

Door Opening Alarm using Hall Sensor & Micro Controller 8051

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Abstract— This simple door-opening alarm uses a hall sensor to produce sound when someone opens the door. The circuit can be installed at a workshop, office or home for security purposes. The 3-terminal hall sensor is easily available in the market. The door alarm system is an electronic device that can be used as a security device. It is an electronic watch dog, because when installed to a door, and somebody touches the door, it sounds an alarm. The unit is built from discrete semiconductor device. It is relatively simple in both its operation and analysis. One particular feature of this project circuit (the door alarm system) is its versatility. The circuit can be adapted for other applications. All the Information necessary for its realization is contained in this project write-up. Chapter one contains the introduction to the door alarm system, Chapter two contains the circuit analysis and component review, Chapter three contains the research and methodology adopted, Chapter four contains the design and construction while the work was concluded in project.

Key words: Hall Sensor, Alarm

I. INTRODUCTION

A security alarm is a system designed to detect intrusion – unauthorized entry – into a building or other area. Security alarms are used in residential, commercial, industrial, and military properties for protection against burglary (theft) or property damage, as well as personal protection against intruders. Car alarms likewise help protect vehicles and their contents. Prisons also use security systems for control of inmates. Some alarm systems serve a single purpose of burglary protection; combination systems provide both fire and intrusion protection. Intrusion alarm systems may also be combined with closed-circuit television surveillance systems to automatically record the activities of intruders, and may interface to access control systems for electrically locked doors. Systems range from small, self-contained noisemakers, to complicated, multi area systems with computer monitoring and control. It may even include two-way voice which allows communication between the panel and Monitoring station. The term door security may refer to any of a range of measures used to strengthen doors against door breaching, Ram-raiding and lock picking, and prevent crimes such as burglary and home invasions. Door security is used in commercial and government buildings, as well as in residential settings.

II. OBJECTIVES

A. Locks

Smart locks can be used to limit door access to only people with an electronic key fob or Near field communication device, like a smartphone. These devices are popular with landlords, who can enable and disable digital access without physically mailing out keys. The locks can log the times of

entry, and can trigger an alarm if they are struck during a break-in attempt.

Deadbolts many manufacturers make deadbolts that are resistant to impact failure, picking and lock bumping. However, most deadbolts are not very secure. Consumer Reports Magazine's testing showed that many manufacturers make deadbolts that break apart and otherwise fail when force is applied to the door.

B. Reinforcement

Strike plate reinforcement can involve reinforcing the strike plate and/or the door frame, to prevent the strike plate from being rammed out of the frame. Door reinforcements various products are made to prevent delamination and or splitting of the door. Sheet steel plate can be placed behind or under the deadbolt and wrap the door edge to prevent breaking the door around the deadbolt. Heavy duty products that place plates on either side the door tied together with screws or bolts can be used to prevent delamination. Door chains allows the doors to be opened slightly to view outside while still remaining locked. Secondary, internal locks sliding bolts, hooks and speciality latches, metal blocks or bars mounted internally. Hinge screws longer or specialized screws that prevent the door from being simply pulled out after removing the hinge pins. Often the hinge pin itself is screwed, from the inside while the door is open, into the hinge to prevent removal of the hinge pin without first opening the door.

C. Other Methods

Burglar Deterrent CD or MP3s Home occupancy sounds recorded on a CD. The CD is played when the home owner is away, to mimic the home occupancy activities. Door viewers small fish-eye lenses that allow residents to view outside without opening the door. Door windows there are three common methods to add security to windows in or beside doors: security bars and grates, security films (coatings applied to the glass in windows to reinforce it), or breakage resistant windows (plexiglas, lexan, and other glass replacement products). Visibility Most police departments recommend shrubs be cleared from near doorways to reduce the chance of a burglar being hidden from public view.

III. RESIDENTIAL SECURITY

A. Common Residential Doors

The following are the types of doors typically used in residential applications: solid wood door, panel doors (hollow and solid core), metal skinned wood-edged doors and metal edge-wrapped doors. Typically, door frames are solid wood. Residential doors also frequently contain wood. Security tests by (CRM) *Consumer Reports Magazine* in the 1990s found that many residential doors fail or delaminate when force is applied to them. Solid wood doors withstood more force than the very common metal skinned wood-edged doors used in newer construction. A broad range door manufacturer,

Premdor (now Masonite) once stated in one of its 1990s brochures entitled "Premdor Entry Systems" page 6 that "The results of tests were overwhelming, Steel edged doors outperform wood-edged doors by a ratio of 7 to 1. When you consider the practically two-thirds of all illegal entries were made through doors... One hit of 100 lbstrike force broke the wood-edged stile and opened the door. To actually open the steel-edged door required 7 strikes of 100 lb pressure." Most door manufactures offer a number of different types of doors with varying levels of strength. *Consumer Reports Magazine* also reported in its test results that door frames often split with little force applied and lower quality deadbolts simply failed when force was applied to the door.

The Chula Vista Residential Burglary Reduction Project which studied over 1,000 incidents found that "methods found to have relatively low effectiveness included: sliding glass door braces, such as wooden dowels, as opposed to sliding door channel or pin locks; deadbolts installed in the front door only; and outdoor lights on dusk-to-dawn timers".

B. Burglary Tactics

The Chula Vista Residential Burglary-Reduction Project yielded the following findings: "From victim interviews, we learned that in 87% of the break-ins that occurred when intruders defeated locked doors with tools such as screwdrivers or crowbars, the burglars targeted "the one door that had no deadbolt lock ... not one burglar attempted to break a double-pane window during the course of successful or attempted burglary."

IV. ALARM CONNECTION AND MONITORING

Depending upon the application, the alarm output may be local, remote or a combination. Local alarms do not include monitoring, though may include indoor and/or outdoor sounders (e.g. motorized bell or electronic siren) and lights (e.g. strobe light) which may be useful for signaling an evacuation notice for people during fire alarms, or where one hopes to scare off an amateur burglar quickly. However, with the widespread use of alarm systems (especially in cars), false alarms are very frequent and many urbanites tend to ignore alarms rather than investigating, let alone contacting the necessary authorities. In short, there may be no response at all. In rural areas where nobody may hear the fire bell or burglar siren, lights or sounds may not make much difference, as the nearest emergency responders may arrive too late to avoid losses.

Remote alarm systems are used to connect the control unit to a predetermined monitor of some sort, and they come in many different configurations. High-end systems connect to a central station or first responder (e.g. police/fire/medical) via a direct phone wire, a cellular network, a radio network (i.e. GPRS/GSM), or an IP path. In the case of a dual signalling system two of these options are utilized simultaneously. The alarm monitoring includes not only the sensors, but also the communication transmitter itself. While direct phone circuits are still available in some areas from phone companies, because of their high cost and the advent of dual signalling with its comparatively lower cost they are becoming uncommon. Direct connections are now most usually seen only in federal, state, and local government buildings, or on a school campus that has a dedicated security, police, fire, or emergency medical

department (in the UK communication is only possible to an alarm receiving centre – communication directly to the emergency services is not permitted).

More typical systems incorporate a digital cellular communication unit that will contact the central station (or some other location) via the Public Switched Telephone Network (PSTN) and raise the alarm, either with a synthesized voice or increasingly via an encoded message string that the central station decodes. These may connect to the regular phone system on the system side of the demarcation point, but typically connect on the customer side ahead of all phones within the monitored premises so that the alarm system can seize the line by cutting-off any active calls and call the monitoring company if needed. A dual signalling system would raise the alarm wirelessly via a radio path GPRS/GSM or cellular path using the phone line or broadband line as a back-up overcoming any compromise to the phone line. Encoders can be programmed to indicate which specific sensor was triggered, and monitors can show the physical location (or "zone") of the sensor on a list or even a map of the protected premises, which can make the resulting response more effective. For example, a heat sensor alarm, coupled with a flame detector in the same area is a more reliable indication of an actual fire than just one or the other sensor indication by itself.

Many alarm panels are equipped with a backup communication path for use when the primary PSTN circuit is not functioning. The redundant dialer may be connected to a second communication path, or a specialized encoded cellular phone, radio, or internet interface device to bypass the PSTN entirely, to thwart intentional tampering with the phone line(s). Just the fact that someone tampered with the line could trigger a supervisory alarm via the radio network, giving early warning of an imminent problem (e.g. arson). In some cases a remote building may not have PSTN phone service, and the cost of trenching and running a direct line may be prohibitive. It is possible to use a wireless cellular or radio device as the primary communication method.

In the UK the most popular solution of this kind is similar in principle to the above but with the primary and back up paths reversed. Utilizing a radio path (GPRS/GSM) as the primary signaling path is not only quicker than PSTN but also allows huge cost savings as unlimited amounts of data can be sent at no extra expense.

V. PROPOSED WORK

A. Circuit and working

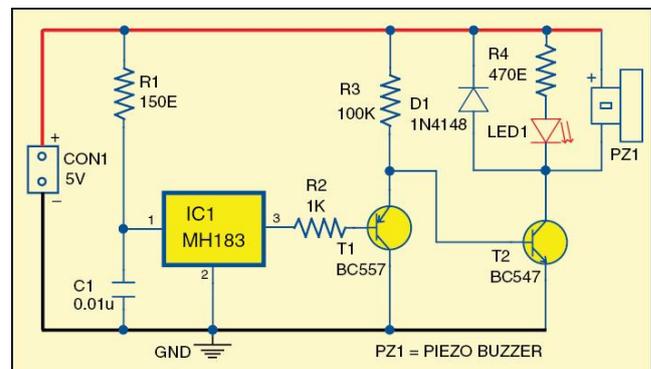


Fig. 1: Block Diagram of Door Opening Alarm Using Hall Sensor & Micro Controller 8051

The circuit diagram of the door-opening alarm is shown in Fig. 1. It is built around hall sensor MH183 (IC1), pnp transistor BC557 (T1), npn transistor BC547 (T2) and a few other components.

Hall sensor MH183 is a magnet-operated solid-state sensor. When the magnet is brought near the sensor, its output goes low. This low output is amplified by pnp transistor T1. npn transistor T2 inverts the operation. When T1 conducts, T2 does not conduct, and vice-versa

The magnet should be fitted on moving part of the door and the sensor at the door frame. When the door is closed, the magnet comes close to the sensor and the alarm is off. But when door is opened, the alarm makes a sound.

The buzzer can be replaced with a 5V relay to control a mains alarm. When the door is closed, neither the buzzer sounds nor LED1 glows. But when the door is opened, the buzzer sounds and LED1 glows, too.

A Hall effect sensor is a transducer that varies its output voltage in response to a magnetic field. Hall effect sensors are used for proximity switching, positioning, speed detection, and current sensing applications.

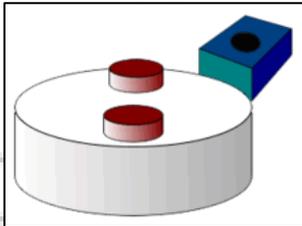


Fig. 2: Hall sensor

In a hall-effect sensor a thin strip of metal has a current applied along it, in the presence of a magnetic field the electrons are deflected towards one edge of the metal strip, producing a voltage gradient across the short-side of the strip (perpendicular to the feed current). Inductive sensors are just a coil of wire, in the presence of a changing magnetic field a current will be induced in the coil, producing a voltage at its output. Hall effect sensors have the advantage that they can detect static (non-changing) magnetic fields.

In its simplest form, the sensor operates as an analog transducer, directly returning a voltage. With a known magnetic field, its distance from the Hall plate can be determined. Using groups of sensors, the relative position of the magnet can be deduced. Working principle of Hall sensor

VI. WORKING PRINCIPLE

Frequently, a Hall sensor is combined with threshold detection so that it acts as and is called a switch. Commonly seen in industrial applications such as the pictured pneumatic cylinder, they are also used in consumer equipment; for example some computer printers use them to detect missing paper and open covers. They can also be used in computer keyboards applications that require ultra-high reliability.

Hall sensors are commonly used to time the speed of wheels and shafts, such as for internal combustion engine ignition timing, tachometers and anti-lock braking systems. They are used in brushless DC electric motors to detect the position of the permanent magnet. In the pictured wheel with two equally spaced magnets, the voltage from the sensor will peak twice for each revolution. This arrangement is commonly used to regulate the speed of disk drives.

VII. APPLICATIONS OF DOOR OPENING ALARM

Position sensing:-Sensing the presence of magnetic objects (connected with the position sensing) is the most common industrial application of Hall effect sensors, especially those operating in the switch mode (on/off mode). The Hall effect sensors are also used in the brushless DC motor to sense the position of the rotor and to switch the transistors in the right sequence.

Smartphones use hall sensors to determine if the Flip Cover accessory is closed. Direct current (DC) transformer:- Hall effect sensors may be utilized for contactless measurements of DC current in current transformers. In such a case the Hall effect sensor is mounted in the gap in magnetic core around the current conductor.

VIII. CONCLUSION

The aim of the project has been the design and construction of a door alarm system. The door alarm system gives an audible alarm when the door handle to which it is connected to is touched. The necessary specification was taken and the design was made according to this specification. The module was then constructed and tested. It operated as required. It suffices me to say that the aim as stated above has been achieved. However, a lot of difficulties were encountered in the process of realizing the project work, one of which is due to first timer syndrome but with advices from my supervisor and colleagues, most of it was conquered. Furthermore, the project work has enabled me to gain experience in electronic circuit designing and construction. Also, it has enabled me to understand properly how the different circuit element works.

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