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Structure and Function Design of A VAT Headphone

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ABSTRACT. Objective: *To design a simple VAT (Vibroacoustic Therapy) headphone for sub-healthy people. Through the core structure and function, music therapy, different intensity massage therapy and different intensity electrical stimulation are used to treat sub-healthy patients actively.*

Keywords: *Sub-health, VAT, headphone*

1. Introduction

The purpose of this project was to develop a simple vibroacoustic acupoint therapy headphone. The human body had a psychological function through the auditory sense of the music, the channel Qi was stimulated by the vibration of the synchronous low-frequency signal on the acupoint so that the channels and collaterals are dredged. Meanwhile, the temples of the human body can be massaged by the massage devices , and when using headphones, the data of physical and mental state can be transmitted to the doctor in real time, according to which the doctor can carry on the intervention treatment in order to achieve a better therapeutic effect. The safety, biological effect and clinical curative effect of the vibroacoustic acupoint therapy have been confirmed. With the continuous improvement of the health demand of the society, the VAT headphone with the characteristics of safety, no toxic and side effect, effective, low cost, strong acceptance, easy popularization and wide application (both the family and the organization can be applied) will gradually be recognized, accepted and loved by people, and will play an active role in the maintenance of health status, the conditioning of sub-health state and even the rehabilitation treatment of clinical diseases as well as the auxiliary treatment of

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diseases.

2. The whole core structure of the headphone

The core of simple VAT headphone are headphone body, massage devices, electrical stimulation devices, power supply, power switch, shell, first voltage regulating circuit, second voltage regulating circuit, boost circuit, hygristor, single-chip module and GPRS module. The positive pole of the power supply and one end of the power switch are connected by wire, the other end of the power switch and the hygristor end, the single-chip module, the GPRS module, the positive pole power input end of the first voltage regulating circuit and the second voltage regulating circuit are connected by wire. The positive power output of the first voltage regulating circuit and the positive power input of the two groups of massage devices are connected by wire, and the positive power output of the second voltage regulating circuit and the positive power input of the boost circuit are connected by wire, the output end of the boost circuit power supply and the positive power supply input end of the electrical stimulation devices are connected through the wire, the power negative pole and the negative power input of the massage devices, the first voltage regulating circuit, the second voltage regulating circuit, the booster circuit, the single-chip module, the GPRS module are connected by wire, the other end of hygristor is connected with the signal input end of single-chip module, and the signal input terminal of single-chip module and GPRS module are connected [1].

3. Graphic description of each functional module

FIGS.1 and 2 are schematic structural diagrams.

Figure 3, 4 is the circuit diagram.

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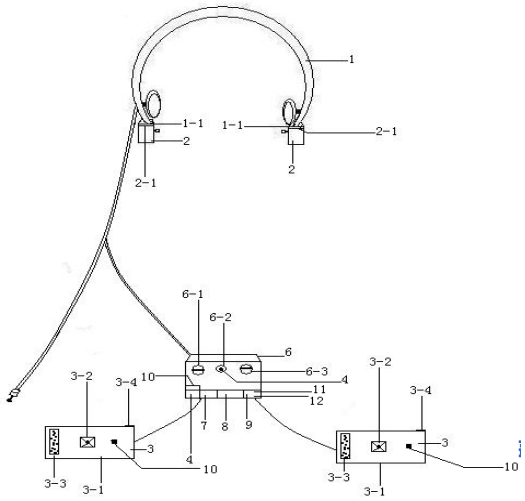

Fig.1 schematic structural diagrams

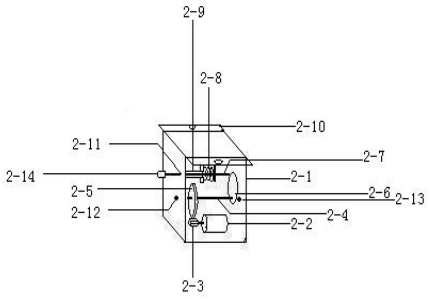

Fig.2 schematic structural diagrams

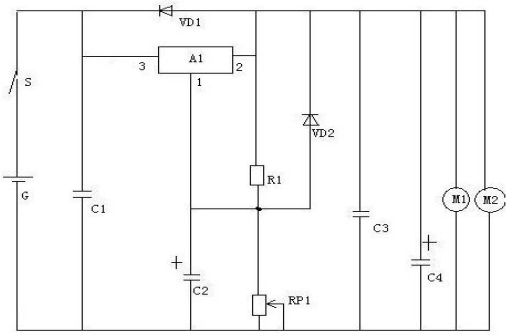

Fig.3 circuit diagram

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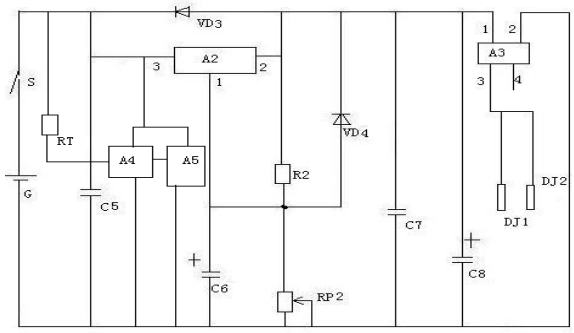

Fig.4 circuit diagram

4. The working principle of the system

As shown in Fig.1 and 2, before use, after the headphone body 1 is worn on the ear, the plug of the headphone is inserted into the headphone socket of the sound device, and two groups of electrical stimulation devices are wrapped on the two arms of the person. Then, the electrodes of two electrical stimulation devices 3 / 2 are in contact with the skin of the human arm. During use, music therapy is carried out on sub-health patients by the soothing music played by the sound devices. After the headphone body 1 is worn on the ear, the two groups of massage devices 2 are respectively positioned at the front temple of the human ear, and the rubber pipes 2-14 on the shafts 2-7 of the two massage devices 2-7 are respectively in contact with the two ends of the human's temple, and after the user turns on the power switch 5, the power supply 4 enters the first voltage regulation circuit 7 and the second voltage regulating circuit 8. By adjusting the different resistance values of the adjustable resistance of the first voltage regulating circuit 7, the voltage of motor 2-2 from the first voltage regulating circuit 7 to two sets of massage equipment 2 can be adjusted, which can reach different rotating speed at different voltages. When the motor 2-2 gets the electricity, the active gear 2-3 rotates with it so that it drives the first driven gear 2-5 and the eccentric wheel 2-6 to rotate. When the inner side of the eccentric wheel 2-6 is rotated to the outer end of the shaft 2-7, the eccentric wheels 2-6 will push the shafts 2-7 to move inwards against the elastic force of the springs 2-8, and the eccentric wheels 2-6 continue to rotate away from the outer end of the shaft 2-7, the shaft 2-7 is moved outwards under the elastic force of the springs 2-8. In this way, the electric motor 2-2 is continuously rotating, and the

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rubber pipes 2-14 of the two sets of massage devices 2 respectively contact the temples at the left end and the right end of the human ear, which can massage the temples, and different massage speeds can be achieved by adjusting the different speed of motot 2-2. At the same time, by adjusting the different resistance values of the adjustable resistor of the second voltage regulating circuit 8, the voltage output of the second voltage regulating circuit 8 to the electrode 3-2 of the two sets of electrical stimulation devices can be adjusted through the boost circuit 9, and the electrode 3-2 can output different voltages to stimulate human muscle tissue and acupoints at different voltages. When the human body carries on massage electric shock, the two hygristors 10 are close to the human skin. The results show that the resistance value of human body will become larger with the increase of the skin moisture when the human body is nervous, so that the resistance value detected by the two hygristors 10 is large, while the resistance value will become smaller with the reduction of the skin moisture when the human body spirit is released, so that the resistance value of the human body detected by the two hygristors 10 is small. The voltage signal inputted to the single-chip module circuit 11 through two hygristors 10 will change according to the difference of the skin resistance value of the human body. The single -chip module 11 converts the dynamic voltage signal into a digital signal into the GPRS module, and the GPRS module transmits the data through the wireless mobile network. When the software in the doctor's mobile phone or PC receives the signal, it converts the changed digital signal into a waveform diagram to be displayed on the screen. It is shown that the peak value of wave is low when the tension of human body is high, and the peak value of wave is high when the tension of human body is low. In this way, the doctor can grasp the mental state of the user in time, which lays the foundation for the follow-up intervention treatment [2].

Fig.3, 4 shows that after the user turns on the power switch G, the power G respectively enters the input end of power of the first voltage regulating circuit, the second voltage regulating circuit, the hygristor ET, single-chip module A4, and the GPRS module. In the first voltage regulating circuit: after the first voltage regulating circuit is electrically operated, the three-terminal adjustable integrated voltage regulator A1 is subjected to the action of the following peripheral element chip, such as capacitance C1, C3, electrolytic capacitor C2, C4, resistance R1, silicon rectifier diode VD1,VD2, to adjust the 2-pin output voltage of the three-terminal adjustable integrated voltage regulator A1 by adjusting the resistance value of the adjustable

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resistance RP1. When the output voltage is between 1.25V and 6V, the chip capacitors C1, C3 and the electrolytic capacitors C2, C 4 play a role in filtering and preventing the self-excitation of the output power supply of the three-terminal adjustable integrated voltage regulator A1, and the silicon rectifier diodes VD1,VD2 play the role of preventing the short circuit of the input and output power supply of the three-terminal adjustable integrated voltage regulator A1. After the output voltage of the 2-pin of the three-terminal adjustable integrated voltage regulator A1 enters the input ends of positive pole power supply of motors M1, M2 of the two sets of massage devices, when the output voltage is high, the speed of motor M1, M2 is high, and when the output voltage is low, the speed of M1 and M2 is low. In the second voltage regulating circuit: after the second voltage regulating circuit is electrically operated, the three-terminal adjustable integrated voltage regulator A2 is subjected to the action of peripheral element chips, such as capacitors C5, C7, electrolytic capacitance C6, C8, resistance R2 and silicon rectifier diodes VD3,VD4, to adjust the output voltage of 2-pin of the three-terminal adjustable integrated voltage regulator A2 by adjusting the resistance value of the adjustable resistance RP2. When the output voltage is between 1.25V and 6V, the chip capacitors C5, C7, and the electrolytic capacitors C6, C8 play a role in filtering and preventing the self-excitation of the output power supply of the three-terminal adjustable integrated voltage regulator A2, and the silicon rectifier diodes VD3,VD4 play the role of preventing the short circuit of the input and output power supply of the three-terminal adjustable integrated voltage regulator A2. After the voltage output from the 2-pin of the three-terminal adjustable integrated voltage regulator A2 enters the 1-pin of the DC/DC power supply boost circuit A3, under the action of the internal circuit of the DC/DC power supply boost circuit A3, The output terminal 3-pin of the DC/DC power supply boost circuit A3 will output a voltage between 6V and DC 70V to enter the positive power supply input electrodes DJ1,DJ2 end of the electrical stimulation devices, so that the conical protrusions of the electrodes DJ1,DJ2 output different voltages to stimulate the muscle tissue and acupoints of the human body at different voltages. As the working power supply is No. 4 or 5 batteries with only 70 V, the low current after voltage boost will not cause life damage. When the human body carries on massage electric shock, two hygristors RT is close to the human skin. The research shows that when the human body is in mental tension, the resistance value will be larger as the skin moisture increases[3],

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so that the resistance value detected by the two hygristors RT are large, while the moisture degree of skin reduced when the human body is relaxed, and the resistance value becomes smaller, so that the resistance value of the human body detected by the two hygristors RT is small. The voltage signal inputted to the single-chip module circuit A4 through two hygristors RT will change according to the difference of the skin resistance value of the human body. The single-chip module A4 converts the dynamic voltage signal into a digital signal and inputs it to the GPRS module A5, and the GPRS module A 5transmits the data through the wireless mobile network. When the software in the doctor's mobile phone or PC receives the signal, it will convert the changed digital signal into a waveform diagram to be displayed on the screen. It is shown that the peak value of wave is low when the tension of human body is high, and the peak value of wave is high when the tension of human body is low. In this way, the doctor can grasp the mental state of the user in time, which lays the foundation for the follow-up intervention treatment.

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