DESIGN OF FIXTURE FORCENTRAL DRILL

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Abstract: Our project is a sponsored project my AMT Skill Enhancement Institute. Our project is a live problem in industry where levelling gauges are manufactured. In order to make a levelling gauge, there are many operations are carried out on the work piece. From that one operation is drilling the hole in the work piece. So the fixture is used to drill the hole in the work piece is not that accurate and the cycle time is also more. Therefore to overcome this problem, we designed a vice to hold the work piece while drilling the operation. This vice is a self-centric vice. With the use of this vice the cycle time is reduced as well as the rejection rate is also reduced.

Introduction: A **fixture** is a work-holding or support device used in the manufacturing industry. Fixtures are used to securely locate (position in a specific location or orientation) and support the work, ensuring that all parts produced using the fixture will maintain conformity and interchangeability. Using a fixture improves the economy of production by allowing smooth operation and quick transition from part to part, reducing the requirement for skilled labor by simplifying how work pieces are mounted.

Fixture design for central drilling refers to the creation of a specialized device or tool, called a fixture, that is used to hold and position work pieces during central drilling operations. Central drilling is a machining process that involves drilling a hole at the centre of a workpiece, often used for precision alignment or as a starting point for other machining operations.

Designing an effective fixture for central drilling involves several considerations to ensure accurate and efficient drilling operations. Here are some key steps to consider in fixture design for central drilling.

Fixture are designed to accommodate the unique characteristics and requirements of the work piece, allowing for precise positioning, alignment and stabilization. they can be as simple as a basic clamp or as complex as a custom-built device tailored to a specific manufacturing process.

Fixture are typically made from materials such as metal, plastic, or wood depending on the application and desired durability.

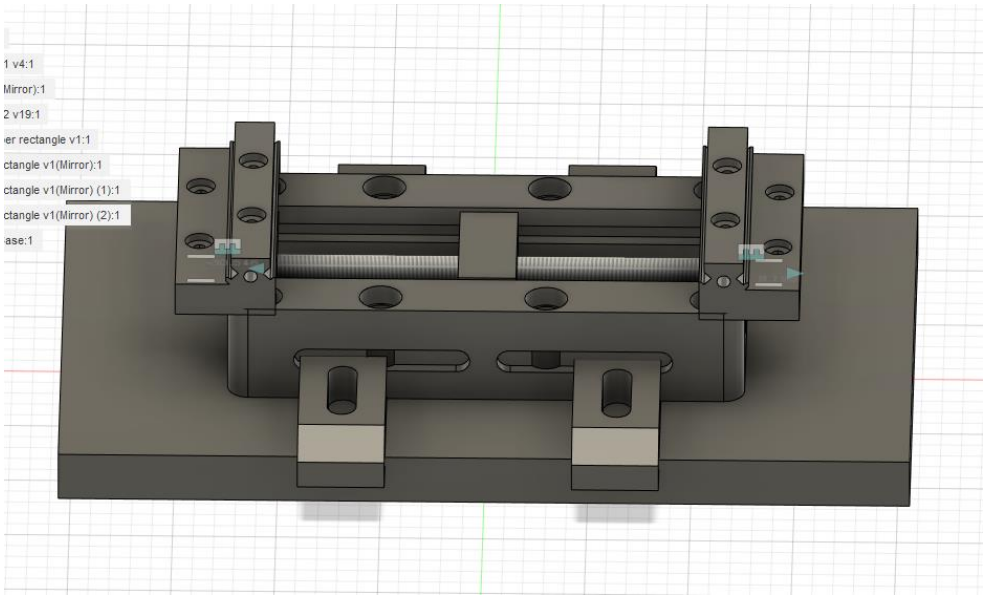
2.1. Literature Review:

Nor Azinee Said, ET. Al (Oct. 2020): Jigs and fixtures were brought to the world of machining, bringing a variety of practical purposes. The concept enables rapid mass production of the same product. Thus, the company will streamline the manufacturing process for each component and boost productivity. At times, the machining operation was carried out entirely by the machine, without jigs and fixtures. As a result, jigs and fixtures were created to expedite the drilling process. The project's objectives are to design a jig and fixture, fabricate it, and analyze the performance on a square block of wood. The structural model for drilling jigs and fixtures was created using the Inventor Professional 2019 Computer-Aided Design Software. The fabrication process used were milling, surface grinding, CNC, wire-cut, and drilling machines. Aluminum 1065 was utilized because it is less expensive, lighter than other materials, and easy to process. The result demonstrates that a hole can be drilled quickly using the jigs and fixtures. Preparing the hole with a jig and fixture takes only 1.28 minutes, compared to 3.45 minutes with a table drill. The advantages of this product are the time operation can be reduced and quickly operations on the drilling process. Fixtures are cost-effective methods of mass-producing a component. Jigs and fixtures are employed and are a critical component of mass production systems. These are one of a kind work-holding tool guidance devices. Jigs and fixtures are devices that facilitate manufacturing operations by enabling interchangeable pieces of work to reduce production costs. These devices include attachments for guiding, positioning and supporting the tools, ensuring that all work pieces produced by a particular jig or fixture are identical. Additionally, the employment of these devices can result in a high degree of accuracy, allowing for the assembly of wok pieces with minimal fitting. A jig or fixture can be customized for a specific application.

Prajakta B. Pimpalkar, ET. Al (2022): Fixtures are rigid and sturdy mechanical devices which allow fast and precision machining with reliable quality, interchangeability, and lead time reduction. As a work holding device, fixtures do not position, guide, and locate the cutting tool, as it is achieved by making necessary adjustments on the machine. Main purpose of a fixture is to locate and, in some cases, hold a work-piece during either a machining operation or some other industrial processes what makes fixtures unique is that they are all manufactured to fit a particular shape or part. Fixtures often fastened to the machine table, are made to hold the work piece firmly and in the desired position during machining

operations. There are sometimes arrangements in the fixture for adjusting the tool with respect to the work-piece/fixture, although the tool is not guided like in a jig. While fixtures are always identified by the machine tool where they are applied, they have broader applications than jigs, and also manufactured for operations where the cutting tools cannot be easily maneuverer like the drilling or boring tools. The different types of fixtures are welding fixture, tapping, fixture, milling fixture, boring and drilling fixture, milling fixture, turning fixture, etc. Jigs and fixture are made from a variety of materials, some of which can be hardened to resist wear. It is sometimes necessary to use nonferrous metals like phosphor bronze to reduce wear of the mating parts, or nylons or fibre to prevent damage to the work piece.

DESIGN OF THE VICE:



Selection of Material (20mn Cr 5): 20MnCr5 is a low-alloy steel that is commonly used in the manufacturing of vise bodies or bases. This is because it offers a number of properties that make it well-suited for this application.

One of the key properties of 20MnCr5 is its high strength and durability. It is a tough and wear-resistant steel that can withstand the heavy loads and stresses that are typically placed on a vise body or base during use. This makes it an ideal material for applications where strength and durability are essential.

Another advantage of 20MnCr5 is its good machinability. This steel can be easily machined and shaped into the desired form, allowing for the manufacture of complex vise bodies or bases with precise dimensions and tolerances.

In addition, 20MnCr5 has good hardenability, which means it can be heat-treated to achieve a hard and wear-resistant surface. This makes it particularly well-suited for use in vise bodies or bases that are subject to wear and abrasion.

Overall, the combination of high strength, good machinability, and good hardenability make 20MnCr5 a popular material for vise bodies or bases, as it can withstand heavy loads and provide long-lasting performance in a variety of applications.

Cost- Effective: 20MnCr5 is a cost- effective material compared to some higher alloys steels. This makes it an attractive choice for applications where achieving the necessary strength and wear resistance is essential while keeping costs under control.

Availability: 20MnCr5 is widely available and commonly used in various industries. Its availability ensures a reliable supply chain, making it easier to source the material for manufacturing vices.

RESULT:

Thus the self-cantering vice has been manufactured successfully and drilling operation has been performed in the workpiece.

Following results were observed-

1) The cycle time of clamping and unclamping the workpiece has been reduced from **120 sec** to **46 sec.**

2) Rejection rate has been reduced from **5%** to **1%** due to the hole is in centre and the work piece is clamp properly.

CONCLUSION:

After implementing a self-centric vice, the rejection rate of the workpiece has been reduced from 5% to 1%. Also, the cycle time of clamping and unclamping the workpiece has been reduced from 120 sec to 46 sec. the problem with previous fixture was that the hole was getting offset due to the taper of the workpiece and the time required to clamp and unclamp the workpiece was more due to the arrangement were needed to made. For this we provide a better solution for the problem which provide benefit to the company.

7. ACKNOWLEDGMENT

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8. CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this paper

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