United States Patent [19]

Mawhinney

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[54] **LETHAL EXPANDIBLE PROJECTILE**

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[21] Appl. No.: **351,525**

Related U.S. Application Data

[62] Division of Ser. No. 173,079, Aug. 19, 1971, Pat. No. 3,762,329.

[52] **U.S. Cl.** ..... **102/42 C,** 102/41, 102/92.7

[51] **Int. Cl.** **F42b 7/02,** F42b 13/16

[58] **Field of Search** ..... 102/42 C, 38, 91, 93, 1, 102/41, 92.5; 29/1.22

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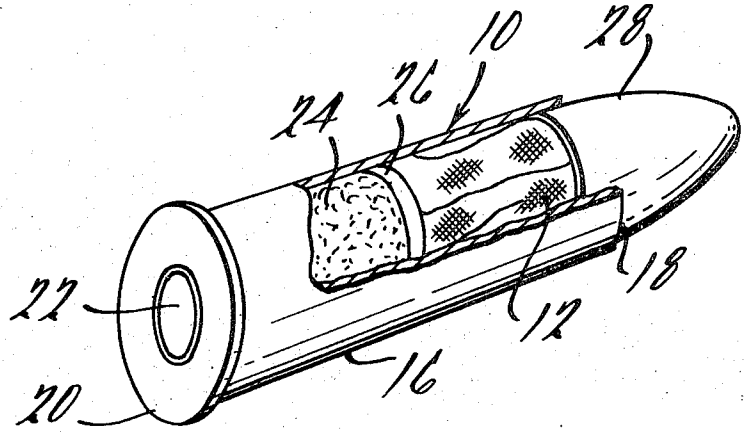
Attorney, Agent, or Firm—Harness, Dickey & Pierce

[57] **ABSTRACT**

A high penetration, short range projectile comprised of a shot filled, deformable, flexible bag which is initially folded or rolled for insertion in a conventional cartridge case of a small firearm or the like, and adapted to be launched therefrom. Upon exit from the muzzle of the small arm, the bag radially expands under the influence of centrifugal force provided by the rifling grooves within the barrel to provide a spin stabilized trajectory characterized by a substantial energy decay in a relatively short, preselected down range distance.

9 Claims, 11 Drawing Figures



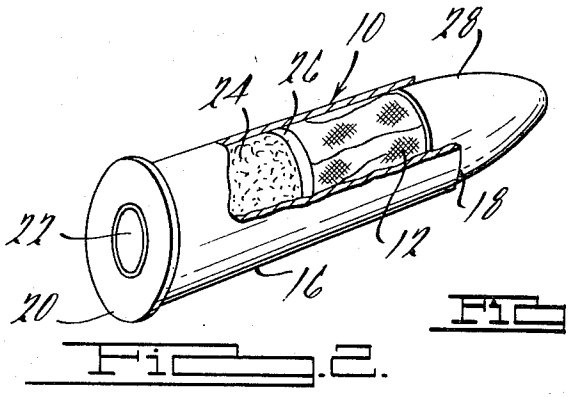


Fig. 2.

Fig. 7.

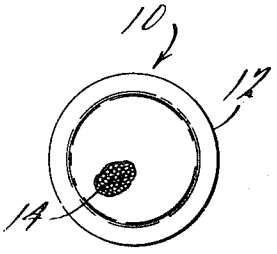
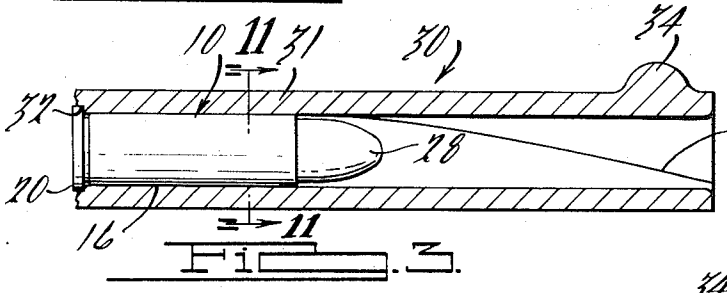


Fig. 1.



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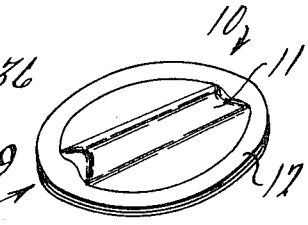


Fig. 8.

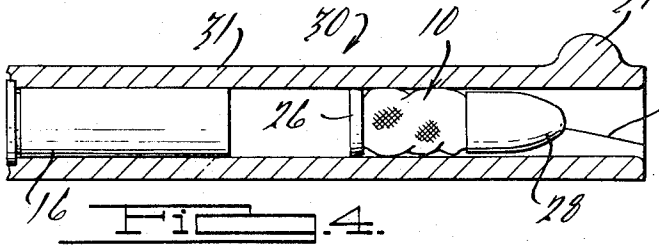
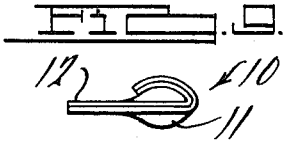


Fig. 4.



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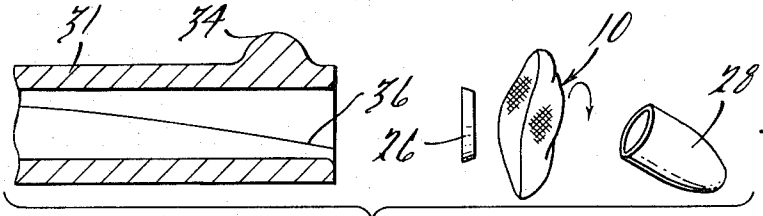

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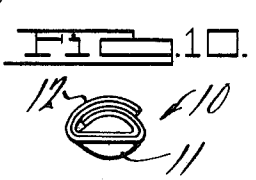

Fig. 10.

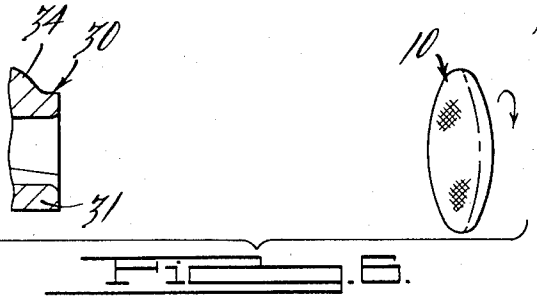

Fig. 6.

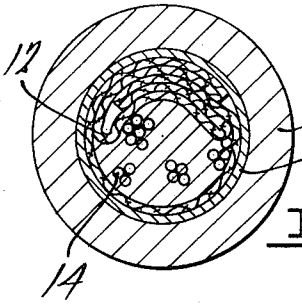

Fig. 11.

LETHAL EXPANDIBLE PROJECTILE

This is a division, of U.S. Pat. application Ser. No. 173,079, filed Aug. 19, 1971 now U.S. Pat. No. 3,762,329.

BACKGROUND AND SUMMARY OF THE INVENTION

This invention relates generally to the munitions art, and more particularly to a high penetration, short range projectile adapted to be fired by a small arm, such as a 0.38 caliber hand gun or the like.

The beneficial effect of the use of firearms in a military engagement, is substantially greater than a domestic law enforcement encounter, due to the difference in environment wherein the weapons are used. In military combat, when a member of the armed forces directs a shot at a target, i.e., an enemy soldier, there is a good chance that the primary target may be in close proximity to a number of secondary targets, such as additional enemy soldiers. Should the fired projectile miss the primary target, the possibility exists that a secondary target may be hit. Even in the event of a complete miss, a certain degree of suppression to the enemy forces is attained, and generally speaking, except for the wasteful expenditures of ammunition, every round directed against the enemy provides the firer with some beneficial effect.

The environment in which firearms are used by domestic law enforcement officials on the other hand is vastly different. This difference results from the fact that the target is typically surrounded, or in close proximity, to noncombatants (innocent bystanders) as opposed to enemy soldiers. This situation can be anticipated in all aspects of law enforcement, especially aircraft hyjacking, bank robberies and fleeing felons. The domestic law enforcement situation implies that the officer must hit his target when he fires, or risk the catastrophic result of striking an innocent bystander. Unlike military combat there are no benefits to the officer if he was justified in firing, but misses his target. Even the so-called "warning shot" fired in the air has a potential range of over a mile and ultimately impacts with dangerously high energy. Thus, it is inopportune and unfortunate that law enforcement officers must rely on essentially the same ammunition which was optimized for the military, such ammunition being characterized by high lethality over an exceptionally long range.

Ideally, optimum law enforcement ammunition should deliver a bullet which would magically stop immediately after it passes by, or through, the target, i.e., a bullet on a string. While this solution is not completely feasible in practice, it can be approached.

An unpowered projectile in horizontal flight has been found to be retarded by aerodynamic forces. Neglecting gravity, it can be shown that the velocity of an unpowered projectile, at any point down range, is determined by the following equation:

$$V_x = V_o e^{-x/\lambda}$$

where

V_x = velocity at some range x
V_o = initial velocity
x = distance from muzzle
λ = slowing down length = $2w/\rho AC_D$
w = projectile weight
ρ = air density

A = projectile presented area
C_D = drag coefficient

If the muzzle velocity (V_o) is assumed to be constant, the only parameter which effects the down range velocity (V_x) is a slowing down length (λ). It will be seen that if the slowing down length is large, its velocity decay is very gradual. Conversely, if the slowing down length (λ) is small, then the velocity degrades very rapidly. Examination of the factors which determine the slowing down length (λ) provides the conclusion that only projectile weight (w), projectile presented area (A), and drag coefficient (C_D) can be manipulated to vary the slowing down length (λ).

Generally speaking, the projectile presented area (A) is fixed and is nearly equal to the cross-sectional area of the bore of the launcher, leaving only the projectile weight (w) and drag coefficient (C_D) of the projectile to be varied. The subject projectile, however, allows the projectile area (A) to increase after exit from the bore of the launcher which allows flexibility in all three parameters. The above described technique is utilized to drastically alter the ballistic properties of the subject projectile in such a manner that the projectile may be made relatively safe for any selected range.

With reference now to the subject invention, a novel type of ammunition is disclosed, which can be optimized for law enforcement work. The ammunition is adaptable to have conventional high lethality, and effectiveness, at the muzzle and throughout the typical encounter range, and rapidly become non-hazardous thereafter. The inventive concept involves the use of a deformable projectile in the form of a shot filled bag which, when folded and packaged in a conventional cartridge case, requires no more volume than a standard round. However, upon launch, as the projectile is forced down the barrel, it engages the rifling grooves thereby acquiring the spin rate necessary for acquiring stability. Upon exit from the muzzle, the projectile is adapted to expand and assume a disc-like shape due to the reactional centrifugal force upon the shot particles within the bag. The enlarged disc-shape provides an increased drag coefficient (C_D) and an increased presented area (A) which afford substantial resistance to the aerodynamic forces and predictable energy decay.

It is therefore a general object of the subject invention to provide ammunition which is optimized for use in a law enforcement situation.

It is another object of the subject invention to provide ammunition useable in conjunction with conventional small arms, such as hand guns or the like.

It is still another object of the present invention to provide a deformable projectile which may be folded and packaged in a conventional cartridge case.

It is yet another object of the subject invention to provide a projectile having spin stabilized trajectory.

It is a further objective of the present invention to provide a projectile which expands and assumes a disc-like shape under the influence of centrifugal force.

It is still a further object of the present invention to provide a projectile that is stable at the conventional muzzle velocities of a small arm.

It is yet a further object of the subject invention to provide a projectile having a substantial energy decay in a selected, relatively short, down range distance.

It is still a further object of the subject invention to provide a projectile characterized by high penetration

on impact over a relatively short range proximate the end of the launcher and by low penetration on impact thereafter.

It is another object of the present invention to provide a projectile which is easy to assemble, and economical to manufacture.

Other advantages of the present invention will become apparent from a consideration of the following detailed description taken in conjunction with the accompanying drawings:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a plan view of an exemplary high penetration, short range projectile of the subject matter, having an interior portion broken away to disclose the interior content;

FIG. **2** is a perspective view of an assembled cartridge, with a partial quarter section broken away, to disclose the interior content thereof, including the projectile illustrated in FIG. **1**;

FIG. **3** is a partial elevation of a small arm, with one half of the barrel portion broken away, to illustrate the orientation of the cartridge illustrated in FIG. **2**;

FIG. **4** is the same partial elevation as in FIG. **3**, illustrating the separation of the projectile from the cartridge case immediately after firing;

FIG. **5** is another partial elevation illustrating the relative positions of the various components after exit from the barrel of the exemplary small arm;

FIG. **6** is another partial elevation illustrating the fully expanded projectile in trajectory towards its target.

FIG. **7** is an end view of the projectile illustrated in plan in FIG. **1**;

FIG. **8** is a perspective view of the projectile illustrated in FIGS. **1** and **7** illustrating the location of the shot prior to the folding step;

FIG. **9** is an end elevation of the projectile illustrated in FIG. **8**, taken in the direction of the numeral **9**, showing a first edge folded over the portion containing the shot;

FIG. **10** is the same end elevation as illustrated in FIG. **9** showing a second edge folded over the first edge; and

FIG. **11** is a cross-sectional elevation of the small arm and cartridge illustrated in FIG. **3** taken along the line **11—11** thereof.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference now to FIGS. **1** and **7** of the drawings, and in accordance with an exemplary embodiment of the subject invention, a high penetration, short range projectile is indicated generally at **10.** The projectile **10** is comprised of a two-sided, relatively thin, disc-shaped bag **12** having a preselected number of grains of suitably sized shot particles **14** disposed therein. One side of the bag **12** is fabricated from a fabric, such as canvas, while the second side preferably includes a heat sealable fabric which provides an annular bond. Dimensionally for use with a 0.38 caliber cartridge case and by way of example, the bag **12** measures approximately one inch in diameter, but it will be appreciated that the diameter could be altered to accommodate other sized cartridge cases and also to affect the ballistic properties thereof. The size and weight of the shot particles **14** may also be varied, but again by way of example, No. 12 bird shot has been found to afford good results with a 0.38 caliber weapon. As previously indicated, the number of grains of shot **14** disposed within the bag **12** will depend to some extent on the desired ballistics of the projectile **10** and the design rangeability thereof in accordance with the slowing down length (λ).

To accommodate insertion into a small arms cartridge case or the like, the flat configuration of the disc-shaped bag **12** must be initially altered. As best observed in FIG. **8**, the shot particles **14** are initially displaced from random locations thereon and urged toward the center of the bag **12** by any suitable means such as by squeezing the outer annular surfaces of the bag **12.** The center positioning of the shot particles **14** form a generally cylindrically shaped diametrically extending, axially enlarged center portion indicated generally at **11,** which is generally oval shaped in cross section as best observed in FIGS. **9** and **10.** The initial folding step is illustrated in FIG. **9** wherein a first outer edge relative to the center portion **11** is folded thereover. The final step is illustrated in FIG. **10** wherein a diametrically opposite outer edge, relative to the first outer edge, is folded or rolled over the first edge to form an elongated generally cylindrical configuration shaped similar to that of a "taco." In this ultimate configuration, the bag **12** is of suitable cross section to be inserted in the open end of a cartridge case.

With reference now to FIG. **2,** a cylindrically shaped cartridge case is indicated generally at **16,** and may be any conventional cartridge case adaptable for use with any type of small arm as for example a .**38** caliber hand gun or the like. One end of the case **16** is open, as indicated at **18,** with the opposite end being closed by an annularly shaped, radially extending end wall portion **20** which projects slightly outwardly from the cartridge case **16** for purposes of being received in and seated in the receiver portion of a small arm or the like as shall hereinafter be described. The end wall **20** further includes a primer portion **22** adapted to be struck by the firing pin of a small arm as is conventional in the art. The propellant for the projectile **10** is provided by a powder charge **24** disposed within the cartridge case **16** adjacent the end wall **20,** retained therein by means of a relatively thin cylindrically shaped bulkhead or gas check **26.** Interposed between the gas check **26** and a relatively thin, cone shaped, end cap **28** is the suitably deformed projectile **10.** Preferably the end cap **28** and gas check **26** are formed from a relatively light weight plastic so as to contribute negligible weight to the assembled cartridge for purposes to be subsequently explained. Additionally, it will be noted that the projectile **10** in its nested position is easily packaged in the conventional cartridge case **16,** with the assembled case **16** requiring no more volume than a standard round.

FIGS. **3** and **11** of the drawings illustrate an exemplary small arm **30** which includes a barrel portion **31** having a front iron sight at **34** and internal rifling grooves designated by **36.** The left end of the barrel **30** is suitably counterbored as indicated at **32,** to receive the radially enlarged end wall **20** of the cartridge case **16.** The small arm **30** may be any hand operated or shoulder supported weapon, and for purposes of illustration will be considered a 0.38 caliber hand gun having internal firing grooves **36.** The cartridge **16** is indicated in the pre-firing position disposed in the receiver portion **32,** the small arm **30** having a firing pin (not

shown) suitably located and adapted to strike the primer **22.** Upon release of the firing pin by any suitable means, such as pull of a trigger, the firing pin will strike the primer **22** thereby detonating the propellant or powder charge **24.** Since the cartridge case **16** is restrained by the engagement of the counterbore or receiver **32** and the enlarged end wall **32,** the detonation force of the propellant launches the gas check **26,** the projectile **10,** and the end cap **28** towards the muzzle end of the barrel **30.** By means of the internal rifling grooves **36** within the barrel **30,** it will be noted that rotation is imparted to the projectile **10** as well as longitudinal thrust.

FIG. **4** indicates the relation of the elements immediately after detonation of the propellant charge **24,** wherein the gas check **26,** projectile **10,** and end cap **28** are disunited from the case **16** and FIG. **5** indicates the relation of the components upon exit from the barrel **30.** The end cap **28** and gas check **26** have appreciably less mass than the projectile **10** and therefore due to aerodynamic forces, separate from the trajectory line of the projectile **10.** Due to rotation of the projectile **10** provided by the rifling grooves **36,** the centrifugal force imposed on the shot particles **14** to radially displace from the center portion **11** and cause the projectile **10** to radially expand, the projectile **10** now assuming a substantially disc shape of enlarged transverse cross section and dimensionally relatively thin with respect to the axis of trajectory.

FIG. **6** illustrates the projectile **10** in its fully radially expanded shape proceeding in its trajectory in a manner calculated to provide substantial energy decay in a relatively short preselected down range distance, and further providing substantial impact energy against a target between the muzzle of the small arm **30** and the preselected distance.

It will be noted that the projectile **10** is adapted to have predictable ballistic characteristics, such characteristics being predictable by the design of the presented cross-sectional area, the basic configuration of the projectile in flight, and the number of grains of shot disposed in the bag **12** which provides the mass to the projectile. Thus, the ballistic characteristics of the projectile **10** are such that the impact energy may be effectively dissipated in any desired distance. It will further be appreciated that the subject invention provides a novel type of ammunition which can be optimized for use in the law enforcement environment. The projectile can have conventional high lethality and effectiveness proximate the muzzle and throughout the typical encounter range, and ultimately become rapidly nonhazardous thereafter. It will be further noted that the projectile **10** will be completely spin stabilized in flight due to the reaction of the imposed centrifugal force acting upon the shot **14,** the centrifugal force and spin rate being initiated by the rifling grooves **36.**

While it will be appreciated that the embodiments illustrated herein are calculated to fulfill the objects above stated, it will be appreciated that the subject invention is susceptible to modification, variation and change without departing from the scope of the invention.

What is claimed is:

1. The method of making an expandible short range projectile adapted to be launched from a small firearm comprising the steps of:

forming a disc shaped bag;

locating a preselected number of shot particles in said bag; and

rolling the bag from one outer peripheral edge into a generally cylindrical shape to accommodate insertion into a cartridge case of a small arm.

2. The method, as recited in claim **1,** wherein said locating step includes urging said shot particles inwardly in said disc shaped bag proximate a common diameter thereof.

3. The method of making an expandible short range projectile adapted to be launched from a small firearm comprising the steps of:

forming a disc shaped bag;

locating a preselected number of shot particles in said bag including urging said shot particles inwardly in said disc shaped bag proximate a common diameter thereof; and

folding the bag to a generally cylindrical shape for insertion in a cartridge case of the small arm, said folding step including folding the first edge of said bag over said common diameter, and subsequently folding a second opposite edge over said first edge.

4. The method of making an expandible short range projectile adapted to be launched from a small firearm comprising the steps of:

forming a disc shaped bag, said forming step including cutting a first disc shaped side from a canvas material, and cutting a second identical disc shaped side from a heat sensitive material;

locating a preselected number of shot particles in said bag; and

folding the bag to a generally cylindrical shape for insertion in a cartridge case of the small arm.

5. The method, as recited in claim **4,** wherein said forming step includes bonding said second side to said first side.

6. The method, as recited in claim **3,** wherein said forming step includes cutting a first disc shaped side from a canvas material, and cutting a second identical disc shaped side from a heat sensitive material.

7. The method, as recited in claim **6,** wherein said forming step includes bonding said second side to said first side.

8. The method, as recited in claim **4,** wherein said locating step includes urging said shot particles inwardly in said disc shaped bag proximate a common diameter thereof.

9. The method, as recited in claim **8,** wherein said folding step includes folding a first edge of said bag over said common diameter, and subsequently folding a second opposite edge over said first edge.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,815,502 Dated June 11, 1974

Inventor(s) Robert C. Mawhinney

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 3, line 14, "matter" should be --invention--.

Column 4, line 66, "firing" should be --rifling--.

Signed and sealed this 17th day of June 1975.

(SEAL)
Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents
and Trademarks

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334

UNITED STATES PATENT OFFICE
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