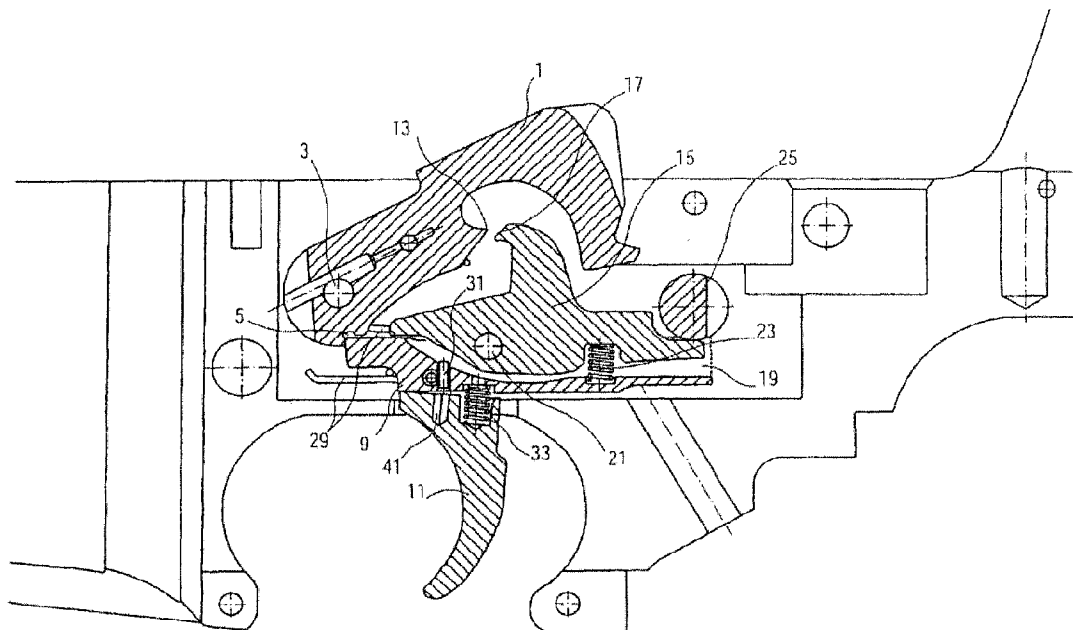




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Fluhr et al.(10) **Pub. No.: US 2009/0188145 A1**(43) **Pub. Date: Jul. 30, 2009**(54) **TWO-STAGE TRIGGER APPARATUS FOR
USE WITH FIREARMS****Publication Classification**(76) Inventors: **Norbert Fluhr**, Oberndorf (DE);
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Oberndorf-Hochmossingen (DE)(51) **Int. Cl.**
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(52) **U.S. Cl.** **42/69.01**
(57) **ABSTRACT**Correspondence Address:
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CHICAGO, IL 60606 (US)(21) Appl. No.: **12/365,034**(22) Filed: **Feb. 3, 2009****Related U.S. Application Data**(63) Continuation-in-part of application No. PCT/EP2007/
006781, filed on Jul. 31, 2007.(30) **Foreign Application Priority Data**Aug. 3, 2006 (DE) 10 2006 036 308.6
Oct. 12, 2006 (DE) 10 2006 048 436.3

Two-stage trigger apparatus for use with firearms are described herein. An example trigger apparatus described herein includes a trigger and a sear arm operatively coupled to the trigger. The sear arm detachably couples to a first catch of a hammer of the firearm. A disconnecter is pivotally coupled relative to the sear arm and detachably couples to a second catch of the hammer. At least one trigger spring operatively couples to the sear arm to bias the sear arm to an initial position. The trigger pivots relative to the sear arm between a first travel stop and a second travel stop of the sear arm, where the first travel stop prevents the trigger from pivotally moving relative to the sear arm in a first direction and the second travel stop prevents the trigger from pivotally moving relative to the sear arm in a second direction opposite the first direction. The trigger pivots between the first travel stop and the second travel stop relative to the sear arm. A biasing element is disposed between the sear arm and the trigger to bias the trigger toward the first travel stop. The trigger spring exerts a greater force on the sear arm than the force exerted by the biasing element on the trigger.



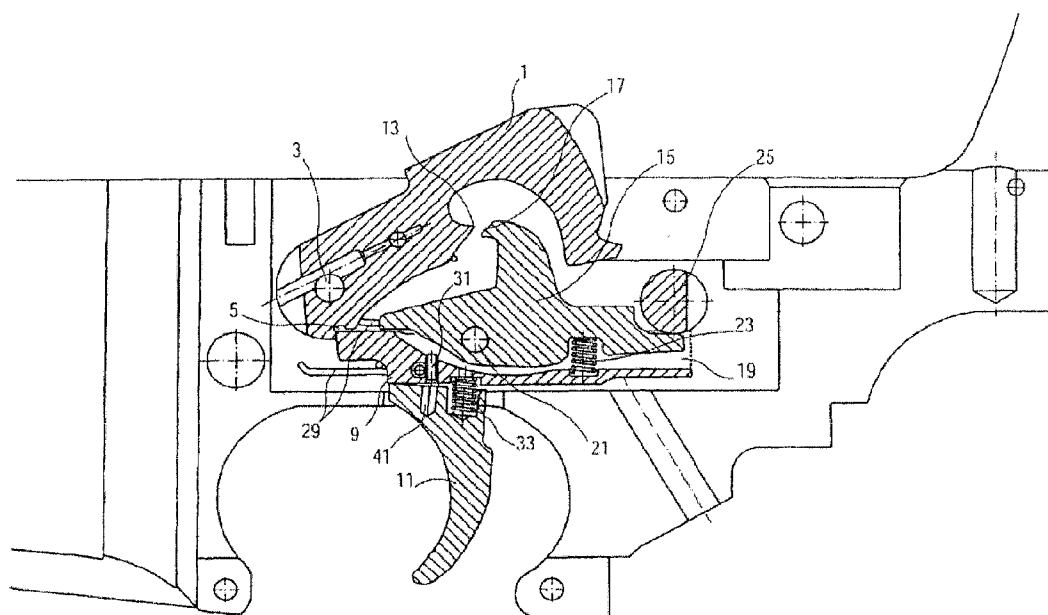


FIG. 1

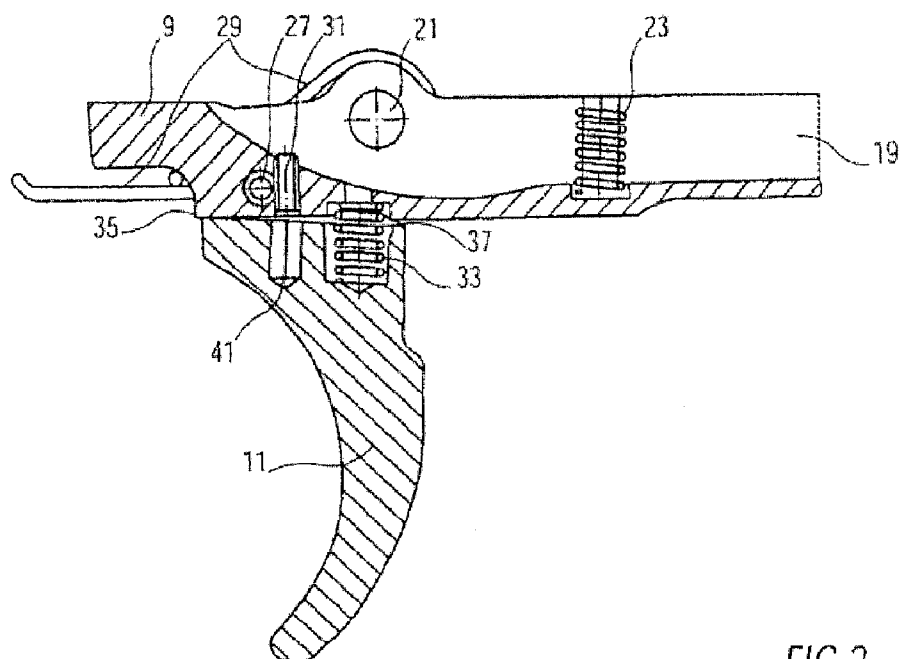


FIG. 2

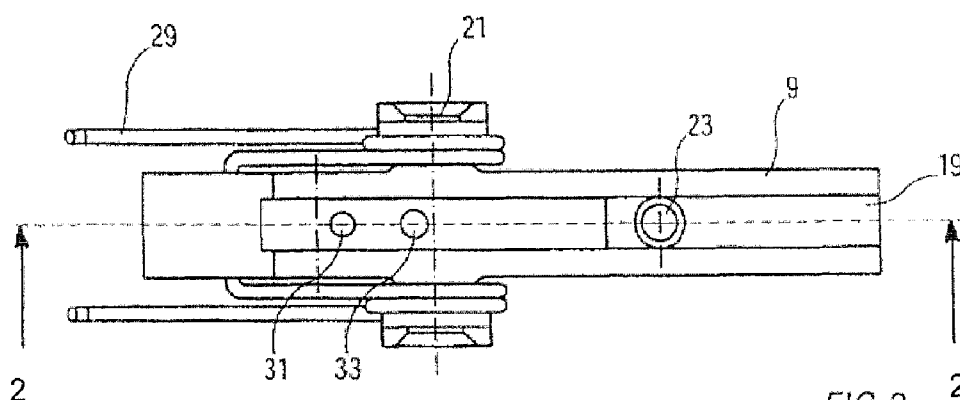


FIG. 3

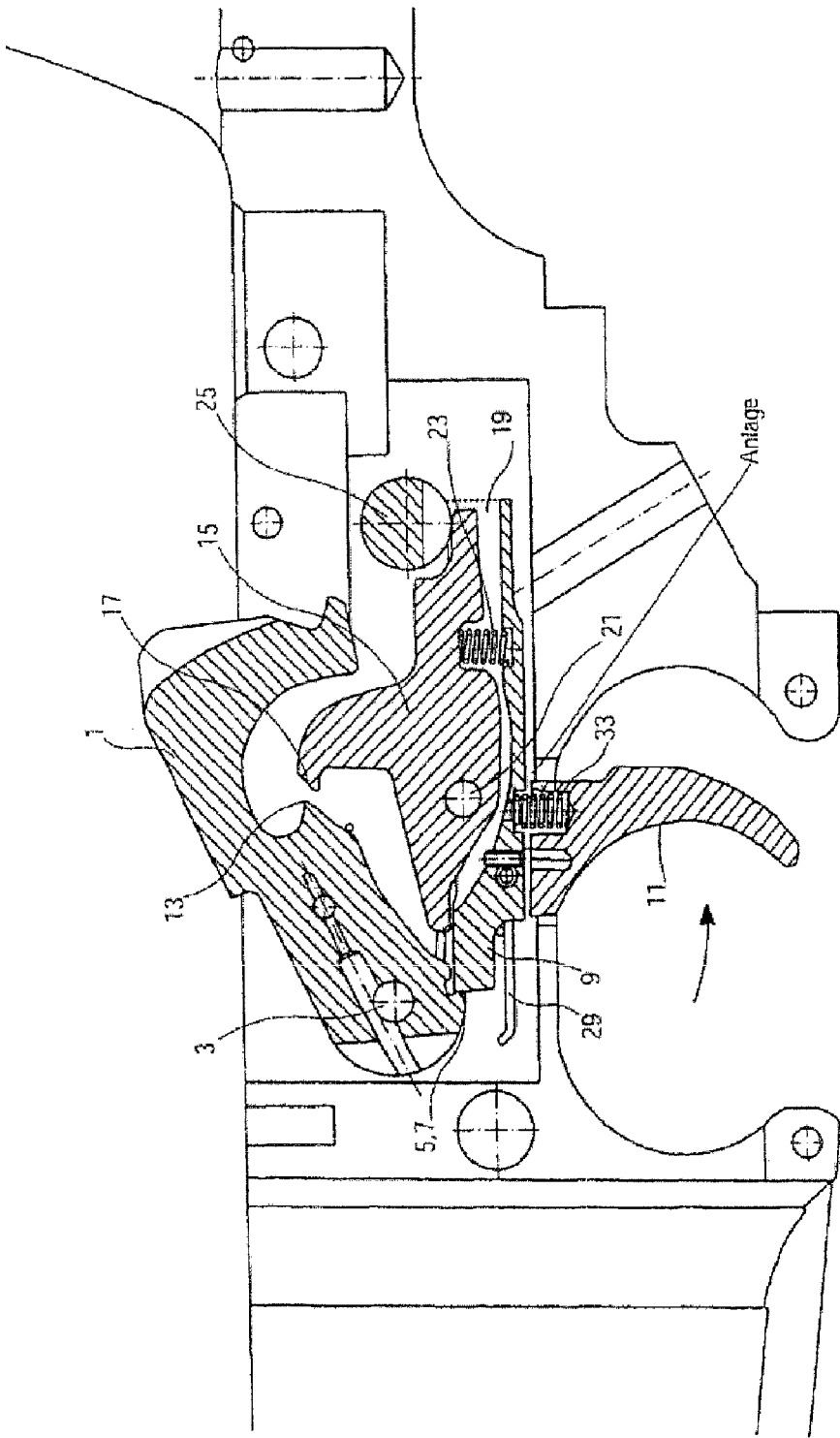


FIG. 4

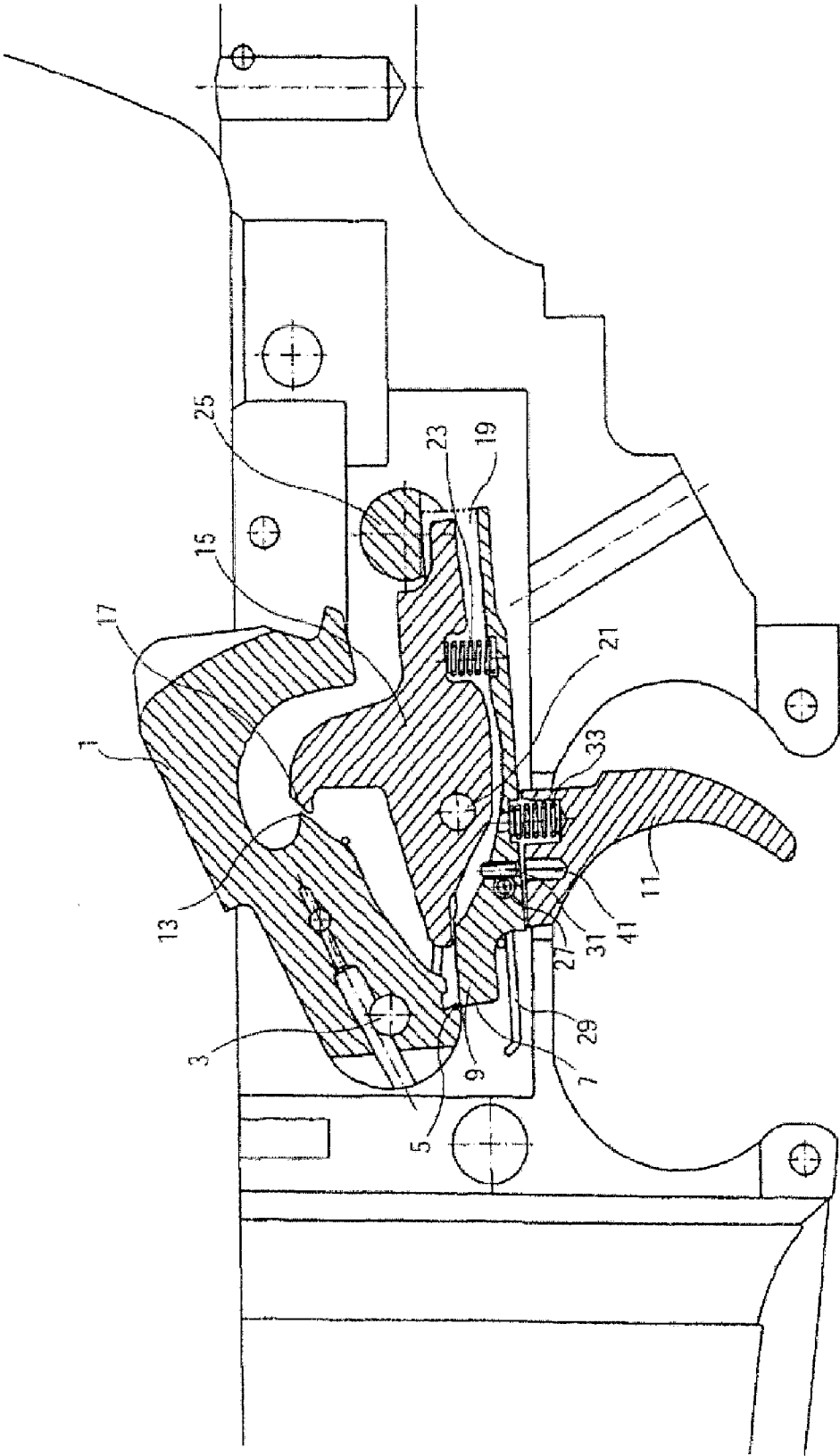


FIG. 5

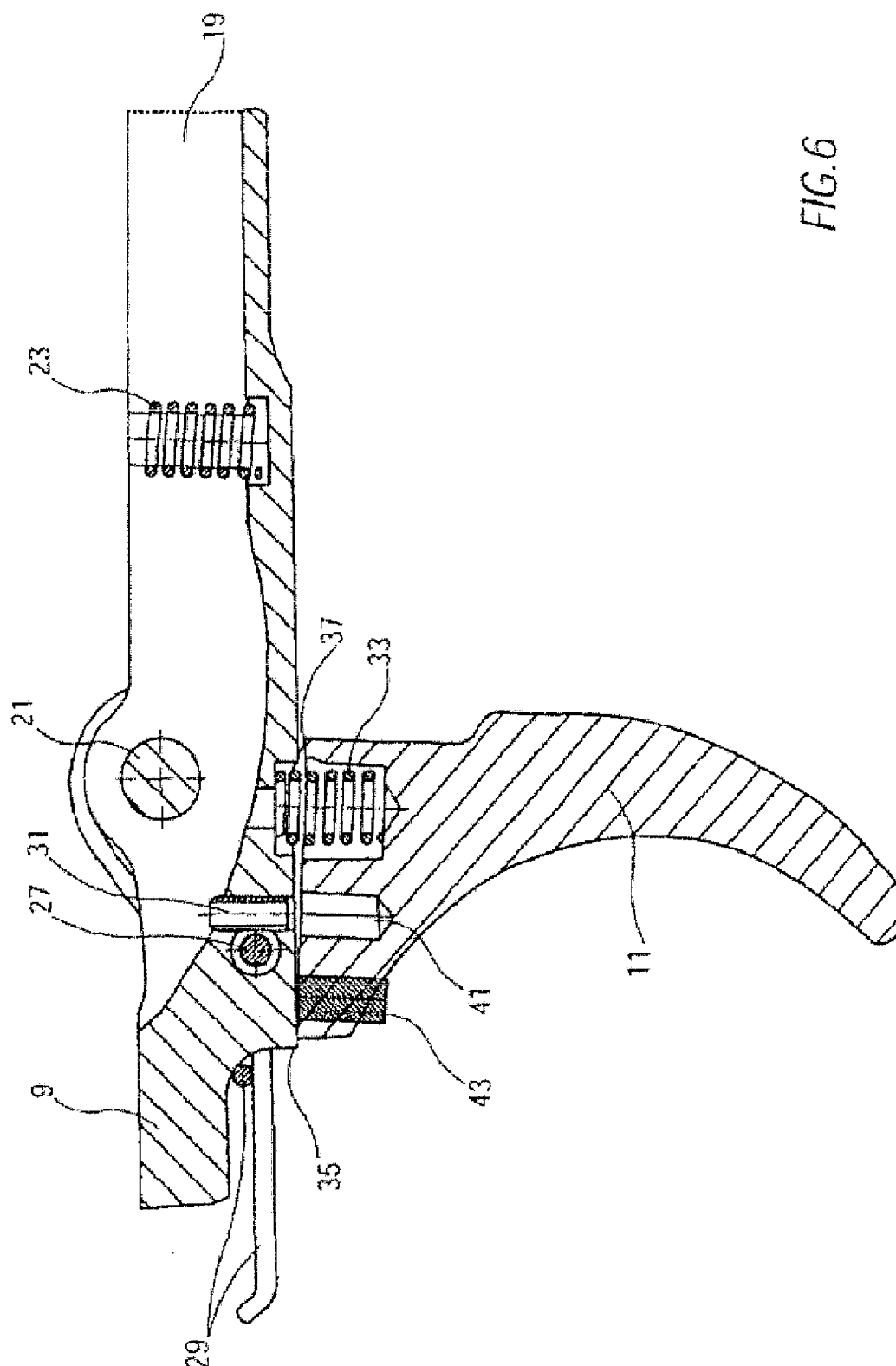


FIG. 6

TWO-STAGE TRIGGER APPARATUS FOR USE WITH FIREARMS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This patent is a continuation-in-part of International Patent Application Serial No. PCT/EP2007/006781, filed Jul. 31, 2007, which claims priority to German Patent Application 10 2006 048 436.3, filed on Oct. 12, 2006, and German Patent Application 10 2006 036 308.6, filed on Aug. 3, 2006, all of which are hereby incorporated herein by reference in their entireties.

FIELD OF THE DISCLOSURE

[0002] The present disclosure relates generally to trigger apparatus and, more particularly, to two-stage trigger apparatus for use with firearms.

BACKGROUND

[0003] More than 100 years ago, the German army employed firearms or weapons (e.g., military rifles) that used a two-stage trigger. In contrast to a single-stage trigger (e.g., a flint-type trigger), the two-stage trigger provides an additional trigger path having a defined trigger resistance. Such resistance provides a first-stage trigger pull or first travel path. Once the first travel path is overcome, a user must typically move the trigger along a second-stage trigger pull or second travel path to a pressure-point position to discharge the firearm. The second travel path is relatively short and has a different resistance than the first travel path. Thus, the two-stage trigger has two different trigger travel paths that provide different trigger pull forces so that the user (e.g., the shooter) can sense a change in trigger force prior to discharge of the firearm.

[0004] In contrast, single-stage triggers provide a relatively uniform or constant trigger force to discharge the firearm. The two-stage trigger apparatus is more advantageous than the single-stage trigger because it reduces the risk of a user unintentionally discharging the firearm upon movement (e.g., a slight movement) of the trigger. For example, in cold weather use, a user's perception of the amount of force required to move (e.g., pull) the trigger may be skewed or altered if the user is wearing protective clothing (e.g., gloves). A single-stage trigger may cause the user wearing protective clothing to unintentionally discharge the firearm if the user places his finger on the trigger (e.g., due to the relatively short travel path of the single-stage trigger and the constant force required to pull the trigger). In another example, a user (e.g., a combat soldier, a police officer, etc.) may misperceive the amount of force required to pull the trigger due to a user's adrenaline or nervousness experienced during a conflict situation (e.g., combat).

[0005] However, unlike single-stage triggers, two-stage triggers require a greater overall trigger travel path (e.g., a first travel path and a second travel path) to reach the pressure-point position, resulting in a relatively greater period of time to discharge the firearm. Additionally, because the two-stage triggers have an additional travel path (e.g., the first travel path), two-stage triggers are more complex and often require additional spacing in the firearm, when space may be limited.

For example, some known two-stage triggers are not feasible for use with automatic firearms (e.g., rifles) due to space in the automatic firearm.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] FIG. 1 is a cross-sectional view of an example trigger apparatus described herein for use with a firearm.

[0007] FIG. 2 illustrates a cross-sectional view of a portion of the example trigger apparatus of FIG. 1 viewed along line 2-2 of FIG. 3.

[0008] FIG. 3 is a plane view of the example trigger apparatus of FIG. 2.

[0009] FIG. 4 illustrates the example trigger apparatus of FIGS. 1-3 showing a safety disengaged with the trigger apparatus to allow firing of the firearm.

[0010] FIG. 5 is a cross-sectional view of the example trigger apparatus of FIGS. 1-4 showing the trigger apparatus just after discharge.

[0011] FIG. 6 illustrates the example trigger apparatus of FIGS. 1-5, but implemented with an adjusting mechanism.

DETAILED DESCRIPTION

[0012] Certain examples are shown in the above-identified figures and described in detail below. In describing these examples, like or identical reference numbers are used to identify common or similar elements. The figures are not necessarily to scale and certain features and certain views of the figures may be shown exaggerated in scale or in schematic for clarity. Additionally, several examples have been described throughout this specification. Any features from any example may be included with, a replacement for, or otherwise combined with other features from other examples. Further, throughout this description, position designations such as "above," "below," "top," "forward," "rear," "left," "right," etc. are referenced to a firearm held in a normal firing position (i.e., wherein the "shooting direction" is pointed away from the marksman in a generally horizontal direction) and from the point of view of the marksman. Furthermore, the normal firing position of the firearm is always assumed, i.e., the position in which the barrel runs along a horizontal axis.

[0013] A firearm or weapon typically employs a trigger apparatus or mechanism to fire or discharge the firearm. In general, to discharge a firearm, a user applies a force to move a trigger (e.g., using his index finger) along a trigger path between an initial position and a pressure point position. In turn, at the pressure point position, the trigger apparatus actuates a hammer or a striker that causes the firearm to discharge or fire. Trigger apparatus or mechanisms are typically classified as single-stage or single-pull (i.e., single-action) or two-stage (i.e., double-action) trigger apparatus. The amount of trigger force required to move the trigger and the length of travel path between the initial position and the pressure-point position varies with different types of trigger apparatus.

[0014] A known example single-stage trigger is a flint-type trigger or single-pull trigger. A single-stage trigger apparatus typically requires a user to apply a continuous pressure to the trigger (e.g., a light trigger pull weight) as the trigger moves or travels along a relatively short trigger path to reach the pressure point position and, thus, discharge the firearm. Single-stage triggers are advantageous because single-stage triggers have a relatively short travel path and/or require a relatively small amount of force to discharge the weapon. A reduction in trigger force and/or trigger travel path results in

a more rapid discharge which, in turn, may increase the likelihood of a more accurate shot. Additionally, such short travel path enables the trigger apparatus to be more compact, requiring less space within the firearm (e.g., being compatible with a trigger guard of the firearm). However, such single-stage triggers may be disadvantageous (e.g., in cold weather, combat situations, etc.) because single-stage triggers that employ a relatively short travel path and/or a relatively small amount of force to discharge the firearm (e.g., a light trigger pull) may cause unintentional discharge of the firearm.

[0015] For example, due to cold temperatures, a user (e.g., a combat soldier, a police officer, etc.) may use protective clothing (e.g., gloves) to protect his hands from the weather elements. However, the gloves may affect the user's perception of the amount of the trigger force required to pull the trigger, which may cause the user to unintentionally discharge the firearm. In some instances, a user (e.g., a combat soldier, a police officer, etc.) may experience an increase in adrenaline or nervousness during a conflict situation that may cause an unintentional discharge. Thus, in some instances, a single-stage trigger having a light trigger pull may be undesirable.

[0016] A known two-stage trigger apparatus, on the other hand, includes a second or additional trigger path having a defined resistance. In this manner, after a trigger travels or moves along a first trigger path, a user must typically increase pressure to move the trigger through the second trigger path and overcome the increased resistance to reach the pressure point. When the pressure-point position is reached, the firearm discharges. The two-stage trigger apparatus is more advantageous than the single-stage trigger apparatus because the two-stage trigger enables a user to identify the pressure-point position (e.g., the discharge position). Thus, a two-stage trigger may reduce the risk of unintentionally discharging the firearm upon a slight movement of the trigger because a user can more accurately perceive the location of the pressure-point position provided by the increased resistance exerted by the trigger during the second travel path. This is particularly advantageous when the firearm is used in cold weather, in which a user may be wearing gloves, or if a user experiences an increase in adrenaline during a conflict situation. However, such additional trigger travel path and the increased resistance may increase the time required to discharge the firearm, thereby affecting the accuracy of a shooter's (e.g., a marksman) intended target.

[0017] Known example two-stage trigger apparatus typically have a trigger integrally formed with a sear to detachably engage a hammer when the hammer is in a cocked or ready-to-fire position. Movement of the trigger causes the sear to release or disengage the hammer, which strikes a firing pin to discharge, or fire, the firearm. Because the trigger and the sear are integrally formed, movement of the trigger causes the sear to move. Thus, to establish a two-stage trigger, the resistance of the first travel path is typically established by adjusting an amount of overlap engagement between the sear and a catch (e.g., a hook) of the hammer. In some known examples, such overlap may be adjusted (e.g., via a screw to increase or decrease an amount of overlap) to increase or decrease the trigger force required to overcome the first travel path. Additionally, a disconnecter spring may be employed to adjust the amount of resistance the shooter feels when pulling through the second travel path. Such disconnecter spring typically engages the trigger, thereby imparting a force on the trigger to provide a resistance. Such resistance is typically imparted to the trigger through the overall trigger travel path.

[0018] Such known configurations are disadvantageous because increasing the overlap between the sear and the hammer typically increases the overall trigger travel path. Such an increase in the length of the first travel path enlarges the overall envelope of the trigger apparatus and the distance that the trigger must travel to discharge the firearm which, in some instances, may be incompatible with the firearm housing and/or may interfere with trigger guards or other firearm operating elements. Additionally or alternatively, in some examples, such known two-stage triggers may often require modifications to the firearm housing, thereby increasing manufacturing costs, inventory, etc.

[0019] The example trigger apparatus described herein advantageously provide a two-stage trigger having an relatively short first travel path that can provide an increased trigger-pull resistance without causing a substantial increase in the length of the first travel path. In other words, the trigger-pull resistance exerted by the trigger during the first travel path may be increased or decreased without increasing the distance of the first travel path. In particular, the example trigger apparatus described herein includes a two-piece trigger and sear arm. The trigger moves independently from the sear arm through the first travel path and engages at least a portion of the sear arm through a second travel path. Such two-piece trigger and sear arm configuration is advantageous because the resistance of the first travel path may be increased without having to increase the length or distance of the first travel path. For example, a biasing element (e.g., a spring) may be employed to increase or decrease the resistance of the trigger during the first travel path. Such a biasing element is to act on the trigger independent from a trigger spring that acts on the sear arm. For example, the biasing element may impart a substantially weaker force to the trigger than a force imparted by the trigger spring to the sear arm.

[0020] An example firearm (e.g., a self-loading military rifle) described herein includes a disconnecter to catch the hammer as it recoils to the cocked position after discharge. The disconnecter maintains or holds the hammer in the cocked position until the trigger is released and the sear arm engages the hammer. A disconnecter spring is disposed between a disconnecter and the sear arm so that the disconnecter spring does not impart an additional resistance to the trigger. In other words, the disconnecter spring does not interfere with the trigger. In this manner, the user can sense the increase in the trigger force to identify or sense the pressure-point position prior to discharge of the firearm. Additionally, the example trigger apparatus described herein can be retrofitted to replace conventional or known trigger apparatus (e.g., single-stage trigger apparatus) without having to make substantial modifications to the firearm housing, trigger guard, or other firearm operating elements, etc., because of the relatively short first travel path.

[0021] FIG. 1 is a cross-sectional view of a portion of an example firearm 2 such as, for example, an assault rifle (e.g., a M16 rifle, etc.), a semi-automatic firearm, a automatic firearm, etc. The firearm 2 is implemented with an example trigger apparatus 10 described herein. The firearm 2 includes a hammer 1 that acts in association with the trigger apparatus 10 to fire or discharge the firearm 2. As shown in FIG. 1, the hammer 1 may be pivotally coupled to the firearm 2 via, for example, a pin, and rotates about a transverse axis 3. The hammer 1 is spring loaded via, for example, a mainspring (not shown) to rotate about the axis 3 in a counter-clockwise direction in the orientation of FIG. 1 to discharge the firearm

2. The trigger apparatus 10 includes a trigger 11 and a sear arm 9, which are discussed in greater detail below in connection with FIGS. 2 and 3.

[0022] A surface 7 (FIG. 4) of the sear arm 9 engages a trigger catch 5 of the hammer 1 when the hammer 1 is in a cocked or ready-to-fire position as shown in FIG. 1. The surface 7 engages the trigger catch 5 to retain or capture the hammer 1 in the cocked position until the trigger 11 is depressed or released beyond a pressure-point or discharge position. When the trigger 11 is depressed or pulled to the pressure-point position, the surface 7 disengages or releases the trigger catch 5, which releases the hammer 1. The hammer 1, via the mainspring, rapidly rotates about the axis 3 in a counter-clockwise direction (in the orientation of FIG. 1) to contact a firing pin (not shown), which causes the firearm 2 to discharge. Upon discharge, the hammer 1 is driven back (e.g., via recoil energy of a fired cartridge) to the cocked position after the firearm 2 is discharged.

[0023] A disconnecter 15 is disposed within a slot 19 of the sear arm 9 and pivotally coupled to the firearm 2 (e.g., via a cross pin) so that the disconnecter 15 may pivot within the slot 19 about an axis 21. The disconnecter 15 is biased toward the hammer 1 via a disconnecter spring 23. As shown in FIG. 1, the disconnecter spring 23 is disposed between the sear arm 9 and the disconnecter 15. The disconnecter 15 has a nose or lip portion 17 that is to engage a disconnecter catch 13 of the hammer 1 when the hammer 1 recoils toward cocked position.

[0024] In the example of FIG. 1, a safety cam 25 engages a rear portion of the disconnecter 15 to prevent the disconnecter 15 from rotating about the axis 21 and, thus, prevents the trigger 11 and the sear arm 9 from rotating about the axis 27 to release the hammer 1 to discharge the firearm 2. The safety cam 25 may be positioned between a safety position (shown in FIG. 1), to prevent discharge of the firearm 2, and a fire position (shown in FIG. 4) to enable discharge of the firearm 2.

[0025] FIG. 2 illustrates a cross-sectional view of the trigger 11 operatively coupled to the sear arm 9 taken along line 2-2 of FIG. 3. FIG. 3 is plane view of the example trigger 11 and the sear arm 9. Referring to FIGS. 2 and 3, the trigger 11 is pivotally or rotatably coupled relative to the sear arm 9 via, for example, a pivot bearing. In this manner, the trigger 11 pivots or rotates about a transverse axis 27 relative to the sear arm 9. A biasing element or a lost-motion spring 33 biases the trigger 11 in a first rotational direction (e.g., a clockwise direction in the orientation of FIG. 1) about the axis 27 so that a front surface of the trigger 11 engages a surface or a front stop 35 (FIG. 4) of the sear arm 9. Likewise, the biasing element 33 biases a rear surface of the trigger 11 away from a surface or rear stop 37 of the sear arm 9. In this example, the biasing element 33 causes a surface (e.g., a lower surface) of the sear arm 9 and a surface (e.g., an upper surface) of the trigger 11 to be inclined relative to each other so that the trigger 11 engages the front stop 35 when the sear arm 9 is at an initial or rest position and the trigger 11 engages the rear stop 37 when the trigger 11 is rotated about the axis 27 toward the rear stop 37 (i.e., the trigger 11 is pulled). The distance between the front and rear stops 35, 37 defines a lost-motion distance or first travel path of the trigger 11.

[0026] The biasing element 33 is disposed adjacent the pivot axis 27 of the trigger 11 between the sear arm 9 and the trigger 11. In this example, the biasing element 33 is a spring at least partially disposed within a surface (e.g., a bore) of the trigger 11 and/or a recess of the sear arm 9. In this manner, the

biasing element 33 does not take-up additional space in the housing. Thus, when retrofitted with an automatic firearm having tight or limited space constraints, the biasing element 33 does not require additional spacing. In some examples, the biasing element 33 may include an adjusting mechanism (e.g., a screw) to adjust (e.g., increase or decrease) the force exerted by the biasing element 33 on trigger 11 to provide an increased or decreased resistance to the trigger 11 during the first travel path. Additionally or alternatively, the biasing element 33 may be accessibly mounted so that it may be easily replaced if the biasing element 33 becomes inoperable due to wear (e.g., worn out, rusted, etc.). Furthermore, the biasing element 33 may be interchangeable with a different biasing element having a different spring rate. In this manner, the interchangeable biasing elements can accommodate a light trigger (e.g., a soft trigger) or a heavy trigger (e.g., a harder trigger) while maintaining a relatively short first travel path.

[0027] Additionally or alternatively, although the biasing element 33 is disposed between the trigger 11 and the sear arm 9, the biasing element 33 does not interfere with the sear arm 9 (as explained in greater detail below). Furthermore, the biasing element 33 does not act or interfere with the disconnecter 15 and/or the disconnecter spring 23 because the disconnecter spring 23 is disposed between the disconnecter 15 and the sear arm 9. Thus, the amount of force (e.g., the spring rate) to be exerted to the trigger 11 by the biasing element 33 may be chosen independent or without regard to the disconnecter 15 and/or the disconnecter spring 23. Additionally, the amount of force to be exerted by the biasing element 33 may be adjusted independent and/or without regard to the disconnecter 15.

[0028] Thus, the resistance exerted by the trigger 11 may be adjusted without having to increase the distance of the first travel path (e.g., provide increased resistance along a relatively short first travel path). In this manner, the trigger apparatus 10 may be adapted to fit within tight or limited space (e.g., a corresponding known slot/slit) of the housing when the trigger 11 emerges from the housing. Therefore, the trigger apparatus 10 may be retrofitted to existing firearms or weapons such as, for example, automatic firearms, without having to substantially modify the housing of a firearm.

[0029] As shown in FIGS. 2 and 3, the trigger apparatus 10 further includes a trigger spring 29. In this example, the trigger spring 29 is a wire spring coaxially aligned with the axis 21 to bias the sear arm 9 in an initial position as shown in FIGS. 1 and 2. The trigger spring 29 prevents movement (i.e., hold the position) of the sear arm 9 until the trigger 11 engages the rear surface 37 of the sear arm 9 and the trigger 11 and the sear arm 9 travel through the second travel path. The second travel path is defined between the position in which the trigger 11 engages the rear stop 37 and the pressure-point position, which causes the firearm 2 to discharge.

[0030] Additionally, the trigger spring 29 imparts a substantially greater force to the sear arm 9 than the biasing element 33 imparts on the trigger 11. In this manner, the two-stage trigger apparatus 10 provides a substantial change in resistance between the first travel path and the second travel path so that a user (e.g., the shooter) can perceive or sense a change in trigger force prior to discharge of the firearm 2. In other words, a user can detect the pressure-point position.

[0031] As shown in this example, the sear arm 9 is pivotally fixed relative to the axis 27 via a retainer pin 31. Such configuration enables the sear arm 9 to rotate relative to the axis

27. In this manner, the trigger 11 can pivot about axis 27 independently from the sear arm 9. Such configuration is particularly advantageous because the trigger 11 may be pulled back from the initial position shown in FIG. 1 along the first travel path without affecting or causing the sear arm 9 to rotate about axis 27. The trigger 11 may include a bore 41 to receive the pin 31 to facilitate disassembly of the trigger 11 and the sear arm 9.

[0032] FIG. 4 illustrates the example trigger apparatus 10 of FIGS. 1-3 showing the safety 25 disengaged from the trigger apparatus 10 (e.g., in the fire position) to allow discharge of the firearm 2. FIG. 5 is a cross-sectional view of the example trigger apparatus 10 of FIGS. 1-4 showing the trigger apparatus 10 just after discharge of the firearm 2.

[0033] Referring to FIGS. 1-5, in operation, a user positions (e.g., rotates) the safety 25 from the safety position shown in FIG. 1 to the fire position shown in FIG. 4 to enable discharge of the firearm 2. As shown in FIG. 1, in the initial or rest position, the biasing element 33 biases (e.g., loads) the trigger 11 (e.g., in a clockwise direction in the orientation of FIG. 1) about the axis 27 so that trigger 11 engages the front stop 35 of the sear arm 9. The surface 7 of the sear arm 9 engages the trigger catch 5 of the hammer 1 to retain the hammer 1 in the cocked position (FIG. 1).

[0034] A user, for example using his index finger, applies a force to pull the trigger 11 in the direction indicated by arrow F in FIG. 4 so that the trigger 11 rotates about the axis 27 in a counterclockwise direction in the orientation of FIG. 4. If the trigger 11 is depressed or pulled, the trigger 11 disengages or vacates the front stop 35 of the sear arm 9. The biasing element 33 compresses as the trigger 11 rotates about the axis 27 to engage the rear stop 37 of the sear arm 9. The trigger spring 29 retains or prevents movement of the sear arm 9 as the trigger 11 is pulled between the initial position (e.g., in which it engages the front stop 35 of the sear arm 9) and the position in which the trigger 11 engages the rear stop 37 of the sear arm 9.

[0035] The distance between the initial position (e.g., the front stop 35) and the rear stop 37 defines the first travel path of the trigger 11. Because the sear arm 9 is rotatably coupled relative to the axis 27 via the pin 31, the trigger 11 rotates independent from the sear arm 9 as the trigger 11 travels along the first travel path. As the trigger 11 travels along the first travel path, the trigger spring 29 retains the sear arm 9 in its position until the trigger 11 engages the rear stop 37. At this point, the trigger 11 must travel through the second travel path to discharge the firearm 2. As the trigger 11 travels through the second travel path, the trigger 11 engages the rear stop 37 and causes the sear arm 9 to rotate relative to the axis 27 in a counter-clockwise direction toward the hammer 1. During the second travel path, the trigger 11 and the sear arm 9 move (e.g., rotate) together about the axis 27. In turn, rotation of the trigger 11 and the sear arm 9 in a counter-clockwise direction about the axis 27 (i.e., along the second travel path) causes the surface 7 of the sear arm 9 to disengage or release from the trigger catch 5, thereby releasing the hammer 1 and causing the hammer 1 to rotate relative to the axis 3 to contact a firing pin (not shown) and discharge the firearm 2.

[0036] Upon discharge, a breech (not shown) via recoil energy caused by discharge, acts on the hammer 1 and causes it to rebound or rotate (e.g., in a clockwise direction about axis 3) toward the disconnecter 15. The disconnecter catch 13 of the hammer 1 engages (e.g., presses against) the lip portion 17 of the disconnecter 15 and causes the disconnecter 15 to

rotate (e.g., downward or to pivot in a counter-clockwise direction about the axis 21) within the slot 19, thereby compressing the disconnecter spring 23. As the disconnecter spring 23 extends, the lip portion 17 engages (e.g., captures) disconnecter catch 13 of the hammer 1 to hold the hammer 1 until the trigger 11 returns to the initial position. When the trigger 11 is released and returns to the initial position, the surface 7 engages a portion of the hammer 1 prior to engaging the trigger catch 5 of the hammer 1. In turn, the disconnecter catch 13 is moved away from the lip portion 17 so that the disconnecter 15 releases the hammer 1 when the surface 7 engages the trigger catch 5.

[0037] FIG. 6 illustrates the example trigger apparatus 10 of FIGS. 1-5 implemented with an adjuster 43. In this example, the adjuster 43 is an adjusting screw spindle that is inserted or coupled to the trigger 11 adjacent the bore 41. The adjuster 43 can be adjusted via, for example, a screw driver. The adjuster 43 may be adjusted to protrude from the trigger 11 to engage the sear arm 9 or retracted substantially within the trigger 11 to move away from the sear arm 9. For example, when the adjuster 43 protrudes from the trigger 11 to engage the sear arm 9, the adjuster 43 shortens or reduces the first travel path. In contrast, when the adjuster 43 is retracted within the trigger 11, the adjuster 43 lengthens or increases the first travel path.

[0038] Thus, the adjuster 43 can be adjusted to substantially eliminate the first travel path (e.g., the lost-motion distance) or maximize the first travel path. In this manner, the distance of the first travel path may be adjusted as desired. Additionally or alternatively, the adjuster 43 enables the trigger 11 and the sear arm 9 to act as a two-stage trigger (when the adjuster 43 is retracted within the trigger 11) or a single-stage trigger (when the adjuster 43 substantially protrudes from the trigger 11 toward the sear arm 9 to cause the rear surface of the trigger 11 to engage the rear stop 37 when the trigger is in an initial position). Such configuration enables a user to switch between a two-stage trigger and a single-stage trigger without having to disassemble the firearm 2 or replace the biasing element 33. Thus, the example trigger apparatus 10 may be adjusted to provide various trigger forces to accommodate, for example, a marksman, a combat soldier, or other users or shooters.

[0039] Although certain example methods and apparatus have been described herein, the scope of coverage of this patent is not limited thereto. On the contrary, this patent covers all methods, apparatus and articles of manufacture fairly falling within the scope of the appended claims either literally or under the doctrine of equivalents.

What is claimed is:

1. A two-stage trigger apparatus for use with firearms, comprising:
 - a trigger;
 - a sear arm operatively coupled to the trigger, wherein the sear arm detachably couples to a first catch of a hammer of the firearm;
 - a disconnecter is pivotally coupled relative to the sear arm and detachably coupled to a second catch of the hammer;
 - at least one trigger spring operatively coupled to the sear arm to bias the sear arm to an initial position, wherein the trigger pivots relative to the sear arm between a first travel stop and a second travel stop of the sear arm, wherein the first travel stop prevents the trigger from pivotally moving relative to the sear arm in a first direc-

tion and the second travel stop prevents the trigger from pivotally moving relative to the sear arm in a second direction opposite the first direction, wherein the trigger pivots between the first travel stop and the second travel stop relative to the sear arm; and

a biasing element disposed between the sear arm and the trigger to bias the trigger toward the first travel stop, and wherein the trigger spring exerts a greater force on the sear arm than the force exerted by the biasing element on the trigger.

2. A trigger apparatus as described in claim 1, wherein the trigger and the sear arm are operatively coupled such that a rotational axis of the trigger is coaxially aligned with a rotational axis of the sear arm.

3. A trigger apparatus as described in claim 1, wherein the biasing element is disposed adjacent a pivotal axis of the trigger between the first and second travel stops.

4. A trigger apparatus as described in claim 1, wherein the trigger is pivotally coupled relative to the sear arm via a pivot bearing.

5. A trigger apparatus as described in claim 1, wherein the sear arm is rotatably coupled to the firearm via a retainer pin.

6. A trigger apparatus as described in claim 1, wherein the first travel stop comprises a front surface of the sear arm and the rear travel stop comprises a rear surface of the sear arm.

7. A trigger apparatus as described in claim 1, further comprising an adjustment mechanism adjacent the front travel stop, wherein the adjustment mechanism may be adjusted to increase or decrease a first travel path of the trigger as the trigger pivots relative to the pivotal axis between the front travel stop and the rear travel stop.

8. A trigger apparatus as described in claim 1, wherein the disconnecter has a lip to engage the second catch of the hammer, wherein the disconnecter is pivotally coupled to the sear arm such that it at least partially pivots within a slot of the sear arm, and wherein a spring is disposed between the disconnecter and the sear arm to bias the disconnecter toward the second catch of the hammer.

9. A two-stage trigger apparatus for use with a firearm, comprising:

a trigger that rotates between a first position, a second position, and a third position, wherein the distance between the first position and the second position defines a first travel path and the distance between the second position and the third position defines a second travel path;

a sear arm rotatably coupled to the firearm, wherein the trigger is operatively coupled to the sear arm such that the trigger rotates relative to the sear arm when the trigger travels along the first travel path, and wherein at least a portion of the trigger engages at least a portion of the sear arm to cause the sear arm to release a hammer of the firearm when the trigger travels along the second travel path;

at least one trigger spring to prevent rotation of the sear arm when the trigger travels along the first travel path; and

a biasing element disposed between the sear arm and the trigger to bias the trigger toward the first position, and wherein the trigger spring exerts a greater force on the sear arm than the force exerted by the biasing element to the trigger.

10. A trigger apparatus as described in claim 9, wherein an axis of rotation of the trigger is coaxially aligned with an axis of rotation of the sear arm.

11. A trigger apparatus as described in claim 10, wherein the biasing element is disposed adjacent the axis of rotation of the trigger between the first position and the second position.

12. A trigger apparatus as described in claim 10, wherein the sear arm is pivotally fixed about the axis of rotation relative to the trigger via a retainer pin.

13. A trigger apparatus as described in claim 10, wherein the trigger is rotatably coupled relative to the sear arm via a pivot bearing.

14. A trigger apparatus as described in claim 9, wherein a first portion of the trigger engages a first portion of the sear arm in the first position.

15. A trigger apparatus as described in claim 9, wherein a second portion of the trigger engages a second portion of the sear arm in the second position.

16. A trigger apparatus as described in claim 9, wherein the third position defines the pressure-point position to discharge the firearm.

17. A trigger apparatus as described in claim 9, further comprising an adjustable screw to define the first position, wherein the screw is adjustable to increase or decrease the distance of the first travel path.

18. A trigger apparatus as described in claim 9, further comprising a disconnecter having a lip to engage a first catch of a hammer of the firearm, wherein the disconnecter is pivotally coupled to the sear arm such that it at least partially pivots within a slot of the sear arm, and further comprising a spring disposed between the disconnecter and the sear arm to bias the disconnecter toward the first catch of the hammer.

19. A trigger apparatus for use with a firearm, comprising:

a trigger rotatably coupled to a sear arm about a common rotational axis, wherein the trigger rotates relative to the sear arm along a first travel path defined by a first travel stop and a second travel stop, and wherein the sear arm rotates with the trigger along a second travel path defined by the second travel stop and a pressure-point position, wherein the trigger causes the sear arm to release a first catch of a hammer at the pressure-point position to discharge the firearm;

a biasing element disposed between the trigger and the sear arm to bias the trigger toward the first travel stop, wherein the biasing element is adjustable to increase or decrease the force exerted by the biasing element on the trigger; and

at least one trigger spring to prevent the sear arm from rotating about the rotational axis when the trigger rotates between the first and second travel stops.

20. An trigger apparatus as described in claim 19, further comprising a disconnecter having a lip to detachably couple to a second catch of the hammer, wherein a spring is disposed between the disconnecter and the sear arm, and wherein the spring does not act or interfere with the operation of the trigger or the biasing element when the trigger travels along the first travel path.

21. An trigger apparatus as described in claim 19, further comprising an adjustable screw disposed adjacent the rotational axis of the trigger, wherein the screw defines the first position, and wherein the screw is adjustable to increase or decrease the distance of the first travel path.

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