

HUMAN BEING SENSOR

FONG POH CHEH

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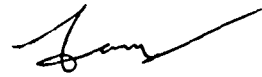
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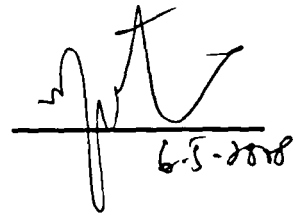
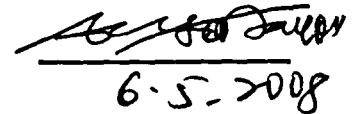
FONG POH CHEH

HS 2005-6209



AUTHORISED BY

Signature

1. SUPERVISOR**(MADAM TEH MEE TENG)**
6-5-2008**2. EXAMINER 1****(ASSOCIATE PROFESSOR DR. JEDOL DAYOU)**
6-5-2008**3. EXAMINER 2****(MR. SAAFIE SALLEH)****4. DEAN****(ASSOCIATE PROFESSOR DR. SHARIFF A.K. OMANG)**
6-5-2008

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ABSTRACT

A human being sensor is used to detect the eddy current which induced by a human being that goes near to this sensor. In this research, the human being sensor is used to trigger a buzzer. The buzzer in this sensor will play sound to scare away the human being that approach to this sensor. The human being sensor can be used to trigger other electronics circuit for different usage. The human being sensor in this research is more likely to be an alarm system that detects the human being who wants to enter or break in our house or forbidden places. This sensor detects the magnetic field in a human being by the electromagnetic field in the coil. The magnetic field in human body is generated by chemical reaction within cells and ionic currents of the nervous system. So, when a human being is approaching to the sensor range of the coil, the sensor will be triggered. The sensor will deactivated when the human being goes away from it. Some experiments have been conducted to test the sensitivity of this sensor. The coil is built in circular shape and wind in 50 turns with three different diameters which is 10cm, 15cm and 20cm respectively. The first experiment has been conducted to measure the maximum front and side detection distance for three different coil's diameter. The Second experiment has been conducted to measure the maximum detection distance for three of the coil with different coil's diameter in the condition where the door knob is in the centre of the coil. The third experiment has been conducted to test the sensitivity of this sensor with five different value of variable resistor which are 5 k Ω , 15 k Ω , 25 k Ω , 75 k Ω and 110 k Ω . The final experiment has been conducted to test the starting voltage for three different coil's diameter in two conditions. The first condition is the coil with door knob in the centre and second condition is the coil without the door knob. The coil with 10 cm diameter is suitable to place on the door knob and require the lowest starting voltage to generate this sensor as compare to the coil with 20 cm diameter. So, the best result or performance for this sensor act as an alarm system is using the 10 cm coil's diameter with this coil place on the door knob behind the door. The maximum front and side detection distance for this sensor using the 10 cm coil's diameter are (30.00 ± 0.05) cm and (27.17 ± 0.05) cm respectively with the 150 k Ω variable resistor and the starting voltage is (8.3 ± 0.1) v.



ABSTRAK

Penderia manusia adalah satu penderia yang diguna untuk mengesan medan magnet yang ada pada seorang manusia yang mendekati penderia tersebut. Dalam penyelidikan ini, penderia manusia digunakan untuk mencetuskan sebuah penggera. Penggera dalam penderia ini akan mengeluarkan bunyi untuk menghalau manusia yang cuba mendekati penderia ini. Penderia manusia boleh digunakan untuk mencetuskan litar elektronik yang lain untuk pelbagai kegunaan. Penderia manusia dalam penyelidikan ini berperanan sebagai satu sistem penggera untuk mengesan manusia yang cuba masuk ke dalam rumah tanpa kebenaran atau masuk ke tempat-tempat terlarang. Penderia ini mengesan medan magnet seorang manusia dengan menggunakan medan electromagnet dalam gegelung dawai yang ada pada penderia tersebut. Medan magnet yang terdapat dalam badan manusia digenerasikan oleh tindak balas kimia di dalam sel-sel dan arus ionic dalam sistem saraf. Oleh itu, apabila seorang manusia cuba menghampiri gegelung dawai pada penderia ini, ia akan dicetus oleh manusia itu. Penderia akan menghentikan penggera yang berbunyi itu apabila manusia tersebut jauhi dari penderia tersebut. Beberapa eksperimen telah dijalankan untuk menguji kepekaan penderia ini. Gegelung dawai adalah dibina dalam bentuk bulatan yang dililitkan dengan 50 putaran dengan tiga diameter yang berbeza iaitu 10 cm, 15 cm dan 20 cm masing-masing. Eksperimen pertama telah dilaksanakan untuk mengukur jarak pengesanan maksimum dari depan dan tepi gegelung dawai yang berbeza diameternya. Eksperimen kedua dilaksanakan untuk mengukur jarak pengesanan maksimum bagi ketiga-tiga gegelung dawai dengan tombol pintu berada pada pusat gegelung tersebut. Manakala, eksperimen ketiga dilaksanakan untuk menguji kepekaan penderia ini dengan menggunakan 5 nilai perintang boleh ubah iaitu 5 k Ω , 15 k Ω , 25 k Ω , 75 k Ω dan 110 k Ω . Eksperimen yang terakhir dijalankan untuk menguji 'votan bermula' bagi tiga lingkaran yang berlainan diameter dalam keadaan yang berlainan. Keputusan yang terbaik bagi penderia ini adalah menggunakan lingkaran yang berdiameter 10 cm dengan tombol pintu berada dalam pusat lingkaran tersebut. Jarak pengesanan terbesar dari depan dan tepi gegelung dawai tersebut masing-masing adalah (33.00 ± 0.05) cm dan (27.17 ± 0.05) cm manakala 'votan bermula' adalah (8.3 ± 0.1) V.



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LIST OF SYMBOLS AND NOTATIONS

Units

m	meter
V	volt
Ω	ohm
F	Farad
$^{\circ}\text{C}$	degree Celsius
A	ampere
W	watt

Prefixes

k	kilo, 10^3
m	mili, 10^{-3}
μ	micro, 10^{-6}
n	nano, 10^{-9}

Electronic symbols

BJT	bipolar junction transistor
FET	field effect transistor
MOSFET	metal-oxide semiconductor field effect transistor
E-MOSFET	enhancement type metal-oxide semiconductor field effect transistor
D-MOSFET	depletion type metal-oxide semiconductor field effect transistor



DC	direct current
NAND	negative – AND
CMOS	Complementary metal–oxide–semiconductor
IC	Integrated circuit

Physics symbols

P_w	Width of the pulse
V_{CEO}	Collector-Emitter Voltage
V_{CBO}	Collector-Base Voltage
V_{EBO}	Emitter-Base Voltage
$R_{\theta JC}$	Thermal Resistance Junction to Case
$R_{\theta JA}$	Thermal Resistance Junction to Ambient
V_{DS}	Drain-source Voltage
V_{DGR}	Drain- gate Voltage, (RGS = 20 kW)
V_{GS}	Gate-source Voltage
T_{stg}	Storage Temperature
T_j	Maximum Operating Junction Temperature



CHAPTER 1

BACKGROUND

1.1 Introduction

In our daily life, some of the people will go near the place that we don't want them to approach or try to enter our house and room to steal some valuable things. So, a human being sensor is created to settle this problem temporary. This human being sensor is a sensor system that detects the eddy current of human being when they approach near to this sensor and then the alarm will be triggered.

How does the eddy current exist? An eddy current is caused when a moving (or changing) magnetic field intersects a conductor, or vice-versa. Circulating flow of electrons, or current within the conductor, is cause by the relative motion. These circulating eddies of current create electromagnets with magnetic fields that oppose the effect of the applied magnetic field (Poh, S.Nagappan & Lim, 2004). The stronger the applied magnetic field, or greater the electrical conductivity of the conductor, or greater the relative velocity of motion, the greater the currents developed and the greater the opposing field.



Where the magnetic fields that intersect the conductors come from? A magnetic field represents a definable, specific, and measurable state of energy. Magnetic fields will generally exert a force on a current-carrying conductor. Likewise, magnetic fields often react with ordinary conductor or we can say non-current-carrying conductor whenever these conductors are aligned perpendicularly to the direction of the field and at the same time are moving in a direction such that the conductor slices through the field perpendicularly.

The world is surrounded by magnetic fields: some generated by the earth's magnetism, others generated by solar storms and changes in weather. Magnetic fields are also created by electrical devices (e.g. motors, televisions, office equipment, computers, microwave ovens, electrical wiring in homes, power lines). However, the magnetic field needed to cause the eddy current in this sensor is come from human. Yes, even the human body produces a subtle magnetic fields generated by chemical reaction within cells and ionic currents of the nervous system (Masamichi, 2006). An electromagnetic field (EMF) is composed of both (an electric and a magnetic field). The electric field is due to the presence of charged particles (such as electrons) and the magnetic field is due to the movement of the charged particles (such as an electron current).

A coil (say 50 turns of 30 s.w.g. copper wire wound on 10 cm, 15 cm and 20 cm diameter) is used as a pick-up coil. The circuit is adjusted by means of tune and fine-tune controls VR1 and VR2, so that it is deactivated when one stands back from the coil.



A 7555 timer (IC2) is wired as a sine-square converter for the receiver. IC2's inputs are biased through VR1, VR2 and R4. IC2 in turn switches NAND gates IC1c and IC1d, to on the buzzer. Capacitor C5 switches the buzzer for about two seconds, and its value may be increased or decreased to give different timing periods. D2 is critical to prevent back-e.m.f. from re-triggering the circuit. Supply decoupling capacitors C1 and C4 are also critical, and should be located close to IC1 and IC2 respectively.

When a human being comes within a certain distance from the coil, the sensor is triggered. The buzzer's sound will chase away the human being that go nearer to it. . This sensor will turn to an alarm system to protect the things behind the door when the coil is placed on the door knob. When someone tries to open the door, the circuit will be triggered to alert everyone in the house and to scare away the thief. This coil is placed in the threshold of a door, door knob or it can be place in any corner of your room or house.

1.2 Purpose

The purpose of this project is to construct a circuit with the ability to detect the induced eddy current which induced by a human being. The alarm in the circuit will scare away the human being who goes near to the circuit.



1.3 Objective

- i. To build a circuit with this human being sensor system.
- ii. To modify the original circuit to have a better performances.
- iii. To test the functionality of this sensor.
- iv. To test the sensitivity of this sensor.

1.4 Scope

The scope of this project is to detect the induced eddy current for a human being that come within a certain distance from the coil of this sensor.

1.5 Hypothesis

The hypothesis for this system is that the sensor will be triggered when the human being goes near to the sensor (the coil) within a certain distance.



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