

TITLE: IMPROVED TRAINING CARTRIDGE

FIELD OF THE INVENTION

This invention relates to cartridges for firearms that operate, or are converted to operate, on the blow-back principle. It is particularly suited for use as training ammunition for firing low mass training projectiles, such as that described in U.S. Patent No. 5,035,183.

BACKGROUND TO THE INVENTION

A number of telescopically expanding cartridge cases have been developed to facilitate the operation of blow-back cycling firearms. Such rounds are needed when a low mass projectile is being fired as the recoil in such cases is greatly diminished.

Examples of such prior art rounds are described in U.S. Patent Nos. 5,359,937 and 5,016,536.

An objective in the designing of such rounds is the minimization of cost. Various materials including plastics and metals may be employed. A further factor for consideration is that a training round which is intended to operate in a minimally converted, standard, firearm should chamber and eject reliably, in the same manner as a normal round. For these and other reasons it is desirable to rely on metals. However, it is difficult to achieve high sealing efficiencies between sliding metal surfaces.

In the case of rounds with telescopically expanding casings, a tight sliding fit is required between parts to contain propellant gases during the cartridge expansion action. This type of fit is difficult to achieve with all-metal parts, and even when non-metal materials are employed.



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The present invention addresses the problem of providing a seal under such circumstances.

The invention in its general form will first be described, and then its implementation in terms of specific
5 embodiments will be detailed with reference to the drawings following hereafter. These embodiments are intended to demonstrate the principle of the invention, and the manner of its implementation. The invention in its broadest and more specific forms will then be further described, and defined, in
10 each of the individual claims which conclude this Specification.

SUMMARY OF THE INVENTION

According to the invention in one aspect a telescopically expanding cartridge equipped with a projectile
15 or formatted as a blank comprises a two part casing portion, which portions are telescopically interfitted into each other over an overlapping region. One "head end" portion of the casing carries the head end of the cartridge and the other, forward, portion constitutes the chambering end portion of the
20 casing, hereafter referred to on occasion as the "sabot".

When assembled, the rearward end of the sabot fits into a sleeve that is part of the head end portion of the casing. The sabot rearward end terminates in a transverse wall pierced by an orifice. In one variant there is a close
25 sliding fit directly between the outside periphery of the rearward end of the sabot and the inner surface of the sleeve. An interior passage extends axially from the orifice to the forward end of the casing, providing a path for propellant gases to escape through the orifice and propel a projectile,
30 if present. The transverse wall and inside surfaces of the

sleeve and head end delimit an internal volume or cavity with the casing.

Fitted against the transverse wall within the internal volume is a sealing disc of flexible, compliant, preferably polymeric material. This disc is dimensioned to effect a tight sliding fit against the inner wall of the sleeve. It contains a central hole aligned with the orifice in the transverse wall of the sabot. This central hole may function as a "choke hole" to allow gases evolving in the inner cavity to escape in a metered manner from the cavity, out through the transverse wall orifice. Alternately, a choke hole may be formed in the transverse wall as the end wall orifice, accessed through a simple hole in the disc.

Optionally but, preferably a frangible membrane overlies the choke hole to seal-out moisture before the firing of the round. Ignition of propellant within the inner cavity ruptures this membrane.

On firing, gases evolving in the inner cavity develop an over-pressure that causes the casing to expand telescopically. The overlapping portion of the sabot slides within the sleeve as the gap between the transverse wall and head end increases. Pressure is applied to the sabot through the sealing disc which travels forwardly with the sabot with respect to the sleeve. Throughout its travel, the sealing disc minimizes the loss of gases through the sabot/ sleeve interface.

The invention is particularly suited to the situation where the sleeve is made of brass and the sabot is made of zinc, or a zinc alloy.

To position the sealing disc accurately, according to one variant, the transverse wall may have a recess or

protrusion, preferably circular, and the disc may have a correspondingly shaped protrusion or hole that mates with the recess or protrusion on the transverse wall so as to fit the parts intimately together.

5 With the sealing disc in place the rearward end of the sabot need not be in direct contact with the inside surface of the sleeve to provide a close sliding fit. The sealing disc may optionally and preferably have a thin, axial extending rim located on the outer periphery of the disc and
10 embracing the outer perimeter of the rearward end of the sabot, adjacent the transverse wall, to seal against the interior wall of the sleeve. This rim is thrust against the sleeve walls under the gas pressure developed by the propellant upon firing, increasing the sealing properties of
15 the disc. This rim can also provide an alternate or supplementary means for positioning the disc centrally on the rearward end of the sabot to the protrusion or hole referenced above.

 To assist in assembly, this rim may have a hooked
20 edge or lip that lockingly engages with a circumferential flange formed at the rearward end of the sabot. The disc may be made of an elastically resilient material to permit the disc to be pressed into position on the rearward end with a "snap" fit. The peripheral edge of the flange may be
25 conically bevelled to ease the engagement of the sealing disc to the sabot when it is snap-fitted into place at the rearward end of the sabot.

 The foregoing summarizes the principal features of the invention and some of its optional aspects. The invention
30 may be further understood by the description of the preferred

embodiments, in conjunction with the drawings, which now follow.

BRIEF DESCRIPTION OF THE DRAWINGS

5 Figure 1 is a side cross-sectional view of an existing, prior art round with a telescopically expanding casing;

 Figure 2 is Figure 1 modified by the presence of the sealing disc of the invention;

10 Figure 3 is an enlarged, side cross-sectional view of the rearward end of the chambering portion of the round of Figure 2 wherein the sealing disc has a peripheral rim;

 Figure 4 is a variant of Figure 3 wherein the sealing disc has a peripheral rim;

15 Figure 5 is a further variant of Figure 3 wherein the sealant disc rim has a lip; and

 Figure 6 is a side cross-sectional view of the round of Figure 1, modified as in Figure 2 in its expanded state after firing.

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DESCRIPTION OF THE PREFERRED EMBODIMENT

 In Figure 1 a prior art training round 1 is fitted with a light weight projectile 2 at the forward end of a telescopically expanding casing 3. The casing 3 has a head
25 end portion 4 with a primer 5 and a chambering end portion 6 also sometimes referred-to as a sabot 6.

 A central passageway 7 extends the length of the chambering portion 6 of the casing. At the rearward end of this passageway 7, a transverse wall 8 pierced by an orifice
30 9 closes-off the greater part of the passageway 7 defining an inner cavity 10 between the wall 8, a cylindrical sleeve 11 on

the head end portion 4 of the casing 3 and the actual head end 12 itself. Propellant powder 13 is present within the cavity 10.

The transverse wall 8 terminates along its outer 5 periphery against the inner side of the sleeve 11. The sleeve 11 extends to overlap a portion of the rearward extent of the chambering portion 6. An indented region 14 formed in this part of the chambering portion 6 accepts an inwardly bent crimp 15 on the sleeve 11 and functions to limit the 10 telescopic expansion of the casing 3.

In the prior art, the orifice 9 is covered by a frangible membrane 16 to prevent moisture from reaching the propellant 13.

In Figure 2, the transverse wall 8 has an enlarged 15 recess 17 with an annular seat 24 formed in place of the orifice 9 of Figure 1. A sealing disc 18, preferably of resilient polymeric material, has a protrusion 19 that interfits with this recess 17. The sealing disc 18 has a centrally located choke hole 20 covered by a frangible 20 membrane 21. The outer circumferential edge 22 of the sealing disc 18 is dimensioned to effect a tight sliding fit against the inner surface of the sleeve 11.

On firing, the chambering portion 6 and sealing disc 18 both move with respect to the sleeve 11 as the casing 3 25 telescopically expands under the pressure of gas 28 evolving from the propellant powder 13. The outer circumferential edge 22 of the disc 18 contains such gases 28 from leaking-out through the transverse wall 18/sleeve 11 interface.

In this manner a improved training round with more 30 reliable performance is provided.

In Figure 3 the outer circumferential edge 22 is modified by a thin, axially extending rim 27 that extends between the chambering portion 6 and the inner wall of the sleeve 11. This rim 27 eliminates direct contact between the
5 outer end of the transverse wall 8 and the sleeve 11, further improving the seal therebetween.

In Figure 4 a further enlarged variant of Figure 3 is shown wherein the rim 27 has a snap-fit locking lip 26 on the inner edge of the outer rim 27 that engages with a
10 circular flange 35 on the rearward end 39 of the chambering portion 6. The snap-fit lip 26 secures the sealing disc 18 to the chambering portion 6 and minimizes the gas leakage that may occur between the sleeve 11 and chambering portion 6.

In Figure 4, because the outer edge 22 of the disc
15 18 has a snap-fit lip 26 on the outer rim 27 that engages with a circular flange 35 on the chambering portion 6, these parts interengage to secure the disc 18 centrally to the chambering portion 6. This makes the protrusion 19 on the sealing disc 18 and recess 17 in the transverse wall (or their converse)
20 redundant as positioning means. A disc without such a protrusion is shown in Figure 5.

Further, in Figure 5 the outer edge 38 of the circular flange 35 is conically bevelled to assist in the installation of the sealing disc 18 on the rearward end 39 of
25 the chambering portion. The sealing disc 18 may have a complimentary surface 37 that lies against the conically bevelled edge 38.

As another further optional feature shown in Figure 5, rim 22 of the disc 18 has an optionally ramped flange 36
30 that lies against the inner wall of the sleeve 11, extending in the direction of the cavity 10. Pressure from evolving gas

will press this ramped flange 36 against the inner wall of the sleeve 11, additionally securing against gas leakage.

In Figure 6 the expanded round is depicted showing the chambering portion 6 telescopically expanded from within the sleeve 11. The membrane 16 has ruptured under the pressure of expanding gas 28. The projectile 2 has been fired through the bore of the weapon (not shown) by gas 28 travelling through the choke hole 20 and central passageway 7. Telescopic expansion is limited by the travel of the crimp 15 in the indented region 14.

The sealing disc 18 is preferably made of a polymeric plastic such as polyoxymethylene acetyl and sold in one version under the trademark DELRIN™. This material permits the membrane 16 to be integrally molded into the sealing disc 18.

The chambering portion may be of any material that requires supplementary sealing, particularly aluminum, zinc and zinc alloys. A preferred material is a zinc alloy containing copper, aluminum and magnesium sold under the brand name "Zamak" by the New Jersey Zinc Company of New Jersey, U.S.A.

The sealing disc 18 can be fitted into a 5.56 mm round with an outer diameter of 0.330 inches, providing an 0.0025 inch interference fit. The preferred embodiment of the Figures has been built with a circular flange 35 of 0.150 inches in width and 0.100 inches thickness. The protrusion extends 0.050 inches out from the annular portion 25. The choke hole was 0.023 inches in diameter and the membrane thickness was 0.0035 inches.

With the rim 27 added as in Figure 3, the rim 27 protruded 0.080 inches from the circular flange 35.

While Figures 3 and 4 show a sealing disc 18 with a protrusion, the transverse wall may conversely present a protrusion or post over which a disc with a central hole (not shown) may be fitted with a tight fit. In such an arrangement, the post on the chambering portion carries the choke hole.

Thus a variety of configurations have been shown which will stabilize the disc 18 on the sabot 6 for ease of assembly and to minimize gas loss along the transverse wall 8/disc 18 interface.

CONCLUSION

The foregoing has constituted a description of specific embodiments showing how the invention may be applied and put into use. These embodiments are only exemplary. The invention in its broadest, and more specific aspects, is further described and defined in the claims which now follow.

These claims, and the language used therein, are to be understood in terms of the variants of the invention which have been described. They are not to be restricted to such variants, but are to be read as covering the full scope of the invention as is implicit within the invention and the disclosure that has been provided herein.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE
PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A telescopically expanding cartridge for use in
blow-back operated firearms comprising:

- 5 1) a casing with a head end portion including a
 cartridge head end fitted to a sleeve with an inner
 wall;
- 2) a primer mounted in the head end;
- 3) a chambering portion or "sabot" said cavity having
10 a forward end, remote from the head end, and a
 rearward end telescopically interfitted with said
 sleeve;
- 4) the casing and sabot defining a cavity for
 containing gas evolved on firing;
- 15 5) the sabot comprising a central longitudinal
 passageway extending from its forward end to its
 rearward end to allow for gas to escape from the
 cavity;

characterized by:

- 20 6) a sealing disc overlying the rearward end of the
 sabot, extending to form at its circumferential
 perimeter a sealing contact with said sleeve
 wherein the sealing disc is pierced by a central hole to allow
 the release of gas evolving from within the cartridge casing
25 into the longitudinal passageway upon firing.

2. A cartridge as in claim 1 wherein said sabot
comprises a recess or protrusion formed in its rearward end
and said sealing disc comprises a complementary disc
protrusion or disc opening interfitted with said sabot recess
30 or protrusion to position the sealing disc on the sabot.

3. A cartridge as in claim 1 or 2 wherein a rim extends from the outer circumferential perimeter of the sealing disc to lie between the sabot and the cartridge sleeve.

4. A cartridge as in claim 3 wherein the rearward end
5 of the sabot carries a circumferential flange and said rim carries a lip that engages with said flange with a snap-fit.

5. A cartridge as in claim 4 wherein the circumferential flange has an outer edge that is conically bevelled to receive the sealing disc in said snap-fit
10 engagement.

6. A cartridge as in claim 5 wherein the sealing disc has a complementary shaped surface that lies against the conically bevelled edge.

7. A cartridge as in claims 1, 2, 3, 4, 5 or 6 wherein
15 the sealing disc comprises around its outer circumferential perimeter a rearwardly- directed sealing flange that bears against the inner wall of the sleeve.