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(54) **System and method for processing audio signals**

(57) A system (1) for processing audio signals comprises an audio processing unit (9) for providing audio signals, an output unit (10) coupled with the audio processing unit (9) for receiving the audio signals and for outputting audio information based on the audio signals, a volume control device (2) which is adapted for receiving user input and controls a volume of the audio information depending on the user input, and a control unit (7) which is adapted to determine at least one parameter indicative of the volume of the audio information. In the event that

the control unit (7) determines that the at least one parameter indicates that the volume of the audio information is equal to or greater than at least one volume threshold (30, 31, 32), the control unit (7) provides an output signal to at least one component (8, 9) of the system for triggering at least one additional function other than associated with controlling the volume of the audio information. In this way, the system may be triggered to perform an additional function in the background without requiring an additional action by the user.

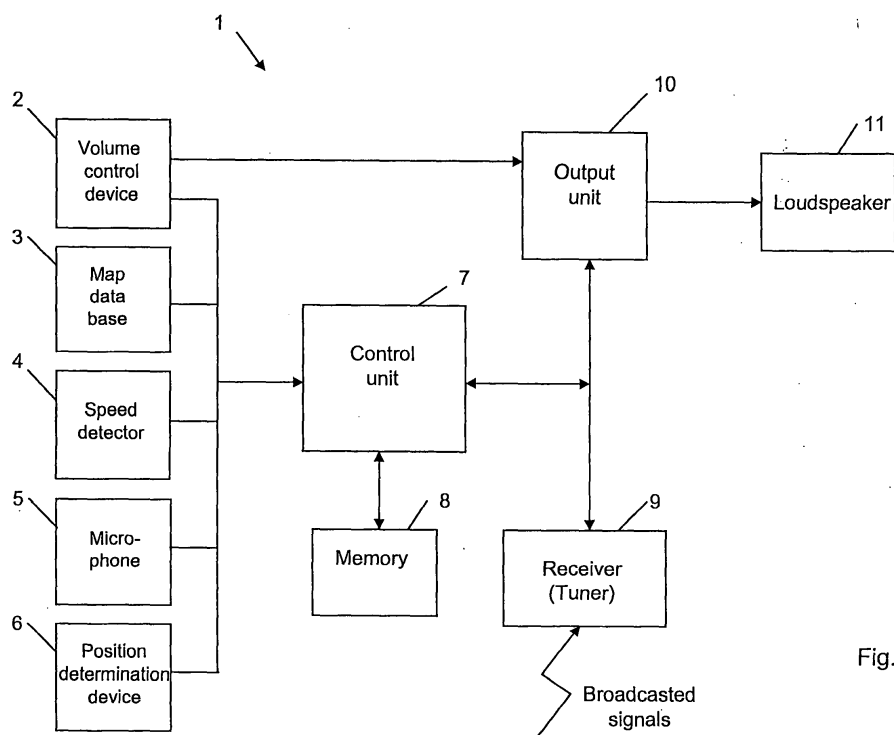


Fig. 1

Description

Background of the Invention

Field of the Invention

[0001] The present invention is directed to a system for processing audio signals comprising an audio processing unit for providing audio signals, an output unit coupled with the audio processing unit for receiving the audio signals and for outputting audio information based on the audio signals and a volume control device providing a volume control signal coupled to the output unit, wherein the volume control device is adapted for receiving user input and control a volume of the audio information output from the output unit depending on the user input. The invention is further directed to a method for processing audio signals in such a system.

Description of the Related Art

[0002] Generally, a system for processing audio signals may be a mobile or stationary electronic device which comprises an audio processing unit for providing audio signals which are coupled to an output unit which receives the audio source signals and outputs corresponding audio information based on the audio signals. For example, an audio processing unit may comprise one or multiple receivers wherein each of the receivers may comprise one or multiple tuners which are capable to tune a particular frequency band of a broadcast channel for receiving broadcasted signals. The receiver or receivers may be coupled to a respective antenna for receiving a respective broadcasted signal having a particular frequency or base band. The signals received by the receiver(s) can be seen as being any kind of signal transmitting audio content and, depending on the application, additional content of information or data (such as broadcast channel, artist of the transmitted audio information, etc.) being broadcasted on the respective broadcast channel. The broadcast signals are provided by an external information provider, such as a radio or TV broadcasting provider and/or an internet provider. In another implementation, the audio processing unit may be an audio information reproduction device such as a DVD player or MP3 player which provides audio signals read from a storing medium such as a DVD or flash memory. In order for the user to listen to the audio information, such as music, the audio signals from any audio processing unit are provided to an output unit which is coupled with the audio processing unit and outputs corresponding audio information based on the audio signals. For example, such output unit may include appropriate processing devices such as amplifiers and may include or may be coupled to one or more loudspeakers which are appropriate for outputting audible audio information. In order for the user to control the volume of the audio information, a volume control device such as a rotating knob or any

other input device is adapted for receiving user input and provides a volume control signal to the output unit to control the volume of the audio information according to the user input.

[0003] When the user is listening to audio information such as music received from a particular broadcast channel, the situation may occur that the user enjoys listening to the music and wants to record the music on a storing medium such as a recording medium implemented in the system. Further, the situation may occur that the user does not know any particulars about the currently broadcasted music, but he or she wants to know or to store any additional information about the currently heard music which may be retrieved at a later time. For example, the user may wish to store corresponding add-on information like track title, artist name or any other additional content about the currently heard music in a list of "liked music" which may be retrieved at a later time. In any such event like storing the currently heard music or any additional information thereof, the user has to perform an additional action like actuating one or more buttons for initiating recording or switching through different kinds of menus for performing a respective action, which is usually not convenient for the user and may distract from the music or any other action the user has to perform, like driving in a vehicle when the system is implemented in a vehicle.

[0004] In JP 2006-260648 A there is disclosed an audio device having an audio control part which manages music data stored in a hard disc drive in a car navigation unit according to preset lists, such as album, artist, category, and performs reproduction by outputting a music data group belonging to a list specified through an operation part or a microphone to loudspeakers. Moreover, the audio control part performs processing for imparting weighting coefficients on respective music data based on a plurality of parameters (accumulated reproduction time for every music data, etc.) showing the reproduction histories of the music data and also performs control so that the output order of the music data becomes the ascending order or the descending order of the weighting coefficients imparted on the respective music data when outputting the music data group belonging to the list to the loudspeakers.

[0005] In JP 2003-317451 A there is disclosed an audio recording and reproducing apparatus which comprises a reading means which reads music data of a plurality of pieces of music stored in a recording medium and/or music data of the music obtained through a communication means. The apparatus is also provided with a title classified music count means which counts the number of reproductions and the number of fast forwardings of the music and classifies the counts in terms of the titles of the music and a music degree of favourite computing means which computes the music degree of favourite based on the count information.

Summary of the Invention

[0006] It is therefore an object of the present invention to provide a system and method for processing audio signals of the type as described above which are capable of improving the operability of an audio processing device.

[0007] In a first aspect, there is provided a system for processing audio signals according to the features of claim 1. In a further aspect, there is provided a method for processing audio signals according to the features of claim 15.

[0008] In a first aspect, there is provided a system for processing audio signals comprising an audio processing unit for providing audio signals, an output unit coupled with the audio processing unit for receiving the audio signals for outputting audio information based on the audio signals, and a volume control device providing a volume control signal coupled to the output unit, wherein the volume control device is adapted for receiving user input and controls a volume of the audio information depending on the user input. Further, there is provided a control unit which is adapted to determine at least one parameter indicative of the volume of the audio information, wherein in the event the control unit determines that the at least one parameter indicates that the volume of the audio information is equal to or greater than at least one volume threshold, the control unit provides an output signal to at least one component of the system for triggering at least one additional function other than associated with controlling the volume of the audio information.

[0009] In a further aspect, a method for processing audio signals in a system which comprises an audio processing device, an output unit and a volume control device as described above comprises the steps of determining at least one parameter indicative of the volume of the audio information and triggering at least one additional function other than associated with controlling the volume of the audio information in the event that the at least one parameter indicates that the volume of the audio information is equal to or greater than at least one volume threshold.

[0010] According to the invention, the operability of an audio processing system can be improved since with controlling the volume of the output audio information an additional function other than associated with controlling the volume of the audio information may be triggered, so that no additional action is needed to be performed by the user. Particularly, the situation may be that the audio information currently listened to by the user shall be recorded on a recording medium. Such additional function may be triggered in the event that the volume of the audio information is controlled to be equal to or greater than at least one volume threshold. In this regard, the invention makes use of the fact that according to natural human behaviour or character, the volume of audio information is often increased in case that the audio information is much enjoyed by the user.

[0011] In a particular case, users often increase the volume of music which the user likes to listen to and, on the other hand, decreases the volume of music which the user does not like to listen to. If the volume is increased above the volume threshold, this may be used as an indication that the user may be interested in performing an additional function such as recording the music on a storing medium or storing of add-on information pertaining to the currently played music on a storing medium which may be retrieved at a later time. In this way, any additional action to be performed by the user such as selecting any menus on an input interface or actuating any additional buttons for performing such additional functions are not necessary, as any such functions may simply be triggered by detecting an increase of the volume level.

[0012] According to an embodiment of the invention, the control unit provides an output signal to a storing unit for triggering recording and storing the audio signals in the storing unit if it is detected that the volume of the audio information is equal to or greater than the volume threshold. In other words, the additional function is recording and storing the audio signals in the storing unit. Thus, the invention makes use of the fact that users often increase the volume of music which the user much enjoys to listen to, wherein upon detecting such volume increase the music is automatically recorded and stored in the storing unit and may be retrieved by the user at a later time.

[0013] According to another embodiment of the invention, if the volume of the audio information is equal to or greater than the volume threshold, the control unit provides an output signal to a storing unit for triggering storing data in the storing unit associated with the audio signals, particularly for storing data regarding an artist, track title, album title or genre associated with the audio signals. In other words, the additional function is the storing of the data associated with the audio signals in the storing unit. Therefore, using the same natural behaviour of a user as described above, in case that music currently listened to by the user is enjoyed, any add-on information associated with the music such as artist, track title, album title or genre may automatically be stored in the storing unit. In this way, a list of favourable music or list of personal preference may automatically be generated by the system which the user may retrieve at a later time.

[0014] According to another embodiment of the invention, the audio processing device comprises a receiver for receiving broadcasted signals from a broadcast channel, wherein the receiver is adapted to convert the broadcasted signals into audio signals. In the event that it is detected that the volume of the audio information is equal to or greater than the volume threshold, the control unit provides an output signal to the receiver for triggering or initiating a search in which the receiver searches for at least one broadcast channel depending on the output signal. In other words, the additional function is the search of the receiver. In this way, the system may au-

tomatically initiate a background search of the receiver for finding broadcast channels which are currently broadcasting the same or similar music, for example, originating from the same artist.

[0015] According to an embodiment, the control unit analyses data associated with the audio signals, particularly data regarding an artist, track title, album title or genre associated with the audio signals, and provides the output signal to the receiver for initiating a search in which the receiver searches for at least one broadcast channel broadcasting signals which have associated data which are at least partially the same or correspond to the data associated with the audio signals. In other words, if the currently processed audio signals are provided with add-on information (such as artist, track title, album title, or genre) associated with the audio signals the receiver searches for at least one broadcast channel which broadcasts signals having at least partially the same or corresponding add-on information, for example is broadcasting music originating from the same artist or from the same album.

[0016] The above embodiments regarding the triggering or initiating of at least one additional function other than associated with controlling the volume of the audio information may be applied alternatively or in any combination in a system according to the invention.

[0017] In the previous embodiments, when referring to data associated with the audio signals or broadcasted signals, any kind of data shall be comprised which do not include any data necessary for reproducing the audio signals to audible audio information. Rather, such data shall be understood to comprise any kind of information which is transmitted or broadcasted in addition to the information necessary for reproducing audio signals into audible audio information such as music or speech. Further, when referring to audio signals, any kind of signal shall be comprised which is appropriate for reproducing audible audio information such as music or speech, wherein audio signals may be embedded in or may be transmitted together with other kinds of signal information such as video information.

[0018] According to another embodiment of the invention, the system further comprises a detecting unit for detecting ambient sound or noise and for providing an output signal depending on the detected ambient sound or noise. The detecting unit is coupled with the control unit, wherein the control unit is adapted to set the at least one volume threshold in accordance with the output signal of the detecting unit. In this way, the volume threshold may be increased in a case in which the detecting unit detects increased ambient sound or noise, so that the additional function is not triggered by simply increasing the volume of the audio information as a result of increased ambient sound or noise.

[0019] Accordingly, in an embodiment of the invention, the control unit is adapted to increase the at least one volume threshold in accordance with the output signal of the detecting unit from a first volume threshold to a sec-

ond volume threshold in the event that the detecting unit detects an increase of ambient sound or noise from a first ambient sound value to a second ambient sound value. Therefore, in situations in which the user increases the volume of the audio information because of increased ambient sound or noise, the additional function is not triggered.

[0020] According to another embodiment of the invention, the system is implemented in a vehicle and further comprises a velocity detection unit for detecting a velocity of the vehicle and for providing an output signal depending on the detected velocity. The velocity detection unit is coupled with the control unit which is adapted to set the at least one volume threshold in accordance with the output signal of the velocity detection unit. Particularly, the control unit increases the at least one volume threshold in accordance with the output signal of the velocity detection unit in the event that the velocity detection unit detects an increase of the velocity. In this way, the system may consider increased ambient sound or noise as a result of increased velocity of the vehicle and may adapt the volume threshold accordingly, so that the additional function is not triggered if the user increases the volume of the audio information because of increased ambient sound or noise resulting from the increased velocity.

[0021] In a further embodiment of the invention, the system further comprises a map data source for providing map data and a position determination device for determining a position of the system with respect to the map data. The map data source is coupled with the control unit which is adapted to set the at least one volume threshold in accordance with the map data of the map data source and the determined position. Particularly, the control unit may increase the at least one volume threshold in accordance with the map data in the event that the position determination device determines the position of the system to be within a tunnel or on a road which causes increased ambient sound or noise when moving along the road compared to a previously used road. Therefore, in the event that increased ambient sound or noise is generated as a result of moving through a tunnel or moving along a road having a bad road surface and the user, as a result thereof, increases the volume of the audio information, the system is adapted to not trigger the additional function since the increased volume is only a result of the increased ambient sound or noise. The map data provided from the map data source may have appropriate attributes associated with the road (stored in corresponding link data) the user is currently moving along which may indicate that the position is currently within a tunnel or on a road with a bad road surface.

[0022] According to another embodiment of the invention, the control unit may provide a second output signal to at least one component of the system for triggering at least one further additional function in the event that the control unit determines that the at least one parameter indicates that the volume of the audio information is lower than at least one second volume threshold. For example,

if the user is decreasing the volume of the audio information below a second volume threshold, this may be interpreted in a way that the user wants to temporarily switch off the reproduction of the audio information. In this case, the output unit may be triggered to switch into a mute status as long as the volume is controlled to be below the second volume threshold.

[0023] According to another embodiment, the control unit analyses data associated with the audio signals, particularly data regarding an artist, track title, album title, or genre associated with the audio signals, and provides an output signal to a receiver of the audio processing unit for triggering or initiating a broadcast channel search. In the event that the control unit determines that the at least one parameter indicates that the volume of the audio information is lower than the at least one second volume threshold, the receiver does not search for at least one broadcast channel broadcasting signals which have associated data which are at least partially the same or correspond to the data associated with the audio signals. Alternatively, the receiver does not show any such broadcast channel in a search result list provided to the user. Therefore, the user is not provided with broadcast channels which broadcast music the user does not like.

[0024] Further advantageous features and embodiments of the invention may be taken from the dependent claims.

Brief Description of the Drawing

[0025] The invention will now be explained in more detail by means of embodiments in conjunction with accompanying drawings, in which:

- Fig. 1 shows a schematical block diagram illustrating a system for processing audio signals according to an embodiment of the invention,
- Fig. 2 shows an embodiment of an exemplary implementation of a volume control device,
- Fig. 3 shows schematical diagrams for illustrating different volume domains and thresholds which are used in connection with an embodiment of the invention,
- Fig. 4 shows an illustration corresponding to Fig. 3 in which volume thresholds are increased as a matter of environmental changes.

[0026] Fig. 1 shows a schematical block diagram illustrating an embodiment of a system for processing audio signals. In the following, well-known function or constructions of a system and of individual components are not described in detail as far as the skilled person is well aware of the respective function, how to implement these components or how these components work. It will be understood by those of ordinary skill in the art how such

components may be implemented in a system for processing audio signals, and the skilled person will understand that the present invention is not limited to the particular detailed descriptions.

[0027] According to Fig. 1, the system 1 comprises an audio processing unit 9 for providing audio signals. In a particular implementation, the audio processing unit 9 comprises a receiver or multiple receivers for receiving broadcasted signals from a broadcast channel. The receiver(s) may comprise multiple components or sections, such as a tuner or multiple tuners and any components associated therewith for tuning to a particular broadcast channel for receiving broadcasted signals from a particular external information provider, such as a radio or TV broadcasting provider and/or an internet provider. The receiver(s) and/or tuner(s) may be implemented in analog or digital form depending on the particular application. The receiver(s) may be coupled to one or more antennas (not shown) for receiving respective broadcasted signals, or may be connected by wire to a conductor or network (such as the internet) for receiving audio signals therefrom.

[0028] The audio processing unit 9 may alternatively or additionally be implemented as an audio reproduction unit which reads audio signals from a storing medium such as a DVD or flash memory (or any other memory type device) for reproducing stored audio signals to audible audio information. In such an embodiment, the audio processing unit does not necessarily comprise a receiver or tuner for receiving broadcasted signals.

[0029] The audio processing unit 9 is coupled with an output unit 10 which receives the audio signals provided from the audio processing unit 9. The output unit 10 is coupled to one or more loudspeakers 11 and may comprise amplifiers and any further processing elements which are necessary for processing the audio signals received from the audio processing unit 9 into audio information to be provided to the loudspeaker(s) 11 and which is made audible by the loudspeaker(s) 11. A volume control device 2 is coupled to the output unit 10, wherein the volume control device is adapted for receiving user input as to controlling a volume information of the audio information output by the output unit 10. In other words, the output unit 10 generates electrical signals depending on the user input which cause the loudspeaker(s) 11 to reproduce the audio information from the output unit 10 in a corresponding volume. For example, as shown in Fig. 2, the volume control device 2 may be implemented as a rotating knob which is rotated, for example, in the right direction for increasing the volume and in the left direction for decreasing the volume. However, any other type of volume control device may be used. Generally, the volume control device provides a volume control signal to the output unit 10 for controlling a volume of the audio information depending on the user input.

[0030] The volume control device 2 is further coupled with a control unit 7 which analyses or determines at least one parameter indicative of the volume of the audio in-

formation. For example, the control unit 7 is adapted to determine a status of the volume control device 2 and may determine the at least one parameter based on the status of the volume control device. For example, if the volume control device uses a potentiometer for providing the volume control signal, the control unit 7 may be adapted to determine the current resistance of the potentiometer which is indicative of the volume of the audio information. In this way, the resistance of the potentiometer may be taken as a parameter which is indicative of the volume of the audio information. However, any other parameter may be used, such as voltage or current associated with the potentiometer, as a parameter indicative of the volume of the audio information. In case that another type of volume control device is used, the skilled person is aware which of the parameters provided by such volume control device may be taken as an indication of the volume of the audio information.

[0031] According to another embodiment of the invention, one or multiple microphones 5 placed inside and/or outside the vehicle may be coupled with the control unit 7. By means of a microphone 5, the volume of the audible audio information output by the loudspeaker(s) 11 may be measured, wherein the microphone 5 generates a corresponding output signal which may comprise or may be taken as a parameter indicative of the volume of the audio information.

[0032] The control unit 7 may further be coupled with a map data base 3 which may act as a map data source for providing map data, such as used in common navigation systems. For example, the map data base 3 may include a DVD ROM or any other memory type device suitable for storing map data. The control unit 7 may further be coupled with a position determination device 6 for detecting the position of the system 1, in case that the system 1 is implemented in a vehicle, for detecting a vehicle position. The position determination device 6 may have or may be coupled with a navigation sensor, such as a receiver for GPS (Global Positioning System) signals, for determining the position of the system or vehicle, respectively. In this way, by means of the position determination device 6, the position of the system or the vehicle, respectively, may be determined with respect to the map data read from the map data base 3.

[0033] Moreover, the control unit 7 may be coupled with a detecting unit 5 for detecting ambient sound or noise. For example, the detecting unit 5 may be implemented as a microphone. Furthermore, the control unit 7 may be coupled with a speed detector 4 which acts as a velocity detection unit for detecting a velocity of the vehicle in which the system is implemented. Further, the control unit 7 may be coupled with a memory 8 which is appropriate for storing audio signals, such as music or speech, and additional information associated with audio signals, such as broadcast channel, artist, track title, album title or genre.

[0034] In Fig. 3, schematic diagrams are shown which illustrate exemplary volume domains and volume thresh-

olds which may be used in connection with the present invention. Particularly, Fig. 3A shows an exemplary scale of volume values from 0 - 25 indicative of the volume level of audio information output from the output unit 10. For example, a volume level from 5 - 13 as shown with volume domain 21 may be taken as a normal listening level. Accordingly, with reproduction of audio information having a volume which lies within the domain 21, it may be supposed that the user is somehow only "consuming" the audio information, for example music received from a broadcast channel. On the other hand, it may be supposed that any audio information reproduced at volume values between 13 - 25 (volume domain 22) can be taken as audio information which the user enjoys to listen to as a matter of the increased volume of the audio information. This reflects the fact that audio information, such as music, the user enjoys to listen to often causes the user to increase the volume. On the other hand, audio information which the user does not enjoy or the user does not want to listen to may be assigned to have a rather low volume level, for example between 0 - 5 according to volume domain 23 as shown in Fig. 3A.

[0035] The volume domains 21 to 23 as shown in Fig. 3A may be delimited from each other by volume thresholds 30 and 40 as shown in Fig. 3B. In the example shown therein, a first volume threshold 30 delimits a border between volume domains 21 and 22. Consequently, if it is determined that the volume of the audio information is equal to or greater than the volume threshold 30 (i.e. lies within volume domain 22) it is supposed that the user enjoys to listen to the currently reproduced audio information and further assumed that this may cause additional user's desires, such as recording and storing of the currently reproduced audio information in a storing unit so that the user may retrieve this audio information again at a later time. Furthermore, listening to audio information which the user likes to listen to may cause the user's desire to store any add-on information associated with the currently reproduced audio information, such as artist, track title, album title or genre in a storing unit. In this way, information regarding the user's personal preference may be stored and retrieved at a later time such as a list of liked music.

[0036] On the other hand, a second volume threshold 40 delimits the volume domain 21 from the volume domain 23. Accordingly, if the volume level is below the volume threshold 40, it may be supposed that the user does not like the currently reproduced audio information.

[0037] In Fig. 3C it is shown that the volume threshold 30 may be increased to a volume threshold 31 or even to a volume threshold 32 depending on particular circumstances as set out in more detail below. In a similar way, the volume threshold 40 may also be varied, although not shown in Fig. 3C.

[0038] In the following, the operation of a audio signal processing system as shown in Fig. 1 will be explained in more detail in connection with Figs. 3 and 4.

[0039] As set out above, the control unit 7 analyses

and determines at least one parameter indicative of the volume of the audio information output by the output unit 10. For example, the control unit 7 evaluates a corresponding parameter provided from volume control device 2 which is indicative of the volume level of the currently reproduced audio information. With evaluating the parameter from the volume control device 2, the control unit 7 may determine a particular volume level between 0 and 25 as shown in Fig. 3. In the event that the control unit 7 determines that the volume of the audio information output from the output unit 10 is equal to or greater than the volume threshold 30 according to Fig. 3B, the control unit 7 provides a particular output signal to at least one of the components, such as memory 8 and/or receiver 9, for triggering at least one additional function which is not associated with controlling the volume of the audio information. For example, if the control unit 7 determines the volume level to be equal to or above the volume threshold 30, it may provide an output signal to the memory 8 for initiating the recording and storing of the audio signals currently provided to the output unit 10 in memory 8. In other words, in case that the volume is increased above the volume threshold 30, the currently reproduced audio signals are also recorded and stored in the memory 8, so that in the "background" of the system the audio signals are automatically recorded and stored and may be retrieved by the user at a later time. In order to perform this additional function, the user is not required to actuate any additional input device such as pushing a button for initiating the recording process.

[0040] In a further embodiment, if the control unit 7 detects a volume of the audio information output from the output unit 10 to be equal to or greater than the volume threshold 30, the control unit 7 may provide an output signal to the memory 8 for additionally or alternatively storing data in the memory which are associated with the audio signals provided from the receiver 9, such as add-on information like artist, track title, album title or genre associated with the currently reproduced audio signals. Again, this additional function is performed in the background of the system automatically without requiring any additional input action to be performed by the user. At a later time, this information stored in the memory 8 may be retrieved by the user in order to get to know the particulars of the music or any other audio information the user enjoyed to listen to.

[0041] According to another embodiment, the control unit may also provide an output signal to the receiver 9 for initiating a search in which the receiver searches for at least one broadcast channel depending on the output signal if a volume above the volume threshold 30 is detected. For example, a search may be initiated in which the receiver searches for at least one broadcast channel which is broadcasting signals which have associated data which are at least partially the same or correspond to the data which are associated with the currently reproduced audio signals. For example, a broadcast channel may be searched which broadcasts signals having add-

on information which is at least partially the same add-on information which is associated with the currently reproduced audio signals. In this way, a background search may be performed searching for other broadcast channels which broadcast the same or similar music, e.g. of the same artist, from the same album and/or the same genre.

[0042] According to another embodiment, the control unit may also provide an output signal to the storing unit 8 or another storing unit which stores audio signals and which is operable to provide the stored audio signals to the output unit 10. For example, the storing unit 8 may store music in MP3 format such that several pieces of music are stored with associated data, such as respective artist, track title, album title, and/or genre. The control unit 7 may provide an output signal to the storing unit 8 for triggering a selection of at least a portion of the audio signals to be provided to the output unit 10, particularly depending on data regarding an artist, track title, album title, or genre associated with the audio signals. For example, the control unit 7 may trigger the storing unit 8 to output only a selection of pieces of music of a particular artist according to stored data (add-on information), which data may also be stored in the storing unit 8 or somewhere else according to any previous recording when liked music was recognized.

[0043] The situation may be that the user increases the volume as a matter of increased ambient sound or noise. If the system is implemented in a vehicle, such increased ambient sound or noise may originate from the passengers currently travelling within the vehicle or from the outside of the vehicle, or may be caused by the fact that the vehicle currently travels through a tunnel or along a road which causes increased ambient sound or noise when moving along the road compared to a previously used road. Increased ambient sound or noise may be detected by means of the microphone 5 which may provide a corresponding output signal depending on the detected ambient sound to the control unit 7. The control unit 7 is adapted to set the volume threshold 30 and/or 40 in accordance with the output signal of the microphone 5, as shown in Fig. 4. For example, if the microphone 5 detects an increased ambient noise, the volume threshold 30 is increased to volume threshold 31, and volume threshold 40 is increased to volume threshold 41. Accordingly, in case of increased ambient sound or noise, the additional function is not triggered by the control unit 7 if the current volume level is below the increased volume threshold 31.

[0044] Additionally or alternatively, the control unit 7 may analyse an output signal from the speed detector 4 which acts as a velocity detection unit and may set the volume thresholds 30 and 40 in accordance with the output signal from speed detector 4. Particularly, the control unit 7 may increase the volume thresholds 30, 40 in the event that the speed detector 4 detects an increase of the vehicle's speed which may cause increased ambient noise. Consequently, if the user increases the volume as

a matter of the increased vehicle's speed, the triggering of the additional function by the control unit 7 shall not be performed if the volume level is below the increased volume threshold.

[0045] According to a further embodiment of the invention, the control unit 7 may also be coupled with the map data base 3 and the position determination device 6 to determine whether the vehicle currently moves along a road or environment which causes increased ambient noise. For example, the control unit 7 increases the volume thresholds 30, 40 in the event that the position determination device 6 determines a position of the vehicle within a tunnel or on a road which causes increased ambient sound when moving along the road compared to a previously used road.

[0046] In the above embodiments using speed detector 4, map data base 3 and position determination device 6, an output signal from the microphone 5 may additionally be used by the control unit 7 for verifying and/or adjusting an appropriate volume threshold.

[0047] According to an embodiment, if the volume level decreases below the volume threshold 40, a corresponding output signal may be provided by the control unit 7 to any of the components 8, 9 or 10 for triggering at least one further additional function. For example, an output signal may be provided to the output unit 10 which controls the output unit 10 to enter a mute status in which no audible audio information is output from the loudspeaker (s) 11.

[0048] According to an embodiment of the invention, the thresholds 30, 31, 32 and/or 40 may be set automatically by the system, thus taking into account a user's specific behaviour and preference of audio volume. For example, if the system determines that the user is listen to audio information with a rather high volume, then the threshold(s) are increased. In other words, the system determines whether the user is "consuming" audio information with a volume different from a preset value set by the manufacturer in order to distinguish between liked/not liked audio information and normal "consumed" audio information. For example, if the system determines that the volume is above the threshold 30 for a time period longer than a specific time period (e.g., 10 min.), which may indicate that the user is "consuming" music with rather high volume, then the system increases the threshold to threshold 31, for example. This process is repeated until the system determines that the time period in which the volume is above the respective threshold is shorter than the specific time period.

[0049] While the invention has been described with reference to exemplary embodiments, it will be understood by those skilled in the art that various changes may be made without departing from the scope of claims, so that the invention is not limited to the particular embodiments.

Claims

1. A system (1) for processing audio signals, comprising:

- an audio processing unit (9) for providing audio signals,
- an output unit (10) coupled with the audio processing unit (9) for receiving the audio signals and for outputting audio information based on the audio signals,
- a volume control device (2) providing a volume control signal coupled to the output unit (10), wherein the volume control device is adapted for receiving user input and controls a volume of the audio information depending on the user input,
- a control unit (7) which is adapted to determine at least one parameter indicative of the volume of the audio information,
- wherein, in the event that the control unit (7) determines that the at least one parameter indicates that the volume of the audio information is equal to or greater than at least one volume threshold (30, 31, 32), the control unit (7) provides an output signal to at least one component (8, 9) of the system for triggering at least one additional function other than associated with controlling the volume of the audio information.

2. The system of claim 1, wherein the control unit (7) provides an output signal to a storing unit (8) for triggering recording and storing the audio signals in the storing unit.

3. The system of claim 1 or 2, wherein the control unit (7) provides an output signal to a storing unit (8) for triggering storing data in the storing unit associated with the audio signals, particularly for storing data regarding an artist, track title, album title, or genre associated with the audio signals.

4. The system of one of claims 1 to 3, wherein

- the audio processing unit comprises a receiver (9) for receiving broadcasted signals from a broadcast channel, the receiver adapted to convert the broadcasted signals into audio signals,
- wherein the control unit (7) provides an output signal to the receiver (9) for triggering a search in which the receiver searches for at least one broadcast channel depending on the output signal.

5. The system of claim 4, wherein the control unit (7) analyses data associated with the audio signals, particularly data regarding an artist, track title, album title, or genre associated with the

audio signals, and provides the output signal to the receiver (9) for initiating a search in which the receiver searches for at least one broadcast channel broadcasting signals which have associated data which are at least partially the same or correspond to the data associated with the audio signals.

6. The system of one of claims 1 to 5, comprising

- a storing unit (8) for storing audio signals and which is operable to provide stored audio signals to the output unit (10),
- wherein the control unit (7) provides an output signal to the storing unit (8) for triggering a selection of at least a portion of the audio signals to be provided to the output unit (10), particularly depending on data regarding an artist, track title, album title, or genre associated with the audio signals.

7. The system of one of claims 1 to 6, further comprising

- a detecting unit (5) for detecting ambient sound or noise and for providing an output signal depending on the detected ambient sound,
- wherein the detecting unit (5) is coupled with the controls unit (7), and the control unit (7) is adapted to set the at least one volume threshold (30, 31, 32) in accordance with the output signal of the detecting unit (5).

8. The system of claim 7, wherein the control unit (7) is adapted to increase the at least one volume threshold in accordance with the output signal of the detecting unit (5) from a first volume threshold (30) to a second volume threshold (31) in the event that the detecting unit (5) detects an increase of ambient sound or noise from a first ambient sound value to a second ambient sound value.

9. The system of one of claims 1 to 8, wherein the system is implemented in a vehicle, the system further comprising

- a velocity detection unit (4) for detecting a velocity of the vehicle and for providing an output signal depending on the detected velocity,
- wherein velocity detection unit (4) is coupled with the control unit (7), and the control unit (7) is adapted to set the at least one volume threshold (30, 31, 32) in accordance with the output signal of the velocity detection unit.

10. The system of claim 9, wherein the control unit (7) is adapted to increase the at least one volume threshold in accordance with the output signal of the velocity detection unit (4) in the event that the velocity detection unit (4) detects an increase

of the velocity.

11. The system of one of claims 1 to 10, further comprising

- a map data source (3) for providing map data and a position determination device (6) for determining a position of the system with respect to the map data,
- wherein the map data source (3) is coupled with the control unit (7), and the control unit (7) is adapted to set the at least one volume threshold (30, 31, 32) in accordance with the map data of the map data source and a determined position of the system.

12. The system of claim 11, wherein the control unit (7) is adapted to increase the at least one volume threshold in accordance with the map data in the event that the position determination device (6) determines a position of the system within a tunnel or on a road which causes increased ambient sound when moving along the road compared to a previously used road.

13. The system of one of claims 1 to 12, wherein, in the event that the control unit (7) determines that the at least one parameter indicates that the volume of the audio information is lower than at least one second volume threshold (40), the control unit (7) provides a second output signal to at least one component (8, 9, 10) of the system for triggering at least one further additional function.

14. The system of one of claims 1 to 13, wherein the control unit (7) is adapted to determine a status of the volume control device (2) and to determine the at least one parameter based on the status of the volume control device.

15. A method for processing audio signals in a system, the system comprising:

- an audio processing unit (9) for providing audio signals,
 - an output unit (10) coupled with the audio processing unit (9) for receiving the audio signals and for outputting audio information based on the audio signals, and
 - a volume control device (2) providing a volume control signal coupled to the output unit (10), wherein the volume control device is adapted for receiving user input and controls a volume of the audio information depending on the user input,
- the method comprising the steps of:
- determining at least one parameter indicative of the volume of the audio information,

- triggering at least one additional function other than associated with controlling the volume of the audio information in the event that the at least one parameter indicates that the volume of the audio information is equal to or greater than at least one volume threshold (30, 31, 32). 5

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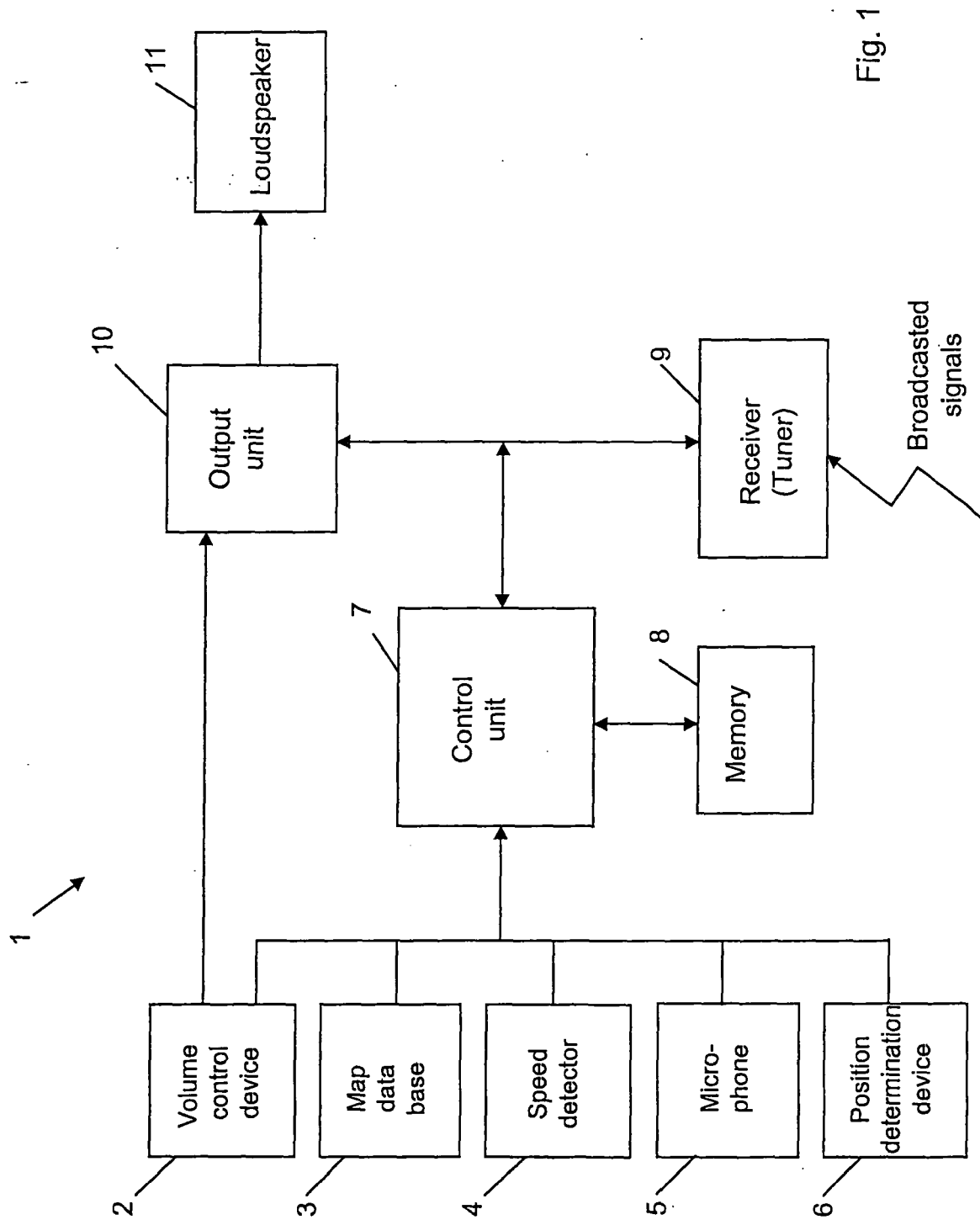


Fig. 1

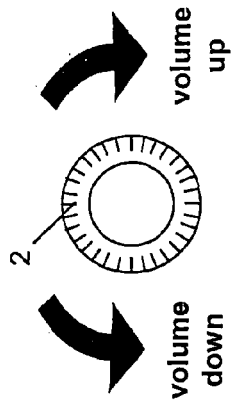


Fig. 2

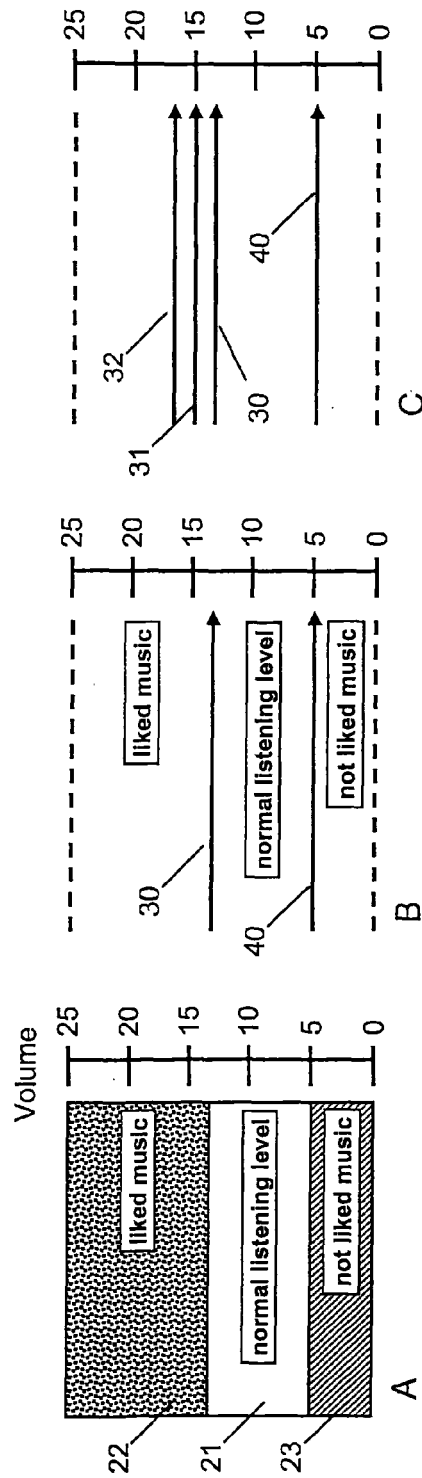


Fig. 3

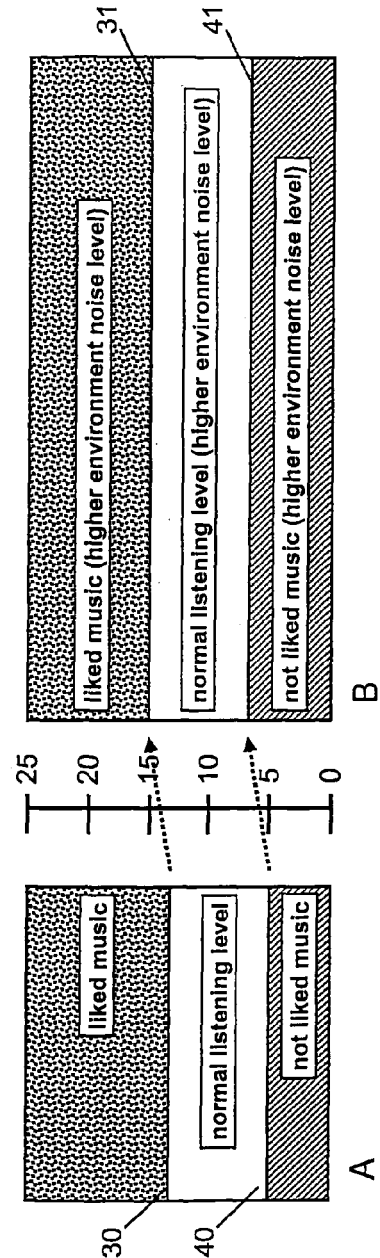


Fig. 4



EUROPEAN SEARCH REPORT

Application Number
EP 09 00 7079

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2005/064941 A1 (KONINKL PHILIPS ELECTRONICS NV [NL]; CLAASSEN ARJAN [NL]) 14 July 2005 (2005-07-14)	1-6, 13-15	INV. H04H60/32
A	* page 2, line 23 - page 6, line 12 * * page 7, line 30 - page 8, line 17 * * page 10, line 11 - page 11, line 25 *	7-12	ADD. H04H60/46
X	EP 1 555 754 A1 (DELPHI TECH INC [US]) 20 July 2005 (2005-07-20) * paragraphs [0007] - [0012] * * paragraphs [0015] - [0016], [0022] - [0030] *	1-15	
			TECHNICAL FIELDS SEARCHED (IPC)
			H04H H04N G06Q
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 4 January 2010	Examiner Van Hoorick, Jan
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 09 00 7079

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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04-01-2010

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