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ELECTRIC MOTORIZED CEILING FAN LIFTING SYSTEM

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Abstract

Ceiling fan plays an important role in human daily activities. Ceiling fan helps to circulate the stagnant air in a room. However, the ceiling fan needs to be cleaned often. This is due to layers of dust accumulated on the fan's blades which eventually affects the efficiency of the ceiling fan's performance. This project mainly concentrates on lifting the ceiling fan in an upward and downward direction from the ceiling in order to ease the cleaning process besides providing better safety aspect compared to the conventional method. In conclusion, with aid of the system designed in this project, the cleaning process of the ceiling fan could be done often in a safer environment.

Keywords: lifting, safety, ceiling fan, motorized

1 INTRODUCTION

A motorized ceiling fan lifting and lowering apparatus for lowering a ceiling fan so that the ceiling fan may be easily cleaned. The lifting system refers to controlling the ceiling's fan height from its original position (on the ceiling) down to the user's desired position and back to its original position once maintenance process had been completed.

Safety concept refers to concept applied for the design in which electric supply to the fan is ensured to be cut-off before the fan can be moved down from its original position. Besides that, the safety concept also ensures that the fan blades have come to a complete stop after the electric supply has been cut-off before the process of moving the fan down could be done. When the fan is lifted up to its original position upon completion of the maintenance process, a safety system is also implemented to check whether the fan has been lifted up exactly to its original position before it is switched on and functions as it is.

2 SYSTEM STRUCTURE

The self-propelled scissor lift concept and theory will be used as references for the development of the height level control mechanism in this project.

- The self-propelled scissor lift concept.

A scissor lift is a type of platform that can usually only move vertically. These lifts are commonly called "scissor lifts" because the work platform is raised by means of metal arms that are hinged together like a pair of scissors [1].

In this project, the scissors concept will be implemented with a little modification whereby electrical system and embedded control system will be integrated for control algorithm of the fan's height level. The power can be in almost any form of standard mechanical drive system, including electric or gasoline powered, or in some cases, a hybrid (especially where it may be used both inside and outside) [2-3].

The conceptual design for this project is shown in Figure 1 to 3. The proposed system is an attempt to overcome the ceiling fan from swinging blindly especially at full speed condition.

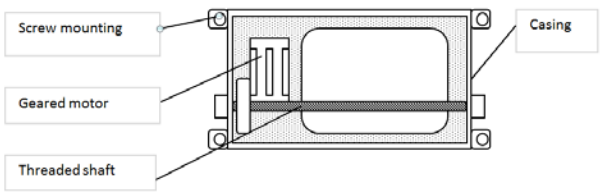

FIGURE 1. Conceptual design (Top View)

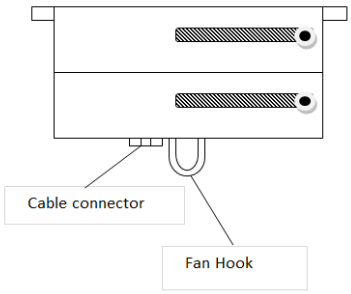

FIGURE 2. Conceptual design (Side View – Close Position)

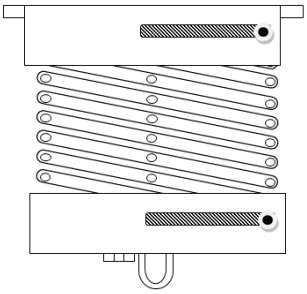

FIGURE 3. Conceptual design (Side View – Open Position)

Mild steel is chosen as the material for the casing due to its light weight and robust property. Scissors mechanism is used for the up and down lifting mechanism for the ceiling fan.

3 CONFIGURATION

The system configuration is divided into two main parts which are the mechanical system and electrical system.

3.1 Mechanical System

Figure 4 briefly describe the apparatus of the project model.

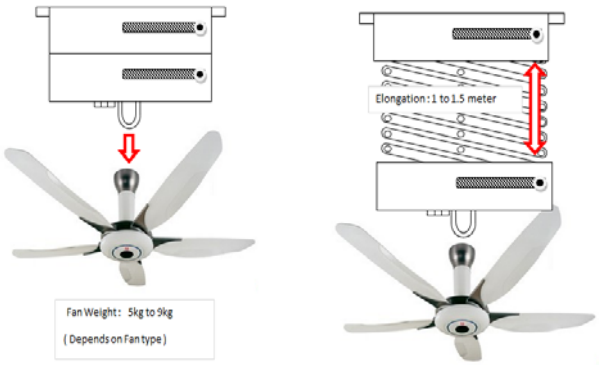

FIGURE 4. Apparatus of the project model

The apparatus design is able to uphold a maximum load of 9kg and elongates to a maximum length of 1.5 meter.

Safety aspect is the main feature of the system design where the ceiling fan is ensured to be completely stop and standstill before it can be moved downward or upward. This is done by cutting off the power supply through circuitry system designed. Details of the system flow are as shown in Figure 5.

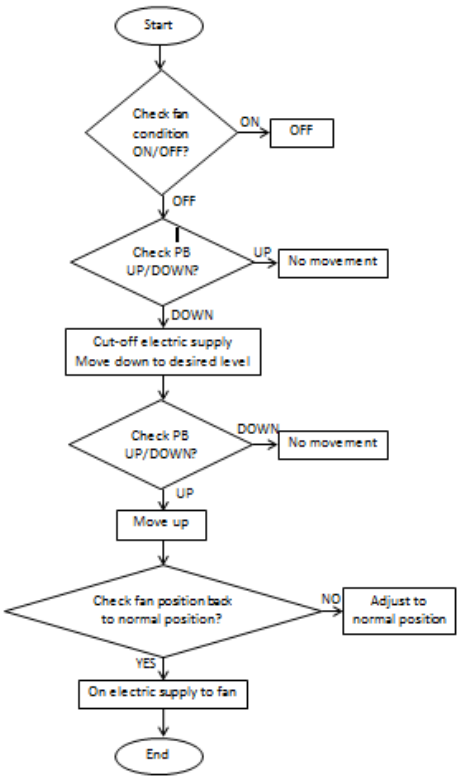

FIGURE 5. System Design Flowchart

3.2 Electrical System

Double pole double switch relay is used for controlling the apparatus upward and downward direction as shown in Figure 6 to 8.

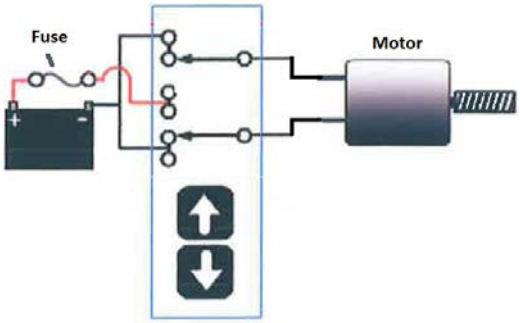

FIGURE 6. Normal condition

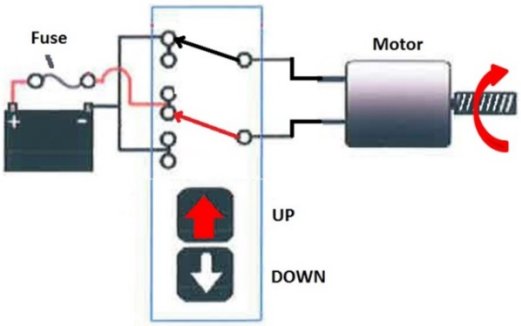

FIGURE 7. Upward position

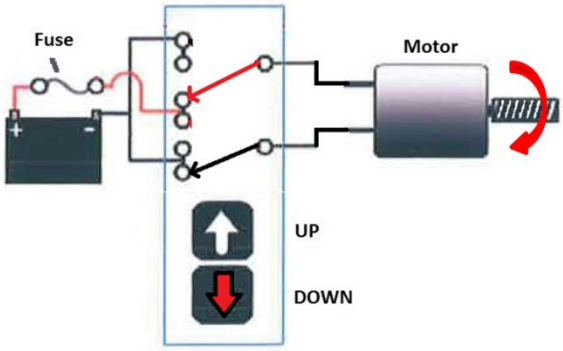

FIGURE 8. Downward Position

The motor rotates in clockwise direction when the UP switch is selected and vice versa.

4 RESULTS and DISCUSSIONS

The hardware was designed for the system with a nominal payload mass of range from 5 kg to 9 kg as shown in Figure 9 and 10. The corresponding parameters with four different types of load are selected based on the fan's weights i.e, 6 kg, 7 kg, 8 kg and 9 kg for analysis purpose. The analysis of height versus time and current versus time for fan moving upward and fan moving downward are used to get the optimum weight for this system.

First experiment involved the time taken for the fan to move downward and upward based on different loads.

FIGURE 9: Normal Position

FIGURE 10: Downward Position

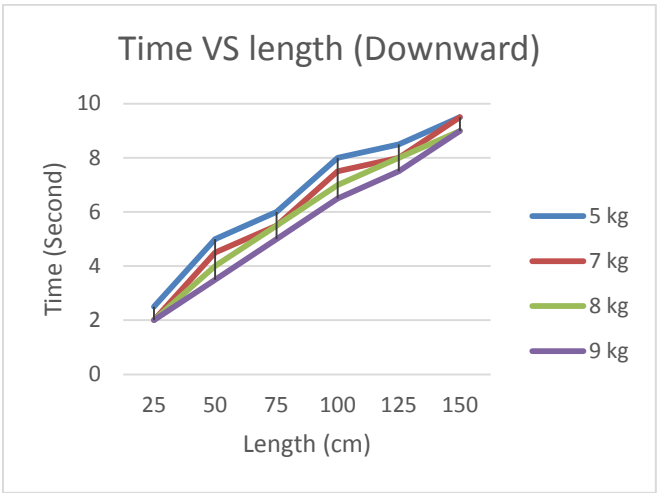

FIGURE 11. Time taken to move the fan downward with different load

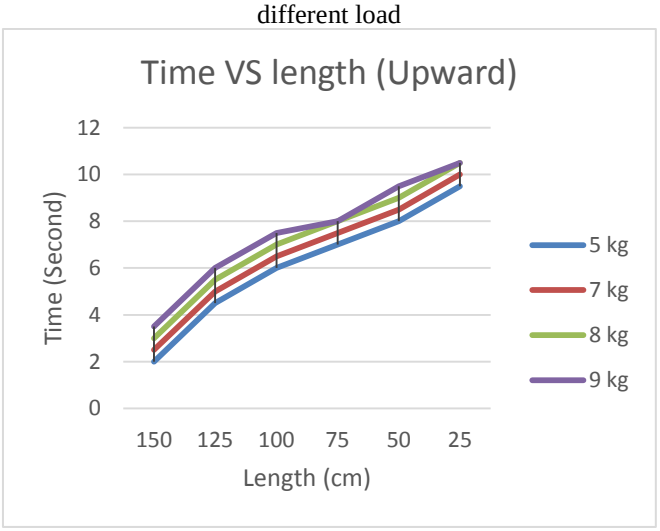

FIGURE 12. Time taken to move the fan upward with different load

Figure 11 and 12 shows that the time taken for the scissor lifting mechanism to move the fan almost not affected by various load.

Second experiment involved the measurement of the current that has been used by the motor to move the fan based on different load.

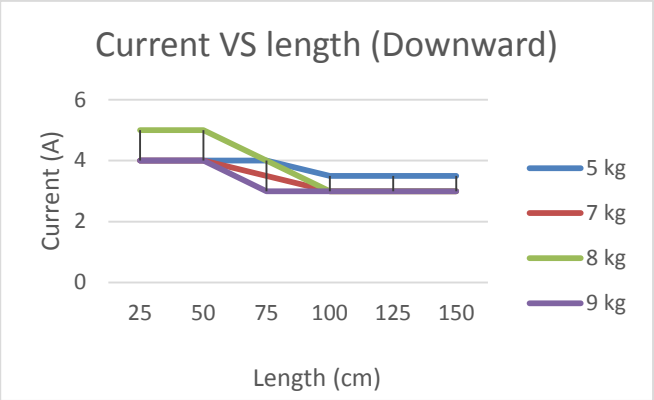

FIGURE 13: Current used by the motor to move the fan downward with different load

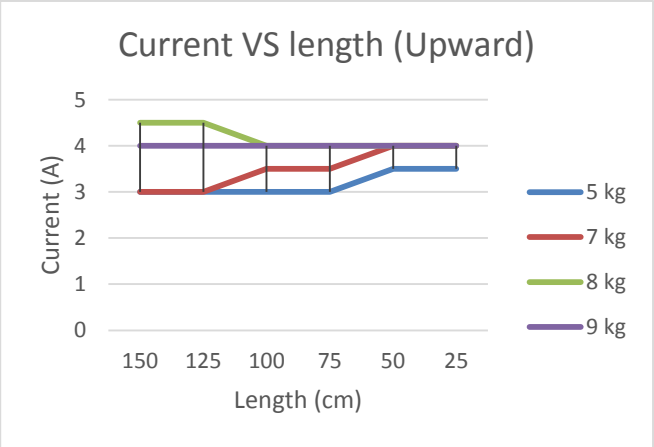

FIGURE 14: Current used by the motor to move the fan upward with different load

Figure 13 and 14 shows that the current used by the scissor lifting mechanism to move the fan almost not affected by various load.

5 CONCLUSION

This paper has attempted to review the optimum load with better safety aspect compared to the conventional method.
It is hoped that this apparatus will be a tool to aid those who are interested in using this apparatus for ceiling fan cleaning and maintenance purposes.

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