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Muzzle-loading firearm with pivoting block action

Abstract

A muzzle-loading firearm having a barrel and a pivoting firing mechanism. The barrel has a breech plug, a pivoting junction axle. and a blocking axle, and the firing mechanism has a trigger, hammer, striker and notch. The firing mechanism is pivotally attached to the barrel at the pivoting junction axle and the blocking axle is movably aligned in the notch. When the firing mechanism is pivoted, it is guided by the blocking axle in the notch ensuring sufficient clearance between said firing mechanism for easy placement of a percussion cap.

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Claims

The invention claimed is:

1. A muzzle-loading firearm comprising: a barrel; a breach plug situated in a rear end of the barrel and adapted to receive a percussion cap; a pivoting block mounted for pivotal motion relative to the barrel and having a firing mechanism mounted thereto, the firing mechanism including a striker for striking the percussion cap, a hammer for driving the striker, and a trigger for tripping the hammer, the pivoting block being pivotal between a blocked position for firing and an unblocked position for providing access to the breech plug for removing a spent percussion cap and replacing it with a fresh percussion cap; and a trigger guard pivotally mounted to the pivoting block for movement between three positions: a locked position locking the pivoting block in its blocked position; an unlocked, blocked position in which the pivoting block is still in its blocked position, but the pivoting block is ready to be moved therefrom; and an unlocked, unblocked position in which the pivoting block has been unblocked, providing access to

the breech plug, and wherein rotation of the trigger guard from the unlocked, blocked position to the unlocked, unblocked position causes the pivoting block to move from its blocked position to its unblocked position.

2. A muzzle-loading firearm as claimed in claim 1 wherein the trigger guard is held in its locked, blocked position by a spring clamp.

3. A muzzle-loading firearm as claimed in claim 2 wherein the spring clamp tends to hold the trigger guard in its locked, blocked position, but does not apply a biasing force biasing the trigger guard against movement from the unlocked, blocked position toward the unlocked, unblocked position.

4. A muzzle-loading firearm as claimed in claim 1 wherein the trigger guard is biased toward its locked, blocked position by a biasing spring.

5. A muzzle-loading firearm as claimed in claim 1 wherein the trigger guard, when in its unlocked positions, is operative to prevent the trigger from being operated.

6. A muzzle-loading firearm as claimed in claim 1 wherein the trigger guard, when in its locked, blocked position engages a fixed barrier to prevent the pivoting block from moving from the blocked position to the unblocked position.

7. A muzzle-loading firearm as claimed in claim 1 wherein as the trigger guard moves from its locked position to its unlocked, blocked position it pivots relative to the pivoting block and wherein as the trigger guard moves from its unlocked, blocked position to its unlocked, unblocked position, the trigger guard and the pivoting block pivot together relative to the barrel.

8. A muzzle-loading firearm comprising: a barrel; a breach plug situated in a rear end of the barrel and adapted to receive a percussion cap; a pivoting block having a firing mechanism mounted thereto, the firing mechanism including a striker for striking the percussion cap, a hammer for driving the striker, and a trigger for tripping the hammer, the pivoting block being pivotal between a blocked position for firing and an unblocked position for providing access to the breech plug for removing a spent percussion cap and replacing it with a fresh percussion cap; and a lever movably mounted to the pivoting block for movement between a locked position locking the pivoting block in its blocked position, an unlocked, blocked position, and an unlocked, unblocked position, and wherein movement of the lever from the unlocked, blocked position to the unlocked, unblocked position moves the pivoting block from its blocked position to its unblocked position.

9. A muzzle-loading firearm as claimed in claim 8 wherein the lever comprises a trigger guard.

10. A muzzle-loading firearm as claimed in claim 9 wherein the trigger guard is pivotally mounted to the pivoting block.

11. A muzzle-loading firearm as claimed in claim 10 wherein the trigger guard is held in its locked, blocked position by a spring clamp.

12. A muzzle-loading firearm as claimed in claim 11 wherein the spring clamp tends to hold the trigger guard in its locked, blocked position, but does not apply a biasing force biasing The trigger guard against movement from the unlocked, blocked position toward the unlocked, unblocked position.

13. A muzzle-loading firearm as claimed in claim 8 wherein the lever is biased toward its locked, blocked position by a biasing spring.

14. A muzzle-loading firearm as claimed in claim 8 wherein the lever, when in its unlocked positions, is operative to prevent the trigger from being operated.

15. A muzzle-loading firearm as claimed in claim 8 wherein the lever, when in its locked, blocked position engages a fixed barrier to prevent the pivoting block from moving from the blocked position to the unblocked position.

16. A muzzle-loading firearm as claimed in claim 10 wherein as the trigger guard moves from its locked position to its unlocked, blocked position it pivots relative to the pivoting block and wherein as the trigger guard moves from its unlocked, blocked position to its unlocked, unblocked position, the trigger guard and the pivoting block pivot together relative to the barrel.

Description

CROSS-REFERENCE TO RELATED APPLICATIONS

The present application claims the priority benefit of U.S. Provisional Patent Application Ser. No. 60/425,950, filed Nov. 12, 2002; U.S. Provisional Patent Application Ser. No. 60/443,936 filed Jan. 31, 2003; and U.S. Provisional Patent Application Ser. No. 60/497,420, filed Aug. 22, 2003; all of which are hereby incorporated herein by reference in their entireties.

TECHNICAL FIELD

The present invention relates to a firing mechanism for a muzzle-loading firearm, such as a muzzle-loading rifle, shotgun, cannon or the like. This invention relates more specifically toward a pivoting block firing mechanism for a muzzle-loader.

BACKGROUND OF THE INVENTION

In the second half of the 19.sup.th century, cartridge style rifles became popular and the market for older muzzle-loading designs started to wane. After the introduction of the cartridge style rifle, which fires a pre-assembled cartridge or bullet, firearm manufacturers started developing movable firing mechanisms (movable blocks) to provide access to the firing chamber for replacing a spent cartridge with a fresh one. Eventually, cartridge style rifles were developed with "bolt action" to speed movement of a cartridge into the firing chamber and ultimately repeating rifles were developed that used the explosive power unleashed from the firing of the cartridge itself to remove the spent shell. These developments effectively obviated the need for movable block actions in cartridge style firearms. Meanwhile, developments in the older, outdated muzzle-loading firearms slowed as the muzzle-loading firearms fell out of favor. Not surprisingly, it does not appear that the movable firing mechanisms used in 19.sup.th century cartridge style firearms were ever adapted to muzzle-loading firearms before the muzzle-loading firearm all but disappeared from manufacture. Now that muzzle-loading firearms have experienced a resurgence in popularity, there is a need for a muzzle-loading firearm that includes a movable firing mechanism to provide convenient access to the breech, as will be explained below.

Hunting with muzzle-loading firearms has become increasingly popular in recent years. Perhaps one of the reasons for this popularity is that some people enjoy manually loading the powder and projectile into the muzzle, and then packing it with the ramrod. As evidence of the increasing popularity of muzzle-loading firearms, some states within the United States have separate hunting seasons for sportsmen using muzzle-loading firearms. Despite their recent increased popularity, muzzle-loading firearms have presented several problems to those that use them.

The muzzle-loading firearms used for hunting can be divided into two major groups. First is the traditional type, which normally is made with the firing mechanism positioned to one side of the barrel. And second is the "in-line" type, which is made to have the firing mechanism "in-line" and includes an ignition system directly behind the barrel, which

therefore is substantially "lined up" with the barrel. Both of these types of firearms typically include a barrel, a trigger positioned within a trigger guard, a hammer, a striker, and their corresponding springs.

However, whether they are traditional or in-line, these firearms typically have problems in common. Such deficiencies of the firearms include the following: Excessive Residue: The black powder that is used in shooting these firearms typically leaves residue on both the barrel and the firing mechanisms. Therefore, these firearms must be disassembled and cleaned periodically. This disassembly is difficult and time-consuming, and obtaining an acceptable cleaning result without disassembling all, or a substantial part, of the firearm is very difficult. Additionally, the traditional type of muzzle-loading firearms are even more difficult to clean, making the residue problem even more severe. Blowback Gas Injuries: Shooting muzzle-loading firearms often causes "blowback gas." This gas, which is a byproduct of the burning of the black powder, can cause injury and burns to the shooter. Typically, the traditional models are safer than the "in-line" ones, as the gas outlet of a traditional model is located to one side of, instead of directly aligned with, the face of the user. However, traditional models face a problem when a left-handed shooter uses a firearm intended to be for a right-handed person. Loading Time: The loading time, which includes the time for replacement of the percussion cap, reloading the powder and the bullet and compressing them, is significantly long. This problem is typically worse for in-line models, as access for reloading the percussion caps or other form of primers is very difficult and a user typically must use a special tool for this purpose. Barrel Length: Because of the type of powder used, these types of firearms typically have relatively long barrels, making them rather heavy.

In-line muzzle-loading rifles were introduced to the marketplace in recent years to address the cleaning difficulties and the lack of reliability and precision often encountered in traditional muzzle-loaders. The precision of the rifle is typically inversely proportional to the time it takes to shoot, considering the shooting time as the time it takes from when the trigger is pulled until the powder, that expels the bullet, explodes.

As previously discussed, previously known in-line rifles have problems with regard to the blowback gas and with the long reloading times. Additionally, this type of rifle also has another disadvantage in comparison to traditional muzzle-loading rifles, as they often have a longer overall length for a given effective barrel length (i.e., the length of the bore into which the powder charge and bullet are loaded), because the firing mechanism and primer loading action are located behind the barrel (rather than beside it), and similarly may also have a greater weight for a given effective barrel length than traditional side-action rifles.

Therefore, it can be seen that a need yet exists for an improved muzzle-loading firearm with convenient access to the breech for replacing percussion caps and for cleaning. It would be further desirable to minimize or eliminate any additional overall length of a rifle that results from inline placement of the firing mechanism and primer loading action at the breech. It is to the provision of a muzzle-loading firearm meeting these and other needs that the present invention is primarily directed.

SUMMARY OF THE INVENTION

The present invention is an improved muzzle-loading firearm and includes a pivoting firing mechanism set that is pivotally attached to the barrel to allow it to swing down and provide free access to the breech plug in such a way that the percussion cap or primer can be replaced easily. The pivotal range of motion of the pivoting firing mechanism (a pivot block or falling block) allows easy access to the percussion cap in order to replace it, as well as to the breech plug, so it can be disassembled and cleaned out. As used herein, the terms "percussion cap" or "primer" include standard percussion caps as well as 209 shotgun primers and other ignition sources for muzzle-loading firearms.

Generally described, the present invention is an improved muzzle-loading firearm that has a pivotally attached firing mechanism (pivot block) and includes a mechanism for providing a positive prevention of unwanted movement from a blocked position to an unblocked position. The invention preferably also prevents inadvertent tripping of the firing mechanism when the pivot block is swung down to its unblocked position.

One example of the present invention is a muzzle-loading firearm including a barrel and a breach plug situated in a rear end of the barrel and adapted to receive a primer. A pivot block is mounted for pivotal motion relative to the barrel and has a firing mechanism mounted thereto, the firing mechanism including a striker for striking the primer, a hammer for driving the striker, and a trigger for tripping the hammer. The pivot block is adapted for pivotal movement between a blocked position for firing and an unblocked position for providing access to the breech plug for removing a spent primerand replacing it with a fresh primer. Further, a trigger guard preferably is pivotally mounted to the pivot block for movement between three positions: (1) a locked position locking the pivot block in its blocked position; (2) an unlocked, blocked position in which the pivot block is still in its blocked position, but the pivot block is unlocked and ready to be moved therefrom; and (3) an unlocked, unblocked position in which the pivot block has been unblocked, providing access to the breech plug. Preferably, rotation of the trigger guard from the unlocked, blocked position to the unlocked, unblocked position causes the pivot block to move from its blocked position to its unblocked position. Preferably, initial rotation of the trigger guard from its locked position does not move the pivot block, but only unlocks it, and continued rotation of the trigger guard does move the pivot block.

Preferably, the trigger guard is held in its locked, blocked position by a spring clamp. An advantage of the spring clamp arrangement is that it tends to hold the trigger guard in its locked, blocked position, but does not apply a biasing force biasing the trigger guard against movement from the unlocked, blocked position toward the unlocked, unblocked position, thereby making it relatively easy to move the pivot block to its unblocked position. Alternatively, the trigger guard can be biased toward its locked, blocked position by a biasing spring.

Preferably, to prevent unwanted movement of the pivot block from its blocked position to its unblocked position, the trigger guard engages a structural barrier to prevent the pivot block from making this unwanted/unintended movement. To free the pivot block for movement, the trigger guard preferably is moved clear of the barrier, thereby allowing the pivot block to be moved, as by further rotation of the trigger guard or by some other mechanism or technique.

In another example embodiment of the present invention, the muzzle-loading firearm has a barrel and a pivoting firing mechanism. The barrel includes a breach plug, which is inserted substantially at the back end of the barrel, a trigger guard blocking axle, and a pivoting junction axle. The pivoting firing mechanism includes a lineal striker, which is substantially in line with the breach plug and substantially at the rear end of the barrel, and a lineal striker spring, which is substantially between the striker and the breach plug. The firing mechanism also includes a hammer, a hammer spring, a trigger, a trigger spring, and a trigger guard. The hammer preferably includes: a strike end, which is substantially behind the lineal striker and rotationally coupled to the firing mechanism for pivotal impact against the striker when fired; a middle portion having a hammer protuberance and a set back uncocking support; and a hammer lever portion which includes a hammer safety notch and a hammer cocked notch. The firing mechanism preferably also includes: a hammer spring in contact at a first end to the hammer protuberance, a trigger spring, a trigger, and a trigger guard. The trigger preferably includes a trigger uncocked lever, a trigger shooting lever and a trigger safety lever. Additionally the trigger guard includes a pivot-guiding notch, wherein the trigger guard blocking axle is slidingly located within the pivot-guiding notch. In this example embodiment, the combination of the pivot-guiding notch and the trigger guard blocking axle limits the pivoting of the firing mechanism with respect to the barrel. Preferably the pivot-guiding notch is substantially an "L"-shaped notch and when the firing mechanism pivots away from the barrel, the pivot is to a sufficient degree as to allow for sufficient clearance for a percussion cap. It is preferable that the trigger guard has a trigger guard safety lever so that when the firing mechanism pivots away from the barrel, the trigger guard safety lever is aligned with the trigger safety lever, thereby preventing substantial movement of the trigger. It is also preferable that when the trigger uncocked lever is substantially contacting the hammer cocked notch, the trigger spring is pre-loaded. Conversely, after shooting the firearm, the firearm is preferably in a post-shooting position where the hammer strike portion remains substantially in contact with the lineal striker. It is preferable that when the firearm is in the post-shooting position, the trigger guard safety lever is positioned in a manner in relation to the trigger safety lever to substantially prevent the rotation of the firing mechanism.

In yet another example embodiment of the present invention the muzzle-loading firearm has a barrel with a breach plug inserted substantially at the back end of the barrel, a blocking axle and a pivoting axle. The firearm also has a pivoting

firing mechanism that has a trigger, a trigger spring, a hammer, a hammer spring, a lineal striker and a striker spring. It is preferable for the trigger guard to have a guiding notch and to have the firing mechanism be pivotally attached at the pivoting axle and the firing mechanism slide within the guiding notch at the blocking axle. It is preferable for the guiding notch to be an "L"-shape notch that has a first portion and a second portion. When the firing mechanism slides along the first portion of the notch, the firing mechanism is unblocked and when the firing mechanism slides along the second portion the lineal striker of the firing mechanism moves away from the barrel of the firearm and provides sufficient clearance for insertion of a percussion cap between the striker and the barrel. It is also preferable for the firing mechanism of the firearm to have a base, which in turn, has a base-hammer protuberance. Additionally the hammer preferably has a hammer protuberance and between these two protuberances is the hammer spring, when the hammer is uncocked, the hammer spring is preferably pre-loaded due to contact of the one end of the spring 48 against the protuberance 45 and the other end of the spring 48 against the protuberance 74. It is also preferable that when the hammer is in a post-shooting position, the hammer return to the uncocked position by action of the spring 48. The trigger spring is then loaded with sufficient force to force the return of the trigger safety lever to the hammer safety notch, thereby returning the hammer to the un-cocked position.

Another example embodiment of the present invention is a firearm with a barrel having a pivot axle and a blocking axle, a firing mechanism with a guiding notch pivotally attached at the pivot axle, wherein the guiding notch directs the pivoting action of the firing mechanism. As noted, it is preferable that the notch is substantially "L"-shaped. It is also preferable for the firing mechanism to have a trigger with a safety notch, and a trigger guard with a safety lever. Then, as the "L"-shaped notch has a first and a second portion, when the firing mechanism glides between the first and the second portion, the trigger safety notch and the trigger safety lever substantially align and prevent the pulling of the trigger. It is also preferable for the barrel to have an open and a substantially closed end, and for the firing mechanism to further have a lineal striker. As before, the "L"-shaped notch can have a first portion and a second portion; so that when the firing mechanism is sliding in the first portion, the linear striker and the closed end of the barrel are substantially aligned; and when the firing mechanism is in the second portion, there is clearance between the striker and the closed end of the barrel to allow for use of a percussion cap between the striker and the closed end of the barrel.

These and other features and advantages of the present invention will be apparent to those skilled in the art in view of the description and appended drawing figures herein.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side view of an example of a muzzle-loading firearm of the present invention, showing its pivoting firing mechanism in a closed or uncocked position, where the hammer is also not cocked.

FIG. 2 is a side view of the pivoting firing mechanism of FIG. 1, showing the pivoting mechanism set unlocked and ready to be unblocked.

FIG. 3 is a side view of the pivoting firing mechanism of FIG. 1, showing the pivoting mechanism set totally unblocked (swung down).

FIG. 4 is a side view of the pivoting firing mechanism of FIG. 1, showing the pivoting mechanism set closed or blocked and the hammer in a cocked position.

FIG. 5 is a side view of the pivoting firing mechanism of FIG. 1, showing the pivoting mechanism set closed or blocked and showing the post-shooting hammer position.

FIG. 6 is a side view of an example of a muzzle-loading firearm of the present invention in a second preferred form, showing its pivoting firing mechanism in a closed or post-shooting position, where the hammer is also not cocked.

FIG. 7 is a side view of the pivoting firing mechanism of FIG. 6, showing the pivoting mechanism set unlocked and

ready to be unblocked.

FIG. 8 is a side view of the pivoting firing mechanism of FIG. 6, showing the pivoting mechanism set totally unblocked (swung down).

FIG. 9 is a side view of the pivoting firing mechanism of FIG. 6, showing the pivoting mechanism set closed or blocked and the hammer in a cocked position.

FIG. 10 is a side view of the pivoting firing mechanism of FIG. 6, showing the pivoting mechanism set closed or blocked and showing the uncocked hammer position.

FIG. 11 is a perspective, partially exploded view of the pivoting firing mechanism of FIG. 6.

FIG. 12 is a series of side views of the pivoting firing mechanism of FIG. 6, showing the pivoting mechanism in use and depicting the movement of the various parts thereof.

DETAILED DESCRIPTION OF THE EMBODIMENTS

The present invention may be understood more readily by reference to the following detailed description of the invention taken in connection with the accompanying drawing figures, which form a part of this disclosure. It is to be understood that this invention is not limited to the specific devices, methods, conditions or parameters described and/or shown herein, and that the terminology used herein is for the purpose of describing particular embodiments by way of example only and is not intended to be limiting of the claimed invention. Also, as used in the specification including the appended claims, the singular forms "a," "an," and "the" include the plural, and reference to a particular numerical value includes at least that particular value, unless the context clearly dictates otherwise. Ranges may be expressed herein as from "about" or "approximately" one particular value and/or to "about" or "approximately" another particular value. When such a range is expressed, another embodiment includes from the one particular value and/or to the other particular value. Similarly, when values are expressed as approximations, by use of the antecedent "about" or the like, it will be understood that the particular value forms another embodiment.

As shown in FIG. 1, which is a lateral view of an example of the present invention in a closed or uncocked position, a muzzle-loading firearm 90 is shown (with some portions of the stock and some portions of the barrel omitted for clarity). The firearm 90 preferably has a pivoting firing mechanism 10, a barrel 20 and a stock 80. The barrel 20 has a front end (not shown) and a back end. At the back end of the barrel 20 a breech plug 22 is inserted. The barrel 20 also includes a pivoting junction axle 75 and a blocking axle 64. The stock 80 is attached at one or more points (not shown) to the barrel 20.

The firing mechanism 10 preferably includes a lineal striker or firing pin 30 and a striker spring 32. As shown, when in the closed position, the striker 30 is aligned with the breech plug 22, and the striker spring is located between the striker 30 and the breech plug 22, to ensure the return of the striker 30 to the position shown in FIG. 1 after shooting the firearm 90.

The firing mechanism 10 preferably also includes a hammer 40 and a hammer spring 42. The hammer 40 has a strike portion 43 that, when the hammer is released forward upon firing the firearm 90, contacts the striker 30, discussed above. The hammer 40 preferably also has a shooting support 44 which act as a pushing support for the hammer. A hammer protuberance 45 is in contact with a first end of the hammer spring 42. The hammer 40 also includes a hammer safety notch 46 and a hammer cocked notch 47, which are also discussed subsequently. Finally, the hammer 40 includes a setback uncocking support 48, which is also discussed subsequently.

The firing mechanism 10 preferably also includes a base 70 which has a base-hammer protuberance 74, which is in contact with a second end of the hammer spring 42. A trigger 50 is preferably included within the firing mechanism 10,