

**DEVICE FOR AND METHOD OF  
PROCESSING AN AUDIO SIGNAL AND/OR A  
VIDEO SIGNAL TO GENERATE HAPTIC  
EXCITATION**

FIELD OF THE INVENTION

**[0001]** The invention relates to a device for processing an audio signal and/or a video signal.

**[0002]** Beyond this, the invention relates to a method of processing an audio signal and/or a video signal.

**[0003]** Moreover, the invention relates to a program element.

**[0004]** Furthermore, the invention relates to a computer-readable medium.

**[0005]** Beyond this, the invention relates to a method of use.

BACKGROUND OF THE INVENTION

**[0006]** Audio playback devices become more and more important. Particularly, audio systems comprising audio manipulating features become more and more important.

**[0007]** U.S. Pat. No. 5,513,270 discloses vented loudspeakers for the reproduction of musical sounds, but particularly to the design and location of ports or vents that tune the enclosure. The loudspeaker system has an enclosure, having a front baffle and a pair of loudspeaker drivers mounted in the baffle. The enclosure has a hexagonal cross-section. A pair of vents are each located at a juncture of the vertical side edges of the front baffle and its adjoining panels. The vents lead into the enclosure via a conduit, which ends in an inlet. The inlet is positioned within the enclosure to face the rear of the loudspeaker driver. By this arrangement high to mid frequency sound waves radiated within the boundaries of the enclosure and entering the inlet are substantially attenuated in the conduit and low frequency sound waves radiated within the boundaries of the enclosure are reinforced with sound waves directly radiated from the front of the loudspeaker driver.

**[0008]** U.S. Pat. No. 5,555,554 discloses a headset speaker in which a driver is provided in the dome of a speaker earcup and the dome has at least one vent aperture. The vent hole is closed by a movable closure having a corresponding opening therein that permits the size of the opening into the dome to be logarithmically varied between a fully open and fully closed position. A tube tuned to enhance bass frequencies is provided extending between the driver side and rear of the earcup. An opening to the tube remains fully closed by the movable closure unless the cup vent aperture is fully closed at which time the tube is opened.

**[0009]** WO 1990/16142 discloses a ported reflex speaker enclosure for use in the automotive audio systems industry. The ported reflex speaker enclosure is primarily intended for six by nine inch standard speaker chassis used in automotive audio systems that typically are found as non-enclosed suspended speakers in the trunk compartment of automobiles. The speaker enclosure is a concave body having an oval shaped rim portion for receiving a similarly shaped speaker device, a convex bottom, a first sound fidelity enhancement reflex port for directing sound waves to a listening compartment, a second sound fidelity enhancement in the form of an exhaust hole for controlling sound wave pressure emanated from an enclosed speaker located within the concave body and a third sound fidelity enhancement in the form of equalizing notches that complement the exhaust hole's control of sound wave pressure emanated from an enclosed speaker.

**[0010]** WO 2005/025076 discloses a portable electronic device including a vibrating transducer having a resilient support and a first mass supported by the first resilient support forming a mechanical resonator, and an electrical circuit coupled to the first vibrating transducer to apply a drive signal. A plurality of tactile vibration transducers can work in unison to produce strong tactile stimulus.

**[0011]** It is further known to equip headphones, for instance directed to video game use, with vibrators, which are activated synchronously with the music and strengthen the impact of, for instance, bass sounds. A motor-created vibration may be used to replace the bass missing from the frequency spectrum reproduced by a loudspeaker. The envelope of the missing bass signal may dictate rotation of the motor, and the synchronization between the acoustic and mechanical signal may give the illusion of a full bandwidth reproduction.

**[0012]** However, it may happen with conventional audio playback systems that the perceived, subjective audio playback quality is poor, particularly in the range of bass frequencies.

OBJECT AND SUMMARY OF THE INVENTION

**[0013]** It is an object of the invention to provide an audio and/or video system having a sufficient subjective audio and/or video playback quality.

**[0014]** In order to achieve the object defined above, a device for processing an audio signal and/or a video signal, a method of processing an audio signal and/or a video signal, a program element, a computer-readable medium and a method of use according to the independent claims are provided.

**[0015]** According to an exemplary embodiment of the invention, a device for processing an audio signal and/or a video signal is provided, wherein the device comprises a haptic excitation generating unit adapted for generating a selective haptic excitation of a specific body part of a user by generating an air flow through a vent in accordance with the audio signal and/or a video signal to be reproduced.

**[0016]** According to another exemplary embodiment of the invention, a method of processing an audio signal and/or a video signal is provided, wherein the method comprises generating a haptic excitation of a specific body part of a user by generating an air flow through a vent in accordance with the audio signal and/or a video signal to be reproduced.

**[0017]** According to yet another exemplary embodiment of the invention, a computer-readable medium (e.g. a CD, a DVD, a USB stick, a floppy disk or a harddisk) is provided, in which a computer program of processing audio and/or visual data is stored which, when being executed by a processor, is adapted to control or carry out a method having the above mentioned features.

**[0018]** According to still another exemplary embodiment of the invention, a program element of processing audio and/or visual data is provided, which program element, when being executed by a processor, is adapted to control or carry out a method having the above mentioned features.

**[0019]** According to yet another exemplary embodiment of the invention, an air flow streaming through a vent of an audio or audio and video playback device and being based on an audio signal is used for directing the air flow to a part, particularly a naked part, of a human body to thereby combine an auditory perception of the audio signal with a tactile perception of the audio signal.

**[0020]** Signal processing, audio and/or visual data management and generation of a haptic excitation stimulus for