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Design of Electromagnetic Press Vice

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Abstract*: *An engineer's vice, also known as a metalworking vice or machinist's vice, is used to clamp metal. It is used to hold metal when filing or cutting. The jaws are often separate and replaceable, usually engraved with serrated or diamond teeth. The jaw opening of an engineer's vice is almost always the same size as the jaw width, if not bigger. An engineer's vice is bolted onto the top surface of a workbench, with the face of the fixed jaws just forward of its front edge. The vice may include other features such as a small anvil on the back of its body. Most engineer's vices have a swivel base. Majority of such manually operated vice requires pretty much manual effort if operation has to be perform continuously. Size of work piece also matters. So we are aiming to design electromagnetic drill press vice which will overcome disadvantages discussed above. Magnets used in the system are electromagnets which makes it easy to vary the force simply by varying the electric current,
Keywords*: *ice, permanent magnet, electromagnet, jaw, swivel base

I. INTRODUCTION

To hold a component firmly while machining is always a crucial task.Workpiece never does have same size, shape and material. It requires variation in force and different sizes of clamping jaw which makes it difficult to operator to perform task continuously. The necessity of design electromagnetic vice lies in reducing the human effort applied during manual of jacks and hence the need of invention in day to day life it is very tedious job to operate the press vice manually and it is also a very time consuming work as well so to make it easier for everyone specially for workers in companies to provide safe and simple automatic press vice without manual effort. There are certain mechanism already available for same purpose which has a definite when we work on job on the press vice the job will not mounted properly but by electromagnetic press vice it is easy to hold the work piece, in such a way as to prevent an additional risk of damage.

II. LITERATURE REVIEW

A. Andree Gothe [1]

He developed a work holding vice which has clamping ability by electromagnetic mean. Coil is powered by 24V DC Supply. The object of the invention is to provide a vice for machine tools and in particular a column-drilling machine, which makes it easy to switch between different work- pieces and/or positions. Furthermore it would be convenient if activation of the magnetic means of the vice could be hand-free i.e. by footswitch or similar external switch. It avoid frequent adjustment of the jaw and object is clamped perfectly.

B. Dr S K Patel [2]

He has designed vice for the sake of drilling and milling. This gave an idea to design the multipurpose vice. It takes too much time for production at large scale with variety of component. Trial and error method is usually practiced until the axis of the hole is properly aligned with the axis of the drill. To maintain accuracy too much effort as well as time requires. Thus it becomes a tedious task. Dr. Patel has been got rid of such impediment and made it easy for workers to do the operation in minimum possible time.

III.COMPONENTS

A. Electromagnet

As name itself indicate system being works on magnetism this is why it requires a magnet, either permanent magnet of electro magnet. Current system has electromagnet for applying the force. To concentrate the magnetic field, in an electromagnet the wire is wound into a coil with many turns of wire lying side by side. For current design it is integrated with the base i.e. Where work piece is hold while operation. It has a transformer of input 230V and of output 12V.

B. Metal plates

It is used to support the metal box. Inside metal box transformers are installed. Plate (metal), a rectangular flat metal stock that is more than 6 mm or 0.25 in thick, not as thin as sheet metal. An element of a folding machine. Vehicle registration plate (license

plate), a sign attached to a vehicle in order to identify it. Metal box is used to protect the electrical connections from hot metal scrap and put power board inside it.Dimensions of the plate are as following

Base plate - 550 x 200 x 15 - 1 plate
L Type - 550 x 40 – 2 plate
C Type - 230 x 140 x 10 – 2 plate
140 x 35 x 10 -4 plate
140 x 10 x10 -4 plate

C. Metal box

To support the transformer and to accommodate work piece and hold it by acting as a magnet. Transformers are located inside metal box and hardener poured in box to constraint the movement of transformer. Metal box mounted over the metal plate and can move longitudinally to accommodate different size work piece.

D. SMPS(Switch mode power supply)

SMPS is used to convert the 230V AC to 12V 20A DC Following fig shows the Image of power supply board. There are three output terminals. Each one is connected to the two electromagnets. When the power supply starts the board are convert the 230V AC to 120V DC. Power board directed the supply to the electromagnets.

Specifications: AC Input -230V 50/60 HZ
DC Output- 3-12V, 0.8-17A

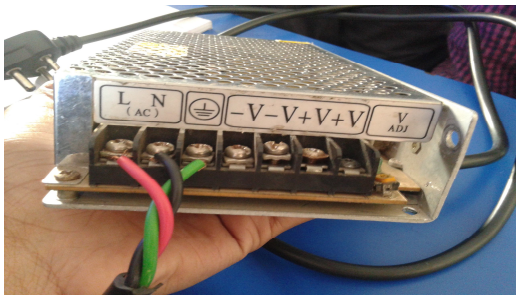

Fig. 1- SMPS

E. Switch

In current design switch is used to magnetize and demagnetise the plates by opening and closing the electric circuit manually. When work piece has to be hold switch is press in order to supply the current and after machining has done switch is pressed to demagnetise the plates.

Current Rating(A)	10	7.5
Material	Polycarbonate	Plastic
Power/Voltage(V)	220-240 V	230

Table 1- Specification of switch

F. Wiring and Insulation

To provide the current to coil some mean of power flow requires. Power is supplied to coil by hard wiring. Wires are well insulated to avoid short circuit which results in scanty chances of any accident. Allowable wire and cable types and sizes are specified according to the circuit operating voltage and electric current capability, with further restrictions on the environmental conditions, such as ambient temperature range, moisture levels, and exposure to sunlight and chemicals.

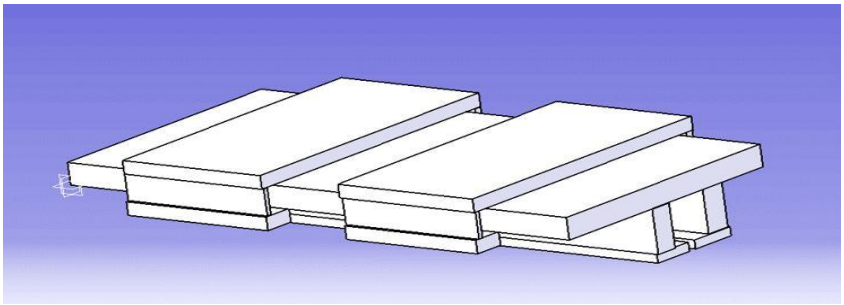

Fig. 2- 3D Model of Electromagnetic press vice

IV. WORKING

Electromagnetic press vice is used to hold the W/P. Fig shows the arrangement of Electromagnetic press vice. Power is supply to the Power board; it converts the 230V AC to 12V dc and supply to switches. The output of power board is connected to the electromagnet and power supply gets starts electromagnetic field produce that electromagnetic field hold the workspace. The main advantage of an electromagnet over a permanent magnet is that the magnetic field can be quickly changed by controlling the amount of electric current in the winding. However, unlike a permanent magnet that needs no power, an electromagnet requires a continuous supply of current to maintain the magnetic field. An electromagnet is a type of magnet in which the magnetic field is produced by an electric current. The magnetic field disappears when the current is turned off. Electromagnets usually consist of insulated wire wound into a coil. A current through the wire creates a magnetic field which is concentrated in the hole in the center of the coil. The wire turns are often wound around a magnetic core made from a ferromagnetic or ferromagnetic material such as iron; the magnetic core concentrates the magnetic flux and makes a more powerful magnet.

V. COMPARISON

Manual press vice	Electromagnetic press vice
Hold the work piece between two jaws.	Hold the work piece by electromagnet.
Skill operator are required to hold work piece.	Skilled operator not require to hold work piece
This type of vice consume more time.	It takes less time compared to manual press vice
It cannot use for bigger shape of material.	It sustain for bigger shape of material.
In this chances damage of work piece.	No damages on work piece.
It require oiling.	No need of oiling.
More maintenance.	Less maintenance.

Table 1- Comparison of vice

VI. CONCLUSIONS

The usefulness of our vice is huge as most of the times the common vice is not able to hold the piece of material in order to drill it and its support is unstable, so the whole procedure is very time consuming. Therefore, Making this vice we can hold bigger and smaller pieces of material in irregular shapes and thickness and still be able to easily drill without any special procedure to support them, in advance. It helps to increase productivity reducing time and increasing profit On drilling machine 1 job is completed in 5 minutes by manual vice and 1 job is completed in 3 minute on electromagnetic press vice Monthly by manual press vice 4320 job completed and with electromagnetic press vice 7200 job are produced so it helps to increasing profitability .

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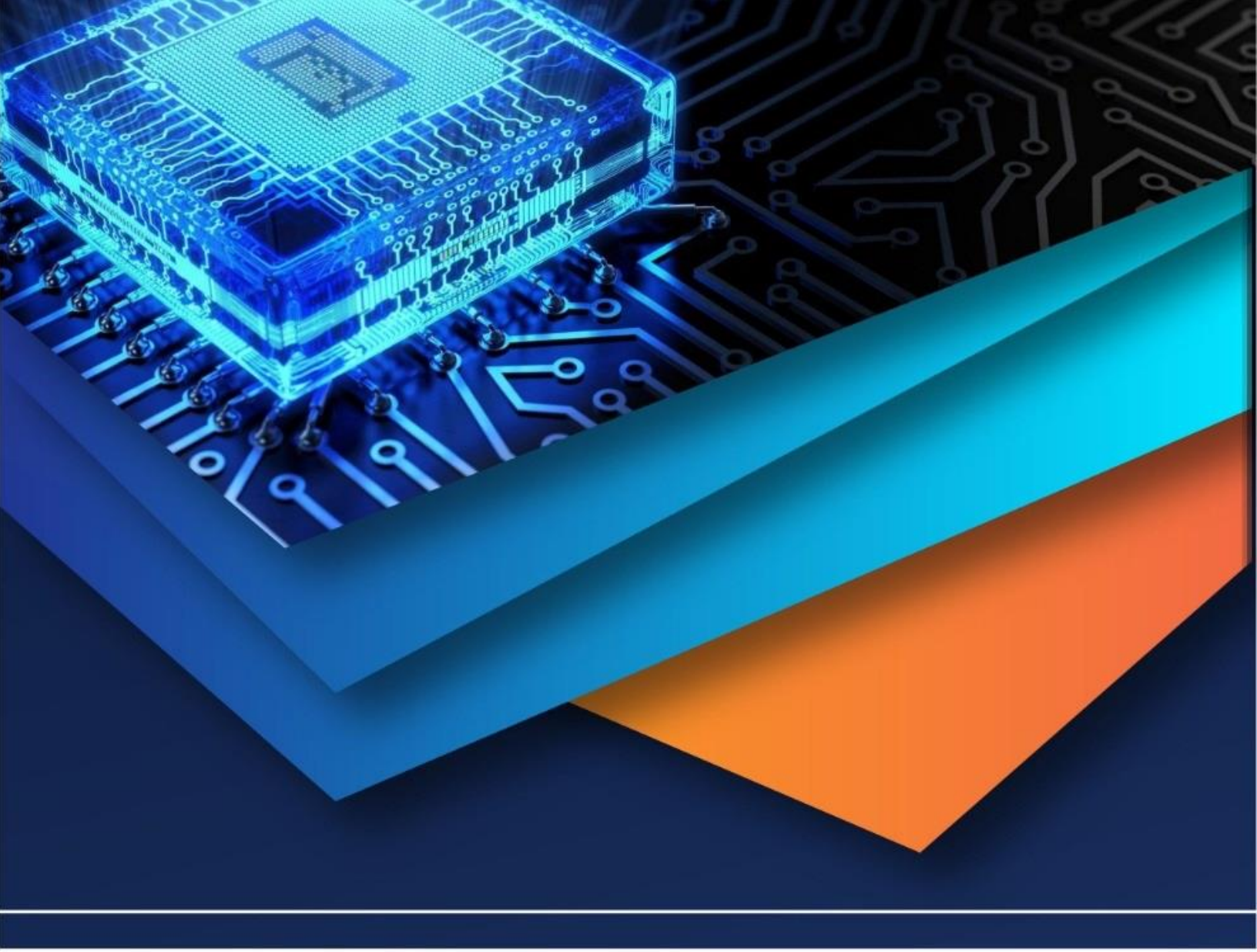

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