

**TITLE: A training device and a system for a firearm weapon, a method for controlling the training device, and use of such device and system**

**Field of the invention**

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The present invention relates to a training device and a system for a firearm weapon. The weapon comprises a bolt assembly comprising a movable bolt configured to act on an ammunition round. The device comprises a blank bolt assembly configured to replace the bolt assembly of the weapon. The blank bolt assembly comprises a  
10 movable blank bolt, which movement is configured to be triggered by the weapon.

The present invention further relates to a method for controlling the training device, and use of the device and the system.

15 **Prior art and background of the invention**

In the realms of military and police operations, proficient weapon handling is a fundamental requirement. Systematic and continuous weapon skill training is a requirement both for recruits as well as for experienced personnel. In addition to  
20 regular training, drills may be conducted before challenging operations to ensure coordinated execution. Mastery of one's weapon, and the techniques used in its deployment, can spell the difference between success and failure in critical situations, potentially determining life and death outcomes.

25 Using the actual weapons that personnel carry daily is crucial for realistic and efficient training. Today blank ammunition is extensively used worldwide, posing significant environmental concerns. These rounds, typically composed of plastic and metal, take a prolonged period to decompose when left in nature, negatively impacting the environment. Moreover, their use results in harmful waste from powder  
30 charges. Using blanks indoors, like in buildings or airplanes, can pollute these environments and leave marks due to fouling. They also pose safety risks, including potential injuries from particles and heat, the risk of hearing impairment due to loud noises, and weapon damage from sediment build-up, leading to frequent cleaning needs. Furthermore, blank ammunition often jams, disrupting training exercises, and  
35 is costly.

While there are alternative solutions like replica weapons or gas-based weapons to simulate gun usage, they fall short in providing a realistic weapon-handling experience and even if precision hitting the target or target shooting is important so is also movement of the weapon and readiness before firing shoots.

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For military personnel, adept weapon handling can influence the outcome of an engagement with the enemy. Effective shots can suppress or eliminate threats, ensuring the safety of comrades and the accomplishment of the mission. For police officers, it can mean successfully neutralizing a threat without harm to innocent bystanders.

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Weapon training ensures that firearms and other equipment are handled safely, minimizing the risk of accidental discharges or other mishaps that could endanger the weapon bearer or others nearby.

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In high-stress situations, the ability to make split-second decisions is paramount. Proper training hones not just the physical aspects of weapon handling, but also the mental and emotional components, teaching individuals when to shoot and when to show restraint.

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Real-world situations are rarely as predictable as training scenarios. Adapting to unique terrains, lighting conditions, and unforeseen obstacles presents a constant challenge.

25 The pressure associated with wielding a firearm in a life-threatening situation is immense. Training must replicate this stress to prepare military and police personnel adequately.

Weaponry, equipment, and tactics are continually evolving. Ensuring that training keeps pace with these changes, while also being relevant and effective, is an ongoing challenge.

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Electronically operated training systems, which can be integrated into real weapons by replacing key components, offer a significantly enhanced realism in training.

35 Additionally, they may have the potential to provide live stream all positions and movements for the benefit of observers and instructors.

Such detailed information and data may be possible to record, store and live stream by utilizing the data processor and local data storage capacity already in place to control all functions in the electronic operated training system.

- 5 For weapon target shooting training and analysing pre-shot weapon movement, accelerometers, gyrocompasses, and other sensors are well-established technologies with a range of products available in the market. Modern systems not only monitor weapon motion using these technologies but also accurately detect the precise moment of firing with the same sensors. The moment of firing is identified by  
10 the sudden acceleration in the weapon, which occurs due to the explosion within the cartridge propelling the bullet.

### **Problem with prior art**

- 15 Existing systems perform effectively with live ammunition, capturing the distinct recoil movement throughout the gun. However, they are less reliable when applied to electronic simulated gun firing and training systems. Electronic simulated gun firing systems, such as E-blanks, produce synthetic recoil by rotating weights. As a result, the timing is not as precise as in a real gun and can vary between shots. While  
20 existing systems can be fine-tuned and calibrated to detect the subtler acceleration from the bolt movement in electronically operated weapons, they may also mistakenly identify various minor movements as shots.

### **Summary of the invention**

- 25 An object of the present invention is to provide an improved training device for a firearm weapon. In particular, an object of the invention is to provide a device and a system that enable a precise recording of a blank shot. A further object of the invention is to provide a device and a system that enable recording and control of a  
30 training session of a firearm weapon.

These objects are obtained by means of a training device for a firearm weapon, which weapon comprises a bolt assembly comprising a movable bolt configured to act on an ammunition round. The device comprises:

- 35 - a blank bolt assembly configured to replace the bolt assembly of the weapon, wherein the blank bolt assembly comprises a movable blank bolt, which movement is configured to be triggered by the weapon,

- a sensor arrangement comprising a blank bolt sensor unit configured to detect a movement of the blank bolt and a motion sensor configured to detect a position and orientation of the weapon,
  - a clock unit configured to produce time information,
  - 5 - a memory unit, and
  - a logic unit configured to receive information from the sensor arrangement and the clock unit,
- wherein the logic unit is configured upon receipt of the information on the event of the detected motion of the blank bolt to gather information into an information
- 10 package on the event comprising the position and orientation of the weapon together with time information from the clock unit, wherein the information package is configured to be stored in the memory unit.

The blank bolt assembly of the device is configured to replace the position of the bolt

15 assembly in the weapon. In live shooting scenarios, the bolt assembly of the firearm is the active component that is engaged by the triggering mechanism to enable firing.

The blank bolt assembly comprises the movable blank bolt that is part of the event of the blank shot. The blank bolt is to be understood as a movable member that is

20 configured to interact with and be triggered by the triggering mechanism of the weapon. Accordingly, the movable blank bolt may be of different shape and form as long as it is arranged movable within the blank bolt assembly.

The sensor arrangement comprises sensors of the device. The sensor arrangement

25 comprises a blank bolt sensor unit configured to detect a movement of the blank bolt. The sensor arrangement further comprise the motion sensor configured to continuously detect the position and the orientation of the weapon.

The information from the sensor arrangement is configured to be transferred to the

30 logic unit. The logic unit is further configured to receive information from the clock unit.

In the event of the movement of the blank bolt, corresponding to the event of a blank shot, the logic unit is configured to receive the information on the event of the

35 detected motion of the blank bolt. Upon receipt of the information on the event, the logic unit is prompted into gathering information into the information package relating to the event. The information package comprises information on the position and the

orientation of the weapon from the motion sensor together with time information from the clock unit. By means of the information package, a training session of the weapon is enabled to be supervised and analyzed.

- 5 By means of prompting the gathering of information into the information package based on the detected motion of the blank bolt, the information package is created in a precise and reliable manner. Furthermore, the information package is created in a simple manner without the need to analyze data in order to identify a specific characteristic corresponding to an event of a blank shot. Moreover, the risk of faulty  
10 detection of an event relating to a blank shot is reduced compared with prior art devices.

The blank bolt sensor unit is configured to detect the motion of the blank bolt. This may involve detecting a change in the position of the blank bolt from its initial  
15 position within the blank bolt assembly to a released position within the blank bolt. The initial position corresponds to the triggered state of the blank bolt, while the released position relates to a released state in which the blank bolt has moved or is in motion from its initial position.

- 20 The term 'blank shot' is to be understood as a form of training shot that, in contrast to a live shot, does not project a projectile, such as a bullet. The event of a blank shot relates to the release of the blank bolt from the triggered state to the released state. The blank shot may preferably be in the form of an 'electronic blank shot,' where no blank ammunition rounds are used.

25 The change in position may for example be detected by means of that the blank bolt sensor unit is a proximity sensor. Alternatively, the blank bolt sensor unit may be a limit switch, a photoelectric sensor, a magnetic sensor, an encoder sensor, a Hall Effect sensor, etcetera. The blank bolt sensor unit is configured to generate  
30 information on the event of the detected motion of the blank bolt that is configured to be received by the logic unit.

The motion sensor is for example an accelerometer, a gyroscope, magnetometer, an Inertial Measurement Unit (IMU), etcetera. The motion sensor is configured to  
35 generate information on the position and orientation of the weapon that is configured to be received by the logic unit.

Preferably, the motion sensor is configured to continuously provide information on the position and orientation of the weapon to the logic unit. This information may be stored in the memory unit. However, the gathering of information on the event into the information package by the logic unit is prompted by receipt of the information on the event of the detected motion of the blank bolt. This has the advantage of enabling the precise moment in which a user fires a blank shot to be recorded.

The memory unit is for example RAM, SRAM, DRAM, and etcetera. The memory unit may be employed for storing the information package as it is being compiled from data gathered by the sensor arrangement and the clock unit. Subsequently, the information package can be transferred to an external unit, such as a training information hub. Alternatively, the memory unit can store the information package for an extended period, like the duration of a training session, and after its completion, the information package is downloaded to an external unit, such as a training information hub.

It shall further be understood that the clock unit produces time information. The time information may be connected to an internal time reference of the device, such as a time reference of the logic unit. Alternatively, the time information is connected to an actual time reference at the location of the training session. It shall further be understood the clock unit does not necessarily need to be a separate unit. For example, the clock unit may be part of the logic unit, such as CPU. For example, the time information may be produced during the use of the logic unit.

According to an embodiment of the invention, the blank sensor unit is arranged at the blank bolt assembly. Preferably, the blank sensor unit is arranged in vicinity of the blank bolt. Alternatively, the blank sensor unit is arranged in engagement with the blank bolt.

According to an embodiment of the invention, the blank bolt assembly comprises a housing, and wherein the blank sensor unit, the clock unit, the memory unit and the logic unit are arranged within the housing. By containing the components used for gathering the information package within the housing of the blank bolt assembly, a compact device is provided, which enables the blank bolt assembly to easily and quickly replace the bolt assembly of the weapon for a training session.

According to an embodiment of the invention, the blank bolt assembly comprises a blank bolt displacement mechanism configured upon triggering by a triggering mechanism of the weapon to induce a movement of the blank bolt. The blank bolt displacement mechanism is for example a solenoid.

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According to an embodiment of the invention, the device comprises a training wireless transmitter device configured to transmit said information package to a wireless receiver device of a training information hub.

- 10 By means of the training wireless transmitter device, the information package gathered by the logic unit is configured to be transferred to an external unit in the form of the training information hub. The information package may be transferred as soon as the information package has been gathered, or alternatively the information package may be transferred to the information hub periodically during a training
- 15 session.

According to an embodiment of the invention, the training wireless transmitter device is a transceiver, wherein the training device and the training information hub are configured to transmit information between each other.

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By means of configuring the training wireless transmitter device as a transceiver, the device is configured to transmit the information package as well as receive information from the training information hub.

- 25 According to an embodiment of the invention, the device comprises a blank magazine, and wherein the sensor arrangement further comprises a blank magazine sensor unit configured to sense an engaged position of the magazine at the weapon in a further event, wherein the logic unit is configured upon receipt of the information on the further event to gather information into a further information package on the
- 30 further event comprising the position and orientation of the weapon together with time information from the clock unit, wherein said further information package is configured to be stored in the memory unit.

- 35 The blank magazine comprises the blank magazine sensor unit that is part of the sensor arrangement. The blank magazine sensor unit is configured to sense when the magazine is brought to the engaged position at the weapon. The information from the blank magazine sensor unit is configured to be transferred to the logic unit.

Upon receipt of the information from the blank magazine sensor unit, the logic unit is configured to gather the information into the further information package on the further event. The further information package comprises information from the motion sensor and the clock unit correspondingly to the information package relating to the movement of the blank bolt.

According to an embodiment of the invention, the blank magazine comprises a blank magazine logic unit and a blank magazine memory unit. In an alternative embodiment, the magazine logic unit is configured to gather the information from the sensor arrangement into the further information package.

According to an embodiment of the invention, the device comprises a blank buttstock comprising a recoil unit configured to be triggered to generate a perceptible beat indicating a blank shot, wherein the logic unit is configured, upon receipt of the information on the event of the detected motion of the blank bolt, to transmit control information that is configured to trigger the recoil unit to generate the perceptible beat.

The recoil unit is configured to generate an artificial recoil in the form of the perceptible beat. The recoil unit is configured to be initiated by the logic unit upon receipt of the information on the event of the detected motion of the blank bolt.

According to an embodiment of the invention, the blank buttstock comprises a blank buttstock logic unit and a blank buttstock memory unit. The blank buttstock logic unit may be used for processing further information that is stored in the blank buttstock memory unit.

According to an embodiment of the invention, the device comprises means for wireless communication between the logic unit and at least one of the blank bolt sensor unit, the blank magazine sensor unit and the blank buttstock. By means of enabling the wireless communication between the logic unit and other components of the device, the communication within the device is facilitated. It shall be understood that in an alternative embodiment the communication between the logic unit and at least one of the blank bolt sensor unit, the blank magazine sensor unit and the blank buttstock may be done wired or by means of the body of the weapon.

According to an embodiment of the invention, the logic unit is configured to generate or receive information on a simulated defect of the blank bolt assembly, and upon generation/receipt of information on the simulated defect be prompted to gather information into a defect mode information package.

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The simulated defect relates to a portion of the training session where the user is required to take certain action to restore the device. The simulated defect may be generated randomly in time or periodically. Alternatively, the simulated defect may be initiated in view receipt of information, such as from the training information hub.

10 Upon generation or receipt of information on the simulated defect by the logic unit, the logic unit will gather information into a designated type of information package in the form of the defect mode information package relating to a defect blank shot.

According to an embodiment of the invention, the logic unit is configured, upon  
15 generation/receipt of information on the simulated defect, not to transmit control information that triggers the recoil unit of the blank buttstock to generate the perceptible beat.

During the simulated defect, the weapon is in a simulated faulty mode and  
20 accordingly the perceptible beat corresponding to blank shots are not to be generated. Correspondingly, the logic unit is controlled such that the perceptible beat is not to be generated by the recoil unit in the simulated faulty mode.

According to an embodiment of the invention, the logic unit is configured to receive  
25 biometric information from the user of the device and upon receipt of the information on the event, the logic unit is configured to gather the biometric information into the information package.

By adding biometric information to the information package, valuable information on  
30 the training session may be detected when analyzing the data from the device.

The above object of the invention is further obtained by means of a system for a  
firearm weapon comprising a training device according to any of the above  
embodiments and a training information hub.

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According to an embodiment of the invention, the training information hub comprises a hub wireless receiver device configured to receive said information package

transmitted from the training wireless transmitter device. The training information hub is used for analyzing the data from one or more training sessions.

5 According to an embodiment of the invention, the hub wireless receiver device is a transceiver and the training wireless transmitter device is a transceiver, wherein the training device and the training information hub are configured to transmit information between each other.

10 According to an embodiment of the invention, the training information hub comprises a hub logic unit configured to process said information package such that the information of the information package is in a form that enables it to be graphically presented.

15 According to an embodiment of the invention, the training information hub is configured to generate information on a simulated defect of the blank bolt assembly, wherein the training information hub is configured to transmit information on the simulated defect to the logic unit of the training device, wherein the logic unit is configured so that, upon receipt of the information on the simulated defect, the logic unit is prompted to gather the information into a defect mode information package.

20 The information on the simulated defect of the blank bolt assembly is configured to be generated by the training information hub and is transmitted from the training information hub to the device. The information on the simulated defect may be generated randomly in time or on the instruction of a user of the training information hub.

25 The above object of the invention is further obtained by means of a method for controlling a training device according any of above embodiments. The method comprises:

- 30 - receiving information from the sensor arrangement and the clock unit,
- identifying receipt of information on an event of a detected motion of the blank bolt,
- upon identification of said event, gathering position and orientation of the weapon together with time information into an information package, and
- storing said information package.

35 The information package comprises information on the position and orientation of the weapon together with time information. The gathering of information into the

information package is prompted by the receipt of information on event of the blank bolt movement. Once the information package has been gathered, the information package is stored for subsequent being analyzed.

- 5 According to an embodiment of the invention, the method further comprises:  
- transferring said information package to a training information hub.

- According to an embodiment of the invention, the method further comprises  
- identifying receipt of information on a further event of an engaged position of the  
10 blank magazine,  
- upon identification of said further event, gathering position and orientation of the weapon together with time information into a further information package, and  
- storing said further information package.

- 15 According to an embodiment of the invention, the method further comprises  
- transferring said further information package to a training information hub.

- According to an embodiment of the invention, the method further comprises,  
- upon identification of the event, triggering the recoil unit to generate a perceptible  
20 beat indicating a blank shot.

- According to an embodiment of the invention, the method further comprises,  
- generating information on a simulated defect of the blank bolt,  
- identifying information on the simulated defect of the blank bolt, and  
25 - upon identification on the simulated defect of the blank bolt, marking the information package as a defect mode information package.

- In the simulated defect of the blank bolt, the user of the device is required to take certain action. The information during the simulated defect of the blank bolt is  
30 gathered in the defect mode information package.

- According to an embodiment of the invention, the method further comprises,  
- generating information on a simulated restored condition of the blank bolt,  
- identifying information on the simulated restored condition of the blank bolt,  
35 - upon identification on the simulated restored condition of the blank bolt, continuing gathering position and orientation of the weapon together with time information into the information package.

When the user is considered to have taken necessary action to restore the blank bolt, the information on a simulated restored condition of the blank bolt is generated and transmitted to the device. Thereafter, the ordinary operation of the device on gathering the information package is continued.

According to an embodiment of the invention, the method further comprises,  
- generating information on a simulated defect condition of the blank magazine,  
- identifying information on the simulated defect condition of the blank magazine,  
- upon identification on the simulated defect condition of the blank magazine,  
gathering position and orientation of the weapon together with time information into a defect mode further information package.

In the simulated defect of the blank magazine, the user of the device is required to take certain action. The information during the simulated defect of the blank magazine is gathered in the defect mode further information package.

According to an embodiment of the invention, the method further comprises,  
- generating information on a simulated restored condition of the blank magazine,  
- identifying information on the simulated restored condition of the blank magazine,  
- upon identification on the simulated restored condition of the blank magazine,  
continuing gathering position and orientation of the weapon together with time information into the further information package.

When the user is considered to have taken necessary action to restore the blank magazine, the information on a simulated restored condition of the blank magazine is generated and transmitted to the device. Thereafter, the ordinary operation of the device on gathering the further information package is continued.

According to an embodiment of the invention, the method comprises:  
- receiving biometric information from a user of the device, and  
- upon identification of the event, gathering the biometric information into the information package.

According to an embodiment of the invention, the method comprises:  
- receiving biometric information from a user, and

- upon identification of the further event, gathering the biometric information into the further information package.

The above object of the invention is further obtained by means of use of a training  
5 device for a firearm weapon according to any of above embodiments.

The above object of the invention is further obtained by means of use of a system for a firearm weapon according to any of above embodiments.

## 10 **Description of the figures**

Embodiments of the present invention will now be described, by way of example only, with reference to the following figures, wherein:

Figure 1a shows an example of recoil information used in prior art to determine the  
15 occurrence of a live shot,  
Figure 1b shows an example of a weapon movement before, during and after a shot, such as a blank shot,  
Figure 2 shows an example of a firearm weapon equipped with a bolt assembly,  
Figure 3 shows an example of the firearm weapon in fig. 2 together with the device  
20 according to an embodiment of the invention,  
Figure 4a shows an example of blank bolt assembly of the device alongside a triggering mechanism of the weapon, where the blank bolt assembly is in a triggered state,  
Figure 4b shows an example of the blank bolt assembly of the device in fig. 4a  
25 alongside the triggering mechanism of the weapon, where the blank bolt assembly is in a released state,  
Figure 5 shows an example of a blank magazine of the device according to an embodiment of the invention,  
Figure 6 shows an example of a blank buttstock of the device according to an  
30 embodiment of the invention,  
Figure 7 shows a schematic example of elements of the device and a system according to an embodiment of the invention,  
Figure 8 shows a schematic example of elements of a logic unit of the device and the system,  
35 Figure 9 shows an example of an information package on the event of the detected motion of the blank bolt.

**Description of preferred embodiments of the invention**

In fig. 1a is an example of graph presenting recoil information from a motion sensor used in prior art to determine the occurrence of a live shot. The graph shows sensor  
5 information in the x, y and z-axis versus time. The graph includes a large amount on information for determining a precise time of the shot.

In fig. 1b is an example of the movement of a firearm weapon during the event of a shot, for example a blank shot. As seen, it is important to determine a precise time of  
10 the shot for establishing the result of the blank shot.

In fig. 2 is an example of a firearm weapon 1 equipped with a bolt assembly 10a disclosed. The bolt assembly 10a is configured to fire live shots by means of a bolt.

15 In fig. 3 is an example of the firearm weapon 1 in fig. 2 prepared to be equipped with a device 5 according to an embodiment of the invention.

The device 5 comprises a blank bolt assembly 10 comprising a blank bolt 12, see also fig. 4a. The blank bolt assembly 10 is configured to replace the bolt assembly  
20 10a of the weapon 1 in fig. 2.

The device 5 further comprises a blank magazine 20 configured to be engaged at the weapon 1. The blank magazine 20 is configured to replace the magazine 20a of the weapon 1 in fig. 2.  
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The device 5 further comprises a blank buttstock 30 configured to be firmly attach at the end of the weapon 1. The blank buttstock 30 is configured to replace the buttstock 30a of the weapon 1 in fig. 2.

30 The weapon 1 in fig. 2 and 3 further comprises a triggering mechanism 32 for triggering a live shot as in fig.2 or a blank shot as in fig. 3.

In fig. 4 is an example of blank bolt assembly 10 of the device 5 disclosed in detail. The blank bolt assembly 10 is disclosed alongside the triggering mechanism 32 of  
35 the weapon 1. The blank bolt assembly 10 comprises the blank bolt 12 that is configured to be triggered by the triggering mechanism 32.

The blank bolt assembly 10 comprises a blank bolt displacement mechanism, such as a solenoid, for inducing the movement of the blank bolt 12 in the blank bolt assembly 10. The movement of the blank bolt 12 is configured by the triggering mechanism 32 in the same manner as when firing a live shot.

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The blank bolt assembly 10 further comprises a sensor arrangement 40 comprising a blank bolt sensor unit 42 configured to detect an event relating to the movement of the blank bolt 12. The blank bolt sensor unit 42 is for example a proximity sensor. In the disclosed embodiment the blank bolt sensor unit 42 is arranged in vicinity to arranged movement of the blank bolt 12.

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In fig. 4a, the blank bolt assembly 10 is in a triggered state, wherein the blank bolt 12 is in an initial position within the blank bolt assembly 10. Upon being triggered by the triggering mechanism 32, the blank bolt 12 is released such that it is set in motion by the blank bolt mechanism in respect to its initial position. In fig. 4a, the blank bolt sensor unit 42 do not sense the presence of the blank bolt 12.

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The sensor arrangement 40 further comprises a motion sensor 44 configured to detect a position and orientation of the weapon 1. The motion sensor 44 is for example a gyroscope, magnetometer, an Inertial Measurement Unit (IMU), etcetera.

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The device 1 further comprises a clock unit 46 configured produce time information. The device 1 further comprises a logic unit 48 and a memory unit 50. In a preferable embodiment of the invention the blank bolt sensor 42, the motion sensor 44, the clock unit 46, the logic unit 48 and a memory unit 50 are contained within a housing of the blank bolt assembly 10.

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The sensor arrangement 40 is configured to provide information from the blank bolt sensor unit 42 and motion sensor 44 to the logic unit 48. Furthermore, the clock unit 46 configured to provide time information to the logic unit 48. In an embodiment of the invention, the clock unit 46 is part of the logic unit 48.

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The logic unit 48 is configured, upon receipt of the information on the event of the detected motion of the blank bolt 12, to gather information from the sensor arrangement 40 and the clock unit 46 into an information package. The information package is configured to be stored by the memory unit 50.

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With reference to fig. 4b, the blank bolt assembly 10 alongside the triggering mechanism of the weapon 1 is disclosed in the released state. In the released state the blank bolt has been set into motion and is detected by the blank bolt sensor unit 42. In fig. 4b the blank bolt sensor unit 42 is in line with the blank bolt 12. Thereby,  
5 the blank bolt sensor unit 42 is configured to sense the presence of the blank bolt 12.

In fig. 5 is an example of the blank magazine 20 of the device 5 according to an embodiment of the invention disclosed.

10 The blank magazine 20 comprise a blank magazine sensor unit 52 that is part of the sensor arrangement 40. The blank magazine sensor unit 52 is configured to sense an engaged position of the blank magazine 20 at the weapon 1 in a further event.

The logic unit 48 of the blank bolt assembly 10 is configured to receive information  
15 on the further event from the blank magazine sensor unit 52. Upon receipt of the information on the further event, the logic unit 48 is configured to gather information into a further information package on the further event. The further information package comprises the position and orientation of the weapon 1 together with time information from the clock unit 46. The further information package is configured to  
20 be stored in the memory unit 50.

In an embodiment of the invention, the blank magazine 20 comprises a blank magazine logic unit 54 and a blank magazine memory unit 56. It shall be understood that the alternatively the blank magazine logic unit 54 may be used to gather  
25 information into the further information package. In the disclosed embodiment, the blank magazine 20 further comprises blank magazine energy storage 58.

In fig. 6 is an example of a blank buttstock 30 of the device 5 according to an embodiment of the invention disclosed.

30 The blank buttstock 30 comprises a recoil unit 60 configured to be triggered to generate a perceptible beat indicating a blank shot. When the logic unit 48 of the blank bolt assembly 10 receives information from the blank bolt sensor unit 42 on the event of the detected motion of the blank bolt 12, the logic unit 48 is configured to  
35 transmit control information to the recoil unit 60 such that recoil unit 60 is induced to generate the perceptible beat. In an embodiment of the invention, the blank buttstock

30 comprises a blank buttstock logic unit 62, a blank buttstock memory unit 64 and a blank buttstock energy storage 68.

5 In fig. 7 is a schematic example of elements of the device 5 and a system 100 according to an embodiment of the invention. The system 100 comprises the device 5 according to an embodiment of the invention and a training information hub 110 comprising a training information hub logic unit 120, see also fig. 8.

10 The training information hub 110 is configured to receive information from the device 5, such as the information package or the further information package. The training information hub 110 is also configured to send information to the device 5.

15 In fig. 8 is a schematic example of elements of a logic unit 48 of the device 5 and the training information hub logic unit 120 of the training information hub 110.

In fig. 9 is an example of an information package on the event of the detected motion of the blank bolt disclosed.

20 In the following is four training scenarios discussed in view of use of the device 5 and the system 100.

Training scenario i) – target shooting

25 Efficient target shooting training transcends merely pulling a trigger. True proficiency lies in mastering the minutiae, the subtle movements just milliseconds before a shot is taken. Electronic weapon simulation systems, augmented with advanced position and movement sensors, have ushered in a revolutionary method of achieving this mastery.

30 Electronic weapon simulation systems E-blanks, that is used in a real weapon can be used to recreate diverse scenarios ranging from a calm shooting range to high-stress combat situations. By utilizing high-definition visuals, sound effects, and even tactile feedback mechanisms like recoil simulation, they create an immersive training environment.

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One of the hallmarks of these systems is their ability to detect even the most minute movements of the weapon. Using a combination of accelerometers, gyroscopes, and other advanced sensors, they can track the subtlest shifts in position and orientation of the weapon in real-time.

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The milliseconds leading up to a shot are critical. Any unintended movement can offset aim and affect shot accuracy. By continuously monitoring the weapon's movement just before the shot, these systems offer insights into patterns that might be detrimental to accuracy. This includes twitching, overcompensation, or any

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instability due to breathing or muscle tension.

Upon taking a shot in the simulation, users receive immediate feedback. This can range from shot accuracy to data on weapon movement just before the shot. By understanding the correlation between their weapon's movement and the end result,

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shooters can refine their technique.

Based on the data collected, training can be tailored to address specific weaknesses. For instance, if a shooter consistently exhibits a slight dip in the weapon's orientation just before firing, exercises focusing on steadying the weapon

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can be recommended.

Over time, the system can plot a shooter's progress, showing improvements in stability, speed, and accuracy. This data-driven approach allows for setting benchmarks, challenging shooters to achieve and surpass them.

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Given the programmable nature of electronic systems, trainees can be exposed to myriad scenarios, targets, and conditions. Whether it's shooting at moving targets, adjusting for wind conditions in simulations, or practicing in simulated low-light conditions, the possibilities are vast.

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Apart from offering comprehensive training, electronic simulation systems provide a safe environment free from the risks associated with live ammunition. Moreover, they present an eco-friendly alternative, eliminating the waste associated with traditional blank shooting.

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In an era where precision and efficiency are paramount, electronic weapon simulation systems equipped with movement sensors offer unparalleled training

opportunities. By scrutinizing the tiny, often overlooked movements in the moments before a shot, they provide shooters with the insights needed to achieve true marksmanship excellence.

5 Training scenario ii) - misfire

Cartridge click (misfire), where a shot doesn't fire due to a fault in the weapon or cartridge, is a situation that regularly occurs when operating handheld weapons.

- 10 In real weapon engagements, such situations can be perilous, making it crucial to train individuals to respond appropriately and adhere to the correct procedure.

Electronic weapon training systems, such as E-blanks, are ideal for this type of training, offering a high degree of realism through sound effects and recoil simulation mechanisms.

- 15 The system can simulate a cartridge click (misfire) and the participant must then follow the correct misfire procedures as taught. Their actions are monitored and recorded by the electronic system.

- 20 Feedback from the training can encompass data such as the participant's reaction time to the misfire, the precision of their procedures, and other pertinent metrics. In light of this feedback, participants receive several chances to hone their misfire procedure skills until they achieve proficiency. The electronic shooting simulation system provides a secure setting for honing these abilities, devoid of the risks tied to live ammunition.

25 Training scenario iii) – weapon magazine change

- 30 Swiftly replacing an empty magazine with a full one is not just a basic manoeuvre but a pivotal weapon skill, especially in dynamic combat or defence scenarios. The ability to execute this action seamlessly could be the deciding factor between success and potential jeopardy. While it's challenging enough in a controlled environment, real-world situations often present unpredictable conditions. An operative might find themselves in complete darkness, navigating through a heavy downpour, battling blinding snowstorms, contending with the pervasive grit of a sandstorm, or facing any myriad of conceivable challenges. In these varied

conditions, fumbling with a magazine not only wastes precious seconds but can also jeopardize mission outcomes or even lives.

Electronic weapon training systems, like E-blanks, recognize the importance of this skill and are tailored to replicate these challenging scenarios. Beyond just simulating conditions, they offer real-time feedback mechanisms. By meticulously measuring the duration from when an empty magazine is ejected to when a new one is securely in place, these systems provide quantifiable data on the trainee's proficiency. This isn't merely a measurement of speed but of precision under pressure. Such granular insights mean that both the participant and the instructor are not left to subjective evaluations but have concrete metrics to review. Based on this feedback, targeted improvements can be suggested, ensuring that the training is not just repetitive but progressive and result-oriented.

Training scenario iv) – coordinated weapon handling skill among several users  
Coordinated weapon handling is paramount in ensuring team efficiency, safety, and overall combat effectiveness among soldiers, police or other armed groups. The nuances of these coordinated movements are not just in the larger tactical maneuvers, but also in the split-second actions preceding a shot. Electronic weapon simulation systems, complemented by precise position and movement sensors, offer an innovative solution to mastering this intricate dance of coordination.

Electronic weapon simulation systems like E-blanks, can craft complex team-based scenarios. This allows soldiers to experience a wide array of situations, from urban combat to open field engagements. Each soldier used their regular weapon equipped with the simulated system, allowing them to interact with the environment and each other in real-time.

By the advanced sensors, these systems capture even the slightest movement of a weapon just milliseconds before a simulated shot. This provides unparalleled insights into how a soldier's individual actions might influence, or be influenced by, their teammates' actions.

Understanding the individual's weapon handling in the context of the group allows for the analysis of team coordination. For instance, do all soldiers engage targets simultaneously? Or do some soldiers inadvertently cause distractions for others

through untimely movements? The system can pinpoint such moments, enabling the team to refine their coordinated efforts.

5 Post-exercise, teams can receive immediate feedback. The system can play back engagements, allowing soldiers and instructors to dissect every movement, shot, and decision. This iterative review accelerates learning and improvement.

10 Should the system identify consistent coordination challenges among the team, it can customize subsequent training sessions to focus on these areas. This ensures that training remains relevant and targeted.

Electronic simulations provide the realism without the associated risks, allowing soldiers to immerse themselves fully without reservations about safety.

15 Electronic systems offer the flexibility to scale from small team drills to large platoon-sized engagements. This adaptability ensures that soldiers are prepared for a wide range of scenarios, from covert operations to larger battlefield engagements.

20 Coordinated weapon handling among soldiers is an intricate ballet of precision, timing, and understanding. Electronic weapon simulation systems, enhanced by precise motion sensors, provide an effective and safe avenue for soldiers to perfect this coordination. By offering realistic scenarios, detailed feedback, and the ability to scrutinize every millisecond of action, they are setting the stage for a new era of military training excellence.

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It should be noted that the above-mentioned embodiments illustrate rather than limit the invention, and that those skilled in the art will be able to design many alternative embodiments without departing from the scope of the appended claims.

Claims

1. A training device (5) for a firearm weapon (1), which weapon (1) comprises a bolt assembly (10a) comprising a movable bolt configured to act on an ammunition round,  
5 wherein the device (5) comprises  
- a blank bolt assembly (10) configured to replace the bolt assembly (10a) of the weapon (1), wherein the blank bolt assembly (10) comprises a movable blank bolt (12), which movement is configured to be triggered by the weapon (1),  
10 - a sensor arrangement (40) comprising a blank bolt sensor unit (42) configured to detect a movement of the blank bolt (12) and a motion sensor (44) configured to detect a position and orientation of the weapon (1),  
15 - a clock unit (46) configured to produce time information,  
- a memory unit (50), and  
- a logic unit (48) configured to receive information from the sensor arrangement (40) and the clock unit (46),  
wherein the logic unit (48) is configured upon receipt of the information on the event of the detected motion of the blank bolt (12) to gather information  
20 into an information package on said event comprising the position and orientation of the weapon (1) together with time information from the clock unit (46), wherein said information package is configured to be stored in the memory unit (50).  
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2. The training device (5) according to claim 1, wherein the blank bolt sensor unit (42) is arranged at the blank bolt assembly (10).
3. The training device (5) according to any of claim 1 and 2, wherein the blank  
30 bolt assembly (10) comprises a housing, and wherein the blank bolt sensor unit (42), the clock unit (46), the memory unit (50) and the logic unit (48) are arranged within the housing.
4. The training device (5) according to any of the previous claims, wherein the  
35 device (5) comprises a training wireless transmitter device configured to transmit said information package to a wireless receiver device of a

training information hub (110).

- 5           5. The training device (5) according to claim 4, wherein the training wireless transmitter device is a transceiver, wherein the training device (5) and the training information hub(110) are configured to transmit information between each other.
- 10           6. The training device (5) according to any of the previous claims, wherein the device (5) comprises a blank magazine (20), and wherein the sensor arrangement (40) further comprises a blank magazine sensor unit (52) configured to sense an engaged position of the magazine at the weapon (1) in a further event, wherein the logic unit (48) is configured upon receipt of the information on the further event to gather information into a further information package on the further event comprising the position and orientation of the weapon (1) together with time information from the clock unit (46), wherein said further information package is configured to be stored in the memory unit (50).
- 15           7. The training device (5) according to claim 6, wherein the blank magazine (20) comprises a blank magazine logic unit (54) and a blank magazine memory unit (56).
- 20           8. The training device (5) according to any of the previous claims, wherein the device (5) comprises a blank buttstock (30) comprising a recoil unit (60) configured to be triggered to generate a perceptible beat indicating a blank shot, wherein the logic unit (48) is configured, upon receipt of the information on the event of the detected motion of the blank bolt (12), to transmit control information that is configured to trigger the recoil unit (60) to generate the perceptible beat.
- 25           9. The training device (5) according to claim 8, wherein the blank buttstock (30) comprises a blank buttstock logic unit (62) and a blank buttstock memory unit (64).
- 30           10. The training device (5) according to any of the previous claims, wherein the device (5) comprises means for wireless communication between the logic unit (48) and at least one of the blank bolt sensor unit (42), the blank
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magazine sensor unit (52) and the blank buttstock (30).

- 5 11. The training device (5) according to any of the previous claims, wherein the logic unit (48) is configured to generate or receive information on a simulated defect of the blank bolt assembly (10), and upon generation/receipt of information on the simulated defect be prompted to gather information into a defect mode information package.
- 10 12. The training device (5) according to any of the previous claims, wherein the logic unit (48) is configured, upon generation/receipt of information on the simulated defect, not to transmit control information that triggers the recoil unit (60) of the blank buttstock (30) to generate the perceptible beat.
- 15 13. The training device (5) according to any of the previous claims, wherein the logic unit (48) is configured to receive biometric information from the user of the device (5) and upon receipt of the information on the event gather the biometric information into said information package.
- 20 14. A system (100) for a firearm weapon (1) comprising a training device (5) according to claim 11-13 and a training information hub.
- 25 15. The system (100) according to claim 14, wherein the training information hub comprises a hub wireless receiver device configured to receive said information package transmitted from the training wireless transmitter device.
- 30 16. The system (100) according to claim 14-15, wherein the hub wireless receiver device is a transceiver and the training wireless transmitter device is a transceiver, wherein the training device (5) and the training information hub (110) are configured to transmit information between each other.
- 35 17. The system (100) according to claim 14-16, wherein the training information hub (110) comprises a training information hub logic unit (120) configured to process said information package such that the information of the information package is in a form that enables it to be graphically presented.

18. The system (100) according to claim 14-17, wherein the training information hub (110) is configured to generate information on a simulated defect of the blank bolt assembly (10), wherein the training information hub (110) is configured to transmit information on the simulated defect to the logic unit (48) of the training device (5), wherein the logic unit (48) is configured so that, upon receipt of the information on the simulated defect, the logic unit (48) is prompted to gather the information into a defect mode information package.
19. A method for controlling a training device (5) according to claim 1-13, wherein the method comprises:
- receiving information from the sensor arrangement (40) and the clock unit (46),
  - identifying receipt of information on an event of a detected motion of the blank bolt (12),
  - upon identification of said event, gathering position and orientation of the weapon (1) together with time information into an information package, and
  - storing said information package.
20. The method according to claim 19, wherein the method further comprises
- transferring said information package to a training information hub (110).
21. The method according to claim 19-20, wherein the method further comprises
- identifying receipt of information on a further event of an engaged position of the blank magazine (20),
  - upon identification of said further event, gathering position and orientation of the weapon (1) together with time information into a further information package, and
  - storing said further information package.
22. The method according to any of claim 19-21, wherein the method further comprises
- transferring said further information package to a training information hub (110).

23. The method according to any of claim 19-22, wherein the method further comprises,  
- upon identification of the event, triggering the recoil unit (60) to generate a perceptible beat indicating a blank shot.

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24. The method according to any of claim 19-23, wherein the method further comprises,  
- generating information on a simulated defect of the blank bolt (12),  
- identifying information on the simulated defect of the blank bolt (12),  
- upon identification on the simulated defect of the blank bolt (12), marking the information package as a defect mode information package.

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25. The method according to any of claim 19-24, wherein the method further comprises,  
- generating information on a simulated restored condition of the blank bolt (12),  
- identifying information on the simulated restored condition of the blank bolt (12),  
- upon identification on the simulated restored condition of the blank bolt (12), continuing gathering position and orientation of the weapon (1) together with time information into the information package.

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26. The method according to any of claim 19-25, wherein the method further comprises,  
- generating information on a simulated defect condition of the blank magazine (20),  
- identifying information on the simulated defect condition of the blank magazine (20),  
- upon identification on the simulated defect condition of the blank magazine (20), gathering position and orientation of the weapon (1) together with time information into a defect mode further information package.

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27. The method according to any of claim 19-26, wherein the method further comprises,  
- generating information on a simulated restored condition of the blank magazine (20),

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- 5                   - identifying information on the simulated restored condition of the blank magazine (20),  
                  - upon identification on the simulated restored condition of the blank magazine (20), continuing gathering position and orientation of the weapon (1) together with time information into the further information package.

- 10           28. The method according to any of claim 19-27, wherein the method comprises:  
                  - receiving biometric information from a user of the device (5), and  
                  - upon identification of the event, gathering the biometric information into said information package.

- 15           29. The method according to any of claim 19-28, wherein the method comprises:  
                  - receiving biometric information from a user, and  
                  - upon identification of the further event, gathering the biometric information into said further information package.

30. Use of a training device (5) for a firearm weapon (1) according to any of claim 1-13.

- 20           31. Use of a system (100) for a firearm weapon (1) according to any of claim 14-18.