United States Patent [19]

Cranston

[11] **3,726,040**

[45] **Apr. 10, 1973**

[54] GUN TRIGGER MECHANISM

[75] Inventor: **Dean H. Cranston,** Albuquerque, N. Mex.

[73] Assignee: **Rolamite Incorporated,** San Francisco, Calif.

[22] Filed: **June 10, 1970**

[21] Appl. No.: **45,065**

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

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

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

[56] **References Cited**

UNITED STATES PATENTS

2,462,585	2/1949	Wesson	42/69 R
2,535,709	12/1950	Weeks	42/69 A

FOREIGN PATENTS OR APPLICATIONS

524,187	11/1953	Belgium	42/65
1,532,327	6/1968	France	42/69 A

Primary Examiner—Samuel Feinberg
Assistant Examiner—C. T. Jordan
Attorney—Burns, Doane, Swecker & Mathis

[57] **ABSTRACT**

A gun trigger mechanism in which a spring loaded striker is held in a cocked position by a sear. The sear engages a sear notch on the striker. The sear includes a roller that releases the striker by rolling relative to the notch. The trigger is connected with the roller so that movement of the trigger causes the roller to roll along the striker notch until the striker is released from the cocked position.

13 Claims, 10 Drawing Figures

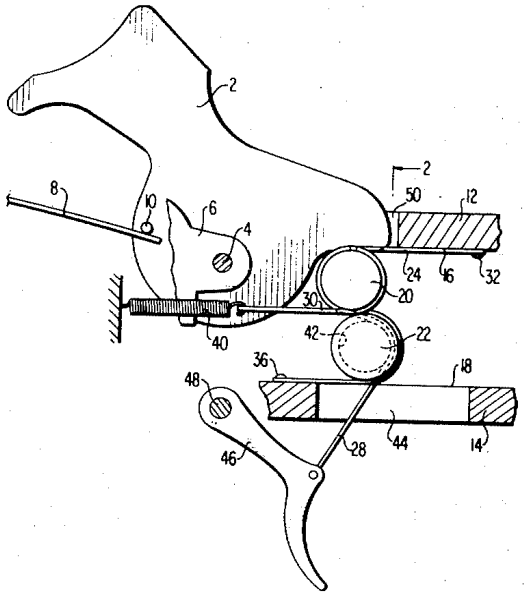


FIG. 1

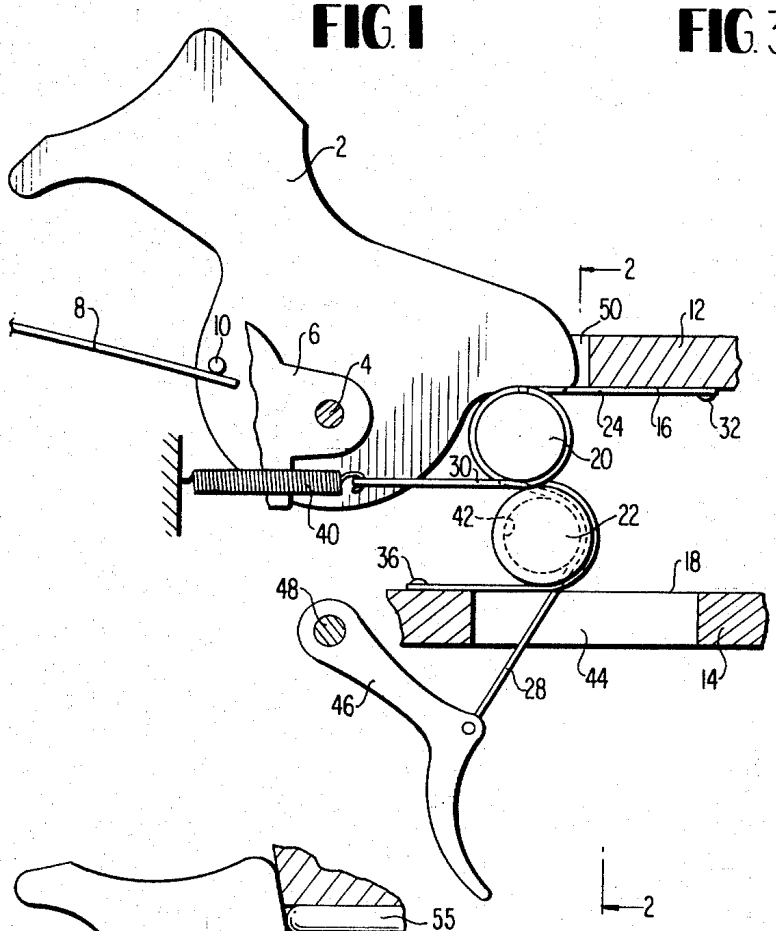


FIG. 3

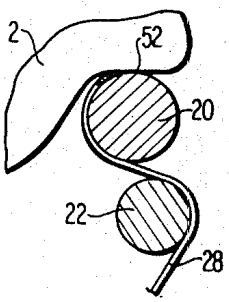


FIG. 2

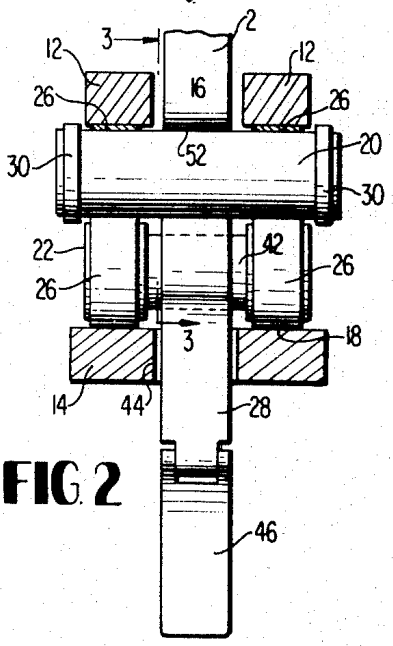


FIG. 4

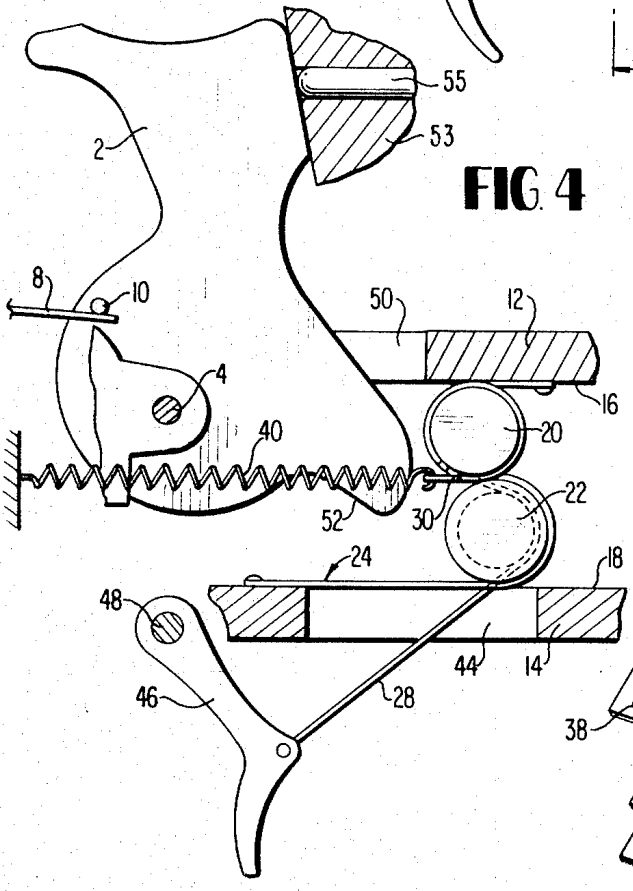
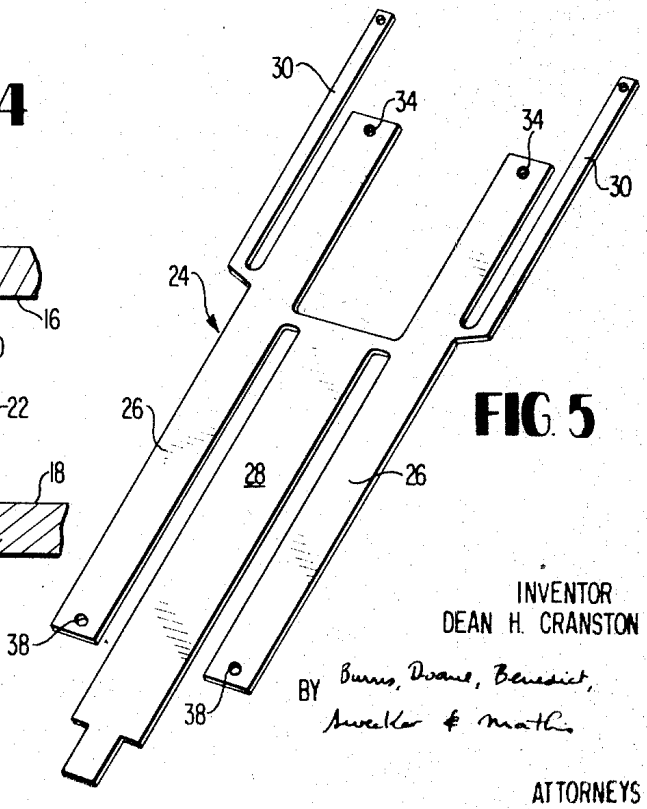


FIG. 5



INVENTOR
DEAN H. CRANSTON

BY Burns, Doane, Benedict, Swecker & Mathis

ATTORNEYS

FIG. 6

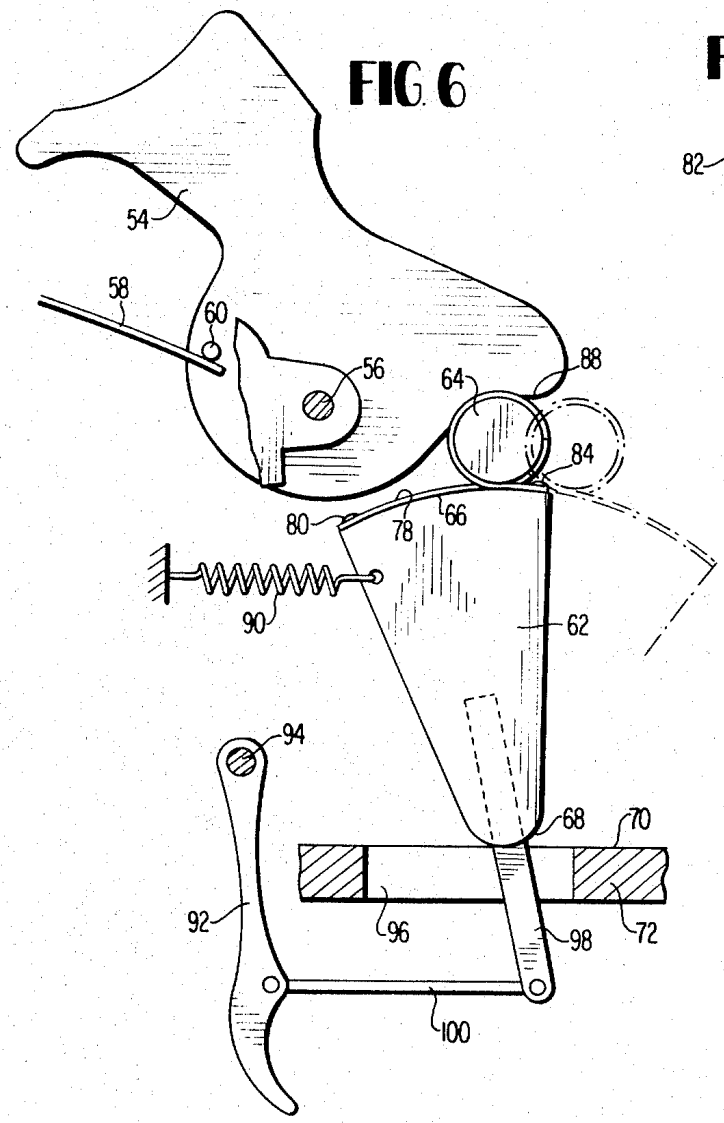


FIG. 8

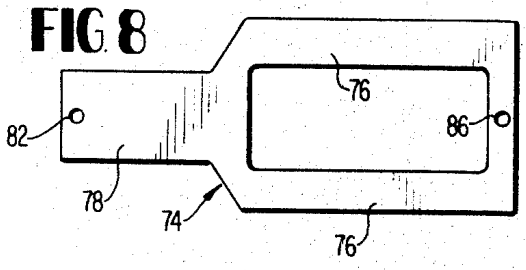
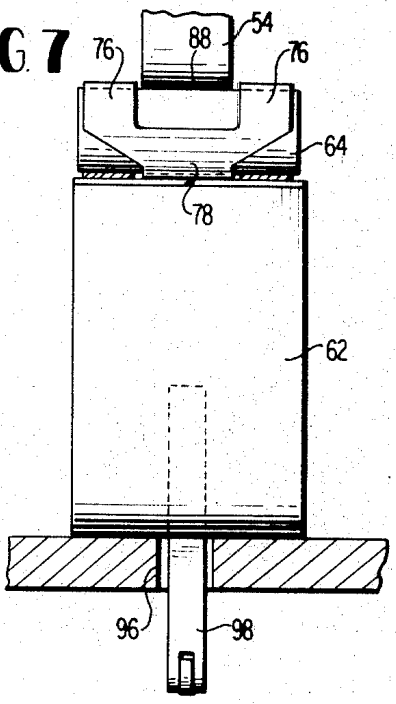


FIG. 7



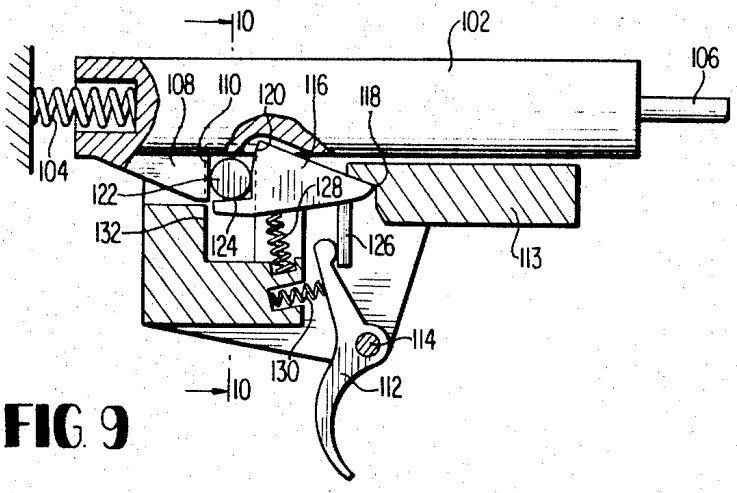


FIG. 9

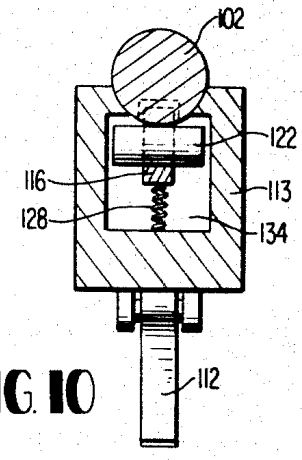


FIG. 10

GUN TRIGGER MECHANISM

BACKGROUND OF THE DISCLOSURE

This invention relates to fire arms and more particularly to mechanisms for holding a spring loaded striker in a cocked position until released by movement of a gun trigger.

A conventional trigger mechanism includes a hammer that pivots between a cocked position and a firing position in which the hammer strikes a firing pin. The spring force urging the hammer toward the firing pin is usually very large in order to cause rapid movement of the hammer when released. The hammer is held in a cocked position by a sear which is typically a pivoted arm that engages a shoulder or notch on the hammer. The sear prevents the hammer from turning about its pivot axis and thus holds the hammer in its cocked position. The trigger is usually connected with the sear by levers, so that the force on the trigger is transmitted to the sear to slide the sear across the surface of the notch on the hammer until the sear no longer obstructs rotation of the hammer and the hammer quickly pivots about its axis until it strikes the firing pin.

Since the hammer motion is controlled by a strong spring, the force exerted by the hammer on the sear is relatively large and this results in a high frictional force resisting sliding movement of the sear relative to the hammer notch. The force necessary to overcome the static frictional force is greater than the force required to maintain the sliding motion between the sear and the notch. This difference in force required at the trigger results in uncertain and erratic trigger motion. Also, to overcome this large frictional force, it is necessary to provide leverage between the trigger and the sear. The trigger leverage may result in excessive travel of the trigger before release.

Another problem with conventional gun trigger mechanisms is that the excessively high loads imposed on the sear and on the hammer notch gradually wear away the metal surfaces, and after a period of time it is necessary to rework the gun mechanism or to replace the worn parts. Gradual wear also results in nonuniform trigger force required for release. Also, as the hammer notch and the sear wear, the areas of engagement gradually decreases and a greater load is imposed on the remaining area so that wear occurs more rapidly.

It is desireable for fire arms of all types, including revolvers, automatic pistols, and rifles, especially those used for hunting or target shooting to have a trigger-pull force that remains substantially constant from the beginning of travel until the sear releases the hammer. It is also desireable for the trigger to have a relatively small distance for travel before release and for the gun action to be relatively free of wear.

SUMMARY OF THE INVENTION

Accordingly, it is an object of this invention to provide a gun trigger mechanism that requires a minimum and substantially constant force for release of the hammer and the trigger travels a minimum distance for release.

A further object of this invention is to provide a gun trigger mechanism in which the characteristics remain substantially uniform throughout the useful life of the mechanism and the mechanism has a relatively long life.

A further object of this invention is to provide a gun trigger mechanism that is inexpensive to manufacture and does not jam.

These objects are accomplished in accordance with several preferred embodiments of the invention. In one embodiment a gun trigger mechanism has a pivoted hammer with a sear notch. The sear is in the form of a roller that engages the surface of the notch to hold the hammer in a cocked position. A second roller and a pair of guides cooperate with a thin flexible band to support the sear roller. The trigger is connected with the second roller and when the trigger is pulled, the roller rolls along the notch surface until it rolls out of the notch and the hammer is released, allowing the hammer to pivot toward the firing pin. In another embodiment of the invention, the roller is supported by a thin, flexible band and rolls along the surface of a cooperating roller or roller segment, without separate guides. In a third embodiment, the sear roller is confined by a guide, without a band.

DETAILED DESCRIPTION OF THE DRAWINGS

These preferred embodiments are illustrated in the accompanying drawings in which:

FIG. **1** is a side elevational view, partially in cross section of one embodiment of the gun trigger action of this invention;

FIG. **2** is a cross sectional view of the gun trigger action along the line **2—2** in FIG. **1**;

FIG. **3** is a cross sectional view of the gun trigger action along the line **3—3** in FIG. **2**;

FIG. **4** is a side elevational view of the gun trigger action of FIG. **1**, but showing the hammer in a firing position;

FIG. **5** is a perspective view of the band in the gun trigger action of FIG. **1**;

FIG. **6** is a side elevational view, partially in cross section of a second embodiment of the gun trigger action of this invention;

FIG. **7** is a front elevational view of the gun trigger action of FIG. **6**;

FIg. **8** is a top plan view of the band in the gun trigger action of FIG. **6**;

FIG. **9** is a side elevational view, partially in cross section of a third embodiment of the gun trigger action of this invention; and

FIG. **10** is a cross sectional view of the gun trigger action along the line **10—10** in FIG. **9**.

DESCRIPTION OF PREFERRED EMBODIMENTS

A conventional rifle or piston has a breech block with a firing pin in position to strike the end of the cartridge to cause the cartridge to fire. The energy for driving the firing pin into the cartridge is provided by a pivoted hammer which is operated by means of a trigger. The hammer is biased to rotate into engagement with the firing pin by a strong spring. When the hammer is cocked, a sear on the trigger, or connected with the trigger engages a sear notch on the hammer and holds the hammer in cocked position against the force of the spring. Pivoting of the trigger displaces the sear out of the notch, allowing the hammer to pivot rapidly into engagement with the firing pin with sufficient energy to detonate the charge in the cartridge.

The gun trigger action of this invention is illustrated schematically in FIG. 1 in which the hammer 2 is pivotally supported for rotation on trunnions 4 which are supported in bearing blocks 6 in the frame of the gun. A strong mainspring 8 engages a pin 10 on the hammer 2 for biasing the hammer to rotate in a clockwise direction, as viewed in FIG. 1, about the trunnions 4.

The frame of the gun includes a pair of opposed guides 12 and 14 having opposed guide surfaces 16 and 18 respectively. A pair of rollers 20 and 22 are interposed between the guide surfaces 16 and 18 and a thin flexible band 24 extends along the upper guide surface 16 and around the periphery of the rollers 20 and 22 generally in the shape of an "S" and along the surface of the lower guide 18. The sum of the diameters of the rollers 20 and 22 is greater than the distance between the guide surfaces 16 and 18 and the diameter of each roller is less than the distance separating the guide surfaces 16 and 18. There is sufficient tension applied in the band 24 to maintain the rollers 20 and 22 in the relative positions shown in FIG. 1 as the cluster of rollers 20 and 22 moves progressively along the guide surfaces 16 and 18.

The band is shown in FIG. 5 before being assembled with the rollers and guide surfaces. The band is made of thin flexible material as is more fully described in research report No. SC-RR-67-656A entitled *Rolamite: A New Mechanical Design Concept*, copies of which are available from the National Bureau of Standards Clearing House of Technical Information, Springfield, Va. The band 24 includes longitudinal strips 26, a tongue 28 and a pair of return slips 30. As shown in FIG. 2, the guide strips 26 are wrapped continuously around the rear side of the roller 20 and around the front side of the roller 22. One end of each strip 26 is secured to the guide surface 16 by screws 32 which extend through holes 34 in the band 24. Similarly, the opposite end of the strips 26 is secured to the lower guide surface 18 by screws 36 which extend through holes 38 in the opposite end of the strips 26. Of course, any other suitable means could be used for fastening the ends of the strips 26 to the respective guide surfaces. Sufficient tension is applied in the strips 26 to firmly hold the rollers 20 and 22 in engagement with each other and in engagement with the guide surfaces 16 and 18. The return strips 30 extend around the front side of the roller 20 and the ends of the strips project rearwardly where they are connected with a pair of return springs 40. The tongue 28 of the band 24 extends around the rear side of the roller 20 and around the front side of the roller 22. The center portion of the roller 22 has a circumferential groove 42 and the tongue 28 is supported on the cylindrical surface of the bottom of the grove 42, as shown in FIGS. 2 and 3. The lower guide 14 has a slot 44 and the tongue 28 passes through the slot. The end of the tongue 28 is attached by a pin connection with a trigger 46. The trigger is mounted on the body of the gun for swinging movement about a pin 48.

The upper guide 12 has a slot 50 that is aligned with the hammer 2. The mid-portion of the roller 20 is engaged by a shoulder 52 on the hammer 2 to prevent rotation of the hammer when the rollers 20 and 22 are in the position shown in FIG. 1.

The hammer 2 is released for pivoting from a cocked to a firing position by displacement of the cluster of rollers 20 and 22 from the position shown in FIG. 1 to the position shown in FIG. 4. Since the shoulder 52 of the hammer engages the cylindrical surface of the roller 20, as the roller 20 rotates in a counterclockwise direction, the roller 20 rolls outwardly along the surface 52 essentially without sliding. Similarly, the lower roller 22 rolls along the lower guide surface 18. The return strips 30 continually urge the cluster of rollers to progress toward the left as viewed in FIG. 1, but force is applied to the rollers through the tongue 28 which is connected with the trigger 46. Since the tongue 28 passes over the surface of the groove 42 which has a slightly smaller diameter than that on which the roller 22 rolls, the displacement of the cluster in relation to longitudinal displacement of the tongue 28 is greater than if the tongue merely passed over the surface at the same diameter as the guide strips 26. This amplification allows greater displacement of the cluster along the guide surfaces 16 and 18 without requiring excessive pivoting of the trigger 46.

In operation, the hammer 2 is pulled back to the cocked position as shown in FIG. 1 against the force of the mainspring 8. The springs 40 urge the cluster of rollers to move toward the left as viewed in FIG. 1. As soon as the shoulder 52 of the hammer is pivoted upwardly to the position shown in FIG. 1, the rollers are free to move rearwardly under the action of the springs 40 until the rollers reach the position shown in FIG. 1. The hammer is shown in the cocked position in FIGS. 1, 2 and 3. When the trigger 46 is pulled in a clockwise direction about the pin 48 with sufficient force to overcome the springs 40, the cluster rollers 20 and 22 begins to move toward the right. Since the shoulder 52 is parallel to the guides 16 and 18, the rollers continue to move toward the right as long as the force applied is greater than the return force of the springs 40. As soon as the upper roller 20 approaches the outer end of the shoulder 52, the curved edge on the hammer shoulder applies additional force urging the cluster toward the right, thereby displacing the cluster out of the path of the shoulder 52 and allowing the hammer 2 to pivot rapidly into engagement with the breech block 53 to drive the firing pin 55 into the end of the cartridge. The cycle can be repeated again by retracting the hammer 2 from the firing position as shown in FIG. 4 to the cocked position as shown in FIG. 1.

Another embodiment of this invention is illustrated in FIGS. 6, 7 and 8. In this embodiment, a hammer 54 is pivotally mounted on trunnions 56 in the same manner as in the embodiment of FIG. 1 and is biased to rotate in a clockwise direction by a mainspring 58 which engages a pin 60 on the hammer. The sear mechanism for releasing the hammer 54 includes a rocker 62 and a roller 64. The rocker 62 has a guide surface 66 at one end and a support surface 68 at the other end. The guide surface 66 has the shape of a cylindrical section. The support surface 68 is also approximately the section of a cylinder and is supported on a surface 70 of the guide 72 in the body of the gun. The relationship between the surfaces 68 and 66 is such that the center of the roller 64 remains at approximately the same distance from the surface 70 as the rocker 62 pivots on the surface 68. The optimum condition of course would

be a knife edge pivot on the surface **70**, but due to the large forces imposed by the mainspring **58**, the cylindrical surface **68** is preferred.

The roller **64** is retained on the surface **66** by a thin flexible band **74**. The band **74** includes a pair of laterally spaced strips **76** and a center strip **78**. The band is looped about the roller **64** and the end of the center strip **78** is secured to the surface **66** by a screw **80** which passes through the hole **82** in the band. Similarly, the opposite end of the band is secured to the surface **66** by a screw **84** which passes through the hole **86** in the band. Of course, any other suitable means could be used for fastening the ends of the band to the surface **66**. The slot in the band separating the strips **76** is sufficiently wide to accomodate the hammer **54**, shown in FIG. **7**. The hammer has a shoulder **88** which engages the surface of the roller **64**, thereby preventing rotation of the hammer in a clockwise direction. The rocker **62** is urged to swing about the surface **68** in a counter-clockwise direction by a return spring **90**. Since the combined cross sectional area of the strips **76** is less than the cross sectional area of the center strip **78**, the band **74** continuously urges the roller **64** to roll toward the position shown in full lines in FIG. **6** with respect to the rocker **62**.

A trigger **92** is mounted in the body of the gun for swinging movement about a pin **94**. The guide **72** has a slot **96** in alignment with the trigger **92** and a lever **98** which projects downwardly from the rocker **62** is connected with the trigger by a link **100**.

In operation, the hammer **54** is initially drawn back to the position shown in FIG. **6**, with the roller **64** engaging the shoulder **88** to prevent rotation of the hammer by the mainspring **58**. A force applied to the trigger **92** is transmitted through the link **100** to the lever **98**, causing the rocker **62** to swing about the support surface **68** when the force of the spring **90** is overcome. The roller **64** rolls progressively along the surface **66** and at the same time rolls outwardly along the shoulder **88** of the hammer. When the rocker **62** has been displaced sufficiently for the roller to reach the end of the shoulder **88**, the rounded end of the shoulder applies a force to the roller **64** and to the rocker **62** to rapidly displace these elements out of the path of the hammer shoulder, thereby allowing the hammer to swing rapidly into engagement with the breech block.

A third embodiment of the invention is illustrated in FIGS. **9** and **10**. In the preceding two embodiments, a conventional hammer serves as the striker element that provides the energy for firing the charge in the cartridge. In certain types of guns, a firing pin is supported in a breech block and biased by means of a strong spring toward the cartridge. The firing pin is held in a cocked position by a shoulder or abutment that engages a sear in substantially the same manner as the sear that engages a conventional pivoted hammer type gun action. In the embodiment of FIGS. **9** and **10**, the sear mechanism of this invention is applied to a gun action of the type having a movable breech block, rather than a hammer. A breech block **102** is shown schematically in FIGS. **9** and **10**. The breech block is biased for longitudinal movement toward the right as viewed in FIG. **9** by a compression spring **104**. The opposite end of the breech block **102** is provided with a firing pin **106**. The breech block **102** includes a projection **108** having a sear shoulder **110**.

The gun action also includes a trigger **112** which is pivoted on the frame of the gun by means of a pin **114**. A rocker **116** is pivoted at one end in a notch **118** formed in the gun frame. The opposite end of the rocker **116** has a guide surface **120** which has the shape of a sector of a cylinder. The center of curvature of the cylindrical section **120** coincides approximately with the notch **118**. A roller **122** is received in the space between the surface **120** and the sear shoulder **110**. An arm **124** on the rocker **116** restricts downward movement of the roller **122**. The rocker **116** is connected with the trigger **112** by a rigid arm **126**. A pair of springs **128** and **130** are provided to urge the rocker **116** upwardly toward the position shown in FIg. **9** and to urge the trigger **112** to remain in engagement with the arm **126**.

When the rocker **116** and the roller **122** are in the position shown in FIG. **9**, the breech block **102** cannot move toward the right. However, when the rocker **116** swings downwardly, rotating about the notch **118**, the roller **122** rolls downwardly across the sear shoulder **110** until the projection **108** is free of the roller and the rocker **116**, and moves rapidly under the action of the mainspring **104**. As shown in FIG. **10**, the roller **122** is wider than the rocker **116**. The sear shoulder **110** has approximately the same width as the rocker **116** and the ends of the roller **122** engage the rear side **132** of the cavity **134** in the frame to guide the roller **122**.

In operation, the breech block **102** is retracted toward the left until it reaches the position shown in FIg. **9**. The spring **128** urges the rocker **116** upwardly, carrying with it the roller **122** due to the presence of the arm **124**. Since the roller **122** is substantially free of stress during the cocking operation, it is capable of sliding relative to the surface **120** and the sear shoulder **110**, is necessary. When the breech block **102** is released, the shoulder **110** moves with the breech block sufficiently to clamp the roller **122** between the surface **110** and the surface **120**. When a force is applied to the trigger **112** causing it to pivot about the pin **114**, the force is transmitted through the arm **126** to the rocker **116** and the frictional engagement between the roller and the surface **120** is sufficient to cause the roller to rotate without sliding until the projection **108** is clear of the roller and the rocker and is free to move rapidly toward the right until the firing pin **106** engages the cartridge.

Since the sear and the sear notch experience rolling motion for release, rather than relative sliding, as in conventional gun actions, the gun action of this invention provides a more uniform resistance to the pull on the trigger and has other desirable trigger characteristics. Furthermore, since relative sliding motion between elements that are loaded by large forces has been substantially eliminated, wear particularly of the sear notch or sear shoulder does not occur. This increases the life of the gun action, as well as contributing to uniform characteristics throughout the life of the gun. Another advantage of the gun action of this invention is that components of the gun action are relatively inexpensive to manufacture and do not require close tolerances, and yet improved characteristics are achieved.

While this invention has been illustrated and described in accordance with several preferred embodiments, it is recognized that variations and changes

may be made therein without departing from the invention as set forth in the claims.

What is claimed is:

1. Gun trigger mechanism comprising:
a striker movable from a cocked position to a firing position,
a sear roller.
means mounting said roller for movement out of and into engagement with a surface operatively connected with said striker to prevent movement of said striker toward said firing position,
said means mounting said roller including a cooperating element, said cooperating element having a guide surface, said guide surface being in the shape of at least a segment of a cylinder, and said roller being clamped between said striker surface and said element guide surface when said striker is in said cocked position, and
means connecting said sear roller with a trigger for imparting rotation to said sear roller and causing said roller to roll along said striker surface in response to movement of said trigger, whereby the striker is released by movement of the sear roller and moves toward the firing position.

2. The gun trigger mechanism according to claim 1 including means connecting said element with said trigger, whereby movement of said trigger is transmitted to said element for driving said roller relative to said striker surface.

3. The gun trigger mechanism according to claim 1 wherein said striker includes a breech block with said striker surface being provided on said breech block.

4. The gun trigger mechanism according to claim 1 wherein said striker includes a hammer pivotally mounted for movement from said cocked position to said firing position and said striker surface being provided by a sear notch on said hammer.

5. A gun trigger mechanism comprising:
a striker movable from a cocked position to a firing position,
a sear, said sear having a surface movable into engagement with a surface on said striker to prevent movement toward said firing position, said sear including a roller and a cooperating element, said cooperating element having a guide surface, said guide surface being in the shape of at least a segment of a cylinder, and said roller being clamped between said striker surface and said element guide surface when said striker is in said cocked position,
a thin flexible band extending around said roller and retaining said roller in engagement with said element,
means connecting said sear with a trigger for movement of said sear by said trigger whereby during release of the striker the sear surface moves relative to the striker surface with a rolling motion.

6. A gun sear comprising means forming a guide surface, a roller movable along said guide surface, a movable element having a surface in the shape of at least a segment of a cylinder, said roller being interposed between said guide surface and said element surface, means preventing relative sliding between said roller and said surfaces, and means for moving said element surface about its geometrical center to displace said roller from a cocked position to a firing position, where-by said roller serves as a sear and operates independently of spring force imposed by a striker on said sear roller while in said cocked position.

7. The gun sear mechanism according to claim 6 wherein said element is in the form of a second roller, and said means preventing relative sliding includes a thin flexible band extending at least around a portion of said second roller.

8. The sear mechanism according to claim 6 wherein said element includes a rocker, said rocker having said cylindrical surface in supporting relation with said roller, the radius of said cylindrical surface being substantially greater than the diameter of said roller, whereby a small degree of rocking movement of said rocker produces amplified motion of said roller.

9. The sear mechanism according to claim 8 including a thin flexible band, said band having opposite ends secured on said rocker surface and being arranged in a loop, said roller being received in said loop, whereby said band retains said roller against displacement away from said surface.

10. In a gun of the type having a striker movable from a cocked position to a firing position and a sear means for temporarily holding the striker in the cocked position and a trigger operatively connected with the sear means for moving said sear means to release said striker from said cocked position, the improvement wherein said sear means comprises:
means forming a pair of opposed guide surfaces, one of said surfaces being connected with said striker and the other of said surfaces being connected with said trigger,
a roller interposed between said guide surfaces, said roller being arranged for translating movement along said one guide surface in response to movement of said other guide surface in the direction of said translating movement rf said roller, said roller in one position holding said surfaces apart, thereby m maintaining said striker in said cocked position, and said roller in a second position allowing at least one of said surfaces to move closer to the other of said surfaces, thereby releasing said striker to move toward a firing position, and
means mounting said other guide surface for movement in said direction of translating movement in response to movement of said trigger.

11. In a gun according to claim 10, said sear means includes spring means biasing said roller toward said one position, whereby release of said trigger allows said roller to return to said one position when said striker is in said cocked position.

12. In a gun according to claim 10 wherein said sear means includes a thin flexible band extending around said roller and retaining said roller in engagement with said other guide surface.

13. In a gun according to claim 10 wherein said means mounting said other surface includes a pivoted element, said other surface being curved and having a center of curvature concentric with the pivot location of said element.

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