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DESIGN AND AUTOMATION OF BAR CUTTING MACHINE

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ABSTRACT

In today's industries, several types of machines are present that can cut single bar at a time. Though single bar cutting machine also differs to its size and shape. Today automation and increase in production rate is main step companies are undertaking for faster and cheaper production. Recently during project work we have seen a machine that can cut a bar (100mm diameter) with automatic feeding and cutting, but machine we have designed can cut three bars at a time and design of this is unique. This Project gives the information regarding the design of the machine and its working. For automatic bar cutting, Holding and feeding operation Hydraulic cylinders are used. Basic view of this Project is to in increase Production rate.

KEYWORDS: Three bar holding mechanism, Automatic feed and cut.

INTRODUCTION

In modern life everyone wants to be quick and fast at every work with less effort. Companies are demanding various different types of machines that can make their Production fast and cheaper. Companies demand machines that are automated where human efforts should be less in order to make the work process cheaper. This Project gives the detail design of the holding and feeding raw material automatically. The design can hold three bars (25mm diameter) at a time while automatic feeding and holding is done by hydraulic cylinders.

BASIC IDEA

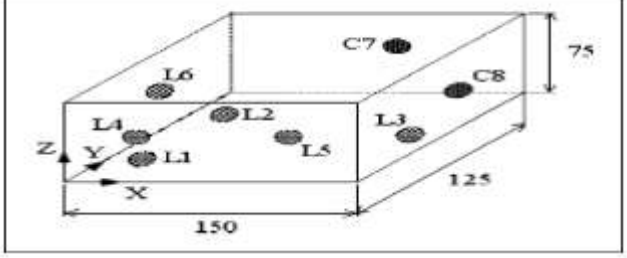
The basic idea is to change the manual operation of cutting and holding of raw material on bar cutting machine by automatic feeding and clamping mechanism.

WORKING PRINCIPLE

Machine will cut three bar at a time by automatic feeding and clamping of material using hydraulic system mechanism. We are using three double acting cylinders from which first two will just clamp and hold the bars while third cylinder will give the feeding motion for cutting operation.

Principle of location: During the design of fixture, most of the time is spend on the restriction of the degree of freedom. As free body has about 12 degree of freedoms and in order to make the fixture fixed at least 9 degree of freedom is restricted. There are 6 degree of transitional movement and 6 degree of rotational movement are present and 9 degree is restricted.

Figure 1: Scheme of 3-2-1 Fixture Setup (Guohua Qin, Weihong, Zhang Min Wan, 2006)



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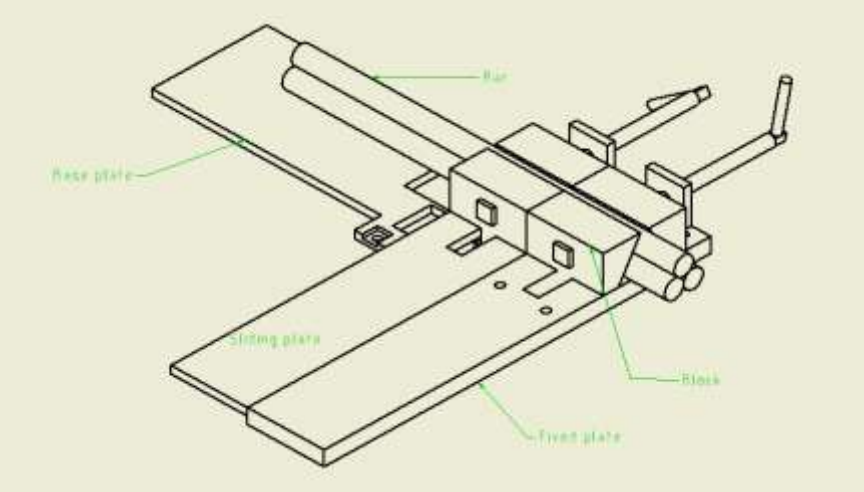

METHODOLOGY

There are various parts that are needed to be manufacture to make the project work. Basically there are three plates taken of which fixed plate just holds the blocks facing each other, sliding plates is used to slide on the base plate. Base plate has three milling slot from which middle slot is to guide the sliding in forward direction. Bars are hold in the clamp in such a way that two bars are at the bottom and third bar is above the two bars which makes clamping of the bars rigid and secure. There are certain types of parts and functions discussed below;

1] Base plate: It is a three slotted plate on which the whole assembly is mounted. Back flat portion is to mount the cylinder at the bottom so that bars could be carried without resistance; other two slots are made for restriction free movement of blocks (Clamping and Unclamping).

2] Sliding plate: It is the two horizontal slotted plate which carry out the movement of blocks. It has an extension on back drilled for the centre adjustment while cutting. One extra square block is welded at the bottom This is connected to the cylinder mounted on base plate to carry out feeding movement in assembly. Back space is to mount the cylinder for the motion of block.

3] Fixed plate: It is the plate fixed on the front of the base plate just for clamping the bars by blocks while cutting operation is being done. It has the same specifications like sliding plate but no extra block is welded at bottom as this plate is fixed and not going to move.

4] Block: These are the rectangular blocks. By milling process it is cut at 60 degree angle. This makes the bar hold in correct position. Small extension is given at the bottom for the guidance of blocks. An hydraulic cylinder is welded on the back of the blocks for forward and backward motion.

SYSTEM ANALYSIS MODEL

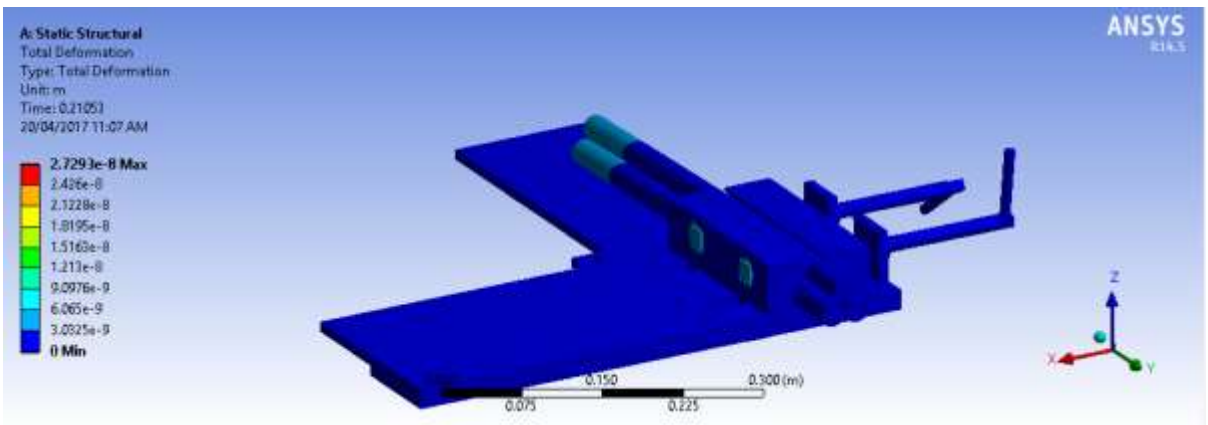

Fig. Bar Holding Mechanism

COMPONENTS AND EQUIPMENT

As automation is undertaken several things are always needed. Thing that would control the motion means cylinders and thing that control the motion of the motion means the circuit. Our Project needs several types of components to run it as specified viz;

1] Hydraulic Cylinders: Hydraulic cylinders get their power from pressurized hydraulic fluid, which is typically oil. The hydraulic cylinder consists of a cylinder barrel, in which a piston connected to a piston rod moves back and front. The barrel is closed on one end by the cylinder bottom and the other end by the cylinder head where the piston rod comes out of the cylinder. The piston has sliding rings and seals. The piston divides the inside of the cylinder into two chambers, the bottom chamber and the piston rod side chamber. We are using three cylinders; all the three cylinders are double acting and going to perform the motion of plate and blocks. A hydraulic trainer kit is required, about three D.C.V, Pump, 1 HP Motor, and Power Pack.

2] Electrical Circuit: The MEGA 2560 is designed for more complex projects. With 54 digital I/O pins, 16 analog inputs and a larger space for your sketch it is the recommended board for 3D printers and robotics projects. This gives your projects plenty of room and opportunities. This Performs all the tasks required for our project.

3] 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. For the motion to perform a work to certain extent limit switch plays important role. As work in series of flow is needed every sequence should be Perfect and existing after once.

SEQUENCE OF OPERATION

When the bars in triangular pattern are loaded in clamps, sliding plate holds the bars and feeds it in forward direction by cylinder. Limit switch is present to a certain length which is adjustable to which the motion of feeding stops. Then clamping on fixed plates clamps the bars for cutting operation. When the operation is done, sliding plate release the clamps and slides back for feeding the next set of bars. Though our Project is related just of automatic feeding, cutting will be done manually.

CONCLUSION

Machine cuts three bars at time which increases there production and there is no requirement of a worker, Once machines starts it works automatically. Machine has various applications in Production industries and companies. Our Project gives the information regarding the design and automation.

ACKNOWLEDGEMENTS

It gives us nice pleasure in presenting this project report titled “Design and Automation of Three Bars cutting machine” and we have a tendency to want to precise our huge feeling to those who provided valuable information and support within the completion of this project. Their guidance and motivation has helped in creating this project a nice success. Thus, we specific deep sense of feeling and satisfaction.

FUTURE SCOPE

This project has scope in production industries and mechanical workshop where bar cutting operation is carried out, since company demands higher production at cheaper cost.Mechanism of three bar cutting will help the industries to cut multiple bars at a time and automation makes it easy. Humans efforts are less by undertaking atomization in machine because most of machines needs the men for holding the bar and another to cut the bar. This project will give the idea of design and atomization.

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