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Design and Fabrication of Angular Plate Jig

Engineering

KEYWORDS : Angular Jig, Holding Device, Mass Production, Manufacturing

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ABSTRACT

Our paper is based on the need for the work holding devices during manufacturing processes. This design and fabrication which will enable the operation like drilling, reaming, tapping process easier. The need for such devices would greatly enhance the ability of the production unit to meet the requirement of the market and higher rate. Our paper is mainly composed of design and fabrication of the Angular Plate jig which cover the absolute design to the specified dimensions of the work piece and would make the production process easier. This jig is economical means to produce. Our paper is based on the need for the work holding devices during manufacturing processes. This design and fabrication which will enable the operation like drilling, reaming, tapping process easier. The need for such devices would greatly enhance the ability of the production unit to meet the requirement of the market and higher rate. Our paper is mainly composed of design and fabrication of the Angular Plate jig which cover the absolute design to the specified dimensions of the work piece and would make the production process easier. This jig is economical means to produce.

1. 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

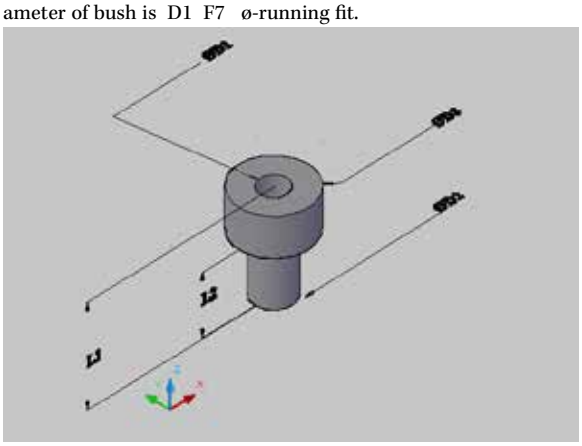
Produced interchangeable parts, because each parts drilled in a drilling jigs should have the same hole pattern as every other part.

2.Design Procedure:

2.1SELECTION OF BUSH;

Fixed bush with hole range diameter 10mm

Select bush of fixed type. The diameter to be drill the work piece is=∅10mm.For 10mm diameter, The tolerance for the inner diameter of bush is D1 F7 ø-running fit.



D1= Ø10.2mm

D2=Ø17mm

And other dimensions of bush are

L1=18mm

L2= 10mm

D3=Ø26mm

In our project Bush dimensions are

L1=34mm

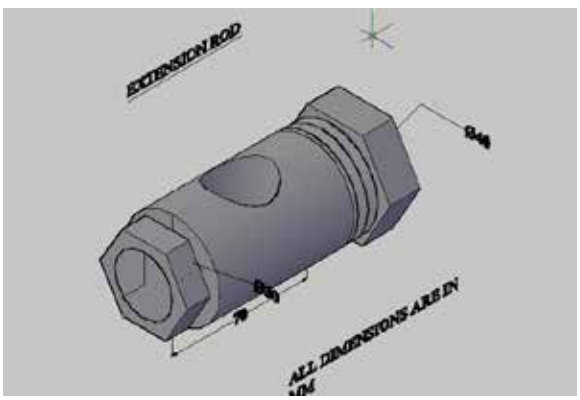
L2= 24mm

D3=38mm

2.2SELECTION OF LOCATERS:
For side location, pin locater is to be fabricated to the work piece.

Locater diameter is 25.5mm that is equal to inner diameter work piece.

Locater height = 70 mm



2.3SCREW DESIGN 0F M20
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=π x dc ^{2} x f1 /4

Tensile stress f1=p 1 x 4/ (π x dc^2)

=57200 x4 (π x 16.8^2)

f1=258.04N/mm^2

As the pin is double shear

P1=2 x π x dc^2 2 x f1/4

f1= 57200 X 4 (2 X π X 168^2)

=128.71mm^2

Shear stress

As the pin is double shear

P = 2 x π dc ^{2} x fs/4

Shear stress =Load/ area

=57200 x 4/ (π x 20$^{2)}$

=91.03N /mm^2

Tensile force>Shear force

258.04> 91.03

2.4SELECTION OF JIG BODY
Thickness of framet =12mm

Base length =3 x Length of work piece

= 3x70 =210mm

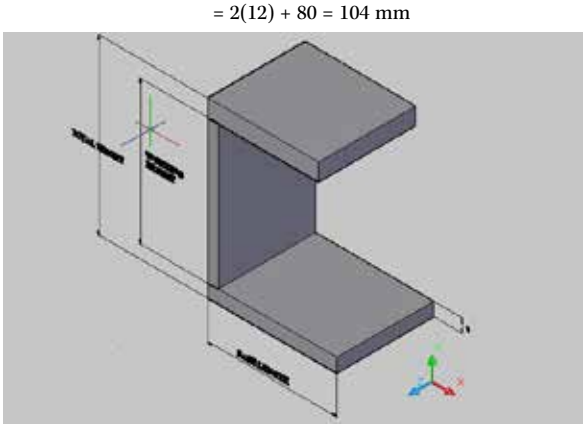
But in our project our base length is designed = 150 mm

Working height h2 = 2 x outer diameter of work piece

= 2x 40 = 80mm

Total Height of jig ht = 2t + h2

= 2(12) + 80 = 104 mm



2.5SELECTION OF JIG BODY
Thickness of framet =12mm

Base length =3 x Length of work piece

= 3x70 =210mm

But in our project our base length is designed = 150 mm

Working height h2 = 2 x outer diameter of work piece

= 2x 40 = 80mm

Total Height of jig ht = 2t + h2

= 2(12) + 80 = 104 mm

2.6DESIGN FOR SCREW ROD
Size of the screw (Bolt) =M24

Pitch =3mm (from5.42)

For coarse thread dc =0.84 x d

=0.84 x 24

Dc=20.14 mm

Stress area = 353 mm^2

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Initial tension in bolt p1= 2860x d

=2860x24

=68460 N

But this p1=(π /4) x dc ^{2} x f t

Tensile stress (ft)=68640/ 318.572

= 214.895N/mm^2

ft=214.895N/mm^2

As the pin is double shear

P1 =2 x (π/4) x dc^2 x ft

ft = 68640/ (2x (π/4) x20.14^2)

= 107.730 N/mm^2

Shear stress as the pin is double shear

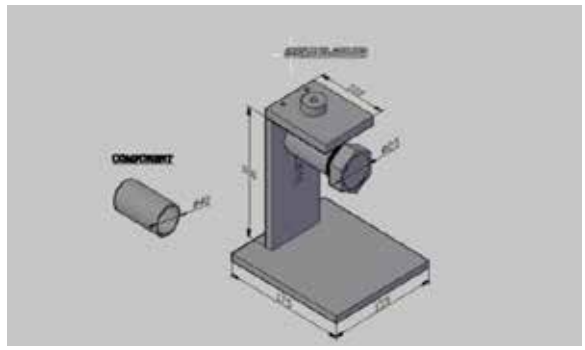
Fs =p/(π x dc x b x n)

Shear stress =Load/ area

= 68640/ (π x20.14x1.5x10)

= 72.133N/mm^2

107.730>72.133



3. 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.

4. Limitations:
It is only used for small size components.

Forces causing deflection may come from handling.

There is no special way to remove the chips produced by drilling. So it requires separate time.

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