"I hereby declared that I have read through this report and found that it has comply the partial fulfillment for awarding the degree of Bachelor of Electrical Engineering (Power Electronics & Drives)"

Signature : [signature]

Supervisor's Name : Hamimi Fadziati A. Wahab

Date : 7/5/07.

TEMPERATURE FLOW CONTROLLED FAN

SARAH BINTI MOHAMAD ALI

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Fakulti Kejuruteraan Elektrik
Kolej Universiti Teknikal Kebangsaan Malaysia

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"I hereby declared that this report is a result of my own work except for the experts that have been cited clearly in the references."

Signature : ....

Name : SARAH BINTI MOHAMAD ALI

Date : 7/5/07

For my dearest mother and father

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ABSTRACT

The temperature flow controlled fan is an automated fan, controlled by a temperature sensor, using fully hardware design. The heart of this project consists of the temperature sensor circuit witch uses variable resistors to let out signals to comparator functions. These variable resistors are collaborated and adjusted to give specific signals to the comparators that will contact the relays, and then will operate the fans speed. When heat is applied to the temperature sensor, this will determine the fan automatically increasing or decreasing in speed according to the four speed levels of a normal fan that are set to different temperature ranges of a room. The temperature sensor will typically sense the temperature, and the variable resistor set in that temperature range will trigger the comparators. In this case, certain resistance will be set according to the measured range of temperature. The fan adjusts to four different speed levels, so one does not need to switch to a different speed level manually. Electricity is also saved.

ABSTRAK

'The temperature controlled' fan merupakan suatu kipas automatik yang dikawal oleh satu pengesan suhu. Projek ini menggunakan rekaan perkakasan penuh. Pusat perkakasan projek ini terdiri daripada litar pengesan suhu di mana terdapat perintang boleh laras yang akan memberi isyarat kepada 'comparator functions'. Perintang-perintang boleh laras ini dilaras supaya keluarannya akan memberi isayarat untuk 'relay' berfungsi seterusnya mengawal kelajuan kipas. Apabila pengesan suhu dipanaskan, ia akan mentukan sama ada kelajuan kipas berkurang atau menaik mengikut empat tahap kelajuan yang telah ditentukan dalam julat-julat suhu suatu bilik. Dengan ini, seseorang pengguna tidak perlu menekan butang kipas secara manual dan ini juga akan menjimatkan elektrik.

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LIST OF ABBREVIATIONS

V	–	Voltage
A	–	Ampere
DC	–	Direct Current
AC	–	Alternate Current
EMI	–	Electromagnetic Interference
IC	–	Integrated Circuit
MOSFET	-	Metal Oxide Semiconductor Field Effect Transistor
PMOS	–	Polycrystalline Metal Oxide Semiconductor
LED	–	Light Emitting Diode
PCB	-	Printed Circuit Board
PIC	-	Peripheral Interface Controller

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CHAPTER 1

INTRODUCTION

1.1 OVERVIEW

This project is to complete and establish an automatic running fan that operates with a temperature sensor, using fully hardware design. The temperature sensor is connected to variable resistors and logic gates that will let out signals. This will determine the fan automatically increasing or decreasing in speed according to the four speed levels of a normal fan that are set to different temperature ranges of a room. The temperature sensor will typically sense the temperature, and the variable resistor set in that temperature range will trigger the logic gates. In this case, certain resistance will be set according to the measured range of temperature. The fan adjusts to four different speed levels, so one does not need to switch to a different speed level manually. Electricity is also saved.

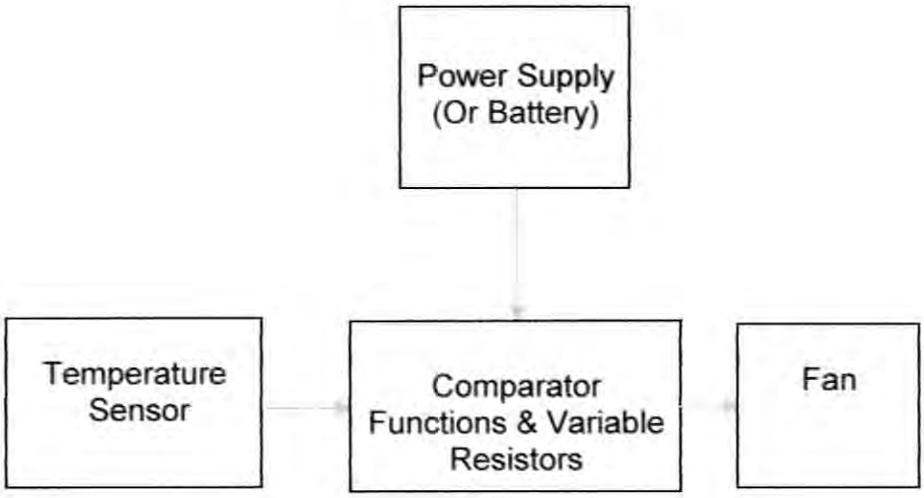

Figure 1.1: Block diagram of project

Figure 1.1 shows the block diagram describing the basic operations of this project. The power supply, which is a battery of 12V 7.2A, supplies voltage to the circuit of comparator functions and variable resistors. Meanwhile, the temperature sensor senses temperature that will trigger the variable resistors later operating the comparator functions that will simulate the circuit. This will then trigger the relays, switching each level of the fan automatically. The fan then will adjust in speed according to the temperature levels set for each speed level 0, 1, 2, and 3.

1.2 OBJECTIVES

There are three main objectives as main goals in carrying out this project, which are:

1. To create an automatic fan that is controlled by the temperature flow, using a temperature sensor.
2. Certain resistors and logic gates will be used in order to compare the temperature, where it will trigger the fan to increase or decrease in speed.
3. Fan will be operated automatically according to the temperature ranges determined. Four levels of fan speed will be developed, that are levels 0, 1, 2 and 3.

1.3 SCOPES

The scope of this project consists of four main components, which are:

1. Fan – An appliance in any household to cool an area.
2. Automatic – The fan will automatically change in speed according to different temperature ranges.
3. Temperature Sensor – A sensor that will detect temperature.
4. Comparators– Are used in simulating the circuit.
5. Controlled – by comparators and the temperature sensor.

1.4 PROBLEM STATEMENT

The problem statements that occur due to non-innovation of fans, in this case this project are:

1. Fans nowadays have manual speed selectors that requires consumers to manually adjust the speed them selves using buttons/switches.
2. Energy and electricity is wasted, if the fan is on for long hours. Fans used in the industrial sector use already set speeds that waste more energy and contributes to a companies expenditures.
3. Manual speed adjustment fans are inappropriate for the handicap and also the elderly.

1.5 EXPECTED RESULTS

The results expected in completion of this project are stated below:

1. Automated fan controlled by temperature flow is created.
2. Fan will be able to automatically increase or decrease in speed according to specific temperature ranges that are detected by the temperature sensor.
3. Comparators and variable resistors are used in operating the circuit.

1.6 LAYOUT OF THESIS

This report contains 7 chapters, the remaining 6 chapters are explained below:

- Chapter 2: Literature Review – Contains the research of other exciting reports of projects, similar to this one. These projects play a role of reference to the construction of the automated fan.
- Chapter 3: Theory of Project – Explains the theory and workings of each component used in this project.
- Chapter 4: Methodology – This chapter of the report explains the steps and levels taken to complete this project.
- Chapter 5: Project's Development – Contains the construction of the project, including explanation and workings of the circuit, hardware model, also materials used to complete the project.
- Chapter 6: Analysis and Final Results – Contains the final results achieved. Other than that, problems that have occurred throughout the completion of this project and their solutions are stated. Also consists of analysis vital to the construction of this project. Experiments and simulation is also included with results and observations. Troubleshooting is also explained in this chapter.
- Chapter 7: Conclusion and Suggestions – This chapter contains the conclusion of the project whole. Suggestions are also mentioned that are to enhance this project.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

A fan is a device used to induce airflow and generally made from broad, flat surfaces which revolve or oscillate. The most common applications of fans are for creature comfort, ventilation, or gaseous transport for industrial purposes. Leaves or flat objects, waved to produce a more comfortable atmosphere, are the simplest kind of fan.

Typical applications include ornamental decorations, climate control, cooling systems, personal wind-generation (e.g., an electric table fan), ventilation (e.g., an exhaust fan), winnowing (e.g., separating chaff of cereal grains), removing dust (e.g., sucking as in a vacuum cleaner), drying (usually in addition to heat) and to provide draft for a fire [1].

2.2 FANS

Old English *fann* referred to a basket or shovel for winnowing. It was a loan from Latin *vannus*, with the same meaning, derived from *ventus* "wind" or a related root (cf. vates). In the sense of "device for moving air" the word is first attested 1390, the hand-held version is first recorded in 1555 [1].

2.2.1 The History on Ceiling Fans

Personal cooling devices have been around ever since some heated anthropoid discovered that waving a palm leaf in the face produced the agreeable sensation of a refreshing breeze. This historical first "wind chill" was duplicated by the royalty and wealthy persons of early Assyria and Egypt who employed a small army of slaves and servants waving huge leaves to make them feel cool on hot days.

Hand fans, still seen today, came into being around the birth of Christ. The Akomeogi, the Japanese folding fan, dates back to sixth century, A.D. A century or so later, the popular Chinese dancing fan, Mai Ogi, appeared with its ten sticks and a thick paper mount depicting the family crest. In India, a large fan of peacock feathers symbolized eternal vigilance of the ruler.

The hand fan was introduced to Europeans in the middle Ages and soon became popular. By the mid 1750s in Paris alone, there were 150 master fan makers. At about this time, the world's greatest inventors started to grapple with the problem of designing mechanically powered, personal wind-generating machines [2]. Some of the more successful of these machines have appeared in the Smithsonian - the official magazine of the Smithsonian Institute in Washington, D.C.

Successful use of mechanical fans was developed in the factories of the Industrial Revolution. Workers sweating at working got the idea of attaching wooden or metal blades to the whirl shafts overhead that were used to drive the machinery. The cooling breeze was evidently so satisfying that within a few years factories on a hot summer day were in danger of having their work blown away as long rows of line-shaft fans howled over the workers.

Thomas Edison introduced the first viable large scale use of electrical power. The ceiling fan had come of age. Electricity had been considered as a fan power source. But electricity was little more than a parlor game.

Diehl is generally considered the father of the modern electric fan. One of the giants of the electrical industry, Diehl was the genius head of Messrs. Diehl and Company. One of Diehl's greatest projects, and one which eventually led to the development of the ceiling fan, was the engineering of a motor suitable for use in Singer sewing machines [2].

In 1882, with great fanfare, Diehl introduced his "invention of the electric ceiling fan." His device was a bubble-blade adaptation of the well known belt driven fan with self-contained electric motor; the latter, a modification of his machine motor. By the end of the 1880s, "The Diehl Electric" was sweeping the country. At the same time the introduction of electric lights, electric street cars, and dozens of home electrical appliances were bringing the use of electricity to cities and towns across the country. The hundreds of generators and transmission stations made power inexpensive and readily available. Inventors scrambled to make their fortunes.

Philip Diehl continued to make major improvements, innovations, such as reducing motor size and adding lights the Diehl "Electrolier" or electrified combination chandelier ceiling fan, the ultimate development in ceiling fan usefulness and soon the idea also became common property, and by the turn of century the ceiling fan was everywhere. It wasn't long before it and sales had traveled around the world.

By the late 1920s, no self-respecting restaurant, drug store, ice cream shop, elegant dining room, or even "speakeasy" was without a ceiling fan as part of their decor and ventilating system [2].

2.2.2 Types of Fans

1) Axial Fan

One of the main types of fans for moving air is the axial-flow fan, as shown in Figure 2.1. The axial-flow fans have blades that force air to move parallel to the shaft about which the blades rotate. Axial fans blow air across the axis of the fan, linearly, hence their name. This is the most commonly used type of fan, and is used in a wide variety of applications, ranging from small cooling fans for electronics to the giant fans used in wind tunnels.

Figure 2.1: An 80 mm DC axial fan [1]

2) Centrifugal Fan (radial)

The centrifugal fan as shown in Figure 2.2, has a moving component (called an impeller) that consists of a central shaft about which a set of blades form a spiral pattern. Centrifugal fans blow air at right angles to the intake of the fan, and spin (centrifugally) the air outwards to the outlet. An impeller rotates, causing air to enter the fan near the shaft and move perpendicularly from the shaft to the opening in the scroll-shaped fan casing. A centrifugal fan [1] produces more pressure for a given air volume, and is used where this is desirable such as in leaf blowers, air mattress inflators, and various industrial purposes. They are typically noisier than comparable axial fans.

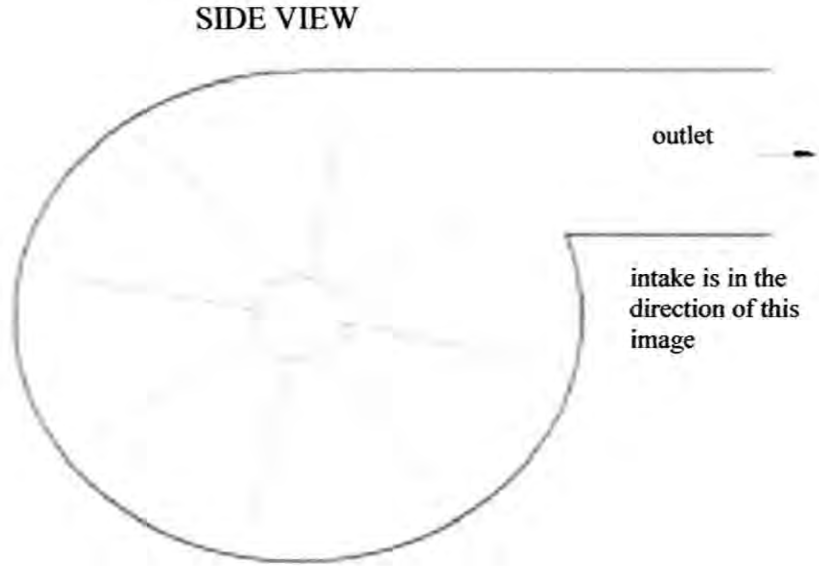

Figure 2.2: A diagram of a centrifugal fan [1]

3) Cross Flow Fan (tangential)

The cross flow fan has a squirrel cage rotor (a rotor with a hollow center and axial fan blades along the periphery). Tangential fans take in air along the periphery of the rotor, and expel it through the outlet in a similar fashion to the centrifugal fan. Cross flow fans give off an even airflow along the entire width of the fan, and are very quiet in operation. They are comparatively bulky, and the air pressure is low. Cross flow fans are often used for cooling in photocopiers. The action of a fan or blower causes pressures slightly above atmospheric, which are called plenums [1].

2.2.3 The Fan Connected to Electric Motors

Fans typically go along together with electric motors. An electric motor's poor low speed torque and powerful high speed torque is a natural match for a fan's load. Fans are often attached directly to the motor's output, with no need for gears or belts. The