United States Patent

[11] 3,598,057

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[73] Assignee **The United States of America as represented by the Secretary of the Navy**

[54] **CANISTER SMALL ARMS CARTRIDGE**
3 Claims, 7 Drawing Figs.

[52] **U.S. Cl.** .... **102/91,** 102/42 C, 102/93
[51] **Int. Cl.** **F42b 13/18**
[50] **Field of Search** .... 102/38, 42, 42 C, 91, 93

[56] **References Cited**

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3,059,578	10/1962	Hegge et al.	102/91 X
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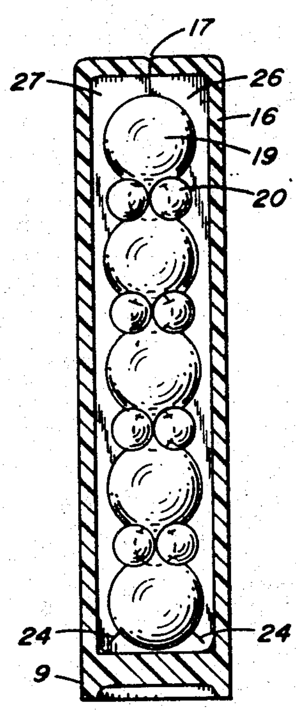
ABSTRACT: A cylindrical canister sized so that it will fit into a standard cartridge case and thereby can be fired from a rifled gun barrel. The canister contains a plurality of primary pellets stacked along its longitudinal axis and a plurality of secondary pellets spaced symmetrically about its longitudinal axis. The rifled gun barrel causes the canister to spin as it is ejected from the barrel, the centrifugal force thereby imparted to the secondary pellets acting on the forward end of the canister and tearing it open allowing aerodynamic forces to strip away the canister and free the pellets.



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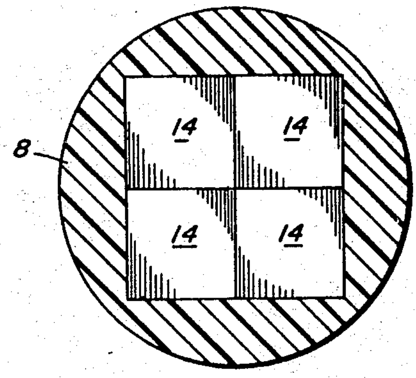

FIG. 3

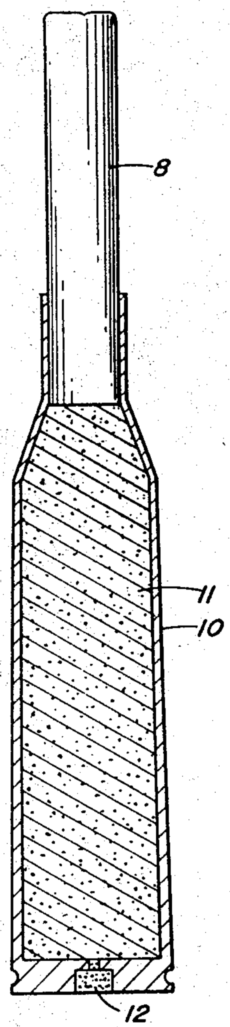

FIG. 1

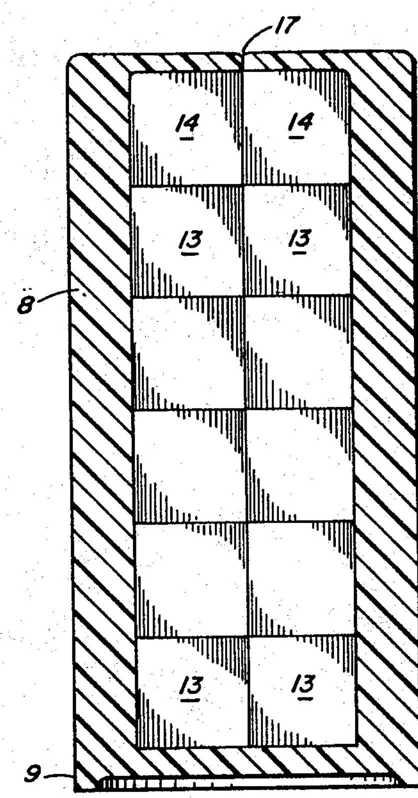

FIG. 2

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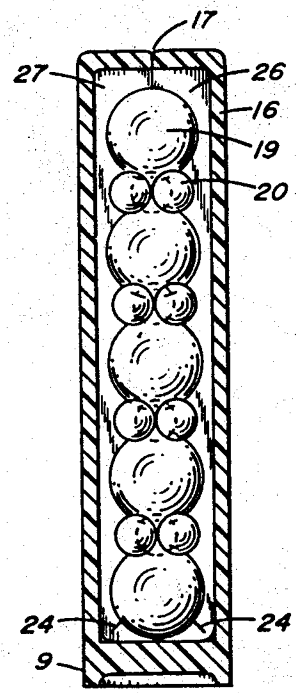

FIG. 4

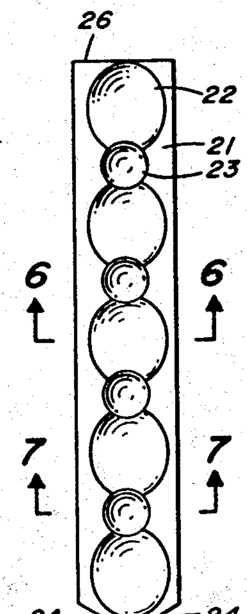
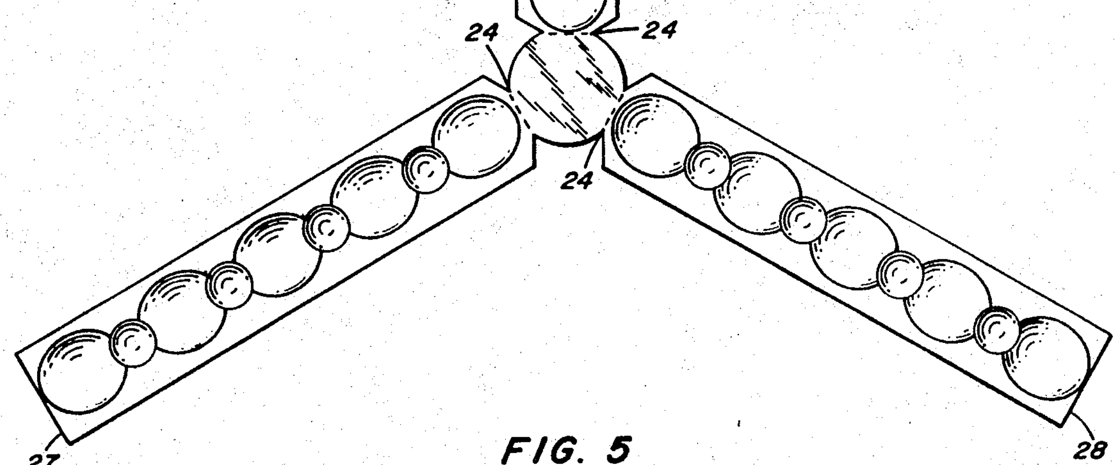

FIG. 5

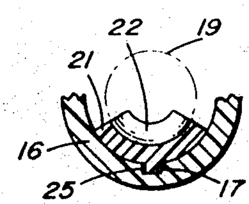

FIG. 6

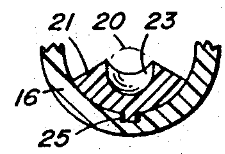

FIG. 7

CANISTER SMALL ARMS CARTRIDGE

STATEMENT OF GOVERNMENT INTEREST

The invention described herein may be manufactured and used by or for the Government of the United States of America for Governmental purposes without the payment of any royalties thereon or therefor.

BACKGROUND OF THE INVENTION

The present invention relates generally to improvements in short-range antipersonnel pellet projectiles. More particularly, the invention relates to a pellet projectile having improved dispersion characteristics and pellets with different range capabilities.

It frequently becomes necessary in modern warfare to spray a given area with a plurality of missiles in order to substantially increase the possibility of hitting one or more stationary or moving targets within that area. Since it is not practical for soldiers to carry one type of gun for shooting bullets and another type of gun for shooting pellets, it has been proposed to provide a canister containing pellets dimensioned so that it will fit into a standard size shell casing (see U.S. Pat. No. 2,766,692 to Mynes). By matching the weight of the canister to that of the conventional bullet, handling and interior ballistic performance of the load would match that of the bullet. Thus the canister load could be used interchangeably with conventional ammunition in existing machine guns and other guns.

As described in U.S. Pat. No. 3,059,578 to Hegge et al., prior art canister made of frangible material and provided with a rotating ring are not satisfactory for use in rifled guns which have high muzzle velocities. One reason for this is that the high initial linear acceleration imparted to the canister tends to longitudinally compress the canister and thereby rupture the walls of the canister causing severe galling and abrasion of the bore surfaces of the gun tube. The walls of the prior art canisters could not effectively be strengthened because this would prevent the pellets from escaping from the canister, or, at the very least, cause a poor dispersion pattern of the pellets during flight.

Further, experiments have indicated that unsymmetrical distribution of the missiles at the target area is primarily due to longitudinal and radial movement thereof in the frangible canister prior to the emergence of the canister from the gun tube. This premature looseness of the missiles is thought to be caused by the unavoidable large disparity between the powerful centrifugal forces imparted thereto by the rotation of the canister during passage through the rifled gun tube and the relatively weak peripheral holding forces provided by the frangible canister. Inasmuch as the rifling imparts an accelerating rotation to the casing the missiles therein are subjected to a continuously increasing centrifugal force which produces a corresponding radial pressure on the interior surfaces of the canister. Such radial pressure often becomes great enough to force the relatively thin walls of the canister outwardly permitting premature shifting of the missiles. The resulting withdrawal of peripheral support afforded to the embedded missiles by the canister frees the missiles for movement therein. During this expansion of the casing walls, the free missiles therein are so unevenly distributed by the radial and setback forces imparted thereto that the subsequent flight pattern thereof is adversely affected.

The Hegge reference attempts to solve these problems by embedding the missiles in a plastic binder in a pattern corresponding to the configuration desired at the target area. The binder keeps the pellets from moving prematurely. The strength of the plastic binder is varied at selected areas so that the missiles will be released in a particular order designed to achieve the desired dispersion pattern. The canister disintegrated upon ejection from the gun barrel, and then centrifugal force breaks the missiles free from the binder in the proper order.

The present invention achieves results similar to those achieved by Hegge et al. in a much simpler fashion. The necessity of a plastic binder, and the difficulty of arranging the pellets therein, to prevent premature movement of the missiles is eliminated. The pellets and the canister assembly are designed so that the pellets fit tightly into and fill the entire free space in the canister assembly. Thus, normally there is no room for premature movement of the pellets.

As previously mentioned, upon firing, the linear acceleration forces and centrifugal forces of the pellets tend to deform prior art canisters and permit premature movement. However, according to this invention linear acceleration from firing will not deform the canister because the interior of the canister is completely filled with rigid material. Thus, there will be no longitudinal compression causing the canister walls to buckle or deform.

Furthermore, centrifugal force will not cause the canister walls of the instant invention to deform in a manner that would allow premature movement of the primary pellets. This is because the secondary pellets are arranged so that they exert centrifugal force primarily only on the forward end of the canister and not on the portion of the walls surrounding the primary pellets. Also, the primary pellets, being aligned on the axis of the canister, do not tend to be moved by centrifugal force when the canister rotates. Thus the canister walls are able to hold the primary pellets in place when the gun is fired.

In addition, this invention achieves the result that the dispersion pattern covers a plurality of ranges because of the relative sizing of the pellets. Larger, primary pellets having a longer range are aligned on the axis of the canister and smaller, secondary pellets are spaced symmetrically about the axis.

OBJECTS OF THE INVENTION

An object of the present invention is the provision of a pellet canister which can be used in a standard cartridge case and fired from a standard rifled gun barrel.

Another object is to provide a canister containing pellets having different range capabilities.

A further object of the invention is the provision of a canister which is opened by the pellets it contains only at its forward end, aerodynamic forces then stripping the canister from the pellets.

Still another object is to provide a canister in which the dispersion pattern of the pellets is reasonably well controlled.

BRIEF DESCRIPTION OF THE DRAWINGS

The exact nature of this invention as well as other object and advantages thereof will be readily apparent from consideration of the following specification relating to the annexed drawings in which:

FIG. 1 shows a cross-sectional view of one embodiment of the canister assembled in a standard cartridge casing;

FIG. 2 shows a cross-sectional view of one embodiment of the canister;

FIG. 3 is a cross-sectional view taken through the top layer of pellets in FIG. 2;

FIG. 4 shows a cross-sectional view of another embodiment of the canister;

FIG. 5 shows, in open position, the insert used to position the pellets in the canister shown in FIG. 4;

FIG. 6 is a cross section on line 6–6 of FIG. 5; and

FIG. 7 is a cross section on line 7–7 of FIG. 5.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 shows a canister assembly **8** assembled in a cartridge case **10** which contains an explosive charge **11** and a primer **12**. Referring more particularly to the details of the canister, FIG. 2 shows a preferred embodiment thereof. The canister is made of a material such as nylon and is the diameter of the standard bullet used in the gun in which the canister is to be used. As can be seen in FIG. 3 the canister has a cylindrical outer surface and a square inner bore. The lower portion of the inner bore contains a stack of cube-shaped primary pellets 13 which fill the inner bore transversely. The top cube in the bore is divided into four secondary pellets. After the cubes have been placed in the canister the top part of the canister is bent over and sealed at 17. Obviously, additional layers having cubes divided into pieces similar to the top layer could be provided if desired. Also, the pellets do not have to be cubes. Any shape of pellets could be used, provided it is mated to the shape of the canister bore, and provided the bore can transmit the canister rotation to the pellets. Further, the pellets must completely fill the space in the bore. When the gun is fired the canister moves through the barrel and begins to rotate because it engages the rifling. This rotation is transmitted to the steel cubes because of the square cross section of the interior of the canister. The rotation of the secondary pellets 14 causes them to press outward but they are constrained by the canister and the gun barrel. The primary pellets 13 exert no centrifugal force since they are aligned on the axis of rotation. When the canister emerges from the gun bore at high velocity the centrifugal forces of the secondary pellets cause the canister to be split open at its front end at corners of the square inside bore. Aerodynamic forces then peel open the whole length of the cup and all the fragments are released. Natural or intentional asymmetries in the fragments and irregularities in flight then cause the fragments to diverge somewhat from the nominal trajectory.

Providing cube-shaped fragments and stacking them in the manner shown in FIG. 2 provides the canister with longitudinal strength necessary to prevent it from buckling during subjection to the high accelerations of firing. The longitudinal strength of the canister is the same as if it were a solid bullet.

Primary pellets 13, because they are aligned on the longitudinal axis of the canister and further because they are held in place by the square bore, do not tend to move out of position in the canister prior to its exit from the gun barrel. The cube quarters 14 in the top layer exert radial pressure on the canister walls at its forward end. However, this does not deform the walls in the area surrounding primary pellets 13. Thus, the centrifugal force exerted by the cube quarters does not enable primary pellets 13 to move out of position and disturb the desired dispersion pattern for the pellets. Therefore, the dispersion pattern of the pellets can be reasonably well controlled.

The large cubes 13 will have a longer range than the secondary pellets 14 because of their greater size. After the canister has been stripped by aerodynamic forces from the pellets the large pellets 13 will spread out slightly, but will proceed generally along the line of fire. The smaller pellets, due to the radial force which has been exerted on them, will spread out around the line of fire. Because of their limited range, occasioned principally by their aerodynamic characteristics, the small pellets are less likely to hit friendly troops or villages which may be in the area.

FIG. 4 shows an alternate embodiment of the canister, in which the canister assembly is made up of an outer canister 16 and an insert 21. The outer nylon canister 16 is the same as in the previous embodiment except that its inner bore is round rather than square and has at least one longitudinal channel 17 in its periphery (FIG. 6). Inside the canister are placed spherical shot of lead alloy or steel. It is not necessary that the pellets be spherical. They could be of any shape. In order to support this short during acceleration, nylon insert 21 is used to fill all of the space between the shot. The insert is molded in the form of a flat "Y" with depressions for holding the shot. Two sizes of shot 19 and 20 are used to make better utilization of the volume and to give an improved shot pattern on firing. The larger shot 19 are aligned with their centers on the longitudinal axis of the canister whereas the smaller shot 20 are spaced symmetrically about the longitudinal axis. The secondary shot 20 are in force transmitting contact with the forward canister side wall via the rigid insert arms. The outer surface of insert 21 is provided with at least one longitudinal protrusion 25 which mates with the longitudinal channel 17 in the inside canister wall so that the canister can transmit torque to the insert. Various other arrangements for transmitting torque could be devised. For example, one such arrangement would be to make the interior cross section of the canister triangular and to make the insert also of a triangular cross section.

The shot is placed into the insert which is folded along lines 24 and it is placed into the canister with the free ends of the insert arms at the forward end of the canister. The upper end of the canister is then heated, bent over and sealed. When fired from a rifled gun barrel the canister transmits rotational motion to the insert. The inertia of the large shot maintained on the axis causes them to slip relative to the rotating insert, but they exert no centrifugal force on the canister assembly. The offcenter small shot 20 are caused to revolve around the axis as the insert rotates thereby exerting centrifugal force which tends to unfold the insert about lines 24. The insert, being rigid, transmits this radial force to ends 26, 27, and 28 of the arms of the insert. Thus the centrifugal force of the secondary pellets is exerted primarily at the forward end of the canister. When the canister emerges from the gun barrel the centrifugal force of the revolving small shot breaks open the front end of the canister and aerodynamic forces open the insert to release all the shot. The large shot from a moderately tight pattern of longer lethal range. The more numerous small shot form a broad pattern of short lethal range. This configuration therefore produces a large area of coverage at both short and longer ranges.

In both of the above embodiments the pellets are coated with a parting material such as a silicone to keep them from sticking to each other or to the canister. Also in both of the embodiments, the canister is provided at its rearward end with lip 9. When the canister is fired from the cartridge casing, lip 9 is forced out against the barrel wall to form a gas seal. Many variations and configurations of the canister materials and fragment size and shape are possible to obtain maximum effectiveness against certain targets at certain ranges. Other plastics or metals might be used in place of nylon. However, nylon has a desirable combination of low cost, availability, producability, mechanical and chemical stability, and strength. The nylon parts of the canister can be fabricated on widely available machinery by standard techniques.

Having thus described the invention, what I claim is:

1. In a multimissile projectile adapted to be fired from a rifled gun barrel:

a canister assembly including at least a cylindrical outer canister having an axial chamber and an outer diameter equal to the diameter of a bullet designed to be shot from said barrel, such that said canister assembly can be fitted into a standard cartridge case designed to be used in said rifled barrel;

a plurality of primary pellets stacked along the longitudinal axis of said canister;

a plurality of secondary pellets smaller than but, having the same cross section as said primary pellets arranged symmetrically around said longitudinal axis such that all of said secondary pellets are forward of at least one of said primary pellets for rotation with said canister about said longitudinal axis, said secondary pellets being in force transmitting contact principally with that portion of the canister wall adjacent the forward end of the canister;

said primary and secondary pellets completely filling the free space within the canister assembly;

whereby said secondary pellets exert centrifugal force upon and tear open the forward end of said canister upon its ejection from said barrel, said centrifugal force being caused by rotation of said canister about its longitudinal axis which is imparted to said canister by said rifled barrel, aerodynamic forces then stripping the canister assembly from the primary and any remaining secondary pellets.

2. The combination defined in claim 1 wherein:

said canister assembly includes an insert contained within said axial chamber, said insert being made up of a bottom member and a plurality of rigid arms, each arm having a free end and an end connected to said bottom member, each arm further having a plurality of depressions on one side thereof and being foldable about the connection with said bottom member to a closed position, the insert conforming in exterior shape and size to the shape and size of the axial chamber when said arms are in their closed positions;

the shape of said chamber is such that rotation of said canister about its longitudinal axis is transmitted to said insert;

the depressions in said insert arms combine when said arms are in their closed position to form individual chambers, each containing either a primary or a secondary pellet; and

the free end of each insert arm is at the forward end of said canister.

3. The combination defined in claim 2 wherein said primary and secondary pellets are spherical.