WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Design and Fabrication of Leaf Drill jig for Pen holder

M. Radhadevi[a], K.SaiSankaran[b], B.Lokesh[c], M. VikasDass[d],J. Akhil[e]

[a,]AssistantProfessor,Dept.ofMechanicalEngineering,PVPSiddharthaInstituteofTechnology,Vijayawada,AndhraPradesh
[b,c,d,e]UGStudents,Dept.ofMechanicalEngineering,PVPSiddharthaInstituteofTechnology,Vijayawada,AndhraPradesh.

ABSTRACT:

The present work deals with the design and fabrication of a Leaf type drill jig for penholder component. In this, the design is ensured by having quick loading and unloading of component so that the operating time is reduced. Hence the production rate increases and also the fatigue of the operator decreases. Quick loading is ensured by using round locators at the centre and unloading is ensured by having leaf plate mechanism, where the Jig plate of the drill jig is rotated by using pivot pin. The drill jig is manufactured accurately as per the design requirements using CNC machining where ever it is necessary. Hence theaccuracy of the component is achieved as it depends on the accuracy of the jig plate, where the drill bit is guided through the holes in the jig plate. So that accurate components are manufactured with less time compare with the conventional drilling of holes without drill jig.

Keywords: Leaf Jig, Penholder, drill jig, mass production.

Introduction

In any of the manufacturing industries, Jigs & Fixtures plays a key role in the assembly of parts, mass production, inspection etc. The purpose of Jig is to positioning of work piece as well as guiding of cutting tool. This ensures the quality of the components as well as increase in production rate. Mainly the fixtures are used for machining, assembly, inspection purposes. In the fixtures, the component is positioned and clamped properly during machining. Hence repeatability and accuracy is achieved. There are different types of Jigs and fixtures are available. In the present work, for drilling of holes in pen holder, a leaf type drill jig is designed and fabricated. Many authors contributed their work in this area. Their work is as follows.

PriyaShinde et.al [1] designed a pneumatic drill jig for cover plate, where they developed a pneumatic system for clamping of the workpiece instead of manual clamping. Anand N et.al [2] designed a turning and drilling fixture for housing component and also analyzed the stresses developed during drilling operation using Ansys software. Raghavendra H et.al [3] designed and fabricated an indexing drill jig for different work piece materials like cast iron, aluminum, mild steel and fiber materials and analyzed the machining time. H Radhwan et.al [4] proposed a semi-automatic jig and fixture design for easy handling and analyzed the stresses using FEA analysis. Rushikesh D. Bhosale et.al [5] studied and designed a fixture for welding of base frame such a way the time is reduced by 90 min per day. AnujShrivastavaet. Al [6] analyzed and designed a adjustable welding fixture for any type of suspension arms welding of passenger vehicles. AvadhutKulkarni et.al [7] designed a drill jig to drill small diameter holes (2mm) of 3 nos. at 58º angle for rod guide component. Abdulhamid .A et.al [8] studied different types of jigs used for drilling opearations and designed a drill jig such that different shapes of work piece can be drilled properly.

In the Present work, a leaf jig is designed and fabricated to drill holes on the penholder component which serves the purpose of keeping the pens in that holder by taking into the consideration of easy loading, unloading of the component and to increase the production rate as well as to achieve quality components.

Design of Drill Jig

Penholder component drawing:

The component or workpiece material is taken as EN8. The component consists of dia 8mm x 6 holes. A drill jig has to be designed to drill these holes accurately with minimum time. The dia 12 mm hole at the centre of the component is already made and that can be used for location of the component in the drill jig. The dimensions of the penholder component are shown in the Fig1.

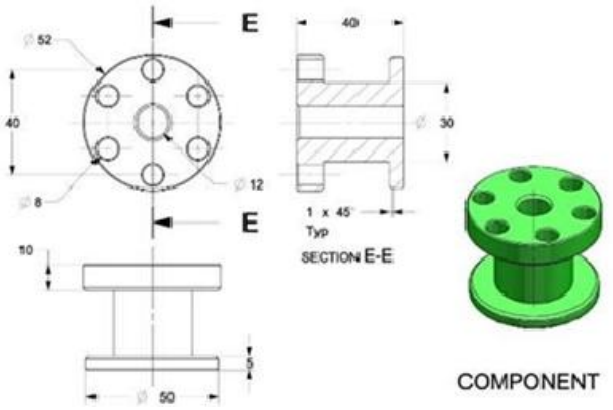
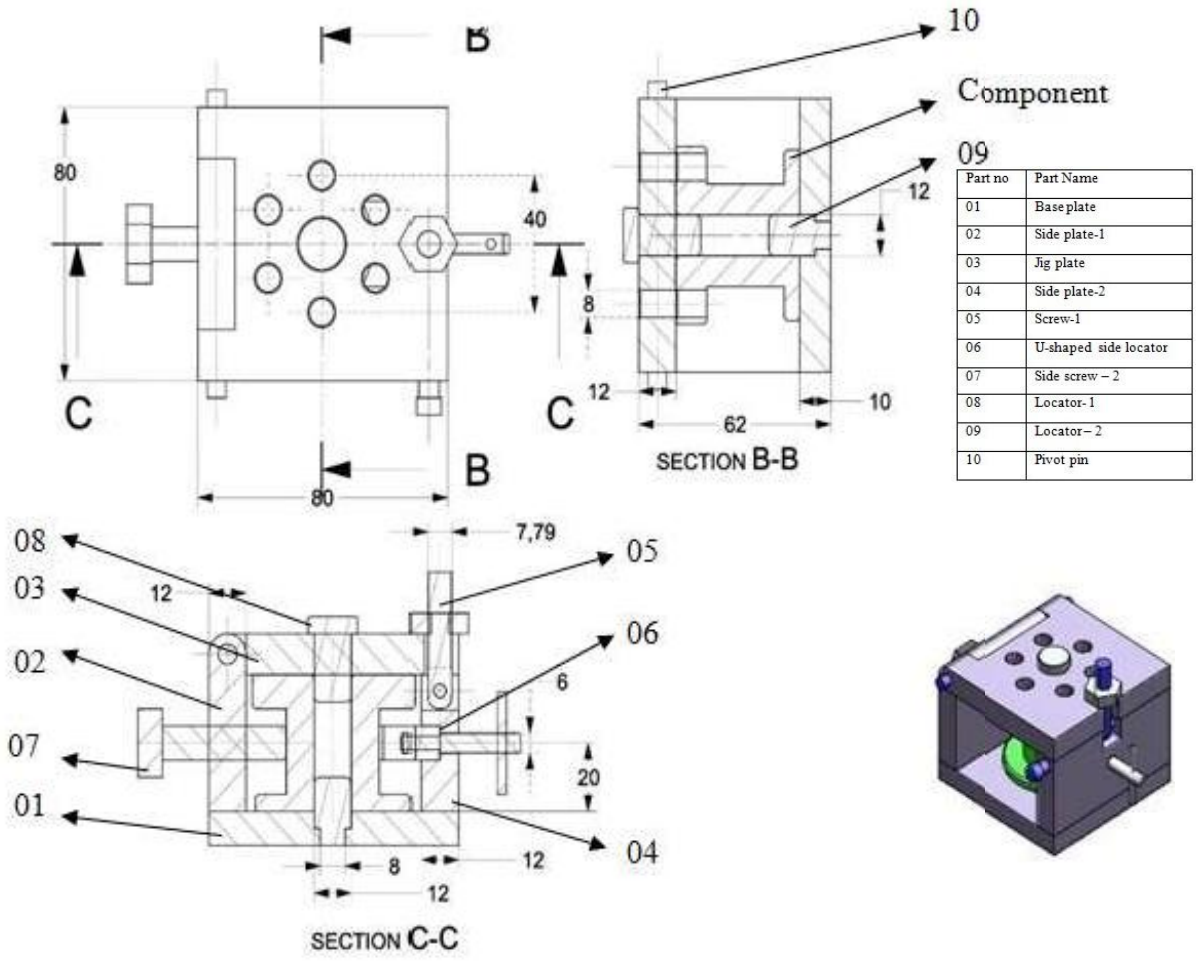


Fig.1 Penholder component drawing

Leaf drill jig assembly design:



Part no	Part Name
01	Base plate
02	Side plate-1
03	Jig plate
04	Side plate-2
05	Screw-1
06	U-shaped side locator
07	Side screw – 2
08	Locator- 1
09	Locator – 2
10	Pivot pin

Fig.2 Assembly design of Drill Jig

A Leaf Jig is designed for penholder component to drill six holes as per component drawing. The leaf jig design assembly is shown in Fig 2. It is a box shaped jig which consists of jig plate on top that can be opened and closed like a door using pivot pin. This facilitates for easy loading and unloading of component. The component can be locked with a bolt at the end of Jig plate. It also consists of locator at bottom that locates the component. It also contains u-shaped locator that holds the workpiece from one side and from another side a screw is placed that can be tightened and loosened. Another locator at the Jig plate locates the component from top side. Hence the design of drill jig is made by ensuring all the degrees of

freedom of the component is arrested during operation and also easy loading & unloading of the component.

Fabrication of Drill Jig

A Leaf drill Jig is fabricated as per the design. The EN 19 material is used for making the total body of the Jig. The fabricated parts are shown in Fig. 3

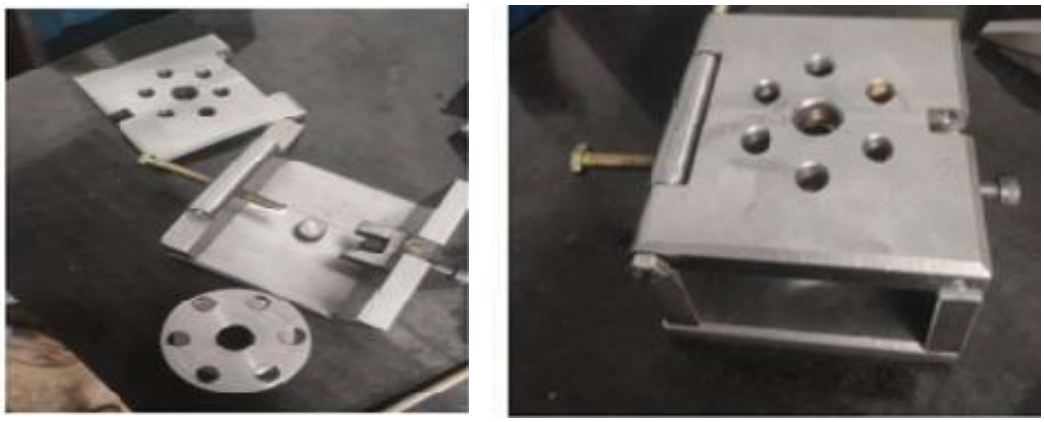


Fig. 3 Fabricated parts of Drill jig

3.1Working of Drill Jig:

The aim of present work is to drill the holes on workpiece/component with less time by using leaf drill jig. In this, the drill bit is guided by holes in the jig plate to the correct position. Drill bushes also can be designed in the place of holes. So that any replacement of hole sizes can be done. The sequence of operations carried out for drilling of holes using drill jig are shown in the Fig.4.

The leaf jig contains a jig plate at the top side that can be opened and closed like a door using pivot pin. One locator is fitted to jig plate for positioning of workpiece at the centre of the Drill jig. Hence lift the jig plate and place the work piece inside the leaf jig. Place the work piece perfectly on end locator at the bottom side (base plate) of the Jig. The leaf jig consists of one u-shaped locator that holds the workpiece from one side. The other end consists of a screw that can be used to tightened or loosened, so that workpiece can't be moved while drilling operation. Now jig plate is locked by using a bolt at the end of the jig plate.

Next ensure that all the degree of freedom is arrested for workpiece. Now perform drilling operations on workpiece through jig plate. By passing drill bit through the jig plate holes, drilling of holes is done on workpiece perfectly.

Now unlock the jig plate by loosening the bolt and lift the jig plate. Now loosen the side screw and u-shaped locator. Now take the workpiece outside easily by lifting it up. Clean the chips that are produced while doing drilling operations on workpiece. Now place another workpiece or component and repeat the process.

Loading Drilling Unloading

Fig. 4 Sequence of operations performed during drilling of holes.

Conclusions

The objective of this paper is to design and fabrication of leaf drill jig for pen holder. The design of the drill jig is prepared using AutoCAD &Catia software. The design is made such a way that easy loading and unloading of the component/workpiece is done through leaf type drill Jig. The drilling time is reduced drastically by comparing the time taken by conventionally drilling of the holes without jig. Hence the production rate also increases. The fabrication of the drill jig is made by using CNC machine where ever accuracy is required. Especially the holes in the jig plate, Locating pin holes are machined by using CNC machine as per the design. In this drill jig, the location of the component is ensured by using locating pins and the drill bit is guided through holes in the jig plate while drilling operation. Hence quality of the component is achieved.

References:

1. P. Shinde, A. Mankar, D. Sonar, G. Kardile, and P. Mahale, "Design and development of pneumatic drill jig," Int. J. Innov. Eng. Res., vol. 7, no. 5, pp. 68–74, 2020.
2. Anand N, Vishwash B, and Mahendra Kumar V S, "Analysis of Turning and Drilling Fixture for HSU Housing Component using FEM," Int. J. Eng. Res., vol. V5, no. 05, pp. 405–410, 2016.
3. S. M. kiran and S. M. S, "Design, Fabrication and Automation of Indexing Drill Jig," Int. J. Sci and Eng. Res.,vol. 9, no. 5, pp. 70–76, 2018.
4. H. Radhwan, M. S. M. Effendi, M. Farizuan Rosli, Z. Shayfull, and K. N. Nadia, "Design and Analysis of Jigs and Fixtures for Manufacturing Process," IOP Conf. Ser. Mater. Sci. Eng., vol. 551, no. 1, 2019.
5. R. D. Bhosale, S. S. Nalawade, and P. Swami, "Study & Design of Jig and Fixture for Base frame of Canopy Fabrication of Generator," Int. Res. J. Eng. Technol., vol. 4, no. 5, pp. 1592–1595, 2017
6. Shrivastava and N. J. Shyam, "Design of a Versatile Jig and Fixture for Welding of Suspension Arms Tool design View project Design of a Versatile Jig and Fixture for Welding of Suspension Arms," Int. Res. J. Eng. Technol., pp. 625–630, 2020.
7. A. Kulkarni and V. Phadtare, "Design of Drilling Jig for Rod Guide," Int. J. C. Eng. Technol., vol. 7, no. 7, pp. 2–4, 2017.
8. M. M. Abdulhamid, A., Sumaila, M., Yawas, D. S., Kaisan, M. U., 1Shaaba, "Design and Construction of Drilling Jig for Drilling Operations," J. Sci. Technol and Edu.,vol. 8, no. 1, pp. 329–336, 2020.