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H. STADLER ET AL

3,292,541

CARTRIDGE

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FIG. 1

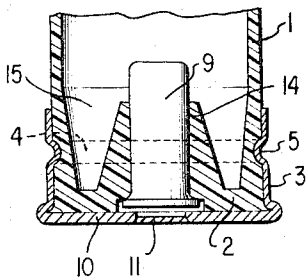


FIG. 2

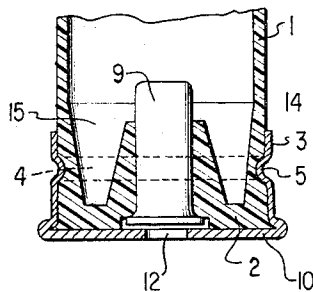


FIG. 3

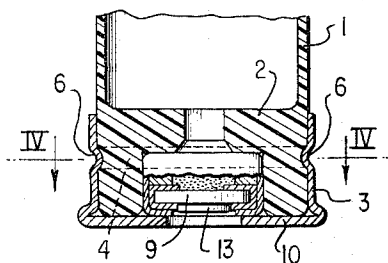


FIG. 4

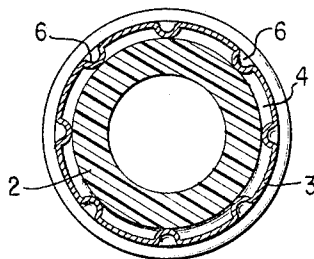


FIG. 5

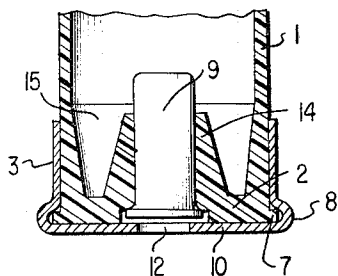
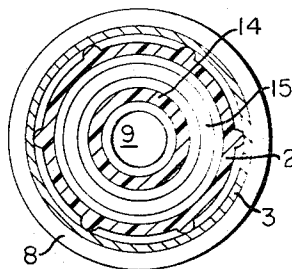


FIG. 6



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15 Claims. (Cl. 102—46)

The present invention relates to cartridges, and more particularly to cartridge cases intended for use with propellant charges of relatively high energy content.

Propellant charge cartridges for commercial or military purposes are similar in their construction to the known buckshot cartridges. They consist of a paper cartridge case closed by a plug or closure member made of cardboard and of a metallic cap at the bottom which is pressed together at the rim thereof with the bottom plug and the case.

Propellant cartridges with an energy content of about up to 200 mkg. may be handled with cartridges of this type. However, for commercial and military purposes, for example, for mortar ammunition, cartridges are necessitated with propellant charges whose energy content amounts to a multiple thereof, to about 0.5 to 5.0 m.t. i.e., metric ton weight (1000 kg.=1 ton). The simple cartridge similar to the buckshot cartridge can no longer be used in that case.

At first glance, a modification of such construction would be available which has already been proposed for buckshot cartridges, namely to injection-mold in one piece and of plastic material the case together with the bottom piece. However, cartridges of this construction would not withstand the high pressure at the contemplated high energy outputs.

With the small wall thicknesses the plastic material would tear or begin to flow. The cartridge could no longer be removed from the chamber. Additionally, bottom perforations would occur and the primers or fuses would fall out.

A cartridge for propellant charges also of large energy content can be created according to the present invention in that the cartridge case is made, especially molded in one piece with a bottom piece whose thickness amounts to at least 3 to 8 times the wall thickness of the case, the bottom piece is protected and reinforced by a metal cap and the primer or percussion cap is inserted directly into a bore of the bottom piece. The bottom piece is thereby to have such a thickness that it is able to absorb about the same forces as the customary metallic bottom piece. The metallic bottom piece is, therefore, obviated and is replaced in accordance with the present invention by a strong bottom piece of plastic material made in one piece with the case. The reinforcement has to participate in the absorption of the forces only to a small proportion, but may also be so constructed that it serves as abutment. The protective reinforcement has the purpose to avoid a flowing of the plastic material by pressure and heat and a piercing and falling out of the bottom piece.

In special realization of the present invention, the bottom piece is so constructed that the primer is partly concentrically surrounded by a powder space. It is achieved thereby that the gas pressure acts not only on the end face of the primer but simultaneously also from the side. A shooting or blasting out of the primer is thereby prevented which would lead to disturbances.

Accordingly, it is an object of the present invention to provide a cartridge for use with commercial or military purposes requiring a relatively high energy content of the order of 0.5 to 5.0 m.t. which obviates the afore-

2

mentioned shortcomings and drawbacks encountered with the prior art constructions.

Another object of the present invention resides in the provision of a cartridge of the type described above which is not only able to accommodate relatively high energy content propellant charges but can be manufactured by simple and relatively inexpensive means.

A further object of the present invention resides in the provision of a suitably molded cartridge made of plastic material which consists of a unitary integrally formed cartridge case and bottom piece capable of withstanding the high pressures produced during the intended high energy outputs.

Still a further object of the present invention resides in the provision of a plastic cartridge made of plastic material in which tearing or flowing of the plastic material is effectively prevented.

Still another object of the present invention resides in the provision of a plastic cartridge which assures safe removal from the cartridge chamber under all operating conditions.

A further object of the present invention resides in the provision of a cartridge construction of the type described above which prevents with certainty the falling out or dropping out of the primer.

Another object of the present invention resides in the provision of a plastic cartridge which obviates the need for a metallic bottom piece without sacrificing strength and proper operation of the cartridge even under relatively high energy output conditions.

Still a further object of the present invention resides in the provision of a plastic cartridge in which the gas pressure of the cartridge is also effective laterally on the primer to aid in the prevention of a falling out on the part of the latter.

These and further objects, features and advantages of the present invention will become more obvious from the following description when taken in connection with the accompanying drawing which shows, for purposes of illustration only, several embodiments in accordance with the present invention and wherein:

FIGURE 1 is a partial axial cross sectional view through a first embodiment of a cartridge in accordance with the present invention,

FIGURE 2 is a partial axial cross sectional view through a modified embodiment of a cartridge in accordance with the present invention in which the primer is exposed directly to the striker mechanism through a central aperture arranged in the metallic cap,

FIGURE 3 is a partial axial cross sectional view through a further modified embodiment of a cartridge in accordance with the present invention having an electric fuse,

FIGURE 4 is a transverse cross sectional view taken along the line IV—IV of FIGURE 3,

FIGURE 5 is a partial axial cross sectional view, similar to FIGURE 2, of a still further modified embodiment of a cartridge in accordance with the present invention, and

FIGURE 6 is a transverse cross sectional view through a modification similar to that shown in FIGURE 5.

Referring now to the drawing wherein like reference numerals are used throughout the various views to designate like parts, all the figures of the drawing show consistently the new construction of the cartridge based on the present invention which is provided with a relatively thin cartridge case 1 of plastic material and with the relatively thick bottom piece 2 made in one piece with the cartridge case 1. The cartridge is appropriately made by conventional molding, for instance, injection molding. In order to avoid deformations of the bottom piece 2 together with the disturbing consequences resulting therefrom, the

3

bottom piece 2 in accordance with the present invention is reinforced with a protective metallic cap 3. The primer or fuse 9 is inserted into the bottom piece 2.

Of the many possible connections of the reinforcing cap 3 with the bottom piece 2, only a few are illustrated herein which are based on a form-locking connection between these two parts.

In the embodiments according to FIGURES 1 to 4, the bottom piece 2 is provided with a molded-in annular groove 4 into which is secured or anchored a metallic cap 3. Such anchoring takes place in the embodiment of FIGURES 1 and 2 by a bead 5 of the cap 3. In the embodiment of FIGURES 3 and 4, this anchoring is realized by pressed-in indentations or bulges 6 of the cap 3.

In the embodiment according to FIGURE 5, the bottom piece 2 is provided with a projecting rim 7 about which the cap is flanged over at 8. If one desires to make even more strong the seating of the reinforcing cap, then one may provide the bottom piece 2 on the outside thereof with corrugations, ridges, or grooves whose outer diameter is larger than the inner diameter of the reinforcing cap 3, for example as shown in FIGURE 6. A strong frictional engagement is achieved by the deformation of the corrugations or ridges upon emplacement of the cap 3.

In lieu of the form-locking connection, however, a material connection may be utilized by bonding, cementing, gluing, or welding. The type of connection is determined by manufacturing considerations and is, therefore, only of subordinate importance to the present invention.

As mentioned above, a primer 9 is inserted into the bottom piece 2 of the cartridge which may be either a percussion fuse or piercing primer as shown in FIGURES 1, 2, and 5 or an electric fuse as shown in FIGURE 3. The construction of the bottom plate 10 of the reinforcing cap 3 is also determined by the type of primer or fuse. In the example of FIGURE 1, the bottom plate 10 is closed but is weakened in its center, circular zone 11. With the protective reinforcing cap 3 of FIGURES 2 and 5, the bottom plate 10 is provided with a circularly shaped aperture 12 so that the firing or striker member can impinge directly on the primer 9.

The embodiment of FIGURE 3 is intended for an electric fuse. In this case, the lower electrode 13 has to be exposed and insulated whereas the outer electrode rests at the reinforcing cap as ground.

Insofar as the primer is not pressed into the bottom piece, the bottom plate 10 serves simultaneously in all embodiments as safety means against a falling out of the primer or fuse.

The aforementioned special construction is illustrated in FIGURES 1, 2, and 5. In these figures an approximately conically shaped extension 14 is formed into the bottom piece 2 so that an annular space 15 is produced about the primer 9 which is filled with powder. The gas pressure of the powder, therefore, exerts a force acting radially on the detonator cap which prevents a blasting out of the detonator cap.

While we have shown and described several embodiments in accordance with the present invention, it is understood that the same is not limited thereto but is susceptible of numerous changes, and modifications as known to a person in the art and we therefore do not wish to be limited to the details shown and described herein but intend to cover all such changes and modifications as are encompassed by the scope of the appended claims.

We claim:

1. In a cartridge for commercial or military purposes containing propellant charges with large energy contents (between 0.5 and 5.0 m.t.) having a plastic cartridge case with a reinforced plastic bottom piece and a primer means inserted in a central bore of the bottom piece, and a metallic cap reinforcing the bottom piece, the improvement comprising mutually interengaging means on the bottom piece and the cap for form-locking engagement

4

operable to produce a clamping positive connection between the cap and the bottom piece, and the end face of the cap being provided with a central aperture having an inside dimension smaller than the adjacent surface of the primer to form an abutment and prevent the removal of the primer.

2. The cartridge according to claim 1, wherein the bottom piece is provided with means for increasing the frictional contact with the reinforcing cap including a plurality of longitudinal corrugations on the outer circumference that are of a greater outer diameter than the inner diameter of the reinforcing cap.

3. The cartridge according to claim 1, wherein the thickness of the reinforced bottom piece is at least 3-8 times the thickness of the wall of the cartridge case.

4. The cartridge according to claim 1, wherein the case is made unitary with the bottom piece.

5. The cartridge according to claim 1, wherein the interengaging means is spaced a substantial distance forward of the rear end of the reinforcing cap.

6. The cartridge according to claim 1 wherein the end face of the reinforcing cap is provided with an annular reinforcing enlarged flange.

7. The cartridge according to claim 6 wherein the interengaging means includes said enlarged flange.

8. The cartridge according to claim 7 wherein the interengaging means includes a rim formed on the rearward end of the bottom piece and interengaged with the enlarged flange.

9. The cartridge according to claim 1, wherein the bottom piece includes an axially extending tubular member receiving the primer means and forming an annular powder chamber surrounding the primer means.

10. The cartridge according to claim 9, wherein said axially extending tubular member is externally frustoconically shaped with its relatively wide base adjacent said central aperture; and the inner and outer walls of said annular powder chamber each covering towards each other in the axial direction toward said central aperture.

11. The cartridge according to claim 10, wherein the end face of the reinforcing cap is provided with an annular reinforcing enlarged flange.

12. The cartridge according to claim 11, wherein the interengaging means includes said enlarged flange and a rim formed on the rearward end of the bottom piece interengaged with the enlarged flange.

13. The cartridge according to claim 12, wherein the thickness of the reinforced bottom piece is at least 3-8 times the thickness of the wall of the cartridge case, and the case is made unitary with the bottom piece.

14. The cartridge according to claim 1 wherein said primer means includes an electric fuse having a plurality of electrodes; said metallic cap abuts against one of said electrodes to establish the ground connection.

15. The cartridge according to claim 14, wherein the thickness of the reinforced bottom piece is at least 3-8 times the thickness of the wall of the cartridge case; and said cartridge case is made unitary with the bottom piece.

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