Nov. 19, 1968 F. A. PACHMAYR ETAL 3,411,404

GUN BARREL LOCATING STRUCTURE

Filed Dec. 29, 1966 3 Sheets-Sheet 1

Fig. 4

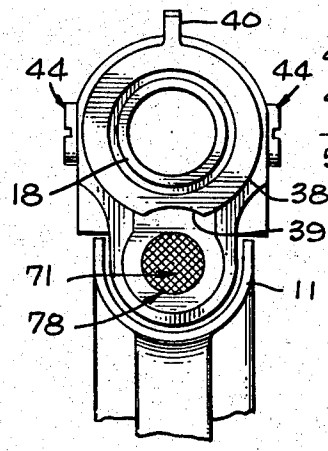


Fig. 5

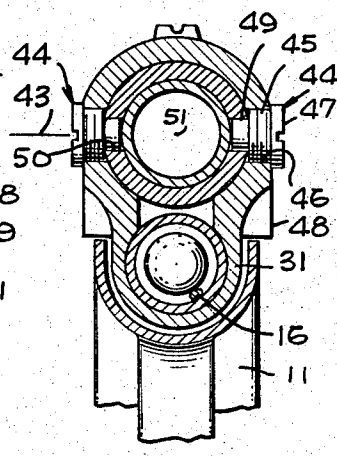


Fig. 6

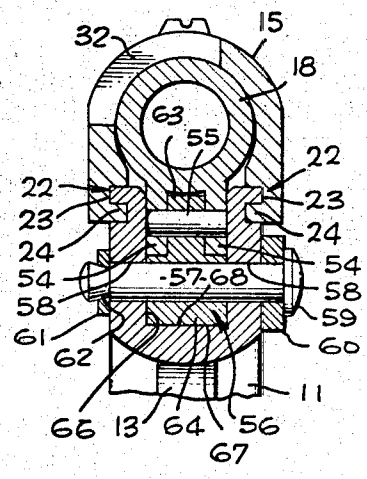
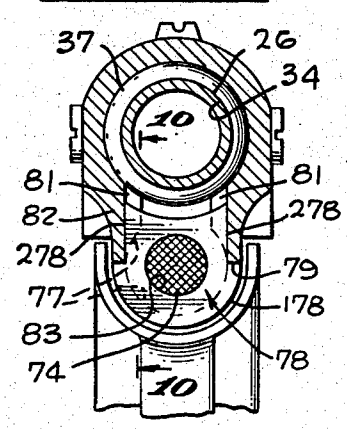


Fig. 8



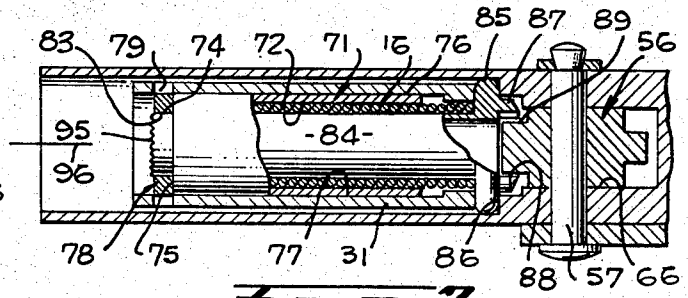
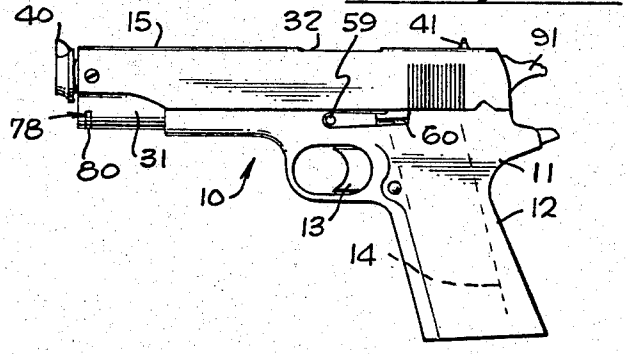


Fig. 7

Fig. 1



FRANK A. PACHMAYR
EDWARD B. MILLER
INVENTORS

BY William P. Green
ATTORNEY

Nov. 19, 1968 F. A. PACHMAYR ETAL 3,411,404

GUN BARREL LOCATING STRUCTURE

Filed Dec. 29, 1966 3 Sheets-Sheet 2

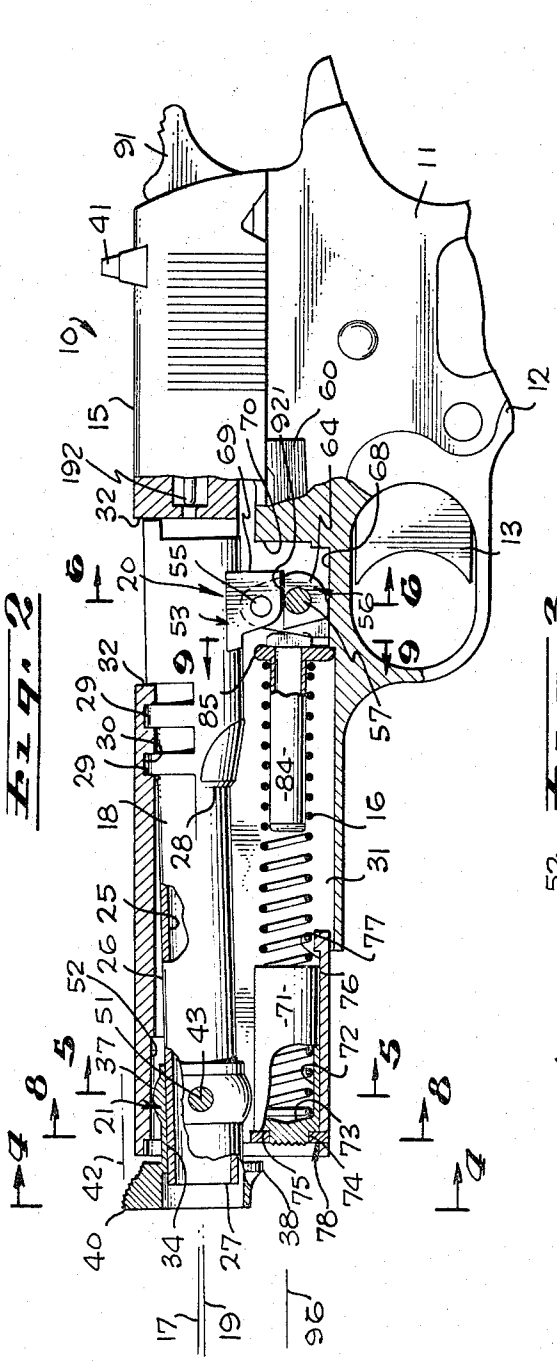


Fig. 2

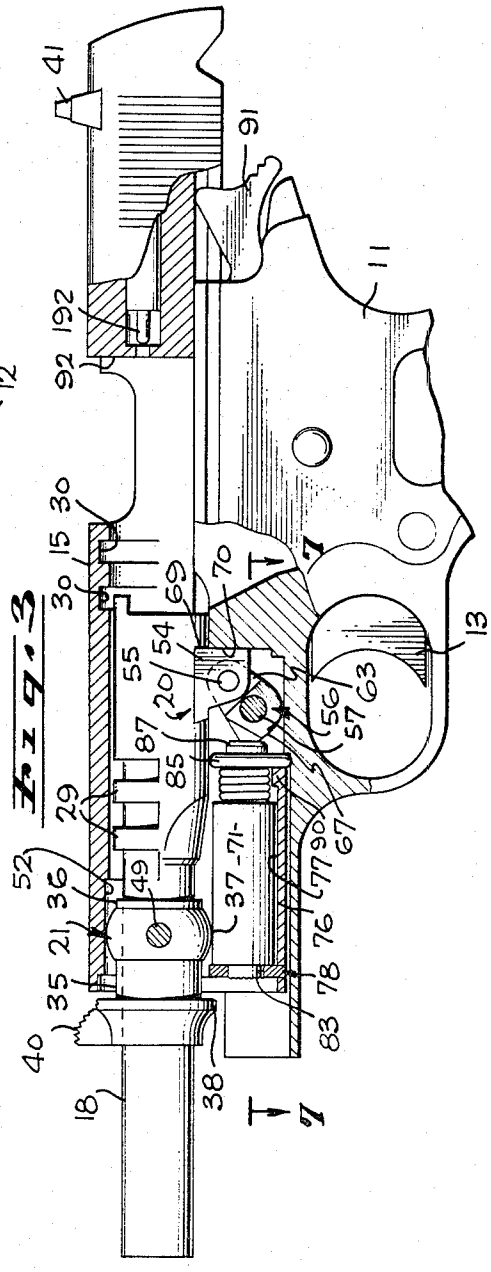


Fig. 3

INVENTORS
FRANK A. PACHMAYR
EDWARD B. MILLER
BY
William P. Green
ATTORNEY

Nov. 19, 1968 F. A. PACHMAYR ETAL 3,411,404

GUN BARREL LOCATING STRUCTURE

Filed Dec. 29, 1966 3 Sheets-Sheet 3

Fig. 9

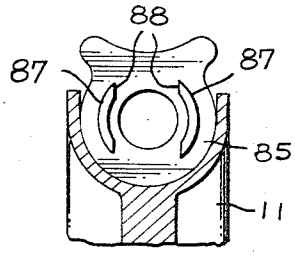


Fig. 10

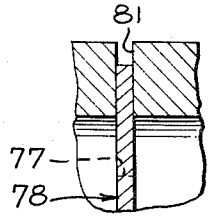
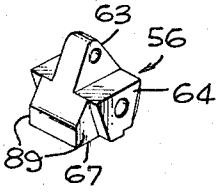


Fig. 11



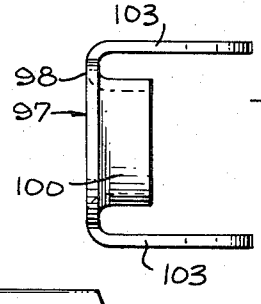


Fig. 16

Fig. 12

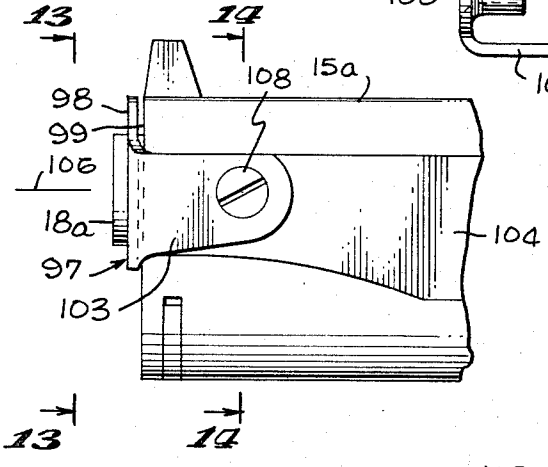
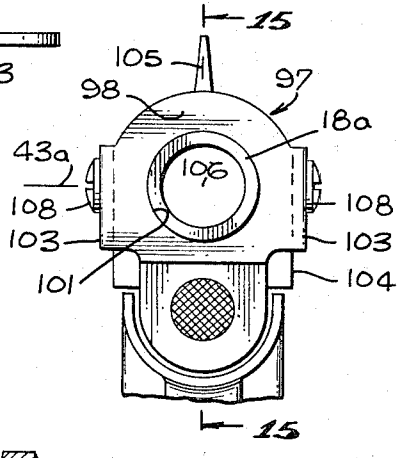


Fig. 13



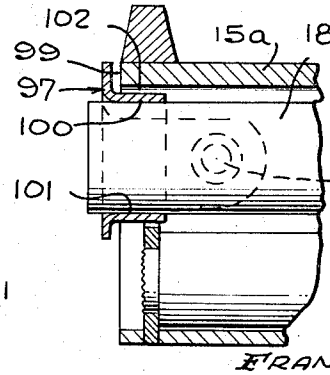
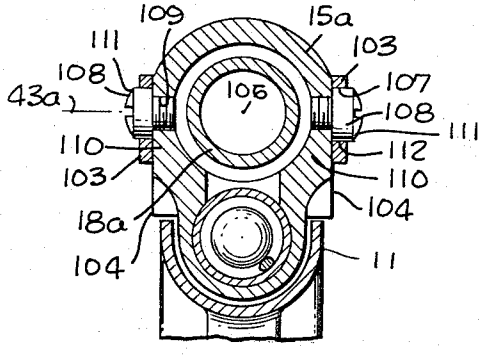


Fig. 15

Fig. 14



INVENTORS
FRANK A. PACHMAYR
EDWARD B. MILLER
BY
William P. Green
ATTORNEY

United States Patent Office

3,411,404
Patented Nov. 19, 1968

3,411,404

GUN BARREL LOCATING STRUCTURE

Frank A. Pachmayr and Edward B. Miller, Los Angeles, Calif., assignors to Pachmayr Gun Works, Inc., Los Angeles, Calif., a corporation of California

Filed Dec. 29, 1966, Ser. No. 605,825
9 Claims. (Cl. 89—163)

ABSTRACT OF THE DISCLOSURE

A gun having a hollow slide which recoils relative to the receiver and barrel of the gun, with the breech end of the barrel being connected to the receiver by a link causing downward swinging movement of that end of the barrel during recoil, and with the forward end of the barrel being located by a bushing which is secured to the slide by a pivotal connection, so that the bushing recoils with the slide relative to the barrel and link, and at the same time pivots relative to the slide to enable the downward movement of the breech end of the barrel.

This invention relates to improvements in the construction of guns, particularly in guns having an action of the type utilized in certain automatic pistols, with the improvements being designed for the purpose of increasing the accuracy of such guns. Certain features of the embodiments illustrated in this application have been disclosed and claimed in U.S. Patent Number 3,207,037, issued Sept. 21, 1965, on "Pistol Barrel Mounting Structure," inventors Frank A. Pachmayr et al.

The guns with which the present invention is concerned are of a type having a slide which reciprocates rearwardly and then forwardly relative to the receiver of the gun during recoil, and relative to the barrel. This recoiling motion may be utilized for effecting removal of a fired cartridge case from the gun, and advancement of a next successive cartridge into firing position. During recoiling movement of the slide, the breech end of the barrel may swing slightly downwardly and rearwardly, to a slightly retracted position for facilitating or enabling the recoiling of the slide.

Guns of the above discussed type as conventionally manufactured are very inaccurate by reason of the ineffectiveness with which the slide, barrel, and receiver are held in alignment with one another, and by reason of the looseness normally encountered in the connections between these various parts, as a result of which there is no reliably and precisely maintained relationship between the gun barrel and the sights of the gun. Consequently, even though a marksman may aim the gun perfectly insofar as the sights are concerned, and may be completely consistent in such aiming, slight changes in the positioning of the barrel relative to the sights after different recoiling operations can introduce errors into the firing of the gun which are completely beyond the control of the user.

The general object of the present invention is to provide improvements in the manner in which the various parts of a gun of the discussed type are interconnected, constructed, and interrelated, for the purpose of accurizing the gun and rendering its aiming characteristics more precise and continually reliable. Certain features of the invention relate to a unique structure for mounting the forward end of the barrel to the slide, in a manner allowing for the discussed slight swinging movement of the barrel relative to the slide during a recoiling motion, but at the same time so locating the barrel as to completely control the accurate alignment of its forward portion when in firing or battery condition. To accomplish this result, we employ a bushing which is disposed about and locates the forward portion

of the barrel, and is slidable axially along the barrel upon recoiling movement, together with a connection which attaches the bushing to the slide for recoiling movement therewith, and for essentially pivotal movement of the bushing relative to the slide during recoil. Preferably, the mentioned connection is of a trunnion type, including two axially aligned pivotal connections at opposite sides of the barrel, connecting the bushing to the slide for the desired pivotal movement.

Additional features of the invention relate to the manner in which the breech end of the barrel is connected to the receiver for its slight recoiling movement, preferably by a link structure having a novel interrelationship with the receiver acting to precisely predetermine the extent of the swinging movement of the barrel as it returns to firing position.

To further enhance the aiming accuracy of the gun, we in one form of the invention desirably connect the forward sight of the gun directly to the bushing, rather than to the slide, to thus completely eliminate any change in relationship between that forward sight and the barrel.

The recoiling movement of the slide may be resisted yieldingly by a coil spring. Another feature of the invention resides in a novel arrangement for transmitting the forward forces exerted by this spring to the slide, by means of a unique retaining element which may be mounted to the slide for bodily sliding movement essentially transversely of the barrel and between predetermined active and inactive positions. This retaining element may engage the forward end of a plug which is urged forwardly by the coil spring.

Still another feature of the invention has to do with the formation of the spring and other parts in a manner such that, in the full recoil position of the slide, the motion of the slide is limited by direct metal to metal contact between successive turns of the spring, which in effect converts the spring to a rigid essentially integral stop-structure supplementing the effect of other stop-shoulders in the gun.

The above and other features and objects of the invention will be better understood from the following detailed description of the typical embodiments illustrated in the accompanying drawing, in which:

FIG. 1 is a side view of an automatic pistol constructed in accordance with the invention;

FIG. 2 is a greatly enlarged side view of the pistol, with some elements partially broken away;

FIG. 3 shows the gun in recoil position;

FIGS. 4 ,5 and 6 are views taken on lines **4—4**, **5—5** and **6—6** respectively of FIG. 2;

FIG. 7 is a fragmentary horizontal section taken primarily on line **7—7** of FIG. 3;

FIGS. 8 and 9 are vertical sections taken on lines **8—8** and **9—9** respectively of FIG. 2;

FIG. 10 is an enlarged section on line **10—10** of FIG. 8;

FIG. 11 is a perspective view of the barrel mounting link;

FIG. 12 is a fragmentary side view of a variational type of front bushing structure;

FIGS. 13 and 14 are views taken on lines **13—13** and **14—14** respectively of FIG. 12, and partially broken away;

FIG. 15 is a fragmentary vertical section taken on line **15—15** of FIG. 13; and

FIG. 16 is a plan view of the FIG. 12 bushing.

Referring first to FIG. 1, we have shown at **10** a gun of a well known conventional type to which the features of the present invention may be applied, and in connection with which these features will be discussed. This pistol includes a receiver or main body part **11**, having

a handle 12 and a trigger 13. A magazine represented at 14 is contained within the handle 12, and holds a series of shells which are sequentially fed to firing position and then automatically ejected from the gun upon successive actuations of the trigger. To the upper side of receiver 11, there is movably mounted a slide 15, which is mounted slidably to the receiver for recoiling movement between the battery or firing position of FIGS. 1 and 2, and the full recoil position of FIG. 3, and which is then returned by a spring 16 (FIG. 2) to the FIGS. 1 and 2 position. This rearward and then forward reciprocating movement of the slide is along the front to rear axis designated 17 in FIG. 2.

Contained within the slide, there is a barrel 18, which is approximately aligned with the slide, but whose axis 19 is actually inclined slightly upwardly and rearwardly in the FIG. 2 battery position. During recoil, the breech end of the barrel 18 swings slightly downwardly to the FIG. 3 position, with the movement and positioning of the breech end of the barrel being controlled by a link assembly designated generally by the number 20, and with the forward or muzzle end of the barrel being located by a bushing 21.

The manner in which slide 15 is mounted and guided for its recoiling movement is brought out best in FIG. 6, which illustrates that the receiver has two upper edges 22 forming oppositely directed parallel flanges 23 extending in a front to rear direction, and coacting with inwardly directed parallel flanges 24 formed on the lower edges of slide 15, in a relation such that each of the flanges 23 and 24 is received within a recess or guideway in the other part, to guide the slide for its desired front to rear recoiling movement, while precluding substantial movement in any other direction.

The barrel 18 of course forms essentially a tube, having an inner substantially cylindrical bore or passage 25 centered about axis 19 and open at its rear end to receive a cartridge, and open at its forward end for discharge of the projectile. Externally, barrel 18 has a cylindrical surface 26 extending rearwardly from its forward end 27 to a location 28. Beyond this location, the barrel may enlarge slightly externally, to form a pair of upwardly projecting semi-circular ribs 29 receivable within mating recesses 30 formed in the interior of slide 15. As will be apparent from FIGS. 2, 5 and 6, the slide extends about the upper side of the barrel, and extends downwardly at its opposite sides, and has an enlargement 31 extending downwardly from the forward end of the slide for coaction with recoil spring 16. An opening 32 in the upper side of the slide allows for ejection of the fired cartridge case in the recoil position of FIG. 3.

About the forward cylindrical surface 26 of barrel 18, there is disposed the previously mentioned bushing 21 (FIG. 2), which is tubular and has an inner straight cylindrical surface 34 of a diameter corresponding substantially to the diameter of outer surface 26 of the barrel, and a close enough fit on that surface to accurately locate the barrel relative to the bushing, while still allowing free rearward sliding movement of the bushing relative to and about the barrel to the position of FIG. 3. Externally, the bushing may have outer cylindrical surfaces 35 and 36 centered about the axis 19 of the bushing and barrel, with an enlarged diameter spherically curved outer surface 37 located between surfaces 35 and 36, and centered about a point on axis 19. At its forward end, the bushing may carry an essentially annular enlarged diameter flange 38, which may be cut away arcuately at its underside, at 39 (FIG. 4), and which carries at its upper side a forward sight 40 for aiming the gun. This forward sight coacts with the usual rear sight 41, which may be carried by the rear portion of slide 15, to define an aiming or sighting line 42 which is parallel to or essentially parallel to axis 19 of the barrel and bushing.

Bushing 21 is connected to slide 15 for relative pivotal movement about an axis 43 disposed transversely of the barrel and bushing and their longitudinal axis 19 (FIGS. 2 and 5). For this purpose, we provide two pivot or trunnion elements 44 (FIG. 5), each of which may take the form of a screw having threads 45 centered about axis 43 and connected into threads 46 also centered about that axis and formed in the slide. Each of these screws may have an enlarged head 47 which is tightenable against the vertical outer surface 48 of the slide, and containing a screwdriver slot. Inwardly beyond its threads 45, each screw may have an externally cylindrical reduced diameter portion 49, centered about axis 43, and received within a correspondingly dimensioned cylindrical opening 50 formed in one side of bushing 21, to mount the bushing for the desired pivotal movement about axis 43. The fit between surfaces 49 and 50 should be close, to prevent any relative motion between the bushing and elements 44, so that the bushing can only move pivotally. As will be apparent from FIGS. 2 and 5, the outer spherical surface 37 of the bushing is centered about a point 51 located at the intersection of axes 19 and 43, and is of a diameter corresponding to the diameter of an engaged inner cylinsurface 52 formed in the slide, so that the interengagement of surfaces 37 and 52 coacts with trunnion elements 45 in preventing upward, downward or lateral movement of the bushing relative to the slide.

At its breech end, barrel 18 has a downwardly projecting connector portion 53, which is integral with the rest of the barrel and may form two laterally spaced depending lugs 54 (see FIG. 6), each having the side view configuration illustrated in FIG. 2. Lugs 54 are pivotally connected by a pin 55 to a link 56, which forms with the other related parts the link assembly heretofore referred to generally by the numeral 20, for controlling the movement of the breech portion of the barrel. Link 56 is in turn pivotally connected to receiver 11 by a pin 57 (FIGS. 2 and 6), which extends through and is located by two cylindrical passages 58 formed in opposite sides of the receiver. Pin 57 has an enlarged head 59 at one of its ends, and adjacent the head extends through an opening within the usual slide stop 60, which coacts with the slide to hold it in open or recoil position under certain operating conditions. As will be understood, slide stop 60 is in most guns of the present type integral with pin 57, but in accordance with the teachings of Patent Number 3,207,037, we prefer to form it separately from the pin as shown. At the second side of the receiver, the pin 57 may be held in installed position by means of a retaining snap ring 61, which may be resilient and extend more than half way about pin 57, and be received within an annular groove 62 to retain the pin against removal.

Pins 55 and 57 are disposed about axes which extend transversely of the recoiling axis 17 of the slide, and transversely of axis 19 of the barrel and bushing, though not actually intersecting these axes. Link 56 has an upper portion 63 which extends upwardly between, and is a close fit between, the two depending lugs 54 of the barrel, with pin 55 extending through mating apertures in lugs 54 and end portion 63 of the link to interconnect these parts for the desired relative pivotal movement between the positions of FIGS. 2 and 3. Beneath its portion 63, link 56 may have a widened portion 64. As best seen in FIG. 6, this portion 64 of the link, and the two lugs 54 on the barrel, have parallel planar surfaces at their opposite sides which are spaced in correspondence with the spacing of inner vertical planar surfaces 66 defining the opposite sides of a recess in the receiver within which the link is contained, so that the opposite sides of the link and of lugs 54 simultaneously engage both of the surfaces 66, to effectively confine link 56 and lugs 54 against any lateral movement, longitudinally of pins 55 and 57. Surfaces 66 in the receiver and the engaged surfaces of the link and barrel lugs are of course disposed transversely of pins 55 and 57, and therefore lie in planes which are essentially parallel to axes 17 and 19.

At its underside, and forwardly of the axis of pin **57**, link **56** has a planar undersurface **67**, which in the battery position of FIG. 2 extends directly horizontally and abuts downwardly against a horizontal bottom wall surface **68** formed in the receiver. Thus, this interengagement of surfaces **67** and **68** acts to positively limit the upward and forward movement of the barrel in the FIG. 2 position. In the FIG. 3 position, two rearwardly facing vertical planar surfaces **69** formed on the back sides of lugs **54** engage a vertical planar surface **70** formed in the receiver and disposed perpendicular to axis **17**, to prevent any further rearward and downward movement of the barrel. It is also noted that, in the FIG. 2 position of the barrel, pin **55** is desirably located approximately directly above pin **57** (preferably slightly forwardly of a position of exact vertical alignment of the pins). Because the pins are in this approximate vertical alignment, any slight forward or rearward shift which may occur for any reason in the firing position of the barrel can not alter substantially the vertical position of the breech end of the barrel, or the position of barrel axis **19**.

The forward end of helical recoil spring **16** is received within and bears forwardly against a plug **71**, which contains a cylindrical passage **72**, within which the spring is a fairly close fit. The forward end of the plug forms a transverse wall **73** against which the spring bears, and which has a reduced diameter externally cylindrical portion **74** and a forward annular transverse surface **75**. Except at the location of this forward portion **74**, the plug may have an increased diameter external surface **76** which is slidably received and located within a cylindrical passage **77** formed in the downwardly projecting forward portion **31** of the slide. The plug is retained against forward movement relative to the slide, to transmit forward forces of the spring to the slide, by means of a retaining element **78**, which is slidably received within a guideway **79** formed in portion **31** of the slide, and extending vertically or transversely of axis **17**. As will be apparent from FIGS. 2 and 8, element **78** may take the form essentially of a flat plate, which bridges across the passage **77** in the lower portion of the slide, with the guideway **79** in that portion of the slide forming an opening extending across the bottom of the slide at **80**, and forming two parrallel internal guideway grooves **81** extending upwardly within the opposite side portions **82** of the slide portion **31**. The peripheral shape of retaining element **78** is brought out best in Fig. 8, which illustrates the part as having a lower externally semi-circular portion **178** which is received within opening **80** and has its outer semi-circular surface **278** flush with the outer surface **131** of slide portion **31**. Above portion **178**, element **78** has two parallel vertical edges **278** which are slidably received and guided within grooves **81**. Element **78** also has an essentially central opening **83** dimensioned in correspondence with forward reduced diameter portion **74** of plug **71**, to receive that portion of the plug in interfitting relation in a manner locking element **78** against downward removal from the slide.

The rear end of the compression spring **16** is received about a spring guide **84**, having a flange **85** at its rear end against which the spring exerts rearward force. This flange **85** in turn bears against a forwardly facing shoulder **86** formed in and by the receiver, with a portion **87** of the guide projecting rearwardly beyond that shoulder. This portion **87** of the guide is in conventional guns of this general type annular, but in accordance with the present invention is specifically formed to avoid interference with the forwardmost portion of link **56**, and for this purpose portion **87** of the guide **84** is milled to form a vertically extending slot or cutaway as shown at **88** in FIGS. 7 and 9. The forward portion of link **56** is reduced somewhat in width at **89** (FIGS 2, 7 and 11), so that this slightly reduced width portion of the link may move upwardly and downwardly within the slot or cutaway area **88** in guide **84** as the link pivots between the positions of FIGS. 2 and 3.

The rearward recoiling movement of slide **15** is in most guns of the present type limited by engagement of the thickened essentially annular portion **90** (FIG. 3) of the slide with the flange **85** of spring guide **84**. To supplement this motion limiting action, we so dimension the various parts and partcularly spring **16** that, in the fully recoiled position of FIG. 3, the successive turns of the spring are all in direct essentially annular engagement with one another, so that there is direct metal to metal contact (continuously throughout 360 circular degrees) between all of the various successive turns of the spring, and between the end turns and the parts engaged thereby, to thus in effect form through the spring a rigid metal connection between surface **73** at the forward end of plug **71** and the flange **85** of spring guide **84**, to in this way coact with the previously mentioned engagement between portion **90** of the guide and flange **85** in positively limiting the recoiling motion.

To now describe a cycle of operation of the pistol shown in FIGS. 1 to 11, assume that the gun is in the battery condition of FIG 2, and that a loaded magazine has been inserted into the handle of the gun, and that one round has been properly positioned in the breech end of the barrel. With the gun in this condition, the user may aim the gun by means of sights **40** and **41**, and then pull the trigger so that hammer **91** causes firing pin **192** to fire the shell which is in the barrel. The gases of combustion produced in the barrel act through the cartridge case to force slide **15** rearwardly relative to the receiver and barrel to the FIG. 3 recoiled position. During the initial portion of this slide movement, the recoil forces also cause the breech end of the barrel to swing rearwardly and downwardly to its FIG. 3 position, about axis **43**, with this motion of the barrel being limited by engagement of lugs **54** with receiver shoulder **70**. The rearward motion of the slide causes ejection of the fired cartridge case, and enables a next successive round to move into firing position in the barrel, following which spring **16** returns the slide forwardly to its FIG. 2 position, with the forwardly facing vertical shoulder surface **92** of the slide first shifting the cartridge forwardly into the barrel, and then engaging the barrel itself during the final portion of the slide movement to force the barrel forwardly and upwardly from its FIG. 3 position back to its FIG. 2 position, in preparation for the next successive firing operation.

The trunnion mounting of the muzzle end of the barrel very effectively locates that portion of the barrel in precisely predetermined position relative to the slide, when the parts are in the battery condition of FIG. 2, and in spite of the limited pivotal movement permitted between these various parts during recoil. Also, the link **56** and its related parts effectively locate the breech end of the slide, preventing any lateral movement thereof, and precisely predetermining the height of the breech end throughout its complete cycle and in its final position. This final battery position of FIG. 2 is rendered very accurate by limiting the returning movement of the barrel by engagement of the previously discussed shoulder or surface **67** on link **56** with the upwardly facing surface **68** in the receiver. In this connection, it is noted that there is preferably no motion halting interengagement between the link and lugs **54** at the location designated **92'** in FIG. 2, or between any other surfaces except at shoulder **67**, so that the engagement of this shoulder on link **56** with surface **68** may desirably function alone to determine the forwardmost position of the barrel.

When it is desired to dismantle the gun, or for other reasons have access to spring **16**, a person may merely press the reduced diameter forward portion **95** of plug **71** rearwardly out of the opening **83** of retaining element **78**, and far enough to enable the retaining element to be slid downwardly, transversely of the axis **96** of the spring, and

out of the guideway **79**, so that the plug and spring may be withdrawn forwardly from the slide. Bushing **21** may be removed by unscrewing the retaining trunnion elements **44**, and the other parts of the gun may be dismantled in conventional manner.

FIGS. 12 through 16 show a variational type of bushing **97** which may be substituted for the bushing **21** of FIGS. 1 to 11, and which functions as does bushing **21** to accurately locate the forward end of a gun barrel **18***a* and mount that barrel for only predetermined limited pivotal movement relative to a gun slide **15***a* about a transverse axis **43***a* corresponding to axis **43** of FIG. 4. Except with respect to the structure at bushing **97**, and the other features discussed hereinbelow, the gun of FIGS. 12 through 16 may be considered as essentially identical with that of the first form of the invention.

Bushing **97** of FIGS. 12 through 16 is desirably stamped from a single piece of sheet material, preferably high quality sheet steel heat treated after stamping to spring temper. This sheet material is stamped to provide a vertically extending front wall portion **98** of the bushing, which extends vertically in front of and in spaced relation to the plane of vertical end surface **99** of slide **15***a*. At the center of this vertical wall **98**, the sheet material is shaped to provide a rearwardly projecting tubular portion **100** of the bushing, which portion has an inner cylindrical surface **101** corresponding substantially in diameter to the outer cylindrical surface of barrel **18***a*, to guide the bushing for axial sliding movement along the barrel. This tubular portion **100** of the bushing extends rearwardly into the interior of the slide, as seen clearly in FIG. 15, and is spaced radially from the slide at **102** to enable the desired limited pivotal movement of the bushing with the barrel.

At its opposite sides, the sheet material of bushing **97** forms two rearwardly projecting parallel mounting arms **103**, which may be identical and lie in parallel vertical planes, and which abut laterally against the vertical parallel opposite side surfaces **104** formed on slide **15***a*. These side surfaces **104**, and the arms **103**, lie in vertical planes which are parallel to the vertical central plane **105** of the gun extending through axis **106** of the barrel. As will be understood, the abutting engagement of the inner vertical planar surfaces **106** of arms **103** with slide surfaces **104** effectively locates the bushing **97** against lateral movement relative to the slide.

Arms **103** contain two aligned openings **107** (FIG. 14) within which there are received two pivot screws **108** having externally threaded shanks screwed into internally threaded passages **109** formed in the opposite side walls **110** of the slide. Screws **108**, passages **109**, and openings **107** are all centered about transverse axis **43***a*, so that the screws guide arms **103** and the rest of bushing **97** for the desired pivotal movement about that axis. For this purpose, the head **111** of each of the screws **108** has an outer cylindrical surface **112** centered about axis **43***a*, which surface engages in closely fitting bearing relation a correspondingly cylindrical surface **112** of the opening **107** in the associated arm **103**, with surface **112** also being centered axis **43***a*. The forward sight **40** of the gun shown in FIGS. 12 to 15 is typically illustrated as mounted to the forward end of the slide, in essentially conventional manner.

In using the gun of FIGS. 12 to 16, the operation is substantially identical with that previously discussed in connection with FIGS. 1 through 11, except for the difference in structure of the bushing **97**. As in the first form of the invention, this bushing pivots around transverse axis **43***a*, as the bushing and slide recoil rearwardly relative to barrel **18***a*, with this slight pivotal movement of the bushing being sufficient to enable the desired slight rearward and downward swinging movement of the breech end of the barrel during recoil. The spacing of bushing **97** from the forward end surface **99** of the slide and from the inner surfaces of the slide at **102** (FIG. 15) is sufficient to avoid any interference with the desired pivotal movement of the bushing. As in the first form of the invention, the barrel is very effectively located by the bushing, and very accurately and precisely maintained in a desired set position relative to the barrel in the battery position of the slide, to avoid any loss of aiming characteristics of the gun such as occurs in conventional firearms of this same general type in which the forward end of the barrel is only loosely located.

During assembly of the arrangement of FIGS. 12 to 16, the bushing **97** may be placed in its illustrated position about the slide prior to the attachment of screws **108** to the slide, and the screws may then be very easily inserted through openings **107** in arms **103** and screwed into the slide. alternatively, the parts may be assembled in a reverse manner in view of the resilence given to arms **103** by the previously mentioned heat treating of the bushing to spring temper. That is, screws **108** may first be connected to the slide, and the bushing then by applied by spreading its arms **103** sufficiently apart to move them past the screws until openings **107** align with the screws, so that the arms may then move inwardly by their own resilience against the opposite sides of the slide and into interfitting pivotal engagement with the screws.

We claim:

1. A gun including a receiver, a slide mounted for recoiling movement relative to said receiver, a barrel within said slide mounted for slight upward and downward swinging movement of the breech end of the barrel relative to said receiver during said recoiling movement of the slide, a bushing disposed about and locating said barrel and slidable therealong axially of the barrel upon said recoiling movement of the slide, and an aiming sight carried by said bushing.

2. A gun including a receiver, a slide mounted for recoiling movement relative to said receiver, a barrel within said slide mounted for slight upward and downward swinging movement of the breech end of the barrel relative to said receiver during said recoiling movement of the slide, a bushing disposed about and locating said barrel and slidable therealong axially of the barrel upon said recoiling movement of the slide, and a connection between said slide and bushing attaching the bushing to the slide for recoiling movement therewith and for essentially pivotal movement of the bushing relative to the slide upon said slight upward and downward movement of the breech end of the barrel, said connection including means forming a spherically curved radially outer surface on said bushing engageable arcuately with an essentially cylindrical inner surface in said slide.

3. A gun including a receiver, a slide mounted for recoiling movement relative to said receiver, a barrel within said slide mounted for slight upward and downward swinging movement of the breech end of the barrel relative to said receiver during said recoiling movement of the slide, a bushing disposed about and locating said barrel and slidable therealong axially of the barrel upon said recoiling movement of the slide, and a connection between said slide and bushing attaching the bushing to the slide for recoiling movement therewith and for essentially pivotal movement of the bushing relative to the slide upon said slight upward and downward movement of the breech end of the barrel, said connection including two axially aligned horizontally extending screws connected threadedly into said slide at opposite sides of said barrel and bushing and having pivot pin ends projecting horizontally into mating recesses in said bushing to mount the bushing for pivotal movement about a horizontal axis relative to said slide, said connection including also a spherically curved radially outer surface on said bushing engageable arcuately with a cylindrically curved inner surface of said slide.

4. A gun including a receiver, a slide mounted for recoiling movement relative to said receiver, a barrel within said slide mounted for slight upward and downward swinging movement of the breech end of the barrel

relative to said receiver during said recoiling movement of the slide, a bushing disposed about and locating said barrel and slidable therealong axially of the barrel upon said recoiling movement of the slide, a connection between said slide and bushing attaching the bushing to the slide for recoiling movement therewith and for essentially pivotal movement of the bushing relative to the slide upon said slight upward and downward movement of the breech end of the barrel, a rear sight, and a forward sight carried by and projecting upwardly from said bushing and pivotally movable therewith.

5. A gun including a receiver, a slide mounted for recoiling movement relative to said receiver, a barrel within said slide mounted for slight upward and downward swinging movement of the breech end of the barrel relative to said receiver during said recoiling movement of the slide, a bushing disposed about and locating said barrel and slidable therealong axially of the barrel upon said recoiling movement of the slide, and a connection between said slide and bushing attaching the bushing to the slide for recoiling movement therewith and for essentially pivotal movement of the bushing relative to the slide upon said slight upward and downward movement of the breech end of the barrel, said bushing having a first portion extending essentially vertically in front of the slide and having a rearwardly projecting tubular portion about and slidably engaging the barrel, said connection including two arms projecting rearwardly from opposite sides of said first portion adjacent opposite outer side surfaces of the slide, and two pivot pins screwed into said slide at opposite sides of the barrel and received in openings in said arms to mount the bushing for said pivotal movement.

6. A gun including a receiver, a barrel, a hollow slide extending across the top of said barrel and downwardly at its opposite sides, guideway means mounting said slide to the receiver for front to rear recoiling movement relative to said receiver and relative to said barrel, link means near the breech end of said barrel connecting said breech end movably to said receiver in a relation causing slight downward and rearward swinging movement of the breech end relative to the receiver during and as a result of said recoiling movement of the slide, a bushing carried by and within said slide and disposed about and locating said barrel and slidable therealong axially of the barrel upon said recoiling movement of the slide, said bushing having portions slidably engaging both the upper side and underside of said barrel and defining a passage through the bushing within which the barrel is closely but slidably confined, and a pivotal connection between said slide and said bushing attaching the bushing to the slide for recoiling movement therewith relative to said receiver and said barrel and said link means and for pivotal movement of the bushing relative to the slide about an axis disposed transversely of the barrel upon said slight downward movement of the breech end of the barrel.

7. A gun including a receiver, a barrel, a hollow slide extending across the top of said barrel and downwardly at its opposite sides, guideway means mounting said slide to the receiver for front to rear recoiling movement relative to said receiver and relative to said barrel, link means near the breech end of said barrel connecting said breech end movably to said receiver in a relation causing slight downward and rearward swinging movement of the breech end relative to the receiver during and as a result of said recoiling movement of the slide, a bushing carried by and within said slide and disposed about and locating said barrel and slidable therealong axially of the barrel upon said recoiling movement of the slide, and a pivotal connection between said slide and said bushing attaching the bushing to the slide for recoiling movement therewith relative to said receiver and said barrel and said link means and for pivotal movement of the bushing relative to the slide about an axis disposed transversely of the barrel upon said slight downward movement of the breech end of the barrel, said connection including two axially aligned pivotal connections at opposite sides of said barrel connecting said bushing to said slide for pivotal movement about only a predetermined horizontal axis disposed transversely of the bushing and barrel.

8. A gun including a receiver, a barrel, a hollow slide extending across the top of said barrel and downwardly at its opposite sides, guideway means mounting said slide to the receiver for front to rear recoiling movement relative to said receiver and relative to said barrel, link means near the breech end of said barrel connecting said breech end movably to said receiver in a relation causing slight downward and rearward swinging movement of the breech end relative to the receiver during and as a result of said recoiling movement of the slide, a bushing carried by and within said slide and disposed about and locating said barrel and slideable therealong axially of the barrel upon said recoiling movement of the slide, and a pivotal connection between said slide and said bushing attaching the bushing to the slide for recoiling movement therewith relative to said receiver and said barrel and said link means and for pivotal movement of the bushing relative to the slide about an axis disposed transversely of the barrel upon said slight downward movement of the breech end of the barrel, said connection including two axially aligned horizontally extending screws connected threadedly into the slide at opposite sides of said barrel and bushing and having pivot pin ends projecting horizontally into mating recesses in said bushing to mount the bushing for pivotal movement about a horizontal axis relative to said slide.

9. A gun including a receiver, a barrel, a hollow slide extending across the top of said barrel and downwardly at its opposite sides, guideway means mounting said slide to the receiver for front to rear recoiling movement relative to said receiver and relative to said barrel, link means near the breech end of said barrel connecting said breech end movably to said receiver in a relation causing slight downward and rearward swinging movement of the breech end relative to the receiver during and as a result of said recoiling movement of the slide, a bushing carried by and within said slide and disposed about and locating said barrel and slidable therealong axially of the barrel upon said recoiling movement of the slide, and a pivotal connection between said slide and said bushing attaching the bushing to the slide for recoiling movement therewith relative to said receiver and said barrel and said link means and for pivotal movement of the bushing relative to the slide about an axis disposed transversely of the barrel upon said slight downward movement of the breech end of the barrel, said connection including two arms received at opposite sides of said slide, and pivot pins connecting said arms pivotally to the slide.

References Cited

UNITED STATES PATENTS

984,519	2/1911	Browning	89—163 X
2,489,816	11/1949	Reilly	89—163
2,865,255	12/1958	Marsh	89—163

FOREIGN PATENTS

347,573	1/1922	Germany.

BENJAMIN A. BORCHELT, *Primary Examiner.*

S. C. BENTLEY, *Assistant Examiner.*