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(54) **FEEDBACK MANAGEMENT FOR HEARING AID**

RÜCKKOPPLUNGSBEHANDLUNG FÜR EIN HÖRGERÄT

GESTION DE L'EFFET DE RETROACTION POUR PROTHESE AUDITIVE

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EP 1 120 008 B1

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Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a method of managing acoustic feedback in hearing aids. Feedback is a problem, which occurs in a hearing aid when the acoustic output signal from the hearing aid propagates beside an ear mould or through a vent and consequently enter the hearing aid microphone as an acoustic input. The hereby closed acoustic loop will especially for frequencies above 1-2 kHz often cause the hearing aid to howl, which disables the function of the hearing aid.

[0002] During time several attempts have been made to avoid or to reduce the feedback problems of hearing aids. Previously known methods comprise the use of a high frequency cut-off filter to reduce the gain for the feedback management. This method can have the form of an isolated filter to be individually adjusted, but suffer from a drawback in that when the volume control of the hearing aid is turned down and hereby reduces the gain of the feedback frequencies, the filter is still in action reducing the high frequency gain. Another known method comprises a combination of the volume control and a high frequency cut-off filter meaning that when the volume control is turned up and hereby increases the gain of the hearing aid, the filter goes gradually into action and reduces the high frequency gain. The drawbacks of this scheme being that until now this could not be individually adjusted and secondly that the steepness of this filter was a modest 6 dB/octave.

[0003] The objective of the present invention is to provide a method for feedback management, which reduces the feedback problems without the previously mentioned drawbacks.

SUMMARY OF THE INVENTION

[0004] The objective of the invention is achieved by a method, which is characterised by:

- using a multi (two or more) channel type of filter hereby splitting the frequency range up in two or more separate parts
- determining the maximum allowable gain in at least one frequency range before feedback occurs
- monitoring the volume control in such a way, that if the maximum allowable gain before feedback occurs is reached or exceeded, the gain is manipulated for an offending frequency range.

[0005] By such a method the above mentioned drawbacks of the previously known methods are remedied and the feedback management may be adjusted individually for the actual user.

[0006] In a further embodiment the determining of the maximum gain before feedback occurs and the monitoring the volume control is applied for several channels.

[0007] By using a multi channel type of filter it is possible by proper selection of the crossover frequencies to use the same type of filter for both feedback and adaption purposes. Using the same filter for both purposes reduces the size of the amplifier and to some extent also the cost of the amplifier.

[0008] A 1 st or preferably higher order multi channel filter can be used for feedback management and adaptation purposes. This filter has shown to possess adequate properties for the purpose of the method according to the invention.

[0009] According to the invention the hearing aid comprises a housing containing a microphone, an amplifier in connection with the microphone, a receiver in connection with the amplifier, where the amplifier comprises a multi channel type of filter, a control system for controlling the gain in at least one channel, and control means for monitoring the volume control in the at least one channel.

[0010] In a further embodiment the determining of the maximum gain before feedback occurs and the monitoring the volume control is applied for several channels.

[0011] In a preferred embodiment the multi channel filter is adapted for both feedback management and adaptation purposes.

[0012] The invention will be explained more detailed in the following with reference to the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] FIG. 1-2 are drawings showing the function of a method according to the invention:

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0014] In the FIGS. 1 to 2 the multi channel filter has as an example been chosen to be a two channel type filter along with a suitable crossover frequency.

[0015] From FIG. 1 a situation appears where the feedback management has been disabled and the volume control functions in a conventional manner. The volume control comprise in this example 15 steps, each step defining a 2 dB increase or decrease of gain. All frequencies are subjected to the same increase or decrease of gain depending on the setting of the volume control.

[0016] From FIG. 2 a situation appears, where the maximum allowable gain in the high frequency channel before feedback occurs has been determined to volume control (VC) setting -12 dB. If the user exceeds this setting of the volume control, the control system takes over and for example keeps the gain in the high frequency channel constant and allows only an increase in gain for the low frequency channel.

[0017] The number of channels, step size, the number of steps etc. may in this connection be chosen different from the above example.

Claims

1. A method of managing acoustic feedback in a hearing aid comprising a user-operable volume control and a filter with at least a first and a second frequency channel, wherein a maximum allowable gain before feedback occurs has been determined for the first frequency channel thereby defining for the first frequency channel a corresponding maximum setting of the volume control, the method comprising:
 - monitoring the setting of the volume control;
 - increasing the gain in the first and second frequency channel as the volume control setting increases; and
 - in dependence on the volume control setting exceeding the maximum setting, keeping the gain in the first frequency channel constant or only slightly increased while allowing an increase in gain in the second frequency channel.
2. A method according to claim 1, wherein the filter is of first order or higher.
3. A method according to claim 1 or 2, wherein the filter is used for feedback management or for adaptation purposes or both.
4. A hearing aid adapted to be operated according to the method of any of the preceding claims.
5. A hearing aid according to claim 4 and comprising a housing containing a microphone, an amplifier in connection with the microphone, a receiver in connection with the amplifier, wherein the amplifier comprises the filter, a control system for controlling the gain in the first frequency channel and control means for monitoring the volume control in the first frequency channel.

Patentansprüche

1. Verfahren zum Handhaben einer akustischen Rückkopplung in einem Hörgerät umfassend eine nutzerbedienbare Lautstärkesteuerung und ein Filter mit mindestens einem ersten und einem zweiten Frequenzkanal, wobei für den ersten Frequenzkanal eine maximale gewährrbare Verstärkung, ab der eine Rückkopplung auftritt, bestimmt worden ist, wodurch für den ersten Frequenzkanal eine entsprechende Maximaleinstellung der Lautstärkesteuerung bestimmt ist, das Verfahren umfassend:
 - Überwachen der Einstellung der Lautstärkesteuerung;
 - Erhöhen der Verstärkung in dem ersten und in dem zweiten Frequenzkanal mit steigender Ein-

stellung der Lautstärkesteuerung; und
 - Konstanthalten der Verstärkung in dem ersten Frequenzkanal oder Halten der Verstärkung bei einem nur leicht erhöhten Wert beim gleichzeitigen Gewähren einer Erhöhung der Verstärkung in dem zweiten Frequenzkanal, in Abhängigkeit davon, ob die Einstellung der Lautstärkesteuerung die Maximaleinstellung überschreitet.

2. Verfahren nach Anspruch 1, wobei das Filter ein Filter erster Ordnung oder ein Filter höherer Ordnung ist.
3. Verfahren nach Anspruch 1 oder 2, wobei das Filter für die Handhabung von Rückkopplung oder für Anpassungszwecke oder für beides verwendet wird.
4. Hörgerät, das ausgebildet ist, gemäß dem Verfahren nach einem der vorstehenden Ansprüche betrieben zu werden.
5. Hörgerät nach Anspruch 4, zusätzlich umfassend ein Gehäuse, das ein Mikrofon, einen Verstärker in Verbindung mit dem Mikrofon, einen Empfänger in Verbindung mit dem Verstärker beinhaltet, wobei der Verstärker das Filter, ein Steuersystem zum Steuern der Verstärkung in dem ersten Frequenzkanal und Steuermittel zum Überwachen der Lautstärkesteuerung in dem ersten Frequenzkanal umfasst.

Revendications

1. Procédé de gestion d'une rétroaction acoustique dans une aide auditive comprenant une commande de volume actionnable par l'utilisateur et un filtre ayant au moins un premier et un deuxième canal de fréquence, un gain admissible maximal avant qu'une rétroaction se produise ayant été déterminé pour le premier canal de fréquence, définissant ainsi pour le premier canal de fréquence un réglage maximal correspondant de la commande de volume, le procédé comprenant les étapes consistant à :
 - surveiller le réglage de la commande de volume ;
 - augmenter le gain dans le premier et le deuxième canal de fréquence au fur et à mesure que le réglage de la commande de volume augmente ; et
 - selon que le réglage de la commande de volume excède le réglage maximal, maintenir le gain constant dans le premier canal de fréquence ou l'augmenter seulement légèrement, tout en permettant une augmentation du gain dans le deuxième canal de fréquence.

2. Procédé selon la revendication 1, dans lequel le filtre est du premier ordre ou plus.
3. Procédé selon la revendication 1 ou 2, dans lequel le filtre est utilisé à des fins de gestion de la rétroaction ou d'adaptation, ou les deux. 5
4. Aide auditive adaptée pour être utilisée selon le procédé de l'une quelconque des revendications précédentes. 10
5. Aide auditive selon la revendication 4, et comprenant un boîtier contenant un microphone, un amplificateur connecté au microphone, un récepteur connecté à l'amplificateur, l'amplificateur comprenant le filtre, un système de commande pour commander le gain dans le premier canal de fréquence et des moyens de commande pour surveiller la commande de volume dans le premier canal de fréquence. 15

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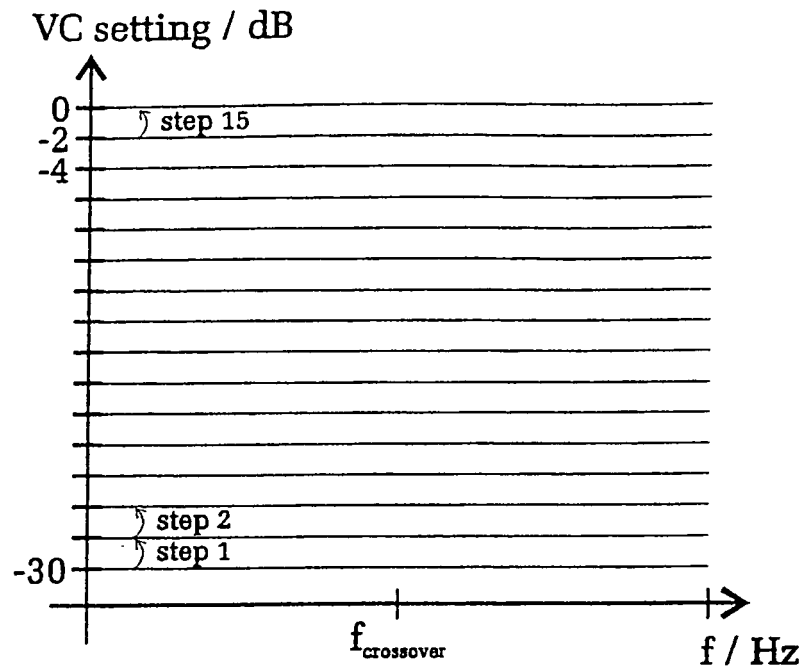
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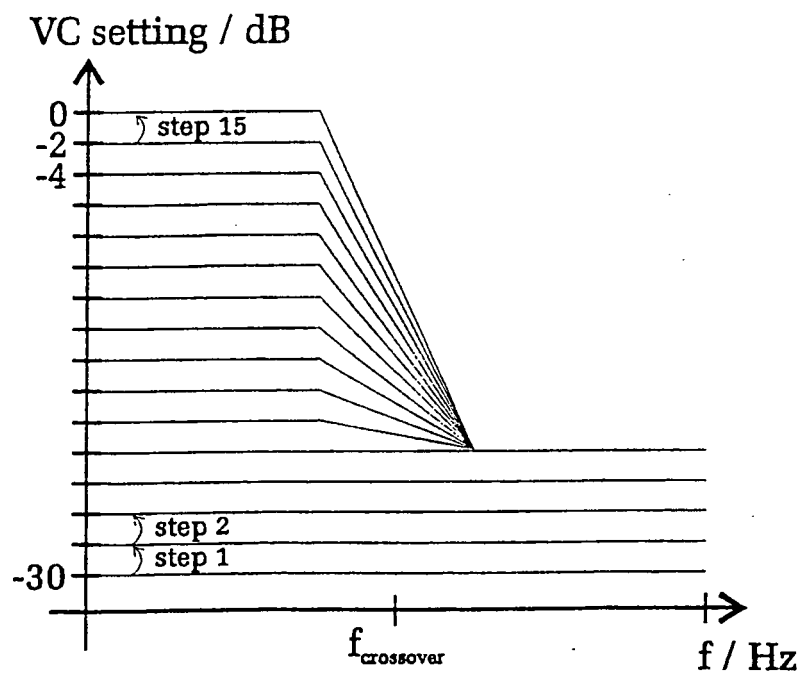
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Figur 1



Figur 2