CAM OPERATED, SINGLE SHOT, FALLING BLOCK FIRING MECHANISM FOR A RIFLE

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ABSTRACT
A single shot rifle having a cam operated, falling breechblock firing mechanism. The firing mechanism includes a breechblock vertically movable within a housing member, and a laterally movable hammer operable to strike a cartridge. The firing mechanism further includes a pivotal breechblock link, connected to a manually operable lever, to effect vertical movement of the breechblock. Additionally, the lever is pivotal about a rotary cam member featuring three cam riding surfaces to operate an ejector mechanism for extracting spent casings from a breech, and to allow manual insertion of a fresh cartridge into the breech.
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FIELD OF THE INVENTION

[0001] This invention is directed to the field of firing mechanisms for single shot rifles, more particularly to a cam operated, falling block firing mechanism incorporating a pivoted breechblock link.

BACKGROUND OF THE INVENTION

[0002] The present invention relates to a unique firing mechanism for a firearm, such as a rifle, that incorporates a pivoted breechblock link. By way of brief background, the breech of a rifle is the rear part of the bore of the firearm, more particularly the opening that permits insertion of the bullet or cartridge. Further, the breechblock is the movable piece of metal for closing the breech of the firearm.

[0003] With this brief understanding, it is recognized that there are a variety of breechblock rifles known in the prior art, which rifles are characterized by their different kinds of action. The specific type of action is determined by the type of movement imparted to the breechblock as the breechblock moves into and out of engagement with the cartridge chamber of the receiver. Known systems for such action include the swinging block action, the rolling block action and the falling block action. The firing mechanism of this invention falls within the latter category, namely a falling block action.

[0004] High powered hunting and target rifles have become more and more popular in recent times and, in such weapons, the accuracy of the weapon is of prime importance. In order to achieve high accuracy, it is desirable to use high powered cartridges. It is further desirable that the breechblock lock as tightly as possible against the end of the barrel to prevent the escape of propellant gases. As such, most if not all of the force of the expending propellant gases is used to force the shell from the barrel of the firearm. In order to accomplish these purposes, innovators in the field have devised firearms wherein the barrel is affixed to the frame of the firearm, while the breechblock is movable to expose the rear of the barrel so that a shell may be inserted therein. In such firearms, it is necessary that the falling breechblock lock tightly against the cartridge in the barrel. When the breechblock locks tightly against the barrel, such a firearm is extremely accurate in operation with the use of ordinary, as well as high powered cartridges and such a firearm is, therefore, highly suitable for hunting or target practice.

[0005] Heretofore, such falling breechblock firearms had a number of disadvantages which prevented their general acceptance and manufacture. One such disadvantage resided in the fact that the falling breechblock portion of the weapon comprised many high tolerance parts and was difficult, as well as expensive, to manufacture and assemble. Further, as a result of the large number of parts and the type of action used to move the breechblock, the movement of the block generated an excessive amount of friction. As a result, an excessive amount of force was needed to move the breechblock. The large amount of friction generated would also cause the weapon to jam, and tend to prematurely wear out the moving parts, necessitating frequent repair and adding to the overall disadvantages associated with such firearms.

[0006] Another disadvantage of such prior art weapons is that the firing pin retracts very slowly during the initial lowering of the breechblock, resulting in the protruding portion of the firing pin remaining in contact with the end of the cartridge during the lowering, and, thus, scraping across the base of the cartridge. After the weapon has been in operation for some time this condition becomes worse due to the wearing of the parts. This condition not only damages the pin, decreasing its efficiency and necessitating its frequent replacement, but also, necessitates the application of great force to lower the breechblock.

[0007] Some early versions of firearms using a firing mechanism with the falling block action may be found in the following U.S. Patents:

[0008] a) U.S. Pat. No. 4,879,827, to Gentry, relates to a single shot, falling block rifle having a one-piece stock, and includes a cam-operated ejector mechanism. The rifle includes a barrel having opposing ends with a receiver mounted on one end of the barrel. The receiver has a rearward face which includes an arch-shaped opening. A breechblock of lesser width than the receiver slides upwardly and downwardly within the arch-shaped opening allowing the size and weight of the action to be reduced. The action also includes a positive sear lock safety and a spring loaded striker which is manually cocked by means of the cooperative action of an operating lever, connecting link and cocking lever. Additionally, there is provided a lever arm that is connected to a cam-operated breechblock link for lowering the breechblock to eject a spent cartridge and insert a fresh cartridge.

[0009] b) U.S. Pat. No. 4,452,001, to Compton, teaches a firing and cocking mechanism for a breech loading firearm that includes a lever arm connected to a slotted breechblock link for lowering the breechblock to eject a spent cartridge and insert a fresh cartridge. The mechanism utilizes a substantially massive pin block disposed in a horizontal track between two counter biasing springs, the main spring and the counter spring. A firing pin extends from the chamber end of the pin block. When the cocked pin block is released, the main spring drives it toward the chamber and the momentum of the moving pin block carries the extended firing into contact with the primer of the cartridge despite the resistance of the counter spring. Lowering the breechblock allows a spring loaded ejector plate to spring backward and pull the spent cartridge casing from the chamber. In addition, the ejector plate strikes a projection of the pin block and drives the pin block back to the cocked position. An extension of a lever which operates the action returns the ejector plate to the chamber so that the breechblock is able to rise unobstructed. Lost motion pivots connecting this lever to the breechblock provide the timing whereby one return stroke of the lever sequentially seats the ejector and raises the breechblock.

[0010] c) U.S. Pat. No. 3,830,000, to Browning, is directed to a lever-action firearm having a breechblock which is activated to open or close the firing chamber by working a lever. When closing the
chamber, the breechblock motion concurrently energizes a spring-loaded ejector mechanism. When opening the chamber, an extractor member provides an autonomous partial extraction of a cartridge from the firing chamber and, thereafter, releases the ejector mechanism. Thereupon, the ejector mechanism drives the extractor to completely expel the cartridge from the firing chamber. The cartridge is impelled over both the breechblock and the hammer and, thereafter, is deflected by a selectively positionable member located towards the rear of the receiver.

Another object hereof is the provision of an improved cam operated, falling block action system for the firing mechanism of a rifle.

A further object of the invention is an improved block and hammer action for a falling block action, single shot rifle.

These and other objects of the invention will become clearer in the specification which follows, particularly by those skilled in the art, when read in conjunction with the accompanying drawings.

A brief description of drawings

The invention is illustrated in the drawings in which like reference characters designate the same or similar parts throughout the figures of which:

FIG. 1 is a partial sectional view of a single shot rifle, showing portions of the barrel and stock, incorporating the falling breechblock, firing mechanism according to this invention.

FIG. 2 is an enlarged, partial sectional view of the firing mechanism of FIG. 1, showing the rifle in the firing position.

FIG. 3 is an enlarged, partial sectional view, similar to FIG. 2, showing the lever arm pivoted downwardly, forcing the breechblock down to allow ejection of a spent cartridge and the insertion of a fresh cartridge.

Detailed description of preferred embodiment

The present invention is directed to an improved firing mechanism for a single shot rifle that incorporates a rotating cam operated cartridge ejector action with a simplified block and hammer action. The improved firing mechanism will now be described with regard to the accompanying Figures, where like reference numerals represent like components or features throughout the various views.

Turning now to the three Figures, FIG. 1 broadly illustrates a single shot rifle 10 incorporating the improved firing mechanism 12 of this invention. The firing mechanism 12 is positioned within a housing 14 joined to and extending between a stock 16, as conventionally known in the art, and a barrel 18 featuring a projectile bore 20 terminating in a breech 22 for receiving and positioning a cartridge “C”, where an exemplary cartridge is shown in said breech 22 in FIG. 3.

Mounted for vertical movement within said housing 14 is a falling breechblock 24, movable from a first or projectile firing position to a second or lower position which opens the breech 22 for ejection of a spent casing and insertion of a fresh cartridge “C”, note FIGS. 2 and 3, respectively. The falling breechblock further includes a housing portion 26 mounting a laterally movable hammer 28, with a forward firing pin 30 positioned for sliding engagement with slot 32, thence into contact with the cartridge “C”. The movable hammer 28 is set in motion by the release of the energy stored in compression plunger spring 34, as more clearly described later. To ensure premature firing of the rifle, a pivotal member with a set 36 is provided, where the set 36 holds the hammer 28 at full or half cock until released by activation of the trigger mechanism 38.

Summary of the invention

This invention relates to unique firing mechanism for a single shot rifle, more precisely to a cam operated, falling block firing mechanism. The rifle comprises a housing containing the firing mechanism, where the housing is intermediate a conventional stock and the breech of the rifle bore opening to the firing mechanism. The firing mechanism incorporates a falling block action, as known in the art, but modified by a cam operated ejector mechanism. The firing mechanism further comprises a pivotal, hand operable lever to shift the breechblock to allow ejection of a spent cartridge and the insertion of a fresh cartridge. That is, the breechblock link is pivoted to engage and force the hammer back into a cocked position and force the breechblock down to allow for the cartridge ejection and insertion. The hammer is secured in place by the sear catch surfaces, where, as known in the art, the lever is a pivoted piece that holds the hammer at full or half cock in the firing mechanism. Simultaneously, as the lever arm is pivoted downwardly, the cam engages an extractor spring mechanism which engages an extractor arm, which in turn engages and eject the spent cartridge casing. When the lever is pivoted back to the firing position, the link engages and forces the breechblock to the firing position. Finally, pulling the trigger releases the hammer to fire the rifle. The operation may then be repeated to allow for the firing of another round.

Accordingly, an object of this invention is to provide an effective, yet simplified firing mechanism for a single shot rifle.
The trigger mechanism 38 includes a pivotal finger trigger 40, pivotal about pin 42, a forward end 44 biased by spring 46 to return the trigger 40 to its pre-firing position, and a rear end 48 pivotally mounting a rod or trigger arm 50 within a relief 52 for limited movement therewithin. The distal end of trigger arm 50 includes a slot 54 for engaging the sear pivot member 56, where the forward end of the pivot member 56 mounts the sear 36, as noted above, see FIG. 2. Biaising the pivot member is spring 57. The trigger arm 50 is biased into contact with said pivot member 56 by tension spring 58. As the finger trigger 40 is squeezed to fire the rifle, the pivotal finger trigger 40 is pivoted causing the trigger arm 50 to move upward and pivoting the sear 36 to free its release from the hammer 28 and plunging same into the cartridge “C”. Finally, as known in the art, a safety lock 60, mounted in the stock 16, is included to ensure against a premature firing of the loaded rifle.

To eject a spent casing and insert a fresh cartridge, a cam operated ejector mechanism 64 is provided. The ejector mechanism 64 comprises a manually pivotal lever 66, pivotal about pin 68, where the pivot head 70 has a predetermined diameter, and includes plural camming surfaces. A first said camming surface 72 is an accurately located eccentric that extends the predetermined diameter, whereas, the second said camming surface 74 reveals a reduced diametrical portion. The manually pivotal lever 66 further includes a pivotal arm 76, pivotal about pin 68 at a first end 78, having a second end 80 from which is suspended a trigger guard 82, as known in the art. Intermediate the respective ends is an upward extension 84 mounting a lateral pin 86. Further, the second end 80 includes an upstanding spring member 88, noted above, that keeps tension on the trigger arm 50 when the rifle is in the firing position, see FIG. 2.

A second element of the ejector mechanism 64, for operative movement along lateral pin 86, is an elongated breechblock link 88. The breechblock link is characterized by a first end 90, pivotal about pin 91 fixed to the lower end 93 of housing portion 26, and vertically movable therewith, for pivoting into holding contact with the hammer 28, and a second end 92 that features an elongated slot 94 along which lateral pin 86 slides during rotation of the lever 66.

As known in the art, a cartridge is characterized by a casing that features a rear annular flange, which allows contact with and ejection of the spent casing from the breech. With that having been noted, the ejector mechanism 64 further includes a pivotal, blank extractor arm 96 that features a tapered first end 98 and a second extractor end 100. The extractor end 100 includes a contact corner 102 that underrides the casing flange to push the spent casing out of the breech 22. The extractor arm 96, at an intermediate point along its front face 104, includes a shoulder or stop 106, as later described. The first end 98, during initial movement of the ejector mechanism, rides along the predetermined diametrical surface of pivot head 70, then contacts and rides along camming surface 74. This action releases the extractor arm 96 for pivoting. Further, a pivotal, spring biased ejector arm 108, which includes a body portion 110 for receiving a spring biased plunger 112 in compression and a lateral arm 114 having a cam riding end 116, is positioned in close proximity to said extractor arm 98 and pivot head 70. Simultaneously with the rotation of pivot head 70, contact of the tapered first end 98 initially with the predetermined diametrical portion and camming surface 74, the cam riding end 116 of the spring biased ejector arm 108 is released from camming surface 72 to allow the extractor arm 108 to pivot, with the plunger 112 pushing into shoulder 106 and further pivoting the extractor arm 96, whereby to eject a spent casing in the manner known in the art. At the same time with the pivoting of the lever 66, the breechblock 24 is caused to “fall” or slide downwardly to said lower position to thus expose the breech 22 for extraction of the spent cartridge and insertion of a fresh cartridge as discussed above compare FIGS. 2 and 3 which show, respectively, the firing mode and spent cartridge extraction mode for the rifle hereof.

It is recognized that variations, changes and modifications may be made to the cam operated firing mechanism for the single shot rifle of this invention, particularly by those skilled in the art, without departing from the spirit and scope thereof. Accordingly, no limitation is intended to be imposed on the invention except as set forth in the accompanying claims. All patents, publications or other documents referred to are incorporated by reference in their entirety herein.

Claimed is:

1. A single shot rifle with a cam operated, falling breechblock firing mechanism, said rifle comprising:
   a. a breechblock housing situated between a stock member and a projectile directing barrel, where said barrel terminates in a breech to receive a projectile, said breech opening into said housing and;
   b. a firing mechanism comprising a breechblock vertically movable within said housing from an upper firing position to a lower position to allow for the extraction of a spent projectile from said breech, and insertion of a fresh projectile; and, a laterally movable hammer operable to strike said projectile in said upper firing position; said firing mechanism further including:
   i. a manually operable lever, pivotal about a rotary cam member, connected to a pivotal breechblock link to effect vertical movement of said breechblock between said upper and lower positions;
   ii. said rotary cam member including a first cam surface of a first uniform radius, a second cam surface having a second uniform radius greater than said first uniform radius, and a third cam surface of varying radius; and,
   iii. a spent projectile ejector mechanism operable with the respective said cam surfaces to effect ejection of said spent projectile.

2. The single shot rifle of claim 1, wherein said ejector mechanism includes a pivotal blank extractor arm operable in a retracted position on said first cam surface, and an extended position on said third cam surface.

3. The single shot rifle of claim 2, including an ejector plunger mechanism containing a spring biased plunger arm cooperating with said extractor arm to pivot said extractor arm from said retracted position to said extended position, where said extractor plunger mechanism is operable on said first and second cam surfaces.

4. The single shot rifle of claim 1, wherein said pivotal breechblock link is retracted in said upper firing position, and pivoted in supporting contact with said breechblock in said lower position.
5. The single shot rifle of claim 1, wherein said breechblock includes a pivotal member mounting a sear for securing said hammer against premature release, and a trigger activated trigger arm for moving said pivotal member to thereby release said sear from contact with said hammer.

6. The single shot rifle according to claim 5, wherein said trigger arm is pivotal from a position in contact with said pivotal member to a retracted position free from said movable breechblock.

7. The single shot rifle of claim 6, wherein said manually operable lever mounts a spring arm acting against said trigger arm in said contact position.

8. The single shot rifle of claim 1, wherein said breechblock link is pivotally mounted to said breechblock, and includes an elongated slot for receiving a pin, where said pin is mounted to said manually operable lever.

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