

Design Of U-Drilling Fixture For Axle Arm

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Abstract: Productivity & quality are the major factor for growth of our indian manufacturing sector. The total machining time is reducing by improving the productivity. In various industries the verity of job is less and high quantity of job produced. Because of high productivity mass production occurs, this is possible when reducing total cost and saving time.so mass production isachivedby use of fixtures. In this project the design of U-drill fixture for drilling operation at different positions. Such fixture are made accurate and precise drilled hole and also individual positioning, marking, frequent checking are eliminated.Fixtures are the tool used to locate and hold the work piece in position during the manufacturing process. Axle arm is the component of vehicles, which has various operations are done on it but In these two holes are drilled by using u-drill fixture. Other drilling tools are broke away with hard material but u-drilled tool didn't broke. So we design u-drill fixture 3D model by using design softwares.(creo , catia , cad) and for analysis (ansys) etc.

I. Introduction

Increasing the productivity and accuracy are the two basic aims of mass production. As we know the solution to this is by reducing the set up cost of the machine and also reducing the manual fatigue. In this case the device that caters our needs is the use of fixtures. In order to align the axis of the hole with the axis of the drill we generally go for trial and error method. Accuracy is the main problem in such cases. In doing so it increases the work load on the operator. Hence using of jig to position and guide the tool to its right path is preferred rather than using scribes, square, straighteners or center punch etc. Thus the productivity is increased which is done by eliminating individual positioning, marking and frequent checking. Interchange-ability is the chief advantage here. All the parts fit in properly except only the similar components are interchangeable.

One does not need to repeatedly clamp and unclamp the object for various purposes like positioning as the locating, clamping and guiding of the tool by fixture. So it reduces the presence of skilled labour. Drill fixture helps to drill, ream and tap at a much faster speed and with great accuracy as compared to holes done conventionally by hand. The responsibility of maintain the accuracy of the hole is now shifted from the operator and given to the fixture. In these project component for drilling is axle arm, for these component design a u-drill fixture. In this project u-drill tool is use, u-drill tool has through coolant and it has tungsten carbide tips. These tungsten carbide tip is very hard than component material e.g. component material is chromium steel which is very hard other simple tools can broke after some time but tungsten carbide don not broke away.

Discussing with the company we found thatproblem , these drilled holes done with 2-3 passes lose of time get more time to complete the job. So we take these problem for our project in study. So we decide that focus on drilling machine used in the manufactured fields. Problem here also drilling machine is holding the Axle arm component and doing the accurate drilling operation is quite difficult. So these problem is overcome by designing of new fixture for our Axle arm component. So we work on design of U-drill fixture on special purpose machine for Axle Arm.so we can reduced production time for these component.

II. Materialspecification

Component Material Specification-

The material of axle arm is 40Cr4 Type8

Heat Treatment process of this component is Hardened & Tempered (Polymer Quenching)

Mechanical Properties

1. Tensile Strength 90-100kg/mm² min
2. Yield Strength 70 Kg/mm² min
3. % Elongation (GL=5D)12 min
4. Hardness 285-320 BHN

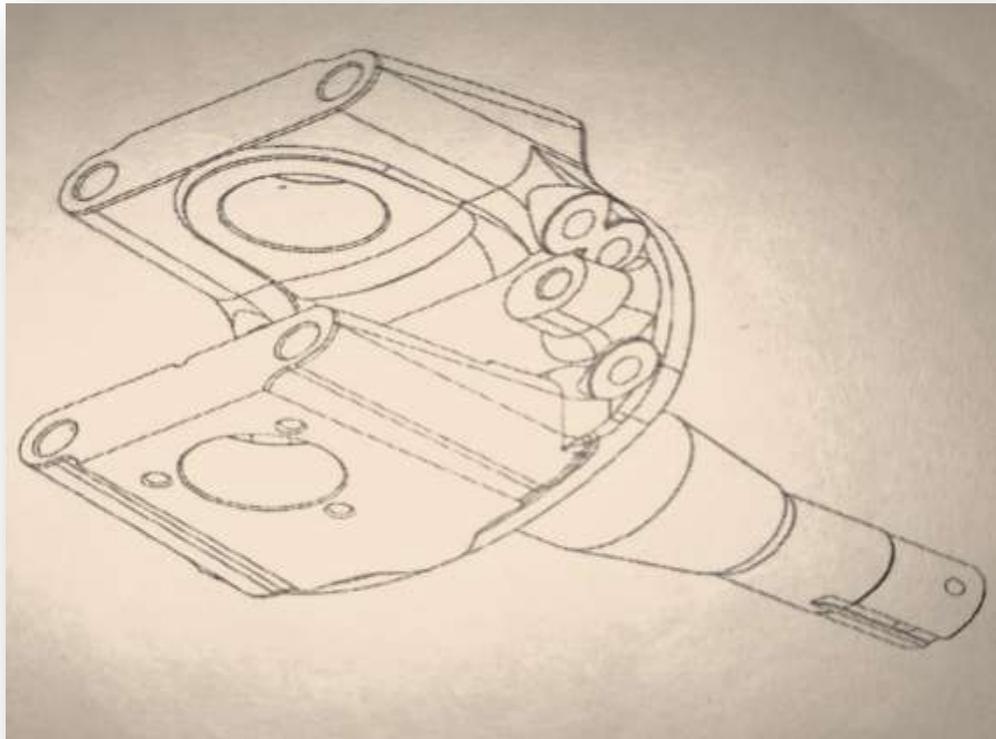


Fig. Axle Arm

III. Steps For Designing Jigs And Fixtures

The following are the essential steps which must be considered in designing a jig or a fixture.

- 1) Study of the existing component.
- 2) Study of various fixtures available in company.
- 3) Study of the locating devices.
- 4) Study of the loading and unloading arrangement.
- 5) Study of the clamping arrangement.
- 6) Study of the indexing devices.
- 7) Study of the tool guiding and cutter setting elements. Study of the ejecting devices.
- 8) Comparing existing and previous used method for holding job.
- 9) Design and Analysis of fixture.

IV. Important considerations While Designing The Fixture

- 3-2-1 principle
As per six point location principle, workpiece can be completely restrained with the help of three location points in one plane, two location points in the second plane and one location point in third plane.
- Base plate
A Base plate is the foundation of base plate. Various components, such as locators and clamps are joined to the base plate.
- Clamping
By using locators workpiece is not completely restrained in the fixture; at that time clamping is essential. A workpiece is securely held in the fixture with the help of clamping device, against the cutting forces.
- External locating
The use of external surface to locate work piece. The 3-2-1 method is an external locating method.
- Internal locating

The use of internal surfaces to locate a work piece. The most common internal locating method is the use of round and relieved pin to locate two machined holes.

- **Locating Pin**
Locating pins are also called as pin locators. Locators pins are plain cylindrical with pin , with collar , conical pin locator.
- **Plate Fixture**
A fixture consisting of assembled components such as a base plate , locating pins, rest buttons , bushes, clamps , etc.

V. Literature Review

Midhun.R1 Vignesh.A2 [1] This paper is on “ Design and Fabrication of Jigs and Fixtures for Drilling Operation” Mass production aims at high productivity to reduce unit cost, and interchange ability to facilitate easy assembly. This necessitates production devices to increase the rate of manufacture and inspection devices to speed up inspection procedure. Jigs are provided with tool guiding element such as drill bushes. These direct the tool to the correct position on the work piece. Jigs are rarely clamped on the machine table. Fixtures hold the work piece securely in the correct position with respect to the machine/cutter during operation. Fixtures are often clamped on the machine table. The use of “JIGS AND FIXTURES” can avoid all geometrical errors which will occur in tool and work piece. Our aim of the project is to overcome the difficulties of drilling and to reduce the time with good accuracy.

Nikhil G. Lokhande* and C.K. Tembhurkar [2] This paper is on “Design of Angular Drilling Fixture and Analysis of Cutting Forces during Drilling on Cylindrical Surfaces ” Applications such as in defense sector, manufacturing of grenade fuse required angular holes on fuse body, producing holes in turbine blades for the aerospace industry, generating micro-holes in diesel fuel injection nozzles etc requires angular drilling. Trepanning, gun drilling are the operations available for drilling at specific angle, but they can be useful when drilling angle should be less than 10 degree. The job having a cylindrical shape and number of holes are required on it at an angle is challenging task for design engineer and hence Computer Aided Fixture Design (CAFD) is incorporated in manufacturing industry. It deals with the integration of CAD and CNC programming in CAM systems using softwares for fixture design. Except V block, no other option is available to hold cylindrical object and hence special type of fixture is designed for this case, which can be used for angular drilling. In this paper, a literature survey of computer aided fixture design and automation over the past decade is proposed. First, an introduction is given on the fixture applications in industry. Then, significant works done in the CAFD field, including their approaches and customer requirements are discussed.

Satyajeetsinh Raijada1 AmitDudhatra[3]This paper is on” Design of a Fixture of Connecting Rod for Boring Operation” Connecting rod is very important part of engine. It should be accurately machined with the acceptable tolerance. Also the fluctuations of dimensions in work-piece to work piece should be minimum so that it will be easier to assemble in engine. But it has been observed that the required dimensions for the bolt diameter and smaller end diameter for the connecting rod are not continuously achievable by using the existing fixture. The diameters required of the bolts and the smaller end of the said connecting rod are 10 ± 0.05 mm and 24 ± 0.01 mm respectively The aim of this project is to design and development of a new fixture for machining (Boring) operation using designing software’s i.e. Pro E and analysis using ANSYS ,which can eliminate the said problems. And the production rate will also increase up to 15% which is quite objective. So for that, a new hydraulic fixture is designed and observed that dimensional accuracy, increased production rate up to 15% and more output per day with boring operation. Which defines process is satisfactory enough and validates the project.

VI. Proposed Flow Of Work And Methodology

1. Study of existing component.
2. Study of different materials
3. Problem identification.
4. Analysis of existing component.
5. Conceptually design.
6. Modelling in CATIA.
7. Analyse model by using ANSYS.

VII. Conclusion

From these project , we can do our drilling operations on Axle arm component very easy without any errors. Because it avoids human error . By these new U-drill fixture ,components are clamped in the desired location , and reducing deflection from clamping force. so that set-up time reduced , productivity increased , minimise material handling , reduced cost per component.

Referances

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