Television signal cable distribution installation.

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The invention relates to a television signal cable distribution installation comprising a plurality of distributor cables each conveying a plurality of satellite signals which are possibly different from cable to cable, at least a service device comprising at least a user terminal for supplying signals to a user, as many tapping units as there are cables for tapping, for each cable, signals corresponding to the plurality of signals from this cable, and at least a switch allowing connection of the user terminal optionally to one of the tapping units.

The invention also relates to a service device for a television signal cable distribution installation, each cable conveying a plurality of satellite signals which are possibly different from cable to cable, which device comprises at least a user terminal for supplying signals to a user, as many tapping units as there are cables for tapping, for each cable, signals corresponding to the plurality of signals from this cable, and at least a switch allowing connection of the user terminal optionally to one of the tapping units.

A television signal cable distribution network of the type described in the opening paragraph is known from US Patent 5,382,971. In the network described in this document, the signals received from terrestrial stations are added in each cable to the signals received via satellite. This is an ingenious means of enabling each user to receive the terrestrial channels without being obliged to choose a particular cable from among the plurality of cables, but it has the drawback that the cables are heavily loaded, which reduces the possibilities of the system and, inter alia, increases intermodulation in amplifiers.

It is an object of the invention to provide an installation which obviates these drawbacks and which particularly authorizes introduction of upstream information without adding cables.

To this end, in a network for distributing television signals via several cables, one of the cables, referred to as "dual" cable conveys, in addition to satellite signals, the assembly of signals from terrestrial stations, and a service device comprises a first low-pass filter having a cut-off frequency between the frequency range of signals from terrestrial stations and the frequency range of satellite signals, and having an input which is connected to a tapping unit for tapping the signals of the dual cable, and an output which is

permanently connected to the user terminal.

The invention is thus based on the idea of distributing the terrestrial signals on all terminals from a single cable, independently of the position of the switch selecting one of the cables.

With a single cable conveying the terrestrial channels, a passband remains available in the other cables. It is thus possible to transmit upstream signals having frequencies which are below the frequency range of signals from terrestrial stations, which upstream signals are conveyed by one of the cables referred to as "return path" cable, which is not the dual cable, and the service device comprises a second low-pass filter having an input which is permanently connected to the user terminal and an output which is intended for connection to the return path cable, this second low-pass filter having a cut-off frequency which is between the frequency range of upstream signals and the frequency range of the satellite signals.

The cables are thus, as it were, specialized and it is therefore possible to obtain a network in a very economical manner, enabling introduction of upstream information, while high-performance filters are not necessary.

To feed different active circuits in the service devices, the installation preferably comprises at least three cables, one of which, which is neither the dual cable nor the return path cable, conveys a power supply voltage.

Advantageously, an amplifier is arranged in series with the first low-pass filter.

The level of the signal at the user terminal can thus be controlled at any desired value.

Advantageously, a first high-pass filter having a cut-off frequency between the frequency range of signals from terrestrial stations and the frequency range of satellite signals is arranged between the tapping unit intended for tapping the signals of the dual cable and the switch.

The mixture of terrestrial signals with satellite signals is thus avoided in the switch.

Advantageously, a second high-pass filter having a cut-off frequency between the frequency range of the upstream signals and the frequency range of the satellite signals is arranged between the tapping unit intended for tapping the signals of the return path cable, and the switch.

The mixture of signals from the return path with the satellite signals is

thus avoided in the switch.

The service device preferably comprises a third high-pass filter having a cut-off frequency between the frequency range of the upstream signals and the frequency range of signals from terrestrial stations, which high-pass filter is arranged in the connection between the user terminal and the dual cable on the side of the user terminal.

The perturbation of terrestrial channels by signals intended for the return path is thus avoided.

The service device is preferably provided with a plurality of user terminals and comprises as many switches as there are user terminals, each switch allowing connection of one of the user terminals optionally to one of the tapping units, and a splitter which supplies the signals filtered by the first low-pass filter to all the terminals at a time.

In this case, the input of the second low-pass filter is connected to each user terminal.

The return path is thus accessible, independent of the terminal chosen.

In a preferred embodiment, the input of the second low-pass filter is connected to each user terminal via a summing device comprising resistors.

Such a summing device is simple and economical.

The splitter advantageously comprises resistors which constitute both the splitter and the summing device, the common input of the splitter also being the output of the summing device.

The combination of these two means is an economical solution.

These and other aspects of the invention will be apparent from and elucidated with reference to the embodiments described hereinafter.

In the drawings:

Fig. 1 shows diagrammatically a television signal cable distribution network, with a network head-end, distributor cables, several service devices and user installations.

Fig. 2 shows diagrammatically a service device,

Fig. 3 shows diagrammatically a switching unit.

The television signal cable distribution installation shown in Fig. 1 has a network head-end 5. Here, for example, it is equipped with four parabolas 10, 20, 30, 40 for

receiving satellite signals, and an antenna 50 for receiving signals from terrestrial stations. Each satellite reception parabola is associated with a low-noise amplifier and frequency converter block 11, 21, 31, 41, generally referred to as "LNB", supplying the signals in a frequency range between 950 and 2150 MHz. Each of these signals is applied to a different distributor cable 1, 2, 3, 4. A sufficient number of channels may also be supplied by parabolas in a number smaller than four, in which case the channels are then distributed by a splitter through the four distributor cables.

The signals from the antenna 50 are amplified by an amplifier 55 covering a frequency range between 45 and 862 MHz and are applied to the distributor cable 4 via a low-pass filter 56 having a cut-off frequency of the order of 900 MHz, i.e. between the frequency range of signals from terrestrial stations and the frequency range of satellite signals. The distributor cable 4 will hereinafter be referred to as "dual" cable because it conveys satellite signals as well as signals from terrestrial stations.

The distributor cable 3 is intended for transmitting upstream signals, i.e. signals returning from the users; this distributor cable 3 will hereinafter be referred to as "return" cable. The return signals have frequencies in a range between, for example, 5 and 30 MHz below the frequency range of signals from terrestrial stations. These signals are transmitted via a low-pass filter 70 to a known device 7 for controlling upstream messages transmitted, for example, through a telephone line 75. A transmission of the return path by a transmitter directed towards a satellite is also envisageable. The low-pass filter 70 has a cut-off frequency of the order of 35 MHz, i.e. it is above the frequency range of upstream signals and well below the frequency range of satellite signals. This filter may have a higher frequency, up to the order of 860 MHz.

A power supply unit 6 supplies a DC power supply voltage intended for different active components of the service device through each distributor cable 1 and 2, via inductances 65 and 60. The power supply of the "LNB", which is not shown so as not to complicate the Figure, is provided by the power supply unit 6 directly within the network head-end 5 without passing through the distributor cables.

The distributor cables 1-4 serve, for example, a dwelling, and the dot-and-dash lines symbolize the different floors. The lodgings on one and the same floor, for example four lodgings, are served by the same service device 8 or 9. Such a device will hereinafter be described in greater detail. It has four connectors 81, 82, 83, 84 each intended to serve a receiver assembly and supplies, on each of these connectors, the assembly of signals from terrestrial stations in addition to the satellite signals.

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A first receiver assembly comprises, for example a known unit 93 which is provided with filters for supplying the satellite signals to a receiver decoder 91 and the signals from terrestrial stations to a television receiver 92; this unit also passes the DC current or the low-frequency current. The receiver decoder 91 is equipped with known means enabling a user to communicate messages by means of appropriate keys, and means for transmitting sequences of digital codes through the lead connected to the unit 93, which codes represent said messages and are modulated in the frequency range between, for example 5 and 30 MHz. A second receiver assembly comprises analog elements 96, 94, 95. A third receiver assembly comprises a television set 99 without a receiver decoder. A dialogue unit 97 is connected by means of a connection unit 98 to the lead which connects the television set to the service device 8. This dialogue unit comprises means enabling a user to send out messages, analogous to those of the receiver decoder 91. Each receiver decoder 91 and 94 also comprises a known control voltage generator which generates, on the cable connecting it to the terminals 84 and 83, for example, a voltage of 14 volts for selecting the distributor cable 1, of 18 volts for selecting the distributor cable 2, of 14 volts with superposition of an AC voltage of 22 kHz for selecting the distributor cable 3, and of 18 volts with superposition of an AC voltage of 22 kHz for selecting the distributor cable 4. This also holds for the control unit 97. The three assemblies are shown side by side so as to simplify the drawing, but it will be evident that they are generally situated in different lodgings.

The service device shown in Fig. 3 comprises the four user terminals 81, 82, 83, 84 for supplying signals to a user, and as many tapping units as there are cables, i.e. four tapping units in this case for tapping, for each cable, signals corresponding to the plurality of signals from this cable. A tapping unit is a known circuit: to realize this circuit, a choice can be made, notably between the resistance tapping unit, which is most economical, not directive but reduces the level of the signal, or the tapping unit with coupled lines, which is directive but does not always have a sufficiently flat response, or the tapping unit may be a ferrite transformer unit; any of these known tapping units may be suitably used in the present application. The tapping units shown are simple resistors 15, 25, 35, 45 which tap the signal from through-connections of the distributor cables 1-4 via the service device. Each resistor 15, 25, 35, 45 is connected to an input 18, 28, 38, 48 of a switching unit 86 which will hereinafter be described in greater detail and with which each user terminal 81-84 can be optionally connected to one of the tapping units. The resistors 16 to 46 connect the outputs 19 to 49 of the switching unit 86 to the user terminals 81-84, respectively.

The dual cable 4 is connected via a tapping unit constituted by a resistor 44 to a first low-pass filter 87 having a cut-off frequency of the order of 900 MHz, i.e. between the frequency range of signals from terrestrial stations and the frequency range of signals from satellites. The output of this filter 87 is permanently connected via an amplifier 88 and another filter 89, to be described hereinafter, to the four user terminals 81-84 via four resistors arranged in fan configuration 17, 27, 37, 47, respectively. These resistors constitute a splitter supplying the filtered signals via the first low-pass filter 87 to all the terminals 81-84 at a time.

The service device also comprises means for connecting the user terminals permanently to the return path cable 3. These means are constituted by the four resistors 17, 27, 37, 47 already mentioned above which now constitute a summing device whose common point, at the right in the Figure, is connected to the return path cable 3 via a second low-pass filter 77. It has a cut-off frequency of the order of 35 MHz, i.e. it is above the frequency range of upstream signals and well below the frequency range of satellite signals. It will be noted that the resistance splitter distributing the signals from the amplifier 88, and the resistance summing device adding the signals from the user terminals to the input of the filter 77 are constituted in practice by the same resistors 17, 27, 37, 47, while the input of the splitter is also the output of the summing device.

A first high-pass filter 85, which has a cut-off frequency of the order of 900 MHz, i.e. between the frequency range of signals from terrestrial stations and the frequency range of satellite signals, is arranged between the tapping unit 45 for tapping the signals of the dual cable 4 and the input 48 of the switching unit 86.

A second high-pass filter 80, which has a cut-off frequency of the order of 35 MHz, i.e. above the frequency range of upstream signals and below the frequency range of satellite signals, is arranged between the tapping unit 35 for tapping the signals of the return path cable 3 and the input 38 of the switching unit 86.

The filter 89, which is arranged between the user terminals and the dual cable, more particularly between the common point of the splitter comprising resistors 17, 27, 37, 47 and the output of the amplifier 88, is a high-pass filter which has a cut-off frequency of the order of 35 MHz, i.e. between the frequency range of upstream signals and the frequency range of signals from terrestrial stations.

The switching unit 86 is shown in detail in Fig. 3. Each input connection 18, 28, 38, 48 is connected to one of the four "contacts" (symbolical contacts, because an electronic switch is used in practice) for each switch 61, 62, 63, 64. Each contact "finger"

(also symbolical) is connected to the input of an amplifier 71, 72, 73, 74 feeding an output 19, 29, 39, 49, respectively. Control receivers 51, 52, 53, 54 decode the DC voltages of 14 or 18 volts and/or the AC voltages at 22 kHz, as mentioned above, for controlling the position of the relevant switch and connecting the user terminal to the selected tapping unit.

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CLAIMS:

1. A television signal cable distribution installation comprising

- a plurality of distributor cables each conveying a plurality of satellite signals which are possibly different from cable to cable,
- at least a service device comprising
  - at least a user terminal for supplying signals to a user,
  - as many tapping units as there are cables for tapping, for each cable, signals corresponding to the plurality of signals from this cable,
  - and at least a switch allowing connection of the user terminal optionally to one of the tapping units,

characterized in that one of the cables, referred to as "dual" cable conveys, in addition to satellite signals, the assembly of signals from terrestrial stations, and in that a service device comprises a first low-pass filter having a cut-off frequency between the frequency range of signals from terrestrial stations and the frequency range of satellite signals, and having an input which is connected to the dual cable and an output which is permanently connected to the user terminal.

2. A distribution installation as claimed in Claim 1, characterized in that it comprises means for transmitting upstream signals having frequencies below the frequency range of signals from terrestrial stations, which upstream signals are conveyed by one of the cables referred to as "return path" cable, which is not the dual cable, and means in the service device for connecting the user terminal permanently to the return path cable.

3. A distribution installation as claimed in Claim 2, characterized in that it comprises at least three cables, one of which, which is neither the dual cable nor the return path cable, conveys a power supply voltage.

4. A service device for a television signal cable distribution installation, each cable conveying a plurality of satellite signals which are possibly different from cable to cable, which device comprises

- at least a user terminal for supplying signals to a user,
- as many tapping units as there are cables for tapping, for each cable, signals corresponding to the plurality of signals from this cable,

- and at least a switch allowing connection of the user terminal optionally to one of the tapping units,

characterized in that the device comprises a first low-pass filter having a cut-off frequency between the frequency range of signals from terrestrial stations and the frequency range of satellite signals, and having an output which is connected to the user terminal and an input which is connected to a tapping unit provided for tapping the signals of one of the cables, referred to as dual cable, conveying, in addition to the satellite signals, the assembly of signals from terrestrial stations.

5. A service device as claimed in Claim 4, characterized in that an amplifier is arranged in series with the first low-pass filter.

6. A service device as claimed in any one of Claim 4 or 5, characterized in that a first high-pass filter having a cut-off frequency between the frequency range of signals from terrestrial stations and the frequency range of satellite signals is arranged between the tapping unit intended for tapping the signals of the dual cable and the switch.

7. A service device as claimed in any one of claim 4 or 5, characterized in that it comprises a second low-pass filter having an input which is connected to the user terminal and an output which is intended for connection to one of the cables referred to as "return path" cable and intended for transmitting, in addition to the satellite signals, upstream signals having frequencies which are below the frequency range of signals from terrestrial stations, said second low-pass filter having a cut-off frequency which is between the frequency range of upstream signals and the frequency range of the satellite signals.

8. A service device as claimed in Claim 7, characterized in that a second high-pass filter having a cut-off frequency between the frequency range of the upstream signals and the frequency range of the satellite signals is arranged between the tapping unit intended for tapping the signals from the return path cable and the switch.

9. A service device as claimed in Claim 7, characterized in that it comprises a third high-pass filter having a cut-off frequency between the frequency range of the upstream signals and the frequency range of signals from terrestrial stations is arranged in the connection between the user terminal and the dual cable at the end of the user terminal.

10. A service device as claimed in Claim 4, characterized in that it is provided with a plurality of user terminals and comprises as many switches as there are user terminals, each switch allowing connection of one of the user terminals optionally to one of the tapping units, and a splitter which supplies the signals filtered by the first low-pass filter to all the terminals at a time.

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11. A service device as claimed in Claim 10, characterized in that it comprises a second low-pass filter having an input which is connected to each user terminal and an output which is intended for connection to one of the cables referred to as "return path" cable and intended for transmitting, in addition to the satellite signals, upstream signals having frequencies which are below the frequency range of signals from terrestrial stations, said second low-pass filter having a cut-off frequency which is between the frequency range of upstream signals and the frequency range of the satellite signals.

12. A service device as claimed in Claim 11, characterized in that the input of the second low-pass filter is connected to each user terminal via a summing device comprising resistors.

13. A service device as claimed in Claim 12, characterized in that said splitter comprises resistors which constitute both the splitter and the summing device, the common input of the splitter also being the output of the summing device.

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