AMBIDEXTROUS FIREARM BOLT CONTROL MECHANISM

Cross-reference to other applications

[0001] The disclosure claims priority from US Provisional Application No. 63/558,169 filed February 27, 2024 which is hereby incorporated by reference.

Field

[0002] The disclosure is generally directed at firearms and, more specifically, at an ambidextrous firearm bolt control mechanism.

Background

[0003] In the field of firearms, there are a multitude of different designs and types of rifles. These include an AR-10 or AR-15 rifle or carbine or a derivative thereof. Control of these automatic firearms are typically placed on only one side of the firearm.

[0004] Therefore, there is provided a novel ambidextrous firearm bolt control mechanism.

Summary

[0005] The disclosure is directed at an ambidextrous firearm bolt control mechanism. In one embodiment, integration of the bolt control mechanism of the disclosure enables a firearm user to use either a right hand or a left hand to engage or disengage a bolt within the firearm that facilitates loading/unloading of cartridges from the magazine. In other embodiments, the ambidextrous firearm bolt control mechanism provides bolt control components on each side of the firearm to engage or disengage a bolt within the firearm that facilitates loading/unloading of cartridges from the magazine.

[0006] In one embodiment, the disclosure includes a left-hand bolt catch/release apparatus or interface (which may be seen as a first control component) along with a right-hand bolt catch/release lever (which may be seen as a second control component). In some embodiments, the right-hand lever is approximately balanced at a horizontal transfer bar pivot location for easy manipulation. One advantage of the disclosure is all external control inputs transfer forces internally within the ambidextrous firearm bolt control mechanism.

[0007] In another embodiment, the disclosure includes a floating force transfer pin that is affixed to or in connection with a force transfer bar which, when deployed, pushes on a cam path within a bolt catch. In yet another embodiment, the disclosure includes a transfer pin that isolates

the left- and right-hand bolt catch apparatus. In a further embodiment, the disclosure includes minimal or small clearances to prevent or reduce control float. In yet a further embodiment, certain components of the bolt control mechanism are preloaded to prevent or reduce control play.

[0008] In another aspect of the disclosure, there is provided an ambidextrous firearm bolt control mechanism for a firearm including a first control component connected to a receiver of the firearm, the first control component including a bolt catch component for engaging a firearm bolt; a second control component connected to the receiver of the firearm; an independent vertical force transfer component; a horizontal force transfer component including an opening for receiving the vertical force transfer component, the horizontal force transfer component connected to the second control component; wherein the first control component is actuated by one of a user's hands and the second control component is actuated by another one of the user's hands; wherein actuation of the first control component causes the first control component to rotate such that the bolt catch component goes from a bolt release state to a bolt catch state; and wherein actuation of the second control component causes the horizontal force transfer component and the vertical force transfer component to move causing the first control component to rotate such that the bolt catch component goes from the bolt release state to the bolt catch state.

[0009] In another aspect, the mechanism further includes a bolt catch spring interfacing with receiver of the firearm and the horizontal force transfer component. In yet another aspect, the second control components includes a front control portion; and a rear control portion; wherein actuation of the front control portion causes the bolt catch component to go from the bolt release state to the bolt catch state and wherein actuation of the rear control portion causes the bolt catch component to go from the bolt catch state to the bolt release state. In a further aspect, actuation of the rear control portion causes the horizontal force transfer component to engage the first control component to rotate whereby the bolt catch component goes from bolt catch state to the bolt release state. In another aspect, engagement of the horizontal force transfer component with the first control component causes the first control component to rotate thereby disengaging the first control component from the vertical force transfer component. In yet a further aspect, the first control component includes an upper control portion; and a lower control portion; wherein actuation of the lower control portion causes the bolt catch component to go from the bolt release state to the bolt catch state and wherein actuation of the upper control portion causes the bolt catch component to go from the bolt catch state to the bolt release state. In an aspect, actuation of the lower control portion causes the first control component to rotate with respect to the firearm receiver thereby engaging the bolt catch component to engage with the firearm bolt. In another

aspect, the upper or lower control portions causes the first control component to rotate independent from the vertical force transfer component.

Brief Description of the Drawings

[0010] Some embodiments of the present disclosure are illustrated as an example and are not limited by the figures of the accompanying drawings, in which like references may indicate similar elements and in which:

[0011] Figure 1 is a perspective of a firearm with an ambidextrous firearm bolt control mechanism;

[0012] Figure 2a is a perspective view of an ambidextrous firearm bolt control mechanism;

[0013] Figure 2b is a front view of the ambidextrous firearm bolt control mechanism of Figure 2a with the left hand control component at rest;

[0014] Figure 2c is a front view of the ambidextrous firearm bolt control mechanism of Figure 2a with the left hand control component actuated;

[0015] Figure 2d is a front view of the ambidextrous firearm bolt control mechanism of Figure 2a with the right hand control component in a partially actuated, pre-deploy state;

[0016] Figure 2e is a front view of the ambidextrous firearm bolt control mechanism of Figure 2a with the right hand control component actuated;

[0017] Figure 3 is a front cross-section view of the ambidextrous firearm bolt control mechanism integrated with a firearm;

[0018] Figure 4 is a left-hand perspective view of the ambidextrous firearm bolt control mechanism mounted to a receiver;

[0019] Figure 5 is a left-hand side view of the ambidextrous firearm bolt control mechanism mounted to a receiver; and

[0020] Figure 6 is a right-hand side view of the ambidextrous firearm bolt control mechanism mounted to a receiver.

Detailed Description

[0021] The disclosure is directed at an ambidextrous firearm bolt control mechanism that may be integrated within a firearm. In one embodiment, the firearm bolt control mechanism enables the firearm to hold to the rear, or catch, a bolt carrier assembly when desired by a firearm user. The catching of the bolt carrier assembly may be performed with either the firearm user's left or right hand thereby providing a firearm bolt control which may be controlled ambidextrously.

[0022] Turning to Figure 1, a perspective view of a firearm with an ambidextrous firearm bolt control mechanism is shown. In the current embodiment, the firearm 10, which may be an AR-10 or AR-15 rifle or carbine or a derivative thereof, includes an upper receiver portion 12 that is connected to a lower receiver portion 14 and a magazine well 16 for receiving a magazine 18 containing ammunition. In the current embodiment, the firearm 10 further includes a standardized mounting interface 20 that is integrated to the top of the upper receiver portion 12. An ambidextrous firearm bolt control mechanism 22 is integrated within the lower receiver portion 14 that is accessible to the firearm user to enable bolt control with either hand. The bolt control mechanism 22 operates to enable a bolt carrier assembly within the rifle or carbine to travel forward within the upper receiver portion 12 of the rifle or carbine 10.

[0023] In use, relative to industry standard AR-10 and AR-15 technology, the bolt catch or control mechanism 22 is deployed by the user or imparted, or urged, by a magazine follower upon interfacing with an empty magazine. In order to move forward, or release, the bolt carrier assembly, the firearm user can either interface with firearm bolt control mechanism or relieve the compressive force from the bolt carrier assembly itself, to allow the firearm bolt control mechanism to return to its resting state, enabling the bolt carrier assembly to travel forward. The ambidextrous firearm bolt control mechanism of the disclosure, while retaining standard AR-10 and AR-15 bolt catch and release principles, features several unique elements in the control of the firearm bolt catch and release mechanism.

[0024] The ambidextrous firearm bolt control mechanism 22 enables the firearm user to actuate a bolt catch and release from both a first, or left-hand, and a second, or right-hand, side of the firearm. Within the bolt control mechanism 22 of the disclosure, there are two unique, independent, hinged control elements that enable control of the firearm bolt catch and release function. When referring to direction or positions in the specification, control orientations shall be interpreted as relative to the firearm being shouldered by a user in the firing position and are used for ease of explanation.

[0025] Turning to Figure 2a, a perspective view of one embodiment of the ambidextrous firearm bolt control mechanism (AFBCM) is shown. The mechanism 22 includes a first, or left, side firearm bolt catch and release, or control, component 30 that includes integrated control inputs which enables a firearm user to control a bolt catch on the left-hand side of the firearm. The control inputs may be seen as interactive parts of the component 30 that enable bolt control to be performed. The first bolt catch and release component 30 may also be seen as a control element. Actuation of the first control component 30 may be via an upper tab, or control, portion 31a or a lower tab, or control, portion 31b. The first control component 30 further includes a bolt

catch portion 33 that engages with a firearm bolt in a “bolt catch” state and is not in contact with the firearm bolt in a “bolt release” state.

[0026] The mechanism 22 further includes a second, or right, side bolt catch and release, or control, element 32 or right hand/side control lever, which enables a firearm user to control a bolt catch from the right side of the firearm thereby providing the ambidextrous bolt catch mechanism. Actuation of the second control component 32 may be via a front tab, or control, portion 33a or a rear tab, or control, portion 33b. The second control element 32 may be seen as a catch/release paddle control.

[0027] In some embodiments, there is clearance for hammer pin removal without the need to remove the second control element 32 from the firearm. In some embodiments, there may be no control interference (when installed) with a dust cover regardless of whether the second control component 32 is at rest or actuated.

[0028] The AFBCM 22 further includes a horizontal force transfer component 34 or transfer bar, a vertical force transfer component 36 or transfer pin and a side pin 38 or bolt catch pin which connects the second side control element 32 to the horizontal force transfer component 34 or transfer bar. The side pin 38 may be seen as being on the right-hand or right side of the firearm. The mechanism 22 further includes a bolt catch spring 40 or transfer bar spring, which interfaces with the firearm receiver and the horizontal force transfer component 34. In embodiments, the end of the spring 40 abuts or rests against the firearm receiver. A first retaining pin 42 attaches the first side control element 30 to the firearm receiver and a second retaining pin 44 attaches the second side control element 32 to the firearm receiver. The horizontal plane in which force is applied to the lower control 31b of the firearm bolt catch and release or the first catch and release component 30 and both control portions 33 of the second side control element 32 is approximately inline for all controls.

[0029] In the current embodiment, the left-hand or left side firearm bolt catch and release component 30 is vertical in orientation and includes the set of upper 31a and lower 31b control inputs. The control inputs may be seen as aspects or parts of the left-hand catch and release component 30 that enable the bolt catch functionality when activated or actuated. In some embodiments, the control inputs may be seen as retention and articulation elements or components. One of the retention and articulation elements may be seen as a hole 48 through which the first retaining pin or first side control element retaining pin 42 passes through that is used for both assembly of the AFBCM 22 to the firearm, as well as a rotational axis. Further control aspects of the disclosure include, but are not limited to, a first surface 50 which interfaces with the horizontal force transfer component 34 and an interior profiled surface 52 which interfaces

with the vertical force transfer component 36. The first bolt and catch release component 30 (or the bolt catch portion 33) may include a flat bottom surface (seen as 59 in Figure 2c) of a protruding component 54 which interfaces with the firearm magazine follower and a flat surface 56 which interfaces with the firearm bolt. In Figure 2a, the flat surface is facing into the page.

[0030] In one embodiment, the interior profiled surface 52 of the firearm bolt catch and release 30 includes a combination of radius and angled paths or surfaces that are able to accommodate or respond to force input or applied from or by the vertical force transfer component 36. The rotational travel of the firearm bolt catch and release 30 and the corresponding interfacing components or components that are in contact with the control inputs is limited by a horizontal flat or flat surface (indicated by 57) below the protruding component 54 for the firearm magazine follower and the interior lower surface 50 which interfaces with the horizontal force transfer component 34. These two surfaces, at their extents of rotational travel, interface with corresponding surfaces on the firearm receiver, defining the permissible angular displacement.

[0031] In the current embodiment, the second side control element 32 is horizontal in orientation and features control inputs (or retention and articulation elements or components) located within forward and rearward areas of the control element 32. One of the retention and articulation elements may be seen as a hole 60 which receives the second side control element retaining pin 44 allowing the pin to pass through and rotate about the axis of the hole 60. The hole 60 may also be used for assembly of the mechanism 22. Other force transfer elements include a pair of slots (not shown) which receive the horizontal force transfer component 34 and side pin component 38 and allow the transfer component 34 to pivot about the slots upon rotation of component 32 and an assembly hole 62 which enables the second side pin 38 to be inserted through both the second side control element 32 and the horizontal force transfer component 34.

[0032] The horizontal force transfer component 34 has a cylindrical body 63 with varying diameters including a spherical radiused end which interfaces with the interior lower surface 50 of the firearm bolt catch and release component 30. The horizontal force transfer component 34 further includes a hole or receiving area 64 with corresponding flats which interfaces with or receives the vertical force transfer component 36. A reduced diameter area of the cylindrical body 63 with corresponding flat surfaces interfaces with the bolt catch spring 40, a chamfered end (not shown), and a hole which interfaces with the second side pin 38. The vertical force transfer component 36 has a cylindrical body 66 with varying diameters and a spherical radiused end which interfaces with the interior profiled surface 52 of the left-hand side firearm bolt catch and release component 30.

[0033] In the current embodiment, the second side pin 38 has a cylindrical body with varying diameters which interfaces with both the second side control element 32 and the horizontal force transfer component 34. The bolt catch spring 40 and retaining pins 42 and 44 may be industry standard components.

[0034] When integrated within the firearm, the first side control element or mechanism 30 (which is typically accessible with the left hand of the firearm user or on the left side of the firearm) is attached to the firearm receiver via the retaining pin 42 which acts as the rotational axis for the control component 30. When the firearm is at rest, the first side control element 30 is preloaded in a "bolt release" state by the horizontal force transfer component 34 and the bolt catch spring 40, where the horizontal force transfer component 34 imparts a pushing force on the internal lower surface 50 of the first side control element 30 using a compressive force imparted by the bolt catch spring 40 between the firearm receiver and the horizontal force transfer component 34. In bolt catch state, with no controls actuated, the spring 40 applies a force to the horizontal force transfer component 34 pushing it into the first control element 30 which causes disengagement of the vertical force transfer component 36 with the first control element 30.

[0035] This is schematically shown in Figure 2b which shows the ABCRM 22 with the left-hand or left side control 30 at rest. Contact between the horizontal force transfer component 34 and the surface 50 is shown at arrow 100. This imparted force generates a clockwise moment on the firearm bolt control component 30, therefore retracting the firearm bolt catch and release component 30 to the "bolt release" state when the assembly is not loaded by the bolt carrier assembly.

[0036] With respect to Figure 2b, in the rest state, the left hand or left side control is functionally similar to a AR-10 or AR-15 design where the horizontal force transfer component 34 acts as a bolt catch plunger which contacts the bolt catch at rest. The bolt catch spring 40 pre-loads the assembly preventing or reducing play and preventing or reducing the likelihood of the bolt catch deploying by accident. The vertical force transfer component 36 floats and is held captive by the bolt catch mechanism.

[0037] When integrated within the firearm, the second side control element 32 (which is typically accessible with the right hand of the firearm user or on the right side of the firearm) is attached to the firearm receiver by the retaining pin 44 which acts as the rotational axis for the control element 32. The horizontal force transfer component 34 is connected to the second side control element 32 via the second side pin 38 which simultaneously passes through the hole 62 in the second side control element 32 and the horizontal force transfer component 34. As detailed above, the vertical force transfer component 36 is connected to the horizontal force transfer

component 34 via the hole 64 (having a diameter that is similar to the diameter of the vertical force transfer component 36). This is schematically shown in Figure 2d which shows the ABCRM 22 with the right hand or right side control element 32 in a partially actuated, pre-deployed state.

[0038] In a partially actuated, pre-deployed state, with respect to the second control element 32, the vertical force transfer component 36 contacts the interior surface 52 of the first control element 30 relieving contact (shown as arrow 88 in Figure 2d) between the horizontal force transfer component 34 and the first control element 30.

[0039] With the ambidextrous firearm bolt control elements 30 and 32 at rest and the firearm in a shouldered state, there is radial clearance, and therefore no contact, between the vertical force transfer component 36 and the firearm bolt catch and release 30. This is more clearly shown in Figure 2b and shown as 86.

[0040] In this state or position, the vertical force transfer component 34 is free to move in a vertical direction but remains captive between the firearm bolt catch and release component 30 and the horizontal force transfer component 34 due to the displacement restricting contact between the horizontal component 34 and the first control element 30 and the positioning of the horizontal and vertical force transfer components.

[0041] When there is a need to load the firearm chamber, the firearm user contacts tab portion 31a or tab portion 31b to manipulate the retention and articulation elements on or associated with the first side control element 30 thereby enabling the component 30 to rotate about its hinged axis and respectively deploy, or release, the firearm bolt catch and release function. Both control inputs impart a pushing force on the firearm bolt catch and release component 30.

[0042] Imparting a pushing force on the lower control input creates a counterclockwise moment on the firearm bolt catch and release 30, therefore deploying the firearm bolt catch and release component 30 to a “bolt catch” state while imparting a pushing force on the upper control input creates a clockwise moment similar, in function, to the moment generated from the force imparted by the bolt catch spring 40 and horizontal force transfer component 34 therefore returning the assembly to a “bolt release” state. The firearm bolt catch and release component 30 can also be actuated by a firearm magazine where, when the magazine is empty, the magazine follower interfaces with the protruding surface 59 on the firearm bolt catch and release component 30 and imparts a vertical force, creating a counterclockwise moment on the firearm bolt catch and release component 30, therefore deploying the firearm bolt catch and release 30 to a “bolt catch” state. This is schematically shown in Figure 2c which shows the ABCRM 22 with the left hand or left side control element in the “bolt catch” state.

[0043] As shown in Figure 2c, the horizontal force transfer component 34 transfers an input force (applied to tab 31b) from the first control element 30 to the second control element 32. The horizontal force transfer component 34 remains in contact with the first control element 30 deploying both the first control element 30 and the second control element 32. The vertical force transfer component 36 floats but is held captive by the first control element 30. In this manner, the firearm user may use either their right hand or their left hand to release the bolt by manipulating control tabs 31a or 33b, or by releasing the pre-load on the bolt carrier assembly.

[0044] When deployed in the “bolt catch” state using the first side control element 30, radial clearance 86, and therefore no contact, remains between the vertical force transfer component 36 and the firearm bolt catch and release component 30 due to the contact 100 between the horizontal transfer force component 34 and the interior profiled surface 52 of the firearm bolt catch and release component 30. In this state, the vertical force transfer component 36 is free to move in a vertical direction but remains captive between the firearm bolt catch and release component 30 and the horizontal force transfer component 34.

[0045] Instead of using the left hand or left side control element 30, the firearm user can manipulate the second control element 32 (such as via front 33a or rear 33b control inputs) to enable the second control element 32 to rotate about its hinged axis and respectively deploy, or release, a firearm bolt catch and release function. Imparting a pushing force on the front control of control element 32 generates or creates a counterclockwise moment on the second side control element 32 which pulls the horizontal force transfer component 34 and the mated vertical force transfer component 36, in an outward direction, away from the firearm bolt catch and release component 30. This motion causes the vertical force transfer component 36 to engage (seen as 84 of Figure 2e) with the interior profiled surface 52 of the firearm bolt catch and release component 30, and, simultaneously, separates the contact between the horizontal force transfer component 34 and the interior lower surface of the firearm bolt catch and release component 30. This is schematically shown in Figure 2e which shows the ABCRM 22 with the right hand or right side control element 32 in a bolt-catch state.

[0046] With the second control element 32 in the actuated state (where force has been applied to one of the tab portions 33), the vertical force transfer component 36 rides along the interior surface 52 thereby engaging both the bolt catch and the first control element 30. The horizontal force transfer component remains out of contact with the first control element 30. The firearm user can then use either their left hand or right hand to release the bolt.

[0047] Continuing this motion enables the vertical force transfer component 36 to progress along the interior profiled surface 52 of the firearm bolt catch and release component 30

which creates or generates a counterclockwise moment on the firearm bolt catch and release component 30, therefore deploying the firearm bolt catch and release 30 to the "bolt catch" state. If the firearm bolt catch and release component 30 is held in position by the corresponding firearm bolt carrier assembly, releasing the pushing force on the front control input 33a will restore the contact between the firearm bolt catch and release component 30 and the horizontal force transfer component 34. In this state, radial clearance, and therefore contact, is restored between the vertical force transfer component 36 and the firearm bolt catch and release component 30 as represented by 82 in Figure 2c.

[0048] With the firearm remaining in this state, imparting a pushing force on the rear control input 33b, the second side control element 32 creates a clockwise moment on the second side control element 32 which pushes the horizontal force transfer component 34, and therefore the mated vertical force transfer component 36 in an inward direction, towards the firearm bolt catch and release component 30. This motion pushes the horizontal force transfer component 34 against the interior lower surface 50 of the firearm bolt catch and release component 30 in an approximately perpendicular fashion, creating a clockwise moment on the firearm bolt catch and release component 30, therefore deploying the firearm bolt catch and release 30 to a "bolt release" state. Concluding this motion will return the ambidextrous firearm control to its resting state.

[0049] Figure 3 is a front cross section view of the ABRCM 22 installed within a firearm or assembly and in the engaged state. As can be seen in Figure 3, the bolt control mechanism 22 is shown with the left hand or left side control component actuated. Initially, the bolt catch component 33 is disengaged with a firearm bolt 300 but in response to the actuation of the bottom of the first control component 31b, the bolt catch component 33 engages with the firearm bolt and is deployed to the bolt catch state.

[0050] Figure 4 is a left-hand perspective view of the ambidextrous firearm bolt control mechanism 22 mounted to a firearm receiver 400. Figure 5 is a left-hand side view of the ambidextrous firearm bolt control mechanism 22 mounted to the firearm receiver 400; and Figure 6 is a right hand side view of the ambidextrous firearm bolt control mechanism 30 mounted to the receiver 400. As discussed above, the control mechanism 22 is mounted via a pair of retaining pins 42 and 44. Retaining pin 42 connects first control component 30 to the firearm receiver and enables the first control component to rotate about an axis created by the retaining pin 42. Retaining pin 44 connects the second control component 32 to the firearm receiver and enables the second control component to rotate about an axis created by the retaining pin 44.

[0051] Applicants reserve the right to pursue any embodiments or sub-embodiments disclosed in this application; to claim any part, portion, element and/or combination thereof of the

disclosed embodiments, including the right to disclaim any part, portion, element and/or combination thereof of the disclosed embodiments; or to replace any part, portion, element and/or combination thereof of the disclosed embodiments.

[0052] The above-described embodiments are intended to be examples only. Alterations, modifications and variations can be effected to the particular embodiments by those of skill in the art without departing from the scope, which is defined solely by the claims appended hereto.

What is Claimed is:

1. An ambidextrous firearm bolt control mechanism for a firearm comprising:

a first control component connected to a receiver of the firearm, the first control component including a bolt catch component for engaging a firearm bolt;

a second control component connected to the receiver of the firearm;

an independent vertical force transfer component;

a horizontal force transfer component including an opening for receiving the vertical force transfer component, the horizontal force transfer component connected to the second control component;

wherein the first control component is actuated by one of a user's hands and the second control component is actuated by another one of the user's hands;

wherein actuation of the first control component causes the first control component to rotate such that the bolt catch component goes from a bolt release state to a bolt catch state; and

wherein actuation of the second control component causes the horizontal force transfer component and the vertical force transfer component to move causing the first control component to rotate such that the bolt catch component goes from the bolt release state to the bolt catch state.

2. The ambidextrous firearm bolt control mechanism of Claim 1 further comprising a bolt catch spring interfacing with receiver of the firearm and the horizontal force transfer component.

3. The ambidextrous firearm bolt control mechanism of Claim 2 wherein the second control components comprises:

a front control portion; and

a rear control portion;

wherein actuation of the front control portion causes the bolt catch component to go from the bolt release state to the bolt catch state and wherein actuation of the rear control portion causes the bolt catch component to go from the bolt catch state to the bolt release state.

4. The ambidextrous firearm bolt control mechanism of Claim 3 wherein actuation of the rear control portion causes the horizontal force transfer component to engage the first control component to rotate whereby the bolt catch component goes from bolt catch state to the bolt release state.

5. The ambidextrous firearm bolt control mechanism of Claim 4 wherein engagement of the horizontal force transfer component with the first control component causes the first control component to rotate thereby disengaging the first control component from the vertical force transfer component.

6. The ambidextrous firearm bolt control mechanism of Claim 1 wherein the first control component comprises:

an upper control portion; and

a lower control portion;

wherein actuation of the lower control portion causes the bolt catch component to go from the bolt release state to the bolt catch state and wherein actuation of the upper control portion causes the bolt catch component to go from the bolt catch state to the bolt release state.

7. The ambidextrous firearm bolt control mechanism of Claim 6 wherein actuation of the lower control portion causes the first control component to rotate with respect to the firearm receiver thereby engaging the bolt catch component to engage with the firearm bolt.

8. The ambidextrous firearm bolt control mechanism of Claim 7 wherein upper or lower control portions causes the first control component to rotate independent from the vertical force transfer component.