ELECTRONICS MULTI-REPELLENT

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BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek : **ELECTRONICS MULTI-REPELLENT**

Sesi Pengajian : **2006/2007**

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DEDICATION

Untuk mak,abah,diana,alin dan mellisa……..

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ABSTRACT

The propose of this project is to built an electronics multi repellent that can chase out the insects or rodent animal that may bring dangerous to health from home. Ultrasonic sound is a frequency that is too high to be heard by the human ear .In fact, ultrasonic waves behave more like light than sound. The sound will radiate outward in a cone shape. People can hear sounds from 20 to 20,000 cycles per second, while dogs and cats can hear up to 27,000 cycles per second. This electronics multi repellent is designed to continually and automatically sweep an ultrasonic frequency and to give the users a complete set of repellent that can chase out not only onc typc of animal. The user just needs to select the switch depend on the types of animals or insects that they want to repel. Normally, new animal will almost always replace the ones you've killed. Using ultrasound in your pest control efforts can result in long-term reductions of animal populations. These devices are appealing to consumers because they are silent to human ears and don't involve any traps or poison. Reduction in rodent and insects activity is in 6 to 10 days on average. One should never expect instantaneous results.

ABSTRAK

Projek ini mencadangkan pembinaan satu alat yang mampu menghalau serangga dan tikus atau binatang yang membahayakan kesihatan .Alat ini juga harus mempunyai lebih dari satu suis supaya ia dapat memberi pilihan kepada pengguna untuk memilih jenis haiwan yang hendak dihalau..Sebagaimana yang kita sedia maklum julat pendengaran manusia dan haiwan adalah berbeza.Manusia hanya mampu mendegar bunyi dari julat 20 ke 20,000Hz sementara haiwan mampu mendegar lebih dari julat tersebut.Oleh itu alat ini direka berdasarkan bunyi supaya manusia tidak dapat mendegarnya tetapi hanya haiwan sahaja yang mampu mendengarnya. Pengguna hanya perlu menekan suis untuk menghalau haiwan yang dikehendakinya. Alat ini akan mengurangkan populasi haiwan tersebut tanpa melibatkan penggunaan racun dan perangkap.Pada kebiasaannya jika kita menggunakan racun atau perangkap, haiwan yang dibunuh akan digantikan oleh haiwan yang baru dan keadaan ini akan berulangan.Oleh itu alat ini sangat berkesan dalam menghalau haiwan yang dikehendaki tanpa perlu membunuhnya. Keputusan boleh dilihat dalam tempoh 6 ke 10 hari penggunaan tetapi pengguna tidak boleh mengharapkan keputusan yang seta merta.

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CHAPTER 1

INTRODUCTION

1.1 Introduction of the Project

Repellent mean a substance that keeps insects or other animals away. The purpose of this project is to create an electronics multi repellent that can chase out not only one type of insect. This electronics multi-repellent will be used in chasing out rats and insects like mosquitoes, ants and cockroach by using ultrasonic frequency.

For this project the efficiency of this system must be shown and proved so the study about the scope of area for this system to work effectively and a study on the insects or animal frequency and its characteristics must be made. This repellent is also must suitable to use at home or office and it must also safe to be used around family and any non-rodent pets like cats, dogs, birds and reptiles.

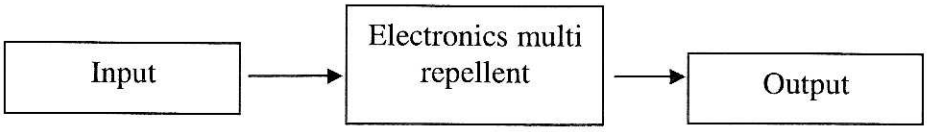

Figure 1.1.1: The block diagram of the repellent

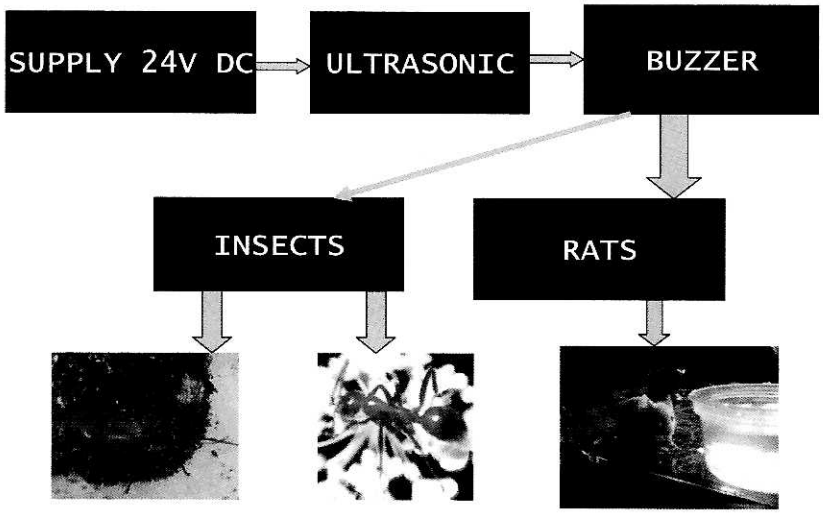

Figure 1.1.2: The block diagram of the repellent operation

1.2 Problem statement

There are many electronics multi-repellent in the market but it doesn't give the user choicer to choose in chasing out the insects from their home because the repellent in the market is suitable only for one insect like mosquitoes. So, this project will be made for giving the user the repellent that they want to chase out from their home and save the consumer money These devices are appealing to consumers because they are silent to human ears and don't involve traps or poison.

1.3 Project objectives

1. To chase the insects or the animal that may bring dangerous to health
2. To give the users a complete set of repellent that can chase out the insects or rodent animal from their home
3. To prove the efficiency of the systems

1.4 Scope of works

The scope of work for this project are mainly about the aiming in produce the multi electronics repellent that can chase out not only one type of insect or animal. A test is made in order to prove the efficiency of the system. Before starting the project, there are several topics to be study on in creating this system. The studies are mainly about:

1. The characteristics of the insects or the animal and the frequency of these insects. Next for the system efficiency, the scope of area for the system to work properly also must be study.
2. The component of the circuit likes ic 4001B and 4020B
3. After that, the circuit for this repellent will be made and a test can only be done after the circuit is designed and proven to work properly.

CHAPTER 2

LITERATURE REVIEW

2.1 Sound

Sound represents vibration energy. It is created when a medium such as air, wood, metal, or a person's vocal cords vibrate. Sounds carried as energy are transferred from one molecule to the next in the vibrating medium. To understand sound, consider the analogy in which a stone is dropped into a body of water. This action produces ripples that will spread out in all directions from the point where the stone contacted the water. The ripples become weaker (decrease in intensity) as they get farther away from the origin. So it is with sound. The vibration through a medium proceeds in waves. However, unlike ripples on water, sound waves move away from their point of origin in three dimensions, not just two.

Sound waves possess specific characteristics. Frequency represents the number of complete wave cycles per unit of time, usually one second (Figure 2.1.1). Frequency is expressed in hertz (Hz), which means cycles per second. Low-frequency sounds are those that vibrate only a few times per second, while high-frequency sounds vibrate many more times per second. The term used to distinguish your perception of higher-frequency sounds from lower-frequency sounds is pitch.

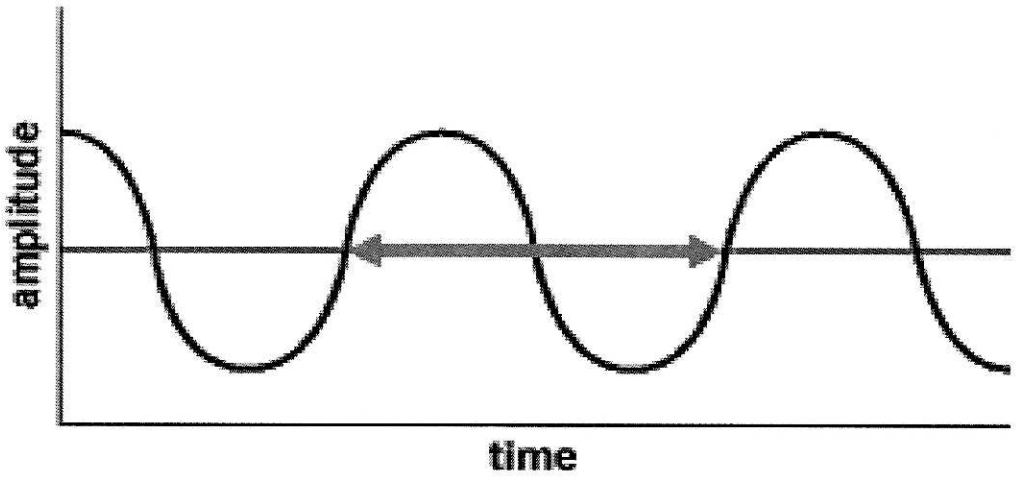

Figure 2.1.1: Representation of frequency

The arrow indicates one cycle of the sound wave. The speed of sound is constant for all frequencies, although it does vary with the medium through which it travels. In air, sound travels at a speed of roughly 340 meters per second. Sound travels fastest through metals because the molecules of that medium are packed very closely together.

Similarly, sound travels about four times faster in water than in air. It follows that sound travels faster in humid air than dry air; in addition, humid air absorbs more high frequencies than low frequencies, leading to differences in the perception of sound heard through the two media. Finally, temperature can affect the speed of sound in any medium. For instance, the speed of sound in air increases by about 0.6 meters per second for each degree Celsius increase in temperature.

The human ear responds to frequencies in the range of 20 Hz to 20,000 Hz (20 kHz), although most speech frequencies lie between 100 and 4,000 Hz. Frequencies above 20,000 Hz are referred to as ultrasonic. Though ultrasonic frequencies are outside the range of human perception, many animals can hear these sounds. For instance, dogs can hear sounds at frequencies as high as 50,000 Hz, and bats can hear

sounds as high as 100,000 Hz. Other sounds, such as some produced by earthquakes and volcanoes, have frequencies of less than 20 Hz. These sounds, referred to as infrasonic or subsonic, are also outside the range of human hearing.

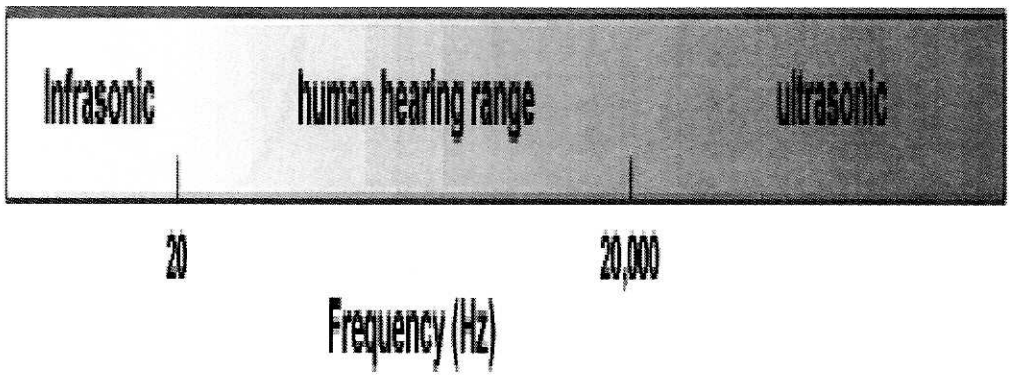

Figure 2.1.2: The sound spectrum

We all know that sounds can be louder or softer, but what does this mean? Sound is energy, and this energy, when traveling through air, displaces, or vibrates, air molecules. For example, the softest sound humans can hear is a sound that displaces particles of air by one-billionth of a centimeter. The extent to which air particles move from their original resting point determines the amplitude of the sound wave (Figure 2.1.3). The greater the amplitude of the sound wave, the greater the intensity, or pressure, of the sound. Intensity refers to the overall amplitude of a sound. This distinction in terms is necessary, since nearly all sounds to which we are exposed are complex sounds made up of a combination of sound waves. Loudness is our perception of the intensity, frequency, and duration of a sound.

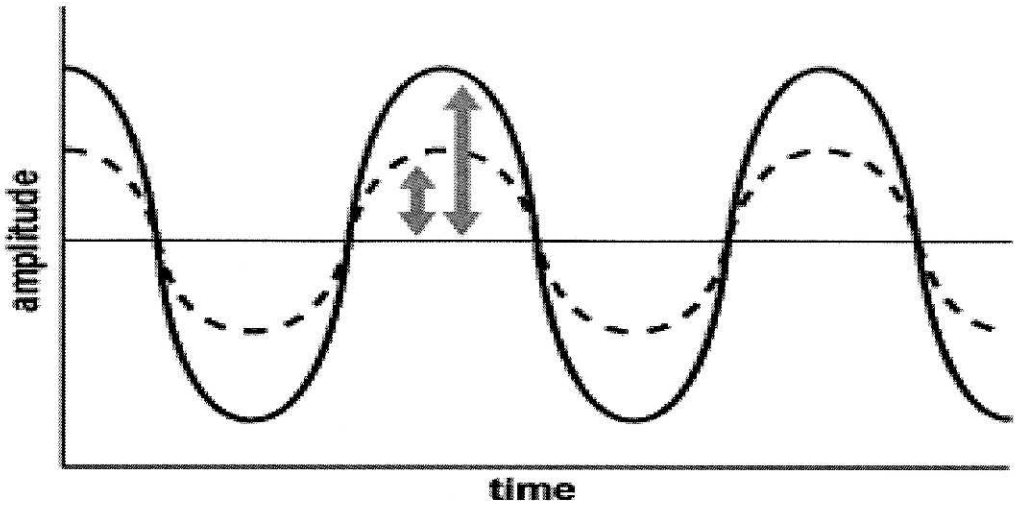

Figure 2.1.3: Representation of amplitudes of a wave.

The dashed line has lower amplitude than the solid line. Every 10-dB increase in sound intensity represents a 10-fold increase in sound intensity and a perceived doubling in loudness. Sound intensity is measured in relation to an accepted reference point. One such reference is the threshold at which a sound can be heard. How the intensity of any given sound compares with this standard reference level is given in units known as decibels (dB). The decibel is one-tenth of a bel, a unit named after the inventor Alexander Graham Bell.

The decibel scale is not a linear one, but rather represents the ratio of the sound to the reference standard. To understand why ratios are necessary, consider the tremendous range of sound intensities we are capable of hearing. Scientists estimate that the human ear is sensitive to about 100,000,000,000,000 (10^{14}) units of intensity. Also consider that a shout is about 1,000,000 (10^{6}) times more powerful than a whisper. Because dealing with such large numbers is cumbersome, the decibel scale is used to simplify comparisons.

Every 10-dB increase in sound intensity represents a 10-fold increase in sound intensity and a perceived doubling in loudness. Therefore, a sound at 60dB is 100 times as intense as a sound at 40 dB but is only perceived as four times as loud. In this way, the predominant range of human hearing is represented on a scale from 0 to 140 dB.

2.2 Ultrasound

Ultrasound is sound with a frequency greater than the upper limit of human hearing, this limit being approximately 20 kilohertz (20,000 hertz).Some animals, such as dogs, dolphins, bats, and mice have an upper frequency limit that is greater than that of the human ear and thus can hear ultrasound. Children can hear some high-pitched sounds that older adults cannot hear, as in humans the upper limit pitch of hearing gets lower with age .This frequency limit is caused by the middle ear that acts as a low-pass filter.

If ultrasound is fed directly into the skull bone and reaches the cochlea without passing through the middle ear, much higher frequencies (up to about 200 kHz) can be heard. A study on rodent fetus brains that are exposed to ultrasound showed signs of damage.

Speculation on human fetuses can be in a range of no significant complications to variety of mental and brain disorder. The study shows that rodent brain cells failed to grow to their proper position and remained scattered in incorrect parts of the brain. The conditions of this experiment are different from typical fetal scanning because of the long dwell times. Care should be taken to use low power settings and avoid pulsed wave scanning of the fetal brain unless specifically indicated in high risk pregnancies.

Rats aren't the only animals that can make high pitched sounds. Bats are the most famous emitters of ultrasound, with their inaudible echolocation clicks in the 25 to 80 kHz range. But bats aren't the only ones, shrews produce 20 to 64 kHz calls during

exploration. And dolphins, who also use echolocation to navigate and locate prey, have trumped the bats: their echolocation clicks range from 80 kHz to an incredible 150 kHz.

Insects produce high pitched sounds as well. Some moths court by fanning their wings at 80 kHz. Some ant species produce pulses at 75 kHz by rubbing parts of their hard exoskeleton together .Bats and dolphins use ultrasound to navigate and hunt. High frequency sound waves are so tiny that they penetrate into and reflect off of the smallest crevice and contour, echoing back a sound profile in minute detail.

Ultrasonic pest repellers are quite popular. The manufacturers claim that their devices produce ultrasonic noise so aversive to pests (including rats) that it drives the pests away. These devices are appealing to consumers because they are silent to human ears and don't involve traps or poison. In addition, ultrasound is quite weak and attenuates very rapidly with distance from the source .Half the energy of ultrasound produced by pest repellers is gone at 15 feet, and no energy remains at 30 feet.

Lastly, ultrasound is blocked by intervening objects like walls and furniture. Ultrasound cannot travel through these objects and cannot go around corners. Therefore, walls, doors, and furniture cast "sound shadows" behind them. Rats and mice can easily use these silent areas for auditory shelter, thus avoiding the ultrasound altogether.