



Use of Battery Operated Triggers for Anti-Personnel Landmines

¹Mr. Tejas Raut, ²Mr. Shirish Sawant, ³Mr. Siddhant Rathod, ⁴Mr. Saurav Jagtap, ⁵Prof. Gouri Kulkarni

^{1,2,3,4}UG Student PVGCOET, Pune 411009, India

⁵Project Guide, Professor, PVGCOET, Pune 411009, India

ABSTRACT

We Present a Battery Operated Trigger option for anti-Personnel mines Which can significantly reduce the problems faced by the currently used firing pin type of triggers such as collateral damage, civilian life loss, post War explosions, and Fatal Risk of life while Demining operations afterwards . This Type of device also offers close range solutions for coll Damage protection . This also allows for reuse of Landmines once their intended purpose is fulfilled .The presented solution is an open Source technology demonstrator.

Keywords: Battery operated Trigger , Anti-personnel landMines, Friend And Foe Identification

Introduction

Despite UN Regulations on Anti-personnel landmines their Use remains a common occurrence in modern warfare , this is mostly due to their cheap cost and effectiveness in deterring the enemy from using the mined land. But the currently used Trigger method (pressure based and mechanically operated) creates various problems with their Disposal After their intended purpose.

A lot of mines left from WW2 still cause fatalities in the areas where they were used. This has considerable impact on Civilian lives and also wastes fertile land which in turn can affect the food supply of the larger region. The mechanically operated detonator can also claim lives while various organizations try to remove the leftover landmines .

In order to overcome the shortcomings of the mechanically operated detonator , we present a Battery operated electronic Detonation Device/circuit which can also act as a smart trigger by differentiating between friend and foe . This electronic system will be battery operated and uses the same pressure plate mechanism as trigger signal , but instead of direct mechanical detonation it uses a small electronic circuit to detonate the explosive. this method has multiple benefits which include the following:

- 1) Control on Time the land mine remains armed.
- 2) Detection of Friend and Foe (Additional and optional)
- 3) With Small upgradation and few extra Parts, this system can create a Programmable mine field.
- 4) Cheaper in the long Run.
- 5) Reusability
- 6) Safety

Proposed Methodology

After Studying Numerous Research Papers , Websites and other Sources for the ill effects of LandMines. It becomes quite clear that the various restrictions and resolutions on the use of landmines are of little effect. This is mostly because every state and non-state actor mostly considers short term gains over long term effects . Militaries and militias have little consideration of environmental and post war effects of Landmines, most parties in wars and Conflict are more concerned about economy, effectiveness, efficiency, and more importantly how deadly a Weapon is , Land mines unfortunately have very favorable scores in all of these parameters.

Considering the above Arguments , It's quite clear that complete abolition of Anti-Personnel Landmines is not possible in Warfare, thus it becomes necessary that We make the land mines itself more safer to use for civilians, Environment, Post War clean-up crews and the militaries Themselves. Keeping that in mind we are proposing the use of the Said Electronic Trigger Mechanism which will provide all the above stated benefits.

Our demonstrative System Uses a switch to mimic the role of the pressure plate , once the switch is pressed due to the applied pressure of someone stepping on it, the switch sends an electric signal to the Circuit which then sends the appropriate voltage and current signal to the detonator which will cause the land mine to explode. This is the Basic functionality of the electronic trigger.

The open source system we have made has an Additional but Very important Functionality of Identifying Friend or Foe , by using the Short Range RF Transmitter and Receiver. The transmitter is fitted on the shoes of friendly soldiers which continuously transmits a specific frequency once turned on using an onboard switch. The transmitter assembly is Powered by an On Board rechargeable battery .

The receiver circuit is Placed inside the Landmine and is powered by the on board battery itself. If the RF Receiver senses the specified Radio Frequency it temporarily Disarms the Trigger Switch Electronically, Thus if an Friendly soldier/Personnel steps on the landmine it doesn't explode saving Valuable Lives .

The size of the battery onboard the Landmine can be used to determine the time it stays Armed , Once the battery runs out of charge the onboard Electronic Trigger can't function and the landmine cannot be Triggered by the pressure plate. .During wartime , Once the calculated time for the Landmine's Armed state is over it can be removed safely , recharged and inducted in service right away Ensuring reusability which in turn reduces the Cost and logistical challenges . In post war scenarios the Battery Operated trigger mechanism poses little threat of explosion by pressure triggering and can be safely Removed And disposed of appropriately . The Use of Battery operated triggers also help the environment by not contaminating fertile land Post war.

Hardware

1 channel 5V 10A Relay Control Board Module With Optocoupler It can be used as a single chip module for appliance control and work with both DC or AC signals where you can control the 220V AC load. A wide range of microcontrollers such as Arduino, AVR, PIC, ARM and so on can control 1 channel 5V 10A Relay Control Board Module with Optocoupler.



2. Red PB5-11A 12MM2PIN Self-Locking Push Button

Push buttons can be explained as simple power controlling switches of a machine or appliance. These are generally metal or thermoplastic switches that are intended to grant easy access to the user. The idea of electric circuits is that the electricity should be able to flow uninterrupted through multiple wires and components. However, circuits that are always complete aren't as useful as the ones that work only when required.



3. Rocket Switch-KDC-30

The Rocker Switch-KDC-30, identified by MPN KDC-30, is a reliable and versatile component designed for diverse applications. Operating in a temperature range of -25°C to 85°C , it features a 250V rated voltage with options for 3A, 6A, and 15A rated current. The switch exhibits low contact resistance (≤ 0.02 ohm), high insulation resistance (≥ 100 Mohm), and can withstand 1500VAC. With a robust design, it ensures a long operational lifetime of 10,000 cycles, providing consistent performance in various electrical systems.



4. 10CM Female to Female Jumper Cable Mostly it is useful with Orange Pi, Banana Pi, Raspberry Pi, Arduino, and other mini pc and development board. It is very useful in the PCB project, pc motherboard, as well as Breadboard connections. Additionally, it allows you to plug and unplug easily for prototyping and can be used over and over again.



5. 3.7V 2600mAh Lithium-ion Battery

Lead acid batteries at 3.7 volts are versatile. They serve a wide array of devices, from small electric toys to robust electric forklifts. Their adaptability makes them suitable for electric bicycles, scooters, and even in electric power systems where consistent energy flow is crucial



6. Black PB5-11A 12MM2PIN Self-Locking Push Button

The Push-button switch is widely used as an operational unit in various electrical circuits, electrical devices, and machines in the home and industry. The switch can operate circuits, turning on and offloads such as contractors, engines, relays, and so on. It is a push ON release OFF type switch.



7. TP4056 Overcharge Protection module

This TP4056 1A Li-ion lithium Battery Charging Module With Current Protection – Type C is a tiny module, perfect for charging single cell 3.7V 1 Ah or higher lithium-ion (Li-Ion) cells such as 16550s that don't have their own protection circuit. Based on the TP4056 charger IC and DW01 battery protection IC this module will offer 1A charge current then cut off when finished.



8. 4CH RC remote control 27MHz circuit PCB transmitter & receiver board with antenna Radio system

The 4 Channel Wireless Four Button RF Remote Control Transmitter Receiver Module with NonLocking mode can be composed of a fixed code four radio receiver circuits, remote control of four four-bit data output code corresponding to the module, you can easily make up a wireless remote control receiver circuit.



Assembled System



Conclusion

The use of battery operated electronic detonation devices can significantly reduce various serious and many a times fatal consequences of using land mines. The presented device gives a demonstration of this method of triggering land mines. The device made also has a very important additional functionality, which is Friend and Foe identification . By identifying a friend or foe the system can reduce the collateral damage which is very important in wartimes. The device has successfully been lab tested and has given satisfactory results.

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