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TITLE OF THE INVENTION (280 characters max)		
Home Network Uses Frequencies Above CaTV		
ENCLOSED APPLICATION PARTS (check all that apply)		
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☒ Applicant claims small entity status. ☒ A check or money order is enclosed to cover the filing fees. ☐ The Commissioner is hereby authorized to charge the required fees to Deposit Account No. 20-0531. Enclosed is a copy of this sheet. ☒ The Commissioner is hereby authorized to charge any additional filing fees or credit any overpayment to Deposit Account Number 20-0531.		
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Home network uses frequencies above CaTV

(Detailed information on how splitters are supported in order to implement a network over existing coax cable infrastructure in houses)

A typical home architecture of coax cable includes power splitters. Power splitters are used to split the input signal (point A) to two or more outputs (points B and C in Figure 1), as depicted in Figure 1.

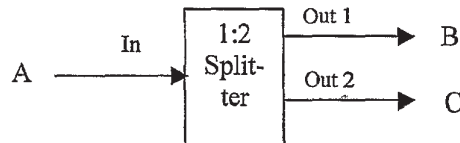


Figure 1

Splitters pass signals in a reverse way as well, as depicted in Figure 2. Signals that input the splitter in the reverse direction (points B and C) are combined together and outputs on the common node (point A in Figure 2).

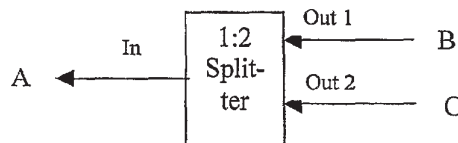


Figure 2

Another feature of power splitters is isolation between output signals. That is signal received at point B and C is mutually isolated as depicted in Figure 3.

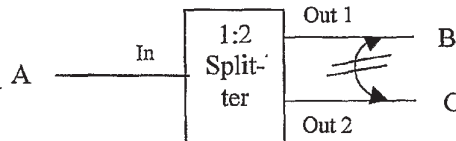


Figure 3

Isolation can be very high in high quality splitters (more than 40 dB of isolation), and significantly lower (about 10 dB) in low quality splitters.

Figure 4 depicts an example of coax wiring structure in a house with three rooms (points B, C and D).

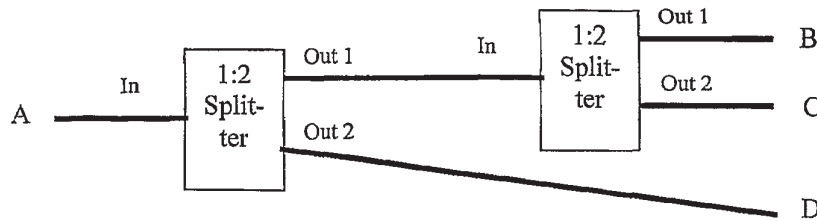


Figure 4

Two power splitters are used to distribute the signal from the entry point (point A) to the three rooms. In a typical application, signal flows from point A to points B, C and D via the splitters over the cable coax, or backward from points B, C and D to point A. Signals that flow from point A into the house are called Forward Signals. They include TV (video), data, voice, management and other signals that arrive from the Cable operator Headend to the house and are distributed in the various rooms. Signals in the reverse direction are called Backward (or return) Signals. They are used, for example, for Internet surfing and Interactive TV. The typical home coax infrastructure does not guarantee signal flow between points B, C and D, due to the unknown and un-guaranteed splitter isolation.

In a home network over coax wiring that includes splitters, there is a need to communicate between units that might be isolated by the splitters. For example, points B, C and D in Figure 4. Since the isolation varies significantly with splitters and is not guaranteed, it is not possible to implement a network, unless some special embodiment is used.

The home network over coax employs an embodiment residing at the demarcation point of the coax (e.g. point A in Figure 4). This embodiment is named Demarcation unit or DU. The DU has three functions:

1. It combines the home network signal and the Cable TV signals. The combined signal is carried over the internal coax wires.
2. It separates the home network signals from the outside cable plant, so that internal home network signals will not leak to the outside plant.
3. It overcomes the splitters isolation and enables the connectivity of the home network. For example a signal transmitted in point C passes the two splitters, reaches point A, where it is reflected back and reaches point C and D (and also B!).

Figure 5 depicts a block diagram of the DU.

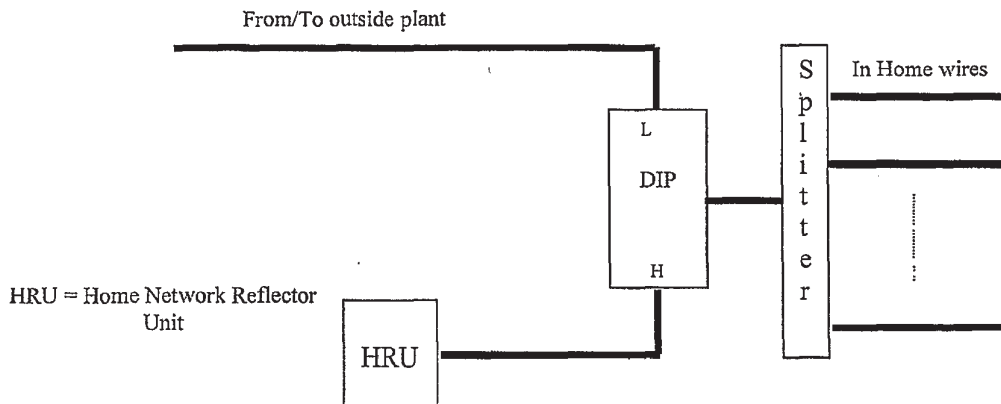


Figure 5

The diplexer combines the Cable TV signals, at its low frequency termination (L) and the in home networking at its high-frequency termination (that comes from the HRU). The combined signal (the C termination) is connected to the main splitter. The splitter splits the coax signal throughout the house. The HRU is a unit that receives the home-network signals and reflects them back into the house. The following describes the operation of the HRU.

The HRU can come in two mode of operation:

1. Active reflector (A-HRU)
2. Passive reflector (P-HRU)

The Active Reflector (A-HRU) receives a signal at one frequency band, amplifies it, moves the signal to another frequency band and transmits it back to the cable network.

A Passive Reflector (P-HRU) receives the signal and reflects it back without shifting in frequency and without amplifying it. The implementation of the P-HRU is very simple. It replaces the HRU in Figure 5 with a short termination or an open termination. All signals that reach this termination are reflected back.

The advantage of the A-HRD is a better reach and performance of the home network. The advantage of the P-HRD is in its simplicity. The DU is located at the entry point of the coax to the house. Sometimes power supply does not exist at that point. In such location the fact that the P-HRD does not require any power (all circuits are passive) makes it very attractive.

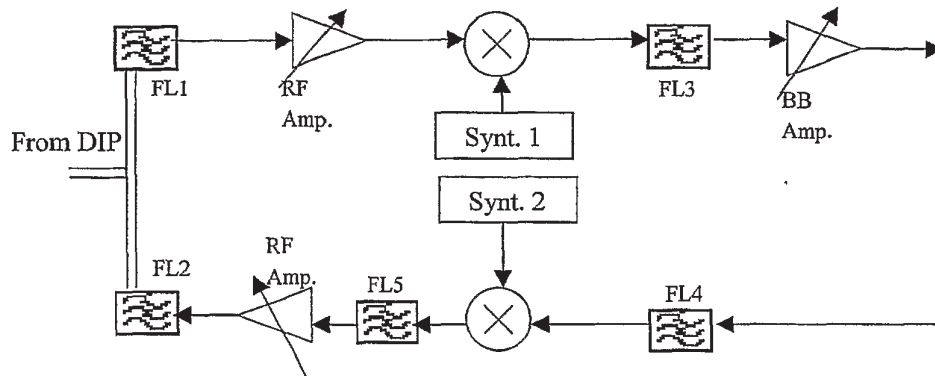


Figure 6

Figure 6 depicts a possible implementation of an A-HRU. FL1 and FL2 together with the striplines implement a diplexer that separates the incoming and outgoing signals.

The incoming signal passes FL1 and goes to a first RF amplifier. The gain of the amplifier can be programmable to increase its dynamic range. The amplified signal goes through a combination of a mixer and a filter (FL3) that shift the signal to a lower frequency where it is amplified again and then is shifted up again by the combination of filters FL4 and FL5 and the second mixer. The shifted signal is amplified again and is output through filter FL2 and transmitted back into the home wiring. The "Synt." Box stands for synthesizers that drive the local oscillators of the mixers. The two synthesizers could have different frequencies, or could use the same frequency. In the latter case only one synthesizer would be required.

This example is only one possible implementation and is given for demonstration purposes. Many other solutions can be implemented to implement the A-HRU.