Design And Manufacturing VMC Fixture of Tool Pocket

Mr. Abhishek Sunil Chougule[1], Mr. Piyush Sachin Mali[2], Mr. Amol Pandhare[3], Mr. Avishkar Jalindhar Rajput[4], Mr. Sohel Ibrahim jamadar[5], Ms. Shital Mahavir Udagave[6]

[1, 2, 4, 5, 6]Dept of Mechanical Engineering

[3]Assistant Professor, Dept of Mechanical Engineering

[1, 2, 3, 4, 5, 6] Sharad Institute of Technology Polytechnical Yadrav (Ichalkaranji)

Abstract- *Machining fixture is required in the various industries as per the requirement of the need. Fox fixing any component for process to be performed on it, without any fixture it takes more time for loading and unloading. Hence fixture efficiently reduces the time required for any component during its loading and unloading also, it provide an help to get better dimensional accuracy by holding a component more rigidly during machining process carried out on a component.*

So fixture improves the production rate by reducing the time required for manufacturing of the finished product and also saves much time.

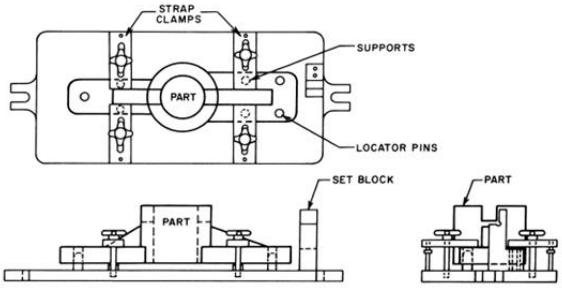
I. INTRODUCTION

A machining fixture is a work-holding or support device used the manufacturing industry. Machining 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 machining 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, and increasing conformity across a production run.

A machining fixture differs from a jig in that when a fixture is used, the tool must move relative to the work piece, a jig moves the piece while the tool remains stationary. A machining fixture's primary purpose is to create a secure mounting point for a work piece, allowing for support during operation and increased accuracy, precision, reliability, and interchangeability in the finished parts. It also serves to reduce working time by allowing quick set-up, and by smoothing the transition from part to part. It frequently reduces the complexity of a process, allowing for unskilled workers to perform it and effectively transferring the skill of the tool maker to the unskilled worker. Machining fixtures also allow for a higher degree of operator safety by reducing the concentration and effort required to hold a piece steady.

Economically speaking the most valuable function of a machining fixture is to reduce labor costs. Without a machining fixture, operating a machine or process may require two or more operators; using a machining fixture can eliminate one of the operators by securing the work piece.

II. FIXTURE



a. The fixture is a device which normally defined as a device fixed to the worktable of a machine and work in a relative to tool. It is a work holding device that holds, supports and locates the work piece for a specific operation, but it does not guide the cutting tool.
b. It provides only reference surface or a device. The 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 process.
c. Fixtures must correctly locate a work piece in a given orientation with respect to a cutting tool or measuring device, or with respect to another component, as for instance in assembly or welding.

There are many standard work holding devices such as jaw chucks, machine vises, drill chucks, collets, etc. which are widely used in workshops and are usually kept in stock for general applications.

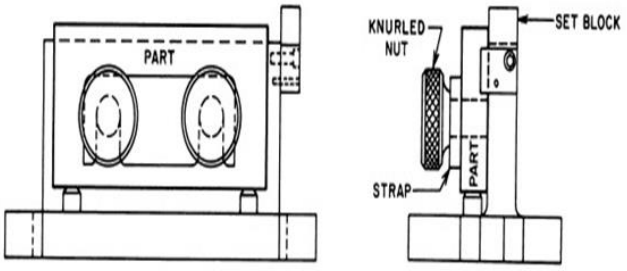
TYPES OF FIXTURE:

1. **Plate fixtures:**

Plate fixtures are the simplest form of fixture. The basic fixture is made from a flat plate that has a variety of clamps and locators to hold and locate the part. The simplicity of this fixture makes it useful for most machining operations. Its adaptability makes it popular.

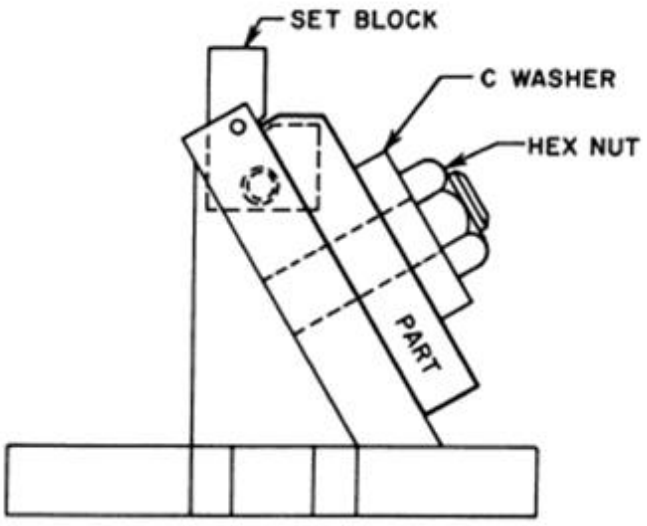
2. Angle-plate fixture:

The angle-plate fixture is a variation of the plate fixture. With this tool, the part is normally machined at a right angle to its locator.



3. Modified angle-plate fixture:

While most angle-plate fixtures are made at 90 degrees, there are times when other angles are needed. In these cases, a modified angle-plate fixture can be used.



III. ELEMENTS OF FIXTURES

A fixture generally consist of the following elements:

1. Locators

A locator is usually a fixed component of a fixture. It is used to establish and maintain the position of a part in the fixture by constraining the movement of the part. For work pieces of greater variability in shapes and surface conditions, a locator can also be adjustable.

2. Clamps

A clamp is a force-actuating mechanism of a fixture. The forces exerted by the clamps hold a part securely in the fixture against all other external forces.

3. Support

A support is a fixed or adjustable element of a fixture. When severe part displacement/deflection is expected under the action of imposed clamping and processing forces, supports are added and placed below the workpiece so as to prevent or constrain deformation. Supports in excess of what is required for the determination of the location of the part should be compatible with the locators and clamps.

4. Fixture Body

Fixture body, or tool body, is the major structural element of a fixture. It maintains the relationship between the fixture elements mentioned above, locators, clamps, supports, and the machine tool on which the part is to be processed.

IV. MATERIAL USED FOR MAKING FIXTURES

1. High speed Steel:

Cutting tools like drills, reamers and milling cutters.

2. Die steels:

Used for press tools, contain 1% carbon, 0.5 to 1%tungsten and less quantities of silicon and manganese.

3. Carbon steels:

Used for standard cutting tools.

4. Collet steels:

Spring steels containing 1% carbon, 0.5%manganese and less of silicon.

5. Non shrinking tool steels:

High carbon or high chromium very little distortion during heat treatment. Used widely for fine, intricate press tools.

6. Nickel chrome steels:

Used for gears .High tensile steels used for fasteners like high tensile screws

7. Mild steel:

Used in most part of Jigs and Fixtures Cheapest material contains less than 0.3% carbon

8. Cast Iron:

Used for odd shapes to some machining and laborious fabrication CI usage requires a pattern for casting contains more than 2% carbon has self-lubricating properties Can withstand vibrations and suitable for base.

9.Nylon and Fiber:

Used for soft lining for clamps to prevent damage to work piece due to clamping pressure.

10. Phosphorous bronze:

Used for nuts as have high tensile strength used for nuts of the lead screw.

V. ESSENTIAL FEATURES OF FIXTURES

a. Reduction of idle time:

Should enable easy clamping and unloading such that idle time is minimum.

b. Cleanliness of machining process :

Design must be such that not much time is wasted in cleaning of burrs, chips etc..

c. Replaceable part or standardization:

The locating and supporting surfaces as far as possible should be replaceable, should be standardized so that their interchangeable manufacture is possible.

d. Provision for coolant :

Provision should be there so that the tool is cooled and the chips are washed away.

e. Hardened surfaces:

All locating and supporting surfaces should be hardened materials as far as conditions permit so that they are not quickly worn out and accuracy is retained for a long time.

f. Inserts and pads:

Should always be riveted to those faces of the clamps which will come in contact with finished surfaces of the work piece so that they are not spoilt.

g. Fool-proofing:

Pins and other devices of simple nature incorporated in such a position that they will always spoil the placement of the component or hinder the fitting of the cutting tool until the latter are in correct position.

h. Economic soundness:

Equipment should be economically sound, cost of design and manufacture should be in proportion to the quantity and price of producer.

i. Easy manipulation –

It should be as light in weight as possible and easy to handle so that workman is not subjected to fatigue, should be provided with adequate lift aids

j. Initial location:

It should be ensured that work piece is not located on more than 3 points in anyone plane test to avoid cracking, spring loading should be done.

k. Position of clamps:

Clamping should occur directly above the points supporting the work piece to avoid distortion and springing.

l. Clearance:

Sufficient amount of clearance should be provided around the work so that operator’s hands can easily enter the body for placing the work piece and any variations of work can be accommodated.

m. Ejecting devices:

Proper ejecting devices should be incorporated in the body to push the work piece out after operation.

n. Rigidity and stability:

It should remain perfectly rigid and stable during operation. Provision should be made for proper positioning and rigidly holding the jigs and fixtures.

o. Safety:

The design should assure perfect safety of the operator.

VI. ADVANTAGES OF JIGS AND FIXTURES

a. Productivity:

Jigs and fixtures increases the productivity by eliminating the individual marking, positioning and frequent checking. The operation time is also reduced due to increase in speed, feed and depth of cut because of high clamping rigidity.

b. Interchangeability and quality:

Jigs and fixtures facilitate the production of articles in large quantities with high degree of accuracy, uniform quality and interchangeability at a competitive cost .

c. Skill reduction:

There is no need for skillful setting of work on tool. Jigs and fixtures makes possible to employ unskilled or semi-skilled machine operator to make savings in labour cost.

d. Cost reduction:

Higher production, reduction in scrap, easy assembly and savings in labour cost results in ultimate reduction in unit cost.

VII. CONCLUSION

The efficiency and reliability of the fixture design has enhanced by the system and the result of fixture design has made more reasonable. To cycle time for loading & unloading of part, This approach is useful. If modern CAD are used in designing the system then significant improvement can be assured. To fulfill the multifunctional and high performance fixture requirement optimum design approach can be used. The proposed fixture will fulfilled researcher production target and enhanced the efficiency**.**