AUTOMATED BAR FEEDING AND CUTTING MACHINE

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ABSTRACT

To reduce human effort for repetitive work of cutter pieces of pipes as well as providing a convenient fixture to support and hold the pipes/rods during cutting. The subject is undertaken as a part of B.E mechanical project. It can be termed as smart machine. There are many industrial applications where round bar or square bars are required to be operated on different machines to make machine components such as Shafts, Bolts, Screws, etc. This needs more and more number of pieces to be cut for mass production of those components. The bar feeding mechanism is a metal cutting machine tool designed to feed the metal. The machine is exclusively intended for the mass production and they represent faster and more efficient way to feed the metal. The clamping arrangement can be varied according to need of operations suitable. The overall system is compact in size, light weight, modular and flexible to be used in small works jobs who need batch production. The setup overall configuration can be adopted by a semi-skilled worker easily and can vary the operations by making certain small changes. The system even has the potential to add up a PLC system to control its overall working with ease and with less effort provided. This system has the potential to adopt higher level of automation if desired in future.

Keywords- Single cylinder **,** Metal Feed Mechanism , Bar Feed Mechanism

INRTODUCTION

The Bar Feeding mechanism is a metal cutting machine tool designed to feed the metal. The machine is exclusively intended for mass production and they represent fasten and more efficient way to feed a metal or wood. Automatic Bar feeding mechanism consists of three major blocks. They are Bar Feed Mechanism , Cutting Mechanism ,sensor Unit .There are numerous types of cutting machines in Engineering field, which are used to fulfill the requirements. IR sensor unit is used to determine the bar dimension to be Cut.

Pneumatic is a word ‘pneuma’ comes from Greek and means breather wind. The word pneumatics is the study of air movement and its phenomena is derived from the word pneuma. Today pneumatics is mainly understood to means the application of air as a working medium in industry especially the driving and controlling of machines and equipment.

Pneumatics has for some considerable time between used for carrying out the simplest mechanical tasks in more recent times has played a more important role in the development of pneumatic technology for automation.

Pneumatic systems operate on a supply of compressed air which must be made available in sufficient quantity and at a pressure to suit the capacity of the system. When the pneumatic system is being adopted for the first time, however it wills indeed the necessary to deal with the question of compressed air supply.

The key part of any facility for supply of compressed air is by means using reciprocating compressor. A compressor is a machine that takes in air, gas at a certain pressure and delivered the air at a high pressure. Compressor capacity is the actual quantity of air compressed and delivered and the volume expressed is that of the air at intake conditions namely at atmosphere pressure and normal ambient temperature, pressure and volume of a particular quantity of gas. This paper is structured as follows. Section II gives the concept of the problem formulation. Section III provides design concept of Leader as MDS optimization techniques. Section IV introduces the design concept of Follower controller as nonlinear model of AUV. Section V provides concept of communication issue. Section V verifies its performance through MATLAB simulation at different iteration. Section VI concludes the paper.

WORKING PRINCIPLE

A. Method of Working

This is a very interesting fully automatic cutting mechanism for production unit. The following work could be done by the system automatically. First you have to set the length to be cut by the help of sensor unit (maximum 12 inch in project). Put the bar to be cut on the feeding mechanism (circular shape for better result).Switch on the system & leave it. It will perform following job automatically, The feeding mechanism automatically pushes the bar to be cut into the cutting mechanism. When the bar reaches at the sensor point the motor stop & the cutting mechanism come to cut the bar(coolant feed manually if needed in case of metal) After cutting mechanism returns to normal position. Manually you have to remove the cutting piece. After which the process continue again.

Production of compressed air

Pneumatic systems operate on a supply of compressed air, which must be made available. In sufficient quantity and at a pressure to suit the capacity of the system. When pneumatic system is being adopted for the first time, however it wills indeed the necessary to deal with the question of compressed air supply. The key part of any facility for supply of compressed air is by means using reciprocating compressor. A compressor is a machine that takes in air, gas at a certain pressure and delivered the air at a high pressure. Compressor capacity is the actual quantity of air compressed and delivered and the volume expressed is that of the air at intake conditions namely at atmosphere pressure and normal ambient temperature. Compressor may be classified in two general types. Positive displacement compressor and Turbo compressor. Positive displacement compressors are most frequently employed for compressed air plant and have proved highly successful and supply air for pneumatic control application. Turbo compressors are employed where large capacity of air required at low discharge pressures. They cannot attain pressure necessary for pneumatic control application unless built in multistage designs and are seldom encountered in pneumatic service.

RECIPROCATING COMPRESSORS

Built for either stationary (or) portable service the reciprocating compressor is by far the most common type. Reciprocating compressors lap be had is sizes from the smallest capacities to deliver more than 500 m^3/min. In single stage compressor, the air pressure may be of 6 bar machines discharge of pressure is up to 15 bars. Discharge pressure in the range of 250 bars can be obtained with high pressure reciprocating compressors that of three & four stages.

Single stage and 1200 stage models are particularly suitable for pneumatic applications , with preference going to the two stage design as soon as the discharge pressure exceeds 6 bar , because it in capable of matching the performance of single stage machine at lower costs per driving powers in the range . Components used in Automatic Bar feeding mechanism consists of three major blocks. They are Metal Feed Mechanism , Cutting Mechanism and IR sensor Unit.

Metal Feed Mechanism

DC MOTOR -An electric motor is a machine which converts electrical energy to mechanical energy. Its action is based on the principle that when a current-carrying conductor is placed in a magnetic field, it experiences a magnetic force whose direction is given by Fleming's left-hand rule. DC motors are also like generators classified into shunt wound or series wound or compound wound motor.

Electromagnets and Motors:

To understand how an electric motor works, the key is to understand how the electromagnet works. An electromagnet is the basis of an electric motor. You can understand how things work in the motor by imagining the following scenario. Say that you created a simple electromagnet by wrapping 100 loops of wire around a nail and connecting it to a battery. The nail would become a magnet and have a North and South pole while the battery is connected.

Now say that you take your nail electromagnet, run an axle through the middle of it, and you suspended it in the middle of a horseshoe magnet as shown in the figure below. If you were to attach a battery to the electromagnet so that the North end of the nail appeared as shown, the basic law of magnetism tells you what would happen: The

North end of the electromagnet would be repelled from the north end of the horseshoe magnet and attracted to the south end of the horseshoe magnet. .

The Armature:

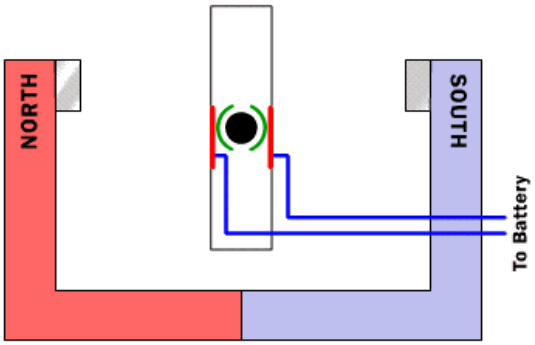
The armature takes the place of the nail in an electric motor. The armature is an electromagnet made by coiling thin wire around two or more poles of a metal core. The armature has an axle, and the commutator is attached to the axle. In the diagram above you can see three different views of the same armature: front, side and end-on. In the end-on view the winding is eliminated to make the commutator more obvious. You can see that the commutator is simply a pair of plates attached to the axle. These plates provide the two connections for the coil of the electromagnet.

The Commutator and brushes:

The "flipping the electric field" part of an electric motor is accomplished by two parts: the commutator and the brushes. The diagram at the right shows how the commutator and brushes work together to let current flow to the electromagnet, and also to flip the direction that the electrons are flowing at just the right moment. The contacts of the commutator are attached to the axle of the electromagnet, so they spin with the magnet. The brushes are just two pieces of springy metal or carbon that make contact with the contacts of the commutator.

Putting It All Together:

When you put all of these parts together, what you have is a complete electric motor:



In this figure, the armature winding has been left out so that it is easier to see the commutator in action. The key thing to notice is that as the armature passes through the horizontal position, the poles of the electromagnet flip. Because of the flip, the North pole of the electromagnet is always above the axle so it can repel the field magnet's North pole and attract the field magnet's South pole.

ROLLER -

It is in the form of stepped pulley. It has got a v-grow on its center of the roller in order to hold the shaft. In our project two rollers is used to move the rod from one place to another place with the help of D.C motor.

BATTERY -

In isolated systems away from the grid, batteries are used for storage of excess solar energy converted into electrical energy. The only exceptions are isolated sunshine load such as irrigation pumps or drinking water supplies for storage. In fact for small units with output less than one kilowatt. Batteries seem to be the only technically and economically available storage means. Since both the photo-voltaic system and batteries are high in capital costs. It is necessary that the overall system be optimized with respect to available energy and local demand pattern. We use lead acid battery for storing the electrical energy from the solar panel for lighting the street and so about the lead acid cells.

Specific Gravity –

Measuring the specific gravity of the electrolyte generally checks the state of discharge for a lead-acid cell. Specific gravity is a ratio comparing the weight of a substance with the weight of a substance with the weight of water. For instance, concentrated sulfuric acid is 1.835 times as heavy as water for the same volume. Therefore, its specific gravity equals 1.835. The specific gravity of water is 1, since it is the reference.

In a fully charged automotive cell, mixture of sulfuric acid and water results in a specific gravity of 1.280 at room temperatures of 70 to 80ºF. as the cell discharges, more water is formed, lowering the specific gravity. When it is down to about 1.150, the cell is completely discharged.

Cutting Machine In the context of machining, a cutting tool or cutter is any tool that is used to remove material from the workpiece by means of shear deformation. Cutting may be accomplished by single-point or multipoint tools. Cutting tools must be made of a material harder than the material which is to be cut, and the tool must be able to withstand the heat generated in the metal-cutting process. Also, the tool must have a specific geometry, with clearance angles designed so that the cutting edge can contact the work piece without the rest of the tool dragging on the work piece surface. The angle of the cutting face is also important, as is the flute width, number of flutes or teeth, and margin size. In order to have a long working life, all of the above must be optimized, plus the speeds and feeds at which the tool is run. Here we use circular saw machine for our project. A circular saw is a power-saw using a toothed or abrasive disc or blade to cut different materials using a rotary motion spinning around an arbor. Circular saws may also be loosely used for the blade itself. Circular saw blades are specially designed for each particular material they are intended to cut and in cutting wood are specifically designed for making rip-cuts, cross-cuts, or a combination of both. Circular saws are commonly powered by electricity, but may be powered by a gasoline engine or a hydraulic motor which allows it to be fastened to heavy equipment, eliminating the need for a separate energy source.

Specific-gravity readings are taken with a battery hydrometer, such as one in figure (7). Note that the calibrated float with the specific gravity marks will rest higher in an electrolyte of higher specific gravity.

Characteristics:

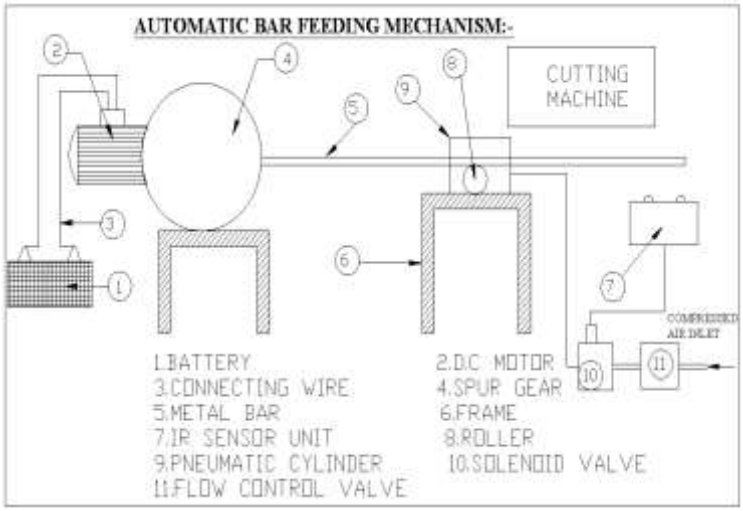
- Cutting is by teeth on the edge of a metal blade or by an abrasive wheel
- The cut has narrow kerf and relatively smooth surface finish
- Cuts are straight and relatively accurate
- The saw usually leaves burrs on the cut edge of metal and plastic (which should then be addressed with sand paper)
- Saw setting should be done geometrically

Design and Fabrication of Automated Hacksaw Machine

The objective of this work is to automate the conventional power hacksaw machine in order to achieve high productivity of work-pieces than the power hacksaw machine using Microcontroller. The automated machine acquires two inputs from the user namely the number of pieces to be cut and the length of each piece that is required to be cut. The inputs are given by the user with the help of a keypad and an LCD display, which will help the user to verify the data given by him. The operator need not measure the length of the work-piece that is to be cut and to load and unload the work-piece from the chuck each time after a piece has been cut. After acquiring the two inputs from the user, the machine automatically feeds the given length of work-piece in to a chuck and starts to cut till the given number of work-pieces has been cut. The machine feeds the work-piece with the help of a conveyor, which is driven by a DC motor and an IR sensor ensures that the feeding stops when the specified length has been reached. A pneumatic cylinder is used for holding the work-piece when cutting operation is done. An AC motor is used to bring about the reciprocating motion required for cutting the work-pieces. There is a self-weight attached with the reciprocating mechanism to provide the necessary downward force required for penetration of hacksaw blade in to the work-piece. When a single piece has been cut, a limit switch will get triggered by the self-weight mechanism, which is sensed by the microcontroller to start the cyclic operation again provided if the specified number of work-pieces has not been cut.

Proposed Methodology The demerit of power hacksaw machine is the automatic feeding of work-piece is eliminated by feeding of work-piece with the help of a conveyor, which directs the work-piece in to the chuck. The conveyor motor is stopped when it has fed the specified length in to the chuck with the help of a microcontroller and IR sensor. After this, a pneumatic cylinder is extended to hold the work-piece firmly to arrest the movement of workpieces when being cut. This is achieved by a solenoid operated DCV, controlled by a

microcontroller. Then the self-weight attached to the blade, which would be previously in a lifted position by means of another pneumatic cylinder will be lowered so that the hacksaw blade will contact the work-piece at the point where the cutting is to be done.



A. Without shaft condition

The IR transmitter sensor is transmitting the infrared rays with the help of 555 IC timer circuit. These infrared raysare received by the IR receiver sensor. The Transistor T1, T2 and T3 are used as an amplifier section. At normal condition Transistor T5 is ON condition. At that time relay is OFF. The motor is in ON condition so that the rod is moved and solenoid valve is OFF condition so that vice is open.

B. At shaft condition

At shaft conditions the IR transmitter and IR receiver, the resistance across the Transmitter and receiver is high due to the non-conductivity of the IR waves. So the output of transistor T5 goes from OFF condition to ON stage. In that time the relay is ON. The motor is in OFF condition and solenoid valve is ON condition so that the vice is closed.

C. Need for automation

Nowadays almost all the manufacturing process is being atomized in order to deliver the products at a faster rate. The manufacturing operation is being atomized for the following reasons. To achieve mass production , reduce man power , increase the efficiency of the plant , reduce the work load, reduce the production cost , reduce the production time , reduce the material handling , reduce the fatigue of workers, achieve good product quality , Less Maintenance.

D. Advantages and Limitation

It is Simple in construction than mechanical hacksaw, compact one , Less Maintenance , Fast production .And its limitation is It is Additional cost is required to do the automation. And Leakage of air affects the working of the unit. Its application is for Small and Medium scale industries Application , Metal Cutting Industries and Work Shops.

CONCLUSION:

In the Automatic bar feeding and cutting machine is working successful. Since the mechanism is so simple and versatile it can be handled by any operator, constriction of the unit is very simple. Handling the machine is easy and smooth operation is achieved.

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