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Surface Finish Detector by Using Ultrasonic Sensor

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ABSTRACT

The main objective of our project, "SURFACE FINISH DETECTOR BY USING ULTRASONIC SENSOR" is used to detect the surface finish of an object. In most of the industries surface finish of an object is can be measured by using many techniques. In our project the ultrasonic sensor is used to determine the surface finish of an object. In this project we are using some major components like Micro controller, Voltage regulator, Transformer, Ultrasonic sensor. Ultrasound waves or ultrasonic waves are the terms used to describe elastic waves with frequency greater than 20,000 Hz and normally exist in solids, liquids, and gases. An ultrasonic wave moves at a velocity (the wave velocity) that is determined by the material properties and shape of the medium, and occasionally the frequency. If any deviations are detected the system will be indicate.

Key Words: surface finish, Ultrasound waves, wave velocity, voltage regulator.

1. INTRODUCTION

Now a days all the industries are mass production industries. Therefore they are using many measuring techniques for finding the surface finish of an objects. The recent report says 90% of companies are using laser techniques, interferometers, for finding the surface finish of an object. It is we known that frequency range of sound audible to humans is approximately 20 to 20,000 Hz (cycles per second). Ultrasound is simply sound that are above the frequency range of human hearing. When a disturbance occurs at a portion in an elastic medium, it propagates through the medium in a finite time as a mechanical sound wave by the vibrations of molecules, atoms or any particles present. Such mechanical waves are also called elastic waves. Ultrasound waves or ultrasonic waves are the terms used to describe elastic waves with frequency greater than 20,000 Hz and normally exist in solids, liquids, and gases.

where distortion caused depending on whether a force is applied normal or parallel to the surface at one end of the solid can result in producing compression or shear vibrations, respectively, so that two types of ultrasonic waves, i.e. longitudinal waves or transverse waves, propagate through the solid. The energy of the wave is also carried with it. In a continuous medium, the behaviour of ultrasonic waves is closely related to a balance between the forces of inertia and of elastic deformation. An ultrasonic wave moves at a velocity (the wave velocity) that is determined by the material properties and shape of the medium, and occasionally the frequency.

2. DESCRIPTION OF EQUIPMENTS

2.1 THIN FILM TRANSISTER (TFT)

Most of the display (CRT) technology is used in television set. ELT240320ATP is a transmissive type colour active matrix liquid crystal display (LCD) which uses amorphous thin film transistor (TFT) as switching devices. This product is composed of a TFT LCD panel, a drive IC, a FPC, and a WLED-backlight unit. The active display area is 2.8 inches diagonally measured and the native resolution is 240*RGB*320. Features of this product are listed in the following table.

This structure present the advantages of a simple fabrication process and high electronic mobility. A construction structure is such as aluminium, chromium, tantalum, or tungsten layer deposition. Then a triple layer of silicon nitrite and amorphous silicon is deposited using PECVD. The TFT display is shown in figure:2.1.1

Figure:2.1.1

2.2 MICROCONTROLLER

Microcontrollers are destined to play an increasingly important role in revolutionizing various industries and influencing our day to day life more strongly than one can imagine. Since its emergence in the early 1980's the microcontroller has been recognized as a general purpose building block for intelligent digital systems.

A microcontroller is a complete microprocessor system built on a single IC. Microcontrollers were developed to meet a need for microprocessors to be put into low cost products. Building a complete microprocessor system on a single chip substantially reduces the cost of building simple products, which use the microprocessor's power to implement their function, because the microprocessor is a natural way to implement many products. The block diagram of microcontroller is shown in figure:2.2.1,

This means the idea of using a microprocessor for low cost products comes up often. But the typical 8-bit microprocessor based system, such as one using a Z80 and 8085 is expensive. Both 8085 and Z80 system need some additional circuits to make a microprocessor system. Each part carries costs of money. But we are using AT89s52 microcontroller. Even though a product design may requires only very simple system, the parts needed to make this system as a low cost product.

The microcontroller contains full implementation of a standard MICROPROCESSOR, ROM, RAM, I/0, CLOCK, TIMERS, and also SERIAL PORTS. Microcontroller also called "system on a chip" or "single chip

microprocessor system" or "computer on a chip".

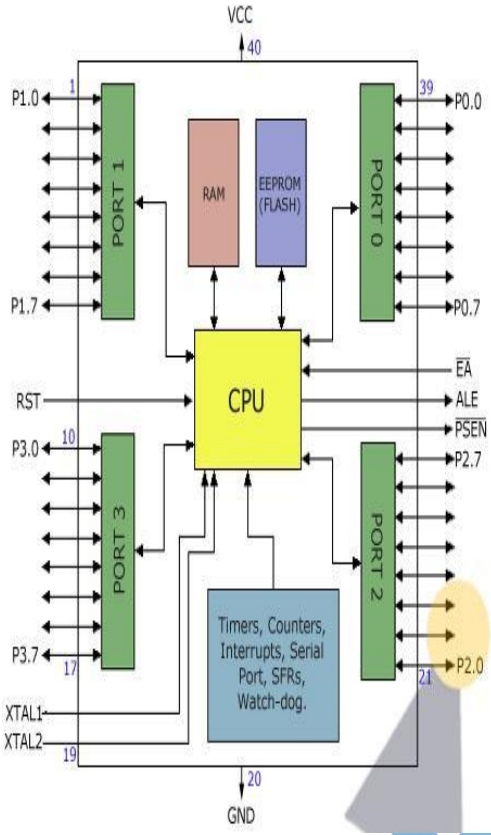

Figure:2.2.1

2.2.1 FEATURES OF MICROCONTROLLER

1. Operating speed: DC - 20 MHz clock input DC - 200 ns instruction cycle.

2. Low-power consumption.

3. Processor read/write access to program memory.

4. Only single 5V source needed for programming capability.

5. Power saving SLEEP mode.

6. Selectable oscillator options.

2.3 POWER SUPPLY

2.3.1 BLOCK DIAGRAM

The AC voltage, typically 220V (RMS), is connected to a transformer which steps that AC voltage down to the level of the desired DC output. The diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a DC voltage. This resulting DC voltage usually has some ripple or AC voltage variation.

A regulator circuit removes the ripple and also remains the same DC value even if the input DC voltage various or the load connected to output DC voltage changes. This voltage regulation is usually obtained using one of the popular voltage regulator IC units. The block diagram of power supply is shown in figure:2.3.1.

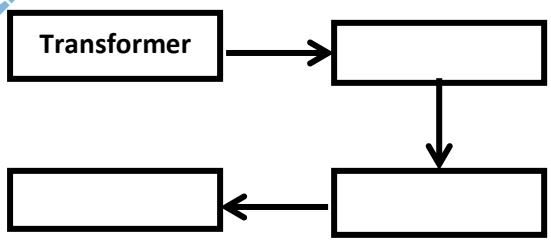

Figure:2.3.1

2.3.2 TRANSFORMER

The potential transformer will step down the3 power supply voltage (0-230V) to (0-9V) level. Then the secondary of the potential transformer will be connected the precision rectifier which is constructed which the help of op-amp. The advantages of using precision rectifier are it will give peak voltage output as DC

rest of the circuits will give only RMS output.

2.3.3 BRIDGE RECTIFIER

When Four diodes are connected as shown in figure:2.3.2, then the circuit is called as bridge rectifier. The input to the circuit is applied to the diagonally opposite corners of the network and the output is taken from the remaining two corners.

Let us assume that the transformer is working properly and there is a potential at point A and a negative potential at point B. the positive potential at point A will forward bias D3 and revers bias D4. The negative potential at point B will forward bias D1 and revers bias D2. At this time D3 and D1 are forward biased and will allow current flow to pass through them; D4 and D2 are reverse biased and will block current flow

2.3.4 IC VOLTAGE REGULATORS

Voltage regulators comprise a class of widely used ICs. Regulators IC units contain the circuitry for reference source, comparator amplifier, control devices, and overload protection all in a single IC. IC units provides regulation of either a fixed positive voltage, a fixed negative voltage, or an adjustable set voltage. The regulators can be selected for operation with load currents from hundreds of milli amperes to tens of amperes, corresponding to power rating from milli watts to tens of watts.

7805 is a 5V fixed three terminal positive voltage regulator IC. The IC has features such as safe operating area protection, thermal shut down, internal current limiting which makes the IC very rugged. Output currents up to 1A can be drawn from the IC provided that there is a proper heat sink.

For ICs, microcontroller, TFT-5 volts

For alarm circuit, switch------- 5 volts

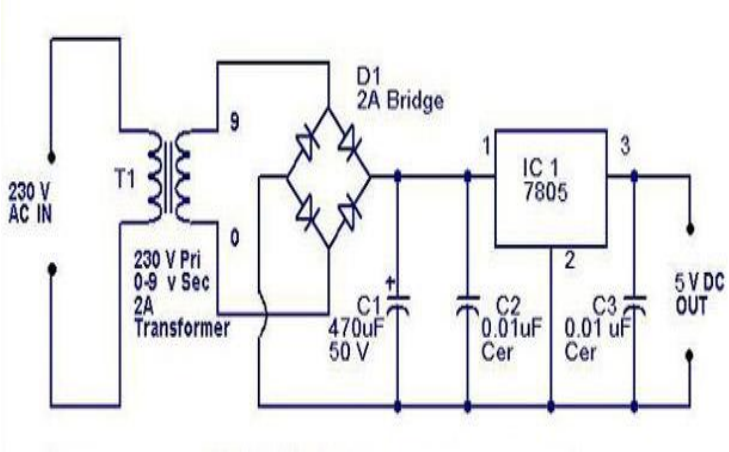

Figure:2.3.2

2.4 ULTRASONIC SENSOR (HC-SR04 WIRE TYPE)

An ultrasonic sensor transmit ultrasonic waves into the air and detects reflected waves from an object. There are many applications for ultrasonic sensors, such as in intrusion alarm systems, automatic door openers and backup sensors for automobiles. Accompanied by the rapid development of information processing technology, new fields of application, such as factory automation equipment and car electronics, are increasing and continue to do so.

Using its unique piezoelectric ceramics manufacturing technology developed over many years, Murata has developed various types of ultrasonic sensors which are compact and yet have very high performance. The ultrasonic sensor is shown in figure:2.4.1.

Figure:2.4.1

2.4.1 FEATURES OF ULTRASONIC SENSOR

1. Compact and light-weight

2. High sensitivity and high sound pressure

3. High reliability

4. Low power consume

2.5 ALARM

2.5.1 BUZZER

A buzzer or beeper is a signalling device, usually electronic, typically used in automobiles, household application such as a microwaves oven, or game shows. It most commonly consist of a number of switches or sensors connected to control unit that determine if and which button was pushed or a pre-set time has lapsed, and usually illuminates a lights on the appropriate button or control panel, and sounds a warning in the form of a continuous or intermittent buzzing or beeping sound. Initially this devices was based on an electromechanical system which was identical to an electric bell without the metal gong (which makes the ringing noise).

2.6 CONTROL SWITCH

In electrical engineering switch is an electrical component than can break an electrical circuit, interrupting the current or diverting it from one conductor to another. The mechanism of switch may be operated directly by a human operated to control a circuit. Example: light , keyboard . In this project the switches are used to fix the primary values.

3. BLOCK DIAGRAM

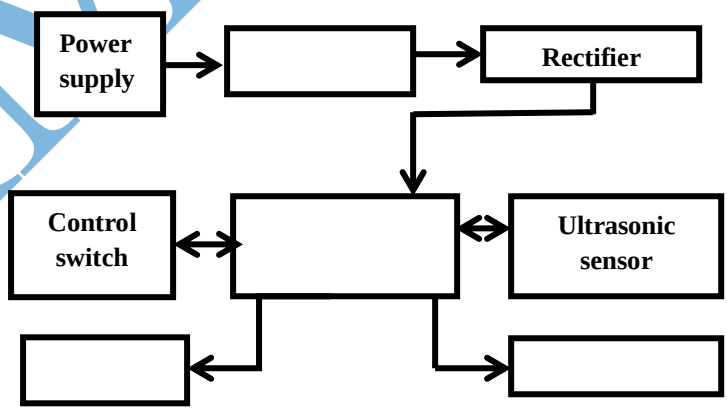

Figure:3.1

4. WORKING PRINCIPLE

Our project consist of a transformer, regulators, sensor, microcontroller and control switches. The transformer is used to reduce the 230vAC-10v-1amp AC supply. Rectifier is used to convert the Ac supply to 5v DC supply and transmit to all over the parts. The coding's are programmed in AT89s52 microcontroller. The microcontroller is having 32 pins.

And also we are using HC-SR04 type ultrasonic sensor for measuring the object. The objects are placed in front of the sensor. The ultrasonic sensor is having two major parts. They are transmitter and receiver. The transmitter is to transmit the sound waves and the receiver is to receive the sound waves. The microcontroller is calculate the time interval and the distance of the object. After sensing the object, the primary frequency values are save by using control switch. The buzzer is connected to the microcontroller. The microcontroller is send the signals to the buzzer. And the Thin Flim Transistor (TFT) is connected in to the microcontroller. Again the ultrasonic sensor is sensing the object and when the secondary frequency values are unmatched to the primary frequency values, the buzzer will be indicating and the variations are displayed in TFT display in graphical view. The graphical view is shown in figure:4.1

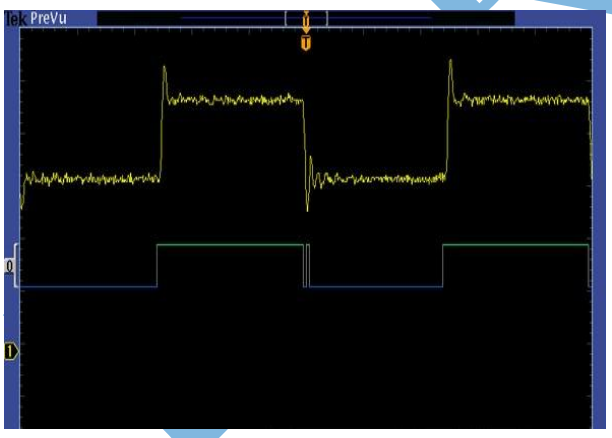

Figure:4.1

5. ADVANTAGES

1. Easy to measure.

2. Low cost compared to laser technologies.

3. Very simple design.

4. Accuracy is high.

5. Easily available IC's are used.

6. DISADVANTAGE

1.It can't be used for more complicated designs.

2.If the microprocessor is collapsed we must change the whole chipset.

7. APPLICATIONS

It is used in quality checking section in industries.

1. Steel plants

2. Manufacturing industries

3. Production industries

8. CONCLUSION

The virtues of this project include various features like

1. Ingenuity

2. Simplicity of design

3. Easy implementation

It is completely integrated so that once it is implemented in all industries then it will be impossible for errors occurred due to the surface finishing of an object.

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