

A Device

Field of the Invention

This invention relates to a device for remotely retracting a firing pin of a rope system
5 cable spiking tool.

Prior Art

All electrical cables with high voltage must be spiked before cutting. This is a standard
safety requirement. Spiking refers to puncturing a hole into the electrical cable to ensure
10 the cable is dead to prevent any electrocution.

Figure 1 illustrates a cable spiking tool 100 for spiking an electrical cable 150. The
cable spiking tool 100 comprises a base 110, a barrel 112 and a breech block 115. The
base 110 is used to clamp the cable spiking tool 100 onto the electrical cable 150. The
barrel 112 extends between the base 110 and the breech block 115. A piston assembly
15 resides within the barrel 112 with one end to receive the hammer pin from the striking latch
120 and the other end connected to the spiker for piercing an electrical cable 150. In order
to spike an electrical cable 150, the base 110 of the cable spiking tool 100 is clamped to
the electrical cable 150. Firstly, a bullet is inserted into the upper portion of the barrel 112.
Secondly, the breech block 115 is screwed firmly onto the barrel 112. Thirdly, the striking
20 latch 120 is pivoted to an almost upright position and thereafter inserting the firing pin 130
to hold it in the striking position. Lastly, the cable spiking tool can be fired by pulling the
firing pin 130 in a horizontal direction as shown by arrow 162. Once the firing pin 130 is
pulled out, the striking latch 120 moves about a pivot point such that the hammer pin on
the striking latch 120 strikes the percussion cap of the bullet which in turn, drives the spiker
25 onto the electrical cable and pierce it.

Electrical cables are usually laid in trenches between 1 meter to 8 meters deep,
there are also certain site conditions which do not allow further excavation to widen the

trenches due to space constraints and existing cable spiking tools can only be triggered by pulling the firing pin 130 horizontally from a locking position. As a result, these conditions pose challenges in triggering the cable spiking tool 100. One common method of pulling the firing pin 130 is by aligning the rope 140 attached to the firing pin 130 over a structure 160 such as a ladder or rod to act as an anchor point so that the rope 140 can be pulled in the direction as shown by arrow 161 from above the trench. However, this causes another risk that could lead to trip and fall. Thereby, accidental activation of the cable spiking tool 100 could happen due to tripping onto the rope 140 or collapse of the structure 160.

Therefore, those skilled in the art are striving to provide an improved cable spiking tool for spiking cables.

Summary of the Invention

The above and other problems are solved and an advance in the art is made by a device in accordance with this invention. A first advantage of the device in accordance with this invention is that the device includes an integrated safety latch to prevent accidental activation. A second advantage of the device in accordance with this invention is that the device includes one or more remote controls to create an interlock system on at least two different frequencies to prevent any frequency interference and accidental activation. A third advantage of the device in accordance with this invention is that the device can be implemented on existing cable spiking tools. With the advantages above, the device in accordance with this invention is able to retract the firing pin remotely and provide another additional safety mechanism to prevent accidental activation. This enhances safety and improves productivity.

A first aspect of the disclosure describes a device for retracting a firing pin from the rope system cable spiking tool. The device comprises: an adapter having an aperture for receiving a breech block of the rope system cable spiking tool; a safety latch extending from a top side of the adapter adaptable to block and unblock a path of the striking latch

of the rope system cable spiking tool; a firing pin puller having a retainer adaptable to grip one end of a firing pin of the cable spiking tool; one or more remotes configured to selectively transmit a first signal pattern and a second signal pattern; wherein each signal pattern is unique and a receiver configured to trigger the safety latch to unblock the path of the striking latch upon receiving the first signal pattern and subsequently trigger the firing pin puller to pull the firing pin away from the cable spiking tool upon receiving the second signal pattern.

In accordance with an embodiment of the first aspect, the safety latch comprises: a spring loaded latch bolt with an angled end such that the latch bolt retracts when the striking latch of the cable spiking tool engages the angled end of the latch bolt and thereafter extends back to the original position after the safety latch of the cable spiking tool moves past the angled end of the latch bolt which block the path of the striking latch of the cable spiking tool; and a first actuator coupled to the spring loaded latch bolt is configured to move the latch bolt to a retracted position such that the angled end of the latch bolt is hidden in the safety latch to unblock the path of the striking latch of the rope system cable spiking tool. In accordance with an embodiment of this embodiment, the safety latch is a solenoid latch.

In accordance with an embodiment of the first aspect, the firing pin puller comprises a retainer adapted to receive a firing pin; a connector coupled to the retainer; and a second actuator secured to the connector and configured to move the retainer together with the firing pin away from the rope system cable spiking tool. In accordance with an embodiment of this embodiment, the second actuator is a linear actuator.

In accordance with an embodiment of the first aspect, the receiver comprises: one or more readers; and a microprocessor operatively configured to: in response to receiving the first signal pattern, activate the first actuator to trigger the latch bolt to move to the retracted position; in response to receiving the second signal pattern, activate the second actuator to move the firing pin away from the rope system cable spiking tool.

In accordance with an embodiment of the first aspect, the first signal pattern comprises of a first signal, and the second signal pattern comprises of a second signal and a third signal continuously transmitted for a predetermined period of time where the second signal has the same frequency as but different amplitude from the first signal, and the third
5 signal has a different frequency from the first signal.

In accordance with an embodiment of the first aspect, the microprocessor is operatively configured to: in response to receiving another first signal pattern, activate the first actuator to trigger the latch bolt to move back to the extended position.

In accordance with an embodiment of the first aspect, the device further comprises
10 a retract button communicatively connected to the receiver and the microprocessor is operatively configured to activate the second actuator to move back to the retracted position in response to receiving a signal from the retract button.

A second aspect of the disclosure describes a method of using the device described above in relation to the first aspect. The method comprises: mounting the adapter onto a
15 breech block of the rope system cable spiking tool; pivoting the striking latch of the rope system cable spiking tool to an almost upright position such that the striking latch of the rope system cable spiking tool moves past the angled end of the latch bolt; inserting a firing pin into the retainer; supplying power to the device; triggering the one or more remote controllers to send the first signal pattern to a receiver to trigger the first actuator to move
20 the latch bolt to the retracted position; and triggering the one or more remote controllers to send the second signal pattern to the receiver to trigger the second actuator to move the firing pin puller to the extended position.

A third aspect of the disclosure describes a method of retracting a firing pin of a rope system cable spiking tool. The method comprises: mounting an adapter of a device
25 onto a breech block of the rope system cable spiking tool; pivoting a striking latch of the rope system cable spiking tool to an almost upright position such that the striking latch of the rope system cable spiking tool moves past an angled end of a latch bolt of a safety

latch of the device; inserting a firing pin into a through opening of a retainer of a firing pin puller of the device; supplying power to the device; triggering one or more remote controllers to send a first signal pattern to the receiver of the device, upon receiving the first signal pattern, the receiver triggers the first actuator of the device to move the latch bolt from an extended position to a retracted position such that the angled end of the latch bolt is hidden in the safety latch to unblock a path of the striking latch of the rope system cable spiking tool; and triggering one or more remote controllers to send a second signal pattern to the receiver, wherein in response to receiving the second signal pattern, the receiver triggers a second actuator to move the firing pin puller to an extended position and pulling the firing pin away from the rope system cable spiking tool.

In accordance with an embodiment of the third aspect, the receiver triggers the first actuator of the device to move the latch bolt from an extended position to a retracted position in response to receiving the first signal pattern comprising a first signal sent by pressing the first button of a first remote. The receiver also activates a buzzer in response to receiving the first signal pattern.

In accordance with an embodiment of the third aspect, the receiver triggers the second actuator to move the firing pin puller to an extended position in response to receiving the second signal pattern comprising a second signal and a third signal simultaneously and continuously transmitted for a predetermined period of time.

In accordance with an embodiment of the third aspect, the method further comprises triggering the one or more remote controllers to send another first signal pattern to the receiver of the device wherein in response to receiving the another first signal pattern, the receiver triggers the first actuator of the device to move the latch bolt back to the extended position.

In accordance with an embodiment of the third aspect, the method further comprises removing the firing pin from the retainer; and pressing a retract button to send a signal pattern to the receiver wherein in response to receiving the signal pattern from the

retract button, the controller triggers the second actuator to move back to the retracted position.

A fourth aspect of the disclosure describes a device for retracting a firing pin of a rope system cable spiking tool. The device comprises: an adapter configured to couple with
5 a breech block of the rope system cable spiking tool; a safety latch extending from a top side of the adapter adaptable to block and unblock a path of a striking latch of the rope system cable spiking tool; a firing pin puller adaptable to guide movement of a firing pin of the cable spiking tool; and a receiver configured to trigger the safety latch to unblock the path of the striking latch upon receiving a first signal pattern and subsequently trigger the
10 firing pin puller to pull the firing pin away from the cable spiking tool upon receiving a second signal pattern.

A fifth aspect of the disclosure describes a device for retracting a firing pin of a rope system cable spiking tool. The device comprises: an adapter configured to couple with a
15 breech block of the rope system cable spiking tool; a safety latch extending from a top side of the adapter adaptable to block and unblock a path of a striking latch of the rope system cable spiking tool; a firing pin puller adaptable to guide movement of a firing pin of the cable spiking tool; and a first reader configured to receive a first signal pattern from one or more remotes to trigger the safety latch to unblock or block the path of the striking latch upon
20 receiving the first signal pattern; and a second reader configured to receive a second signal pattern from one or more remotes to trigger the firing pin puller to pull the firing pin away from the cable spiking tool upon receiving the second signal pattern.

In accordance with an embodiment of any one of the first to fifth aspects, the first signal pattern comprises a first signal, and the second signal pattern comprises a second
25 signal and a third signal simultaneously and continuously transmitted for a predetermined period of time.

In accordance with an embodiment of any one of the first to fifth aspects, the first signal and second signal are generated by a first remote controller and the third signal is generated by a second remote controller.

In accordance with an embodiment of any one of the first to fifth aspects, the frequency of the first signal is at the same frequency of the second signal, the amplitude of first signal is different from the amplitude of the second signal and the frequency of the third signal is different from the frequency of the first and second signals.

Brief Description of the Drawings

The above and other features and advantages in accordance with this invention are described in the following detailed description and are shown in the following drawings:

Figure 1 illustrating an existing cable spiking tool;

Figure 2 illustrating a perspective view of the device where a firing pin puller is in a retracted position in accordance with an embodiment of this disclosure;

Figure 3 illustrating a perspective view of the device where the firing pin puller is in an extended position in accordance with an embodiment of this disclosure;

Figure 4 illustrating a front side view of the device in accordance with an embodiment of this disclosure;

Figure 5 illustrating a rear side view of the device where the firing pin puller is in the retracted and extended positions in accordance with an embodiment of this disclosure;

Figure 6 illustrating a bottom view of the device where the firing pin puller is in the retracted and extended positions in accordance with an embodiment of this disclosure;

Figure 7 illustrating a top view of the device where the firing pin puller is in the retracted and extended positions in accordance with an embodiment of this disclosure;

Figure 8 illustrating a left side view of the device in accordance with an embodiment of this disclosure;

Figure 9 illustrating a right side view of the device in accordance with an embodiment of this disclosure;

Figure 10 illustrating the firing pin puller in accordance with an embodiment of this disclosure;

5 Figure 11 illustrating a block diagram of a processing unit housed in the device in accordance with an embodiment of this disclosure;

Figure 12 illustrating a process flow to activate the device to retract the firing pin of an existing cable spiking tool in accordance with an embodiment of this disclosure;

Figure 13 illustrating a process flow performed by the main server in accordance
10 with an embodiment of this disclosure;

Figure 14 illustrating the mounting of the adapter to the breech block of the rope system cable spiking tool in accordance with an embodiment of this disclosure;

Figure 15 illustrating the pivoting of the striking latch of the rope system cable spiking tool in accordance with an embodiment of this disclosure;

15 Figure 16 illustrating the inserting of the firing pin into the rope system cable spiking
tool in accordance with an embodiment of this disclosure; and

Figure 17 illustrating the activating of the firing pin puller to pull the firing pin away from the cable spiking tool upon receiving the second and third signals in accordance with an embodiment of this disclosure.

20 Detailed Description

This invention relates to a device for remotely retracting a firing pin of a cable spiking tool.

It is envisioned that a device in accordance with embodiments of this invention may be used for remotely retracting the firing pin of an existing cable spiking tool in a safe and orderly manner. Presently, there are various existing cable spiking tools for spiking cables. In some cable spiking tools, a complete spiking set with a wireless system may be provided. However, such complete spiking set with a wireless system performs spiking of cable

differently from existing cable spiking tools. For example, firing pin and striking latch are not provided in such complete spiking set with a wireless system as the spiker is activated to puncture the cable directly by the wireless system. Differently, the device in accordance with this disclosure is an accessory that can be mounted onto an existing cable spiking tool such as a rope system cable spike gun. Some examples of rope system cable spike gun include “MP-213 Blade and Cartridge Cable Spiking Kit” from CATU; “Spike Tool” from Spike Tool Inc.; and “Schermer Cable Spiking Gun” from Verotest. As a result, the device in accordance with this disclosure allows retracting the spike gun pin remotely and without the rope. Furthermore, a safety latch is provided to prevent accidental activation.

Figures 2-9 illustrate various views of the device 200 for remotely retracting the safety latch and the firing pin of an existing rope system cable spiking tool in accordance with this invention. Specifically, figure 2 illustrates a perspective view of the device 200 with the firing pin puller 213 of the housing 210 in retracted position; figure 3 illustrates a perspective view of the housing 210 with the firing pin puller 213 in extended position; figure 4 illustrates a front side view of the housing 210 with the firing pin puller 213 in extended position; top of figure 5 illustrates a rear side view of the housing 210 with the firing pin puller 213 in retracted position; bottom of figure 5 illustrates a rear side view of the housing 210 with the firing pin puller 213 in extended position; top of figure 6 illustrates a bottom view of the housing 210 with the firing pin puller 213 in retracted position; bottom of figure 6 illustrates a bottom view of the housing 210 with the firing pin puller 213 in extended position; top of figure 7 top view of the housing 210 with the firing pin puller 213 in retracted position; bottom of figure 7 illustrates a top view of the housing 210 with the firing pin puller 213 in extended position; figure 8 illustrates a left side view of the housing 210; and figure 9 illustrates a right side view of the housing 210.

The device 200 includes a housing 210, a first remote controller 220, a second remote controller 230 and a receiver 900.

The housing 210 includes an adapter 211, a safety latch 212, a firing pin puller 213, a battery indicator 214, a retract button 215, and a buzzer 216. Optionally, a power switch 217 may be provided to switch on and off the device 200.

The adapter 211 has an aperture 211a extending from the top to the bottom of the adapter 211. The aperture 211a is shaped according to the breech block 115 and is adapted to receive the breech block 115.

While the figures 2-3 and 6-7 illustrate a cylindrical shape aperture 211a, one skilled in the art will recognise that other shapes may be provided without departing from the disclosure. More importantly, the aperture 211a is provided accordingly and adapted to receive the breech block 115. The safety latch 212 extends from a top of the adapter 211 and comprises a latch bolt 212a extending from a surface of the safety latch 212 and a first actuator 941 coupled to the latch bolt 212a. The latch bolt 212a is spring loaded with an angled end. The latch bolt 212a is arranged on the safety latch 212 such that the latch bolt 212a retracts when the striking latch 120 of the cable spiking tool 100 engages the angled end of the latch bolt 212a and extends back to original position after the striking latch 120 of the cable spiking tool moves past the angled end of the latch bolt 212a. The latch bolt 212a is connected to a first actuator 941 configured to move the latch bolt 212a to a retracted position such that the angled end of the latch bolt 212a is within the surface of the safety latch 212 to allow the striking latch 120 to be moveable between the striking position and back to original position. In one embodiment, the latch bolt 212a and first actuator 941 may be replaced with a solenoid latch. Essentially, the safety latch 212 is configured to block and unblock a path of a striking latch 120 of the cable spiking tool.

The firing pin puller 213 has a retainer 213a adapted to receive the firing pin 130, and it is coupled to a second actuator 942 at connector 213b. As shown in figure 10, the retainer 213a is adaptable to grip one end of a firing pin 130 of the cable spiking tool 100. More specifically, the retainer 213a is provided at one end of the firing pin puller 213 defining a through opening 2131 with a dimension that allows the rod of the firing pin 130

to be inserted and but prevents the head of the firing pin 130 from moving through. The retainer 213a is coupled to the second actuator 942 via the connector 213b to move the firing pin puller 213 to an extended position where the retainer 213a together with the firing pin 130 move away from the cable spiking tool as shown in figure 3. Subsequent activation
5 of the second actuator 942 moves the firing pin puller 213 back to the retracted position as shown in figure 2. The second actuator 942 is a linear actuator. One skilled in the art will recognise that other types of actuator may be provided without departing from the disclosure and the main purpose of the second actuator is to pull the firing pin away from the cable spiking tool to spike a cable.

10 The battery indicator 214 is provided on a surface of the adapter 211 to indicate the remaining power left in the power source. The battery indicator 214 may be an LCD or LED screen providing the reading of the battery based on percentage or based on colour coded range. Preferably, the battery is at least 50% charged before the device 200 can be used.

A power connector 218 is provided on a rear of the adapter 211 to allow a user to
15 power up the device 200. The device 200 may be switched on by manually connecting the cable from the power source 990 to the device 200. Optionally, a power switch 217 may be provided to switch on and off the device 200 in addition to connecting the power connector 218 to the power source 990.

A buzzer 216 is provided to sound an alarm to warn that the housing 210 is armed
20 and ready to fire. The buzzer 216 may be a 12-voltage buzzer. However, one skilled in the art will recognise that other types of buzzers can be implemented without departing from the disclosure.

The housing 210 can be manufactured using a 3D printer, injection moulding, etc. Parts of the device 200 may be provided separately and hence can be easily replaced.
25 Preferably, the material for manufacturing the housing 210 has high ultra violet (UV) resistance and is a robust material.

The housing 210 further includes a communication device to allow receiving of signals from the first and second remote controllers 220 and 230 over a wireless connection. The communication device comprises a dual channel wireless module and a single channel wireless module.

5 Figure 11 shows the block diagram of the receiver 900 of the device 200. The receiver 900 is housed within the housing 210. The receiver 900 comprises a processor 910, memory 920, wireless communication device 930, and input/output ports 940. The receiver 900 and the devices connected to the receiver 900 are powered by a power supply 990.

10 The processor 910 is a processor, microprocessor, microcontroller, application specific integrated circuit, digital signal processor (DSP), programmable logic circuit, or other data processing device that executes instructions to perform the processes in accordance with the present invention. The processor 910 has the capability to execute various applications that are stored in the memory 920.

15 The memory 920 may include read-only memory (ROM), random-access memory (RAM), electrically erasable programmable ROM (EEPROM), flash cards, or any storage medium.

Wireless communication device 930 connects processor 910 to an external device such as the first and second remote controllers 220 and 230. The wireless communication
20 device 930 uses wireless communication means to receive signals from the first and second remote controllers 220 and 230. Specifically the wireless communication device 930 is a radio frequency reader. In one embodiment, the wireless communication device 930 comprises two radio frequency readers where each radio frequency reader is configured to read a specific frequency range. For example, the first frequency reader is
25 configured to read the signal at a frequency of 315MHz from the first remote 220 and the second frequency reader is configured to read the signal at a frequency of 433MHz from the second remote 230. In this embodiment, one or more remotes are configured to

selectively transmit a first signal pattern and thereafter a second signal pattern, where each signal pattern is unique. Upon receiving the first signal pattern, the wireless communication device 930 triggers the safety latch to unblock the path of the striking latch and subsequently triggers the firing pin puller to pull the firing pin away from the cable spiking tool upon receiving the second signal pattern. In another embodiment, the wireless communication device 930 uses short range wireless network such as Bluetooth to communicate with an external device. In another embodiment, the wireless communication device 930 comprises a dual channel wireless module and a single channel wireless module. The dual channel wireless module is configured to read two signals at different frequencies namely, a second frequency and a third frequency. The single channel wireless module is configured to read one signal at a first frequency. In this embodiment, the single channel wireless module is configured to operate the safety latch while the dual channel wireless module is configured to operate the firing pin puller. Essentially, the two remote controllers are used to create an interlock system on at least two different frequencies to prevent any frequency interference. Specifically, the single channel wireless module is configured to receive the first frequency from the first remote controller 220 while the dual channel wireless module is configured to receive both the second and third frequencies from the first and second remote controllers. This ensures that the correct command is received by the receiver 900 to correctly activate either the safety latch receiver or the firing pin puller.

One or more input/output (I/O) ports 940 can be configured to allow the processor 910 to communicate with and control from various I/O devices. Peripheral devices that may be connected to communication interface of receiver 900 via the I/O ports 940 include a USB storage device, an SD card or other storage device for transmitting information to or receiving information from the communication interface of receiver 900. In addition to updating applications stored on memory 920 or installing new applications onto the memory via the wireless communication 930, a user may alternatively install new applications or

update applications on the memory 920 through a user interface such as a USB via the I/O ports 940. I/O ports 940 also include necessary connectors to connect to a plurality of devices to perform the processes in accordance with this disclosure. This includes the first actuator 941, the second actuator 942, buzzer 216 and retract button 215.

5 The first actuator 941 is configured to trigger the latch bolt 212a to move from the extended position to the retracted position. The second actuator 942 is configured to linearly move the firing pin puller 213 from the retracted position to the extended position to pull the firing pin away from the cable spiking tool. The retract button 215 is communicatively connected to the receiver 900 to trigger the processor 910 to activate the
10 second actuator 942 to move back to the retracted position.

 One skilled in the art will recognize that other features may be included in the receiver 900. Further, the components in receiver 900 may be replaced by other components that perform similar functions. In brief, the receiver 900 as shown in figure 11 is considered merely illustrative and non-limiting. Essentially, the receiver 900 is configured
15 to receive signals from two different sources to activate the first actuator 941 and second actuator 942 accordingly.

 The first and second remote controllers 220 and 230 are signal transmitters configured to transmit a first signal pattern and a second signal pattern. The first signal pattern comprises of a first signal and the second signal pattern comprises of a second
20 signal and a third signal. The first remote controller 220 is configured to transmit a first signal and second signal and the second remote controller 230 is configured to transmit a third signal. In one embodiment, the first and second remote controllers 220 and 230 are radio frequency transmitters, each configured to transmit at certain radio frequencies. Specifically, the first remote controller 220 may be configured to selectively transmit at
25 315MHz with a set of different amplitudes for the receiver to distinguish between the first signal and second signal, while the second remote controller 230 may be configured to transmit at 433MHz. In another embodiment, the first remote controller 220 has two buttons

for activating a radio frequency transmitter to transmit the first frequency and second frequency respectively and the second remote controller 230 has one button for activating a radio frequency transmitter to transmit the third frequency. In this embodiment, a user needs to press the first button of the first remote controller 220 to activate the safety latch
5 212 and subsequently pressing both the second button of the first remote controller 220 and the first button of the second remote controller 230 will activate the firing pin puller.

Figure 12 illustrates a process 1200 of a process flow for using the device 200. Process 1200 is performed after the cable spiking tool 100 is clamped to the electrical cable 150, a bullet is inserted into the upper portion of the barrel 112 and that the breech block
10 115 is screwed firmly onto the barrel 112. Prior to mounting the adapter 211 onto the breech block 115 of the cable spiking tool 100, it is advisable that the user check that the battery is at least 50% charged. It is also advisable that the user check the device 200 is in working condition. For example, a test run of the device 200 is performed to ensure that the device 200 is working properly. Process 1200 begins with step 1205 by mounting the adapter 211
15 onto the breech block 115 of the cable spiking tool as shown in figure 14. Particularly, the adapter 211 is lowered to the breech block 115 as shown by arrow 1410 as shown on the left of figure 14 and fitted into the breech block 115 as shown on the right of figure 14.

In step 1210, the striking latch 120 of the cable spiking tool 100 is pivoted to an almost upright position as shown by arrow 1510 in figure 15. Specifically, the striking latch
20 120 of the cable spiking tool 100 moves past the angled end of the latch bolt 212a as shown on the right of figure 15.

In step 1215, the firing pin 130 is inserted into the through opening of the retainer 213a as shown by arrow 1610 in figure 16 and into the aperture of the breech block to hold the striking latch 120 in the striking position. At this step, the device 200 has not been
25 switched on to ensure that the latch bolt 212a cannot be activated to move to the retracted position and the retainer 213a cannot be activated to move to the extended position.

In step 1218, power supply is supplied to the device 200. Specifically, the cable of the power source is connected to the receiver 900 via power connector 218. It is advisable that the user moves away from the device 200 to a safety distance. He or she also may have to ensure that no one is within the safety distance before activating the device 200 to spike the cable.

In step 1220, the first remote controller 220 is triggered to send a first signal to the receiver 900. In response to receiving the first signal, the receiver 900 triggers the first actuator 941 to move the latch bolt 212a from the extended position to the retracted position. The receiver 900 also activates the buzzer 216 to sound a warning alarm.

In step 1225, the first remote controller 220 and the second remote controller 230 are triggered to send the second signal and the third signal respectively to the receiver 900. In response to receiving both second and third signals, the receiver 900 triggers the second actuator 942 to move the firing pin puller 213 to the extended position pulling the firing pin away from the cable spiking tool as shown by arrow 1710 in figure 17. In turn, the striking latch 120 moves about the pivot point as shown by arrow 1720 in figure 17 such that the hammer pin on the striking latch 120 strikes the percussion cap of the bullet which in turn, drives the spiker onto the electrical cable and pierce it.

In step 1230, the first remote controller 220 is triggered to send the first signal to the receiver 900. In response to receiving the first signal, the controller triggers the first actuator 941 to move the latch bolt 212a back to the extended position.

In step 1235, the user removes the firing pin from the retainer 213a and presses the retract button to move the second actuator back to the retracted position. The user can now proceed to remove the cable spiking gun and the device 200.

Process 1200 ends after step 1235.

Figure 13 illustrates a process 1300 of a process flow performed by the receiver 900 according to an embodiment of this invention upon powering up of the receiver 900. Process 1300 begins with step 1305 by receiving a first signal. The first signal is a signal

triggered by the first button of the first remote controller 220. If the first signal is not received, process 1300 repeats step 1305. If the first signal is received, process 1300 proceeds to step 1310 to actuate the first actuator 941 to move the latch bolt 212a from the extended position to the retracted position. The receiver 900 also activates the buzzer 216 to sound
5 a warning alarm.

In step 1315, process 1300 receives the second and third signals. If both second and third signals are not received, process 1300 repeats step 1315. The second and third signals are signals triggered by the second button of the first remote controller 220 and the first button of the second remote controller 230. If the second and third signals are received,
10 process 1300 proceeds to step 1320 to actuate the second actuator 942 to move the firing pin puller 213 to the extended position to pull the firing pin away from the cable spiking tool. In one embodiment, process 1300 proceeds to step 1320 only after receiving the second and third signals continuously for a predetermined period of time. This is to ensure that second and third signals are not accidentally triggered by a user. One skilled in the art will
15 recognise that other sequences of signals may be used to trigger the second actuator without departing from the disclosure. For example, the sequence of signal may be in the order of first receiving the second signal and subsequently the third signal. Further, while three signals are illustrated in process 1300, one skilled in the art will recognise that the first signal and third signal may be the same frequency while the second signal is a
20 frequency different from the first and third signals.

In step 1325, process 1300 actuates the first actuator 941 back to the extended position in response to receiving another first signal from the first button of the first remote controller 220.

Process 1300 ends after step 1325. In processes 1200 and 1300, the first signal is
25 generated by the first remote controller 220 in response to a trigger by the first button of the first remote controller 220; the second signal is generated by the first remote controller 220 in response to a trigger by the second button of the first remote controller 220; and the

third signal is generated by the second remote controller 230 in response to a trigger by the first button of the second remote controller 230. In this regard, one skilled in the art will recognise that the first, second and third signals can be used interchangeably among the first and second remote controllers 220 and 230 without departing from the disclosure. For example, the first signal may be generated by the second remote controller 230 in response to a trigger by the first button of the second remote controller 230; the second signal is generated by the first remote controller 220 in response to a trigger by the first button of the first remote controller 220; and the third signal is generated by the first remote controller 220 in response to a trigger by the second button of the first remote controller 220. More importantly, the device uses three different signals to ensure the correct command is received by the receiver 900 to correctly activate the device to retract the latch bolt and pull the firing pin. One skilled in the art will also recognise that it is possible to implement two different signals instead of three different signals to achieve this result. For example, transmitting of only one signal activates the device to retract the latch bolt and subsequent transmitting of another different signal activates the device to pull the firing pin. Furthermore, each of the signals may differ based on frequency. Alternatively, the frequency of all signals may be identical but with different amplitudes.

While the above describes the use of two separate remote controllers for sending a first signal pattern and a second signal pattern, wherein each signal pattern is unique, it is possible that only one remote controller be implemented such that the first and second buttons (as provided in the first remote controller 220) are spaced apart from the third button (as provided in the second remote controller 230).

The above is a description of exemplary embodiments of a device in accordance with this disclosure. It is foreseeable that those skilled in the art can and will design alternative devices based on this disclosure.

The applications of the present disclosure shall not be limited to remotely pulling a firing pin of a spiking tool and shall be extended to other applications where a linear movement is remotely controlled.

Claims

1. A device for retracting a firing pin of a rope system cable spiking tool comprising:

an adapter having an aperture for receiving a breech block of the rope system cable spiking tool;

a safety latch extending from a top side of the adapter adaptable to block and unblock a path of a striking latch of the rope system cable spiking tool;

a firing pin puller having a retainer adaptable to grip one end of a firing pin of the cable spiking tool;

one or more remote controllers configured to selectively transmit a first signal pattern and a second signal pattern, wherein the first signal pattern is different from the second signal pattern; and

a receiver configured to trigger the safety latch to unblock the path of the striking latch upon receiving the first signal pattern and subsequently trigger the firing pin puller to pull the firing pin away from the cable spiking tool upon receiving the second signal pattern.

2. The device according to claim 1 wherein the safety latch comprises:

a spring loaded latch bolt with an angled end such that the latch bolt retracts when the striking latch of the cable spiking tool engages the angled end of the latch bolt and extends back to original position after the striking latch of the cable spiking tool moves past the angled end of the latch bolt blocking the path of the striking latch of the cable spiking tool; and

a first actuator coupled to the spring loaded latch bolt and configured to move the latch bolt to a retracted position such that the angled end of the latch bolt is hidden in the safety latch to unblock the path of the striking latch of the rope system cable spiking tool.

3. The device according to claim 2 wherein the safety latch is a solenoid latch.

4. The device according to claim 2 wherein the firing pin puller comprises:

a retainer adapted to receive a firing pin;

a connector coupled to the retainer; and

5 a second actuator secured to the connector and configured to move the retainer together with the firing pin away from the rope system cable spiking tool.

5. The device according to claim 4 wherein the second actuator is a linear actuator.

10 6. The device according to claim 4 wherein the receiver comprises:

one or more signal readers; and

a microprocessor operatively configured to:

in response to receiving the first signal pattern, activate the first actuator to trigger the latch bolt to move to the retracted position; and

15 in response to receiving the second signal pattern, activate the second actuator to move the firing pin away from the rope system cable spiking tool.

7. The device according to claim 6 wherein the first signal pattern comprises of a first signal, and the second signal pattern comprises of a second signal and a third signal
20 simultaneously and continuously transmitted for a predetermined period of time.

8. The device according to claim 6 wherein the microprocessor is operatively configured to:

in response to receiving another first signal pattern, activate the first actuator to
25 trigger the latch bolt to move back to the extended position.

9. The device according to claim 8 further comprises a retract button communicatively connected to the receiver and the microprocessor is operatively configured to activate the second actuator to move back to the retracted position in response to receiving a signal from the retract button.

5

10. A method of using the device according to any one of claims 4-9 for retracting a firing pin of a rope system cable spiking tool comprising:

mounting the adapter onto a breech block of the rope system cable spiking tool;

pivoting the striking latch of the rope system cable spiking tool to an almost upright

10 position such that the striking latch of the rope system cable spiking tool moves past the angled end of the latch bolt;

inserting a firing pin into the retainer;

supplying power to the device;

triggering the one or more remote controllers to send the first signal pattern to a

15 receiver to trigger the first actuator to move the latch bolt to the retracted position; and

triggering the one or more remote controllers to send the second signal pattern to the receiver to trigger the second actuator to move the firing pin puller to the extended position.

20 11. A method of retracting a firing pin of a rope system cable spiking tool comprising:

mounting an adapter of a device onto a breech block of the rope system cable spiking tool;

pivoting a striking latch of the rope system cable spiking tool to an almost upright position such that the striking latch of the rope system cable spiking tool moves past an

25 angled end of a latch bolt of a safety latch of the device;

inserting a firing pin into a through opening of a retainer of a firing pin puller of the device;

supplying power to the device;

triggering one or more remote controllers to send a first signal pattern to a receiver of the device wherein in response to receiving the first signal pattern, the receiver triggers a first actuator of the device to move the latch bolt from an extended position to a retracted position such that the angled end of the latch bolt is hidden in the safety latch to unblock a path of the striking latch of the rope system cable spiking tool; and

triggering the one or more remote controllers to send a second signal pattern to the receiver wherein in response to receiving the second signal pattern, the receiver triggers a second actuator to move the firing pin puller to an extended position pulling the firing pin away from the rope system cable spiking tool.

12. The method according to claim 11 wherein the receiver activates a buzzer in response to receiving the first signal pattern.

13. The method according to claim 11 wherein the receiver triggers the first actuator to move the latch bolt to the retracted position in response to receiving the first signal pattern comprising of a first signal, and the receiver triggers the second actuator to move the firing pin puller to an extended position in response to receiving the second signal pattern comprising of a second signal and a third signal simultaneously and continuously transmitted for a predetermined period of time.

14. The method according to claim 11 further comprising:

triggering the one or more remote controllers to send another first signal pattern to the receiver of the device wherein in response to receiving the another first signal pattern, the receiver triggers the first actuator of the device to move the latch bolt back to the extended position.

15. The method according to claim 14 further comprising:
removing the firing pin from the retainer; and
pressing a retract button to send a signal pattern to the receiver wherein in response to receiving the signal pattern from the retract button, the receiver triggers the second
5 actuator to move back to the retracted position.

16. A device for retracting a firing pin of a rope system cable spiking tool comprising:
an adapter configured to couple with a breech block of the rope system cable
spiking tool;

10 a safety latch extending from a top side of the adapter adaptable to block and
unblock a path of a striking latch of the rope system cable spiking tool;

a firing pin puller adaptable to guide movement of a firing pin of the cable spiking
tool; and

a receiver configured to trigger the safety latch to unblock the path of the striking
15 latch upon receiving a first signal pattern and subsequently trigger the firing pin puller to
pull the firing pin away from the cable spiking tool upon receiving a second signal pattern.

17. A device for retracting a firing pin of a rope system cable spiking tool comprising:
an adapter configured to couple with a breech block of the rope system cable
20 spiking tool;

a safety latch extending from a top side of the adapter adaptable to block and
unblock a path of a striking latch of the rope system cable spiking tool;

a firing pin puller adaptable to guide movement of a firing pin of the cable spiking
tool;

25 a first reader configured to receive a first signal pattern from one or more remote
controllers to trigger the safety latch to unblock or block the path of the striking latch upon
receiving the first signal pattern; and

a second reader configured to receive a second signal pattern from one or more remote controllers to trigger the firing pin puller to pull the firing pin away from the cable spiking tool upon receiving the second signal pattern.

5 18. The device according to any one of claims 1, 11, 16 or 17, wherein the first signal pattern comprises a first signal, and the second signal pattern comprises a second signal and a third signal simultaneously and continuously transmitted for a predetermined period of time.

10 19. The device according to claim 18, wherein the first signal and second signal are generated by a first remote controller and the third signal is generated by a second remote controller.

20. The device according to claim 18, wherein the frequency of the first signal is the
15 same as the frequency of the second signal, the amplitude of first signal is different from the amplitude of the second signal and the frequency of the third signal is different from the frequency of the first and second signals.