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Touchless Doorbell

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Abstract: *The Touchless Doorbell System is an innovative solution designed to enhance convenience, safety, and hygiene at entryways. By leveraging proximity sensors, this system allows users to activate the doorbell without physical contact, reducing the risk of transmission of germs and improving accessibility for individuals with mobility challenges.*

The system detects the presence of a hand or object within a designated range, triggering the doorbell mechanism automatically. Additionally, it integrates with smartphone applications for remote notifications, enabling homeowners to receive alerts and communicate with visitors even when not at the door. The design emphasizes energy efficiency, low-cost components, and ease of installation, making it a practical upgrade for residential and commercial properties.

This project aims to provide a seamless, hygienic, and modern solution to traditional doorbell systems, aligning with contemporary needs for health-conscious and tech- savvy environments..

Keywords: Touchless Doorbell System

I. INTRODUCTION

The Touchless Doorbell System addresses these challenges by using proximity sensors to enable activation without physical contact. Instead of pressing a button, the system detects the presence of a hand or object in close proximity and automatically triggers the doorbell, offering both a more hygienic solution and enhanced user convenience. The integration of wireless communication allows homeowners to receive notifications on their smartphones or other connected devices, ensuring they are alerted to visitors even when they are not physically present at the door.

This project focuses on the development of a touchless doorbell system that is simple to install, cost-effective, and reliable. It incorporates modern sensor technology, such as infrared or ultrasonic sensors, to accurately detect user presence while minimizing false activations. Additionally, it offers the potential for customization, such as integrating security features or providing remote visitor communication.

By reducing the need for physical interaction with doorbell buttons, the touchless system promotes greater hygiene, reduces the spread of germs, and enhances accessibility, all while offering a modern, user-friendly solution. As part of an ongoing trend toward more intelligent and health-conscious home automation, this touchless doorbell aims to set a new standard for residential and commercial entryway systems

II. LITRETURE SURVEY

The touchless doorbell project aims to improve the traditional doorbell system by incorporating advanced sensing technologies, such as gesture recognition, motion detection, or facial recognition. This project not only enhances convenience but also improves hygiene by reducing the need for physical contact. The following literature survey provides an overview of existing research and technologies related to touchless doorbells and similar systems, focusing on key components such as sensing techniques, system design, and applications.

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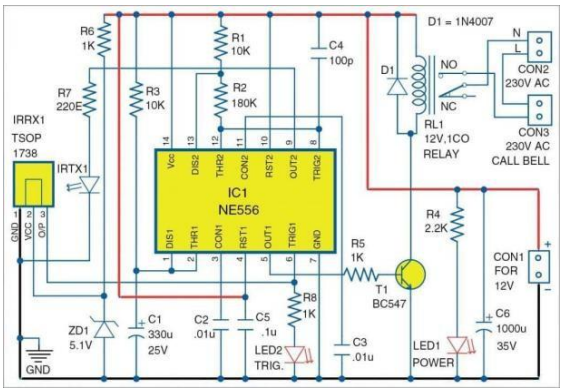
III. CIRCUIT DIAGRAM



In this touchless doorbell project, we will use an IC 556, which is a dual-timer IC, to design a touchless doorbell system that activates the bell when a person is detected. The system can be designed using a motion sensor (such as a PIR sensor) and a relay to control the doorbell. Here's how the circuit works and how the IC 556 fits into it

Components Used:

IC 556: A dual timer IC, which can be used as two
555 timers. Each timer is used to control specific parts of the circuit.
PIR Motion Sensor: Detects the presence of a person by sensing infrared radiation from their body.
Relay: Controls the activation of the doorbell.
Power Supply: Powers the components (typically 5V or 12V depending on the relay and components).
Doorbell: A standard bell or buzzer that will be activated when the person is detected.
Resistors and Capacitors: Used for timing and signal conditioning.

Circuit Explanation:

PIR Sensor (Motion Detection):

The PIR sensor is responsible for detecting the presence of a person. When a person enters the sensor's detection range, the PIR sensor will send a high signal to the input of the IC 556 (which is set up as a monostable multivibrator).

IC 556 Configuration:

Monostable Multivibrator Mode: In this configuration, IC 556 is used as a monostable multivibrator. A monostable multivibrator generates a pulse when triggered. When the PIR sensor detects motion, it sends a signal to the trigger pin of one of the timers in the 556 IC. This triggers the timer to generate a pulse of a specified duration.

IC 556 Timer 1 (Monostable Multivibrator): The first timer in the 556 IC is configured in a monostable mode, where it will generate a short output pulse when triggered by the PIR sensor. The width of this pulse is determined by the resistor and capacitor connected to the timing pins (pin 6 and pin 2).

IC 556 Timer 2 (Astable Multivibrator): The second timer in the 556 IC can be configured as an astable multivibrator, which is continuously oscillating. This timer is used to control the relay to activate the doorbell for a specific time after detection. The second timer ensures that the relay stays activated for a sufficient amount of time to ring the doorbell.

Relay Activation:

The output from the second timer (astable multivibrator) is connected to a transistor that controls the relay. When the output goes high, it activates the relay, allowing current to flow to the doorbell (or buzzer), thus ringing the bell

The relay is responsible for handling the higher current required to drive the doorbell (since the IC 556 and associated circuitry operate at low currents).

Power Supply:

The circuit is powered by a standard DC power supply (5V or 12V), depending on the relay and doorbell specifications. The PIR sensor and IC 556 are powered from this supply, and the relay is powered to control the doorbell.

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Step-by-Step Working:

1. Motion Detection: When a person approaches the door, the PIR sensor detects the infrared radiation emitted by the person's body. It sends a signal to the trigger input (pin 2) of the first timer in the IC 556.
2. Triggering the Monostable Multivibrator: This signal from the PIR sensor triggers the first timer in the 556 IC, which then generates a short output pulse. The duration of this pulse is determined by the resistor and capacitor connected to the IC.
3. Triggering the Relay: The pulse output from the first timer is sent to the second timer (configured as an astable multivibrator). This timer oscillates and generates a steady signal to the transistor, which in turn drives the relay.
4. Activating the Doorbell: The relay closes its contacts, allowing current to flow to the doorbell (buzzer or chime), causing it to ring or make sound for a brief period.
5. Resetting the Circuit: After the relay is triggered, the system automatically resets, waiting for the next detection event (when the PIR sensor detects another person).

IV. PCB DESIGNING

THERE ARE TWO TYPES OF PCB MAKING

1. Photo printing.
2. Screen printing.

SCREEN PRINTING

PCB production by photo printing method is expensive, through accurate. The screen process uses a resist ink applied through a stencil or mask to the surface of the blank circuit board. The stencil is produced and attached to a fine mesh, metal, nylon, polyester or silk screen. The resist ink is forced through openings in the stencil onto the surface of the blank board. This process produces a positive of the circuit on the copper foil. When dry the board is ready for etching

V. ADVANTAGES

1. Enhanced Hygiene and Health Safety

Reduces Contact with Surfaces: A touchless doorbell eliminates the need for physical interaction with the doorbell button, which can be a breeding ground for germs and viruses. This is particularly beneficial in preventing the spread of illnesses like the flu, COVID-19, and other contagious diseases.

Ideal for Sensitive Populations: For elderly individuals, people with disabilities, or those with compromised immune systems, a touchless system offers peace of mind by minimizing the need to touch public surfaces.

2. Convenience and User Experience

• Hands-Free Operation: A touchless doorbell is typically activated through motion sensors, voice commands, or even facial recognition, offering greater convenience. Visitors don't have to fumble with buttons, making it easier for anyone, including children or people with disabilities, to use the doorbell.

• More Modern and Intuitive: As technology advances, people are increasingly familiar with voice-activated and sensor-based interactions. A touchless system offers a more seamless, high- tech user experience.

3. Improved Accessibility

• Ideal for Disabled or Elderly Users: For individuals with limited mobility, using a traditional doorbell may be a challenge, especially if bending down or reaching for a button is difficult. A motion-activated doorbell allows users to simply approach the door, and it rings automatically.

• Voice-Activated Solutions: Some touchless systems integrate with smart home assistants (like Amazon Alexa or Google Assistant), allowing users to activate the doorbell with a voice command.

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4. Security Benefits

• Reduced Tampering: Since the doorbell button is not a physical button, there's less chance of vandalism or tampering, which is common with traditional doorbells. This can make your home more secure.

• Smart Features: Touchless doorbells can be integrated with smart security systems, allowing for features like video surveillance, motion detection, and remote communication, providing enhanced security.

VI. APPLICATIONS

1. Residential Homes

• Health and Hygiene: In homes, touchless doorbells reduce the need to physically touch a doorbell, promoting better hygiene by minimizing the spread of germs and viruses, especially in the context of health crises like the COVID-19 pandemic.

• Smart Home Integration: Homeowners can integrate touchless doorbells with their smart home ecosystem, enabling features like video surveillance, voice activation, or automatic unlocking, enhancing security and convenience.

2. Healthcare Facilities

• Hospitals and Clinics: In healthcare settings, a touchless doorbell ensures minimal physical contact between patients, visitors, and staff, which is critical in maintaining hygiene standards and reducing the transmission of infections.

• Nursing Homes: Elderly residents can benefit from the ease of using a touchless system, reducing the need for assistance when visitors arrive and promoting autonomy for patients with limited mobility.

3. Offices and Commercial Buildings

• Corporate Offices: Businesses can implement touchless doorbells at their entrances, promoting a hygienic environment for employees and visitors while offering convenience in high-traffic areas.

• Customer Interaction: In offices or service areas where clients may have to wait (e.g., law firms, banks, insurance offices), a touchless doorbell allows clients to alert staff without touching shared surfaces, maintaining a high standard of cleanliness.

4. Retail and Commercial Establishments

• Customer Service: In retail stores, restaurants, or cafes, touchless doorbells can be installed at entrances for customers to notify staff of their arrival, enhancing service efficiency and reducing the need for physical interaction.

• Smart Retail Systems: For businesses that rely on automation or smart systems, integrating touchless doorbells with video cameras and communication tools can help store staff manage

VII. CONCLUSION

In conclusion, the touchless doorbell represents a significant advancement in both convenience and hygiene, offering a modern, efficient solution to traditional doorbell systems. By eliminating the need for physical contact, it enhances safety by reducing the spread of germs and viruses, which is especially important in today's health- conscious world. Additionally, touchless doorbells improve accessibility for individuals with disabilities, the elderly, or those with limited mobility, making it easier for everyone to interact with their environment.

Beyond hygiene and accessibility, these systems integrate seamlessly with smart home technologies, offering added security, energy efficiency, and a more intuitive user experience. Whether for residential, commercial, healthcare, or public sector applications, the versatility of touchless doorbells is undeniable. They provide a cleaner, more efficient way to interact with visitors while ensuring greater convenience, security, and durability.

As technology continues to evolve, the potential for touchless doorbells to become a standard feature in homes, businesses, and public spaces is significant, aligning with the broader trend of contactless interactions and smart environments. Ultimately, the touchless doorbell enhances quality of life, making it a valuable addition to modern living and commercial spaces alike.

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