SPECIFICATION

Fin-stabilized projectile

This invention relates to a fin-stabilized projectile with ogival projectile body and nose portion and tail portion with joined-on tail tube and finned tail unit.

It is known to provide the fin-stabilized projectile of the kind stated with a bursting charge containing shrapnel, e.g. steel balls and the like, the shrapnel being arranged in an embedding substance. In one particular form of construction of this known projectile of the kind stated, the nose and base portions are screwed rigidly to one another through an internal tube. The vacant space surrounding the internal tube within the envelopment of the ogival projectile body is filled in this form of construction by the bursting charge containing the shrapnel.

It is furthermore known to arrange this bursting charge between the nose and base portions in such a way that the bursting charge containing the shrapnel is not confined at the ogival peripheral area by a casing surrounding the bursting charge. The purpose of this is that the full effect of the detonation can be expended on the bursting forth of the shrapnel. The force of the detonation need not break through an outer jacket of steel or the like, for which purpose additional power is consumed.

On discharge of the fin-stabilized projectile from the mortar barrel, the projectile and also the plastics bursting charge is subject to a sudden, very high acceleration. The result of this is that the bursting charge is exposed in the axial direction to very high thrust forces which are equivalent to an impact load on the bursting charge. Due to this, the internal tube may react to the very high thrust forces in a different way than the bursting charge, because, on the one hand, the properties of the materials are different, and, on the other hand, the bursting charge is disposed between relatively small annular surface areas between nose and base portions, whereas the connecting tube is a part rigidly connected with the nose and tail portions. On account of the different effects of the stresses, it may come about that a stable unity between the projectile body and the bursting charge containing the shrapnel is endangered. With this, it must be borne in mind that the bursting charge, owing to its unencumbered peripheral area, comes into direct contact with the tube wall on discharge of the projectile, whereby the bursting charge is subject to additional stresses, which may also impair the cohesion between bursting charge and the internal tube of the projectile.

The object of the invention is to reduce the stresses acting on the bursting charge containing the shrapnel, under the effect of the discharge forces, and rather to disperse said stresses on to the projectile body, in order to make the ogival projectile body of the fin-stabilized projectile more resistant in general.

In accordance with the present invention, we provide a fin-stabilized projectile comprising an ogival projectile body, a nose portion, a tail portion with joined-on tail tube and finned tail unit, an internal tube rigidly interconnecting the nose and tail portions, and a bursting charge of embedding substance, such as a plastics material, containing shrapnel, such as steel balls, about the full length of the internal tube between the nose and tail portions and with a peripheral surface not confined by a jacket or casing, the internal tube having in the peripheral surface thereof spaced annular grooves which are undercut in cross-section.

Through such a development of the ogival projectile body with shrapnel-containing bursting charge arranged between nose and tail portions, substantial increases in the thrust forces from the projectile body on to its bursting charge through radial surfaces can be achieved with simple means. In that way the specific pressure per unit area is considerably reduced. The embedding substance of the shrapnel-containing bursting charge is kept fully restrained, over the length of the bursting charge, at various positions with regard to the axially-acting thrust forces, whereby the transmissive effect on the thrust forces arising at the discharge is significantly mitigated. The unit between bursting charge and projectile body is considerably improved stresswise. Directly on differential effect of the thrust forces acting on the internal tube and the bursting charge on discharge of the projectile from the barrel, the thrust can be better absorbed at the bursting charge. Breaking of the bursting charge under the very large pressure effect, which is operative thereon on firing of the projectile, can be more efficiently prevented. A further advantage resides in the fact that, owing to the grooves in the connecting tube, the force required for bursting the tube is no longer so great, so that the energy released in this way can contribute to the hurling forth of the shrapnel, which makes possible the attainment of a greater range of projection.

The invention is explained hereinafter with the aid of an exemplary embodiment represented in the drawing in longitudinal section and partly in elevation.

The fin-stabilized projectile 1 has an ogival projectile body as well as a nose portion 3 and a tail portion 4 with joined-on tail tube 5 and finned tail unit 6. The nose and tail portions 3 and 4 are rigidly screwed together through an internal connecting tube 7, namely in such a way that nose and tail portions 3 and 4 find a bearing on the ends of the internal tube 7. Within the steel connecting tube 7 is the explosive charge 8,

which is ignited when the projectile strikes, through an igniter arranged on the nose of the projectile.

Outside of the connecting tube 7 is the bursting charge 9, which extends from the nose portion 3 as far as the tail portion 4 of the projectile body 2. The bursting charge consists of an embedding substance for the shrapnel 10, e.g. balls, arranged therein, the embedding substance preferably being a plastics material. The bursting charge 9 has an ogival shape at its external periphery, as is usual with fin-stabilized projectiles. In the zone of greatest diameter of the ogival projectile body there are, in the bursting charge, grooves 11 through which is achieved a damming effect of the propellant gases in the tube, on firing the projectile, in order that the propellant gases do not break through forwardly and the projectile leaves the barrel as free from oscillation as possible. The bursting charge is not encased by a jacket of steel or other high strength material with the result that the effect of detonation of the explosive charge can be fully concentrated on the hurling forth of the shrapnel 10. The embedding substance of the bursting charge 9 may be provided close to its external periphery with fibres 12 or the like stengthening the plastics material.

The internal tube 7, which rigidly interconnects the nose portion 3 and the base portion 4, is provided at its external periphery with annular grooves 13, which may be arranged more or less uniformly distributed over the length of the tube 7. The annular grooves, are undercut in cross-section to improve the anchorage with the embedding substance for the shrapnel. Through the recesses 13 in the tube 7, the radial surfaces 14 and 15 on which are operative, the thrust forces of very high magnitude on discharge of the fin-stabilized projectile from the barrel, are substantially increased as a result of the radial surfaces of the recesses 13, so that the bursting charge is stressed substantially more uniformly than hitherto during the firing phase. The danger of a rupture, breaking loose, or crumbling of the bursting charge of plastics material is considerably reduced.

The cohesion between nose portion, connecting tube, and tail portion on the one hand, and bursting charge on the other hand, is considerably improved with reference to the stress in the discharge phase of the projectile along with the comparability of the pressure load on the plastics bursting charge. The fin-stabilized projectile therewith obtains a greater reliability in carrying out the effect conceived therefor.

CLAIMS

1. A fin-stabilized projectile comprising an ogival projectile body, a nose portion and a tail portion with joined-on tail tube and finned tail unit, an internal tube rigidly interconnecting the nose and tail portions, and a bursting charge of embedding substance, such as a plastics material, containing shrapnel, such as steel balls, arranged about the full length of the internal tube between the nose and tail portions and with a peripheral surface not confined by a jacket or casing, the internal tube extending the full length of the bursting charge and having in the peripheral surface thereof spaced annular grooves which are undercut in cross-section.

2. A fin-stabilized projectile substantially as hereinbefore described with reference to the accompanying drawing.

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