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Design and Fabrication of Semi-Automatic Slotting Machine

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Abstract **An engineer is always focused towards challenges of bringing ideas and concepts to life. Therefore, sophisticated machines and modern techniques have to be constantly developed and implemented for economical manufacturing of products. At the same time, we should take care that there has been no compromise made with quality and accuracy. In the age of automation machine become an integral part of human being. By the use of automation machine prove itself that it gives high production rate than manual production rate. In competition market everyone wants to increase their production & make their machine multipurpose. The engineer is constantly conformed to the challenges of bringing ideas and design into reality. New machines and techniques are being developed continuously to manufacture various products at cheaper rates and high quality.**

Keywords: Shiva Enterprises, Blade Slotting, Semi-Automatic machine.

I. INTRODUCTION

HSS blade is commonly used for steel rule wooden die manufacturing. slotting operation is perform on HSS blade. the standard thickness of blade is 0.71mm, 23.3mm wide and 1m long. The conventional method used for slotting the HSS Blades is manually slotting. . It consumes more time. To overcome this problem we are going to do the "Semi-Automatic Blade Slotting Machine." Due to this the productive rate increases & reduce the time of machining. more effort is required during slotting. less accuracy & more scrap during slotting. without any automation unit for the blade slotting, this m/c cannot be adopted in today's automated die making plants.

To perform the most rigid operation with high speed we needed automation in slotting machine. manual slotting machines are currently used in industries, it is very hectic to perform slotting operation on manual slotting machine as it consumes more time to perform various slotting operations, as they are manually operated so fatigue on worker is more, also production rate is also low. to overcome various problems we are trying to develop Semiautomatic slotting machine. By using this we can reduce the consumption of time required to perform slotting operations and also reducing fatigue on worker, therefore production rate will also get increase.

Based on the need for well-defined experiments and accurate experimental data for model validation, the research question is formulated as: "What are the requirements on an experimental shear cutting procedure to allow accurate high sensitivity studies of small process parameter variations?" .This work aims to develop a procedure for experimental evaluation of shearing and includes the design, build and evaluation of an experimental set-up with high measurability

and consistent and predictable output. Finally, three material grades, representative for low, medium and high strength steels, are selected for the study of clearance and clamp configuration, two shear parameters identified as important to the shear process.

A. Objectives

1) To reduce the power consumption during machining.

2) To maintain the accuracy& reduced the scrap.

3) To develop automation unit for the blade slotting, so that m/c can easily be adopted in today's automated die making plants plants.

4) This type of m/c provides work practically at low cost, low maintenance, low capital investment in less space.

5) To perform the most rigid operation with high speed.

B. Process Flow Chart

The below flow chart shows the sequential operation/steps that will be performed during the project process.

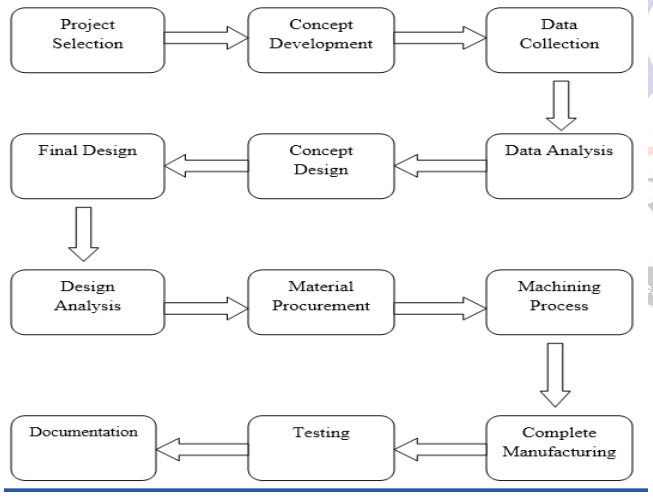

Fig. 1 System Flow

II. LITRATURE SURVEY

A. Conventional machine:

Helmold equipment: benders, notchers, cutters and miter machines, company brochure. Used for slotting and bridging rule, the standard slotter comes equipped with an adjustable link so that the knife we can be reset after sharpening for entry into female knife. Heavy duty slotter is also available. Special size slotter can be made to order. Standard size slotting of 1/4" x 5/8" or 5/16" x 3/4" are available for use with up to 3- point rule. In standard slotting machine, we have to press the lever by hand. Because of this the production rate gets slower and fatigue on worker is more.[7]

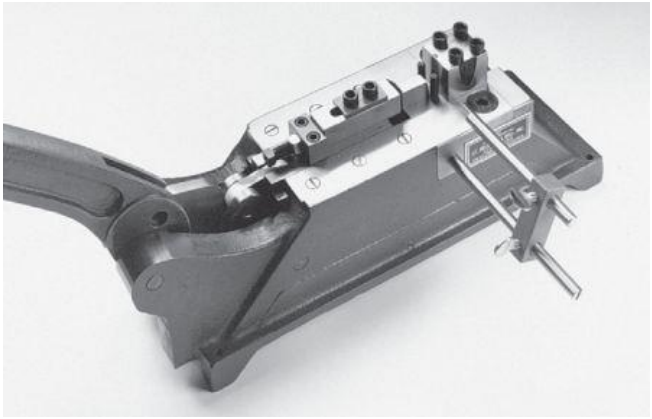

Fig. 2 Standard Rule Slotting Machine

B. Design of Semi-automatic Slotter Machine using PLC

Saurin Sheth, Purvi Chauhan, Mechanical Engineering Department B.V.M. Engineering College, Vallabh Vidyanagar, Anand Dist., Gujarat, in this paper, the semi automate the Slotter machine using PLC and hydraulic system are discussed. CNC turning centers, VMC and CNC grinding are available in the market, but a retrofitting of Slotter machine is the prime requirement as it is not readily available. So they develop the machine for the slotting purpose by using PLC controller and hydraulic system. This machine uses lots of programmable sensors as well as hydraulic accessories like hydraulic reservoir, directional control valve, flow control valve are used. Therefore, it is possible to reduce the fatigue of the operator and achieves the best results and reduces the operating time.

III. CONSTRUCTION & WORKING

A. Electric Geared Motor

An electric motor is an electrical machine that converts electrical energy into mechanical energy. In normal motoring mode, most electric motors operate through the interaction between an electric motor's magnetic field and winding currents to generate force within the motor. In certain applications, such as in the transportation industry

with traction motors, electric motors can operate in both motoring and generating or braking modes to also produce electrical energy from mechanical energy with gear reduction ratio.

Fig. 3 Electric Geared Motor

B. Oldham's Coupling

A Oldham coupling is a device used to connect two shafts together at their ends for the purpose of transmitting power. Couplings do not normally allow disconnection of shafts during operation, however there are torque limiting couplings which can slip or disconnect when some torque limit is exceeded. The primary purpose of couplings is to join two pieces of rotating equipment while permitting some degree of misalignment or end movement or both. By careful selection, installation and maintenance of couplings, substantial savings can be made in reduced maintenance costs and downtime.

Couplings are used in machinery for several purposes. The most common of which are the following.

- To provide for the connection of shafts of units that is manufactured separately such as a motor and generator and to provide for disconnection for repairs or alterations.

- To provide for misalignment of the shafts or to introduce mechanical flexibility.

Fig. 4 Oldham's Coupling.

A) Shaft

Shaft is a common and important machine element. It is a rotating member, in general, has a circular cross-section and is used to transmit power. The shaft may be hollow or solid. The shaft is supported on bearings and it rotates a set of gears or pulleys for the purpose of power transmission.

B) Material for Shaft

The ferrous, non-ferrous materials and nonmetals are used as shaft material depending on the application.

Fig 5 Shaft

1) 4.4 Regenerative Braking & Dc Control Device

The DC motor are virtually the mechanical machine, it was immediately realized that if machine is stop after slotting the blade it could use its motors to act as some braking effect if a suitable way could be found to dispose of the energy like regenerative braking . The idea formed that the power could be stop at the source. Which ON or OFF the supply to system.

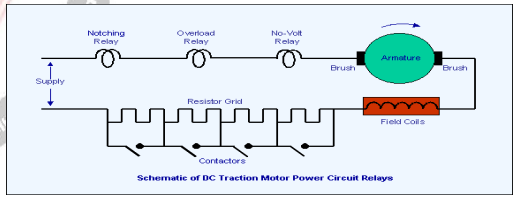

Fig. 6 Regenerative Braking & Dc Control Device

A. Limit Switch

They are used for controlling machinery as part of a control system, as a safety interlocks, or to count objects passing a point. A limit switch is an electromechanical device that consists of an actuator mechanically linked to a set of contacts. When an object comes into contact with the actuator, the device operates the contacts to make or break an electrical connection.

Fig. 7 Limit Switches

B. Slider Cam Mechanism

A cam is a rotating or sliding piece in a mechanical linkage used specially in transforming rotary motion cam into linear motion of follower or vice versa. The contact between them is maintained by the weight of follower itself when it is sufficient. The cam is driver member and the follower is driven member. In this mechanism power is supplied to shaft by motor, which is connected to cam with the rotation of cam , follower moves in liner motion.

Fig. 8 Slider CAM Mechanism.

C. Working

This paper is consists of slotting tool which is mounted on top sides M.S. sliding structure on upper slider & at the middle of the frame. When we want to do a slotting on blade then we push the foot pedal that start the supply electricity to motor & other driver units.

An electronic controller is provided with limit switch to off the motor after one rotation of shaft that is after slotting of blade. When we insert the blade in between slotting tool and push the foot paled then, the electricity is supply through control panel to make one rotation of motor & after cutting of blade the control panel will stop the motor. This project working is depending on principal of slider cam mechanism & cam operation.

III. Result Analysis

A. *Concept Drawing*

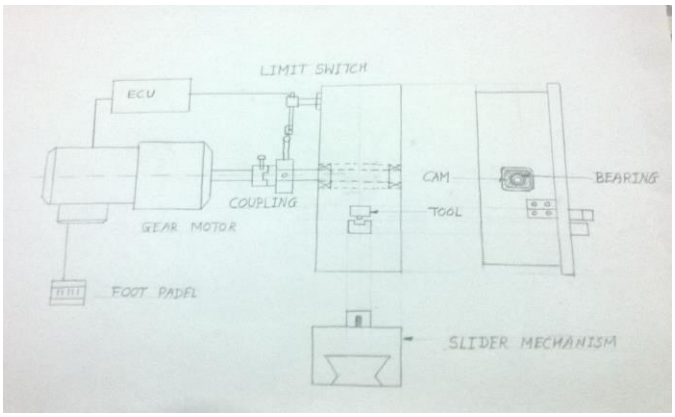

Fig. 9 Block Diagram

This project is consists of slotting tool which is mounted on top sides M.S. sliding structure on upper slider & at the middle of the frame

Fig. 10 Result 1

An electronic controller is provided with limit switch to off the motor after one rotation of shaft that is after slotting of blade.

Fig. 11 Result 2

An electronic controller is provided with limit switch to off the motor after one rotation of shaft that is after slotting of blade. When we insert the blade in between slotting tool and

push the foot paled then, the electricity is supply through control panel to make one rotation of motor & after cutting of blade the control panel will stop the motor. This project working is depending on principal of slider cam mechanism & cam operation.

Fig 12 Result 3

When we insert the blade in between slotting tool and push the foot paled then, the electricity is supply through control panel to make one rotation of motor & after cutting of blade the control panel will stop the motor.

Fig. 13 Result 4

When we want to do a slotting on blade then we push the foot pedal that start the supply electricity to motor & other driver units.

IV. CONCLUSION

By developing the Semi-automatic Blade slotting Machine we definitely increase the production rate of company. i.e. by conventional manual slotting machine usually 6 blades are get slotted in one minute. But by using semi-automatic blade slotting machine approximately increased to 15-20 blades. This automation helps to reduce fatigue of worker by replacing manual force application .

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