

PROTOTYPE DESIGN COLLECTION

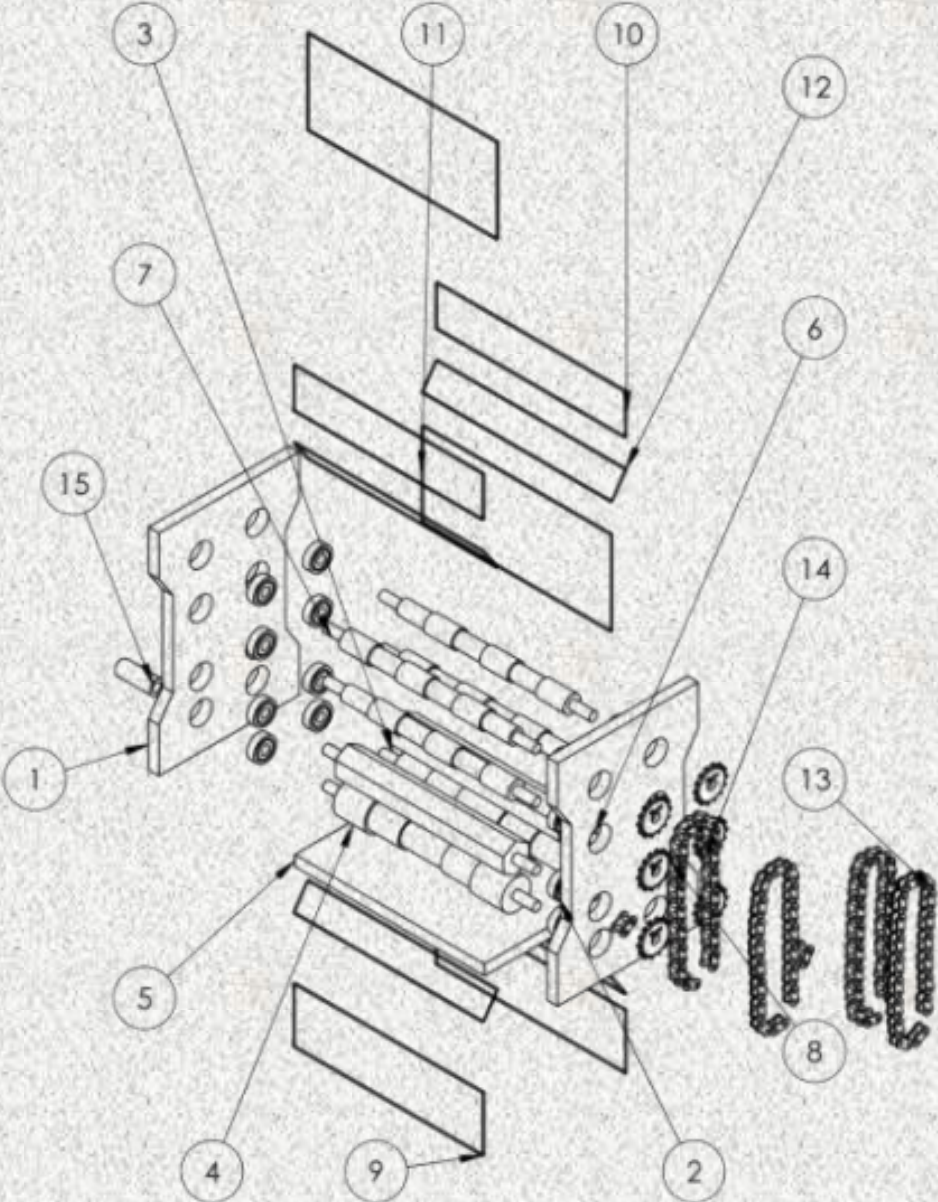
SERIES 4



Universiti Teknologi MARA
Pasir Gudang Campus

Prototype Design Collection

Series 4



Ahmad Najmie Rusli

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FOREWORD

This digital book on Prototype Design Collection Series 4 (PDC Series 4) is published as a reference design for mechanical engineering students. The designs presented experience a few phases of analysis before fabrication of prototype. Each project summarises the project description, prototype, figures, and design parameter. The design products vary in tools or equipment for household, workshop, entrepreneur, etc. Suggested material and detail of prototype dimension are also mentioned in this book.

It is hoped that this book will assist the students to have more ideas on innovation design products in the future.

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CHAPTER 22

Design and Fabrication of an Automated LED Bulb Replacement Device

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PROJECT DESCRIPTION

Manual LED bulb replacement poses safety risks, particularly in high-ceiling installations where ladder use increases the likelihood of falls. This project focuses on the design and fabrication of an automated LED bulb replacement device equipped with a motorized gripping mechanism enhance efficiency. The design process involved concept development, CAD modeling, material selection, and fabrication using lightweight aluminum for durability and ease of handling. Engineering analysis determined the motor torque specifications, and stability considerations for various ceiling heights. Testing validated that the device successfully removed and installed LED bulbs with the gripper ensuring a secure hold without damaging the bulb. Performance evaluation indicated smooth mechanical operation, though refinements in grip adjustability, automation response time, and improved maneuverability are recommended for future iterations. The findings demonstrate the feasibility of automated bulb replacement systems in reducing workplace hazards and providing a convenient, user-friendly alternative to traditional methods.

Keywords: *Automated Bulb Replacement, Motorized Gripping Mechanism*

PROTOTYPE



DESIGN PARAMETER

