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DESIGN AND FABRICATION OF AUTOMATICALLY OPERATED DOUBLE HACKSAW

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Abstract – There are many electrically operated powers hack saw machine of different configuration and different manufactures are available for the use in machine shop. These machines can cut rods of different material precisely at very fast rate but they can cut rods of one material at a time which means they can't able to cut dissimilar material at a same time. Now in industry, it is necessary to cut metal bars with very high rate to achieve mass production requirement. So, there is need to move for a new technology which gives us a mass production with less time and less energy input. It is impossible to depend upon conventional hack saw machine. By using this two-way hack saw machine, the two metal bar, pipes or rods can be cut the simultaneously to achieve high-speed cutting rate and mass production for maximum benefits in manufacturing industries.

This machine overcomes the drawbacks and limitation of single frame hack saw machine. It can be used in a small workshops and industries as it is available in very low price and its smaller size and high efficiency.

This paper focus on presents the manufacture and idea of two-way hacksaw removing machine predominantly conveyed for creation-based ventures. Businesses are fundamentally implied for creation of valuable merchandise and ventures at low generation cost, Machinery cost and low stock cost. Today in this world each errand has been made snappier and quick because of innovation progression yet this headway likewise requests colossal speculation and consumption, each industry wants to make high efficiency rate keeping up the quality and standard of the item at low normal cost. We have developed a prototype model, which is efficient and do multiple cutting operations. These machines can be utilized as a part of remote spots where power is customary. It is composed as a convenient one which can be utilized for cutting in different spots. It can be utilized for working on materials like thin metals, wood.

Keywords: Double Hack saw, Slider Crank Mechanism, Arduino UNO.

1 INTRODUCTION

A hacksaw is a handheld device used to slice through materials like plastic tubing and metal funnels. Its cutting system is given by removable edges which include sharp teeth along their external edge. As a rule, a hacksaw comprises of a metal casing that takes after a descending confronting. A handle of plastic, wood, or metal is regularly joined to one end of the casing. The edge's closures highlight

customizable pegs that can be fixed to anchor a sharp edge set up, and extricated to expel it. Hacksaw sharp edges are long, thin portions of solidified steel that element a line of teeth along their front line. Each finish of the edge is punched with a little gap that fits onto the saw edge's pegs. Most sharp edges extend long from ten to 12inches (25.4 to 30.48 cm), albeit six-inch (15.24 cm) edges can be acquired to fit littler hacksaw models. A gadget that applies compel, alters the course of a power, or changes the quality of a power, with a specific end goal to play out an errand, by and large including work done on a heap. Machines are regularly intended to yield a high mechanical preferred standpoint to decrease the exertion expected to do that work. A straight forward machine a wheel, a lever or a slanted plane. Every single other machine can be constructed utilizing mixes of these straightforward machines. Illustration: A penetrates utilizes a blend of riggings (wheels) to drive helical slanted planes (the bore) to part a material and cut an opening in it.

1.1Types of Sawing

1.1.1Power Hacksawing –

The basic forward and backward movement of the cutting edge made the hacksaw one of the principal kinds of sawing machines intended for control. The straightforwardness in the sharp edge movement has kept the cost of the saw machine generally less expensive than different kinds of sawing machines. The low introductory cost combined with the adaptability and versatility, has empowered the hacksaw to stay well known in industry. In hacksawing, a solitary sharp edge is tensioned in the bow, and responded forward and backward finished the work piece. The cutting activity is accomplished just amid half of the cycle of task. Amid the second 50% of the cycle, the arrival stroke, the sharp edge is lifted clear of the work piece, giving a spasmodic cutting activity, which is thought to be one of the disadvantages of the task. In spite of this inconvenience, when contrasted with the consistent cutting activity of the band saw, hacksaws remain similarly or much more famous elective machines. Likewise with numerous other fundamental procedures, hacksawing is an attempted and tried strategy, solid, reliably precise, fast and simple to repair, is less subject to remedy cutting edge strain and more averse to run-out. Besides control hacksaws can be left unattended for significant lots when cutting substantial distance across bar and require least administrator aptitude. Edge substitution is moderately shabby and straightforward.

1.1.2 BAND SAWING–

Band sawing, unlike hacksawing, is a continuous cutting operation. An endless blade, the band, is tensioned between two shrouded, rotating wheels, and part of the band is exposed to carry out the cutting operation of the work piece. The band travels in a continuous motion, with the teeth fed against the work piece. Whilst earlier metal sawing bands were wide (over 25 mm), and were used strictly for cut off methods, narrow blades, introduced about 50 years ago brought contouring capabilities. Furthermore, due to the small throat clearance of the early band saws, they were limited in use by the basic design, thus the length of the work piece could only be as long as the machine throat. However modern machines have been modified to give adequate throat clearance, by intentionally twisting the blade so that the toothed faces in line with the machine throat. As with hacksaw machines, band saws can be divided into two broad categories. A general-purpose band saw having gravity fed system, controlled by a dash-pot and using a25 mm (1 inch) deep blade, is the most popular machine available. This machine is suitable for general fabrication work and accurate cutting of solid bars. This type of machine is limited to about 175 mm (7 inches) diameter for mild steel. In order to meet the present-day requirements for high-volume production, cutting all grades of steel and to introduce high accuracy and reliability, it has been necessary for the band saw machine manufacturers to incorporate in the design not only heavy-duty construction having capacities up to 450 mm (18 inches) diameters but also innovations in the hydraulic power down feed, to allow the cutting of difficult alloys., such as mnemonics and titanium.

1.1.3 CIRCULAR SAWING –

Roundabout saws have a constant cutting activity; utilize sharp edges having numerous teeth, and an extensive scope of rotational velocities. This activity is like a processing task. The machines accessible range from the prior, economical, hand-stacked models to the specific vast, control stacked write and join material taking care of gadgets for semi and after that completely programmed task. Present day generation roundabout saws are worked with a few substitutes essential feed components i.e. level, vertical, shaking head and varieties of these. The decision of the most appropriate kind of machine relies upon the specific application and the size and state of segment. With vertical feed, the

pivoting edge ventures downwards in a straight line to draw in the work piece. On machines intended for even feed the cutting edge is sustained into the work piece from the back. A third fundamental encouraging plan is a turn movement or shaking head framework, this is as proficient as a vertical feed framework and is a tough course of action. The seat or floor mounted manual- feed round observed, when introduced together with a general obligation band saw or hacksawing a little workshop, gives an entire slicing office to the little fabricator. Completely programmed round saws, having highlights, for example, dial-in segment length, in process checking, decision of stacking magazines, and so on are broadly utilized where top-notch creation is required and frequently give the generation build a troublesome decision to make between roundabout sawing and band sawing.

1.2 Manufacturing Process

1.2.1 Mild Steel:

Mild steel is a kind of carbon steel with a low measure of carbon – it is entirely known as "low carbon steel." Although ranges differ contingent upon the source, the measure of carbon ordinarily found in mellow steel is 0.05% to 0.25% by weight, while higher carbon steels are normally depicted as having a carbon content from 0.30% to 2.0%. In the event that any more carbon than that is included, the steel would be delegated solid metal. Mellow steel isn't composite steel and, in this manner, does not contain a lot of different components other than press; you won't discover huge measures of chromium, molybdenum, or other alloying components in mild steel. Since its carbon and alloying component content are generally low, there are a few properties it has that separate it from higher carbon and composite steels. Less carbon implies that mild steel is regularly more bendable, machinable, and weldable than high carbon and different steels, in any case, it likewise implies it is almost difficult to solidify and fortify through warming and extinguishing. The low carbon content likewise implies it has next to no carbon and other alloying components to square disengagements in its gem structure, by and large bringing about less elasticity than high carbon and compound steels. mild steel additionally has a high sum iron and ferrite, making it attractive.

1.2.2 Manufacturing:

Mild steel is made like how other carbon steels are made. A typical way this is done includes a blend of iron metal and coal. Once the coal and iron mineral are separated from the earth, they are softened together in an impact heater. Once dissolved, the blend is moved to another heater to consume off any polluting influences that they may have, and also to make some other changes in accordance with the mild steel's synthetic organization. Following that, the steel is permitted to cement into a rectangular shape. This piece of mellow steel is then more often than not conveyed down to the coveted size utilizing forms called hot rolling or cool illustration, despite the fact that there are different techniques that can likewise be utilized.

2. LITERATURE REVIEW

David Gordon Wilson studied the vast literature to understand the concepts which effect the performance of the machine The concept of two-way hacksaw cutting machine mainly carried out for production-based industries.

Zoeb khan expressed that Industries are essentially implied for generation of valuable merchandise and enterprises at low creation cost, Machinery cost and low stock cost. Information about built up a model of a machine reach would be fit for performing diverse task all the while, and it ought to be monetarily productive. These machines can be utilized as a part of remote spots where power is customary. It is planned as a versatile one which can be utilized for cutting in different spots. It can be utilized for working on materials like thin metals, wood. A solitary stage vertical electric engine unbendingly set at the focal point of metallic establishment gave.

Linxu et al. research about the shaft of motor rotates at 90- 100 rpm with the power 2HP. The circular disc is mounted on the shaft of motor with the help of key and key slot arrangement. It consists of pedal powered machine setup which has a simple mechanism operate with chain and sprocket arrangement.

Chaudhary Pravin kumar k learned about the chain is put on the teeth of the haggle. The pole is mounted on platform direction. To begin with mechanical linkage is evacuated by expelling nut and screws and v belt drive boring connection. It is realized that regular power hacksaw machine can be supplanted with robotized control Hacksaw machine.

S. G. Bahaley et al. expressed that automated power hacksaw machine gives high efficiency in brief day and age in examination with the ordinary power hacksaw machines. The real preferred standpoint of this machine is intercession of work is lessened to greatest level. In this fast-developing modern segment the utilization of intensity Hacksaw machine is wide, time and work assume a noteworthy part underway process. The Material choice and testing of hacksaw sharp edge in light of mechanical properties expressed that the suitable saw edge must be chosen for better activity and fine cutting by choosing number of teeth per inch.

Leonel et al. stated that the designers of machines or structures must achieve acceptable levels of performance and at the same time, assure the part is safe and durable. Therefore, it is necessary to avoid excess deformation, such as bending, twisting, or stretching, of the machine's components. In addition, cracking in components must be avoided entirely to prevent the crack from progressing to the point of complete fracture to avoid structural failure, the stress in a component must not exceed the strength of the material, where the strength is simply the stress that causes a deformation or fracture failure. Failures in mechanical structures occur due to various reasons.

Boyer et al. showed that failures could occur due to mechanisms and environmental factors. He also suggested that failure analysis of a metal structure requires identifying the type of failure mode. The failure mode is classified as either a deformation or fracture.

Layer et al. concluded that the process of identifying a failure mode is complicated because different techniques can be used to determine the actual cause of failure.

Linder et al. studied and they are worried about the numerical displaying of split expanding in weak materials utilizing limited components with installed solid discontinuities, that is, discontinuities in the relocation field characterizing the arrangement of the basic limit esteem issue. Specifically, new limited components are produced in this structure pleasing the distinctive branches of the bifurcating intermittence in the component inside. The key part of these advancements is the right portrayal of the kinematics of these designs. This is expert through the distinguishing proof of the correct partition modes portraying these arrangements and their fuse in the discrete strain field of the limited component. The subsequent improved modes are enacted in view of a spreading model contingent upon the speed of the break tip. The execution of the new components is represented with a few numerical reproductions including different methodologies for the treatment of expanding and examinations.

Travas et al. investigated the influence of loading rate on the failure mode of the beam parametric. The numerical results are evaluated, discussed and compared with test results known from the literature. It is shown that the beam resistance and failure mode strongly depend on loading rate. For lower loading rates beam fails in bending (mode-I fracture). However, with increasing loading rate there is a transition of the failure mechanism from bending to shear. Results are in good agreement with theoretical and experimental results known from the literature.

3. METHODOLOGY

In this paper mainly focused the power supply is provided to the motor and the power is transmitted to rotorplate by attaching to shaft of the motor. Two connecting rods are attached to the rotor plate, then these two connecting rods are attached to the hack saw frames then the entire system works as slider-crank mechanism, coverts the rotatory motion coverts into reciprocating motion.

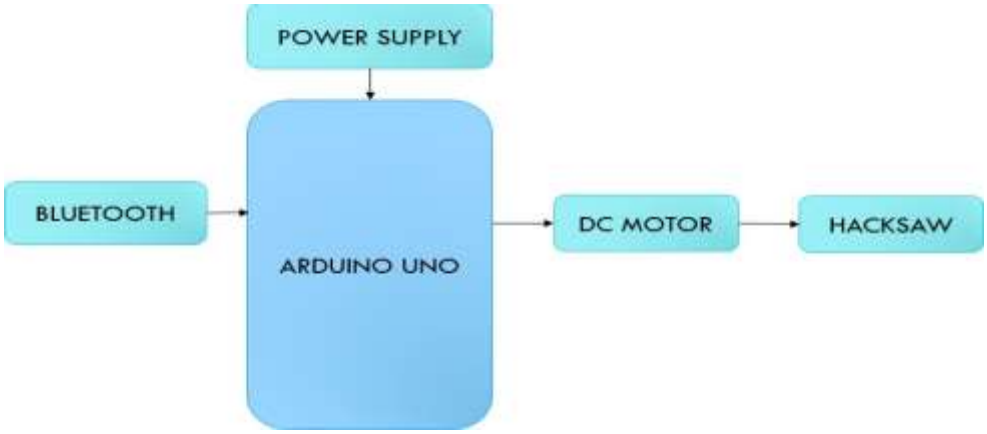

Fig 3.1 Block Diagram

3.1 Hardware Requirements:

- DC Motor
- Nuts
- Bolts
- Iron Frame
- Arduino Uno
- Bluetooth
- Battery
- Middle Arm
- Rotating Shaft

3.2 ComponentDescription

3.2.1 MiddleArm-Itisusedtobalancethemotoranditisattachedtoshaft.Its dimension is (23x9x6.5) inch.

Fig 3.2 MiddleArm

3.2.2. Bolt- It is used for the fixing of bench vice for proper alignment of shaft and flywheel.

Fig 3.3Bolt

3.2.3. Nut- It is used in bench vice, connecting rod and shaft for tightening bolts.

Fig3.4 Nut

3.2.4.Base-Itisstandonwhichallpartsaremountedlikedcmotor, shaft size (66 x 45.5 x 25) cm

Fig 3.5-Base

3.2.5.RotatingShaft-Itisusedhereformovingofbotharmscarrying hacksaws.

Fig3.6–Rotating Shaft

3.2.6 Shaft

A shaft is a pivoting machine component which is utilized to transmit control starting with one place then onto the next. The power is conveyed to the shaft by some unrelated power and the resultant torque (or turning minute) set up inside the shaft allows the ability to be exchanged to different machines connected up to the shaft. Keeping in mind the end goal to exchange the power starting with one shaft then onto the next, the different individuals, for example, pulleys, gears and so forth., are mounted on it. These individuals alongside the powers applied upon them makes the shaft bowing. As it were, we may state that a shaft is utilized for the transmission of torque and bowing minute. The different individuals are mounted on the shaft by methods for keys or splines.

3.2.7. Hacksaw

A hacksaw is a fine-tooth saw with an edge under pressure in a casing, utilized for cutting materials, for example, metal. Hand-held hacksaws comprise of a metal edge with a handle, and sticks for joining a thin dispensable cutting edge. A screw or other system is utilized to put the thin cutting edge under pressure. A power hacksaw (or electric hacksaw) is a sort of hacksaw that is controlled by electric engine. Most power hacksaws are stationary machines yet some helpful

models do exist. Stationary models commonly have a framework to lift up the saw sharp edge on the entry stroke and some have a coolant pump to keep the saw bleeding edge from overheating.

Fig 3.7– Cutter Blade

3.2.8. DC Motor

A DC motor is an electric motor driven by an immediate current (DC). The DC motor usually comprises of two essential parts, an outside stationary stator having loops provided with substituting current to deliver a pivoting attractive field, and an inside rotor connected to the yield shaft creating a second turning attractive field. The rotor attractive field might be created by lasting magnets, hesitance saliency, or DC or AC electrical windings. The responding movement of the Hacksaw sharp edge, as a result of which the cutting procedure happens, is delivered with the assistance of a DC motor, which works by a basic wrench component to change over rotating movement of wrench into responding movement Hacksaw edge. The DC motor is turned on after the work- piece has been immovably fit in the pneumatic toss. The Torque of motor is expanded by transmission of capacity to a pulley by belt transmission.

Fig 3.8 DC Motor speed- 50 rpm

4 HARDWAREDESCRIPTION

4.1 ArduinoUNOBoard

Arduino is a single-board microcontroller meant to make the application more accessible, whichareinteractiveobjectsanditssurroundings.Thehardwarefeatureswithan open-source hardwareboarddesignedaroundan8-bitAtmelAVRmicrocontrollerora32-bitAtmelARM. CurrentmodelsconsistsaUSBinterface,6analoginputpinsand14digitalI/Opinsthatallows the user to attach various extension boards.

The Arduino Uno board is amicrocontroller basedon the ATmega328. It has 14 digital input/output pins in which 6 can be used as PWM outputs, a 16 MHz ceramic resonator, an ICSPheader,aUSBconnection,6analoginputs,apowerjackandaresetbutton.Thiscontains all the required support needed for microcontrollers. In order to get started, they are simply connected to a computer with a USB cable or

with anAC-to-DC adapter or battery.Arduino Uno Board varies from all other boards, and they will not use the FTDI USB-to-serial driver chip in them. It is featured byAtmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

Fig 4.1 Arduino UNO board

4.2 Relay

Fig 4.2 Relay

The relay is the device that open or closes the contacts to cause the operation of the other electric control.
It detects the undesirable condition with an assigned area and gives the commands to the circuit breaker
to disconnect the affected area through ON or OFF.
Every electromechanical relay consists of
Electromagnet
Mechanically movable contact
Switching points and
Spring

4.3 Bluetooth Module Hc-05

- It is used for many applications like wireless headset, game controllers, wireless mouse, wireless keyboard and many more consumer applications.
- It has range up to <100m which depends upon transmitter and receiver, atmosphere, geographic & urban conditions.
- It is IEEE 802.15.1 standardized protocol, through which one can build wireless Personal Area Network (PAN). It uses frequency-hopping spread spectrum (FHSS) radio technology to send data over air.
- It uses serial communication to communicate with devices. It communicates with microcontroller using serial port (USART).
- HC-05 is a Bluetooth module which is designed for wireless communication. This module can be used in a master or slave configuration.

Fig 4.3 Bluetooth Module

5 SOFTWARE DESCRIPTION

5.1 Arduino Software (Ide)

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuine hardware to upload programs and communicate with them.

5.2 Writing Sketches

Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved with the file extension. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor.

NB: Versions of the Arduino Software (IDE) prior to 1.0 saved sketches with the extension. It is possible to open these files with version 1.0, you will be prompted to save the sketch with the extension on save.

5.3Steps:

1. Download and install Arduino IDE (https://www.arduino.cc/en/Main/Software)
2. Plug in your Arduino Board
3. Select the proper board in the IDE (Tools>Boards>Arduino Uno)
4. Select the proper COM port (Tools>Port>COMx (Arduino Uno))
5. Open the “Blink” sketch (File>Examples>Basics>01.Blink)
6. Press the Upload button to upload the program to the board
7. Confirm that your board is working as expected by observing LED Troubleshooting Uploading Errors:

Arduino has lots of community support and documentation. Your best bet when running into unexpected problems is to search online for help. You should be able to find a forum where someone had the same problem you are having, and someone helped them fix it. If you don’t find results, try modifying your search, or post on the Arduino forums.

- My board isn’t listed under devices and is not recognized by IDE:

  - Most likely, this means that the ATMega328p chip is not programmed with the Arduino firmware. If you have a separate working Uno available, you can program the unprogrammed chip using this guide and a few jumper cables: https://www.arduino.cc/en/Tutorial/ArduinoISP
  - If you don’t have a separate Arduino available, let me know and I can use an Atmel Programmer to upload the firmware.
  - There may be hardware damage if you had the board plugged into USB and external power at the same time. You may have to replace the chip if this is the case.

- Error Message: avrdude: stk500_recv (): programmer is not responding

  - Double-check that you are using the correct COM port.
  - Make sure that your Arduino Board is plugged into the computer.The IDE says “Uploading…” after pressing the upload button, but nothing is happening.
  - Double-check that you have the correct board selected in the Tools menu.
  - Depending on the size of your program, it may take a few seconds to upload. If you feel like it is taking too long, it may be encountering an error and you can try unplugging and plugging in the Arduino board.

6. RESULTS AND DISCUSSION

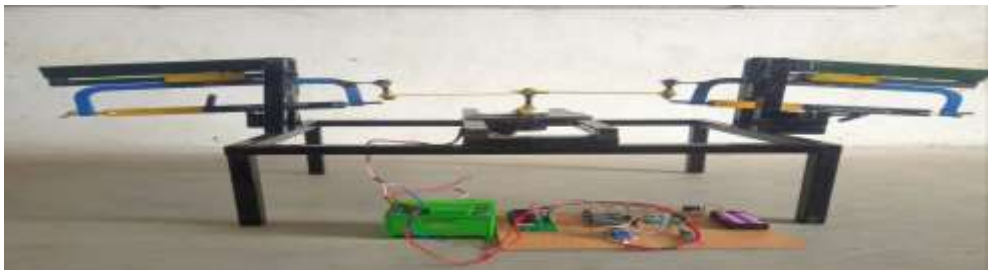

Fig 6.1 Fabricated Model

Motor speed	50rpm
Depth of cut	3mm/cut
Bladespecifications	12x1x0.5 cm

6.1 MACHINE CUTTING TIMINGS FOR DIFFERENT MATERIALS

S. NO	MATERIAL	SPECIFICATIONS	TIME
1	WOOD	1 INCH BAR	60 SEC
2	PLASTIC	1 INCH BAR	20 SEC
3	ALLUMINIUM	1 INCH BAR	40 SEC
4	MILD STEEL	1 INCH BAR	100 SEC

TABLE 6.2 CUTTING TIMINGS FOR DIFFERENT MATERIALS

7. CONCLUSION

Itisrealizedthatordinaryhacksawmachinecanbesupplantedwithprogrammedtwofold hacksaw machine. Programmedtwofoldhacksawmachinegiveshighefficiencyin brief era in examination with the regular hacksaw machines. The real favorable position of this machine is that intercession of work is diminished to greatest level. In this fast-developing moderntime,theutilizationoftwofoldHacksawmachineiswide.Timeandworkassumea noteworthy part underway process this can be overwhelmed by utilizing this sort of programmedmachines.Theprogrammedhacksawmachinecanbemadeutilizationofatany of the ventures like furniture enterprises. The scope of size of work-pieces that can be cut utilizing the programmed hacksaw machine can be shifted by changing the sharp edge estimate. Right now, the machine utilizes 12-inch edge for cutting.

- It is realized that customary hacksaw machine can be supplanted with Automated Double Hacksaw machine.
- ComputerizedDoubleHacksawmachinegiveshighprofitabilityinbriefdayandage in examination with the

regularhacksawmachinehacksawmachines.Therealpreferredstandpointofthismachine is mediation of work is diminished to greatest level.

- Inthisfast-developingmechanicalsegmenttheutilizationoftwofoldHacksawmachineis wide, time and work assume a noteworthy part underway process. This can be overwhelmed by utilizing this kind of computerized machines.

Therobotizedhacksawmachinecanbemadeutilizationofatanyoftheventureslikepump fabricatingbusinessesthat includemassmeasureofshaftsthatmustbecuteverynowand again.Thescopeofsizeofwork-piecesthatcanbecututilizingthecomputerizedhacksaw machine can be fluctuated by changing the cutting-edge measure.As of now, the machine utilizes 12-inch sharp edge for cutting. Another headway that can be executed in mechanized hacksaw machines is that the client can likewise get cut work-bits of various lengths in a single cycle itself. This implies the client needs to indicate the quantity of workpiecesthatmustbecutineveryoneofthedistinctivelengthesteemsdetermined.This will be conceivable with the assistance of a progressed microcontroller than AT89C51,which ought to have high programmable memory.

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