Design and Development of Jig for drilling machine

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Guided by,
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- Methodology of project and future planning:
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What is Jig and Fixture?

- These are work holding device and tool guided device. Quality of performance of process is largely depends on design of jig and fixture.

- A jig differs from a fixture in sense of that it guides a tool to its correct position.
Introduction

• A CNC can also do the drilling work with accuracy but the cost of a CNC is very high. For working with this machine we need special training, which is very costly. Its use for automation into the manufacturing companies.

• So in our project we are creating a one model like CNC. our model is use for the drilling purpose and automation,its a jig, which is use for the drilling and automation. its easy to use and understand. so its easy to use in manufacturing companies.
Objectives of Present Investigation

• This project basically consists of manufacturing of a fixture for drilling machine. It has to reduce the time and to increase the accuracy of the drilling machine.

• This project is mainly for small scale industries. This will be very useful for the mass production. So this project is basically for automation of the drilling machine.

• So our project will help to make sure that the time and cost constraint is resolved.
APPLICATION

• Where Less skill labours are worked
• Fast work with high accuracy in industry
• This application can be also used for milling or any kind of cutting machine
• For mass production in small industries
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<tr>
<th>Design and requirement</th>
<th>Method</th>
<th>Result</th>
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<tr>
<td>Better quality and high production</td>
<td>• SPM method are use • Comparisons of SPM, manual method</td>
<td>SPM method are less costly compared CNC And less time required manually</td>
<td>M.P. Groover In USA, 2008</td>
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<tr>
<td>development of automated jig saw machine</td>
<td>Three step • Size • User interface and programming • Communication link</td>
<td>avoid this point • serious accidents • inaccuracy in profiles • time consumption • loss of raw material</td>
<td>Prajakta H. Dahake, Vivek V. Patil (2013)</td>
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<td>Design of Jigs and Fixtures for Hydraulic Press Machine</td>
<td><em>Design(U,V shape), Simulation, analysis in ANSY software</em></td>
<td>Better gripping and holding, Less deformation,</td>
<td>Taufik, R.S., Hirmanto</td>
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<td>Design and Finite Element Analysis of JIGS and Fixtures for Manufacturing of Chassis Bracket</td>
<td>FEM</td>
<td>Manufacturing of Chassis Bracket of Bajaj car RE60 (passenger)</td>
<td>Sawita D. Dongre</td>
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<td>Mathematic simulation of +13 mm particles motion in jig</td>
<td>1. Analysis of particle motion (vibration, motion equation, Velocity, Acceleration)</td>
<td>The equations might be used directly in control process of jig.</td>
<td>Kuang Ya-li</td>
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<td>Implementation of Automatic Identification Technology in a Process of Fixture</td>
<td>Radio Frequency Identification (RFID) technology</td>
<td>automated data identification</td>
<td>Stevan Stankovski</td>
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<td>Inaccuracy of the AO ELFN recon jig: A case series</td>
<td>ELFN(EXPERT LATERAL FEMORAL NAIL)</td>
<td>USED IN SURGEONS (IN X–RAY RADIOPHOTOGRAPHY)</td>
<td>O.A. Ibrahim, R. Freeman, G.J.R. Slater</td>
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<td>Planar malty-reflecting time of flight mass analyzer With a jig saw ion path</td>
<td>MR TOF(MULTI-REFLECTING TIME OF FLIGHT)</td>
<td>HIGH TRANSMISSION AND STABLE OPERATION</td>
<td>Mikhail yavor, Juri hasin, Boris kozlov</td>
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<td>Self-optimization in large scale assembly</td>
<td>SELF-OPTIMIZING CONTROL ALGORITHMS</td>
<td>AIR CRAFT PRODUCTION AND INCREASE THE</td>
<td>R. Schmitt, M. Janssen</td>
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<td>ULTMYMATE TROUGH- Fabrication, Erection and commissioning of the worlds largest parabolic trough collector</td>
<td>SCA(solar collector assembly)</td>
<td>Solar power plant</td>
<td>A. Schweitzer W. Schiel P. Nava</td>
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<tr>
<td>Components</td>
<td>Type</td>
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<td>Lead screw</td>
<td>Single thread</td>
<td>Nominal diameter(d) outer diameter(Do) core diameter(Dc) Pitch(p) Mean diameter(Dm) Lead(l)</td>
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<td>microcontroller</td>
<td><strong>Microcontroller 89s52</strong></td>
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<tr>
<td>Bearing</td>
<td>Slider bearing</td>
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<td>motor</td>
<td>Stepper Motor</td>
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<tr>
<td>Bolt and nut</td>
<td>Single thread</td>
<td>Diameter</td>
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Design:-

1. Lead screw
2. Gear pair
3. Bolt and nut
4. Motor calculation
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<th>Torque required</th>
<th>Total Motor Torque Required, ( T = T_1 + T_2 )</th>
<th>T1-due to inertia ( T_2 )-frictional</th>
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<tr>
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<td>( T_1 = w \times (d/2) = 545 \text{ N.mm} )</td>
<td>Total ( T = 755 \text{ N.mm} )</td>
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<td></td>
<td>( T_2 = w \times (d/2) \times \tan(\phi + \alpha) = 230 \text{ N.mm} )</td>
<td>( T_1 ) due to inertia ( T_2 )-frictional</td>
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Load on lead screw
- Tensile stress
- Torsion stress
- Buckling effect

\[ \sigma = \frac{w}{(\pi/4 \times d^2)} = 0.522 \text{ Mpa} \]
\[ \Gamma = \frac{16T}{(\pi/4 \times d^3)} = 2.16 \text{ Mpa} \]

Material strength
- Tensile stress
- Torsion stress

\[ \sigma_t = \frac{\sigma_y}{f.o.s} = 112 \text{ Mpa} \]
\[ \sigma_c = 1.5 \times 112 = 168 \text{ Mpa} \]
\[ \tau = 0.5 \times \sigma_t = 0.5 \times 112 = 56 \text{ Mpa} \]
Design parameter

• Lead Screw
  P=3 mm   d=13 mm   l=280 mm   µ=0.15
  Dm =11.5 mm , ƛ = 8.530

• Design of Bolt
  p=2 mm   l=63 mm   d=6 mm

• Design of nut
  P=2 mm   h=6 mm

• Design motor
  RPM= K1 * V, where,  K1= induced voltage constant, V=voltage applied
CONTROLLER UNIT
Microcontroller
LCD
Circuit diagram
Power supply diagram
Transformer
Proto type Pro e Model
Model Preparation
THANK YOU