United States Patent

[11] **3,631,620**

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[32] Priority **June 29, 1968**
[33] **Japan**
[31] **43/44839**

[54] **BOLT OF BOLT-ACTION FIREARMS**
8 Claims, 26 Drawing Figs.

[52] **U.S. Cl.** ..... **42/16,** 42/69 A
[51] **Int. Cl.** **F41c 11/00,** F41c 17/06
[50] **Field of Search** ..... 42/16, 16.1, 69 A, 70

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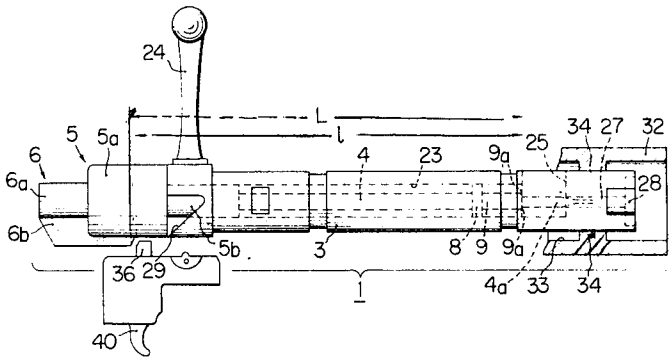
Primary Examiner—Benjamin A. Borchelt
Assistant Examiner—C. T. Jordan
Attorney—Holman & Stern

ABSTRACT: A firearm bolt assembly including a firing pin with an engagement part which is aligned with and permitted to enter an engagement slot in a bolt cylinder into a position whereby firing is possible only when the bolt cylinder is in its fully locked position. The driving force of the main spring initially borne by the engagement part in contact against a shoulder part of the cylinder is transferred, when the engagement part thus enters the slot, to the catch of the cooking piece thereby brought into contact with and arrested by the sear in preparation for firing.



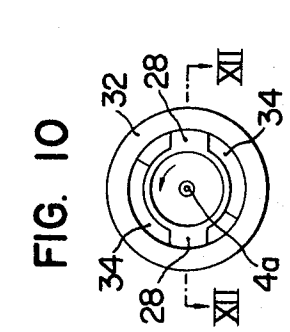


FIG. 10

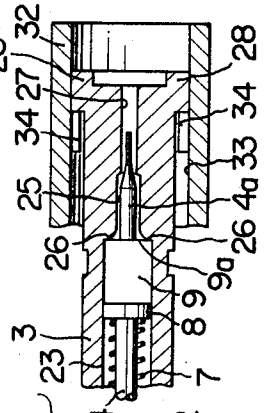


FIG. 12

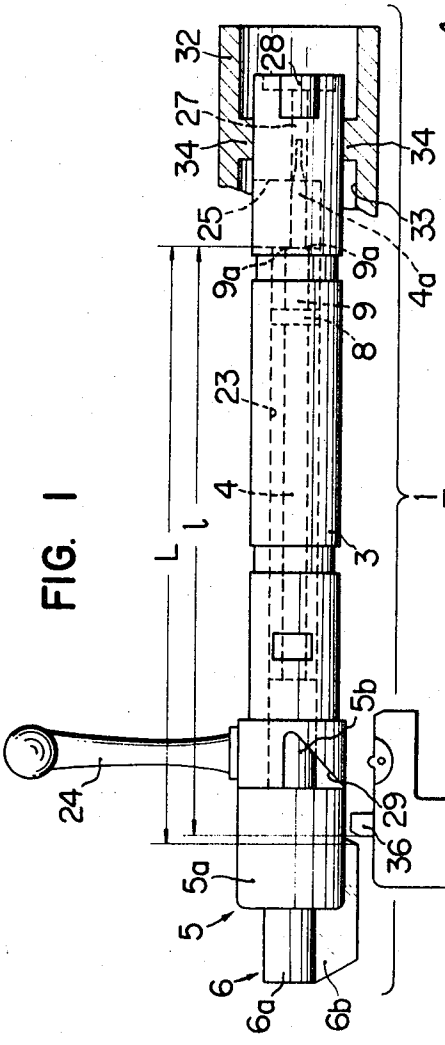


FIG. 1

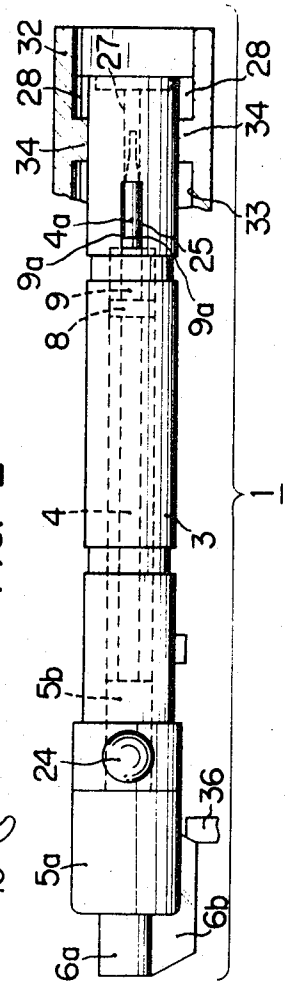


FIG. 2

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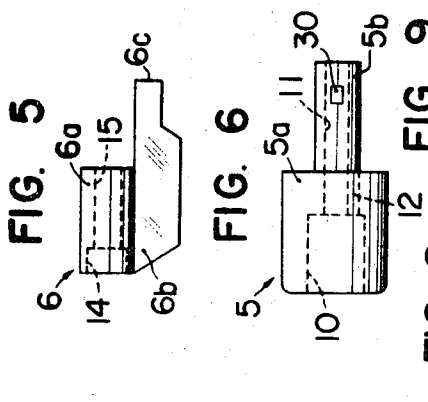

FIG. 5

FIG. 6

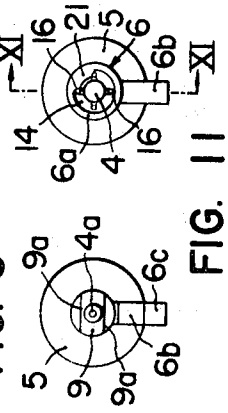

FIG. 9

FIG. 8

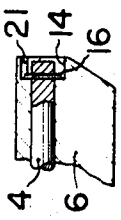

FIG. 11

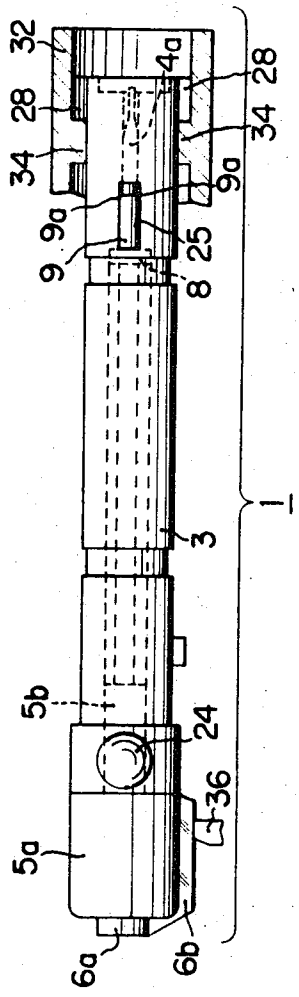

FIG. 3

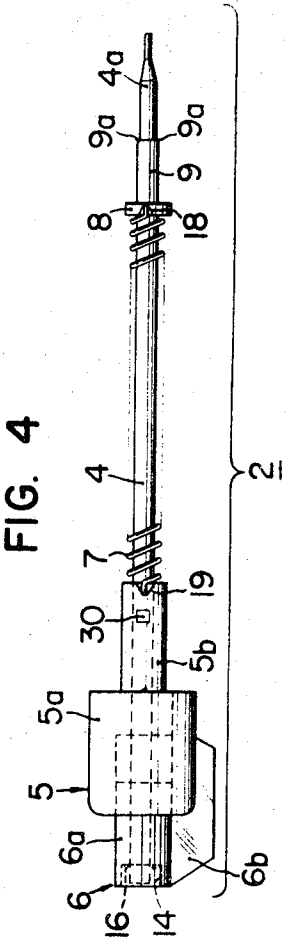

FIG. 4

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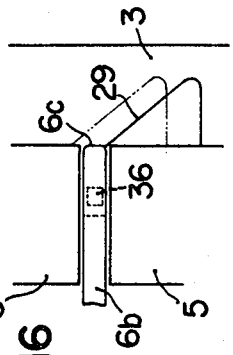
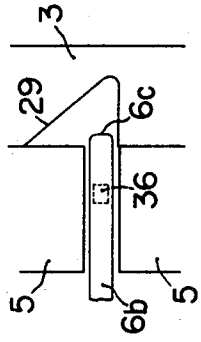


FIG. 16



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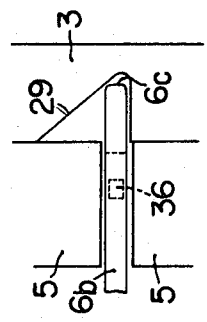

FIG. 18

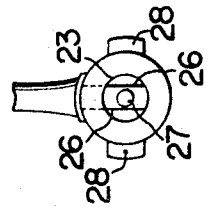

FIG. 15

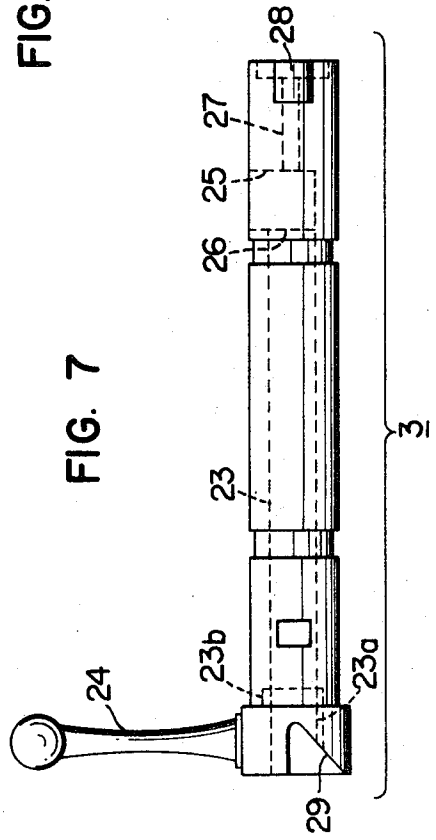

FIG. 7

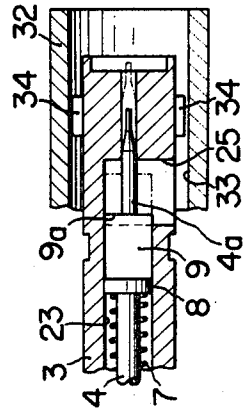

FIG. 14

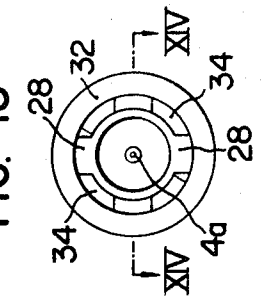

FIG. 13

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FIG. 19

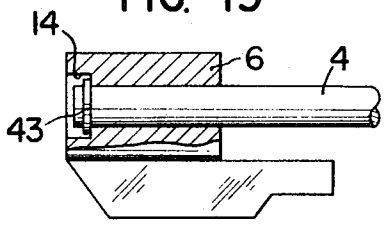


FIG. 20

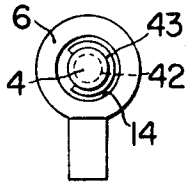


FIG. 21

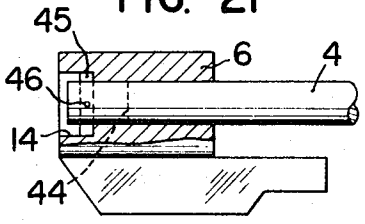


FIG. 22

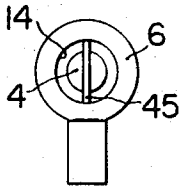


FIG. 23

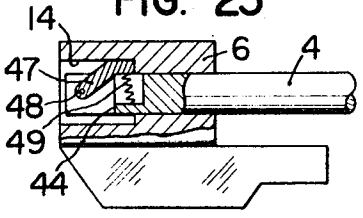


FIG. 24

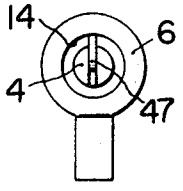


FIG. 25

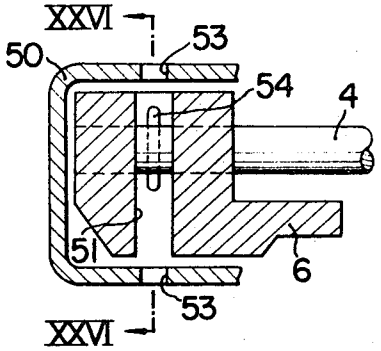
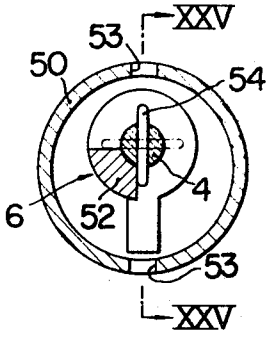


FIG. 26



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BOLT OF BOLT-ACTION FIREARMS

BACKGROUND OF THE INVENTION

This invention relates generally to firearms and firing mechanisms thereof and more particularly to a new and improved bolt mechanism which can be advantageously applied to almost all kinds of bolt-action firearms including rifles and shotguns.

A representative bolt-locking mechanism in bolt-action rifles of types commonly known heretofore has a bolt housing and guiding frame or receiver provided on its inner wall surface with a lug for locking and a bolt cylinder or bolt body adapted to be inserted longitudinally into the receiver in the longitudinal direction thereof and having a lug for locking on the periphery of the front extremity thereof.

This bolt body is further adapted to be supported rotatably about its axis within the receiver between an unlocked position in which the locking lug thereof does not engage the locking lug of the receiver, and also the bolt body can retract rearwardly within the receiver and a locked position in which the locking lug of the bolt body engages with the locking lug of the receiver, and the rearward retraction of the bolt body is arrested. Furthermore, the bolt body contains therein a firing pin about which a main spring is wound. This firing pin is impelled by the main spring in the compressed state to plunge forward and thereby to accomplish firing upon release of the cocking piece by the sear, which is caused by the manipulation of the trigger to protrude into and retract from the receiver interior.

In known rifles having bolts of this character, there have been instances wherein, even when the bolt handle of the bolt body is partially rotated in the direction for locking, and a cam groove formed on the rear end surface of the bolt body has merely reached a position at which it is partially confronting the cocking piece, whereby the bolt is not fully locked, the cocked firing pin is released when the trigger is pulled because of carelessness or some kind of impact force. Consequently, the cocking piece is released and moves forward, sliding along the inclined surface of the cam groove, whereby the firing pin is impelled forward to cause accidental firing.

At the time when an accidental firing of this nature occurs, the locking lug of the receiver have not yet fully engaged. If the area of pressure contact between the two locking lugs is thereby very small, the bolt will be incapable of resisting the force due to the gas pressure of the firing in the firing chamber, and a part of the locking lug of the bolt body or the locking lug of the receiver will be sheared off, whereby the bolt body will be impelled violently toward the rear. As a result of such accidental firing, there have been instances of injury to the person handling the gun and of damage to the receiver and/or bolt.

While such accidents relating to firearm mechanisms are very rare, they cannot be neglected or permitted since they are a source of danger to persons handling the firearms.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a bolt device of a bolt-action firearm capable of positively preventing accidents of the above-described nature.

Another object of the invention is to provide a bolt device of the above-stated character in which the bolt body is automatically compelled to rotate toward the lock position thereof from a position immediately therebefore, whereby the rotation of the bolt toward and into the fully locked position is facilitated.

Still another object of the invention is to provide a bolt device of the above-stated character in which the torque resistance to rotation of the bolt body from the locked position toward the unlock position is relatively high.

A further object of the invention is to provide a bolt device of the above-stated character in which, when the bolt is not in its fully locked state, the cocking piece and the sear for releasing the cocking piece are maintained in a mutually spaced-

apart state and cannot contact each other, the cocking piece and the sear engage only when the bolt is in its fully locked state to make firing possible.

A still further object of the invention is to provide a bolt device of the above-stated character in which the firing pin is inserted through the cocking piece in a relatively rotatable and, moreover, a freely detachable manner with respect thereto, and, at the same time, the range of rotational angle of the firing pin relative to the cocking piece is limited, whereby the firing pin is caused to have a specific rotational range, and, moreover, the disassembly and assembly of the bolt is facilitated.

Other objects and advantageous features of the present invention will presently become apparent as the disclosure proceeds.

According to the present invention, briefly summarized, there is provided a bolt device of the character referred to above in which the firing pin has an engagement part having a distinctive cross section which is aligned with and permitted to enter a corresponding engagement slot in the bolt cylinder or body in the forward direction into a position whereby firing is possible only when the bolt body is in its fully locked position, the forward driving force of the main spring being initially borne by the engagement part in contact against a shoulder part of the bolt body but being transferred to the catch of the cocking piece brought into contact with and arrested by the sear in preparation for firing when the engagement part thus enters the engagement slot.

The nature, principle, details, and utility of the invention will be more clearly apparent from the following detailed description with respect to preferred embodiments of the invention when read in conjunction with the accompanying drawings, in which like parts are designated by like reference numerals.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a side (right-hand) elevation, with parts cut away, showing the essential parts of an example of a bolt device according to the invention with the bolt in its unlocked state;

FIG. 2 is a similar side elevation showing the bolt illustrated in FIG. 1 in its fully locked state prior to firing;

FIG. 3 is a similar side elevation showing the same bolt in its firing state with the firing pin in the released and advanced state;

FIG. 4 is a right-hand side elevation of the firing pin assembly extracted from the bolt device shown in FIG. 1;

FIG. 5 is a right-hand side elevation showing a cocking piece included in the firing pin assembly illustrated in FIG. 4;

FIG. 6 is a right-hand side elevation showing a bolt sleeve included in the same firing pin assembly;

FIG. 7 is a right-hand side elevation showing the bolt cylinder or body of the bolt device illustrated in FIG. 1;

FIG. 8 is an end elevation of the firing pin assembly illustrated in FIG. 4 as viewed from the right therein (rifle muzzle side);

FIG. 9 is an end elevation of the firing pin assembly illustrated in FIG. 4 as viewed from the left therein (rifle butt side);

FIG. 10 is an end elevation of the bolt device shown in FIG. 1 as viewed from the right therein (rifle muzzle side);

FIG. 11 is a fragmentary section taken along the central vertical plane indicated by line XI—XI in FIG. 9 as viewed in the arrow direction;

FIG. 12 is a fragmentary section taken along the central horizontal plane indicated by line XII—XII in FIG. 9 as viewed in the arrow direction;

FIG. 13 is an end elevation of the bolt device illustrated in FIG. 2 as viewed from the right therein (rifle muzzle side);

FIG. 14 is a fragmentary section taken along the central horizontal plane indicated by line XIV—XIV in FIG. 13 as viewed in the arrow direction;

FIG. 15 is an end elevation of the bolt body illustrated in FIG. 7 as viewed from the left therein (rifle butt side), showing the interior in an insertion hole of the bolt body with the firing pin extracted;

FIGS. 16, 17 and 18 are fragmentary diagrammatic views indicating the relationships between the cocking piece and a cam slot respectively in the states indicated in FIGS. 1, 2, and 3;

FIG. 19 is a fragmentary side elevation showing a modified example of coupling means of the cocking piece and the firing pin;

FIG. 20 is an end elevation of the parts illustrated in FIG. 19 as viewed from the left therein, (rifle butt side);

FIG. 21 is a fragmentary side elevation showing another modified example of the coupling means of the cocking piece and the firing pin;

FIG. 22 is an end elevation of the parts shown in FIG. 21 as viewed from the left therein;

FIG. 23 is a view similar to FIG. 19 showing still another modification of the coupling means of the cocking piece and the firing pin;

FIG. 24 is an end elevation of the parts illustrated in FIG. 23 as viewed from the left thereof.

FIG. 25 is a view similar to FIG. 19 and is a section taken along the central vertical plane indicated by line XXV—XXV in FIG. 26 as viewed in the arrow direction, showing a further modification of the coupling means of the cocking piece and the firing pin; and

FIG. 26 is a cross section taken along the vertical plane indicated by line XXVI—XXVI in FIG. 25 as viewed in the arrow direction.

DETAILED DESCRIPTION

Referring first to FIGS. 1, 2, and 3, the firearm (rifle) bolt designated generally therein by reference numeral 1 consists, essentially, of a bolt cylinder or body 3 as shown in FIG. 7 and a firing pin assembly 2 as shown in FIG. 4 fitted slidably within the bolt body.

As shown most clearly in FIGS. 4, 5, and 6, the firing pin assembly 2 comprises a firing pin 4, a bolt sleeve 5, a cocking piece 6, and a firing pin spring or main spring 7. As shown in FIG. 4, the firing pin 4 has a stop flange 8 of disk shape near its front end (right end as viewed in FIG. 4) and an engagement part 9 which is integrally and contiguously formed with the flange 8 and extends forwardly therefrom. This engagement part 9 has a substantially oblong cross section and, furthermore, two edges of relatively long dimensions between opposed sides, and muzzle side surfaces thereof are chamfered into arcuate shoulders 9*a*, 9*a*.

A bolt sleeve 5 is fitted onto the base or rear end (left end as viewed in FIG. 4) of the firing pin 4, and a main spring 7 is installed between this bolt sleeve 5 and the aforementioned stop flange 8 and around the middle shank part of the firing pin 4. The bolt sleeve 5 is made up of a large diameter cylindrical part 5*a* and a small diameter cylindrical part 5*b* as shown in FIGS. 4 and 6 and is provided internally therethrough in the axial direction with a large diameter bore 10 and a small diameter bore 11 contiguous thereto. A slot 12 is formed in the large diameter cylindrical part 5*a* in the axial direction thereof.

A cocking piece 6 if further fitted onto the base end (left end) of the firing pin 4 and, as shown in FIG. 5, is made up of a cylindrical part 6*a* and a cocking catch part 6*b* of plate form. The cylindrical part 6*a* is provided axially through its interior with a large diameter bore 14 and a small diameter bore 15.

The rear or base end part of the firing pin 4 is inserted rearward through the bores 15 and 14 and projects outward toward the rear, being held by a stop pin 16 passed therethrough. The main spring 7 is thereby compressed between the stop flange 8 and the bolt sleeve 5*a*. In the installation of this main spring 7, the two ends thereof are respectively engaged with and anchored in cutouts 18 and 19 formed respectively in the stop flange 8 and bolt sleeve 5*a*. Moreover, a residual torsional force or torque should be forcibly imparted previously to the main spring 7 itself.

When the cocking piece 6 is assembled in the state indicated in FIG. 4, the catch part 6*b* thereof is inserted slidably into the slot 12 of the bolt sleeve 5*a*, and the cylindrical part 6*a* thereof is inserted slidably into the large bore 10 of the bolt sleeve 5*a*.

The above-mentioned stop pin 16 is adapted to contact a rotational stop 21, which projects into the large diameter bore 14 at the base end or rear end of the cocking piece 6 as shown in FIGS. 9 and 11, thereby to establish one limit to the rotational angle range of the firing pin 4 under the torque due to the main spring 7. Accordingly, the engagement part 9 near the front end of the firing pin is held in the horizontal position as indicated in FIG. 4.

As shown in FIG. 7, the bolt body 3 has therewithin in the longitudinal direction a chamber or bore 23 for insertion therein of the firing pin, which bore 23 has an inner diameter such that the small diameter cylindrical part 5*b* of the bolt sleeve 5 can be inserted therein with a sliding fit. The bolt body 3 is provided at its rear end with a bolt handle 24 integrally formed therewith. In the example illustrated, the bolt rotational angle is 90° and the bolt handle 24 extends outward in a substantially straight line perpendicular to the bolt axis.

The bolt body 3 is provided in its interior contiguously forward of the bore 23 with an engagement slot 25 of an oblong cross section, the axis of its longer dimension being vertical when the bolt is in the angular position indicated in FIGS. 1, 7, and 15. This engagement slot 25 is open to the outside at the upper surface (the bolt handle side) of the bolt body 3 as shown particularly in FIGS. 2 and 3. The width of the slot as measured perpendicularly to its longitudical direction is made slightly larger than the narrower dimension in cross section of the engagement part 9 of the firing pin 4.

At the juncture of the bore 23 for insertion of the firing pin and the engagement slot 25, ledges or shoulders 26 of arcuate shape are formed. Contiguous to and forward of the engagement slot 25 there is formed a through hole 27 of small diameter in the forward part of the bolt body 3. The diameter of this hole is made slightly larger than the outer diameter of the forward end part 4*a* (FIG. 4) of the firing pin assembly 2.

The bolt body 3 is further provided on opposite lateral sides of its front end part with a pair of locking lugs 28 projecting outwardly. The bolt body 3 also has a cam recess 29 at the lateral side of its base or rear end part.

The firing pin assembly 2 and the bolt body 3 are assembled in the state indicated in FIG. 1. More specifically, the firing pin 4 is inserted into the firing pin insertion bore 23 within the bolt body 3, and the arcuate shoulder parts 9*a*, 9*a* (FIG. 4) forming the forward extremity of the engagement part 9 of oblong cross section of the firing pin 4 are caused to engage with the above-mentioned shoulder parts 26 of the bolt body 3. Since the orientation about the longitudinal axis of the engagement slot 25 and that of the engagement part 9 are not coincident in this assembly state, i.e., substantially at right angles, the engagement part 9 cannot advance further forward.

The above described engagement mechanism including the shoulder parts 9*a* and the shoulder parts 26 constitutes some of the important technical features of the present invention.

After the engagement part 9 has been placed in abutting engagement with the shoulder part 26, the bolt sleeve 5 is forced forward to cause the small diameter cylindrical part 5*b* thereof to slide over and along the firing pin 4 as the main spring is compressed, thereby to be forced into the interior of the bore 23 for insertion of the firing pin. In this assembly step, the cylindrical part 5*b* of the bolt sleeve 5 is pushed forward with a lug 30 (as shown in FIGS. 4 and 6) provided on the peripheral surface thereof in a state of insertion in a groove 23*a* (FIG. 7) formed in the axial direction at the rear end of the bore 23 in the bolt body. Then, when the bolt sleeve 5 has been advanced forward to a point where the lug 30 reaches an annular groove 23*b* in the bore 23, the bolt sleeve 5 is rotated.

The lug 30, groove 23*a*, and annular groove 23*b* thus constitute a so-called bayonet lock device whereby the front end surface of the large diameter cylindrical part 5*a* of the bolt sleeve 5 abuts ad contacts the rear end surface of the bolt body 3 as indicated in FIG. 1.

After the firing pin assembly 2 has been fitted in the bolt body 3 as described above the resulting assembly is inserted into the frame or receiver 32 of the rifle as indicated in FIG. 1.

The inner surface of the axial bore 33 within the receiver 32 is provided with a diametrically opposed pair of upper and lower arcuate lugs 34 for locking, between which are provided a pair of cutout parts each of a transverse dimension such as to permit passage therethrough in the axial direction of the locking lugs 28, 28 of the bolt body 3. Therefore when the angular positions of the locking lugs 28 are caused to coincide with those of the cutout parts, and the bolt body is then pushed forward, the lugs 28 reach the position indicated in FIG. 1 in which they have emerged forward of the arcuate lugs 34. This position corresponds to the unlocked state of the closed bolt 1.

The bolt is so designed that when it is in this state, the distance "L" from the engagement shoulder 26 of the bolt body 3 to the engagement surface of the catch part 6*a* of the cocking piece 6 is slightly longer than the distance "*l*" from the shoulder 26 to the engagement surface of the sear 36. (We have found that a suitable difference between these distances "L" and "*l*" in practice is approximately 1 mm.) Consequently, with the closed bolt in this unlocked state, the sear 36 and the cam part 6*b* of the cocking piece 6 are not in contact. This mechanical state constitutes another important feature of the present invention.

As mentioned hereinbefore, the firing pin 4 in this state of the bolt is being subjected to a torque due to the main spring 7 but is being limited in rotational movement by the contact of the stop pin 16 against the rotational stop 21, whereby the engagement part 9 of the firing pin is maintained in its horizontal position. Furthermore, when the bolt is in this state, the elastic force of the main spring 7 is being received by the shoulders 26 of the engagement slot 25, with which the engagement part 9 engages, and the annular groove 23*b*, with which lug 30 engages. Accordingly, the spring force of the main spring 7 does not act on the pressure contact surfaces of the stop pin 16 and the cocking piece 6.

The bolt of the above-described organization according to the invention operates in the following manner.

While the bolt is in any angular position between the unlocked state shown in FIG. 1 and the fully locked position indicated in FIG. 2 which is reached after the bolt body 3 has been turned 90° (clockwise as viewed forward from rifle butt to rifle muzzle) from the uncocked position, the aforementioned distance "L" is longer than the distance "*l*". Therefore, a gap is maintained between the cooking piece 6 and the sear 36, which is thereby in a mutually confronting state without any interconnection therebetween, and the firing mechanism is inoperative.

While the bolt body 3 is thus being rotated from the fully unlocked state to the fully locked state, the firing pin 4 is in a state of rest, wherein the shoulders 9*a* of the engagement part 9 are in engagement with the engagement shoulders 26, irrespective of the bolt rotation. Then, when the bolt body 3 completes its 90° rotation, the engagement slot 25, which was initially vertical, is now horizontal as indicated in FIG. 2 and is thereby in angular alignment with the engagement part 9 of the firing pin.

During this rotation of the bolt body 3 and immediately before completion of the full 90° turn, that is when the engagement slot 25 reaches an angular position immediately before it is exactly aligned with the rest position of the engagement part 9, the arcuate shoulders 9*a* of the engagement part 9 and the arcuate step shoulders 26 undergo a relative rotationally sliding motion due to the mutual action of the rotational force applied to the bolt body 3 and the elastic force of the main spring 7 applied to the engagement surface of the engagement part 9. As a result the bolt body 3 is then compulsorily rotated.

As the bolt body 3 is rotated in the above-described manner, the locking lugs 28 at the front end thereof rotate from the fully unlocked state as indicated in FIGS. 1 and 10 in the direction of the arrow in FIG. 10, and the rear faces (left end faces as viewed in FIG. 1) of the lugs 28 progressively engage with the front faces (right end faces as viewed in FIG. 1) of the arcuate locking lugs 34 of the locking of the bolt 1 is started. Immediately before completion of the 90° turn of the bolt body 3, the bolt body is compulsorily rotated as mentioned above, whereby the locking lugs 28 engage fully with the front faces of the locking lugs 34. The bolt 1 is thus fully locked. This fully locked state of the bolt is indicated in FIGS. 2 and 13.

When the bolt 1 is thus placed in the fully locked state by rotating the bolt body 3 through 90° of angle, the engagement slot 25 of the bolt body 3 is in angular alignment with the rest position of the engagement part 9 of the firing pin 4. Consequently, the engagement between the shoulders 26 and the engagement part 9 is terminated, and the firing pin 4 is compelled by the elastic force of the main spring 7 to advance forward together with the cocking piece 6 through the distance of the gap (L–*l*) between the cam part 6*a* of the cocking piece 6 and the seat 36, whereupon the cam part 6*a* of the cocking piece 6 engages the sear 36 as indicated in FIG. 2.

At the same time, a part of the front extremity of the engagement part 9 is thrust into the engagement slot 25 through a distance corresponding to the difference L–*l*, whereby firing of the rifle becomes possible. This state of the bolt device will be clearly apparent from a study of FIGS. 12 and 14.

On one hand, while the bolt 1 is locked in the above-described manner, the cam recess 29 at the rear end of the bolt body 3 shifts rotationally from its position indicated in FIG. 16 to that indicated in FIG. 17 as in a conventional mechanism of like character. In the state indicated in FIG. 16, the front end 6*c* (FIG. 5) of the catch part 6*b* of the cocking piece 6 is being pressed by spring force against the rear end of the bolt body 3, whereby the forward advance of the cocking piece 6 is being arrested.

Then, as the bolt body 3 rotates, the cam recess 29 thereof assumes a position as indicated in FIG. 17 in which it is confronting the cocking piece 6, whereupon the cocking piece advances forward by differential corresponding to L–*l*, as above mentioned, and thereby projects into the cam recess 9 by this distance. When the cocking piece 6 advances forward in this manner, and the catch part 6*b* thereof engages with the sear 36, a contact sound is emitted, whereby the fully locked state of the bolt 1 can be confirmed.

As will be apparent from the foregoing, in accordance with this invention, the engagement part 9 of the firing pin 4 is prevented from advancing forward until the bolt body 3 has bee fully locked after the rotation thereof through 90°. Thus, the firing mechanism cannot be operated. It will also be appreciated that when the bolt body is fully locked the catch part 6*b* of the cocking piece 6 engages the sear 36 and firing may be effected by pulling the trigger 40 (FIG. 1) to cause the sear 36 to retract.

The condition after firing is shown in FIG. 3, during which firing the cocking piece 6 moves completely into the cam recess 29 as shown in FIG. 18, and the firing pin 4 is impelled forward under the force of the main spring 7 to cause the tip portion of the firing pin 4 to project beyond the bolt body 3, with the stop flange 8 engaging the shoulders 26 in the bolt body.

It will be noted that, in accordance with this invention, accidental firing due to incomplete locking of the bolt body is completely prevented since here is provided a "double engagement mechanism" which allows the engagement of the cocking piece with the sear for enabling firing only after the fully locked position of the bolt body has been attained.

Moreover, in accordance with this invention, the resistance for locking is considerably reduced. This is because the firing pin 4 is not rigidly secured to the cocking piece 6 as opposed to the conventional firing pin, which was rigidly secured to the cocking piece. Since the firing pin 4 is connected to the

cocking piece 6 through the stop pin 16 and is subjected to a resilient force of the main spring 7 urging the pin 4 rearwardly (toward the left as viewed in FIGS. 1–3) until the fully locked position of the bolt is attained so that the engagement part 9 engages with the shoulders 26, the cocking piece 6 is not forced against the rear end face of the bolt body 3 until the fully locked position is reached. The reduction of the resistance to locking is further assisted by the compulsory locking operation as previously described.

Contrary to this, the resistance to unlocking of the bolt 1 which has been once locked is relatively high. More particularly, because in the locked position of the bolt the torque of the main spring 7 is acting on the engagement part 9 received in the engagement slot 25 and therefore on the bolt body 3, it is necessary to turn the bolt body 3 against the torque of the spring 7 in order to unlock the body 3. Thus, a relatively high resistance to unlocking is created The unlocking resistance also serves to prevent natural unlocking of the bolt 1 by unexpected external forces.

A further advantage of the arrangement according to this invention is that there is no necessity for an operation such as tapping the head of the bolt handle 24 by hand before firing for the purpose of making sure that the bolt is in the fully locked position, this operation having been customary heretofore in bolt action guns.

When the bolt handle 24 and therefore the bolt body 3 begin to be turned toward the unlocked position of the bolt after firing and in preparation for the next firing, the firing pin 4 with its engagement part 9 engaged within the engagement slot 25 also turns with the bolt body 3 against the torque of the spring 7 while the engagement part 9 turns 90° degrees from the horizontal position to the vertical position.

On the other hand, since the cam recess 29 returns to the position shown in FIG. 16 from the position shown in FIG. 18 as the bolt body 3 turns toward the unlocked position, the cocking piece 6 is subjected to cam action by cam edge of the cam recess 29 and gradually moves rearwards.

Thus, it will be appreciated that the firing pin 4 is given the turning movement through its engagement part 9 as well as the rearward movement through the cocking piece 6. When the bolt body 3 has completely turned to the unlocked position, the pin 16 takes the position shown by dot-and-dash line in FIG. 9 and prevents further rotation of the firing pin 4.

When the engagement part 9 of the firing pin takes the vertical position as aforementioned after the bolt body 3 has completed its rotation through 90° to return to the unlock position shown in FIG. 1, the cocking piece 6 is moved completely out of the cam recess 29 and the rearward movement of the firing pin 4 is stopped. At this time, the engagement part 9 is completely free from the engagement slot 25. Therefore, the firing pin 4 can turn to the original position under the influence of the torque of the spring 7 until the pin 16 contacts the rotational stop 21. In this original position the engagement part 9 is in its horizontal position, engaging the shoulders 26 again in the crossed relationship to the engagement slot 25, and the bolt is fully unlocked while the catch part 6*b* of the cocking piece 6 is in spaced apart relationship to the sear 36.

The bolt 1 according to this invention as above described may be applied to all kinds of bolt action firearms irrespective of whether the gun is a rifle or a shotgun. In the embodiment described the bolt-rotating angle is 90°. However, it will be understood that a bolt-rotating angle other than 90° may be used. In all cases, however, the bolt-rotating angle must be same as the crossing angle between the engaging slot 25 and the engagement part 9. Further, it will be understood that the extending direction of the engagement slot 25 is not limited to the vertical direction as shown in FIG. 1 and may be any direction. However, it is necessary in all cases for the rotational stop 21 to be positioned so as to stop the rotation of the firing pin 4 when the engagement part 9 takes a position in which it crosses the engagement slot 25 at 90°.

In FIGS. 19 through 24, there are shown several modifications of connecting means between the firing pin and the cocking piece. In these figures, the same or corresponding parts are designated by the same numerals as are applied to the previous figures.

In the modification shown in FIGS. 19 and 20, the firing pin 4 is formed with an annular groove 42 at the rear end thereof, and a resilient snap hoop or circular clip 43 engaged in the groove 42 abuts against the shoulder of a counterbore recess 14 cut in the rear wall of the cocking piece 6.

In the modification shown in FIGS. 21 and 22, the firing pin 4 is formed with a deep diametrical slot 44 in the rear end thereof, and in the groove of the slat 44 there is pivoted a stop pin 45 by means of a pivot pin 46. When the firing pin 4 is to be passed through the cocking piece 6, the stop pin 45 is turned about the pivot pin 46 so that it completely enters the slot 44 and is at right angles to the position shown in FIG. 21 The stop pin 45, after the firing pin 4 has been passed through the cocking piece 6, is returned to the position shown in FIG. 21 and is brought into engagement with the shoulder of the recess 14.

In FIGS. 23 and 24 there is shown a further modification in which the firing pin 4 is formed with a diametrical slot 44, and a stop pin 47 is pivoted at one end thereof at 48 within the slot 44 and urged counterclockwise as viewed in FIG. 23 against the side wall of the recess 14 by means of a compression spring 49. When the firing pin 4 is to be passed through or to be removed from the cocking piece 6, the stop pin 47 is depressed into the slot 44 against the force of the spring 49.

In the three modifications shown in FIGS. 19 through 24, no such rotational stop as shown in FIGS. 9 and 11 and designated by the reference numeral 21 is provided. However, any suitable means functioning as stop means may be provided. However, any suitable means functioning as stop means may be provided in lieu of the stop 21 in these modifications.

In FIGS. 25 and 26 there is shown a still further modification of the connecting means for the firing pin and the cocking piece. In this modification, a transverse cutout 51 is provided in the middle part of the cocking piece 6 through 270° so as to leave a connecting portion 52, and a stop pin 54 is removably inserted through the portion of the firing pin 4 located in the cutout 51. The connecting portion of the firing pin 4 located in the cutout 51. The connecting portion 52 serves as a stop for the pin 54. The cocking piece 6 is covered by a cup-shaped casing 50 having a pair of diametrically oppositely arranged holes 53 through which the stop pin 54 may be inserted into and removed from the firing pin 4.

I claim:

1. In a bolt device of a bolt-action firearm having a receiver and a sear, and adapted for sliding and rotating bolt action within said receiver and of the type comprising a firing pin having an engagement part; a bolt body having a hollow interior for accommodating said firing pin; and engagement slot in the bolt body permitting passage therethrough in an axial direction of said engagement part only when said part is angularly aligned with said slot thereby to permit the firing pin to be impelled forward in firing motion, said bolt body being rotatable, when in the longitudinally closed state, between an angular unlocked position and an angular fully locked position; a main spring imparting an elastic forward force to said firing pin; recess in a cocking piece adapted for cooperative operation with a cam recessing the bolt body and having a catch part for engagement with said sear, the engagement part being out of alignment with the engagement slot when the bolt body is not in said fully locked position and being permitted to slide into the engagement slot only when the bolt body is in the fully locked position, thereby to enable the firing pin to be impelled forward in firing motion, the improvement wherein said cocking piece is connected to said firing pin in a manner such that, while said engagement part of the firing pin is not aligned with the engagement slot and is prevented from advancing forward, the cocking piece is disposed in a position spaced apart from said sear.

2. The bolt device as claimed in claim 1 wherein said main spring is a coil spring connected at one end thereof to said engagement part and at the other end thereof to a bolt sleeve which does not rotate relative to the receive, whereby resistance to unlocking is imparted to said bolt body when the bolt body is rotated from the locked position toward the unlocked position thereof.

3. The bolt device as claimed in claim 1 wherein said engagement slot has shoulder parts at a rear entrance thereof and said engagement part has a front extremity for abutting against said shoulder parts when the engagement pat and slot are not in alignment, corner parts of said front extremity and said shoulder parts being rounded to impact a cam action thereto whereby a torque urging said bolt body to rotate automatically into said fully locked position is imparted thereto from an angular position thereof slightly before the fully locked position.

4. The bolt device as claimed in claim 1 wherein said cocking piece is fitted slidably onto a rear end of said firing pin and prevented from being disconnected therefrom by a stop device.

5. The bolt device as claimed in claim 2 wherein said firing pin is rotatable about the axis thereof with respect to said cocking piece within a rotational angle range determined by a limiting device, and said main spring imparts a torque to the firing pin

6. The bolt device as claimed in claim 4 wherein said stop device comprises a pin passing through said firing pin transversely thereto.

7. The bolt device as claimed in claim 4 wherein said stop device comprises a pin pivotally secured in a split groove at the rear end of said firing pin.

8. The bolt device as claimed in claim 4 wherein said stop device comprises a pin pivoted within a split groove at the rear end of said firing pin for freely emerging from and retracting into said groove and continually urged outward by a spring.

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