

**DESIGN AND FABRICATION OF ADJUSTABLE CEILING FAN BLADE
CLEANER**

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requirements for the award of the Diploma
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ABSTRACT

This thesis is based on the project about design and fabrication of adjustable ceiling fan blade cleaner. 'Adjustable Ceiling fan blade cleaner' is equipment that can clean the blade ceiling fan. The fabrication of this product started with surveying in market about the product, specification analysis, concept designing, detail concept designing and fabrication of the product. Four (4) products were selected from the market for the analysis and investigation. One types of the product that suitable and fit all the specification was chosen to fabricate. The investigation was made in scope of the constraint that may occur for the development of the product and relevance of the product manufacturing processes. This product have been fabricate according to engineering method through many fabrication process such as welding, cutting, drilling and assembling. For development of this project and future works, some suggestion was made for upgrading the product. The suggestion like dust case and more durable of the holder to make sure this product will competitive with the existing products in the market.

ABSTRAK

Projek Tahun Akhir ini adalah mengenai “*adjustable ceiling fan blade cleaner*” yang merupakan alat yang digunakan untuk mencuci bilah kipas siling. Proses penghasilan produk telah dimulakan dengan membuat tinjauan terhadap pasaran, penganalisan spesifikasi produk, reka bentuk konsep, reka bentuk kosep yang terperinci, dan penghasilan produk. Terdapat empat (4) produk di pasaran yang dikenal pasti dan di senaraikan untuk tujuan kajian dan analisis. Setelah dianalisis kesemua produk, satu produk yang menepati kesemua spesifikasi yang telah ditetapkan telah dipilih. Kajian di buat dengan melihat kesesuaian produk terhadap proses pengeluaran dan halangan yang timbul seperti ketiadaan bahan serta keadaan mesin di dalam menghasilkan produk ini. Produk ini dihasilkan mengikut cara kejuruteraan seperti mengimpal, memotong, menggerudi dan mencantum. Beberapa cadangan telah dibuat untuk menambahbaik produk tersebut. Diantaranya ialah bekas penampung habuk dan juga bahan pemegang produk tersebut yang akan menggunakan bahan yang lebih tahan untuk memastikan produk ini mampu bersaing dengan produk yang sedia ada di pasaran.

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CHAPTER 1

INTRODUCTION

1.1 Project Synopsis

1.1.1 General Project Synopsis

Final year project is one of the subjects for this semester. In this subject, a project needs to do to fulfil the subject requirement. This project is to design and fabricate the adjustable ceiling fan blade cleaner. This adjustable ceiling fan blade cleaner should be entirely different from existing product in the market. In this project, we need to fabricate and make sure the adjustable ceiling fan blade cleaner suitable for the blade of standard ceiling fan. This project is more on designing the idea.

1.1.2 Specific Project Synopsis

This project title is Adjustable Ceiling Fan Blade Cleaner. The project involves the fabricated of the adjustable ceiling fan blade cleaner. The project involves the analysis of the ceiling fan blade cleaner developed earlier with concerns regarding strength, material and cost. Modifications are required to give a different type of ceiling fan blade cleaner that exists in the market. After that, testing is needed to be done to make sure the adjustable ceiling fan blade cleaner is functional and to

determine the strength of the holder. Overall, the project will meet acquire skills of design, analysis and fabrication.

1.2 Problem Statement

- i. In conventional method, a ladder is use in cleaning process.
- ii. Problems of the height of the ceiling fan and the ladder.
- iii. It takes time to clean by using conventional method.

1.3 Project Scope

- i. Design the adjustable ceiling fan blade cleaner using Solid Work software.
- ii. Fabrication the adjustable ceiling fan blade cleaner using metal inner gas (MIG) and drilling for joining method.
- iii. Material to be used is paint roller and PVC plastic rod.

1.4 Project Objective

- i. To identify the uses and functioning of ceiling fan blade cleaner.
- ii. To fabricate the ceiling fan blade cleaner according to engineering method such as cutting, drilling, welding and assembling.
- iii. To create one simple method to clean the ceiling fan blade compared the conventional way that using ladder and wool.
- iv. To compared specification with existing product that exist in the market such as customer request, adjustable, durability, ease to use, ease to manufacture and cost to manufacture.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Ceiling fan blades collect lots of dust, and then they spread it around. A ceiling fan blade cleaning device includes a fork member and a separable cleaner member. The fork member has a tubular handle by which the user holds the device for cleaning purposes. The cleaner member is formed of fibrous web material and has a rectangular central portion formed of a pair of spaced apart rectangular webs presenting an opening into which a ceiling fan blade may extend for simultaneous cleaning of its upper and lower surfaces. Users do not have to stand on a chair to clean their ceiling fan blade.

This adjustable ceiling fan blade cleaner commonly produces by PVC plastic rod, plastic and fabric. This items has been chosen because strength, light in weight, easy to fabricate, long life and etc. This adjustable ceiling fan blade cleaner also commonly fabricate using welding method such as MIG welding to joining part that been made by steel. This method has been chosen because can produce the durable, clean and interesting adjustable ceiling fan blade cleaner.

2.2 Theoretical Review

2.2.1 Housekeeping Tool

The ceiling fan blade cleaner is to cleaning the ceiling fan blade. This ceiling fan blade cleaner commonly used at the house, school, office and etc.

2.3 Technical review

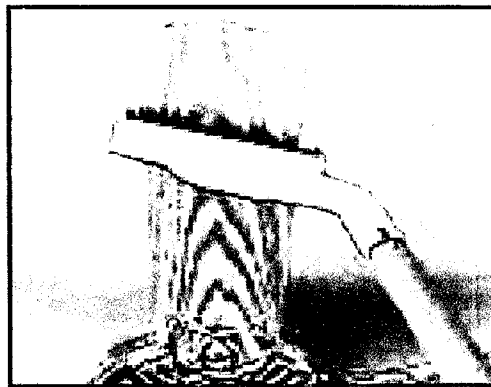


Figure 2.1: Vacuum ceiling fan blade cleaner

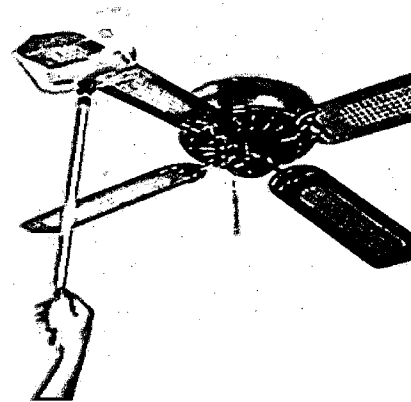


Figure 2.2: Ceiling fan blade cleaner with dust holder

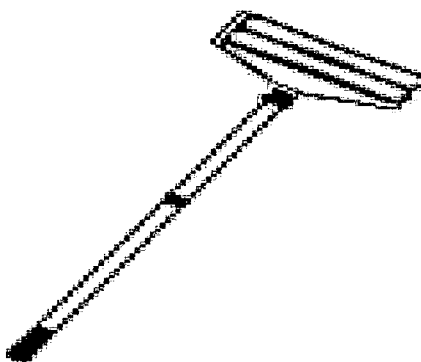


Figure 2.3: Wiper type ceiling fan blade cleaner

2.4 Joining Method of Welding Process

2.4.1 Basic Theory of Metal Inert Gas(MIG) Welding

This clothesline will be joined by using the permanent joint which is welding process. The method joining that be able to fabricate and assembled the frame is Metal Inert Gas (MIG) Welding.

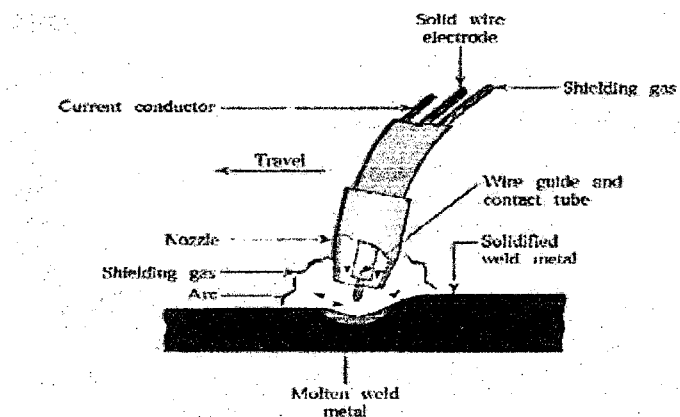


Figure 2.4: Basic structure of metal inert gas (MIG) welding.

Metal Inert Gas (MIG) Welding: An arc is struck between a consumable electrode and the sheet metal to be welded. The consumable electrode is in the form of continuous filler metal. An inert gas surrounds the arc and shields it from the ambient to prevent oxidation. Carbon steels, low alloy steels, stainless steels, most aluminum alloys, zinc based copper alloys can be welded using this process.

Gas Metal Arc Welding (GMAW) is frequently referred to as MIG welding. MIG welding is a commonly used high deposition rate welding process. Wire is continuously fed from a spool. MIG welding is therefore referred to as a semiautomatic welding process. The shielding gas, forms the arc plasma, stabilizes the arc on the metal being welded, shields the arc and molten weld pool, and allows smooth transfer of metal from the weld wire to the molten weld pool. There are three primary metal transfer modes which are spray transfer, globular transfer and short circuiting transfer.

2.4.2 The Advantages of MIG Welding

- i. High productivity, because based on this machine the consumer no need to stop their work to change rods or chip and brush the weld frequently.
- ii. Easy to learn and makes great-looking welds.
- iii. Can weld on stainless steel, mild steel, and aluminium.
- iv. This welding process also can be weld in all positions.

2.4.3 The Disadvantages of MIG Welding

- i. Costs money of consumable, such as tips and nozzles.
- ii. Is not worth a dang on paint, rust, or dirty surfaces.
- iii. No good for thick steel, because it does not get the proper penetration.

2.4.4 Welding Gun and Wire Feed Unit

The Figure 2.5 has shown the basic structure on the nozzle of the MIG welding.

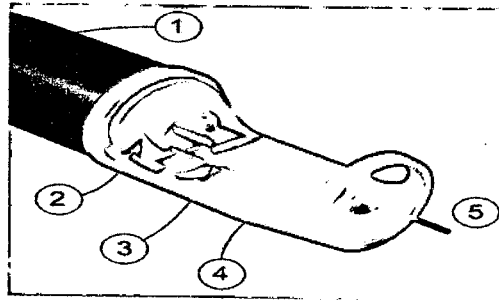


Figure 2.5: GMAW torch nozzle cutaway image. (1) Torch handle, (2) Molded phenolic dielectric (shown in white) and threaded metal nut insert (yellow), (3) Shielding gas nozzle, (4) Contact tip (5) Nozzle output face.

2.4.5 Process of MIG Welding

In spray transfer, small, molten metal droplets from the electrode are transfer to the weld area at a rate of several hundred droplets per second. The transfer is spatter-free and very stable. High Direct Current (DC) and voltages and large-diameter electrodes are used with argon or argon-rich gas mixture used as the shielding gas. The average current required in this process can be reduced by using a pulsed arc, which superimposes high-amplitude pulses onto a low, steady current. The process can use in all welding positions.

In globular transfer, carbon-dioxide-rich gases are utilized, and globules are propelled by the forces of the electric-arc transfer of the metal, resulting in considerable spatter. High welding currents are used, making it possible for greater weld penetration and higher welding speed than are achieved in spray transfer. Heavier sections commonly are joined by this method.

In short circuiting, the metal is transferred in individual droplets (more than 50 per second), as the electrode tip touches the molten weld metal and short circuits. Low currents and voltages are utilized with carbon-dioxide-rich gases and electrodes made of small-diameter wire. The power required is about 2 kW.

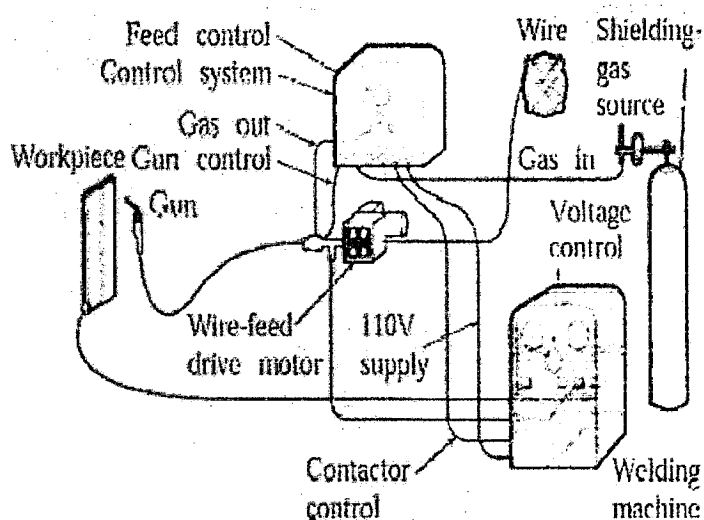


Figure 2.6: Basic equipment used in MIG operations

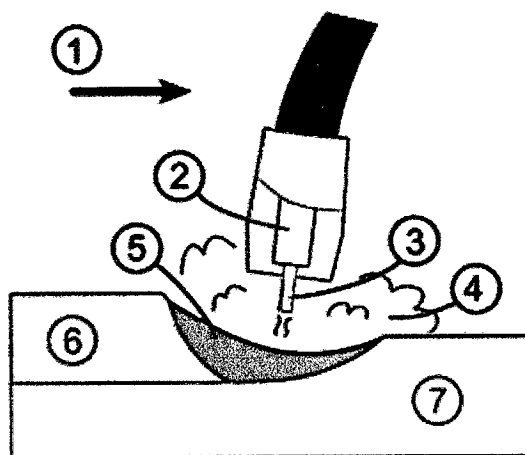


Figure 2.7: GMAW weld area. (1) Direction of travel, (2) Contact tube, (3) Electrode, (4) Shielding gas, (5) Molten weld metal, (6) Solidified weld metal, (7) Work piece.

In most of its applications, gas metal arc welding is a fairly simple welding process to learn, requiring no more than several days to master basic welding technique. Even when welding is performed by well-trained operators, however, weld quality can fluctuate, since it depends on a number of external factors. And all GMAW is dangerous, though perhaps less so than some other welding methods, such as shielded metal arc welding.

CHAPTER 3

PROJECT METHODOLOGY

3.1 Project Flow Chart

In fabrication of adjustable ceiling fan blade cleaner, there is a planning of the overall progress to assure the project can be finish on schedule. This project started with the literature review and research about the product. The main important of the project is determination the objective. Then, study and make a lot of investigation about ceiling fan blade cleaner. This is including a review concept of the cleaner, fan technology, and type of cleaner use in various ceiling fan blade cleaner. These tasks have been done through research on the internet, books and others sources.

The project will be continuing with the design process. In this stage, the knowledge and lessons that have studied will be applied in sketching. It is important to make a suitable design for the project. After several design sketched, design consideration have been made and one of the design have been chosen. The selected sketch will be transfer to solid modelling and engineering drawing by using Solid Works program.

After all the engineering drawing finished, the drawing was used as a reference for the next process, which it is fabrication stage. This process is consists fabricate all the parts that have design before by following all the dimension using various type of manufacturing process. The manufacturing process included in this process is welding, cutting, drilling and others. During the fabrication process, if

there is something wrong occur, such as not balance dimension so the process will be stop and go back to previous step, make a modification against the current design.

Testing stage has been implementing after fabrication stage. The testing is to gathered information about strength, durability, and safety of the design that has been fabricated. Due to some problem that will discuss later in other chapter, the testing only can be made on several aspect only. During the testing, if problem occur such as malfunction, the process step back to previous process, which is fabrication. If the cleaning process is working, the project will be declaring success.

Then, all the process mentioned above is done; all the material for report writing is gathered. The report writing process will be guided by the UMP final year project report writing. The project ended after the submission of the report and the slide presentation has been present.

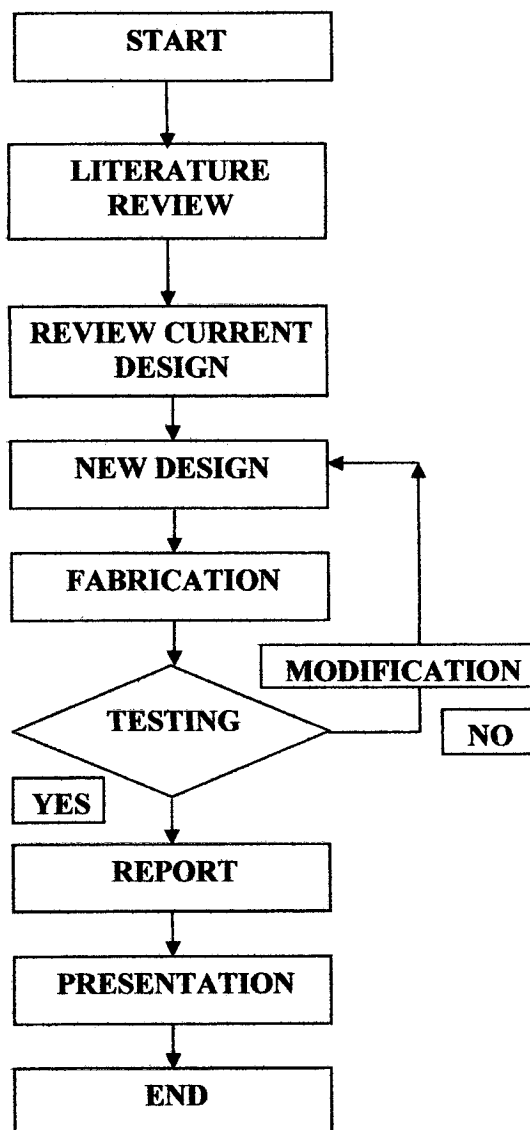


Figure 3.1: Project flow chart

3.2 Design

3.2.1 Introduction

The design of the adjustable ceiling fan blade cleaner must be compliance to several aspects. The design consideration must be done carefully so the design can be fabricated and the ceiling fan blade cleaner functioning. The aspect that must be considered in designing the adjustable ceiling fan blade cleaner table is:

- 3.2.1.1 Adjustable : This ceiling fan blade cleaner should have adjustable aspect compared other ceiling fan blade cleaner that exist in the market.
- 3.2.1.2 Material : The material that will choose must be suitable such as light in weight to fabricate this adjustable ceiling fan blade cleaner.
- 3.2.1.3 Cost : It depends on material and manufacturing process was chosen.

3.2.2 Concept Selection Method

The design of adjustable ceiling fan blade cleaner must through process of concept selection method. It includes selecting four current designs that exist in the market and sketching two designs of ceiling fan blade cleaner that have certain characteristic and advantages. The selection and sketching of ceiling fan blade cleaner table is:

Concept A

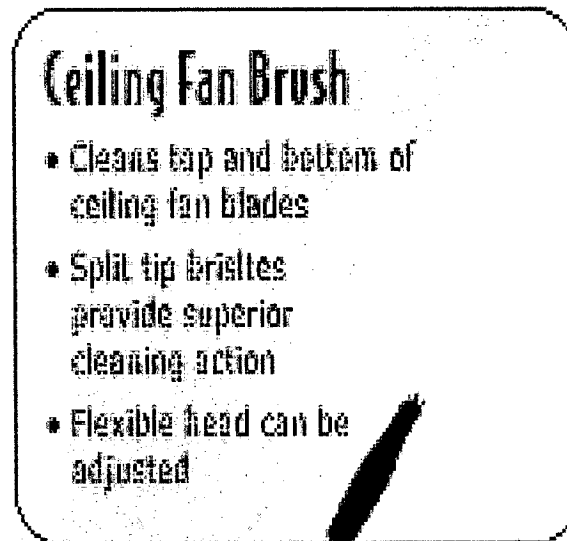


Figure 3.2: Concept A

It is known as datum concept because this cleaner already found in the market. The advantages of this design are light and easy to use. The disadvantages of this design are the cleaning process not very clean and it easily to bend when cleaning process.