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LIGHT EMITTING SHOTGUN CARTRIDGE

Filed June 30, 1967

2 Sheets-Sheet 1

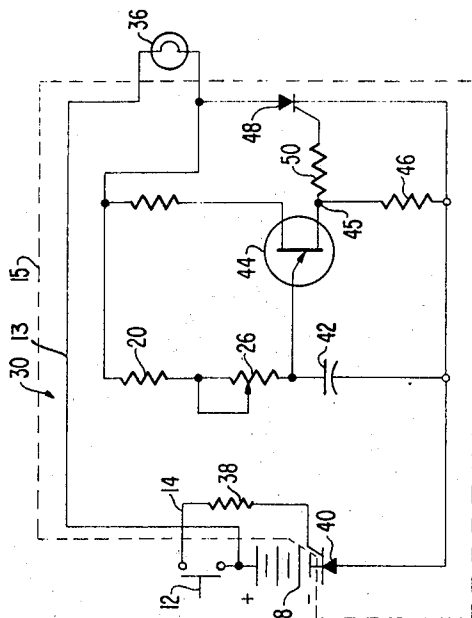


FIG. 1

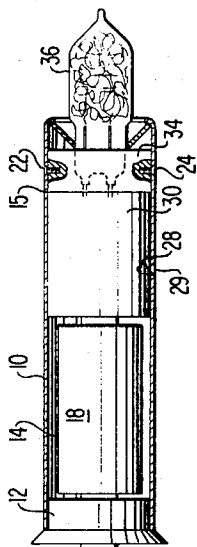


FIG. 2

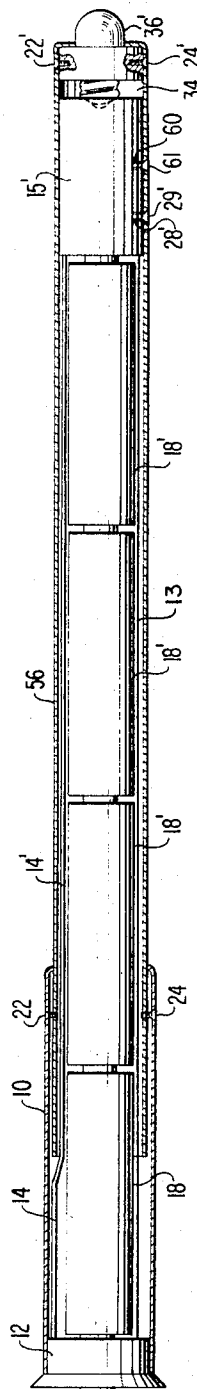


FIG. 3

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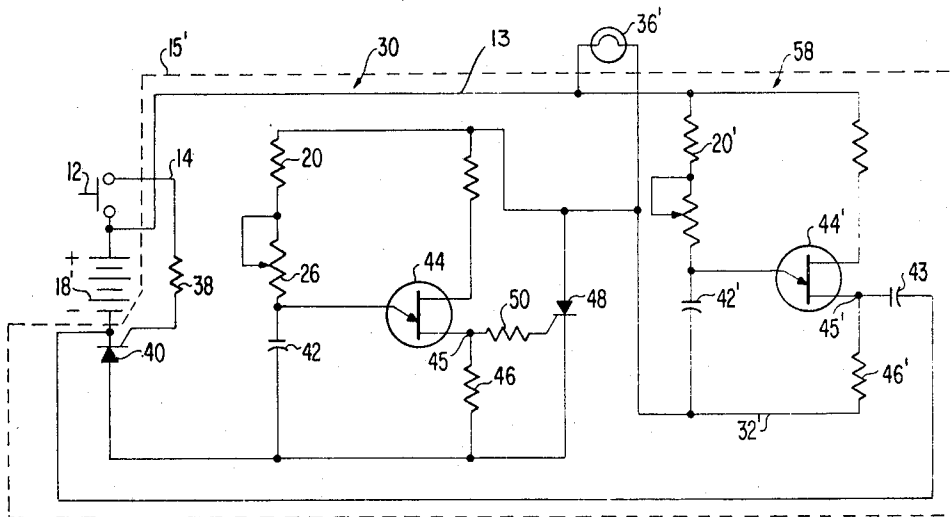
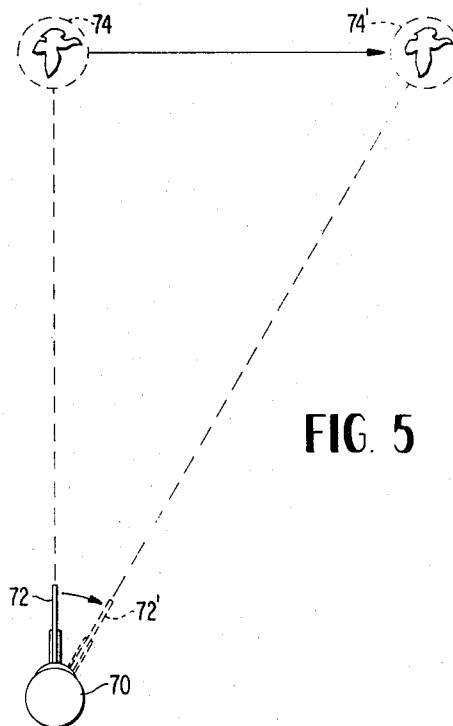


FIG. 4



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1

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8 Claims

ABSTRACT OF THE DISCLOSURE

A self-contained light emitting shotgun cartridge employing a time delay circuit. The cartridge has an adjustable resistor which controls the interval between closing of the firing pin actuated switch and emission of light from the cartridge contained bulb.

It is known in the prior art to utilize a self-contained light projecting dummy cartridge in a conventional weapon, such as a shotgun, to simulate target shooting. Cartridges of this type may be readily inserted into a conventional shotgun in the same manner as a normal projectile bearing cartridge without additional adapters or firearm modifications. Such a system provides a safe, accurate and economical method of target practice without the disadvantages of noise, recoil and powder fumes. The system may be used in the home, club or the like, and is highly desirable when employed to train people in the use of firearms.

The prior art cartridges do not simulate the actual projectile velocity and therefore cannot be used to practice shooting at moving targets. For example, under actual conditions of field shooting, if a shooter was 20 yards away from a bird and the bird was traveling at 100 feet per second, he would swing past the bird and pull the trigger just when he was passing the target and continue his follow-through. Due to the bird's speed of 100 feet per second, the shot charge velocity of, say, 900 feet per second, and the 20 yard range of the target, it would take about 0.067 second for the shot to reach the bird and at the same time, the bird would have traveled 6.7 feet. Therefore, in order to simulate the true projectile situation, the cartridge must simulate the projectile velocity so that a shooter must swing past the target, pull the trigger and follow through the swinging motion before a hit is indicated on the target.

Accurate simulation is provided in the present invention by including a delay means within the self-contained cartridge which delays the emission of light from the cartridge the amount of time it takes a projectile to travel the distance between the shotgun and the target.

The features and advantages of the present invention will be apparent from the following description by way of the accompanying drawings, in which:

FIGURE 1 is a schematic of the time delay circuit employed in the illuminating cartridge.

FIGURE 2 is a side view of the self-contained illuminating cartridge employing the delay circuit of FIGURE 1.

FIGURE 3 is a side elevation of the illuminating cartridge of FIGURE 2 adapted for short range target shooting.

FIGURE 4 is a schematic of the time delay circuit of FIGURE 1 provided with additional delay circuitry for use in the short range light shot of FIGURE 3.

FIGURE 5 is a diagram illustrating the point of trigger pull and delayed light flash.

As seen in FIGURE 2, the light shot consists of a cylindrical shell casing 10 of a diameter suitable for insertion into the breech of a conventional shotgun. At the rear of the shell casing 10 is a firing pin actuated switch 12 which is a commercially available normally open push

2

button type switch having a built-in overtravel. The small diameter push button extends outwardly from the rear of the casing 10 and is generally similar in geometrical configuration to that of the conventional primer cap of a projectile bearing cartridge. One terminal of the firing pin switch 12 is in electrical contact with the positive terminal of the cartridge contained battery 18. Forwardly of the battery 18, the casing 10 houses a time delay means 30 and a lamp socket 34. The time delay means 30 and lamp socket 34 are electrically interconnected and assembled together to form a single unit. The unit is then encapsulated to form a cylindrical module 15 which may be readily inserted into the casing 10 and secured thereto by screws 22 and 24. The firing pin switch 12 is electrically connected to the module 15 by a flat insulated wire 14 extending from the second terminal of the switch 12 and by conductor 13 indicated in FIGURES 1 and 4. Conductor 13 may take the form of a separate elongated wire as indicated in FIGURE 3 or conductor 13 may comprise the casing 10 itself when the casing is made of a conductive material. Other equivalent means of electrically connecting the switch 12 to the module 15 or 15' may, of course, be used. An aperture 28 in the shell casing 10 provides an opening to an adjustment screw 29 for adjustment of the delay circuit 30. Flashbulb 36 is removably supported in the casing 10 by the lamp socket 34 and extends forwardly thereof.

Upon pulling the trigger of the firearm, the hammer strikes the firing pin (not shown) resulting in a depression of the firing pin switch 12. Referring to FIGURE 1, closure of the switch 12 applies a portion of the current from battery 18 through insulator wire 14 to a gate resistor 38 connected to the gate of a silicon controlled rectifier 40. This triggers the silicon controlled rectifier 40 causing it to conduct and connect the negative terminal of the battery 18 to the negative portion of the time delay circuit 30, one terminal of a capacitor 42, a resistor 46 connected to base terminal 45 of a unijunction transistor 44, and the cathode terminal of a second silicon controlled rectifier 48.

A charging current, which is not sufficient to illuminate flashbulb 36, flows through the flashbulb 36 and allows the voltage on the time delay circuit capacitor 42 to build up. When the voltage level builds up to the threshold level of the unijunction transistor 44, it conducts because of the lower emitter to base 45 resistance. This conduction generates a pulse through base leg 45 of transistor 44 which flows through the gate resistor 50, triggering a second silicon controlled rectifier 48 causing it to conduct. This conduction of silicon controlled rectifier 48 connects the low side of flashbulb 36 to the negative portion of the time delay circuit. Current then flows directly through the flashbulb 36 and silicon controlled rectifier 48 causing bulb 36 to emit one flash of light. After bulb illumination, the flashbulb acts as an open circuit and the silicon controlled rectifier 40 turns off automatically leaving the circuit in a reset condition.

The rate of charge of the capacitor 42 determines the time interval between closure of the firing pin switch 12 and illumination of the bulb 36. Adjustable resistor 26 in series with resistor 20 serves to control the rate of charge of capacitor 42. This rate of charge may be readily controlled by the adjustable resistor 26. This allows the adjustment of the time delay so that varying range and target velocity conditions may be simulated with a high degree of accuracy.

In the preferred embodiment of the cartridge illustrated in FIGURE 2, the illuminating bulb is a single shot type flashbulb 36. However, a conventional light bulb may be readily used with dummy shotgun cartridges of the present invention.

The use of a conventional bulb is illustrated in a modified form of the invention of FIGURES 3 and 4. All parts of the cartridge shown in FIGURE 3 are identical to those of FIGURE 2 with the exception of the elongated cylindrical extension 56 secured to shell casing 10 by screws 22 and 24. The insulated wire 14 of shell casing 10 electrically connects with insulated wire 14' within the cylindrical extension 56 and makes connection with the module 15' in a manner generally similar to that discussed above with reference to FIGURE 2. The purpose of the cylindrical extension 56 is to accommodate additional batteries 18' for illuminating bulb 36'. The cylindrical extension 56 extends beyond the breech of the shotgun and into the barrel portion thereof. The use of a conventional illuminating bulb 36', as contrasted with a flash-type bulb, may be used many times although it has substantially lower illumination intensity. However, the modified embodiment is desirable for relatively short range target practice due to the enhanced economic feature of a reusable bulb.

This embodiment of the light shot functions in generally the same manner as discussed above with reference to FIGURE 2 up to the point where the second silicon controlled rectifier 48 is switched to the conducting stage. An additional delay circuit, generally indicated by reference numeral 58, is required when utilizing a conventional illuminating bulb in the time delay circuit 30 of FIGURE 1. This is due to the oscillating nature of time delay circuit 30. When capacitor 42 has drained sufficiently to turn off the transistor 44, the potential across resistor 46 will drop and the second silicon controlled rectifier 48 will be turned off. The current will then begin to flow through resistor 20 and adjustable resistor 26 and the capacitor 42 will begin to build up a second time until the transistor 44 is again switched on. This would then produce a second bulb illumination. In order to prevent multiple light emission from bulb 36' in response to a single closure of switch 12, the second delay circuit 58 is provided.

When the second silicon controlled rectifier 48 conducts, it causes the conventional bulb 36' to illuminate and also applies the negative portion of the battery 18 to the second delay circuit 58 along line 32' to one terminal of the capacitor 42', and one terminal of the resistor 46'. This allows a charging current to flow through resistors 20' and 26' causing a voltage to build up on capacitor 42' to the threshold level of the unijunction transistor 44'. When the threshold level is reached, the transistor 44' conducts because of the lowered emitter to base 45' resistance causing a pulse to be generated at the base terminal 45' of the transistor 44'. This pulse is coupled to the cathode of the silicon controlled rectifier 40 through a capacitor 43. This drives the silicon controlled rectifier 40 to the off position, thus extinguishing bulb 36' and resetting the complete circuit to its quiescent state ready for a repeated cycle.

In the delay circuit of FIGURE 1, the value of capacitor 42 determines the rate of drain of voltage therefrom when the unijunction transistor 44 is in the on state. When attempting to simulate the shot pattern from a shotgun, it is necessary to compensate for the depth of the pattern as the shot grouping tends to expand as it travels from the gun. For example, at a range of 20 yards, the shot depth, that is, the distance between the leading shot particle and the trailing shot particle, is about 5 times the diameter of the shot pattern, which is the lateral spread of the shot group. At this range, the pattern diameter is approximately 2 feet and thus, the depth of the pattern is approximately 10 feet. Therefore assuming a shot velocity of 900 feet per second, it would take approximately 0.011 second for the depth of the shot charge to travel by the target. When using a flash-type bulb, the on time of the bulb may be controlled by the proper selection of the bulb. However, when utilizing the conventional bulb 36' and the delay circuit illustrated in

FIGURE 4, adjustment of resistor 26' provides the proper duration of light emission to simulate the shot depth by controlling the rate of build-up on capacitor 42'. Aperture 28' and adjustment screw 29' are provided in the cylindrical extension 56 to adjust the variable resistor 26 to simulate the time delay, and aperture 60 and adjustment screw 61 are provided in the cylindrical extension 56 to adjust the variable resistor 26' of the additional delay circuit 58 to control the duration of illumination of the light bulb 36'.

FIGURE 5 diagrammatically illustrates the operation of the delay circuit to simulate shooting at a moving target. Assuming the shooter wishes to simulate shooting at a moving target which is traveling at a rate of 100 feet per second and at a range of 20 yards, and that the average shot charge velocity is 900 feet per second, the shooter could determine, such as by chart, graph or the like, the time it would take for the shot to reach the target and the distance the target would have moved during that time interval. He would then adjust the screw of the variable resistor 26 if he is using the long range light shot or variable resistor 26' if he is using the short range light shot, by inserting a screwdriver or the like through aperture 28 or 28' in the shell casing 10 or cylindrical extension 56, respectively, to set the delay circuit for a 0.067 second delay from the time of trigger pull to the time bulb illumination. In the case of the short range light shot, the shooter would also adjust the variable resistor 26' by inserting a screwdriver or the like through aperture 60 in cylindrical extension 56 to compensate for the shot depth. In order to simulate the target velocity, either a target moving at a velocity equal to the desired velocity could be used, or two stationary targets spaced apart a distance corresponding to the distance the target would have moved during the projectile time of flight, which in the example given would be 6.7 feet. As illustrated in FIGURE 5, shooter 70 aims gun 72 at target 74 and pulls the trigger. In the absence of a time delay means, an instantaneous recording of a hit would be registered on target 74 at this point. However, due to the time delay circuit the shooter 70 continues his follow-through, as indicated by the arrow of FIGURE 5, to the gun position 72', at which time the bulb is illuminated to indicate a hit on target 74'. Thus, if the shooter does not follow-through, or if his follow-through is incorrect, the time delay will accurately simulate a target miss and the shooter will be readily able to correct his mistake.

Various types of light-responsive targets well known in the art could be employed either as a moving or stationary target in conjunction with the self-contained illuminating cartridge of the present invention, and such targets constitute no part of the present invention.

While the invention has been particularly shown and described with reference to a preferred embodiment, it will be understood by those skilled in the art that various changes in form and details may be made without departing from the spirit and scope of the invention.

What is claimed is:

1. A dummy cartridge for use in a conventional shotgun having a trigger actuated firing pin comprising:

- a cartridge case having a front end and a rear end,
- a light emitting bulb in said front end,
- a normally open firing pin actuated switch in said rear end,
- an electric power supply means,
- electric delay means electrically interconnected with said bulb, said switch and said power supply means, said electric delay means being responsive to the closure of said switch to electrically connect said power supply means with said bulb for actuating said bulb a predetermined time after switch closure.

5

2. A cartridge as in claim 1 wherein said delay means is adjustable.

3. A cartridge as in claim 1 wherein said light emitting bulb is a one shot flashbulb.

4. A cartridge as in claim 1 wherein said light emitting bulb is removably mounted in a lamp socket, said socket being electrically connected to said time electric delay means and said switch.

5. A cartridge as in claim 4 wherein said lamp socket is secured to said electric time delay means to form a single unit, said unit being encapsulated in an insulating substance and secured within said cartridge case.

6. A cartridge as in claim 1 wherein said delay means comprises a first SCR, the cathode of said first SCR being connected to a negative terminal of said electric power supply means, the gate of said first SCR being connected to one terminal of said switch, the other terminal of said switch being connected to a positive terminal of said electric power supply means, said light bulb being connected in series with said combination of said positive terminal of said electric power supply means and said other switch terminal, a second SCR, the anode of said second SCR being connected in series with said bulb, the cathode of said second SCR being connected in series with the anode of said first SCR, and a unijunction transistor, a variable resistor and a capacitor, said variable resistor and said capacitor being in series and connected in parallel with said unijunction transistor, the junction of said capacitor and said variable resistor being connected to the emitter terminal of said unijunction transistor, said parallel combination of said unijunction transistor and said variable resistor and capacitor being in parallel with said second SCR, the gate of said second SCR being connected to one base of said unijunction transistor, said one base of said unijunction transistor being further connected to the anode of said first SCR, the other base of said unijunction transistor being connected

6

in series with said bulb and in parallel with the anode of said second SCR and in parallel with said variable resistor.

7. A cartridge as claimed in claim 6 wherein said delay means further comprises a second unijunction transistor, a second variable resistor, and a second capacitor, said second variable resistor and said second capacitor being in series and connected in parallel with said second unijunction transistor, the junction of said second capacitor and said second variable resistor being connected to the emitter of said second unijunction transistor, said parallel combination of said second unijunction transistor and second variable resistor and capacitor being in parallel with said bulb, and a third capacitor connected in series with one base of said second unijunction transistor and said anode of said first SCR, the other base of said second unijunction transistor being connected in series with said switch and a positive terminal of said electric power supply means and in parallel with said second variable resistor and said bulb.

8. A cartridge as in claim 6 wherein said bulb is a conventional reusable light bulb and second variable resistor controls the duration of illumination from said bulb.

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