DESIGN AND FABRICATION OF MILLING MACHINE FIXTURE

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ABSTRACT

The design and fabrication of a milling machine Fixture is a crucial project aimed at creating a precision tool used for securely clamping work pieces during milling operations. Milling Fixtures are integral to ensuring accurate cuts, preventing part movement, and improving the overall quality of machining processes. This project focuses on designing a robust milling Fixture that accommodates various workpiece sizes, providing stability and precision during milling.

Keywords: Fixture, Milling, Cycle time, Static Analysis, Engine Block.

1.1 INTRODUCTION

In the field of manufacturing and machining, precision and accuracy are of paramount importance. One of the key components that ensures high precision during milling operations is the milling Fixture. A milling Fixture is a mechanical device used to securely clamp a workpiece to a machine tool, preventing it from shifting or moving during the milling process. By providing stability and support, the milling Fixture plays a critical role in achieving accurate cuts and maintaining the quality of the final product. The design and fabrication of a milling machine Fixture focuses on creating a tool that is not only functional but also durable and precise. The milling Fixture must withstand the forces exerted during machining, which often involve high-speed rotations, cutting forces, and vibrations. As a result, careful consideration must be given to the materials, design features, and manufacturing processes used to create the Fixture.

PROBLEM DEFINATION

The design and fabrication of a milling machine Fixture involve several technical challenges that need to be addressed to ensure the final product meets the required functional and performance standards. These problems can arise during the conceptual design phase, material selection, machining, or assembly.

LITERATURE SURVEY

Prof. P.B.Chavan, Prof. D .K. Patil and Prof. D.S. Dhondge developed to help small-scale farmers to meet an increased demand for local grains, by designing a reaper machine oharvest grains more efficiently. Their study was about design and development of manually operated reaper. The exploration work focused on ease of harvesting operation to the small land holders for harvesting varieties of crop in less time and at lowcost by considering different factorsaspower requirement, cost of equipment, ease of operation, fie ld condition, time of operation with varies with climatic conditions. It is high man power saving equipment, the cost of harvesting with this manual operated reaper is highly decrease with traditional method and due to the variation ofthe cost, itis so affordable to small farmers. The efficiency is increases

from59%to66% due to its modifications [2].

A.S. Adekunle, I.O Ohijeagbon, H. D. Olusegun studied about motorized operated melon shelling in order to meet the domestic, commercial and industrial requirement of melon for food processing. Shelling in most part of the world, usually done manually by hand and it is not safe. But this machine is highly time consuming and strenuous. It is made up of three sections namely the hopper, the shelling chamber consists of the shelling disc, shaft, and the gear system. The materials used in the construction of this machine were easily available, cost effective and possess the required properties were based on strength, suitability and local availability and it is from locally sourced materials and it can be used in both urban and rural areas even where there is no power supply. It is very applicable for local production, operation, repair and maintenance. Also a melon shelling plant based on this technology could provide employment and at the same time it makes available quality melon seeds at low cost for domestic use and for melon oil processing industry[3].

Kyada, A. R, and Patel, D. B. Seed planting is possible for different size of seed at variable depth and space between two seed. It increased seed planting, seed/fertilizer placement accuracies and it was made of durable and cheap material affordable for the small scale harvester farmers. The operating, adjusting and maintaining principles were made simple for effective handling by unskilled farmers. The task for the study was to promote this technology and have available to farmers at an affordable price. The manual Seed Planter machine can be readily made from local components in workshops. By using of this machine, achievement of flexibility of distance and depth variation for different seed plantation is possible. A manually operated template row planter was designed and developed to advance planting efficiency and reduce drudgery involved in manual planting method[4]..

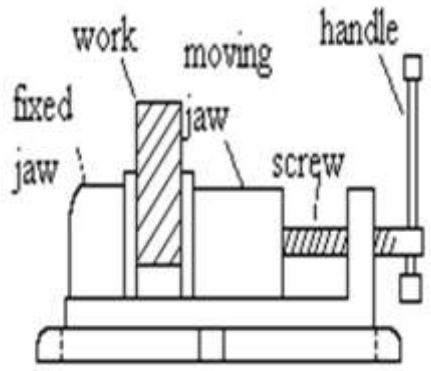
FUTURE SCOPE

The design and fabrication of a milling machine Fixture provides a solid foundation for future advancements in precision clamping and machining operations. As technology continues to evolve, several opportunities exist to enhance the functionality, performance, and versatility of milling Fixtures.

OBJECTIVES

- To design a milling Fixture that provides accurate and stable clamping of workpieces during milling operations. The Fixture must prevent any movement or shifting of the workpiece, ensuring high precision and repeatability in machining tasks.
- To fabricate a milling Fixture using high-quality, durable materials that can withstand the mechanical stresses and forces encountered during machining. The Fixture should be able to perform reliably under both light and heavy-duty conditions without losing its structural integrity.
- To create a user-friendly clamping mechanism that enables quick and easy adjustment of the movable jaw. The design should facilitate efficient clamping and unclamping of workpieces, whether manually or through motorized means, ensuring smooth and secure operation.

BLOCK DIAGRAM



BLOCK DIAGRAM

METHODOLOGY

- Machining the base: The base is milled as a reference, and then other parts are machined in relation to it.
- Making circular T-slots: These slots house the main body of the Fixture.
- Machining the body: The body is made of High Speed Steel and machined on all required surfaces.
- Machining the movable jaw: The movable jaw is milled, and its sides are drilled and tapped for jibs.
- Machining the screws and nuts: The screws and nuts are machined on a lathe.
- Machining the square shank: The square shank on the screw is machined on a milling machine.
- Machining the jibs: The jibs are an integral part of the body and are also machined.

MATERIALS

1) Screw Lock Plate

A Screw Lock Plate is an essential component used in various mechanical clamping systems, including milling machine Fixtures.

2) Screw & Nut

The screw and nut mechanism plays a fundamental role in the operation of a milling machine Fixture, as it is responsible for clamping and holding the workpiece securely during milling operations.

3) FIX JAW

The fixed jaw is a critical component in the structure of a milling machine Fixture. It serves as the stationary part of the Fixture, providing a stable platform for securely clamping the workpiece.

MOVING JAW WITH GUIDE

The moving jaw with guide is a critical component in a milling machine Fixture, providing the ability to clamp and secure workpieces by moving the jaw toward the fixed jaw. It also ensures smooth, precise movement for accurate clamping.

JAW PLATES

The jaw plates of a milling machine Fixture are crucial components that ensure a secure and stable grip on the workpiece during milling operations. They provide the necessary surface contact to hold the workpiece in place, enabling precision machining.

FABRICATION PROCESSES

1. Material Selection
2. Rough Cutting
3. Machining Operations
4. Surface Finishing
5. Assembly
6. Final Inspection and Testing

Inspection and Testing

ADVANTAGES

Precision and Accuracy:

Milling Fixtures are designed to hold workpieces securely, ensuring precise alignment during machining operations. This results in high accuracy for operations like milling, drilling, and grinding. The Fixture helps maintain tight tolerances, which is critical in industries such as aerospace, automotive, and medical device manufacturing.

Improved Workpiece Stability:

The primary function of the milling Fixture is to provide a stable clamping mechanism, preventing the workpiece from shifting or vibrating during the machining process. This ensures consistent results and reduces the chances of error or defects caused by part movement.

DISADVANTAGE

Limited Clamping Force for Large Workpieces:

While milling Fixtures are designed to handle a wide range of workpieces, their clamping force may be insufficient for very large or heavy parts. For large components, additional clamping mechanisms or more robust workholding solutions may be required to ensure secure fixation.

Setup Time for Complex Parts:

For highly precise or complex parts, the process of clamping and aligning the workpiece in the Fixture can be time-consuming. Fine adjustments and alignment may be needed to ensure the workpiece is correctly positioned for optimal machining, leading to longer setup times.

APPLICATIONS

The milling machine Fixture is a critical tool in precision machining and manufacturing, offering secure clamping and positioning of workpieces during milling operations. The design and fabrication of a milling machine Fixture enables its application across various industries and machining processes.

PHOTO VIEW

CONCLUSION

The design and fabrication of a milling machine Fixture is a fundamental project in machining and mechanical engineering. The milling Fixture plays a critical role in securing workpieces during the milling process, ensuring accuracy, precision, and safety.the design and fabrication of a milling machine Fixture is an integral project in understanding precision engineering. It combines theoretical knowledge with practical skills, such as material selection, fabrication techniques, and mechanical design principles.

Through this process, we gain a deeper appreciation of the importance of reliable tooling in machining operations and its impact on overall production efficiency and safety.

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