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HIGH SENSITIVE LOW POWER ELECTRONIC HEARING AID

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Abstract:

Normally, hearing aid circuits consume battery power continuously once they are switched on. This project is designed to save battery power by switching on the sound amplifier section only when sound is detected. The sensitivity of the detection section and the 'on' time duration of the sound amplifier circuit can be set by the user. Also the circuit uses only a single condenser mic for sound detection and amplification. This hearing aid project consists of a condenser microphone, earphone, and sound detection and amplification sections. The sound detection section employs a quad op-amp and a timer. The sound signal received at the mic is pre-amplified by transistor BC549. The voltage at its collector is fed to the inverting terminal of op-amp, which is used as a comparator. The reference voltage (V_{ref}) at the non-inverting terminal is set using a preset. The preset is also used to control the sensitivity of the sound signals received by the circuit. The output is fed to the trigger input of timer, which is configured in monostable mode. When sufficient sound signal strength is detected at the base of transistor, it triggers the Opamp.

Keywords: Audio amplifier, Comparator, Voltage gain, Audio pre-amplifier, Microphone, Headphones and Trigger.

1. Introduction

A hearing aid is a device that can amplify sound waves in order to help a deaf or hard-of-hearing person hear sounds more clarity.

Recent technology can help most people with hearing loss understand speech better andachievebetter communication.More than 1,000 different models are availablein the United States. All of them include a microphone (to pick up sound), amplifier (to boost sound strength), a receiver or speaker (to deliver sound to the ear) and are powered by a battery. Depending on the style, it's possible to add features to filter or block out backgroundnoise minimize feedback, lowersoun

dinnoisysettings, or boost power when needed.Hearing aids are either "monaural" (a hearing aid for one ear) or "binaural " (for two ears); more than 65% of all userhave binural aids.

Hearing aids are divided into several different types:

- digital
- in-the-ear
- in-the-canal
- behind-the-ear
- on-the-body

Digital aids are sophisticated, very expensive aids that borrow computer technology to allow a person to tailor an aid to a specific hearingloss pattern. Using miniature computer chips, theaid can selectively boost certain frequencieswhileleavin g others alone. This means a personcould wear such an aid to a loud party, and screen out unwanted back ground noise while tuning in one conversations.

The aid is programmed by the dealer to confortto the patient'sspecific hearing loss. Some models can be programmed to allow the wearer to choose different settings depending onthe noise of the environment.Intheear aids are lightweight devi ces whose custommade housings contain all the components; this device fits into theear canal with no visible wires or tub es. It's possible to control tone but not volume with these aids, so they are helpfulonly for people with mild hearing loss. Some people find these aids are easier to put on and take off than behind-the ear aids. However, because they are custom fit to a person's ear, it is not possible to try on before ordering. Some people find them uncomfortable in hot weather. In the canal aids fit far into the canal, with only a small bit extending into the external ear. The smallest is theMicroCanal, which fits out of sight down next to the eardrum and is removed with a small transparent wire.

These areextremely expensive, but they are not visible, offer better acoustics, and are easier to maintain. They canmore c loselymimic natural sound because of the position of the microphone; this position also cuts down on wind noise. But the irsmall size makes them harder to handle, and their battery is especially small and difficult to insert. Adjusting the volum emay be hard, since a person must stick a finger down into the ear to adjust volume, and this very tiny aid doesn't haveth e power of other, larger, aids.

2. Literature Survey:

There are so many technologies for hearing aid. Early devices are called Ear horns or trumpets, were passive funnel-like amplification cones implemented to collect sound energy and send it direct into the ear canal. Early days there is hearing aid which is amplified and then too large to carry them from one place to another when they move it is too difficult. Simultaneously there are devices which include bone anchored hearing aid and cochlear implant. The first electrical hearing aid was introduced in 1896 used the carbon microphone of the telephone. The electronic amplification is possible by vacuum tube. So they minimize the hearing aid and made them as portable models after World War II using vacuum tubes. In 1948 another hearing aid was invented by transistor which is the application of low power and small size; hearing were the early adopters of transistors. In this hearing aid integrated circuits and digital image processing plays an important role. Integrated circuits developed and further improvements are done for wearable aid. Digital image processing also implemented a lot and give programmability for the individual user's needs. After doing so many improvements now we are using high sensitive low power electronic hearing aid.

3. Working of hearing aid:

The block diagram is normally a hearing aid used for deaf and dumb people. They will consume the battery power continuously once they were switched on. This aid is that the user should set the detection section and then the 'on' time duration. The above figure is designed to switch on the sound amplifier section when the sound is detected. Then transistor BC549 receives sound signal that are pre-amplified at the mic. The collector voltage is fed to op-amp of inverting terminal called as comparator. This hearing aid is also represented by using the circuit diagram which is given in the following diagram.

Audio amplifier operation mainly depends upon four parameters

1. Gain

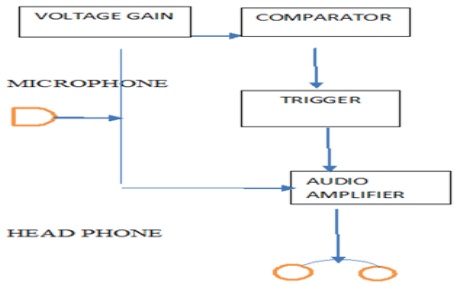
2. Frequency response.

3. Noise.

4. Distortion.

1. Block diagram of hearing aid: There are hearing aids with the amplifier section which again pre-amplifies the signals. In the audio amplifier signals which has low range of frequencies convert into high range of frequencies.

Comparator is also used in the block diagram which will compare both the voltages and currents the output is given. Input is given as the analog and output is given as digital in the comparator. And it gives ideal output.



By using negative feedback distortion and noise can be reduced. It also reduces gain. Most of the audio amplifiers are class AB type. Audio amplifier is that which converts low signals into high signals. In the audio power amplifier input signal is measured in tens or few hundreds of microwatts. And the output signal is measured in tens to thousands of watts. The block diagram explains about how we get the high sensitive hearing aid. In this first we will connect the voltage gain which is denoted by Av. It is the ratio between the output and input .They are measured in same ways as the RMS valve or peak value. When the signal is passed through the hearing it first goes to the voltage gain and there it will function. In the voltage gain it will give the zero decibels for the given magnitude response. At first the signal will be taken by the microphone and then when the signal was detected it will give to the voltage gain (Av). The signal then goes to the voltage gain and then goes to the comparator then it compare the signals which they will hear and then they will do comparison with the signals. Then after completing the comparison it will goes to the trigger which is that input. The input is signal in trigger so that they have given as the following of the process. Then it will goes to the audio amplifier which the low signals are converted into high signals From the audio amplifier it goes to the audio pre-amplifier in that block the signals are gain amplified so that it is called as the audio pre-amplified. In the audio amplifier it is again the signal will be checked they are high signals are so that they will be given to headphones. From the headphones it will be given to hearing aid that will be kept by the person who are affected by the deaf. The block diagram will be inside the hearing aid that are very small.

Conclusion: From the above following it is understood that high sensitive hearing aid are very useful in this type of generation. Voltage gain is the bandwidth which gives the difference between the higher frequency and lower frequency is called bandwidth. There are many hearing aid but high sensitive means it will detect minute signal also it will be hear by the person.

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