

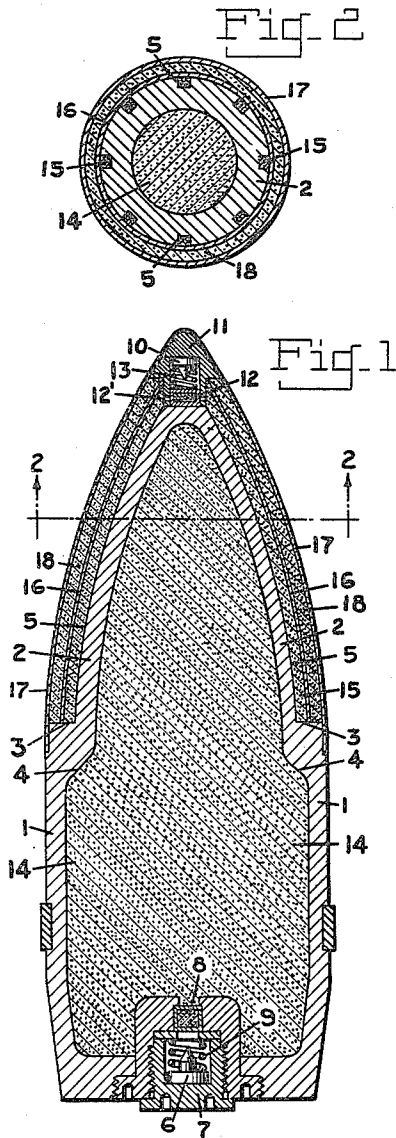
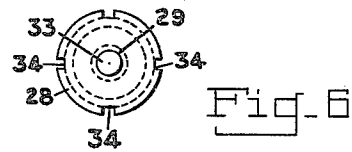
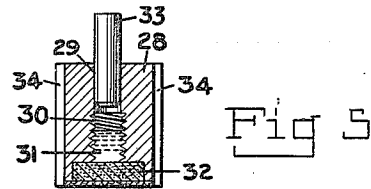
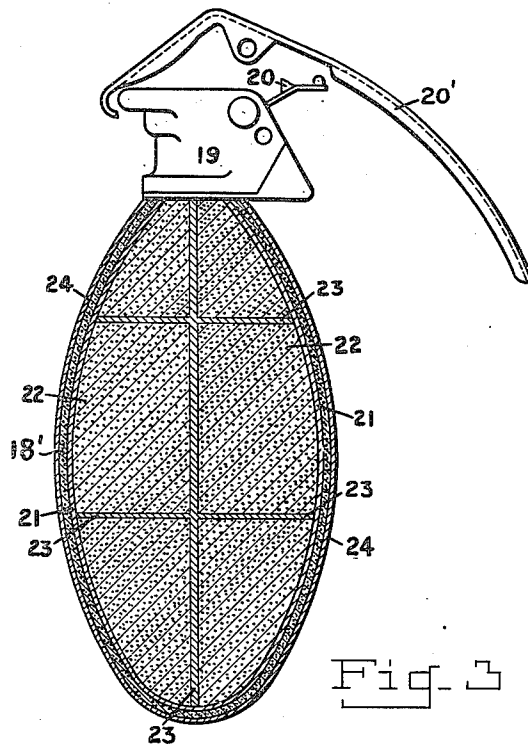
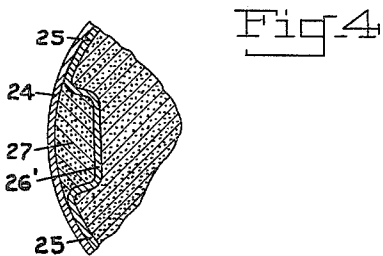
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2,417,437

FUSION PROJECTILE

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FUSION PROJECTILE

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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 missile for offensive action and is applicable to all such missiles, whether thrown by hand, from a gun or any other projecting means. In particular it has reference to a missile which is designed to adhere by welding action to the structure forming the target, so that its work of destruction will be more thoroughly accomplished. For example in the case of a tank vehicle, the missile, if intended for incendiary action, will fuse and adhere to the tank body preparatory to the incendiary action which will proceed more effectively than if the missile had fallen away after impact or penetration.

The effects are accomplished by providing a missile carrying a highly exothermic component which is initiated in flight and a welding flux which is prepared for functioning by the heat effects of the thermic component.

It is therefore an object of the invention to provide a missile designed to adhere to a target by fusion.

More particularly it is an object of the invention to provide a missile carrying a weld-promoting flux and a thermic component for cooperative action.

The specific nature of the invention as well as other objects and advantages thereof will clearly appear from a description of a preferred embodiment as shown in the accompanying drawings in which:

Fig. 1 is an axial sectional view of a projectile embodying the invention,

Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1,

Fig. 3 is an axial sectional view of a hand grenade embodying a modification of the invention,

Fig. 4 is a fragmentary view in section of another grenade showing a modified structure,

Fig. 5 is a detail view of a firing mechanism, and

Fig. 6 is a top plan view of Fig. 5.

Referring to the drawing by characters of reference there is shown a projectile body 1 having a reduced ogive 2 forming with the body 1 a shoulder 3 exteriorly of the shell, and a corresponding shoulder 4 interiorly thereof, whereby the thickness of the shell walls is maintained nearly constant throughout. Spaced longitudinal grooves 5 are provided in the ogive.

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An impact firing pin 6 is provided in the central recess of a base plug 7 and the pin is separated from a primer 8 by means of a spring 9. A firing pin 10 is provided in the nose cap 11 and held forward of a primer 12 by means of a spring 13. Flash holes 12' are provided for the primer 12 in the nose cap 11.

Within the body of the shell is a highly exothermic material 14, such as thermite. A similar material 15 fills the grooves 5 and is held therein by a covering shield 16 of thin metal conforming to the shape of the reduced ogive 2. An outer metal shield 17 of a material suitable for pressure welding is provided in the form of the normal outline of the true ogive, and in the space between covers 16 and 17 is included a flux material 18 which may be a combination or mixture of an absorbent material such as: activated charcoal, carbon or silica gel, with such active chemical agents as: sulphuric acid, ammonium chloride, phosphoric acid, and commercial welding fluxes.

Upon firing of the shell, the inertia firing pin 10 sets back and ignites the primer 12 which may be of any composition capable of communicating ignition to the thermite 15. Ignition is carried to the thermite 15 through flash holes 12' or any other convenient means. The heat developed by reaction of the thermite will release the flux constituent in the flux 18 by conduction through partition 16. The liquid flux constituent will distribute itself thoroughly between the shield 17 and the projectile body 1 by capillary action between the two. Upon striking a metal plate, the force of impact will actuate the base firing pin 6 to ignite thermite charge 14 and the force of impact at the front of the projectile will cause a welding action between the projectile and the metal target, the flux 18 providing the flux means, and the shield 17 serving as the welding rod.

At the instant of impact the thermite in the space between the ogive and shield 16 will be completely molten, but the thermite 14 will be inert.

The relatively small amount of thermite used at 15 in the space between the ogive 2 and shield 16 will function and upon engagement with the target the large mass of the cool target will absorb much of the heat communicated so that a function occurs analogous to soldering or brazing, whereby the projectile body is fixed in place for a time at least. As the target conducts heat from the nose portion the latter will be less quickly melted by the subsequent thermal reaction of the thermite 14 than the distant parts of the body 1, and the latter will be ruptured by

the larger body of thermite and the molten product will be spilled on the target.

In Fig. 3 is shown a grenade embodying the invention. A conventional firing unit comprising a primer housing 13, firing pin 20 and hand gripping lever 20' is shown on the grenade. The grenade body comprises an inner wall 21 of porcelain or sheet metal containing a thermite charge 22, and a network of partitions 23 of screening or sheet metal, preferably soft and pliable are provided to quickly distribute heat throughout the mass after initiation. Aluminum will preferably be used for the network since it is a good conductor of heat and in addition will contribute in the reaction of the thermite.

An outer wall 24 of screening or perforated metal sheet is spaced from the inner wall 21, and the space between the two walls is filled with flux material 18' of the type described in connection with Fig. 1.

Upon releasing the grenade from the hand, the thermite, ignited, will heat the flux, releasing the acid or flux constituent from the absorbent material. The outer casing will be saturated with the flux material immediately after the thermite is ignited. After striking a metal target, the flux material will attack and clean the surface of the same, causing the outer casing 24 to weld to the plate. As the thermite continues to react, the molten metal product will flow, stick and freeze to the metal thus holding the grenade thereto. If the metal is painted, the heated flux material released from the grenade will attack the paint, exposing a fresh metallic surface.

It may be understood that the welding of the wall element 24 to the target may occur without actual contact of the molten product of thermite reaction, initially; or may be due to, or aided by, contact of the molten thermite mass. In the first case, the material 24 will be at a much lower temperature than the thermite product, but still readily united with a target with the aid of the flux material. In the second case, the thermite product in molten state will tend to fall away from the part of the target actually engaged by the grenade wall, and so only a small amount will be present there, which may become quickly set by reason of the rapid conduction of heat therefrom, to and through the target.

In case the grenade strikes the side of a tank turret and fails to become attached thereto, but falls, it will land on horizontal or sloping deck or other cover parts, where gravity will exert less force tending to move the projectile from its location on the target, and so permit its more ready retention by welding and/or deformation of the projectile, while the molten content escapes. This molten material is largely effective in gaining access to joints and interstices by which operating parts are prevented from functioning; by fastening closures; by effecting breaches in fuel tanks, as well as producing fumes by contact with material in the target; by burning personnel; by causing detonation of ammunition, etc. In its small size especially, it need not effect a breach in heavy armor to be effective, and vertical armor plate will rarely be breached by being melted by the thermite of the device.

It will be appreciated that the wall 21 is comparatively fragile, and that the wall 24 as described is moderately flexible, so that the projectile tends to become flattened on impact with a target, which—in addition to facilitating attach-

ment—will tend to prevent the projectile from rolling on flat surfaces.

A variation of the flux compartment is shown in Fig. 4, wherein the outer wall 24 is fitted on an inner wall 25 and the latter is provided with indentations 26' containing the flux 27. The indentations may be square, circular or otherwise, and should be evenly distributed over the inner wall 25. Upon exudation of the flux liquid by heat, it will distribute itself thoroughly between the outer casing and the inner casing by reason of capillary action.

In order to protect the outer surface of the inner casing and the whole of the outer casing from attack by the flux it may be necessary to treat them, as by lead plating or by a plastic, acid-resistant coating.

In Fig. 5 is shown an igniting device which may be employed in the conventional igniter housing 19. A bushing 28 is drilled to provide a bore 29 and the latter is tapped as at 30 for a portion of its length. Liquid phosphorus pentoxide 31 is placed in the tapped portion and associated therewith is a charge of barium dioxide 32. The latter may, however, be placed separately in the igniter housing 19 or within the body of the grenade. A rod 33 is slidably fitted in the bore 29, and the bushing has longitudinal channels 34 to admit air for oxidation. The bushing will be so placed in housing 19, that the rod 33 will receive the impact of the firing pin 20 and, sliding through the bore 29 will cause the phosphorus pentoxide to ignite by friction with the threads in the tapped portion of the bore. This will in turn heat the barium dioxide which will ignite the thermite.

I claim:

1. A projectile comprising a charge of highly exothermic welding substance near the exterior thereof and a charge of welding flux material exteriorly of and adjacent said substance, and means to initiate thermal reaction of said substance upon firing of said projectile.

2. A projectile comprising a charge of highly exothermic substance near the exterior thereof, a charge of welding flux material exteriorly of said substance, means separating said substance and said material, means enclosing said material, and means to initiate thermal reaction of said substance upon firing of said projectile.

3. A projectile comprising a body portion including an ogival portion of reduced profile, a charge of highly exothermic welding substance at said ogival portion, a charge of welding flux material exteriorly of and adjacent said substance, and means to initiate thermal reaction of said substance upon firing of said projectile.

4. A projectile comprising a body portion and an ogival portion of reduced profile, a charge of highly exothermic substance on said ogival portion, a charge of welding flux material exteriorly of said substance, means separating said substance and said material, means enclosing said material and defining a true ogive with respect to said body portion, and means to initiate thermal reaction of said substance upon firing of said projectile.

5. A projectile comprising a body portion and an ogival portion of reduced profile, longitudinal channels in said ogival portion, a highly exothermic substance in said channels, covering means for said substance in said channels, an envelope on said body portion defining a true ogive with respect to said body portion, welding flux material between said envelope and said covering

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means, and means to initiate thermal reaction of said substance upon firing of said projectile.

6. In a projectile as in claim 5, a main charge of a highly exothermic substance in said body portion.

7. A projectile comprising a body portion, a charge of highly exothermic substance in said body portion, an outer envelope spaced from said body portion, welding flux material between said envelope and said body portion, and means to initiate thermal reaction of said substance.

8. A projectile comprising a body portion, a charge of highly exothermic substance in said body portion, an outer envelope spaced from said body portion, welding flux material between said envelope and said body portion, means to initiate thermal reaction of said substance, and a network of thermally conducting material in said highly exothermic substance.

9. A projectile comprising a body portion, a charge of highly exothermic substance in said body portion, recesses in the outer surface of said body portion, an envelope around said body por-

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tion, welding flux material in said recesses, and means to initiate thermal reaction of said substance.

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