United States Patent

Kronman et al.

[15] **3,695,141**

[45] **Oct. 3, 1972**

[54] **EXPLOSIVE ORDNANCE DEMOLITION WEAPON**

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[73] Assignee: **The United States of America as represented by the Secretary of the Navy**

[22] Filed: **Nov. 6, 1970**

[21] Appl. No.: **87,522**

[52] **U.S. Cl.** .....**89/1 B**, 42/1 F, 102/92.1

[51] **Int. Cl.** **F41f 1/00**

[58] **Field of Search** .....89/1; 42/94, 1, 1 S, 1 F; 102/1, 24 HL, 22, 92.1; 99/40

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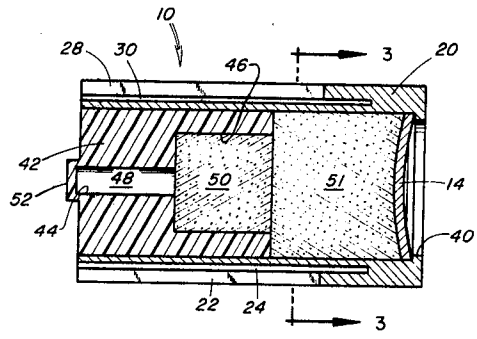
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[57] **ABSTRACT**

A weapon for firing a ballistic disc at an explosive ordnance device for disabling the target device. The ballistic disc, which is spherically curved and being of greater thickness at its central portion than at its peripheral portion, is positioned transversely within a cartridge casing with its concave side toward the target. A planar shock front is generated by an explosive train in the cartridge to propel the disc toward the target at very high velocities and, during initial flight, the concave disc configuration inverts to a convex streamlined tear-drop shape.

5 Claims, 4 Drawing Figures



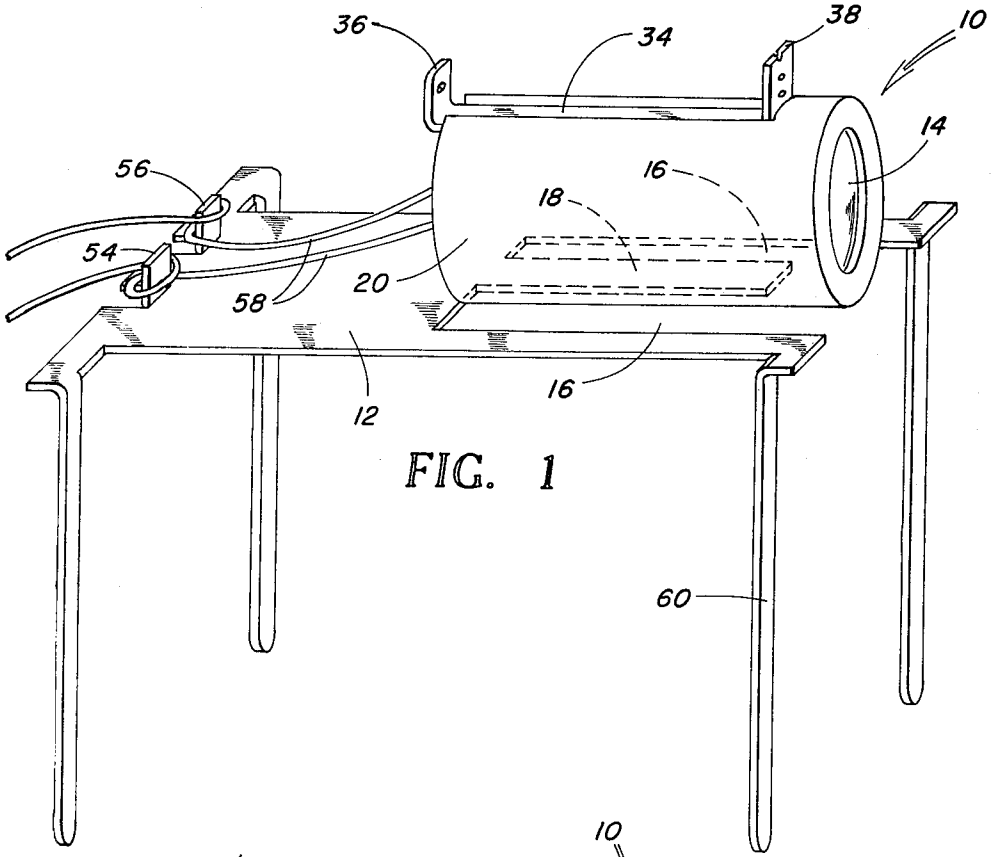


FIG. 1

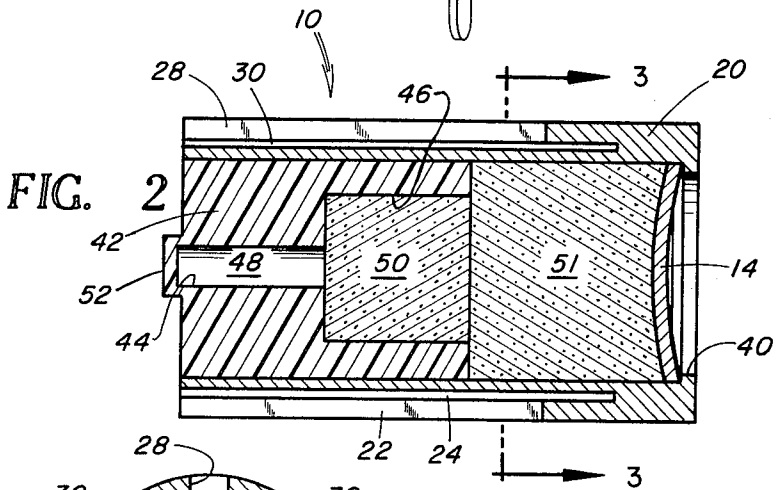


FIG. 2

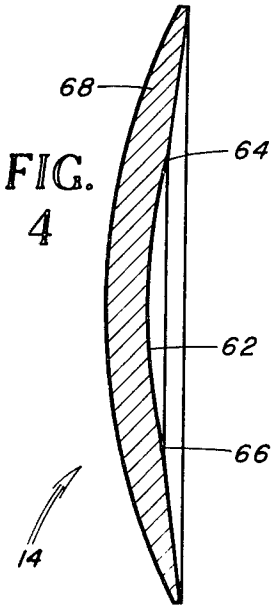


FIG. 4

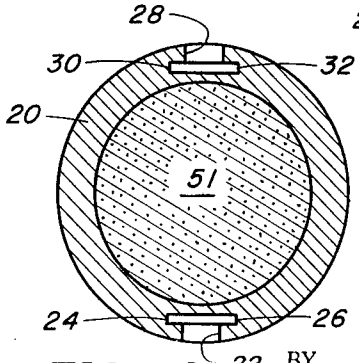


FIG. 3

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EXPLOSIVE ORDNANCE DEMOLITION WEAPON

BACKGROUND OF THE INVENTION

This invention relates generally to disabling devices and more particularly to a weapon for disarming an explosive ordnance device.

In military combat zones, enemy explosive ordnance devices such as bombs, mines, and warheads of various types are frequently encountered by friendly forces. These explosive ordnance devices, which may have been dropped by planes, delivered by missiles, or planted by saboteurs, frequently have not detonated, due to either a malfunction of the device or by its intended design, and therefore remain a threat to friendly military and/or civilian personnel. Similarly, armed explosive devices are sometimes found in public buildings in noncombat areas and also must be safely disarmed.

If the explosive device has been found in an area from which all personnel may be evacuated and in which little damage to property or material will result from detonation of the device, it may be intentionally detonated by an igniter of the type disclosed in U.S. Pat. No. 3,288,067. However, many such explosive ordnance devices are not found in locations where they may be detonated without endangering lives or inflicting substantial losses to property. Moreover, many of these devices cannot be safely moved to a remote area for subsequent detonation or disabling because its fuze may have been set to trigger the device upon either movement of the device or attempted removal of its fuze. Furthermore, demolition experts are rarely able to determine merely from an inspection of the exterior of the device whether the fuze is so designed. In the past, explosive ordnance devices could not be disabled with safety because there has been no satisfactory instrument capable of reliably disabling an explosive ordnance device without either causing it to detonate or necessitating the hazardous removal of its fuze.

SUMMARY OF THE INVENTION

Accordingly, one object of the present invention is to provide a new and improved explosive ordnance disposal device.

Another object of the invention is to provide an explosive ordnance disposal device which affords greater safety to operating personnel and property in the vicinity.

A further object of the instant invention is the provision of a device for safely disabling an explosive ordnance item in situ.

Yet another object of the present invention is to facilitate the disabling of an explosive ordnance device from a standoff distance.

Still another object of the invention is to provide an explosive ordnance disposal device which is characterized by being compact and easily transportable.

Briefly, in accordance with one embodiment of this invention, these and other objects are attained by providing a weapon having a cartridge containing an explosive train for generating a planar shock front to propel a curved disc, received in the discharge end of the cartridge, at an ordnance item to be disabled. The disc, which is curved and is thicker at its central portion than at its peripheral portion, is mounted in the cartridge with its concave side facing the target and, upon firing, inverts to a streamlined tear-drop configuration during flight toward the target. The cartridge is mounted on a support platform for firing and has sighting means provided thereon for aiming the weapon.

BRIEF DESCRIPTION OF THE DRAWINGS

A more complete appreciation of the invention and many of the attendant advantages thereof will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

FIG. **1** is a perspective view of an explosive ordnance demolition weapon constructed in accordance with the preferred embodiment of the present invention;

FIG. **2** is a longitudinal cross-sectional view of the cartridge portion of the present invention;

FIG. **3** is a transverse cross-sectional view of the cartridge case taken along line **3—3** of FIG. **2**; and

FIG. **4** is an enlarged cross-sectional view of the ballistic disc portion of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings wherein like reference characters designate identical or corresponding parts throughout the several views, and more particularly to FIG. **1** thereof wherein the explosive ordnance demolition weapon of the present invention is shown as consisting essentially of an explosive loaded cartridge **10** mounted upon a support platform or firing stand **12** for propelling a ballistic disc **14** from the forward end of the cartridge. That portion of firing stand **12** which otherwise would be masked by the presence of the cartridge **10** is shown in phantom to more clearly illustrate the manner in which the cartridge is mounted upon the firing stand. The firing stand **12** is of a unitary construction and includes a pair of upright tabs **54** and **56**, the purpose of which will be hereinafter described, four legs **60**, and a U-shaped cutout portion **16** at the forward end thereof defining a tongue-shaped key **18** which is adapted to be slideably received within a complementary keyway formed in the casing **20** of cartridge **10**.

The keyway is more clearly illustrated in FIGS. **2** and **3** in which the cartridge casing **20** is shown as having a longitudinally extending slot **22** formed along a portion of its length with laterally extending coplanar channels **24** and **26** formed on opposed sides thereof. By this construction, the cartridge **10** may be quickly and securely mounted upon the firing stand **12** by inserting the tongue-shaped key **18** of the firing stand within the keyway channels **24** and **26** in the cartridge casing. The cartridge casing is also provided with a diametrically opposed longitudinal slot **28** having laterally extending coplanar channels **30** and **32** formed on opposite sides thereof for slideably receiving the base portion **34** of a sighting mechanism which has upstanding aligned sights **36** and **38** at the rearward and forward extremities thereof, respectively, as shown in FIG. **1**, for the purpose of accurately aiming the disc **14** at a target.

Referring again to FIG. **2**, it will be seen that the ballistic disc **14** is spherically curved and is positioned within cartridge **10** with its concave side adjacent the forward end of the cartridge. The disc is yieldingly

retained in this position by an inwardly extending annular rib or flange **40** formed on the forward end of the cartridge casing **20**. Also secured within the cartridge but at the rearward end thereof is a cylindrical plug **42** having an outer diameter substantially equal to the inner diameter of the cartridge casing. The plug is provided with an axial bore **44** extending through a portion of its length and with a communicating larger diameter coaxial counterbore **46** extending the remainder of its length, which bores define an igniter chamber **48** and a booster chamber **50**, respectively. A main propellant chamber **51** is defined by the cartridge casing **20** in the space between the disc **14** and the forward end of the plug **42**.

The main propellant material may be selected from any number of suitable explosives, such as for example, Octal which is a mixture of approximately 70 percent cyclotetramethylene tetranitramine (HMX) and approximately 30 percent trinitrotoluene (TNT). Positioned within the booster chamber **50** is a cylindrical booster charge, which may be selected from a number of suitable explosives, such as Tetryl, and which is in intimate contact with the main charge. An igniter or detonator is adapted to be received within the igniter chamber **48** but has not been illustrated within the chamber **48** because the igniter is normally inserted just prior to use of the weapon. Plug **42** is also provided with a severable closure cap **52** extending across the rearward end of the bore **44** to hermetically seal the contents of the cartridge casing from the environment until the cartridge is required for use, at which time the severable cap may be readily removed by cutting or punching with a suitable tool and the igniter or detonator **44** then inserted into chamber **48** to complete the explosive train. Upon removal of the severable cap **52** and insertion of a detonator within chamber **48**, electrical leads **58** from the detonator may be wound around the pair of upstanding tabs **54** and **56** formed on the firing stand, as shown in FIG. **1**, to prevent the possibility of accidental withdrawal of the detonator from chamber **48** as the operator carries the electrical leads and a firing device to a remote location.

It has been found that extremely high disc velocities and penetrating powers are achieved when disc **14** is constructed of a hard metal such as steel and when the central portion of the disc is of greater thickness than the thickness around the disc periphery. As shown in FIG. **4**, in which the shape of the disc is enlarged and exaggerated for purposes of clarity, disc **14** has a spherically curved central portion **62** of constant thickness extending approximately one-half of the total disc diameter, between points **64** and **66**, and a peripheral portion **68** extending radially outwardly from the central portion and being of lesser thickness than the central portion. The disc's peripheral portion **68** has an inner surface which conforms to a frusto-conical configuration so that the thickness of the peripheral portion **68** diminishes at a constant rate from the thickness of the central portion toward a predetermined lesser thickness at the peripheral edge of the disc.

It has also been found that extremely high disc velocities and penetrating power are attained by designing the explosive train within the cartridge to develop a planar shock front for propelling the disc toward the target. This is achieved by making the cylindrical booster charge **50** of a configuration such that its axial length is greater than its diameter.

In operation, the firing stand **12**, which may be constructed of aluminum or other flexible metals, may be compactly stored and transported in a flat sheet configuration and easily bent into the configuration illustrated in FIG. **1** just prior to assembling the weapon. The cartridge is mounted upon the firing stand by simply inserting the tongue-shaped key **18** of the firing stand into the complementary keyway in the cartridge and the sighting device is similarly mounted upon the cartridge. The detonator may then be inserted into chamber **48** by severing the closure cap **52** on the cartridge plug and the weapon is ready for firing. Since the firing stand is constructed of flexible material, the stand may be utilized in a variety of ways, such as by resting legs **60** upon firm ground, embedding the legs into soft ground, or wrapping the legs around a post or stake, thus enabling the weapon to be fired from a variety of positions.

With the device of the present invention, a one and one half inch diameter ballistic disc is capable of total penetration through 0.75 inches of mild steel plate while a 2 ⅞ inch diameter ballistic disc is capable of total penetration through 1.75 inches of mild steel plate. When the weapon is fired, the concave disc configuration inverts to a convex streamlined tear-drop configuration at about a distance of one disc diameter from the point at which it was fired, thus further attributing to the attainment of the extremely high disc velocities and great penetrating power of the weapon, while also enhancing the flight accuracy of the disc. The present invention may be effectively fired from a close range of only one disc diameter from the target as well as being fired from long ranges with great accuracy. Thus, when appropriately aimed, the disc of the present invention is capable of penetrating the casing of an explosive ordnance device and disabling the fuze of that device without causing the device to detonate.

It will be apparent that the present invention provides a simple and reliable weapon for performing an ordnance demolition function heretofore unattainable by previously existing devices. It will also be apparent that although the invention has been described in connection with the disabling and disarming of explosive ordnance devices, it is not so limited and is equally applicable for use as an anti-personnel weapon, as well as against various motorized vehicles, pressure vessels, and other potentially hazardous devices.

Obviously, numerous modifications and variations of the present invention are possible in light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described herein.

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

1. An ordnance disabling weapon comprising:
   an elongate casing having a cylindrical bore extending longitudinally therethrough,
   a spherically curved ballistic disc having concave and convex sides and a central portion of greater thickness than the peripheral portion, said disc yieldingly retained about its periphery within said bore at a first end of said bore with the concave side facing outwardly,

main pressure generating means disposed within said bore behind said disc for generating a planar shock front to propel said disc from its yieldingly retained position,

an elongate plug received and fitting the diameter of a second end of said bore and having a length less than the length of said casing,

said plug having a stepped axial bore defining a small igniter chamber and a large booster chamber having a length greater than its diameter,

an igniter charge received in said igniter chamber,

a booster charge received in said booster chamber whereby said booster charge contacts said main pressure generating means and said initiator charge, and

a platform adapted for supportingly engaging said casing when firing said ordnance disabling weapon.

2. The device of claim 1 further comprising:

a severable closure cap attached to said plug and hermetically sealing said igniter chamber.

3. The device of claim 1 wherein said platform comprises:

a flat rectangular body of manually bendable material having a U-shaped cutout portion formed in one end thereof to define an elongate key and additionally having a plurality of longitudinal slits cut therein whereby said platform may be stored and transported in a flat knocked down configuration and bent by hand to form legs to hold said ordnance disabling weapon in use.

4. The device of claim 3 wherein said casing has a complementary keyway formed therein along a portion of the length of said casing and adapted to slidably receive said key.

5. The device of claim 3 further comprising:

an optical sighting mechanism mounted on the exterior of said casing for aiming the weapon.

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