Our Ref 302607

FORM 1

AUSTRALIA
Patents Act

615359

APPLICATION FOR A STANDARD PATENT

Fabrique Nationale Herstal, of 4400, HERSTAL, BELGIUM

hereby applies for the grant of a standard patent for an invention entitled

High-performance projectile

which is described in the accompanying complete specification.

Details of basic application(s):

Basic Application:	Country:	Date:
8801362	BELGIUM	5 December 1988

The address for service is:

ARTHUR S. CAVE & CO.
Patent & Trade Mark Attorneys
Level 10, 10 Barrack Street
SYDNEY NSW 2000

DATED this FOURTH day of DECEMBER 1989

Fabrique Nationale Herstal
By Its Patent Attorneys
ARTHUR S. CAVE & CO.

P.R. TAYLOR, FIPAA

TO:
The Commissioner of Patents
COMMONWEALTH OF AUSTRALIA

FEE: 171.00

6011791 04/12/89

5010

Form 8

AUSTRALIA

Patents Act 1952

DECLARATION IN SUPPORT OF A CONVENTION APPLICATION FOR A PATENT

In support of the Convention application made for a patent for an invention entitled: HIGH PERFORMANCE PROJECTILE

We, Robert KARLSHAUSEN and Pierre GABRIEL

of, 4400 Herstal, Belgium

I,

of FABRIQUE NATIONALE HERSTAL, en abrégé "FN", société anonyme

do solemnly and sincerely declare as follows:

1. ~~I am the applicant for the patent~~

We are *(or, in the case of an application by a body corporate)*

1. ~~I am~~ authorized by FABRIQUE NATIONALE HERSTAL, en abrégé FN, société anonyme, the applicant for the patent to make this declaration on its behalf.

2. The basic application as defined by section 141 of the Act was made in Belgium on the 5th day of December, 1988, by FABRIQUE NATIONALE

3. I am the actual inventor of the invention referred to in the basic application.

(or, where a person other than the inventor is the applicant)

3. J.-P. DENIS, rue Méan 234, 4330 GRACE-HOLLOGNE, BELGIQUE; M. NEUFORGE, Rue Belle-Croix, 20, 4070 AYWAILLE, BELGIQUE

of

are

~~I am entitled~~ the FABRIQUE NATIONALE HERSTAL S.A. is the actual inventors of the invention and the facts upon which is entitled to make the application are as follows:—

as inventors' employer

4. The basic application referred to in paragraph 2 of this Declaration was the first application made in a Convention country in respect of the invention the subject of the application.

(or, where a request is made under section 142AA of the Patents Act 1952, for an earlier application made in a Convention country to be disregarded)

4.—(1.) The basic application referred to in paragraph 2 of this Declaration was not the first application made in a Convention country in respect of the invention the subject of the application.

(2.) An earlier application in respect of the invention the subject of the application was made in

on

(3.) A request has been made to you under section 142AA of the *Patents Act* 1952 to disregard that earlier application.

(Here set out in succeeding sub-paragraphs the facts that show that section 142AA is applicable)

Except as stated in this paragraph, the basic application referred to in paragraph 2 of this Declaration the first application made in a Convention country in respect of the invention the subject of the application.

Declared at HERSTAL this 23th day of November, 1989

Robert KARLSHAUSEN
Conseiller juridique
Pierre GABRIEL
Chef du Service Juridique
FABRIQUE NATIONALE HERSTAL, en abrégé FN, société anonyme.

(Signature of Declarant)

TO: THE COMMISSIONER OF PATENTS.

(IMPORTANT) Cross out inapplicable words in above Form.)

(12) PATENT ABRIDGMENT (11) Document No. AU-B-45891/89
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 615359

(54) Title
HIGH-PERFORMANCE PROJECTILE

International Patent Classification(s)
(51)[4] **F42B 011/08**
(51)[5] **F42B 030/02**

(21) Application No. : **45891/89** (22) Application Date : **04.12.89**

(30) Priority Data

(31) Number	(32) Date	(33) Country
8801362	05.12.88	BE BELGIUM

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(71) Applicant(s)
FABRIQUE NATIONALE HERSTAL

(72) Inventor(s)
J.-P. DENIS; M. NEUFORGE

(74) Attorney or Agent
ARTHUR S CAVE & CO , GPO Box 3876, SYDNEY NSW 2001

(56) Prior Art Documents
EP 373140
FR 1349178
DE 1428692

(57) Claim

1. A projectile with low recoil and high stopping power comprising a hollow casing of hard material and a core inserted within the casing, said core being completely made from material having a lower density than the material of the casing, and said casing comprising a tapered head portion and at least a cylindrical portion connected to the head portion, said hollow casing having an overall length, characterized in that the ratio of the overall length and the calibre dimension of the hollow casing lies between 3 and 6, the head portion has a length between 1.5 and 3 times said calibre dimension, the cylindrical portion has a length between 0.7 and 2 times said calibre dimension, the projectile having a centre of gravity situated in the cylindrical portion.

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FORM 10

COMPLETE SPECIFICATION

(ORIGINAL)

Application Number:
Lodged:

Complete Specification Lodged:
Accepted:
Published:

Priority:
Related Art:

Applicant(s): Fabrique Nationale Herstal
4400
HERSTAL
BELGIUM

Address for Service: ARTHUR S. CAVE & CO.
Patent & Trade Mark Attornerys
Level 10, 10 Barrack Street
SYDNEY NSW 2000

Complete specification for the invention entitled

"High-performance projectile".

The following statement is a full description of this invention, including the best method of performing it known to me:-

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High-performance projectile

The present invention concerns a low-recoil, high stopping power projectile. It applies to all calibres of hand-held or infantry weapons.

It is known that the stopping power of a projectile is inherent to its ability to dissipate, upon impact of the target, a maximum of energy in a minimum of time.

It is also known that the kinetic energy of a projectile, at a given distance, is given by the equation:

$$Ec = \frac{m\ Vr^2}{2}$$

in which:

m = mass of the projectile
Vr = residual projectile velocity at the given distance.

Thus, Ec is directly proportional to the mass and the square of the residual velocity of the projectile.

Furthermore, it is known that weapon recoil is detrimental to the aiming of the weapon, and therefore negatively affects the

accuracy of the succeeding round, the ability to fire by bursts and the psychology of the shooter.

Recoil value is specified by the recoil impulse:

$$Ir = Vo\ (m + 1.75\ c)$$

for which

Vo = weapon muzzle velocity
m = mass of the projectile
c = powder charge

Thus, the recoil impulse is directly proportional to both the mass and the muzzle velocity of the projectile.

The above indicates that the requirement of an elevated Ec is fundamentally incompatible with a low Ir.

The projectile according to the present invention is intended to minimize this incompatibility.

The projectile according to the invention which makes it possible to obtain said minimization is characterized by its geometry and in particular the ratio l/d (length versus calibre), which will be preferably greater than 3.

In one broad form the invention provides a projectile with low recoil and high stopping power comprising a hollow casing of hard material and a core inserted within the casing, said core being completely made from material having a lower density than the material of the casing, and said casing comprising a tapered head portion and at least a cylindrical portion connected to the head portion, said hollow casing having an overall length, characterized in that the ratio of the overall length and the calibre dimension of the hollow casing lies between 3 and 6, the head portion has a length

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between 1.5 and 3 times said calibre dimension, the cylindrical portion has a length between 0.7 and 2 times said calibre dimension, the projectile having a centre of gravity situated in the cylindrical portion.

In order to better explain the characteristics of the invention, the following embodiments are described by way of example, without being limitative in any way, with reference to the drawings, where:

figure 1 shows a longitudinal section in exploded view of the consistuent elements of a projectile according to the invention;

figure 2 also shows a longitudinal section of a projectile according to the invention;

figure 3 shows a variant of figure 2.

As shown in the drawings, the projectile 1 is largely made up of two elements, respectively the casing 2 and the core 3.

The casing 2 is hollow and is made of a hard material, for example a copper alloy, steel or a similar material.

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The core 3 is made of a rigid material with a lower density than the casing, such as a high-density plastic, for example polycarbonate, polyamide etc., possibly filled with glass fibres or pellets or similar elements.

The core 3 can be made of one or several pieces, rigidly fitted together or not.

In this way, a projectile with a low ~~m/s~~ mass/s ratio is obtained.

The shape of the projectile is such that optimum aerodynamics are achieved, making it possible to maintain the high residual velocities of the projectile which are necessary for the required achievements.

This aerodynamic optimization of the projectile reduces the loss of speed on the trajectory, requires a smaller powder charge to achieve the required velocities, and, therefore, contributes to the reduction of the recoil impulse.

By using a core 3 made of a material such as specified above, deformation of the projectile within soft targets is prevented.

The combination of a casing 2 made of a hard material and a core 3 made of a material having a lower density than the casing 2, i.e. a lighter material, causes the bullet to tip in a soft body as a result of the rapid loss of stability of said projectile, while maintaining a considerable penetrating power due to its high velocity and its rigid structure.

By way of example and without being limitative in any way, for a type of projectile according to the invention with a 5.56 mm calibre, the characteristics would be:

- mass between 1.5 and 2 g
- ratio l/d: 4.5 +/- 0.5

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- head 4: 2.5 times the calibre +/- 0.5 times the calibre;
- cylindrical part 5: 1.5 times the calibre +/- 0.5 times the calibre;
- rear cone 6: 0.5 times the calibre +/- 0.5 times the calibre to be combined within the limits of l/d.

The centre of gravity 7 will be situated in the cylindrical part 5, at a distance between 0 and 4 mm from the connection with the head.

The present invention is in no way limited to the embodiments described by way of example and shown in the accompanying drawings; on the contrary, numerous modifications are possible within the scope of the invention.

Thus, the core 3 can be composed of two or more parts, mounted in line and possibly rigidly fitted together in one way or other.

The claims defining the invention are as follows:

1. A projectile with low recoil and high stopping power comprising a hollow casing of hard material and a core inserted within the casing, said core being completely made from material having a lower density than the material of the casing, and said casing comprising a tapered head portion and at least a cylindrical portion connected to the head portion, said hollow casing having an overall length, characterized in that the ratio of the overall length and the calibre dimension of the hollow casing lies between 3 and 6, the head portion has a length between 1.5 and 3 times said calibre dimension, the cylindrical portion has a length between 0.7 and 2 times said calibre dimension, the projectile having a centre of gravity situated in the cylindrical portion.

2. A projectile according to claim 1, characterized in that the hollow casing includes a rear conical portion having a length no longer than the calibre dimension.

3. A projectile according to claim 1 or claim 2, characterized in that the centre of gravity is situated in said cylindrical portion between 0 and 4mm from the connection of the cylindrical portion to the head portion.

4. A projectile according to any one of claims 1 to 3, characterized in that the casing is made from metal.

5. A projectile according to any one of claims 1 to 4, characterized in that the core is made from a high-density plastics material.

6. A projectile according to claim 5, characterized in that the core is made of polycarbonate.

7. A projectile according to claim 5, characterized in that the core is made of polyamide.

8. A projectile according to any one of claims 5 to 7, characterized in that the plastics material is reinforced with glass fibres.

9. A projectile according to any one of claims 5 to 7, characterized in that the plastics material is reinforced with pellets.

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10. A projectile according to any one of claims 1 to 9, characterized in that the core is made in one piece.

11. A projectile according to any one of claims 1 to 10, characterized in that the core comprises at least two constituent elements.

12. A projectile according to claim 11, characterized in that the constituent elements are rigidly attached to each other.

13. A projectile, substantially as herein described with reference to the drawings.

DATED this 1st day of July, 1991.

FABRIQUE NATIONALE
By Its Patent Attorneys
ARTHUR S. CAVE & CO.

PATENT OFFICE AUSTRALIA

Fig. 1

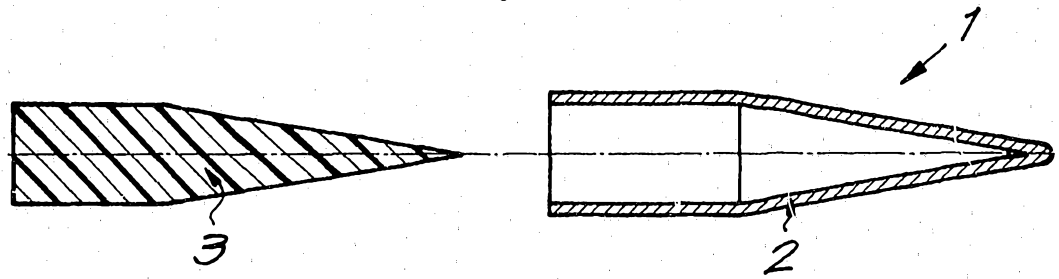

Fig. 2

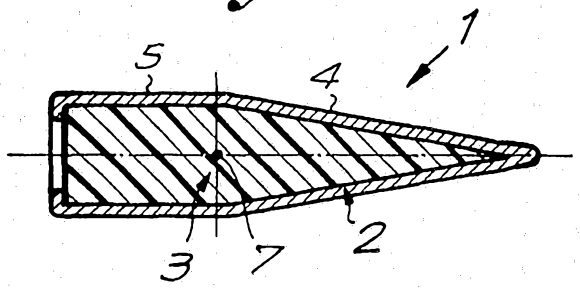

Fig. 3

