US 20150377572A1

(19) **United States**

(12) **Patent Application Publication**

Darragjati

(10) **Pub. No.: US 2015/0377572 A1**

(43) **Pub. Date: Dec. 31, 2015**

(54) **SYSTEM AND METHOD FOR TRACKING AMMUNITION**

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(21) Appl. No.: **14/752,303**

(22) Filed: **Jun. 26, 2015**

Related U.S. Application Data

(60) Provisional application No. 62/060,371, filed on Oct. 6, 2014, provisional application No. 62/017,643, filed on Jun. 26, 2014.

Publication Classification

(51) **Int. Cl.**

F41A 9/62 (2006.01)

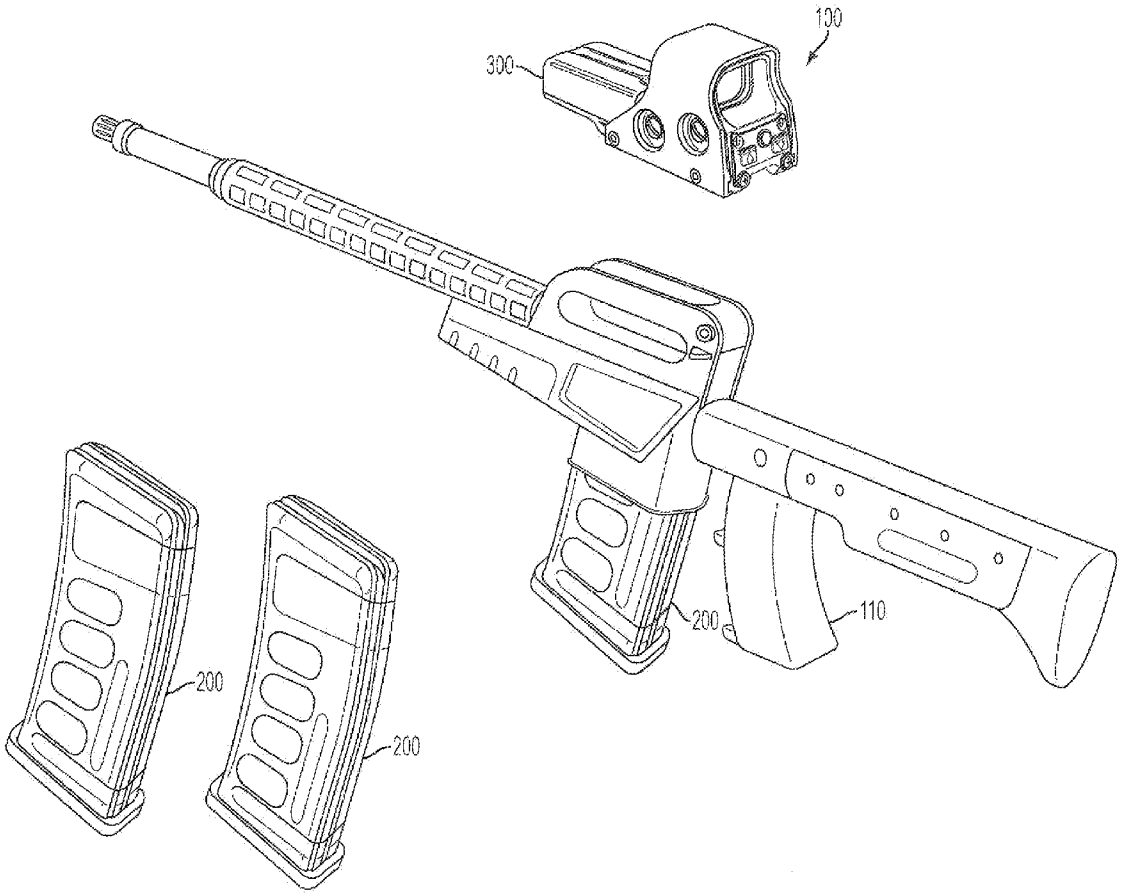
F41A 9/64 (2006.01)

(52) **U.S. Cl.**

CPC ***F41A 9/62*** (2013.01); ***F41A 9/64*** (2013.01)

(57) **ABSTRACT**

A system and method for tracking ammunition, including a magazine that stores ammunition rounds, a top plate that slides along a longitudinal axis of the magazine, and a processing unit that determines the number of ammunition rounds in the magazine based on the position of the top plate. The system may output the number of ammunition rounds in the magazine to a display and/or store a time stamp indicative of each time a round was chambered and/or fired.



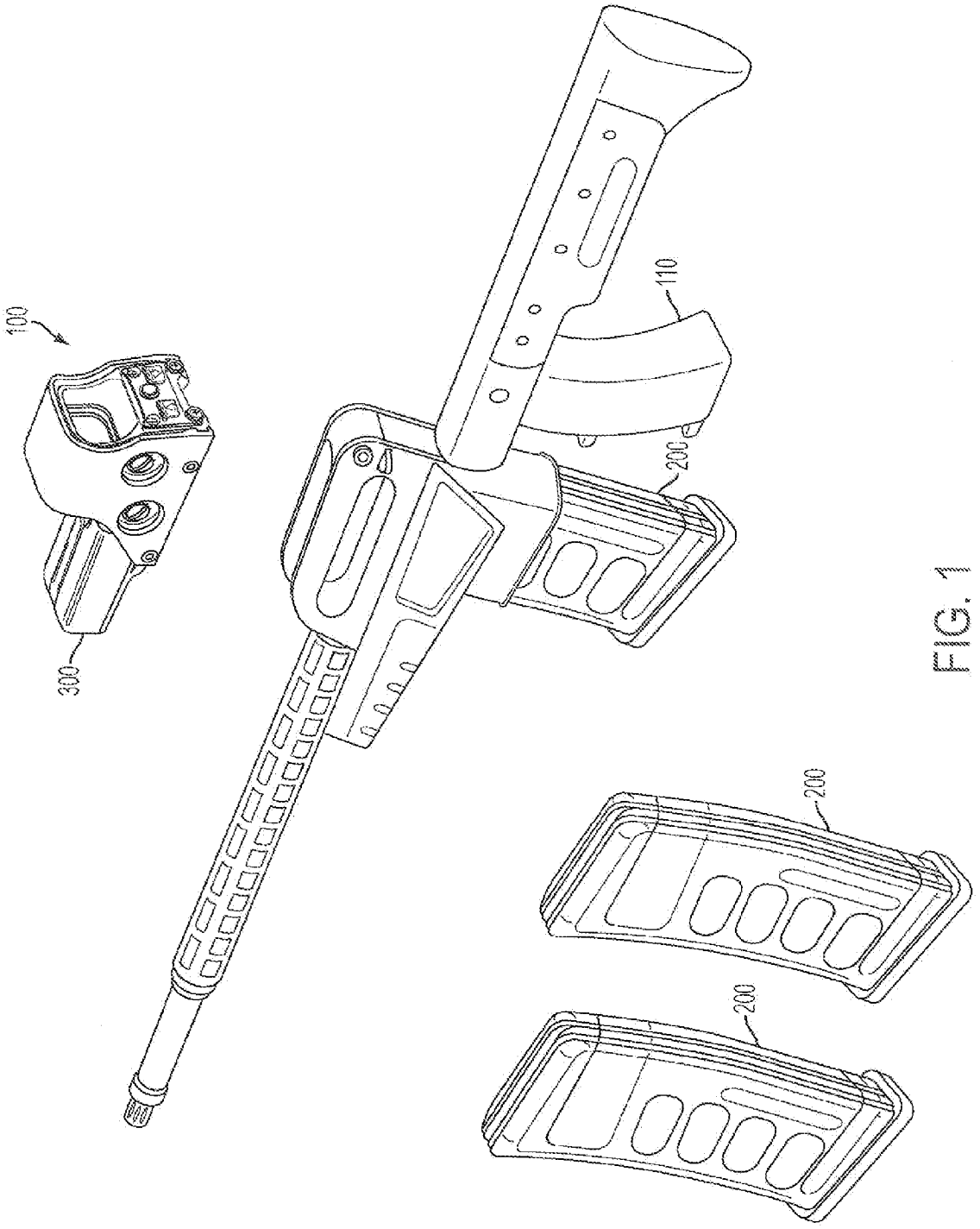


FIG. 1

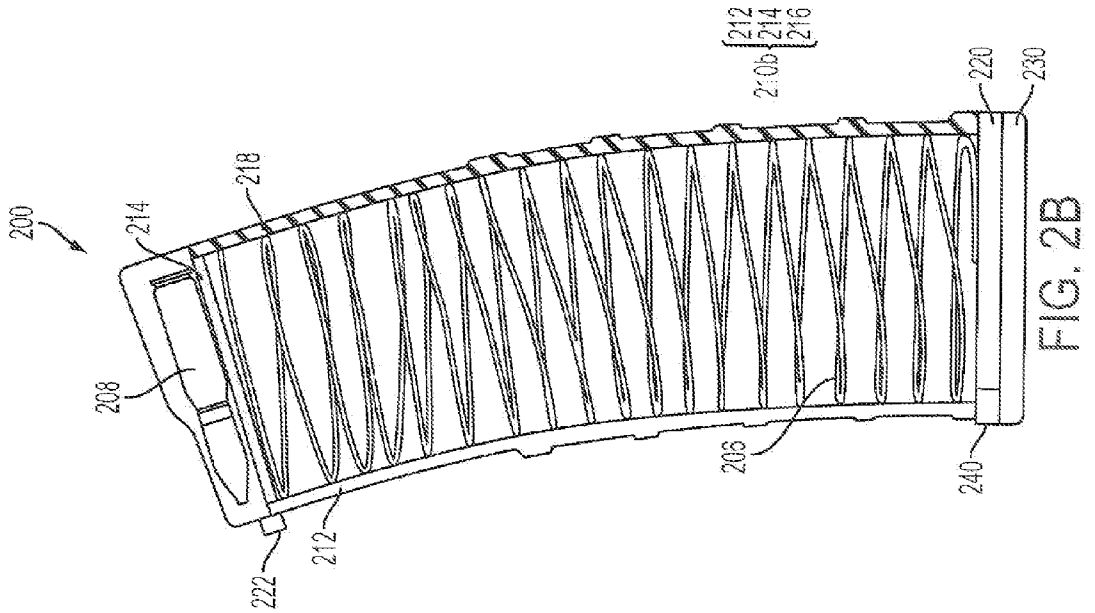

200
214
218
208
222
212
206
240
210b
212
214
216
220
230

FIG. 2B

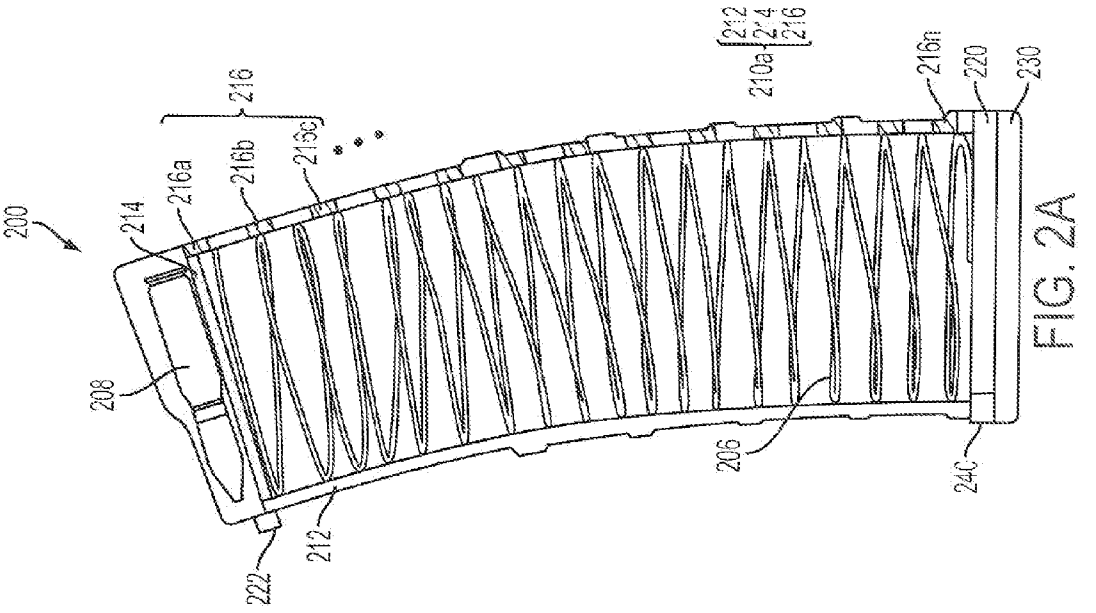

200
214
216a
216b
216c
216
208
222
212
206
240
210a
212
214
216
216n
220
230

FIG. 2A

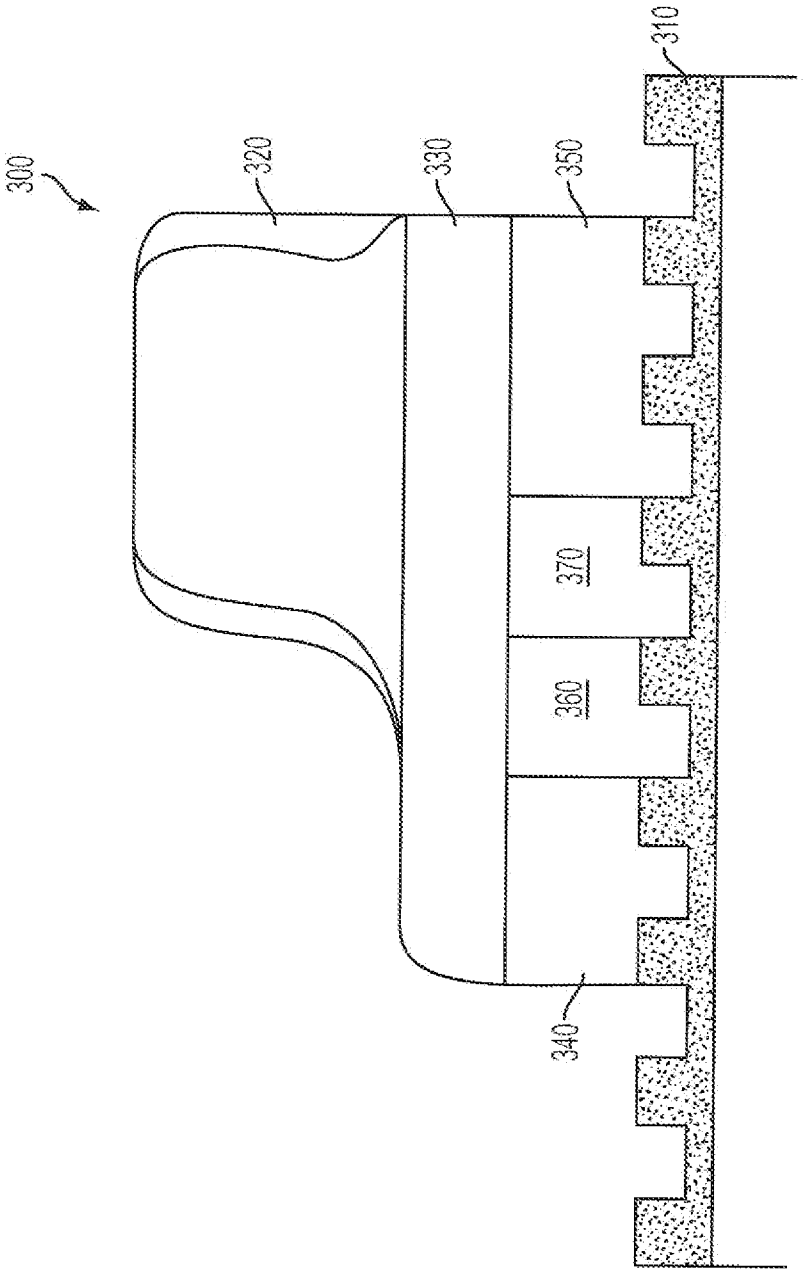


FIG. 3

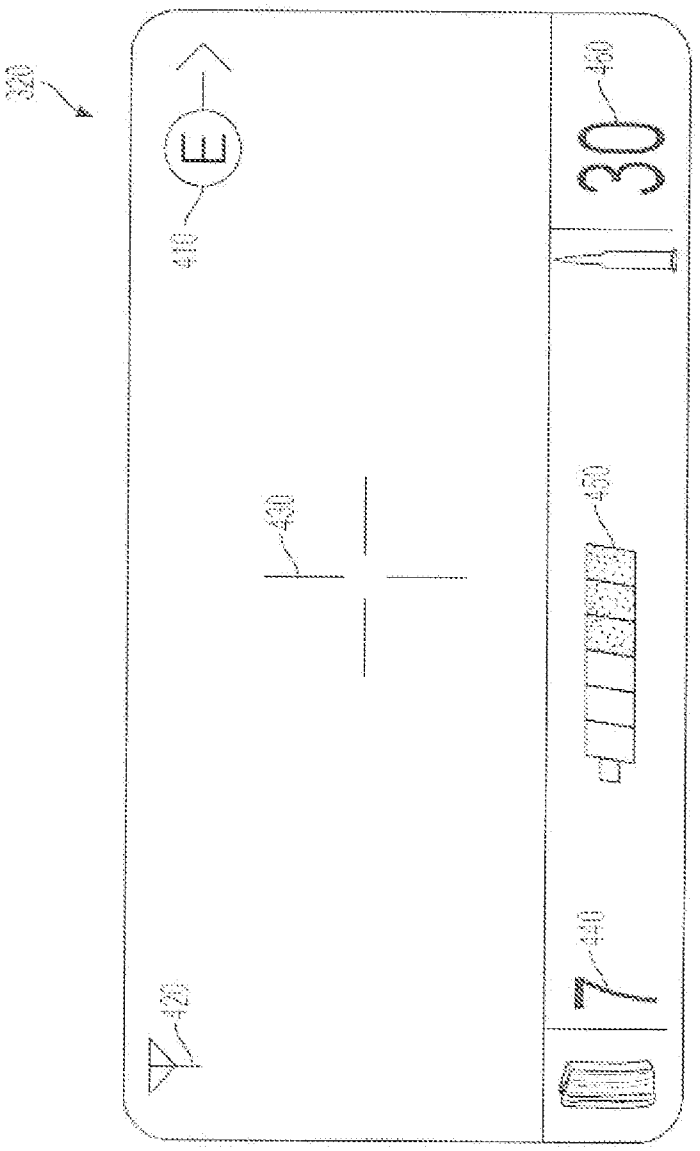


FIG. 4

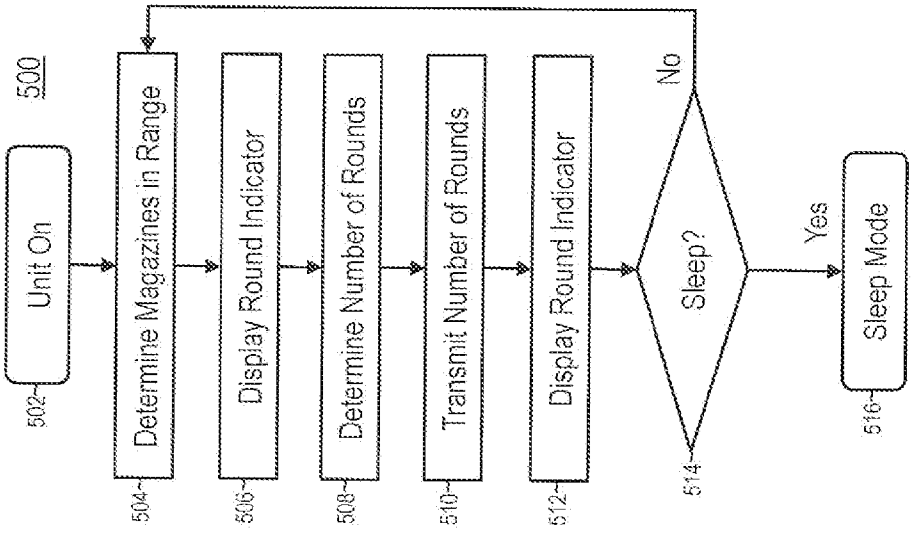

500
Unit On
502
Determine Magazines in Range
504
Display Round Indicator
506
Determine Number of Rounds
508
Transmit Number of Rounds
510
Display Round Indicator
512
Sleep?
514
No
Yes
Sleep Mode
516

FIG. 5

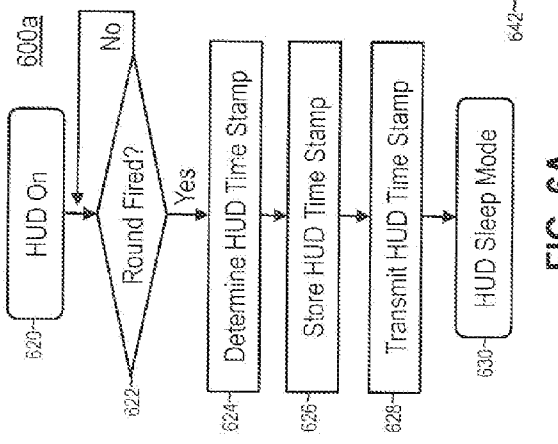
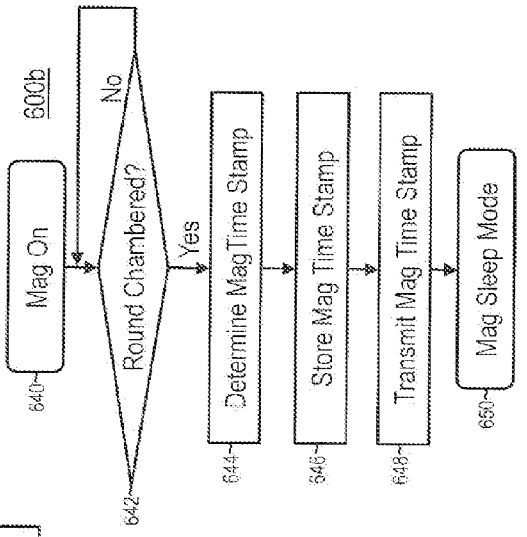

600a
620
HUD On
622
Round Fired?
No
Yes
624
Determine HUD Time Stamp
626
Store HUD Time Stamp
628
Transmit HUD Time Stamp
630
HUD Sleep Mode

FIG. 6A


600b
640
Mag On
642
Round Chambered?
No
Yes
644
Determine Mag Time Stamp
646
Store Mag Time Stamp
648
Transmit Mag Time Stamp
650
Mag Sleep Mode

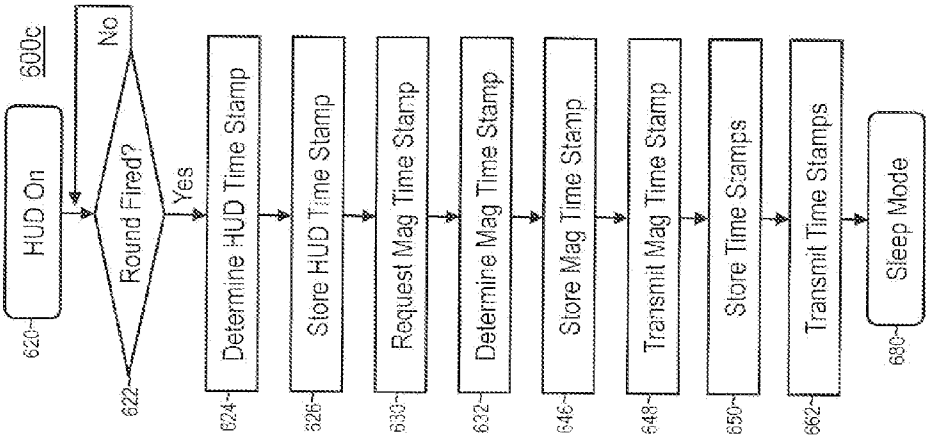

600c
620
HUD On
622
Round Fired?
No
Yes
624
Determine HUD Time Stamp
626
Store HUD Time Stamp
630
Request Mag Time Stamp
632
Determine Mag Time Stamp
646
Store Mag Time Stamp
648
Transmit Mag Time Stamp
650
Store Time Stamps
662
Transmit Time Stamps
680
Sleep Mode

FIG. 6C

SYSTEM AND METHOD FOR TRACKING AMMUNITION

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional Appl. No. 62/017,643, filed Jun. 26, 2014, and U.S. Provisional Appl. No. 62/060,371, filed Oct. 6, 2014, the entire content of which are hereby incorporated by reference.

BACKGROUND OF THE INVENTION

[0002] An accurate count of the number of rounds included in a firearm magazine enables a user to better anticipate the need to replace the magazine in the firearm. Furthermore, sharing information regarding ammunition enables better coordination of military and law enforcement personnel. For example, one individual with excess ammunition may coordinate with another individual who has spent more ammunition if information regarding ammunition is shared between military or law enforcement personnel. In another example, accurate ammunition tracking allows supervisory or support personnel to resupply military or law enforcement personnel. If military or law enforcement personnel are better able to be resupplied, those military or law enforcement members are able to carry less ammunition with the confidence that the will be resupplied when necessary.

[0003] Additionally, after a firearm is discharged, an objective and accurate record of the time that each ammunition round may help corroborate or disprove a witnesses' statement of events. For example, in the aftermath of a shooting, a law enforcement official may give testimony as to the time of a shooting and the number of rounds discharged. In this instance, an objective and accurate record of the firing of each round may corroborate the evidence presented by the law enforcement official.

[0004] Conventional firearms do not provide these benefits. Accordingly, there is a need for an improved system and method for tracking ammunition.

SUMMARY OF INVENTION

[0005] According to an aspect of an exemplary embodiment, there is provided a system and method for tracking ammunition, including a magazine that stores ammunition rounds, a top plate that slides along a longitudinal axis of the magazine, and a processing unit that determines the number of ammunition rounds in the magazine based on the position of the top plate. The system may output the number of ammunition rounds in the magazine to a display and/or store a time stamp indicative of each time a round was chambered and/or fired.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] Aspects of exemplary embodiments may he better understood with reference to the accompanying drawings. The components in the drawings are not necessarily to scale, emphasis instead being placed upon illustrating the principles of exemplary embodiments.

[0007] FIG. **1** is an overview of a weapons system according to an exemplary embodiment of present invention;

[0008] FIGS. **2**A and **2**B are overviews of a magazine according to exemplary embodiments of the present invention;

[0009] FIG. **3** is a profile view of a heads up display according to an exemplary embodiment of the present invention;

[0010] FIG. **4** is an overview of a reflex sight display according to an exemplary embodiment of the present invention; and

[0011] FIG. **5** is a flowchart illustrating a process for tracking ammunition according to an exemplary embodiment of the present invention; and

[0012] FIGS. **6**A, **6**B, and **6**C are flowcharts illustrating processes for tracking ammunition chambering and firing according to an exemplary embodiment of the present invention.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

[0013] Reference will now be made in detail to exemplary embodiments by way of reference to the accompanying drawings, wherein like reference numerals refer to like parts, components, and structures.

[0014] FIG. **1** is an overview of a weapons system **100** according to an exemplary embodiment of the present invention. The weapons system **100** includes a firearm **110**, one or more magazines **200**, and a heads up display (HUD) **300**.

[0015] FIG. **2**A illustrates a magazine **200** according to an exemplary embodiment of the present invention. The magazine **200** includes a magazine spring **206**, one or more rounds **208**, and a top plate **214**. The magazine **200** also includes a magazine processing unit **220**, an on/off sensor **222**, a magazine power source **230**, and a magazine database **240**.

[0016] As rounds **208** are added to the magazine **200**, the downward pressure of each round **208** pushes the top plate **214** towards the bottom of the magazine **200** and condenses the magazine spring **206**. As each round **208** is removed (either manually or by chambering the rounds **208** in the firearm **110**), the energy stored in the magazine spring **206** pushes the top plate **214** up towards the top of the magazine **200**.

[0017] The magazine processing unit **220** includes instructions to determine the number of rounds **208** in the magazine **200** based on the relative position of the top plate **214**. For example, the magazine **200** may include a close circuit system **210***a*. The close circuit system **210***a* includes a power rail **212**, a conductive portion of the top plate **214**, and a plurality of electrodes **216** that are each be individually connected to the magazine processing unit **220**. As the top plate **214** moves up and down the magazine **200**, the conductive portion of the top plate **214** completes a circuit from the power rail **212** to one or the plurality of electrodes **216** and the magazine processing unit **220** determines the relative position of the top plate **214** based on which one of the plurality of electrode **216** is connected to the power rail **212** by the conductive portion of the top plate **214**.

[0018] The power rail **212** receives power from the magazine power source **230**. The top plate **214** may be conductive or may include a conductive portion. In either instance, the top plate **214** electrically connects the power rail **212** and one of the plurality electrodes **216** based on the relative position of the top plate **214**. Because the rounds **208** are a standard dimension, the electrodes **216** may be evenly spaced in a longitudinal direction. The electrodes **216** include a first electrode **216***a* located such that it is electrically connected to the conductive portion of the top plate **214** when the magazine **200** is empty, a second electrode **216***b* located such that it is electrically connected to the conductive portion of the top

plate **214** when the magazine **200** includes one round **208**, additional electrodes at evenly spaced intervals in the longitudinal direction, and a final electrode **216***n* located such that it is electrically connected to the conductive portion of the top plate **214** when the magazine **200** is full.

[0019] In the exemplary embodiment illustrated in FIG. **2**A, the magazine processing unit **220** is configured to determine and store the number of rounds **208** in the magazine based on a signal from the close circuit system **210***a* indicative of the identity of the electrode **216** electrically connected to the power rail **212** by the conductive portion of the top plate **214**.

[0020] FIG. **2**B illustrates the close circuit system **210***b* according to another exemplary embodiment of the present invention. Similar to close circuit system **210***a,* the close circuits system **210** includes a power rail **212** and a conductive portion of the top plate **214**. Instead of the plurality of electrodes **216**, however, the close circuit system **210***b* includes a resistive element **218** located along the longitudinal direction of the magazine **200** and electrically connected to the magazine processing unit **220**. As the top plate **214** moves up and down the magazine **200**, the top plate **214** conductor completes a circuit from the power rail **212** to the resistive element **218**. In the exemplary embodiment illustrated in FIG. **2**B, the close circuit system **210***b* forms a variable resistor with the conductive portion of the top plate **214** acting as the sliding contact along the resistive clement **218**.

[0021] The resistance of the resistive element **218** is proportional to the distance from the base of the resistive element **218** to the junction of the resistive element **218** and the conductive portion of the top plate **214**. Similar to the close circuit system **210***a,* the close circuit system **210***b* supplies power to the power rail **212** and the conductive portion of the top plate **214**. As one of ordinary skill in the art would recognize, the voltage of the circuit formed by the close circuit system **210***b* is equal to the current multiplied by the resistance of the circuit and, because the resistance of the power rail **212** and the conductive portion of the top plate **214** is negligible, the resistance of the circuit is substantially equal to the resistance of the resistive element **218**. Accordingly, the magazine processing unit **220** may be configured to determine the relative position of the top plate **214** by applying a constant voltage between the power rail **212** and the base of the resistive element **218** measuring the current. Alternatively, the magazine processing unit **220** may supply a constant current to the power rail **212** and measure the voltage between the power rail **212** and the base of the resistive element **218**.

[0022] In the exemplary embodiment illustrated in FIG. **2**B, the magazine processing unit **220** is configured to determine and store the number of rounds **208** in the magazine based on a signal from the close circuit system **210***b* indicative of the relative position of the top plate **214**. The position of the top plate **214** relative to the top of the magazine **200** is the difference between the total height of the magazine and the distance from the base of the resistive element **218** to the junction of the resistive element **218** and the conductive portion of the top plate **214**, which, as described above, is determined based on the resistance of the circuit.

[0023] The magazine processing unit **220** includes a transmitter that outputs a signal to the firearm **110** indicative of the number of rounds **208** in the magazine **200**. The transmitter may be any suitable device configured to output a signal to the firearm **110**, including a wired transmitter or wireless transmitter. The wireless transmitter may output a frequency modulated radio signal according to a known standard such as Bluetooth or any other radio frequency communications method.

[0024] The magazine processing unit **220** determines whether the magazine **200** is an active magazine (i.e., if the magazine **200** includes at least one round **208**) based on the output of the close circuit system **210** and outputs a signal to the firearm **110** that the magazine **200** is an active magazine. When the magazine **200** is placed in the firearm **110**, the on/off sensor **222** makes contact with the firearm **110**. Based on the output of the on/off sensor **222**, the magazine processing unit **220** determines that that the magazine **200** is in the firearm **110** and outputs a signal to the HUD **300** indicative of the number of rounds **208** in the magazine **200**.

[0025] FIG. **3** illustrates a profile view of a HUD **300** according to an exemplary embodiment of the present invention. The HUD **300** is mounted to a picatinny rail **310** and includes a reflex sight display **320**, reflex sight hardware **330**, a HUD power source **340**, a HUD processing unit **350**, a firing sensor **360**, and a HUD database **370**.

[0026] FIG. **4** illustrates a view of the reflex sight display **320** of FIG. **3** according to an exemplary embodiment of the present invention. The reflex sight display **320** may be a reflective display, a partially reflecting glass element such that an illuminated projection is superimposed on the field of view. Alternatively, the display **320** may be any display (e.g., a liquid crystal display (LCD), light emitting diode (LED), organic light emitting diode (OLED)) that outputs age (for example, from a camera mounted on the firearm **110**) and the illuminated projection. As illustrated in FIG. **4**, the illuminated projection may include a directional indicator **410**, a wireless communications indicator **420**, a cross hair **430**, a magazine indicator **440**, a power source indicator **450** and a round indicator **460**.

[0027] The directional indicator **410** indicates a direction (e.g., a cardinal direction) of the firearm **110**. The wireless communications indicator **420** indicates whether the HUD **300** is in wireless communication with one or more magazines **200**. The cross hair **430** is located in an optically appropriate position to give an accurate aiming point of the firearm **110**. The cross hair **430** may be embedded fibers, engraved lines or a computer-generated image superimposed on a screen.

[0028] The magazine indicator **440** is indicative of the number of active magazines **300** carried by the user. For instance, the magazine indicator **440** may indicate the number of active magazines **300** within wireless range of the HUD **300**. Because the magazine indicator **440** is limited by the wireless range of the HUD **300**, the magazine indicator **440** will count only the magazines carried by the user. (If, for example, a soldier leaves a fully loader magazine **200** back in the base, it will not be in range and therefore will not be included in the count of magazines **200** output by the magazine indicator **440**). The power source indicator **450** may be an indication proportional to the estimated lifespan of the HUD power source **340** and/or the magazine power source **230**. The round indicator **460** may indicate the number of rounds in the magazine **200** currently in the firearm **110**.

[0029] Each time the firearm **110** discharges a round **208**, the round indicator **460** is reduced by one. When all of the rounds **208** of a a magazine **200** are discharged, the magazine

processing unit **220** no longer outputs a signal indicating that the magazine **200** is active and the magazine indicator **440** is reduced by one.

[0030] FIG. **5** is a flowchart illustrating a process **500** for tracking ammunition according to an exemplary embodiment of the present invention. The system **100** is turned on in step **502**. The HUD **300** determines the number of active magazines **200** within wireless range in step **504**. The HUD displays a magazine indicator **440** based on the number of active magazines **300** within wireless range of the HUD **300** in step **506**. The magazine processing unit **220** determines number of rounds **208** in the magazine **200** based on the relative position of the top plate **214** in step **508** and transmits the number of rounds **208** to the HUD **300** in step **510**. The HUD **300** displays a round indicator **460** based on the number of rounds **208** in the magazine **200** in step **512**. The steps **504** through **514** are repeatedly performed so that the magazine indicator **400** and the round indicator **460** may be updated to reflect changes in the number of active magazines **200** and/or rounds **208**. In order to conserve power, the magazine **200** and HUD **300** enter sleep mode in step **518** (for example, in the HUD **301**) and/or magazine **200** are inactive for a pre-determined period of time) The HUD **300** and/or the magazine **200** determine whether the conditions to enter sleep mode have been satisfied in step **514**.

[0031] The process **500** may be stored as instructions in any non-transitory computer readable storage medium and executed by one or more processors for example, the magazine processing unit **220** and/or the HUD processing unit **350**).

[0032] The HUD **300** may also wirelessly transmit information indicative of the number of rounds **208** in an active magazine **200** and the number of the active magazines **200** carried by a user to team commanders, unit commanders etc. This wireless communication will provide real-time or near real-time communication to appropriate personnel when a soldier is discharging his or her weapon. Ammunition consumption information as well as the location of the firearm **110** may be displayed, for example, on a topographical map. The location of the firearm **110** may he determined by global positioning satellites (GPS) and output by the HUD **300**. Accordingly, based on the consumption speed of munitions, appropriate personal may determine whether a soldier is coming under heavy fire and determine if additional personnel and/or additional ammunition should be deployed.

[0033] The wireless signals output by the magazine **200** and/or the HUD **300** may be encrypted. If the HUD power source **340** and/or the magazine power source **230** is such that it will soon no longer able to supply power, the HUD **300** may output a "last call" wireless signal to alert appropriate personnel that the unit is terminating. The "last call" wireless signal may include, for example, the time, date and location of the termination.

[0034] The wireless signals output by the magazine **200** and/or the HUD **300** may also be used by law enforcement. For example, if a suspect is in possession of a firearm **110**, the wireless signals output by the magazine **200** and/or the HUD **300** may indicate to law enforcement personnel that the suspect is armed, whether a magazine **200** is active, weather a round **208** is chambered, etc.

[0035] Areas where firearms are prohibited such as schools and federal buildings may include fencing that uses the wireless signals output by the magazine **200** and/or the HUD **300** to detect the presence of the firearm **110**, whether a magazine **200** is active, weather a round **208** is chambered, etc.

[0036] The weapons system **100** may also be configured to store a time stamp indicative of a time each round **208** is chambered and/or tired. Referring back to FIG. **3**, the HUD **300** may include a firing sensor **360** and a HUD database **370**. The firing sensor **360** may detect if and when the rearm **110** fires a round **208** and output a signal based on a determination that the firearm **110** has fired round **208**. In response to the signal from the firing sensor **360**, the HUD processing unit **350** may be further configured to store a time stamp indicative of the time each round **208** is fired in the HUD database **370**. The time stamp stored by the HUD processing unit **350** may be indicative of the time of day or may be relative to the time that the previous round **208** was fired. The firing sensor **360** may be any suitable device capable of detecting if and when the firearm **110** fires a round **208**. For example, the firing sensor **360** may be a motion sensor configured to output a signal based on a motion of the firearm **208** indicative of the recoil from firing a round **208**. The faring sensor **360** may be located in the HUD **300** as shown in FIG. **3**. Alternatively the firing sensor **360** may be separately located from the HUD **300** (for example, incorporated within the firearm **110**).

[0037] Referring back to FIG. **2**, the magazine **200** may include a magazine database **240**. The magazine processing unit **220** may be configured to store a time stamp indicative of the time each round **208** is chambered in the magazine database **240**. The magazine processing unit **220** may determine the time each round is chambered based on the relative position of the top plate **214** as described above. In other words, in response to a determination that the top plate **214** has moved upwards by a distance indicative of the chambering of a round **208**, the magazine processing unit may determine the no and store a time stamp in the magazine database **240**. The time stamp stored by the magazine processing unit **220** may be indicative of the time of day or may be relative to the time that the previous round **208** was chambered.

[0038] The HUD **300** and the magazine **200** may be configured to store two redundant time stamps for each round **208**. Because the firing of a round and the chambering of the subsequent round are nearly contemporaneous, the HUD processing unit **350** may determine the time a round **208** was fired based on the output of the firing sensor **360** as described above and the magazine processing unit **220** may determine the time that the round **208** was fired based on the chambering of the subsequent round **208**.

[0039] In order to save power, the system **100** may be configured such that the magazine **200** enters a low power mode and the **300** outputs a signal to the magazine **200** in response to a determination that a round **208** has been fired. In this instance, instead of storing a time stamp indicative or the chambering of the subsequent round **208**, the magazine processing unit **220** may be configured to determine and store a time stamp based on the time the signal was received from the HUD **300**.

[0040] The magazine processing unit **220** may transmit the time stamp(s) determined by the magazine processing unit **220** to the HUD **300**. The HUD **300** may store the time stamp(s) received from the indicative of the chambering of each round **208** in the HUD database **370** along with the time stamps indicative of the firing of each round **208**. The redundancy of the double time stamp allows precision timing and compensates for any data loss in the event that communication between the magazine **200** and the HUD **300** is inter-

rupted. Transmissions to and from the magazine **200** and the HUD **300** may be wired or wireless as described above. The HUD **300** may transmit the time stamps indicative of the chambering and/or firing of each round **208** to appropriate personnel as described above. Wireless transmissions may be encrypted as described above.

[0041] FIG. **6**A is a flowchart illustrating a method of tracking ammunition fining according to an exemplary embodiment of the present invention. The HUD **300** is turned on in step **620**. In step **622**, the HUD processing unit **350** determines whether a round **208** is fired based on the output of the firing sensor **360**. If the HUD processing unit **350** determines that a round **208** is fired (Step **622**: Yes), the HUD processing unit **350** determines the time indicative of the firing of the round **208** in step **624** and stores a time stamp indicative of the firing of the round **208** in the HUD database **370** in step **626**. The HUD **300** may transmit the time stamp or time stamps to appropriate personnel in step **628**. In order to conserve power, the HUD **300** may enter sleep mode in step **616**.

[0042] FIG. **6**B is a flowchart illustrating a process **600***b* of tracking ammunition chambering according to an exemplary embodiment of the present invention. The magazine **200** is turned on in step **640**. In step **642**, the magazine processing unit **220** determines whether a round **208** is chambered. If magazine processing unit **220** determines whether a round **208** is chambered (Step **642**: Yes), the magazine processing unit **220** determines a time indicative of the chambering of the round **208** in step **644** and stores a time stamp indicative of the chambering of the round **208** in the magazine database **240** in step **646**. The magazine **300** may transmit the time stamp to the HUD **300** in step **648**. In order to conserve power, the magazine **200** may enter sleep mode in step **650**.

[0043] FIG. **6**B is a flowchart illustrating a process **600***e* for tracking ammunition firing according to another exemplary embodiment of the present invention. Similar to the process **600***a*, the process **600***c* includes steps **620** through **626** wherein the HUD **300** determines and stores a time stamp indicative of the firing of a round **208**. The HUD **300** may output a signal to the magazine **200** requesting an additional timestamp in step **630** and, in response, the magazine processing unit **220** may determine, store and transmit to the HUD **300** a time stamp indicative of the time of receipt of the signal from the HUD **300** in steps **632**, **646**, and **648**. (Instead of determining, storing, and transmitting the time stamp in response to a signal from the HUD **300**, the magazine processing unit **200** may determine the time stamp based on the chambering of the next round **208**. In other words, steps **630** and **632** of the process **600***c* may be replaced with steps **642** and **644** of the process **600***b*.) The HUD processing unit **350** stores the time stamp received from the magazine **200** in the HUD database **370** in step **660**. The HUD **300** may transmit the time stamp determined by the HUD **300** and/or the time stamp received from the magazine **200** to appropriate personnel in step **622**. In order to conserve power, the magazine **200** and the HUD **300** may enter sleep mode in step **680**.

[0044] The processes **600***a-c* may be stored as instructions in any non-transitory computer readable storage medium and executed by one or more processors (for example, the magazine processing unit **220** and/or the HUD processing unit **350**).

[0045] The foregoing description and drawings should be considered as illustrative only of the principles of the inventive concept. Exemplary embodiments may be realized in a variety of shapes and sizes and are not intended to be limited by the preferred embodiments described above. Numerous applications of exemplary embodiments will readily occur to those skilled in the art. Therefore, it is not desired to limit the inventive concept to the specific examples disclosed or the exact construction and operation shown and described. Rather, all suitable modifications and equivalents may be resorted to, falling within the scope of this application.

What is claimed is:

1. A system, comprising:

a magazine configured to store a plurality of ammunition rounds, the magazine comprising a top plate configured to slide along a longitudinal axis of the magazine;

a processing unit configured determine a number of ammunition rounds in the magazine based on a relative position of the top plate.

2. The system of claim **1**, further comprising a close circuit system, wherein:

the close circuit system comprises:

a power rail located along the longitudinal axis of the magazine; and

a plurality of electrodes located along the longitudinal axis, each of the plurality of electrodes electrically connected to the processing unit;

the top plate includes a conductive portion electrically connecting the power rail to one of the plurality of electrodes based on the relative position of the top plate; and

the processing unit is configured to determine the relative position of the top plate based on the electrode electrically connected to the power rail.

3. The system of claim **1**, further comprising a close circuit system, wherein:

the close circuit system comprises:

a power rail located along the longitudinal axis of the magazine; and

a resistive element located along the longitudinal axis;

the top plate includes a conductive portion electrically connecting the power rail to the resistive element to form a closed circuit; and

the processing unit is configured to determine the relative position of the top plate based on an electrical resistance of the closed circuit.

4. The system of claim **1**, wherein the processing unit is further configured to output a round indicator indicative of the number of ammunition rounds in the magazine; and

a display configured to output the round indicator.

5. The system of claim **4**, wherein the processing unit wirelessly transmits the round indicator the display.

6. The system of claim **5**, wherein the display is further configured to output a magazine indicator indicative of a number of magazines within wireless range that include at least one ammunition round.

7. The system of claim **6**, wherein the system is configured to wirelessly transmit the magazine indicator.

8. The system of claim **4**, wherein the display is mounted on a firearm.

9. The system of claim **1** wherein the magazine further comprises a magazine database and the processing unit is configured to store time stamps indicative of the chambering of each of the ammunition rounds in the magazine database.

10. The system of claim **1**, wherein the display further comprises a display database and the display is further configured to store time stamps indicative of the firing of each of the ammunition rounds in the display database based on the output of a firing sensor.

11. A method for tracking ammunition, the method comprising:

determining, by a processing unit, a number of ammunition rounds in a magazine configured to store the ammunition rounds based on a relative position of a top plate configured to slide along a longitudinal axis of the magazine.

12. The method of claim **11**, further comprising:

outputting power by a power rail located along the longitudinal axis;

providing a plurality of electrodes located along the longitudinal axis, each of the plurality of electrodes electrically connected to the processing unit;

electrically connecting, by a conductive portion of the top plate, the power rail to one of the plurality of electrodes based on the relative position of the top plate; and

determining, by the processing unit, the relative position of the top plate based on the electrode electrically connected to the power rail.

13. The method of claim **11**, further comprising:

outputting power by a power rail located along the longitudinal axis;

providing a resistive element located along the longitudinal axis;

electrically connecting, by a conductive portion of the top plate, the power rail to the resistive element to form a closed circuit; and

determining, by the processing unit, the relative position of the top plate based on a resistance of the closed circuit.

14. The method of **11**, further comprising:

outputting, by the processing unit, a round indicator indicative of the number of ammunition rounds in the magazine; and

outputting, by the display, the round indicator.

15. The method of claim **14**, further comprising:

wirelessly transmitting, by the processing unit, the round indicator to the display.

16. The method of claim **15**, further comprising:

outputting, by the display, a magazine indicator indicative of a number of magazines within wireless range that at least one ammunition round.

17. The method of claim **16**, further comprising:

wirelessly transmitting, by the display, the magazine indicator.

18. The method of claim **17**, further comprising:

mounting the display on a firearm.

19. The system of claim **11**, further comprising:

determining a time indicative of a chambering one of the plurality of ammunition rounds based on a change in the relative position of the top plate:

storing a time stamp indicative of the tune in a database.

20. The method of claim **11**, further comprising:

determining a time indicative of a firing of one of the plurality of ammunition rounds based on an output of a firing sensor;

storing a time stamp indicative of the time in a database.

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