United States Patent [19]

Into et al.

[11] **3,771,415**

[45] **Nov. 13, 1973**

[54] **RIFLE CONVERSION ASSEMBLY**

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[22] Filed: **Feb. 7, 1972**

[21] Appl. No.: **224,208**

[52] **U.S. Cl.** ..... **89/16,** 42/25, 42/49 A, 89/29, 89/128, 89/197, 89/198

[51] **Int. Cl.** **F41c 21/12**

[58] **Field of Search** ..... 42/77; 89/14 R, 16, 89/29, 128, 194, 197, 198, 199

[56] **References Cited**

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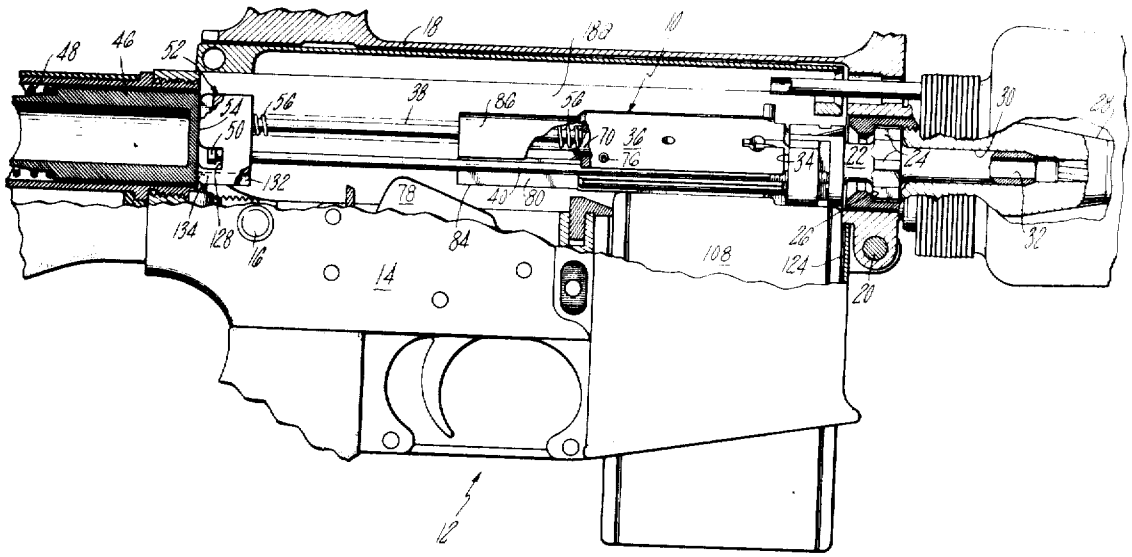
[57] **ABSTRACT**

An assembly is provided for converting a firearm of standard caliber to one of a smaller caliber and includes a conversion chamber adaptor with a bolt mounted for movement between recoil and battery positions. A backplate damper assists in maintaining the operating components in assembly and absorbs recoil impact energy of the recoiling mass upon firing of the weapon. When the conversion assembly is installed in a weapon having a buffer disposed rearwardly of its chamber, the backplate damper additionally serves to transmit that energy to the buffer.

8 Claims, 5 Drawing Figures



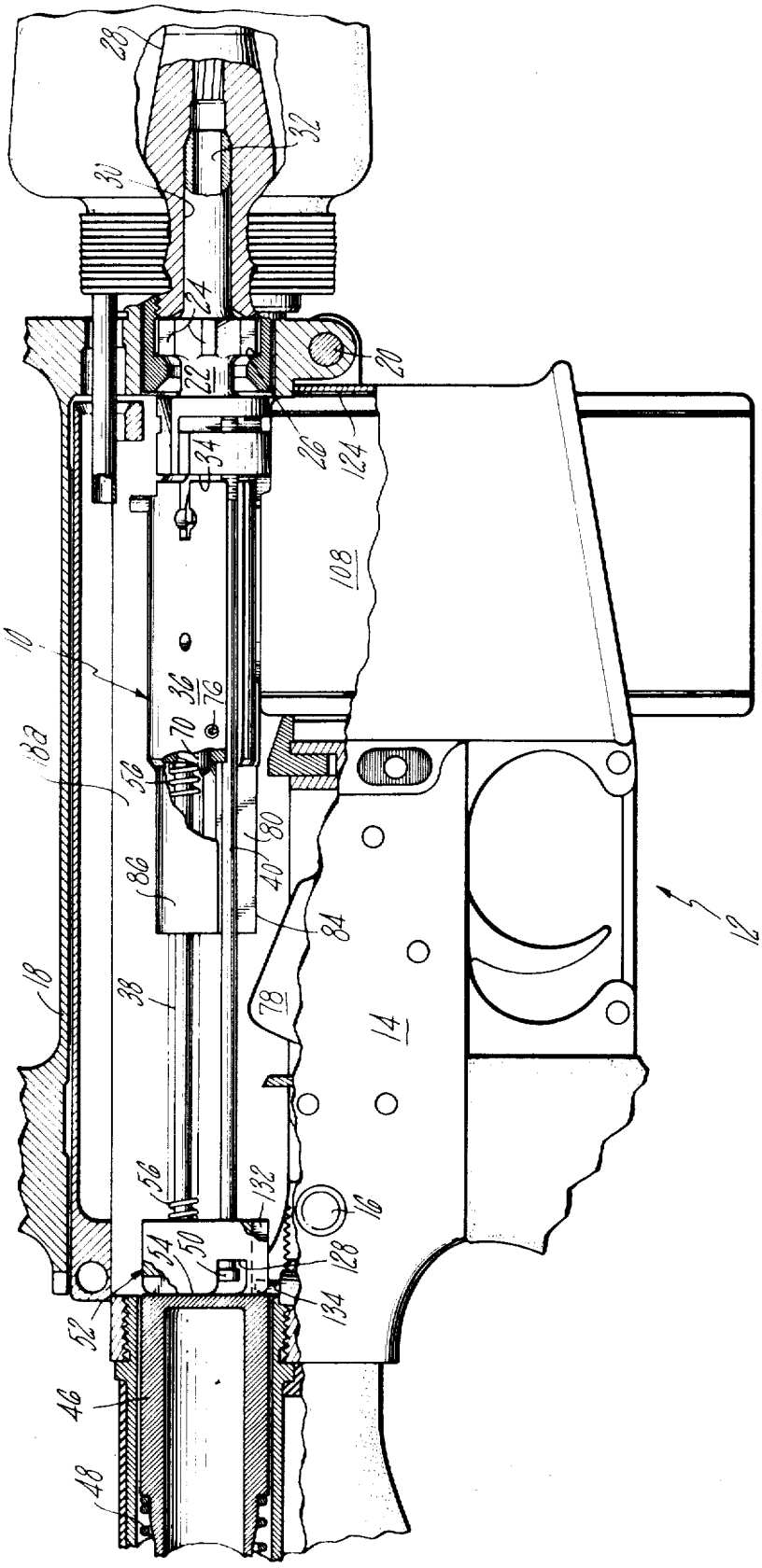

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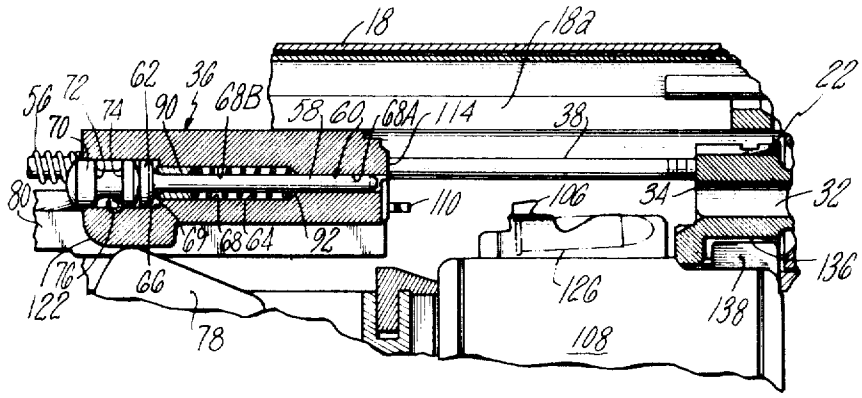
FIG. 1

FIG. 2



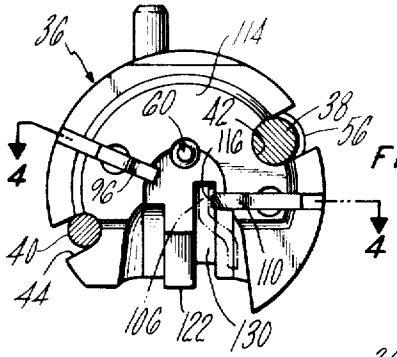


FIG. 3

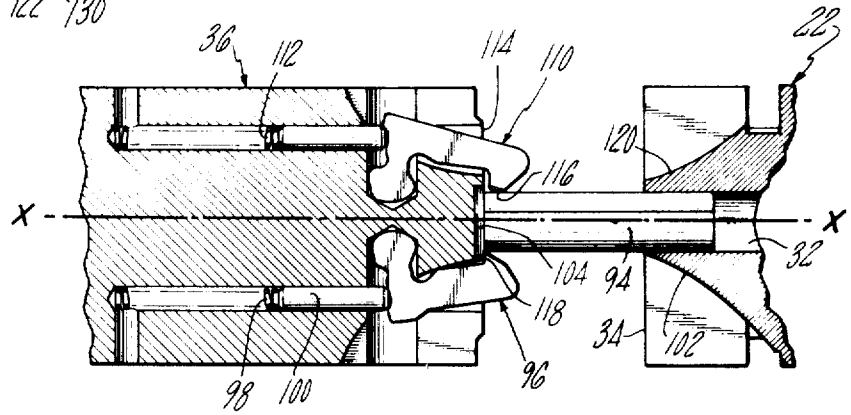


FIG. 4

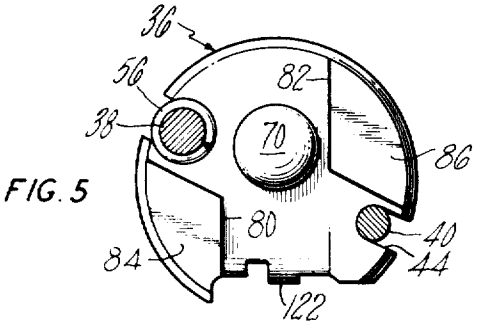


FIG. 5

RIFLE CONVERSION ASSEMBLY

This invention generally relates to gas operated firearms and particularly to a conversion assembly for converting a firearm to fire smaller size ammunition.

A primary object of this invention is to provide a new and improved conversion assembly of a compact, rugged construction which may be quickly and easily manufactured at relatively low cost and which is suited for converting standard weapons such as rifles to fire a relatively inexpensive bullet of smaller caliber for training purposes and the like.

Another object of this invention is to provide a new and improved conversion assembly featuring a combination backplate and damper device which not only assists in maintaining the conversion components in assembly but also absorbs and transmits bolt recoil impact energy to a buffer of the firearm in which the assembly is installed.

A further object of this invention is to provide a conversion assembly of the type described having a new and improved cartridge ejector and extractor arrangement.

Another object of this invention is to provide such a conversion assembly having a new and improved firing pin arrangement particularly suited to minimize any tendency of hammer blows to weaken or fracture thin portions of the firing pin shank. Included in this object is the aim of permitting a relatively large fillet radius between the shank and an enlarged head of the firing pin to further minimize undesired failures and at the same time to eliminate any spreading of its return spring coils and binding of the pin.

Other objects will be in part obvious and in part pointed out in more detail hereinafter.

A better understanding of the objects, advantages, features, properties and relationships of this invention will be obtained from the following detailed description and accompanying drawings which set forth an illustrative embodiment and is indicative of the way in which the principle of this invention is employed.

In the drawings:

FIG. **1** is a fragmentary side elevational view, partly broken away and partly in section, of a rifle with a conversion assembly incorporating this invention shown installed in the rifle and illustrated in a battery positipn;

FIG. **2** is a side view, partly broken away and partly in section, showing certain details of a bolt and modified magazine of the conversion assembly of FIG. **1** illustrated in a recoil position;

FIG. **3** is an enlarged view, partly in section, showing a front face of the bolt;

FIG. **4** is an enlarged view, partly broken away and partly in section, of the bolt taken generally along lines **4—4** of FIG. **3** and shown in an intermediate recoiling position relative to a conversion chamber adaptor; and

FIG. **5** is an enlarged view, partly in section, showing a rear face of the bolt.

Referring now to the drawings in detail, a preferred embodiment of this invention is shown incorporated in a conversion assembly generally designated **10**. It will be understood that while the conversion assembly is shown installed in a gas operated automatic rifle **12** for purposes of illustration, the conversion assembly **10** of this invention is readily adapted for use in other firearms of a magazine fed, gas operated type which fire from closed bolt position.

To convert the illustrated rifle **12** to fire ammunition of a smaller caliber in the rifle **12** which is chambered for a larger, more expensive caliber bullet, the conversion assembly **10** is installed after a standard bolt carrier group (not shown) of the rifle **12** has been removed. This is accomplished by simply removing the standard rifle magazine from lower receiver **14**, pushing out a takedown pin **16** interconnecting the lower receiver **14** to upper receiver **18** and swinging the lower receiver **14** downwardly about pivot pin **20**. The standard bolt carrier group may then be withdrawn rearwardly from the upper receiver **18** of the opened weapon and the conversion assembly **10** may be installed.

To facilitate such installation and to ensure ease in removing and otherwise handling the conversion assembly **10** without requiring any loose parts, detents, thumb screws, etc. normally associated with devices of this type, the replacement components to be substituted for the standard bolt carrier group to effect the desired conversion are designed as an integral one-piece unit.

This unit includes a conversion chamber adaptor **22** having suitable lugs **24** engageable with conventional bolt locking lugs **26** on a breech end of barrel **28** upon inserting and rotating the adaptor **22** within rifle chamber **30** to lock the adaptor **22** in operative position. (An upper adaptor lug preferably engages an interior receiver wall **18*a*** for guiding the assembly **10** during its installation and removal.) Upon adaptor **22** being moved home into the rifle chamber **30**, e.g., the assembly **10** is rotated and an upper lug is angularly moved into a generally vertical position with the adaptor lugs **24** lockingly engaged with the bolt locking lugs **26** of the rifle chamber **30**. The adaptor **22** has a chamber **32** extending axially forwardly of its rear face **34**, and the chamber **32** is bored for a caliber, such as a 0.22 long rifle, e.g., which is smaller than the standard caliber of rifle **12**.

A bolt **36** is supported for reciprocating movement between a battery position (shown in FIG. **1** with the bolt **36** engaging rear face **34** of adaptor **22**) and a rear recoil position (FIG. **2**) and is supported for such movement on a pair of guide rods **38, 40** received in exposed longitudinally extending grooves **42, 44** of generally "U" shaped cross-section formed in generally diametrically opposed sides of the bolt **36**, preferably in a plane disposed at an angle to the horizontal as best seen in FIGS. **3** and **5**. The guide rods **38, 40** are suitably fixed to a rear portion of adaptor **22**, as by the illustrated threaded connection, and extend axially rearwardly from the adaptor **22** to a position adjacent a buffer **46** of the rifle **12**. The buffer **46** is reciprocably mounted in a tubular body of the lower receiver **14** and is biased forwardly by a spring **48** into a normal position illustrated in FIG. **1**. In the specifically illustrated embodiment, guide rods **38, 40** terminate in radially enlarged heads as seen at **50** in FIG. **1** which is disposed in forwardly spaced adjacent relation to the buffer **46** within the confines of a backplate damper **52**. As fully described below, backplate damper **52** is seated on a front face **54** of the buffer **46**, and backplate damper **52** serves to engage the recoiling bolt **36** for establishing its recoil position (FIG. **2**). A coil compression action spring **56** is provided guidance and support on the guide rod **38** and normally maintains the backplate damper **52** bottomed against the buffer face **54** while

urging the bolt 36 into its battery position in engagement with the rear face 34 of the conversion chamber adaptor 22.

A longstanding problem encountered in firearm bolts such as the one illustrated in this embodiment concerns the desirability to provide a relatively large fillet radius at the juncture of the shank 58 of the firing pin 60 (FIG. 2) and its enlarged rear flange or head 62 to minimize any sharp corners which may otherwise result in the shank 58 being broken off from the flange 62 under repeated hammer impact which imposes certain bending moments on the reduced cross-sectional portion of the pin 60. Nonetheless, when the juncture between the shank 58 and the flange 62 is formed with a large fillet radius, end coils of the return spring 64 adjacent the juncture tend to spread and bind up the pin 60 particularly between the pin 60 and rear maximum diameter portion 66 of the firing pin passageway 68. It will be understood that the forward limit of firing pin movement is established by engagement of its rear flange 62 with shoulder 69 in the passageway 68.

To overcome these problems, the illustrated embodiment shows a three-piece firing pin arrangement in FIG. 2 wherein the firing pin 60 is mounted directly in front of the striker 70 which is received in maximum diameter portion 66 of the passageway 68 for limited movement between forward and rear operative limit positions. The forward and rear operative limit positions of striker 70 are determined by engagement of the striker 70 with the firing pin 60 in its forward limit position and engagement of striker shoulder 74 with a fixed retaining pin 76 between shoulders 72, 74 of striker 70. Upon impact of hammer 78, after a full drop between opposed vertical walls 80, 82 (FIG. 5) of rearwardly extending longitudinal shoulders 84, 86 of the bolt 36, the pin 60 is driven forwardly from its illustrated rear position to its forward position wherein the tip of the pin 60 protrudes outwardly of a forward reduced portion 68A of passageway 68 to detonate a primer of a chambered cartridge and fire its bullet.

A relatively large fillet radius is desirably provided at the juncture of firing pin shank 58 and flange 62, without the undesired tendencies of the end coils of return spring 64 spreading within the passageway 68, by virtue of a sleeve 90 fitted in concentric relation about a rear portion of shank 58. Sleeve 90 presents an annular forwardly facing wall serving as a seat for an end of return spring 64 which is thereby positively confined within intermediate passageway portion 68B. The opposite end of return spring 64 fits against a bevelled shoulder 92 within the bolt 36 at a juncture between the intermediate passageway portion 68B and the forward reduced portion 68A of passageway 68.

Upon firing, the reaction force of gases formed upon explosion of the chambered round drive bolt 36 rearwardly. Automatic extraction and ejection of empty cartridge cases such as at 94 in FIG. 4, through an ejection port, not shown, is effected by a simplified but significantly compact, rugged arrangement during rearward recoil of bolt 36. An extractor member or claw 96 is pivotally mounted in bolt 36 and urged inwardly toward its major longitudinal axis X—X by an extractor spring 98 biasing a plunger 100 forwardly against a heel of the claw 96, whereby during colt recoil, claw 96 rides down a ramp surface 102 within the conversion chamber adaptor 22 and engages a rim 104 of the spent cartridge case 94 to withdraw it from the adaptor chamber 32.

During continued bolt recoil, the case 94 emerges from adaptor chamber 32 and the base of the case 94 engages an ejection member or lug 106 of magazine 108, whereupon an ejector assist member of paw 110 throws the empty case 94 out the ejection port under the force of its plunger spring 112 which is biased as best seen in FIG. 4 in a manner similar to that shown in connection with the claw 96. The pawl 110 protrudes forwardly of bolt face 114 and provides a cartridge wall engaging portion 116 which is positioned a discrete distance beyond the cartridge rim engaging portion 118 of the claw 96 such that, during recoil, the spring loaded pawl 110 rides down ramp surface 120 in the adaptor 22, engages the wall of the spent case 94 and throws it out at a selected angle through the ejection port when the cartridge base engages the cooperating magazine ejection lug 106.

In this respect, the ejection lug 106 is located adjacent the path movement of the pawl 110, and the pawl 110 is mounted in a predetermined position relative to the extractor claw 96 and the ejection port to ensure a proper angle of ejection. In the specific illustrated embodiment, the pawl 110 is supported for pivotal movement in a generally horizontal plane extending axially of the bolt 36 with the path of pivotal movement of the extractor claw 96 lying in an axial plane extending at an angle of about 22 ½° to the horizontal to eject cartridge cases over the extractor claw 96 and out the ejection port with an upward thrust in the embodiment illustrated.

As the bolt 36 is driven back toward its recoil position, the compression action spring 56 coiled about the guide rod 38 is loaded, as spring 56 absorbs part of the recoil energy, and the hammer 78 is returned to its illustrated cocked position upon being engaged by an underlying shoulder 122 on the recoiling bolt 36. When the bolt face 114 clears the magazine 108, which is suitably modified to be installed within the magazine well 124 of lower receiver 14 for storing and feeding rounds of a desired smaller caliber, a magazine follower spring, not shown, feeds a live cartridge into ready position (as seen in broken lines at 126 in FIG. 2) to be picked up by the bolt 36 during its return forward movement and to be chambered in the adaptor 22 for firing.

To minimize rebound and repeatedly absorb high impact loads responsive to firing and to also effect a smooth counter recoil movement to the bolt 36 under the bias of the compressed action spring 56 with minimal bolt bounce at battery impact, the backplate damper 52 is mounted on the guide rods 38, 40 at the rear of the conversion assembly 10. This damper not only absorbs recoil impact energy when the recoiling mass strikes the damper 52, but additionally transmits that energy to the rifle buffer 46 and effectively minimizes impact energy return to bolt 36. Accordingly, in accordance with this invention, the damper 52 is seated against the buffer 46 and is supported for limited movement on the guide rods 38, 40 with the damper 52 normally urged forwardly a predetermined distance from its rear limit position by the buffer 46 when bolt 36 is in battery. As best seen in FIG. 1, the extent of damper movement is limited by a clearance gap between abutment walls of rod receiving wells such as at 128 and the heads 50 of the guide rods 38, 40 which establish a rear limit position for the damper 52. It has been found that

a clearance of, say, 0.080 to 0.100 inch provides satisfactory damping of the recoiling mass and subsequent transmission of its energy to the rifle buffer **46** to bring the bolt **36** to a substantially dead stop for a smooth return motion under the bias of the loaded action spring **56**. As the bolt **36** moves forwardly, its face **114** picks up a cartridge such as at **126** from the magazine **108** and chambers the round. The ejection lug **106** on magazine **108** will be seen to be received within a longitudinally extending groove **130** on the bottom surface of the bolt **36** (FIG. 3). As the bolt **36** moved home into battery position, the claw **96** and ejector assist pawl **110** are biased radially outwardly upon their engaging ramp surfaces **102** and **120** in adaptor **22** and the conversion assembly **10** is conditioned for firing the next round.

In addition to serving as both a backplate and a damper, member **52** additionally has a lug receiving locating slot **132** which cooperates with a buffer catch lug **134** in lower receiver **14** to maintain conversion assembly **10** in operative position. A similar cooperating slot and lug arrangement is provided at the forward end of the assembly (FIG. 2) wherein a bottom surface of adaptor **22** has a longitudinally extending slot **136** which receives an upstanding lug **138** at the front of the top wall of magazine **108** to additionally restrain the installed conversion assembly **10** against undesired angular movement relative to receiver **14**. Moreover, hammer movements additionally are of assistance should any minor misalignment of bolt **36** relative to its guide rods **38, 40** occur, for the longitudinally extending shoulders **84, 86** on the rear of bolt **36** would then be engaged and cammed back into proper position by hammer **78** during its movement between cocked and firing positions.

A conversion assembly **10** of the type disclosed will be seen to be quickly installed and easily removed from a firearm with which it is being used. To remove the conversion assembly **10**, the rifle **12** shown in the specifically illustrated embodiment need only be opened, after the magazine **108** has been removed, and the conversion assembly **10** is then rotated as a unit to disengage its adaptor lugs **24** from the breech end of barrel **28** whereupon the entire conversion assembly **10** is detachable as an integral unit. Moreover, the conversion assembly **10** of this invention may be economically manufactured and, due to its simplified but rugged construction, is particularly suited for extended use with minimum service requirements.

As will be apparent to persons skilled in the art, various modifications, adaptations and variations of the foregoing specific disclosure can be made without departing from the teachings of the present invention.

We claim:

1. A firearm conversion assembly detachably insertable into a chamber of a firearm receiver upon removal of its standard bolt means for converting the firearm to fire ammunition of a caliber smaller than its standard caliber and comprising a conversion chamber adaptor insertable into the firearm chamber in fixed relation thereto, a bolt, a backplate damper, detachable mounting means releasably mounting the adaptor, bolt and backplate damper in a unitary assembly and including a guide rod detachably connecting the bolt and the backplate damper in assembled relation and supporting the bolt and the backplate damper on the guide rod, the bolt and the backplate damper being reciprocable on the guide rod with the bolt movable between a forward battery position in engagement with the conversion adaptor and a rear recoil position, the guide rod establishing a rear limit position for the backplate damper and cooperating therewith in establishing the rear recoil position of the bolt, and an action spring supported on the guide rod with opposite ends of the spring seated on the bolt and the backplate damper, the spring urging the bolt forwardly toward battery position and urging the backplate damper toward its rear limit position, the backplate damper being engageable with the bolt and serving to absorb recoil impact energy of the recoiling mass when the bolt moves from battery to recoil positions.

2. The assembly of claim **1** in combination with a firearm having a buffer engageable with the backplate damper upon installation of the conversion assembly into the firearm chamber, wherein the backplate damper is urged a predetermined distance forwardly of its rear limit positions by the firearm buffer when the bolt is in battery position for minimizing rebound of the bolt during its movements between battery and recoil positions.

3. The assembly of claim **1** wherein the backplate damper includes a lug receiving locating slot for locating and retaining the conversion assembly in operative position relative to the firearm receiver.

4. The assembly of claim **3** further including a modified conversion magazine having an upstanding lug, the conversion adaptor having a bottom surface with a lug receiving locating slot which cooperates with the magazine lug, upon mounting the magazine in the firearm receiver, for locating and retaining the conversion ssembly in operative position relative to the firearm receiver.

5. The assembly of claim **1** wherein the bolt is an elongated member having an axially extending firing pin passageway, a firing pin is received in the passageway for reciprocating movements between forward and rear positions, a hammer actuated striker is mounted in the bolt for movement between forward and rear operative limit positions, a return coil spring is concentrically received in the passageway about the firing pin for urging it toward its rear position and biasing the striker toward its rear limit position for hammer engagement, and a sleeve is received in the passageway surrounding the firing pin and having an annular front wall serving as a return spring seat.

6. The assembly of claim **1** wherein the bolt is an elongated member carrying a cartridge rim-engaging extractor and cartridge wall-engaging ejector assist member, the extractor and the ejector assist member each being supported on the bolt for pivotal movement toward and away from the major longitudinal axis of the bolt, spring means in the bolt normally biasing the extractor and the ejector assist member toward the central longitudinal axis of the bolt, the conversion adaptor having a rear face with a cartridge chamber extending axially forwardly therefrom, and first and second ramp surfaces formed in the adaptor and diverging from the rear face of the conversion adaptor radially outwardly of its chamber for camming the extractor and ejector assist member radially outwardly when the action spring moves the bolt into battery in engagement with the rear face of the conversion adaptor.

7. A firearm conversion assembly detachably insertable into a chamber of a firearm receiver upon removal

of its standard bolt means for converting the firearm to fire ammunition of a caliber smaller than its standard caliber and comprising a conversion chamber adaptor insertable into the firearm chamber in fixed relation thereto, a bolt, a backplate damper, mounting means including a pair of guide rods threadably fixed to the adaptor and supporting the bolt and the backplate damper for reciprocable movement, the bolt being reciprocable between a forward battery position in engagement with the conversion adaptor and a rear recoil position, at least one of the guide rods establishing a rear limit position for the backplate dampler and cooperating with the backplate damper in establishing the rear recoil position of the bolt, an action spring mounted on one of the guide rods between the bolt and the backplate damper urging the bolt forwardly toward battery position and urging the backplate damper toward its rear limit position, the backplate damper being engageable with the bolt and serving to absorb recoil impact energy of the recoiling mass when the bolt moves from battery to recoil positions, the guide rods detachably securing the conversion assembly components in an integral unit for quick and easy installation and removal relative to the firearm receiver.

8. A firearm conversion assembly detachably insertable into a chamber of a firearm receiver upon removal of its standard bolt means for converting the firearm to fire ammunition of a caliber smaller than its standard caliber and comprising a conversion chamber adaptor insertable into the firearm chamber in fixed relation thereto, an elongated bolt including an axially extending firing pin passageway having concentric passageway portions with a rear maximum diameter portion, a forward reduced diameter portion and an interconnecting portion therebetween of intermediate diameter size, a firing pin in the passageway reciprocable between forward and rear positions, the firing pin having a radially enlarged end flange received in the maximum diameter passageway portion and a shank extending into the forward passageway portion and merging with said end flange with a smoothly contoured fillet radius, a hammer actuated striker received in the rear maximum diameter passageway portion of the bolt for movement between forward and rear operative limit positions, a return coil spring concentrically received in the passageway about the firing pin for urging it toward its rear position and biasing the striker toward its rear limit position for hammer engagement, a sleeve received in the passageway surrounding the firing pin shank and having an annular front wall serving as a return spring seat, the sleeve confining the return spring within the intermediate passageway portion between the front wall of the sleeve and an abutment formed at the juncture between the intermediate and forward passageway portions, mounting means mounting the bolt for reciprocable movement between a forward battery position in engagement with the conversion adaptor and a rear recoil position, a backplate damper supported by the mounting means in a position disposed rearwardly of the bolt, and an action spring between the bolt and the backplate damper urging the bolt forwardly toward battery position, the backplate damper being engageable with the bolt and serving to absorb recoil impact energy of the recoiling mass when the bolt moves from battery to recoil positions.

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