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PROPELLANT CONTAINER, PLASTIC IMPREGNATED GLASS

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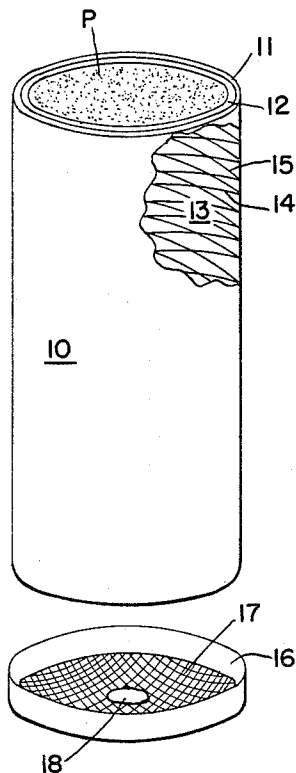


FIG. 1.

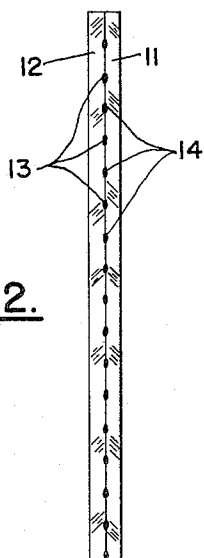


FIG. 2.

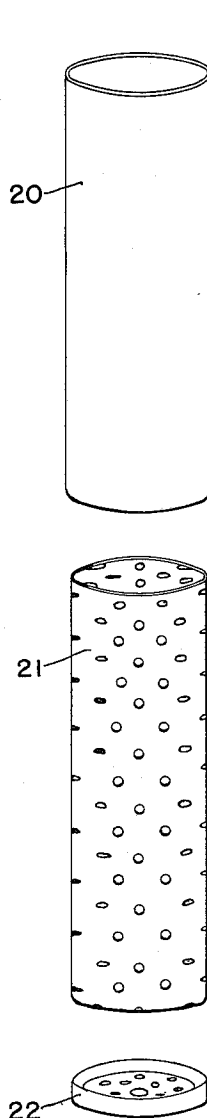


FIG. 3.

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PROPELLANT CONTAINER, PLASTIC IMPREGNATED GLASS

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1 Claim. (Cl. 102-43)

(Granted under Title 35, U.S. Code (1952), sec. 266)

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

This invention relates to improved ammunition and more particularly concerns lightweight, inexpensive cartridge cases or propellant envelopes which undergo preferential break-up when fired in recoilless weapons.

Brass and steel have been the commonly used metals for recoilless weapon cartridge cases because they satisfactorily meet the requirements of ammunition components in regard to shape, strength, corrosion resistance and extractability from the weapon. Use of these metals however has certain disadvantages and among them may be enumerated high cost and weight and short supply during emergency.

The frangible and combustible type propellant envelopes, while considerably cheaper and lighter than metal cartridge cases suffer cook-off when the ammunition is placed in a hot weapon and exhibit poorer interior ballistics than their metallic counter part due to generally unrestrained expansion and incomplete burning of the propellant.

Briefly then, my invention overcomes these and the aforementioned infirmities by providing a propellant container or cartridge case which is strong, light in weight, inexpensive to fabricate and yet is so designed that upon ignition of the propellant contained therewithin, expansion of the propellant grains is momentarily restrained to yield their complete and efficient burning, the container then breaking up in preferred patterns or along predetermined lines for discharge through the venturi of the recoilless weapon.

It is therefore a principal object of the invention to provide a novel propellant envelope for recoilless weapons.

It is another object of the invention to provide a propellant container which is lighter in weight and cheaper in cost than the metallic type container.

A still further object of the invention is to improve interior ballistic performances over those attainable with frangible or combustible containers by providing a container which permits more complete burning of the propellant before the container is preferentially broken-up and discharged.

A final object of the invention is to provide a unique cartridge case resistant to "cook-off."

With these and other objects in view, as will hereinafter more fully appear, and which will be more particularly pointed out in the appended claim, reference is now made to the following description taken in connection with the accompanying drawings in which:

FIG. 1 shows an exploded perspective view, partially broken away, of a preferred embodiment of the propellant container of the invention;

FIG. 2 is a vertical section of the wall of the embodiment of FIG. 1; and

FIG. 3 is an exploded view of a modified propellant container of the invention.

Referring to the drawings, there is illustrated a propellant container 10 including a propellant P, and comprising an outer cylindrical case 11 and an inner cylin-

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drical case 12 both preferably of fiberglass cloths reinforced with a resin such as epoxy or polyester. My containers of envelopes find application with various sizes recoilless ammunition, those illustrated in the drawings being usable with a 120 mm. cartridge, for example:

Between the cases 11 and 12 are a plurality of helically wound wires 13 providing a multiplicity of diamond-like patterns which promote a preferential break-up of the fiberglass cases in general accordance with these patterns when the gas pressure within the containers is of sufficient magnitude to cause their fracture.

The wire patterns illustrated comprise two wires, a helically wound right hand lead wire 14 and a similar left hand lead wire 15 wound directly thereover. Obviously, the lead angles may be increased or decreased to provide diamond patterns of varying shapes. Additionally, more than two wires may optionally be employed to control the size of the diamond patterns. I have found that square-edged patterns do not promote good container break-up. A possible reason for this resides in such a pattern having right angles only whereas diamond patterns offer areas of weakness between the obtuse angles.

A head or base 16 of the aforescribed reinforced fiberglass contains a wafer-shaped wire screen 17 having a numerous diamond pattern configuration. The wire 17 is covered with another wafer of the fiberglass material and a primer hole 18 is provided as shown. The base member 16 is secured to an end of outer casing 11, and the inner and outer cases, with the wires 17 embedded therebetween, are secured together by a single curing operation to be later described.

FIG. 2 shows a vertical section of a wall of my container. In practice, the plastic or resin reinforced fiberglass cloths 11 and 12 may suitably be a fiberglass tape, for example, which is windable around a mandrel to form the cases.

In the modification shown in FIG. 3, the outer case member 20, the inner case member 21 and head 22 are preferably of the aforescribed fiberglass composition. The inner case 21 however is now provided with spaced perforations causing a preferential break-up of the entire container in accordance with the perforations. Head 22 contains a similarly perforated piece or wafer, there being now no necessity for any wires.

In the fabrication of my novel propellant container, I prefer to employ a fiberglass cloth consisting essentially of about 60 to 70 weight percent of fiberglass impregnated with 30 to 40 weight percent of a polyester. Such a product is sold under the trade-mark "Volan-A," manufactured by the Exeter Mfg. Co. The polyester may consist of about 10 weight percent chlorinated polyester, about 26 weight percent di-allyl phthalate and about 64 weight percent normal glycol polyester, and catalyzed with benzoyl peroxide. I do not wish to be limited specifically to a polyester impregnated fiberglass and other suitable plastic materials such as 30-40 weight percent epoxy may be used equally advantageously.

The cloth is wrapped around a suitable mandrel and cut to proper size, if necessary. The cloth is easily cut with a pair of scissors, its thickness for a 120 mm. cartridge preferably ranging between about 0.020-0.030 inch. While the cloth is held secure to the mandrel, a first wire is helically wound around the cloth. A second wire is then similarly wound over the first wire but oppositely directed, thus producing a multiplicity of small diamond patterns. A second cloth is then wrapped around the wired assembly. The wire may be of stainless steel, piano wire, and the like, and will preferably be 0.010-0.015 inch in diameter for a 120 mm. cartridge. Quite naturally, the thickness of the fiberglass and the diameter of the wires will be varied in accordance with the caliber of the ammunition.

Alternatively, the inner and outer case members may be constituted of a fiberglass tape which will be wound around a mandrel as aforementioned. In this case however, circumspection is necessary to prevent or minimize overlapping or the formation of voids.

The head may be molded by any of the several conventional practices. A diamond-configured pattern of the above wire is positioned at the bottom portion of the head as shown, and is covered by a fiberglass wafer. The primer hole may then be formed by a simple punching operation.

The modified container of FIG. 3 includes a perforated inner fiberglass member which obviates any need for intersecting wires. It is therefore only necessary to wrap the outer case around the inner perforated case to provide the desired preferential break-up of the container. Similarly, the head requires only a perforated fiberglass wafer to be contained therewithin.

In either the preferred or modified embodiment, the head or base is fitted over an end of the outer case and the entire assembly cured at about 250° F. for about 8 hours, thus forming an integral piece.

In the practice of my inventive propellant container in recoilless weapons, ignition of the propellant within the container causes it to fracture in accordance with the diamond pattern or perforations. The container however is of sufficient strength to momentarily restrain the expansion of the propellant grains resulting in a more complete burning thereof and thus providing improved ballistic efficiency over the frangible or combustible type containers. The fractured pieces of the container are generally non-consumable and are discharged through the venturi of the weapon.

The containers of the instant invention, being of an epoxy or polyester impregnated fiberglass, is less expensive than the brass or steel cartridge cases. Further, my containers are approximately 40 times as light in weight as the steel containers, a 120 mm. steel cartridge case weighing about 10 pounds whereas the same size case made in accordance with my invention weighs only about 4 ounces. Finally, the undesirable "cook-off" prob-

lem suffered by other containers has been completely eliminated.

Those familiar with recoilless weapons know that a 120 millimeter recoilless gun has approximately a bore diameter of 4.7 inches. Counting the number of diamond configurations radially outward in the head or base from the primer hole 18 there are 5 with a fraction at each end of such a radius. Thus by neglecting the size of hole 18 it may be conservatively said there are a total of about 14 such configurations in a diameter. $\frac{1}{14}$ of 4.7 inches means that in an end wall of such a case a maximum dimension of each broken piece should be about $\frac{1}{3}$ of an inch.

I claim:

A recoilless weapon frangible reinforced plastic container for propellant comprising a cylindrical wall and at least one end wall and formed to be ruptured by breaking into many pieces when a propellant is fired, both the cylindrical wall and an end wall being provided with a patterned substantially entire surface forming repetitive diamond configuration having areas of dissimilar strengths with edge portions of the diamond shapes stronger than the rest of said configurations under pressure within the container to break up the container walls, at least one of said walls having configurations of a size to cause the broken pieces to be as small as of an order of about a third of an inch in one dimension.

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