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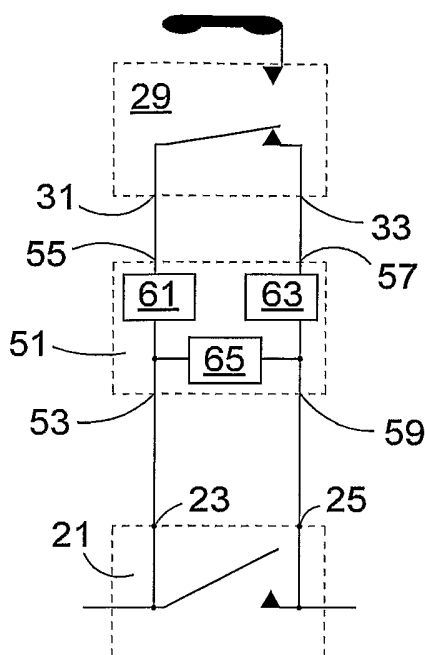
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(54) Title: APPARATUS FOR HIGH-SPEED DATA CONNECTION



(57) Abstract: Usually, a DSL modem must be inserted in the first telephone outlet. The inventive adapting device enables the connection of the DSL modem in any outlet, especially for installations where the telephone outlets are connected in series, but also for parallel outlets, or in a mixed topology. The adapting device is arranged to be connected between a telephone (29) and a telephone outlet (21), and comprises - a first and a second low-pass filter (61) each connected between a terminal at the telephone outlet and a telephone terminal, - a high-pass filter connected between a first and a second terminal of the telephone outlet. The computer can be connected in any telephone outlet if this adapting device is inserted in the other outlets. A switch may be provided to the high-pass filter to enable the automatic selection between a computer connection and a telephone connection in the same outlet.

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Apparatus for high-speed data connection**Technical Field**

5 The present invention relates to an adapting device as defined in the preamble of claim 1 and to a telephone and a telephone outlet as defined in the preamble of claim 4 and 5, respectively, and to a telephone connection as defined in the preamble of claim 6.

Background and Related Art

10 A traditional telephone connection uses frequencies up to approximately 3400 Hz. Speech occupies the frequency range of 300 – 3400 Hz. The ring signal is approximately 20Hz and in addition a DC current is provided. The Digital Subscriber Line (DSL) technology works by modulating the data signals to higher frequencies 3400 Hz.

15 DSL also works together with Integrated Services Digital Network (ISDN), where the speech signal is digitized occupying frequencies up to about 100 kHz. The speech and data signals are separated by means of a diplex filter, that is, a combined high-pass filter, which lets the data through and a low-pass filter letting speech and lower frequency signals through.

20

In countries, such as Sweden, where telephone outlets belonging to a single subscriber are connected in series, only the first outlet in the series may be used for the data connection. If the DSL modem and the computer are connected at a later outlet the data connection will be interrupted if a telephone connected earlier in the series goes off hook.

25

One solution to this problem is to use a cable of sufficient length between the first telephone outlet and the computer. This is often impractical.

WO 01/06751 discloses an internal computer network for use within a flat or a building, where the telephone lines within the flat are used for transmitting data and telephone signals. The telephone outlets included in the internal network are connected in parallel. A junction box is used to separate the internal network from the PSTN network.

WO 01/805434 discloses a similar internal network as the one disclosed in WO 01/06751, wherein a combination of wireless and wired communication can be used.

WO 02/056575 discloses a telephone outlet enabling telephone and data equipment to be connected to a telephone line via a common connector. The outlet comprises a built-in low-pass filter. If an unfiltered signal is desired at a particular outlet, the low-pass filter can be bypassed by using two other pins in the connector, not normally used for the telephone connection. In all the embodiments discussed in this document the outlets are connected in parallel.

Object of the Invention

Thus, it is an object of the present invention to enable the connection of a DSL modem in any one of a number of serially connected telephones.

Summary of the Invention

This object is achieved according to the invention by an adapting device arranged to be connected between a telephone and a telephone outlet, said device comprising:

- a first input/output terminal connectable to a first outlet terminal,
- a second input/output terminal connectable to a first telephone terminal,
- a third input/output terminal connectable to a second outlet terminal,
- a fourth input/output terminal connectable to a second telephone terminal,
- a first low-pass filter connected between the first and second input/output terminals,
- a second low-pass filter connected between the first and second input/output terminals, and

- a high-pass filter connected between the first and fourth input/output terminals.

This adapting device separates the high-frequency data signal from the low-frequency telephone signal and forwards only the telephone signal to a telephone.

- 5 The data signal bypasses the telephone connection and is combined again with the telephone signal after the telephone connection. By inserting such an adapting device in each telephone outlet before the one where the computer is connected, the computer can be connected in any telephone outlet. This is particularly useful if the telephone outlets are connected in series, but it can also be used where the outlets
10 are in parallel, or in a mixed topology.

- The cut-off frequencies of the filters should be selected to match the appropriate cut-off frequencies, which will depend on the types of connections, that is, the type of telephone connection, such as Public Switched Telephone Network (PSTN) or an
15 ISDN connection and the type of DSL connection, for example, Asymmetric DSL (ADSL), High bit-rate DSL (HDSL), or Very high bit-rate DSL (VDSL). The skilled person is familiar with the various types of telephone and DSL connections available.

- 20 The adapting device may comprise a switch arranged to connect the high-pass filter either to the fourth input/output terminal or to a fifth input/output terminal, which is connectable to a DSL modem.

- In this way, the adapting device can be used in all outlets, including the one to
25 which the computer is connected. Even though adapters are only needed in the outlets before the one where the computer is connected, they may be provided in all outlets, for flexibility. Such an adapting device will also work if the telephone outlets are connected in parallel, provided adapting devices are arranged in all outlets.

The inventive adapting device may be comprised in a telephone, or in a telephone outlet, or it may be a separate unit connectable between the telephone outlet and the telephone.

- 5 According to the invention, a telephone connection comprising at least two serially connected outlets is characterized in that at least the outlet closest to the telephone network comprises an inventive adapting device.

Brief Description of the Drawings

- 10 The invention will be described in more detail in the following, with reference to the appended drawings, in which

Figure 1 shows a prior art setup for connecting a user site to a telephone station using DSL technology.

- 15 Figures 2a, 2b and 2c show a standard serial telephone outlet according to the prior art, with no telephone connected, with a telephone connected and on-hook, and with a telephone connected and off-hook, respectively.

Figure 3 shows a general embodiment of a user's site according to the invention.

Figure 4 shows an adapter according to a basic embodiment of the invention.

Figures 5a and 5b illustrate a more flexible embodiment of the invention.

20

Detailed Description of Embodiments

- Figure 1 shows a prior art setup for connecting a user site 1 to a phone station 3 using DSL technology. Each connection shown as a line in the Figure consists of a pair of wires. At the phone station 3 a telephone exchange 5 is used for handling the telephone signals, in a conventional way. A Digital Subscriber Line Access Multi-
25 plexer (DSLAM) 7 terminates a DSL line in the telephone station and is typically connected to the Internet. The telephone exchange 5 and the DSLAM 7 are both connected to a first diplex filter 9 communicating with a second diplex filter 11 at
30 the user's site 1.

Each of the diplex filters 9, 11 has three input/output terminals:

The second diplex filter is connected to a first telephone 13 and, through a DSL modem 15, to a computer 17. One or more additional telephones 19 may be connected in series with the first telephone 13.

In the prior art, the computer has to be connected at the first telephone outlet, as shown in Figure 1.

Figures 2a, 2b and 2c show a standard serial telephone outlet 21 comprising a first and a second outlet terminal 23, 25, respectively according to the prior art. Each line in the drawing corresponds to two electrical wires. The person skilled in the art is familiar with the details of such connections. Normally other outlets of the same kind will be serially connected with this outlet 21. The outlet 21 contains a switch 27, which is shown as closed in Figure 2a. Since no telephone is connected, any telephone signal is transmitted directly through the outlet to the following outlet.

In Figure 2b a telephone 29 on-hook is connected to the outlet 21. A first telephone terminal 31 is connected to the first outlet terminal 23 and a second telephone terminal 33 is connected to the second outlet terminal 25. The switch 27 is then open. The signal passes through the switch in the telephone 29 instead of directly through the outlet. The telephone 29 comprises a similar switch 35 as the one in the outlet, which is closed while the receiver is on-hook, as shown in Figure 2b. In Figure 2c the telephone receiver is off-hook. Therefore, the switch 35 in the telephone is open. Any telephone outlet connected after this telephone is cut off from the connection while the receiver is off-hook.

As can be seen from Figure 2c, if one serially connected telephone goes off-hook, the series is interrupted. The outlets connected after this telephone will not receive any signal.

Figure 3 shows a general embodiment of a user's site 41 according to the invention. In this Figure, a computer 17 is placed at the last outlet in the series, but this is not necessarily so. A telephone 19 is connected to the last outlet and there is one telephone outlet to which a telephone 13 is connected, before the last outlet. There may also be more telephones connected in series after the telephone 19. Of course, the computer may also be connected at the first outlet. In order to avoid disturbances of the data signal if the hook is lifted on the first telephone 13, a bypass unit 43 comprising a first and a second diplex filter 45, 47 are provided. The first diplex filter 45 communicates with the diplex filter at the phone station (see Figure 1). It is also arranged for low-speed communication with the telephone 13. The data signals, which have a higher frequency are transmitted directly to the second diplex filter 47, which also receives the telephone signal from the first telephone 13.

At the last outlet there is a third diplex filter 49 communicating with the second diplex filter 47. The third diplex filter 49 communicates with a telephone 19 and a DSL modem 15, which in turn communicates with the computer 17.

If there are more than two serially connected telephones each of the telephones before the DSL modem must be provided with a bypass unit 43 comprising a configuration of two diplex filters as the ones 45, 47 shown for the first telephone 13.

Figure 4 shows a simple adapter 51 according to a basic embodiment of the invention. The adapter is connected between the outlet 21 and the telephone 29. Again, please note that each line indicating a connection in Figure 4 really comprises a pair of wires. Each wire may be connected to a single connector, so that each terminal discussed in connection with Figures 2a, 2b, 2c and 4 is implemented as two connectors.

The adapter 51 comprises a first input/output terminal 53 for connection to the first outlet terminal, a second input/output terminal 55 for connection to the first telephone terminal, a third input/output terminal 57 for connection to the second telephone terminal and a fourth input/output terminal 59 for connection to the second outlet terminal.

A first low-pass filter 61 is connected between the first 53 and the second 55 terminal. A second low-pass filter 63 is connected between the third 57 and the fourth 59 terminal. Between the first and the fourth terminal 53, 59 a high-pass filter 65 is connected.

The cut-off frequencies of the filters 61, 63, 65 are selected in such a way that the telephone signals will reach the telephone 29 whereas the data signals, which have a higher frequency, will be transmitted directly through the adapter. In this way, even if the telephone goes off-hook, the data signal will still pass through the outlet to the next serially connected outlet. The properties of the filters can be selected substantially like the ones currently used for DSL modems.

Thus, the user can choose the outlet to which the computer should be connected. At this outlet a diplex filter 49 is used to separate the telephone and data signals. On all outlets before this outlet an adapter like the one 51 shown in Figure 4 should be connected. Outlets after this outlet may, but need not have an adapter connected.

A more flexible embodiment of the adapter is shown in Figures 5a and 5b. In this embodiment the adapter 71, like the one shown in Figure 4, comprises a first input/output terminal 73 for connection to the first outlet terminal, a second input/output terminal 75 for connection to the first telephone terminal, a third input/output terminal 77 for connection to the second telephone terminal and a fourth input/output terminal 79 for connection to the second outlet terminal.

A first low-pass filter 81 is connected between the first 73 and the second 75 terminal. A second low-pass filter 83 is connected between the third 77 and the fourth 79 terminal. On the first terminal 73 one end of a high-pass filter 85 is connected. The other end of the high-pass filter 85 is connectable, by means of a switch 87, either to the fourth terminal 79 or to a fifth terminal 89 to which a DSL modem 91 is connectable. Figure 5a shows the situation where a DSL modem is not connected. In this case, the switch 87 is set to connect the high-pass filter to the fourth terminal. The adapter then functions in the same way as the one shown in Figure 4. In figure 5b a DSL modem is connected. In this case the switch connects the high-pass filter to the DSL modem, which may in turn be connected to a computer. Thus, the computer will receive the data signals through the DSL modem. The telephone signal will pass through the low-pass filter from the telephone 29 to the outlet 21, as long as the telephone 29 is on-hook.

Preferably, the switch is controlled mechanically. When the DSL modem is connected the switch automatically connects to the fifth terminal 89. In this case the switch 87 may be implemented by means of a RJ45 or RJ11 connector with built-in switch functions. Such connectors are commercially available.

Alternatively the switch may be controlled manually.

If the adapter 71 of Figures 5a and 5b is placed in all outlets, it will be possible to connect the DSL modem to any outlet. Alternatively, the DSL modem may be connected through a duplex filter, as is done when using the adapter of Figure 4.

The adapter 71 will also work when the outlets are connected in parallel, provided that adapters are placed in all outlets. Moreover, the adapter 71 will also handle a mixed parallel/serial configuration of the telephone outlets.

In the opposite direction, the signals will take the same path, i.e. the telephone signals will pass through the telephone (as long as the receiver is on-hook) and the data signals will pass through the high-pass filter thereby bypassing the telephone.

5 The physical design of the adapter according to the invention may have to vary from country to country, depending on the layout of the connecting means in each country. Alternatively, the adapter can consist of a separate box, connected to the outlet and the telephone through wires, in which case the box may remain the same.

10 In the last outlet in the series the splitter regardless of whether the adapting unit 51 shown in Figure 4, or that of Figures 5a and 5b, is used in the previous outlets. The adapting unit 71 shown in Figures 5a and 5b can be used in any outlet.

15 The adapter according to the invention can be implemented as a separate unit to be plugged in between the telephone outlet and the telephone. It can also be incorporated in the telephone. In this case, the telephone will comprise both the telephone itself 29 as shown in Figures 4, 5a and 5b, and the adapter unit 51, 71. Such a telephone can be connected to an ordinary outlet in the normal way and be used according to the invention.

20 Alternatively, the adapter can be incorporated into the outlet. The outlet will then comprise both the outlet itself 21 as shown in Figures 4, 5a and 5b, and the adapter unit 51, 71. If the outlet is modified in this way, an ordinary telephone can be connected to the outlet in the normal way and be used according to the invention.

25

Claims

1. An adapting device (51;71) arranged to be connected between a telephone (29) and a telephone outlet (21), said device comprising:

- 5 - a first input/output terminal (53;73) connectable to a first outlet terminal (21),
- a second input/output terminal (55;75) connectable to a first telephone terminal (29),
- a third input/output terminal (57;77) connectable to a second outlet terminal (21),
- 10 - a fourth input/output terminal (59;79) connectable to a second telephone terminal (29),
- a first low-pass filter (61;81) connected between the first and second input/output terminals (53, 55;73,75),
- a second low-pass filter (63;83) connected between the first and second input/output terminals (57, 59;77,79),
- 15 - a high-pass filter connected between the first and fourth input/output terminals (53, 59;73,79).

20 2. An adapting device according to claim 1 wherein the cut-off frequencies of the filters are selected to enable ADSL.

25 3. An adapting device according to any one of the preceding claims further comprising a switch (87) arranged to connect the high-pass filter (85) either to the fourth input/output terminal (59) or to a fifth input/output terminal (89) which is connectable to a DSL modem (91).

4. A telephone comprising an adapting device (51; 71) according to any one of the preceding claims.

5. A telephone outlet comprising an adapting device (51; 71) according to any one of the claims 1 - 3.

5 6. A telephone connection comprising at least two serially connected outlets characterized in that at least the outlet closest to the telephone network comprises an adapting device (51; 71) according to any one of the claims 1-3.

1/2

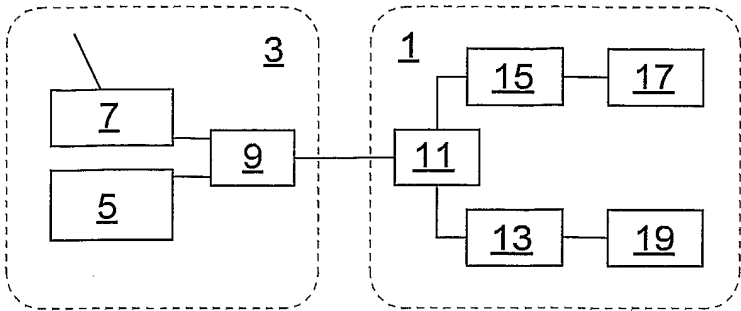


Fig. 1
Prior art

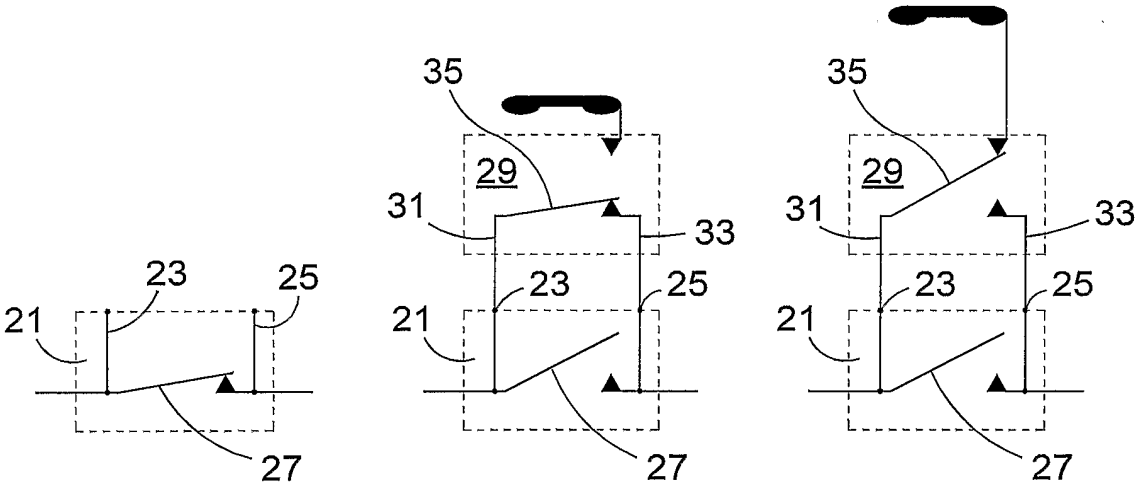


Fig. 2a
Prior art

Fig. 2b
Prior art

Fig. 2c
Prior art

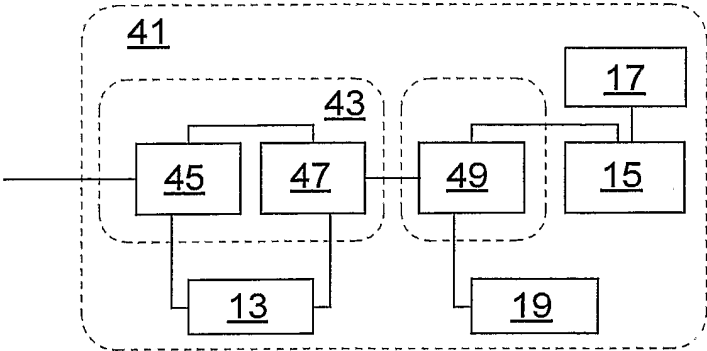


Fig. 3

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Fig. 4

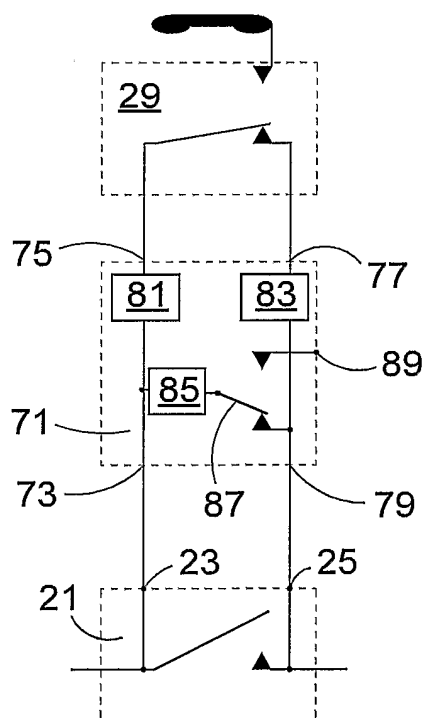
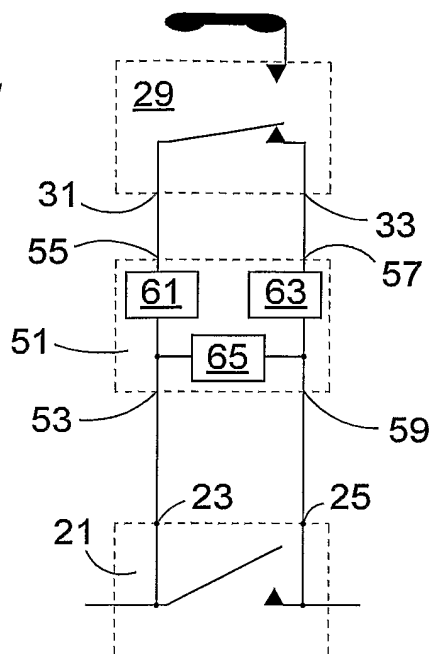


Fig. 5a

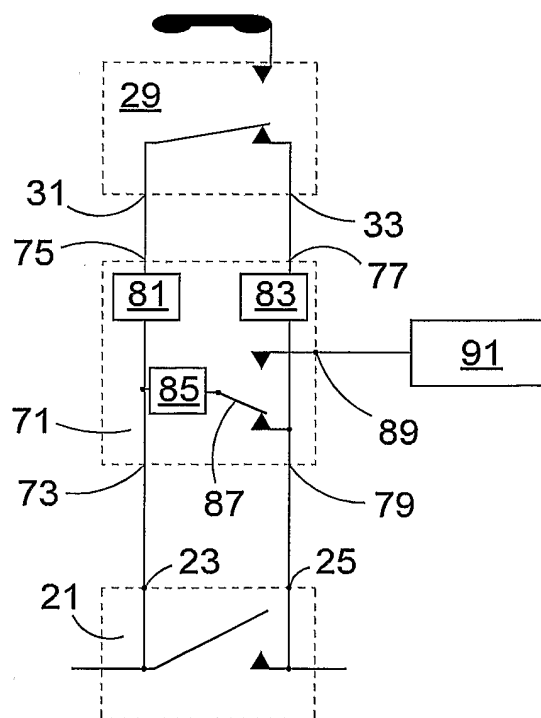


Fig. 5b

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 2005/001145

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H04M 11/00, H04Q 11/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: H04M, H04Q, H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A	US 6690677 B1 (BINDER, Y), 10 February 2004 (10.02.2004) --	1-6
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A	US 5841841 A (DODDS, D E ET AL), 24 November 1998 (24.11.1998) --	1-6

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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INTERNATIONAL SEARCH REPORT

International application No.

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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