



(72) HEIDEMANN, Rolf, DE

(72) KRIMMEL, Heinz, DE

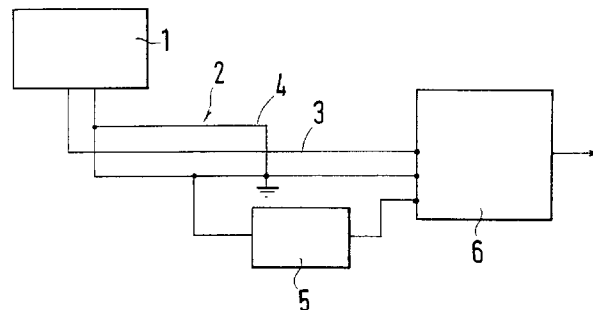
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(54) **PROCESSUS ET SYSTEME DE SUPPRESSION DE SIGNAUX
PARASITES DANS LES CABLES COAXIAUX**

(54) **PROCESS AND ARRANGEMENT FOR SUPPRESSING
PARASITIC SIGNALS IN COAXIAL CABLES**



(57) A process for suppressing parasitic signals caused by external fields is proposed, and also an arrangement in which the parasitic signals 8 run both in the inner conductor 3 and also in the sheath conductor 4 of the cable, and the parasitic signals 8 are detected on the sheath conductor, and the phase and/or amplitude of the detected parasitic signals 8 are adapted to the parasitic signals in the inner conductor 3, and are taken away from the total signal 9 consisting of useful signal 7 and parasitic signal 8.

ABSTRACT

Process and arrangement for suppressing parasitic signals in coaxial cables

A process for suppressing parasitic signals caused by external fields is proposed, and also an arrangement in which the parasitic signals 8 run both in the inner conductor 3 and also in the sheath conductor 4 of the cable, and the parasitic signals 8 are detected on the sheath conductor, and the phase and/or amplitude of the detected parasitic signals 8 are adapted to the parasitic signals in the inner conductor 3, and are taken away from the total signal 9 consisting of useful signal 7 and parasitic signal 8.

Process and arrangement for suppressing parasitic signals in coaxial cables

The invention proceeds from a process and an arrangement for suppressing parasitic signals in coaxial cables as per the species of the independent claims.

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Telecommunication systems, especially hybrid fibre/coax access networks, have a backward channel from the subscribers to the head station of the system. This backward channel works for example in a frequency range of 5 to 30 MHz, and can be impaired by interference and noise because of external fields. This interference leads to the receiver in the head station of the system being unable for example to adequately resolve a signal transmitted on a backward channel. The parasitic signals penetrating the cable originate from short-wave transmitters such as private radio stations or broadcasting transmitters. These parasitic signals are introduced into the system at several points in a distributed network. For example bad shielding of coaxial cables leads to the introduction of parasitic signals into the (inner) cable. If the shielding of a coaxial cable is defective, the signals are introduced both in the inner conductor of the cable and also in the sheath conductor. External parasitic signals are also introduced into the inner cable through the subscriber terminals themselves, e.g. through the set-top boxes or through the television receivers. In this case the useful signals are transmitted in the field between the inner conductor and the sheath conductor of the cable. In the interests of clarity, the following discussion refers to a useful signal line in the inner conductor.

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The parasitic signals can possibly be suppressed by almost perfect shielding both of the subscriber terminal equipment and of all coaxial connections. But this would be very resource-intensive, and even small leaks in the shielding would immediately give rise to high introduction of parasitic signals.

- 10 A remote supply separating filter for a line terminal of an information transmission system is disclosed in DE-OS 32 35 111. Interference voltage can penetrate the cable at the connection to the line terminal, and lead to interference potential between the outer conductor of the coaxial cable with DC floating potential, and the cable out conductor. In order to effectively attenuate the interference voltages, an input system for the connected line terminal is proposed that can be fully wired and is structured for the low-pass route by means of a ceramic tubular body with ramped impedance
- 20 level, and by means of a line filter constructed with this coaxial cable running through it, by means of a line repeater for separating the high-pass and low-pass route, and by means of a low-pass filter for the low-pass route, connected to a line choke. This arrangement serves to suppress interference arising from inadequate separation of the signal current and the supply current. The circuit is however not capable of suppressing interference located in precisely the same frequency band as the useful signal.
- 30 The process disclosed for suppressing parasitic signals in coaxial cables with the characteristic features of the independent claim has by contrast the advantage that parasitic signals whose frequency is located precisely in the frequency band of the useful signal are suppressed. Suppression is achieved simply by the parasitic signals being detected in the sheath conductor of the coaxial cable and

subtracted from the total signal comprising the useful signal and the parasitic signal.

The measures set out in the sub-claims enable advantageous development and improvement of the process indicated in the independent claim.

10 Detection and subtraction of the parasitic signal are advantageously carried immediately before further processing of the useful signal. This relieves the useful signal receiver of interference, and makes it capable of more sensitive detection. This enables higher channel capacities by means of more complex types of modulation, even in the presence of external parasitic signals. Cost savings also arise from the reduced need for network processing when introducing backward channel signalling for bidirectional services. A further advantage is that the process disclosed enables an adaptive unit to carry out subtraction so that suppression of the parasitic signals adjusts adaptively to
20 the presence, frequency and changing signal strength of the parasitic signals, increasing the interference reduction effect.

The arrangement for suppressing parasitic signals in coaxial cables is of simple construction and is effected with a measurement circuit, with a sheath choke, and picking up the signal at the sheath conductor before and after the sheath choke, subtraction of the parasitic signal being possible both by a passive unit and also by an active unit. It is
30 advantageous that in the case of using a passive unit, a repeater or an operational amplifier is adequate for subtracting the parasitic signals. For optimum adaptation of the subtraction to irradiation by different parasitic signals, an active unit is advantageous, e.g. in the form of a processor. In order to optimise the process, the phase and amplitude of the parasitic signal are adapted to the parasitic signal of the inner conductor so that subtraction

of the signals enables good suppression of the parasitic signals.

Embodiments of the invention are shown in the drawing, and explained in greater detail in the following description.

Figure 1 shows a telecommunications system

Figure 2 shows a schematic diagram of signal paths and

Figure 3a-c shows possible variants of parasitic signal suppression.

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Figure 1 shows the schematic structure of a telecommunication system in which the subscriber terminal 1 is linked to a coaxial cable 2 comprising an inner conductor 3 and a sheath conductor 4. An amplitude and phase adapter 5 attaches to the outer conductor 4, and is connected on the output side to a subtraction unit 6. The subtraction unit is connected to the inner conductor 3 on the input side and to an earth. The procedure for carrying out the process is described in greater detail with reference to Figure 2. The parasitic
20 signal 3 introduced into the cable moves together with the actual useful signal 7 along the inner conductor of the coaxial cable as a total signal 9. The parasitic signal 8 that runs on the outer conductor 4 of the coaxial cable is very similar to the parasitic signal of the inner conductor. The two parasitic signals differ mainly in their amplitude, since propagation on the outer conductor of the cable is not perfect. Phase differences can therefore also occur as well as frequency-dependent amplitude differences in the transmission of the parasitic signals. Amplitude and phase
30 adaptation must therefore be carried out before subtraction of the parasitic signal detected in the sheath conductor.

Figure 3a shows a passive variant of the arrangement for suppressing parasitic signals. The coaxial cable is enclosed by a sheath choke 10, or is wound on it. The sheath conductor signal is sensed before and after the sheath choke, viewed in the signal direction. The signal picked up passes through the

phase and amplitude adapter 5 and is passed to a transformer 12 with the total signal of the inner conductor 3. The parasitic signals are subtracted via the transformer 12 on the inner or outer conductor, and the useful signal can be picked up on the output side of the transformer.

A further possibility is to use an operational amplifier 13 connected on the input side to the inner conductor 3, to an earth and to the pickup of the parasitic signal 8. The total
10 signal 9 on the inner conductor 3 is high at the non-inverting input of the amplifier, and the parasitic signal 8 that has already passed through the amplitude and phase adapter is high at the inverting input of the amplifier.

Another variant for achieving the arrangement for suppressing parasitic signals is shown in Figure 3c. The signals on the inner conductor 3 consisting of the total signal 9 and the detected parasitic signal 8 are high at a processor 14. With the aid of such a processor, both the phase and amplitude
20 adjustment of the parasitic signal 8 can be carried out, as well as the subtraction from the total signal of the parasitic signal detected on the sheath conductor. Such an active unit also makes it possible to adapt to changed circumstances for the whole transmission system. Thus simpler adaptation to changed interference frequencies, parasitic signal field strengths and introduction or forwarding mechanisms is simple to achieve.

The use of the arrangement for suppressing parasitic signals
30 in a cable distributed network is easy to achieve. The passive arrangement can be integrated into any existing cable network without extensive circuitry requirements, and can also guarantee good parasitic signal suppression, even in existing networks. Parasitic signals are moreover suppressed centrally at the head station of the distributed system or at the transition to the optical glass fibre of the feeder system so that no changes and innovations become necessary

for the numerous end customers. The use of an active subtraction unit in a distributed system offers the future prospect of guaranteeing good parasitic signal suppression even with broader band backward channels, and suppressing interference emissions with the aid of simple measurements of the parasitic signals on the sheath of the coaxial cable.

CLAIMS

1. Process for suppressing parasitic signals (8) caused by external fields in coaxial cables, in which the parasitic signals (8) are transmitted both in the inner conductor (3) and also in the sheath conductor (4) of the cable, whereby the parasitic signals (8) are detected on the sheath conductor (4) and the phase and/or amplitude of the parasitic signals detected (8) are adapted to the parasitic signals in the inner conductor (3) and taken away from a total signal (9) running in the inner conductor consisting of a useful signal (7) and the parasitic signal (8).
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2. Process for suppressing parasitic signals in coaxial cables as per Claim 1 whereby the detection (5) and the subtraction (6) of the detected parasitic signal (8) takes place before further processing of the useful signal (7).
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3. Process for suppressing parasitic signals in coaxial cables as per Claim 1 or 2 whereby processing the detected parasitic signal (8) and the useful signal (7) takes place in an adaptive unit (14).
4. Arrangement for suppressing parasitic signals in coaxial cables in which the parasitic signals are transmitted both in the inner conductor (3) and also as sheath waves in the sheath conductor (4) of the cable and in which the parasitic signal (8) is picked up from the sheath with the aid of a sheath choke (10) and that the parasitic signal (8) measured over the sheath choke (10) in the sheath (4) is fed to a compensator (6) for subtraction.
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5. Arrangement for suppressing parasitic signals as per Claim 4, whereby the compensator is a repeater (12).
6. Arrangement for suppressing parasitic signals as per Claim 4, whereby the compensator is an operational amplifier (13).
- 10 7. Arrangement for suppressing parasitic signals in coaxial cables in which the parasitic signals are transmitted both in the inner conductor (3) and also as sheath waves in the sheath conductor (4) of the cable and in which the parasitic signal is picked up on the sheath with the aid of a sheath choke (10) and that the parasitic signal (8) measured over the sheath choke (10) in the sheath (4) is fed to an active unit (14) for subtraction.
- 20 8. Application of the arrangement as per Claims 4 to 7 whereby the suppression of parasitic signals is used in the backward channel of a TV distributed network.

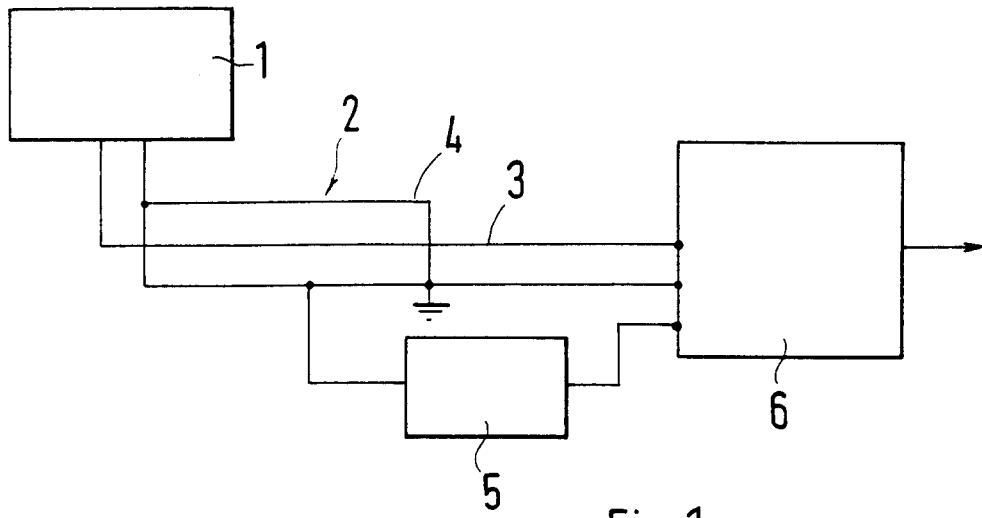


Fig.1

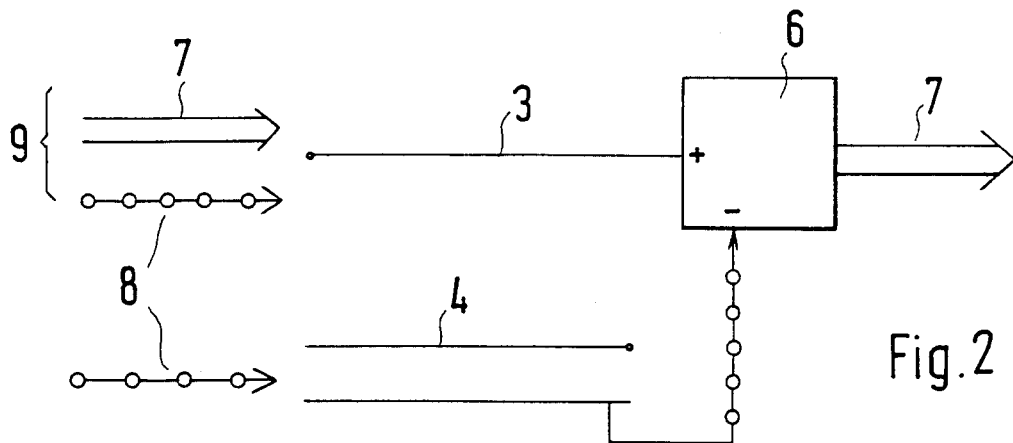


Fig.2

