

[54] RIFLE BOLT ACTION
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[52] U.S. Cl. **42/16**
 [51] Int. Cl. **F41c 11/00**
 [58] Field of Search **42/16**

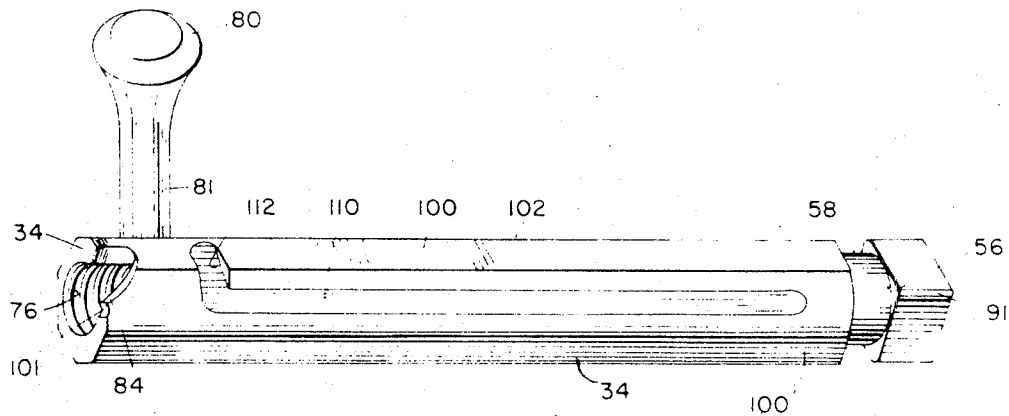
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[57] **ABSTRACT**
 A rifle bolt action that employs a multi-sided bolt for being carried within a cylindrical channel of a receiver. Only a small portion of the surface area of the bolt contacts the channel of the receiver, thus minimizing friction. The multi-sided bolt provides substantial space between the bolt and receiver within which dirt and grit can collect to prevent binding of the bolt within the receiver.

10 Claims, 8 Drawing Figures



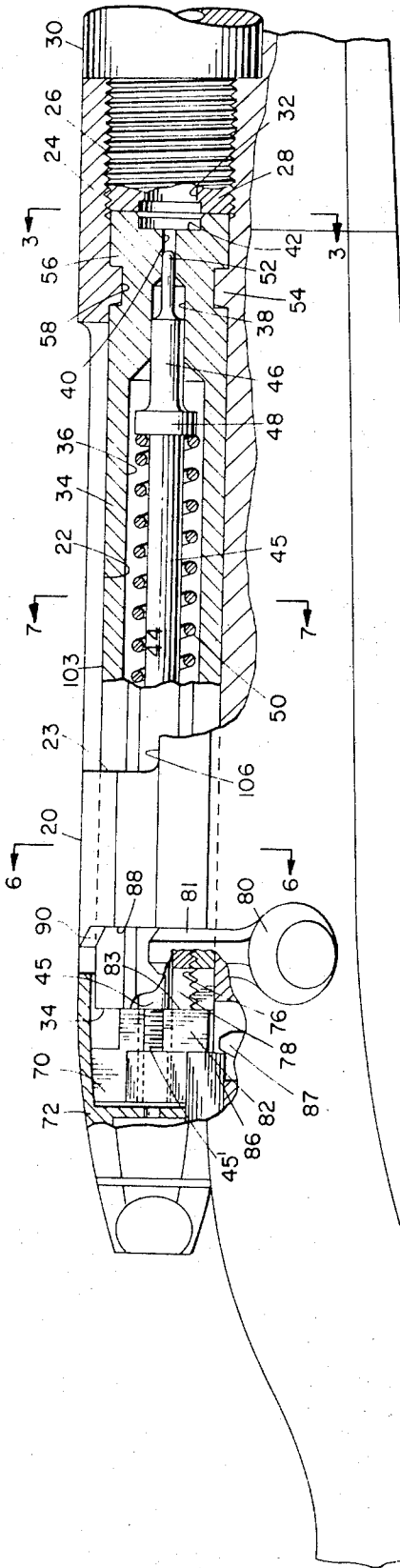


FIG. 1

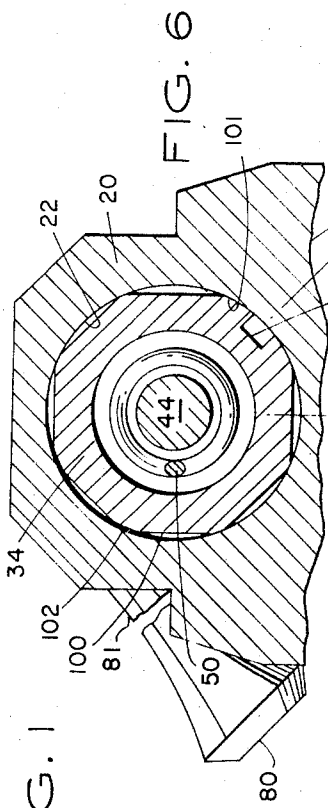


FIG. 6

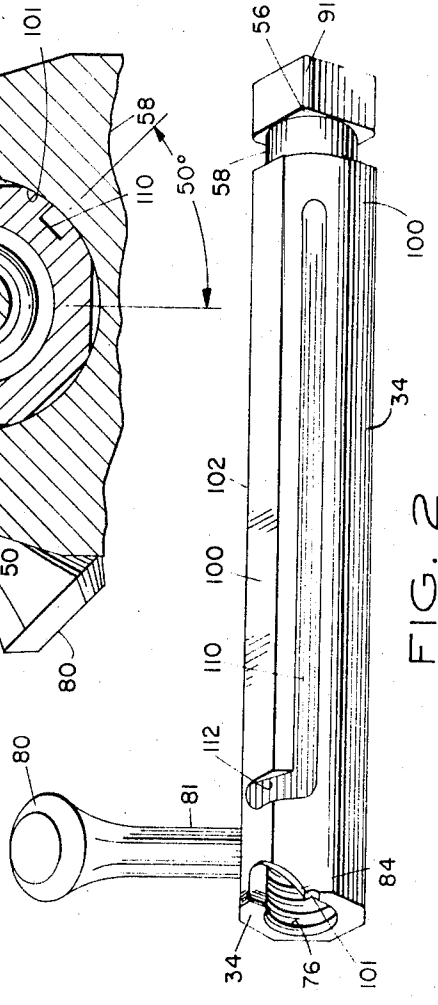


FIG. 2

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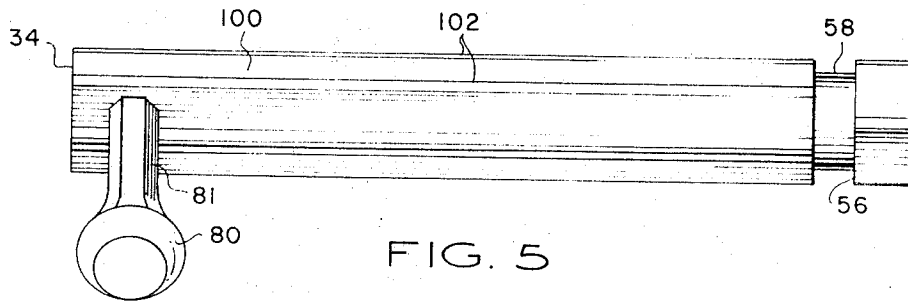


FIG. 5

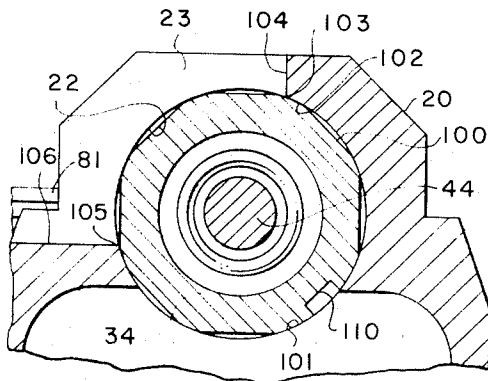


FIG. 7

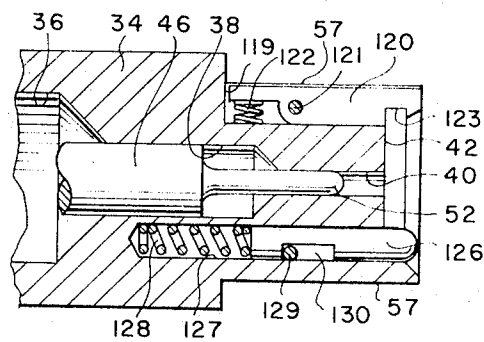


FIG. 8

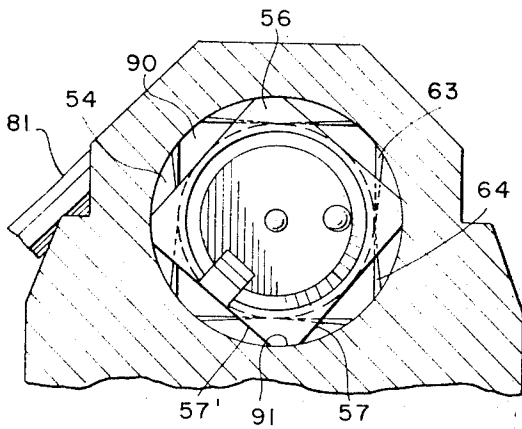


FIG. 4

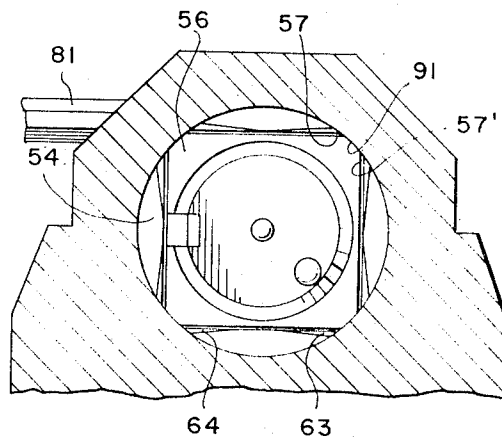


FIG. 3

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RIFLE BOLT ACTION

This invention relates to firearms, and more particularly to a bolt for being carried within the receiver of a firearm.

Although substantial improvements have been made in bolt action rifles in the last few years, very little has been done to improve the bolt itself, such as to improve the efficiency with which the bolt is operated within the receiver. The bolt desirably should fit very closely within the channel of the receiver so that it tends to act as a piston moving in and out of a sleeve. However, maintaining tolerances this close does not take in account dirt and grit, and other foreign matter, that collects between the bolt and the receiver during use. Thus bolt actions with close tolerances between the bolt and the receiver channel tend to be difficult to operate in the field where the probability is high that the action will become contaminated with dirt. In other words, friction is generated in operating the bolt within the receiver, thus causing rough operation and wear.

Allowing too great a tolerance between the outside bolt diameter and the inside diameter of the receiver channel causes wobble between the bolt and the receiver, in addition to substantial wear on the bolt and the receiver when operated.

Usually, the bolt has a circular cross-section as does the channel receiver, with there being no space provided for collecting dirt and other foreign matter, except for the small space resulting from the tolerances between the two diameters.

The present invention provides a multi-sided bolt in which only a small percentage of the outer surface area of the bolt actually bears against the surface of the receiver channel, so that friction is minimized. At the same time, very close tolerances can be maintained between the maximum outside diameter of the bolt and the inside diameter of the receiver channel, so that the bolt acts as a piston during its in and out movement, with little wear resulting. The multi-sided feature permits substantial space within the receiver channel between the bolt and receiver to be utilized for collecting dirt and grit without causing the bolt to bind within the receiver. In one embodiment, the bolt is provided with a plurality of flat sides with the intersection of adjacent sides bearing against the wall of the receiver. Thus dirt can be accommodated between the receiver wall and the flat side without causing the bolt to bind within the receiver. In addition, the flat sides are so arranged that the receiver is effectively sealed on either side of the port through which cartridges are loaded and unloaded when the bolt is in the locked position, thus minimizing the possibility of dirt from contaminating the receiver.

Many other objects, features and advantages of the invention will become readily apparent from the following detailed description of a preferred embodiment thereof when taken in conjunction with the appended claims and the attached drawing wherein like reference numerals refer to like parts throughout the several figures, and in which:

FIG. 1 is a side elevational view, partly in section, of a rifle bolt mechanism employing the bolt of the invention;

FIG. 2 is a perspective view of a preferred embodiment of the bolt of the invention;

FIG. 3 is an end elevational view, in section, showing the bolt and the receiver locking lugs with the bolt in the forward but unlocked position;

FIG. 4 is an end elevational view, in section, showing the bolt and receiver locking lugs with the bolt in the forward but locked position;

FIG. 5 is a side elevational view of the rifle bolt of the invention;

FIG. 6 is an end elevational view, in section, of the bolt, taken through section lines 6—6 of FIG. 1;

FIG. 7 is an end elevational view, in section, of the bolt and receiver taken through section lines 7—7 of FIG. 1; and

FIG. 8 is a fragmentary side elevational view, in section, of the front part of the bolt showing the details of the cartridge extractor and ejector.

A composite view of a rifle bolt mechanism that utilizes a front end locking lug system and the bolt of the invention is shown in the side elevational view, partly in section of FIG. 1. The system includes a receiver 10 having a cylindrical bore or channel 22 extending longitudinally therein, and a cylindrical front portion 24 that is internally threaded along a length of the inner wall 26 for receiving and being secured to the threaded rear portion 28 of a barrel 30. The receiver includes a port 23 opening intermediate its ends and along the top and one side thereof through which cartridges may be loaded and unloaded into the mechanism. The barrel also includes a longitudinal bore 32 into which cartridges may be chambered for firing.

A bolt 34 is carried within the cylindrical bore of the receiver for rotational and longitudinal movement therein. The bolt can be rotated about a longitudinal axis as will be seen hereinafter for locking and unlocking the bolt within the receiver. The bolt also is provided with a longitudinal and centrally disposed cylindrical bore 36 of a first diameter and extending the major length thereof, another smaller diameter cylindrical bore 38 located forward of and opening into the larger diameter bore 36, and a further smaller diameter cylindrical bore 40 located forward of and opening into bore 38. The smallest diameter bore 40 opens into a recessed front face 42 of the bolt, wherein the butt or case of the cartridge is disposed within this recessed face when the cartridge is chambered for firing. A firing pin 44 is carried inside the bolt and includes a cylindrical main body portion 45 having a forward portion 46 that rides within bore 38. An enlarged cylindrical shoulder 48 is disposed intermediate portions 45 and 46 against which a spring 50 bears for urging the firing pin forward. The firing pin mechanism also includes a firing pin 52 at the front end thereof that rides within bore 40 and projects forward of recessed face 42 when the mechanism is released to move to its forward position.

The receiver includes a plurality of inwardly extending locking lugs 54 located adjacent the front end thereof, and similarly, the bolt includes a plurality of corresponding locking lugs 56 located adjacent the front end thereof for engaging the receiver locking lugs. The bolt includes a short section 58 immediately behind the locking lugs 56 that is of a diameter less than the diameter of the major portion of the bolts. The maximum diameter across the bolt locking lugs is equal to the maximum diameter of the major portion of the bolt, so that the bolt and locking lug system may be withdrawn longitudinally within the cylindrical bore of the receiver, when unlocked.

The firing pin mechanism main body portion 45 extends rearward in the bolt to approximately the rear

wall thereof, and includes a threaded extension 45' extending rearward thereof. A cocking piece 70 is threadedly secured to the rearward extension 45' and serves to cock the firing pin mechanism for firing when the bolt is rotated, all as will be explained. The cocking piece is contained within a cocking piece cover 72, wherein the cocking piece cover is loosely threaded into the rear of the bolt. More specifically, a portion 76 of the inner wall of the bolt is threaded, and the cocking piece cover includes a forwardly extended threaded portion 78 that is loosely threaded into the rear of the bolt, so that the bolt may be rotated about a longitudinal axis relative to the cocking piece cover. The cocking piece cover rides on a rearward extension of the receiver (not shown) so that it is prevented from rotation when the bolt is rotated. Similarly, the cocking piece bears against inner surfaces of the cocking piece cover, so that it likewise is prevented from rotating when the bolt is rotated.

A bolt handle 80 is secured to the bolt 34 at the rear portion thereof, and extends laterally from the side of the receiver immediately behind the rear surface 88 thereof. The rear surface of the receiver includes a rearwardly extending beveled surface 90 adjacent the top thereof. The bolt may be rotated along a longitudinal axis by lifting the bolt handle 80, wherein the surface 90 engages the body 81 of the bolt handle during the last few degrees of the rotation. When the bolt handle is raised to rotate the bolt, the bolt is unlocked by rotating the bolt locking lugs 56 to coincide with spaces between the receiver locking lugs 54, so that the bolt may then be retracted rearwardly in the receiver. On the last few degrees of rotation to unlock the bolt, the bolt handle body 81 engages surface 90 of the receiver to cause the bolt to be withdrawn a slight amount to break loose the cartridge within the chamber. The configurations of the locking lugs are such as to permit the slight rearward movement of the bolt over the last few degrees of rotation when unlocking it.

Reference is had to both FIGS. 1 and 2 to illustrate how the firing pin mechanism is cocked for firing when the bolt is rotated from the locked to the unlocked position, with FIG. 1 showing the firing pin in the cocked position. The cocking piece 70 includes a lower portion 86 that has a front shoulder for being engaged by a sear 87 connected to the trigger mechanism, wherein the sear holds the cocking piece and firing pin mechanism in a retracted, cocked position until trigger 99 is pulled. The cocking piece includes a cam 82 that rides along a corresponding cam surface 84 formed in the rear wall of the bolt 34. The cam surface is provided by cutting an arcuate section out of the rear wall of the bolt, and the cam includes a rounded front face 83 for riding along the surface. The cam is positioned at the bottom of the cam surface when the firing pin mechanism is in its most forward, fired position. As the bolt is rotated by lifting the bolt handle 80 upward, the cocking piece 70 and firing pin mechanism attached thereto is urged rearward relative to the bolt by action of the cam riding along the cam surface. This is made possible by preventing the rotation of the cocking piece by constraining it against any rotational movement by the cocking piece cover. The bolt is rotated until the cam 82 of the cocking piece completely clears the cam surface 84 provided in the rear of the bolt and comes to rest on a surface of the rear wall of the bolt off of the cam surface. This prevents the cocking piece from sliding back

along the cam surface when the bolt is withdrawn in the receiver. The sear 87 is caused to extend upward in front of the shoulder 86 of the cocking piece when the cocking piece attains the position relative to the bolt as shown in FIG. 1. Then when the bolt is rotated in the opposite direction by urging the bolt handle downward so that the cam 82 is again directly in line with the cam surface of the bolt, but retracted relative thereto, the firing pin cannot be forced forward by spring 50 until the trigger 99 is pulled.

Referring to FIGS. 3 and 4, which are front elevational views, in section, showing the combination of the bolt and receiver locking lugs system in the unlocked and locked positions, respectively, the receiver comprises four locking lugs 54 extending inwardly from the inner wall of the receiver with spaces 90 provided between adjacent locking lugs. Each of the receiver locking lugs has an arcuate length along the inner wall of the receiver that subtends an angle of 77°, and constitutes a segment of a circle, in cross-section, except for the forward chamfered surface thereof that will be discussed hereinafter. The minimum distance between opposite locking lugs 54 is just slightly greater than the diameter of the reduced diameter bolt part 58, so that the bolt may be withdrawn rearwardly in the receiver when it is unlocked.

There are four bolt locking lugs 56 that extend outwardly from the body of the bolt immediately forward of reduced diameter portion 58, each of which has two perpendicular edges 57 and 57' that terminate in a third, curved edge 91. Edge 91 generally conforms to the curvature of the receiver wall and makes an angle of about 45° with edges 57 and 57'. The four bolt locking lugs form a substantially "square" configuration, except for the small curved edges 91. The spaces 90 between adjacent receiver locking lugs is slightly greater than the width of curved edges 91 of the bolt locking lugs, so that the bolt locking lugs pass between the receiver locking lugs when the bolt is unlocked to withdraw it within the receiver.

Each receiver locking lug 54 has chamfered or beveled surfaces 63 and 64 cut into the forward face and inner side thereof, on either side respectively, of the center line of the lug. This allows the bolt to be moved forward over the first few degrees of rotation as it is rotated to the locked position. More specifically, the rear surfaces of the bolt locking lugs can be moved in front of the front edges of the receiver locking lugs where the latter are beveled, or chamfered, during the first few degrees of rotating the bolt shut when the body 81 of the bolt handle rides on beveled surface 90 of the receiver. An angle of rotation of approximately 40° to 55° is required to lock the bolt from the unlocked position, so that the bolt locking lugs are disposed in front of the receiver locking lugs as shown in FIG. 4.

Reference is now had to the perspective view of the bolt shown in FIG. 2, the side elevational view of FIG. 5 and the front elevational views, in section, of FIGS. 6 and 7 taken through section lines 6-6 and 7-7, respectively, of FIG. 1. The particular embodiment of the bolt is substantially octagonal in cross-section, wherein the outside surface is comprised of seven elongated, major flat surfaces 100 extending the length of the bolt, and one curved side 101. The surfaces 100 are of equal width and are symmetrically spaced about the perimeter of the bolt, with adjacent surfaces being separated by coextending curved surfaces 102 of lesser widths,

also extending the major length of the bolt. The diameter across the bolt between opposite minor flat surfaces 102 is substantially equal to the inside diameter of the receiver bore or channel 22, so that the bolt is carried within the receiver channel and engages the walls of the latter only along surfaces 102. Consequently, only a relatively small total area of the bolt body engages the surface of the receiver channel, so that friction is minimized. Similarly, the diameter or distance between opposite surfaces or edges 91 of the bolt locking lugs 56 is substantially equal to the inside diameter of the bolt channel 22, so that these edges also ride along the inner surface of the receiver.

The bolt also includes a slot 110 in curved surface 101 extending from adjacent the front end thereof to adjacent the rear thereof, and terminating adjacent the rear in a right angle ramp 112. The slot is disposed at an angle of approximately 50° from the bottom when the bolt is in the locked, closed position as seen in both FIGS. 6 and 7, so that slot 110 is then at the very bottom of the receiver channel when the bolt is rotated to the unlocked position. A key or pin (not shown) extending upward into the receiver channel from the housing containing the trigger mechanism rides in slot 110 and acts to limit the rearward movement of the bolt when it is withdrawn to eject a cartridge. The use of such slots and pins are commonly employed, whereby the pin may be released by a mechanism (not shown) to permit withdrawing the bolt completely from the bolt channel. Ramp 112 is used to depress the pin when the bolt is locked to operate the magazine (neither shown nor material to this invention).

The end elevational view, in section, shown in FIG. 7, is taken through section lines 7-7 of FIG. 1, or through a vertical plane intersecting the cartridge ejection port 23. The bolt is also shown in its closed, locked position in this view. The port 23 includes a substantially vertical wall 104 at the top of the receiver which terminates along a line 103 lying in the surface of the wall of the receiver channel. Similarly, the port includes a lower, horizontal wall 106 that terminates along a line 105 lying in the surface of the wall of the receiver channel. The configuration of the bolt and the position in which it is locked into the receiver is such that a minor curved surface 102 that engages the inner surface of the receiver channel substantially coincides with each of lines 103 and 105. This produces an effective seal between the bolt and the receiver along these lines to prevent dirt and other matter from falling into the receiver channel when the bolt is in locked firing position.

The bolt also includes a conventional cartridge extractor and ejector as shown in FIG. 8. Here, an extractor 120 is pivotally held within a recess 119 in the front wall of the bolt by a pin 121, and has a front lip 123 for fitting over the rim of a cartridge. The lip is biased inward by a spring 122 located rearward of pin 121 between the wall of the recess 119 and the extractor. Thus as the bolt forces the cartridge into the firing chamber, the lip 123 rides up over the cartridge rim as the cartridge becomes seated against the recessed face 42. The extractor then can withdraw the cartridge when the bolt is withdrawn.

An ejector pin 126 is also contained within a recess

127 in the front face of the bolt, and includes a slot 130 therein intermediate its ends that accommodates a lateral pin 129 that prevents the pin from coming out of the recess. A spring 128 biases the pin forwardly, but wherein the pin may be urged by the cartridge butt into the recess so that the front thereof is substantially even with recessed face 42. When the bolt is withdrawn so that the extractor withdraws the cartridge, ejector pin 126 throws the cartridge free of the extractor and port 23 as the cartridge clears the front edge of the port.

Although the invention has been described with reference to a preferred embodiment thereof, certain modifications and substitutions that do not depart from the true scope of the invention will undoubtedly occur to those skilled in the art. Accordingly, it is intended that the invention be limited only as defined in the appended claims.

What is claimed is:

1. A rifle bolt action comprising:
 - a. a receiver having a cylindrical bolt channel therein, and
 - b. a bolt rotatably and slidably carried in said bolt channel having alternating and coextending first and second pluralities of sides extending longitudinally therealong, said first plurality of sides engaging the surface of said bolt channel and said second plurality of sides being spaced from said bolt channel.
2. A rifle bolt action as set forth in claim 1 wherein said first plurality of sides are curved and generally conform to the curvature of said bolt channel.
3. A rifle bolt action as set forth in claim 1 wherein said second plurality of sides are flat.
4. A rifle bolt action as set forth in claim 1 wherein said receiver has a port opening into said bolt channel through which cartridges may be loaded and unloaded, said bolt is rotatable between a locked position and an unlocked position, and first and second of said first plurality of sides generally coincide with the opposite edges, respectively, of said port when said bolt is rotated to said locked position.
5. A rifle bolt action as set forth in claim 1 wherein said first plurality of sides comprises a substantially minor portion of the total surface area of said bolt.
6. A rifle bolt action as set forth in claim 1 wherein there are seven of each of said first and said second pluralities of sides.
7. A rifle bolt action as set forth in claim 1 wherein one of said first plurality of sides is relatively wide and the remainder of said first plurality of sides are each relatively narrow, and said bolt includes a slot in the surface of said one of said first plurality of sides extending horizontally therein.
8. A rifle bolt action as set forth in claim 7 wherein each of said second plurality of sides is relatively wide.
9. A rifle bolt action as set forth in claim 8 wherein said first plurality of sides are curved and generally conform to the curvature of said bolt channel.
10. A rifle bolt action as set forth in claim 7 wherein said bolt includes a ramp extending into one end of said slot and terminating in the surface of one of said second plurality of sides.

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