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Design and Development of Automatic Punching and Cutting Machine

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Abstract – *Punching Machine is one of the principle machines in paper cutting and sheet metal industry. Press or machine punch is a tool used to work metal by changing its shape and internal structure. A punch press uses a type of machine press used to cut hole in a material. It can be small and manually operated. So we are going to make a multipurpose machine used to cut a cardboard, asbestos sheets, papers, foam, and thin plastic sheet. The machine is simple to maintain, easy to operate. Automatic punching machine is working on the principle of Jigsaw Motor. The sheet is inserted on base frame; the IR sensor senses the metal sheet and sends signal to the relay to actuate the Jigsaw machine.*

***Key Words*: IR Sensor, Metal Sheet, Jigsaw Motor, Relay, Multi purpose.**

1. INTRODUCTION

In today's practical and cost conscious world, sheet metal part has already replaced many expensive casts, forged and machined parts. The reason is obviously the relative economy of operation, easier implementation for mass production, as well as greater control on the technical parameter. In most of the sheet metal operation, punching and pressing operation is the main and initial operation in the process sequence. Automatically, this operation results in reduce lead times and also can reduce human efforts.

Automation can be defined as the "technology concerned with application of mechanical, electronic and computer based system to operate and control production". By automation, one can have a greater control over process. Programmable logic controllers are used for the control of the system. This system can replace existing manual field and operated punching and pressing machine. By interfacing 8051 control with the conventional machine it isis possible to achieve good result in the form of reduced manufacturing lead time and increased safety of the worker.

The punching is the major operation performed in industry and to perform this operation, man power is required is in mass number which results into high cost of production, more time required to complete the operation, affect the accuracy of product so for automation in the system we are trying to do work on a new system in punching.

We aim to provide the force required for punching by Jigsaw Motor. By converting electrical energy into the mechanical energy. Electric supply can be accurately controlled to generate the correct amount of force required to punch the sheet metal.

2. LITERATURE SURVEY

The some of research papers are given below as follows.

SR. NO	LITERATURE SURVEY	DATE OF PUBLICATION	AUTHOR NAME	STUDY TOPIC
1	We have studied automatic electromagnetic punch	25th Feb,2017	M.S. Wani, Shubham Jagtap	Electromagnetic Punch
2	We learned the conceptual diagram of punch	8th May, 2016	Kundan kumar	Design and fabrication of Auto Roll Punching Machine
3	We have studied electromagnetic punch with low cost approach	9th Sep,2012	Arun S, Sree Rajendra	Automatic Punching Machine
4	We have Studied Jigsaw Machine can cut material With High accuracy	3rd Mar,2019	Deshmukh Venkatesh Dnyaneshwar	Jig Saw machine

3. PROBLEM DEFINITION

1. COSTING

As per traditional methods, the costing of pneumatic or hydraulic is more expensive and can be afforded by small scale industries. Both systems require a certain type of

pump and some valves for force and velocity control of the actuators. Tons of horsepower is required to compress atmospheric air into its normal working pressure.

2. ABSENCE OF SENSORS

Due to absence of IR sensor chances of accidents are more. The position of the tool and to turn on and turn off the input current supply no sensor is available in traditional methods. Sensor allows the detection of material that can be analyzed to improve product quality of operational efficiency.

3. TOOL PROFILE

Different types of profile cutting are not possible in traditional method. Only round shaped tool can be used in traditional machining. Different types of tools cannot be used to get the desired shape or sized hole into the work piece according to the requirement of the consumer. The punching is major operation performed in industry, and to perform this operation in mass number, the manpower is required which results into high cost production and more time required to complete the operation, effect the accuracy of product.

4. ACCURACY

Profile cutting is less accurate and is not possible at all position. The tool is centrally oriented is traditional machining. We cannot feed the tool manually. When a specially shaped punch is used to create multiple usable parts from a sheet of a material, then the process is known as blanking. In metal forging implemented in all small scale industries result into control of accuracy of parts.

5. SKILLED WORKER

Skilled workers are mandatory because the punching is traditional machining is not automatic, it is self operated. The punching is major operation performed in industry, and to perform this operation in mass umber, the manpower is required which results into high cost production and more time required to complete the operation.

6. POWER CONSUMPTION

Power Consumption of traditional machining is very high. Tons if horsepower is required to compress atmospheric air into its normal working pressure. High power is required to compress the oil in hydraulic punch. In metal forging implemented in all small scale industries result into control of power consumption.

4. OBJECTIVES

- To optimize the cost of machine by using Jigsaw Machine.
- To avoid the intervention of human by using IR sensor.
- Due to provision of tool mounted different types of profile cutting is possible.
- Orientation of the tool can be adjusted manually.

5. WORKING

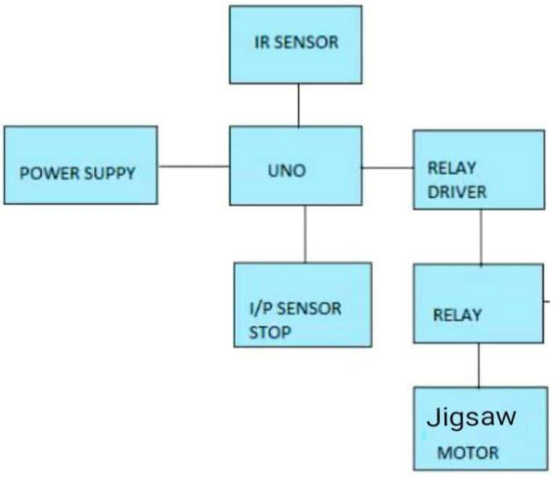

Fig.1: Block Diagram Of Our Project

The model works as a counter and hence by automation using microcontroller is a reliable circuit that takes over the task of controlling the sheets entered very accurately. In our project, the sheet is inserted on base frame the IR sensor sense the metal sheet only (so avoids human intervention and acts as a safety feature) and sends signal to the relay to actuate the motor.

For punching operations, the IR sensors are mounted just besides the motor. Two square bars are supported by wheel clamp perpendicular to each other. The whole frame is made up of Mild Steel hollow square bars which are wedded to give good rigidity.

We have modified the jig saw in such a way that different types of profile cutting are possible due to the provision of tool mounter. The different shapes we used are round and triangular.

We can slide the sheet with the help of side guide ways provided. It helps to locate the exact point and makes the operation more accurate. The use of IR sensors can avoid human intervention. This increases workers' safety.

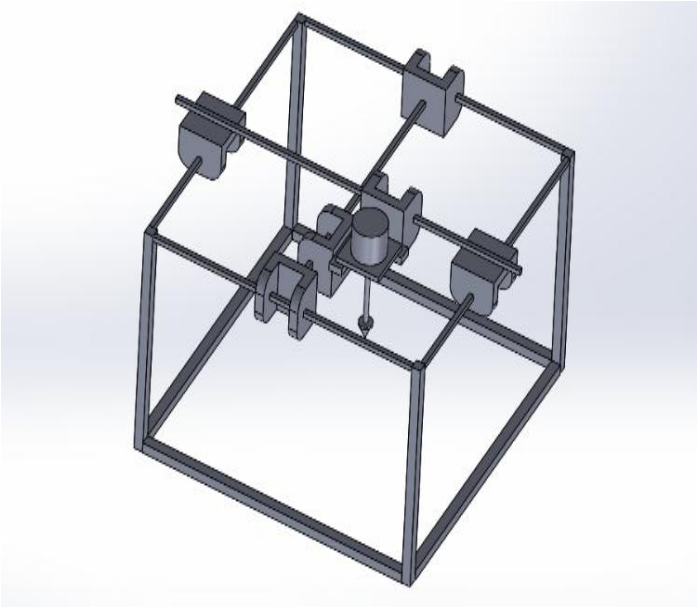

Fig.2: Automatic Punching and Cutting Machine

6. CONCLUSION

Thus we studied method of controlling operation of punching machines. Very less amount of electric power is required to punch by using Jigsaw. Efficiency of the system is higher than conventional systems. By using microcontroller good control of the system is achieved. Manufacturing lead time of the system can be reduced by developing automatic feeding the punch tool mechanism. Worker safety can be increased by reducing human effort in the process by using IR Sensor.

7. FUTURE SCOPE

1) By increasing the power of the Jigsaw motor; the amount of force applied by the tool can be increased.
2) Automatic sheet feeding can be provided.

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BIOGRAPHIES

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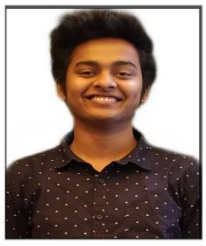

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