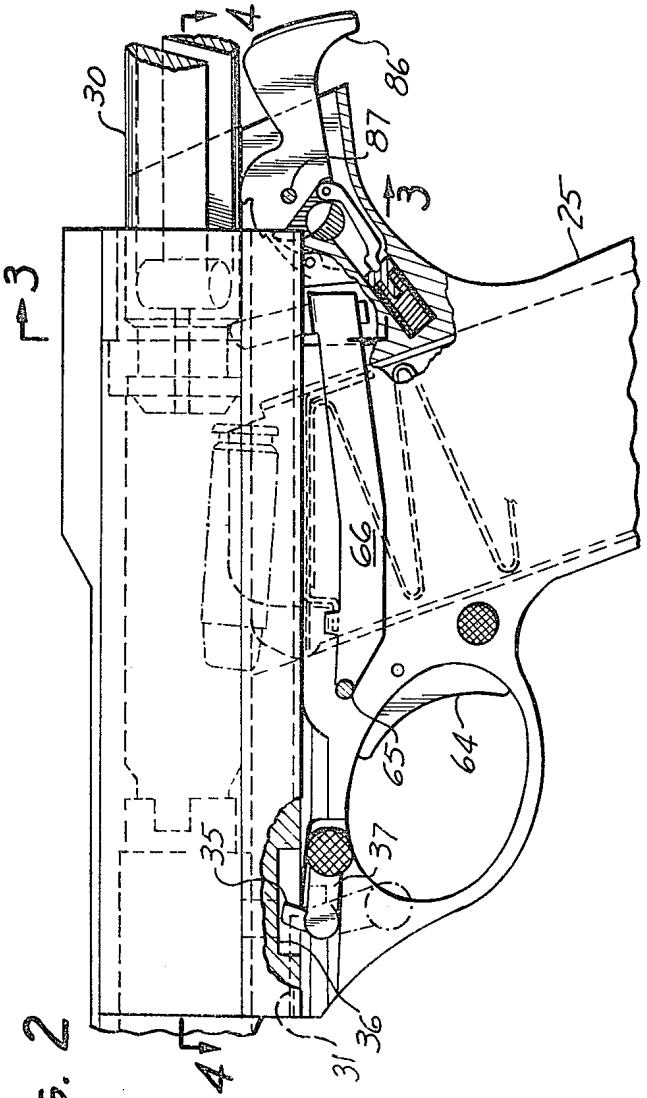
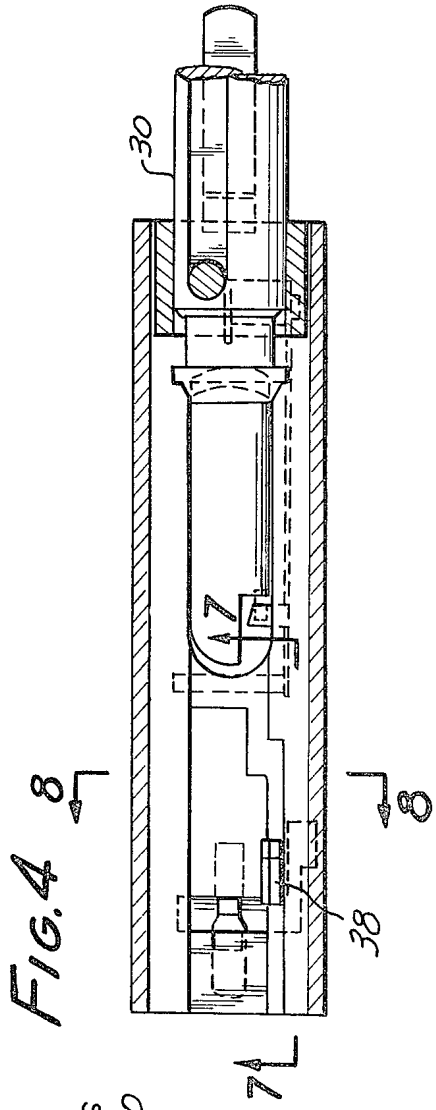


FIG. 2



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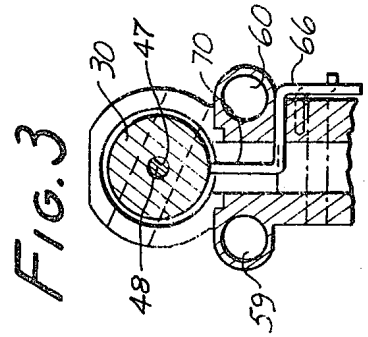


FIG. 3

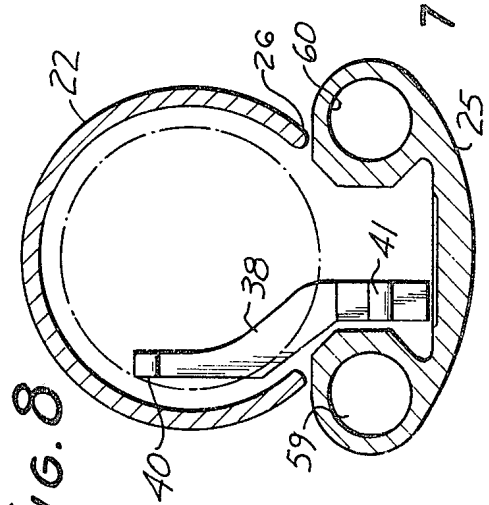


FIG. 8

FIG. 7

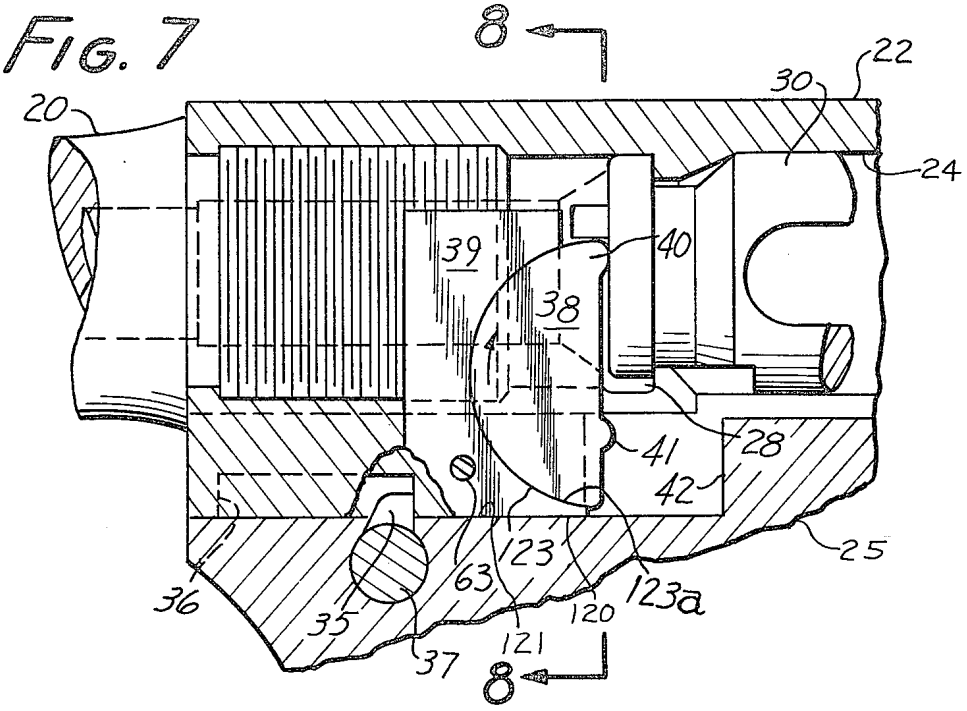


FIG. 11

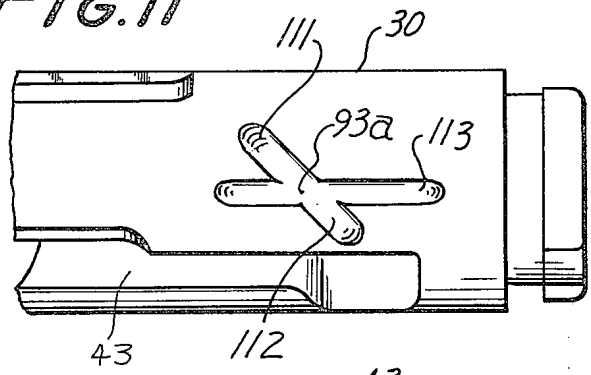
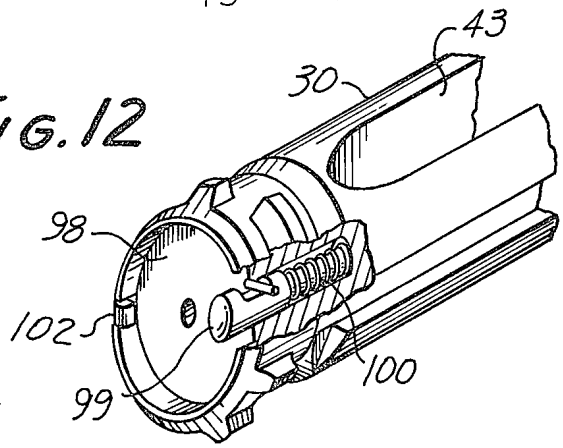


FIG. 12



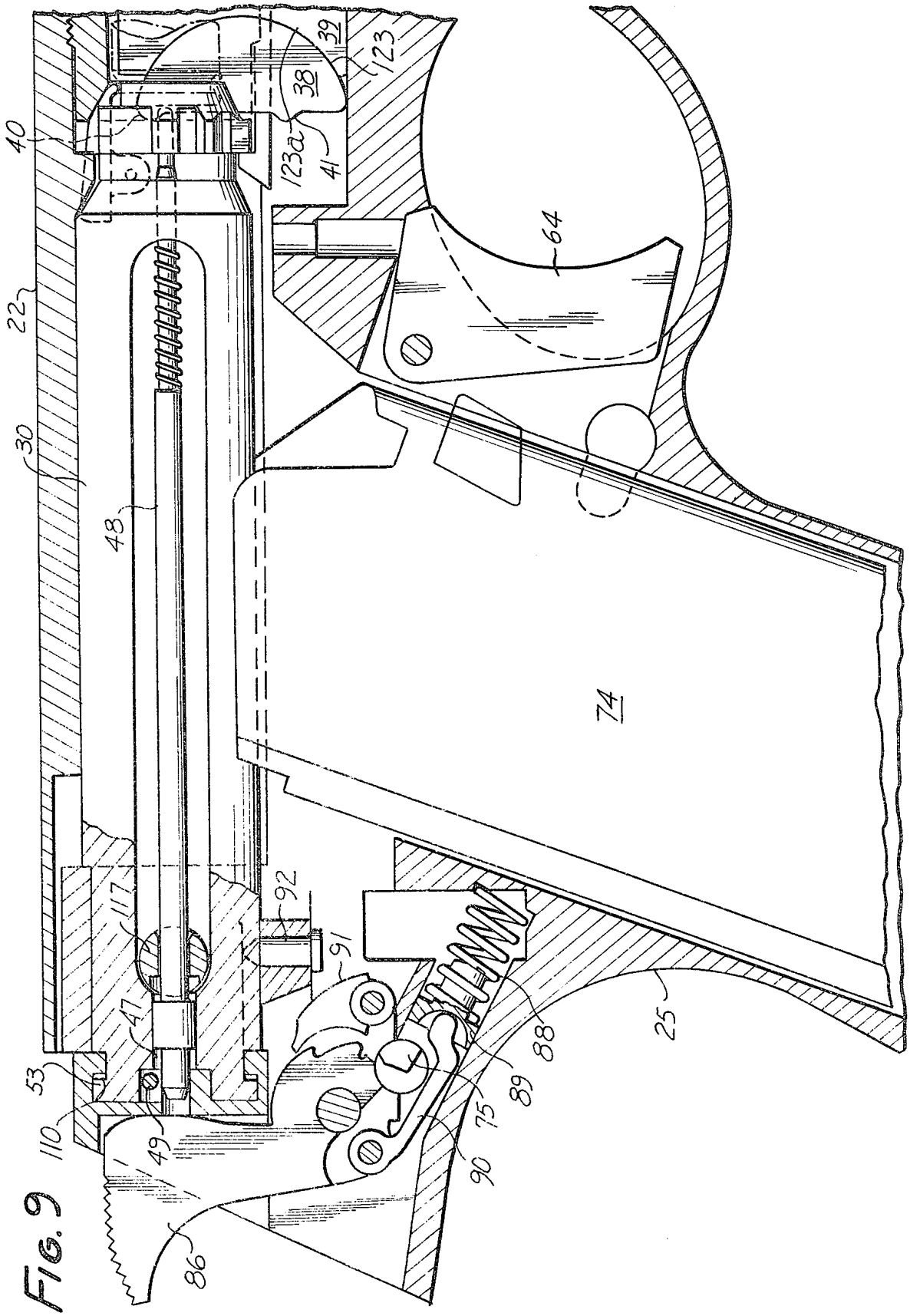

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FIG. 9

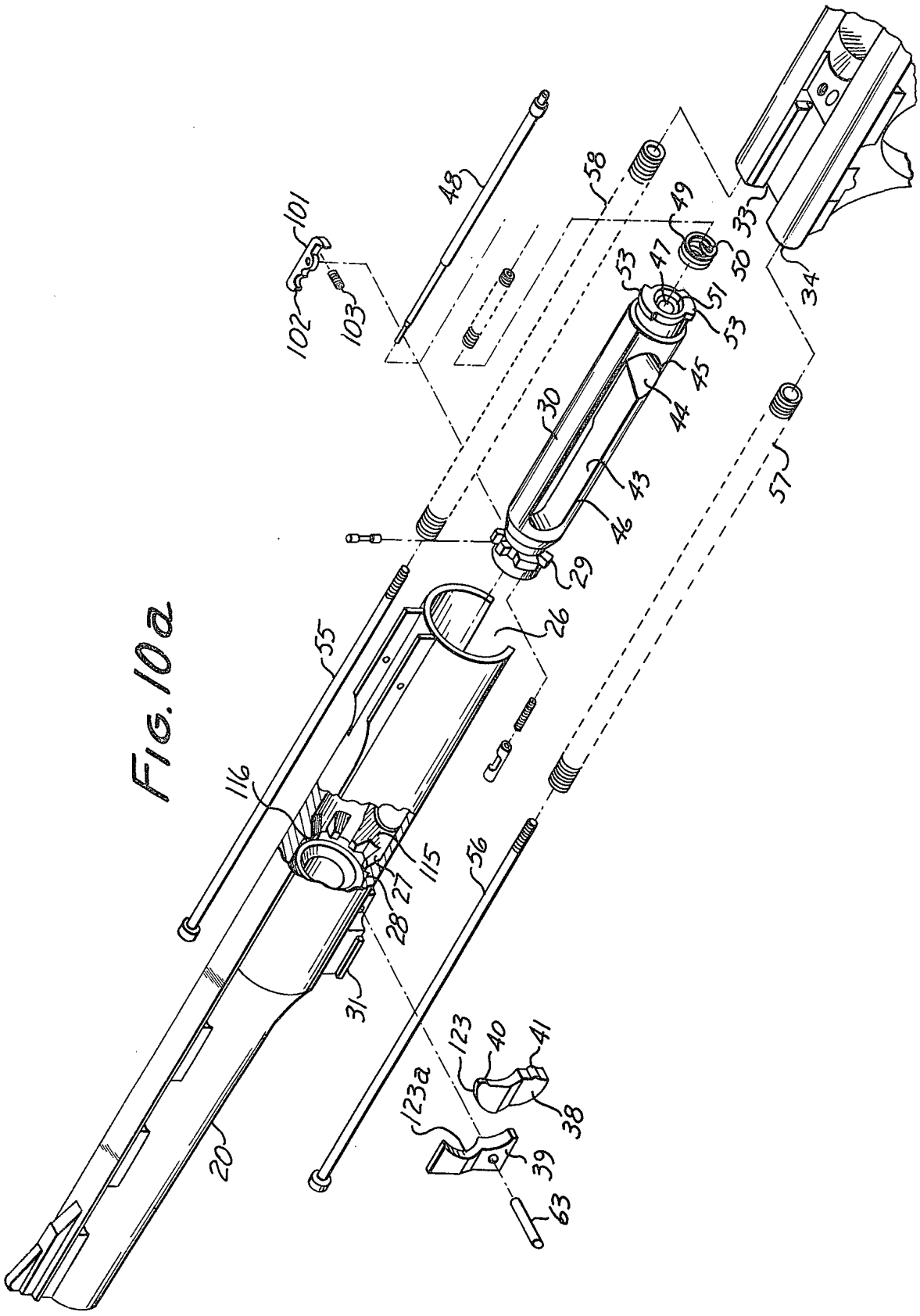
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FIG. 10a

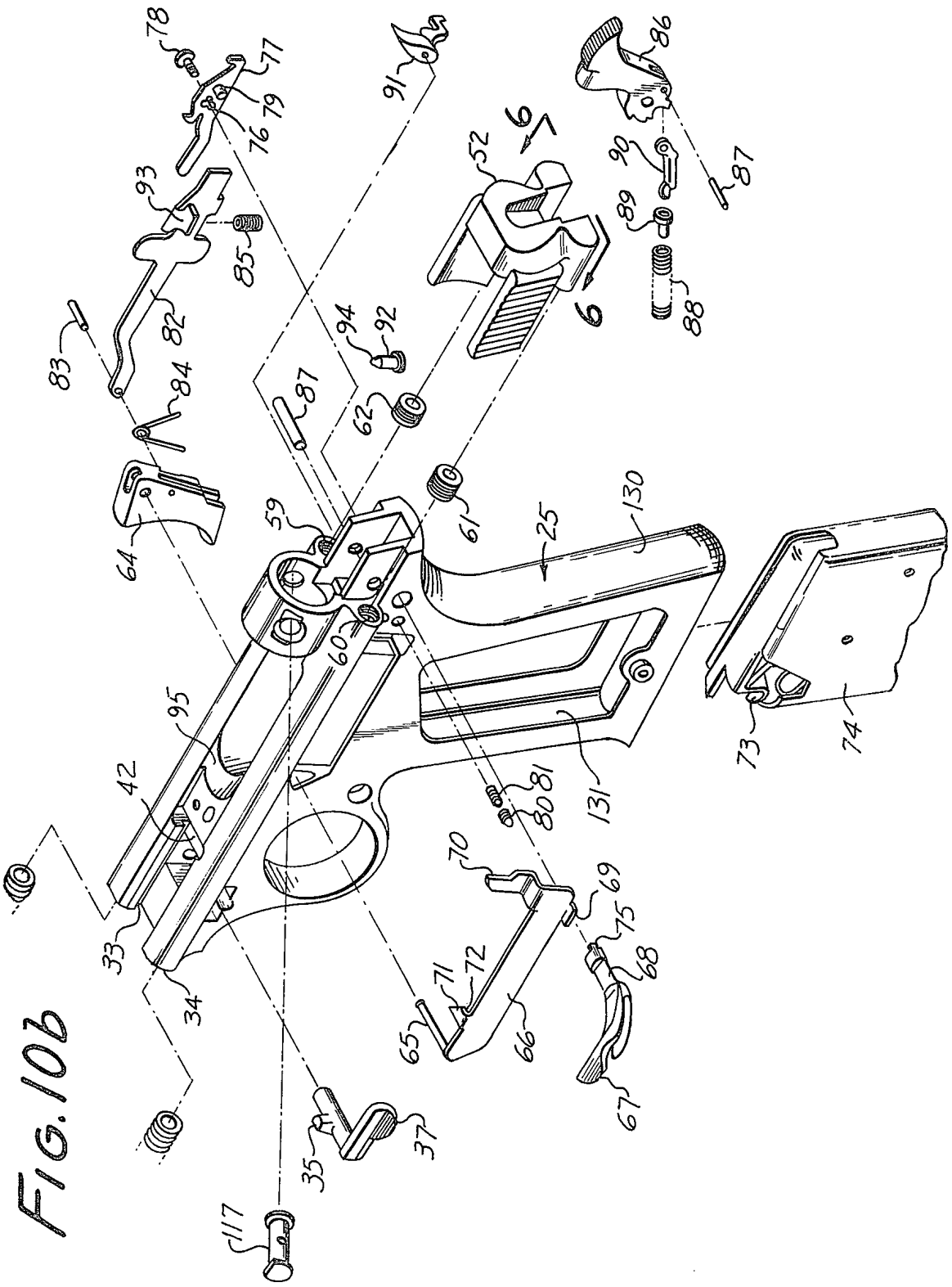
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FIG. 10b

AUTOMATIC HAND GUN

This is a division of applicant's co-pending U.S. Pat. application Ser. No. 145,259, filed May 20, 1971, entitled "Automatic Hand Gun," now U.S. Pat. No. 3,780,618, issued Dec. 25, 1973.

BACKGROUND OF THE INVENTION

This invention relates generally to hand guns which have recoilactuated mechanisms, for breech-locking with rotational motion, and for loading and cocking.

There have been several attempts to produce a hand gun capable of firing large caliber, high power cartridges at high muzzle velocities, but in the past, all such inventions have failed due to inherent weaknesses in concept.

A hand gun with rotating breech lock was invented by Andreas Wilhelm Schwarzlose, shown in a patent issued in Britain in 1892, Pat. No. 23,881, to be followed by Pat. No. 1934 of 1898 in England to the same inventor. Only the model of 1898 and the rotating breech lock, and in this model the bolt rotation was accomplished by a single groove engaging a pin which acted as cam follower to rotate the bolt. The frame was substantially open, and the force applied to the bolt was unbalanced, thereby creating binding stresses in rotation. To quote the book on such weapons, called "The Hand Gun", by Geoffrey Boothroyd, "As with most of the self-loading 'dinosaurs,' the Schwarzlose will work quite satisfactorily when kept clean and lubricated. A very well-made pistol, it is a delight to handle, but the mechanism is too complex, and there are far too many parts for it to function with any degree of reliability under anything but the most benign conditions."

This quotation reflects the fact that the design did not take into account the dynamics and directions of forces required to rotate and return the bolt, and to operate the breech-locking mechanism, as well as for the timing and positioning of the barrel to insure feeding of the cartridges.

At about this same period there was invented in England the Mars pistol which is shown in British Pat. No. 14,777, issued on Aug. 17, 1900. This followed a previous design granted British Pat. No. 9067 in 1898. This pistol and its history was completely described in "The Gun Digest for 1961," published by The Gun Digest Company, Chicago, Ill. To quote a military report cited in the article, "The recoil of these pistols is very severe. Mr. Fairfax should be asked whether he could alter the .45-inch pistol so as to give a velocity not greater than 1000 f.s., and as much less down to 800 as he could arrange for." In other portions of this article, it is pointed out that the certainty of action was not very good, particularly in the smaller size cartridges. To quote a technical report included in the article, "The pistol has jammed several times, the last time necessitating stripping before it could be made safe. The cause of this jam was apparently the crimping of the cartridges in the magazine . . . . No one who fired once with the pistol wished to shoot with it again. Several of those who fired are good shots and in the 'Excellent's Pistol Team'."

Thus, it can be seen from past records that attempts to make a semi-automatic hand gun to perform with large caliber, high velocity bullets have been failures, and it is the object of this invention to overcome previous difficulties with a design that provides for a practical firearm that will handle the loads and calibers required without discomfort to the user. A further object

of this invention is to provide rotary return motion to a rotary-locking breech bolt through the use of a torsion spring loaded by the initial unlocking action of a breech bolt. A further object of this invention is to provide a hand gun with a slidable receiver to contain the action for absorbing excess energy of recoil. Still a further object of the invention is to provide safety means to prevent premature firing of the gun until all parts of the action are locked and in their rest position ready for firing. Still another object of the invention is to provide for feeding of ammunition into the chamber without regard to the position of the chamber with respect to the magazine during the firing cycle. Still a further object is to provide for a balanced camming action for rotation of the bolt due to recoil, and to prevent a binding of action under the stresses and speed of recoil imparted function. Still another object of the invention is to provide for mechanical accelerator means to utilize excess recoil energy of the barrel and receiver assembly to impart an added thrust to the bolt after disengagement unlocking of the breech-locking means in order to provide energy for the extraction, cocking and loading operations.

SUMMARY OF THE INVENTION

In accordance with the teaching of the present invention, there is provided a frame for the pistol which is substantially open, but which is provided with a cylindrical bridging member across the rear of the open frame which carries a cross-pin to act as a cam follower for a bolt which is provided with a through-slot having cam means formed thereupon, to be acted upon by the cross-pin. A semi-circular, tubular receiver has the gun barrel threadably mounted to it and bears spline-type breech-locking means. A cartridge chamber is formed at the end of the barrel which opens into the receiver. A torsion spring is provided at the end of the bolt opposite the breech-locking end to be loaded by the unlocking rotation of the bolt occurring under recoil action in order to store energy for aiding the cross-pin to the through-slot cam means to rotate and relock the breech-locking action of the bolt. A rotary mechanical accelerator, in the form of a partial disc, is swivelly mounted to the receiver of the hand gun to provide for striking of the accelerator by the frame of the gun at the conclusion of recoil motion of the receiver-barrel assembly, which causes the accelerator to strike the bolt at the precise moment that the bolt is rotated out of breech-locking relationship to the receiver in order to impart an additional rearward thrust on the bolt to aid in loading certain return springs, in cocking the hammer, in extracting the spend cartridge and in feeding a new cartridge.

All the above features can be understood by reference to the following specification in which a detailed description of the preferred embodiment of the invention appears.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation, partially in cutaway cross-section, of the presently preferred embodiment of the invention;

FIG. 2 is a partial side elevation, partially in cutaway cross-section, of the embodiment of FIG. 1 seen from the opposite side,

FIG. 3 is a cross-section taken on line 3—3 of FIG. 2;

FIG. 4 is a cross-section taken on line 4—4 of FIG. 2;

FIG. 5 is a cross-section taken on line 5—5 of FIG. 1;

FIG. 6 is a cross-section taken on line 6—6 of FIGS. 10*a* and 10*b*;

FIG. 7 is a fragmentary cross-section of the side elevation of FIG. 4 taken at line 7—7 therein, showing details of constructions;

FIG. 8 is a cross-section taken on line 8—8 of FIG. 4;

FIG. 9 is a side elevation, partially in cutaway cross section, to show additional details of construction of FIG. 1;

FIGS. 10*a* and 10*b* are exploded views of the embodiment of FIG. 1, showing the details of the component parts. These FIGS. match as an overlay at the lower right-hand corner of FIG. 10*a* and the upper left-hand corner of FIG. 10*b*.

FIG. 11 is a fragmentary side elevation of the embodiment of FIG. 1; and

FIG. 12 is an end view, partially in cross-section, taken on line 12—12 of FIGS. 10*a* and 10*b*.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

As seen in FIG. 1, the invention comprises a pistol having a barrel 20 threadably engaged by threads 21 to a tubular barrel extension-receiver 22. The receiver 22. The receiver 22 has an external extraction port 23 which leads to an internal cylindrical bore 24. This bore 24 has an opening 26 to the frame 25 of the pistol. This opening 26 can be seen on the exploded views of FIGS. 8, 10*a* and 10*b*. A series of locking splines 27 is formed in the receiver 22 adjacent the barrel 20. There is an undercut 28 between the screw threads 21 and the locking splines 27 which permits turning and locking of the bolt 30 after the external splines 29 have passed axially through splines 28 into the recess. When so rotated, the splines bear against one another to lock the slot in a breech-locking action. This is best shown in FIGS. 8, 10*a* and 10*b*. A pair of slideways 31 and 32 engage slots 34 and 33 to slidably mount the barrel-receiver assembly to the frame 25. A rotatable locking key 35 (FIG. 2) engages a slot 36 in the receiver 22 to prevent the receiver 22 from sliding out of assembly with the frame 25 when the bolt breech-locking means is disengaged. The locking key 35 is rotated out of engagement for disassembly by lever 37 as may be seen in phantom line in FIG. 2. A mechanical rotary accelerator 38 (FIGS. 4 and 8) is rotatably mounted to the receiver 22 by the accelerator plate 39. Plate 39 is sometimes referred to as a "block member", and accelerator 38 is sometimes referred to as "a rotary accelerator means." One end 40 of the accelerator 38 contacts the bolt 30, while the other end of the accelerator has a protrusion 41 which is adapted to strike a portion of the frame 25 at surface 42. Accelerator plate 39 is mounted to receiver 22 by pin 63 as shown in FIGS. 8, 10*a* and 10*b*, and is wholly contained within the receiver 22, along the accelerator 38 as can be seen in FIGS, 7 and 8.

The accelerator plate 39 is pinned to the receiver 22, by pin 63 so that the flat surface 120, as shown in FIG. 7 abuts surface 121 of receiver 22. The arcuate surface 123*a* of accelerator plate 39 matches the arcuate surface 123 of the accelerator 38. This surface-to-surface contact provides bearing action for rotary transmission of the accelerating force from the motion of the receiver 22 to the bolt 30 and also provides surface-to-surface transmission of reactive force from the accelerator 38 through the accelerator plate 39 to the receiver 22.

End 40 and protrusion 41 are sometimes referred to as "striking faces," and they are located adjacent to the periphery of the accelerator means, spaced apart on opposite sides of its center of rotation. The accelerator is in the form of a segment of a disc (when viewed from the side). The accelerator is joggled, as can be seen in FIG. 8.

The bolt 30, as can be seen in FIGS. 10*a* and 10*b*, has a through-slot 43 which has formed on its opposing faces cam surfaces 44 and dwell portions 45 and 46. The bolt 30 has a longitudinal passage 47 which slidably mounts a firing pin 48. One end of the passage 47 is enlarged to form an enlarged bore 51 to accept a helical torsion spring 49. The torsion spring 49 has tangs bent radially toward the center at each end, as exemplified by tang 50, and one tang 50 engages a recess in the enlarged bore 51, while the opposite tang 50*a* engages a recess in the cocking piece 52 (FIG. 10*b*). The torsion spring is thereby reacted against the bolt and against the frame (the cocking piece being mounted to the frame). The cocking piece 52 is adapted with lug slots 54 to match mounting lugs 53 on the bolt 30 and so may be removably mounted to the bolt 30. The bolt lugs 53 pass through the lug slots 54 as the cocking piece 52 is rotated from its vertical position, and there is a clearance groove 110 behind the lug slots 54 which permits the cocking piece to be rotated to its vertical position, thus locking the cocking piece to the bolt, but yet permitting the necessary rotation of the bolt 30. This may be seen in FIG. 9 most clearly.

In FIGS. 10*a* and 10*b*, the through-slot 43, with camming surfaces 44 to rotate the bolt 30 in conjunction with cam-follower pin 117, is shown. Dwell surfaces 45 and 46 permit longitudinal motion of the bolt 30 without rotation during motion with the breech locked to hold it to the receiver and also without rotation by itself after having been unlocked by initial rotation.

During the continuing description of this invention, the muzzle end of the gun will be defined as the front, the hammer end of the gun as the rear, the left side of the gun is that side which is towards the left when the gun is held with the muzzle pointing away from the holder, and the right side is that side which is toward the right when the gun is held in the hand with the muzzle pointing away from the holder.

The cocking piece 52 is retained in assembly with the frame by a pair of spring retainer rods 55 and 56, which are installed within springs 57 and 58. Retainer rods 55 and 56 are assembled with springs 57 and 58 through enclosed channels 59 and 60, which are disposed at the top of the frame 25 and displaced laterally from the centerline on the right and left sides of the frame 25. The centerline, as referred to in this and in other parts of the description, is the centerline that passes through the bore of the barrel and is common with the bore of the receiver 22 and the bolt 30. A pair of frame inserts 61 and 62 act as bearing guides for rods 55 and 56, and the rods 55 and 56 are threadably engaged with the cocking piece 52 and locked in place with nylon thread locking means.

The trigger 64 is pivotally mounted to the frame by pin 65, which forms of bolt hold-back lever 66. Hold-back lever 66 acts in conjunction with safety lever 67, which has a flat portion 68 that acts as a cam to push on the surface 69 of holdback lever 66, when the safety lever 67 is depressed, to raise bolt hold-back lever 66 so that its protrusion finder 70 engages a face of bolt 30 to hold the bolt 30 open in the rear position. Lever 66 has a transversely extending portion 71 which has a lower surface 72 which is adapted to be engaged by a portion of the magazine follower 73 so that, upon the firing of the last cartridge, lever 66 is pushed upwards so that its protrusion finger 70 will hold the bolt open, signalling time to remove the empty magazine 74 and replace with a fresh loaded one. Safety lever 67 is mounted to rotate in the frame 25 extending from the left through to the right side of the frame and having a protruding cylindrical finger 75 which acts in the cam recess 76 of the trigger safety plate 77 to rotate the trigger safety plate 77 downward on pin 78, permitting trigger bar support pin 79 to be lowered, preventing the trigger bar 82 from releasing the sear 91, and thus firing the gun. Thus, the safety lever 67 has three positions; horizontal, or center which is the firing position; down, which is the bolt hold-open position; and up, which is the trigger safety position. All three of these positions being signalled and held in place by detent 80 and detent spring 81, which are mounted in the frame 25. Trigger bar 82 is pivotally mounted to trigger 64 by pin 83, and pin 83 also mounts the trigger spring 84, which acts to hold the trigger forward out of firing position. Compression spring 85 acts to support trigger bar 82 and return it to pre-firing position upon release of the safety.

The hammer 86 is pivotally mounted to the frame 25 by pin 87 and has a spring 88, spring follower 89, and strut 90 to apply firing pressures in a conventional manner to a firing pin 48, previously described. The sear 91 holds the trigger at full or halfcock position and is released by action of the trigger bar 82 to release hammer 86 for firing. A tappet pin 92 acts on surface 93 of the trigger bar 82, the nose 94 of the tappet pin 92 following the surface of bolt 30 until the tappet pin 92 reaches a point where the nose 94 enters a spiral groove 112 (FIG. 11) with a deepened recess 111 at the point 93*a* where the bolt and receiver are locked together and in the forward battery position ready for firing. At this time the spring 85 acts to push the trigger bar upwards against the tappet pin 92, pushing the nose 94 into the recess 111 and placing the trigger bar 82 in firing position for releasing the sear 91, as can be seen in FIG. 5. Therefore, the action is saftied until the pistol is in battery position ready for firing. The straight groove 113 allows for the tappet pin 92 to remain engaged in safety position during non-rotational motion of the bolt 30.

A conical surface 95 (FIG. 10b) of the frame 25 acts to guide bullets from the magazine into the chamber of the receiver 22. The length of this conical surface 95 allows the bullets to be fed into the chamber at any point along the sliding motion of the action of the receiver 22 in conjunction with a similar conical lead surface 115 at the adjacent forward end of the receiver adjacent the interior locking splines 116.

The bolt 30 has a unique ejection feature as shown in FIG. 12 in which the bolt 30 has a recessed front face 98 and a spring-loaded ejector pin 99, which is spring-loaded by spring 100. A pivoted extractor 101 (FIG. 10a) is mounted on the bolt 30, and the extractor 101 has a hook end 102 which protrudes into the recess 98 to extract the spent cartridge case. The spent cartridge case is blown back by the force of the firing to force back the hooked end 102 of extractor 101 against spring pressure of spring 103, which is located in a recess in the bolt 30 to spring-load the pivotally-mounted extractor 101, and when the cartridge case has forced the hook end 102 back and is seated in the recess 98 of the bolt 30, the hook 102 retains the raised edge of the cartridge case and the bolt, in its backward motion, extracts the cartridge case from the chamber, until a point where the extraction port 105 in the receiver 22 is passed by the cartridge, and the pressure of ejector pin 99 against the end of the cartridge case flings the empty case out of the extraction port 105.

The entire function of the firearm is described as follows: In battery or rest position, the bolt 30 is breech-locked to the receiver 22 with a cartridge in place in the chamber and the hammer 86 cocked. Pulling the trigger 64 raises the trigger bar 82, actuating the sear 91, which releases hammer 86, striking firing pin 48, to discharge the cartridge. The reaction of the discharge of the bullet causes the assembly of barrel 20, receiver 22, and bolt 30 to travel backwards as a unit until the movement of the receiver 22 is stopped by the frame 25. At this point, the rotary accelerator 38 strikes a portion of the frame 25 and imparts a blow to the bolt 30 at the same time that the cam follower pin 117 has rotated the bolt 30 on cam surfaces 44 to free the locking splines 29. The added energy to the bolt 30, given by the impact of rotary accelerator 38 drives the bolt backwards until its motion is limited by the cam follower pin 117. In rotating bolt 30 to unlock the splines 29, torsion spring 49 is pre-loaded and, during recoil of the barrel 20, receiver 22 and bolt 30 assembly, as well as during the independent motion of the bolt 30, return springs 57 and 58 are compressed. As the bolt 30 travels backwards, it extracts the cartridge from the chamber and flings it out of the extractor port. During this backward motion, the tappet pin 92 presses the trigger bar 82 down, preventing premature firing of the pistol. After reaching the extreme backward position, at which point the pistol is cocked for the next firing, the bolt returns and is rotated under the stored energy of torsion spring 49 into breech-locking relationship with the receiver 22, and the entire assembly of the action returns to battery position under the urging of compression springs 57 and 58. During its return motion, the bolt 30 pushes a new cartridge into the chamber of receiver 22.

As is all hand guns of this same general configuration, the frame 25 includes a grip member 130 and a cartridge clip chamber 131 formed within the grip member.

As in all modern pistols, the barrel 20 has an internal, spiral rifling that imparts a spin to the bullet to provide a straight and true flight, move first, without tumbling end-for-end, or wobbling and losing precision. For right-hand rifling, the bullet would spin to the right, and the spinning bullet, as well as expanding gases, would impart a reactive left-hand torque to the barrel which the shooter's hand would have to overcome. In the present invention, the rotating bolt imparts a reactive torque to the frame 25 of the pistol through the cam pin 117. Therefore, by having a left-hand rotation on the

bolt, the reactive torque on pin **117** would be of right-hand, and so would help offset the left-hand reactive torque of the bullet, thus giving a steadier firing of the firearm and less strain on the shooter. At the conclusion of its rearward motion, the receiver **22** is free to travel forward before engagement with the returning bolt and, at any point in the return motion, it can receive the new bullet. After the last bullet has been fired, the follower **73** of the magazine **74** pushes up on the bolt hold-back bar, holding the bolt open to signal that reloading is necessary and saving the shooter the trouble of opening the bolt to insert a new magazine for reloading. The bolt may be held open after the empty magazine is extracted by pushing down on the safety lever **67** to hold-open bar **66** upwards.

This invention is not to be limited by the embodiment shown in the drawings and described in the description, which is given by way of example and not of limitation, but only in accordance with the scope of the appended claims.

I claim:

1. In an automatic pistol having a frame and a recoil-actuated bolt mounted to said frame and rotated by cam means for breech-locking with spline means, and by primary recoil energy imparted to said bolt by the recoil of a barrel and receiver assembly, having a trigger mechanism for firing, improvements which comprise:

torsion spring means, said torsion-spring means engaging the bolt and the frame of said pistol and being reacted against each of them, said torsion-spring means being preloaded by unlocking rotation of said bolt, and said torsion-spring means releasing stored energy for rotation of said bolt to breech-lock the same;

mechanical accelerator means, said mechanical accelerator means removing energy from said barrel and receiver assembly and transferring said energy by impact to said bolt, said energy transfer imparting a secondary energy input to said bolt after said breech-locking is released, said accelerator means being in the form of a segment of a disc, said disc being mounted for rotation on said movable receiver, a pair of striking faces on the accelerator means adjacent the periphery thereof, but spaced apart on opposite sides of the center of rotation thereof, one of said pair of striking faces striking a portion of said frame of said pistol at the conclusion of motion of said barrel and said receiver assembly in one direction, the other face of said pair striking said bolt at the instant of unlocking of said breech lock to impart a secondary energy transmitting impact to said bolt.

2. A recoil-actuated firearm which comprises:

a frame;

a receiver member, said receiver member having a longitudinal bore;

a barrel member, said barrel member being mounted to said receiver member coaxially with said bore, said receiver member being slidably mounted to said frame;

a bolt member, said bolt member being slidably mounted on said frame coaxially within said receiver member;

rotary accelerator means, said rotary accelerator means being mounted to said receiver member in energy-transfer relationship therewith, whereby to transfer energy of recoil from said receiver member to said bolt member by striking said frame member and swiveling to strike said bolt member; and an accelerator block member, said block member mounted to said receiver member, said block member having an arcuate surface, said rotary accelerator means having an arcuate surface, said arcuate surfaces of said accelerator block member and of said rotary accelerator means abutting one another for rotatable mounting said rotary accelerator means.

3. Apparatus according to claim **2** in which rotary breech-locking means is disposed between said bolt member and said receiver member, said bolt member having through-slot means; said through-slot means having opposed cam surface means and cam follower means mounted to said frame member and engaging said cam surface means.

4. Apparatus according to claim **2** in which rotary spring means is mounted to said bolt member and to said frame, said rotary spring means being pre-loaded by recoil motion of said bolt member to store energy for return motion actions of said bolt member.

* * * * *

United States Patent [19]

Sanford

[11] **3,889,574**

[45] **June 17, 1975**

[54] **AUTOMATIC HAND GUN**

[75] Inventor: **Harry W. Sanford,** Arcadia, Calif.

[73] Assignee: **T. D. E. Inc.,** El Monte, Calif.

[22] Filed: **May 14, 1973**

[21] Appl. No.: **360,159**

Related U.S. Application Data

[62] Division of Ser. No. 145,259, May 20, 1971, Pat. No. 3,780,618.

[52] **U.S. Cl.** **89/169**

[51] **Int. Cl.** **F41d 3/06**

[58] **Field of Search** 89/169, 172, 185

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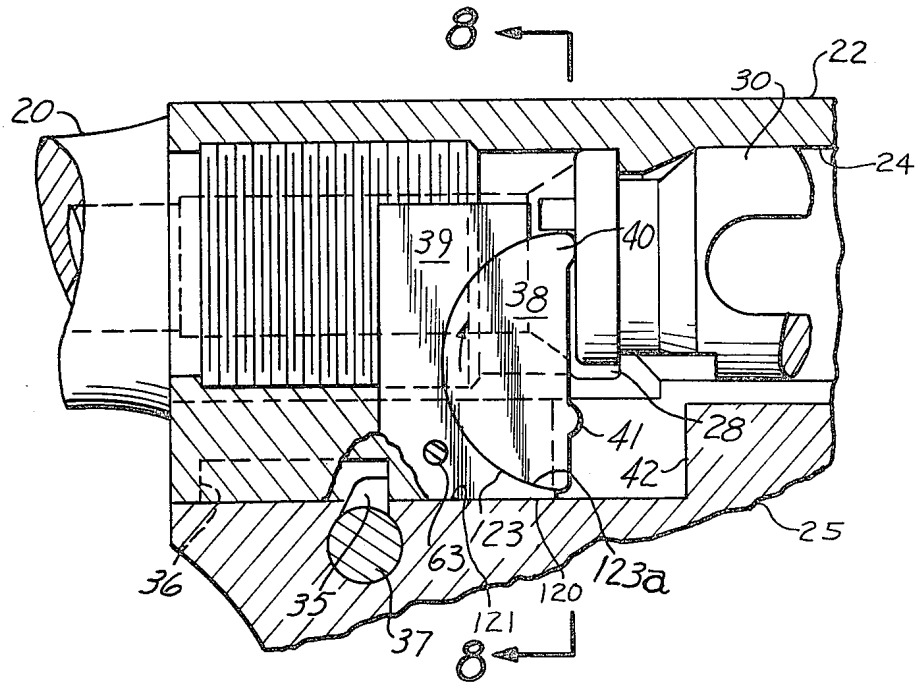
Primary Examiner—Stephen C. Bentley
Attorney, Agent, or Firm—Donald D. Mon

[57] **ABSTRACT**

This invention relates to a recoil-actuated automatic hand gun, which provides for utilizing a maximum sized cartridge in a hand gun system. The reactive thrust as the bullet leaves the muzzle of this gun causes a barrel, barrrel extension, receiver, and bolt to slide back locked together a set distance during initial motion until the bullet leaves the bore of the gun, and the gas pressure decreases to a level low enough to permit the safe unlocking of a locked breech action. The sliding receiver reaches its limit of travel and hits a portion of the frame of the pistol. A through-slot in the bolt bears the cam surfaces which rotate the bolt out of breech-locking splines in the breech action thereby to release the bolt from engagement with the receiver and permit the inertia of the bolt to carry it backwards to perform ejection, cocking, and the loading of a new cartridge. In order to replace some of the dissipated energy and to increase the speed of travel of the bolt to load spring-return mechanisms, and to perform the functions of the bolt with the speed required, a rotary, mechanical accelerator forms a part of the action and imparts a blow to the bolt at the time that the receiver reaches its stop position. The bolt is rotated out of the breech-locked position by balanced cam follower means fixed to the frame that follow the cam surfaces, and upon return to the breech-locked lock position, the entire assembly travels as a unit to the battery position with a loaded cartridge in the chamber. A safety tappet pin engages a spiral groove in the bolt to prevent premature firing before the action has reached an appropriate position. The bolt is adapted with unique ejection means, which ejects the spent cartridge case forward and away from the shooter's head and face.

4 Claims, 13 Drawing Figures



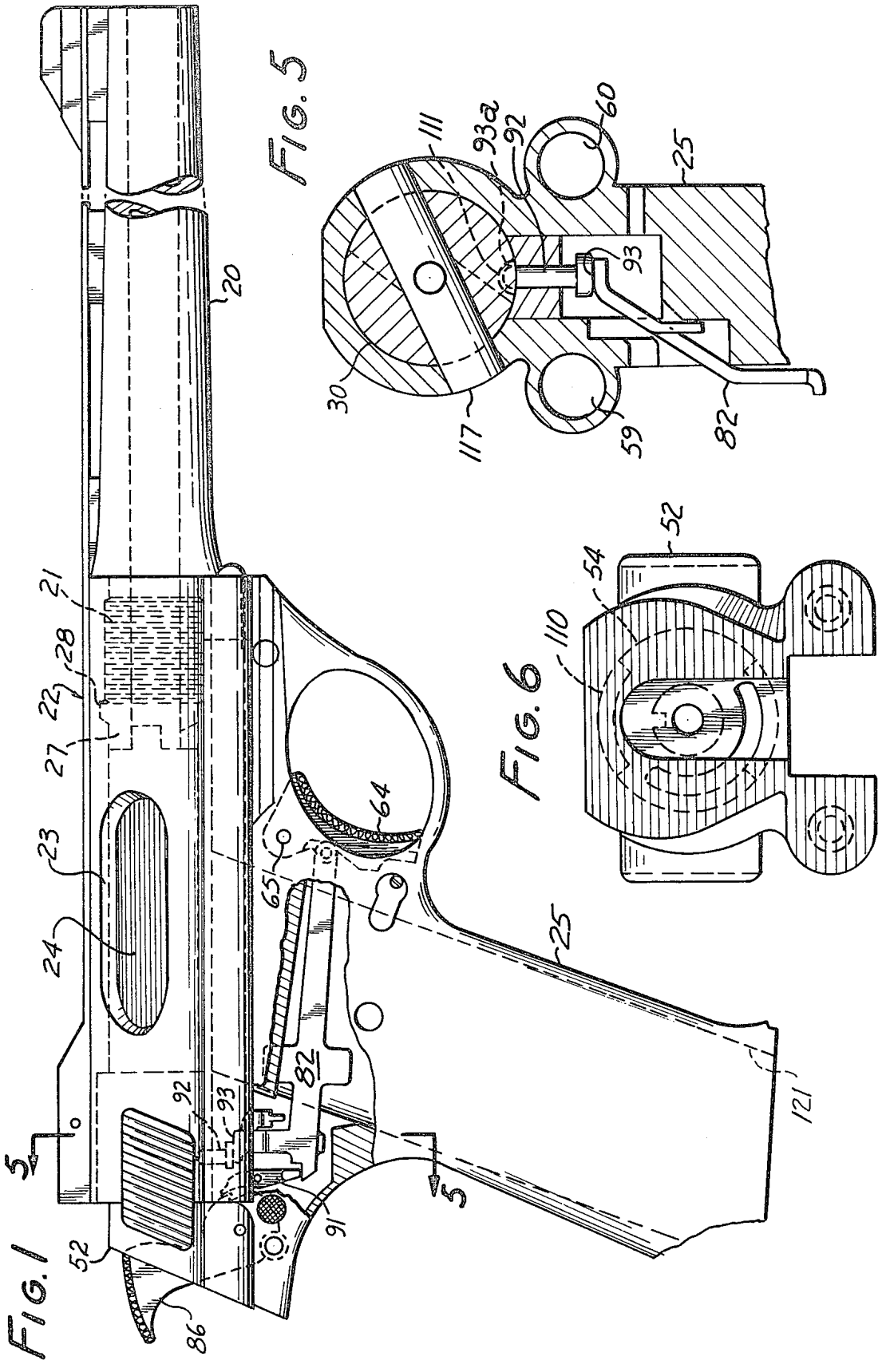


FIG. 1

FIG. 5

FIG. 6