Design and Assembly of Fixture

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Abstract— Jigs and fixture are the special production tool which make the standard machine tool, more versatile to work as specialized machine tools. They are normally used in large scale production by semi-skilled operations; however they are also use in small scale. Fixture is a clamping device used to locate and holds components which is to be machined. Fixture position component accurately and holds component rigidly and prevent movement during working in order to impact greater productivity an part accuracy. Fixture is required in various industries according to their applications. This can be achieved by selecting the optimal location of fixture elements such as a locator and clamp. The fixture setup of component is done manually. to reduce the manual efforts the fixtures are used. Smoothness and accuracy is achieved by using of fixture.

Keywords: Design, Assembly, Fixture

I. INTRODUCTION

The fixture is a device which sets work piece in proper position during manufacturing operation manufacturing process is eliminated by fixture. This increase productivity and reduce operation time. Fixture is widely used in the industry practical production because of feature and advantages. To locate and immobilize work pieces for machining, inspection, assembly and other operations fixtures are used. A fixture consists of a set of locators and clamps. Locators are used to determine the orientation and position of a work piece, whereas clamps exert clamping forces on the work piece so that the work piece is pressed firmly against locators. Clamping must be appropriately planned at the stage of machining fixture design. The design of a fixture is a highly complex and intuitive process, which require knowledge. Fixture design plays an important role at the setup planning phase. Proper fixture design is crucial for developing product quality in different terms of accuracy, surface finish and precision of the machined part.

There are various types of fixture such as: 1.Plate fixture 2. Angle-plate fixture 3. Vice jaw fixture 4. Turing fixture 5.Milling fixture 6. Inspection fixture 7. Fixture of grinding 8. Fixture of boring 9. Indexing fixture.

Frequent checking, positioning, individual marking and non-uniform quality during
Milling fixture are further classified into

- Types of operation: Face milling, Slot milling, Plain milling, Side milling
- Basis of clamping: Mechanical clamping, Hydraulic clamping, Pneumatic clamping, automatic clamping, vice clamping

II. LITERATURE SURVEY

A. V. R.Basha, J.J. Salunke, IJERA, June 2015

A fixture is a mechanism used in manufacturing to hold a work piece, position it correctly with respect to a machine tool, and support it during machining. Fixture is a device for locating, holding and supporting a work piece during a manufacturing operation. Fixtures are essential elements of production processes as they are required in most of the automated manufacturing, inspection, and assembly operations. Fixtures must correctly locate a work piece in a given orientation with respect to a cutting tool or measuring device. They are normally designed for a definite operation to process a specific work piece and are designed and manufactured individually. Widely used in manufacturing, fixtures have a direct impact upon product quality, productivity and cost. Generally, the costs associated with fixture design and manufacture can account for 10%–20% of the total cost of a manufacturing system. Approximately 40% of rejected parts are due to dimensioning errors that are attributed to poor fixture design. Fixture design work is also tedious and time-consuming. Traditionally, the design and manufacture of a fixture can take several days or even longer to complete when human experience in fixture design is utilized. And a good fixture design is often based on the designer's experience, his understanding of the products, and a try-and-error process. Therefore, with the increasingly intense global competition which pushes every manufacturer in industry to make the best effort to sharpen its competitiveness by enhancing the product's quality, squeezing the production costs and reducing the lead time. There is a strong desire for the upgrading of fixture.

B. Shivaji Mengawade, Vaibhav Bankar, Pratik P Chaphale, IJERGS, April 2016

Fixtures are the tool used to locate and hold the work piece in position during the manufacturing process. Fixtures are used to hold the parts firmly which are to be machined, it is used to produce the duplicate parts accurately. In order to produce parts with required accuracy and dimensions the parts must be firmly and accurately fixed to the fixtures. To do this, a fixture is designed and built to hold, support and locate the work piece to ensure that each work piece is machined within the specified limits. Set blocks, feeler or thickness gauges are used in the fixture to refer the work piece with the cutter tool. A fixture should be securely fastened to the table of the machine upon which the work is to be done. Though largely used on milling machines, fixtures are also designed to hold the work for various operations on most of the standard machine tools. Fixtures vary in design based on the use of relatively simple tools to expensive or complicated devices. Fixture helps to simplify metalworking operations performed on special equipments.

C. Shailesh S.Pachbhai, Laukik P.Rau, IJERGS, MARCH 2014

The fixture is a special tool for holding a work piece in proper position during manufacturing operation. For supporting and clamping the work piece, device is provided. Frequent checking, positioning, individual marking and non-uniform quality in manufacturing process is eliminated by fixture. This increase productivity and reduce operation time. Fixture is widely used in the industry practical production because of feature and advantages. To locate and immobilize work pieces for machining, inspection, assembly and other operations fixtures are used. A fixture consists of a set of locators and clamps. Locators are used to determine the position and orientation of a work piece, whereas clamps exert clamping forces so that the work piece is pressed firmly against locators. Clamping has to be appropriately planned at the stage of machining fixture design. The design of a fixture is a highly complex and intuitive process, which require knowledge. Fixture design plays an important role at the setup planning phase. Proper fixture design is crucial for developing product quality in different terms of accuracy, surface finish and precision of the machined parts In existing design the fixture set up is done manually, so the aim of this project is to replace with hydraulic fixture to save time for loading and unloading of component. Hydraulic fixture provides the manufacturer for flexibility in holding forces and to optimize design for machine operation as well as process function ability.

III. PROBLEM DEFINITION

Earlier this company used to use lathe machine for same operation. The old fixture which was been used had several problems such as during the process:

1) Skilled worker are required,
2) More time is required in this process
3) Smooth facing could not be achieved
4) Life of tool is less .

A. General requirement of sponsor

1) Easy operation
2) Low cost
3) Increase in production rate
4) safety of workers
5) Convenience of control.

IV. PROPOSED METHODOLOGY OF SOLVING IDENTIFIED PROBLEM

A. Product specification

1) Element of fixture:

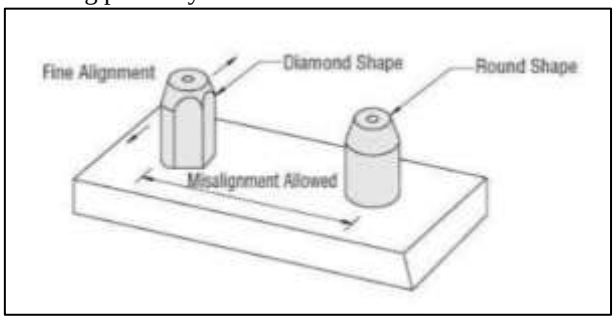
1) Body:
2) Clamping element:
3) Guiding and setting element:
4) Positioning element:

B. Base plate

The base of milling fixture consists of a base plate. A base plate has a flat and accurate undersurface and forms main body on which various components are mounted. This surface aligns with the surface of the mill table and forms the reference plane with respect to the mill feed movement.

C. Locating pin

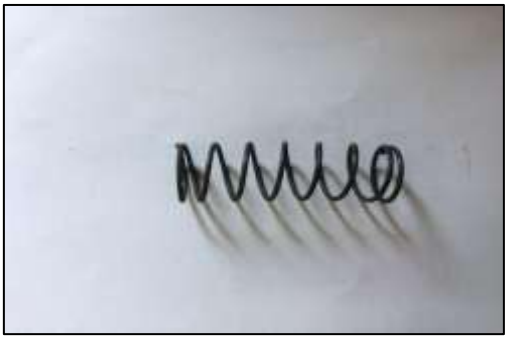
Locating pins are used for controlled, fine tolerance positioning of a work piece. For example, a pallet that is moved along one axis, where the drive mechanism is not accurate and stable enough to place it in a position sufficiently accurate to execute a particular process, the use of locating pins may be the best solution.



D. Resting pad

Rest pads are used in fixture and jig construction as support and locating elements. They can be used as feet, supports, side locators, and wear points. They are also known as rest buttons and thrust bolts

E. Spring and washer



Spring washers, also called disc springs or conical washers use spring loads to create axial flexibility. This counteracts settlements and maintains an initial level of preload. The washers are installed between the bolt head/nut and the mating surface.

F. Nuts and studs

Wheel studs are the threaded fasteners that hold on the wheels of many automobiles. They are semi-permanently mounted directly to the vehicle hub, usually through the brake drum or brake disk. Lug nuts are fastened onto the wheel stud to secure the wheel.

G. Assembly of fixture Advantages of new fixture:

1) To locate and hold work piece correct alignment and orientation during machining operations.

1) To hold the work piece in fixed location without change the alignment.
2) It reduces operation time. It also increases productivity and efficiency.
3) Increases quality of product.
4) Less energy consumption.

H. Resources and consumables required

For the completion of the work following facilities are required:

1) Software: Solid-Works or Catia
2) College library facility.
3) Internet facility.
4) Industry fabrication facility.

REFERENCES

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