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[54] **TRIGGER MECHANISM FOR FIREARMS**

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[52] **U.S. Cl.** ..... **42/69 A**, 42/69 R

[51] **Int. Cl.** **F41c 19/00**

[58] **Field of Search** ..... 42/69 A, 16, 69 B, 42/69 R, 65, 41, 42 R

[56] **References Cited**

UNITED STATES PATENTS

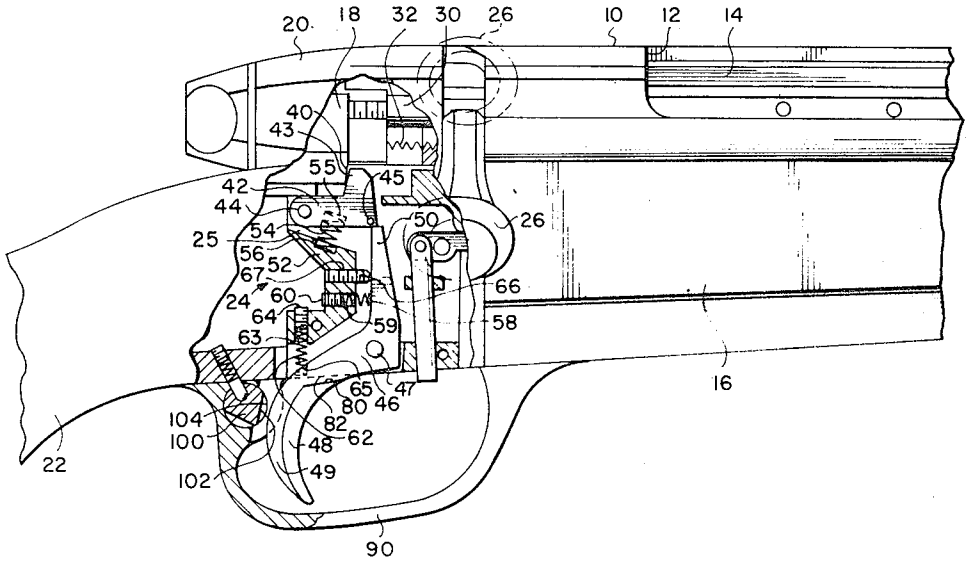
3,013,355	12/1961	Weatherby	42/69 A
3,330,061	7/1967	Koon, Jr.	42/69 A
1,693,530	11/1928	Spencer	42/69 A
2,274,195	2/1942	Garrison	42/69 A
2,085,258	6/1937	Giovannetti	42/42 R

Primary Examiner—Benjamin A. Borchelt
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[57] **ABSTRACT**

A trigger mechanism for firearms that employs a pair of springs acting against a trigger piece tending to urge the trigger in opposite rotational senses, respectively, thereby providing a smoother trigger pull. Shoulders are provided on the trigger piece and trigger housing to act as a shoe to prevent over-pull of the trigger when the mechanism is fired.

10 Claims, 5 Drawing Figures



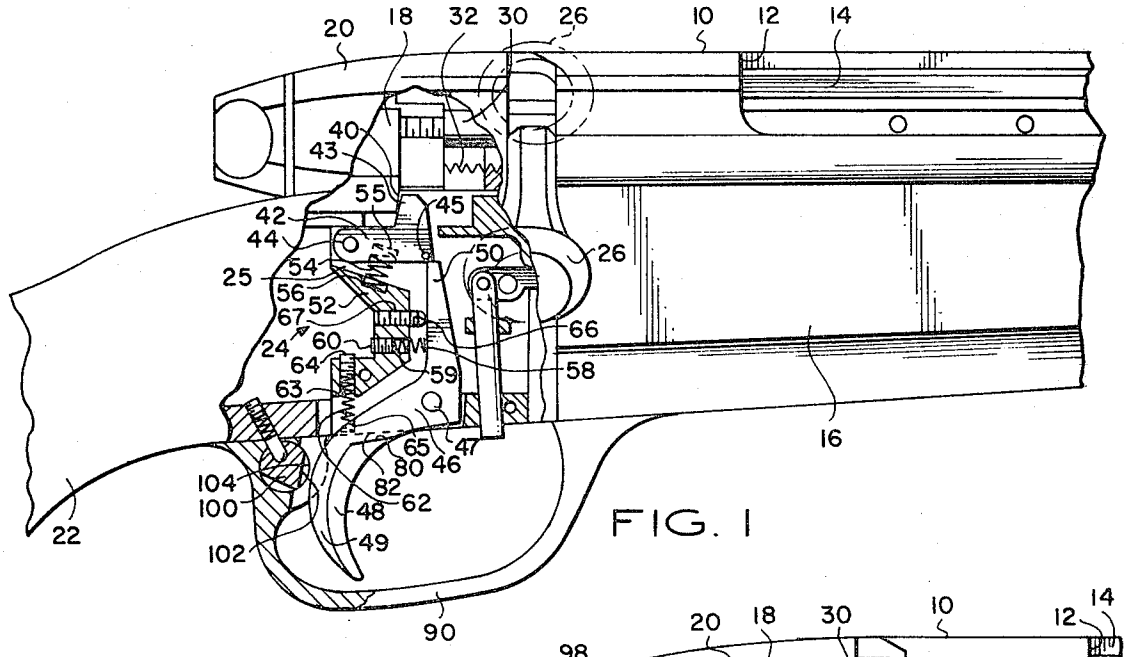


FIG. 1

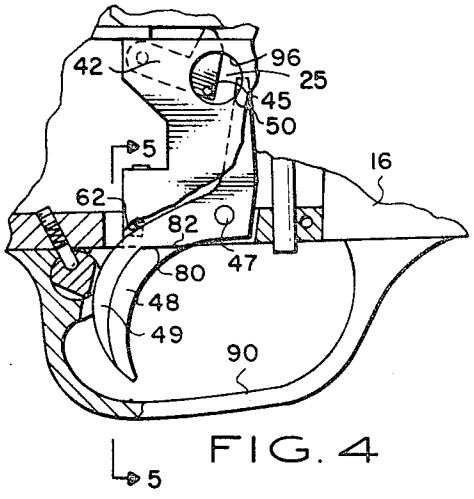


FIG. 4

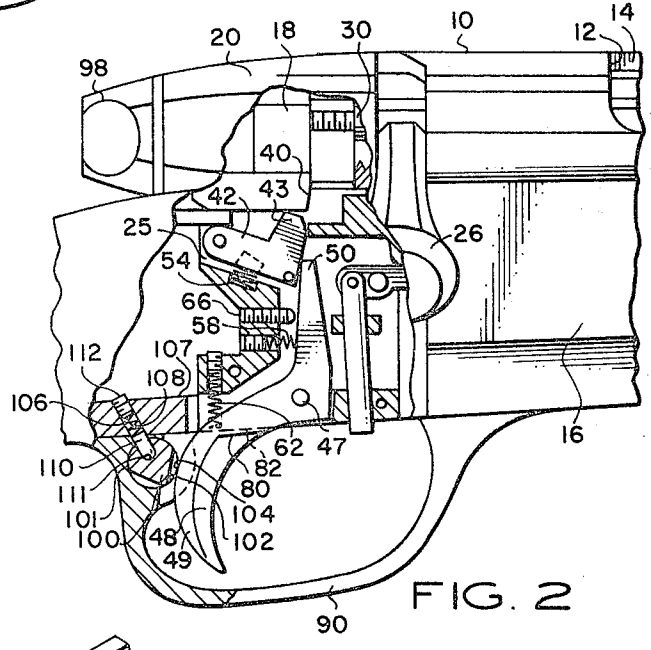


FIG. 2

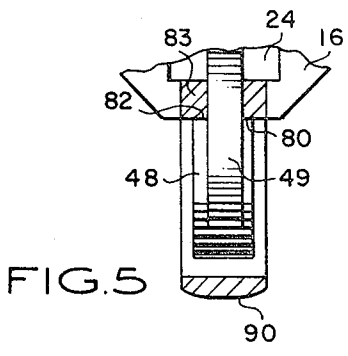


FIG. 5

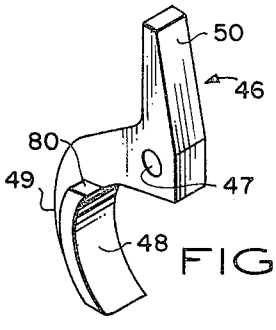


FIG. 3

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TRIGGER MECHANISM FOR FIREARMS

This invention relates to firearms, and more particularly to a trigger mechanism for firearms.

Many factors must be taken into account to achieve high accuracy and efficient operation of a firearm system, such as a hand gun or rifle. A significant factor in both accuracy and efficient operation is the trigger mechanism that is employed to release the firing pin of the firearm. More specifically, the smoothness of pull of the trigger to fire the mechanism is very important as it relates to the accuracy to be achieved by the operator. The adjustability of the pull, both in terms of force and distance, is important. This is primarily so because of the different preferences of the different operations. Thus it is desirable to provide a trigger mechanism that can be efficiently adjusted to a wide range of "feel" and "pull." Still further, prevention or elimination of substantial over-pull, or over-stroke, is important, in that continued movement of the trigger rearward after the mechanism has been fired can cause movement of the firearm and a consequent reduction in accuracy.

The present invention relates to a trigger mechanism that promotes a much increased accuracy in the firing of firearms, and allows the operator a wide range of adjustability in the trigger pull. Briefly, the invention comprises a trigger mechanism that employs a pair of springs acting on the trigger piece that tend to urge the trigger in opposite rotational senses, thereby acting against each other. When the trigger is pulled, one spring is further compressed as the other spring aids in the pulling. Both springs can be adjusted in terms of compression so as to properly adjust the forces acting against the trigger piece. Consequently, a very smooth and constant trigger pull is achieved, in addition to giving full control over the force of pull required. Suitable adjustment means are also provided for adjusting the length of travel of the trigger piece when pulled. Moreover, means are provided on the trigger piece in conjunction with the trigger housing to act as a shoe to prevent over-pull, or over-stroke, of the trigger when the mechanism is fired.

Many other objects, features and advantages 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, in section, of the trigger mechanism of the invention shown used in conjunction with a bolt action rifle mechanism;

FIG. 2 is a side elevational view, in section, of the trigger mechanism shown after the trigger has been pulled, the firing pin mechanism released and the trigger subsequently released;

FIG. 3 is a perspective view of the trigger piece;

FIG. 4 is a fragmentary, side elevational view, in section, showing the trigger piece in its most rearward position; and

FIG. 5 is a fragmentary, rear end view, in section, of the trigger piece and housing taken through section lines 5—5 of FIG. 4.

The trigger mechanism of the invention can be employed in a variety of rifle mechanisms, although it is herein described to operate in conjunction with a bolt action rifle. Refering particularly to FIG. 1, the rifle system comprises a receiver 10 having a port 12 opening in the top and one side thereof through which cartridges are loaded and unloaded. A bolt 14 is carried within the receiver for rotational and longitudinal sliding movement therein. The system also includes a magazine 16 disposed immediately beneath the receiver for containing cartridges.

A firing pin assembly is contained within the bolt with a portion 30 extending rearward thereof. A cocking piece 18 is secured to the rearward portion of the firing pin assembly. The cocking piece is utilized to cock the firing pin when the bolt is rotated from the locked to the unlocked position, and to operate in conjunction with the trigger mechanism to release the firing pin assembly to fire the cartridge. A cocking piece sleeve 20 covers the cocking piece and operates in conjunction therewith to cock the firing pin assembly.

A stock 22 is attached to the system in any suitable manner, such as bolting it to the trigger guard and receiver.

The trigger mechanism 24 includes a housing 25 for containing the various components thereof. The trigger mechanism is shown in broken away view so that the various components thereof can be seen and described.

A bolt handle 26 is secured to the bolt 14, so that the bolt can be rotated between the locked and unlocked positions and moved rearward and forward to eject spent cartridges and to chamber unfired cartridges, respectively. When the bolt handle is lifted (shown in phantom) to rotate the bolt from the locked to the unlocked position, the cocking piece 18 is urged rearwardly and carries with it the firing pin assembly. Any suitable mechanism can be employed to cause the cocking piece to be urged rearward, such as the cocking piece having a suitable cam that rides on a cam surface of the bolt (neither shown), all of which is well known. The cocking piece sleeve 20 is employed to prevent the cocking piece from rotating when the mechanism is cammed to cock the firing piece, also as is well known. As will be seen hereinafter, the trigger mechanism engages the cocking piece to maintain it in the rearward, cocked position until the trigger is pulled.

The cocking piece includes a shoulder 40 projecting downward for being engaged by the trigger mechanism to maintain the cocking piece and firing pin assembly in the cocked position until the trigger is pulled. The trigger mechanism includes a sear 42 that is secured between the opposite walls of the trigger mechanism housing by means of a pin 44, so that the sear can rotate in a vertical plane. The sear includes an upstanding shoulder 43 for being positioned in front of the cocking piece shoulder 40 when the sear is rotated in a counterclockwise direction as seen in the plane of the drawing. A block or wall member 52 is also secured between the opposing walls of the trigger mechanism housing for holding adjustment screws and springs. A suitable spring 54 is contained between a recess 55 in the lower part of the sear and another recess 56 in block 52, so as to urge the sear in a counterclockwise direction.

A trigger piece 46 is contained within the housing between the opposing walls thereof by means of a pin 47, so that the trigger piece can also rotate in a vertical plane. The trigger piece includes a trigger 48, or finger piece, and an integral upstanding portion 50 for engaging the bottom surface of the sear 42. Another spring 58 is contained at one end within a bore 59 in the block 52 and bears against the upstanding portion 50 of the trigger piece 46, thereby tending to urge the trigger

piece in a clockwise direction. A set screw **60** is threaded into the rear of the recess and against which spring **58** abuts, so that the compression of the spring and the amount of force exerted by the spring against the trigger piece can be adjusted. Access to the set screw is had between the walls of the trigger mechanism housing from the rear thereof, since bore **59** extends completely through block **52.**

Another spring **62** is contained between a bore **63** in the block **52** and a recess **65** in the finger piece **48,** and which tends to urge the trigger piece in a counterclockwise direction about pin **47.** Another set screw **64** is threaded into bore **63** against which the spring abuts for adjusting the compression on the spring and thus the amount of force exerted on the trigger in the counterclockwise direction. It will be seen that spring **58** provides a horizontal force tending to rotate the trigger piece in a clockwise direction, whereas spring **62** provides a vertical force perpendicular to that of spring **58** which tends to urge the spring in a counterclockwise direction. As will be seen hereinafter, the springs work against each other so as to provide a smoother pull and to give better adjustments.

A horizontal adjustment screw **66** is threaded in another bore **67** that extends through block **52,** so that the upstanding portion **50** of the trigger piece comes to rest against the front of this adjustment screw. This screw is provided to adjust the distance that vertical portion **50** of the trigger piece extends under sear **42,** so that the length of trigger pull can be adjusted.

FIG. **1** shows the firing pin mechanism in the cocked position, wherein the sear **42** prevents forward movement of the cocking piece and firing pin assembly as a result of the upstanding portion **50** of the trigger piece **46** preventing downward or clockwise movement of the sear. Referring also to FIG. **2,** the firing pin assembly and cocking piece is shown in the fired position, in which the trigger has been pulled to move the upstanding portion **50** of the trigger piece forward from under the sear, thereby allowing the sear to rotate in a clockwise direction and the cocking piece to override the sear against the pressure of spring **54,** as shown in FIG. **2.** As will be seen hereinafter, the force of spring **62** acting against the trigger is always adjusted to exceed the force of spring **58,** so that part **50** of the trigger piece is returned to beneath the sear when the cocking piece is moved rearward. It will now be seen that set screw **66** controls the counterclockwise movement of the trigger in this regard, or how far the upstanding portion **50** thereof moves under the sear. Thus the further the upstanding portion of the trigger piece is permitted to move under sear **42,** the longer the pull to release the firing pin mechanism.

Two facts as relating to trigger pull will now be described that affect accuracy and relate to operator's preference. The first is the length of pull, or the distance the trigger piece must be pulled or rotated for firing. Again, this is the distance the upright member **50** must be moved before it clears the sear, which distance is controlled by adjustment screw **66.** The other factor is the amount of force required by the operator to pull the trigger, wherein this is determined by the relative adjustments to springs **58** and **62.** A very wide range of adjustments to trigger pull can be achieved by combining these two factors.

To achieve a very sensitive or "hair" trigger pull, adjutment screw **66** is advanced forwardly until the upright part **50** is barely seated under the front edge of the sear when the cocking piece is moved rearward. At the same time, the relative compressions on springs **58** and **62** can be adjusted so that the force exerted by spring **62** is only slightly greater than the force exerted by spring **58.** As a result, only a slight force of the finger over a very short distance is required to pull the trigger to release the firing pin mechanism.

To achieve a very hard and insensitive trigger pull, adjustment screw **66** is moved rearward to allow a much longer travel of the upright part **50** of the trigger piece under the sear before it clears it. In addition, the force of spring **62** is increased greatly relative to the force created by spring **58,** so that the force required to pull the trigger is greatly increased.

It will now be apparent that any combination of adjustments can be achieved to give a very smooth trigger pull with the optimum amount of force and trigger travel.

A perspective view of the trigger piece is shown in FIG. **3** and includes the upstanding or vertical portion **50** and a downwardly projecting rib **49.** A broad trigger face **48** is formed on the front of the trigger rib **49** and includes a pair of flat shoulders **80** at the top thereof. These shoulders, acting in conjunction with surfaces at the bottom of the trigger housing prevent over-pull, or over-stroke, of the trigger when the mechanism is fired. Referring particularly to FIG. **4,** which shows the trigger in the pulled or rearward position, and to FIG. **5** which is a section view through section lines **5—5** of FIG. **4,** it will be seen that the trigger housing contains walls **83** on each side of the trigger piece and between which the trigger piece passes. These walls have shoulders **82** for being engaged by shoulders **80** of the trigger piece when the trigger is pulled to its most rearward position. Thus, the rearward movement of the trigger piece is limited. In fact, the trigger is pulled rearward a distance only sufficient to move the edge of the upright part **50** theeeof just beyond the front of sear **42,** all as is shown in FIG. **2.** This increases the accuracy that can be achieved with the rifle system, since the operator is prevented from further moving the trigger rearward after the mechanism is fired.

A pin **45** is secured to the lower front part of sear **42** and extends laterally therefrom through a circular opening **96** provided in the trigger mechanism housing wall **25,** all as shown in FIG. **4.** When the bolt is completely removed from the receiver, the upper edge of slot **96** limits the upward movement of sear **42** stopping the movement of pin **45,** so that spring **54** will not rotate the sear too far upward. This prevents disassembly of the spring **54.** In addition, the pin **45** and circular opening **96** permits visual inspection of adjustments, so that the operator can actually see how far member **50** extends under sear **42.**

To illustrate this, the positions of the various springs and adjustment screws can be changed and yet achieve the same or equivalent results. For example, springs **58** and **62** do not have to be horizontal and vertical, respectively, so long as the clockwise and counterclockwise forces are provided.

Any suitable safety or safeties can be used with the firearm. An upper safety **98** is shown for engaging the cocking piece inside the cocking piece sleeve (not shown), so that manual rotation of this safety about a horizontal axis causes engagement and disengagement thereof. Another lower safety is also shown comprising

a pin **100** extending through a bore **101** in the trigger guard **90** immediately rearward of the finger piece **48,** and is operated similar to a "shotgun" safety. The pin includes a section **102** cut out intermediate to its two ends, so that movement of the safety pin inward into the plane of the drawing positions the cut out section immediately behind the finger piece. This is the firing position whereby the finger piece can be moved rearward into the cut out section to fire the rifle. Movement of the safety upward out of the plane of the drawing positions the full body portion **104** of the pin immediately rearward of the finger piece, so as to prevent firing of the rifle.

Another bore **106** is provided in the upper part **107** of the trigger guard and in which a spring **108** is located. A metal head **110** rides in slot **111** provided in pin **100,** with the spring being compressed between the head and a set screw **112.** Adjustment of the set screw changes the compression of spring **108,** and thus the amount of force required to move the safety pin inward and outward.

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

What is claimed is:

1. A trigger mechanism for a firearm of the type that has a cocking piece to be engaged by a sear for controlling movement of the firing pin assembly, comprsing:

a. a sear moveable to a position in engagement with said cocking piece to prevent forward movement of said firing pin assembly,

b. a trigger having a part for engaging said sear to hold said sear in said position, and a finger piece for moving said part out of engagement with said sear when pulled rearward,

c. first adjustable resilient means continuously acting on said trigger tending to urge said part to engagement with said sear, and

d. second adjustable resilient means continuously acting on said trigger tending to urge said part out of engagement with said sear,

e. said first and said second resilient means being substantially equivalent in adjustability of force acting on said trigger.

2. A trigger mechanism as set forth in claim **1** including third resilient means for biasing said sear to said position in engagement with said cocking piece.

3. A trigger mechanism as set forth in claim **2** including support means for pivotally supporting both said sear and said trigger for rotation in a vertical plane, and said trigger engages said support means when said finger piece is pulled to limit the rearward movement of said finger piece.

4. A trigger mechanism as set forth in claim **3** including adjustment means coupled to said support means for selectively limiting the distance said finger piece must be pulled to move said part out of engagement with said sear.

5. A trigger mechanism as set forth in claim **1** including first and second independent adjustment means for adjusting the relative forces exerted on said trigger by said first and said second resilient means, respectively.

6. A trigger mechanism as set forth in claim **1** including a housing from which said finger piece of said trigger extends, and said finger piece includes shoulders that come to rest against said housing when said finger piece is pulled rearward to limit the rearward movement of said finger piece.

7. A trigger mechanism as set forth in claim **1** including support means for supporting both said sear and said trigger for rotation in a vertical plane, third resilient means biasing said sear for rotation upward, said first resilient means biases said part for rotation under said sear to prevent downward rotation of said sear until said finger piece is pulled, and adjustment means coupled to said support means for limiting the distance said part can be rotated under said sear.

8. A trigger mechanism as set forth in claim **1** including support means for supporting said first and said second resilient means, and adjustment means coupled to said support means to which access may be had for adjusting the relative forces exerted on said trigger by said first and said second resilient means.

9. A trigger mechanism as set forth in claim **5** wherein said first and said second means comprise first and second springs, respectively, bearing against said trigger, and said first and said second adjustment means comprise first and second members against which said first and said second springs also bear and which can be adjusted to change the amounts of compressions on said first and said second springs.

10. A trigger mechanism as set forth in claim **9** including an another adjustment means for selectively limiting the distance said finger piece must be pulled to move said part out of engagement with said sear.

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