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(19)

(54) SABOT PROJECTILE

(71) We, WERKZEUGMASCHINENFABRIK OERLIKON-BUHRLE AG., a Swiss Company of Birchstrasse 155, Postfach 888, Zurich CH-8050 Switzerland do hereby declare the invention for which we pray that a patent may be granted to us and the method by which it is performed to be particularly described in and by the following statement:—

This invention relates to a sabot projectile, also called a subcalibre projectile, having a pyrotechnic composition, in particular a flare composition, mounted on the projectile body.

In sabot projectiles, the pyrotechnic composition is customarily sunk in a bore in the tail of the projectile body, as is shown, for example, in Swiss Patent No. 461,309.

Since the projectile body is in most cases fabricated from heavy metal, the fitting of the comparatively light-weight pyrotechnic composition leads to a reduction of the weight of the projectile body. This means that the projectile has a lower penetrating power than a projectile without a pyrotechnic composition. Furthermore, the material which has to be cleared out when the bore is made represents a considerable loss in view of the high price of the heavy metal.

It is the object of the invention to provide a sabot projectile, having a pyrotechnic composition, in which the loss of material from the projectile body is reduced and the effectiveness of the projectile is increased.

According to the invention there is provided a sabot projectile having a solid body of heavy metal formed with an axial recess in the tail of the projectile body, and extending for a minor part of the length of the body, a pyrotechnic composition mounted in the recess and protruding from the tail of the projectile body, and a jacket surrounding said protruding part.

Some illustrative embodiments of the subject of the invention are represented in the drawing, in which:

Figure 1 shows a longitudinal section of the drive base projectile and

Figures 2-7 show longitudinal sections, drawn on a larger scale, through the tail of the projectile body.

According to Figure 1, a projectile body 1 of the sabot projectile has in the tail a recess 2 which is formed as a blind bore which is coaxial to the longitudinal axis of the projectile body and has two sections 2*a* and 2*b* of different diameters. Only a part of a flare composition 11 is accommodated therein, and the composition 11 is surrounded by a jacket 3. Other examples of this jacket 3, for example a piece of pipe, are shown in Figure 2-7. The front part of this jacket 3 with a reduced diameter is inserted in the narrower part of the recess 2*b* by a snap-fit. A shoulder 17 of the jacket 3 here bears against a shoulder 13 of the projectile body 1. The rear part 3*a* of the jacket 3 has a annular groove 6 into which a thin-walled collar 7 of the projectile body 1 is beaded. The jacket 3, which has a bore of the same diameter throughout, projects from the tail of the projectile body 1 to the rear into a central bore 8 in the tail part of the sabot, which central bore opens into a recess 9 therein. As a result of a snap-fit, by means of which the jacket 3 is held, gases from the propellant charge are prevented, on firing the projectile, from penetrating into the recess 2*b*, igniting the front end of the flare composition 11 and thus ejecting the latter rearwards from the jacket 3.

In order to avoid a premature ignition of the flare composition 11, the latter is pressed into the jacket 3, already fixed in the projectile body 1, only after a projectile jacket 12, which consists of plastics material and is injection-moulded at a processing temperature of about 570°K, has been applied. When it is pressed in, the flare composition 11 also fills an annular groove 16, which is incised into the wall of the bore of the jacket 3, so that it is anchor in the latter.

In the illustrative embodiment shown in Figure 2, an end face 4 of the jacket 3 bears against a shoulder 13 which separates the two parts of the recess 2*a* and 2*b* of the projectile body 1 from one another.

SHEET(S) ATTACHED

A part of the flare composition 11, which is not shown in greater detail in Figure 2, thus located in the jacket 3 and the other part is located in the recess 2*b* of the projectile body 1, which recess has the same diameter as the bore in the jacket 3. Since the jacket 3 is here located in the region of a conical support surface 14 of the projectile body 1, it cannot be inserted with a snap-fit into the recess 2*a*, in order to avoid a fracture of the projectile body 1. A sealing agent 15 provided between the end face 4 of the jacket 3 and the shoulder 13 prevents the penetration of gases from the propellant charge into the part of the recess 2*b*.

In the embodiment shown in Figure 3, the projectile body 1 has a recess 2, the diameter of which is not reduced and which corresponds to the diameter of the front part of the jacket 3. As a result, it is possible to fix the jacket 3 with a snap-fit in the recess 2 of the projectile body 1, without the risk of a fracture of the projectile body 1. The shoulder 17 of the jacket 3 bears against an annular tail face 18 of the projectile body 1.

In the illustrative embodiment shown in Figure 4, the recess 2 of the projectile body 1 has an annular groove 19 at the front end. In the original state (as shown in the right-hand half of Figure 4), the jacket 3 has a flanged edge 20 pointing inwards. To fix the jacket 3, the flanged edge 20 is displaced by plastic deformation (left-hand half of Figure 4) into the groove 19 and against the base 5 of the recess 2, as a result of which the recess 2 is sealed against the penetration of gases from the propellant charge and the jacket 3 is anchored in the projectile body 1.

The jacket 3 can also be fixed in the recess 2 of the projectile body 1 by means of an adhesive bond. In Figure 5, an adhesive layer, which makes this bond, for example a self-setting resin such as that available under the trade mark Araldite, or a layer of brazing solder, is marked by the numeral 21.

In a further illustrative embodiment shown in the right-hand side of Figure 6, the jacket 3 is anchored by a disc 22 in the recess 2 of the projectile body 1, which recess is slightly curved in the original state (shown in dots and dashes on the right-hand side of Figure 6) and has a diameter which is equal to the internal diameter of the jacket 3. The disc 22 is pressed against the base of the recess 24 and flattened under pressure. During the radial extension, thus resulting, of the disc 22, the front end of the jacket 3 is pressed against the wall of the recess 2 and retained in the latter. As shown in the left-hand side of Figure 6, the jacket 3 is held in the recess 2 of the projectile body 1 by a displacement body 25. The latter can be designed as a solid or as a shell. Two of its outer boundary surfaces are conical, and in particular one of these has the same aperture angle as the base of the recess and a surface adjacent thereto has a very small aperture angle. The largest diameter of this displacement body 25 is somewhat larger than the internal diameter of the jacket 3. This effects a radial extension of the jacket 3 when the displacement body 25 is introduced, and the jacket 3 is thus firmly clamped in between the wall of the recess and the displacement body 25.

In the embodiment of Figure 7, the front of the jacket 3 is closed off by a cover 23. The base 24 of the recess 2 of the projectile body 1, into which the jacket 3 is inserted, is, for example, aligned perpendicular to the axis of the projectile body, but it can also be conical. In the end state, the cover 23 of the jacket 3 bears against the base of the recess 24. In the original state, the cover 23 is not plane, but curved towards the interior of the jacket 3. The cover 23 is pressed against the base of the recess 24 with plastic deformation. Cavities which could be formed as a result of differences in tolerance between the recess 2 and the jacket 3, are thus avoided. On firing, while the projectile passes through the gun barrel, such cavities could be filled with gas from the propellant charge, which could expand after the projectile has left the barrel, and could eject the flare composition 11 from the projectile body 1 to the rear. The jacket 3 is pressed against the wall of the bore as a result of the radial extension which the jacket 3 undergoes when the cover 23 is flattened under pressure.

The distance by which the jacket 3 may project behind the tail face of the projectile body 1 must be determined experimentally since, after the projectile body 1 and the sabot 10 have separated, the jacket 3 first must still move out of the bore 8 of the sabot 10. Since, however, the sabot 10 leaves the trajectory, followed so far together with the projectile body 1, immediately after the separation, the jacket 3 may project only by such a distance that a contact with the sabot 10 after the separation is excluded. Otherwise, the target accuracy would be impaired.

That no gap is provided between the pyrotechnic composition 11 and the base of the recess 5 has the additional advantage that the jacket 3 is not subjected to any stress by the propellant gases. In particular, the gas pressure can act via the flare composition 11 on the recess 5 and hence directly on the projectile body 1.

In addition, the jacket 3 which protrudes from the tail of the projectile body, has a favourable effect on the aerodynamic properties of the projectile body 1.

The design according to the invention also includes the accommodation of a different pyrotechnic composition, for example a smoke mixture, in place of the flare composition.

WHAT WE CLAIM IS: 1. A sabot projectile having a solid body ~~jacket 3. The disc 22 is pressed against the~~ of heavy metal formed with an axial recess provided in the tail of the projectile body and extending for a minor part of the length of the body, a pyrotechnic composition mounted in the recess and protruding from the tail of the projectile body and a jacket surrounding said protruding part.

2. A projectile according to Claim 1, wherein the pyrotechnic composition is a flare composition.

3. A projectile according to Claim 1 or 2, wherein the jacket is formed by a piece of pipe fixed to the projectile body and having an annular groove on the inside.

4. A projectile according to Claim 1, 2 or 3, wherein the recess directly receives a part of the pyrotechnic composition.

5. A projectile according to Claims 1, 2 or 3, wherein the jacket projects into the recess up to the base thereof, and means are provided for anchoring the jacket.

6. A sabot projectile, substantially as described herein with reference to the accompanying drawings.

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ERRATUM

SPECIFICATION No. 1,601,254

Page 2, line 57, *for* dis *read* disc

Page 3, line 7, *delete* whole line *insert*

1. A sabot projectile having a solid body

THE PATENT OFFICE

3rd December, 1981