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GUN LAUNCHED, TERMINAL GUIDED PROJECTILE

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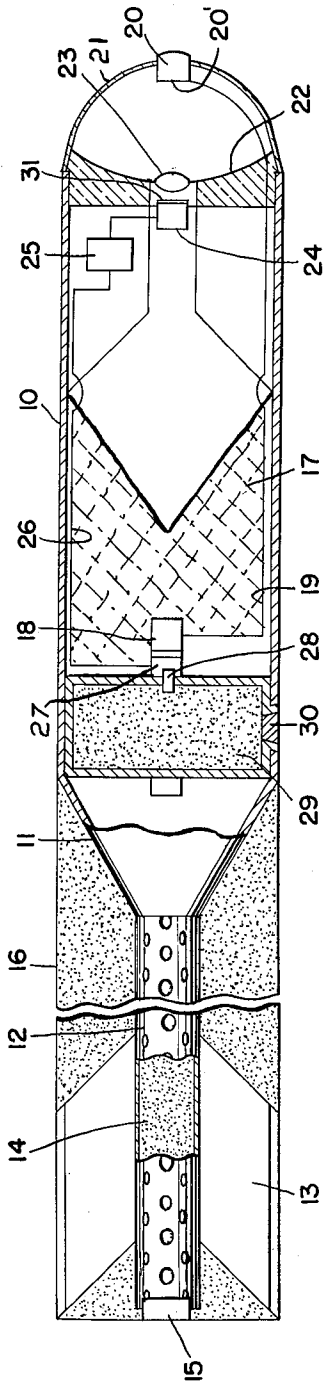


FIG. 1.

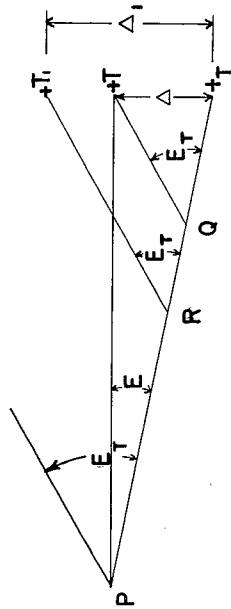


FIG. 2.

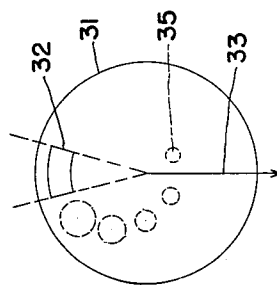


FIG. 3.

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GUN LAUNCHED, TERMINAL GUIDED PROJECTILE

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2 Claims. (Cl. 102—50)

(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment to me of any royalty thereon.

This invention relates to projectiles which have within themselves means for recognizing and correcting an error in their trajectory with respect to a target, and has for its principal object the provision of a compensated trajectory projectile which avoids the complexity heretofore characteristic of such projectiles.

Various types of compensated trajectory projectiles have been proposed. These prior art projectiles have usually involved the use of a plurality of charges and complicated systems of one kind or another for controlling the firing of these charges. Thus United States Patent 2,415,348 of J. E. Haigney discloses a projectile including a plurality of charges, the firing of which is controlled by a relay system connected between them and a pair of photoelectric cells. A prior suggestion has contemplated charges fired under control of a gyroscope. In each case, (1) the charges are fired in response to the operation of moving mechanisms, and (2) a plurality of charges are utilized to apply thrusts whereby the trajectory of the projectile is corrected.

The present invention is distinguished by the fact that it involves no time consuming mechanical moving mechanisms prior to the firing of a corrective pulse and requires only a single explosive charge to produce the pulse whereby the trajectory of the projectile is corrected. As hereinafter explained, this pulse is produced in response to radiation from the target and always functions to redirect the projectile to the target, this result being achieved by means of a nozzle through which the gas of the explosive charge is discharged and a mask having an opening so located with respect to this nozzle and to the longitudinal axis of the projectile that the charge is fired only when said axis is at a predetermined angle with the line of sight between the projectile and target and the target is 180° from this line.

The invention will be better understood from the following description when considered in connection with the accompanying drawings and its scope is indicated by the appended claims.

Referring to the drawings:

FIG. 1 is a sectional view indicating the relation between the various parts of the explosive system or projectile,

FIG. 2 is an explanatory diagram relating to its operation, and

FIG. 3 indicates the path of the target image on a mask or reticle located at the light sensitive detector of the projectile.

The projectile includes a head 10, an adapter 11 and a boom 12 which has fins 13 at its breech end, is hollow and perforated, and encloses an ignition powder 14 arranged to be fired by a primer 15. Surrounding these parts is a frangible propellant casing, or the like, 16. This part of the projectile is conventional.

The head 10 encloses a shaped charge 17 which is arranged to be fired by a fuze 18. This fuze is connected through an electrical lead 19 to a piezoelectric fuze 20, or the like, which functions upon impact of the projectile to apply to the fuze 18 a voltage whereby it is caused to fire the shaped charge 17 in a well known manner.

The fuze 20 has a reflecting surface 20' and is mounted

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in a transparent nose or cover 21 which has at its base a curved mirror 22. The mirror 22 has a perforation concentric with the longitudinal axis of the projectile. Alined with this perforation are a lens 23 and a detector or photocell 24 which is connected through a timed amplifier 25 and a lead 26 to a fuze 27. The fuze 27 functions to provide, between its ignition position and the firing of a primer 28, a time delay commonly known as a safety arming device prevents firing of a charge at short range or during launching of the projectile.

Firing of the charge 29 generates a gas which is discharged through a nozzle 30 and produces at the gravitational center of the projectile a thrust which changes the trajectory of the projectile. This thrust is produced only when the trajectory of the projectile is off the target and is applied only in a direction to redirect the projectile to the target. The medium through which this result is achieved is a spot of light or other radiation reflected from or emitted by the target.

The target, such as a tank, may be illuminated from any convenient point. The radiation or light reflected or emitted from it passes through the transparent cap 21 to the mirror 22 from which it is reflected to the mirror 20'. Light from the mirror 20' is reflected through the lens 23 which forms an image of the target on a mask 31.

The mask 31 (see FIG. 3) has an aperture 32 which is located 180° from the nozzle 30, the central axis of the nozzle being along the arrow 33 which indicates the direction of gas discharge.

As the projectile rotates the target image 35 moves about on the mask 31 and as it approaches the target this image increases in size. So long as the image travels near enough the center of the mask to clear the aperture 32 nothing happens. When the image is displaced from the center of the mask far enough to pass over the aperture 32, the fuze 27 is ignited the primer 28 is fired and the charge 29 is fired.

The gun utilized to launch the projectile of the present invention may be a recoilless rifle. Whatever the type of gun used, it is aimed at the target in the customary manner.

Assuming the projectile to be at P (see FIG. 2) and to be moving along a line P—I, whose intersection with the target plane at I, impact point, is displaced from the target T, by a miss distance Δ, the aperture 32 of the mask 31 is displaced at the threshold line of sight error angle E_T from the line P—I along which the projectile is moving. The image of the target will subtend a lesser angle E which will not pass thru the aperture. When the projectile reaches the point Q, however, the angle subtended by the image is E_T and the detector can see the target image through the aperture 32 and the charge 29 is fired, diverting the projectile through a correction angle equal to E_T and onto trajectory Q—T. If the target is located at T_1 , the detector 24 sees it at the point R and the projectile is diverted to the trajectory R— T_1 . Thus the farther the projectile impact is displaced from the line of sight between the projectile and target, the farther away from the target is the trajectory corrected. Maximum values, fixed by probable miss distances are determined by operational analysis of the weapon system.

As the above line of sight system geometrically excludes all fallacious images optically, the detector mask and amplifier may be electrically tuned to exclude specious targets electrically by responding only to the characteristic or signature radiation of the probable target or the specifically designed reflected radiation projected by an illuminator from the gun site or displaced vantage point.

I claim:

1. A gun fired, fin stabilized projectile having rotation, said projectile having a casing with a nose cross sectional area a major portion of which is transparent to radiations

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from a target, an explosive charge carried by said projectile, a nozzle having its axis through the gravitational center of said projectile and adapted upon firing said charge to produce a thrust transversely of the longitudinal axis of said projectile, electronic means operable to fire said charge in response to radiations from a target received through said transparent nose area, said electronic means including a detector of target radiations operable to fire said charge in response to such received radiations, means including a mask located in front of said detector, 10 rotatable with said projectile and provided with an aperture radially displaced from said longitudinal axis but substantially opposite said nozzle, said aperture being located far enough from said longitudinal axis to admit target radiations to said detector when said longitudinal

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axis is at a definite angle with the line of sight from said projectile to said target.

2. A projectile according to claim 1 in which a mirror is located to direct target radiations to said detector through said mask aperture after reflecting them onto and from a substantially axial reflecting surface.

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