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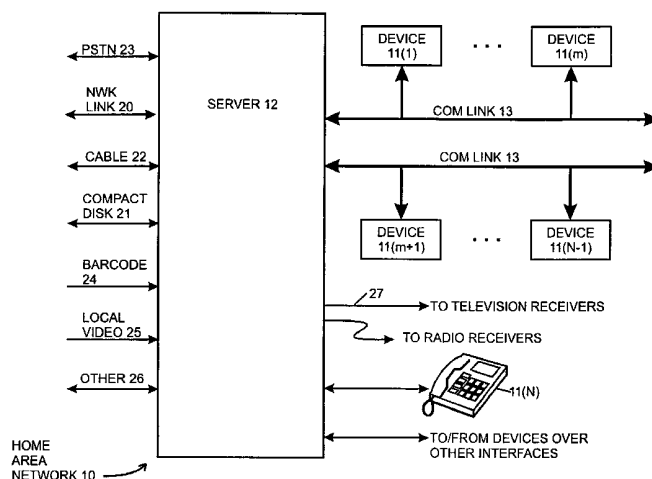
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(54) Title: SYSTEM AND METHOD FOR PROVIDING VIDEO PROGRAMMING INFORMATION TO TELEVISION RECEIVERS



(57) Abstract: A system is disclosed for providing video programming information from a plurality of sources over a unitary set of channels comprising a notch filter, a video program information receiver, a modulator, and a composite video generator. The notch filter is configured to receive the receive video programming information from a first source over the unitary set of channels and provide notched video programming information comprising the received set of channels, except a selected channel. The video program information receiver is configured to receive other video programming information from a second source. The modulator is configured to modulate the other video programming information onto a channel corresponding to the selected channel, thereby to provide modulated other programming information. The composite video generator is configured to combine the notched video programming information from the notch filter and the modulated other programming information generated by the modulator thereby to provide composite video programming information over the unitary set of channels for provision to a television receiver.



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SYSTEM AND METHOD FOR PROVIDING VIDEO PROGRAMMING INFORMATION TO TELEVISION RECEIVERS

INCORPORATION BY REFERENCE

U. S. Patent Application Serial No. 09/365,726, filed August 3, 1999, in the name of Richard Edson, entitled "Multi-Service In-Home Network With An Open Interface" and assigned to the assignee of this application, incorporated by reference.

U. S. Provisional Patent Application Serial No. 60/193,813, filed March 31, 2000, in the name of Theodore F. Tabloski, et al., entitled "Home Area Network" and assigned to the assignee of this application, incorporated by reference.

FIELD OF THE INVENTION

The invention relates generally to the field of user-premises or home area networking, to allow different types of systems and/or communications devices to utilize one in-home network to communicate with each other and to access a number of external communication services, and more specifically to systems and methods of providing video programming information from a plurality of sources to television receivers over a unitary set of channels to which the television receivers are adapted to tune.

BACKGROUND OF THE INVENTION

U. S. Patent Application Serial No. 09/365,726, filed August 3, 1999, in the name of Richard Edson, entitled "Multi-Service In-Home Network With An Open Interface" (hereinafter "the Edson application") and U. S. Provisional Patent Application Serial No. 60/193,813, filed March 31, 2000, in the name of Theodore F. Tabloski, et al., entitled "Home Area Network" (hereinafter "the Tabloski, et al., application") describe various embodiments of an in-home network and server therefor that provides a number of services. Generally, one of the services is to distribute video program information to, for example, television receivers for viewing thereon. In one embodiment, the video program information may be provided by one or more of a number of sources, including, for example, over-the-air broadcast, a cable provider or a digital satellite provider, and the server generally distributes the video program information to the television receivers over a cable connection that defines a unitary set of channels to which the television receives are adapted to tune. It is also desirable to allow the server to also receive video program information from one or more secondary sources, such as a local video source, and integrate that video program information with the video program information from the other source(s), over the same unitary set of channels.

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SUMMARY OF THE INVENTION

The invention provides a new and improved system and method of providing video programming information from a plurality of sources to television receivers over a unitary set of channels to which the television receivers are adapted to tune.

In brief summary, the invention provides system for providing video programming information from a plurality of sources over a unitary set of channels comprising a notch filter, a video program information receiver, a modulator, and a composite video generator. The notch filter is configured to receive the receive video programming information from a first source over the unitary set of channels and provide notched video programming information comprising the received set of channels, except a selected channel. The video program information receiver is configured to receive other video programming information from a second source. The modulator is configured to modulate the other video programming information onto a channel corresponding to the selected channel, thereby to provide modulated other programming information. The composite video generator is configured to combine the notched video programming information from the notch filter and the modulated other programming information generated by the modulator thereby to provide composite video programming information over the unitary set of channels for provision to a television receiver.

BRIEF DESCRIPTION OF THE DRAWINGS

This invention is pointed out with particularity in the appended claims. The above and further advantages of this invention may be better understood by referring to the following description taken in conjunction with the accompanying drawings, in which:

FIG. 1 depicts a home area network including an arrangement for providing video programming information from a plurality of sources to television receivers over a unitary set of channels to which the television receivers are adapted to tune; and

FIG. 2 depicts a functional block diagram of the video program information providing arrangement useful in the home area network depicted in FIG. 1.

DETAILED DESCRIPTION OF AN ILLUSTRATIVE EMBODIMENT

FIG. 1 depicts a home area network 10 including an arrangement for providing television programming information from a plurality of sources to television receivers over a unitary set of channels to which the television receivers are adapted to tune. FIG. 1 depicts a home area network 10 including an interface to the public switched telephony network (PSTN), constructed in accordance with the invention. Generally, the home area network 10 facilitates the connection of

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a plurality of household appliances, devices, television and radio receivers, telephone sets, and other facilities (generally "devices") 11(1) through 11(N) (generally identified by reference numeral 11(n)) to a home server 12 over one or more digital communication links generally identified by reference numeral 13 and one or more analog communication links generally identified by reference numeral 14. The home server 12 can also connect to a number of external connections, including a central office in the public switched telephony network (PSTN) over a PSTN link 23, a network such as the Internet over a network link 20, a cable connection (for use in providing cable television, telephony, Internet and other services as will be apparent to those skilled in the art) over cable link 22, a compact disk player over a compact disk link 21, a barcode reader over barcode link 24, a local video source 25, and perhaps other devices (such as devices providing information via satellite and the like, home security devices, and so forth) over other links generally identified by reference numeral 26.

As described in, for example, the aforementioned Edson and Tabloski, et al, applications, the devices 11(n) can transfer information among themselves over the respective communication link 13, 14 to which they are connected. In addition, the devices 11(n) connected to one communication link 13, 14 can transfer information to devices connected to another communication link 13, 14 and between the devices 11(n) and the PSTN, network, cable, etc., through the server 12; in that operation, if one device 11(n') is connected to an analog communication link 14 and another device 11(n'') (n'≠n'') is connected to a digital communication link 13, the server 12 can perform a digital to analog or analog to digital conversion as necessary. In addition, the server 12 operates to store information received from the PSTN, network, cable, and devices 11(n) for later transmission over the PSTN, network, cable, etc., and later transmission to the devices 11(n). The information transferred over communication links 13 is preferably in digital form, as is the information stored on the server. On the other hand, information may be transferred over other connections in digital or analog form as appropriate.

The devices 11(n) that can be connected to the home area network 10 can include a number of types of appliances, including but not limited to devices such as personal computers, personal digital assistant (PDA) devices, telephony devices (illustratively device 11(N)), and home entertainment devices such as radio and television receivers, DVD, compact disk, video and audio tape and record players, and the like. In addition, devices 11(n) that can be connected to the home area network can include lighting, heating and cooling, and similar systems, as well as appliances such as stoves and ovens. If a particular device is a "legacy" device, that is, a device that itself does

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not have an interface that can be connected to a digital communication link 13, that legacy device can be provided with a suitable interface to allow it to be so connected.

Generally, the home area network 10 operates to allow information to be stored on the server 12, transferred among the devices 11(n), and transferred from or to a number of external sources or destinations, including, for example, sources or destinations over a network such as the Internet or the public switched telephony network (PSTN), cable or satellite television or radio, music sources such as compact disks. The information may comprise any form of information, including, for example, audio information, image and video information, information in text form, control information for, for example, controlling one device from another or from the server 12 in relation to, for example, occurrence of certain events, computer programs, and so forth. The home area network can be used to, for example, transfer audio information from sources to destinations such as the server 12 for storage or to various devices 11(n) for playing. Similarly, the home area network 10 can be used to transfer image or video information from sources to destinations such as the server 12 for storage or to various devices 11(n) for display. In addition, the home area network 10 can be used to transfer control information to control controllable devices, such as lighting, appliances such as stoves and ovens, heating and cooling systems, alarm systems and the like.

The communication links 13 may be in any form, including a hard link such as a wire, optical fiber or other arrangement for transferring electrical, optical or other signals among the appliances. Alternatively or in addition, communication links 13 may comprise wireless links, such as but not limited to infrared links or links provided by signals in other parts of the electro-magnetic spectrum. Communication links 13 may comprise communication links specially provided for the home area network 10, and/or they may include pre-existing links such as telephone lines, wiring provided for, for example, AC power distribution, and the like.

Each device 11(n) connected to a digital communication link 13 preferably includes or is provided with an interface (not separately shown) that enables it to transmit information, in the form of message packets to, and/or receive information in the form of message packets from each other and the home server 12 over the respective communication link 13. When a device 11(n) receives message packets containing information, it can use the information as described below.

Generally, the server 12 includes a number of components (not separately shown), including components for processing, storing and retrieving data in digital form, and for converting data between digital and analog form. With particular reference to the instant invention, the home area network 10, and, in particular, server 12, provides an arrangement whereby video program

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information provided by, for example, a local video source over local video link 25, can be integrated with video program information provided by a cable provider over cable link 22, and distributed to the television receivers over a unitary set of channels. The unitary set of channels will conform to the set of channels over which the cable provider normally provides video program information, and which are tunable by the television receivers to which the server 12 provides the video program information. For example, if the cable provider provides video program over a set of channels arbitrarily numbered 1 through N, the video program information arrangement essentially removes the video program information provided by the cable provider for one channel "n," and substitute for some or all of the channel "n" video program information that is received over the local video link 25 in that channel. Accordingly, the video program information arrangement will provide, to the television receivers connected to the server 12, a composite video signal for channels 1 through "n-1" and "n+1" through N as provided by the cable provider, and a substituted video image signal for channel "n" as generated by the server's video program information arrangement. The video program information arrangement described herein does not provide, in the substituted channel, a substitute audio signal for the substituted channel, but a substitute audio signal may be provided using arrangements not described herein.

The video program information from the local video link 25 may completely substitute for the video program information from the cable provider in the substituted channel. Alternatively, the video program information from the local video link 25 may substitute for a portion of the video program information from the cable provider, in a window in, for example, a picture-in-picture format, in the channel, with the video program information from the local video link 25 being displayed in a region of the video screen of predetermined size, with the video program information from the cable provider being displayed in the rest of the video screen. As another alternative, the video program information from the cable provider may be displayed in a small region of the video screen, with the video program information from the local video link 25 being displayed in the rest of the video screen. The video program information from the local video link 25 may be any form of video program information, including, for example, information from one or more cameras to facilitate monitoring of areas of the home, such as for security, baby or child monitoring and other operations that will be apparent to those skilled in the art.

FIG. 2 depicts a functional block diagram of a video program information providing arrangement 30 useful in the home area network depicted in FIG. 1. With reference to FIG. 2, video program information providing arrangement 30 includes a tuner 31, a frame grabber 32, a frame

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buffer 33, a graphics blending circuit 34, an encoder 35, a modulator 36, a notch filter 37 and a signal combiner 38, all of which operate under control of a processor 40. The processor 40 may be dedicated to the video program information providing arrangement 30, or it may also perform operations in connection with other functions performed and services provided by the server 12. The tuner 31 is tuned to the channel in which the video program information from the local video link 25 is to be substituted or with which the video program information from the local video link 25 is to be blended. The video programming information input received by the tuner 31 from the cable 22 is in analog form and comprises a number of analog signals associated with a number of channels. The respective channels are arbitrarily identified by numerical identifiers 1 through N, where "N" may be any convenient integers. The respective channels may include signals containing both video image information and audio information, or only video image information or audio information. In the following, it will be assumed that the channel to which the tuner 31 is tuned will include at least a signal that contains video image information. The tuner 31 will selectively couple that video image information signal for that channel as a SEL AN VID CH selected analog video channel signal to the frame grabber 32.

The frame grabber 32 receives the SEL AN VID CH selected analog video channel signal from the tuner 31 and converts video image information contained in the signals to digital form, represented by a DIG FR IN digitized frame in signal, for storage in the frame buffer 33. The frame buffer 33 buffers digitized video image information from the frame grabber 32 for later retrieval for use in providing video image information for the channel to which the tuner 31 is tuned, as will be described below, which channel will be substituted for the channel as received from the cable link 22 before being provided to the television receivers to which the server 12 is connected. As is conventional, television receivers (not separately shown) that are to receive video image information from the server 12 display images comprising a plurality of picture elements, or "pixels," in a plurality of rows and columns, and the frame buffer 33 stores digitized video image information in a plurality of storage locations, which are logically organized in rows and columns that conform to the rows and columns of the television receivers' pixels. In addition, as is conventional, images are displayed on television receivers on a video frame-by-video frame basis, and the frame buffer 33 stores the digitized video image information in a video frame-by-video frame basis. In one embodiment, in which the rows of consecutive pairs of frames are interleaved, the frame buffer 33 includes separate sets of storage locations for two frames, and, while digitized video image

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information is retrieved for one frame from one set of storage locations, digitized video image information for the other frame can be stored in the other set of storage locations.

As noted above, the video image information from the local video link 25 is to be substituted for some or all of the video image information received over the cable link 22. The graphics blending circuit 34 receives the video image information from the local video link 25, and, if the video image information is in analog form, converts it to digital form. In addition, the graphics blending circuit 34 blends the digitized video image information that it generates with the digitized video image information provided by the frame grabber 32, and provides a BL DIG FR IN blending digitized frame input signal therefor. Generally, the graphics blending circuit 34 will be enabling digitized video image information that it generates to be stored in storage locations that are associated with the respective pixels in regions of the television receivers' video display screen in which the video image information is to be displayed. Accordingly if the video image information from the local video link 25 is to be displayed on the entire video display screen, the digitized video image information from the graphics blending circuit 34 will substitute for all of the digitized video information from the frame grabber 32, for each frame. On the other hand, if the video image information from the local video link is to be displayed in only a predetermined region of the video display screen, such as in a window in a "picture in a picture" format, the graphics blending circuit 34 will enable digitized video image information therefrom to be stored in storage locations associated with that region. If the video image information received over the local video link 25 would normally provide a video image that is larger or smaller than the predetermined region, the graphics blending circuit 34 will provide a scaling operation so that the digitized video image information will conform to the window. It will be appreciated that information as to the location and size of the window, and, accordingly, the storage locations in the frame buffer 33 in which digitized video information from the graphics blending circuit is to be stored, can be provided to the graphics blending circuit 34 by the processor 40.

As noted above, video image information that is stored in the frame buffer 33 is in digital form. The digital video program information will, on a video frame-by-video frame basis, be retrieved from the frame buffer 33, converted to analog form, and the analog video image information will be used to modulate a carrier wave. The carrier wave that is to be modulated will be of the frequency that is associated with the video image signal for the channel to which the tuner 31 is tuned, and the modulated carrier wave will be substituted for the video portion of the channel to which the tuner 31 is tuned, in the signals that are provided by the server 12 to the television

receivers connected thereto. These operations are performed by the encoder 35, modulator 36, notch filter 37 and combiner 38.

More specifically, the processor 40 enables digitized video image information to be retrieved from the frame buffer 33 on a video frame-by-video frame basis and provided to the encoder 35. The frame buffer 33 provides the digitized video image information to the encoder as a DIG BL FR OUT digitized blended frame out signal. As noted above, the frame buffer stores digitized video image information in two sets of storage locations and, while digitized video image information for one frame is being loaded into the set of storage locations associated with one frame, the digitized video image information can be retrieved from the frame buffer from the set of storage locations associated with the other frame. After encoder 35 receives the digitized video image information, it will convert the digitized video program information to analog signal form, which it provides to the modulator 36 as an AN BL FR OUT analog blended frame out signal.

The modulator 36 will modulate the analog video image information onto a carrier wave to create a video signal that is to be substituted for the video signal for the channel to which the tuner 31 is tuned, in the cable signal that is to be provided to the television receives connected to the server 12. The modulator 36 will generate a carrier wave of the frequency that corresponds to the frequency of the carrier wave of the channel to which the tuner 31 is tuned, and use the analog video image signal provided by the encoder 35 to modulate the carrier wave. The modulator 36 provides the modulated carrier wave to the combiner 38 as a MOD FR modulated frame signal.

The notch filter 37 receives the signal from the cable 22 and deletes, or notches out, at least the signal that carries the video image portion of the channel to which tuner 31 is tuned, and provides the signals associated with the remaining channels to the combiner 38 as a NOTCHED CABLE signal. Accordingly, if channel "n" is the channel for which video image information is to be substituted, which, as noted above, corresponds to the channel to which tuner 31 is tuned, the notch filter 37 will couple the signals from the cable link 22 for the video image and audio information for channels 1 through n-1 and n+1 through N to the signal combiner 38. In addition, the notch filter may couple the signal for the audio information for the channel "n" for which the substitute video image information is to be provided to the signal combiner 38. As noted above, the notch filter will not couple the signal for the video information for the channel "n" for which the substitute video information is to be provided to the signal combiner 38.

The signal combiner 38 receives the signals from the notch filter 37 and the modulator 36 and combines them to provide a COMP VIDEO composite video signal for transmission over the internal

cable link 27 to the television receivers. It will be appreciated that, since the signal provided by the modulator 36 is associated with the same channel as that of the signal that was removed by the notch filter 37, the composite video signal provided by the signal combiner 38 comprises video image signals for all of the channels 1 through "n-1" and "n+1" through "N" as provided by the cable provider, as well as the substituted video image signal for channel "n" from the modulator 36. In addition, the composite video signal provided by the combiner 38 includes the audio signals for the respective channels as provided by the notch filter 37. Accordingly, if the notch filter 37 provides the audio signals for channels 1 through N to the signal combiner 38, the signal combiner 38 will provide audio signals for those channels 1 through N in the COMP VIDEO composite video signal. On the other hand, if the notch filter 37 provides audio signals for channels 1 through "n-1" and "n+1" through "N" as provided by the cable provider to the signal combiner 38, the signal combiner will provide audio signals for those channels 1 through "n-1" and "n+1" through N in the COMP VIDEO composite video signal. In that case, if the signal combiner 38 is also provided with an audio signal for channel "n" from another source (not shown) it can also include that audio signal in the COMP VIDEO composite video signal.

The invention provides a number of advantages. In particular, the video program information providing arrangement 30 whereby video program information provided by, for example, a local video source over local video link 25, can be integrated with video program information provided by a cable provider over cable link 22, and distributed to the television receivers over a unitary set of channels over an internal cable link 27. This will allow television receivers (not separately shown) that are connected to the internal cable link 27 to receive and, if tuned to the channel over which the video program information provided by the local video source is transmitted, display the video program information provided by the local video source, thereby avoiding any necessity of having a separate or special display arrangement for viewing the video program information provided by the local video source.

It will be appreciated that numerous modifications may be made to the video program information providing arrangement 30 described herein. For example, if it is desired to provide video program information from a plurality of local video sources, a plurality of arrangements 30 may be cascaded together to facilitate notching out of video image signals associated with successive ones of channels n_1, n_2, \dots and substitute therefor video program information from successive ones of local video links $25_1, 25_2, \dots$

In addition, although the video program information provided over cable link 22 has been described as being provided by a cable provider, it will be appreciated that the video program information may, instead or in addition, be provided by, for example, a satellite provider or one or more over-the-air broadcasters. In addition, although the video program information has been described as being provided by a video source that is local to the home associated with the server 12, it will be appreciated that the video program information may instead be provided by other video program sources, including, for example, a broadcast source, a source that provides video program information over global networks such as the Internet, or any other source, as will be appreciated by those skilled in the art.

Furthermore, as noted above, the video program information providing arrangement 30 may either substitute video image information that it receives over the local video link 25 for all of the video image information for a channel "n" that it receives over the cable link 22, or, alternatively, it may substitute the video image information that it receives over the local video link 25 for some portion, in a window in a "picture-in-picture" arrangement, with the size and location of the window being determined by the processor 40. If it is desired to just have the video program information providing arrangement 30 substitute the video image information that it receives over local video link 25 for all of the video image information for channel "n," and not provide the option of substituting for only a portion of the video image information for the channel "n," the arrangement 30 need not provide a tuner 31 and frame grabber 32.

It will be appreciated that a system in accordance with the invention can be constructed in whole or in part from special purpose hardware or a general purpose computer system, or any combination thereof, any portion of which may be controlled by a suitable program. Any program may in whole or in part comprise part of or be stored on the system in a conventional manner, or it may in whole or in part be provided in to the system over a network or other mechanism for transferring information in a conventional manner. In addition, it will be appreciated that the system may be operated and/or otherwise controlled by means of information provided by an operator using operator input elements (not shown) which may be connected directly to the system or which may transfer the information to the system over a network or other mechanism for transferring information in a conventional manner.

The foregoing description has been limited to a specific embodiment of this invention. It will be apparent, however, that various variations and modifications may be made to the invention, with the attainment of some or all of the advantages of the invention. It is the object of the appended

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claims to cover these and such other variations and modifications as come within the true spirit and scope of the invention.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

CLAIMS

1. A system for providing video programming information from a plurality of sources over a unitary set of channels comprising:
 - A. a notch filter configured to receive the receive video programming information from a first source over said unitary set of channels and provide notched video programming information comprising the received set of channels, except a selected channel;
 - B. a video program information receiver configured to receive other video programming information from a second source;
 - C. a modulator configured to modulate the other video programming information onto a channel corresponding to said selected channel, thereby to provide modulated other programming information; and
 - D. a composite video generator configured to combine the notched video programming information from the notch filter and the modulated other programming information generated by the modulator thereby to provide composite video programming information over said unitary set of channels for provision to a television receiver.
2. A system as defined in claim 1 further comprising:
 - A. a tuner configured to receive video programming information from the first source over the unitary set of channels and provide an output comprising video programming information from said selected channel; and
 - B. a channel combiner configured to combine the video programming information from said selected channel as provided by the tuner and the other video programming information from the second source as received by the video program information receiver thereby to provide a combined video programming information for the selected channel, the modulator being configured to use the combined video programming information for the selected channel in generating said modulated other programming information.
3. A system as defined in claim 2 in which said channel combiner comprises:
 - A. a frame buffer configured to store at least one frame of video programming information;
 - B. a frame grabber configured to receive the video programming information from said selected channel as provided by the tuner and store at least one frame in said frame buffer;
 - C. a blender configured to receive the video programming information from the second source and store at least a portion of at least one frame in said frame buffer, thereby to provide at least one combined frame; and

- D. a frame retriever configured to retrieve said at least one combined frame from said frame buffer for provision to said modulator as the combined video programming information.
4. A system as defined in claim 3 in which:
- A. the frame buffer stores said at least one frame of video programming information in digital form;
 - B. the frame grabber is configured to convert the video programming information from said selected channel as provided by the tuner to digital form for storage in said frame buffer;
 - C. the blender is configured to convert the video programming information from the second source to digital form for storage in said frame buffer; and
 - D. said frame retriever is configured to convert the said at least one combined frame as retrieved from said frame buffer from digital form to analog form for provision to said modulator as the combined video programming information.
5. A method of providing video programming information from a plurality of sources over a unitary set of channels comprising:
- A. a notch filter step in which video programming information is received from a first source over said unitary set of channels and notched video programming information comprising the received set of channels, except a selected channel is provided;
 - B. a video program information receiving step in which other video programming information is received from a second source;
 - C. a modulation step in which the other video programming information is modulated onto a channel corresponding to said selected channel, thereby to provide modulated other programming information; and
 - D. a composite video generation step in which the notched video programming information generated during the notch filter step and the modulated other programming information generated during the modulation step is generated thereby to provide composite video programming information over said unitary set of channels for provision to a television receiver.
6. A method as defined in claim 5 further comprising:
- A. a tuning step in which video programming information is received from the first source over the unitary set of channels and an output comprising video programming information from said selected channel is provided; and

- B. a channel combining step in which the video programming information from said selected channel as provided during the tuning step and the other video programming information from the second source as received during the video program information receiving step are combined to provide a combined video programming information for the selected channel, the combined video programming information for the selected channel being used during the modulation step in generating said modulated other programming information.
7. A method as defined in claim 6 in which said channel combining step comprises:
- A. a frame grabbing step in which at least one frame of the video programming information from said selected channel as provided during the tuning step is stored in a frame buffer;
 - B. a blending step in which at least a portion of at least one frame of the video programming information received from the second source is stored in said frame buffer, thereby to provide at least one combined frame; and
 - C. a frame retrieval step in which said at least one combined frame from said frame buffer is retrieved for provision to said modulator as the combined video programming information.
8. A method as defined in claim 7 in which:
- A. the frame grabbing step includes the step of converting video programming information from said selected channel as provided by the tuner to digital form for storage in said frame buffer;
 - B. the blending step includes the step of converting the video programming information from the second source to digital form for storage in said frame buffer; and
 - C. the frame retrieval step includes the step of converting said at least one combined frame as retrieved from said frame buffer from digital form to analog form for use as the combined video programming information during the modulation step.
9. A computer program product for use in connection with a programmable device to provide a system for providing video programming information from a plurality of sources over a unitary set of channels, the computer program product comprising a device readable medium having encoded thereon:
- A. a notch filter module configured to enable said programmable device to receive the receive video programming information from a first source over said unitary set of channels and provide notched video programming information comprising the received set of channels, except a selected channel;
 - B. a video program information receiver module configured to enable said programmable device to receive other video programming information from a second source;

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- C. a modulator module configured to enable said programmable device to modulate the other video programming information onto a channel corresponding to said selected channel, thereby to provide modulated other programming information; and
 - D. a composite video generator module configured to enable said programmable device to combine the notched video programming information from the notch filter and the modulated other programming information generated by the modulator thereby to provide composite video programming information over said unitary set of channels for provision to a television receiver.
10. A computer program product as defined in claim 9 further comprising:
- A. a tuner module configured to enable said programmable device to receive video programming information from the first source over the unitary set of channels and provide an output comprising video programming information from said selected channel; and
 - B. a channel combiner module configured to enable said programmable device to combine the video programming information from said selected channel as provided by the tuner and the other video programming information from the second source as received by the video program information receiver thereby to provide a combined video programming information for the selected channel, the modulator being configured to enable said programmable device to use the combined video programming information for the selected channel in generating said modulated other programming information.
11. A computer program product as defined in claim 10 in which said channel combiner module comprises:
- A. a frame grabber module configured to enable said programmable device to receive the video programming information from said selected channel as provided by the tuner and store at least one frame in a frame buffer;
 - B. a blender module configured to enable said programmable device to receive the video programming information from the second source and store at least a portion of at least one frame in said frame buffer, thereby to provide at least one combined frame; and
 - C. a frame retriever module configured to enable said programmable device to retrieve said at least one combined frame from said frame buffer for provision to said modulator as the combined video programming information.
12. A computer program product as defined in claim 11 in which:

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- A. the frame grabber module is configured to enable said programmable device to convert the video programming information from said selected channel as provided by the tuner to digital form for storage in said frame buffer;
- B. the blender module is configured to enable said programmable device to convert the video programming information from the second source to digital form for storage in said frame buffer; and
- C. said frame retriever module is configured to enable said programmable device to convert the said at least one combined frame as retrieved from said frame buffer from digital form to analog form for provision to said modulator as the combined video programming information.

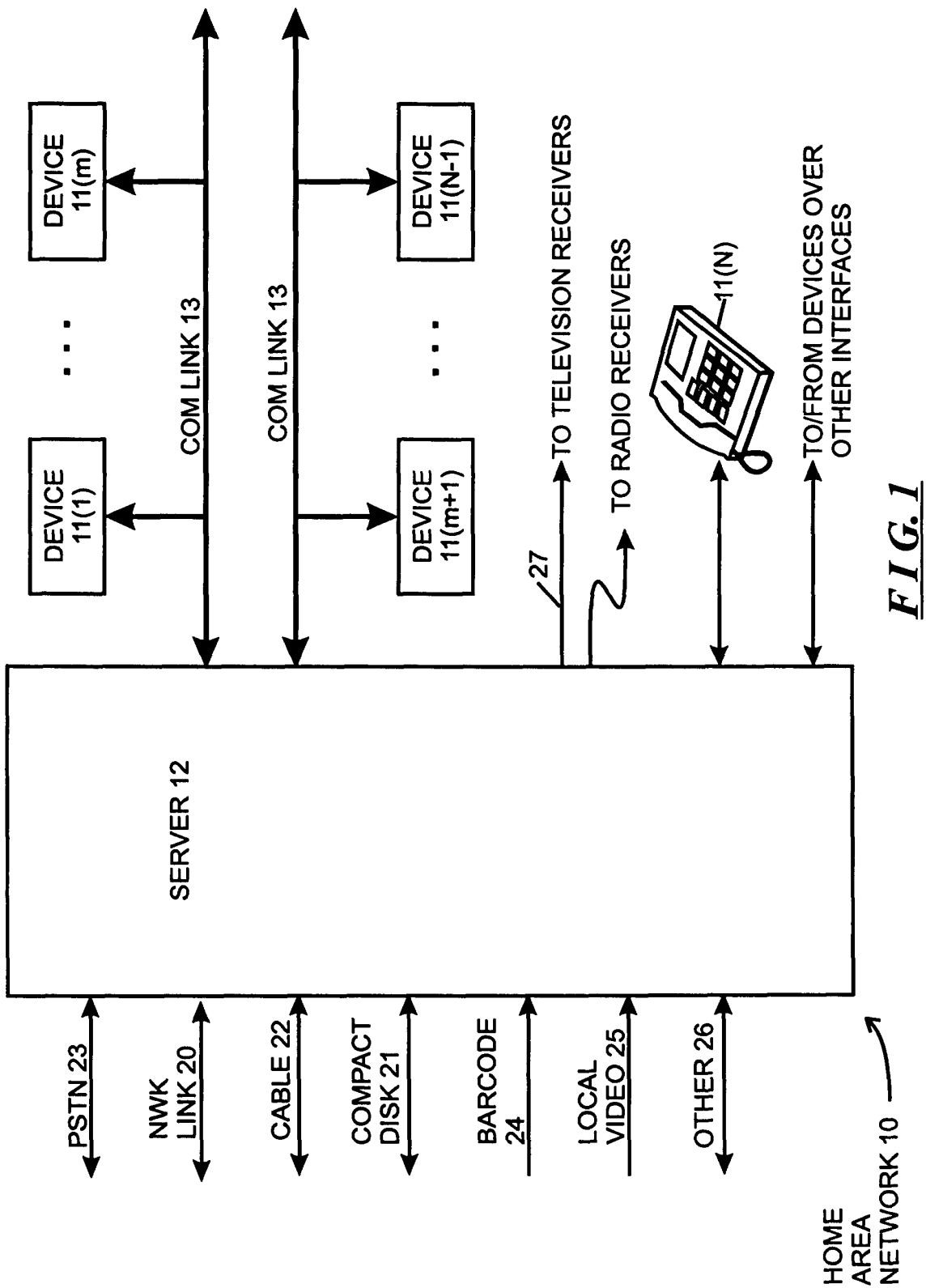


FIG. 1

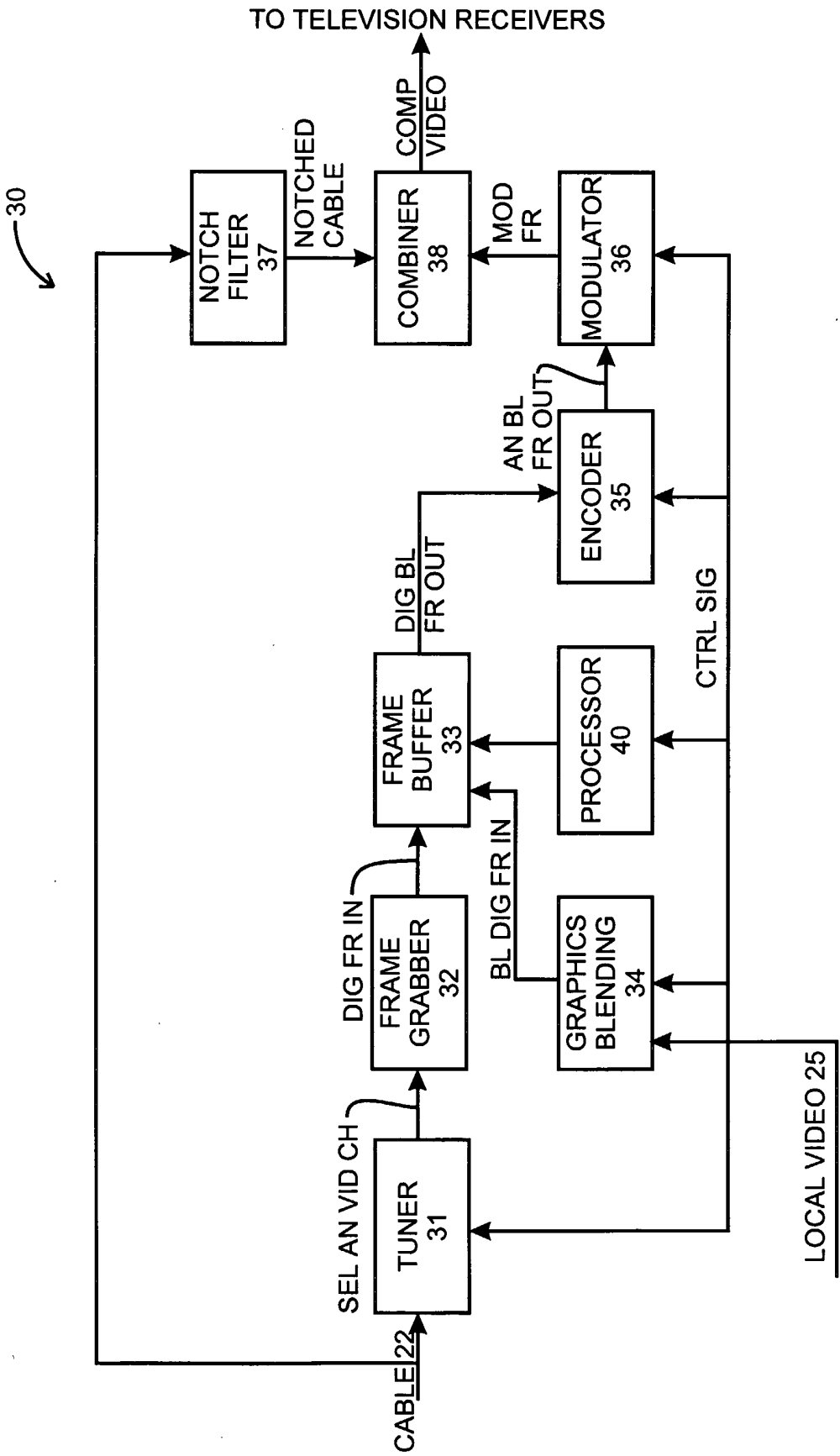


FIG. 2