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(54) **Hybrid conference system**

(57) The present invention is related to a delegate unit (1) for use in a conference system comprising a first module (10) arranged for operating said delegate unit in a wired mode, a second module (20) arranged for operating said delegate unit in a wireless mode and a motherboard (5) provided with a physical interface (30) for connecting with either said first or said second module. The invention further relates to a conference system (100) comprising at least one such delegate unit (1) and a central unit (2) arranged for connecting with the delegate unit.

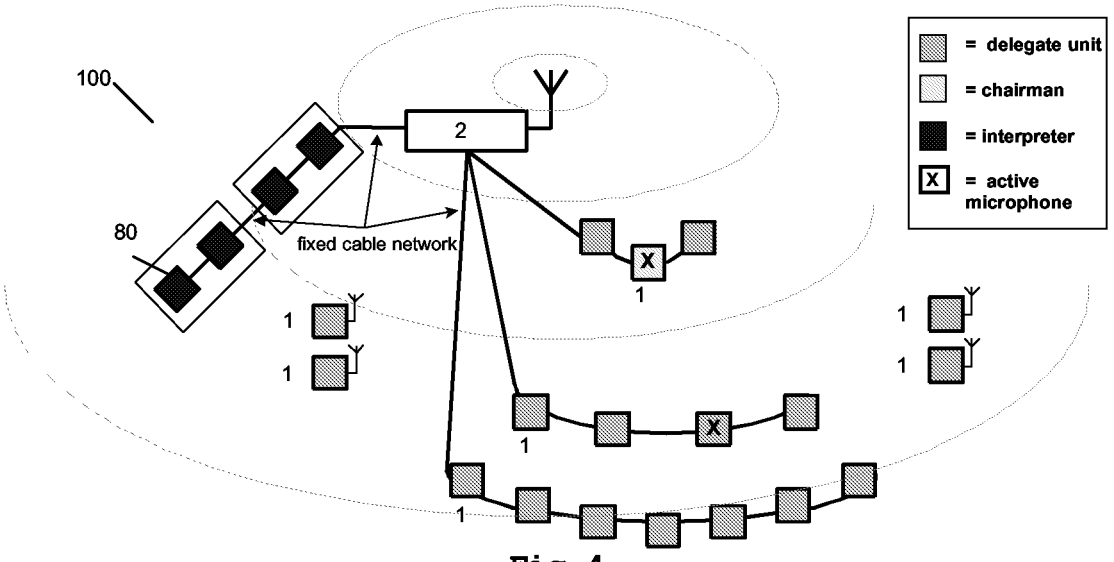

Fig.4

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Description

Field of the invention

[0001] The present invention relates to a conference system comprising a central unit and at least one delegate unit connectable to the central unit.

State of the art

[0002] A conference system includes a central unit in connection with several delegate units for the participating delegates. The central unit serves to combine audio channels from various delegate units and for distributing the received audio and data channel and combinations of these channels. In the prior art solutions these delegate units are connected to the central unit either by using a fully wired or a fully wireless infrastructure. It is not possible to use a mixture of both. This substantially reduces the flexibility of the digital conference system.

[0003] A fixed wired conference system requires a lot of preparation when a temporarily extension of the conference room is necessary. Cables need to be placed between the additional delegate units and the central unit. This is especially difficult when cables are mounted in the furniture or the central unit is placed in a separate control room.

[0004] A wireless system requires additional managing. For instance the wireless link quality and the remaining battery capacity need to be monitored. Special interventions, like replacing the battery or changing the transmit frequency or power, are necessary when a monitor signal reaches a certain threshold. It is most likely that a conference system is placed in a dedicated room where it possible to provide a fixed cabling. Utilising a wireless system in these circumstances requires unnecessary additional managing for the fixed wireless units.

[0005] In conference systems with simultaneous interpretation the speaker's channel is translated in a number of languages. This translation is performed by interpreters preferably in acoustically isolated rooms. For this reason it is not possible to use a wireless conference system due to a high RF attenuation.

[0006] Therefore there is a need for a conference system that overcomes these drawbacks and that allows the use of a mixed wired/wireless infrastructure.

[0007] Patent application WO2005/117409 relates to a conference system comprising a central unit and speaker units connectable to the central unit. The central unit is provided with an adaptive filter for suppressing feedback. Each speaker unit comprises an adaptive filter coupled between a microphone and a loudspeaker. When the speaker unit is not activated, the adaptive filter serves as an echo canceller, while serving as a feedback suppressor when the speaker unit is activated.

Aims of the invention

[0008] The present invention aims to provide a conference system that does not suffer from the drawbacks related to the use of either wireless or wired systems known in the state of the art.

Summary of the invention

[0009] The present invention relates to a delegate unit for use in a conference system comprising a first module arranged for operating the delegate unit in a wired mode, a second module arranged for operating the delegate unit in a wireless mode and a motherboard provided with a physical interface for connecting with either the first or the second module.

[0010] In a preferred embodiment said motherboard of the delegate unit comprises detection means for detecting which module is connected. The detection means preferably comprises a reading means for reading an identifier on the connected module. The reading means is advantageously a processor or a field programmable gate array (FPGA).

[0011] In an advantageous embodiment at least one of said modules is provided with an EEPROM.

[0012] In a further embodiment the motherboard is arranged for modifying the protocol used for connecting the physical interface with either the first or the second module.

[0013] Typically the second module comprises a RF section comprising an antenna and a transceiver.

[0014] In a specific embodiment at least one of the modules is arranged for operating according to at least two different protocols. Alternatively, the delegate unit may comprise a plurality of modules, whereby each module is arranged for operating the delegate unit either in wired mode or in wireless mode according to a different protocol.

[0015] In a second aspect the invention relates to a central unit for use in a conference system. The central unit comprises first connection means for establishing a connection with a delegate unit, said delegate unit arranged for use in wired mode, and second connection means for connecting said delegate unit when the delegate unit is arranged for use in wireless mode.

[0016] In a preferred embodiment the first and second connection means each are in a separate module. In an alternative embodiment the first and second connection means are placed in an integrated module.

[0017] Preferably the second connection means comprises an output connector for connecting an external antenna.

[0018] In another aspect the invention relates to a conference system comprising a central unit as previously described and at least one delegate unit as described.

[0019] Advantageously the conference system further comprises at least one interpreter unit. The central unit preferably is arranged for receiving an interpreter chan-

nel signal from the at least one interpreter unit.

[0020] In a preferred embodiment the conference system further comprises a wireless access point in connection with the central unit. Advantageously the second connection means of the central unit is disabled when the conference system is in operation. Typically the wireless access point is connected to the central unit by a wired network.

Short description of the drawings

[0021] Fig. 1 represents a delegate unit with a motherboard and an add-on module for operation in wired mode.

[0022] Fig. 2 represents a delegate unit with a motherboard and an add-on module for operation in wireless mode.

[0023] Fig. 3 represents a general view of the conference system according to the present invention.

[0024] Fig. 4 represents a hybrid conference system with wired and wireless delegate units in connection with the central unit.

[0025] Fig. 5 represents a conference system according to the invention, provided with a wireless access point.

Detailed description of the invention

[0026] The conference system according to the present invention allows connecting a delegate unit either by cables or by a wireless connection. The central point in the system remains the central unit, which is given additional functionality such that it is capable of dealing with an infrastructure comprising both wired and wireless delegate units.

[0027] In prior art conference systems the mechanical design is fixed and cannot be adapted easily in order to allow for other functions. In the approach according to the present invention an advantageous design for the delegate units is employed. A delegate unit (1) according to the invention comprises a motherboard (5), a first add-on module (10) for operation as a wired unit and a second add-on module (20) for operation in wireless mode. The mechanical design of the delegate units provides an open place where the two add-on modules can easily be placed and replaced, e.g. by a click system.

[0028] The add-on module (10) (see Fig.1) for operation in wired mode comprises the specific components required for making the delegate unit (1) operable as a wired unit :

- network drivers (12) for transmitting and receiving data on a wired network,
- connectors (14) to connect the unit to the network,
- DC/DC conversion means (16) for converting the incoming voltage to a working voltage,
- interface (30) to the motherboard (5).

[0029] The add-on module (20) (see Fig.2) for operation in wireless mode comprises the specific components required for making the delegate unit (1) operable as a wireless unit :

- a RF section comprising
  - o front end (22) comprising a power amplifier, switch, filters, ...
  - o base band CPU (24) for modulation, encoding/decoding, ...
  - o transceiver (26) for transmitting and receiving a RF signal,
  - o antennas (28)
- battery management comprising a DC/DC converter, an external DC connector to connect an external wall adapter, an external DC contacts to charge the battery,
- a battery pack,
- interface (30) to the motherboard (5).

[0030] So, the network/module specific components are placed or connected on one board. This way, two different modules (10,20) are obtained which make it possible to use the delegate unit (1) as a wired or wireless unit. The modules are so designed that the same physical interface (30) can be used for connecting to the motherboard (5). The interface communication protocol used between the motherboard and the add-on module depends on the components placed on the module. Different protocols may be used for different modules. Some possible protocols that can be provided on an add-on module include Ethernet, Cobranet, WLAN, ... depending on whether the module is intended for a wired or wireless module. Optionally there are more than two add-on modules, each operable either in wired mode or in wireless mode and each arranged for operating according to a different (wired or wireless) protocol. Alternatively, an add-on module may comprise specific components for operation in one protocol as well as other specific components for operation according to a second protocol (whereby both protocols are either for wired mode or for wireless mode).

[0031] The motherboard (5) comprises a processing unit for filtering the desired channels from the network stream (i.e. the collection of various audio channels (microphone channels in the uplink), the floor channel in the downlink - Fig.3) or signals received from the central unit, such that the desired audio channels can be listened to via headphone or loudspeaker. The processing unit is also arranged for modifying the uplink network stream or for preparing the uplink antenna signal if the microphone from the delegate unit is activated. The motherboard is capable of detecting which module is attached and can adjust the interface protocol between the motherboard and the add-on module to allow bidirectional communication. In a fully bidirectional bit synchronised wired network for example, the data (audio, control, ...) is placed

in downlink and uplink frames. Each audio channel (floor channel, interpreted channels) has a fixed position in the frame. These frames are transmitted on the wired network with a LVDS link. Therefore on the add-on module an LVDS network driver and receiver is necessary. In addition, the interface between motherboard and add-on module is modified in a way that data communication is possible between the processing unit on the motherboard and network drivers. In this example this can be LVDS (low voltage differential signalling) or TTL logic depending on the network drivers and receivers used. Placing the delegate units in daisy chain makes it possible for each delegate unit to receive the transmitted data from the central unit and, if needed, to add data in the uplink stream. At system start-up the motherboard learns which module has been connected by reading the identifier on the module. This identifier can be implemented in many ways. One possible way consists in simply adding an N-bit digital ID on the module that is read by a processor or FPGA on the motherboard. Another way to implement the identifier is to assign a serial number range to each kind of module, such that a module's serial number falling within a given range identifies the kind of module. A serial number is programmed in the add-on module to allow unique identification of the module. Together with this identifier the motherboard knows the module's hardware and software version. The identifier can be used to select the interface communication protocol.

[0032] In an embodiment of the present invention the identification and interface protocol selection is combined. An FPGA on the motherboard is used together with an EEPROM (Electrically Erasable Programmable Read Only Memory) that programs the FPGA during start-up. If this EEPROM is placed on the add-on module, the identification can be realised by the code inside the EEPROM. The FPGA takes care of the interface protocol and as the FPGA code is loaded from the used add-on module during start-up, the interface protocol is matched to the components used on the add-on module. This technique can be further extended for different network types by placing the network specific components on the module and programming the FPGA with the EEPROM in a way such that at start-up the correct interface protocol is used between motherboard and add-on module.

[0033] The central point in the conference system according to the invention is the central unit (2), which is comprises a processing unit, interconnection means and RF input/output means. Fig.3 illustrates in general a conference system according to the present invention.

[0034] The processing unit in the central unit (2) has the task to mix all incoming microphone channels on a general floor channel. Although the transmitted audio channel from a wireless delegate unit is intercepted by other wireless units, they must ignore this signal. This is done by dividing the transmitted packets from delegate and central unit into several classes. Only the classes intended for the delegate units are further processed. The packet classification is performed by a header identifier in front of the data in each packet. Next to the mixing, the central unit is also used to receive the interpreter channels from the interpreter units. Furthermore, the processing unit prepares the network stream and RF signal that is put on the wired and wireless network. This network stream contains the general broadcast channel and also the interpreter channels.

[0035] In order to connect the wired delegate units to the central unit, the central unit is equipped with connectors. Through these connectors the units and access points (cfr. infra) can be powered and have access to the network data.

[0036] A RF output connector on the central unit is used to connect an external antenna arranged for broadcasting the general floor channel and interpreter channels. A RF input connector is used to connect an external antenna to intercept the transmitted signals from the delegate units. The RF module for the central unit and the connectors for the wired network can be placed in separated modules or integrated in one module. Separated modules are interconnected by means of the wired network.

[0037] Optionally the conference system further comprises a wireless access point (50) for use as an interface between the wired and wireless network. Fig. 5 shows a configuration of a conference system with a wireless access point (50). If this element is used, the RF input and output connectors on the central unit are disabled. The advantage of using an access point is that the RX and TX antennas can be placed in an optimal position. The central unit can also be placed in another room, e.g. a control room. It suffices to have one cable between the central unit and the wireless access point. Several access points may be used in very large conference rooms. The access point (50) is connected to the central unit by using the wired network. A suitable network connector is provided. The access point further comprises a processing unit for transforming the wired network into the wireless network and vice versa. No other manipulations on the network stream are performed. The media access control is implemented in the processing unit. The front-end of the access point (50) comprises a baseband processor and transceiver+antennas for signal transmission and reception. RF input/output connection means are provided for connecting an external antenna for intercepting transmitted signals from the delegate units and for broadcasting the general floor channel and interpreter channels.

[0038] In a preferred embodiment the conference system comprises a central unit (2) and a plurality of delegate units (1) (e.g. up to 100 or even more). Facilities for simultaneous interpreting are provided. A specified number of channels can be simultaneously mixed on a general floor channel. The mixing is done by the central unit. Each delegate unit has a loudspeaker that can play back the floor channel. The floor channel can also be distributed to external equipment. The microphone channels are further subdivided in president channels and del-

egate channels. These channels share the same physical characteristics, but are treated differently on the application layer. A delegate unit can be assigned to a certain audio channel by the central unit. A delegate unit has the possibility to request access to an audio channel. Therefore a control channel is used. The central unit responds and assigns the delegate a free audio channel.

[0039] The floor channel can be simultaneously interpreted into different languages by interpreter units (80) that are connected to the central unit (2) by wires. Each delegate unit can choose an interpreter channel for his headphone. This means that each delegate unit is able to receive all interpreter channels and to choose the selected channel. Changing the interpreter channel should be possible without interaction with the central unit. Next to the audio channels there are data channels in the uplink and downlink. These data channels must have at least the same data rate as the audio channels. If a delegate wants to send data on the data channel he must request permission from the central unit using the control channel.

[0040] As the system uses a centralised approach. all channel assignments and other settings are controlled by the central unit.

[0041] Although the present description presents the invention as a conference system in a conference room or hall, it is immediately apparent to those skilled in the art that the same conference system can also be applied e.g. in an airplane, a boat, a bus, ...

Claims

1. Delegate unit (1) for use in a conference system, said delegate unit comprising a first module (10) arranged for operating said delegate unit in a wired mode, a second module (20) arranged for operating said delegate unit in a wireless mode and a motherboard (5) provided with a physical interface (30) for connecting with either said first or said second module.

2. Delegate unit as in claim 1, wherein said motherboard (5) comprises detection means for detecting which module is connected.

3. Delegate unit as in claim 2, wherein said detection means comprises a reading means for reading an identifier on said connected module.

4. Delegate unit as in claim 3, wherein said reading means is a processor or a field programmable gate array (FPGA).

5. Delegate unit as in any of the claims 1 to 4, wherein at least one of said modules is provided with an EEPROM.

6. Delegate unit as in any of claims 1 to 5, wherein said motherboard (5) is arranged for modifying the protocol used for connecting said physical interface (30) with either said first or said second module.

7. Delegate unit as in any of the previous claims, wherein said second module (20) comprises a RF section comprising an antenna and a transceiver.

8. Delegate unit as in any of the previous claims, at least one of said modules (10,20) is arranged for operating according to at least two different protocols.

9. Delegate unit as in any of claims 1 to 7, comprising a plurality of modules (10,20), whereby each module is arranged for operating said delegate unit (1) either in said wired mode or in said wireless mode according to a different protocol.

10. Central unit (1) for use in a conference system, said central unit comprising first connection means for establishing a connection with a delegate unit, said delegate unit arranged for use in wired mode and second connection means for connecting said delegate unit when said delegate unit is arranged for use in a wireless mode.

11. Central unit (1) as in claim 10, wherein said first and second connection means each are in a separate module.

12. Central unit (1) as in claim 10, wherein said first and second connection means are placed in an integrated module.

13. Central unit (1) as in any of claims 10 to 12, wherein said second connection means comprises an output connector for connecting an external antenna.

14. A conference system (100) comprising a central unit (2) as in any of claims 10 to 13 and at least one delegate unit (1) as in any of claims 1 to 9.

15. Conference system (100) as in claim 14, further comprising at least one interpreter unit (80).

16. Conference system (100) as in claim 15, wherein said central unit (2) is arranged for receiving an interpreter channel signal from said at least one interpreter unit.

17. Conference system as in any of claims 14 to 16, further comprising a wireless access point (50) in connection with said central unit (2).

18. Conference system as in claim 17, whereby, in operation, said second connection means of said cen-

tral unit (2) is disabled.

19. Conference system as in claim 17 or 18, wherein said wireless access point (50) is connected to said central unit by a wired network.

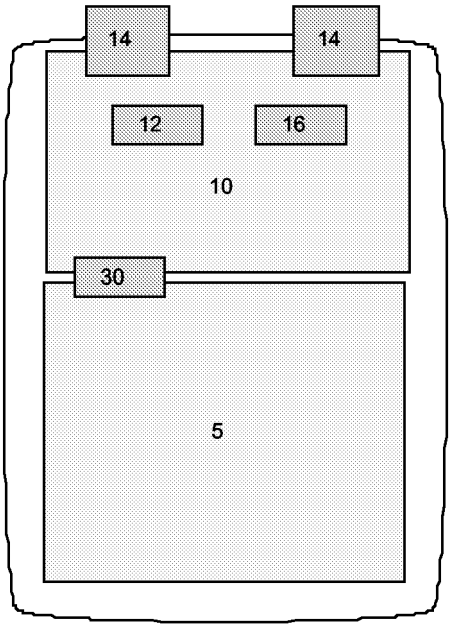
14
14
12
16
10
30
5

Fig.1

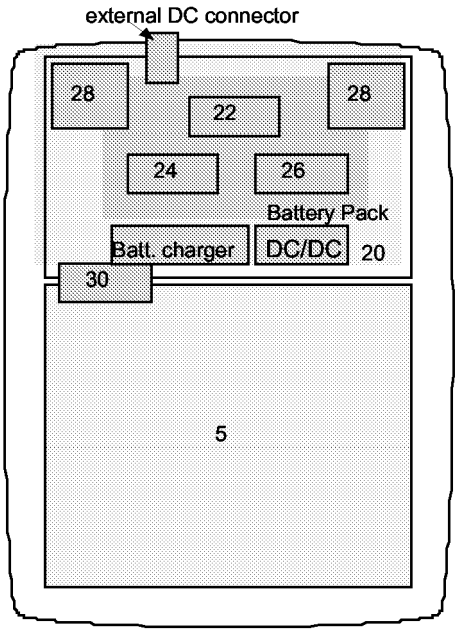
external DC connector
28
28
22
24
26
Battery Pack
Batt. charger
DC/DC
20
30
5

Fig.2

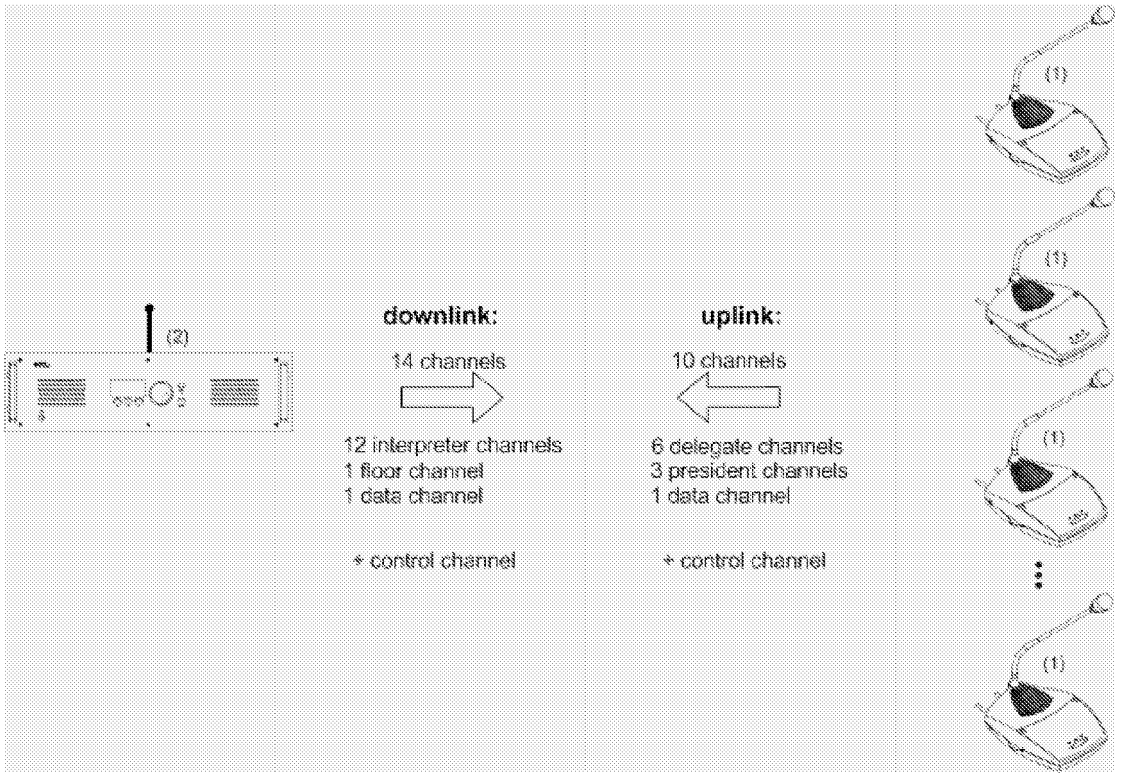
(2)
downlink:
14 channels
12 interpreter channels
1 floor channel
1 data channel
+ control channel
uplink:
10 channels
6 delegate channels
3 president channels
1 data channel
+ control channel
(1)
(1)
(1)
(1)

Fig.3

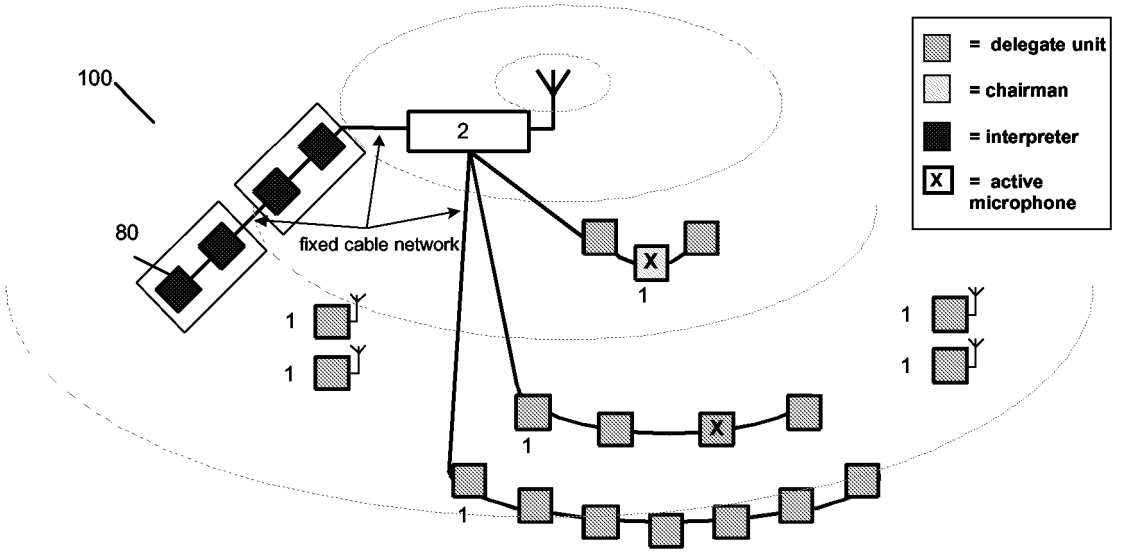
100
2
80
fixed cable network
= delegate unit
= chairman
= interpreter
= active microphone
X
1

Fig.4

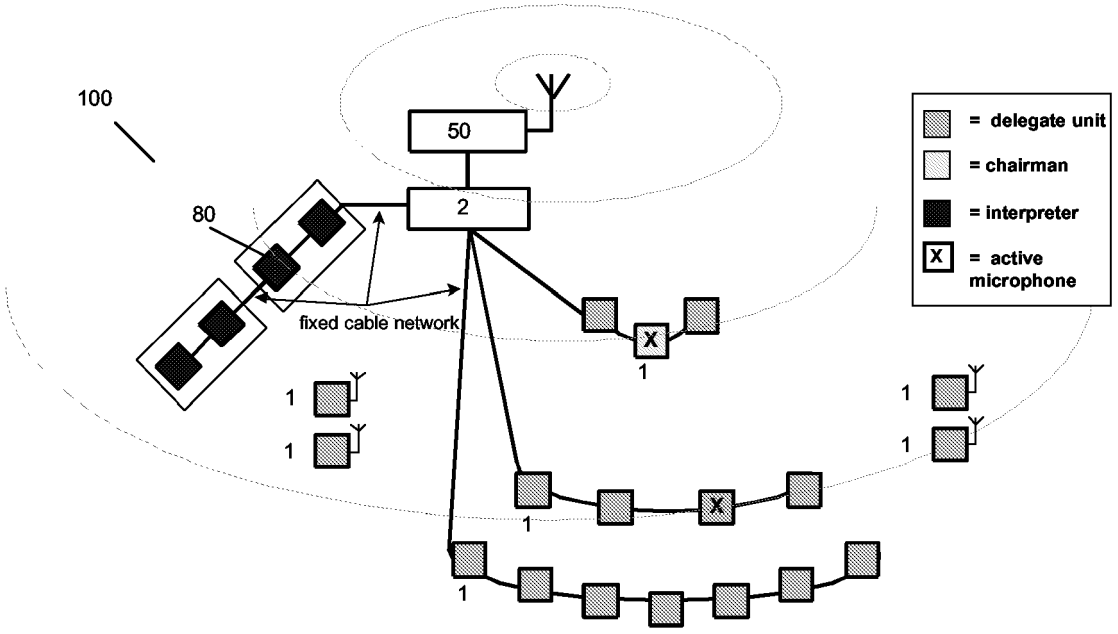
100
50
2
80
fixed cable network
1
1
1
1
1
1
1
= delegate unit
= chairman
= interpreter
= active microphone

Fig.5

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 11 6247

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2005/175188 A1 (CHEN CHIN-CHUN [TW]) 11 August 2005 (2005-08-11) * paragraphs [0018], [0019]; figures 1-4 *	1-19	INV. H04R27/00
A	DE 10 2004 037856 A1 (FRAUNHOFER GES FORSCHUNG [DE]) 23 February 2006 (2006-02-23) * paragraphs [0019], [0023], [0035] - [0037], [0051] *	1-19	
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TECHNICAL FIELDS SEARCHED (IPC)

H04R
H04M

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	25 October 2006	Sorrentino, Andrea

CATEGORY OF CITED DOCUMENTS

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25-10-2006

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REFERENCES CITED IN THE DESCRIPTION

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