Design and fabrication of angular post JIG

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ABSTRACT

An objective of the mass production is to increase the productivity and the accuracy. This is done by reducing the set up cost and manual burnouts. Thus mass production can be acquired by the use of jigs. For large scale production of unlike materials a lot of time is wasted in start of the device and clamping the device. An experimental approach method is regularly practiced until the axis of the hole is properly line up with the axis of the drill. In such a situation a division of time is being wasted to maintain the accuracy. This paper is mainly composed of design and fabrication of the Angular postjig which cover the absolute design to the described dimensions of the work piece and would make the production process easier.

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

I.INTRODUCTION

Mass production targets at high productivity to reduce unit cost and interchangeability to aideasy assembly. This make necessary production devices to increase the rate of manufacture and inspection device to advance inspection procedure.Jigs are special target tools which are used to aid production like machining, assembling and survey operations. The mass production of work-piece is based on the concept of interchange skill according to which every part produced inside an established tolerance. Jigs provide a method of manufacturing interchangeable parts since they establish a relation with calculated tolerances, between the work and the cutting tool. Once the jig is correctly set up, any number of identical parts may be readily produced without additional set up. Jigs are used on drilling, reaming, tapping, milling and tapping. There are many benefits for using jigs in production. Jigs remove individual making, positioning and repeated checking. This reduces operation time and increase productivity.

II.DESIGN PROCEDURE

The points that are taken into discussion for designing a product are as following:

a) Jig must be so powerful that the deflection in the jig should be as limited as possible. The deflection that is mentioned involved the forces of cutting, clamping of workpiece to the machine table. The frame of the fixture should have enough mass to prevent vibrations while the machining of the job.

b) Another important design application is the clamping which should be actively sufficient and require limited amount of effort.

c) Arrangement of clamps should be such that they are conveniently available. They should also have the arrangement for convenient removal as well.

d) Is waving of clamp system is provided for removal of workpiece the clamp should swing as far as possible for unclamping the device.

e) There should also be supplying for convenient removal of chip. This will prevent the interference of the chip with the operation on the workpiece i.e. cutting operation.

f) The clamps and stake points which are to be adapted in due course of time should be preferred of same size. It will be better if the clamps and adaptable support points can be conducted from the front of the fixture.

g) If the surface area of clamping is too many it damages the workpiece. This can be avoided by making the surface area of clamping as tiny as possible.

h) As it is difficult to get spare parts during the activity so it is designed in such a way that they can be conveniently replaced on failure.

i) The study of the design should be finished thoroughly before fabricating. It should always be make sure that the work is done in proper order. This will ensure zero loss of material. It should always be preferred that there is maximum operation in a single setting of the workpiece.

j) The movement of the workpiece is restricted i.e. there is zero degree of freedom of the workpiece after clamping the workpiece. Sharp edges and redundant locators must be avoided. One should try to maintain at least one event surface.

k) The design must obtain enough rigidity and robustness to prevent vibration else it may advance to undesired movement of the workpiece and tools.

l) Minimum cost should be incurred while the fabrication of the project and the design should be as clear as possible. In such a way it will help even a lay man to operate the device.

III.PROBLEM DEFINITION

Drilling jigs makes possible the drilling of holes at higher speeds,with greater accuracy and with limited skilled workers then is possiblewhen the holes are laid out and drilled “by hand”. Also, theyproduced altering parts, because each parts drilled in ajigs should have the same hole pattern as every other part. Eventhough irregular or contour surface is very complicated. Due tothis reason we have decided to design a new jig for contour profile.

IV.JOB PROFILE

A given workpiece is to be drilled with a hole range diameter 8mm at an angle of 45 deg.

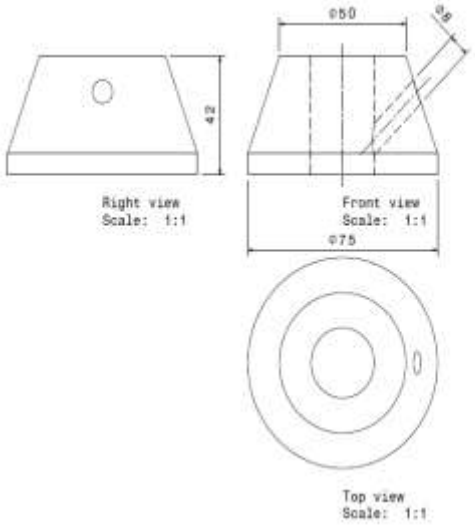

Fig.1. Dimensions of the job

1. Outer diameter of the job = 75mm
2. Inner diameter of the job = 50 mm
3. Length of the job = 42mm
4.Required diameter of the drill = 8mm

V. SELECTION OF BUSH

Press fit is preferred, therefore chosen fixed bush with hole range diameter 8 mm.
Generally the outside diameter of the bush will be press fit or push fit and inner holebush will be running fit.
Chose bush of fixed type DDB; 5.100
The diameter to be drill the work piece is = 8mm
As per design standards bush sizes (long) are
L1 = 20 mm
L2 = 16mm
D3 = 20mm
In this project bush dimensions are
L1 = 32mm
L2 = 20mm
D3 = 25mm

VI. SELECTION OF JIG BODY

Thickness of frame (t) = 20mm
Base length = 3 x length of work piece = 3x42 = 126mm
But in this project base length is designed = 102mm
Working height (h2) – 2 x outer diameter of work piece = 2x 75 = 150mm
But in this project working height = 107mm
Total height of jig (ht) = 2t + h2 + bush head = (2 x 20) + 150 +12 = 202mm
But in this project Total height = 159mm

VII. DESIGN 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
Initial tension in bold p1 = 280 x d
= 2860x 24
= 68460 N
But this p1 = $(\pi/4) \times dc^2 \times ft$
= 214.885n/mm^2
ft = 214.885n/mm^2
As the pin is double shear
P1 = 2 x $(\pi/4) \times dc^2 \times ft$
ft = 68640/(2 x $(\pi/4)$ x 20.14^2)
= 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 x 20.14 x 1.5 x 10)
= 72.133N/mm^2
107.730>72.133
Therefore our design is safe

VIII. SELECTION OF LOCATING PIN

For side location, pin locater is to be assembled to the work piece. Locater diameter is 24 mm that is to be shoulder the inner diameter work piece.
Locater height = 80mm

IX. DIMENSION OF THE JIG COMPONENTS

1. Length and width of base plate of the jig = 102 x 145 mm
2. Thickness of the plates= 20 mm
3. Vertical jig plate length & width = 107 x 150mm
4. Top jig plate length & width = 79 x 65mm
5. Angular post plate = 117 x 63mm
6. Locater diameter = 24.5mm

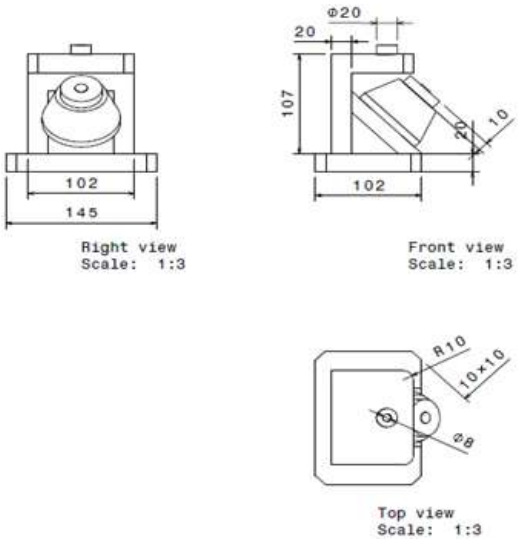

Fig.2. Design of Angular Post Jig

X.ADVANTAGES

- It eliminates the individual marking; positioning and repeatedchecking.
- The operation time is shortened due to increase in speed,feed and depth of cut because of huge clamping rigidity.
- It is verymuch valuable in mass production.It makes possible to manipulate unskilledor semi-skilled operator to make savings in labour cost.
- It fractionally automates the tools.
- It reduces the expenditures onquality control of machine parts.

XI. LIMITATIONS

It is only used for small-scale components. It is only used for the hollow cylindrical work piece. Forces causing deflection may arrive from handling.There is no special way to unload the chips produced by drilling.So it requires separate time.

XII. CONCLUSION AND FUTURE SCOPE

This paper deals with the design and fabrication of Angular post jig and the detailed drawing of the component and assemblies. It is very useful to industries for mass production of identical parts. In future it may used for special purposes shaping to suit the profile of the component and to minimize weight by use of thinner section thus makes the advantage of economy of time. The special drill bushes can be used if hole being drilled is in recess and thus preferred for accurate work when light work piece to be drilled.

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