

Hearing aid having selectable programmes, and method for changing the programme in a hearing aid

The present invention relates to a hearing aid having a number
5 of selectable programmes for different listening situations, where said hearing aid is adapted for the use with different input sources. The present invention moreover relates to a method for changing the programme in such a hearing aid.

It is commonly known to use several input sources in connection with hearing aids. Such input sources may *inter alia* comprise several microphones, an FM radio receiver, and a telecoil pick-up. Usually
10 the hearing aid has a number of user selectable programmes for various listening situations.

Ideally, each user selectable programme uses the best possible
15 combination of input sources, in order to allow the user to hear those sounds of interest to him. Prior art hearing aids consequently have a number of user selectable programmes. Thus, in the street the user could select a programme "Street" with a high degree of omnidirectionality, allowing him to be aware of the traffic around him, this programme
20 then emphasising on the signals from the omnidirectional microphone, and suppressing or even excluding the signals from the directional microphones. In a personal conversation in an otherwise quiet room the user could select a programme "Conversation" with a high degree of directionality, i.e. with the emphasis on the directional microphones. In a
25 conversation in noisy surroundings such as a cocktail party, emphasis of a programme "Cocktail" would be on the directionality, and suppression or exclusion of the signals from the omnidirectional microphones. Similarly a programme "Auditorium", suitable for distributed high noises scattered around the user, but with an emphasis on the forward directionality so as to hear the speaker at the lectern in the bottom of the
30 auditorium, could be used.

For situations where the best possible combination of input sources include more specialized input sources, such as telecoil pickups or FM radio, the prior art hearing aids have user selectable programmes,

e.g. "Telecoil" or "FM", for these. The term specialized in this respect is to mean that these sources, unlike microphones, cannot be used everywhere, but only where appropriate infrastructure exists. Typical places where such infrastructure exists are auditoriums, churches and other places where audiences are addressed.

In such places the user will have to switch to the programme "Telecoil" or "FM" in order to better hear e.g. the speaker.

The problem with the prior art is that the user selectable programme for the specialized sources may be good for use with the specialized source, but not necessarily good for the user in the remainder of the environment in which the specialized source is used. Moreover it may not suit the preferences of the user.

Another problem if appropriate programmes exist for all possible combinations of input devices and listening situations, the user may resented with far too many possibilities, to be able to cope with them. In this respect DE 102004025691, which is incorporated herein by reference, discloses a hearing aid in which the hearing aid attempts to determine the current listening situation, and presents the user with a reduced set of selectable programmes. The user himself must then select the appropriate programme.

Example embodiments may overcome at least the above problems.

In a first aspect of the invention, there is provided a hearing aid having a number of programmes for different listening situations, a number of background programmes for use with different input sources and associated with respective listening situation programmes, means for allowing the user to select among the listening situation programmes, and means for detecting activation of an additional, or alternative, input source and for automatically selecting an appropriate background programme in dependence of said detection and in dependence of the listening situation programme currently selected at the time of the detection.

In a second aspect of the invention, there is provided a method for changing the programme in a hearing aid, wherein the user selects a listening environment programme and the hearing aid, in response to the user selecting

an additional, or alternative, input source, automatically changes from a listening situation programme into a background programme, said background programme being selected in dependence of the listening situation programme.

In example embodiments, there is provided a hearing aid having a number of selectable programmes for different listening situations, where said hearing aid is adapted for the use with different input sources, and where the hearing aid comprises means for automatically selecting an appropriate programme among said number of the selectable programmes in dependence of the input sources used.

Having the hearing aid itself and not the user selecting the appropriate programme, allows the use of far more programmes for the hearing aid than the normal user could cope with in terms of selecting an appropriate one. Thus, rather than having to select a specific programme for the use with the specialized input sources, or having to select an ap-

propriate programme among a multitude of programmes for numerous specific situations, the user only has to select one, leaving the rest of the selection to the hearing aid.

In example embodiments, there is provided a method for changing the programme in a hearing aid, wherein the programme used by the hearing aid is automatically changed by said hearing aid from a first programme to a second programme in response to the selecting of an additional, or alternative, input source.

The user will thus not have to select more than one programme, the hearing aid in which the method is implemented, will select a more appropriate programme once the additional, or alternative, input source is activated.

According to a preferred embodiment of the hearing aid according to the invention, the means for automatically selecting an appropriate programme comprises means for detecting the attachment of an additional, or alternative, input source to said hearing aid and selecting said appropriate programme in dependence of said detection. Thus, if the additional, or alternative, input source is an auxiliary part to be attached to the hearing aid, the hearing aid will automatically select the most appropriate programme upon attachment to the additional, or alternative, input source.

According to a preferred alternative embodiment of the hearing aid according to the invention, said means for automatically selecting comprises means for detecting user activation of an additional, or alternative, input source to said hearing aid and selecting said appropriate programme in dependence of said detection. Thus, if the additional, or alternative, input source is a built-in facility of the hearing aid, the user will only have to activate the source, upon which the hearing aid switches to the most appropriate programme.

According to a further preferred embodiment of the hearing aid according to the invention, said means for automatically selecting an appropriate programme is furthermore adapted to select an appropriate programme in dependence of a first programme currently selected at the

time of said detection. This allows the user simply to select the most appropriate programme for the situation, e.g. "Auditorium" when he enters. Then, when the speaker using the telecoil or FM radio comes on, the user only needs to activate the telecoil pickup or FM receiver, respectively, and the hearing aid will automatically switch to the most appropriate programme.

According to yet another preferred embodiment, the hearing aid further comprises means for detecting the removal of an additional, or alternative, input source to said hearing aid and returning the hearing aid to the first programme. Thus, when the speaker stops using the telecoil or FM radio, the user can simply remove the telecoil pickup or the FM receiver, upon which the hearing aid will return to the programme "auditorium".

Similarly, the hearing aid may comprise means for detecting user deactivation of an additional, or alternative, input source to said hearing aid and returning the hearing aid to the first programme, if the hearing aid is of the type having built-in telecoil pickup or FM receiver.

According to a preferred embodiment of the hearing aid according to the invention, at least some of said appropriate programmes may only be selected automatically. This reduces the number of choices, which the user has to choose between, and the risk selecting an inappropriate programme for a given situation.

According to a preferred embodiment of the method according to the invention, the programme is automatically changed in response to user selection of an additional, or alternative, input source. Thus, the user only needs to select an appropriate programme for the listening environment. Then, later, when the additional source is activated, the hearing aid, in which the method is implemented, automatically selects an appropriate programme.

According to one preferred embodiment of the method according to the invention, said user selection is effected through the attachment of an additional, or alternative, input source to the hearing aid. Thus, the user need only perform one action, i.e. attaching the addi-

tional, or alternative, input source to the hearing aid. He does not subsequently need also to manually select this source.

According to yet another preferred embodiment of the method according to the invention, the second programme is selectable only by the hearing aid. As indicated above, this reduces the number of options which the user has to cope with.

Example embodiments will now be described in greater detail, based on non-limiting exemplary embodiments in connection with the drawings.

In the drawings,

fig. 1 is flow chart of the method according to the invention, and

fig. 2 is a hearing aid according to the invention in which the method of fig. 1 is implemented.

In fig. 1 an embodiment of the method according to the invention is depicted as a flow chart.

The method according to the invention starts in 101. Then in 102, the user selects a desired programme among a number of user selectable programmes. Incorporating such selectable programmes in hearing aids is well known. Information to this can be found in the patents US-A-4471171, US-A-4425481 and US-A-4187413 incorporated herein by reference. This programme could be one among numerous such as "Street", "Conversation", "Cocktail" or "Auditorium".

Some of these user selectable programmes may have associated background programmes according to the invention, which are not user selectable, e.g. "Auditorium with Telecoil" or "Auditorium with FM radio".

If the user selects "auditorium", the hearing aid will start, in 103, using the settings for this programme as set up during the initial fitting of the hearing aid to the user, and using a first group of input sources, giving the desired match of directionality and omnidirectionality in respect of parameters such as amplification and signal strength as well as noise suppression and the like.

Presuming now that the user is sitting in an auditorium fitted with FM radio via which the speech of a lecturer can be heard, and that the user wants to use this option, he activates the FM receiver as an ad-

ditional, or alternative, input source. If the FM receiver is built-in in the hearing aid this can be done by pressing an appropriate button, e.g. on a remote control or on the hearing aid itself. If the FM receiver is not built-in he may instead attach it to the hearing aid.

5 104 represents a means for detecting the selection of an additional, or alternative, input source such as the FM receiver. If or when, in 104 the detection means in the hearing aid detects the selection of the additional, or alternative, input source the hearing aid selects an appropriate background programme in 105, where e.g. the level of the input
10 signal from the FM receiver matches the level of the first input sources.

 If no background programme is associated with the user selected programme, e.g. because the user has forgotten to switch away from the "Street" programme, the hearing aid may first switch to an alternative programme, e.g. "Auditorium" and then subsequently switch to
15 the background programme "Auditorium with FM radio". As an alternative to the automatic selection, the hearing aid may just point the user to one or more programmes having an associated background programme, allowing the user to decide himself which one to use. Here it should be noted that "Street" is just an example of a programme, where
20 no background programme exists. It does not exclude that "Street" could have an associated background programme for FM radio. The latter is merely a matter of fitting, in principle background programmes could be associated to all first programmes during the initial fitting of the hearing aid to the user. Alternatively they could all be inherently present
25 in the hearing aid from the production thereof, e.g. coded therein.

 From this point the hearing aid uses the background programme "Auditorium with FM radio" selected in 105 using both first and second input sources as indicated in 106, until in 107 the de-selection of the additional, or alternative, input source is detected. The de-selection
30 evidently could be both the detachment of the attached additional, or alternative, input source, or the deactivation of a built-in additional, or alternative, input source.

 When the hearing aid detects the de-selecting of the second or additional input source it returns to using the first input sources in 103

in accordance with the user selected programme as originally selected in 102. Alternatively, if the originally selected programme did not have an associated background programme and a background programme associated to another programme was selected, the hearing aid may return
5 to that programme instead. In the example above that would mean returning from "Auditorium with FM radio" to "Auditorium" instead of "Street".

It should be noted that it is not necessarily so that each of the first programmes, which has associated background programmes, has
10 its own set of unique background programmes. In order to save storage space for the parameters and the like associated with each of the programmes, it may be convenient to associate the same background programme to several first programmes. An example could be similar programmes, such as a general programme for "Low noise", the programme "Auditorium" or a program "Church", which would all direct to
15 the same background programme, when the telecoil pickup is activated or attached.

Moreover it should be noted at in order to save storage space in the hearing aid it is not necessary to allocate a full programme location
20 in order to code the parameters of a background programme. If e.g. a user selectable programme comprises following parameters or control data blocks: overall gain for the programme, gain in individual frequency bands and control parameters for directionality, then it would for the volume balance between microphones and e.g. FM receiver only be necessary to store a data block with the overall gain for the FM receiver,
25 with which the gain can be adjusted in relation to the overall gain for the programme.

Similarly, if the use of an additional, or alternative, input source only necessitates a compensation for the frequency characteristics, it is
30 sufficient to store gain values for the individual bands. In one embodiment these may be stored as additive values. Thus, a gain setting is stored, and when the background programme is activated, the value is added to the corresponding parameters of the first programme. How this is done depends on the actual construction of the hearing aid, but is

within reach of the skilled person.

Fig. 2 illustrates a hearing aid 1 according to the invention. The hearing aid comprises a housing 2, containing the electronics including input microphones. An additional input device 3 such as an FM receiver
5 or a telecoil pickup has been attached to the hearing aid 1 via a shoe 4. Upon the detection by the hearing aid 1 that the additional input device has been attached, the hearing aid 1 changes the programme from the currently selected programme using the first input sources, i.e. the built-in microphones, to a background programme using the first input
10 sources and second input sources such as a telecoil pickup or FM radio in the additional input device 3, as the case may be.

It is also conceivable to have the possibility of using a plurality of different types of additional input devices, so that e.g. multiple different types of FM receivers can be used with the hearing aid. Each input
15 device may be assigned a specific device identification code to identify the type of input device to the hearing aid, and the identification code may be taken into account on the selection of programme. Hence in a system adapted for selection of an input device among M devices of N different types, a total of $M \times N$ programme storage positions are re-
20 quired. If J different types of FM receivers form part of the N different types of devices, then the device identification code will point to which of the J specific storage positions to be used. The identification code can be passive, e.g. by a set of contacts making up a binary code, or active so that a binary code is transmitted to the controller choosing among the
25 programmes.

A particularly simple embodiment the user cannot select programme, i.e. there is only one user selectable programme, but one or more background programmes.

P A T E N T C L A I M S

1. A hearing aid having
 a number of programmes for different listening situations,
5 a number of background programmes for use with different input
sources and associated with respective listening situation programmes,
 means for allowing the user to select among the listening
situation programmes, and
 means for detecting activation of an additional, or alternative,
10 input source and for automatically selecting an appropriate background
programme in dependence of said detection and in dependence of the
listening situation programme currently selected at the time of the
detection.
- 15 2. The hearing aid according to claim 1, comprising means for
detecting the removal of the additional, or alternative, input source to
said hearing aid and returning the hearing aid to the listening situation
programme currently selected at the time of the detection.
- 20 3. The hearing aid according to claim 1, comprising means for
detecting user deactivation of an additional, or alternative, input source
to said hearing aid and returning the hearing aid to the listening
situation programme currently selected at the time of the detection.
- 25 4. The hearing aid according to any one of the preceding claims,
wherein at least some of said background programmes may only be
selected automatically.
- 30 5. The hearing aid according to any of the preceding claims,
comprising means to respond to the event of activation of an additional
input source while in a listening environment programme that has no
associated background programme by switching into a listening
situation programme that does have an associated background
programme and then into the associated background programme.

6. The hearing aid according to any of the preceding claims, comprising means for selection among different background programmes depending on an identification of the specific input device.

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7. A method for changing the programme in a hearing aid, wherein the user selects a listening environment programme and the hearing aid, in response to the user selecting an additional, or alternative, input source, automatically changes from a listening situation programme into
10 a background programme, said background programme being selected in dependence of the listening situation programme.

8. The method according to claim 7, wherein said user selection is effected through the attachment of an additional, or alternative, input
15 source to the hearing aid.

9. The method according to claim 7 or 8, wherein the background programme is selectable only by the hearing aid.