July 2, 1940. P. E. J. DENOIX 2,206,809

PROJECTILE

Filed June 28, 1938

Fig. 1.

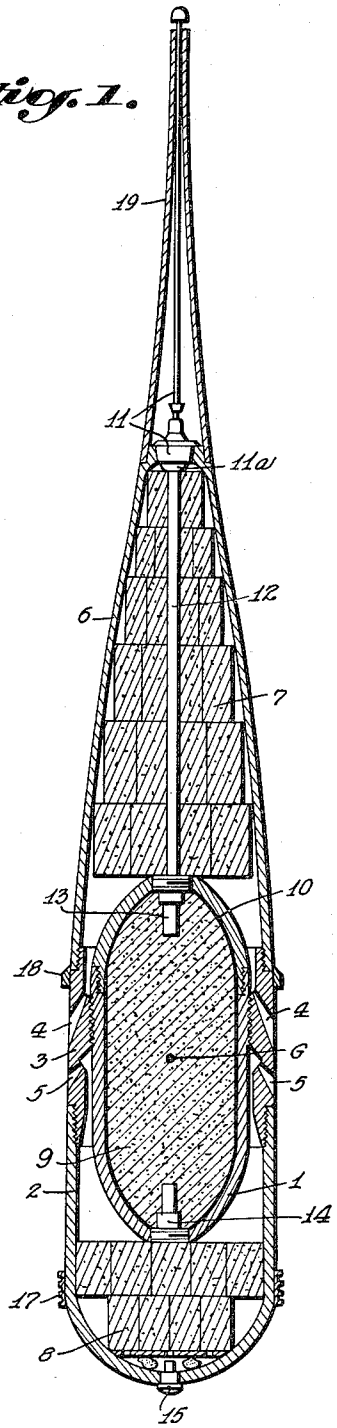
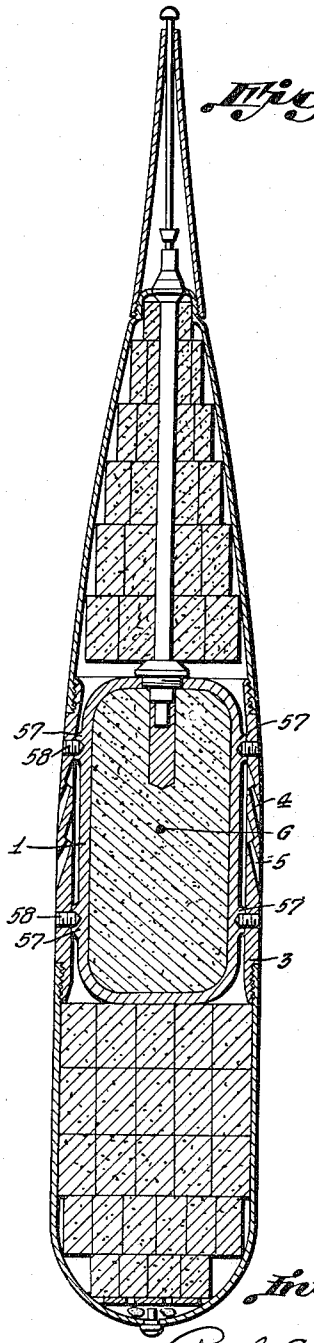


Fig. 2.



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Patented July 2, 1940

2,206,809

UNITED STATES PATENT OFFICE

2,206,809

PROJECTILE

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Application June 28, 1938, Serial No. 216,406
In Luxemburg June 28, 1937

3 Claims. (Cl. 102—23)

This invention relates to projectiles comprising a reaction propulsion device.

Shells enclosing a reaction propulsion charge which discharges either into a central nozzle or into lateral nozzles have already been proposed. The nozzles may be directed parallel to the longitudinal axis of the shell, in which case the reaction effect imparts thereto only an acceleration of translation; particularly when they are disposed on the periphery of the projectile, said nozzles may also be inclined relatively to the axial plane of the shell, with a view to having at the same time the effect of increasing or reducing its velocity of gyration.

The projectiles of the present invention are characterised in that the lateral propulsive nozzles, with which they are provided, are disposed near or slightly in front of the centre of gravity of the charged projectile.

By virtue of this arrangement, the stability of the projectile cannot be affected in any appreciable manner by a defect of symmetry in the thrusts applied by the nozzles, due, for example, to an irregularity in their discharge or to imperfect centering.

According to another feature of the invention, the complete shell is constituted by a casing or body of optimum aerodynamic or streamline shape enclosing a projectile of any desired shape, and, if desired, an ordinary projectile suitably immobilised and centred near the centre of gravity of the whole arrangement.

In one embodiment, the centering of the internal projectile is effected, in whole or in part, with the aid of the nozzle-carrier member, on which the internal projectile is fastened by any suitable means. In the case of an explosion projectile, this arrangement promotes the destruction of the nozzle-carrier member and ensures its efficacious utilisation on impact, when explosion occurs.

According to a further feature of the invention, the front and rear portions of the casing hold reactive charges which discharge into the nozzles placed level with or in front of the centre of gravity.

This concentration of the mass of the entire projectile on its periphery and near the centre of gravity enables excellent stability to be obtained and retained during the trajectory, despite the reduction in weight of the projectile under the effect of the combustion of the reaction charge, since, when two propulsive charges are employed, this reduction in weight takes place at the two ends of the projectile and has the effect of further strengthening the concentration of the mass in the midway portion.

The forward portion of the complete projectile may advantageously comprise a point having an inflected curve, of the type described in my corresponding U. S. patent application 192,411 filed on February 24, 1938.

The shell may be fired with the aid of a weak initial firing charge, imparting only a minimum of reaction to the apparatus. The latter can thus be mounted without inconvenience on an aircraft, which will be able to discharge bomb projectiles, at great distances, at the objectives that it desires to hit.

Further features and advantages of the invention will become apparent from the following description taken in conjunction with the accompanying drawing which illustrates diagrammatically and by way of example, various embodiments thereof and in which:

Figure 1 is an axial section of one form of the invention.

Figure 2 is an axial section of a modified form of the invention.

In the embodiment shown in Fig. 1, the complete shell consists of an outer casing, in which is centred an internal shell 1, cylindro-ogival in shape and disposed near the centre of gravity G of the complete charged shell. The casing is of streamline shape and has the greatest part of its longitudinal exterior profile in the form of a tip decreasing from the portion of maximum diameter of the casing to the front end thereof.

The casing comprises a base 2 fixed on a nozzle-carrier ring 3, which serves at the same time for centering the shell 1. The lateral nozzles 4, 5 are situated substantially at the height of the centre of gravity G. The forward portion 6 of the casing has preferably an inflected curve, in order to facilitate the penetration of the air, as described in the aforesaid specification No. 192,411.

The compartments 7 and 8 bounded by the casing in front of and behind the shell 1 hold a reaction charge. The rear charge discharges into the nozzles 5 and the front charge into the nozzles 4.

The offensive charge 9 enclosed in the shell 1 is insulated from its walls by means of a layer 10 of suitable heat-insulating material.

The offensive charge 9 is primed with the aid of a percussion device 11 connected by a firing tube 12 to a fuze 13.

The shell may, furthermore, contain a base fuze 14.

The rear reaction charge is brought into operation with the aid of an ignition fuze 15 or any other suitable device. A similar fuze, preferably placed at 11*a* ignites the reaction charge in the compartment 7.

These fuzes are regulated so as to bring the reaction charges operation at the desired moment, during the trajectory or on departure of the shot.

17 denotes a driving band disposed on the base of the casing 2, and 18 a discardable centering band mounted on the nozzle-carrier ring 3. The projectile ends at the front in a tapered point 19, the outer surface of which prolongs the inflected curve of the portion 6 of the casing.

Fig. 2 shows a modification of the projectile shown in Fig. 1, from which it differs in that the internal shell 1, instead of itself having a screw-thread coming into engagement with a thread on the nozzle-carrier member 3, is in contact with the latter only through shoulders 57 engaging assembly screws 58. The external side walls of the shell 1 stand a slight distance away from the internal walls of the member 3, in order to permit the gases free access to the nozzles 4, 5 placed near the centre of gravity G.

In shells such as that shown in Fig. 1, comprising a propulsive charge at the front and another at the rear, the position of the centre of gravity of the whole projectile remains practically immovable throughout the trajectory, the projectile being lightened at both ends in proportion as the combustion of the reactive charges proceeds.

It is to be clearly understood that minor changes in the details of construction and arrangement of parts may be made without departing from the scope of the invention as set forth in the appended claims.

I claim:

1. A projectile comprising an outer casing of streamline shape, a nozzle carrying member disposed on the casing in the vicinity of the center of gravity of the projectile and being provided with nozzles, an inner casing separate from said outer casing and centered in said nozzle carrying member and completely enclosed within said outer casing and spaced therefrom, said inner casing having an offensive charge therein and forming an internal shell, and a propulsive rocket charge in the space provided between said outer casing and said inner casing and in discharge communication with said nozzles.

2. A projectile comprising a casing having the greatest part of its longitudinal exterior profile in the form of a tip decreasing from the portion of maximum diameter of the casing to the front end thereof, a nozzle carrying member disposed on the casing in the vicinity of the center of gravity of the projectile, said nozzle carrying member being provided with nozzles, a shell centered in said nozzle carrying member and completely enclosed within said casing, a bursting charge in said shell, and a propulsive rocket charge in said casing and in discharge communication with said nozzles.

3. A projectile comprising a casing having the greatest part of its longitudinal exterior profile in the form of a tip decreasing from the portion of maximum diameter of the casing to the front end thereof, a nozzle carrying member fixed in said casing in the vicinity of the center of gravity of the projectile, said nozzle carrying member being formed with a front and rear series of nozzles, a shell centered in said nozzle carrying member and completely enclosed within said casing, a bursting charge in said shell, a front rocket charge in said casing in front of said shell, a rear rocket charge in said casing in rear of said shell, said front and rear rocket charges being in discharge communication with said front and rear series of nozzles respectively.

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