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Description

The present invention relates to a method and apparatus for delivering audio information.

A traditional jukebox is a unit including a plurality of records. A user can select, by the manipulation of switches, a particular record to be played. That record is played and all those within earshot of the jukebox speakers listen to the record which has been selected. An improved version of the traditional jukebox can be found in many restaurants. A separate selector box and speaker are placed at each table in the restaurant. The jukebox is wired to each selector box so that a record can be selected by a patron at any table. Of course, only one record at a time is played and the music is delivered directly to the speaker at the table.

A music lover is able to bring into the home particular audio entertainment that he or she wishes to hear by buying records and playing them on a home high-fidelity stereo system. Unfortunately this requires buying each record to be played. This can get quite expensive. An alternative is for the music lover to listen to the radio. The problem with this is that one can only listen to the particular music selected by the disc jockey. There is no way to hear particular songs when the listener wishes to hear them without buying a record or a cassette tape.

GB—A—870,064 describes a method for delivering audio information comprising the steps of generating a frequency multiplexed composite electrical signal corresponding to a plurality of pieces of audio information; transmitting the composite signal to a subscriber; at the subscriber demultiplexing the composite electrical signal and selecting one of the pieces of audio information; and transducing the selected piece of audio information into an audio signal. Thus, this specification describes how more than one piece of audio information may be transmitted to a receiver.

The present invention seeks to deliver audio information to a subscriber such that the subscriber has access to any one of a plurality of selections at any time.

The present invention provides a method of delivering audio information as defined above, characterised in that said generating step comprises generating a plurality of electrical signals simultaneously, each said electrical signal of said plurality representing an individual piece of audio information, multiplexing said electrical signals into a plurality of channels, wherein each said channel has a different phase, and wherein said electrical signals are each placed in more than one said channel, and frequency multiplexing said channels to form said frequency multiplexed composite electrical signal.

From the subscriber's point of view, the method provides an active retrieval library, for example, of approximately 200 selections. The selections can be routinely updated, for example, on a monthly basis or whenever a new "hit" occurs. The musical selections are played at a central jukebox facility using either a plurality of conventional turntables or any other type of reproduction system that can produce electrical signals from pre-recorded records. In a preferred embodiment, said plurality of electrical signals are generated by simultaneously playing a plurality of pre-recorded records.

For example, said plurality of electrical signals may be generated by playing one ore more pre-recorded optical-type records using a laser playback device. Each said optical-type record may be played using a plurality of read-out beams.

Alternatively, a plurality of pieces of audio information may be recorded on a single video-type laser disc. The plurality of electrical signals may then be generated and multiplexed into said channels by simultaneously playing said disc by way of a plurality of laser beams.

Preferably, said step of demultiplexing comprises the steps of selectively frequency converting a portion of said composite signal corresponding to said particular desired piece of audio information to a predetermined intermediate frequency; and demodulating at said intermediate frequency to provide said particular desired audio information at baseband.

In an embodiment, said step of demodulating comprises the step of demodulating using an audio IF train of a television receiver.

GB—A—870,064 also describes apparatus for delivering audio information comprising means for generating a frequency multiplexed composite electrical signal corresponding to a plurality of pieces of audio information, means for transmitting the composite electrical signal to a subscriber, means for demultiplexing the composite electrical signal and selecting one of said pieces of audio information, and means for transducing the selected piece of audio information into an audio signal.

The present invention also provides apparatus as defined above characterised in that said means for generating a frequency multiplexed composite electrical signal comprises means for generating a plurality of electrical signals simultaneously, each said electrical signal of said plurality representing an individual piece of audio information, means for multiplexing said representative electrical signals into a plurality of channels, each said channel having a different phase, and said representative electrical signals being placed in more than one said channel, and means for frequency multiplexing said channels to form said frequency multiplexed composite electrical signal.

Preferably, said generating means comprises one or more playback devices arranged to play one or more pre-recorded discs. Each said playback device may include a plurality of read-out heads. For example, a plurality of pieces of audio information may have been recorded on a single video-type laser disc, and a single playback device is provided having a plurality of laser beams for reading from said disc simultaneously.

As is known, with a laser system, a semiconductor laser shines a beam of coherent light onto a rapidly spinning optically readable disc on which a music selection has been encoded. The laser beam "reads" the coded disc and converts it into an electrical signal. With a laser disc system, a plurality of read-out beams can be used for each record that is being continuously played. Thus, the same musical selection can be placed on a plurality of different audio sub-channels of a video channel, each sub-channel having a different "phase" with respect to the others. Thus, if a 3 minute song is played repeatedly on six different audio sub-channels with equally spaced starting times, one would never be more than a half a minute from the beginning of the musical selection desired.

The audio signals for 200 (more or less) such audio channels could be generated by 200 compact audio disc playback units, each playing a different song with its own laser beam. However, in a preferred embodiment, the system will use a more practical technique which uses only one playback unit. As many as 200 audio channels could be recorded, with specially designed recording equipment, on a single video-type laser disc because it has the full bandwidth of a video channel. This disc could then be played back at the cable head with a playback unit similar to conventional video disc playback units. All of the audio channels recorded on the disc could then be played back by a single laser beam and can be transmitted through a single video cable channel simultaneously. All of the audio channels would thus be available at the subscriber's location at the same time.

The preferred embodiment is a laser video disc system employing a plurality of lasers to read each disc so that if the average song lasts three minutes and six lasers are used, the beginning of any given song will never be more than approximately 30 seconds away. From one disc containing 200 musical selections, six lasers can be used to generate signals for 1200 audio channels. Each of the 200 musical selections would be carried on six of these 1200 channels but with starts at 30-second intervals. By transmitting the 1200 audio channels, which are equivalent to six video channels, through six channels of the cable, the system would have the capability of delivering any of the 200 selections — from the beginning of the selection, within approximately 30 seconds — to the system in the subscriber's home. Start and stop signals can be incorporated into the system so that the user's musical choice automatically switches to the audio sub-channel carrying the next beginning of the selection desired.

The subscriber's audio converter box could include a microprocessor based system having a memory so that one could program a sequence of desired musical selections, including repeat plays of a single song or a variety of songs in a predetermined order. The converter box would respond to the microprocessor based system by tuning to each particular appropriate audio sub-channel in the order programmed by the user.

In an embodiment, said demultiplexing means comprises means for selectively frequency converting a portion of said composite signal corresponding to said selected piece of audio information to a predetermined intermediate frequency; and means for demodulating at said intermediate frequency to provide said particular desired audio information at baseband.

Alternatively, said demultiplexing means comprises a converter for receiving said transmitted composite signal, said converter comprising means for synthesizing a local oscillator signal the frequency of which can be user controlled; means for mixing said synthesized signal with an input signal derived from said composite signal to provide a desired sub-channel on a predetermined intermediate frequency; means for modulating said selected audio sub-channel onto a carrier predetermined frequency; means for mixing said predetermined intermediate frequency modulated with said audio sub-channel onto said video carrier frequency for transmission to a television.

Preferably, said converter further comprises means for detecting said intermediate frequency signal for detecting start and stop tones on said audio sub-channel; and means for controlling said local oscillator frequency responsive to said start and stop tones. The converter may further comprise means for muting audio output of said television when there is not audio information on a selected sub-channel.

One video cable channel having a bandwidth of 6 MHz can contain a number of different audio sub-channels, the number being a function of the signal format used for the audio information. If each sub-channel is of the standard TV FM sound signal format, 75 different sub-channels can be formed in each video channel. It is possible to increase the number of audio sub-channels if a different signal format is used. Any different signal format requires that the selected sub-channel signal be demodulated with the resulting audio being impressed onto an FM carrier with the standard TV FM sound signal format so that it can be demodulated in the user's television if the television is to be used as the playback instrument.

In addition to the TV FM sound signal format, there are several signal formats that can be used, each of which has its own advantages and disadvantages. With some there is a slight degradation in audio quality either through a decrease in the maximum audio frequency that can be transmitted or in poorer signal to noise performance or both. With appropriate selection of signal format, it is possible to obtain about 200 audio sub-channels for each video channel. For 200 audio subchannels, the total signal width (audio information) plus some guard band to protect against mutual interference must be no more than 30 kHz.

One alternative format is that of an FM signal with limited high frequency audio response. Using a modulation index of 1.67 (the same as that for the standard TV FM signal) and constraining the signal width to 30 kHz, a maximum audio frequency of 6500 Hz can be used. This corresponds roughly to AM broadcast quality and may be considered too low a fidelity.

A second possible audio sub-channel format is simple amplitude modulation. With a bandwidth of 30 kHz, a maximum audio frequency of 15 kHz is theoretically possible, but because of the absence of capture effect enjoyed by FM systems, which reduces adjacent channel interference, a maximum audio frequency of less than 15 kHz, but not less than 12 kHz, is more realistic. This quality is not far from that of TV FM sound. Besides somewhat reduced high frequency audio response, some increase in noise and signal distortion can be expected.

Of these two formats, the second, the AM system, is presently conceived as being preferable.

The subscriber is provided with an audio sub-channel converter which can be provided either as part of the home subscriber's video converter box supplied by the cable television operator or as a separate unit. A separate unit is presently conceived as being the most desirable arrangement. Advantage may be taken of the fact that, in most cable systems, the channel selected by the subscriber's video converter box is converted to channel 3. The subscriber's television set remains tuned to channel 3 at all times. The additional converter box for the jukebox system could be designed for installation between the television and an existing video cable converter box supplied by the subscriber's cable television operator. The desired video channel (carrying many audio sub-channels) is selected on the existing video converter box, with the desired musical selections then being selected by the additional audio sub-channel converted. Only one design would thus be necessary for the audio sub-channel converter, a decided economic advantage.

The "jukebox" concept described is not limited to cable television systems. Rather, it is applicable to any system by which a traditional "video" channel of approximately 6 MHz bandwidth can be delivered to a subscriber. For example, some subscribers now receive television pictures by direct transmission from a satellite which transmits hundreds of video channels. One or more of such channels could be dedicated for "jukebox" service. An earth satellite receiver from which a subscriber obtains video entertainment could be fitted with an audio sub-channel converter box so that jukebox selections can be transmitted to the subscriber via the same satellite-to-earth link.

Some television subscribers now receive pay television transmissions from a traditional broadcast station. These transmissions are scrambled and the subscriber is given a decoding box to unscramble the transmission before it is coupled to the subscriber's television. In a similar fashion, a video channel filled with audio sub-channel music selections could be scrambled and broadcast over the air in the same manner that commercial television is broadcast. Subscribers could be given appropriate decoding apparatus and converter boxes so that they could select the desired music selections transmitted "over the air".

Embodiments of the invention will hereinafter be described, by way of example, with reference to the accompanying drawings, in which:-

FIGURE 1 is a schematic diagram illustrating the general concept of the present invention;

FIGURE 2 is a block diagram of an audio sub-channel converter for use with a television audio signal format; and

FIGURE 3 is a block diagram of an audio sub-channel converter for use with an AM format.

General Concept

A plurality of musical selections are "played" at a central "jukebox" facility 110. Electrical signals are generated for each such selection. Facility 110 can include either a video bandwidth laser disc player or a plurality of record players, laser disc players, cassette tapes, or the like. The signals for individual music selections are transmitted to a distributor 112. Distributor 112 can be either a cable television operator, a satellite operator, a commercial broadcast operator, or the like.

If distributor 112 is a cable operator, the music selections are multiplexed onto one or more cable television channels and distributed via cable 114 to individual subscriber televisions 116. If distributor 112 is a satellite operator or commercial television broadcaster, the video channel information can be broadcast over the air as represented by arrow 118 to either a master antenna system symbolized by antenna 120, for distribution to televisions 122 or broadcast directly to individual TV subscribers as symbolized by arrow 124 and televisions 126.

Constraints of Television Receiver

The sound channels of modern television receivers accept a frequency modulated (FM) signal having a peak carrier deviation of $\pm$ 25 kHz. Audio frequency response is 50 Hz to 15 kHz with a high frequency de-emphasis time constant network of 75µs being used to equalize noise performance between high and low audio frequencies. FM signal amplification and detection are done at an IF frequency of 4.5 MHz, corresponding to the frequency difference between the frequency modulated aural carrier and the AM (vestigial side band) modulated video (picture) carrier. The TV set depends upon the presence of the visual carrier to heterodyne the aural carrier down to 4.5 MHz through the action of the mixer stage in the TV set. Therefore the TV set must be provided not only with an appropriate FM sound carrier on some TV channel, but with an appropriate visual carrier as well, and they must be separated by 4.5 MHz. The visual carrier need not, of course, be modulated with any picture information. It does, however, perform an additional, and in this case, desirable function of darkening the screen of the TV set, which would otherwise be illuminated by noise or snow.

Cable Channel Capabilities

The presently contemplated preferred manner for transmitting music selections to individual subscribers is via a cable television system. Other transmission schemes include the use of an "over the air" broadcast channel, direct reception of a satellite communication channel, etc. This portion of the description discusses the constraints of a cable television system used as the transmission medium to a subscriber.

Each individual television channel used in CATV system is 6 MHz in bandwidth. Almost all of this is filled with information. The signal format and frequency assignments are the same or similar to the channels used for broadcasting but, on cable, additional channels are used. These lie in frequency bands other than those allocated for broadcasting, and, indeed, in bands occupied by other broadcasting or communication services. Because of the closed nature of the cable system, mutual interference is not ordinarily encountered if the cable system is installed and maintained to high technical standards.

One or more of these channels could be used for "jukebox" service. These would probably be channels that are vacant on a particular cable system already in place. The chosen channel should be filled with as many frequency modulated signals as is possible without mutual interference, all spaced on contiguous sub-channels.

For simplicity, each signal should have the same characteristics as that normally received on a singular basis by the subscriber's TV set. Thus, the modulating frequency range, peak carrier deviation and pre-emphasis time constants should be the same as for the FM audio signal in any TV broadcast. Given the peak deviation value of 25 kHz and maximum modulating frequency of 15 kHz, a minimum spacing of 80 kHz is desirable. This is based upon a common criterion that the spectrum occupied by an FM signal is approximately twice the sum of the peak carrier deviation and the highest modulating frequency. This criterion is reflected in the choice of channel spacing for standard FM broadcasting. The calculated value of channel width is 180 kHz, and a spacing of 200 kHz is used. If 80 kHz spacing is used for the proposed service, then 75 possible music selections can be transmitted, assuming no two are alike.

The Subscriber's Converter Box for an FM System

Different signal formats require different subscriber converter box arrangements. The first such format and converter box arrangement described is for an FM system.

This discussion assumes the use of a single 6 MHz cable channel containing 75 FM signals (75 different music selections). The signals transmitted on the cable are highly accurate in frequency, i.e., having an error of only ± 1 kHz.

Referring now to FIGURE 2 there is shown a block diagram for the subscriber's converter box, referred to generally by reference numeral 200. An incoming signal from the subscriber's cable television cable first passes through a band pass filter 202 to reduce out-of-channel signals and feed-through of the converter's local oscillator to the cable system. The signal is mixed in a mixer 204 with a local oscillator signal from a synthesized local oscillator 206 and heterodyned down to 4.5 MHz. A band pass filter 208 at 4.5 MHz allows only the desired signal to pass. The bandwidth of filter 208 should be about 80-100 kHz. Oscillator 206 tunes in 80 kHz steps, and must be accurate to within ± 1 or 2 kHz. Therefore, it is preferably an indirect synthesizer. Tuning of oscillator (206) is under control of a selection and control unit (210) responsive to user command.

The 4.5 MHz signal from filter (208) is used in two ways. It is detected, that is converted to audio, to provide start and stop tones needed by selection and control unit (210). The signal from filter (208) is amplified by an amplifier (212) which is coupled to a limiter (214). Limiter (214) is coupled to an FM detector (216) which provides the start and stop tones to selection and control unit (210). The 4.5 MHz signal is also coupled to a mixer (218) which produces as an output an unmodulated video carrier and an audio sub-channel FM modulated carrier 4.5 MHz higher in frequency.

This is the total signal needed for output to the TV set. An output channel video carrier oscillator (220) driving the mixer must be near (± 250 kHz) to the proper video carrier frequency for the channel to which the TV set is tuned.

It is desirable to suppress any audio output from the TV set when selection and control unit (210) so dictates. This will occur between music selections. There are two ways in which this can be done. In no case must the FM modulated carrier be removed, its audio modulation must be suppressed. This may be accomplished by substituting a steady 4.5 MHz carrier, derived from a crystal oscillator (222) for the 4.5 MHz FM signal derived as described above or by detection of the FM signal, suppression of the detected audio between selections and remodulation onto a 4.5 MHz carrier. The last method is more direct, but the first is superior from the standpoint of preventing sound distortion that could result in a detection and remodulation process. A mute control signal is provided by selection and control unit 210 to a switch 224. Switch 224 selects, responsive to the presence or absence of the mute control signal, the input to mixer 218 as either the 4.5 MHz oscillation from oscillator 222 or the 4.5 MHz signal carrying music selected from filter 208.

At the output of mixer 218 there is provided an output channel band-pass filter 226 which provides a filtered output signal from converter 200 to the subscriber's television.

If desired, the audio signal that has been demodulated can be coupled to the subscriber's stereo or other amplifier/speaker arrangement instead of being put into TV sound format to be "played" through the television.

The Subscriber's Converter Box for an AM System

Referring now to FIGURE 3 there is shown a block diagram of a subscriber converter box suitable for use with an AM signal format (presently preferred). The AM converter box is referred to generally by reference numeral 300.

Using an AM format, a total signal bandwidth of 30 kHz can provide a theoretical maximum audio frequency of 15 kHz. In practice the maximum audio frequency is somewhat degraded. Because of the absence of the capture effect enjoyed by FM systems, which reduces adjacent channel interference, a maximum audio frequency of less than 15 kHz, but probably no less than 12 kHz is more realistic. This provides a sound quality not far from that of TV FM sound.

The converter box 300 block diagram of FIGURE 3 assumes an input from a video cable selector on television channel 3 (60-66 MHz).

Converter 300 is basically a low sensitivity AM receiver. Two frequency conversions are used to attain adequate image rejection and adjacent channel rejection. IF frequencies are chosen to be standard frequencies for which components are readily available. The muting function described in the FIGURE 2 embodiment is still used, but the muting tones are now at sub-audible frequencies. The 4.5 MHz VCO (voltage controlled oscillator) may require stabilization within a small phase lock loop to meet the ± 1 kHz tolerance discussed in the FM format section of this description.

The channel 3 input signal is coupled through a channel 3 bandpass filter 302 and mixed in a mixer 304 with a signal from a synthesized local oscillator 306. The frequency of the output of oscillator 306 is controlled by a selection and control unit 308 which is responsive to user command.

As in the case of FM converter box 200, selection and control unit 308 is responsive to start and stop tones and provides a mute control signal. Mixer 304 provides a first conversion by mixing the desired music selection to 10.7 MHz (a standard IF frequency) where it is filtered by a bandpass filter 310. A second conversion is provided by mixing the output of filter 310 in a mixer 312 with a signal from an oscillator 314 operating at 11.155 MHz. This provides an output at mixer 312 at 455 kHz which is another standard IF frequency. The 455 kHz output of mixer 312 is filtered by a filter 316 and coupled to an AM detector and muting unit 318. Selected audio from AM detector 318 is coupled to a 4.5 MHz voltage controlled oscillator 320 which provides an FM sound signal in television format. This television format FM sound signal is mixed in a mixer 322 with a signal from an output channel video carrier oscillator 324 which provides a carrier for a television channel to be tuned by the subscriber. The output of mixer 322 is filtered by an output channel bandpass filter 326 for coupling to the subscriber's television.

If desired, the audio signal that has been demodulated can be coupled to the subscriber's stereo, or optional amplifier/speaker arrangement, instead of being put into TV sound format to be "played" through the television.

Alternatives

It is possible to use more than one cable video channel, if they are available, to increase the number of music selections from which to choose. An extra channel might be used to broadcast picture information giving current information on the selections available. The attending sound would be chosen from one of the subchannels available on an adjacent 6 MHz channel and heterodyned onto the correct frequency for the sound carrier accompanying the picture.

There can be provided some means of alerting the listener's converter box that a particular selection has ended or is about to begin. This is desirable to ensure that when a selection is made it will be played from the beginning, and when ended will not be played again if another selection has been made. One means of achieving this action is the use of two different subaudible tones, as discussed above. One, a "start" tone, would be present just before a selection, while the other, a "stop" tone, would occur in a short burst immediately after the termination of a selection. This would signal the converter box to retune to the next selection desired, or to search for whichever selection of a number of chosen selections first occurs. Since the normal range of frequencies used for television sound is 50 Hz to 15 kHz, as previously stated, the signal tones must be below 50 Hz. Another option, of course, is to use tones well above 15 kHz, an equally effective solution.

The concepts of the present invention can be applied to other delivery systems such as, for example, direct broadcast from a ground-based transmitter, satellite transmission direct to a subscriber, etc. or some combination of transmission schemes.

Claims

1. A method for delivering audio information comprising the steps of generating a frequency multiplexed composite electrical signal corresponding to a plurality of pieces of audio information; transmitting the composite signal to a subscriber; at the subscriber demultiplexing the composite electrical signal and selecting one of the pieces of audio information; and transducing the selected piece of audio information into an audio signal, characterised in that said generating step comprises generating a plurality of electrical signals simultaneously, each said electrical signal of said plurality representing an individual piece of audio information, multiplexing said electrical

signals into a plurality of channels, wherein each said channel has a different phase, and wherein said electrical signals are each placed in more than one said channel, and frequency multiplexing said channels to form said frequency multiplexed composite electrical signal.

2. A method as claimed in Claim 1, wherein said plurality of electrical signals are generated by simultaneously playing a plurality of pre-recorded records.

3. A method as claimed in Claim 1, wherein said plurality of electrical signals are generated by playing one or more pre-recorded optical-type records using a laser playback device.

4. A method as claimed in Claim 3, wherein each said optical-type record is played using a plurality of read-out beams.

5. A method as claimed in Claim 1, wherein a plurality of pieces of audio information are recorded on a single video-type laser disc, and said plurality of electrical signals are generated and multiplexed into said channels by simultaneously playing said disc by way of a plurality of laser beams.

6. A method as claimed in any preceding claim, wherein said step of demultiplexing comprises the steps of selectively frequency converting a portion of said composite signal corresponding to said particular desired piece of audio information to a predetermined intermediate frequency; and demodulating at said intermediate frequency to provide said particular desired audio information at baseband.

7. A method as claimed in Claim 6, wherein said step of demodulating comprises the step of demodulating using an audio IF train of a television receiver.

8. Apparatus for delivering audio information comprising means (110) for generating a frequency multiplexed composite electrical signal corresponding to a plurality of pieces of audio information, means (114; 118; 124) for transmitting the composite electrical signal to a subscriber (116; 122; 126), means (200; 300) for demultiplexing the composite electrical signal and selecting one of said pieces of audio information, and means (116; 122; 126) for transducing the selected piece of audio information into an audio signal, characterised in that said means (110) for generating a frequency multiplexed composite electrical signal comprises means for generating a plurality of electrical signals simultaneously, each said electrical signal of said plurality representing an individual piece of audio information, means for multiplexing said electrical signals into a plurality of channels, each said channel having a different phase, and said electrical signals being placed in more than one said channel, and means for frequency multiplexing said channels to form said frequency multiplexed composite electrical signal.

9. Apparatus as claimed in Claim 8, wherein said generating means (110) comprises one or more playback devices arranged to play one or more pre-recorded discs.

10. Apparatus as claimed in Claim 9, wherein each said playback device includes a plurality of read-out heads.

11. Apparatus as claimed in Claim 9 or 10, wherein a plurality of pieces of audio information have been recorded on a single video-type laser disc, and a single playback device is provided having a plurality of laser beams for reading from said disc simultaneously.

12. Apparatus as claimed in any of Claims 8 to 11, wherein said demultiplexing means (200; 300) comprises means (204; 304) for selectively frequency converting a portion of said composite signal corresponding to said selected piece of audio information to a predetermined intermediate frequency; and means (208; 310; 312) for demodulating at said intermediate frequency to provide said particular desired audio information at baseband.

13. Apparatus as claimed in any of Claims 8 to 11, wherein said demultiplexing means comprises a converter (200; 300) for receiving said transmitted composite signal, said converter comprising means (206; 306) for synthesizing a local oscillator signal the frequency of which can be user controlled; means (204; 304) for mixing said synthesized signal with an input signal derived from said composite signal to provide a desired sub-channel on a predetermined intermediate frequency; means (222; 320) for modulating said selected audio sub-channel onto a carrier predetermined frequency; means (220; 324) for mixing said predetermined intermediate frequency modulated with said audio sub-channel onto said video carrier frequency for transmission to a television.

14. Apparatus as claimed in Claim 13, wherein said converter further comprises means (216; 318) for detecting said intermediate frequency signal for detecting start and stop tones on said audio sub-channel; and means (210; 308) for controlling said local oscillator frequency responsive to said start and stop tones.

15. Apparatus as claimed in Claim 13 or 14, wherein said converter further comprises means (224; 318) for muting audio output of said television when there is not audio information on a selected sub-channel.

Patentansprüche

1. Verfahren zum Abgeben von Audioinformation mit den Schritten: Erzeugen eines frequenzmultiplexierten zusammengesetzten elektrischen Signals, das eine Anzahl von Audioinformationsstücken entspricht; Senden des zusammengesetzten Signals an einen Abnehmer; beim Abnehmer Entmultiplexieren des zusammengesetzten elektrischen Signals und Auswählen eines der Audioinformationsstücke; und Umsetzen des ausgewählten Audioinformationsstücks in ein Audiosignal, dadurch gekennzeichnet, daß der Erzeugungsschritt das gleichzeitige Erzeugen einer Anzahl elektrischer Signale umfaßt, wobei jedes der elektrischen Signale der Anzahl ein

individuelles Stück von Audioinformation darstellt, daß die elektrischen Signale in einer Anzahl von Kanälen multiplexiert werden, wobei jeder der Kanäle eine unterschiedliche Phase hat, und wobei die elektrischen Signale jeweils auf mehrals einen der Kanäle gelegt werden, und daß die Kanäle frequenzmultiplexiert werden, um das frequenzmultiplexierte zusammengesetzte elektrische Signal zu bilden.

2. Verfahren nach Anspruch 1, wobei die Anzahl der elektrischen Signale durch gleichzeitiges Spielen einer Anzahl von voraufgezeichneten Platten erzeugt wird.

3. Verfahren nach Anspruch 1, wobei die Anzahl der elektrischen Signale durch Spielen von einen oder mehreren voraufgezeichneten optischen Platten erzeugt werden, indem eine Laser-Playbackeinrichtung verwendet wird.

4. Verfahren nach Anspruch 3, wobei die jede der optischen Platten gespielt wird, indem eine Anzahl von Auslesestrahlen verwendet wird.

5. Verfahren nach Anspruch 1, wobei eine Anzahl von Stücken von Audioinformation auf einer einzigen Bildspeicherplatte aufgezeichnet wird und die Anzahl der elektrischen Signale erzeugt und in die Kanäle multiplexiert werden, indem gleichzeitig die Platte durch eine Anzahl von Laserstrahlen abgespielt wird.

6. Verfahren nach einem der vorhergehenden Ansprüche, wobei der Schritt des Entmultiplexierens die Schritte der selektiven Frequenzumwandlung von einem Teil des zusammengesetzten Signals entsprechend dem bestimmten gewünschten Audioinformationsstück auf eine vorgegebene Zwischenfrequenz; und Demodulieren bei der Zwischenfrequenz umfaßt, um die bestimmte gewünschte Audioinformation auf dem Grundband zur Verfügung zu stellen.

7. Verfahren nach Anspruch 6, wobei der Schritt des Demodulierens die Verwendung einer Audiozwischenfrequenzfolge eines Fernsehempfängers umfaßt.

8. Vorrichtung zum Abgeben von Audioinformation mit: Mitteln (110) zum Erzeugen eines frequenzmultiplexierten zusammengesetzten elektrischen Signals, das einer Anzahl von Audioinformationsstücken entspricht; Mitteln (114; 118; 124) zum Senden des zusammengesetzten elektrischen Signals an einen Abnehmer (116; 122; 126); Mitteln (200; 300) zum Entmultiplexieren des zusammengesetzten elektrischen Signals und Auswählen eines der Stücke von Audioinformation; und mit Mitteln (116; 122; 126) zum Umsetzen des ausgewählten Audioinformationsstücks in ein Audiosignal, dadurch gekennzeichnet, daß das Mittel (110) zum Erzeugen eines frequenzmultiplexierten zusammengesetzten elektrischen Signals Mittel zum gleichzeitigen Erzeugen einer Anzahl von elektrischen Signalen, wobei jedes elektrische Signal der Anzahl ein einzelnes Stück von Audioinformation darstellt, und Mittel zum Multiplexieren des elektrischen Signals in eine Anzahl von Kanälen aufweist, wobei jeder Kanal eine unterschiedliche Phase hat, und daß die elektrischen Signale in mehr als einen der Kanäle eingespeist werden, und Mittel zum Frequenzmultiplexieren der Kanäle, um das frequenzmultiplexierte zusammengesetzte elektrische Signal zu bilden.

9. Vorrichtung nach Anspruch 8, wobei das Erzeugungsmittel (110) eine oder mehrere Playbackeinrichtungen aufweist, die angeordnet sind, um eine oder mehrere voraufgenommene Platten abzuspielen.

10. Vorrichtung nach Anspruch 9, wobei jede der Playbackeinrichtungen eine Anzahl von Laserköpfen aufweist.

11. Vorrichtung nach Anspruch 9 oder 10, wobei eine Anzahl von Audioinformationsstücken auf einer einzelnen Bildplatte aufgezeichnet wurden, und wobei eine einzige Playbackeinrichtung vorgesehen ist, die eine Anzahl von Laserstrahlen zum gleichzeitigen Lesen der Platte aufweist.

12. Vorrichtung nach einem der Ansprüche 8 bis 11, wobei das Entmultiplexiermittel (200; 300) Mittel (204; 304) zum selektiven Frequenzumsetzen eines Teils des zusammengesetzten Signals aufweist, das dem ausgewählten Stück von Audioinformation entspricht, und zwar in eine vorgegebene Zwischenfrequenz; und Mittel (208; 310; 312) zum Demodulieren bei der Zwischenfrequenz, um die bestimmte gewünschte Audioinformation im Grundband zur Verfügung zu stellen.

13. Vorrichtung nach einem der Ansprüche 8 bis 11, wobei das Entmultiplexiermittel einen Umsetzer (200; 300) aufweist, um das gesendete zusammengesetzte Signal aufzunehmen, wobei der Umsetzer Mittel (206; 306) besitzt, um ein lokales Oszillatorsignal zu synthetisieren, dessen Frequenz vom Benutzer gesteuert werden kann; Mittel (204; 304) zum Mischen des synthetisierten Signals mit einem Eingangssignal, das aus dem zusammengesetzten Signal abgeleitet wurde, um einen gewünschten Unterkanal auf einer vorgegebenen Zwischenfrequenz zur Verfügung zu stellen; Mittel (222; 320) zum Modulieren des ausgewählten Audiounterkanals auf eine vorgegebene Trägerfrequenz; Mittel (220; 324) zum Mischen der vorgegebenen Zwischenfrequenz, die mit dem Audiounterkanal moduliert ist, auf die Videoträgerfrequenz zur Übertragung an ein Fernsehgerät.

14. Vorrichtung nach Anspruch 13, wobei der Umsetzer ferner Mittel (216; 318) aufweist, um das Zwischenfrequenzsignal für das Erkennen der Start- und Stop-Töne auf dem Audiounterkanal festzustellen; und Mittel (210; 308) zum Steuern der lokalen Oszillatorfrequenz in Abhängigkeit von den Start- und Stop-Tönen.

15. Vorrichtung nach Anspruch 13 oder 14, wobei der Umsetzer ferner Mittel (224; 318) zum Unterdrücken der Audioausgabe aus dem Fernseher aufweist, wenn sich keine Audioinformation auf einem ausgewählten Unterkanal befindet.

Revendications

1. Méthode pour délivrer des informations sonores comprenant les étapes consistant à pro-

duire un signal électrique multiplexé en fréquence qui correspond à une pluralité de morceaux d'informations sonores; à transmettre le signal composite à un abonné; à démultiplexer chez l'abonné le signal électrique composite et à sélectionner l'un des morceaux d'informations sonores; et à convertir le morceau sélectionné d'informations sonores en un signal sonore, caractérisée en ce que pour former le signal composite la méthode consiste à produire une pluralité de signaux, chaque signal électrique de ladite pluralité représentant un morceau individuel d'informations sonores, à multiplexer ces signaux électriques sur une pluralité de canaux, chaque canal ayant une phase différente et lesdits signaux électriques étant placés chacun sur plus d'un desdits canaux et à multiplexer en fréquence les canaux de manière à former ledit signal électrique composite multiplexé en fréquence.

2. Méthode selon la revendication 1, caractérisée en ce que cette pluralité de signaux électriques est produite par la lecture simultanée d'une pluralité de disques préalablement enregistrés.

3. Méthode selon la revendication 1, caractérisée en ce que ladite pluralité de signaux électriques est produite par la lecture, au moyen d'un dispositif de lecture à laser, d'un ou de plusieurs disques de type optique prealablement enregistrés.

4. Méthode selon la revendication 3, caractérisée en ce que la lecture de chacun desdits disques de type optique est faite en employant une pluralité de faisceaux de lecture.

5. Méthode selon la revendication 1, caractérisée en ce qu'une pluralité de morceaux d'informations sonores sont enregistrés sur un seul vidéo-disque à laser, et en ce que ladite pluralite de signaux électriques sont produits et multiplexéssur lesdits canaux par la lecture simultanée dudit disque au moyen d'une pluralité de faisceaux laser.

6. Méthode selon l'une quelconque des revendications precedentes dans laquelle l'étape de démultiplexage consiste à convertir sélectivement la fréquence d'une partie dudit signal composite qui correspond au morceau particulier désiré d'informations sonores en une fréquence intermédiaire prédéterminée; et à démoduler á ladite fréquence intermédiaire de manière à fournir les informations sonores particulières désirées à la bande de base.

7. Méthode selon la revendication 6, caractérisée en ce que l'étape de démodulation consiste à démoduler en utilisant un train sonore de fréquence intermédiaire (FI) d'un récepteur de télévision.

8. Système de distribution d'informations sonores comprenant des moyens (110) pour produire un signal électrique composite multiplexé en fréquence qui correspond à une pluralité de morceaux d'informations sonores, des moyens (114; 118; 124) pour transmettre le signal électrique composite à un abonné (116; 122; 126), des moyens (200; 300) pour démultiplexer le signal électrique composite et sélectionner l'un desdits morceaux d'informations sonores, et des moyens (116; 122; 126) pour convertir le morceau sélectionné d'informations sonores en un signal sonore, caractérisé en ce que lesdits moyens (110) pour produire le signal électrique composite multiplexé en fréquence comprennent des moyens pour produire simultanément une pluralité de signaux électriques, chacun desdits signaux électriques de ladite pluralité représentant un morceau individuel i'informations sonores, des moyens pour multiplexer lesdits signaux électriques sur une pluralité de canaux, chacun desdits canaux ayant une phase différente et les signaux électriques étant places sur plus d'un desdits canaux, et des moyens pour multiplexer en fréquence lesdits canaux pour former ledit signal électrique composite multiplexé en fréquence.

9. Système selon la revendication 8, caractérisé en ce que lesdits moyens (110) pour produire le signal composite comprennent un ou plusieurs dispositifs de lecture arrangés de manière à pouvoir lire un ou plusieurs disques préalablement enregistrés.

10. Système selon la revendication 9, caractérisé en ce que chacun desdits dispositifs de lecture comprend une pluralité de têtes de lecture.

11. Système selon la revendication 9 ou 10, caractérisé en ce qu'une pluralité de morceaux d'informations sonores ont été enregistrés sur un seul vidéo-disque à laser, et qu'un seul dispositif de lecture est prévu avec une pluralité de faisceaux laser aptes à lire simultanément ledit disque.

12. Système selon l'une quelconque des revendications 8 à 11, caractérisé en ce que lesdits moyens (200; 300) pour démultiplexer comprennent des moyens (204; 304) pour convertir sélectivement la fréquence d'une partie dudit signal composite qui correspond audit morceau sélectionné d'informations sonores en une fréquence intermédiaire prédéterminée; et des moyens (208; 310; 312) pour démoduler à ladite fréquence intermédiaire de manière à fournir lesdites informations sonores du morceau sélectionné à la bande de base.

13. Système selon l'une quelconque des revendications 8 à 11, caractérisé en ce que lesdits moyens de démultiplexage comprennent un convertisseur (200; 300) pour la réception dudit signal composite, ledit convertisseur comprenant un moyen (206; 306) pour synthétiser le signal d'un oscillateur local dont la fréquence peut être commandée par l'usager; un moyen (204; 304) pour mélanger ledit signal synthétisé avec un signal d'entrée provenant dudit signal composite pour fournir un sous-canal désiré sur une fréquence intermédiaire prédéterminee; un moyen (222; 320) pour moduler ledit sous-canal sélectionné sur une fréquence porteuse prédéterminée; un moyen (220; 324) pour mélanger ladite fréquence intermédiaire prédéterminée modulée avec ledit sous-canal sonore sur ladite fréquence

porteuse vidéo pour la transmettre à un poste de télévision.

14. Système selon la revendication 13, caractérisé en ce que ledit convertisseur comprend en plus des moyens (216; 318) pour reconnaître ledit signal de fréquence intermédiaire pour détecter des tonalités de commencement et d'arrêt sur ledit sous-canal sonore; et des moyens (210; 308) pour commander ladite fréquence de l'oscillateur local qui est sensible auxdites tonalités de commencement et d'arrêt.

15. Système selon la revendication 13 ou 14, caractérisé en ce que ledit convertisseur comprend en plus des moyens pour assourdir la sortie son dudit récepteur de télévision quand il n'existe pas d'informations sonores sur un sous-canal sélectionné.

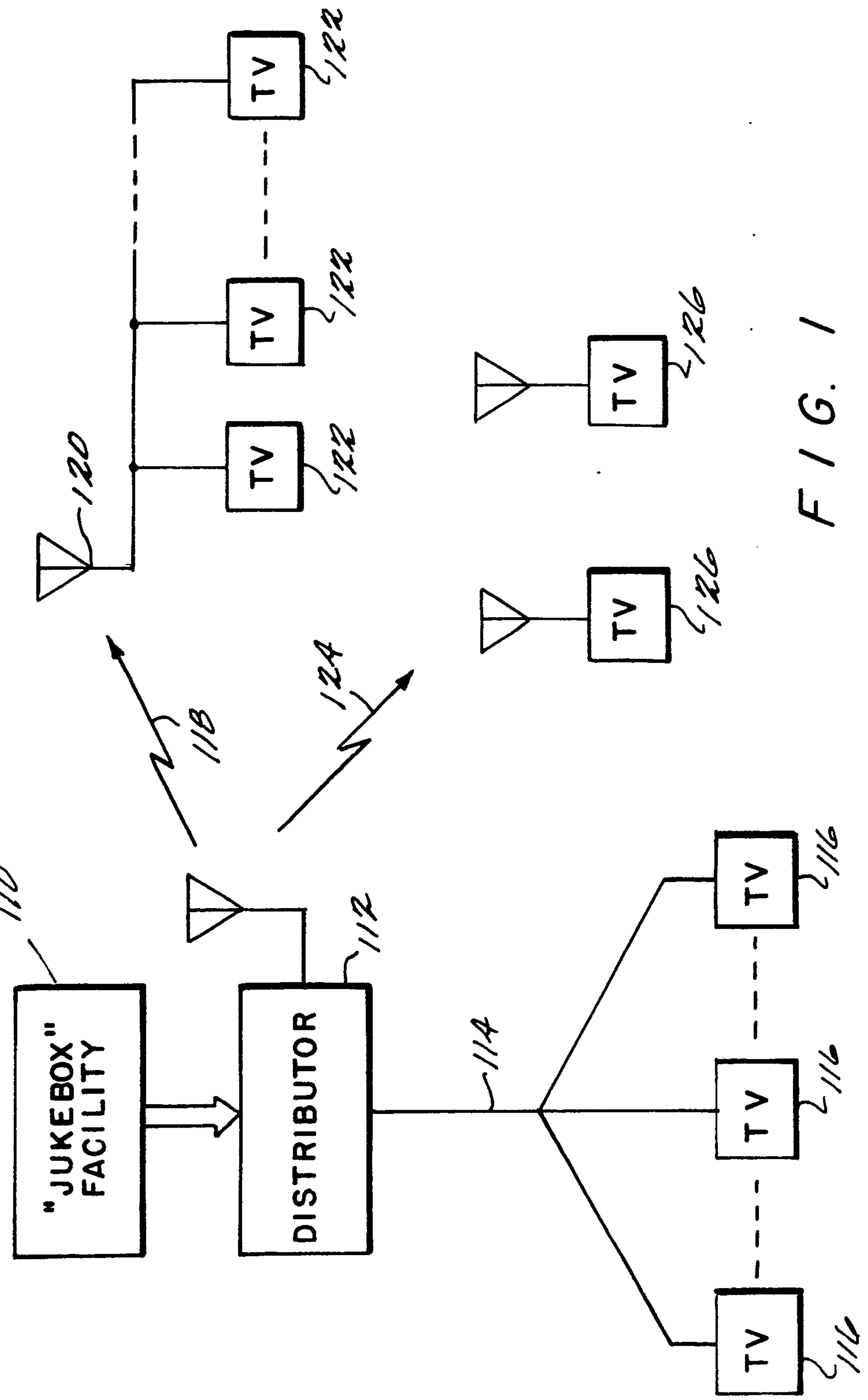
"JUKEBOX" FACILITY
110
DISTRIBUTOR
112
114
116
116
116
118
124
120
TV
122
122
122
126
126

FIG. 1

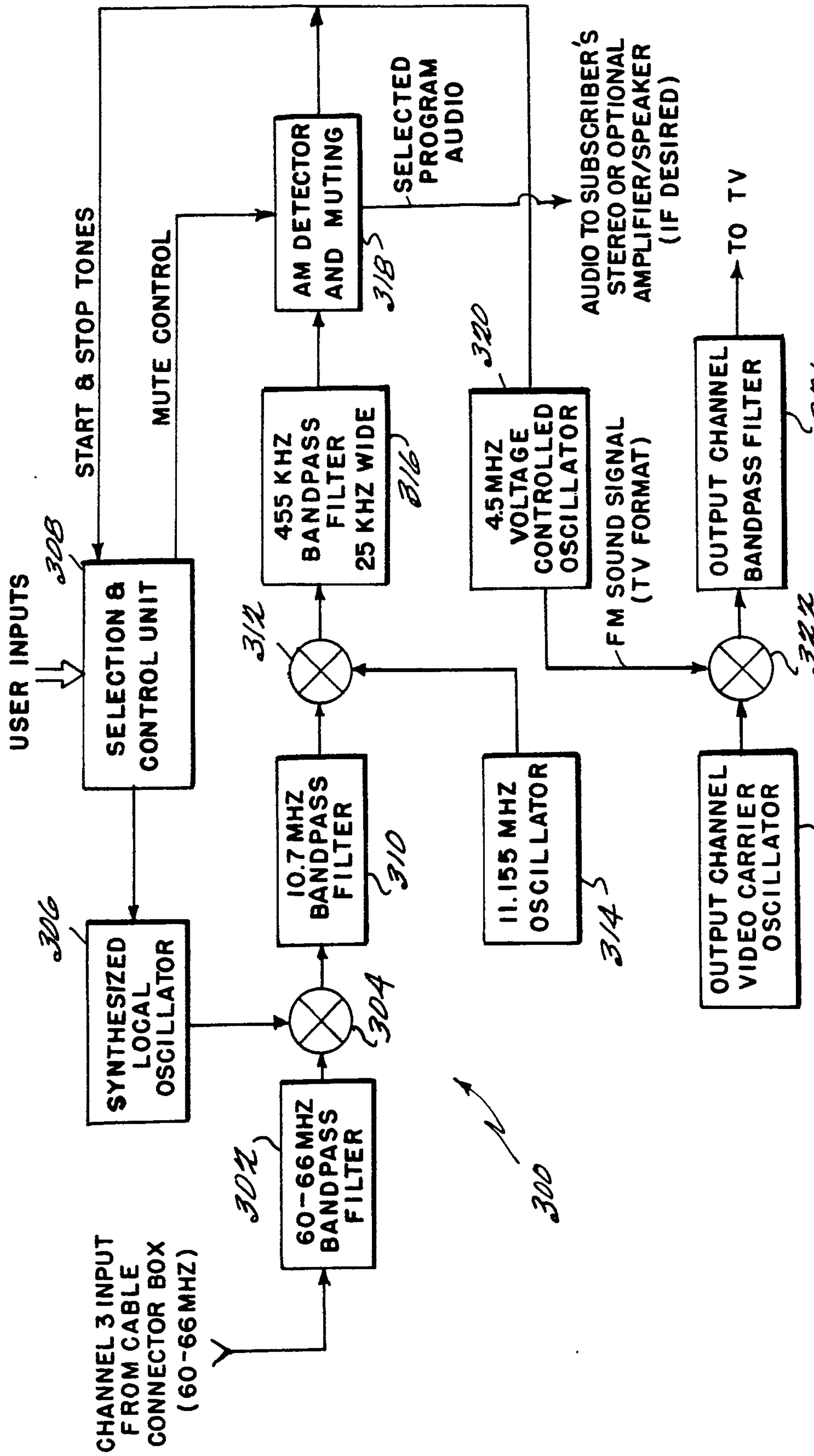
CHANNEL 3 INPUT FROM CABLE CONNECTOR BOX (60-66MHZ)
60-66MHZ BANDPASS FILTER
302
SYNTHESIZED LOCAL OSCILLATOR
306
304
10.7 MHZ BANDPASS FILTER
310
11.155 MHZ OSCILLATOR
314
312
455 KHZ BANDPASS FILTER 25 KHZ WIDE
316
AM DETECTOR AND MUTING
318
SELECTED PROGRAM AUDIO
AUDIO TO SUBSCRIBER'S STEREO OR OPTIONAL AMPLIFIER/SPEAKER (IF DESIRED)
USER INPUTS
SELECTION & CONTROL UNIT
308
START & STOP TONES
MUTE CONTROL
4.5 MHZ VOLTAGE CONTROLLED OSCILLATOR
320
FM SOUND SIGNAL (TV FORMAT)
OUTPUT CHANNEL VIDEO CARRIER OSCILLATOR
324
322
OUTPUT CHANNEL BANDPASS FILTER
326
TO TV
300

FIG. 3

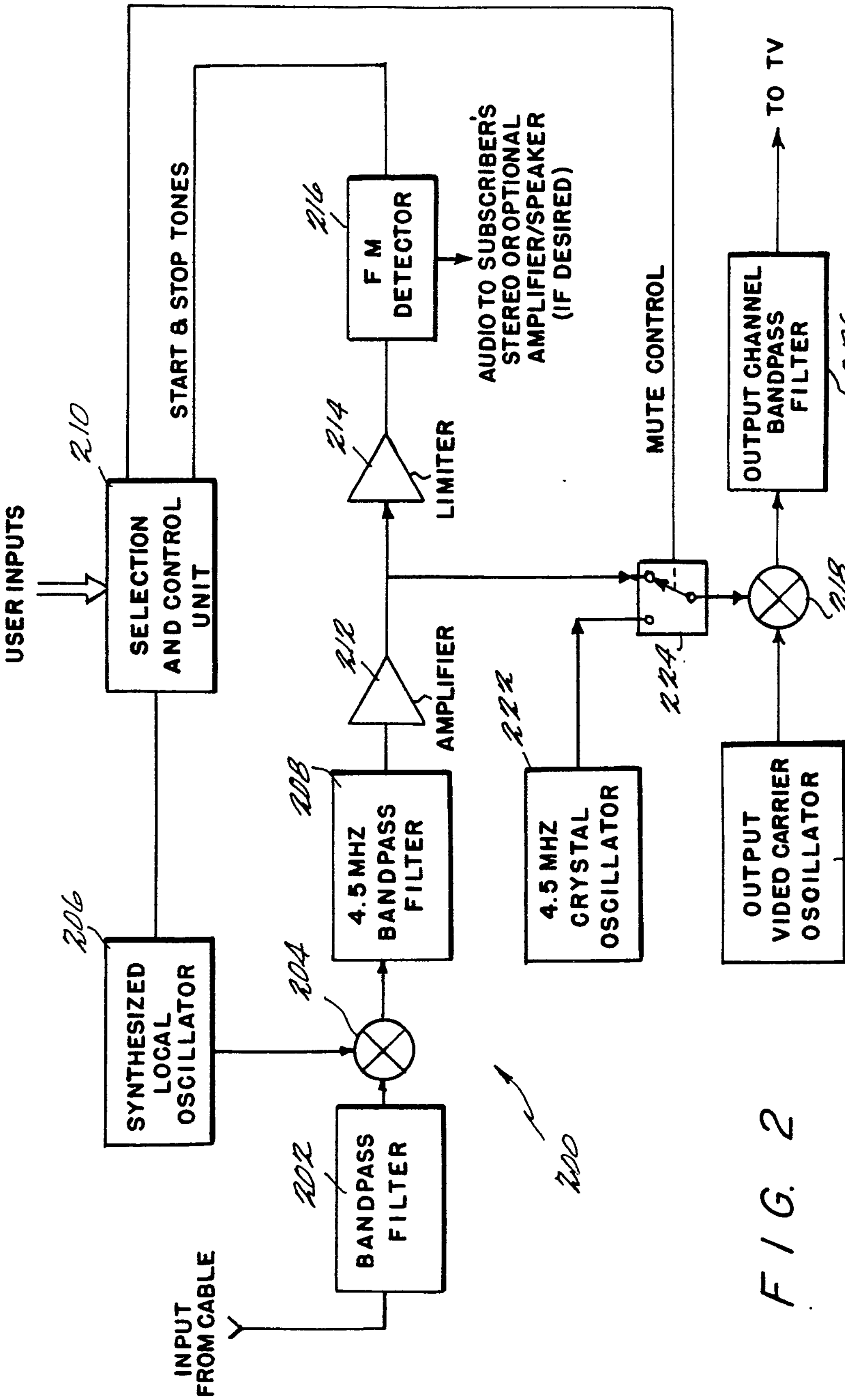
INPUT FROM CABLE
BANDPASS FILTER
202
204
SYNTHESIZED LOCAL OSCILLATOR
206
200
4.5 MHZ BANDPASS FILTER
208
AMPLIFIER
212
LIMITER
214
F M DETECTOR
216
AUDIO TO SUBSCRIBER'S STEREO OR OPTIONAL AMPLIFIER/SPEAKER (IF DESIRED)
USER INPUTS
SELECTION AND CONTROL UNIT
210
START & STOP TONES
MUTE CONTROL
4.5 MHZ CRYSTAL OSCILLATOR
222
224
OUTPUT VIDEO CARRIER OSCILLATOR
220
218
OUTPUT CHANNEL BANDPASS FILTER
226
TO TV

FIG. 2