FORM 2

THE PATENTS ACT, 1970

(39 of 1970)

&

The Patent Rules, 2003

COMPLETE SPECIFICATION

(See sections 10 & rule 13)

1. TITLE OF THE INVENTION

EARPHONE WITH AUTO ON AND OFF PROVISION THROUGH MONITORING BRAIN SIGNALS

2. APPLICANT (S)

NAME	NATIONALITY	ADDRESS
Chitkara University	IN	Chitkara University, Chandigarh-Patiala National Highway, Village Jhansla, Rajpura, Punjab - 140401, India.
Chitkara Innovation Incubator Foundation	IN	SCO: 160-161, Sector - 9c, Madhya Marg, Chandigarh- 160009, India.

3. PREAMBLE TO THE DESCRIPTION

COMPLETE SPECIFICATION

The following specification particularly describes the invention and the manner in which it is to be performed.

TECHNICAL FIELD

[0001] The present disclosure relates to the field of audio devices. More particularly, the present disclosure is a wearable device with a pair of plug-in earphones used with a mobile device to play audio and provides auto on/off facility through detection and monitoring of the state of the brain of a user.

BACKGROUND

[0002] Background description includes information that may be useful in understanding the present invention. It is not an admission that any of the information provided herein is prior art or relevant to the presently claimed invention, or that any publication specifically or implicitly referenced is prior art.

[0003] Generally, a set of earphones are used to listen to audio of different types and mostly for listening to music. These earphones are working with external devices such as a radio, a tape recorder, a smartphone, a laptop etc. However, the use of such devices for regular and long durations especially when music is listened to by the listener in a calm or resting state, the user gets to sleep and the music carries on playing. This result in unwanted use of the power supply and sometimes the user could not sleep well due to the different pitch of the sound.

[0004] The advent of technology made it possible to minimise the sizes of earphones and make them wireless as well as play with a timer. But their design won't keep the ears healthy if used for a longer period of time and is not turned off automatically, particularly when in the state of sleep. Moreover, the chances of infections in the ear can happen by repeated moving in and out of the earphones. Efforts have been taken to address these issues and head or neck worn devices have come into the market where the user is comfortable and in an easy posture. But failed to switch off the sound when the listener falls asleep and minimise infection of the ear.

[0005] Therefore, there is a need to overcome the drawbacks and limitations associated with the existing earphones and provide a simple, improved, and cost-effective device that can turn off the music automatically by sensing the state of sleep of the listener in a network and minimise the chance of infections in the ear.

OBJECTS OF THE PRESENT INVENTION

[0006] Some of the objectives of the present invention, which at least one embodiment herein satisfies are as listed herein below.

[0007] It is an object of the present invention to provide a simple, improved, and cost-effective device that can turn off the music automatically by sensing the state of sleep of the listener by mapping the brain of the user.

[0008] An object of the present invention is to minimise the chance of infections in the ear of the listener by using UV rays.

[0009] Another object of the present invention is to eliminate unwanted use of power by automatically turning off the music in case of sleep of the user.

SUMMARY

[0010] The present disclosure relates to the field of audio devices. More particularly, the present disclosure is a wearable device with a pair of plug-in earphones used with a mobile device to play audio and provides auto on/off facility through detection and monitoring of the state of the brain of a user.

[0011] This summary is provided to introduce simplified concepts of a system for the time-bound availability check of an entity, which is further described below in the Detailed Description. This summary is not intended to identify key or essential features of the claimed subject matter, nor is it intended for use in determining/limiting the scope of the claimed subject matter.

[0012] In an aspect, disclosure is a plug-in earphone device with auto on and off by monitoring brain parameters including a headset configured with a pair of earphones and each earphone is configured with a UV lamp, a plurality of sensors to detect brain signals of a user are coupled to the headset, a control unit in communication with a mobile device in a network. The control unit is configured with a tracking module and a microcontroller where the microcontroller further includes one or more processors coupled with a memory stores instructions executable by one or more processors.

[0013] In an aspect, the control unit is configured to detect brain signals through the plurality of sensors, record, and transmits the received signals to the

mobile device on demand to analyse and identify conditions associated with the brain signals to activate and deactivate audio corresponding to the state of the brain.

[0014] In an aspect, the plurality of sensors are electroencephalography (EEG) sensors coupled to the headset through individual electric wires to supply detected brain signals to the control unit. Whenever the user uses the device, the EEG sensors are to be arranged at different parts of the head of the user to pick brain signals. The detected signals are transmitted to the mobile device on demand.

[0015] In an aspect, the mobile device is configured to analyse, record, and provide output data indicative of EEG signals, for example, alpha, beta, theta, and delta waves. The different waves correspond to the different brain activities including the state of sleepiness in the brain. Based on the sleep state of the brain of the user, the mobile device correspondingly switches on and off the earphone device.

[0016] In an aspect, the earphone is ergonomically designed to provide comfort to the user and each earphone has UV lamps that generate UV rays to kill bacteria and helps to reduce wax in the ear. The device also comprises a tracking module that facilitates to track lost, misplaced, and stolen earphone device through the mobile device using a bluetooth network.

[0017] In an aspect, a rechargeable battery is placed with the headset to provide electrical power to the device and recharged using an external power supply through a USB port configured with the headset. The mobile device is selected one from a smartphone, personal digital assistant, and laptop.

[0018] Various objects, features, aspects, and advantages of the inventive subject matter will become more apparent from the following detailed description of preferred embodiments, along with the accompanying drawing figures in which like numerals represent like components.

BRIEF DESCRIPTION OF DRAWINGS

[0019] The accompanying drawings are included to provide a further understanding of the present disclosure and are incorporated in and constitute a part of this specification. The drawings illustrate exemplary embodiments of the present

disclosure and, together with the description, serve to explain the principles of the present disclosure. The diagrams are for illustration only, which is not a limitation of the present disclosure.

[0020] In the figures, similar components and/or features may have the same reference label. Further, various components of the same type may be distinguished by following the reference label with a second label that distinguishes among the similar components. If only the first reference label is used in the specification, the description is applicable to any one of the similar components having the same first reference label irrespective of the second reference label.

[0021] FIG. 1 illustrates an exemplary view of the proposed plug-in earphone device, in accordance with an embodiment of the present invention.

[0022] FIG. 2 illustrates various types of waveforms generated by brain activities and picked-up by the sensors, in accordance with an embodiment of the present invention.

[0023] FIG. 3 illustrates various types of waveforms corresponding to the brain activities to be analysed by the mobile device, in accordance with an embodiment of the present invention.

DETAILED DESCRIPTION OF THE PRESENT INVENTION

[0024] The present disclosure to the field of audio devices. More particularly, the present disclosure is a wearable device with a pair of plug-in earphones used with a mobile device to play audio and provides auto on/off facility through detection and monitoring of the state of the brain of a user.

[0025] The following is a detailed description of embodiments of the disclosure depicted in the accompanying drawings. The disclosed embodiments are merely exemplary of the invention, which may be embodied in various forms. The embodiments are in such detail as to clearly communicate the disclosure. However, the amount of detail offered is not intended to limit the anticipated variations of embodiments; on the contrary, the intention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the present disclosure as defined by the appended claims.

[0026] In an embodiment, the disclosure is a plug-in earphone device with auto on and off by monitoring brain parameters can include a headset configured with a pair of earphones and each earphone is configured with a UV lamp, a plurality of sensors to detect brain signals of a user coupled to the headset, a control unit in communication with a mobile device in a network. The plurality of sensors are electroencephalography (EEG) sensors coupled to the headset to supply detected brain signals to the control unit. The detected signals are then transmitted to the mobile device on demand.

[0027] In an embodiment, a tracking module facilitates the tracking of lost, misplaced, and stolen earphone device through the mobile device using a bluetooth network. A device on/off button, a Bluetooth device, and a rechargeable battery is placed with the headset to provide electrical power to the device and recharged using an external power supply through a USB port configured with the headset.

[0028] FIG. 1 illustrates an exemplary view of the proposed plug-in earphone device 100 that includes a headset 102 configured with a pair of plug-in earphones 104-1 and 104-2 and each earphone 104 is configured with a UV lamp 106-1 and 106-2, a plurality of sensors 108-1, 108-2, ….., 108-N to detect brain signals of a user, are coupled to the headset 102, a control unit 110 in communication with a mobile device in a network. The control unit 110 is configured with a microcontroller where the microcontroller with one or more processors coupled with a memory stores instructions executable by one or more processors, and a location detection module 112 to detect brain signals through the plurality of sensors 108 and records. And transmits the received brain signals to the mobile device on demand to analyse and identify conditions associated with the brain to on and off audio corresponding to the state of the brain.

[0029] In an aspect, the earphone is ergonomically designed to provide comfort to the user and each earphone 104 has UV lamps 106-1 and 106-2 that generate UV rays. The high-energy UV rays emitted by UV lamps 106 is strongly absorbed by the microorganisms that may present in the ear of the user, damaging their molecular structure, via a process called photo-dimerization and thereby, destroying their ability to replicate and thus infect. Hence, on and off use of

earphones that may cause infection is avoided and thereby reducing the formation of wax in the ear.

[0030] In an embodiment, the sensors 108 are electroencephalography (EEG) sensors coupled to the headset 102 through individual electric wires and supply detected brain signals to the control unit 110. The control unit 110 detects brain signals through the sensors 108, records, and transmits the received signals to the mobile device on demand to analyse and identify conditions associated with the brain. The mobile device, according to the patterns of the received signals, compare them with the pre-stored patterns and decides the state of brain activities. In case the signal matches with the sleep signals send a signal command to the control unit 110 to switch off device 102 and device 102 is switched off. Also, in a similar manner device 102 is switched on if the matched signals are awake and the rest signals.

[0031] In an embodiment, the location detection module 112 is configured with device 100 that facilitates to track of lost, misplaced, and stolen earphone device 100 through the mobile device using a bluetooth network where the blutooth unit 120 emits bluetooth rays. In case the device is missing, the bluetooth signals are pick-up by the mobile device by linking the device 100 and located.

[0032] In an embodiment, a rechargeable battery 114 is placed with the headset 102 to provide electrical power to the device 100 and is recharged using an external power supply through a USB port 118 configured with the headset 102. The mobile device is selected one from a smartphone, personal digital assistant, and laptop.

[0033] FIG. 2 shows various types of brains signals 206 generated by the brain 204 of a user 202. These brain signals 206 are picked up by the sensors 108 whenever mapping of the brain 204 is done. The EEG sensors 108 are arranged at different parts of the head of user 202 to pick brain signals 206. The detected brain signals 206 which are different in their patterns are transmitted to the mobile device on demand.

[0034] In an aspect, the brain signals 206 are selected on sub-frequency bands carrying the neuro-signals. To pick-up brain signals 206, the plurality of

sensors 108 are placed on the surface of the scalp. The electric field produced by the activity of neurons is measured. The amplitude of these signals is very small and is measured in microvolts. The main frequencies of human EEG waves are beta, alpha, theta, and delta. The theta waves as per research findings denote the start of the sleep or the first stage of sleep and whereas the delta denotes the subsequent stages of the deep sleep.

[0035] FIG. 3 illustrates various types of waveforms corresponding to the brain activities to be analysed by the mobile device. The mobile device is configured to analyse, record, and provide output data indicative of brain signals 206, for example, beta 302, alpha 304, theta 306, and delta 308 waves. The different waves correspond to the different brain activities including the state of sleepiness in the brain 204. Based on the sleep state of the brain 204 of the user 202, the mobile device 100 correspondingly switches on and off the earphone device 100.

[0036] In an aspect, the brain signals 206 beta 302, alpha 304, theta 306, and delta 308 waves are indicative of, for example, different brain activities including the state of sleepiness of the brain 204. Among all waves, the theta wave 306 denotes the rest and the start of the sleep state of the brain 204. The delta 308 pattern is indicative of the further state of sleepiness including deep sleep and even the state of dreams. The mobile device sends the signal command to the control unit 110 of the earphone device 100 to switch off as and when the wave pattern received is very similar to the theta 306 wave. And when the waveform is detected for the brain signals is similar to the alpha 304 indicative of awake and resting, the earphone device 100 is switched on through transfer of command signals.

[0037] While the foregoing describes various embodiments of the invention, other and further embodiments of the invention may be devised without departing from the basic scope thereof. The scope of the invention is determined by the claims that follow. The invention is not limited to the described embodiments, versions, or examples, which are included to enable a person having ordinary skill in the art to make and use the invention when combined with information and knowledge available to the person having ordinary skill in the art.

[0038] Moreover, in interpreting both the specification and the claims, all terms should be interpreted in the broadest possible manner consistent with the context. In particular, the terms “comprises” and “comprising” should be interpreted as referring to elements, components, or steps in a non-exclusive manner, indicating that the referenced elements, components, or steps may be present, utilized, or combined with other elements, components, or steps that are not expressly referenced.

ADVANTAGES OF THE PRESENT INVENTION

[0039] Some of the advantages of the present invention, which at least one embodiment herein satisfies are as listed herein below.

[0040] The present invention is to provide a simple, improved, and cost-effective device that can turn off the audio automatically by sensing the state of sleep of the listener by monitoring brain of the user.

[0041] The present invention is to minimise the chance of infections in the ear of the listener by using UV rays.

[0042] The present invention can eliminate unwanted use of power by automatically turning off the audio in case of sleep of the user.

We Claim:

1. A plug-in earphone device (100) with auto on and off by monitoring brain signals (206), the device (100) comprising:

a headset (102) configured with a pair of earphones (104), wherein each earphone is configured with a UV lamp (106);

a plurality of sensors (108) coupled to the headset (102) to detect brain signals (206) of a user (202);

a control unit (110) in communication with a mobile device in a bluetooth network, configured with a location detection module (112), a microcontroller wherein the microcontroller comprises one or more processors coupled with a memory stores instructions executable by one or more processors and wherein the control unit (110) is configured to:

detect brain signals (206) through the plurality of sensors (108) and records;

transmits the received brain signals (206) to the mobile device on demand to analyse and identify conditions associated with the brain signals (206) to activate and deactivate audio corresponding to the state of the brain; and

a rechargeable battery (114) to provide electrical power to the device (100).

2. The device as claimed in claim 1, wherein the earphone (104) is ergonomically designed to provide comfort to the user (202), wherein the UV lamps (106) generate UV rays to kill bacteria and reduce wax in the ear.

3. The device as claimed in claim 1, wherein the plurality of sensors (108) are electroencephalography (EEG) sensors coupled to the headset (102) through individual electric wires to supply detected brain signals (206) to the control unit (110).

4. The device as claimed in claim 3, wherein the sensors (108) are arranged at different parts of the head of the user (202) to pick brain signals (206).

5. The device as claimed in claim 1, wherein the detected brain signals (206) are transmitted to the mobile device on demand and wherein the mobile device

is configured to analyse and record and provide output data indicative of EEG comprising, for example, beta (302), alpha (304), theta (306), and delta (308) waves.

6. The device as claimed in claim 5, wherein the beta (302), alpha (304), theta (306), and delta (308) waves correspond to the different states of the brain (204) performing different activities including the state of sleep of the brain (204).

7. The device as claimed in claim 5, wherein based on the sleepiness state of the brain (204) of the user (202), the mobile device correspondingly switches on and off the earphone device (100).

8. The device as claimed in claim 1, wherein the location detection module (112) facilitates to track lost, misplaced, and stolen earphone device (100) through the mobile device by using the bluetooth network.

9. The device as claimed in claim 1, wherein the headset (104) comprises the rechargeable battery (114), a device on/off button (116), and a USB port (118) to charge the battery (114).

10. The device as claimed in claim 1, wherein the mobile device is selected one from a smartphone, personal digital assistant, and laptop.

For Chitkara University and
Chitkara Innovation Incubator Foundation

Tarun Khurana
Regd. Patent Agent [IN/PA-1325]
Dated: 30th September, 2022

ABSTRACT

EARPHONE WITH AUTO ON AND OFF PROVISION THROUGH MONITORING BRAIN SIGNALS

An earphone device 100 with auto on and off by monitoring brain signals 206 comprises a headset 102, a pair of earphones 104 with a UV lamp 106, a plurality of sensors 108 to detect brain signals 206 of a user 202, a location detection module 112, and a control unit 110 comprises a microcontroller in communication with a mobile device in a Bluetooth network 120. The detected brain signals 206 are transmitted to the mobile device to analyse the state of sleep of the brain 204 and to switch on and off the device 100. UV lamps 106 generate UV rays to kill bacteria in the ear.

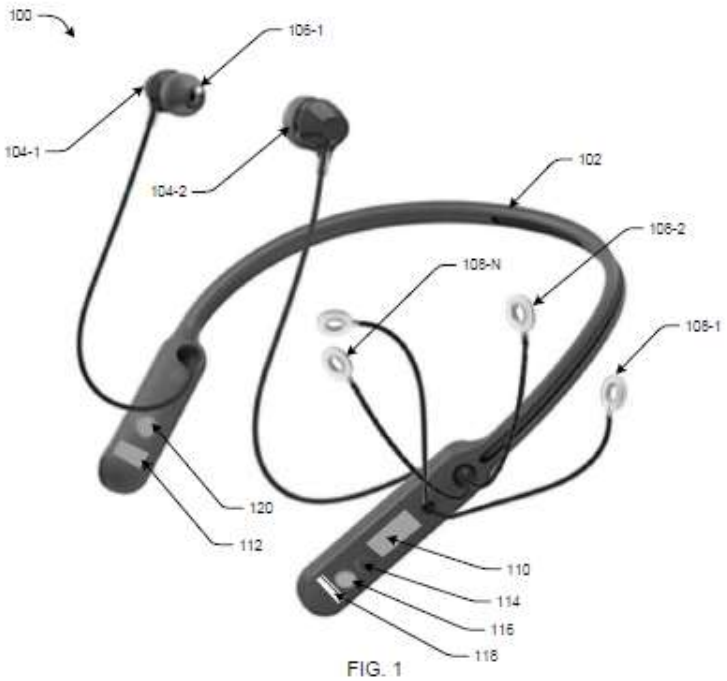

FIG. 1

For Chitkara University and
Chitkara Innovation Incubator Foundation

Tarun Khurana
Regd. Patent Agent [IN/PA-1325]
Dated: 30th September, 2022