

The invention relates to a multiple effect projectile including a perforating body of the actual projectile surrounded at least partially by an envelope, the aforementioned body showing a longitudinal hollow enclosing at least an explosive charge and an incendiary charge behind, the aforementioned envelope forming a protrusion in front in order to realise, at the front of the body a chamber comprising a delayed action pyrotechnic charge.

A projectile of this type is described in FR-A- 2 533 309. The body of the projectile has the shape of a bowl of which the front extremity has a shape tapered toward the interior, a supplementary penetration element (primary penetration element) being mounted on the closed bottom of this bowl. This supplementary element diminishes the space available for the charges. Since the hollow of the body is formed by deformation of the body, it is clear that the steel of which the body is made is a deformable steel, which limits the penetration effect of the body. In addition, the body only has a limited mass in front which causes a relatively significant deformation of the body at the time of penetration and diminishes the penetrating effect and the fragmentation effect. An increase of this mass in front is virtually not possible since this would cause a narrowing of the opening in front and would render difficult the filling of the body which must necessarily be effected by this opening in front, since the bottom is closed.

The projectile according to US-A- 4 625 650 includes a body surrounded by an envelope and enclosing an explosive charge and an incendiary substance behind, this substance

forming the plug closing the hollow of the body. This body is in an alloy with tungsten and therefore rather expensive. The walls of the body are thin and the mass of the body is, especially in front, small which reduces the penetrating effect and the fragmentation effect. This projectile is moreover only destined for penetrating through light armour.

The principal purpose of the invention is a projectile eliminating the aforementioned disadvantages, this projectile ensuring an incendiary and fragmentation effect after penetration, which means behind the target, and this both for light targets and for heavier targets.

For this purpose, the body is of hardened steel and the longitudinal hollow is a bore which crosses through the body, the rear extremity of this bore being plugged by a plug, this bore showing in the front of the body a part of reduced diameter in order to achieve a considerable local mass.

Projectiles including a hollow body surrounded by an envelope and containing a charge are also described in the following documents, but these projectiles are not normally multiple effect projectiles, and their body is not made of hardened steel.

In the projectile according to US-A-2 364 646. the body consists of two hollow parts which are only filled with one same charge. There is a detonation charge between the two parts. The body is closed at the front and at the rear.

The projectile according to DE-B 1 240 760 only includes incendiary charges. The body is closed at the front or only includes a narrow channel.

In the projectile according to US-A-2 475 532 the body consists of two parts, a tube for example of steel surrounded by a lead envelope so that the manufacture of this projectile is very complicated. The body includes a rounded protuberance in front serving to promote the detonation at the time of impact but not serving to facilitate the perforation. Furthermore this projectile normally only includes a single charge. The charge in the chamber in front of the body is the same as the charge in the bore. This projectile likewise does not include a plug in the bore of the body.

In the projectile according to US-A-2 364 643, the body likewise consists of two parts: an exterior tube in soft material and an interior tube movable in the exterior tube and provided with rounded protuberances serving to compress the detonator material at the time of impact. Apart from this detonator, the body normally only includes a single charge, incendiary or explosive. The protuberances are not at the front extremity and do not facilitate the penetration.

In the projectile according to US-A-2 532 323 the bore shows no narrowed part. Furthermore the projectile only includes an incendiary charge.

In a particular embodiment of the invention the aforementioned delayed action pyrotechnic charge has a part situated in the aforementioned chamber, the other part being lodged in the body of the projectile.

In order to clarify the invention better, some embodiments of projectiles according to the invention are described hereafter with reference to the enclosed drawings, in which:

figure 1 represents, in longitudinal section, a

projectile according to the invention;
figures 2 to 5 are similar views to that from figure 1, but for variants.

The aforementioned projectile substantially consists of a hollow perforating body 1 preferably of hardened steel, surrounded by an envelope 2, for example of brass, closed at the rear by means of sealing lead 3.

The aforementioned body 1 extends over nearly the whole length of the projectile. This body 1 is traversed by a longitudinal bore 4. At the rear extremity of the projectile, this bore 4 shows a part 5 of larger diameter in order to form a seat for the plug 6, whereas the other extremity of the aforementioned bore 4 shows a part 7 with reduced diameter in order to achieve that the front mass of the body 1 is as great as possible in such manner to realise an element of considerable penetration. Nevertheless, nothing prevents a bore 4 being provided over the entire length of the body 1.

With a view to accentuating further the penetration effect of the aforementioned body 1, this is provided with a chamfer in such manner to obtain a pointed element 8.

The projectile is completed by a delayed action pyrotechnic charge 9 and a rear incendiary charge 10 between which an explosive charge 11 is confined.

The aforementioned body 1 shows a slightly smaller length than the total length of the envelope 2 in order to form in the front of the aforementioned body a chamber comprising a part of the aforementioned delayed action pyrotechnic charge 9 of which the other part is lodged in the aforementioned body 1.

At the time of the impact of the projectile according to

the invention, the body 1, by its pointed form, ensures its penetration into and through the target.

Upon contact with the target, the delayed action pyrotechnic charge 9 is detonated by the heating generated by the crushing of the point of the envelope 2.

The delay thus obtained is sufficient in order that the detonation of the explosive charge 11 only takes place after the total penetration of the projectile through the target. The detonation of this charge 11 ensures the fragmentation of the body 1 of the projectile behind or in the target.

At the same time, the ignition of the incendiary charge 10 is achieved behind or in the target.

It is clear that in this manner a projectile is realised permitting at one and the same time a fragmentation and an incendiary effect after perforation of the target.

In the variant from figure 2, the envelope 2 is only provided over a certain part of the body 1. In this case, the envelope 2 consists of parts 12 and 13 attached in some manner to the extremities of the aforementioned body 1.

In this manner it is achieved that the penetration mass is significantly increased.

The variant according to figure 3 shows a realisation according to which the body 1 is provided with a hollow pointed element 3 in such manner to improve the hooking of the aforementioned body onto inclined targets.

Figure 4 shows a projectile according to the invention of the type provided with a forcing belt 14. In this

example, the part 12 of the aforementioned envelope becomes superfluous.

Finally, figure 5 shows a variant in which the explosive charge 11 is also provided in the part 7 of the longitudinal bore 4.



Claims.

1.- Multiple effect projectile, including a perforating body of the actual projectile (1) surrounded at least partially by an envelope (2), the aforementioned body (1) showing a longitudinal hollow (4) enclosing at least an explosive charge (4), and an incendiary charge (10) behind, the aforementioned envelope (2) forming a protrusion in front in order to realise, at the front of the body (1) a chamber comprising a delayed action pyrotechnic charge (9), characterised in that the body (1) is of hardened steel and the longitudinal hollow (4) is a bore which crosses through the body (1), the rear extremity of this bore (4) being plugged by a plug (6), this bore (4) showing in the front of the body (1) a part of reduced diameter (7) in order to achieve a considerable local mass.

2.- Projectile according to the preceding claim, characterised in that the aforementioned delayed action pyrotechnic charge (9) has a part situated in the above mentioned chamber, the other part being lodged in the body of the projectile (1).

3.- Projectile according to claim 1 or 2, characterised in that the envelope (2) consists of two parts, respectively (12) and (13) attached to the extremities of the aforementioned body (1), the part in front (13) constituting a chamber comprising a part of the aforementioned delayed action pyrotechnic charge (9).

4.- Projectile according to claim 1 or 2, characterised in that the envelope (2) only consists of a part (13) attached to the front extremity of the aforementioned body (1), this part (13) constituting a chamber comprising a part of the aforementioned delayed action pyrotechnic



charge (9).

5.- Projectile according to any of the preceding claims, characterised in that the front edge of the hollow body (1), edge surrounding the bore (4) is chamfered over its whole bulk.

6.- Projectile according to the preceding claim, characterised in that the aforementioned chamfer of the edge of the aforementioned body (1) extends obliquely in front toward the exterior.

7.- Projectile according to claim 5, characterised in that the aforementioned chamfer of the edge of the aforementioned body (1) extends obliquely in front toward the interior.