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OPTIMIZATION OF DRILLING PROCESS & DRILLING MACHINE

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Abstract - *This paper is about design and produce a jig. Work starts with a look at special tools. Various types of drill jigs are tested at work place. The design involved consideration of the jig force, work duration at which the operation was performed. It has been found that these forces can be easily carried by their components in their construction. The complexity of the design was put to a minimum and so this ensured that the jig must be easily constructed. The report provided a detailed description of the jigs which increased productivity, cheaper in costs, high precision parts, reduced need for testing, the simplification of complex and heavy materials, as well as the low variability in size. In this paper, we start with the basic design of the jig and then come up with this model that can satisfy the concepts of ideas for jig design. 3D model design is done in Catia.*

Key Words: jig, drill, thrust, locator, production, Catia etc.

1. INTRODUCTION

Every company's Mass production goal is to increase productivity and accuracy by means of reducing the cost of setup and manual operation.so here our goal is achieving mass production goals is to use jigs. Let us assume the example that one receives an order for 10000 products in such a way that three holes will be drilled in the work piece. In such cases, the designer will set the location of each hole with the help of a square, straight, writers, middle fist, etc. Generally, the probe and error method is preferred to the axis of the hole is well aligned with the drill axis. Therefore, this method consumes more time. Eventually it increases operator fatigue. Therefore, instead of this conventional method, the operator uses the jug to place and direct the ball in the correct position.

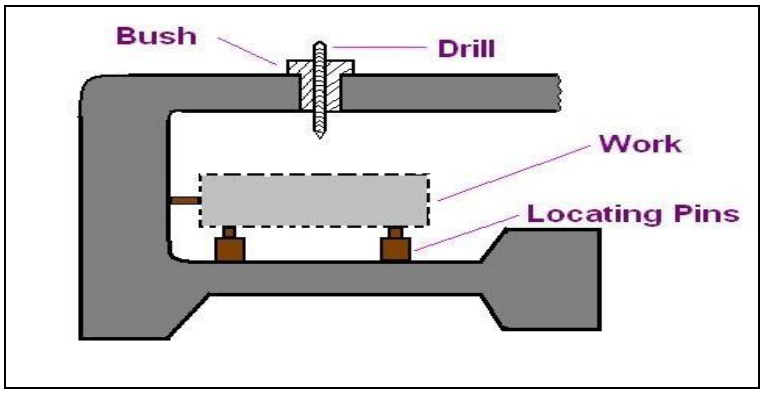

Fig (1) Jig Fixture

The drill jig gains the productivity by removing each marking, placement, and regular inspection. Exchange is one of the best benefits of jig. There is no need for the selected meeting. In addition, the jig reduces the repetitive requirements for drilling. The toolbar helps set the wrong location for the tool. Skilled workers are not needed. A jig can be defined as a working position that holds and detects that places, controls the cutting tool. A drill jig is a tool to ensure a hole is drilled or renamed in the workplace at right place. Generally, the work area is jig-shaped. Jigs complete the performance of an individual, a position in the regular routine. This reduces processing time and increases productivity of product.

1.1 Company Requirement

As per the companies' present requirement, they need such a technique for drilling operation which can be efficiently used to reduce the cost of production, improves the quality of product, increase the production rate and reduce the operation time.

Problems Company facing listed below:

a. Material rejection rate increase because of overrunning, short run during machining, risk of working is high in manual process.
b. Accuracy of product gets decreased as there is misalignment between tool and work piece.
c. More time consumption.
d. Manual process requires more manpower and machine hour.
e. The risk of working is high in manual processes.
f. Production cost increases.

1.2 Organization Information

Sponsored By: Right Tight Fasteners Vendor Monarch Industries, Address: Plot No A-2, MIDC Malegaon Sinnar, Dist.: Nasik, Establishment Year: 2007

2.0 DESIGN

The thickness of Jig = Thickness of the head of bolt + Extra clearance

=**15.7mm.**

Length of Jig = 2*Diameter of head of bolt + clearance

= **80mm**

Width of Jig = **50mm**

Depth of slot = Thickness of bolt head = 5.7/5.9mm

Length of slot = 25.50mm (precision sliding fit)

Diameter of slot = 14mm (as per outer diameter of bolt)

2.1 Design of Clamping Knob

Size of thread = M10

Min length = Thickness of flange = 15.7mm

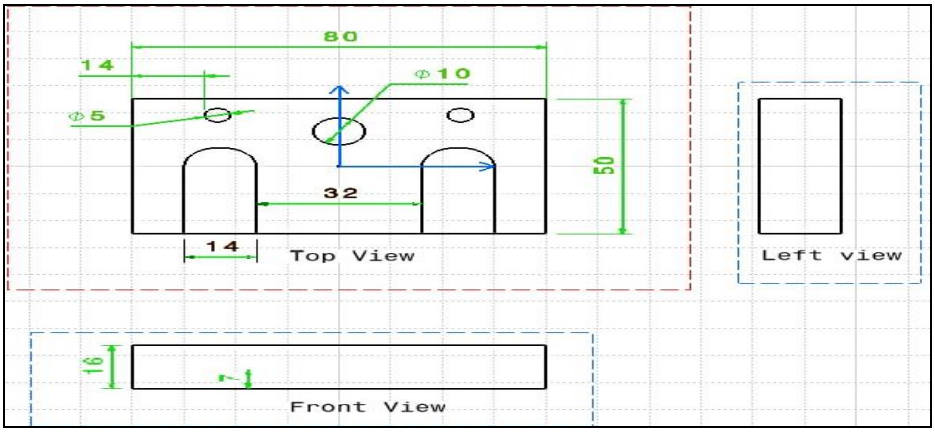

Figure (2) Jig Plate 2D Drawing

2.2 Design of Guide Plate

Dimensions = 28*25*3mm

Diameter of bolt holding gap = 15 mm

Diameter of guide pin = 5mm

2.3 Force Analysis on Jig Plate

The Force acting on each of the lips from the equation,

But k is the material factor, k for mild steel = 1.5,

The diameter of drill = 5 mm (as indicated above),

S is the feed rate = 0.125 mm/rev substituting,

Thrust *(T)= 0.195 HB × S0.8 × d0.8 + 0.002 HB × d2---------- (1)*

Where, HB- Brinell Hardness & for MS HB is 130

d- Diam. Of cutting tool

S- Feed Rate

Put all the values in equation3,

T= 0.195×130×0.125×0.8×5×0.8 + 0.002×130 ×25

T= 16.64 N ---------- (2)

Clamping force

Clamping force= Thrust × Fos

Clamping force = 16.64 × 3

Clamping force = 49.92 N ---------- (3)

From equations (2) and (3),

Clamping force > Thrust

- **Design is safe**

2.4 Time Analysis

OPERATION	EXISTING SOLUTION	PROPOSED SOLUTION	(USING JIG)
		By standard table	BY measurement
Marking and punching	60 sec	-	-
Loading and unloading	20 sec	45 sec	45 sec
Drilling time	20 sec	12 sec	10 sec
Total time	100 sec	57 sec	55 sec

3. JIG MANUFACTURING PROCESS

Generally, we can firstly manufacture the part that is, the body, clamping, and the locator by using casting method. After that we can use the operation machining, milling, turning, and drilling to get the exact dimension and smooth surfaced part.

4. CONCLUSIONS

We conclude that drilling accuracy. Thus, the drill jig has been successfully designed and developed as per the requirements of the component. The usage of this jig will certainly help the industry in reducing the faulty product, production time & also reducing the production cost apart from increasing the productivity. The results indicate that operating time is saved to a greater extent, & higher accuracy is achieved. Thus, the output will be more and even the human power is minimized.

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