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Firearm recoil devices, systems, and methods

Abstract

A recoil system is deployed with a slide plug comprising a catch means along with a plug retainer comprising a catch means. The slide plug catch means and plug retainer catch means may be compatible to permit the slide plug catch means and the plug retainer catch means to interfit and hold the recoil system in a partially compressed configuration. A method comprising a step of interfitting a slide plug catch means with a plug retainer catch means to hold the recoil system in a partially compressed configuration is described.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS (1) This application claims the benefit under 35 U.S.C. § 119 (e) of U.S. Provisional Patent Application Ser. No. 63/527,768 filed Jul. 19, 2023.

BACKGROUND

(1) Some firearms, for example semiautomatic pistols, may be configured with reciprocating slides. In some of these configurations, rearward motion of the slide following a shot is damped by compression of a spring. Forward motion of the slide back into battery results when the spring resiles from that compression. During compression and resiling of the spring, in some configurations a guide rod constrains the spring into a generally linear orientation. In some configurations, the guide rod is disposed through an opening in a plug disposed proximal to the muzzle end of the slide. This disclosure describes and enables various systems, structures, and configurations for recoil springs, guide rods, and plugs, and various methods for assembly and disassembly of recoil springs, guide rods, and plugs with a slide and barrel.

SUMMARY

(2) In various embodiments, a recoil system is deployed a with slide plug comprising a catch means along with a plug retainer comprising a catch means. The slide plug catch means and plug retainer

catch means may be compatible to permit the slide plug catch means and the plug retainer catch means to interfit and hold the recoil system in a partially compressed configuration.

(3) In various embodiments, a recoil system may be removed from an assembled configuration with a slide and barrel by a method comprising a step of interfitting a slide plug catch means with a plug retainer catch means to hold the recoil system in a partially compressed configuration.

Description

BRIEF DESCRIPTION OF DRAWINGS

- (1) FIG. 1 is an exploded perspective view of a recoil system embodiment.
- (2) FIG. 2 is a longitudinal section view of the system depicted in FIG. 1.
- (3) FIG. 3 is a longitudinal section view of the system depicted in FIG. 1.
- (4) FIG. 4 is a longitudinal section view of the system depicted in FIG. 1.
- (5) FIG. 5 is a longitudinal section view of the system depicted in FIG. 1.
- (6) FIG. 6 is a perspective view of the slide plug depicted in FIG. 1.
- (7) FIG. 7 is a perspective view of the slide plug depicted in FIG. 1.
- (8) FIG. 8 is a section view of the slide plug depicted in FIG. 1 taken upon section plane 8-8 indicated on FIG. 7.
- (9) FIG. 9 is a perspective view of the plug retainer depicted in FIG. 1.
- (10) FIG. 10 is a section view of the plug retainer depicted in FIG. 1 taken upon section plane 10-10 indicated on FIG. 9.
- (11) FIG. 11 is an exploded perspective view of a recoil system embodiment.
- (12) FIG. 12 is a longitudinal section view of the system depicted in FIG. 11.
- (13) FIG. 13 is a longitudinal section view of the system depicted in FIG. 11.
- (14) FIG. 14 is a longitudinal section view of the system depicted in FIG. 11.
- (15) FIG. 15 is a longitudinal section view of the system depicted in FIG. 11.
- (16) FIG. 16 is a perspective view of the slide plug depicted in FIG. 11.
- (17) FIG. 17 is a perspective view of the slide plug depicted in FIG. 11.
- (18) FIG. 18 is a section view of the slide plug depicted in FIG. 11 taken upon section plane 18-18 indicated on FIG. 17.
- (19) FIG. 19 is a perspective view of the plug retainer depicted in FIG. 11.
- (20) FIG. 20 is a section view of the plug retainer depicted in FIG. 11 taken upon section plane 20-20 indicated on FIG. 19.
- (21) FIG. 21 is a side view of the system depicted in FIG. 11 installed with an exemplary slide and barrel.
- (22) FIG. 22 is a section view of the components depicted in FIG. 21 taken upon section plane 22-22 indicated on FIG. 21.

DESCRIPTION

(23) When used in this disclosure with respect to surfaces, edges, protrusions, recesses, or other geometries, unless clearly used differently the terms “compatible” and “complementary” mean that the items are configured to abut, fit together, or otherwise engage in a way that restrains relative translation or rotation, or both, in one or more directions, for example by having matching profiles mated together. As used in this disclosure, unless clearly used differently the term “interfitting parts” shall refer to plural structures having compatible or complementary surfaces, edges, protrusions, recesses, or other geometries, and those plural structures may be said to “interfit.”

(24) When used in this disclosure with respect or reference to a firearm or firearm components, unless clearly used differently the term “longitudinal” is used to refer to a direction substantially in alignment with the direction in which a projectile is ejected the firearm. In addition, when used in this disclosure with respect or reference to a firearm, unless clearly used differently the term

“lateral” is used to refer to a direction that substantially deviates from the longitudinal direction, for example substantially orthogonal to the longitudinal direction. Unless clearly used differently, the terms “up,” “upper,” “top,” “vertical,” “down,” “lower,” “bottom” and “horizontal” are used with reference to a firearm when the firearm is oriented in the normal, most common position in which such device is operated by a person having ordinary or better skill using such device.

(25) When used in this disclosure with respect to a structure or component, unless clearly used differently the correlative terms “attachable” and “detachable” indicate that such structure or component is capable of being attached or fastened to another structure or component, or correlatively detached or unfastened from another structure component, by use of fastening means such as screws, pins, detents, springs, pawls, clips, low-tack removable adhesives, compatible or complementary surfaces, and similar readily engageable and disengageable means, and the terms “attachment means,” “fastening means,” and “fasteners” shall be used in this disclosure to refer to any such items and any combination of such items. The terms “attaching” and “detaching” as used in this disclosure mean, respectively, attaching or fastening, and detaching or unfastening, structures or components that are “attachable” and “detachable.” Structures and components that are integrally formed, or that are welded, bonded with high-tack permanent adhesives (such as cyanoacrylates and epoxies), or joined with similar difficult-to-disengage means, are not “attachable” or “detachable” as those terms are used in this disclosure, and may be referred to as “permanently” joined to connote that separation of such structures or components is not intended. In this disclosure, the term “driving means” with respect to screws or other threaded fasteners means any of the various shaped cavities and protrusions on a screw head that allow torque to be applied to a screw, including but not limited to recesses having a slot, cross, Phillips, frearson, French recess, JIS B 1012, Mortorq, Pozidriv, Supadriv, torq-set, or combination phillips/slotted shape, and also recesses or protrusions having a square, pentagonal, hex, 12-point, tri-angle, Robertson, hex socket, security hex, double-square, triple-square, XZN, 12-spline flange, double hex, torx, T & TX, security torx, TR, torx plus, Polydrive, torx ttap, line head, line head, tri-point, tri-groove, tri-wing, clutch A, clutch G, one-way, Bristol, Quadrex, pentalobular, or spanner shape. Also, in this disclosure the terms “head” and “screw head” mean the end of a threaded fastener comprising the driving means, which may have various shapes, including but not limited to pan head, button or dome head, round head, mushroom or truss head, countersunk or flat head, oval or raised head, bugle head, cheese head, fillister head, socket head, and which may be configured with or without flanges or shoulders or both.

(26) FIG. 1 and FIG. 11 each depict an exploded view of a recoil system embodiment. For each of these preferred embodiments, the recoil system comprises guide rod assembly **100/500**, damper assembly **200/600**, and slide plug **300/700**.

(27) In the embodiments of FIG. 1 and FIG. 11, guide rod assembly **100/500** comprises guide rod **110/510**, guide rod head **130/530**, and plug retainer **170/570**. Guide rod **110/510** in the depicted embodiments is generally cylindrical. For these embodiments, guide rod head **130/530** is disposed adjacent to the reward end of guide rod **110/510**. Preferably, guide rod head **130/530** and guide rod **110/510** are made integrally, but in other embodiments may be made separately and permanently or detachably joined. Also for these embodiments, plug retainer **170/570** is disposed adjacent to the forward end of guide rod **110/510**. Preferably, plug retainer **170/570** and guide rod **110/510** are separate attachable and detachable components, but in other embodiments may be integral or permanently joined. Because slide plug **300/700** and damper assembly **200/600** (or a single recoil spring) are captured between guide rod head **130/530** and plug retainer **170/570**, if the ability to disassemble the damper system is desired, at least one of guide rod head **130/530** and plug retainer **170/570** should be detachable from guide rod **110/510**.

(28) In the embodiments of FIG. 1 and FIG. 11, guide rod head **130/530** comprises guide rod head spring face **133/533**. A guide rod head spring face preferably is generally planar, but other configurations capable of supporting the end of a spring may be used. In the depicted

embodiments, guide rod head **130/530** has a “shield” shape with edge scallops configured and oriented to accommodate structures in a pistol, for example the bottom of a barrel or the edges of a slide, but other configurations may be used.

(29) In the embodiments of FIG. **1** and FIG. **11**, plug retainer **170/570** is disposed at guide rod forward end **150/550**. In these embodiments, plug retainer **170/570** is attachable to and detachable from guide rod **110/510** by the interfitting of complementary plug retainer attachment means **173/573** and guide rod forward end attachment means **151/551**. Plug retainer **170/570** of these embodiments comprises plug retainer catch means **175/575** and plug retainer seating bevel **177/577**.

(30) In the embodiments of FIG. **1** and FIG. **11**, damper assembly **200/600** comprises inner spring **210/610**, outer spring **230/630**, and damper tube **250/650**. In the assembled configuration of these embodiments, inner spring **210/610** extends longitudinally from inner spring forward end **213/613** to inner spring rearward end **215/615**, and outer spring **230/630** extends longitudinally from outer spring forward end **233/633** to outer spring rearward end **235/635**. In the depicted embodiments, each of inner spring forward end **213/613** and inner spring rearward end **215/615** are closed, outer spring forward end **233** and outer spring rearward end **235/635** are closed, and outer spring forward end **633** is open, but in other embodiments the inner and outer springs may have closed ends (either square or ground), open ends, or pigtail ends in any combinations. In the embodiments of FIG. **1** and FIG. **11**, damper tube **250/650** comprises damper tube forward end **251/651**, damper tube rearward end **255/655**, damper tube inner spring seat **253/653**, and damper tube outer spring seat **257/657**. In the assembled configuration of these embodiments, inner spring forward end **213/613** is supported by damper tube inner spring seat **253/653**, inner spring rearward end **215/615** is supported by guide rod head spring face **133/533**, outer spring forward end **233/633** is supported by slide plug spring seat **360/760**, and outer spring rearward end **235/635** is supported by damper tube outer spring seat **257/657**.

(31) In the embodiments of FIG. **1** and FIG. **11**, slide plug **300/700** comprises slide plug body **310/710** and slide plug head **330/730**. In these embodiments, slide plug body boring **320/720** extends longitudinally through slide plug body **310/710** and slide plug head **330/730**. Preferably, slide plug articulation bevel **340/740** is disposed in the lower portion of the reward opening of slide plug body boring **320/720**, which enhances the ability of assembled guide rod assembly **100/500** to cant or tilt downward with respect to slide plug **300/700** as depicted in FIGS. **4** and **14**, which in turn enhances the interfitting of plug retainer catch means **175/575** with slide plug catch means **350/750** as depicted in FIG. **5** and FIG. **15**. In the depicted embodiments, slide plug spring seat **360/760** is disposed at the forward end of slide plug body boring **320/720** and supports outer spring forward end **233/633** when the recoil system is assembled and operating. The depicted embodiments also comprise slide plug seating bevel **370/770**, which preferably is configured with portions complementarily to portions of plug retainer seating bevel **177/577** and arranged to interfit with portions of plug retainer seating bevel **177/577** when the recoil system is in the assembled position depicted in FIG. **2** and FIG. **12**.

(32) In the embodiment depicted in FIG. **1**-FIG. **5**, FIG. **6**-FIG. **8** depict further structures and arrangements of slide plug **300**, and FIG. **9** and FIG. **10** depict further structures and arrangements of plug retainer **170**. In this embodiment, plug retainer catch means **175** is deployed at least partially as a tab or slot, and slide plug catch means **350** is deployed as a shelf-like protrusion from the forward face of slide plug body **310**, and is sized and configured to interfit with plug retainer catch means **175** when this exemplary recoil system embodiment is in the position depicted in FIG. **5**. As shown in FIG. **8**, slide plug spring seat **360** is beveled, which may enhance the centering of outer spring forward end **233** around guide rod **110**. In this embodiment, plug retainer attachment means **173** is configured as a threaded cylindrical section of the body of plug retainer **170**, with threads compatible with the threads of guide rod forward end attachment means **151**, which is deployed as a threaded boring. The compatible threads may be cut so that plug retainer **170** is

indexed in vertical alignment with guide rod head **130** when plug retainer **170** is firmly affixed to guide rod forward end **150**. Alternatively, other indexing means may be used, such as knurling on the abutting ends of plug retainer **170** and guide rod forward end **150**, or such as a crush washer or lock washer or thrust washer inserted around plug retainer attachment means **173** and disposed between the head of plug retainer **170** and guide rod forward end **150** when those components are tightened. Preferably, plug retainer **170** comprises plug retainer seating bevel **177**, which in this embodiment is disposed along the outer edges of the inner forward face of plug retainer **170** and along the central portion of that face. The cooperation and compatibility of plug retainer seating bevel **177** with slide plug seating bevel **370** encourages the centralized relocation and interfitting of plug retainer **170** with slide plug **300** when guide rod assembly **100** translates rearward upon the slide of the firearm returning into battery.

(33) In the embodiment depicted in FIG. **10**-FIG. **15**, FIG. **16**-FIG. **18** depict further structures and arrangements of slide plug **700**, and FIG. **19** and FIG. **20** depict further structures and arrangements of plug retainer **570**. In this embodiment, slide plug catch means **750** is deployed as a portion of the forward edge and upper outer face of slide plug body **710**, with plug retainer catch means **575** configured as a shelf-like protrusion or tab on the forward inner face of plug retainer **570** and the space below that protrusion. When this embodiment is arranged as depicted in FIG. **15** so that this recoil system embodiment is held in a partially compressed configuration, slide plug catch means **750** is disposed in the space below the shelf-like protrusion portion of plug retainer catch means **575** with lateral edge portions of the forward inner face of plug retainer **570** in contact with slide plug support shelves **780**. In this embodiment, slide plug spring seat **760** is not beveled, but other embodiments may deploy a beveled slide plug spring seat. In this embodiment, plug retainer attachment means **573** is configured as a threaded fastener having a head with plug retainer attachment driving means **579**, the threads being compatible with the threads of guide rod forward end attachment means **551**, which is deployed as a threaded boring. In this embodiment, plug retainer **570** is indexed in vertical alignment with guide rod head **530** when plug retainer **570** is firmly affixed to guide rod forward end **550** by complementary interfitting of plug retainer index means **574** with guide rod forward end index means **554** deployed as interfitting notches.

Alternatively, other indexing means may be used, for example knurling, washers, or releasable adhesives. Preferably, plug retainer **570** comprises plug retainer seating bevel **577**, which in this embodiment is disposed along portions of the outer edge of the inner forward face of plug retainer **570**. The cooperation and compatibility of plug retainer seating bevel **577** with slide plug seating bevel **770** encourages the centralized relocation and interfitting of plug retainer **570** with slide plug **700** when guide rod assembly **500** translates rearward upon the slide of the firearm returning into battery.

(34) FIG. **21** and FIG. **22** depict the recoil system embodiment of FIG. **11**-FIG. **20** deployed in an exemplary firearm configuration. The depicted embodiments of this disclosure are particularly adaptable for use in single-stack or double-stack pistols patterned generally on the M1911 pistol design of John Browning for Colt Manufacturing Company, but the depicted embodiments and other embodiments deploying a slide plug catch means and a plug retainer catch means may be adapted and arranged for other firearm designs having a reciprocating slide and a recoil system. In the example of FIG. **21** and FIG. **22**, the firearm comprises exemplary slide **1010**, which is formed with an open bottom except for exemplary slide spring tunnel **1020**. FIG. **21** and FIG. **22** also depict exemplary barrel **1030** comprising exemplary barrel lower lug **1040** and exemplary barrel link **1050**. Except for the exemplary embodiment of a recoil system depicted, FIG. **21** and FIG. **22** do not show other components of the firearm, such as the frame, grip, fire control components, sights, etc., which are well known to those of skill in the art.

(35) As depicted in the exemplary environment of FIG. **21** and FIG. **22**, the recoil system embodiment of FIG. **11**-FIG. **20** comprises slide plug head **730**, outer spring **630**, damper tube **650**, inner spring **610**, guide rod **510**, and guide rod head **530**, and the other components depicted in

FIG. 11-FIG. 20 and described elsewhere in this disclosure. In this example of an assembled configuration, guide rod head **530** is adjacent to barrel lower lug **1040** and barrel link **1050**. Also in this preferred embodiment, slide plug body **710** interfits in a complementary boring in slide spring tunnel **1020**, with slide plug head **730** outside and abutting the rearward end of slide spring tunnel **1020**. In other embodiments, however, a slide plug head may be deployed entirely or partially within the slide spring tunnel.

(36) A recoil system comprising a slide plug catch means and a plug retainer catch means, for example such as depicted in FIG. 1-FIG. 10 and FIG. 11-FIG. 20, enables novel methods of removing the recoil system from an assembled configuration with a slide and barrel. For example, FIG. 13-FIG. 15 depict an exemplary method of removing the recoil system from the exemplary deployment depicted in FIG. 21 and FIG. 22. For example, with the slide, barrel, and recoil system assembled and at rest as shown in FIG. 21, FIG. 22, and FIG. 12, forward pressure on guide rod head **530** compresses inner spring **610** and outer spring **630** and translates guide rod assembly **500** forward. With plug retainer **570** translated forward and no longer captured in the forward end of slide plug **700**, in this example guide rod head **530** can be moved downward or tilted as depicted in FIG. 14, rotating guide rod assembly **500** with respect to slide plug **700**. As further discussed elsewhere in this disclosure, the preferred deployment of slide plug articulation bevel **740** enhances the range of rotation available, but other embodiments may omit the bevel feature. With guide rod assembly **500** rotated with respect to slide plug **700** and with plug retainer **570** translated forward and no longer captured in the forward end of slide plug **700**, pressure on guide rod head **530** may be partially released, causing inner spring **610** and outer spring **630** to resile and translate guide rod assembly **500** rearward until the position depicted in FIG. 15 is reached, at which point pressure may be fully removed from guide rod head **530** causing all spring forces to be borne by the interfitting of slide plug catch means **750** and plug retainer catch means **575**. In this example of a tilt-lock method, the recoil system is now in a partially compressed configuration and may be removed from the installation depicted in FIG. 21 and FIG. 22. A similar tilt-lock method may be used for the recoil system depicted in FIG. 1-FIG. 10.

(37) For other embodiments of a recoil system comprising a slide plug catch means and a plug retainer catch means, novel method of removing the recoil system comprise the step of interfitting the slide plug catch means with the plug retainer catch means to hold the recoil system in a partially compressed configuration.

(38) Although each of the above-described preferred embodiments deploy damper assembly **200/600**, other embodiments may omit the use of a damper assembly. For example, some embodiments may deploy a single recoil spring, with its forward end seating on a surface of a slide plug and its rearward end seating on a surface of a guide rod head. Operating and capturing structures and methods in such embodiments preferably may be configured consistently with those depicted in FIG. 1-FIG. 10 or FIG. 11-FIG. 22, although other structures and methods and combinations thereof may be deployed.

(39) In some alternate embodiments, a guide rod plug retainer may be fixed to a guide rod forward end. In such embodiments, disassembly of the recoil system may be provided by deploying detachable means for securing the guide rod head to the rearward end of the guide rod. For example, the rearward end of the guide rod may be provided with external threads engageable with internal threads of a boring in the guide rod head. Alternatively, the rearward end of the guide rod may be provided with a boring having internal threads engageable with threaded fastener configured to pass through a boring in the guide rod head and configured with a head sized to retain the guide rod head to the guide rod when the fastener is tightened in the guide rod boring. In some of these alternate embodiments, the guide rod, the guide rod head, or both may be configured with index means that maintain a specific orientation of the guide rod with the guide rod head, for example, interfitting notches such as guide rod forward end index means **554** and plug retainer index means **574**. In yet other embodiments in which the ability to disassemble the recoil system is not desired,

the guide rod, guide rod head, and plug retainer may be permanently joined.

(40) After appreciating this disclosure, those of skill in the art will recognize that the steps of the various methods, processes, and other techniques disclosed herein need not be performed in any particular order, unless otherwise expressly stated or logically necessary to satisfy expressly stated conditions or circumstances. In addition, after appreciating this disclosure, those skilled in the art will recognize that other embodiments may have a variety of different forms of devices and systems, and that various changes, substitutions, and alterations may be made without departing from the spirit and scope of this disclosure. The described embodiments are illustrative only and are not restrictive, and the scope of this disclosure is defined solely by the following claims and any further claims in this application or any application claiming priority to this application.

Claims

1. A recoil system for a firearm comprising: a slide plug comprising a first catch means and configured to interfit in a complementary boring in a slide spring tunnel of the firearm; and a guide rod having a forward end, the guide rod comprising a plug retainer disposed at the forward end, and the plug retainer comprising a second catch means; with the first catch means and the second catch means configured compatibly to interfit; and with the recoil system having a partially compressed configuration in which the guide rod is tilted with respect to the slide plug, and the first catch means and the second catch means interfit.
 2. The recoil system of claim 1 in which the slide plug comprises an articulation bevel disposed along a rearward end of the slide plug.
 3. The recoil system of claim 2 in which the slide plug comprises a support shelf and the plug retainer comprises an inner face, with the support shelf in contact with the inner face when the recoil system is in the partially compressed configuration.
 4. The recoil system of claim 2 in which the first catch means comprises a protrusion.
 5. The recoil system of claim 2 in which the second catch means comprises a protrusion.
 6. The recoil system of claim 2 in which the first catch means comprises a portion of a forward edge of the slide plug and an upper outer face of the slide plug.
 7. The recoil system of claim 2 in which the second catch means comprises a tab.
 8. The recoil system of claim 2 in which the second catch means comprises a slot.
 9. The recoil system of claim 2 in which the plug retainer is attachable to and detachable from the guide rod.
 10. The recoil system of claim 9 further comprising attachment means for attaching the plug retainer and the guide rod.
 11. The recoil system of claim 10 in which the attachment means comprise a fastener.
 12. The recoil system of claim 11 further comprising index means for holding the plug retainer in a vertical orientation with respect to the slide plug.
 13. The recoil system of claim 12 in which the index means comprise notches having a complementary interfitting configuration.
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