United States Patent [19]

Kelly et al.

[11] **3,726,231**

[45] **Apr. 10, 1973**

[54] **SABOT BULLET**

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[22] Filed: **May 18, 1970**

[21] Appl. No.: **38,102**

[52] **U.S. Cl.** **102/93,** 102/38, 102/92.1

[51] **Int. Cl.**.....**F42b 13/16**

[58] **Field of Search**.....102/93, 38, 92.1, 102/94

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[57] **ABSTRACT**

An improved sabot bullet particularly designed for loading in a standard shotgun shell. The bullet is provided with a diametrically constructed portion intermediate its ends, and the sabot segments are provided with matching and complementary inner surfaces so that axial stresses or pressures created during firing on the sabot segments and/or the bullet are readily transferred from one to the other.

10 Claims, 3 Drawing Figures

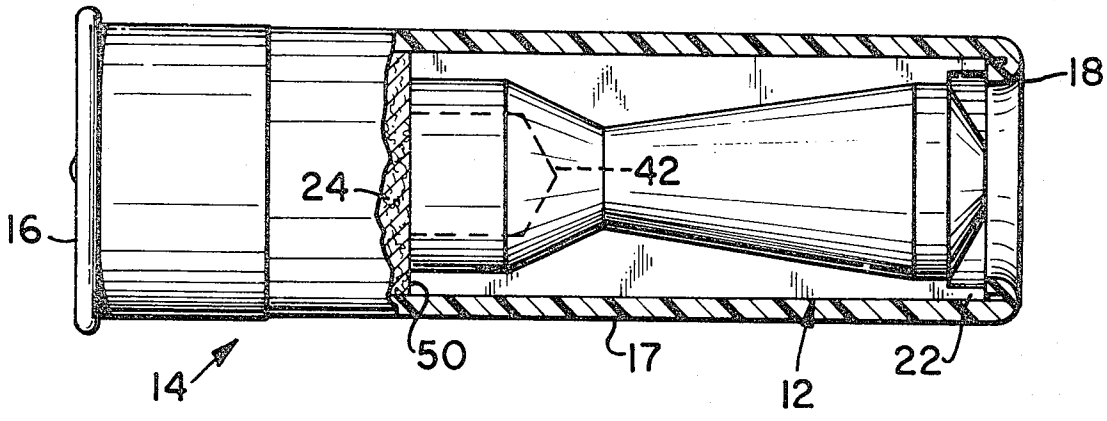


FIG_1

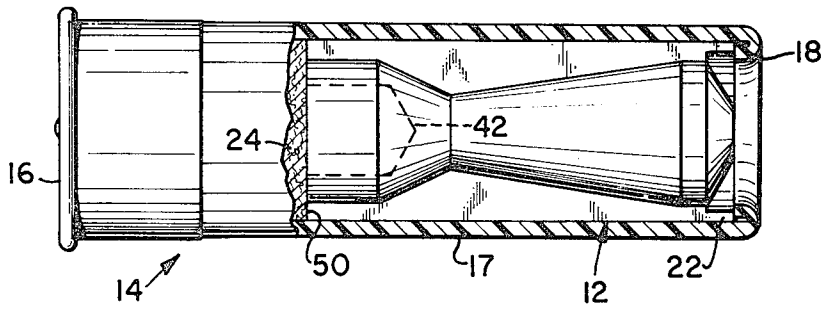


FIG_2

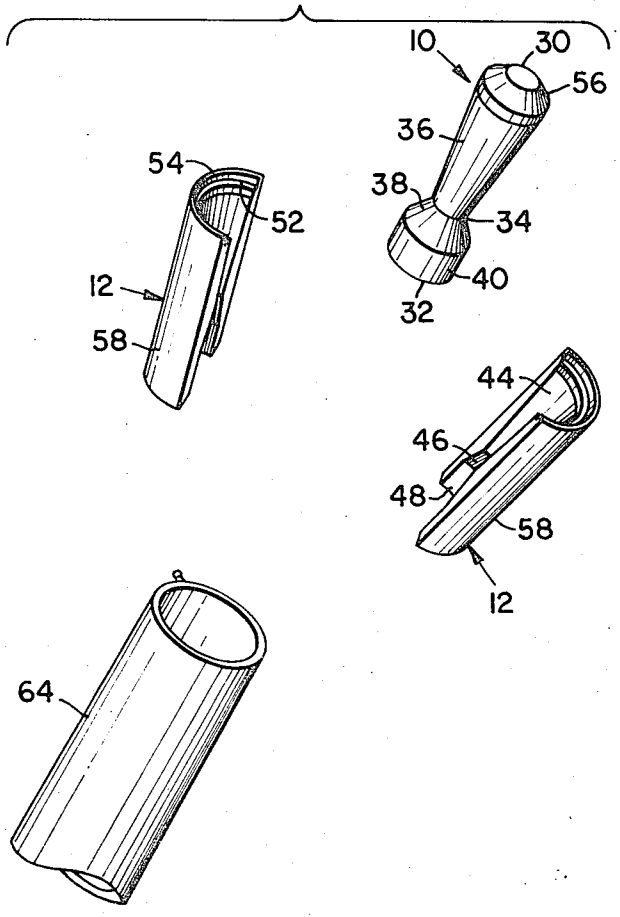
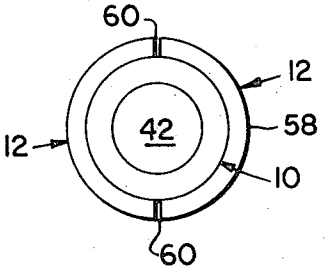


FIG_3



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SABOT BULLET

BACKGROUND OF THE INVENTION

Sabot is a commonly used ordnance term to define a sleeve, shim or other support to center a sub-caliber projectile in a gun bore. Upon firing, the sabot is intended to separate from the projectile after the assembly leaves the gun muzzle. A number of different sabot systems have been developed, but it has been found that such systems are not suitable for use in a shotgun, i.e., where it is desired to use a single sub-caliber bullet and a sabot loaded into a standard shotshell. While the following description may make specific reference to shotguns and/or shotgun shells, it is not intended that the invention be so limited.

Some of the problems encountered in providing a sabot bullet for a shotgun include the fact that there exist uncertain and non-standardized variations in shotgun bore diameters, length, configurations and interior taper or choke. The shellcase diameter will normally exceed the bore diameter or the choke, and therefore any load component, e.g., projectile, wadding, sabot etc., must either be of a lesser diameter than the minimum choke diameter, or be formed of a material which may compress or otherwise be capable of deformable flow to pass through the choke.

Another problem that must be considered is that if a sub-caliber bullet is loaded in a shotshell over a conventional wad column, the inertia of the bullet will cause it to penetrate the wadding when the shell is fired. However, even if a suitable wad material was available, which would avoid penetration due to the bullet inertia, the same inertia or setback forces would deform a projectile made of lead or a lead alloy, thereby necessitating a steel bullet which sacrifices density and ease of fabrication.

The setback forces which would deform a projectile are substantial, and if a shotgun projectile is only supported around its circumference with a sabot of desirably light weight and compressible material, the inertial forces have been heretofore considered an unsolvable problem.

SUMMARY OF THE INVENTION

In accordance with the teachings of the present invention, a sabot bullet is provided which may be readily fired in a standard shotgun shell. The bullet-sabot configuration and relationship is such that about one-half of the face of the wadding is covered by the base of the bullet and the other half covered by the base of the sabot. The greater portion of the force imposed upon the sabot base is transferred to the forward portion of the bullet. Also, with matching and complementary confronting surfaces on the bullet and sabot, all axial forces resulting from setback are distributed evenly. This is generally accomplished by providing the bullet exterior with a medial portion of reduced diameter and then tapering outwardly towards the front and base portions thereof. The exterior surface of the sabot or sabot segments conform to such exterior bullet surface.

When the shell is fired, the inclined surfaces of the bullet and the sabot moving under setback stress, cause the segments of the sabot to spread. This allows the bullet-sabot system to be made with a small enough diameter to be loaded into a shellcase of uncertain interior tolerances. The interior diameter of the shellcase may also be larger than the diameter of the barrel. In addition, the chamber of the gun may be of uncertain length as may the forcing cone. The sabot-bullet by this expansion of the sabot segments, maintains a snug fit while traveling through these uncertain and varying tolerances. This is a desirable function of any "-payload" (projectile, shot, slug, etc.) in a shotgun, otherwise the wadding may not effectively seal the propelling gases.

A further function of setback or inertial forces acting upon the engaged inclined surfaces of the bullet's exterior and the sabot's interior, is the unmistakable tendency of this action toward centering the mass of the bullet in the exact center of the bore. While previous shotgun projectiles have been designed to compress or "swage down" as they passed through the choke of a shotgun, there has been no design provision to ensure they would do so evenly and keep their mass centered in the bore.

As the sabot-bullet travels down a shotgun bore, a point may be reached where the propellent has been entirely burned or at least is no longer effectively generating propelling gas. At this point, interior bore pressures will drop rapidly and the sabot-bullet will cease accelerating. Since the circumferential surface of the sabot is in contact with the gun bore, the resulting friction will make the sabot tend to travel more slowly than the bullet. In this circumstance, it will encounter a "setforward" instead of a setback of the bullet. Now the inclined surfaces on the rearward portion of the bullet and sabot become active again. Previously, these surfaces were active in keeping the bullet positioned and secured in the loaded shellcase and to keep the bullet from being moved forward in the sabot by surge pressures or the priming charge during the resistance the shot encounters while opening the shotshell crimp and/or entering the forcing cone.

As the bullet moves forward in the sabot, the bullet-sabot is prevented from premature separation. Also, the rear inclined surfaces now perform the function of centering the bullet's mass in the bore, and keeping the sabot segments spread into a snug, accuracy enhancing bore fit.

In addition to the foregoing, it is essential that the sabot-bullet leave the muzzle as a stable single projectile so as to avoid any tumbling tendency, and the assembly of the present invention is weight stable. Next, after leaving the muzzle, it is necessary that the sabot segments separate from the bullet without imparting an uneven force as they drop away. With the present construction, the sabot segments, after initial opening, can only have contact with the bullet at a point rearward of the bullet's center of balance. Further, the segments are so constructed that as they open and begin to fall away, they will continue to turn outward and thus will not disrupt the stabilizing air flow over the bullet.

The bullet itself is constructed to not only cooperate with the sabot segments as above described, but is itself stabilized with its center of balance or center of gravity positioned forwardly of its geometric center. Additionally, the bullet is aerodynamically stabilized, i.e., the least surface is presented to the air in straight forward flight.

THE DRAWING

FIG. 1 is a side elevational view of a conventional shotgun shell loaded with the sabot bullet of the present invention.

FIG. 2 is an exploded perspective view of the bullet and sabot segments shortly after leaving the muzzle of a shotgun.

FIG. 3 is an end view of the base of the bullet and sabot segments.

DESCRIPTION

With the features of the present invention hereinabove stated in the Summary of the Invention, the following is a description of an extremely simple, but practical embodiment of such invention.

In broad terms, the assembly of this invention includes a bullet **10** and a plurality of sabot segments **12**, here shown as two in number, but it should be apparent to those schooled in the art that a larger number of segments could be provided. When in its operative assembled condition for firing, i.e., with the segments **12** positioned adjacent and around the bullet, the assembly is adapted for loading in a conventional shotgun shell **14** in place of the usual slugs or pellets.

A standard shotshell includes a circular base **16**, and a tubular body **17** terminating at its leading or forward end with an inwardly crimped curl **18** which holds the bullet and sabot assembly in the body. The charge is positioned in the shell chamber **22** adjacent base **16** and forwardly of the charge is wadding **24** which transfers the explosive charge force to the projectile in the chamber.

As illustrated in FIG. 1 of the drawing, the length of the bullet **10** and sabot **12** is such that they extend between the forward surface of the wad column **24** and the rear surface of cover **20**. The outer diameter of the sabot segments when assembled in the bullet will permit ready insertion of the assembly in the shell body **17** with a minimum of play therebetween.

Referring now to the bullet **10**, best illustrated in FIG. 2 of the drawing, it will be seen to comprise a generally cylindrical body having a leading end **30** and a base **32**. The body is radially constructed as indicated at **34** at a transverse plane closer to the base than the leading end, with the body tapering or diverging outwardly and forwardly as shown at **36** towards end **30** and likewise tapering or diverging outwardly and rearwardly as shown at **38** towards base **32**. Taper **38** could continue to the base, but for aerodynamic considerations terminates in a short cylindrical body portion **40** adjacent the base. The foregoing construction results in an aerodynamically stable projectile whose center of gravity is positioned forwardly of the center of the geometric mass. Preferably the rear end portion of the bullet is hollow, as indicated in FIG. 1, and a plug **42** of epoxy, plastic or the like is inserted therein.

The sabot is of generally annular configuration, as indicated in FIG. 3, with each of the two segments **12** extending for approximately one-half the circumference thereof. The inner surface of the segments match and are complementary to the outer adjacent portions of the bullet, thus having a forward tapered portion **44**, a rear tapered portion **46**, a cylindrical portion **48**, and an annular base **50** coplanar with the bullet base **32**. The forward end portions of the segments are provided with shoulders **52**, thus radially spacing the distal annular end **54** of the segments from the frustro-conical nose **56** of the bullet. The outer surface **58** of each segment is here shown as a segment of a cylinder, but if desired, the segments could be formed of uniform thickness, and in such case, the outer surface would follow the inner surface. Irrespective of the outer configuration it is of course essential that at least a portion of the segments in one or more transverse planes maintain a snug fit when passing through the gun bore, which as previously mentioned, is prerequisite of any payload.

It will also be noted in FIG. 3 that the confronting edges of adjacent segments define a gap **60** therebetween. This gap, which may be in the neighborhood of 0.020 inches, permits a diametrical construction of the segments, which are preferably formed of a plastic material, to pass through the choke of the gun. A flow of material could also be attained where the segments have a uniform thickness. By way of explanation, a typical 12 gauge shotgun has a 0.729 inch bore, and might have a choke I.D. ranging from 0.729 inches (no choke) down to 0.680 inches (full choke). For use with a 12 gauge shotgun shell, the sabot bullet of this invention would have an assembled O.D. of 0.725 inches, would expand to approximately the I.D. of the bore diameter as it travels therealong, and due to the plasticity of the sabot material and/or the provision of gap **60** can pass through the I.D. of even a full choke.

With the sabot bullet loaded in the shotgun shell **14**, and upon firing, a portion of the propulsion force is exerted on the base **32** of the bullet and the other portion exerted on the annular base **50** of the sabot, the exact apportionment of forces can be varied by the diameter of the bullet or its base area. For example, with a .50 caliber bullet in a 12 gauge shell, there results a substantial equal division of propulsion force on the bullet and on the sabot segments. Due to the interengagement of the bullet taper **36** and the sabot taper **44**, the greater portion of the force exerted on the sabot base will be transferred to the forward portion of the bullet, a desired feature to overcome the setback forces on the heavier bullet. Such tapered surfaces also cause the sabot segments to spread under setback forces to insure a proper snug fit of the assembly in traveling through the gun barrel.

During the "set forward" phase of travel, as previously explained, the rear tapered surfaces **38** of the bullet and **46** of the sabot are effective to prevent the bullet from travelling faster than the sabot which has a frictional drag load imparted to it by contact with the gun bore. Such rear surfaces further center the bullet's mass in the bore and maintain the sabot segments spread to maintain a snug fit with the bore.

When the assembly leaves the muzzle **64** of the shotgun, the segments **12** will readily fall away from the bullet **10** without imparting any uneven force to the bullet, and without affecting the airflow over the bullet. With the slightest opening of the segments, the only further contact that a segment can have with the bullet is as a point rearwardly of the bullet's center of balance. Prior to any separation, the sabot and bullet assembly is weight stable. The construction of each sabot segment, considered as a projectile itself, is stable with its original leading edge to the rear. Thus, as the segments

open and begin to depart from the bullet, they will continue to turn outward and not disrupt the stabilizing airflow over the bullet.

We claim:

1. A sabot bullet assembly comprising:
a bullet,
a plurality of sabot segments,
said segments generally axially contacting said bullet,
said bullet having axially spaced outer surface portions defining at least two axial load transfer means,
each of said segments having axially spaced inner surface portions defining at least two tapering axial load transfer means,
said inner and outer surface portions complementary to and contacting with each other to provide for relative wedging movement therebetween,
one of said tapering axial load transfer means of said bullet and segments being forwardly diverging tapers, and the second of said tapering axial load transfer means being rearwardly diverging tapers,
the arrangement being such that the segments will be wedged outwardly from the bullet upon relative rearwardly or forwardly movement between the bullet and segments.

2. A sabot bullet as defined in claim 1 in which the center of gravity of said bullet is positioned forwardly of the geometric center thereof.

3. A sabot bullet as defined in claim 1 in which said sabot segments define at one end thereof a generally annular base and said bullet has a transaxial base coplanar with said annular base of said segments.

4. A sabot bullet as defined in claim 3 in which the area of each of said bases is substantially equal.

5. A sabot bullet as defined in claim 4 in which said bullet has a recess extending to said base, and a plug of material inserted in said recess.

6. A sabot bullet as set forth in claim 1 in which said segments are provided with longitudinally extending confronting edge portions with a gap therebetween.

7. A sabot bullet as defined in claim 1, including a shotgun shell, said bullet and said segments being positioned in said shell and each extending from the wad column thereof to the forward end of the shell, and the outer surfaces of said segments engaging the inner surface of said shell.

8. A sabot bullet as defined in claim 1 in which said tapers converge at a diametrically restricted waist portion disposed rearwardly of the center of gravity of the bullet.

9. A sabot bullet as defined in claim 1 in which said segments cooperate to define an annular base, and said bullet has a transaxial base generally coplanar with the segment base.

10. A sabot bullet assembly as defined in claim 1 in which said sabot segments define at the opposite end thereof a shoulder radially spaced from a forward end of the bullet whereby said spacing promotes said segments to readily fall away from the bullet after exiting from a muzzle without disturbing the airflow over the bullet.

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