noise. Audio system 305 includes audio controller 310, zone microphones 315, power amplifiers 340 and zone speakers 350. Power amplifiers 340 are 70 volt Crown CT200. The audio output from the signal sent through the satellite is sent into audio controller 310 on Line in 1. Line in 2 is unused. Audio controller 310 monitors the sound level in various areas with zone microphones 315 (ZONE 1 MIC, ZONE 2 MIC, ZONE 3 MIC, and ZONE 4 MIC) connected to audio controller 310 at its microphone inputs (MIC IN1, MIC IN2, MIC IN3, and MIC IN4). The audio controller takes the information from both the audio input and microphone inputs and generates audio signals which are sent to audio power amplifiers 340. Amplifiers 340 amplify the received signals and then sends them to zone speakers 350 (ZONE A speaker corresponds to ZONE 1 MIC, etc.).

Zone microphones 315 are, for example, Crown PXM11 sold commercially by Crown International Incorporated and power amplifiers 340 are, for example, Crown CT200 also sold commercially by Crown International Incorporated. Zone

speakers 350 are speakers made up of two loudspeakers sitting back to back. These loudspeakers are positioned with their faces at 70 degree angles such that their sound is directed toward the area where an average height person would be walking in the retail store.

Audio Controller 310 also provides the following: PAGE output 322, DUCk input 323 and MON output 324. PAGE output 322 is a relay closure which sends out a signal to enable background music when regular audio is not playing. DUCK input 323 is an opto-isolated input which causes the controller to drop the audio level by 10dB in order to enable the store's paging system to be heard. MON output 324 allows for monitoring of the audio with headphones (very useful for testing and set-up of the audio system).

Fig. 15 is a process flow chart for control processor 356 which is the automatic level control in audio controller 310. The device samples the area noise and adjusts the sound level in the four zones, described above, in a round-robin fashion. Control processor 356 receives the display's audio at program source 357. Reverberated program 358 is distinguished from noise generated by other sources in room 359. This is accomplished by constructing room Model 360 based on a comparison of program 357 and microphone signals 361. The system must learn the room Model before the signal to noise ratio estimation or control of the signal to noise ration can occur. Room learning must be done following a reset. Room Model 360 produces estimate of signal power 362 which is the signal power the microphones would detect if room 359 was absent of noise 358. Signal estimate 362 is compared with the combination of signal and noise 361 detected by the microphones to produce noise estimate 363 and the signal to noise ratio (in decibels).

The automatic level control utilizes a computer program which simulates the room. The computer program performs a Fast Fourier transform ("FFT") on the two signals (program and microphone), and for the amplitude in each band of frequency for both signals, the program finds the average

of the ratio of the two signals (the room response measurement).

The automatic level control also contains a controlled time response. In order to avoid drastic sound changes, an error signal output is applied to a long time constant gain servo. The maximum change allowed is only 0.5 dB/minute in the preferred embodiment.

The implementation of this system using a digital signal processor (Motorola's DSP 56002 PQFP can be used) requires that the audio signals be represented by 16 bit integers immediately after analog to digital conversion and immediately before digital to analog conversion (internal representation uses more bits). This requires that analog signal levels be adjusted to stay within a fixed range, but it is nonetheless desired to use as much of the range as possible. This is the purpose of the gain adjustments and level meters provided in the audio controller. The analog to digital conversion is performed by a CODEC manufactured by Crystal (CS4248 rev C). The digital signal processor in this embodiment communicates with a microcontroller (Siemens SAB 83C537-16-N) which runs the display, keyboard and serial interface.

Audio Controller 310 in distributed audio system 305 has the following four main functions: (1) audio program compression, (2) equalization, (3) monitoring sound and controlling gains/attenuators, and (4) automatic level control. First, the audio program compression involves compressing the analog dynamic range (over the first 10 dB of operational range it does not compress). This is adjustable on the front panel of the audio system in the receiving sites. The adjustment can be made from 1-1 to 4-1 in integer steps. This compression can be done by a DBX 160 from DBX Corporation in Boston. Second, the equalization is achieved with two equalizers. A second order highpass filter is used to protect the loudspeaker (this filter can prevent damaging low frequency signals from reaching the loudspeaker). The highpass filter gives a fourth order highpass characteristic to the system along with a corner frequency of about

approximately 100 Hz. The threshold for potential damage to a loudspeaker depends on the loudspeaker. An equalizer (similar to the one used in an automobile) is used to improve the acoustical performance of the loudspeaker. A Klark-Technik DN360 can be used for the equalization. Third, monitoring and controlling can be done with a mixing console Ramsa WR 1244 (Ramsa is a division of Panasonic). This device provides meters for various stages within the sound system (see Fig. 16 below: program level 370, output levels 382, and microphone level 376). This device also controls the gains and attenuators such that external equipment can be matched, and this device can be controlled from the front panel of the audio system in the receiving sites. Fourth, the automatic level control was described above (Fig. 15).

Fig. 16 is a block diagram of audio controller 310. The audio output from the signal sent from the uplink site to the receiving site is input to audio controller 310 and sent through buffer 367 to amplifier 368 which amplifies the incoming signal to match the range of analog to digital converter ("ADC") 369. After passing through ADC 369, the signal is monitored by meter 370 and sent through equalizer 366 to control processor 356. Equalizer 366 is a cascade of digital filters. Control processor 356 monitors the sound in the room via microphones 365. The signal from microphones 365 is sent through buffers 371 to multiplexer 374 and to amplifiers 372. Multiplexer 374 sends one signal at a time through buffer 375 to an output allowing for monitoring of the signals from microphones 365. Amplifiers 372 amplify the incoming signals to match the range of ADC 377 and then sends these amplified signals to multiplexer 373 which allows only one microphone signal to enter ADC 377 at a time. The signal output by ADC 377 is monitored by meter 376 and is sent to control processor 356.

The signal output by the control processor 356 is sent to the automatic attenuators 378 which attenuate the signal based on information received from control processor 356. Attenuators 378 output to monitors 382 and to DACs 379. The signals are next sent to output attenuators 380 which

attenuate the signals such that they match the subsequent equipment. The output from attenuators 380 is sent through buffers 381 and then output from audio controller 310. Control processor 356 also has an interactive paging system. Signals received through opto-isolator 391 inform control processor 356 that a page is going to occur throughout the store. Based on this information, control processor 356 causes the sound from audio system 305 to be turned down during the page. Control processor 356 outputs, in order to interface with the paging system, through relay 390.

The distributed audio system is a 70 volt system which permits many speakers to be placed in parallel. A transformer is utilized to change the speaker load from a low impedance load to a high impedance load. The reflected impedance is approximately 1 Kohm when driven by a high voltage which allows 20-25 loudspeakers to be placed in parallel as desired in the preferred embodiment.

A Kenwood KFC-1053 driver and Soundolier HT-87 transformer can be used in the loudspeakers. The low frequency performance of the KFC-1053 driver are characterized by Thiele-Small parameters, which are measured using impedance curves obtained in a 4'x4' baffle and in a 1.18 liter box and are listed below.

f_s	144 Hz
R_e	3.7 ohm
Q_{ts}	0.89
Q_{ms}	5.75
Q_{es}	1.05
V_{as}	1.51 liter

The volume of the cavity behind each driver in the loudspeaker is 5 liters, which results in a system Q of approximately 1. In the preferred embodiment, the box is operated in conjunction with a second order high pass filter to give a 4th order high pass characteristic to the system.

The combined filter and loudspeaker have a lower 3dB cutoff frequency and steeper roll-off below the cutoff frequency than the unfiltered box. This filter is implemented digitally in audio controller 310.

The KFC-1053 driver has a plastic dust cap and whizzer cone that radiate efficiently beyond 10 kHz. This gives a quality of "brightness" to the sound that is desirable in the store environment.

In the preferred embodiment, the loudspeaker is intended for operation in a 70.7 V distribution system. Each of the two drivers is equipped with its own transformer and primary tap selector switch. The specifications of the Soundolier HT-87 constant voltage transformer are listed below:

primary voltage	70.7V
frequency response	+- 1 dB, 50 Hz - 15 kHz
primary taps	1, 2, 4, 8 W
secondary impedance	4 and 8 ohm

Tap selection is provided to allow the sound level to be adjusted to compensate for local noise conditions such as proximity to refrigerators. Both the loudspeaker and transformer contribute to the total harmonic distortion produced by the system.

Fig. 17 is a drawing of the loudspeaker for the distributed audio system in the preferred embodiment. Loudspeaker 400 consists of two separate cavities 402 and 404, one for each driver. All cabinet joints and penetrations are air-tight. The material is 1/2" birch veneer plywood, and all joints are glued and nailed. This method of construction provides sufficient freedom from cabinet vibration without additional bracing. Loudspeakers 400 is covered with cloth grills made of nylon monofilament fabric specifically intended for loudspeaker use. The rear interior surface of each cavity is covered with 2" of glass wool to damp high-frequency

internal reflections. The dimensions of loudspeaker 400 are as shown in the drawing.

WHAT IS CLAIMED IS:

1. A video media distribution network comprising:

a distribution center for transmitting video program segments to a plurality of receiving sites;

receivers located at the receiving sites;

a tracking system tracking product movement at the receiving sites;

a network management system forming playlists for each of the receiving sites in response to inputs from a user, the user having access to the product movement information from the tracking system; and

display units for displaying the playlists at the receiving sites.

2. The video media distribution network of claim 1 wherein the tracking system tracks previously played program segments and wherein the network management system determines the playlists in response to both the product movement and the previously played program segments.

3. The video media distribution network of claim 1 further comprising:

a data communications link between the distribution center and the receiving sites for transmitting information including reception verification, alarm messages and statistical information.

4. The video media distribution network of claim 1 further comprising:

a plurality of controllers storing and playing back the program segments, the controllers playing back the program segments after time delays in response to the network management system.

5. The video media distribution network of claim 1 further comprising:

* C L M S *

at least one personal computer controlling transmission of the program segments and placement of the program segments in the playlists.

6. The video media distribution network of claim 1 wherein the receiving sites comprise stores.

7. The video media distribution network of claim 1 wherein the distribution center further comprises a satellite for transmitting the program segments.

8. The video media distribution network of claim 1 wherein the distribution center further comprises a optical fiber link for transmitting the program segments.

9. The video media distribution network of claim 1 wherein the distribution center further comprises a dedicated communication channel for transmitting the program segments.

10. The video media distribution network of claim 1 wherein control data is placed in the program segments.

11. The video media distribution network of claim 1 wherein the display units comprise television sets.

12. The video media distribution network of claim 1 wherein the receiving sites comprise schools.

13. The video media distribution network of claim 1 wherein the receiving sites comprise hospitals.

14. The video media distribution network of claim 1 wherein the video program segments result in a multi-media display.

15. The video media distribution network of claim 1 wherein the video program segments are stored at the receiving sites and forwarded to the display unit for display in

response to the playlists formed by the network management system.

16. A video media distribution network comprising:

a distribution center for transmitting video program segments to a plurality of stores, the stores having associated receiver addresses, and the video program segments having associated clip numbers;

receivers located at the stores;

a tracking system tracking product movement at the stores and tracking previously played program segments at the stores, the tracking system organizing information based on the receiver addresses and the clip numbers;

a network management system forming playlists for the stores in response to inputs from a user, the user having access to information about the product movement and the previously played program segments; and

display units for displaying the playlists at the stores.

17. A video media distribution network comprising:

a distribution center for transmitting video program segments to a plurality of receiving sites, the receiving sites having associated receiver addresses;

receivers, located at the receiving sites, for receiving and storing the video program segments;

a network management system forming playlists for the receiving sites in response to inputs from a user, the network management system controlling which video program segments are sent to each of the receiving sites; and

display units for displaying the video program segments at the receiving sites, the network management system controlling when the video program segments are forwarded to the display unit for display.

18. A method of broadcasting video program segments to a plurality of stores, for display on video monitors in said stores, the method comprising:

transmitting said program segments to said stores;

receiving said program segments at each store;

storing said program segments at said stores;

forming a desired playlist at a network management site in response to inputs from a user;

transmitting said playlist to said stores; and

playing back said stored program segments in said stores on said video monitors in an order determined by said desired playlist.

19. The method of broadcasting video program segments in claim 18 further comprising:

tracking previously played program segments; and

forming a desired playlist in response to both product movement and previously played program segments.

20. The method of broadcasting video program segments in claim 18 further comprising:

transmitting information to said stores, said information including reception verification, alarm messages and statistical information.

21. The method of broadcasting video program segments in claim 18 wherein said playing back of said stored program segments occurs after time delays, said time delays are in response to a network management system.

22. The method of broadcasting video program segments in claim 18 wherein said transmitting of said program segments is done with a satellite.

23. The method of broadcasting video program segments in claim 18 wherein said transmitting of said program segments is done with an optical fiber link.

24. The method of broadcasting video program segments in claim 18 wherein said transmitting of said program segments is done with a dedicated communication channel.

25. The method of broadcasting video program segments in claim 18 wherein control data is placed in said program segments.

26. The method of broadcasting video program segments in claim 18 wherein said video monitors are television sets.

27. The method of broadcasting video program segments in claim 18 wherein said video program segments result in a multi-media display.