ABSTRACT

This project deals with a model of laser security alarm system design. Laser security systems used to be difficult to install and rarely available to anyone other than the super-rich. Now, there are dozens of different security systems on the market that utlize lasers and can effectively protect everything from small apartments and businesses to large areas of property. Most home laser security systems consist of two parts: a basic alarm unit and an infrared motion detector. Laser based security system is a type of security and alarm system that uses laser light and a light sensor. Why a laser to be used? It is known that a laser light goes through long distance without any scattering effect (disturbing) and it is only visible at source and the destination point so it can be used as mediator between source and destination but to analyses the source a sensor is need, here the use of LDR is applicable. Just analysis is not enough alerting should be done in general alerting is sound effect so here buzzer act as alerting. Making use of this, a laser security system is designed. Its working: There is a laser diode that generates the laser beam which continuously strikes over the Light dependent resister sensors. When any person crosses the path, it inhibits laser to reach LDR and the sensor generate a low which is read by controller to power on the buzzer.

LASER-Ray goes through long distance without scattering effect and the Ray is almost invisible. Only the radiation point and incident point is visible. So by this security project we can make an invisible boundary of a sensitive area. There is two part of the system. One is transmitter and other is receiver. The transmitter part is built with a LASER radiator, a pair of dry cell batteries, an on-off switch and a stand to hold it. The receiver side, there is a focusing LDR (Light depending Resistor) sensor to sense the LASER continuously. The LDR sensor also holds with a stand and it connected with the main driver circuit. The circuit has two parts. One is filtered the signal of discontinuity ray and others is alarm circuit. When anybody crossover the invisible ray the main circuit sense the discontinuity by sensor and tum on the alarm circuit. If once the alarm circuit is on it will still ringing until push the reset button. There is two option of ringing. One is the duration of ringing depends on preset timer and another reset manually. Any option can be set by DPDT switch. If anybody wants to bind a sensitive area with the single ray he has to use mirror at every corner to reflect it. The system has built with low cost and high performance. The power consumption of the system is very low.

Chapter 1

INTRODUCTION

Need of security is the basic necessity of any individual. The feeling that we are safe and everything around us is all right is imperative for a peaceful living. But in this unsafe world, when crime, terror and threats are on their peak, how can one attain that sense of security? Here, laser security system provides us with a solution and for this reason more and more people are installing them in order to stay safe and secure. Various electronic security systems can be used at home and other important working places for security and safety purposes.

Laser Security alarm is a device used for security purposes. It has a wide application in fields of security and defense starting from the security of simple house hold material to a very high valued material of an organization. They once used to be expensive solutions for security needs. Owing to cost cutting and fast technological advancements, this form of security system is becoming more affordable.

Lasers differ from other light sources in a few significant ways. There are two features that are important for security systems. Unlike a light bulb or flashlight, laser light doesn't spread out, it is a narrow beam. And laser light is essentially a single color. Because laser light doesn't spread much, it can be sent it a long way and still have enough energy in a small area to trigger the security system detector. Because it's a single wavelength, it can put a blocking filter on the detector to let laser light through without letting background light onto the detector.

Laser light travels in a straight line. For instance, to protect the front of the yard, putting the laser at one comer and the detector at the other comer would do the job. That's not a very practical configuration, though. More typically, if it is needed to protect the perimeter of a room, or at least the enhances. So, laser security systems start with a laser pointing to a small mirror. The first mirror is angled to direct the beam to a second small mimor, and so on until the final mirror directs the beam to the detector. If the beam is interrupted anywhere between the laser and the detector, the electronics will put the warming signal.

1.1 BASIC PRINCIPLE

There are three components to laser security system:a laser, a detector and sensing circuit. The laser is a concentrated light source that puts out a straight line, pencil beam of light of a single color The detector sensitive to light and puts out voltage whether light his The detector is connected to the sensing out. When the laser beam is intend cannot reach the detector,its voltage output changes, and the circuit sense the change and put out awaming signal.

A laser security alarm system operates on the basic principle of detecting an interruption in a focused laser beam, using a light-dependent resistor (LDR) to monitor the beam's intensity; when the beam is blocked by an intruder, the LDR's resistance changes, triggering an alarm circuit that activates a siren or notification signal.

A laser security system is the one that emits a narrow beam of light and gets to know the intruder presence on getting the beam reflected from the intruder. On the basis of the reflected beam, the system is able to know the distance, size and speed of the intruder and differentiate it from other objects.

Chapter 2

CIRCUIT COMPONENTS

2.1 RESISTORS

As shown in fig 2.1 Resistors are the most common passive electronic component (one that does not require power to operate). They are used to control voltages and currents. While a resistor is a very basic component, there are many ways to manufacture them. Each style has its own characteristics that make it desirable in certain types of applications.

Fig 2.1 : Resistor

Choosing the right type of resistor is important in making high-performance or precision circuits work well. This bonus chapter covers the resistor types and helps with picking the right one for the project. All resistors are basically just a piece of conducting material with a specific value of resistance. For that piece of conducting material to be made into a practical resistor, a pair of electrodes and leads are attached so current can flow. The resistor is then coated with an insulating material to protect the conducting material from the surrounding environment and viceversa. There are several different resistor construction methods and bodystyles (or packages) that are designed for a certain range of applied voltage, power dissipation, or other considerations. The construction of the resistor can affect its performance at high frequencies where it may act like a small inductor or capacitor has been added, called parasitic inductance or capacitance.

2.2 LASER LIGHT

Fig 2.2 : Laser light

As shown in fig 2.2 a laser is a device that emits light through a process of optical amplification based on the stimulated emission of electromagnetic radiation. The term "laser" originated as an acronym for "light amplification by stimulated emission of radiation".

A laser differs from other sources of light in that it emits light coherently. Spatial coherence allows a laser to be focused to a tight spot, enabling applications such as laser cutting and lithography. Spatial coherence also allows a laser beam to stay narrow over great distances (collimation), enabling applications such as laser pointers. Lasers can also have high temporal coherence, which allows them to emit light with a very narrow spectrum, i.e., they can emit a single color of light. Temporal coherence can be used to produce pulses of light as short as a femtosecond.

2.3 TRANSISTOR

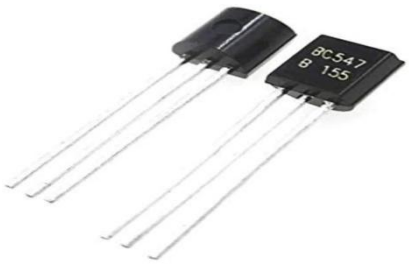

Fig 2.3 : Transistors

As shown in fig 2.3 transistor is a semiconductor device used to amplify and switch electronic signals and electrical power. It is composed of semiconductor material with atleast three terminals for connection to an external circuit. A voltage or current applied to one pair of the transistor's terminals changes the current flowing through another pair of terminals. Because the controlled (output) power can

be higher than the controlling (input) power, a transistor can amplify a signal. Today, some transistors are packaged individually, but many more are found embedded in an integrated circuits.

2.4 BUZZER

Fig 2.4 : Buzzer

A buzzer shown in fig 2.4 is a audio signaling device, which may be mechanical, electromechanical, and piezoelectric. Typical use buzzers and includes alarm devices, timers and confirm a of user input such as a mouse click or keystroke. The buzzer consists of an outside case with two pins to attach it to power and ground. When current is applied to the buzzer it causes the ceramic disk to contract or expand. Changing this then causes the surrounding disc to vibrate. That's the sound that you hear. Adjust the potentiometer to increase or decrease the resistance of the potentiometer. If you increase the resistance of the potentiometer then it will decrease the volume of the buzzer. If you decrease the resistance of the potentiometer then it will increase the volume of the buzzer

2.5 LIGHT DEPENDENT RESISTOR (LDR)

Fig 2.5 : LDR

As shown in fig 2.5 a light-dependent resistor (LDR) is a photocell light-controlled variable resistor. The resistance of a photo resistor decreases with increasing incident light intensity; in other words, it exhibits photoconductivity. A photo resistor can be applied in light-sensitive detector circuits, and light- and dark-activated switching circuits.

2.6 BATTERY

Fig 2.6 : Battery

In electricity, a battery as shown in fig 2.6 is a device consisting of one or more electrochemical cells that convert stored chemical energy into electrical energy. Since the invention of the first battery (or "voltaic pile") in 1800 by Alessandro Volta and especially since it technically improved in 1836, batteries have become a common power source for many household and industrial applications. According to a 2005 estimate, the worldwide battery industry generates US$58 billion in sales each year, with 6% annual growth. There are two types of batteries: primary batteries (disposable batteries), which are designed to be used once and discarded, and secondary batteries (rechargeable batteries), which are designed to be recharged and used multiple times. Batteries come in many sizes, from miniature cells used to power hearing aids and wristwatches to battery banks the size of rooms that provide standby power for telephone exchanges and computer data centres.

Chapter 3

CIRCUIT DIAGRAM

The circuit shown in fig.3.1 is constructed using basic electronic components like resistors, light dependent resistor, transistors, buzzer, laser light and a few other components. The circuit is powered by a 12V battery.

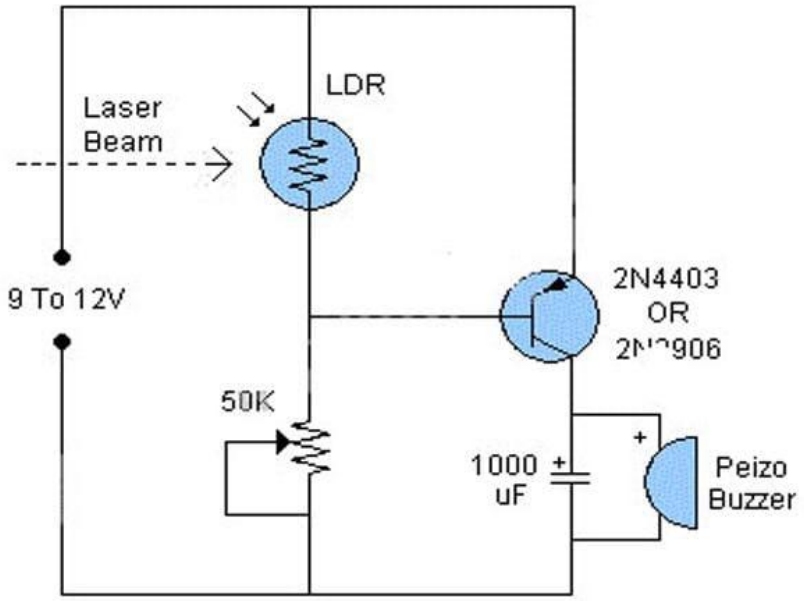

Fig 3.1 : Circuit diagram of a laser security alarm system

As shown in fig 3.1 when the laser beam falling over the LDR is interrupted by the object in the field of laser net, hence the LDR develops an output voltage and the alarm rings showing the sign of any intruders. The Laser Security System has been successfully designed and developed. The buzzer is turned on as the laser beam falling on the LDR is interrupted. The experimental model was made according to the circuit diagram and the result was as expected.

Chapter 4

WORKING PRINCIPLE AND OPERATION

4.1 Working Principle:

The basic sensing component of a modern laser security system is an infrared motion detector. The motion detector contains four parts: the laser, the mirrors, the detector and the sensing electronics. An infrared motion detector works by projecting a beam of light that shoots across a space into a series of mirrors and finally into a detector, which emits a particular voltage into the sensing electronics as long as the laser hits it. When the beam of light is broken, the detector changes its voltage output into the sensing electronics, which then trigger an alarm. If infrared sensors are placed strategically, the beams of light will make it impossible for an intruder to come into the area without the sensor being alerted. The sensor, which is connected to the basic alarm unit through a wireless connection, then triggers the basic unit to alert the monitoring service through which the customer purchased the security plan. The monitoring service will contact the home and, if no response is received, will contact the police. In most models, the basic unit also sounds a loud alarm, though some systems use a silent alarm that contacts the police without notifying the suspected criminal.

4.2 Principle of operation:

A laser security alarm system operates by using a laser beam that is directed onto a light-dependent resistor (LDR); when the beam is interrupted by an intruder, the change in light received by the LDR triggers a circuit to activate an alarm, usually a loud buzzer, signifying a security breach; essentially, the system detects the presence of an object by the disruption of the laser beam, allowing for contactless intrusion detection. In a closed-circuit system, the electric circuit is closed when the door is shut. This means that as long as the door is closed, electricity can flow from one end of the circuit to the other. But if somebody opens the door, the circuit is opened, and electricity can't flow. This triggers an alarm. A laser security alarm system operates on the principle of detecting interruption in a focused laser beam using a light-dependent resistor (LDR); when the beam is broken by an intruder crossing the monitored area, the LDR's resistance changes, triggering a circuit that activates an alarm signal, typically a loud buzzer, to alert of a potential intrusion.

Chapter 5

Advantages and Disadvantages

5.1 ADVANTAGES

1. These are easy to install and work at both within as well as outside houses.
2. Lasers are strong in beam width and can be focused on the perfect target.
3. By using laser security system one can be safe in the case of harmful effects to the body. As the beam width used in the laser security systems are not strong beam widths.
4. The circuit, construction and setup for the Laser Security System are very simple. If used with a battery, the laser security system can work even when there is a power outage.
5. By technological innovations cost of the security systems has been cut to a large extent. So, making laser systems one among affordable security system options can be very safe.

5.2 DISADVANTAGES

1. The laser security system works only if the laser is obstructed. If the intruder passes without obstructing the laser, it is considered as a failure.
2. Visibility: The system's components, like cameras, reflectors, and boxes, are easy to spot. This can be a deterrent for some, but others may prefer a more hidden system.
3. Cost: To secure a larger area, more lasers and sensors are required, which can be expensive.
4. Eye damage: Lasers can harm the eyes if they directly enter them. However, some lasers are designed not to affect the human eye.
5. The system's effectiveness depends on the ambient light.

Chapter 6

APPLICATIONS

1. Home Security: Protecting entry points like doors and windows.
2. Business Security: Securing high-value assets like cash registers or display cases.
3. Perimeter Security: Monitoring boundaries of property or facilities.
4. Museum Security: Protecting valuable artifacts from unauthorized access.
5. Industrial Security: Monitoring restricted areas within a factory.
6. Installed in bank vaults and ATMs to detect unauthorized movement. Can integrate with CCTV and alert systems for enhanced security.
7. Used to protect valuable artifacts and paintings from theft or damage.
8. Triggers an alert when someone crosses the restricted area.
9. Deployed in restricted zones to detect intruders.
10. Used along borders and military bases for surveillance.

Chapter 7

COST ESTIMATION

Table 7.1 shows the cost estimation of the components used. The approximate cost estimation of the mini project is 415/- where the laser light, buzzer, LDR and the transistor plays a major role among all the component.

SL.NO	NAME	COST	QUANTITY
1	Laser light	100/-	1
2	BC547NPN Transistor	10/-	1
3	LED 5mm 3volt	10/-	1
4	LDR	10/-	1
5	10k Resistor	5/-	3
6	Buzzer	150/-	1
7	Connecting wires	10/-	1
8	12V battery	20/-	1
9	Breadboard	100/-	1

Table7.1 : Cost estimation of the components used

Chapter 8

8.1 CONCLUSION

Laser security system provides us the security against any crime, theft in our day-to-day life and so people are installing them in order to stay safe, secure and sound. Various electronic security systems can be used at home and other important working places for security and safety purposes. It is a great opportunity and source of saving man power contributing no wastage of electricity. The "Laser Security System" is an important helping system. Using this system robbery, thefts & crime can be avoided to large extend. Avoiding thieves results in the safety of our financial assets and thereby this system provides us protection against all.

The Laser & LDR system is highly sensitive with a great range of working. The system senses the light emitted by the Laser falling over the LDR connected with the circuit. Whenever the beam of light is interrupted by any means, it triggers the alarm or siren. This highly reactive approach has low computational requirement: therefore, it is well suited to surveillance, Industrial application and smart environments.

8.2 FUTURESCOPE

The future scope of laser security alarm systems looks promising, with potential advancements including integration with artificial intelligence (AI) for improved threat detection, wider applications in various sectors like high-value asset protection, more sophisticated laser beam configurations, and the use of IoT connectivity for real-time monitoring and response, ultimately leading to more intelligent and adaptable security systems.We can increase the range of this equipment by using better Mic.

8.3 RESULT

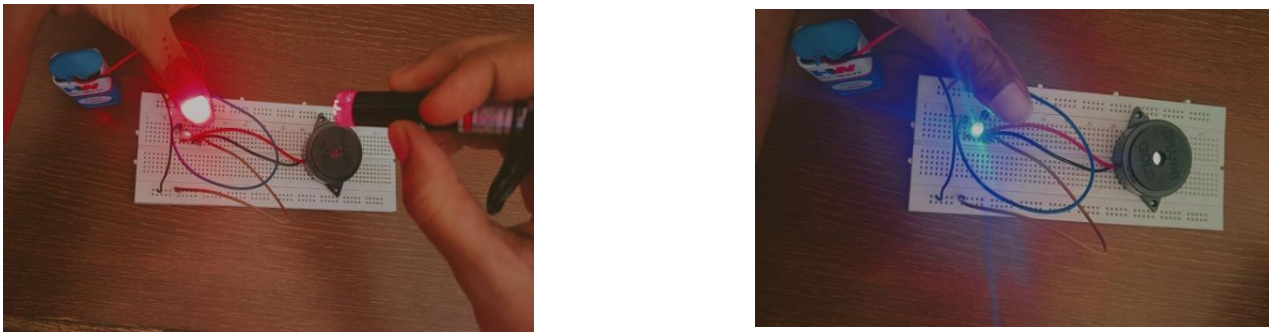

Fig 8.1: Designed circuit of a laser security alarm system

We constructed the circuit as shown in fig 8.1 as per the circuit diagram shown in fig 3.1 and verified the circuit i.e, when the laser beam falling over the LDR is interrupted by the object in the field of laser net, hence the LDR develops an output voltage and the alarm rings showing the sign of any intruders. The Laser Security System has been successfully designed and developed. The buzzer is turned on as the laser beam falling on the LDR is interrupted. The experimental model was made according to the circuit diagram and the result was as expected. The LDR has to be placed in dark place or inside a case so that the other source of light except the laser beam doesn't affect the LDR. This helps the circuit to work faster and properly.

REFERENCES

[1] www.scribd.com

[2] www.electronicsforu.com

[3] www.circuiteasy.com

[4] https://easyelectronicsproject.com

[5] https://youtu.be/n-Phvv4F59c?si=WROnODWzTJbaAmDE