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Design and Fabrication of Latch Jig for Contour Profile Component

Engineering

KEYWORDS : Drilling, Clamping, Latch jig, Production rate

Muthukumaran	Final Year Mechanical Engineering, Saveetha School of Engineering, Saveetha University-602105
Ravi	Final Year Mechanical Engineering, Saveetha School of Engineering, Saveetha University-602105
C.Sivaram	Final Year Mechanical Engineering, Saveetha School of Engineering, Saveetha University-602105
Dinesh	Final Year Mechanical Engineering, Saveetha School of Engineering, Saveetha University-602105
P.S. Balaji	Final Year Mechanical Engineering, Saveetha School of Engineering, Saveetha University-602105
C.Sadasivam	Assistant Professor Mechanical Department, Saveetha School of Engineering, Saveetha University-602105
A.Muniappan	Associate Professor Mechanical Department, Saveetha School of Engineering, Saveetha University-602105

ABSTRACT

Our paper is based on the need for the work holding devices. This design and fabrication which will enable the operation like drilling, reaming, tapping process easier even the job profile are Angular. Our project is mainly composed of design and fabrication of the "LATCH JIG" which cover the absolute design to the specified dimensions of the work piece. Angular jig permits drilling holes in one sides of the work piece with a single location and clamping operation this saves time and increase production rate.

INTRODUCTION

Drilling jigs are used to machine holes in mechanical products. To obtain positional accuracy of the holes, hardened drill bushes or jig bushes are used to locate and guide the drill, reamers etc., in relation to the work piece. These guide bushes are not essential but these prove to be economical and technically desirable as will be discussed ahead. The portion of the jig into which the hardened bushes are fitted is called bushes. Drilling jigs are either clamped to the work piece in which holes are to drill on the work piece is housed and clamped in the jig body. If more than one hole is to be drilled, the drill jig made to slide on the table of the drilling machine. Such a drill jig is moved by hand into the position under the drill so that the drill readily enters the bush. During the drilling operation, the jig is held by hand. If the drill size is large enough to produce high torque, either stops should be provided or the drill jig clamped to the table on the drilling machine.

Drilling jigs makes feasible the drilling of holes at higher speeds, with greater accuracy and with less skilled workers than is possible when the holes are laid out and drilled "by hand". Also, they produced interchangeable parts, because each parts drilled in a drilling jigs should have the same whole pattern as every other part.

DEFINITIONS

1.2.1 Jigs

A jig may be defined as a device which hold and positions the work, locate or and guides the cutting tool relative to the work piece and usually is not fixed to the machine table. It is usually lighter in construction.

Jigs are designed to hold, support and locate the work piece to ensure that each part is machine within the specified tolerance. Jigs are usually fitted with hardened steel bushes for other cutting tools.

1.2.2 Fixtures

A fixture is a work holding device, which only holds and positioned the work, but does not itself guide, locate or positioning the cutting tool. The setting of the tool is done by machine adjustment and a setting block or by using slip gauges. A fixture is bolted or clamped to the machine table. It is usually heavy in construction.

1. GENERAL RULES FOR DESIGNING JIGS

The following rules may be given as the main points to be considered in the designing of jigs:

- Before planning the design of a tool, compare the cost of production of the work with present tools with the expected cost of production, using the tool to made, and see that the cost of building is not in excess of expected of gain.
- Before laying out the jigs, decide upon the locating point and outlining a clamping arrangement.
- Make all clamping and binding devices as quick as possible.
- In selecting locating points, see that two components parts of a machine can be located from corresponding points and surfaces.
- Make the jig "fool-proof"; that is, arrange it so that the work cannot be inserted except in the correct way.
- For rough casting, make some of the locating points adjustable.
- Locate clamps so that they will be in the best position to resist the
- Pressure of the cutting tool when at work.

➢ Avoid complicated clamping at arrangement, which are liable to wear or get out of order.

➢ Round all corners.

➢ Place all clamps as near as possible opposite some bearing point of the work to avoid springing.

➢ Core out all unnecessary metal, making the tool as light as possible, consistence with rigidity and stiffness.

➢ Provide feet, preferable four, opposite all surfaces containing guide busing in drilling and boring the jigs.

➢ Place all bushings inside of the geometrical figure formed by connecting the point of location of the feet.

➢ Provide holes on escapes for the chips.

Provide clamping lugs, located so as to prevent springing of the fixture, on all tools, which must be held to the table of the machine while in use, and tongues for the slots in the tables in all milling.

PROBLEM IDENTIFICATION

Drilling jigs makes feasible the drilling of holes at higher speeds, with greater accuracy and with less skilled workers then is possible when the holes are laid out and drilled "by hand". Also, they produced interchangeable parts, because each parts drilled in a jigs should have the same hole pattern as every other part. Even though irregular or contour surface is very complicated. Due to this reason we have decided to design a new jig for contour profile.

ELEMENT OF JIG

i. Jig body:

The jig body supports the work piece and has locating and clamping elements in it. It is provide with four jig feet and rests on the machine table.

ii. Jig feet:

A jig feet which is not bolted to machine tool is provide with four jig feet, instead of the entire bottom surface lying flat on the machine table. Jig feet are either cast with the jig body or detachable or welded to the base.

They are usually hardened and ground to have flat bottom.

iii. Jig bushing:

For guiding drills, reamer and boring bars, hardened steel bushes are employed which are fixed in the jig plates. The bushes can replaced when worn-out with less cost than replacing entire jig plates.

iv. Jig plate or bush plate:

Usually the jig plate carries jig bush for guiding the tool. The jig plate may be rigidly construed as a single unit of a jig or it may be of leaf.

In this type, the plate must be clamped with the jig frame.

DESIGN

Dimension of the jig components:

1. Base plate of the jig = 135 X75mm

2. Thickness of the base plate = 30mm

3. Left side of the jig plate length &Breadth, Width=

4 .Length of screw rod =85 mm

5. Dia meter of the screw rod=20mm

6. Length of the handle =100mm

Dimension of the Job:

1. Diameter of the job = 25mm

2. Height of the job = 22 mm

3. Required dia of the drill= 8mm(No)

DESIGN CALCULATION

7.1 DIMENSION OF THE JIG COMPONENTS

DIMENSION OF THE JOB:

- Outer Diameter of the job = 25mm
- Height of the job = 20mm
- Required dia of the drill = 8mm(No2)

7.2. DESIGN PROCEDURE OF THE LEAF JIG

SELECTION OF JIG

An Angular post jig is to be selected for making an angular hole on Cylindrical surface required diameter=9mm

SELECTION OF BUSH

Press fit is preferred, therefore select fixed bush with hole range diameter 8 mm.

Generally the outside diameter of the bush will be push fit or press fit and inner hole will be running fit.

Select bush of fixed type DDB; 5.100

The diameter to be drill the work piece is=8mm

As per design norms bush sizes(long) are

L1=20mm

L2= 16mm

D3=20mm

In our project bush dimensions are

L1=32mm

L2= 26mm

D3=25mm

SELECTION OF JIG BODY

Thickness of frame (t) = 36mm

Base length = 3 x Length of work piece = 3 x50 =150mm

But in our project our base length is designed =132mm

Working height (h2) = 2 x outer diameter of work piece =2 x25 =50mm

But in our project working height =70mm

Total Height of jig (ht) = 2t + h2+bush head = (2 x 32) + (50) +8 =122mm

But in our project Total height =156mm

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DESIGN FOR SCREW ROD

Size of the screw (Bolt) =M20

Pitch =2.5 mm (from pg –coarse series table1)

For coarse thread dc =0.84 x d

=0.84 x 20

Dc=16.8mm

Stress area =245mm^2

Initial tension in bolt p 1=2860d

=2860 x 20 =57200N

But this p 1=3.14 x dc 2 x f1 /4

Tensile stress f1=p 1 x 4/(3.14 x dc2)

=57200 x4 (3.14 x 16.82)

F1 =258.04N/mm2

As the pin is double shear

P1 =2 x 3.14 x dc2 2 x f1/4

F1= 57200 X 4 (2 X 3.14 X 1682)

=128.71mm2

Shear stress

As the pin is double shear

P = 2 x 3.14 dc 2 x fs/4

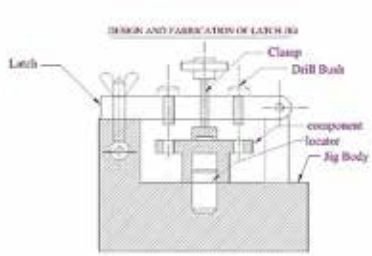
Shear stress =Load/ area

=57200 x 4/(3.14 x 202)

=91.03N /mm2

Bill of Materials

S.No	Part Name	Material	No.Off
1	Bush	EN8	2
2	Jig plates	Mild steel	2
3	Screw Rod clamp	Mild steel	1
4	Handle for screw rod	Mild steel	1
5	component	Mild steel	1
6	Leaf	Mild steel	1
7	Hinged edge	Mild steel	1



ADVANTAGES:

It eliminates the individual marking, positioning and frequent checking. The operation time is reduced due to increase in speed, feed and depth of cut because of high clamping rigidity.It is very much useful in mass production. It makes possible to employ unskilled or semi-skilled operator to make savings in labour cost.It partially automates the tools. It reduces the expenditures on quality control of machine parts.

LIMITATIONS:

It is only used for small size components. It is only used for the elbow pipes with flanges, which has the height of mm. Forces causing deflection may come from handling.There is no special way to remove the chips produced by drilling. So it requires separate time.

13. CONCLUSION&FUTURE WORKS

This report deals with the design and fabrication of latch jig and the detailed drawing of the component and assembles. The project carried out by us made an impressing task in drilling works. It is very useful industries for mass production of identical parts. The latch jig was also fabricated in this project. In future it will convert pneumatic operated jig. It Will helpful for quick loading and un loading.