

The invention relates to perforating projectiles or missiles comprising, as described in patent FR-A-477 375, a main projectile having the calibre of the weapon and in which is provided at least one axial bore open towards the front and located in said bore an auxiliary projectile having the calibre of said bore, a propulsive charge being positioned between the bottom of the bore and the auxiliary projectile. A release or triggering device is provided for igniting the propulsive charge in order to bring about the firing of the auxiliary projectile before or at the time of impact of the main projectile on its target. Such a triggering device with a proximity detonating fuse is known (cf. patent GB-A-2 110 799).

Such perforating projectiles, whose perforating effect is consequently caused on the one hand by the auxiliary projectile and on the other by the main projectile, are known and the aim of the invention is to give them supplementary destructive properties, particularly with respect to explosive and/or incendiary effects, which are in particular described in patent FR-A-2 356 906.

To this end, the main profile has on the one hand at least one explosive and/or incendiary charge located in the main projectile upstream of the auxiliary projectile prior to the firing of the latter and on the other hand means for igniting said explosive and/or incendiary charge which are automatically triggered as soon as the auxiliary projectile has been fired.

According to an advantageous embodiment of the invention said means for igniting the explosive and/or incendiary charge are sensitive to the passage of the auxiliary projectile in the axial bore made in the main projectile. The igniting means can then be constituted by at least one channel connecting the axial bore made in the main projectile to the explosive and/or incendiary charge.

The axial bore can have rifling, whose spacing is such that the angular velocity produced on the auxiliary projectile is added to the angular velocity imparted by the main projectile to said auxiliary projectile.

From the constructional standpoint, it is advantageous to provide joining means so that, prior to its firing, the auxiliary projectile is integral in rotation with the main projectile, whereby said joining means can be constituted by a self-locking conical coupling or joint. The latter positioned between the auxiliary and main projectiles also serves as a temporary retaining means for the auxiliary projectile in the axial bore and permits an optimization of the bringing up to velocity (axial velocity and rotary velocity) of the auxiliary projectile during the ignition of the propulsive charge.

Apart from the arrangements which have just been described, the invention consists of certain arrangements preferably used at the same time and which will be explained in greater detail hereinafter.

The invention is described in greater detail hereinafter relative to non-limitative embodiments and with reference to the attached drawings, wherein show:

- Fig. 1      An axial sectional view of a projectile according to the invention.
- Fig. 2      A section along line II-II of fig. 1.

The perforating projectile according to the invention can be produced in calibres such as 12.7 mm (.50), which is that of most of the machine guns in use at present. However, it is also possible to envisage the application of the invention to other calibres, particularly 15, 20, 25, 30, 35, 40 mm and even higher.

The perforating projectile comprises a main projectile 1 at least partly made from a hard material (steel), said projectile having the calibre of the weapon, an axial bore 2 open towards the front being provided in said main projectile, coaxially to its axial axis of symmetry and, located in said axial bore 2, an auxiliary projectile 3 essentially made from a hard material (steel), said auxiliary projectile having the calibre of said bore 2, a propulsive charge 4 being located between the bottom of said bore 2 and the auxiliary projectile 3.

A release or triggering device, designated in general terms by reference 5 and whereof a more detailed description will be given hereinafter, is provided for igniting the propulsive charge 4 in order to bring about the firing of the auxiliary projectile 3 before or at the moment of impact of the main projectile 1 on its target.

The main projectile 1 is advantageously made in several parts, namely a central core 6 made from a hard material (steel), or which is both hard and heavy (tungsten), said central core having a truncated cone-shaped rear portion 6a, whose diameter decreases towards the rear and a truncated cone-shaped front portion 6b, whose diameter decreases towards the front; a rear shoe 7 made from a less hard material than steel (brass) and having a truncated cone-shaped bore 7a which can be coupled to the truncated cone-shaped rear portion 6a of the central core 6, said rear shoe 7 having an annular bulging zone 7b, whose external diameter is such that it cooperates with the rifling of the barrel by which the projectile according to the invention is fired; and a front cap 8 made from a material less hard than steel (brass) and having a truncated cone-shaped bore 8a which can be coupled to the truncated cone-shaped front portion 6b of the central core 6, said front cap 8 having an annular bulging zone 8b, whose external diameter is such that it cooperates with the rifling of the gun by which the projectile according to the invention is fired.

The aforementioned rear shoe 7 and the aforementioned front cap 8 are interconnected level with a joining plane P, the external diameter of the projectile according to the invention at said plane P being smaller than the external diameter of the rear shoe 7 at its annular bulging zone 7b and the external diameter of the front cap at its annular bulging zone 8b and the proportions are such that the cavity connecting the said two annular bulging zones is not in contact with the barrel by which the projectile according to the invention is fired.

Thus, the axial bore 2 of such a projectile is located in the central core 6 having at its front a muzzle 9 covered by the cone 10 of the front cap 8 which, at said muzzle 9, has a limited thickness.

In order to give such a projectile destructive properties, particularly with regards to explosive and/or incendiary effects, the main projectile

1 has one or preferably several explosive and/or incendiary charges 11 located in the main projectile 1 upstream of the auxiliary projectile 3 prior to the firing thereof and ignition means for said explosive and/or incendiary charge 11 designated in general terms by the reference 12 are provided and arranged so as to automatically trigger as soon as the auxiliary projectile 3 has been fired. It is advantageous to position these explosive and/or incendiary charges 11 between the central core 6 and the front cap 8.

To this end recesses 13 are provided in regularly circumferentially spaced form and located in the central core 6, each of these recesses 13 containing an explosive and/or incendiary substance and are closed by the inner wall of the front cap 8.

The means 12 for igniting these explosive and/or incendiary charges 11 are advantageously such that they are sensitive to the passage of the auxiliary projectile 3 in bore 2. Therefore there is at least one channel 14 connecting the axial bore 2 to each explosive and/or incendiary charge 11 in its recess 13.

The ignition of the propulsive charge 4 brings about the firing of the auxiliary projectile 3 and, as soon as said projectile 3 has passed beyond the opening of the channels 14 into bore 2, the hot gases penetrate the channels 14 and ignite the explosive and/or incendiary charges sheltered in the recesses 13.

The axial bore 2 can have rifling 15, whose spacing is such that the angular velocity produced on the auxiliary projectile 3 is added to the angular velocity imparted by the main projectile 1 to the auxiliary projectile 3.

It is advantageous to provide joining means for rendering the auxiliary projectile 3, prior to its firing, integral in rotation with the central core 6 of the main projectile 1. These means are constituted by a self-locking conical coupling 16 between the rear portion of the auxiliary projectile 3 and the bottom of the axial bore 2 and made in the central core 6.

This self-locking conical coupling 16 between the auxiliary projectile 3 and the central core 6 also serves as a means for temporarily retaining the auxiliary projectile 3 in the auxiliary bore 2 and permits an optimization of the bringing up to the appropriate velocity (axial velocity and rotary velocity) of the auxiliary projectile 3 during the ignition of the propulsive charge.

In order to increase the volume of the propulsive charge 4, it can be advantageous to provide an increased diameter zone 2a at the bottom of the axial bore 2.

The triggering device 5 for igniting the propulsive charge 4 with a view to bringing about the firing of the auxiliary projectile 3 can comprise a detonating proximity fuse 17 located to the front of the projectile, e.g. between the cone 10 of the front cap 8 and the muzzle 9 by which the axial bore 2 issues from the central core 6 and one or preferably several ducts 18 containing a pyrotechnic substance and connecting said detonating

proximity fuse 17 to the propulsive charge 4, whereby said ducts 18 can be located between the central core 6 on the one hand and the rear shoe 7 and front cap 8 on the other.

From the constructional standpoint, it is pointed out that a projectile according to the invention can be produced in all calibres. However, the smaller the calibre, the greater the constructional problems.

Therefore, in order to obtain a construction compatible with mass production at reasonable cost, any calibre smaller than 12.7 mm (.50) should be avoided at least in the first stage, but without being excluded from the scope of the invention.

In calibre 12.7 mm (.50), it is possible to adopt a construction similar to that shown in the drawing and this also applies to calibre 15 mm. For larger calibres of 20, 25, 30, 35, 40, 50 mm and more, the architecture of the projectile according to the invention could be more freely designed in view of the dimensions which could then be given to the components of the projectile.

As is obvious and is apparent from what has been stated hereinbefore, the invention is not limited to the embodiments already described and in fact covers all variants falling within the scope of the attached claims.



CLAIMS

1. Perforating projectile comprising a main projectile (1) with the calibre of the weapon and in which is provided at least one axial bore (2) open towards the front, an auxiliary projectile (3) located in said bore (2) and having the calibre of the latter, a propulsive charge (4) being located between the bottom of bore (2) and the auxiliary projectile (3), a triggering device (5) for igniting the propulsive charge (4) in order to bring about the firing of the auxiliary projectile (3) before or at the instant of the impact of the main projectile (1) on its target, characterized in that it comprises on the one hand at least one explosive and/or incendiary charge (11) located in the main projectile (1) upstream of the auxiliary projectile (3) prior to its firing and on the other hand means (12) for igniting said explosive and/or incendiary charge (11), which are automatically triggered as soon as the auxiliary projectile (3) has been fired.
2. Perforating projectile according to claim 1, characterized in that the means (12) for igniting the explosive and/or incendiary charge (11) are sensitive to the passage of the auxiliary projectile (3) in the axial bore (2).
3. Perforating projectile according to claim 2, characterized in that the means (12) for igniting the explosive and/or incendiary charge (11) are constituted by at least one channel (14) connecting the axial bore (2) to the explosive and/or incendiary charge (11).
4. Perforating projectile according to any one of the claims 1 to 3, characterized in that the axial bore (2) has rifling (15), whose spacing is such that the angular velocity produced on the auxiliary projectile (3) is added to the angular velocity imparted by the main projectile (1) to the auxiliary projectile (3).
5. Perforating projectile according to any one of the claims 1 to 4, characterized in that joining means (16) are provided for rendering auxiliary projectile (3) integral in rotation with the main projectile (1).
6. Perforating projectile according to claim 5, characterized in that the joining means (16) are constituted by a self-locking conical coupling.