March 2, 1971 C. WALTON MUSSER 3,566,528

GUN BARREL

Filed April 23, 1958 2 Sheets-Sheet 1

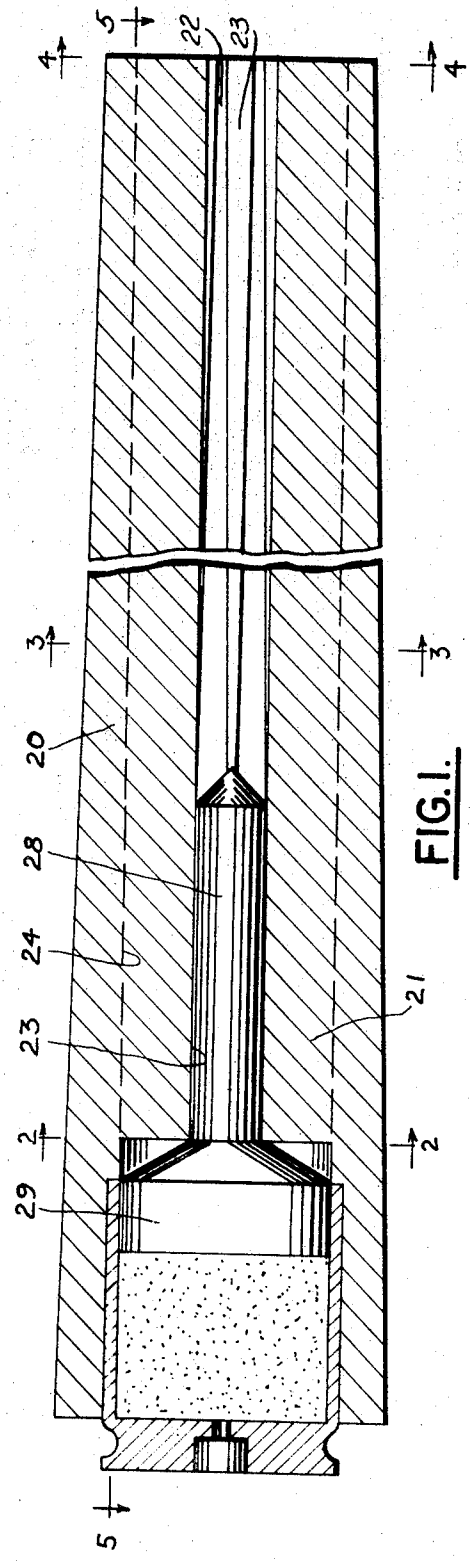


FIG. 1.

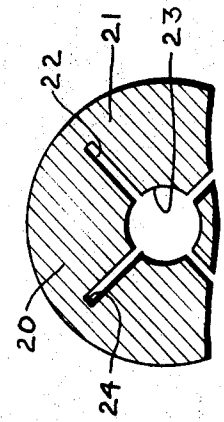


FIG. 4.

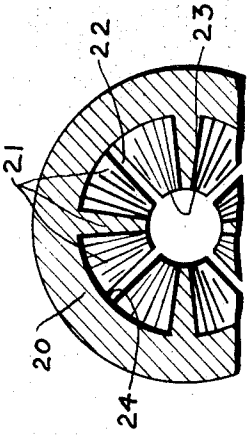


FIG. 3.

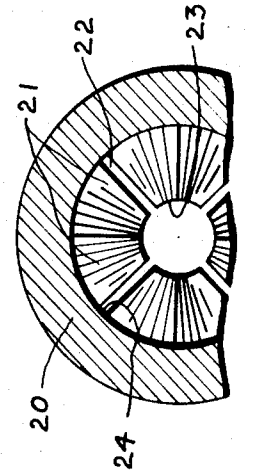


FIG. 2.

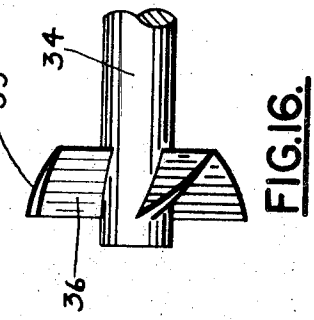


FIG. 16.

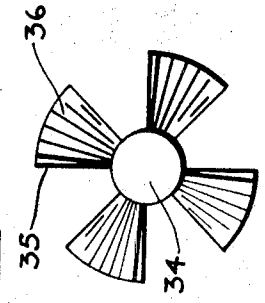


FIG. 17.

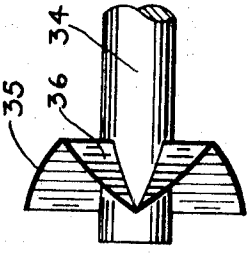


FIG. 14.

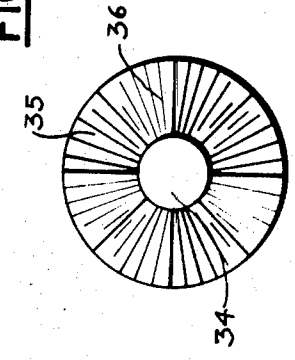


FIG. 15.

INVENTOR.
C. WALTON MUSSER

BY
W. E. Thibodeau, J. J. Lynch & A. R. Johns

March 2, 1971 C. WALTON MUSSER 3,566,528

GUN BARREL

Filed April 23, 1958 2 Sheets-Sheet 2

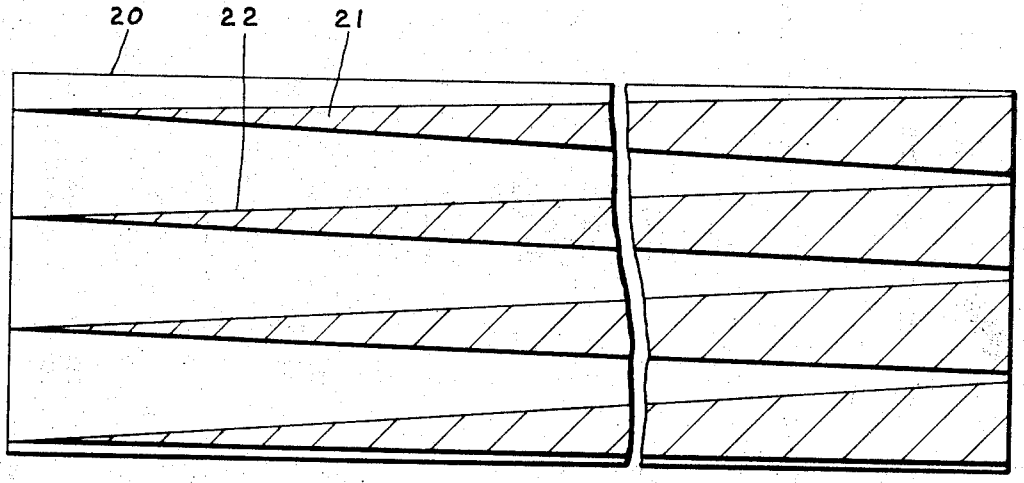


FIG.5.

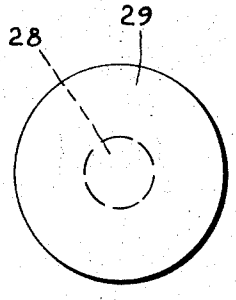


FIG.7.

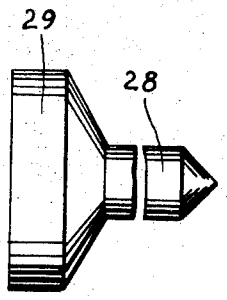


FIG.6.

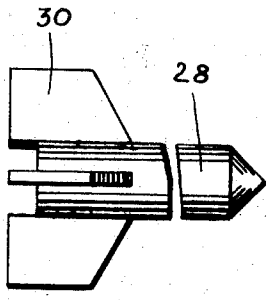


FIG.8.

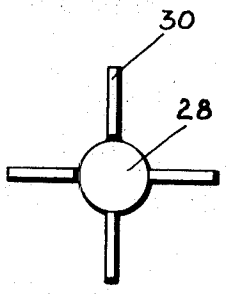


FIG.9.

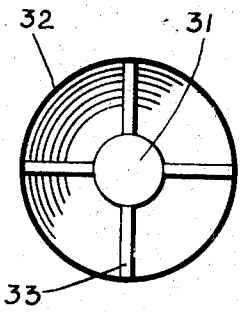


FIG.11.

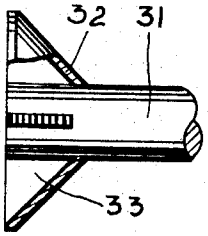


FIG.10.

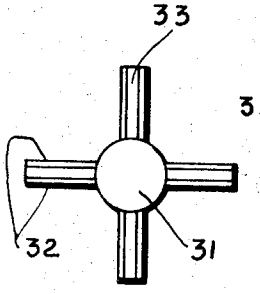


FIG.13.

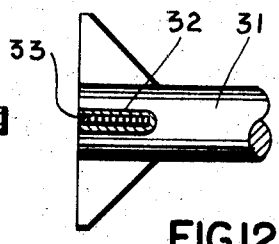


FIG.12.

INVENTOR.
C. WALTON MUSSER

BY
W. E. Thibodeau, T. J. Lynch
& H. R. Johns

United States Patent Office 3,566,528 Patented Mar. 2, 1971

3,566,528

GUN BARREL

C Walton Musser, Beverly, Mass., assignor to the United States of America as represented by the Secretary of the Army

Filed Apr. 23, 1958, Ser. No. 731,078
Int. Cl. F41c 21/00; F42b 11/00, 15/00
U.S. Cl. 42—78 3 Claims

The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment of any royalty thereon.

This invention relates to a gun barrel for small arms ammunition weapon systems and to a method of permanently reshaping a projectile into a flechette, or small steel dart with fins or vanes, during its passage through the gun barrel. Heretofore, the only way flechettes were accurately formed was by a molding process that was not only costly, but required a costly means to affix them to cartridge cases for launching.

The purpose of this invention is to provide a gun barrel which is capable of permanently reshaping a specially formed bullet into a flechette during the bullet's passage through the bore of the gun, the bore diameter being constant from the breech to the muzzle to eliminate balloting or wobble of the projectile therein, as a result of which the bullet will have superior exterior ballistics.

The large area of the base of the bullet presented to the powder gases prior to its reshaping in the barrel imparts a greater force to the bullet improving its interior ballistics while the reshaped bullet on leaving the muzzle of the gun barrel offers less external resistance further improving its external ballistics.

More specifically, the invention consists in providing the gun barrel with tapered lands and grooves that extend from the breech to the muzzle to act as forming dies to reshape a part of the bullet and, if desired, curve the fins to impart rotation to the projectile as it leaves the muzzle. Lands in the prior art are tapered for a relatively short distance from the breech in order to facilitate introduction of a projectile wtih a pre-engraved surface on its outer periphery.

A method of reshaping a projectile while within the weapon has been employed by Moore (Pat. No. 2,089,-219) wherein the lands squeezed down the preformed tail of a missile or bullet. However, this has not been found to be satisfactory.

In a gun of this type the accuracy of the projectile is at the mercy of the uniformity of squeeze-down on the projectile. For example, if the projectile were to differentially deform so that one side of it deformed earlier than the other side, the projectile would be givn a side component velocity and as a consequence it would either be improperly formed or it would start balloting or wobbling within the gun bore, since the front cylindrical part of the projectile is unsupported. In either case, its accuracy upon leaving the muzzle of the gun is destroyed. Very frequently these projectiles were so malformed that the external ballistics were seriously impaired.

In contrast to these, the proposed invention preferred to maintain the groove and bore diameter constant from breech to muzzle. By so doing the cylindrical portion of the projectile, which preceded the deformable portion, coul fit within the bore diameter and be positively guided throughout its entire journey in the barrel.

To these and other ends, the invention consists in the construction, arrangement and combination of elements described hereinafter and pointed out in the claims formig a part of this specification.

A practical embodiment of the invention is illustrated in the accompanying drawings wherein the characters of reference indicate corresponding parts throughout the several views and wherein:

FIG. 1 is a longitudinal sectional view of a gun barrel constructed in accordance with the invention.

FIGS. 2, 3 and 4 are sectional views on the respective lines of FIG. 1.

FIG. 5 is a developed view taken at the outside diameter of the grooves on lines 5—5 of FIG. 1.

FIG. 6 is a longitudinal sectional view of a bullet of the preferred embodiment before passing through the gun barrel.

FIG. 7 is a rear end view of FIG. 6.

FIG. 8 is a view in side elevation of the bullet after passing through the gun barrel.

FIG. 9 is a rear end view of FIG. 8.

FIG. 10 is a longitudinal sectional view of an alternative embodiment of bullet before passing through the gun barrel.

FIG. 11 is a rear end view of FIG. 10.

FIG. 12 is a view in side elevation of the bullet shown in FIG. 10 after passing through the gun barrel.

FIG. 13 is a rear end view of FIG. 12.

FIG. 14 is a longitudinal sectional view of another alternative embodiment of the bullet before passing through the gun barrel.

FIG. 15 is a rear end view of FIG. 14.

FIG. 16 is a view in side elevation of the bullet shown in FIG. 14 after passing through the gun barrel.

FIG. 17 is a rear end view of FIG. 16.

Referring to FIGS. 1 to 4, the gun barrel **20** has a bore **23** in which the lands **21** are gradually widened from a point at the projectile receiving chamber to the muzzle, the bore diameter **23** being uniform throughout the entire length of the gun barrel with the result that the grooves **22** are gradually narrowed in width toward the muzzle but are at a uniform depth or diameter **24** (which approximately corresponds to the diameter of the projectile receiving chamber in which is the enlarged base **29** of the projectile body **28**) from the projectile receiving chamber to the muzzle. The lands **21** and grooves **22** may also be cut with a helical angle in order to impart spin to the projectile on leaving the muzzle. The lands may be tapered in width from the portion of the projectile receiving chamber in which the enlarged base **29** is located, to adjacent the muzzle so that the width of the grooves corresponds to the desired fin thickness.

A preferred form of bullet for use with the gun barrel is shown in FIGS. 6 to 9 and consists of a body **28**, preferably of steel, and an integral enlarged cylindrical base or tail **29** made of lead or other readily deformable material, and capable of being permanently reshaped, the said tail being approximately one-quarter as long as the body. The diameter of the base **29** is approximately three times the diameter of the body and equal to the maximum diameter **24** of the grooves **22**.

The gun barrel **20** with its lands **21** and grooves **22** constitutes a forming die which acts on the base **29** of the bullet to permanently reshape it forming the fins **30** as shown in FIGS. 8 and 9. During travel of the bullet through the gun barrel **20**, its body **28** is in constant contact with the gun barrel **23** whereby the bullet is given stability while its base **29** is being reshaped.

An alternative embodiment of bullet for use with the gun barrel is shown in FIGS. 10 and 11 and consists of a body **31**, preferably of steel and an integral enlarged hollow and readily deformable base **32**, constituting a conical-shaped tail approximately one-quarter as long as the body. The diameter of the rear end of base **32** is the same as the maximum diameter of the grooves **24**. The said base is formed with a conical-shaped cavity through which extends the body **31** of the projectile to the end of

the base. In this cavity and extending radially outward from the outside diameter of the body of the projectile are four fins **33** spaced 90° apart, said fins meeting and merging into the walls of the conical tail, the latter being relatively thin so that it is readily deformable. The lands in the gun barrel, functioning as a forming die, act on the conical base shearing the cone midway between the fins in the conical cavity, in addition to bending said sheared portions against the fins during passage of the projectile through the gun barrel, so that the projectile emerges from the muzzle in the form of a flechette as shown in FIGS. 12 and 13.

Another alternative embodiment of bullet for use with the gun barrel is shown in FIGS. 14 and 15, and consists of a body **34**, preferably of steel and an integral enlarged readily deformable base **35** and **36** approximately one-fourth as long as the body, said base comprised of a series of fins extending radially outward from the body to a diameter essentially equal to the maximum diameter of the grooves **24**, said fins being formed into a series of interconnected V shaped members as the fins encircle the body of the bullet. The lands in the gun barrel, functioning as a forming die, act on the V shaped members opening up the apices of the V's at the tail end of the base and bending side **36** thereof against side **35** during passage of the projectile through the gun barrel, so that the projectile on emerging from the muzzle, is in the form of a flechette as shown in FIGS. 16 and 17.

I claim:

1. In a gun barrel of the type having a chamber for receiving a projectile having a body portion and an enlarged somewhat conical base, lands and grooves in the gun barrel extending from said chamber for receiving said enlarged base to the muzzle of said gun barrel, and the grooves being tapered in width from a maximum width at said chamber for said conical base to a minimum width adjacent said muzzle whereby said enlarged base of a projectile may be formed into upstanding fins as said projectile is moved through said gun barrel toward the muzzle, the combination therewith of the improvement to reduce balloting or wobble of the projectile in the gun barrel and enhance accuracy in its flight after leaving the gun barrel, said improvement including the said body portion being cylindrical in front of said fins and said lands extending inwardly transversely of the gun to contact and guide the cylindrical body portion of a projectile during substantially its entire movement within the gun barrel.

2. A gun barrel according to claim **1** in which the fins formed from the enlarged base of the projectile have each a height about equal to the diameter of the cylindrical body portion of a projectile and the maximum diameter of the fins is about **3** times that of the cylindrical body portion of the projectile.

3. A gun barrel according to claim **1** in which the lands and grooves are at an angle to the longitudinal axis of the gun barrel to impart at least some rotation to the projectile on its longitudinal axis.

References Cited

UNITED STATES PATENTS

50,433	10/1865	Trauth	42—78
1,275,028	8/1918	Holter	42—78
2,089,219	8/1937	Moore	42—78

EAMUEL W. ENGLE, Primary Examiner

C. T. JORDAN, Assistant Examiner

U.S. Cl. X.R.

42—76; 102—38, 92.1; 244—3.24