Oct. 25, 1960 C. L. LOVERCHECK 2,957,391

FIRING MECHANISM FOR FIREARMS AND THE LIKE

Filed April 18, 1955 2 Sheets-Sheet 1

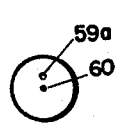


FIG. 4

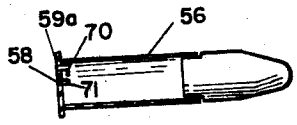


FIG. 3

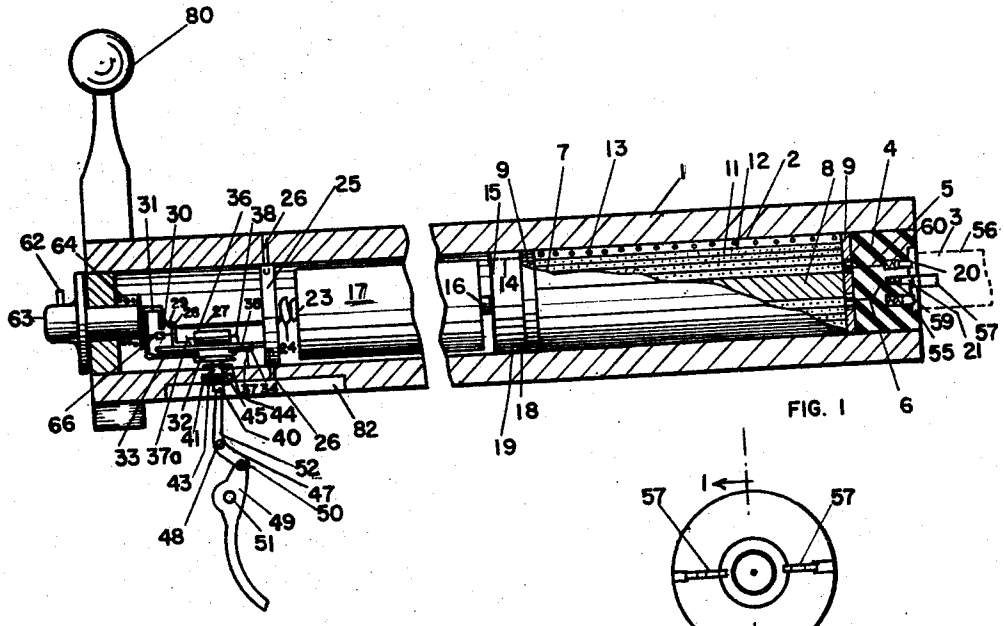


FIG. 1

FIG. 2

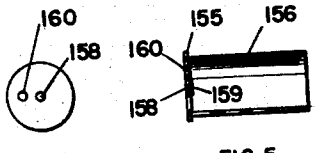


FIG. 6 FIG. 5

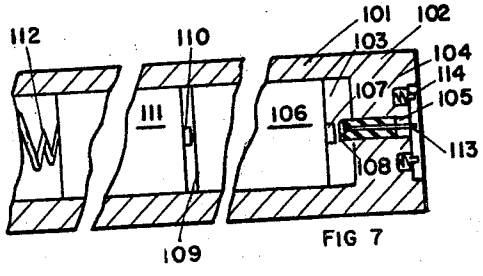


FIG 7

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Oct. 25, 1960 C. L. LOVERCHECK 2,957,391

FIRING MECHANISM FOR FIREARMS AND THE LIKE

Filed April 18, 1955 2 Sheets-Sheet 2

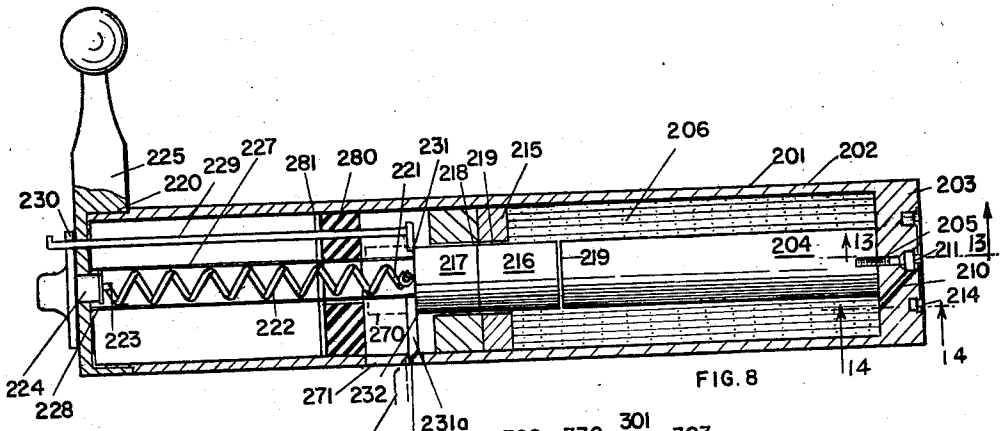


FIG. 8

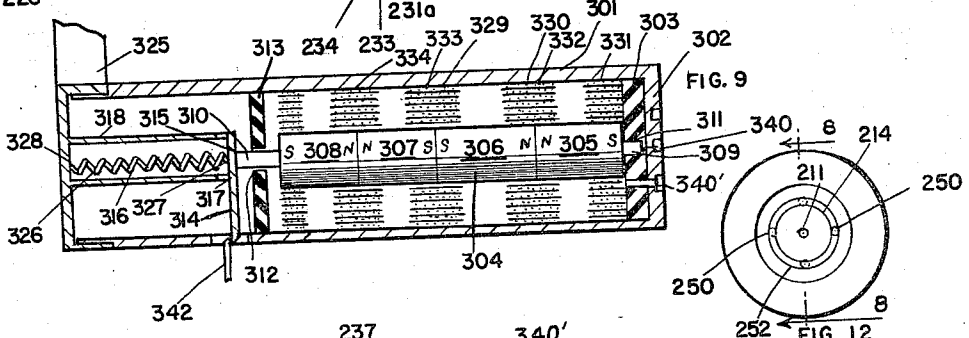


FIG. 9

FIG 12

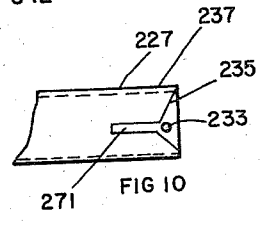


FIG 10

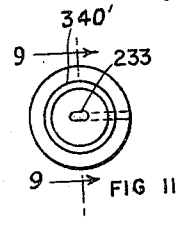


FIG 11

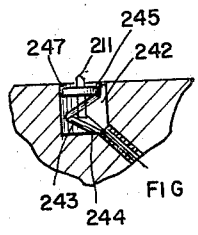


FIG 13

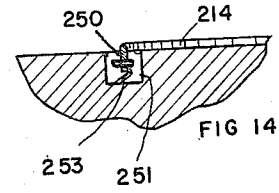


FIG 14

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2,957,391

FIRING MECHANISM FOR FIREARMS AND THE LIKE

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6 Claims. (Cl. 89—28)

This invention relates to firearms and ammunition therefor and more particularly to firearms utilizing an electrical current for firing ammunition therein.

The most common type of firearms now in use utilizes a mechanically actuated device for striking a primer to detonate a charge of explosive in the ammunition. These prior devices must be manually cocked after each charge is fired and this, in some guns, requires considerable energy on the part of the operator. Generally, there is a fairly heavy firing mechanism which falls with an impact on the cartridge and the impact is inclined to disturb the position of the gun on the target. Electrically primed ammunition has been made according to previous designs but the shells for use in this type of ammunition were usually made up of several parts and had fairly complicated electrical contacts from the gun to the ammunition.

The present disclosure solves the above problems by providing an electrically actuated firing device for a gun wherein the electrical system will be contained in a compact unit which is a part of the gun and which may, in some instances, be interchanged with corresponding parts of mechanically actuated firearms. To eliminate some of the expenses in manufacturing electrically actuated ammunition, it is proposed to make the shell cases of an integral plastic body and to provide a simple inexpensive means of making electrical contact between the shell cases and the ammunition.

Provided also is a simple inexpensive safety device which prevents the gun from being inadvertently fired.

More specifically, it is an object of this invention to provide an electrically actuated device for firearms which is simple in construction, economical to manufacture, and simple and efficient to use.

Another object of this invention is to provide an improved design of ammunition for firearms.

Another object of the invention is to provide an electrically actuated firing mechanism for firearms which will be interchangeable with the existing mechanically actuated firearms.

A further object of the invention is to provide an improved electrical operating mechanism for firearms.

With the above and other objects in view, the present invention consists of the combination and arrangement of parts hereinafter more fully described, illustrated in the accompanying drawings and more particularly pointed out in the appended claims, it being understood that changes may be made in the form, size, proportions, and minor details of construction without departing from the spirit or sacrificing any of the advantages of the invention.

In the drawings:

Fig. 1 is a cross sectional view taken on line 1—1 of Fig. 2 of a bolt for a bolt action gun showing the various parts of the firing mechanism therein;

Fig. 2 is an end view of the bolt shown in Fig. 1;

Fig. 3 is a cross sectional view of a plastic shell for use with the bolt shown in Fig. 1;

Fig. 4 is an end view of the shell shown in Fig. 3;

Fig. 5 is a cross sectional view of a shell similar to that shown in Fig. 3;

Fig. 6 is an end view of the shell drawn in Fig. 5;

Fig. 7 is a cross sectional view of a firing mechanism constituting another embodiment of the invention;

Fig. 8 is a longitudinal cross section view taken on line 8—8 of Fig. 12 of still another embodiment of a firing mechanism;

Fig. 9 is a cross sectional view taken on line 9—9 of Fig. 11 of another embodiment of a firing mechanism;

Fig. 10 is a detailed view of part of the firing mechanism rotated ninety degrees from the position in which it is shown in Fig. 8;

Fig. 11 is an end view of the part of the tube of the firing mechanism shown in Fig. 9;

Fig. 12 is an end view of a bolt shown in Fig. 8;

Fig. 13 is an enlarged view of a contact member taken on line 13—13 of Fig. 8; and

Fig. 14 is an enlarged view of another contact member taken on line 14—14 of Fig. 8.

Now with more specific reference to the drawings, in Fig. 1, a bolt 1 is shown for use with a bolt action gun. The bolt 1 has a bore 2 therethrough and has the end adjacent a shell 3 plugged with a plastic plug 4. The bore 2 could be made in the form of a blind hole and, instead of the plastic plug 4, a solid body integral with the bolt 1 could be provided with insulated holes therein to receive the ends of wires 5 and 6. Inside the bolt 1 is provided an induction coil 7 which has a core 8, with iron pole pieces 9 which are in engagement with the magnetic shell 3 of the bolt 1. The core 8 could be made of separate rods, laminations, or of any other desired practical construction. A secondary winding 11 having many turns of fine wire is wrapped around insulation 12 between the primary winding 13.

The primary winding 13 having relatively few turns is wrapped around the secondary winding 11 and has one end 14 thereof connected through a conductor 15 to a positive end 16 of a battery 17 and has the other end 18 thereof grounded to the bolt 1 at 19. The secondary winding 11 has the wires 5 connected to a contact ring 20 at one end thereof and the end of wires 6 connected to a contact pin 21. A negative end 23 of the battery 17 is connected through a spring 24 to an insulating support 25 which is anchored to the inside of the base 1 by pins 26. The spring 24 is connected through a wire 27 to a contact member 28 which has a contact 29 thereon and forms electrical contact with contact 30 on contact support 31. The contact support 31 is connected to a contact support 32 and the contact supports 31 and 32 are supported by means of rivets 33 on an insulated support 34. Another contact 35 is supported on the insulated support 34 and the capacitor 36 has its ends 37a and 38, respectively, connected across the contacts 31 and 35. The contact 35 is connected through a wire 37 to the outside of bolt 1. A contact actuating member 40 is slidably supported in a hole 41 in the bolt 1 and has a washer 43 to keep it in place in the hole 41 and a second washer 44 is engaged by a spring 45.

A trigger mechanism comprising a bell crank 47 which is pivoted to the gun frame at 48 has a trigger 49 attached thereto which is pivoted to the bell crank 47 at 50 and pivoted to the gun frame at 51. A bell crank or actuating member 52 is urged upward by the usual sear spring member 45 to hold the contacts 35 and 32 closed when in an unactuated position.

The plug 4 has a counterbore 55 to receive the flange of a shell 56 and extractor hooks 57 are adapted to overlie the flange of the shell 56 in the conventional manner to extract it. The contact pin 21 is urged into engagement with a firing contact 58 of the shell 56 by means

of spring 59 and the contact 20 is urged into engagement with contact 59a by means of a spring 60.

The safety is operated by means of a cam mounted on the gun frame which is adapted to engage a pawl 62 to pull a safety actuating member 63 outward and compress a spring 64, allowing the spring contact carrying member 31 to open the contacts 29 and 30, thereby interrupting the circuit from the battery 17 to the primary of the induction coil. A resistor 66 may be connected across the contacts 29 and 30 to prevent sudden break of the current in the induction coil.

The shell 56 will preferably be made of molded plastic and have the center contact 58 molded therein and the contact 59a having a laterally extending point 70 bent toward a point 71 of the firing contact 58 to provide a shorter gap of lesser electrical resistance between the two contacts 58 and 59a inside the shell 56 than out so that the spark will jump between the points 70 and 71 rather than the ends outside the shell 56.

Figs. 5 and 6 show another embodiment of the invention wherein a molded shell case 156 has a flange 155 through which a central member 158 having a head 159 thereon extends and a pin 160 is provided toward the outer periphery of the shell 156. The head 159 on the central pin 158 provides a shorter electrical path between the head 159 and the pin 160 to insure that the spark will jump inside the shell 156 and not out.

The bolt disclosed can be varied in shape depending upon the particular gun in which it is to be used. Substantially the same structure could be used in the breech block of automatic or semi-automatic guns. In operation, the conventional bolt or breech block in the gun which is to be used will be removed and the bolt 1 disclosed herein substituted therefor. Then the shell 56 or 156 will be inserted in the chamber and the bolt 1 closed by the operator grasping handle 80 and rotating and pulling it. As the bolt 1 slides toward the cartridge, the actuating member 52 will slide in slot 82 until the contact actuating member 40 engages the actuating member 52. This will close the contacts 32 and 35 but will not cause a spark to jump across the gap because of the inductance of the primary builds up slowly. Therefore, the induced secondary is not sufficient to cause a spark to jump between the contacts 58 and 59a. If the operator then desires to postpone firing the gun, he actuates a cam which engages the pawl 62, pulling the member 63 outward against the spring 64 and opening contacts 29 and 30. There will not be a sudden interruption of the current which will cause a spark to jump because the resistor 66 will allow the current to slow down gradually.

When the operator desires to fire the gun, he will release the safety 63, allowing the safety member 63 to close the contacts 30 and 29. Then, since the member 52 is holding the contacts 32 and 35 closed, current will flow through the primary winding 13 through the wire 14, the positive terminal 16 of battery 17, the spring 24, the wire 27, through the contacts 28 and 30, through the contacts 32 and 35, and then to ground through wire 37. From ground, it will flow through the wire 18 to the other side of the primary 13. This current, when interrupted by the operator pulling the trigger 49 to cause the bell crank 52 to open the contacts 32 and 35, will suddenly interrupt the current in the primary 13, thereby inducing a current in the secondary 11, causing a magnetic flux in the core 8 of the ignition coil to suddenly collapse and induce a high voltage in the secondary 11. The high voltage causes a spark to jump across the gap between points 70 and 71, igniting the powder or combustible material in the shell case 56 and firing the projectile. The bolt 1 can then be withdrawn and the cartridge 56 extracted and a new one substituted and the procedure repeated.

Another embodiment of the invention shown in Fig. 7 discloses a breech block 101 adapted to be disposed in a firearm. The figure shown can be adapted to any style firearm having a breech which engages a cartridge; however, a breech block such as that shown in Fig. 1 is disclosed. The breech block 101 illustrated is adapted to be used with a bolt action firearm. The breech block 101 has an iron body 102 having a bore 103 therethrough which is closed at end 104 and has a hole 105 through the end closure therefor. An induction coil 106 has a terminal 107 in engagement with contact 108 and the other end 109 of the induction coil 106 is contacted by a terminal 110 of battery cell 111. The other end of the battery cell 111 is held in place by means of a spring 112. A terminal 113 is adapted to engage the contact 58 of the cartridge 56 shown in Fig. 3 and ring 114 is adapted to make contact with the contact member 59a shown in Fig. 3. A circuit interrupting mechanism such as that in Fig. 1 will be provided for causing the coil 106 to induce a voltage in the secondary.

Fig. 8 shows another embodiment of the invention made up of a breech block 201 which has an iron body 202 closed at end 203 and has a permanent magnet 204 located concentric therewith and supported therein by means of a screw 205. A coil 206 of fine wire is wrapped around the magnet 204 and has one end thereof grounded to the body member 202. The other end 210 of the coil 206 connects to a terminal 211 adapted to engage the center contact 58 of the cartridge 56. Therefore, the body 202, the end partition 203, and slug 215, along with armature 216, form a magnetic circuit. The armature 216 has a light weight non-magnetic guide member 217 attached thereto which, along with the slug 215, makes sliding contact with holes 218 and 219 and armature 216 engages the hole 219 of the magnet 204.

The guide member 217 has end 221 of a spring 222 attached thereto and the other end 223 of the spring 222 is fixed to an end member 224. A handle 225 is rotatably mounted on the body member 202 and has a tube 227 attached thereto at 228. A safety lock 229 extends through a hole 230 in the handle 225 and is attached at 231 to the guide member 217. A trigger engaging member 231a is attached at 232 to the guide member 217 and extends downward and terminates in a point 233 which is adapted to engage a trigger mechanism 234 on a firearm.

The tube member 227 is better shown in Fig. 10 which shows a cam surface 235 which is adapted to engage the trigger engaging member 231a and the end 237 of the tubular member 227 extends down into a slot 271. Therefore, when the guide 217 is in the position shown when trigger member 234 is pulled down out of engagement with trigger member 231a, spring 222 pulls plug 216 away from magnet 204, interrupting the magnetic circuit and, therefore, inducing a high voltage in coil 206. This voltage with proper combination of spring tension in spring 222, magnetic strength of magnet 204, and coil turn numbers will induce a sufficient voltage to fire the explosive charge in the shell.

Fig. 12 shows an end view of the breech block 201 showing the contact ring 214 and the terminal 211.

Fig. 13 shows a cross sectional view showing the center terminal 211 which is set in an opening 242 and has a spring 243 engaging the bottom of the hole 242 at 244 and, at the other end thereof, engaging a rim or disk member 245 which is fixed to the terminal 211. The edge of the opening 242 in the hole may be peened over at 247 to hold the disk member 245 in place. A resilient block 280 is secured to plate 281 and thereby supported in the hollow body to provide a resilient stop for the guide member 217 and the plug 216 in their rearward travel.

Fig. 14 shows a view of the contact ring 214 having spring urged members 250 mounted at spaced points on the underside thereof and embedded in openings 251 in slot 252. Springs 253 are in engagement with each spring urged member 250 and urge the ring 214 into engagement with the outer contact 59a of the cartridge 56.

During operation, the operator will fit a cartridge

such as that shown in Fig. 3 into the chamber of his gun and force the breech block into engagement with the cartridge. Then he will rotate the handle **255** on the mounting member **201**. This will cause the cam **235** to force the pin **233** away from the handle **225** which will carry the guide member **217** and the armature **216** forward into engagement with the magnet **204**. The point **233** will slide forward over the trigger **234** and will be held by the trigger **234** until it is desired to fire the gun. When the operator pulls the trigger to move the member **234** downward, the point **233** will slide above it and spring **222** will snap the guide member **217** to the dotted line position **270**. This will quickly interrupt the flow of magnetic flux across the gap **219**, thereby inducing a current in the coil **206** which will flow through the contact member or terminal **211** across the gap between contacts **59***a* and **58** of the cartridge **56**, thereby causing a spark to jump across the gap and igniting the charge of powder or combustible material in the cartridge **56**. During its movement from the position shown in full lines in Fig. 8 to the dotted line position **270**, the pin **233** will slide along slot **271** and will, therefore, not be interrupted in its rapid movement across the gap.

The operation of the breech block and firing mechanism therein depends for its operation on the fact that when a magnetic circuit is suddenly interrupted, the lines of force thereon will collapse and if a coil of wire is disposed in the collapsing field and the turns of the wire cut thereby, a voltage will be induced in the coil proportional to the number of turns of wire on the coil and also to the strength of the magnetic field. For a magnet in this application, one of the high strength permanent magnets which are at present sold under the trademark "Alnico" is preferably used.

The embodiment of the invention shown in Fig. 9 shows a bolt **301** made in the form of a bolt for a bolt action gun; however, it could be made of a breech block for use in a suitable gun. The bolt **301** is made of magnetic material, is hollow and has a closed end **302** in which a non-magnetic member **303** is disposed. Magnet **304** made up of a plurality of magnetic elements **305**, **306**, **307**, and **308** having like poles disposed adjacent each other is arranged concentrically in the bolt **301**. The magnet **304** has bearing members **309** and **310** attached at either end thereof. The bearing member **309** slides in a hole **311** in non-magnetic member **303** and the bearing member **310** slides in a hole **312** in spacer member **313**. Sear member **314** is attached to the bearing member **310** at **315** and a spring **316** is attached thereto at **317**. A tubular member **318** is formed similar to the member **227** and has a similar slot which engages the sear member **314** to stop the magnet **304** when a handle **325** is rotated. A spring **326** is attached to the sear **314** at **327** and to the handle **325** at **328**. A coil **329** is made up of a plurality of coils **330**, **331**, **332**, **333**, and **334** of turns which are wound in opposite directions to each other. The coil **331** has the end thereof connected at **340** to the contact member **211** and downward to the sliding member **310** at the other end thereof.

During operation, when a shell is inserted in the gun and the contact members are in engagement with the corresponding contact members on the end **302**, the coil is connected to the cartridge. When member **342** is actuated when the trigger is pulled, the sear **314** is released. The spring **316** snaps the magnet **304** toward the handle **325**, causing the lines of magnetic force between the magnet **304** and the outside shell to cut across the windings, thereby inducing a voltage in the coil **329**. By locating like poles adjacent each other, the fields of the magnet **304** will be out through the winding coils and through the iron member back to the other side of the end of each of the magnets. By locating the like poles adjacent each other, the lines of force will be more directly straight outward through the windings. If unlike poles of the magnets were disposed adjacent each other, the entire magnetic assembly would act as one magnet and, therefore, less coils would cut the lines of force.

The foregoing specification sets forth the invention in its preferred practical forms but the structure shown is capable of modification within a range of equivalents without departing from the invention which is to be understood is broadly novel as is commensurate with the appended claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A bolt for a bolt action firearm comprising a hollow bolt member closed at one end, means in said hollow member to induce a magnetic field, a coil of wire disposed in said hollow member adjacent said field inducing means, means to electrically connect said coil to a firing mechanism including means adapted to be electrically connected to a contact member on a cartridge, and means to interrupt said magnetic field whereby a voltage is induced in said coil connected to said firing mechanism, said member having one end thereof adapted to engage said cartridge.

2. The bolt block recited in claim 1 wherein said means to interrupt said magnetic field comprises a movable armature movable out of said magnetic field whereby said magnetic field is interrupted.

3. A firing mechanism for a bolt action firearm having a bolt, said bolt comprising a core made of magnetic material in said bolt, a primary coil in said bolt, a source of electrical power for said primary coil in said bolt, a secondary coil in said bolt, means to connect said secondary coil to a cartridge to be fired, and means to interrupt the flow of current in said primary coil whereby a voltage is induced in said secondary coil.

4. A firing mechanism for a bolt action firearm comprising a hollow bolt member for said firearm, one end of said hollow bolt member having a cartridge engaging portion thereon, an electrical circuit in said hollow bolt member, said electrical circuit connected to electrode engaging members in said cartridge engaging portion, and means to selectively open and close said electrical circuit whereby an electrical spark results between said electrodes in said cartridge.

5. The firearm recited in claim 4 wherein said source of electrical energy comprises a battery disposed in said hollow member.

6. The firearm recited in claim 5 wherein said electrical source further comprises a switch in series with said battery, said switch actuatable to interrupt the flow of current through said coil.

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