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Design & Fabrication of Rope Making Machine

Aniket Sumedh Gajbhiye[1], Naresh Mohan Karangala[2], Shubham Dhanraj Chaudhari[3], Prof. Pravin D. Padole[4]

[1234] Department of Mechanical Engineering
Rajiv Gandhi College of Engineering Research and Technology, Chandrapur, Maharashtra, India
[1] aniketgajbhiye470@gmail.com, [2] karangalanaresh@gmail.com,
[3] shubhamchaudri99@gmail.com, [4] pravinpadole@rediffmail.com

Abstract: *The "Design & Fabrication of Rope Making Machine" focuses on developing a compact, low-cost, and efficient machine for rope production using multiple woolen threads. Traditional rope making methods require more manual effort and produce non-uniform ropes. To overcome these limitations, an automated rope making mechanism was designed using DC motors, gear transmission, pulley arrangements, bearings, and 3D printed components.*

The machine operates on a 12V DC supply and uses synchronized rotating hooks to twist six woolen threads of 1.5 mm diameter into a uniform rope. Solid-works software was used for CAD modeling and assembly design before fabrication. The developed prototype showed satisfactory performance with smooth rope formation and reduced manual effort. Minor tolerance issues were observed in some 3D printed parts during testing.

The project demonstrates a simple and economical solution for small-scale rope manufacturing and provides future scope for further automation and industrial applications.

Keywords: Rope Making Machine, DC Motor, Rope Twisting, 3D Printing, Solidworks, Mechanical Automation.

I. INTRODUCTION

Rope is one of the oldest and most useful products used in various fields such as agriculture, construction, transportation, marine work, packaging, and household applications. Traditionally, ropes are made manually by twisting fibers or threads together using hand-operated methods. These conventional methods require more human effort, consume more time, and often produce ropes with uneven twisting and inconsistent quality.

With the advancement in mechanical systems and automation, there is a growing need for low-cost and efficient rope making machines that can improve productivity while reducing manual labor. Commercial rope making machines available in industries are generally expensive and complex, making them unsuitable for small-scale industries, rural areas, and educational projects.

The "Design & Fabrication of Rope Making Machine" project aims to develop a compact, portable, and economical machine capable of producing uniform ropes using multiple woolen threads. The machine works using DC motors, pulley mechanisms, gears, bearings, and 3D printed components. A synchronized twisting mechanism is used to twist six woolen threads together to form a strong and uniform rope.

Solid-works software was used for designing and assembly of the machine components before fabrication. The fabricated prototype operates on a 12V DC supply and includes speed controllers for controlling motor speed and rope twisting operation.

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Problem Statement

Traditional rope making processes are labor intensive, time consuming, and produce inconsistent rope quality. Industrial rope making machines are expensive and unsuitable for small-scale applications. Therefore, there is a need for a compact, economical, and easy-to-operate rope making machine that can reduce manual effort while improving rope quality and production efficiency.

II. OBJECTIVES

- To design a compact rope making machine.
- To reduce manual effort in rope production.
- To improve uniformity and quality of rope twisting.
- To fabricate a low-cost machine using locally available materials.
- To implement 3D printed components in mechanical assembly.
- To develop a portable and easy-to-operate system.

III. LITERATURE REVIEW

Review 1

Several traditional rope making methods are manually operated and require significant human effort. These methods often produce ropes with non-uniform twisting and inconsistent strength. Automation in rope manufacturing helps improve productivity and rope quality.

Review 2

Researchers have developed rope twisting mechanisms using DC motors, pulley systems, and synchronized rotating hooks. Motorized rope making systems reduce manual labor and improve twisting accuracy while maintaining constant rope tension.

Review 3

Recent studies show that 3D printing technology is widely used in prototype development due to its low manufacturing cost, flexibility, and fast production. Components such as gears, supports, and hook assemblies can be easily fabricated using 3D printing techniques.

Review 4

CAD software such as Solidworks is commonly used for mechanical design and assembly analysis. It helps in accurate modeling, visualization, and fabrication planning before the actual manufacturing process begins.

IV. METHODOLOGY / WORKING PRINCIPLE

The machine operates using DC motors connected to rotating hook assemblies through gears and pulley arrangements. Six woolen threads are fed through guide mechanisms and twisted simultaneously to form a rope. The pulley system maintains thread tension while rotating hooks provide synchronized twisting motion.

A 12V DC battery is used as the power source, and speed controllers are used to regulate motor speed. Bearings are provided to reduce friction and ensure smooth rotation. The overall assembly was designed using Solid-works software before fabrication.

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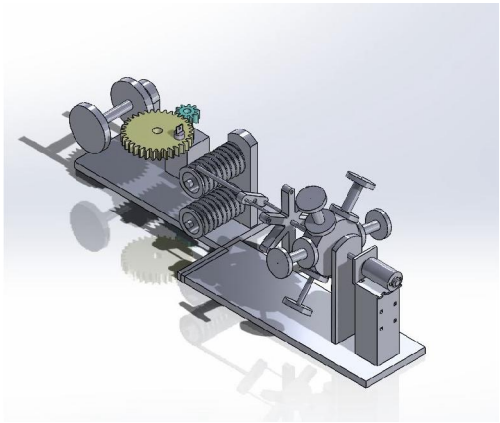

Fig 1: CAD Model of Rope Making Machine

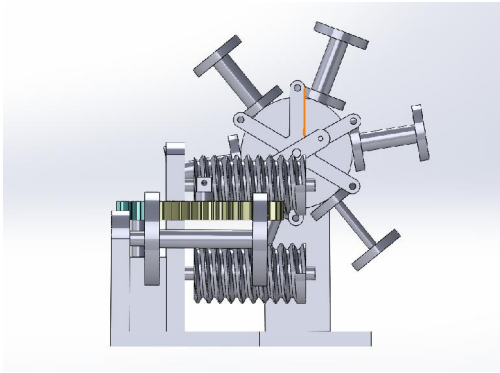

Fig 2: Side View of Rope Twisting Mechanism

Design & Components

Main Components Used

Sr. No	Component	Specification
1	DC Motor	12V / 3V
2	Bearings	6.5 mm
3	Speed Controllers	2 Units
4	Pulley	Wooden
5	Gears	3D Printed
6	Hook Assembly	3D Printed
7	Power Supply	12V Battery
8	Rope Material	Woolen Thread

Design Software

Solid-works software was used for:

- CAD modeling
- Assembly design
- Component visualization
- 3D printable part design

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V. FABRICATION PROCESS

The fabrication process started with CAD modeling of machine components in Solidworks. Various components such as gears, pulley supports, hook holders, and guide mechanisms were manufactured using 3D printing technology.

The wooden base structure was prepared for mounting motors, bearings, and pulley arrangements. Bearings were fixed using nuts and bolts, while speed controllers and wiring connections were assembled carefully. Wooden pulleys were used for smooth thread rotation and tension control.

After assembly, the machine was tested using woolen threads to verify rope formation and synchronized operation.

Calculations

Motor Speed Calculation

Given:

- Motor Speed = 3000 RPM
- Number of Threads = 6

Assuming reduction through pulley arrangement:

Final Hook Speed = 3000 / 3

Final Hook Speed = 1000 RPM

Rope Diameter

Single Thread Diameter = 1.5 mm

Total Rope Diameter ≈ 9 mm to 10 mm

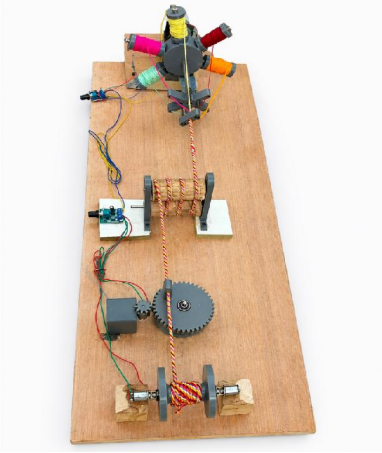
The calculations confirm that the machine can produce a uniform rope within the required diameter range.

VI. RESULTS AND DISCUSSION

The fabricated prototype successfully produced rope using six woolen threads. The synchronized rotation of hooks resulted in proper twisting and improved rope consistency. The machine operated smoothly using a 12V DC battery supply.

The use of 3D printed components reduced fabrication cost and simplified assembly. During testing, minor alignment and tolerance issues were observed in some printed parts, but overall system performance was satisfactory.

The developed machine reduced manual effort and demonstrated the practical application of low-cost mechanical automation.



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Advantages

- Low manufacturing cost
- Compact and portable design
- Reduced manual effort
- Easy operation and maintenance
- Use of 3D printing technology
- Suitable for small-scale applications

VII. CONCLUSION

The "Design & Fabrication of Rope Making Machine" project was successfully completed and tested. The developed system effectively demonstrated rope twisting using multiple woolen threads through a motorized mechanism.

The machine provides a low-cost and practical solution for small-scale rope production. The integration of DC motors, pulley systems, and 3D printed components helped in achieving compact design and smooth operation.

The project also highlights the importance of CAD modeling and mechanical fabrication techniques in developing economical automation systems.

VIII. FUTURE SCOPE

- Use of metal gears for higher durability
- Automatic tension control mechanism
- Industrial-grade motor integration
- PLC-based automation system
- Production of ropes with different materials and diameters

REFERENCES

1. R.S. Khurmi and J.K. Gupta, Machine Design.
2. V.B. Bhandari, Design of Machine Elements.
3. SolidWorks CAD Modeling Documentation.
4. Research papers on rope twisting and fabrication mechanisms.
5. Manufacturing Technology and Workshop Practice manuals.