United States Patent

[11] 3,631,969

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[33] **France**
[31] **177376**

[54] **ENCLOSURE FOR AN OGIVAL SHELL**
10 Claims, 10 Drawing Figs.

[52] **U.S. Cl.** ..... **206/3,** 206/46 FC, 206/46 FR, 217/52, 220/4 E
[51] **Int. Cl.** **F42b 37/00**
[50] **Field of Search** ..... 206/3, 46 FR, 46 FC, 46 R, 65 R; 217/27, 35, 52, 53 R; 220/9 F, 4 E

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Assistant Examiner—Steven E. Lipman
Attorney—Waters, Roditi, Schwartz and Nissen

ABSTRACT: An ogival shell is covered by an impermeable flexible sheet and sealed therein and the tip of the thus-covered shell is fitted with a protective ferrule and placed in a molded cavity of two half casings which corresponds to the shape of the shell and the ferrule. The casings are then placed in an outer, strong covering such as a box. The ferrule has an outer body in which extends a conical inner body in which the tip is removably inserted, and the outer body is flared at the end opposite that in which the tip is inserted.

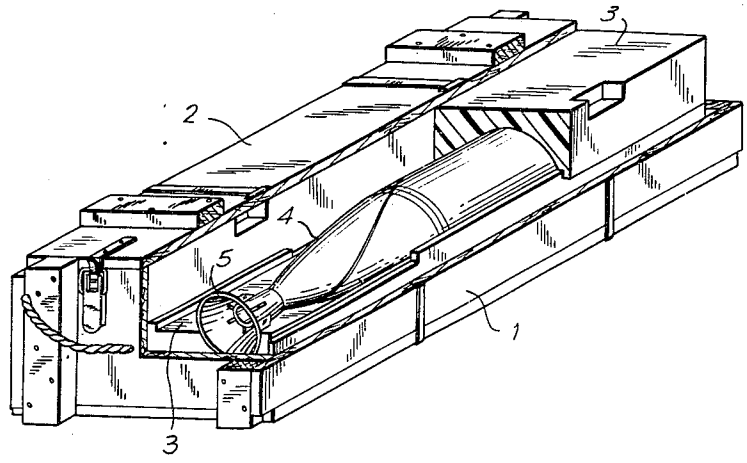


FIG. 1

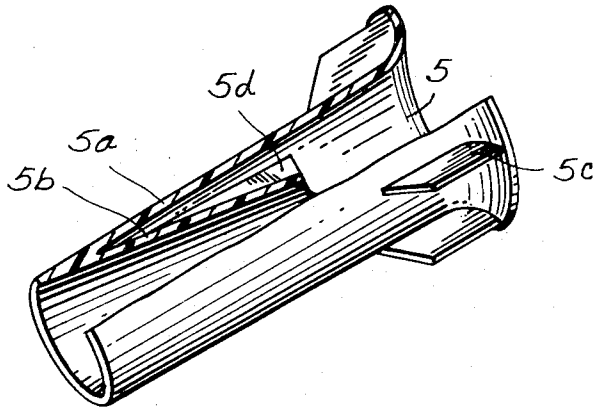


FIG. 2

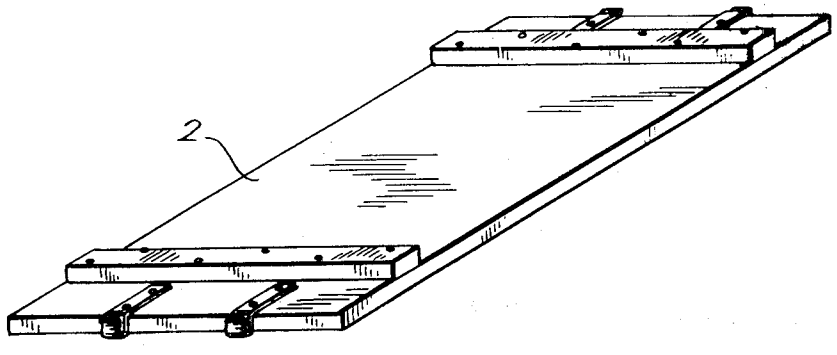


FIG. 3

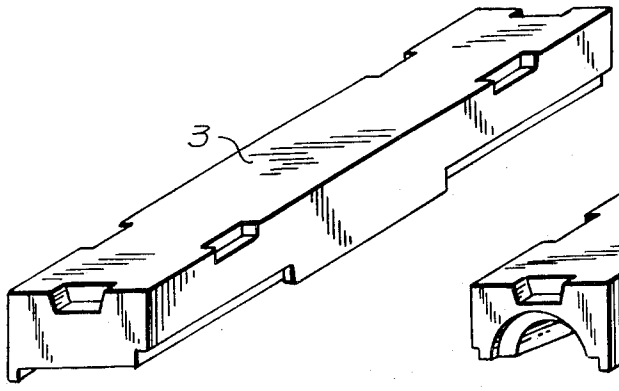


FIG. 4

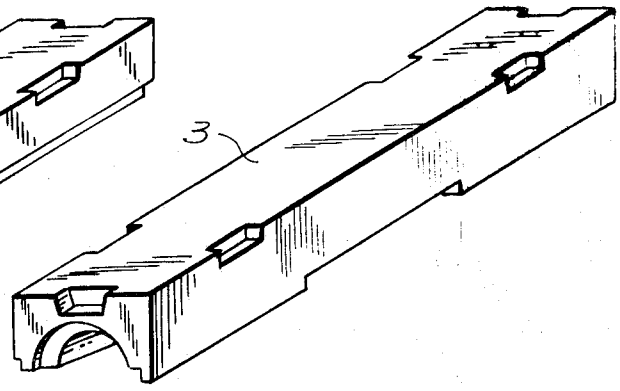


FIG. 5

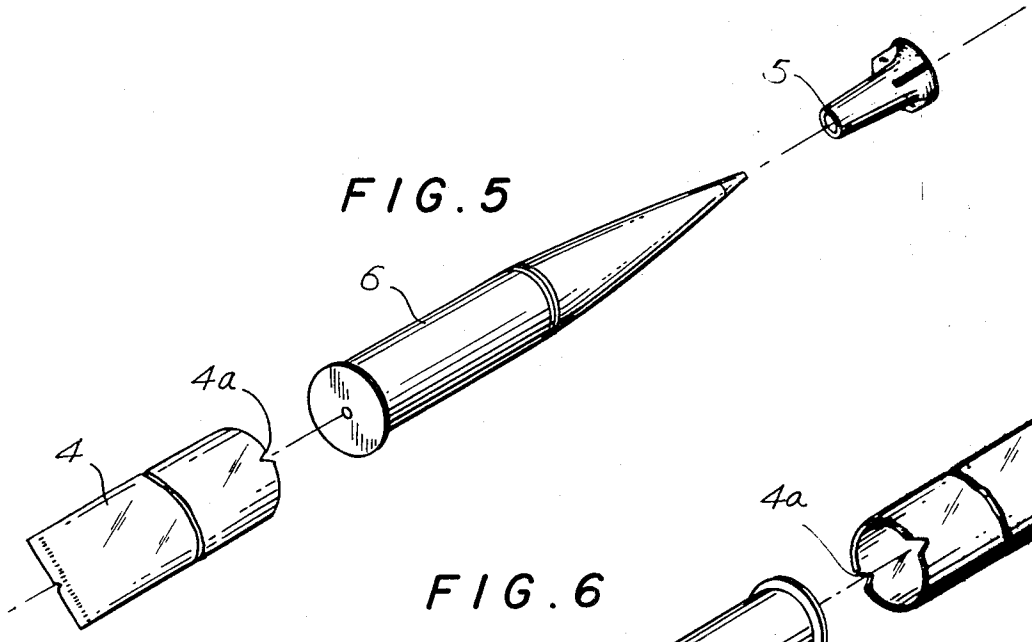


FIG. 6

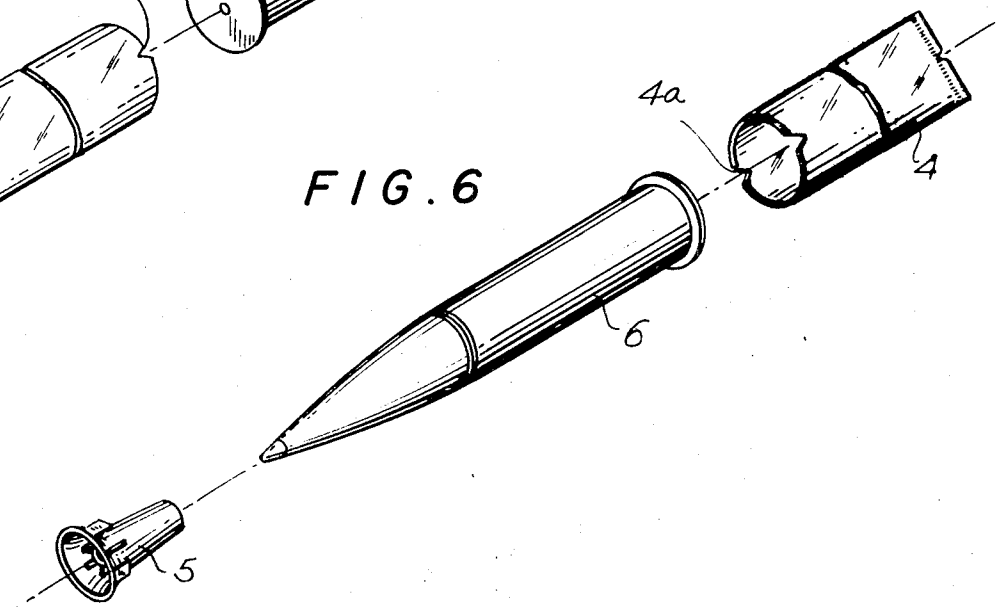


FIG. 7

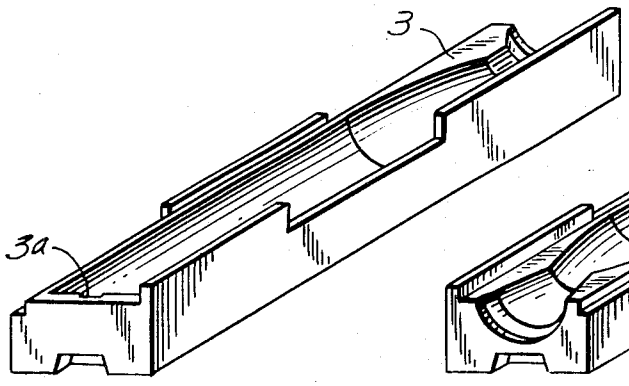


FIG. 8

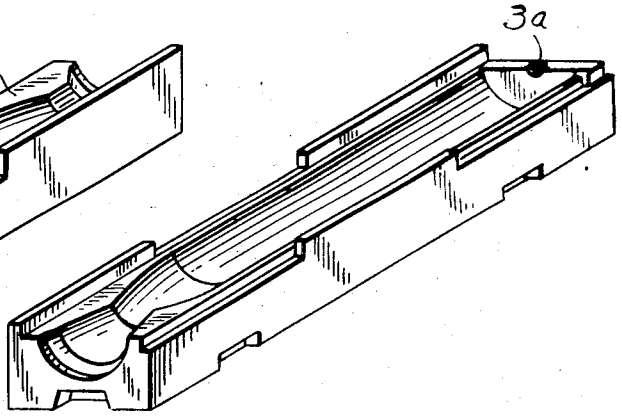


FIG. 9

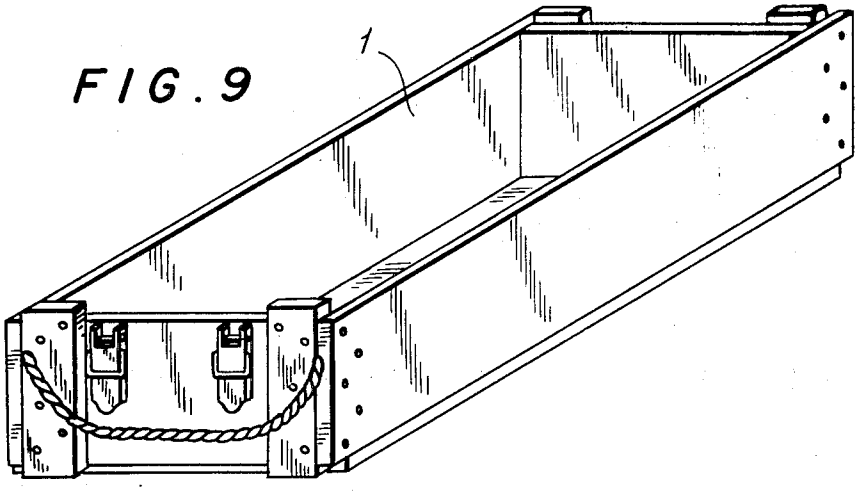
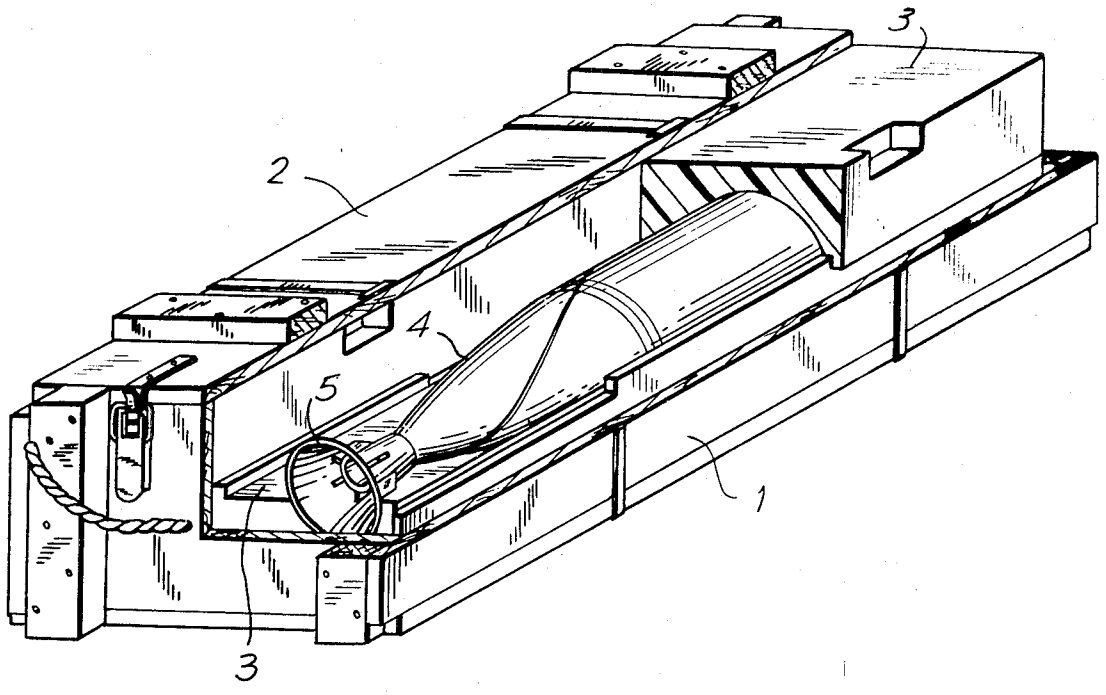


FIG. 10



ENCLOSURE FOR AN OGIVAL SHELL

BRIEF SUMMARY OF THE INVENTION

The invention relates to an enclosure or packing for an ogival shell, i.e. a shell with a tapered tip, which will protect the shell against impact while permitting stacking and transport.

More particularly, the invention relates to an enclosure or packing for a shell or projectile which will enable a parachute drop to be carried out without any damage to the shell. Moreover, such enclosure must protect the shell against corrosion due to ambient conditions and against environmental conditions such as shock and impact forces from falls, jolts and drops.

The shells are composed of a projectile to which a case of steel, brass or combustible material is crimped or cemented. The weak point of such shells is the junction between the case and the projectile. In the course of handling, stresses may be produced which disturb the junction and can destroy the rigidity of the shell and consequently the alignment of the projectile on its case.

The known packing consists of a box and cardboard containers enclosing the shell. During a parachute drop, these cartons inadequately support the shell and do not guarantee absorption of shock and provide the support necessary for both pancake and end-on landings of the packed shell.

An object of the invention is to provide a packing or enclosure for a shell which satisfies the above requirements.

According to the invention, the enclosure is buoyant, thermally insulative, and impact absorbing and the enclosure comprises a flexible impermeable wrapping material covering the shell and hermetically sealing the shell therein against the ambient atmosphere, a pair of half casings of foam material cooperatively defining a cavity for the shell conforming to the shape thereof, a removable ferrule fitted on the tip of the shell and supported within the cavity to absorb impact produced by axial forces, and a rigid outer cover tightly enclosing the half casings.

The principle of the enclosure according to the invention is to support the shell over its entire surface in such a way as to distribute the stress, due to impact, such as from a parachute drop, over as large a surface area as possible, in order that the pressure exerted on the half casings is minimal. The shell must therefore have its entire outer surface in contact with the half casings to ensure permanent support.

The sharp pointed tip of the shell may pierce the half casing in a drop "on end" of the enclosure and this can produce damage to the shell. The ferrule is fitted on the tip to distribute the longitudinal stress over a larger surface area and hence prevent damage to the shell.

To secure fullest cohesion of the half casings on the shell and avoid bouncing of the shell therewithin, the half casings are secured in place by a slight clamping effect by the closure of the outer cover which may be a box or the like.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view, partially cutaway, of a cap for the tip of a shell, said cap constituting a part of a container for the shell;

FIG. 2 is a perspective view of a cover for the container;

FIG. 3 is a perspective view from one end of a half casing of the container;

FIG. 4 is a perspective view from the other end of the same half casing;

FIG. 5 is a exploded view of the shell and several components of the container;

FIG. 6 is an exploded view from the opposite end of FIG. 5;

FIG. 7 is a perspective view of the half casing of FIG. 3 in inverted position;

FIG. 8 is a perspective view of the half casing of FIG. 4 in inverted position;

FIG. 9 is a perspective view of an open box of the container; and

FIG. 10 is a perspective view, partially cutaway of the assembled container with a shell therein.

DETAILED DESCRIPTION

The container of the invention comprises an outer box 1 with a cover 2 in which are fitted two half casings 3 which support and enclose a shell or projectile 6 wrapped in a flexible covering 4 and fitted at the tip with a ferrule 5.

The covering 4 is an impermeable Rilsan wrapping adapted to assure protection of the shell against moisture and corrosion by hermetically sealing the shell therewithin. To increase its efficiency in this respect, a vacuum can be created inside the wrapping which will then tightly enclose the shell. At the ends of the cover 4, there is a V-shaped notch 4*a* to make it easier to tear the wrapping open when unpacking.

After the shell is sealed in the wrapping 4, the ferrule 5 is fitted on the ogival tip of the shell. The ferrule is made of polyethylene. The function of the ferrule is, on the one hand to protect the delicate parts of the front end of the shell (fuse, cap, etc.) by preventing contact thereof with the rest of the container during a fall or the like and on the other hand to absorb the longitudinal impact force of the fall (which is a maximum in the case of an end-on drop).

In order to achieve the above, it is necessary:

1. To support the ferrule on the shell, and for this purpose the ferrule has an inner formed portion 5*b* of conical shape to engage the tip and cushion the delicate parts thereof (fuse, cap). Circumferentially spaced radial ribs 5*d* connect portion 5*b* with the outer body 5*a* of the ferrule 5 to stiffen the portion 5*b*.

2. To be able to "give" during the fall, without the projectile tip striking the packing, and for this purpose the outer body 5*a* has a length and thickness determined in terms of the maximum force of impact to be absorbed:

Let

E = energy due to fall, resulting from the release height defined for the shell in question,

e = amount of maximum "give" permissible so that the shell shall not strike its packing,

F = brake force of the ferrule,

x = longitudinal displacement of the shell in relation to its packing, then

$$E \leq \int_0^e F(x)\,dx$$

Moreover, the brake force $F(x)$ must never be greater than the limit of longitudinal resistance of the shell.

The end portion of ferrule 5, opposite the end in which the tip of the shell is inserted, is flared and has external ribs 5*c* to guide the "give" of the ferrule.

The two half casings 3 have respective cavities which, when the half casings are engaged in facing contact, cooperatively define the shape of the shell with the ferrule thereon. In this way proper absorption is assured in all directions, which during a fall or a parachute drop, avoids or reduces the distortion of the shell to negligible proportions and preserves it for subsequent use. For falls "base-on" a clearance 3*a* is provided in the center of the casing 3 to provide pyrotechnic safety and to have a crash effect best satisfying the relation

$$E \leq \int_0^e F(x)\,dx$$

The height of the half casings 3 is calculated so as to ensure a tight fit when the packing is closed.

The material of the half casings 3 must be light and have cells of the expanded polystyrene type, so as to provide buoyancy of the whole container (specific gravity = 0.7) and good thermal insulation.

Finally, the container comprises the outer box 1 and cover 2 which allows conveyance, stockpiling and assures cohesion of

the entire package. The box 1 and cover 2 may be made of wood although other material assuring the same results could be used, e.g. cardboard, pressboard or the like.

What is claimed is:

1. An enclosure for an ogival shell, said enclosure comprising casing means defining a cavity for said shell, and a ferrule fitted on said shell on the tip thereof and supported within the cavity of said casing means to protect and cushion said tip, said ferrule comprising a deformable outer body portion with opposite ends, said tip of the shell being insertable in one of said ends, a stiffened conical inner body on said outer portion for engaging the tip of the shell when inserted into said one end, the other end of the outer body portion including ribs thereon.

2. An enclosure as claimed in claim 1 wherein said outer body portion is outwardly flared at said other end.

3. An enclosure as claimed in claim 2 wherein said ribs on the outer body portion extend radially thereon at said outwardly flared end.

4. An enclosure as claimed in claim 1 comprising an outer cover means enclosing said casing means and including a box and lid.

5. An enclosure as claimed in claim 4 wherein said casing means comprises a pair of half casings engaged together and tightly fitted within said outer cover means, said cavity in said casing means being formed in both half casings to provide a shape corresponding to the shell with the ferrule mounted thereon whereby the shell and ferrule are supported over their entire surface by the half casings.

6. An enclosure as claimed in claim 1 wherein said casing means comprises a pair of half casings engaged together to hold the shell and ferrule thereon within the half casings.

7. An enclosure as claimed in claim 6 wherein said half casings are constituted of an expanded cellular polymer.

8. An enclosure as claimed in claim 1 wherein said ferrule includes circumferentially spaced radial ribs between said inner and outer body portions.

9. An enclosure as claimed in claim 1 comprising a flexible, impermeable wrapping material covering said shell and hermetically sealing the shell therein.

10. An enclosure as claimed in claim 6 wherein said half casings are provided with notches for providing a clearance with the shell at the center of the base thereof.

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