Jan. 20, 1959 H. H. SEFRIED II, ET AL 2,869,268

SPRING EJECTOR MEANS

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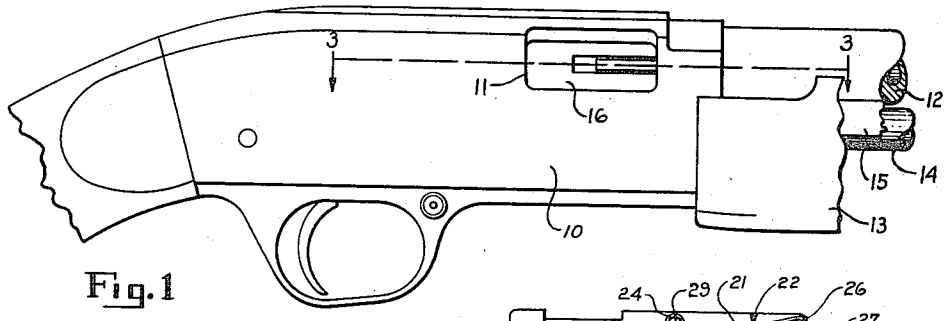


Fig. 1

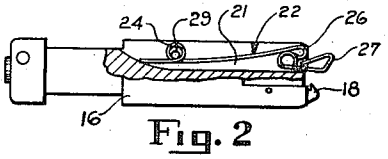


Fig. 2

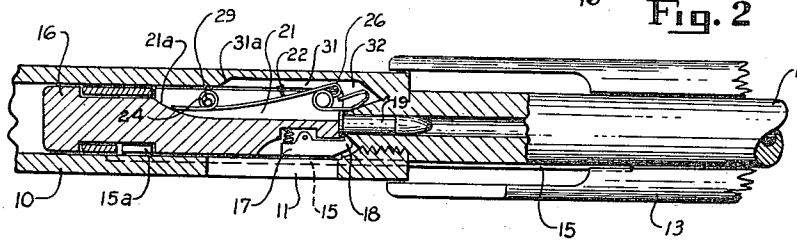


Fig. 3

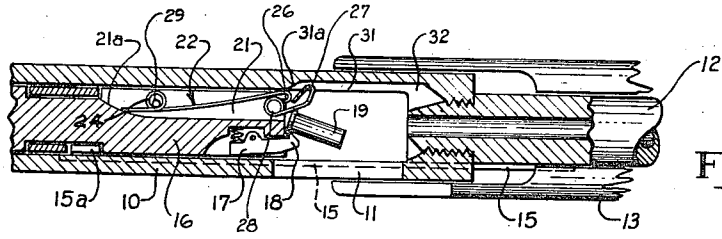


Fig. 4

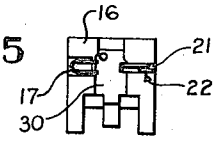


Fig. 5

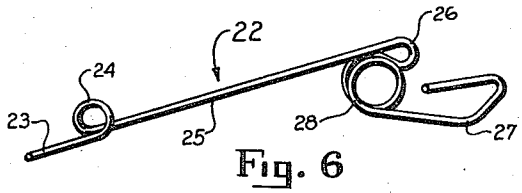


Fig. 6

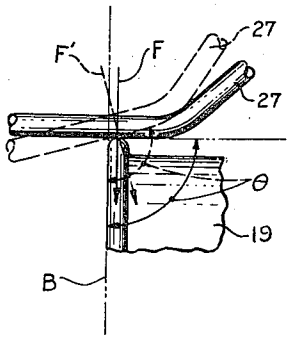


Fig. 7

INVENTORS
HARRY H SEFRIED II &
ERIK J. GUNNESSON
BY

Stewart & Stewart

THIER ATTORNEYS

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SPRING EJECTOR MEANS

Harry H. Sefried II and Erik J. Gunnesson, New Haven, Conn., assignors of one-half to Sears, Roebuck and Co., Chicago, Ill., a corporation of Illinois, and one-half to The High Standard Manufacturing Corporation, Hamden, Conn., a corporation of Connecticut

Application September 7, 1955, Serial No. 532,848

7 Claims. (Cl. 42—25)

This invention relates to ejector means for firearms, and it relates more particularly to a spring-type of ejector whereby the cartridge case is positively ejected from the receiver by means of a spring. The invention is most advantageously employed in firearms which are loaded manually as pump guns. However, it is also applicable in automatic and semiautomatic firearms as well.

In pump guns and bolt-action firearms, especially, the forearm or bolt may, for one reason or another, be retracted so slowly that an empty cartridge shell or unfired cartridge to be ejected from the gun receives insufficient push from the ejector to throw it clear of the receiver. Where this occurs, the cartridge may remain in the receiver and cause the gun to jam. This difficulty is due to the fact that the force exerted by the ejector on the cartridge depends on the speed at which the bolt is retracted. Thus, in many prior constructions, a member is fixed on the inner wall of the receiver in such a position that as the bolt is retracted to extract a cartridge from the chamber, one side of the head of the cartridge strikes the ejector member causing the cartridge to be thrown laterally out of the receiver as the bolt continues to move to its rearmost position. Obviously, if the bolt is retracted very slowly, the force by which the cartridge is ejected is small and the cartridge may not be thrown clear of the receiver.

In automatic or semiautomatic firearms, it is sometimes necessary to extract an unfired cartridge from the chamber manually and in doing so the shooter is quite likely to retract the bolt slowly so that the cartridge is not fully ejected making it necessary to turn the firearm over so that the cartridge will drop out of the receiver. In some cases it is extremely awkward and troublesome to dislodge a misplaced cartridge in the receiver.

It is therefore an object of this invention to provide an improved cartridge ejector capable of throwing the cartridges well clear of the receiver at any speed at which the bolt may be retracted, even at extremely slow speeds.

It is a further object of the invention to provide an improved cartridge ejector having a positive snap-action in order to ensure that a cartridge, which is intended to be ejected from the gun, will not remain in the receiver to cause a jam during reloading operations.

Another object of the invention is to provide a cartridge ejector which helps to grip the cartridge as it is fed into the chamber as well as during at least a portion of the rearward travel of the bolt in order to ensure proper feeding and extraction of the cartridge.

With the above objects in view and some others which will be apparent to those skilled in the art from the description hereinafter, ejector means embodying the invention comprises an ejector member mounted on the bolt of the gun and having a nose portion extending forwardly of the front face of the bolt adapted to contact the edge of the head of a cartridge carried on the face

of the bolt. The ejector member is secured to the bolt so as to prevent it from moving any substantial distance longitudinally of the bolt and has its nose portion resiliently biased inwardly of the bolt so that the nose portion is pressed firmly against the edge of the cartridge head and helps hold it on the face of the bolt while the cartridge is being chambered and extracted. Means are provided for changing the direction in which the force exerted by the ejector is applied to the cartridge whereby, instead of holding the cartridge in position, the ejector releases the cartridge from the bolt and ejects it from the receiver.

Furthermore, as the direction of the force exerted by the ejector on the cartridge is changed to bring about ejection, this force is substantially increased to ensure that sufficient kinetic energy is imparted to the cartridge to throw it clear of the receiver. In fact, in the embodiment of the invention hereinafter described, the change in the direction of the force exerted by the ejector and the increased magnitude thereof are dependent one upon the other since they are both effected by the same means. Thus, means may be provided for camming a portion of the ejector inwardly toward the bolt in order to simultaneously increase the force exerted on the cartridge by the nose portion and deform the ejector so as to change the direction in which said force is applied to the cartridge.

An important advantage of the invention is that a very substantial reduction in cost is realized by using this spring ejector, which is simple to manufacture and to install yet is remarkably durable. Moreover, it can be used in place of both the extractor and ejector required in most types of firearms and, therefore, noticeably contributes to savings in cost of materials. This is especially important in the case of semiautomatic firearms.

One practical embodiment of the invention is hereinafter particularly described in connection with the accompanying drawings, in which

Fig. 1 is a fragmentary side elevational view of a firearm embodying the invention;

Fig. 2 is a top plan view of the bolt with a portion thereof broken away to show the ejector;

Fig. 3 is a cross-sectional view taken along line 3—3 of Fig. 1, the parts being shown in the positions which they assume when a cartridge is chambered;

Fig. 4 is a view similar to Fig. 3, but showing the bolt withdrawn to its rearmost position;

Fig. 5 is a front elevational view of the bolt;

Fig. 6 is an enlarged perspective view of the ejector member as it appears when not mounted on the bolt; and

Fig. 7 is a diagram showing the manner in which the force applied by the ejector is shifted in order to effect ejection of the cartridge.

Referring to the drawings, the firearm here shown for illustrative purposes only is of the pump-action type and is provided with a receiver 10 having an ejection port 11. Barrel 12 extends forwardly from the receiver, and forearm slide 13, which surrounds a tubular magazine 14, is located under the barrel. An action bar 15 (Figs. 1, 3 and 4) for manually moving a bolt 16 into and out of breech closing position is connected at its forward end to the forearm 13 and at its rear end to the bolt 16 by means of a laterally extending lug 15*a*. Bolt 16 is mounted for reciprocatory movement within the receiver 10 in the usual manner. In this particular instance, the bolt is rectangularly shaped and its sides fit substantially flush with the inner side walls of the receiver.

Bolt 16 carries a right-hand extractor 17 of a type commonly used, the extractor being equipped with extractor hooks 18 adapted to engage the head of a cartridge or cartridge case 19 in order to extract the cartridge from

the chamber and to help hold it against the forward face of bolt **16**. A slot **21** cut longitudinally in bolt **16** on the side opposite the extractor **17** is adapted to receive an ejector member designated generally by reference numeral **22**. As may be seen in Figs. 2–4, the base of slot **21** curves outwardly at **21***a* toward the side of the bolt for a purpose to be described hereinafter. Slot **21** extends forwardly to the face of bolt **16** to permit the forward end of extractor **22** to project beyond the face of the bolt.

As may be more particularly observed in Fig. 6, ejector **22** is an elongated member formed from resilient material such as heavy music wire, and comprises a tail portion **23** having a mounting loop **24** by which the ejector is secured to the bolt **16**, an intermediate body section **25** terminating at its forward end in a cam portion **26**, and nose portion **27**. In the specific embodiment here illustrated, a loop **28** consisting of about one and one-half turns of wire is formed between the nose portion **27** and the cam portion **26** to provide the ejector with added structural strength and resiliency.

In order to mount the ejector **22** within slot **21** of the bolt as shown in Fig. 2, the tail portion **23** is placed against the sloping rear section **21***a* of the base of slot **21** and the inner surface of the nose portion **27** rests against the base of the slot at the face of the bolt. It is then necessary to spring the body section **25** of the ejector inwardly in order to align the loop **24** with holes drilled vertically in the bolt so that a pin **29** may be driven through the bolt and loop **24** to hold ejector **22** in place. Various other means of mounting the ejector **22** on the bolt may be provided. For instance, if desired, the sloping rear section **21***a* of the base of slot **21** could be dispensed with by simply providing a longer tail portion **23** on the ejector so that the ejector must be bent intermediate its ends in order to mount it.

When no cartridge is carried on the face of bolt **16**, ejector **22** will be in the position shown in Fig. 2 with the inner surface of its nose portion **27** pressed against the base of slot **21**. In this position of the portion **27**, the cam portion **26** is usually, but not necessarily, wholly within slot **21**. If a cartridge **19** is fed into position between the extractor **17** and the ejector **22**, the forward portion of the ejector including the nose portion **27** and cam portion **26** are moved outwardly by the head of the cartridge to the position shown in Fig. 3. The firearm is, of course, provided with conventional cartridge-feeding means (not shown), which lift a fresh cartridge from magazine **14** up to a position in which the face of the bolt **16** will contact the head of the cartridge during the forward stroke of the bolt, moving the cartridge forwardly toward the chamber. As the cartridge is fed into the chamber, its head is moved vertically along the face of bolt **16** until it is positioned between the extractor **17** and ejector **22**. The face of the bolt is most desirably provided with a vertical recess **30** (Fig. 5) for positioning the head of the cartridge laterally.

When the nose portion of the ejector is pushed outwardly by the head of the cartridge, cam portion **26** extends laterally out of slot **21** well beyond the side of the bolt **16** (Fig. 3). Since the side of the bolt is substantially flush with the inner wall of the receiver, a groove **31** is provided in the wall of receiver **10** adjacent the ejector in order to accommodate the cam portion **26** and the tip of the nose portion **27**, when a cartridge is being fed or extracted. In this position, sufficient force is exerted by the ejector on the head of the cartridge to retain the cartridge in place on the face of the bolt. However, the force required to move the nose **27** of the ejector outwardly should not be so great as to interfere with proper positioning of the cartridge on the face of the bolt as it is being fed into the chamber. Groove **31** terminates at its after-end in an inclined surface **31***a* located substantially opposite the rear edge of the ejection port **11**. When the bolt is forward, the nose portion **27** of the ejector fits within a recess **32** cut in the rear face of barrel **12**. The forward tip of the nose portion **27** is inclined with respect to the rear face of barrel **12** so that when the firearm action is closed without reloading, the nose portion of ejector **22** will be cammed outwardly by the rear face of barrel **12** as the nose of the ejector is received within the recess **32**.

It will be noted that in the position of the ejector shown in Fig. 3 the inner surface of nose portion **27** forms an angle with the head of the cartridge which is insufficient to displace the edge of the cartridge head from the face of the bolt. As shown in Figs. 3 and 7, this angle is most desirably about 90° or less but, as pointed out hereinafter, it may be slightly greater than 90°. Since the head of the cartridge is fixed laterally of bolt **16** in the recess **30**, the pressure of the ejector in its position shown in Fig. 3 will tend to grip the cartridge and hold it in place. Moreover, the claws **18** of extractor **17** grip the opposite edge of the head of the cartridge to help retain it in place.

As the bolt **16** is moved rearwardly in order to extract the cartridge or empty shell from the chamber, the extractor and ejector continue to grip the cartridge **19** until the bolt reaches the position shown in Fig. 4, at which point the cam portion or loop **26** of the ejector comes in contact with the inclined camming surface **31***a* at the rear of groove **31**. Continued rearward movement of the bolt causes camming surface **31***a* to force cam portion **26** of ejector **22** into slot **21** of the bolt forcing the loop **28** inwardly and causing the nose portion **27** to pivot about the fulcrum formed by the head of cartridge **19**. As the cam portion **26** and loop **28** are thus cammed inwardly, the direction of the force exerted by the ejector on the cartridge is shifted as is clearly illustrated in Fig. 7, so that it will pass well forward of the point about which the cartridge will swing as it is ejected, thereby initiating ejection of the cartridge.

In Fig. 7, F represents the force exerted by the nose portion **27** of the ejector in its normal position shown in solid lines. F′ represents the force exerted when the nose of the ejector is pivoted to the position shown in broken lines when it acts to swing the head of the cartridge outwardly as seen in Fig. 4. The foregoing may also be stated in terms of the angle θ formed between the surface of the ejector which is in contact with the cartridge and the face of the bolt represented by the vertical line B of Fig. 7. Thus, theoretically the cartridge will be held in place as long as the angle θ is 90° or less and will be ejected when it exceeds 90°. However, in practice it has been found that due to friction and the particular manner in which the extractor may grip the opposite edge of the cartridge head, the angle θ may be somewhat greater than 90° before the cartridge is ejected. Since it is usually desirable to have this angle normally at a point where only a relatively small change in the direction of the force is necessary to eject the cartridge, angle θ may in such cases be somewhat greater than 90° and still permit the ejector to grip the cartridge. In other words in actual practice, so long as the angle θ is not substantially greater than 90°, the ejector acts to grip the cartridge, but when it becomes sufficiently obtuse, it will move the head of the cartridge away from the face of the bolt which will then permit the ejector to snap inwardly imparting considerable kinetic energy to the cartridge causing it to be ejected.

It is a particular feature of the present invention that the ejecting action, once initiated, will continue regardless of whether or not the bolt continues to move rearwardly and irrespective of the speed with which the bolt is retracted. This is in distinct contrast to the operation of prior cam-actuated ejectors, in which continuation of the ejecting action is dependent on continued withdrawal of the bolt, once the action has been initiated, and in which there is always danger that the cartridge or empty shell will not be ejected when the bolt is retracted very slowly,

or when it is not retracted to its full limit of rearward travel.

From the foregoing it will be seen that when the ejector is bent inwardly intermediate its tail and nose portions by the camming surface on the inner wall of the receiver, the nose portion exerts an increased force on the cartridge, this force being applied in a different direction from that which the ejector normally exerts on the cartridge, in order to cause ejection of the cartridge. It will be appreciated of course that the normal force exerted by the nose portion against the cartridge is greatly increased by the deformation of the ejector as its cam portion is forced inwardly of the bolt, and once the angle formed between the nose portion and the bolt face has been increased to a point at which the cartridge head will begin to slip against the inner surface of the nose portion, the latter will immediately snap toward the bolt ejecting the cartridge with considerable velocity. Consequently, the force with which the cartridge is ejected is in no way dependent on the speed at which the bolt is retracted, thereby ensuring that the cartridge will always be properly ejected, even though the bolt may be retracted very slowly.

It is appreciated that cam-actuated ejectors have been proposed heretofore. However, in all such instances a direct camming action has been exerted against a substantially rigid ejector member in such a way that the force with which the cartridge is ejected depends in large part upon the speed at which the bolt is withdrawn. As has been pointed out hereinbefore, prior ejectors are therefore subject to the danger that if the bolt is retracted slowly enough, the cartridge may not be fully ejected from the receiver and will cause the action to jam unless it is removed before the gun is reloaded. The ejector of the present invention completely overcomes this disadvantage. It is simple in construction and, moreover, is highly reliable in operation.

While the ejector may be made of spring steel wire as suggested hereinbefore, it can also be formed from any tough resilient material which is not necessarily circular in cross-section. It could, moreover, conceivably be a rigid member which, however, is resiliently mounted in such a way that the direction of the force exerted by it on the cartridge is capable of being changed in a manner similar to that of the specific embodiment of the invention herein disclosed. Likewise, the particular shape of the ejector is of course not restricted to that shown in the drawings. For instance, it will be possible to eliminate the loop **28** or the cam portion **26** by making suitable changes in the ejector member itself and in the camming means mounted on the receiver. These and other modifications would of course come clearly within the scope of this invention.

What is claimed is:

1. In a firearm, a receiver, a bolt reciprocably movable in the receiver and having a forward face against which the head of a cartridge is adapted to be held, an ejector mounted on the bolt and secured against substantial relative movement longitudinally thereof, said ejector having a nose portion extending forwardly of the bolt face and exerting a resilient force substantially continuously against the head of a cartridge positioned on the bolt face while the cartridge is being chambered and extracted, the surface of said nose portion in contact with the cartridge normally lying at an angle with respect to the bolt face such that it will hold the cartridge in position on the bolt face, and means for bodily shifting the nose portion of said ejector angularly with respect to said cartridge whereby the angle formed between the cartridge contacting surface of said nose portion and said bolt face is changed such that the force exerted by the said ejector on the cartridge will eject the cartridge from the receiver.

2. In a firearm, a receiver having an ejection port, a bolt having a forward face adapted to contact the head of a cartridge, said bolt being movable reciprocably in the receiver, an extractor carried on the bolt on the side

adjacent the ejection port and adapted to hold a cartridge in contact with the bolt face, an ejector carried on the opposite side of the bolt and secured against substantial relative movement longitudinally thereof said ejector being formed of resilient material and having a nose portion extending forwardly of the bolt face and continuously biased inwardly by the resiliency of said ejector into engagement at its inner surface with the head of a cartridge positioned on the bolt face between said ejector and said extractor, said inner surface of said nose portion normally forming an angle of substantially 90° with the bolt face, and means located near the rearward limit of travel of said bolt adjacent said ejector for bodily shifting the nose portion of said ejector angularly with respect to said cartridge whereby the angle formed between the inner surface of said nose portion and the bolt face is increased sufficiently beyond 90° to pivot the cartridge about said extractor and to forceably eject the cartridge from the receiver through said ejection port.

3. In a firearm, a receiver having an ejection port, a bolt reciprocably movable in the receiver, said bolt having a forward face adapted to contact the head of a cartridge, an extractor carried on the side of the bolt adjacent said ejection port, an ejector mounted on said bolt opposite said ejection port and secured against substantial relative movement longitudinally of said bolt, said ejector being an elongated member formed of resilient material and comprising a nose portion extending forwardly of the bolt face and continuously biased inwardly toward said bolt to contact the head of a cartridge positioned on the bolt face, said nose portion being cooperatively associated with said extractor to hold a cartridge therebetween during chambering and extraction thereof, said ejector further comprising a tail portion secured to said bolt and a cam portion intermediate said nose and tail portions projecting laterally of said bolt, the surface of said nose portion in contact with the cartridge normally forming an angle with the bolt face which is not substantially greater than 90°; and a cam surface on the inner wall of the receiver adjacent said ejector arranged to force the cam portion of the said ejector inwardly upon retraction of the bolt whereby the force exerted by the ejector on the cartridge is increased and the elongated ejector member is deformed in a manner to increase the angle between the cartridge contacting surface of the nose portion and the bolt face sufficiently to effect ejection of the cartridge.

4. In a firearm, a receiver having an ejection port on one side thereof, a bolt reciprocably movable in the receiver, said bolt having a forward face adapted to contact the head of a cartridge to chamber the same, an extractor carried on the side of the bolt adjacent the ejection port, said bolt having a longitudinal slot on the side opposite the ejection port, an ejector mounted within said slot and comprising an elongated member made of resilient wire and having a nose portion extending forwardly of the bolt face adapted to contact the head of a cartridge positioned on the bolt face between it and said extractor, the edge of the nose portion in contact with the cartridge lying normally substantially at right angles to the bolt face in order to hold the cartridge in contact with the bolt face during chambering and extraction thereof, said elongated member also having a cam portion adjacent said nose portion, a tail portion rigidly secured within the bolt slot and a body section connecting the cam and tail portions, said cam portion being arranged to project laterally from said bolt slot when a cartridge is in position on the face of the bolt; said receiver having an elongated groove on the inner wall adjacent said ejector to accommodate said cam portion, the rear end of said groove terminating in an inclined camming surface located opposite said ejection port, said camming surface being capable of forcing the cam portion of the ejector during retraction of the bolt inwardly of the bolt in order to

increase the force exerted by the ejector on the cartridge and to deform the ejector to cause the end of the nose portion in contact with the cartridge to form an angle with the face of the bolt sufficently great to effect ejection of the cartridge.

5. In a firearm having a receiver and a bolt reciprocably moveable therein, an ejector mounted on the bolt and secured against substantial relative movement longitudinally thereof, said ejector having a nose portion extending forwardly of the face of the bolt for engagement with the head of a cartridge positioned on the bolt face, means for resiliently biasing said nose portion continuously against one side of the head of the cartridge while the latter is being chambered and extracted, said bolt having provision on its face for receiving the other side of the head of the cartridge, the surface of said nose portion in contact with the cartridge normally forming an angle with the bolt face such that said ejector in cooperation with said provision on the bolt face will hold the cartridge in place, and means adjacent said ejector for causing the cartridge contacting surface of said nose portion to assume an angle with respect to the bolt face during rearward travel of the bolt such that the force exerted by said ejector on the cartridge will eject the cartridge from the receiver.

6. In a firearm, the combination defined in claim 1, wherein one side of said bolt is provided with a longitudinal slot in which said ejector is mounted, a portion of said ejector being arranged to project laterally from said slot when a cartridge is in position on the face of the bolt, said side of the bolt being substantially flush with the adjacent inner wall of the receiver throughout a major portion thereof, said inner wall of the receiver having an elongated groove adjacent said ejector to accommodate said laterally extending portion of said ejector, the rear end of said groove terminating in an inclined camming surface by which said laterally projecting portion of said ejector is cammed inwardly of the bolt during retraction of the bolt in order to increase the force exerted by said ejector and to bend its nose portion outwardly, thereby changing its angle of contact with the cartridge.

7. In a firearm, a receiver, a bolt reciprocably movable in the receiver and having a forward face against which the head of a cartridge is held, an ejector mounted on the bolt against substantial movement longitudinally thereof, said ejector having a nose portion extending forwardly of the bolt face and a cartridge engaging surface on said nose portion resiliently urged into engagement with the head of a cartridge positioned on the face of the bolt, cartridge positioning means carried by said bolt on the opposite side of said cartridge against which the head of the cartridge is substantially continuously urged by said ejector while the cartridge is being chambered and extracted, said cartridge engaging surface comprising a substantially straight section of said nose portion normally lying at an angle with respect to the cartridge head such that the cartridge is held in position on the bolt face between said cartridge positioning means and said ejector, the nose portion of said ejector being shiftable angularly with respect to said cartridge, and means for bodily shifting said nose portion angularly with respect to said cartridge whereby the angle formed between said cartridge engaging surface and said cartridge head is changed such that the resilient force exerted by said ejector on the cartridge pivots the cartridge about said cartridge positioning means and ejects it from the receiver.

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