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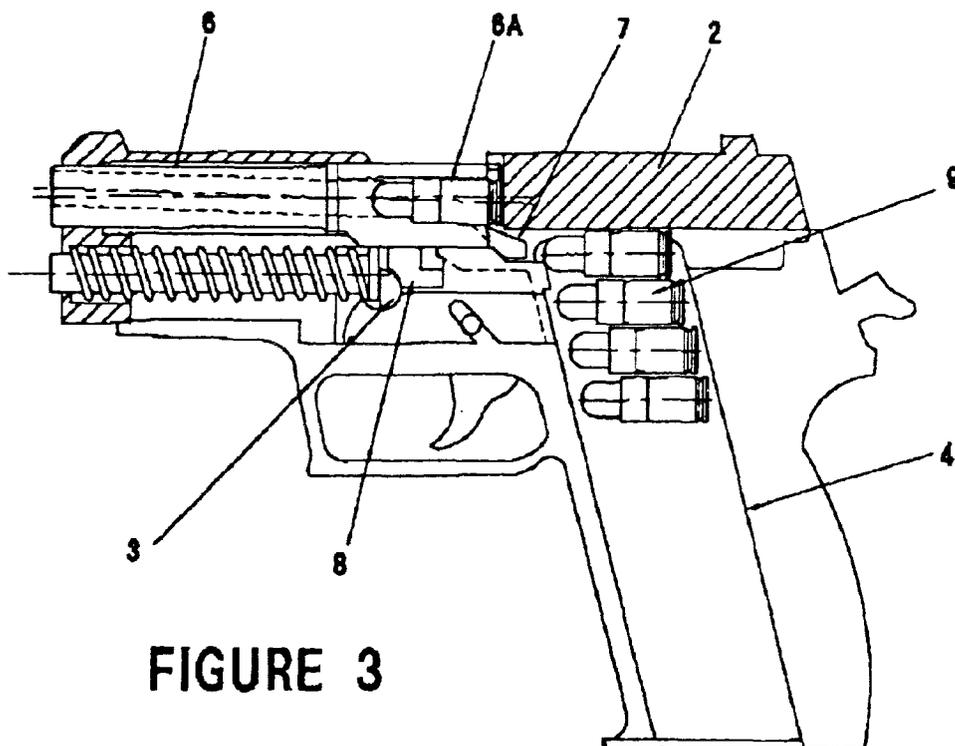
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**(54) Training barrel with projectile feed ramp for automatic firearms**

(57) A training barrel for conversion of a firearm from lock-breech blow-back operation to non-locked-breech operation has an insert which provides a guide ramp for

chambering rounds during the reload cycle. the guide ramp compensates for the absence of rearward displacement of the barrel when the firearm is converted to a training configuration.



**FIGURE 3**

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## Description

### FIELD OF THE INVENTION

This invention relates to the field of firearms and provisions for modifying semi-automatic firearms for training purposes. In particular, it relates to reliable chambering of ammunition in blow-back firearms that have been modified to fire low-energy ammunition.

### BACKGROUND TO THE INVENTION

In military and police firearms applications almost all of the ammunition consumed is used in training. For some training purposes, however, normal ammunition is not adequate. An alternative type of known training ammunition, represented by United States Patent No. 5,359,937, fires a low-mass projectile relying on a special, low-energy cartridge designed to provide cycling of suitably-modified, recoil-operated automatic weapons.

An advantage of the low-energy training ammunition is that it has a shorter range and lower penetration capacity than standard ammunition. This permits use of smaller, less secure firing ranges as training facilities. If standard ammunition were accidentally employed in these facilities, unexpected dangers would arise from the increased striking power and range of standard ammunition.

The weapon modifications required to permit cycling while firing low-energy training ammunition generally include replacing or modifying the barrel and sometimes replacing or adding one or two other components, depending on the weapon involved. These modifications also serve to increase safety. For example, in 9 mm automatic firearms, the calibre of the substitute barrel may be smaller than the diameter of the projectiles in standard 9 mm ammunition. If an attempt is made to chamber a standard round in such a training-adapted firearm, the barrel will not normally admit entry of the standard projectile. This ensures that such modified weapons cannot fire standard, live ammunition.

The low-energy cartridge represented by United States Patent No. 5,359,937, in combination with a substitute training barrel, allows normal recoil and cartridge case ejection through a blow-back action.

When firing standard ammunition, with its abundant associated energy, it is necessary in many weapons, particularly hand guns, to lock the barrel to the slide during the beginning of their rearward motion for a period long enough for the projectile to exit the barrel muzzle while the breech is still closed. This allows the chamber pressure to drop before the breech opens to eject the spent cartridge case. A locking mechanism couples the slide and barrel together for the first portion of the recoil, and then releases the slide. Upon unlocking, the slide continues its rearward travel while the barrel stops in the proper position to receive the next round from the magazine to be chambered.

In a training barrel it is necessary to omit this breech-lock mechanism. This is because there is not sufficient energy in low-energy training cartridges to precipitate sufficient recoil to unlock the barrel and the slide in their standard configurations. A training barrel of the type addressed by this invention is similar in most aspects to the standard barrel for a particular breech-locked pistol but is modified, in part, by removing the locking mechanism that holds the barrel and slide together for the first portion of the recoil cycle.

In some 9 mm pistols, however, after the locking mechanism has been removed so that the weapon can fire low-energy ammunition as represented by United States Patent No. 5,359,937, the training barrel does not move rearward far enough after firing to be in its proper position to receive the next round to be chambered. This happens precisely because the barrel is no longer locked to the slide, which would normally carry the barrel to the correct position before unlocking and leaving it there.

One way to solve this problem is described in PCT Application No. PCT/CA97/00174 (filed 14 March 1997) for semi-automatic pistols such as the Walther P-5 in which the recoil spring(s) are not beneath the barrel. In such instances, a spring-loaded Barrel Positioning Mechanism may be attached to one or more of the lugs of the training barrel, thereby ensuring that the barrel is moved sufficiently rearward when the breech is open to reliably chamber the next cartridge to be fired.

In other automatic pistols, however, the location of the recoil spring under the training barrel precludes such a solution for correctly locating the barrel for reliable chambering of the next cartridge to be fired. It is, therefore, an object of this invention to provide a training barrel system for this class of firearms that will ensure the proper positioning of the barrel for chambering of the next cartridge to be fired.

The invention in its general form will first be described, and then its implementation in terms of specific embodiments will be detailed with reference to the drawings following hereafter. These embodiments are intended to demonstrate the principal of the invention and the manner of its implementation. The invention in its broadest and more specific forms will be further described, and defined, in each of the individual claims which conclude the specification.

### SUMMARY OF THE INVENTION

This invention is directed to certain semi-automatic pistols, especially those where the recoil spring is located under the barrel, which are adapted to fire low-energy training ammunition by the substitution of a training barrel that omits the breech-lock feature normally present. It provides a system for ensuring proper chambering of ammunition by fitting a removable ramp extension to the breech end of the training barrel, such extension extending rearward towards the top of the magazine in such a

fashion as to allow smooth passage from the magazine to the chamber of the next round to be fired. Without this ramp extension, the barrel breech would be too far forward from the top of the magazine and the incoming cartridge would not necessarily enter the chamber cleanly, hence provoking a weapon jam whenever such misalignment should occur.

According to the invention, a firearm is provided with a slide and a training barrel which at no time are locked together during the firing cycle. The training barrel is provided with a removable feed ramp extension protruding rearward from the barrel towards the magazine. The length of this extension is such that its rearward end is sufficiently close to the top of the magazine that, when it is time to chamber the next round to be fired, the nose of the round is guided smoothly into the chamber by the extension as the slide moves forward into the firing position.

The feed ramp extension is removable so as to allow the training barrel/feed ramp extension to be assembled into the slide and frame without modification to either the slide or the frame. Conveniently, some barrel designs include a protrusion in the form of a rear lug into which the feed ramp extension may be fitted. A feed ramp extension removably fitted to the rear lug of a training barrel constitutes an ammunition chambering mechanism.

The rear lug on a barrel of a typical weapon addressed by the invention will usually abut at its forward end the barrel locking pin. When the weapon is ready to fire, the training barrel is at its farthest forward position and is held there against the locking pin by the slide. When firing occurs, the slide recoils without pulling the barrel back with it, even though there is nothing obstructing rearward motion of the barrel, because the two pieces (slide and barrel) are not locked together. Thus, when the slide reaches its maximum rearward travel and it is time to chamber the next round from the magazine, the gap between the top of the magazine and the entrance to the chamber is filled by the feed extension ramp provided by the invention, which smoothly guides the round forward into the chamber as the slide returns to close the breech.

Without the feed ramp extension being present, and without the barrel moving rearward upon firing because it is not locked to the slide, the gap between the entrance to the chamber at the rear face of the barrel and the top of the magazine would be too great to ensure that the incoming cartridge would reliably enter the chamber without jamming.

One way of fitting the feed ramp extension into the rear lug of the training barrel is to form a rearward facing slot or recess in the lug which will match and receive the forward portion of the extension. The rearward end of the extension, in the form of a smooth concave groove with a diameter approximately that of the outer diameter of the cartridge case of the ammunition to be chambered, will then protrude downwards and rearwards at

such an angle, and be of such length, that its rearward face falls just short of, and slightly below, the top of the magazine.

The foregoing summarizes the principal features of the invention and some of its optional aspects. The invention may be further understood by the description of the preferred embodiments, in conjunction with the drawings, which now follow.

## 10 SUMMARY OF THE FIGURES

Figure 1 is a partially cutaway, cross-sectional side view of a prior art pistol ready to fire standard 9 mm ammunition;

15 Figure 2 is a partially cutaway, cross-sectional side view of the same prior art pistol as in Figure 1 with the slide in its most rearward position, ready to be moved forward by the slide recoil spring or springs. The spent case from the cartridge of Figure 1 after firing has been ejected from the weapon and the next cartridge from the magazine is in position to be chambered by the returning slide;

20 Figure 3 is the same side view cross-section of the same pistol as in Figure 1 except that it now contains a training barrel, complete with the ammunition chambering mechanism, and is ready to fire low-energy ammunition as represented by United States Patent No. 5,359,937;

25 Figure 4 shows the pistol of Figure 3 after firing with the slide in its most rearward position, ready to be moved forward by the slide recoil spring or springs. The spent case from the cartridge of Figure 3 after firing has been ejected from the weapon and the next cartridge from the magazine is in position to be chambered by the returning slide;

30 Figure 5 shows a partial cutaway side view of the training barrel with its feed ramp extension assembled for the 9 mm Sig 225 pistol;

35 Figure 6 shows a rear view of the barrel alone showing the groove into which the feed ramp extension fits.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

45 In Figure 1 a prior art 9 mm pistol is shown having barrel 1 and slide 2 with normal locking between the two components, and magazine 4 containing standard service ammunition 5. The weapon is ready to fire with a cartridge 5 chambered in chamber 1A and slide 2 all the way forward, and the barrel lug 8A resting against the locking pin 3. After the weapon is fired, the slide 2 recoils, compressing recoil springs 15, and Figure 2 depicts it in its most rearward position with the spent case from the round just fired already ejected from the weapon and the next round to be chambered having been thrust upwards by magazine 4 almost into line with chamber 1a while awaiting the return of slide 2 to push it forward into chamber 1A and close breech 2A. The

nose 5A of the projectile of cartridge 5 to be chambered is very close to the entrance or breech 2A of chamber 1A, and hence will experience no difficulty in smoothly moving forward into chamber 1A for proper chambering. Barrel 1 is so propitiously placed because it has been carried back to this position from locking pin 3 within frame 12 by slide 2, to which it was locked during the first portion of the firing cycle.

When this pistol is converted to fire low-energy ammunition 9 as represented by United States Patent No. 5,359,937, barrel 1 is replaced by training barrel 6 in conjunction with feed ramp extension 7, as shown in Figure 3 with the pistol ready to fire (as in Figure 1). Similarly, Figure 4 depicts the same situation for the training configuration of the weapon as does Figure 2 for the standard weapon. Again, slide 2 is fully rearward and the next round of training ammunition 9 is in position to be chambered by the returning slide 2 moving under the urging of the resilient spring 15. Since barrel 6 does not move rearwards during firing, remaining abutted against locking pin 3 because there is no locking with slide 2, the resulting large gap between the breech 6B and the nose 9A of the projectile of cartridge 9 to be chambered is filled by feed ramp extension 7. Round 9 will, therefore, be smoothly guided by extension 7 into chamber 6A when slide 2 moves forward to chamber round 9 and close breech 6B.

Feed ramp extension 7 is slidably fitted into a recess 14 formed within lug or protrusion 8 of training barrel 6 as shown in Figure 5. The extension 7 has an upwardly facing guide surface 11 which serves to guide a round 9 into position as it is being chambered within barrel 6. Lateral movement of the extension 7 in barrel 6 is prevented by its being situated within groove 10 located on the upper side of the recess 14, at the rearward end of barrel 6, as depicted in Figure 6. The fit between barrel 6 and extension 7 is preferably a sliding one to permit the assembly of barrel 6 and extension 7 into slide 2; if the extension 7 were an integral part of the barrel 6, in many weapons this would not be possible due to the design of slide 2. Longitudinal motion of extension 7, once assembled both in barrel 6 and with slide 2 in place, is restricted at its front end by the forward end of groove 10 and, at its rearward end, by a portion of the frame 12 of the pistol.

The functioning of the subject ammunition chambering mechanism has been tested many hundreds of times in Sig 225 pistols with complete success and reliability. The ammunition chambering mechanism of the invention is particularly suited for training barrels for such 9 mm semi-automatic pistols as the Sig 255, but also aids in the chambering of training ammunition in modified Sig 226, 228 and 229 pistols as well as being applicable to other semi-automatic firearms that fire low-energy ammunition as represented by United States Patent No. 5,359,937.

## CONCLUSION

The foregoing constituted a description of specific embodiments showing how the invention may be applied and put into use. These embodiments are only exemplary. The invention in its broadest, and more specific aspects, is further described and defined in the claims which now follow.

These claims, and the language used therein, are to be understood in terms of the variants of the invention which have been described. They are not to be restricted to such variants, but are to be read as covering the full scope of the invention as is implicit within the invention and the disclosure that has been provided herein.

## Claims

1. A training barrel for an automatic firearm comprising:
  - (1) a barrel with forward and rearward ends;
  - (2) a protrusion extending from the barrel and;
  - (3) a feed ramp positioned at the rearward end of the protrusion, such ramp having an upwardly-facing guide surface for guiding a round as it is being chambered into the barrel.
2. A training barrel as in claim 1 wherein the protrusion has a rearwardly directed recess and the feed ramp is dimensioned to be slidably fitted into the protrusion recess.
3. The training round of claim 1 wherein the protrusion provides a stop for positioning of the barrel against the frame of a pistol.
4. The training barrel of claim 1 in combination with a weapon with a frame having a slide that is free to move rearwardly with respect to the barrel and wherein the feed ramp is contained laterally by a groove formed in the upper side of the recess.
5. A firearm comprising:
  - (1) a frame;
  - (2) a barrel with forward and rearward ends mounted on the frame with the barrel positioned against the frame to prevent forward displacement of the barrel with respect to the frame;
  - (3) a slide mounted on the frame free for sliding displacement, independent of the barrel, from a battery position when the slide bears against the barrel to a position rearward of the barrel;
  - (4) resilient means urging the slide forwardly, towards the battery position;
  - (5) a protrusion extending downwardly from the barrel;

(6) a feed ramp positioned rearwardly of the protrusion, such feed ramp being provided with an upwardly-facing guide surface for guiding a round as it is being chambered into the barrel.

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6. A firearm as in claim 5 wherein the protrusion has a rearwardly directed recess and the feed ramp is dimensioned to be slidingly fitted into the protrusion recess

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7. A firearm as in claim 6 wherein the feed ramp is contained laterally within the recess by a groove formed in the upper side of the recess.

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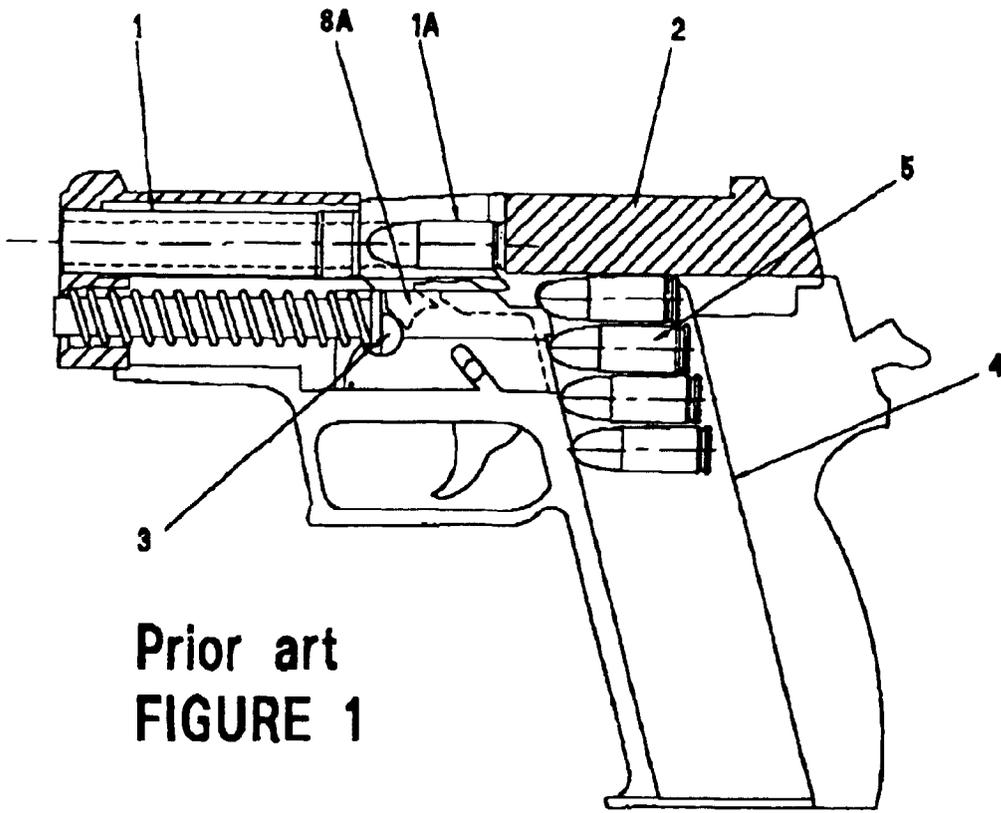
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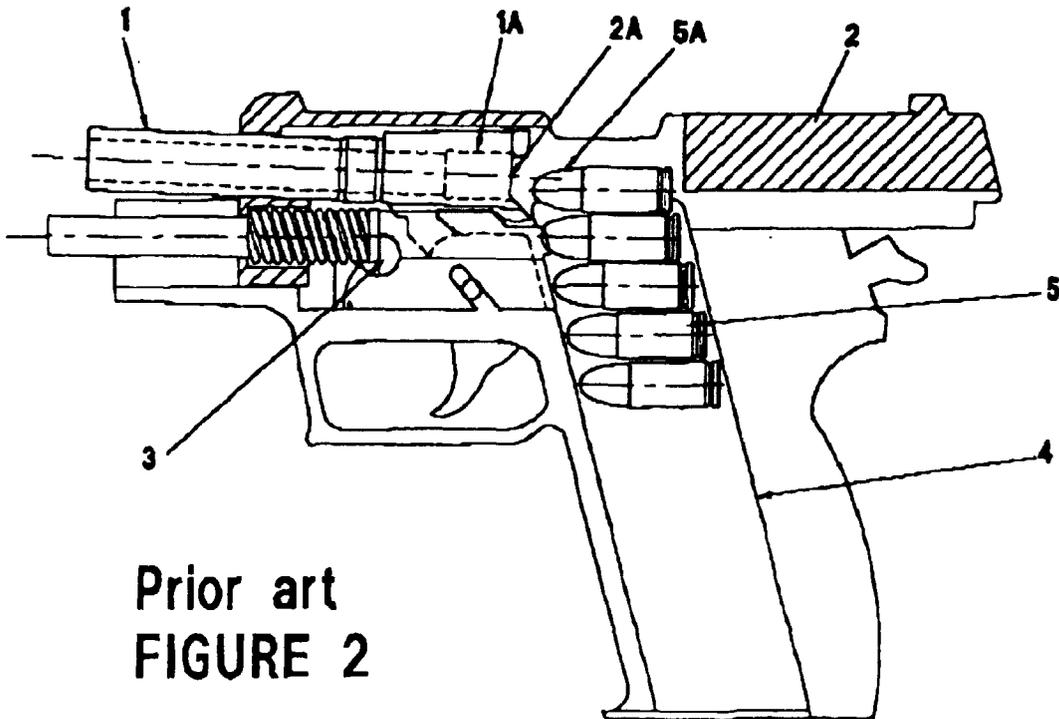
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Prior art  
FIGURE 1



Prior art  
FIGURE 2

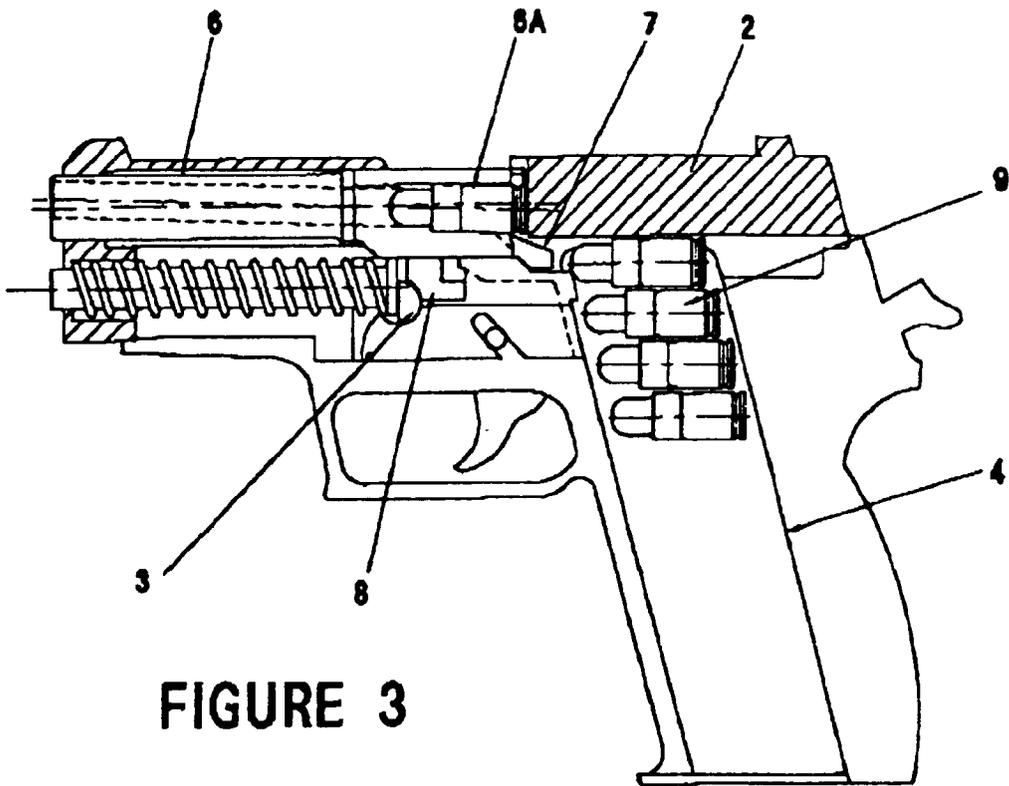


FIGURE 3

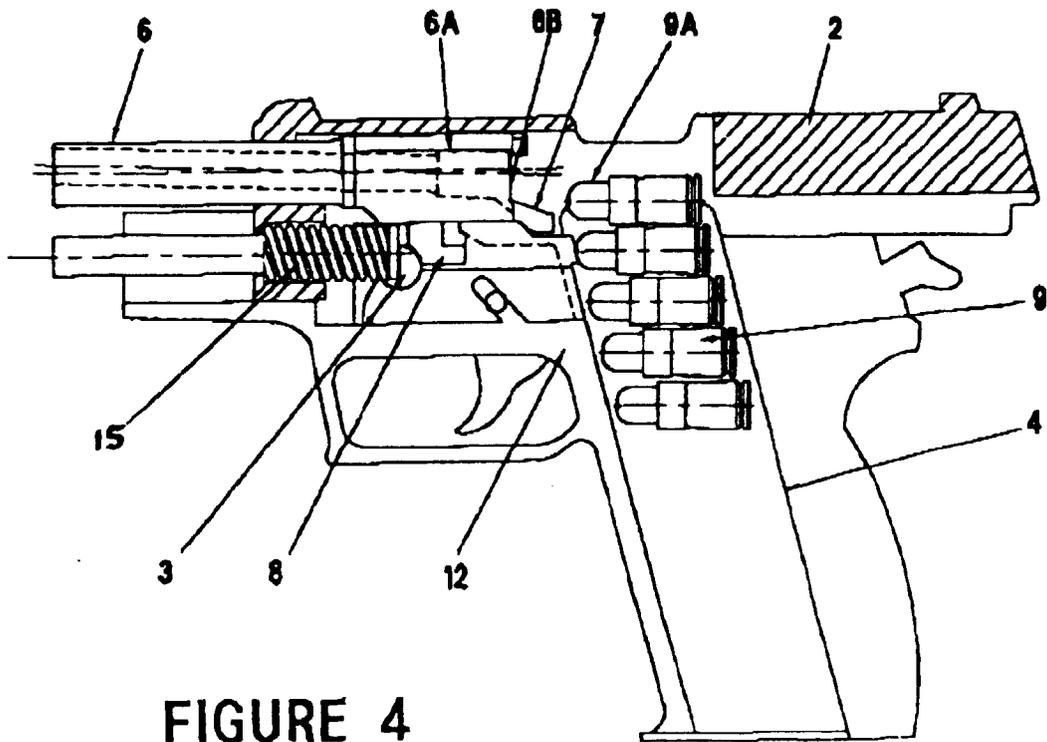


FIGURE 4

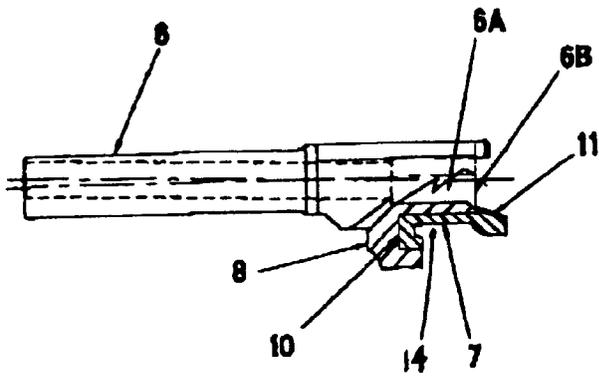


FIGURE 5

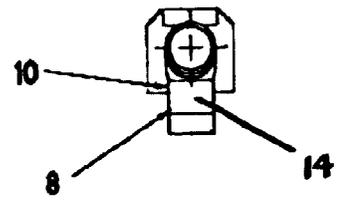


FIGURE 6



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EUROPEAN SEARCH REPORT

Application Number  
EP 98 20 1674

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	US 4 907 362 A (HOBBIE EDWARD H) 13 March 1990 * column 3, line 28-40 * * column 5, line 36 - column 6, line 14; figures 2A-2E *	1	F41A33/00 F41A9/55
Y	---	3	
Y	WO 96 22500 A (HECKLER & KOCH GMBH ; BRANDL RUDOLF (DE); MATT HEINZ (DE); ROMER TH) 25 July 1996 * figures 1,2 *	3	
A	--- EP 0 291 474 A (ATIS SPA) 17 November 1988 -----		
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			F41A
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		27 October 1998	Van der Plas, J
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