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Hudson

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[54] **MINI-CALIBER FIREARM FOR LAUNCHING HYPERVELOCITY PROJECTILES**

[75] Inventor: **Colin M. Hudson,** Moline, Ill.

[73] Assignee: **The United States of America as represented by the Secretary of the Army,** Washington, D.C.

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[52] **U.S. Cl.** ..... **42/1 J**

[51] **Int. Cl.** **F41c 9/02**

[58] **Field of Search** ..... 42/1 J, 1 G, 1 H, 1 Z, 42/10; 89/161

[56] **References Cited**

UNITED STATES PATENTS

1,681,172	8/1928	Cocho	42/1 J
2,001,405	5/1935	Abbott	42/1 J
3,084,466	4/1963	Duncan	42/1 J

FOREIGN PATENTS OR APPLICATIONS

154,068	4/1956	Sweden	42/1 Z

Primary Examiner—Samuel Feinberg
Assistant Examiner—C. T. Jordan
Attorney, Agent, or Firm—Edward J. Kelly; Herbert Berl

[57] **ABSTRACT**

In order to provide an accurate, low-mass, highly effective personal weapon, a firearm has been designed. The projectile mass is such that the ratio thereof to the firearm mass will provide a weapon of extremely light weight and yet heavy enough to be virtually unaffected by the recoil forces generated during the firing thereof, but sufficient for excellent lethality. The components of the weapon are limited to a hand-held receiver, a barrel slidably disposed in the forward end of the receiver, a coiled tension spring for coupling the barrel to the receiver, a sear for releasably retaining the barrel in a forward cocked position against the bias of the spring, and an optional safety for blocking release of the sear. Upon release by the sear, the barrel is biased rearwardly to bring the cartridge chambered therein into firing contact with a fixed striker in the receiver.

7 Claims, 5 Drawing Figures

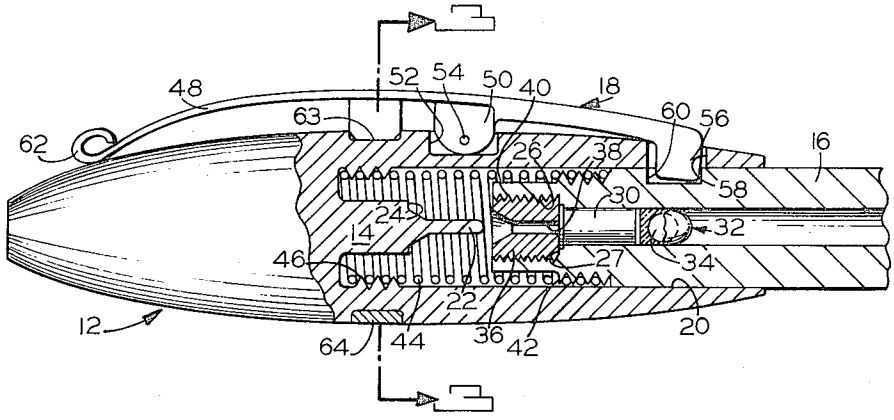


Fig 1

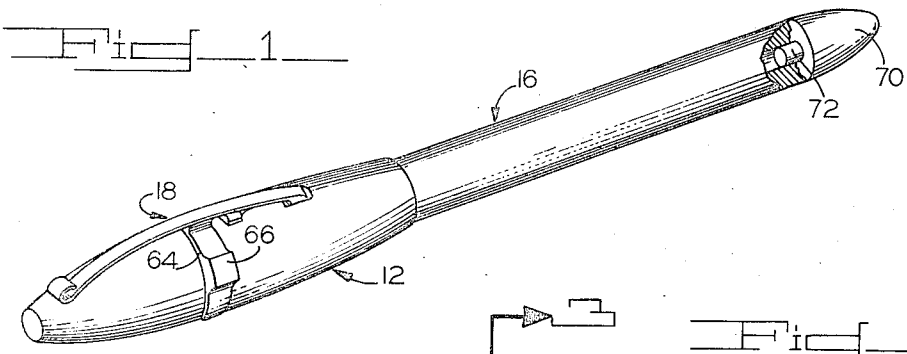


Fig 2

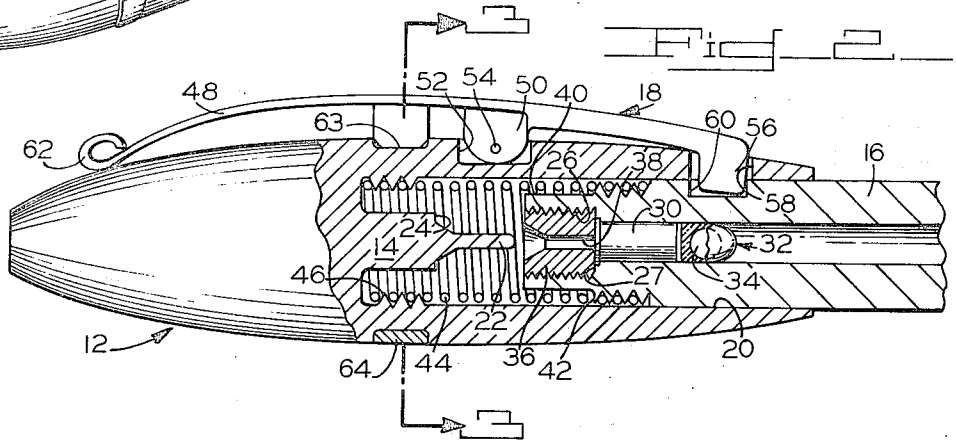


Fig 3

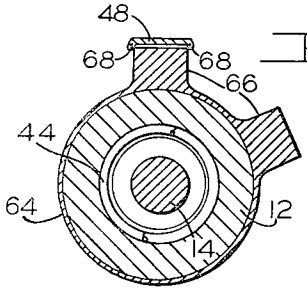


Fig 5

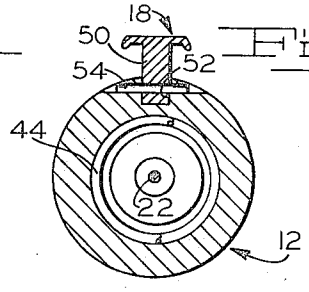
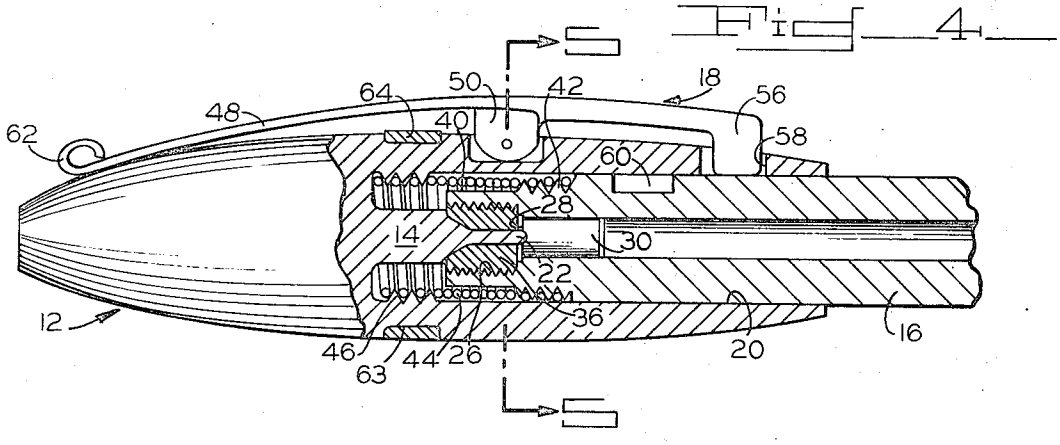


Fig 4



MINI-CALIBER FIREARM FOR LAUNCHING HYPERVELOCITY PROJECTILES

BACKGROUND OF THE INVENTION

This invention relates to small arms of mini-caliber size, i.e., less than caliber .22, and is more particularly directed to a self-defense type of hand-held firearm capable of firing projectiles at hypervelocity speeds.

While small caliber pistols are generally regarded as best-suited for self-defense purposes, the effectiveness thereof in emergency situations, such as the hijacking of an aircraft in flight, is substantially diminished by the relatively time-consuming effort required to shift from a concealed or stowed position to an aimed position, release the safety, and place the trigger finger in a ready-to-fire position. In addition, the heavy recoil often causes the user to miss a target. Attempts to improve the ease with which a conventional pistol can be brought to bear against a given target in a rapid and unobtrusive manner have heretofore been limited to reducing the size and caliber thereof. However, it has been found that conventional pistols of less than caliber .22 in size do not provide the accuracy and striking power required to incapacitate an assailant under close and crowded conditions. Experience has also shown that where the components in the cocking and firing mechanisms of conventional pistols are significantly reduced in size, the functional simplicity and reliability thereof are adversely affected.

SUMMARY OF THE INVENTION

It has been discovered that the foregoing disadvantages encountered in many pistols which have been reduced to mini-caliber size can be successfully overcome by a weapon which fires an appropriate projectile of very low mass (say 1 to 3 grains) at extremely high velocity. The design of such a weapon uses a structure wherein the firing pin or striker is integrally formed within the interior of an elongated oval housing which is, in turn, slidably fitted onto the breech end of the barrel and flexibly coupled thereto by a coiled tension spring. The rear end of the spring is threaded directly into the interior of the housing in surrounding relation to the striker while the forward end of the spring is similarly threaded onto the breech end of the barrel. When either the striker housing or the barrel is manipulated to tension the spring, the forward end of a sear pivoted in the housing drops into a notch formed in the upper periphery of the barrel to retain the latter in a cocked position. If desired, the housing may be provided with a safety which can be manually rotated into position to block the firing release of the sear. When the sear is pivoted out of the sear notch in the barrel, the extension spring will retract the latter to bring the chambered round in the breech end thereof into firing impact with the striker in the housing. The striker housing fits over the breech end of the barrel to serve as a guide for the reciprocation thereof. A plug threaded into the breech end of the barrel chamber following the loading of a round therein serves as a fixed breechblock. The round is designed to provide sufficient power to propel a spherical projectile or cylindrical flechette of mini-caliber size through the corresponding bore in the barrel at a velocity which will incapacitate an assailant regardless of where he may be hit. Furthermore, the streamlined exteriors of the striker housing and the barrel provide a relatively unobstructed and symmetrical configuration which facilitates the handling involved in transferring the firearm from a concealed or stowed position to a ready-to-fire position thereby improving the ability of the user to fire rapidly and accurately against a moving target.

It is, therefore, an object of this invention to provide a hand-held firearm, less than caliber .22 in size, capable of firing projectiles with an accuracy and lethality substantially equivalent to or greater than that of a conventional pistol of considerably larger caliber.

A further object of the present invention is to provide a personal defense weapon system, as aforesaid, wherein the size, configuration and weight is specifically designed to facilitate the handling thereof involved in shifting from a concealed or stowed position to an aimed, ready-to-fire status.

Another object of this invention lies in the provision of a reliable and effective firearm, as aforesaid, wherein the firing mechanism consists of a fixed striker which does not require any headspace control.

Still another object of this invention is to provide a small compact firearm for launching projectiles of mini-caliber size at hypervelocity speeds with no discernible recoil movement.

A further object of this invention is the provision of a throwaway self-defense firearm wherein the mass thereof and that of the projectiles are specifically selected to provide a muzzle velocity in excess of 5,000 feet per second and yet avoid any discernible recoil movement thereof during firing.

An additional object of this invention is to provide a simple and inexpensive preloaded firearm, as aforesaid, wherein the firing mechanism therefor is almost completely sealed against moisture, dust, and other detrimental elements of the environment.

BRIEF DESCRIPTION OF THE DRAWING

The exact nature of the invention as well as other objects and advantages thereof will be readily apparent from consideration of the following specification relating to the annexed drawing, wherein:

FIG. **1** is a perspective view of the firearm in the cocked position thereof with the muzzle end of the barrel broken away to show the rear end of the muzzle cap;

FIG. **2** is an enlarged side view partly in section showing the details of the firing and cocking mechanism in the cocked position thereof;

FIG. **3** is a section taken along line **3**—**3** in FIG. **2** to show the manner in which the safety prevents manual actuation of the sear;

FIG. **4** is a view similar to that of FIG. **2** but showing the position of the parts following the firing release of the sear and the movement of the barrel to the fired position; and

FIG. **5** is a section taken along line **5**—**5** of FIG. **4** showing the manner in which the sear is mounted to the housing.

DESCRIPTION OF A PREFERRED EMBODIMENT

As shown in the drawing, wherein similar reference characters are employed to designate corresponding parts throughout, the basic components of the firearm of the present invention are a firing member or receiver **12** housing an integral striker **14**, a barrel **16** slidably

coupled to the interior of receiver **12**, and a sear **18** for releasably retaining barrel **16** in a cocked position relative to striker **14**.

Receiver **12** is a elongated generally oval-shaped member having a forwardly opening hollow interior **20** terminating in a closed rear end and of sufficient diameter to slidably receive the breech end of barrel **16**. Striker **14** is preferably integrally joined to the rear end wall within receiver interior **20** and extends forwardly therefrom to terminate in a firing tip **22** of reduced diameter. The junction between firing tip **22** and the remainder of striker **14** provides an annular shoulder **24** for halting the rearward movement of barrel **16**.

In order to permit the launching of projectiles at hypervelocity speeds, barrel **16** is formed with a smooth bore of mini-caliber size, i.e., between 0.125 and 0.220 inches in diameter and of sufficient elongation to provide a length/diameter ratio of about 50 to 1. The breech end of the barrel bore is counterbored to about twice the diameter of the bore, as indicated at **26**, and is also provided with a circumferential recess **28** adjacent the forward face **27** of counterbore **26** to accommodate the enlarged rim at the base of a stub cartridge case **30**. A sabot **32** of molded plastic is suitably pressfitted into the mouth of case **30** and a spherical projectile **34** between 1–3 grains in weight is completely embedded in sabot **32**. Greater target penetration may be obta
jectile, i.e., an arrow-shaped needle with a plurality of fins at the rear end thereof. For best results in accuracy and striking power, such flechettes are designed to provide a length/diameter ratio of between 10 to 1 and 20 to 1 and are preferably fabricated of a relatively dense material such as tungsten alloy, for example. An impact plug **36** is threadably inserted into counterbore **26** in position to abut the base of cartridge case **30** and is provided with a central hole **38** therethrough for passage of the firing tip **22** of striker **14**. Inasmuch as impact plug **36** is slightly smaller in length than firing tip **22**, the latter will have completed the required firing impact with the primer in cartridge case **30** by the time the rearward travel of barrel **16** is halted by annular shoulder **24** on striker **14**.

The breech end of barrel **16** is also provided with a reduced diameter exterior portion **40** and a threaded section **42** forwardly adjacent thereto. One end of a coiled tension spring **44** is threaded onto section **42** of barrel **16** and, although the diameter of the coils is slightly less than the root diameter of the threads on barrel section **42**, the pitch of such coils provides sufficient flexibility thereto to readily conform to the slight expansion imparted thereto during assembly onto barrel **16**. However, the binding pressure exerted on barrel section **42** by the expanded coils effectively resists any tendency thereof toward rotation in the direction of disassembly.

The rear end portion of central opening **20** is also threaded, as indicated at **46**, to the same pitch and longitudinal extent as barrel section **42**. Once assembly of spring **44** onto barrel **16** is completed, both components are inserted into central opening **20** in receiver **12** and barrel **16** rotated until spring **44** is threaded into engagement with all of threads **46**. As in the case of the coils at the forward end of spring **44**, the coils at the rearward end thereof are readily threaded into central opening **20** but thereafter resist any rotation thereof in the opposite direction. Thus, once spring **44** is threaded into receiver opening **12** and onto the breech end of barrel **16**, the distance to which firing tip **22** is permitted to protrude beyond impact plug **36** will not be altered despite any rotation of barrel **16** relative to receiver **12**. The portion of spring **44** between the engaged ends thereof is free to be extended in response to any movement of the breech face of barrel **16** away from striker **14**.

The retention of barrel **16** in a cocked, ready-to-fire position is accomplished by sear **18** which is pivoted to the exterior of receiver **12** and is preferably formed of flat spring stock curved to provide a longitudinally bowed first class lever. Sear **18** is provided with a depending mounting lug **50** which fits into a suitable recess **52** in the exterior periphery of receiver **12** and is pivotally retained in place by a transverse pin **54**, as best shown in FIG. **5**. The forward end of sear **18** terminates in a depending nose **56** of sufficient length to pass through a suitable hole **58** in receiver **12** and enter into a rectangular notch **60** in the exterior periphery of barrel **16**. Rearwardly of lug **50**, sear **18** is of reduced cross-section, as indicated at **48**, and terminates in a reverse curl **62** at the rear end thereof arranged to resiliently press against the exterior periphery of receiver **12** as a result of the differing curvatures of sear **18** and receiver **12**. The spring action thus imparted to sear **18** tends to resist pivotal disengagement of nose **56** from sear notch **60** as barrel **16** is being longitudinally displaced forwardly in receiver **12**. Sear notch **60** is so located in barrel **16** that upon entry therein of sear nose **56**, the breech face of barrel **16** will be positioned, as best shown in FIG. **2**, slightly forward of firing tip **22** on striker **14**.

The exterior of receiver **12** is circumferentially recessed, as indicated at **63** in FIGS. **2** and **4**, to rotatably seat an annular safety **64** provided with a pair of spaced apart blocking lugs **66** projecting outwardly therefrom to a slightly greater distance than the space between the underside of sear portion **48** and the exterior periphery of receiver **12**. As safety **64** is rotated by the pressure of the thumb or index finger of the firearm operator on one of blocks **66**, the other block will be forced beneath sear **48** into releasable retention therewith. To this end, the opposite edges of sear **18** are of rolled construction, as best shown at **68** in FIG. **3**, to prevent accidental rotation of safety **64** while the firearm is in a concealed or stowed position.

The muzzle end of barrel **16** is protected against the entry of moisture, dirt, and other environmental material which might, in time, lead to deterioration of the cartridge or of spring **44**. Such protection is afforded by a simple disposable muzzle cap **70** of a molded plastic material provided with a protruding stem **72** dimensioned to be press-fitted into the bore of barrel **16** at the muzzle end thereof. When the firearm is discharged, the resulting gases will compress the air in the bore of barrel **16** and thereby produce sufficient pressure to blow muzzle cap **70** off of barrel **16** prior to the exit of projectile **34** therefrom.

The loading of ammunition in the firearm is, of course, accomplished prior to the assembly of impact plug **36** into barrel **16**. Thereafter, plug **36** is threaded into counterbore **26** until halted by abutment with, as in this embodiment, cartridge case **30**. Tension spring **44** is then assembled into the threaded rear end portion **46** of receiver **12**. The breech end of barrel **16** is then inserted into opening **20** in receiver **12**, and the barrel

is then rotated to engage threaded section **42** with the forward end of spring **44,** care being taken to simultaneously extend spring **44** sufficiently to avoid contact between the cartridge primer and striker **14.** Finally, barrel **16** and receiver **12** are pulled apart until sear nose **56** engages in notch **60** in barrel **16** to retain the latter in the cocked position thereof. In view of the rather extensive manipulation required to accomplish the foregoing loading and cocking procedures, the use of the firearm for more than one firing is not considered practical and consequently the design and fabrication of parts are oriented toward treating the firearm as a throwaway item to be discarded after firing. In other words, the mini-caliber firearm of the present invention is like a self-contained unit such as a hand grenade intended for disposal immediately after use. In the event circumstances require the firing of more than one cartridge, this may be conveniently accomplished by the employment of several separate firearms. The small size and low weight of each firearm would readily permit the concealment or stowage of more than one unit on the person of the operator. However, if still more firepower should be required, the barrel could be enlarged to incorporate a plurality of bores or individual tubes radially disposed about a common central axis in position to chamber a corresponding number of preloaded cartridges. Firing of these cartridges in sequence could be readily accomplished by a simple semiautomatic striker mechanism or by a suitable electric ignition system incorporating a conventional stepping switch.

In order to fire the single shot version shown in the drawing, the operator need only to remove the firearm from its concealed or stowed position, grasp receiver **12** in the palm of one hand, and raise the firearm to an aiming position while simultaneously using the thumb or index finger to rotate safety **64** out of engagement with sear **18.** Thereafter, pressing downward on the reduced cross-section portion **48** of sear **18,** will lift sear nose **56** out of notch **60** in barrel **16** and permit the extended central portion of spring **44** to impart a rapid rearward movement to barrel **16.** As threaded plug **36** impacts against annular shoulder **24** on striker **14,** firing tip **22** thereon has passed through hole **38** to strike the primer in cartridge case **30** and initiate firing. Thus, the impact of the moving barrel **16** and the setback of the fired cartridge are both absorbed by the much greater mass of receiver **12.** In addition, the recoil forces produced by the acceleration imparted to sabot **32** and projectile **34** imbedded therein are transferred through barrel **16** to receiver **12.** Since the combined weight of sabot **32** and projectile **34** is on the order of 3 grains while the weight of the entire firearm can be controlled to within 4 ounces, the nearly 600 to 1 ratio of firearm to projectile mass results in the virtual absence of any recoil movement thereby permitting the attainment of highly accurate fire. Furthermore, inasmuch as the projectile possesses a unique combination of high density and minimum cross-section, the muzzle velocity thereof will exceed 5,000 feet per second which, at the relatively close ranges for which the firearm is designed, will produce a corresponding striking velocity of over 4,000 feet per second thereby insuring a relatively high degree of lethality against a human or other animal target.

Thus, there is here provided a remarkably lightweight firearm which can be readily drawn from a concealed or stowed position and fired with a high degree of accuracy and lethality. The firing mechanism therefor is of such simplicity that no headspace control is required and yet provides positive firing once the safety has been released. The firearm is additionally unique in that it is a preassembled throw-away item essentially devoid of all openings which will permit the entry of undesirable moisture, dirt, or other foreign material affecting the ability of the ammunition and firing components to function in a reliable manner even after a relatively long period of non-use. Although the present invention is shown and described as utilizing a cased round of ammunition, it will be recognized by persons skilled in the art that other forms of ammunition are readily adaptable to the firearm. For example, caseless ammunition, or ammunition comprising separate propellant and projectile components may be utilized.

The foregoing disclosure and description of the invention is illustrative only. Various changes may be made within the scope of the appended claims without departing from the spirit of the invention.

I claim:

1. A hand-held firearm for firing a mini-caliber cartridge comprising,

a hollow receiver having a forwardly projecting striker integrally formed within the interior thereof,

a barrel slidably disposed in said receiver to project forwardly from one end thereof, said barrel having a cartridge chamber in the breech end thereof,

a tension spring having one end threadably engaged in said receiver and having the opposite end thereof similarly engaged with the breech end of said barrel whereby the portion therebetween is freely disposed to perform the spring function, and

a sear pivoted on said receiver for releasably retaining said barrel forwardly of said striker against the resilient bias of said spring whereby the release of said barrel by said sear allows said spring to retract said barrel into operative firing contact with said striker.

2. The firearm as defined in claim **1** including safety means rotatably and releasably disposed on the exterior surface of said receiver for retaining said sear in an operative position.

3. A hand-held firearm for firing a mini-caliber projectile comprising,

a receiver having a hollow interior terminating in a forward open end and in a closed rear end,

a striker extending forwardly from said rear end within said receiver and terminating in a firing tip of reduced diameter,

a barrel having an impact plug threaded in the breech end thereof and an ammunition chamber forwardly of said plug, said breech end being disposed within said receiver open end,

a tension spring having the rear end thereof secured within said receiver interior and extending forwardly in surrounding relation to said striker, the forward end of said spring being secured to the breech end of said barrel,

a sear pivotally mounted on the exterior of said receiver, and

releasable means on said sear disposed for engagement with said barrel in response to the bias of said spring thereby to retain said barrel in a cocked po-

sition preparatory to release for firing said projectile.

4. The firearm as defined in claim **3** wherein said impact plug is disposed in abutment with ammunition disposed in said barrel and is provided with a hole therethrough for the passage of said firing tip in response to rearward movement of said barrel relative to said receiver.

5. The firearm as defined in claim **3** wherein said receiver is provided with a hole disposed through a sidewall thereof and communicating with said hollow interior, said barrel being provided with a notch in the exterior periphery disposed for alignment with said receiver hole in response to said barrel being manually actuated against the bias of said spring to a cocked position, and said sear having a depending portion at the forward end thereof engageable with said barrel notch thereby releasably retaining said barrel against the bias of said spring.

6. The firearm as defined in claim **3** and including a forwardly tapering cap having a rear face equal in diameter to said barrel and a rearwardly projecting stem releasably fitted into the muzzle end of said barrel to protect the bore thereof against the environment, said cap being releasable from said barrel in response to an increase in pressure in the barrel bore incident to firing ammunition in said firearm.

7. A hand-held, self-defense firearm for launching a mini-caliber projectile at hypervelocity speed comprising,

a receiver having a fixed striker therein,

a barrel slidably disposed in the forward end of said receiver and having a bore diameter of less than .22 caliber for chambering a cartridge containing a sabot with a projectile embedded therein,

a tension spring having one end engaged in said receiver and the opposite end thereof engaged with said barrel, and

sear means in said receiver for releasably retaining said barrel forwardly of said striker and against the bias of said tension spring whereby the cartridge is urged into firing contact with said striker upon the release of said barrel by said sear means, the ratio of projectile to firearm mass being selected to prevent any recoil movement thereof responsive to the firing of the cartridge and yet permit launching of the projectile at a muzzle velocity in excess of 5,000 feet per second.

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