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(54) Title: SATELLITE BROADCAST RECEIVING AND DISTRIBUTION SYSTEM

(57) Abstract

The present invention provides a satellite broadcast receiving and distribution system (10) that will permit for the transmission of vertical and horizontal or left–hand circular and right–hand circular polarization signals simultaneously via a single coaxial cable or the use of a fiber cable (16a or 16b). The system of the present invention will accommodate two different polarity commands from two or more different sources at the same time. This satellite broadcast receiving and distribution system (10) of the present invention will provide for the signals received from the satellite to be converted to standard frequencies so as to permit for signals to travel via existing wiring which the present day amplifiers can transport in buildings, high–rises, hospitals, and the like so that satellite broadcasting can be viewed by numerous individuals by way of a single satellite antenna.

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TITLE OF THE INVENTION

Satellite Broadcast Receiving and Distribution System

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to a satellite broadcasting receiving and distribution system and more particularly to a broadcasting receiving and distribution system that will allow for the transmission of vertical and horizontal signals or left-hand circular and right-hand circular polarization signals to be transmitted simultaneously via a single coaxial cable or fiber optic.

2. Description of the Prior Art

Satellite broadcasting has become very popular throughout the United States. Conventionally, broadcast signals are transmitted through an artificial satellite at very high frequencies. These frequencies are generally amplified and are processed by a particular device after received by an antenna or antennas and prior to application to a conventional home television set or the like.

Typically, broadcasting systems comprises an outdoor unit, generally associated with the antenna, and an indoor unit, generally associated with the television set or the like. Both units, indoor and outdoor, are coupled via a coaxial cable or fiber optic.

A problem associated with these types of systems is that they are designed to accept signals through a line of sight. Accordingly, if the satellite is not visual from a building, then the signal cannot be transmitted. Thus, these systems are rendered useless for high-rises, hotels, hospitals, schools, and the like. These systems are limited in usage, and, as such, can only be utilized in residential homes.

As an example, US Patent No. 5,301,352, issued to Nakagawa et al. discloses a satellite broadcast receiving system. The system of Nakagawa et al. includes a plurality of antennas which, respectively, include a plurality of output terminals. A change-over divider is connected to the plurality of antennas and includes a plurality of output terminals. A plurality of receivers are attached to the change-over divider for selecting one of the antennas. Though this system does achieve one of its objects by providing for a simplified satellite system, it does, however, suffer a major short-coming by not providing a means of receiving satellite broadcasting for individuals who are not in the direct line of sight to the antennas. This system is silent to the means of simultaneously transmitting vertical and horizontal polarized signals via a single coaxial cable.

US Patent No. 5,206,954, issued to Inoue et al. and US Patent No. 4,509,198 issued to Nagatomi both disclose yet another satellite system that includes an outdoor unit that is connected to a channel selector. In this embodiment, the satellite signal receiving apparatus receives vertically and horizontally polarized radiation signals at the side of a receiving antenna. The signals are then transmitted, selectively, to provide for either one of the vertically or horizontally polarized signals to be transferred. Hence, utilizing a switch to allow only one polarity to be transmitted. This design and configuration provides for one coaxial cable to be utilized, but does not provide for the vertical and horizontal signals to be transmitted simultaneously. This system selectively transmits the desired signal and polarity.

Systems have been attempted for transferring two frequencies on the same co-axial cable. Frequencies of the same polarity can easily be transmitted via a single co-axial cable, however, transmitting two signals, from two sources, each of different polarities can be a challenge. In some satellite configuration systems, once a timing diagram is plotted for the signals to be transmitted, it is seen that a forbidden path occurs between frequencies of 950 MHz and 1070 MHz. This will inherently prohibit the frequencies within that range to be transmitted successfully. Hence, it is desirable to obtain a system which will not allow for conversion to occur at frequencies of the forbidden conversion.

As seen in German Patent Number DE4126774-A1, signals can fall within the range of the forbidden path, thereby, providing for a non-working system. Additionally, this product, like the assembly disclosed in Japanese Application No. 63-293399 both disclose a system which receives a single signal and demultiplexed them into vertical and horizontal polarized signals. These systems, are complex and require a numerous amount of components in order to employ the invention. This increase in components will inherently cause an increase in component failure. Further, these systems fail to disclose a means of reconverting the signals into their original frequency and polarity, a necessity for satellite systems. Consequently, the system provides a signal which will not maintain its respective polarity.

SUMMARY OF THE INVENTION

The present invention is a satellite broadcast receiving and distribution system that will permit for the transmission of vertical and horizontal or left-hand circular and right-hand circular polarization signals simultaneously via a single coaxial cable or optionally via the use of a fiber optic cable. The system of the present invention will accommodate two different polarity commands from two or more different sources at the same time. This satellite broadcast receiving and distribution system of the present invention will provide for the signals received from the satellite to be converted to standard frequencies so as to permit for signals to travel via existing wiring which the present day amplifiers can transport in buildings, high-rises, hospitals, and the like so that satellite broadcasting can be viewed by numerous individuals by way of a single satellite antenna.

The satellite broadcast system of the present invention comprises a satellite antenna which receives the polarized signals, a head-in frequency processor for converting the polarized signals, a single co-axial cable for transmitting the converted signal or, optionally, fiber optics can be utilized, a head-out receiver processor for re-converting the signals to their original frequency and polarity, and a source, which receives the signals in their respective original frequency and polarity. Structurally, the head-in frequency processor is coupled to the head-out receiver processor via the single co-axial cable, optionally, fiber optics can be utilized. The source is coupled to the head-out receiver processor.

Hence, to allow for successful conversion, the head-in processor converts the received signals of two different polarities to frequencies which permit for transmission simultaneously. The head-in processor will also accommodate two different polarity commands from two or more different sources at the same time via the single cable or the use of fiber optics.

The single cable, or the fiber optic, couples the head-in processor to the head-out processor. Once in the head-out processor, the signals are re-converted to their original state for transmission to the source (i.e. television).

Accordingly, it is the object of the present invention to provide for a satellite broadcast receiving and distribution system which will overcome the deficiencies, shortcomings, and drawbacks of prior satellite broadcast systems and signals and polarity transfer methods.

It is another object of the present invention to provide for a satellite broadcast receiving and distribution system that will convert different frequencies and different polarized signals in order to permit the signals to be transmitted via a single coaxial cable or, optionally, utilizing a single line fiber optic system.

Another object of the present invention is to provide for a satellite broadcast receiving and distribution system that will provide service to mid/high-rise office buildings, condominiums, schools, hospitals and the like via a single satellite.

Still another object of the present invention, to be specifically enumerated herein, is to provide a satellite broadcast receiving and distribution system in accordance with the preceding objects and which will conform to conventional forms of manufacture, be of simple construction and easy to use so as to provide a system that would be economically feasible, long lasting and relatively trouble free in operation.

Although there have been many inventions related to satellite broadcast receiving and distribution systems, none of the inventions have become sufficiently compact, low cost, and reliable enough to become commonly used. The present invention meets the requirements of the simplified design, compact size, low initial cost, low operating cost, ease of installation and maintainability, and minimal amount of training to successfully employ the invention.

The foregoing has outlined some of the more pertinent objects of the invention. These objects should be construed to be merely illustrative of some of the more prominent features and application of the intended invention. Many other beneficial results can be obtained by applying the disclosed invention in a different manner or modifying the invention within the scope of the disclosure. Accordingly, a fuller understanding of the invention may be had by referring to the detailed description of the preferred embodiments in addition to the scope of the invention defined by the claims taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1a is a block diagram illustrating the components used for the satellite broadcast receiving and distribution system according to the present invention.

Figure 1b is a block diagram illustrating the components used in the satellite broadcast receiving and distribution system of the present invention, when a fiber optic cable is used.

Figure 2 is a block diagram representing a first embodiment of the head-in frequency processor and two embodiments of the head-out frequency processor used for the satellite broadcast receiving and distribution system according to the present invention.

Figure 3a is a schematic diagram of the down converter used for the satellite broadcast signal receiving and distribution system according to the present invention.

Figure 3b is a schematic diagram of the up converter used for the satellite broadcast signal receiving and distribution system according to the present invention.

Figure 4 is a block diagram of the second embodiment of the satellite broadcast signal receiving and distribution system according to the present invention.

Figure 5 is a block diagram of the third embodiment of the satellite broadcast signal receiving and distribution system according to the present invention.

Similar reference numerals refer to similar parts throughout the several views of the drawings.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference to the drawings, in particular to **figure 1a**, the present invention, a satellite broadcasting receiving and distribution system, denoted by reference numeral **10**, will be described. As illustrated in **figure 1a**, the satellite system **10** of the present invention includes a receiving satellite **12** that will transmit signals (Vertical-polarized signals and Horizontal-polarized signals or left-hand circular and right-hand circular polarization signals) to a head-in equipment frequency processor **14,** also known as the head-in box. It is at this head-in equipment frequency processor or head-in box **14** where the signals are received simultaneously and then transmitted via a single coaxial cable **16** to the head-out receiver processor **18**, also known as the head-out box. The head-in box **14** will enable for the single coaxial cable **16** to transmit signals of two different polarities and frequencies simultaneously. From the head-out frequency processor or head-out box **16** the signals are reconverted to its original state and then transmitted to a source **20**. As seen in **figure 1a**, the two different polarities (Vertical-polarized signals and Horizontal-polarized signals or left-hand circular and right-hand circular polarization signals) are transported to the source via separate cables **22a** and **22b**, respectively.

Optionally, to enhance transportation of the signals and possibly reduce damage to the system, fiber optics can be used in place of the trunk cables or wiring, such as trunk wire **16**, illustrated in **figure 1a**. This alteration is illustrated in **figure 1b**. As seen in this figure, the satellite broadcasting receiving and distribution system **10** includes the head-in box **14**. Coupled to the head-in box **14** is a transmitter **15**. The fiber optic cable **16a** is secured to the transmitter **15**. Located on the opposite end of the fiber optic cable is the receiver box **17**. Using the transmitter and the receiver enables the signals to be transmitted successfully via the fiber optic cable **16a**. Consequently, the transmitter and receiver provides a means of transmitting via the fiber optic cable **16a**. The use of fiber optic has been used to produce favorable results.

The design and configuration and use of the transmitting means will provide for any one, a selective few, or all of the trunk wiring to be replaced by fiber optics. Allowing such a configuration will permit for a unit to be customized to the consumer/user.

The system of the present invention includes separate embodiments, and the first embodiment is illustrated in **figure 2**. As seen in the first embodiment of the present invention **10a**, there is shown a head-in frequency processor **14a** couple to either a first head-out frequency processor **18a** or a second head-out frequency processor **18b**.

It is noted that **figure 2** illustrates the head-in processor **14a** to be coupled to two separate head-out processors **18a** and **18b**, respectively. This is shown for illustrative purposes only. In actuality, only one head-out receiver processor is utilized with the head-in processor **14a**. The type and embodiment used for the head-out receiver processor is dependent to the combination of the satellite receiver and source that is utilized.

As seen in **figure 2**, the head-in equipment frequency processor **14a** will receive two signals or two separate polarities and convert them to separate frequencies for enabling transmission via a single coaxial cable **16a** or the use of fiber optics.

A low-noise block converter (LNB) **24** will receive the signals from the satellite **12**. This LNB **24** is conventional and is used for amplifying the respective polarized signals (Vertical-polarized signals and Horizontal-polarized signals or left-hand circular and right-hand circular polarization signals). Accordingly, after signals are received, they pass the low-noise block converter **24**, to provide for the signals to enter the head-in equipment frequency processor **14a** (illustrated in **figure 2** as dashed lines) via conduit or fiber optics **26a** and **26b**, respectively.

The head-in equipment frequency processor **14a**, illustrated in **figure 2**, provides for the signals to be converted, via converters **28** and **30**, to the frequencies which the present day amplifiers can transport. In this stage of the system, the object is to convert the signals of one polarity up (via converter **30**) and to convert the signals of second polarity down (via converter **28**). This will render the converted signals to be transmitted without emerging into the forbidden frequency conversion.

From the conduit or fiber optics **26a** and **26b**, the signals are transmitted to a first converter or down converter **28** and a second converter or up converter **30**. These frequency converters, **28** and **30**, respectively, convert the entered frequencies to a frequency which present day amplifies can transport. The converters will be discussed in further detail in **figures 3a and 3b**. The utilization of two converters permit for the acceptance of two signals or polarized transponders that are of a different frequency.

In the down converting means **28**, the transponder is converted down to a specified frequency. The specified frequency is the frequency that is required for the present day amplifiers for transportation. The newly converted frequencies are amplified through the amplifying means **32a**. At means **32a**, the converted frequencies are amplified so not to create second harmonics. These signals are then transferred to a conventional four way splitter **34a**.

In the up converting means **30**, the transponders are converted up to a specified frequency. The converted frequencies then are converted down via a down converter **36**. This process of converting up and then down provides for frequencies to be converted without difficulties and avoiding the forbidden conversion area.

The converted signals are transferred to the four way splitter **34a** in order to combine the frequency of the amplified signal of **32a** and frequency from converter **36**. To synchronized the system, the frequencies from the phase lock loop (PLL) transmitter **38a** are transmitted to the splitter **34a**.

From the splitter **34a**, the signals are passed through an AC power separator **40** which routes 60 Volts power to a DC power supply of 18 Volts. This will permit for the dual frequencies from the satellite dish **12** to be transmitted simultaneously via a single coaxial cable **16a** or optionally, via fiber optics. In the fiber optic embodiment, the signals are transmitted simultaneously utilizing a single unit fiber optic.

Dependent upon the length of the cable, an optional conventional amplifier **42** can be coupled thereto. If fiber optics are used, the conventional amplifier can be eliminated. Power from a power source **44** is inserted into the lines via a power inserter **46**. The signals are amplified, as needed, with additional amplifiers **48**. It is noted that the amplifiers are optional and are dependent to the distance that the head-in frequency processor **14a** is located from the head-out frequency processor **18a** or **18b**. The power supply and power source **11** energizes the head-in frequency processor **14a**.

From the single coaxial cable **16a** or fiber optic, the signals are adjusted via a tap **50a** to permit for the appropriate decibels that are required for the head-out processor **18a** or **18b**.

The head-out frequency processor used for the head-in processor **14a** illustrated in **figure 1**, can include two embodiments, dependent upon the embodiment for the source in combination with the satellite receiver.

The first embodiment for the head-out frequency processor is illustrated in **figure 2** by way of dash line **18a**. As seen in this embodiment, the simultaneously transmitted signals enter the processor via conduit **16b** or fiber optic. The conduit or fiber optic **16b** is coupled to a conventional four (4) way splitter **34b**. The conduit or fiber optic **16b** can be a fiber optic unit. This fiber optic unit is optional, yet will be beneficial to the unit by providing a system which is faster, safer, and which can prevent damage, vandalism or the like. A conventional phase lock loop (PLL) receiver **56a** is coupled to the splitter **34a** to permit for the signals to be locked to the proper and desired frequencies. From the splitter **34b** the first frequency is transmitted to a first converter **58a** in order to permit for the signals or transponders to be converted up to a specified frequency. This up converted signal from the first converter or up converter **58a** is then transmitted to the satellite receiver by way of a conduit or fiber optics **22b**.

The second frequencies are transmitted to a first or up converter **52a** and then are transported to a second or down converter **54a**. This will permit for the signals to be converted to the desired frequency. This second or down converter is coupled to the satellite receiver **21** via conduit or fiber optic **22a**. The signals from down converter **54a** and from up converter **58a** are in the original state, both frequency and polarity, when transmitted from the satellite to the head-in processor **14a**, via lines **26a** and **26b**. Lines **26a** and **26b** can be either conventional wiring or optionally can be fiber optics. The re-converted signals, frequencies and polarity in its original state, are transmitted to the satellite receiver **21** via lines **22a** and **22b**. The satellite receiver **21** is coupled to a source **20** (illustrated as a television) to provide for proper transmission of the signals. The transmission line between the satellite receiver **21** and source **20** is illustrated but not labeled.

It is noted that any of the electrical lines, used for coupling and transmitting the signals can be replace by the use of fiber optics. This replacement will enhance the product.

Hence, it is seen that the head-in processor converted the signals to different frequency to enable the transmission of two separate polarized signals via a single co-axial cable (or fiber optic) to a head-out processor. From the head-out processor, the signals are re-converted to their original state, which was received via lines **26a** and **26b** (or fiber optics). For example, with satellite systems, frequencies typically range between 950 - 1450 MHz. If the satellite transmits a frequency of 1450 for both the horizontal and vertical polarities, then one of the polarities, such as horizontal, is converted down to 560 MHz via converter **28**. The second frequency of the second polarity, such as vertical, is first converted up to 2010 and then back down to 1070, via converters **30** and **36**, respectively. Such a conversion allows for the two frequencies of two different polarities, 560 MHz (horizontal) and 1070 MHz (vertical), to be transmitted simultaneously on a single co-axial cable or fiber optic (**16b**).

As illustrated, this head-out frequency processor is the reverse process of the head-in processor. This is to provide for the signals to reconverted to its original frequencies so as to provide for the satellite receiver **21** and source **20** to accept the signals. The single cable or fiber optic **16a and 16b** accepts the signals at frequencies different than that of the source.

Accordingly, the head-out processor must re-convert the signals to the frequencies that are utilized by the source **20**.

An alteration of the satellite receiver requires an alteration in the head-out receiver processor. This alteration is illustrated in **figure 2** and is shown in outline designated as reference **18b**. In this design and configuration, the satellite receiver utilizes only one wire and accepts only one type of signal, selectively, such as only left-hand circular or only right hand circular polarized signals.

As seen, the frequencies are tapped via **50b**. The tap **50b** is coupled to the head-out processor **18b** via line **16b** which is connected to a four (4) way splitter **34c**. To provide for the signals to be locked in proper frequencies, the four way splitter is coupled to a phase lock loop (PLL) receiver **56b**.

From the splitter **34c**, the first signal of a first polarity is transmitted to a first or up converter **52b** and then is transmitted to a second or down converter **54b**. The conversion of the signals from up to down provides the benefit of converting the frequency without any mishap or error. This method of conversion will avoid the forbidden conversion area as well as provide for the original received frequency and polarity of the signals.

The signals of the second frequency and second polarity are transmitted to an up converter **58b** which will inherently convert the signals to its original received frequency while maintaining its polarity. A polarity switch **60** is connected to converters **52b**, **54b**, and **58b** for coupling the head-out processor to the satellite receiver via a single cable or fiber optic **22c** and a joining means, which is a four way splitter **34d**. The satellite receiver **21** is connected by way of a line (illustrated, but not labeled) to a source **20**. In this embodiment, the switch **60** is used to determine which polarity will enter into the head-out processor **18b**.

In the embodiments shown above, the satellite receiver **21** and source **20** are conventional components and as such, their schematics are not shown in further detail. The up and down converters used in the embodiment above will be discussed in further detail in **figures 3a** and **figure 3b**. **Figure 3a** represents the schematic rendering of the down converters (**28**, **36**, **54a**, and **54b**) and **figure 3b** represents the schematic rendering of the up converters (**30**, **52a**, **52b**, **58a**, and **56b**).

As seen in the schematic diagram of **figure 3a**, the signals enter the down converter via line **L1**. The entered signal passes through a first capacitor **C1** which is coupled to an amplifier **AMP**. After passing the amplifier **AMP**, the signal passes a second capacitor **C2** before entering a first low pass filter **LPF1**. This first **LPF1** is coupled to a mixer which is coupled to a second **LPF2**. This second **LPF2** is connected to a third capacitor **C3** which is coupled to a second choke **CH1**. The mixer is also connected to an oscillator **OSC**. The oscillator is coupled to a **PLL**. The first capacitor **C1** is also connect to a first choke **CH2**. Capacitors **C** are coupled to the amplifier, oscillator, phase lock lope **PPL**, and the second low pass filter. Resistors **R** are coupled to the amplifier, oscillator, first low pass filter and mixer. Chokes are also coupled in series with capacitors **C1, C2, C3** to provide for the chokes to be parallel with the amplifier **AMP** and the second low pass filter, respectively. As seen the chokes **CH1** and **CH2** (inductors) and capacitors are a DC bypass filter network and provide a DC path and enables passing DC power to the antenna electronics.

The up converter is disclosed in **figure 3b**. As seen in this drawings, the signal enters the up converter via a first line **L2**. The converter further includes an amplifier **AMP** that is coupled to a first low pass filter **LP1**. The amplifier is also coupled to an oscillator **OSC**. The oscillator and the first low pass filter are connect to a mixer. This mixer is coupled to a high pass filter **HPF**. The oscillator is also connected with a phase lock loop receiver **PLL**. A second amplifier **AMP2** is coupled to the high pass filter **HPF**. A second low pass filter **LPF2** is coupled to the second amplifier. Capacitors are coupled to the first amplifier, first lower pass filter, and a the amplifier. Resistors **R** are coupled other first and second amplifiers, oscillator, first low pass filter, and mixer. Chokes are also used in this circuit. The first choke is coupled to a capacitor which is coupled to the first amplifier. The second chock is coupled to the phase lock loop.

Simplifying the head out processor described above, will provide another embodiment for the satellite broadcast receiving and distribution system. This system is illustrated in further detail in **figure 4**. This embodiment simplifies the above describe embodiment and also provides a device which avoids the forbidden path. Alteration for this embodiment occurs in the head-in equipment frequency processor **14b** and the head-out frequency processor **18c.**

As with the first embodiment, a low-noise block converter (LNB) **24** will receive the signals from the satellite **12**. This LNB **24**, as stated previously, is conventional and is used for amplifying the respective polarized signals (Vertical-polarized signals and Horizontal-polarized signals or left-hand circular and right-hand circular polarization signals). Hence, after signals are received, they pass the low-noise block converter **24**, to provide for the signals to enter the head-in equipment frequency processor **14b** (illustrated in **figure 4** as dashed lines) via conduits **26a** and **26b**, respectively or optionally via fiber optics.

The head-in equipment frequency processor **14b**, provides for the signals to be converted, via converters **28** and **30**, as identified for the first embodiment. Thereby providing a system which includes frequencies that the present day amplifiers can transport. In this stage of the system, the object is to convert the signals of one polarity up (via converter **30**) and to convert the signals of second polarization down (via converter **28**).

From the conduit or fiber optics **26a** and **26b**, the signals are transmitted to a first converter or down converter **28** and a second converter or up converter **30**. These frequency converters, **28** and **30**, respectively, convert the entered frequencies to a frequency which present day amplifies can transport. The converters have been discussed in further detail in **figures 3a and 3b**. The utilization of two converters permit for the acceptance of two signals or polarized transponders that are of a different frequency.

In the down converting means **28**, the transponder is converted down to a specified frequency. The specified frequency is the frequency that is required for the present day amplifiers for transportation. Though not illustrated, the newly converted frequencies are amplified through the amplifying means, as illustrated in **figure 2** via element **32a**. At the amplifying means **32**, the converted frequencies are amplified so not to create second harmonics. These signals are then transferred to a conventional two way splitter **34c**.

In the up converting means **30**, the transponders are converted up to a specified frequency. The converted signals are transferred to the two-way splitter **34c** in order to combine the frequency of the amplified signals. To synchronized the system, the frequencies from the phase lock loop (PLL) transmitter **38a** are transmitted to the splitter **34c**.

From the splitter **34c**, the signals are passed through a conventional tilt and gain **62.** This will permit for the dual frequencies from the satellite dish **12** to be transmitted simultaneously via a single coaxial cable or fiber optic **16a**. Dependent upon the length of the cable or fiber optic, an optional conventional amplifier **42** can be coupled thereto. Power from a power source **44** is inserted into the lines via a power inserter. The signals are amplified, as needed, with additional amplifiers **48**. It is noted that the amplifiers are optional and are dependent to the distance that the head-in frequency processor **14b** is located from the head-out frequency processor **18c**. The power supply and power source **11** energize the head-in frequency processor **14b**.

From the single coaxial cable or fiber optic **16a**, the signals are adjusted via a tap **50a** to permit for the appropriate decibels that are required for the head-out processor **18c**.

The head-out frequency processor used for the head-in processor **14b** is illustrated in by way of dash line **18c**. As seen in this embodiment, the simultaneously transmitted signals enter the processor via conduit or fiber optic **16b**. The conduit or fiber optic **16b** is coupled to a conventional two (2) way splitter **34d**. A conventional phase lock loop (PLL) receiver **56a** is coupled to the splitter **34d** to permit for the signals to be locked to the proper and desired frequencies. From the splitter **34d** the first frequency is transmitted to a first converter **52c** in order to permit for the signals or transponders to be converted up to a specified frequency. The converted signals from the first converter or up converter **52c** are then transmitted to the satellite receiver by way of a conduit or fiber optic **22a**.

The second frequencies are transmitted to a down converter **54c**. This will permit for the signals to be converted to the desired frequency. This second or down converter is coupled to the satellite receiver **21** via conduit or fiber optic **22b**. The signals from down converter **54c** and from up converter **52c** are in the original state, both frequency and polarity, when transmitted from the satellite to the head-in processor **14b**, via lines **26a** and **26b**. The re-converted signals, frequencies and polarity in its original state, are transmitted to the satellite receiver **21** via lines **22a** and **22b**. The satellite receiver **21** is coupled to a source **20** (illustrated as a television) to provide for proper transmission of the signals. The transmission line between the satellite receiver **21** and source **20** is illustrated but not labeled.

Hence, it is seen that the head-in processor converted the signals to different frequencies to enable the transmission of two separate polarized signals via a single co-axial cable or fiber optic to a head-out processor. From the head-out processor, the signals are re-converted to their original state, which was received via lines **26a** and **26b**. The above identified embodiment is ideal for long distant use, i.e. exceeding 1000 feet. However, for shorter distance, i.e. less than 1000 feet, the components can be simplified again to provide for a device which is ideal for use in apartments or the like.

As seen in **figure** 5, the present invention includes the head-in equipment frequency processor **14c** and the head-out frequency processor **18d.**

As with the previous embodiments, a low-noise block converter (LNB) **24** will receive the signals from the satellite **12**. This LNB **24**, as stated previously, is conventional and is used for amplifying the respective polarized signals (Vertical-polarized signals and Horizontal-polarized signals or left-hand circular and right-hand circular polarization signals). Hence, after signals are received, they pass the low-noise block converter **24**, to provide for the signals to enter the head-in equipment frequency processor **14c** (illustrated in **figure 5** as dashed lines) via conduit or fiber optics **26a** and **26b**, respectively.

As seen, this head-in equipment frequency processor **14c** is simplified. The head-in equipment frequency processor **14c**, provides for signals of one frequency to be converted, up via converter **30**, as identified for the first embodiment. Thereby providing a system which includes frequencies that the present day amplifiers can transport. In this stage of the system, the object is to convert the signals of one polarity up (via converter **30**). The signal of the second polarity is amplified via conventional amplifier **32a**.

From the conduit or fiber optics **26a** and **26b**, the signals are transmitted to a first converter or up converter **30** and an amplifier **32a**. The up converters have been discussed in further detail in **figure 3a**.

From the amplifier and up converter, the signals are transferred to a conventional hybrid mixer **36a**. From the mixer, the signals pass a deplexer **64**. Signals exit the deplexer via a single co-axial cable or fiber optic **16a**.

From the single coaxial cable or fiber optic **16a**, the signals can be adjusted via a tap (illustrated, but not labeled) to permit for the appropriate decibels that are required for the head-out processor **18d**.

The head-out frequency processor used for the head-in processor **14c** is illustrated in by way of dash line **18d**. As seen in this embodiment, the simultaneously transmitted signals enter the processor via conduit or fiber optic **16b**. The conduit or fiber optic **16b** is coupled to a conventional mixer **36b**. to the proper and desired frequencies. From the mixer **36b** the first frequency is transmitted to an amplifier **32b** and the second frequency of a different polarity is transferred to a down converter **52d** for converting the frequency to its original state.

The re-converted signals, frequencies and polarity in its original state, is transmitted to the satellite receiver **21** via lines **22a** and **22b**. The satellite receiver **21** is coupled to a source **20** (illustrated as a television) to provide for proper transmission of the signals. The transmission line between the satellite receiver **21** and source **20** is illustrated but not labeled.

Hence, it is seen that the head-in processor converted the signals to different frequency to enable the transmission of two separate polarized signals via a single co-axial cable or fiber optic to a head-out processor. From the head-out processor, the signals are re-converted to their original state, which was received via lines **26a** and **26b**.

The satellite system of the present invention will permit for two signals of different frequency and polarities to travel simultaneously via a single coaxial cable or fiber optic. The use of this will provide for a satellite system that is versatile, economical and compact. The usage of the single cable or fiber optic permits for a system that can accept satellite broadcasting in places that were previously render impossible. These places include mid/high-rise office buildings, condominiums, hospitals, schools, etc. The unique design and configuration enables the signals to be transmitted via the existing wiring of the buildings. The only renovations that may need to be done is the upgrading of the existing amplifiers.

While the invention has been particularly shown and described with reference to an embodiment thereof, it will be understood by those skilled in the art that various changes in form and detail may be made without departing from the spirit and scope of the invention.

We claim:

1. A satellite broadcasting system comprising:

a satellite dish coupled to a low-noise block converter;

said low-noise block converter is coupled to a first means of converting vertical polarization signals and horizontal polarization signals or left-hand circular polarization signals and right-hand circular polarization signals from a satellite; and

at least one fiber optic cable is coupled to said first means via a transmission means for enabling said signals to be transmitted via said at least one fiber optic cable.

2. A satellite system as in claim 1 wherein said first means provides for two different frequencies and polarities to be transmitted simultaneously via a single fiber optic.

3. A satellite system as in claim 2 wherein a second means is coupled to said fiber optic cable, said second means converts said vertical polarization signals and said horizontal polarization signals or said left-hand circular polarization signals and said right-hand circular polarization signals from said first means to its original received state from said satellite dish.

4. A satellite system as in claim 3 wherein a satellite receiver is coupled to said second means and a source is coupled to said satellite receiver.

5. A satellite system as in claim 3 wherein said second means provides for said signals to be converted separately and independently to said satellite receiver by a transporting means.

6. A satellite system as in claim 5 wherein said transporting means further includes a polarity switch for permitting said signals to be selectively converted to said satellite receiver.

7. A satellite system as in claim 1 wherein said first means includes a first converting system for converting said signals of a first direction to a desired first frequency and polarization and a second converting system for converting said signals of a second direction to a desired second frequency and polarization.

8. A satellite broadcasting system comprising:

a satellite dish coupled to a low-noise block converter;

said low-noise block converter is coupled to a first means of converting vertical polarization signals and horizontal polarization signals or left-hand circular polarization signals and right-hand circular polarization signals from a satellite;

a second means is coupled to said first means;

said second means converts said vertical polarization signals and said horizontal polarization signals or said left-hand circular polarization signals and said right-hand circular polarization signals from said first means to its original received state from said satellite dish;

a satellite receiver is coupled to said second means; and

said source is coupled to said satellite receiver.

9. A satellite system as in claim 8 wherein said second means provides for said signals to be converted separately and independently to said satellite receiver by a transmitting means.

10. A satellite broadcasting system comprising:

a satellite dish coupled to a low-noise block converter;

said low-noise block converter is coupled to a first means of converting vertical polarization signals and horizontal polarization signals or left-hand circular polarization signals and right-hand circular polarization signals from a satellite and transporting simultaneously via a single coaxial cable for enabling two different frequencies and polarities to be transmitted simultaneously via said single coaxial cable;

a second means is coupled to said first means; and

said second means is a reverse process of said first means and said second means converts said vertical polarization signals and said horizontal polarization signals or said left-hand circular polarization signals and said right-hand circular polarization signals to its original received state from said satellite dish.

11. A satellite system as in claim 10 wherein said first means includes a first converting system for converting said signals of a first direction to a desired first frequency and polarization and a second converting system for converting said signals of a second direction to a desired second

frequency and polarization, said first converting system avoids a forbidden zone of conversion for enabling transmission of said desired frequency and polarization.

12. A system as in claim 10 wherein said first means includes a tilt and gain.

13. A system as in claim 10 wherein said first means includes a first converting system for converting said signals of a first direction to a desired first frequency and polarization and said signals of a second direction remains the same.

14. A satellite system as in claim 10 wherein said first means includes a first converting system for converting said signals of a first direction to a desired first frequency and polarization and a second converting system for converting said signals of a second direction to a desired second frequency and polarization, said first converting system avoids a forbidden zone of conversion for enabling transmission of said desired frequency and polarization.

15. A system as in claim 1 wherein said second means is a reverse process of said first means.

16. A system as in claim 1 wherein at least one amplifier is located between said first means and said second means.

17. A system as in claim 8 wherein said second means provides for a transmitting means for said signal to be selectively converted to said satellite receiver via a first cable coupled to said second means.

18. A system as in claim 8 wherein said first means includes a first converting system for converting said signals of a first direction to a desired first frequency and polarization and a second converting system for converting said signals of a second direction to a desired second frequency and polarization.

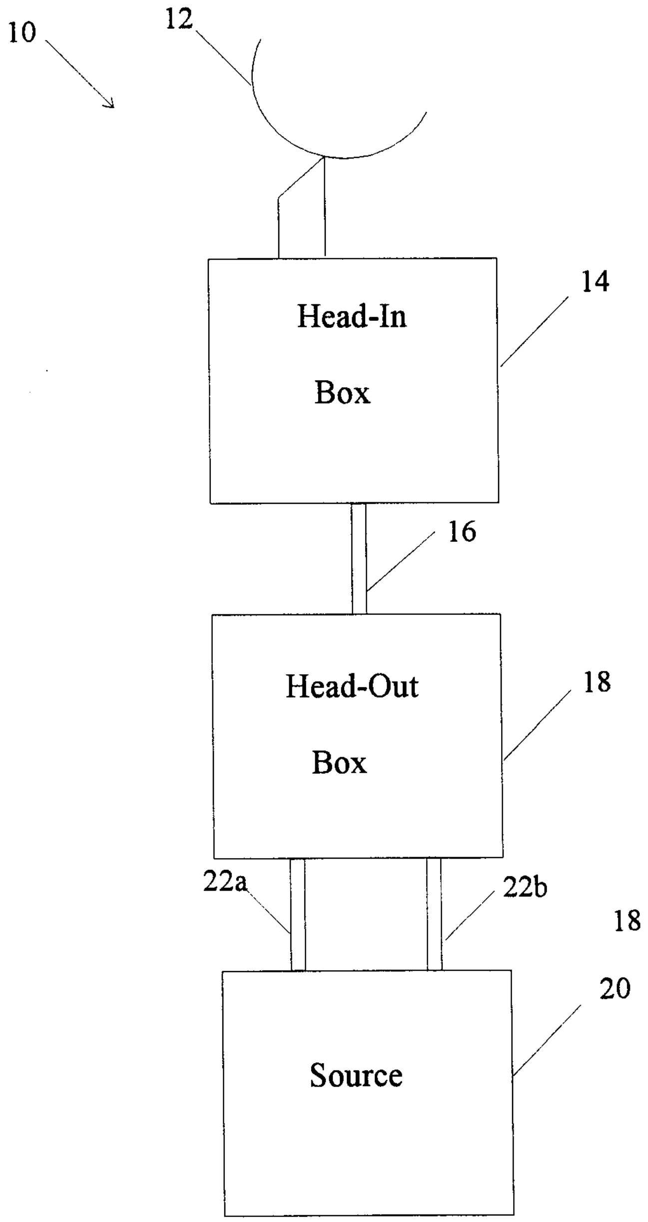

Figure 1a

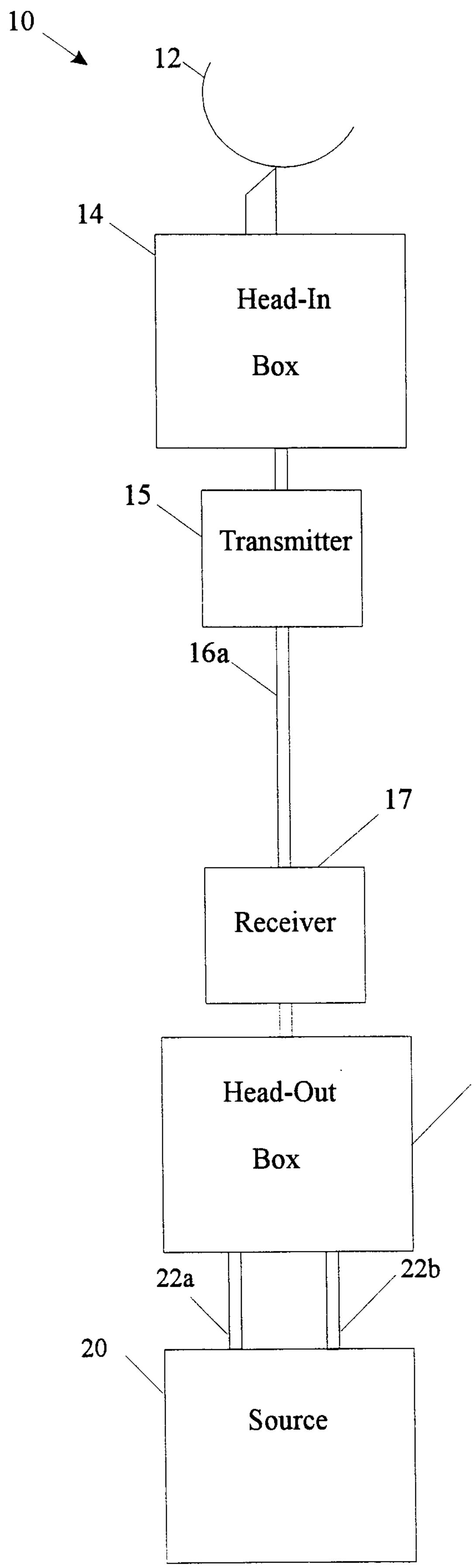

Figure 1b

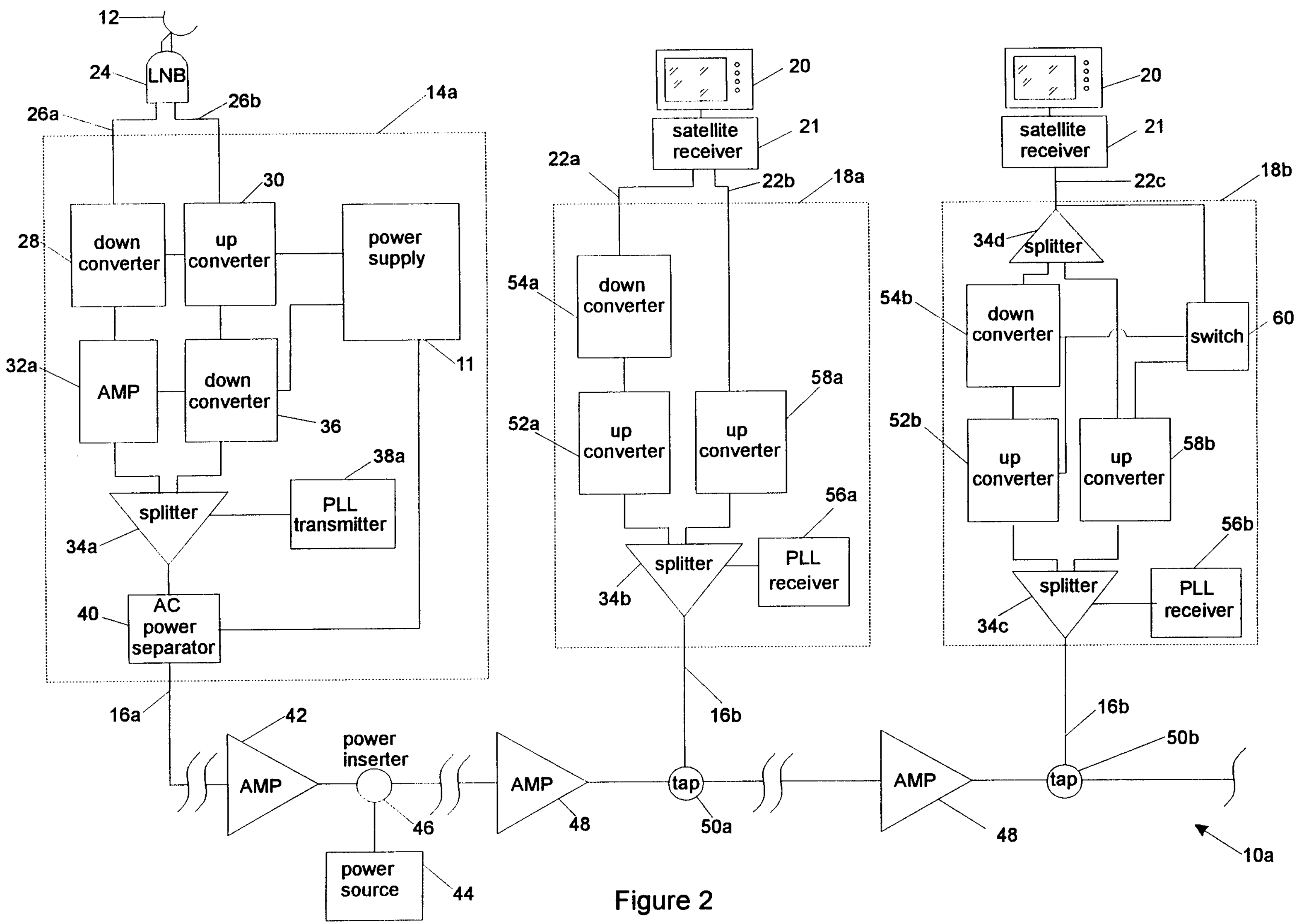
12
24
LNB
26a
26b
14a
30
28
down converter
up converter
power supply
32a
AMP
down converter
11
36
38a
splitter
PLL transmitter
34a
40
AC power separator
16a
42
power inserter
AMP
46
power source
44
AMP
48
tap
50a
16b
AMP
48
tap
50b
16b
10a
20
satellite receiver
21
22a
22b
18a
54a
down converter
52a
up converter
up converter
58a
56a
splitter
PLL receiver
34b
20
satellite receiver
21
22c
18b
34d
splitter
54b
down converter
switch
60
52b
up converter
up converter
58b
56b
splitter
PLL receiver
34c

Figure 2

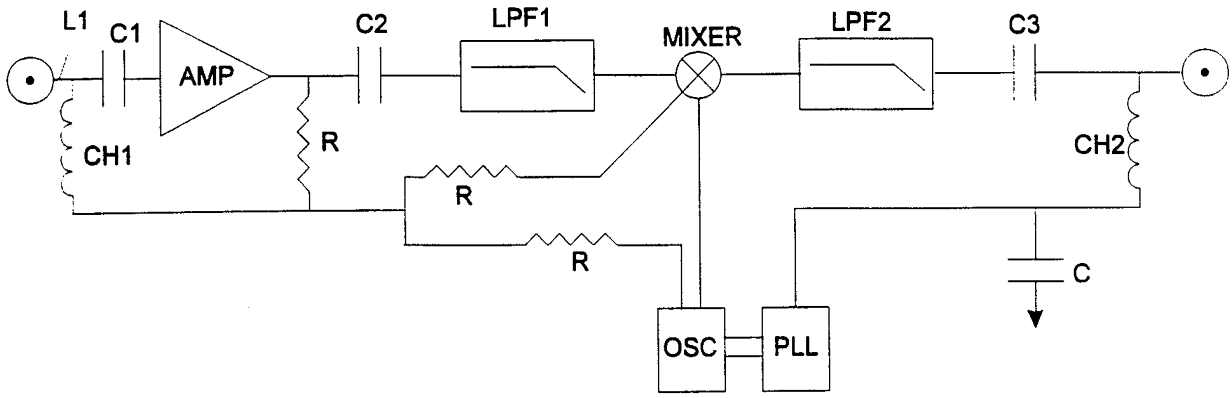

Figure 3a

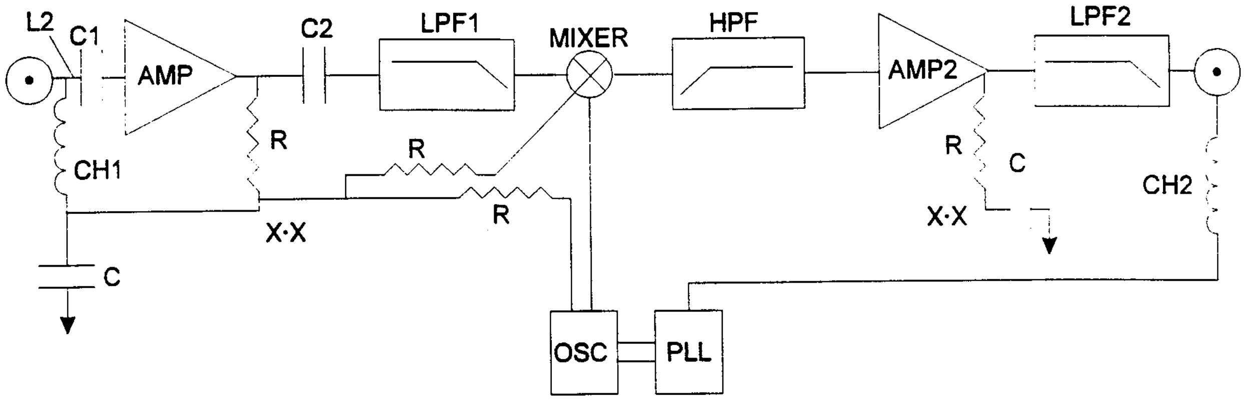

Figure 3b

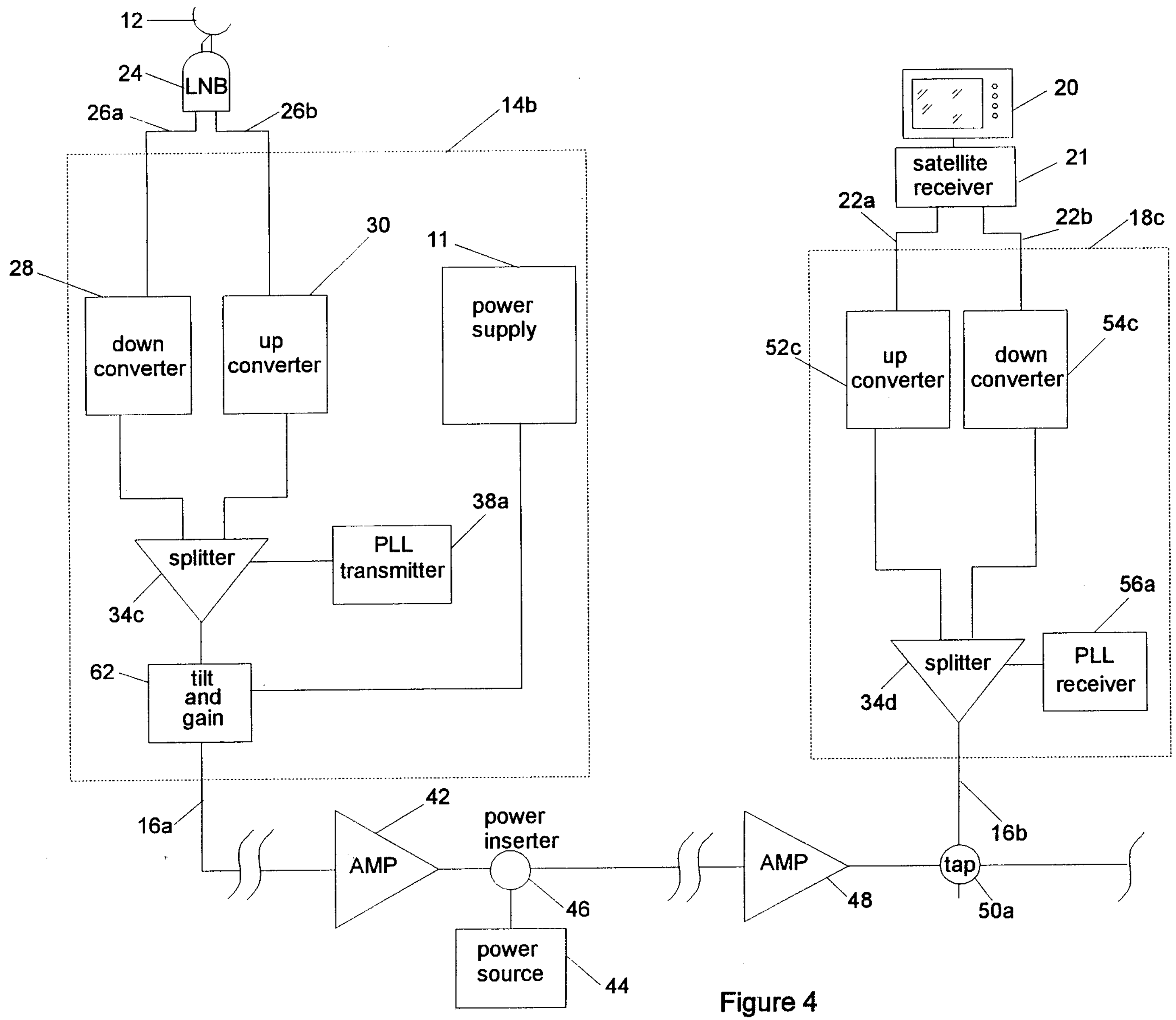
12
24
LNB
26a
26b
14b
28
down converter
30
up converter
11
power supply
38a
PLL transmitter
splitter
34c
62
tilt and gain
16a
AMP
42
power inserter
46
power source
44
AMP
48
tap
50a
16b
20
satellite receiver
21
22a
22b
18c
52c
up converter
down converter
54c
56a
splitter
PLL receiver
34d

Figure 4

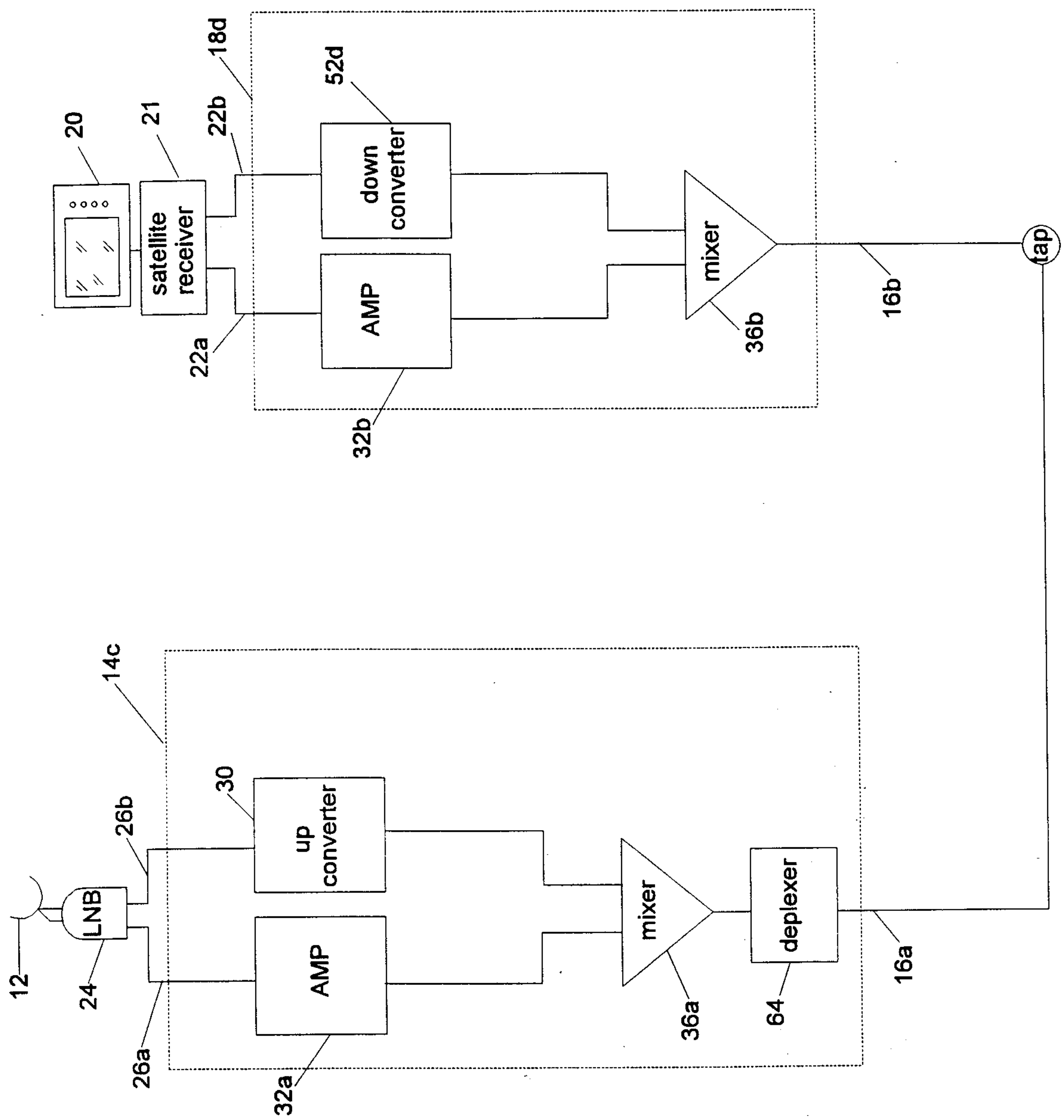
20
21
satellite receiver
22b
22a
18d
52d
down converter
AMP
32b
mixer
36b
16b
tap
14c
30
26b
up converter
12
LNB
24
AMP
26a
32a
mixer
36a
deplexer
64
16a

Figure 5