United States Patent

Rogers et al.

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[54] SPECIAL PURPOSE FIREARMS PROJECTILE

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[52] **U.S. Cl.** **102/92.3**, 244/3.1

[51] **Int. Cl.** **F42b 11/02**

[58] **Field of Search** 244/3.1; 102/38, 92.2, 92.3, 102/105, 92.4; 89/1

[56] **References Cited**

UNITED STATES PATENTS

3,086,467	4/1963	Gallagher et al.	244/3.1
2,324,346	7/1943	Albree	244/3.1
3,011,404	12/1961	Russell	89/1
3,050,000	8/1962	Katsanis	102/105
3,107,619	10/1963	Daniels	102/105
3,267,857	7/1966	Lindberg, Jr.	102/105

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[57] **ABSTRACT**

A small arms bullet with controlled flight characteristics fireable at high velocities from conventional small arms. The bullet has a projecting spike tip forming a supersonic shock wave cone. The bullet travels inside this shock wave cone and has low aerodynamic drag at supersonic velocities. The bullet is light weight and has a blunt drag face providing a high aerodynamic drag configuration for the bullet at subsonic flight velocities to rapidly decelerate the bullet after a preselected initial combat range, thereby reducing its long range danger to bystanders and property. Within the preselected combat range the shape and velocity characteristics of the bullet provide high "stopping power" yet a reduced lethality.

1 Claim, 5 Drawing Figures

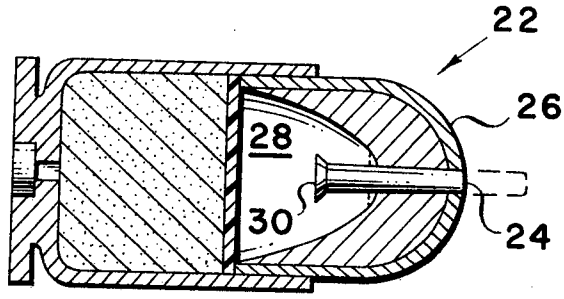


FIG. 1

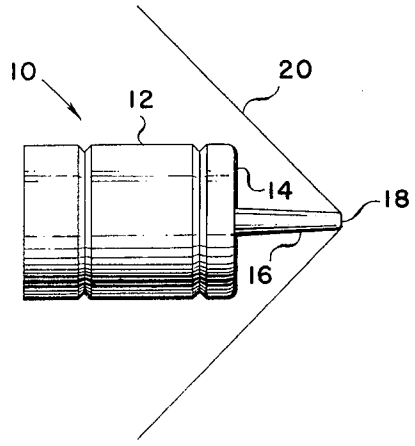


FIG. 2

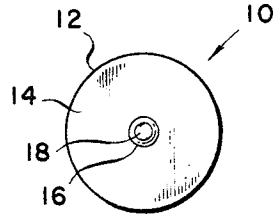


FIG. 3

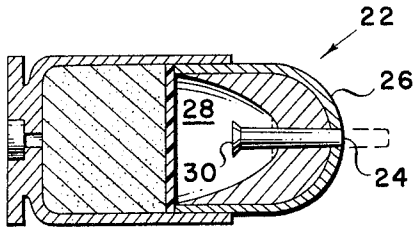


FIG. 4

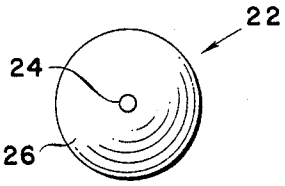
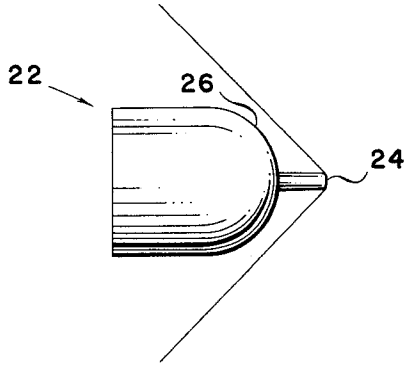


FIG. 5



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SPECIAL PURPOSE FIREARMS PROJECTILE

The present invention relates to a small arms bullet with controlled flight characteristics, and in particular to a bullet providing a higher velocity over a short preselected combat range yet a rapid reduction in velocity over a short preselected combat range yet a rapid reduction in velocity beyond said combat range by a simple fixed configuration with low supersonic aerodynamic drag and high subsonic aerodynamic drag.

The desired combat range for small arms, for example police pistols, is quite short. The generally recognized maximum effective range for hand guns is 50 yards, and fire is rarely directed beyond this range. Yet conventional bullets for such small arms have mass and sustained velocity characteristics rendering them extremely dangerous, particularly in urban areas, to innocent personnel and objects over a range extending far beyond this desired combat range. Also, conventional bullets are often unnecessarily lethal, in that the kinetic energy transfer from the bullet to the target necessary for "-stopping power" is largely expended internally through the target rather than rapidly transferred to the target upon impact. These same disadvantages are also present in other small arms use in urban areas for riot control and the like; e.g., shotgun slugs, rifle and light machine gun bullets.

The flight characteristics of a projectile can, of course, be changed by varying the configuration of the projectile in flight. However, this requires moving mechanisms operating in flight, as shown for example if U.S. Pat. Nos. 2,936,710 and 3,157,123. These projectiles are obviously not suitable for small arms bullets.

There is disclosed herein a special purpose bullet with controlled flight characteristics particularly suitable for small arms used in urban areas. This bullet overcomes the above stated and other disadvantages of conventional small arms bullets. Its controlled variable drag flight characteristics are provided by a simple, inexpensive, integral structure. Yet no moving parts are required during the flight of the bullet; i.e., it has a fixed flight configuration. The disclosed bullet also provides a rapid impact energy transfer to the target for good stopping power, yet provides reduced internal injuries.

Further objects, features and advantages of the invention pertain to the particular arrangement and structure whereby the above mentioned aspects of the invention are attained. The invention will be better understood by reference to the following description and to the drawings forming a part thereof, which are substantially to scale, wherein:

FIG. 1 is a plan view of a first exemplary bullet embodiment of the invention in flight;

FIG. 2 is a frontal view of the bullet of FIG. 1;

FIG. 3 is an axially cross-sectional view of a second bullet embodiment of the invention shown prior to firing;

FIG. 4 is a frontal view of the bullet of FIG. 3; and

FIG. 5 is a plan view of the bullet of FIGS. 3 and 4 in flight.

Referring first to FIGS. 1 and 2, there is shown therein a small arms bullet **10** in accordance with the present invention. The bullet **10** has a generally conventional bullet body **12** adapted to be fired from conventional small arms cases through a conventional small arms barrel. The particular bullet shape illustrated is for a conventional 38 caliber police revolver. The bullet body **12** is somewhat lighter in weight than a conventional bullet of the same caliber so as to have a higher supersonic muzzle velocity than a conventional bullet.

In contrast to a conventional bullet nose, the bullet **10** has a large blunt drag face **14** at its forward end extending transverse the direction of flight of the bullet. The drag face **14** is here a flat annular shoulder area extending across the front face of the bullet with a diameter substantially that of the full (maximum) bullet diameter.

Fixed axially forward of the drag face **14** from the bullet body **12** is a central spike **16**. The spike **16** may be constructed as an integral part of the body **12** (of the same material) or it may be a separate attached member of a suitable material such as a copper pin. The spike **16** has a forward tip **18** having a much smaller effective frontal area than the drag face **14**.

For supersonic flight of the bullet **10** the spike tip **18** is adapted to form a clean low drag supersonic shock wave cone **20** (flow separation region) which has its apex at the spike tip **18** and opens rearwardly toward the bullet body **12** about the central axis of the bullet **10**. The included angle of this shock wave cone **20** is, of course, a known function of velocity, air pressure and temperature.

The spike tip **18** and the drag face **14** are positioned with respect to one another on the bullet **10** so that for supersonic flight of the bullet **10** the drag face **14** and the entire bullet body **12** is positioned entirely inside the shock wave cone **20** formed by the spike tip **18**, thereby providing a low aerodynamic drag configuration for the bullet **10** at supersonic flight velocities. For this flow separation effect to be effective the ratio of the distance between the drag face **14** and the spike tip **18** to the diameter of the drag face **14** should be between 0.5 and 3.0. For example, for a pistol bullet with a muzzle velocity of 1,400 ft/sec the total included angle of the shock wave cone **20** is less than 80° and therefor this ratio can be approximately 1.0. By this low supersonic drag configuration, the bullet **10** maintains a high supersonic flight velocity for a pre-selected initial combat range after firing.

The bullet weight and charge are selected to give a muzzle velocity such that over an initial selected combat range (e.g. 50 yards) the velocity of the bullet **10** will remain supersonic, but will have dropped to approximately the speed of sound as the bullet reaches the outer end of that range. At that point, with its velocity dropping below the speed of sound, the configuration of the bullet **10** automatically provides a radically altered aerodynamic characteristic which rapidly further decelerates the bullet by high aerodynamic drag. This high aerodynamic drag is provided by the high drag configuration of the blunt drag face **14** at subsonic flight velocities. Thereby, within a short distance beyond the preselected combat range, the bullet **10** is slowed to a velocity at which it is of greatly reduced danger to objects and personnel. The maximum range of the bullet is also greatly reduced.

If desired, even further drag may be provided by deliberately introducing instabilities in the flight of the bullet **10** beyond the combat range. This may be provided for example by slightly unbalancing or offsetting the position of the spike **16** with respect to the central bullet axis.

Considering the action of the bullet **10** against a target within the selected combat range, as stated above the bullet **10** is traveling at a supersonic velocity. The combination of this high velocity and the blunt face of the drag face **14** provide a high energy transfer to the target upon impact, thus providing improved stopping power. The bullet **10** has the stopping power advantages of a blunt nosed bullet without the disadvantageous flight characteristics normally associated with such bullets. Yet the light weight and blunt face of the bullet **10** reduces the penetration of the bullet into the target. Accordingly, maximum energy transfer takes place in the first 3 to 4 inches of target penetration. Further, the bullet **10** is constructed so that it does not mushroom. The combination of these features provides a bullet **10** which has a reduced likelihood of inflicting lethal wounds as compared to conventional bullets, yet without any reduction in stopping power. This may be better understood from the recognized formula for stopping power discussed in Chapter 12, *Text Book of Pistols & Revolvers*, Major Julian S. Hatcher, Ordnance Dept., U.S. Army, Small Arms Technical Publishing Co., 1935, (see especially pages 427 – 435). The lower lethality potential is indicated, for example, by the text *Wound Ballistics*, Col. James S. Cottes, Jr., Editor in Chief, Office of the Surgeon General, Department of the Army, 1962, Library of Congress Card Catalogue No. 62–60002 (see especially page 225).

Referring to FIG. 3 – 5, a second embodiment of the invention is in the form of a chambered **22** which is illustrated therein. While the bullet **10** functions well in revolvers, the bullet **22** is preferred for magazine or belt fed weapons. For such weapons, the bullet **22** allows conventional feeding without requiring modification of the fire arm. The bullet **22**

differs from the bullet **10** primarily in that it has a spike **24** which prior to firing is recessed substantially flush with the bullet nose in the interior of the bullet. Thus, until the bullet **22** is fired, its external profile is close enough to that of a conventional bullet that it can be fed and chambered in the same manner as a conventional bullet. However, when the bullet **22** is fired, as shown in FIG. **5** and the dashed outline in FIG. **3**, the chamber pressure of the firearm drives the spike **24** into a fixed projecting position where it then functions in the same manner as the spike **16** of the bullet **10** of FIG. **1** throughout the flight of the bullet **22**.

The bullet **22** has a drag face **26** more rounded at its outer edges than the drag face **14** of the bullet **10** in order to allow proper magazine feeding. However, the bullet **22** has a large diameter with respect to its length and mass so as to provide a large effective drag face **26** transverse the direction of flight.

As may be seen in FIG. **3**, the bullet **22** has a large recess **28** in its base or rear portion. This substantially reduces the mass of the bullet without affecting its stability and allows an increase in its supersonic muzzle velocity. The recess **28** also provides the space into which the spike **24** is retracted prior to firing of the bullet **22**. The bullet **22** is shown conventionally copper or steel jacketed with a lead interior.

The spike **24** is preferably a slightly tapered pin constructed from brass or other suitable material harder than the lead interior of bullet **22**. The spike **24** has an enlarged head **30** at its rearward end in the recess **28**. Prior to firing the spike **24** is held by a press fit in a corresponding axial hole through the bullet **22**.

Upon firing of the bullet **22**, gas pressure drives the spike **24** forward through the bullet body until its enlarged head **30** engages the rearward face of the bullet interior. The head **30** of the spike **24** thereby limits the projection of the spike **24** to the desired distance of extension of the spike tip from the drag face **26**, as shown by the dashed out line position of the spike **24** in FIG. **3**. This projection distance is determined in the same manner as for the spike tip **18** of bullet **10**. The spike **24**, having been forced tightly through the hole in the lead core of bullet **22**, is fixed in its extended position for the entire flight of the bullet. This is assisted by the fact that the drag forces on the body of the bullet **22** are much higher than those on the smaller diameter spike **24**. Thus, the bullet **22** maintains the configuration shown on FIG. **5** throughout its flight, thereby maintaining a high supersonic flight velocity for a preselected initial combat range after firing and then rapidly decelerating thereafter by a high subsonic drag, similarly to the bullet **10**.

It may be seen that there has been described herein an improved small arms bullet with novel characteristics. While the bullet described herein is presently considered to be preferred, it is contemplated that numerous further variations and modifications within the purview of those skilled in the art can be made therein. The following claims are intended to cover all such variations and modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. A small arms bullet with controlled flight characteristics, said bullet having:

a light weight generally cylindrical bullet body adapted to be fired from conventional small arms at a supersonic muzzle flight velocity,

a blunt forward drag face providing a high aerodynamic drag configuration for said bullet at subsonic flight velocities and rapid impact energy transfer,

said drag face being substantially flat and extending over substantially the entire frontal area of said bullet,

and a non-ablative, integral spike tip fixed forwardly of said drag face at a fixed distance in the flight of said bullet,

said spike tip having a much smaller effective frontal area than said drag face,

said spike tip being adapted to form a supersonic shock wave cone at the forward end of said bullet during the flight of said bullet,

said spike tip and said drag face being positioned with respect to one another on said bullet so that for supersonic flight of said bullet said drag face is inside said shock wave cone formed by said spike tip, thereby providing a low aerodynamic drag configuration for said bullet at supersonic velocities,

whereby said bullet maintains a high supersonic flight velocity for a preselected initial combat range after firing but then rapidly decelerates due to high aerodynamic drag after the bullet slows to a subsonic flight velocity, thereby reducing said bullet's danger to objects and personnel outside of said combat range and reducing said bullet's range.

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