

improving audio and/or video playback quality which may be performed according to embodiments of the invention can be realized by a computer program, that is by software, or by using one or more special electronic optimization circuits, that is in hardware, or in hybrid form, that is by means of software components and hardware components.

[0021] The term “haptic” may particularly denote an excitation relating to the sense of touch, like a tactile stimulation. Haptic means may pertain to the technology of touch. There are different types of sensory neurons (mechanoreceptors) involved in the haptic modality. The haptic, or tactile, sensory modality is related to the active sense that can be used to explore the environment.

[0022] The term excitation of a “specific” body part may particularly denote that the air flow is intentionally directed (or redirected) to a predefined target body part, and not in an arbitrary or unspecific manner.

[0023] The term “portable device” may particularly denote a device which is adapted to be used independent of a fixed configuration. A portable device may be dimensioned, shaped and/or designed so that a (normal or average) human being may carry the portable device during use in a convenient manner. A portable device may have built-in communication components (like antennas) and/or an autonomous power supply (like a rechargeable battery). A portable device may be configured as a one-piece, self-contained device. “Portable devices” may particularly refer to hand-held or wearable devices. The size of portable device may be relatively small so that a user can carry and use the portable device without the necessity to install or mount it at a specific position.

[0024] The term “vent” may particularly denote a hole for the escape of gas or air. Such a vent may be formed as a void within an audio playback device (like a loudspeaker) or may be designed as a tubular conduit directing air from an air stream source to a specific target.

[0025] According to an exemplary embodiment, adding a simultaneous haptic excitation, to stimulate a body part with an air beam, may enhance an acoustic experience or perception of a user playing back music via a loudspeaker. Particularly in the bass frequency range, in which many audio or audio and video playback devices have only a medium to low audio playback capability, the audio bass feeling may be enhanced with an air stream improving the subjective sound experience. In a scenario in which an audio bass feeling is not strong enough, particularly a non-linear air flow through a vent may then act on the tactile sense of a user, thereby generating an impressive experience due to the synergistic effect of the haptic excitation and the acoustic excitation. According to another exemplary embodiment, adding a simultaneous haptic excitation, to stimulate a body part with an air beam, may enhance an visual experience or perception of a user watching moving pictures on a screen of e.g. a TV set or a monitor.

[0026] Therefore, according to an exemplary embodiment, an audio and/or video experience enhancement system may be provided using an acoustic vent output as a haptic excitation signal.

[0027] A vented acoustic system according to an exemplary embodiment may be designed in such a way that the air flow coming from the vent is directed to a (for instance naked) part of the body of a user, so as to combine the auditory perception of a bass signal with the tactile sensation of the bass signal.

This may be applied particularly advantageously in a scenario in which the vent airflow is put in its non-linear turbulent regime.

[0028] In the frequency range in which the vent is active and in which an airflow is sufficient to be felt by the user, this tactile excitation enhances the overall experience (multi-sensory excitation) and may give the user the feeling of a more powerful system.

[0029] This effect can in particular be used in small-dimensioned audio devices, for instance portable audio systems, where reinforcement of the perceived (limited) bass may be strongly desirable.

[0030] For generating the air stream, a sufficient volume of air needs to be put in motion to create a sufficiently high pressure at a low frequency.

[0031] Embodiments of the invention remedy to some extent to the fact that small sound reproduction systems are relatively poor at reproducing low frequencies in a loud way, and therefore fail to convey a sense of “weight” in the audio reproduction.

[0032] According to an exemplary embodiment of the invention, a device (which may be operable by a user) is provided, comprising an electro-acoustic transducer for rendering an input signal. Furthermore, an enclosure may be provided comprising a vent and being acoustically loadable by the electro-acoustic transducer, wherein the device may be designed in such a way that the vent outlet of the vent is directed towards a/an (naked) area to be stimulated of the body of a user while the device is operated by the user.

[0033] Such a vent may be positioned at a given distance from the area of a user to be stimulated, which distance may be preferably less than five times the diameter of the transducer. According to an exemplary embodiment, the vent may be adapted for producing a turbulent (and/or non-linear) airflow. If only a small enhancement of an audio experience is desired, even a laminar flow may be sufficient.

[0034] A sound reproduction part of such a system may comprise or may be incorporated in any device used preferably at a given distance from the body, for instance handheld sound reproduction systems, wearable jackets (for example a jacket with built-in speakers for instance), nearfield sound reproduction systems (for example a headrest of an airplane), a headphone or earphone, or a sound reproduction system further away but with an extension directed to the body of a user (for instance a PC keyboard).

[0035] By taking the measures according to exemplary embodiments of the invention, it may be possible to provide an improved perception of low audio frequencies to a user.

[0036] Therefore, exemplary fields of application of embodiments of the invention are handheld sound reproducing systems equipped with loudspeakers (audio, A/V players, portable gaming consoles). Any wearable devices, including clothing, may also be equipped with an audio system according to an embodiment of the invention. Furthermore, headphones may be provided, directing a vent to the skin of the ear or the area surrounding the ear. A sound reproducing system may be equipped with loudspeakers, placed at a few centimetres distance from a user (integrated in a plane seat headrest or in a car seat headrest, for instance). Beyond this, sound reproduction systems may be provided which can be placed further away from the user, but using a long extension (tube).

[0037] In the following, some considerations will be explained based on which exemplary embodiments of the invention may become understandable.