June 15, 1965 S. C. HELLIS 3,188,956

SHOT GUN CARTRIDGE

Filed Oct. 9, 1961 2 Sheets-Sheet 1

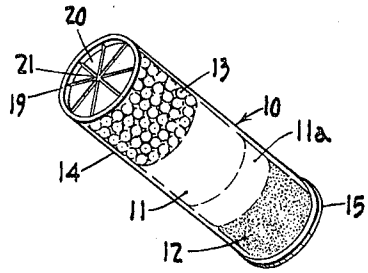


FIG. 1.

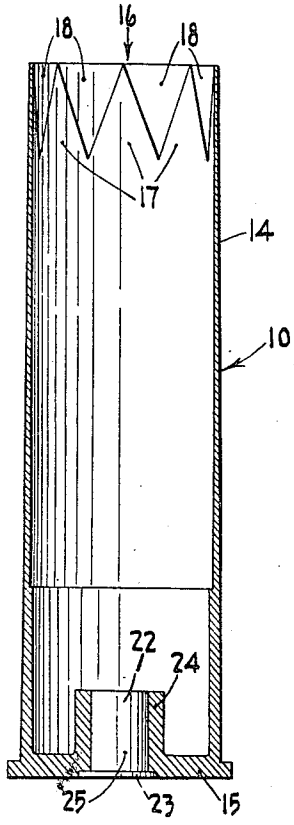


FIG. 2.

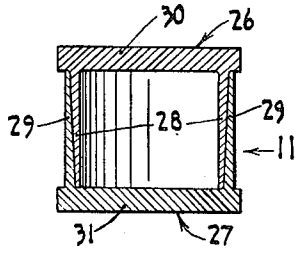


FIG. 3.

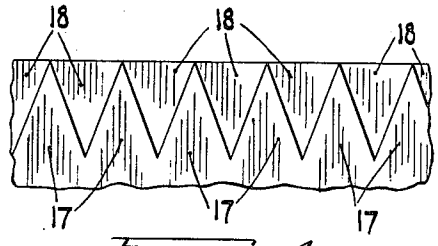


FIG. 4.

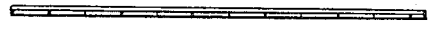


FIG. 5.

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SHOT GUN CARTRIDGE

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2 Sheets-Sheet 2

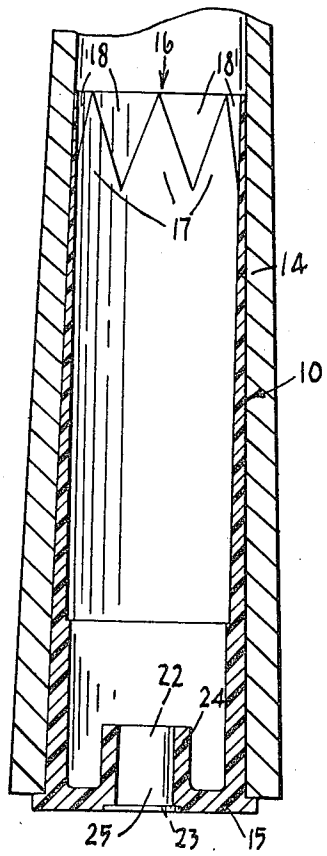


FIG. 6.

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SHOT GUN CARTRIDGE

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This invention relates to cartridges and more particularly to a plastic cartridge for a shot gun.

For some years, plastic materials have been used in the construction of all-plastic cartridges with several advantages over the conventional cartridge comprising paper walls and brass base which heretofore has been the commonest type of shot gun cartridge marketed. Paper cartridge walls will swell from dampness whereas plastic cartridges are moisture proof. Plastic materials can be made available in large quantities more economically than the components of the paper and brass cartridge. Furthermore, translucent plastic material has been employed to expose the contents of the cartridge to view which has a special appeal to certain customers.

However, the use of plastic materials in cartridges has created certain problems. For instance, fixing the primer assembly or the battery cup primer, in the base of the cartridge casing is awkward and if improperly done the casing may split when the cartridge is fired or the escape of gas from around the battery cup primer will result in reduced effectiveness. One method still employed to secure the battery cup primer in the casing involves pressing the battery cup primer into the base of the casing and imbedding it in a pliable base wad made from paper or some other substance inside the casing. Considerable force is required to mould the base wad to grip the battery cup primer and to mould the base wad into the casing to prevent gas escape on firing. In previous all-plastic cartridges, the base of the casing has been made flat both inside and outside, and of fairly thin section to facilitate moulding. Such design did not give much area of bearing surface between the battery cup primer and the casing.

It has been found that this disadvantage may be overcome by having a plastic sleeve extend into the casing to form part of the primer pocket.

Further features of the present invention are intended to provide cartridges which give substantially complete satisfaction during firing.

For instance, conventional cartridge casings made of paper and brass have the internal and external cylindrical casing wall surfaces parallel to each other and the casing wall is of uniform thickness throughout its length. On the other hand, chambers of weapons are tapered, being of smaller diameter at the front than at the rear, in order to facilitate ejection of live or fired cartridges.

The present invention provides a cartridge casing with the external diameter of the casing wall smaller at its open end hereinafter referred to as the mouth than at its base to conform to the dimensions of the weapon chamber, and at the same time the casing wall has a larger internal diameter at the mouth than at the base. The larger mouth eliminates the necessity of enlarging the mouth of the casing when inserting the ingredients of the cartridge, that is propellant, wad and shot charge, and particularly when inserting the wad. With conventional paper and brass casings the mouth of the casing must be enlarged when the wad is inserted to prevent the wad from catching on the mouth of the casing because the wads are a close fit in the mouth of the casing when the casing has not been expanded.

The most common mouth closure for plastic casings and for conventional paper and brass casings has been effected by rolling the mouth of the casing inwards onto a thin wad to retain the shot. This wad being located

between the shot and the target must necessarily cause disruption of the shot in flight.

It has been found that this disadvantage can be overcome by forming the mouth of the casing of alternating thick and thin pie-shaped portions formed by a plurality of mating portions of triangular shape which are adapted to be crimped closed, the thin portions folding under the thick portions to provide a watertight closure (with the exception of a tiny hole at the centre of the closure where the apex ends of the thick portions meet), which permits uninterrupted shot flight.

The purpose of a wad in a cartridge is to provide a gas seal between propellant gases and the shot and to act as a cushion partially to absorb the initial shock of the propellant against the shot and to prevent distortion by one pellet crushing another. This cushioning effect also lessens the recoil of the gun in which the cartridge is discharged. A wad should be as light as possible to keep recoil to a minimum.

Wads, have in the past been formed of two hollow substantially cylindrical cups, one inverted inside the other, the wad being so arranged or constructed that the powder gases have access to its interior when the cartridge is fired. The powder gases finding their way into the interior of the wad tended to force the walls outwardly against the casing wall at the same time that the wad is driven forwardly, thus producing the desired obturation seal between the wall and the wad.

Other wads have been constructed of a hollow cylinder or ring (usually of cork or its equivalent) combined with two disks or cards in such manner as to form or constitute a closed chamber in which air is imprisoned. This type of wad was termed a "pneumatic wad" and the cushioning effect it gave resulted in a reduction of pressure in the barrel with consequent diminished recoil.

In the inverted cup wad the diameter of the base of the cup was no greater than the outer diameter of the cylindrical walls of the cup and the cups were so constructed with relation to the casing that the outer wall of the outer cup was a friction fit in the casing throughout most of the length of the outer cup wall.

A wad should have good radial expansion under compression and at the same time should not create excessive friction with the casing wall which would waste propellant force and create excessive pressures in the weapon.

It has been found that the wads heretofore used can be very greatly improved upon by denying the powder gases access to the interior of the wad. This can be accomplished by forming the wad from two hollow cups each comprising a substantially cylindrical wall open at one end and closed at the other end by a base having a diameter greater than the diameter of the wall and a thickness substantially more than twice as thick as the wall, the cups being adapted to being inverted one inside the other to form a unit which fits snugly inside the casing wall.

Since the base of the wad is of greater diameter than the outer diameter of the cup walls, it is the two cup bases which throughout their respective thicknesses fit snugly inside the casing wall and there is a space between the casing wall and the outer surface of the wall of the outer cup throughout the length of the outer cup wall. Furthermore, the greater diameter of the cup base insures that the hollow in the centre of the wad is air tight and that, on firing, the powder gases will not have access to the wad interior. On firing the thin cup walls permit slight crushing at the ends thereof, thereby increasing the cushioning effect of the wad. The space between the cup and casing walls permit radial expansion of the cup walls as the two cup base portions are driven together thereby considerably increasing the cushioning

effect of the wad which in turn causes reduced weapon pressure and reduced recoil. The snug fit between the cup bases and the casing wall provides sufficient obturation to keep the powder gases separate from the shot charge with a minimum of friction.

It has been found that upon firing, the rapid acceleration of the wad and the shot charge is such that the mouth of the casing, crimped over the shot charge, is unable to unfold quickly enough and is torn away instead. To avoid this a second wad, hereinafter referred to as the foam wad, which can be made from expanded polystyrene foam is inserted between the cup wad and the propellant. Being of a spongy consistency the foam wad acts as a shock absorber. Although the foam wad is not essential to the functioning of the cartridge, the inclusion of it renders fired cartridges much more acceptable to the public eye.

In drawings which illustrate embodiments of the invention,

FIGURE 1 is a perspective view of a cartridge;

FIGURE 2 is an elevation view in section of the casing of the cartridge in FIGURE 1;

FIGURE 3 is an elevation view in section of the unit formed by two wad cups;

FIGURE 4 is an elevation view of a portion of the unrolled mouth of the cartridge casing, showing the thick and thin pie-shaped portions; and

FIGURE 5 is a plan view of the embodiment shown in FIGURE 4.

FIGURE 6 is an elevation view of the cartridge and gun barrel.

Referring to FIGURES 1 and 2 the cartridge illustrated comprises a casing **10** enclosing a plastic cup wad **11**, a foam wad **11***a*, propellant **12** and shot charge **13**. The casing comprises a cylindrical casing wall **14** cloesd at one end by a base **15** and having, at its other end, a mouth **16** formed of reversed thick and thin pie-shaped portions **17** and **18** respectively. (See FIGURES 4 and 5.) The thick portions **17** are of the same thickness as adjacent portions of the casing wall **14** and the thin portions **18** are approximately half that thick. The mouth **16** of the cartridge casing **10** is closed by crimping down the pie-shaped portions **17** and **18** to form a lip **19** (see FIGURE 1). The balance of the thin portions **18** fold under the thick portions **17** and form a flat water-tight closure surface **20** composed of the now abutting thick portions **17**. There is a small hole **21** where the apexes of the thick portions **17** meet when closed and through this hole moisture could reach the interior of the cartridge casing **10**. This access to the interior of the casing **10** can be blocked off by pasting or otherwise affixing a piece of cardboard or other suitable material (not shown) to the closure surface **20**. The triangular pie-shaped portions **17** and **18** illustrated in FIGURES 1, 2 and 4 are in the form of isosceles triangles.

The base **15** of the cartridge casing **10** contains a primer pocket **22** comprising a hole **23** through the base **15** and a sleeve **24** which extends into the interior of the casing **10**. The primer pocket **22** receives the battery cup primer **25** and maintains it in position in a pressure grip.

Referring to FIGURE 3 the wad **11** is shown as comprising a unit formed by two hollow cups **26** and **27**, each having substantially cylindrical walls **28** and **29** respectively and bases **30** and **31** respectively. The outer surface of the wall **28** of the cup **26** tapers inwardly in a direction from the base **30** to the open end of the wall **28** and the inner surface of the wall **29** of the cup **27** tapers outwardly in a direction from the base **31** to the open end of wall **29**. The outer diameter of the wall **28** of the cup **26** is the same or slightly less than the inner diameter of the wall **29** of the cup **27** so that the cups **26** and **27** can be inverted one inside the other as shown in FIGURE 3 to form a unit. The diameter of the bases **30** and **31** of cups **26** and **27** is the same as the inner diameter of the casing wall **14** of the casing **10** at approximately the place where the wad is to be positioned in the casing **10** so that the wad fits snugly inside the casing wall **14**.

Reference to FIGURES 2 and 6 will show that the casing wall **14** of the cartridge **10** is thickened towards its base end for reinforcement at the point of explosion. The remainder of the inner surface of the casing wall **14** of the cartridge **10** tapers outwardly in a direction from the base **15** to the mouth **16** and the outer surface of the casing wall **14** of the cartridge **10** tapers inwardly in a direction from the base **15** to the mouth **16**.

Cartridges made in accordance with this invention generally require approximately one-quarter less propellant than is used in conventional cartridges thereby occasioning substantially less recoil, yet the velocity imparted to the shot charge is equal to that imparted in conventional cartridges using the additional powder. At the same time, cartridges made in accordance with this invention consistently display a superlative shot pattern, there being no wad in the cartridge mouth.

What I claim is:

1. A cartridge including a casing having a substantially cylindrical casing wall closed at one end by a base, a primer pocket in said base, a battery cup primer disposed in said primer pocket, a plurality of alternating thick and thin mating triangular portions in said casing wall at the mouth end thereof, said portions forming a closure surface across said casing and a wad, a propellant and a shot charge disposed within the casing.

2. A cartridge including a casing having a substantially cylindrical casing wall closed at one end by a base, a primer pocket in said base, a battery cup primer disposed in said primer pocket, a plurality of alternating thick and thin mating triangular portions in said casing wall at the mouth end thereof, said portions forming a substantially flat closure surface across the casing with the thin portions disposed beneath the thick portions, and a wad, a propellant and a shot charge disposed within the casing.

3. A cartridge including a casing having a substantially cylindrical casing wall closed at one end by a base, a primer pocket in said base, a battery cup primer disposed in said primer pocket, a plurality of alternating thick and thin mating isosceles triangular shaped portions in said casing wall at the mouth end thereof, the thick portions being approximately twice as thick as the thin portions and substantially of the same thickness as the casing wall adjacent said portions, said portions forming a substantially flat closure surface across said casing with the thin portions disposed beneath the thick portions, and a wad, a propellant and a shot charge disposed within the casing.

4. A wad for a cartridge comprising a pair of hollow cups, each of said cups having a substantially cylindrical wall open at one end and closed at the other end by a substantially circular base, the base of each of said cups having a diameter greater than the diameter of the wall the cylindrical bases having flat surfaces, the wall of one of said cups being of smaller diameter than the wall of the other of said cups, said cups being inverted one inside the other to form an air-tight unit, the bases are driven together on firing expanding the cylindrical walls through the annular space between said unit and said casing wall increasing the cushioning effect of said wad.

5. A wad for a cartridge according to claim 4 in which the walls of the cups are thin in comparison to the thickness of the bases of the cups.

6. A cartridge including a casing having a substantially cylindrical casing wall closed at one end by a base, a primer pocket in said base, a battery cup primer retained in said primer pocket, and closure means at the end of said casing opposite said base, said closure means holding a wad, a propellant and a shot charge enclosed within the casing wall, said wad comprising a pair of hollow cups, each of said cups having a substantially cylindrical wall open at one end and closed at the other end by a

substantially circular base, the wall of one of said cups being substantially disposed within the wall of the other cup, the base of each of said cups having a diameter greater than the diameter of the wall of either cup, and the peripheral surfaces of the bases of said cups being in contact with the inner surface of the casing wall of the cartridge whereby a space is defined between the exterior surface of the outermost cup wall and the inner surface of the casing wall, the bases are compressed on firing expanding the cylindrical walls through the annular space between said unit said casing wall increasing the cushioning effect of said wad.

7. A cartridge according to claim 6 in which the walls of the cups are thin in comparison to the thickness of the bases of the cups and the walls of the two cups are of slightly different diameter so that the wall of one cup is adapted to fit within the wall of the other cup.

8. A cartridge according to claim 6 in which the outer wall of the inner cup tapers inwardly in a direction from the closed end to the open end thereof and the inner wall of the outer cup tapers outwardly in a direction from the closed end to the open end thereof, whereby the walls of said two cups are adapted to fit snugly one within the other to form a substantially airtight unit.

9. A cartridge including a casing having a substantially cylindrical casing wall closed at one end by a base, a primer pocket in said base, a battery cup primer retained in said primer pocket, and closure means at the end of said casing opposite said base, said closure means holding two wads, a propellant and a shot charge enclosed within the casing wall, the lower of said wads comprising a pair of hollow cups, each of said cups having a substantially cylindrical wall open at one end and closed at the other end by a substantially circular base, the wall of one of said cups being substantially disposed in the wall of the other cup, the base of each of said cups having a diameter greater than the diameter of the wall of either cup, and the peripheral surfaces of the bases of said cups being in contact with the inner surface of the casing wall of the cartridge whereby a space is defined between the exterior surface of the outermost cup wall and the inner surface of the casing wall, the second wad being disposed immediately above the first wad.

10. A cartridge including a casing having a substantially cylindrical casing wall closed at one end by a base, a primer pocket in said base, a battery cup primer retained in said primer pocket, and closure means at the end of said casing opposite said base, said closure means holding two wads, a propellant and a shot charge enclosed within the casing wall, the lower of said wads comprising a pair of hollow cups, each of said cups having a substantially cylindrical wall open at one end and closed at the other end by a substantially circular base, the wall of one of said cups being substantially disposed in the wall of the other cup, the base of each of said cups having a diameter greater than the diameter of the wall of either cup, and the peripheral surfaces of the bases of said cups being in contact with the inner surface of the casing wall of the cartridge whereby a space is defined between the exterior surface of the outermost cup wall and the inner surface of the casing wall, the second wad is a substantially cylindrical wad of expanded polystyrene foam disposed immediately above the first wad.

11. A cartridge including a casing having a substantially cylindrical casing wall closed at one end by a base, a primer pocket in said base, a battery cup primer disposed in said primer pocket, a plurality of alternating thick and thin triangular portions arranged side by side in respectively inverted relationship, said mating triangular portions in said casing wall at the mouth end thereof, said portions forming a substantially flat closure surface across the casing with the thin portions disposed beneath the thick portions, and a wad, a propellant and a shot charge disposed within the casing.

12. A cartridge including a casing having a substantially cylindrical casing wall closed at one end by a base, a primer pocket in said base, a battery cup primer disposed in said primer pocket, a plurality of alternating thick and thin triangular portions arranged side by side in respectively inverted relationship, said mating isosceles triangular shaped portions in said casing wall at the mouth end thereof, the thick portions being approximately twice as thick as the thin portions and substantially of the same thickness as the casing wall adjacent said portions, said portions forming a substantially flat closure surface across said casing with the thin portions disposed beneath the thick portions, and a wad, a propellant and a shot charge disposed within the casing.

13. In a cartridge casing having a substantially cylindrical casing wall, the improvement comprising a plurality of alternating thick and thin portions in said casing wall at the mouth end thereof, said thick and thin portions being isosceles triangular in shape and disposed in side-by-side inverted relationship.

14. In a cartridge casing having a substantially cylindrical casing wall, the improvement comprising a plurality of alternating thick and thin portions in said casing wall at the mouth thereof, said thick portions being approximately twice as thick as the thin portions and substantially of the same thickness as the casing wall adjacent said portions, the portions being isosceles triangular in shape and disposed in side-by-side inverted relationship, said portions being adapted to be formed into a closure surface across the casing.

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