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Design & Fabrication of Double Disc Lapping Machine

(Enhancing Productivity Through Simultaneous Dual-Side Machining)

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Abstract - This work focuses on a double disc lapping machine for improved surface finishing. The system reduces processing time by enabling simultaneous dual-side machining. It is cost-effective and suitable for small-scale production. The machine delivers precise and smooth finishes. Results indicate enhanced productivity with consistent quality.

Keywords – Double Disc Lapping Machine, Surface Finishing, Productivity improvement ;

I. INTRODUCTION

The effectiveness and service life of engineering components are closely linked to the condition of their surfaces. Surface properties influence important factors such as resistance to wear, frictional performance, dimensional precision, and assembly compatibility. In addition, a well-finished surface improves the visual quality of manufactured products.In real-world production, achieving perfectly defined geometries as specified in design drawings is challenging. Machining processes inherently introduce imperfections that lead to deviations from ideal shapes. As a result, finishing operations are required to refine the surface and meet desired specifications.

Lapping is a highly precise finishing technique that removes minute amounts of material using abrasive action. This process enables the achievement of extremely smooth surfaces and high dimensional accuracy. Despite its advantages, conventional lapping systems are limited by their inability to process both surfaces simultaneously, leading to longer production cycles and reduced efficiency. To overcome these issues, this work focuses on the development of an adjustable double disc lapping machine. The proposed design allows concurrent processing of both sides of a workpiece, thereby improving productivity.The system is developed with a focus on affordability, compact design, user convenience, and low maintenance requirements.

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II. PROBLEM STATEMENT

In modern manufacturing, lapping is a critical finishing technique used to obtain precise surface characteristics. However, conventional methods are labor-intensive and time-consuming, leading to increased operational costs. The reliance on manual processes also introduces inconsistencies that can negatively impact the quality and accuracy of the final product.Moreover, most available lapping machines are designed for single-side processing. This limitation requires the workpiece to be manually repositioned for machining the opposite face, resulting in additional time, effort, and reduced productivity. Such constraints highlight the necessity for an improved system that can overcome these drawbacks.To address these challenges, this work focuses on the development of a double disc lapping machine capable of simultaneously finishing both sides of cylindrical components, thereby improving efficiency and reducing overall production time.

III. OBJECTIVES

1)Minimize manual involvement in the process 2)Enhance surface quality and precision 3)Design an economical and compact machine 4)Enable simultaneous processing of both surfaces 5)Improve productivity and operational performance.

IV. SCOPE

The proposed machine is developed to carry out precise lapping operations in an efficient manner. It supports the simultaneous finishing of both sides of cylindrical components, which helps improve operational efficiency. The system is well-suited for use in small and medium-scale industrial setups requiring economical and dependable machining solutions.The implementation of this machine leads to a reduction in processing time and labor requirements while improving surface smoothness and dimensional accuracy. Additionally, the design allows for future modifications,

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including automation and expansion for high-volume industrial applications.

V. CONSTRUCTION & WORKING

The Double Disc Lapping Machine is designed to perform simultaneous finishing on both sides of a workpiece. The machine consists of several mechanical and electrical components assembled together to achieve smooth and precise operation.The construction is kept simple, compact, and cost-effective so that it can be easily used in small and medium-scale industries.

A.Components

1)Frame (Base Structure)-The frame acts as the foundation of the machine. It supports all other components and ensures stability during operation.2)Lapping Discs (Double Disc Arrangement)-The machine uses two circular discs placed opposite each other.3)Electric Motor-An electric motor is used to provide rotational motion to the discs.4)Shaft and Bearings-The shaft transmits motion from the motor to the lapping discs.5)Workpiece Holding Mechanism-This component is used to hold the job securely between the two discs.6)Adjustment Mechanism-An important feature of this machine is adjustability.

B.Working

The working of the double disc lapping machine is based on the principle of abrasive wear, where material is removed due to friction between the workpiece and abrasive particles.

Fig- Actual Images of Double Disc Lapping Machine

VI. RESULTS

The developed system effectively achieved concurrent lapping of both surfaces of cylindrical workpieces, leading to enhanced precision and shorter machining duration. The machine demonstrated flexibility in handling components of varying sizes while maintaining consistent surface quality. Performance testing along with cost assessment verified that the system is a practical and economical solution for use in small-scale manufacturing setups and academic environments.

VII. ADVANTAGES , LIMITATIONS & APPLICATIONS

A.Advantages

The machine provides dual-side finishing in a single operation, which enhances productivity and reduces cycle time. It delivers uniform and smooth surfaces with improved dimensional precision. The system reduces reliance on manual labor, lowering operator effort and fatigue.

Its design eliminates the need for repositioning, improving efficiency. The use of economical components makes it affordable, while the compact structure allows easy installation. The simple mechanism ensures user-friendly operation and minimal maintenance requirements.

B.Limitations

The system is mainly intended for lapping applications and is not suitable for heavy-duty machining. Its performance depends on proper alignment and setup conditions. Abrasive materials used in the process experience wear and require periodic replacement.

The machine is semi-automatic, requiring some manual intervention. Additionally, it is best suited for small and medium-scale production and may need modifications for large-scale use.

C. Applications

The machine is used for precision finishing of bearings, gears, engine valves, and press tools. It is also applicable in inspection and quality control processes where high surface accuracy is required.

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