shown in **FIG. 12** for adjusting speech processing so a user of the mobile phone can have personalized hearing parameters. The personalized hearing parameters can either be selected by a trial-and-error basis, preset values or personalized values given by a user's physician, for example.

Advantages of the Invention

[0064] Some advantages of the invention include the following:

[0065] 1) New hearing aid devices can be made available.

[0066] 2) The user's ears will not be the only channel to distribute speech for listening.

[0067] 3) People having significant hearing loss can use mobile phones easier than before (if previously at all possible). The invention will also help hearing in a noisy environment where there is typically reduced hearing capability.

[0068] 5) The invention may be implemented with only minor hardware/software modification, which is primarily related to use of the mechanical vibration component.

[0069] 6) The invention has potential for integration with other audio enhancement features, for example, such as with active background noise reduction by shifting pitch as related to background noise level to assist hearing with all other users as well.

[0070] 7) If a hearing loss will prevent someone from having conversations, they still are able to communicate with other people with the help of a mobile phone having this feature. This feature has the potential even to turn a phone into a hearing aid, leading to frequent and required every day use of the device.

[0071] 8) If a network-based solution is used, this feature will work with older phones as well and more processing power can be used. Also, a separately priced network service can be provided to a specific customer.

[0072] 9) Finally, some improvement of hearing capability can also be expected in a noisy environment with normal hearing ability as well.

Scope of the Invention

[0073] Accordingly, the invention comprises the features of construction, combination of elements, and arrangement of parts which will be exemplified in the construction hereinafter set forth.

[0074] It will thus be seen that the objects set forth above, and those made apparent from the preceding description, are efficiently attained and, since certain changes may be made in the above construction without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

We claim:

1. A telecommunications network having a mobile phone, characterized in that

the mobile phone comprises an audio-modulated vibrotactile module that responds to a telecommunications signal containing information about incoming speech from a called/calling party, for providing an audio-modulated vibrotactile module force containing information about the incoming speech from the called/calling party to vibrate a user's fingers, facial skin, wrist, cheek or other suitable location.

2. A telecommunications network according to claim 1, characterized in that

the audio-modulated vibrotactile module comprises an audio-to-vibrotactile converter that responds to the telecommunications signal, for providing an audio-to-vibrotactile converter signal containing information about a vibration modulation of the incoming speech from the called/calling party.

3. A telecommunications network according to claim 2, characterized in that

the audio-modulated vibrotactile module comprises a vibrotactile actuator that responds to the audio-to-vibrotactile converter signal, for providing the audio-modulated vibrotactile module force in the form of a vibrotactile actuator force.

4. A telecommunications network according to claim 1, characterized in that

the telecommunications system comprises an audio-to-vibrotactile converter that responds to an incoming audio signal containing the incoming speech from the called/calling party, for providing the telecommunications signal in the form of an audio-to-vibrotactile converter signal containing information about a vibration modulation of the incoming speech from the called/calling party.

5. A telecommunications network according to claim 4, characterized in that

the audio-modulated vibrotactile module comprises a vibrotactile actuator that responds to the audio-to-vibrotactile converter signal, for providing the audio-modulated vibrotactile module force in the form of a vibrotactile actuator force.

6. A telecommunications network according to claim 1, characterized in that the audio-to-vibrotactile converter includes a hardware-based signal processor for performing a vibration modulation.

7. A telecommunications network according to claim 6, characterized in that the vibration modulation includes frequency domain filtering or equalization.

8. A telecommunications network according to claim 6, characterized in that the vibration modulation includes linear/non-linear amplification.

9. A telecommunications network according to claim 6, characterized in that the vibration modulation includes mixing speech signals with other signals.

10. A telecommunications network according to claim 1, characterized in that the audio-to-vibrotactile converter includes a software-based signal processor for performing vibration modulation.