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(54) RECEIVER SYSTEM FOR A BOLT ACTION FIREARM

(57) Receiver system (3) for a bolt action firearm (1), comprising:
- a receiver (5) comprising a forward end adapted to receive a barrel (7) and a rearward end arranged to receive a breech bolt (9) in a boltway (5f) provided in said receiver (5);
- a breech bolt (9) adapted to slide linearly in said boltway (5f) and to lock to said receiver (5) by rotation when said breech bolt (9) is in a closed position;
- a buttstock interface block (19) attached at a rearward end of said receiver (5) and adapted to interface with said stock (13);
- a trigger mechanism (11) provided in said buttstock interface block and arranged to cooperate with a cocking piece 31 carried by a striker (33) provided in said breech bolt.

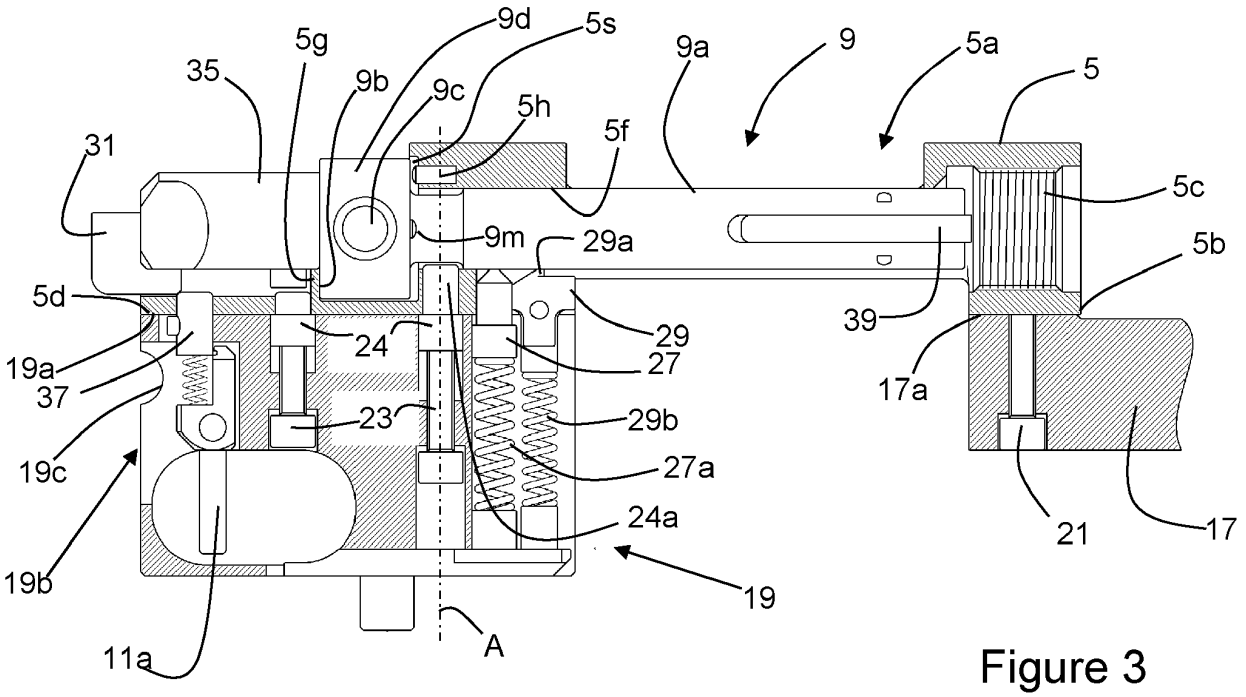

Figure 3

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Description

Technical Field

[0001] The present invention relates to the technical field of firearms. More particularly, it relates to a receiver system for a bolt action firearm such as a rifle, long-range pistol or shotgun.

State of the art

[0002] Bolt action firearms typically comprise a receiver, the forward end of which comprises a mounting adapted to receive a firearm barrel e.g. by threading, shrink-fitting, pinning or similar. The barrel can either be internally smooth or can be provided with rifling grooves in order to impart a spin to a projectile passing along it, as is generally known. In order to seal a cartridge in a chamber provided at the proximal end of the barrel, a breech bolt is movably mounted in the receiver, inserted into a boltway from the rearward end thereof. The bolt comprises one or more locking surfaces which cooperate with corresponding locking shoulders in the receiver, in order to resist the forces generated by propellant gases when firing the cartridge. In the type of bolt action firearm which is the subject of the present invention the bolt is rotary, and the rotation thereof at the forward end of its linear travel brings the locking surfaces in and out of engagement with the corresponding locking shoulders provided in the receiver. When the bolt is unlocked, it may be moved rectilinearly in the boltway in order to feed a fresh cartridge into the chamber, and to extract a fired (or unfired) cartridge already present therein.

[0003] In order to present the firearm in an ergonomically appropriate package, the receiver is mounted in a one- or two-piece stock, which comprises a forend extending under the barrel, and a butt extending in the opposite direction and adapted to be placed against the user's shoulder. The interface between the receiver and the stock, whether this latter is in one or two parts, is critical for accuracy, and for the overall strength of the firearm. A weak interface with the stock will lead to the receiver moving under recoil with respect thereto, and can even result in breakage of the stock, particularly when this is made of wood.

[0004] As a result, receivers typically comprise a recoil lug or similar structure(s) which provide a strong and consistent interface for transmitting recoil force from the receiver to the stock. These structures complicate the machining of the receiver, and as a result various simplifications have been sought over the years.

[0005] One of the more successful simplifications of such a receiver from a production engineering perspective was implemented by the Remington company in their Model 700 rifles. Instead of being integral with the receiver, the recoil lug is provided as a separate element, machined from a metal plate and sandwiched between the barrel and the receiver during breeching-up (i.e. when the barrel is screwed into the receiver's barrel threads). As a result, the outer profile of the receiver can be essentially cylindrical and can hence be turned from bar stock on a lathe, other external features such as integral sight rails, mounting points for the trigger mechanism, the recess for the bolt handle and so on being manufactured simply with conventional tools.

[0006] However, such receivers are still complicated to manufacture internally. Since the locking surfaces are provided on conventional lugs situated at the front end of the bolt (i.e. its extremity facing the chamber), internal raceways and locking shoulders must be cut inside the receiver by broaching or by single-point cutters, which is expensive and time-consuming to carry out.

[0007] An aim of the present invention is hence to overcome the above-mentioned disadvantages of the prior art, and thereby to propose a firearm receiver system which can be manufactures entirely with simple, conventional, tooling.

Disclosure of the invention

[0008] More precisely, the aim of the invention is attained by a receiver system for a bolt action firearm such as a rifle, long-range pistol or shotgun, the receiver system comprising:

- a receiver comprising a forward end adapted to receive a barrel e.g. by threading, pinning, shrink fitting or similar, and a rearward end arranged to receive a breech bolt in a boltway provided therein;
- a breech bolt adapted to slide linearly in said boltway and to lock to the receiver by rotation when said breech bolt is in a closed position;
- a buttstock interface block attached at a rearward end of said receiver, namely at the underside thereof, e.g. by means of one or more fixing bolts, locking studs or similar, and adapted to interface with said stock;
- a trigger mechanism of any convenient type provided in said buttstock interface block and arranged to cooperate with a cocking piece fixed to a striker provided in said breech bolt.

[0009] As a result of this particular construction, the receiver system can be particularly simple to manufacture with basic tooling, since complex cuts can be eliminated entirely. Indeed, it is possible to fabricate some variants of the receiver system of the invention with a lathe and a 3-axis mill, using rotary cutters only. The principal parts (receiver and buttstock interface block) can then simply be attached together e.g. by means of fixing bolts or similar. The integration of the trigger mechanism into the buttstock interface block also renders the system simple and compact.

[0010] Advantageously, said receiver comprises at least one rail on a lower side thereof, said rail being adapted to interface with said buttstock interface block. Good

alignment with this latter is thereby assured, and such a rail can be easily cut on the aforementioned simple machines.

[0011] Advantageously, said buttstock interface block is fixed to said receiver by means of at least one conventional fixing bolt, which is particularly simple and robust.

[0012] Advantageously, said receiver comprises a locking shoulder situated behind the rear of said boltway, i.e. towards the rear of the receiver. This places the locking shoulder outside of the enclosed part of the receiver, making it easily accessible for machining, even by means of a standard rotary cutter of any convenient type.

[0013] Advantageously, said breech bolt comprises at least one locking surface adapted to interact with said locking shoulder when the bolt is forwards and is rotated towards a locking position, said locking surface being adjacent to (i.e. contiguous with) a bevelled surface arranged to cooperate with the locking shoulder, specifically the corner thereof, so as to provide a mechanical advantage when rotating said breech bolt towards a locked position. This helps to force a dirty or damaged cartridge into the chamber.

[0014] Advantageously, said breech bolt comprises a first primary extraction cam arranged to interact with a second primary extraction cam provided on a rearward-facing surface of said receiver when the bolt is turned towards its fully unlocked position. One or both of these two primary extraction cams can for instance be domed hardened steel studs which are arranged in the manner described, typically such that they meet each other when the bolt is pushed forward but not rotated.

[0015] Advantageously, said breech bolt comprises two locking surfaces arranged symmetrically such that by rotating said breech bolt in a first direction (e.g. clockwise) about its longitudinal axis a first of said locking surfaces can be brought into engagement with said locking shoulder, and by rotating said breech bolt in a second direction opposite to said first direction (e.g. anticlockwise) about its longitudinal axis a second of said locking surfaces can be brought into engagement with said locking shoulder. The system can hence be used ambidextrously without any modification whatsoever, simply by the user choosing to rotate the bolt clockwise (i.e. to the right) or anticlockwise (i.e. to the left), considered from the viewpoint of a user observing from the rear in a forward direction.

[0016] Advantageously, said breech bolt and said locking shoulder are adapted so as to define:

- an unlocked position in which said at least one locking surface is clear of said locking shoulder, in which the bolt is free to reciprocate rectilinearly;
- a locked position in which a locking surface of the breech bolt is in contact with said locking shoulder and wherein said cocking piece, and hence said striker, is free to travel forwards to its fullest extent so as to strike the primer of a cartridge situated in the chamber; and
- a safety position situated between said unlocked position and said locked position in which a locking surface of said breech bolt is in contact with said locking shoulder and wherein said cocking piece, and hence said striker, is prevented from traveling forwards to its fullest extent.

[0017] This intermediate safety position, in which the bolt is prevented from moving axially, prevents undesired discharge of a cartridge before the user places the bolt into the locked position, and removes the need for any separate safety catch system. Furthermore, it is very ergonomic for the user, particularly visually, since the angle of the bolt handle gives an immediate indication of whether the firearm is ready to fire or not. The exact rotational angles of the locked position and safety position can be chosen at will by the skilled person.

[0018] Advantageously, the system further comprises a detent system adapted to maintain said breech bolt in each of said positions, said detent system for instance comprising a spring-loaded plunger mounted in one or both of said receiver and said buttstock interface block, the plunger being arranged to cooperate with a series of flats and/or notches provided on the bolt.

[0019] The above-defined receiver system can be integrated into a firearm which further comprises a barrel fixed to said forward end of said receiver, and buttstock interfacing, or indeed integral with, with said buttstock interface block.

Brief description of the drawings

[0020] Further details of the invention will become apparent in the following description, with reference to the drawings in which:

- Figure 1 is a schematic side view of a firearm comprising a receiver system according to the invention;
- Figure 2 is a schematic side view of a receiver system according to the invention;
- Figure 3 is a lateral cutaway view of the receiver system of figure 2;
- Figure 4a is a bottom view of the receiver and a top view of the buttstock interface block;
- Figure 4b is a cross-sectional view of the interface between the receiver and the buttstock interface block, along the line A of figure 3;
- Figure 5 is a partial side view of the bolt;
- Figure 6 is a rear view of the bolt in various positions, namely 0°, 20°, 45° and 90° from its unlocked position;
- Figures 7a-g are partially cutaway side views of the bolt in various positions, respectively unlocked and partially withdrawn; at its forward position prior to rotation; rotated by 45° from its unlocked position; locked to the receiver at 90° from its unlocked position with the striker cocked; as per the previous orientation but illustrating the striker also in its fired po-

sition; at 45° to its unlocked position with the striker in its recocked position; returned to its unlocked position; and

- Figure 8 is a rear cross-sectional view of the interaction between the detent plunger and the flats and notches on the bolt.

Embodiment of the invention

[0021] Figure 1 illustrates schematically a bolt-action firearm 1 comprising a receiver system 3 according to the present invention. In the present specification, "forward" and "front" are used to indicate a direction in which the barrel 7 extends from the receiver 5, towards its muzzle, which is also the direction of projectile travel. "Rearward" and "rear" are used to indicate the opposite direction, that is to say towards the shoulder of the firer. "Upper", "lower", "underside" and similar are used with reference to the conventional orientation of the firearm in use.

[0022] The receiver system 3 is illustrated in more detail in figures 2-4b and comprises, as is generally known, a receiver 5 of broadly tubular form, provided with a rifled or smooth-bored firearm barrel 7 attached at a forward end thereof and provided with an appropriate bore and chambering. This fixation can be carried out by threading (e.g. by means of the barrel threads 5c provided at the front end of the receiver 5 as illustrated in figure 3), pinning, shrink-fitting or by any other known means. As illustrated, the main portion of the receiver has a circular cross-section, but it is equally possible to utilise a rectangular, square or otherwise polygonal outer cross-section.

[0023] The receiver 5 is bored out longitudinally so as to define a boltway 5f (see figures 3 and 4b) adapted to receive the bolt body 9a of a breech bolt 9, of the turnbolt type, such that the breech bolt 9 can slide linearly therein parallel to the axis of the barrel 7, and can rotate about its longitudinal axis to lock to the receiver 5 at the forward end of its stroke. The breech bolt 9 comprises a striker 33 (see figures 7a-g) fixed to a cocking piece 31 and adapted to strike a primer of a cartridge provided in the chamber of the barrel 7 by means of a firing pin 33a (see figures 5 and 7a), the striker 33 being driven by a spring (not illustrated) as is generally known. The spring may be a coil spring, a stack of conical or dished washers (so-called "Belleville washers"), or any other known type.

[0024] The firearm is provided with a trigger mechanism 11 arranged to retain the cocking piece 31 and striker 33 in a cocked position by means of a sear 37, and to release it to strike the primer in response to a predetermined pressure on a trigger 11a, as is generally known.

[0025] The barrelled receiver 5 is supported in a stock 13, which may be of any convenient shape, and may be a so-called one-piece stock in which at least part of the buttstock 13a is integral with at least part of the forend 13b, or a so-called two-piece stock in which the buttstock 13a and forend 13b are distinct parts not directly linked to each other. The stock 13 can be made of multiple subcomponents, and can be provided with attachment points for accessories (bipods, downgrips, sling mounting points, monopods, lights, lasers and so on) as is generally known.

[0026] The firearm 1 as illustrated comprises a magazine 15 of any convenient type removably attached to the underside of the receiver 5 and adapted to hold unfired cartridges such that they can be fed into the chamber by reciprocation of the bolt 9. Alternatively, the system 3 may have an internal non-removable magazine, or may be single-shot and not be provided with a magazine. As illustrated, the receiver comprises an ejection port 5a on an upper side thereof, so as to permit ejecting empty cases and unfired live rounds. Alternatively, one or more ejection ports 5a can be provided on one or both side faces of the receiver at any convenient angle, or can even be omitted in the case in which the cartridge is clipped into the bolt face prior to insertion of the bolt 9 into the receiver 5 in a single-shot configuration, as is already the case in certain precision rifles.

[0027] The core of the first aspect of the invention lies in the overall construction of the receiver system 3, and how it is adapted to interface with the stock 13. Standard, non-relevant features such as rails or mounts for sights or similar are well known to the skilled person and hence need not be discussed.

[0028] The receiver system 3 does not comprise a conventional recoil lug. Instead, it is constructed of three separate parts: the receiver 5, a forend interface block 17, and a buttstock interface block 19, this latter also housing the trigger mechanism 11. The buttstock interface block 19 is adapted to interface with a buttstock 13a, whether this is integrated with a forend 13b or not.

[0029] The forend interface block 17 is attached at the front of the receiver 5 on the underside thereof, by means of a dovetail rail 5b or other suitable rail cooperating with a further rail 17a of complementary form provided on the upper surface of the forend interface block 17. As illustrated in figure 3, the forend interface block 17 is attached to the front end of the receiver, adjacent to the barrel threads 5c, by means of a fixing bolt 21 or any other convenient means arranged to push the forend interface block 17 away from, or to pull it towards, the receiver 5, thereby tensioning the dovetail interface 5b, 17a. As can be seen from figure 4a, the rail 5b on the receiver is male and that provided on the forend interface block 17 is female, however the opposite configuration is equally possible, as are other equivalent arrangements and rail shapes. Furthermore, instead of rails, lugs and corresponding recesses can be provided in the receiver 5 and forend interface block 17, or other equivalent means to positively interface the two parts 5, 17 can be provided, such as bolts or similar attaching these two components together in any convenient manner.

[0030] The forend interface block 17 can be fixed into a groove of complementary shape inletted into the forend 13b of the stock 13, the fixation being by means of bolts,

screws, bonding, welding (in the case in which the stock is made of metal or contains a metal chassis), or any other convenient means, and keeps the forend 13b in place on the front of the receiver system 3 via these fixing means. Furthermore, the rear face of the forend interface block 17 may also comprise a guide such as a groove or rail for guiding a magazine, and/or retention means for releasably retaining such a magazine.

[0031] However, other means for attaching the forend 13b to the receiver 5 and/or barrel 7 are also possible, and are well-known to the skilled person. This applies whether the forend 13b and buttstock 13a are directly attached to each other, and also when the stock 13 comprises a separate buttstock 13a and forend 13b which are not directly connected together.

[0032] The buttstock interface block 19 is likewise mounted to the rear of the receiver 5 by means of a further rail 5d provided on the underside of this latter, which cooperates with a complementary rail 19a provided on the upper surface of the buttstock interface block 19. These two rails 5d and 19a can have the same or different forms to the rails 5b and 17a respectively, or may have different forms, and a pair of fixing bolts 23 urge mounting studs 24 firmly against edges of corresponding openings in the receiver 5, pushing the dovetails 19a, 5d apart and thereby securely attaching the receiver 5 to the buttstock interface block 19. As an alternative, it is also possible for fixing bolts 23 to engage with corresponding threaded holes provided in the receiver 5, or with separate threaded elements provided in the receiver 5 so as to pull the receiver 5 towards the buttstock interface block 19. The same considerations for alternatives to rails as discussed above in respect of the forend interface block 17 apply equally here, and again the front end of the buttstock interface block 19 may also comprise a guide for guiding a magazine, and/or retention means for releasably retaining such a magazine.

[0033] In order to transmit recoil force to the buttstock 13a, the rear face 19b of the buttstock interface block 19 can simply abut a corresponding shoulder provided in the stock 13. This shoulder can be reinforced with a pin 25, arranged to abut a corresponding notch 19c provided in said rear face 19b. Alternatively, the pin 25 may be flat-faced so as to provide a planar abutment surface with respect to said rear face 19b, and may simply contact this latter or engage with a correspondingly-shaped notch 19c.

[0034] In the case in which the buttstock 13a is not integrated with the forend 13b (i.e. in the case generally known as a "two-piece stock"), the buttstock 13a can be fixed to the buttstock interface block 19 by any suitable means, such as bolts, pins or similar, or may simply be integrated therewith in a monobloc fashion, together with a pistol grip (if present). Likewise, the forend 13b may be integrated with the forend interface block 17 in a unitary construction.

[0035] In view of the construction as described above, both the forend fixing block 17 and buttstock interface block19 can be constructed very simply, using conventional tooling on conventional 3-axis milling machines using rotary cutters, whether manually-operated or CNC-operated. Furthermore, the receiver 5 can be turned on a simple lathe, and then its other features as described above can be milled on a conventional 3-axis milling machine with appropriate rotary cutters.

[0036] This aspect of the invention, considered broadly, places no particular constraints on the nature of the locking system or the bolt, which can be of any convenient type and can be either front or rear locking. However, the illustrated construction is particularly simple and efficient to manufacture, as will become clear in the following description. Furthermore, as is generally known, rear locking results in a relatively short bolt travel, ease of cleaning, and so on.

[0037] Consulting figure 3, it can be clearly seen that the boltway 5f provided in the receiver for receiving for the body of the bolt 9 is cylindrical and extends in a longitudinal direction, and can hence be lathe bored or drilled and reamed. This is a consequence of the locking arrangement, in which one or more locking surfaces 9b (commonly known as "lugs") are provided on a widened portion 9d of the bolt 9 which serves as the base or root of the bolt handle 9c, whether this latter is integral with the bolt 9c or is a separate part attached thereto. The locking surface 9b cooperates with a locking shoulder 5g, which extends upwards from the inner lower face of the rear end of the receiver perpendicular to the longitudinal axis of the bolt 9, and hence permits locking the bolt 9 when the handle 9c has been rotated such that the locking surface 9b engages with the locking shoulder 5g. This engagement resists the forces generated upon firing.

[0038] Since the locking shoulder 5g is situated to the rear of the entirety of the boltway 5f, it is outside of the tubular portion of the receiver 5. As a result, it is easily machinable with conventional rotary cutters on a 3-axis milling machine, and presents several further advantages, as will become clear below. It should also be noted that the locking shoulder 5g may be provided as a separate part mounted on the receiver 5. In such a case, various dimensions of locking shoulder 5g can be provided in order to easily adjust headspace, as is generally known. Alternatively, headspace can be set in any one of a plurality of conventional manners, such as careful individual machining of the chamber, timing washers of appropriate thicknesses situated between the barrel shoulder and the receiver 5, Savage-type breeching-up nuts, a separate threaded piece provided in the receiver 5, or similar.

[0039] Figure 5 illustrates part of the bolt 9 in greater detail, figure 6 illustrates a part of the bolt 9 viewed from the rear in various positions, and figures 7a-7g illustrate in partially cutaway side view the interaction between the bolt 9 and the rear portion of the receiver 5. Since it is unnecessary to repeat the reference signs on each part of figures 6 and 7, they have only been included on the

left-most diagram of figure 6, and on figure 7a.

[0040] As noted above, the locking surface 9b is formed on a wider section 9d of the bolt 9, which is wider than the part thereof which enters into the boltway 5f and into which the bolt handle 9c is fitted. Indeed, two such locking surfaces 9b are provided symmetrically on either side of said wider section 9d, although only one is required in respect of this aspect of the invention.

[0041] In the position indicated as 0° on figure 6, the locking surfaces 9b are clear of the summit of the locking shoulder 5g in the receiver 5, illustrated by the line R-R. The bolt 9 can hence be moved rectilinearly so as to feed a cartridge into the chamber of the barrel 7, or to extract a spent or live cartridge therefrom, as is generally known and is likewise represented in the positions illustrated in figures 7a and 7b. When the bolt 9 is pushed fully forward without rotating, a bevelled surface 9f overlaps the locking shoulder 5g, and a first primary extraction cam 9m abuts a corresponding second primary extraction cam 5h provided on a rearward-facing surface 5s of said receiver, this second primary extraction cam 5h hence serving as a forward bolt stop. In the illustrated embodiment, both of these primary extraction cams 9m, 5h are formed as dome-headed studs fitted into the bolt 9 and receiver 5 respectively, but other forms of cam are also possible, such as wedge-shaped cams.

[0042] When the bolt 9 is then rotated a certain angle clockwise, illustrated as the approximately 20° position in figure 6, this brings the bevelled surface 9f the locking surface 9b into contact with the locking shoulder 5g, so as to provide a degree of mechanical advantage when closing the bolt 9 on a damaged, dirty or "sticky" cartridge or chamber.

[0043] Further rotation of the bolt handle 9c, as illustrated in the 45° position of figure 6 and on figure 7c, causes positive engagement between the locking surface 9b and the locking shoulder 5g, as can clearly be seen from the fact that a portion of the locking surface 9b which is perpendicular to the axis of the bolt 9 is below the line R-R on figure 6 and is clearly in engagement on figure 7c, and the bolt 9 is hence mechanically locked. This position can be used as a safety position, as will be described below, and other angles such as between 20° and 70° are also possible in respect of this safety position. However, this intermediate safety position is not essential to the present aspect of the invention.

[0044] Further rotation to the 90° position fully locks the bolt 9 to the receiver 5, and frees the passage of the cocking piece 31 as is generally known in bolt-action rifles. Since many variations of blocking means arranged such that the cocking piece 31 can only travel fully forward and cause the firing pin 33a to strike the primer of a cartridge are known in the art, they do not need to be discussed in detail here, although a discussion of the particularities of the present construction is discussed below in the context of the safety system.

[0045] In order to maintain the breech bolt 9 in each of its (quasi-)stable angular positions against undesired rotation, a detent system is provided. This system comprises a plunger 27 which is mounted in the buttstock interface block 19 and in the receiver 5, crossing from the former into the latter. The plunger 27 is pressed against the underside of the bolt 9 by means of a spring 27a. The bolt body 9a is provided with a number of detent flats 9g, 9h and notches 9i, which are situated proximate to the wider section 9d and are best visible on figures 7a-g and 8. Other forms of detent surfaces other than flats and notches are of course possible.

[0046] In the 0° position, i.e. with the bolt handle 9c vertical, the plunger 27 presses against a first detent flat 9g, which may also extend the length of the bolt body 9a at least over the distance over which contact will be maintained between the plunger 27 and the bolt body 9a. This first flat 9g hence positively defines the unlocked position of the bolt 9. Rotation of the bolt 9 when it is not in the forward position is prevented by means of the head 24a of the frontmost mounting stud 24 (see figures 3, 4b and 7a), which interacts with a flat provided to this purpose on the bolt body 9a. Alternatively, in a non-illustrated variant, the head 24a of this stud 24 can penetrate into a groove provided in the underside of the bolt body 9a, or undesired rotation can be prevented by other similar known means. The head 24a may also act as a safety lug in the case in which a shoulder in the bolt body is situated forward of the head 24a when the bolt 9 is in its locked position. In such an arrangement, if the locking surface 9b fails, the stud 24 retains the bolt and prevents it from leaving the receiver 5.

[0047] In the 45° position, the plunger 27 presses against a further detent flat 9h, which likewise serves to maintain the bolt 9 in this position. In the 90°, fully locked position, the plunger presses into a groove 9i, which serves to maintain it in this position against undesired rotation, without providing excessive resistance to a deliberate rotation.

[0048] After firing a cartridge, when the bolt 9 is rotated back towards the 0° position, the two primary extraction studs 9m, 5h enter into contact and generate a backwards movement of the bolt 9 by camming action, the bevel 9f providing sufficient clearance such that the locking surface 9b can clear the locking shoulder 5g.

[0049] In respect of the safety system of the present construction, as noted above, the intermediate approximately 45° bolt position of figures 6, 7c and 7f serves as a safety position.

[0050] In the present construction, the firing pin 33a is actuated by a cocking piece 31, affixed on the extremity of a rod-shaped striker 33 as is generally known. The firing pin 33a may be integral with this striker 33, as in a Lee-Enfield, Mauser or similar system, or may be a separate part as in e.g. a Swiss K31 type rifle. The cocking piece 31 is surrounded and guided by a shroud 35, which is shaped so as to maintain the cocking piece 31 in a vertical position irrespective of the angle of the bolt 9 with respect to the receiver 5.

[0051] The rear end of the bolt 9 comprises a set of

safety lugs 9n, which serve to only permit the cocking piece 31 to travel sufficiently far forward to fire a cartridge when the bolt handle 9c is fully locked, serve to block such travel in all other angular positions thereof, and also serve to prevent undesired rotation of the cocking piece 31 with respect to the bolt 9 when this latter is in an open position. The exact shape of the safety lugs 9n to carry this out is unimportant, and need not be described in detail since a great number of variations are possible which exhibit the functionality described below. The safety lugs 9n are also be arranged to withdraw the striker a certain distance when the bolt 9 is unlocked after firing, as is generally known, by means of a cam surface 9p which interacts with the cocking piece 31 as will be described further below.

[0052] Figure 7a illustrates the bolt in the out of battery position. The cocking piece 31 is in contact with the safety lugs 9n, and hence cannot go sufficiently forward to fire a cartridge. In this position, the cocking piece 31 is prevented from rotating with respect to the bolt 9 by means of a pair of symmetrical shoulders 9q, which define a notch 9r (see figure 6) in which it rests. Upon closing the bolt as illustrated in figure 7b, the cocking piece 31 engages with a sear 37 (see figure 3), and the user can rotate the bolt 9 as described in the context of figure 6. It should be noted that the present construction is a "cock-on-open" system with a relatively short striker travel, but it is also possible for the sear 37 to be positioned further to the rear such that the system is a "cock-on-closing" system in which the firing pin spring is compressed on the forward movement of the bolt 9.

[0053] In the 45° position of figure 7c, the cocking piece 31 rises onto one of the shoulders 9q of the safety lugs, and is hence prevented from falling to strike a cartridge.

[0054] In the 90° "locked" orientation of the bolt handle 9c (see figure 7d), the safety lugs 9n are clear of the path of the cocking piece 31, which hence rests on the sear 37. When the trigger 11a is pulled in this position, the cocking piece 31 can drop, as illustrated in figure 7e, causing the firing pin 33a to protrude and strike the primer of a cartridge. The exact nature of the trigger mechanism 11 is unimportant to the present invention and hence need not be described in detail, innumerable versions of such mechanisms being known to the skilled person.

[0055] After dropping the cocking piece, upon rotating the bolt handle 9c back towards the 45° position as shown in figure 7f, a cam surface 9p formed by the safety lugs 9n withdraws the cocking piece 31 a certain distance such that the firing pin 33a is withdrawn from contact with the fired cartridge, back into contact with the shoulder 9q. Finally, when the bolt 9 is rotated back to the initial position, first primary extraction cam 9m and second primary extraction cam 5h interact to withdraw the bolt 9 slightly to effect primary extraction, and the cocking piece 31 falls back into the notch formed between shoulders 9q. The bolt 9 can be withdrawn and the cycle can repeat.

[0056] Another advantage of the receiver 5 construction of the present invention is that it can be arranged to be fully ambidextrous without requiring any modification whatsoever. To this end, the bolt 9 is constructed symmetrically about a plane intersected by the bolt handle 9c, and hence comprises two locking surfaces 9b and two bevels 9f arranged symmetrically either side of said plane. As a result, the bolt handle 9c can be turned either clockwise or anticlockwise when it is being locked.

[0057] It is also for this reason that the extractor 39, of conventional form, is arranged such that it is oriented upwards when the bolt 9 is unlocked, and why the ejection port 5a is arranged on the top of the receiver 5 as in a Swiss K11 or K31 system. For similar reasons, the ejector 29 is arranged underneath the bolt 9, and is of the vertically-sliding type known in the aforementioned K31 rifle. This ejector 29 is arranged to protrude from a corresponding slot in the bolt face when the bolt 9 is in its fully retracted position subjected to a force provided by a spring 29b tending to push the ejector 29 in the direction of the bolt body 9a. The ejector 29 furthermore carries a bolt stop 29a arranged such that, upon retraction of the bolt, a shoulder in the bolt 9 hits the bolt stop 29a to prevent further rearward movement of the bolt 9. In the case in which the ejection port 5a is located on the side of the receiver, the extractor 39 can be positioned as appropriate in the bolt body 9a, and the ejector may be a conventional plunger type situated in the face of the bolt 9 diametrically opposite to the extractor 39 as is well known in the art and need not be described further. Indeed, such a plunger-type ejector can also be used with substantially vertical ejection.

[0058] However, as noted above, the bolt does not need to be ambidextrous in this manner, in which case only a single locking surface 9b is required. Furthermore, it is possible to keep the ambidextrous capability while turning the bolt handle 9c down, for instance by arranging this latter as a separate part which can be attached to the remainder of the bolt 9 in either orientation for left-handed or right-handed use.

[0059] Furthermore, it is noted that the various angles of the bolt handle 9c in various positions are not to be construed as limiting. For instance, the unlocked position does not have to be 0° from the vertical, but can be at any convenient angle, particularly when the bolt 9 is not arranged to be ambidextrous. Likewise, the locked position does not have to be 90° from the vertical, but can be any desired angle such that there is sufficient mating area between the locking surface 9b on the bolt 9 and the locking shoulder 5g on the receiver 5 in order to safely resist the forces generated on firing. In the case in which the unlocked position is not vertical and the firearm 1 is intended to be used ambidextrously, multiple second primary extraction cams 5h can be provided as desired.

[0060] As a final note, the above-described construction is very simple, with relatively few edges and relatively few interior corners, which makes machining and subsequent gauging for quality control purposes very simple (few gauges, relatively little gauging time). The relative lack of interior corners also makes cleaning simple for

the user.

[0061] Although the invention has been described in terms of a specific embodiment, variations thereto are possible without departing from the scope of the invention as defined in the appended claims.

Claims

1. Receiver system (3) for a bolt action firearm (1), comprising:

   - a receiver (5) comprising a forward end adapted to receive a barrel (7) and a rearward end arranged to receive a breech bolt (9) in a boltway (5f) provided in said receiver (5);
   - a breech bolt (9) adapted to slide linearly in said boltway (5f) and to lock to said receiver (5) by rotation when said breech bolt (9) is in a closed position;
   - a buttstock interface block (19) attached at a rearward end of said receiver (5) and adapted to interface with said stock (13);
   - a trigger mechanism (11) provided in said buttstock interface block and arranged to cooperate with a cocking piece 31 carried by a striker (33) provided in said breech bolt.

2. Receiver system (3) according to the preceding claim, wherein said receiver (5) comprises at least one rail (5b, 5d) on a lower side thereof, said rail (5d) being adapted to interface with said buttstock interface block (19).

3. Receiver system (3) according to any preceding claim, wherein said buttstock interface block (19) is fixed to said receiver (5) by means of at least one fixing bolt (23).

4. Receiver system (3) according to any preceding claim, wherein said receiver (5) comprises a locking shoulder (5g) situated rearward of said boltway (5f).

5. Receiver system (3) according to claim 4, wherein said breech bolt (9) comprises at least one locking surface (9b) adapted to interact with said locking shoulder (5g), said locking surface being adjacent to a bevelled surface (9f) arranged to cooperate with said locking shoulder (5g) so as to provide a mechanical advantage when rotating said breech bolt (9) towards a locked position.

6. Receiver system (3) according to claim 5, wherein said breech bolt (9) comprises a first primary extraction cam (9m) arranged to interact with a second primary extraction cam (5h) provided on a rearward-facing surface (5s) of said receiver (5) when said bolt (9) is turned towards its fully unlocked position.

7. Receiver system (3) according to any of claims 5 and 6, wherein said breech bolt (9) comprises two locking surfaces (9b) arranged symmetrically such that by rotating said breech bolt (9) in a first direction about its longitudinal axis a first of said locking surfaces (9b) can be brought into engagement with said locking shoulder (5g), and by rotating said breech bolt (9) in a second direction opposite to said first direction about its longitudinal axis a second of said locking surfaces (9b) can be brought into engagement with said locking shoulder (5g).

8. Receiver system (3) according to any of claims 5-7, wherein said breech bolt (9) and said locking shoulder (5g) are adapted so as to define:

   - an unlocked position in which said at least one locking surface is clear of said locking shoulder;
   - a locked position in which a locking surface (9b) is in contact with said locking shoulder (5g) and in which said cocking piece (31) is free to travel forwards to its fullest extent; and
   - a safety position between said unlocked position and said locked position in which a locking surface (9b) is in contact with said locking shoulder (5g) and in which said cocking piece (31) is prevented from traveling forwards to its fullest extent.

9. Receiver system (3) according to claim 8, further comprising a detent system (27, 27a, 9g, 9h, 9i) adapted to maintain said breech bolt (9) in each of said positions.

10. Receiver system (3) according to claim 9, wherein said detent system comprises a spring-loaded plunger (27) mounted in at least one of said receiver and said buttstock interface block (19), said plunger (27) being arranged to cooperate with a plurality of detent surfaces (9g, 9h) and/or notches (9i) provided on said breech bolt (9).

11. Firearm (1) comprising:

    - a receiver system (3) according to any preceding claim;
    - a barrel (7) fixed to said forward end of said receiver; and
    - a buttstock (13a) interfacing with or integral with said buttstock interface block (19).

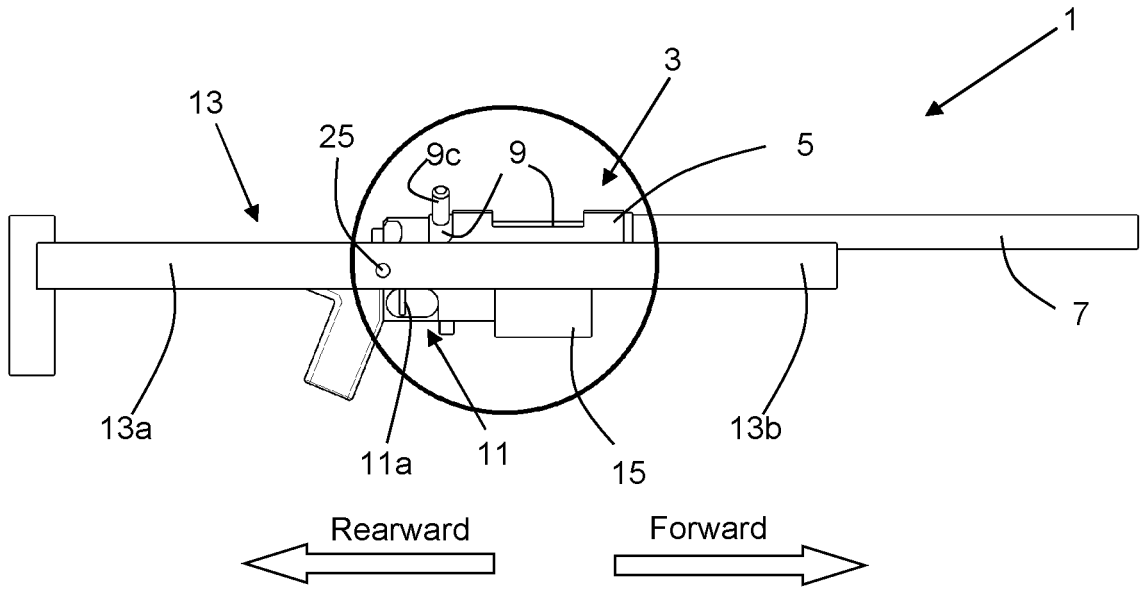


Figure 1

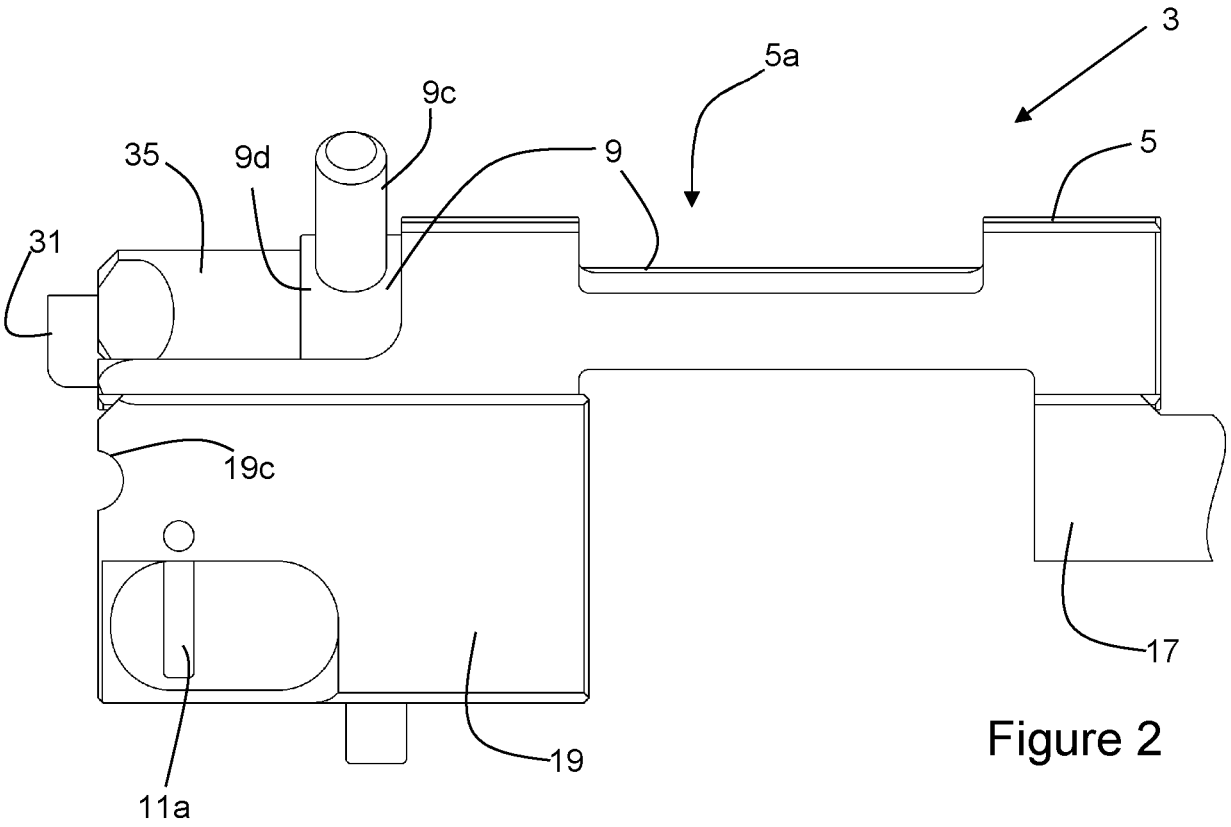
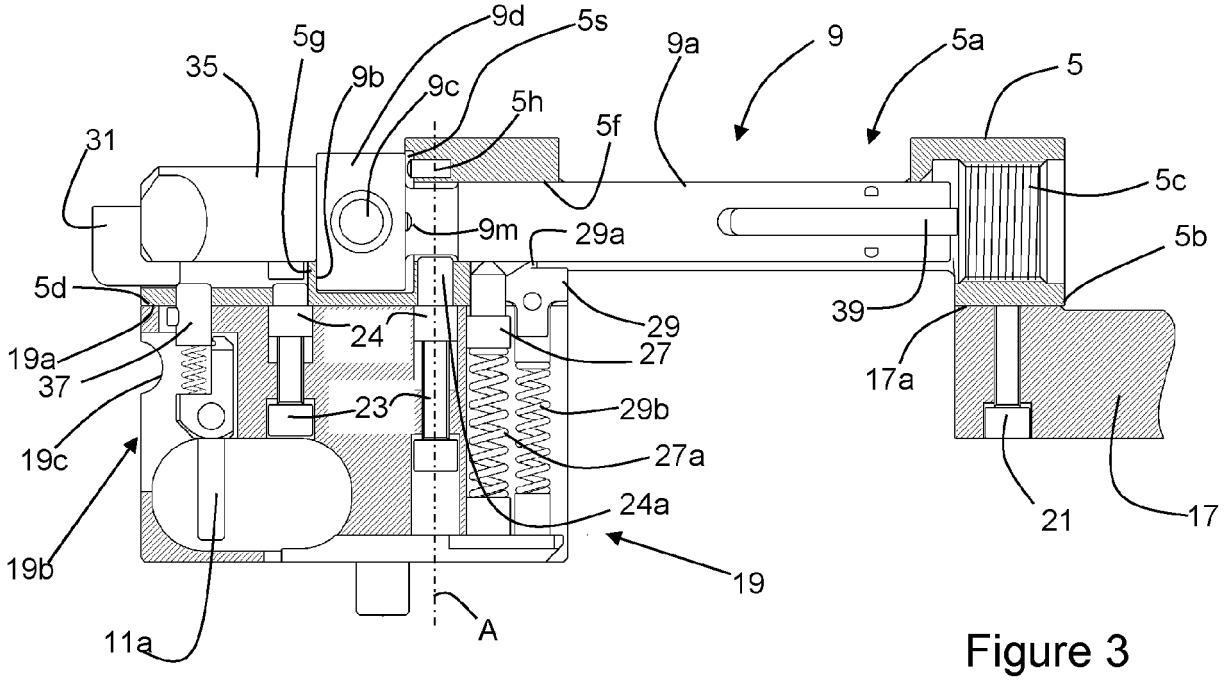


Figure 2



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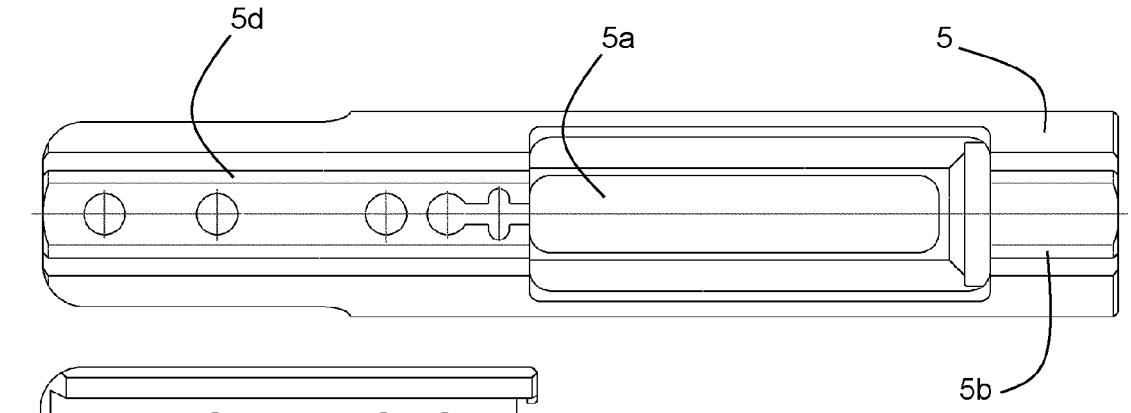


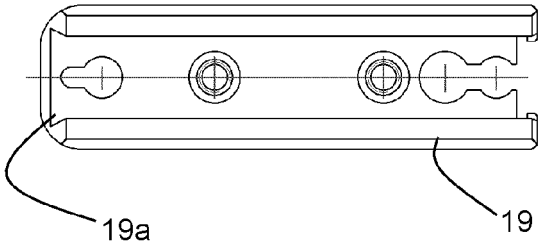


Figure 4a

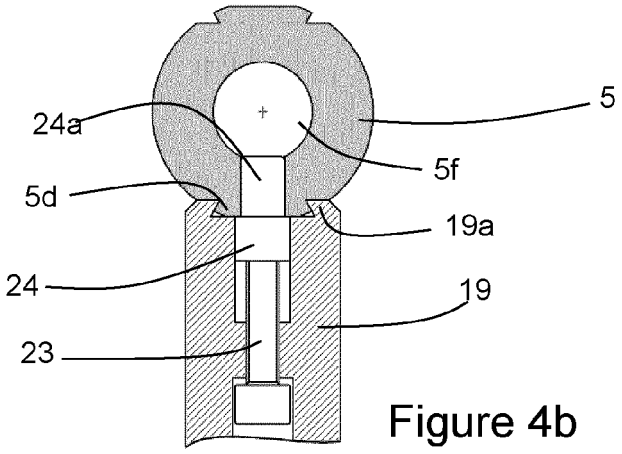


Figure 4b

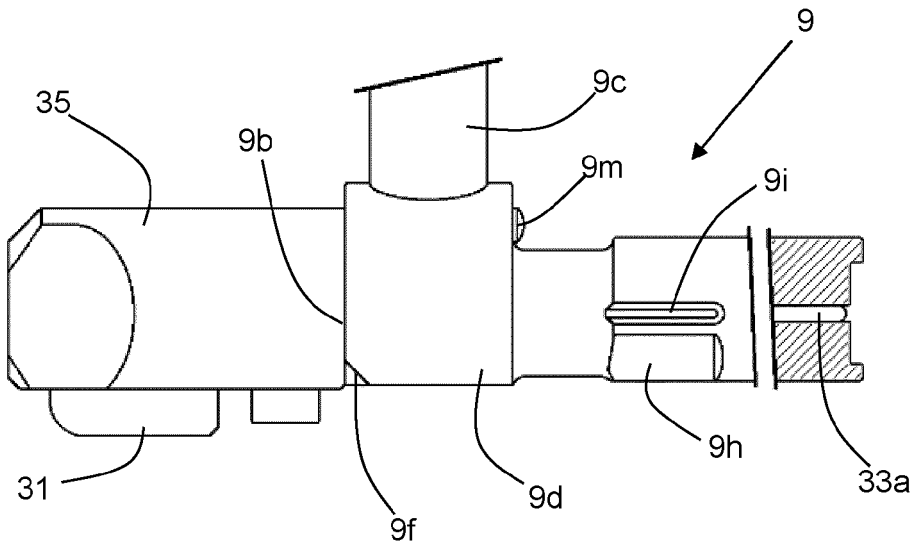
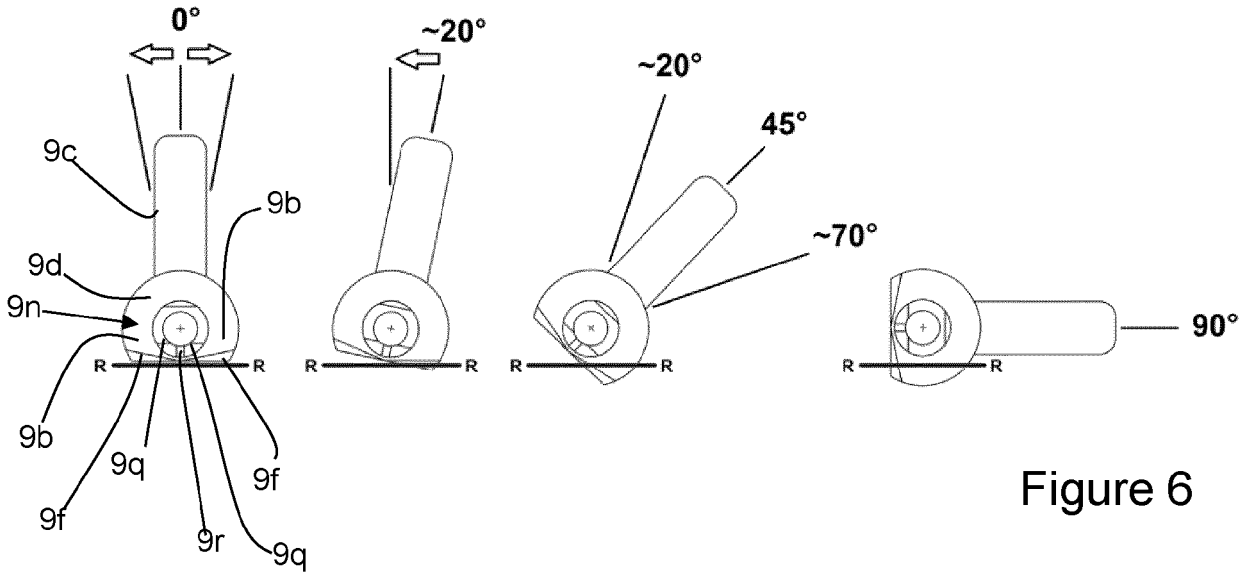


Figure 5



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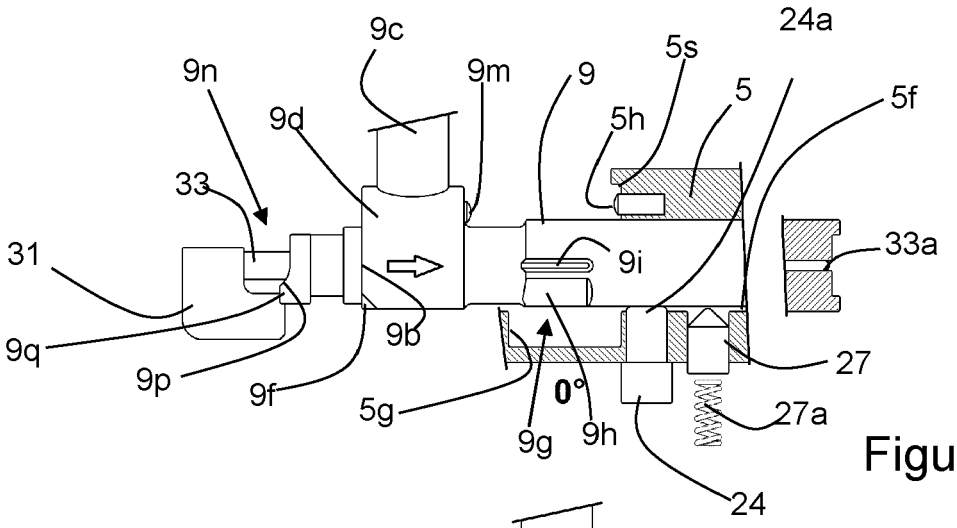

Figure 7a

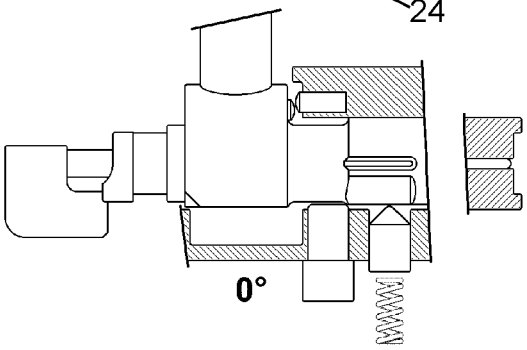

Figure 7b

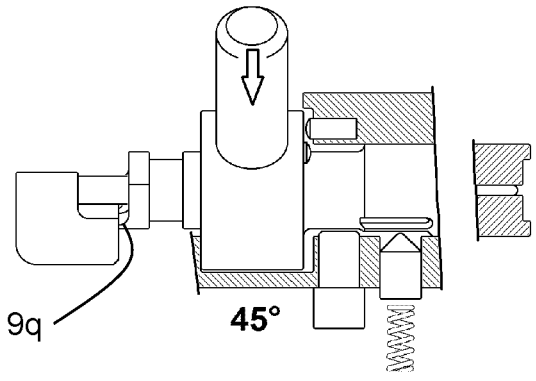

Figure 7c

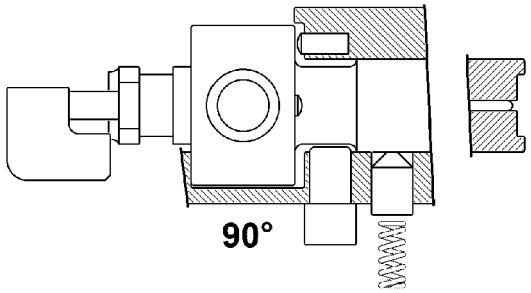

Figure 7d

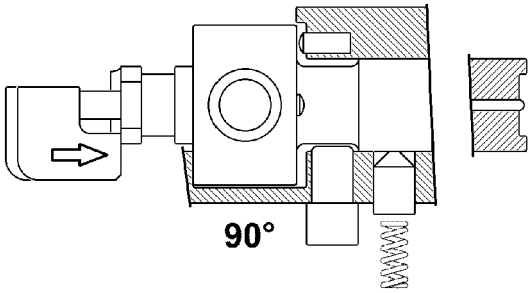

Figure 7e

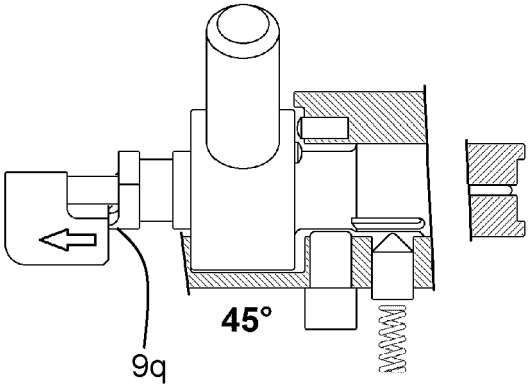

Figure 7f

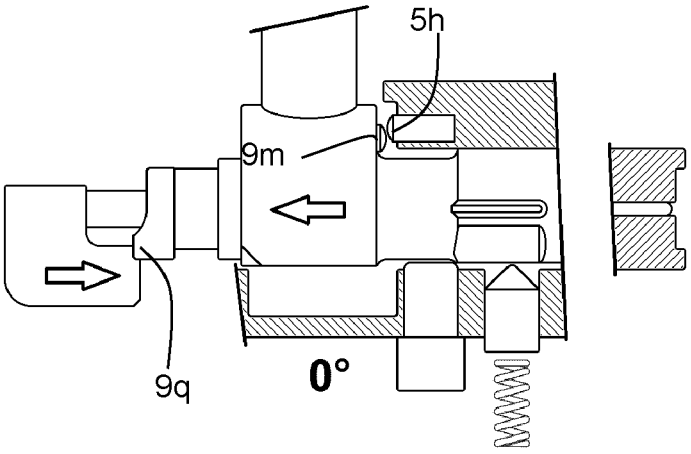

Figure 7g

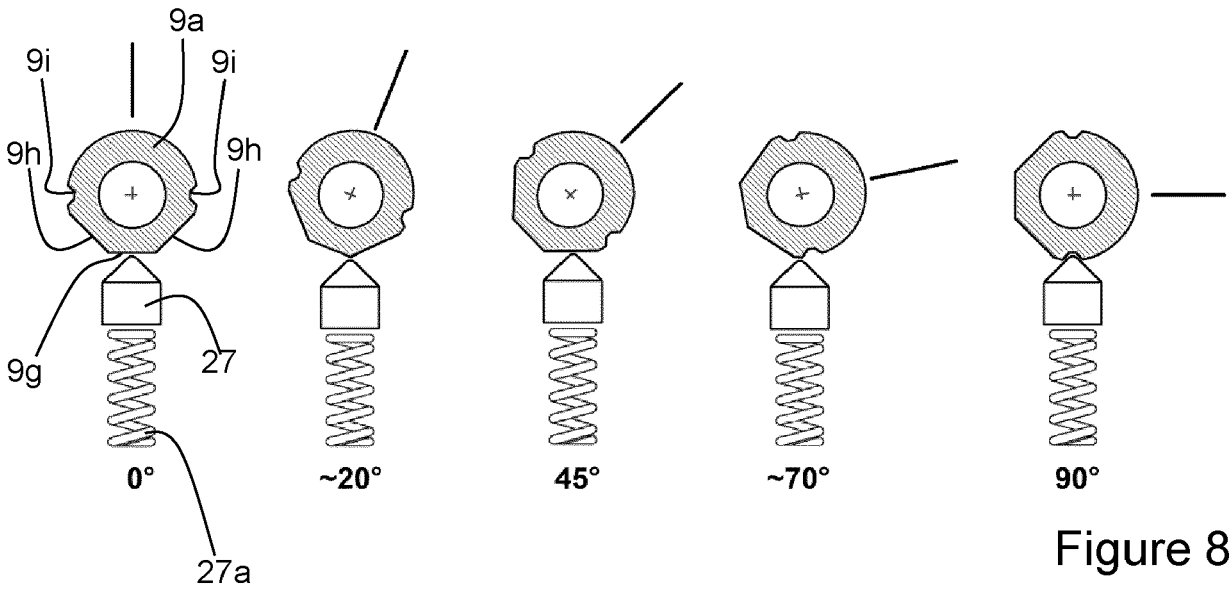

Figure 8

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EUROPEAN SEARCH REPORT

Application Number
EP 19 21 7697

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y A	US 2010/162604 A1 (DUBOIS JASON R [US]) 1 July 2010 (2010-07-01) * abstract * * paragraph [0029] * * paragraph [0030] * * figures * -----	1-3,11 4,5 6-10	INV. F41A3/66 F41A3/24 F41A3/22 F41A11/02
Y	CH 29 177 A (GODSAL PHILIP THOMAS [GB]) 31 July 1904 (1904-07-31) * page 2 * * figures * -----	4,5	
X Y	WO 2016/086191 A2 (GRAY MICHAEL S [US]) 2 June 2016 (2016-06-02) * abstract * * paragraph [0036] - paragraph [0039] * * figures * -----	1,3,11 4,5	
Y	DE 298 13 477 U1 (KEPPELER DIETER [DE]) 15 October 1998 (1998-10-15) * abstract * * paragraph [0007] * * paragraph [0010] * * figures * -----	4,5	TECHNICAL FIELDS SEARCHED (IPC) F41A
A	US 2018/003457 A1 (MCCALLUM JAMIN [US] ET AL) 4 January 2018 (2018-01-04) * abstract * * paragraph [0035] * * paragraph [0036] * * figures * * drop in fire control group * -----	1-11	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	9 July 2020	Vermander, Wim

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09-07-2020

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2010162604 A1	01-07-2010	US 2010162604 A1	01-07-2010
		US 2012144713 A1	14-06-2012
CH 29177 A	31-07-1904	NONE	
WO 2016086191 A2	02-06-2016	US 2018087854 A1	29-03-2018
		WO 2016086191 A2	02-06-2016
DE 29813477 U1	15-10-1998	NONE	
US 2018003457 A1	04-01-2018	US 2018003457 A1	04-01-2018
		US 2020025482 A1	23-01-2020

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