Prototype Design and Research Collection

Series 1

Universiti Teknologi MARA
Pasir Gudang Campus

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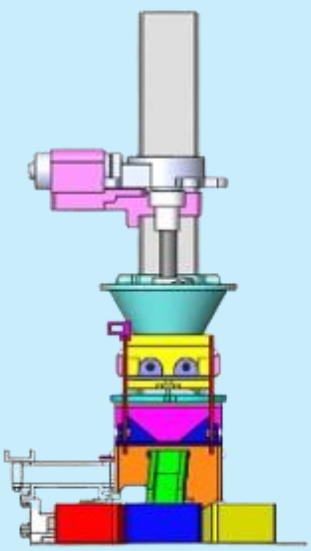

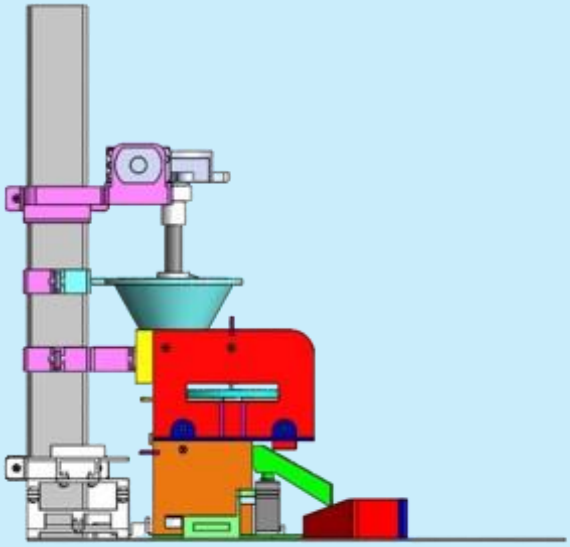

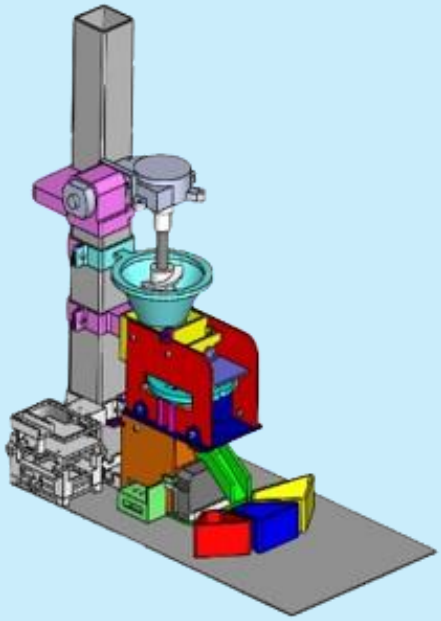

AHMAD NAJMIE RUSLI

CHIEF EDITOR:

Ahmad Najmie Rusli

EDITOR:

Nurul Nadiah Rasdi

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FOREWORD

This digital book on Prototype Design and Research Collection Series 1 (PDRC Series 1), is designed as a comprehensive reference for mechanical engineering students. The designs featured in this collection undergo an extensive analysis process, incorporating both prototype development and research to ensure a thorough understanding of design principles. Each project is carefully analysed before the prototype fabrication with detailed summaries of the project description and design parameters. The design and research products presented in this series cover a wide range of tools and equipment for various applications including household, workshop and entrepreneurial purposes.

This collection aims to foster innovation by offering students valuable insights into both the technical and research aspects of product design. It is hoped that this book will inspire future engineers and designers to approach product development with a deeper understanding of the design and research processes.

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CHAPTER 8

Development of a Prototype Spray Paint Hut

Muhammad Farhan Mahadi [1] and Nurul Hanna Mas'aud [2*]
[1,2]*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, Bandar Seri Alam, 81750 Masai, Johor Darul Ta'zim.*
**Corresponding author (e-mail): nurul989@uitm.edu.my*

ABSTRACT

Recognizing the limitations of traditional painting methods in achieving precision and efficiency, this paper presents the development of the Spray Paint Hut, a pioneer solution designed to address the challenge of painting small parts in various industries. The prototype of the spray paint hut offers a compact, user-friendly solution. Through a hut which includes a rotating platform, a pump to generate pressure for the paint, and a battery for portable usage, this spray paint hut enables users to achieve intricate detailing with ease, enhancing productivity and minimizing the mess as well as the duration of the painting process. This prototype development process starts with problem identification, concept generation using Morphological Chart, design selection by Pugh Chart, design development using Solidwork, and lastly fabrication and testing process. This prototype of a spray paint hut is limited to a certain size of product so that it will be easier to fabricate. Nevertheless, this innovation unlocked the possibilities in design and production of diverse applications across industries such as automotive, electronics, and toys manufacturers. In summary, the prototype of the spray paint hut represents a significant advancement in painting, offering a transformative solution to the challenge of painting small parts. Its precision, efficiency, versatility, accessibility, and innovation have the potential to enable users to minimizing time and energy and ensure a clean environment during the painting process.

Keywords: Paint hut, Spray painting

1 INTRODUCTION

Spray painting methods involve the application of paint using pressurized air or gas to atomize and propel the paint particles onto a surface. This method offers several advantages, including fast application, smooth finish, and even coverage. There are various spray-painting techniques, each suited to different applications and desired outcomes [1].

Currently, painting small parts typically involves manual methods that can be time-consuming, labour-intensive, and prone to inconsistencies. Some common techniques include aerosol spray can, airbrushing, and spray guns [1]. Therefore, there is a need for innovative solutions that can overcome these limitations and provide users with greater control, consistency, and productivity in painting small parts.

2 LITERATURE REVIEW

Spray painting is a technique for applying paint to a surface using a device that sprays the paint in a fine mist or aerosol. This method is widely used in various industries, artistic pursuits, due to its efficiency, versatility, and ability to achieve smooth, uniform coverage [1]. Aerosol spray cans are convenient and portable, making it possible for DIY projects and outdoor use, however, they may lack the precision required for intricate detailing [2]. Airbrushing involves using a small, handheld airbrush gun connected to an air compressor. It allows for precise control over the flow of paint and air pressure, making it suitable for detailed work. But they may cause an unhealthy environment as the paint is sprayed to the parts, the paint particles are spread away [3]. While for spray guns, it is commonly used in professional painting applications such as automotive refinishing, furniture finishing, and industrial coatings. These guns operate at lower air pressure resulting in reduced overspray and offer greater control over paint flow, enabling users to have finer finishes with less waste [4].

(a) Aerosol spray cans

(b) Airbrushing

(c) Spray guns

Fig. 1: Existing Spray-Painting Tools

3 METHODOLOGY

This prototype development process starts with problem identification, concept generation using Morphological Chart, design selection by Pugh Chart, design development using Solidwork, and lastly fabrication and testing process as shown in Fig. 2 below.

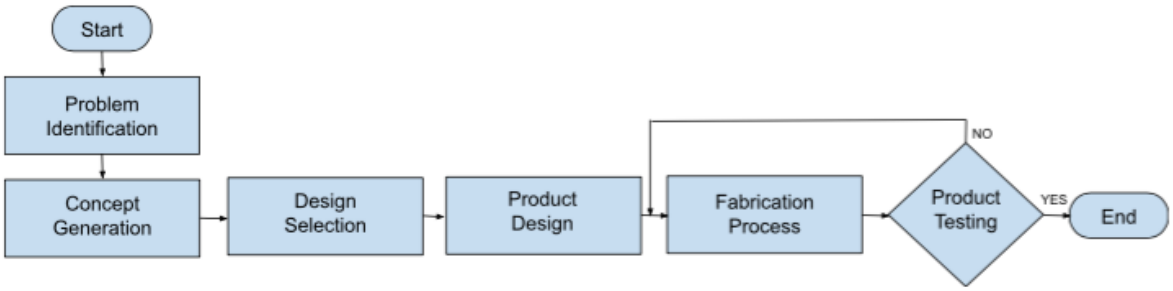

Fig. 2: Product Flowchart

Fig. 3 shows an assembly drawing of the Prototype of Spray Paint Hut. Based on the drawing, it will then proceed with the next process which is the fabrication process. In this process, it involves selecting the raw materials, cutting, shaping, machining, grinding, and assembling the product.

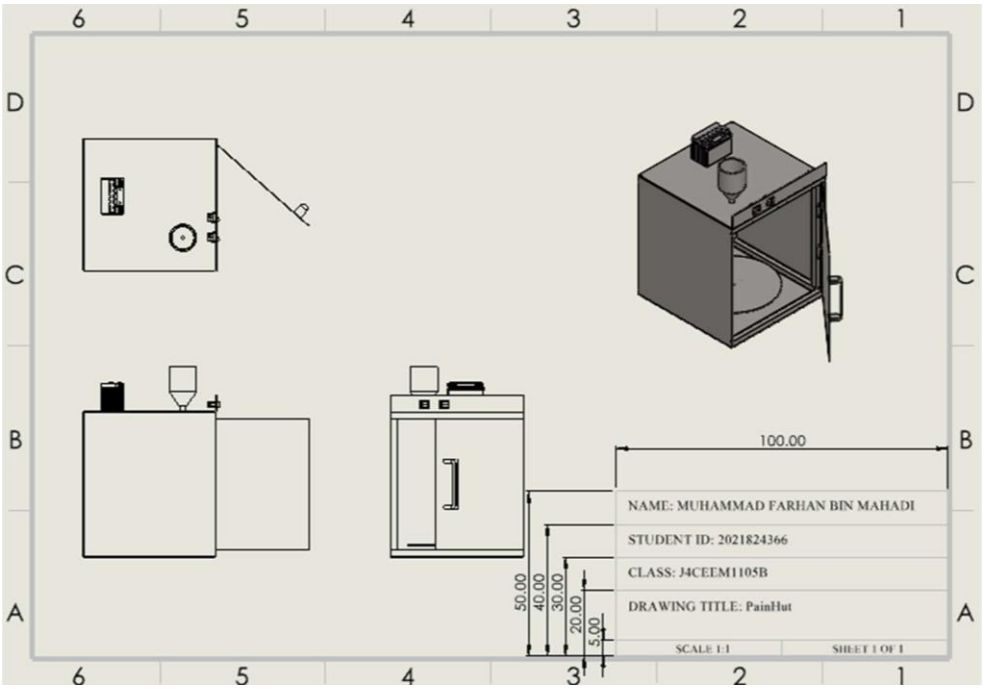

Fig. 3: Assembly Drawing

4 RESULTS AND DISCUSSION

The fabrication process of the Spray Paint Hut prototype is a critical stage in development of the product, bridging the gap between design and functionality. In conjunction to ensure the product is successful, engineering analysis also has been conducted. It simulates the behaviour and performance of the design during force application. Based on Fig. 4, it shows that the frame is strong enough to handle the max load applied. The selection of material is also suitable as it is able to support the load. The final product has successfully fabricated as shown in Fig. 5.

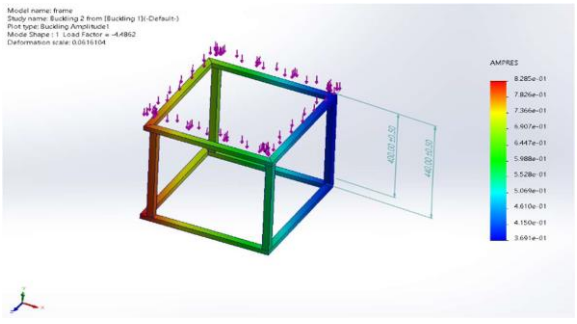

Fig. 4: Assembly Drawing

Fig. 5: Final Product

5 CONCLUSIONS

In conclusion, the innovation of the Spray Paint Hut prototype offers valuable insights into the future of painting technology, highlighting the importance of precision and intricate detailing on small parts, overcoming the limitations of traditional painting methods. Besides that, this prototype also enhances efficiency and productivity. It reduces the time and effort required for painting tasks, allowing users to complete projects more quickly and effectively. Lastly, the Spray Paint Hut prototype represents a significant advancement in painting technology, with the potential to drive further innovation and development in the field. It opens up new possibilities for customization, product design, and sparking creativity.

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