

## Intelligent Headphones

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### Abstract

We have been showered by innumerable technologies with accuracy and precision to aid us in all walks of life. It is to be noted that certain technologies come hand in glove with complex problems. Regardless, some of these are so necessary to us that we have continued using them as a necessity none the less. Here the concern is the health, particularly the human audio systems -ear. Varieties of headphones are available in the market but none of them care for the wellbeing of the ears, with respect to the user expectation. The design of such gadgets should be in accordance with the gifted human sensors namely the ear drum; any deviation from these criteria will ultimately result in its deterioration. So our simplified approach to solve this problem is through an intelligent headphone which is not in any fixed pre-tuned form. Our project is a sensible gadget which operates entirely based on the ear's physical characteristics of the respective user. This works on the principle of echo & vibration of the diaphragm of headphone on the basis of sensed and measured intensities. Here the utilization of electromechanical process and back E.M.F of headphones are done.

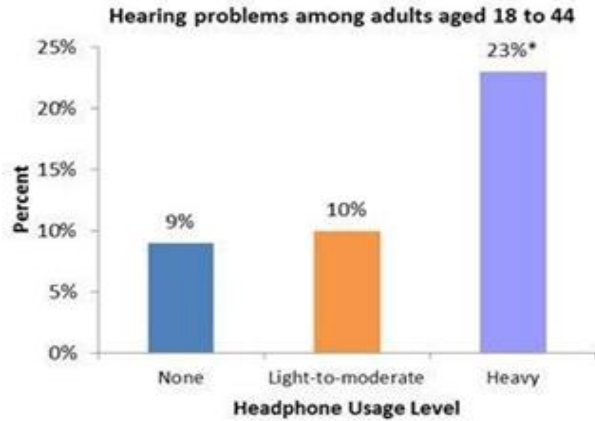
**Keywords:** *Induced Defaming, Hearing loss, Back E.M.F.*

### I. INTRODUCTION

Music is enjoyed by everyone irrespective of their age. In this process most of us are damaging our sound perception and hearing capabilities permanently. Large swathes of population are affected by it. This happens due to prolonged and dangerous usage of headphones/earphones as claimed by All India Institute of Speech and Hearing (AIISH), Mysore. It is our ardent wish that in the name of music there must be no permanent physical damage. We believe that we can prevent this disaster from happening. Out of this situation arises our solution, this itself is our inspiration.

#### A. Market Analysis

According to IBIS world, their figures show that in U.S.A alone the headphone industry's annual turnover was about \$2billion with an annual growth rate of 8.4%(2009-14). Such is the astronomical numbers of head phone users. Any event relating to using head phones, in blogs, journals and seminars, now mainly deal with the increase in deafness due to headphone usage. Here is an official New York city community health survey 2011 statistics in figure 1.

**Figure1: Health survey**

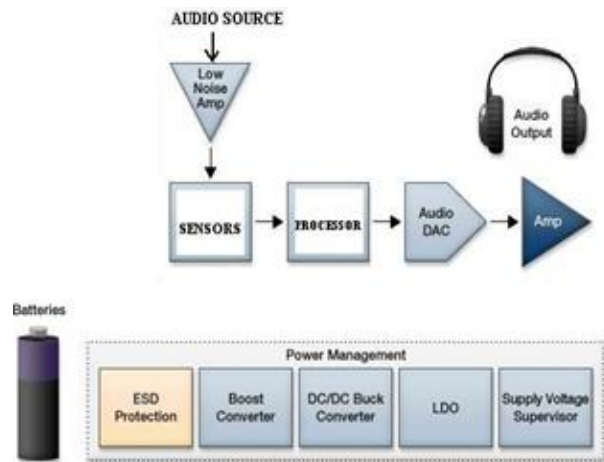
Source: NYC Community Health Survey 2011.

It is clearly visible that the damages endured for all age groups are significant. There are records that One in five teenagers have some form of hearing loss. The propaganda is extremely large for Ear health. now is the high time for such an Innovation that concerns Ear care. this is accomplished by our Project. This is a highly automated device, hence it immediately adjusts itself to different users there by effectively minimizes the damages of not preventing it, with a touch of a button. It is Noteworthy that the Gadget design standards follow PTPA (parent tested parent approved) & IEC (international electromechanical commission) which includes a universally used 3.5mm jack standards therefore higher market acceptance.

### B. Technical Background

It is quite unfortunate that we find numerous intelligent headphones which play music intelligently but doesn't intelligently prevent induced deafening. Apparently there are neither researches nor any technological background in this field that has seen the light of the day. We may not be wrong if we claim to be the pioneers in this area.

## II. PROPOSED SOLUTION

**Figure2: Proposed block diagram**

The solution is simple, decrease the extreme loudness that emanates from the source and modifies the slightest of sounds, this is to be done automatically and intelligently. Intelligent in the sense, it must immediately adjust to the wearer's sound perceptual abilities. Thereby setting up as well as working at safe, permissible and non-damaging parameters. The sound perception varies largely with age and other minor factors. Our design caters to everybody's needs. It is to be known that a lot of audio signal manipulation is carried on. The output is indeed an audio wave.

The cost is not at all a factor here. This was intended to be a cost effective- low cost initiative and we must admit that we've been faithful in this regard entirely. Our design is a modification to the main apparatus. So rest assured in matters of cost. Again, since this is a modification, there is no significant increase in weight or even size.

## III. IMPLEMENTATION

The headphones include 4 main parts namely sensor, RF amplifier, high gain amplifier with negative feedback, amplifier and a switching

circuit if needed. The figures of the following circuits are included below,

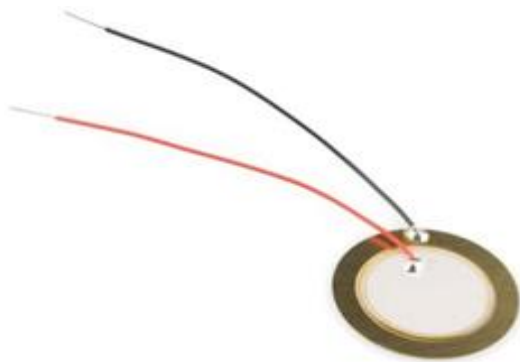
A. Sensors

The sensor can be small gauge copper wire or piezo electric disc sensor. Where the copper wire which is capable of sensing the magnetic flux and that will be converted into voltage by RF amplifier In the case of the piezo electric disc sensor the vibration of diaphragm is sensed and converted to the form of voltage and further amplification will be done. Any of the below sensor can be used as a sensor to detect the audible level from the diaphragm and sensed signal will be converted to the form of voltage.

**Figure3: Copper sensor**

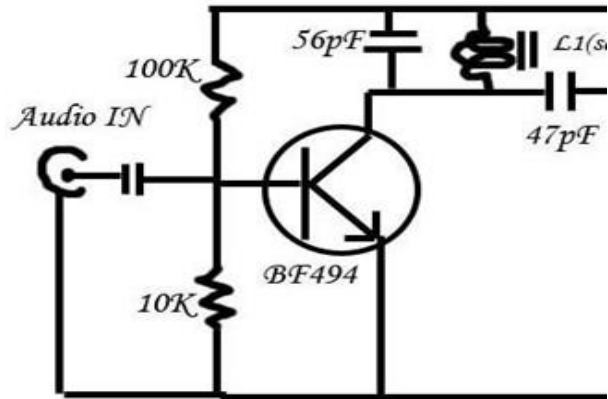


**Figure4: piezo electric disc sensor**



B. RF Amplifier

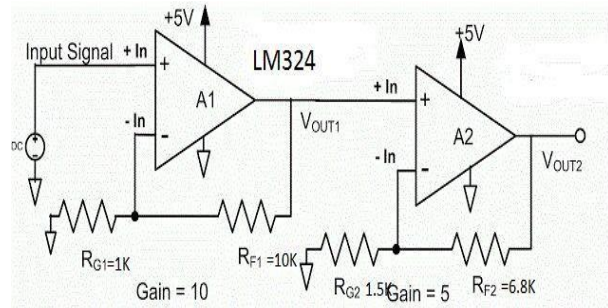
**Figure5: RF Amplifier (bf494)**



The circuit with the BF194 transistor is capable of sensing small amount of voltages produced in micro volts, capable of amplifying the sensed signal and it also acts as a switch when there is no reflection of the signal and allows the headphone to perform normal operation.

C. High Gain Amplifier (LM 324)

**Figure6: high gain amplifier**



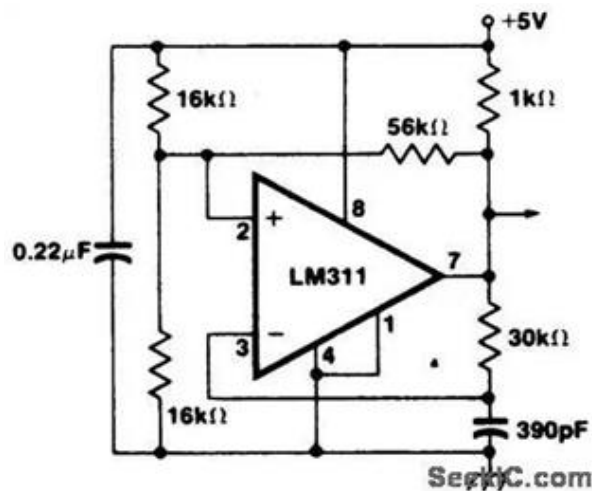
LM 324 is a high gain amplifier which consists of four internally compensated op-amps which provide high gain in the sense here the voltage fed by bf494 will be in micro volts it will be converted into the range of almost volts.

D. Negative Feedback Amplifier (LM311)

LM 311 is a negative feedback amplifier which increases the voltage level if the reflection of signal sensed from the sensor is less up to a level of 95db and decreases if reflection is

more. The output of the block fed directly to the headphone speakers.

**Figure7: Negative feedback Amplifier (bf494)**



#### E. Construction & Working

The RF amplifier detects the signal from the coil which is placed in the headphone diaphragm. The 10-15 rounds small gauge coil or the piezo disk vibration sensor for sensing the vibration from the diaphragm of the headphone that detected signal is amplified and fed to the lm724 high gain amplifier which includes 4 op-amps and the further amplified signal is fed to the negative amplifier block of the lm311 which correspondingly varies with high level and low level signal as per the (NVC) negative voltage coefficient .if the reflection is more from the corresponding Ear then there is an increase in the voltage across lm724 which results in decrease of audible voltage in lm311 as the ear resistance and reflection of voltage tolerated by the ear and again the vice versa if the reflection is less. The switch provides the link between lm311 outputs to the headphone. RF amplifier acts as short when there is more reflection in the ear if not it remains stationery the base and emitter of bf

194 will get shorted the expected audio is fed to headphones.

#### F. Merits

- Compatible
- Very less complexity (in construction /manufacture)
- Low Cost
- Compact
- Durable
- Suitable for all age groups
- Automatic
- Intelligent

#### IV. RESULTS

We people have designed the headphones to attenuate the signal above 95db. Depending on the reflection in ear and ear resistance the audible level is sensed and controlled.

#### V. CONCLUSION

This is a cost effective gadget which is entirely automatic, safe for all age users which effectively reduces the ear damage if not preventing it. Moreover, it enhances the quality of the audio being heard ultimately leading to user contentment in a simplified solution. Headphone is economical, user friendly, lesser in weight.

We say from this project point of view the children should listen at an audible level of 75+/-5db. The teens should listen at an audible level of 85+/-5db. The adults must make habit of listening the audible level of below 80db as per doctors of AIISH Mysore, this may reduce the quality of audio a bit but reduces the induce defining.

## References

<http://Aerial-arcadeangel-Arcade-Children's-Headphones/dp/B008N1VEDU>

<https://bitcointlk.org/index.php?topic=452204.0>

<http://mummysmiles.com/reviews/aerial7-bantam-headphones-review-and-giveaway/>

<http://androidforums.com/htc-hero/37947-auto-volume-control-while-headphone-plugged-in.html>

<http://www.nyc.gov/html/doh/html/pr2013/pr024-13.shtml>

<http://www.personal.psu.edu/afr3/blgs/siowfa12/2012/10/hearing-loss-from-headphones.html>

<http://www.cdc.gov/healthyyouth/noise/>

[http://www.nbcnews.com/id/38742752/ns/health-childrens\\_health/t/us-teens-has-hearing-loss-new-study-says/](http://www.nbcnews.com/id/38742752/ns/health-childrens_health/t/us-teens-has-hearing-loss-new-study-says/)