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FUZE FOR PROJECTILES

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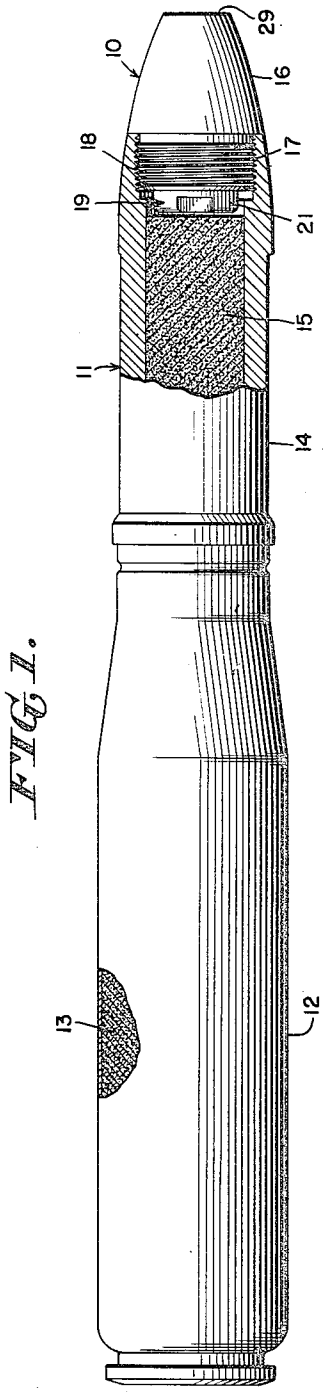


FIG. 1.

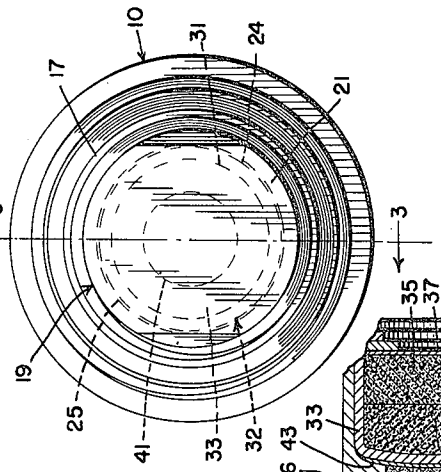


FIG. 2.

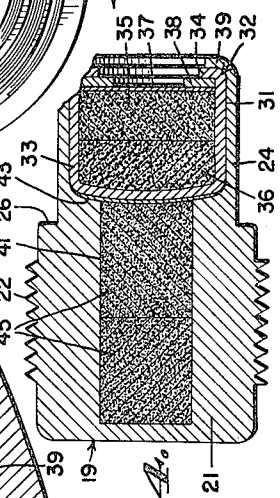


FIG. 4.

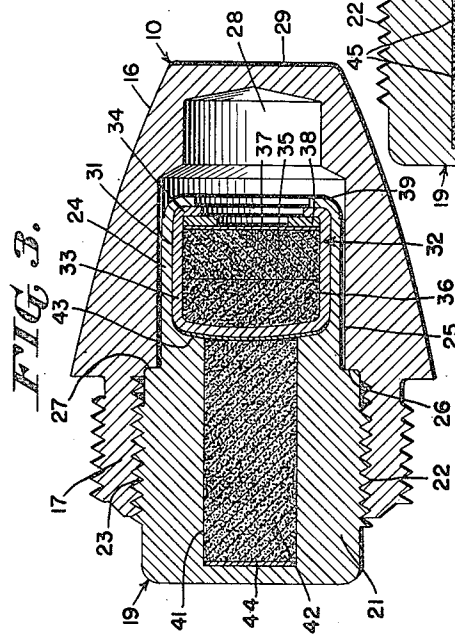


FIG. 3.

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FUZE FOR PROJECTILES

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2 Claims. (Cl. 102—73)

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This invention relates to a fuze for a projectile and more specifically to an impact fuze for an explosive shell particularly adapted for use against aircraft and having a crushable impact member secured thereto and a detonator arranged within the impact member adapted to detonate a bursting charge disposed within the shell in predetermined time delayed relation with respect to the crushing of the member upon impact with a target.

The principal object of the invention is the provision of an impact fuze for an explosive shell, having a crushable nose and a detonating charge arranged therein in predetermined spaced relation with respect to the nose and a booster charge in abutting relation with respect to the detonating charge whereby, upon a sudden impact, the nose will be crushed or deformed rearwardly thereby to initiate firing of the detonator and explosion of the shell after the shell has entered the target.

An object of this invention is the provision of a new and improved fuze for an explosive projectile adapted to be secured interiorly to the impact nose thereof and having a detonator arranged therein in predetermined proximate spaced relation with respect to the end wall of the nose such that the explosion of the projectile will be effected within the interior of the target in response to piercing of the target by the impact nose.

Another object of the invention is the provision of a new and improved fuze for a projectile whereby the projectile is made particularly effective for destroying war equipment such, for example, as aircraft engines, fuselages, airplane wings, gas tanks, and the like by exploding the projectile within the target.

A further object of the invention is the provision of a new and improved fuze for an explosive projectile having a plurality of explosive charges arranged herein in abutting relation and composed of any suitable substance to insure the explosion of the projectile as the projectile strikes and enters a target.

A still further object is the provision of a new and improved fuze for a projectile which is economical to manufacture, reliable in operation and which possesses the qualities of durability and safety during handling and transportation.

Still further objects, novel features and advantages of the invention will become apparent from the following description taken in connection with the accompanying drawings, wherein:

Fig. 1 is a view of a cartridge case and projectile partly in section and partly in elevation showing the manner in which the new and improved fuze is secured to the projectile;

Fig. 2 is an end view of the fuze;

Fig. 3 is a sectional view of the fuze taken on line 3—3 of Fig. 2; and

Fig. 4 is a fragmentary sectional view of an alternative arrangement of the booster charge within the fuze.

Referring to Fig. 1 of the drawing in detail for a more complete understanding of the invention, the fuze disclosed thereon and generally indicated by the reference character **10** is adapted to be secured to a projectile **11**. The projectile is of any well known type such, for example, as the type known to those skilled in the art as twenty millimeter type projectile as used by the armed forces for destroying aircraft and the like. As best shown on Fig. 1 of the drawing the projectile **11** is detachably secured to the usual shell casing or cartridge **12** having an explosive charge **13** arranged therein, the projectile comprising a shell **14** secured to the shell casing **12** in the usual manner, the shell having a bursting charge **15** arranged therein.

The fuze **10** comprises a crushable nose or impact member **16** composed of any material suitable for the purpose such, for example, as zinc, or any other relatively soft metal and secured to the forward end of the shell **11** as by an externally screw threaded nipple **17** integrally connected to the nose **16** and having screw threaded engagement with a screw threaded opening **18** provided in the end of the shell **11**. Arranged within the nose **16** is an adapter generally indicated by the reference character **19** composed of any material suitable for the purpose and provided with a body **21** having a screw threaded portion **22** adapted to have screw threaded engagement with an internally screw threaded opening **23** provided in the nipple **17** thereby securing the adapter **19** within the nose **16** in proximate spaced relation to the leading end portion thereof.

A reduced extension **24** is integrally connected to the body **21** of the adapter **19** and extends a predetermined distance into a reduced bore **26** provided in the nose **16**. A shoulder **26** is provided on the body **21** of the adapter **19** and is adapted to have abutting relation with respect to a shoulder **27** provided within the nipple **17** of the nose **16** thereby to limit the movement of the reduced extension **24** on the body **21** within the reduced bore **25** during the assembly of the parts thereby to provide a space or small air chamber **28** between the outer end of the extension **24** and the flattened or impact end **29** of the nose **16**. The reduced extension **24** is provided with a recess **31** adapted to receive a detonator generally indicated by the reference character **32**, the detonator comprising a cup-shaped member **33** composed of relatively thin material such, for example, as a sheet copper or the like, the cup-shaped member being flanged as at **34**.

A plurality of explosive charges of any well known type such, for example, as lead azide indicated by the reference character **35**, and Tetryl indicated by the reference character **36**, are enclosed within the cup-shaped member **33**. It will be understood, however, that although the charges **35** and **36** are highly sensitive to shock, the set back force developed when the projectile is fired from the gun is insufficient to cause detonation thereof. A disk **37** composed of lead foil or any other material suitable for the purpose is disposed upon the explosive charge **35** and an annular member **38** is disposed between the disk **37** and the flange **34** on the cup-shaped member **33** whereby the explosive charges **35** and **36** are retained within the cup-shaped member in abutting relation with respect to each other and moisture is excluded therefrom.

As shown on the drawing, especially Figs. 3 and 4 thereof, the detonator **32** is secured within the recess **31** as by rolling the end of the extension **24** so as to form a flange **39**, the flange being adapted to engage the flange **34** on the cup-shaped member **33**, and thus the detonator **32** is clamped within the recess **31**. The adapter **19** is provided with a reduced bore **41** communicating with the recess **31** and of such length as to extend substantially through the body **21** thereof. A booster charge **42** is arranged within the bore **41** in proximate relation with respect to the detonator and in predetermined spaced relation with respect to the bursting charge **15** and in such relation with respect to each other that each succeeding charge is fired by and under the influence of the explosion of the preceding charge in predetermined time delayed relation. It will be understood from the foregoing that a predetermined interval of time will elapse before the detonator will fire in response to impact of the shell with the target.

A thin disk or separator **43** composed of any material suitable for the purpose is disposed within the recess **31** between the end wall of the detonator and the booster charge **42** in such a manner as to seal the booster charge within the bore **41** between the disk **43** and a cushion disk **44**, thus preventing shifting of the charge within the bore and the premature firing thereof by friction or shock during assembly, handling and transportation of the fuze.

As hereinbefore described, a small space or chamber **28** is provided between the outer end of the extension **24** supporting the detonator **32** and the flattened or impact

portion **29** of the nose **16** whereby the detonator is spaced a predetermined distance from the impact portion **29** in proximate relation therewith such that piercing of a target by the nose of the shell will be effected prior to detonation of the charge and ignition of the charge will be effected within the interior of the target rather than upon the outer surface thereof. It will be understood, however, that upon impact of the shell with a target such, for example, as an airplane wing, gas tank or the like, the impact nose **16** will be crushed, deformed, or forced rearwardly and will initiate explosion of the detonator **32** thereby exploding the booster charge **42** which will detonate the main or bursting charge **15** within the shell after the shell has penetrated the target, thus destroying or rendering maximum damage to the target.

On Fig. 4 of the drawing, the booster charge **42** is replaced by a plurality of explosive pellets **45**. The pellets **45** are arranged within the bore **41** within the adapter **19** in any manner desired. It will be understood, however, that the pellets **45** may be composed of any suitable explosive substance and, if desired, the proportions thereof may vary to accomplish any desired results. As the adapter shown on Fig. 4 is otherwise identical in construction with the adapter shown on Fig. 3, like reference characters are used to designate like parts thereof.

The many advantages of the fuze constructed in accordance with the present invention will be readily apparent from the foregoing description taken in connection with the drawing and, whereas a preferred embodiment of the device is illustrated and described, it is to be understood that changes in the details of construction and in the combination and arrangement of parts may be resorted to which fall within the scope of the invention as claimed.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A firing device for an explosive shell comprising a unitary structure consisting of a body having a cylindrical wall, an extension formed on said body and having a wall composed of relatively thin material with respect to the material of said cylindrical wall, said extension having a well formed therein terminating in a bore in the body, a booster charge arranged within said bore, a detonator disposed within said well, a disk disposed between and in sealing engagement with said detonator and booster charge, the wall of said extension being turned to form a flange on the extension in abutting engagement with said detonator for maintaining the detonator within said well and the disk in sealing engagement with the charge thereby to prevent shifting of said charge within the bore and shifting of the detonator within said well, and means on said body for attaching said firing device to said shell as a unit in accordance with the unitary structure thereof.

2. A firing device for an explosive shell comprising an impact nose having a well formed therein terminating in a bore of reduced diameter with respect to the well and an internally threaded portion in said bore of larger diameter with respect to the diameter of said well, an end wall bordering on said bore, an adapter having a cylindrical body portion threadedly engaging said internally threaded portion of the bore, a tubular extension integrally formed on said body portion and disposed within said well with one end thereof in proximate relation with respect to said end wall, said extension having a cavity therein terminating in well means of reduced diameter with respect to the diameter of said cavity, a booster charge arranged within said well means, a detonator disposed within said cavity, a disk disposed within said well means between and in sealing engagement with said detonator and the booster charge, an inwardly turned flange formed on said extension in abutting engagement with said detonator for locking the detonator within the cavity and maintaining the disk within the well means in sealing engagement with said charge, a shoulder formed at the junction of said well and threaded portion, and a complementary shoulder formed on said adapter at the junction of said body portion and the tubular extension in abutting engagement with said shoulder for maintaining the detonator within said well in proximate relation with respect to said reduced bore and the end wall.

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