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Boller

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[54] **BOMB RECOVERY AND SHIELD APPARATUS**

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[52] **U.S. Cl.** .....**109/49.5,** 89/36 R, 109/1 R, 294/67 DB

[51] **Int. Cl.** **E06b 9/00**

[58] **Field of Search**.....109/49.5, 1, 57, 58, 59, 85; 102/22; 89/36 R, 1 R; 214/1 D; 294/67 DA, 67 C, 67 D, 67 DB, 67 E, 92, 93, 75 H

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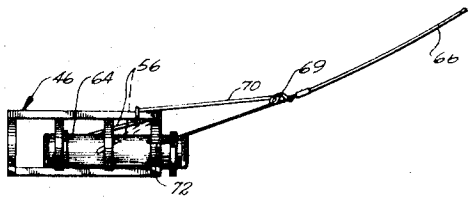
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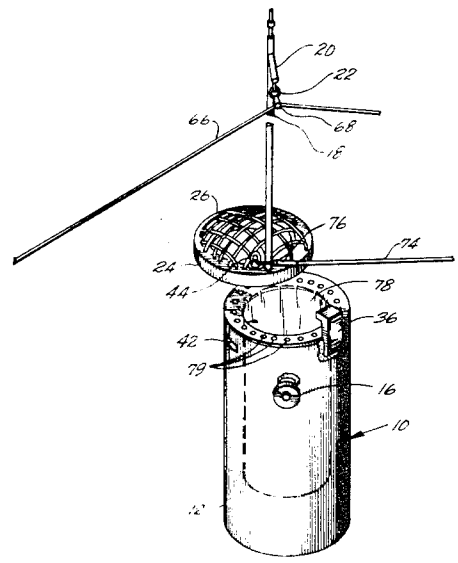
Primary Examiner—Dennis L. Taylor
Attorney—Walter G. Maxwell et al.

[57] **ABSTRACT**

Bomb recovery and shield apparatus includes a cage shaped to slip over a bomb, and a clip in the cage adapted to engage the bomb and retain it inside the cage. The apparatus also includes and explosion-resistant tubular shell having an upwardly opening end and a post extending above the open end. The post supports a pulley, and a line reeved over the pulley is secured to the cage. A workman standing a safe distance from the bomb pulls the line to slip the cage over the bomb and thereafter guide the bomb into the shell. A remote-controlled lid with an open mesh screen can be closed over the open end of the shell after the bomb is safely inside.

16 Claims, 6 Drawing Figures





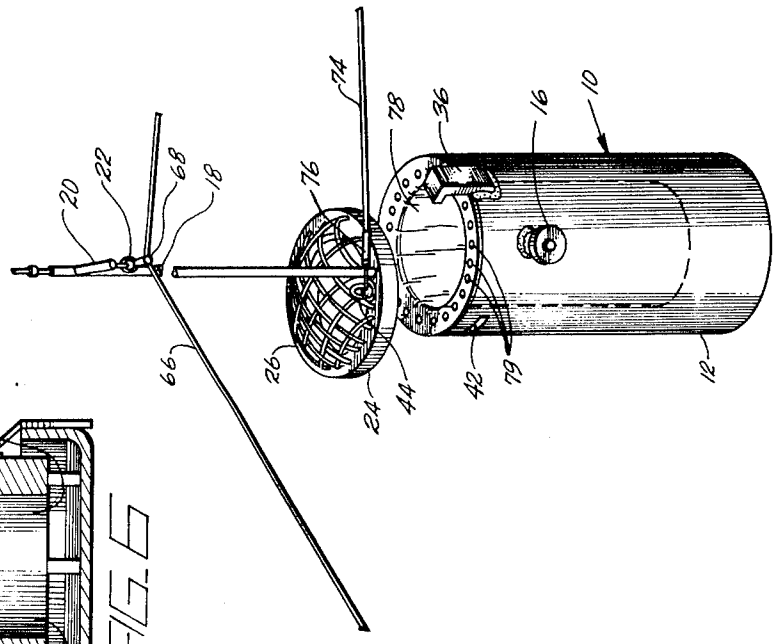


FIG. 4

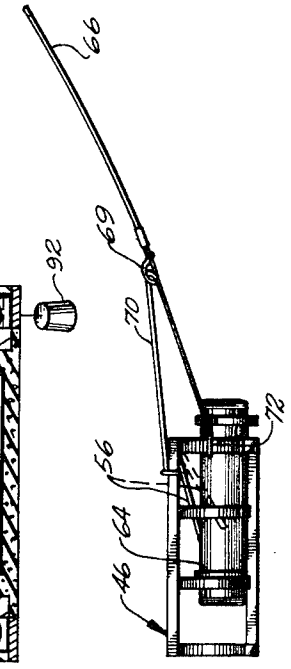


FIG. 5

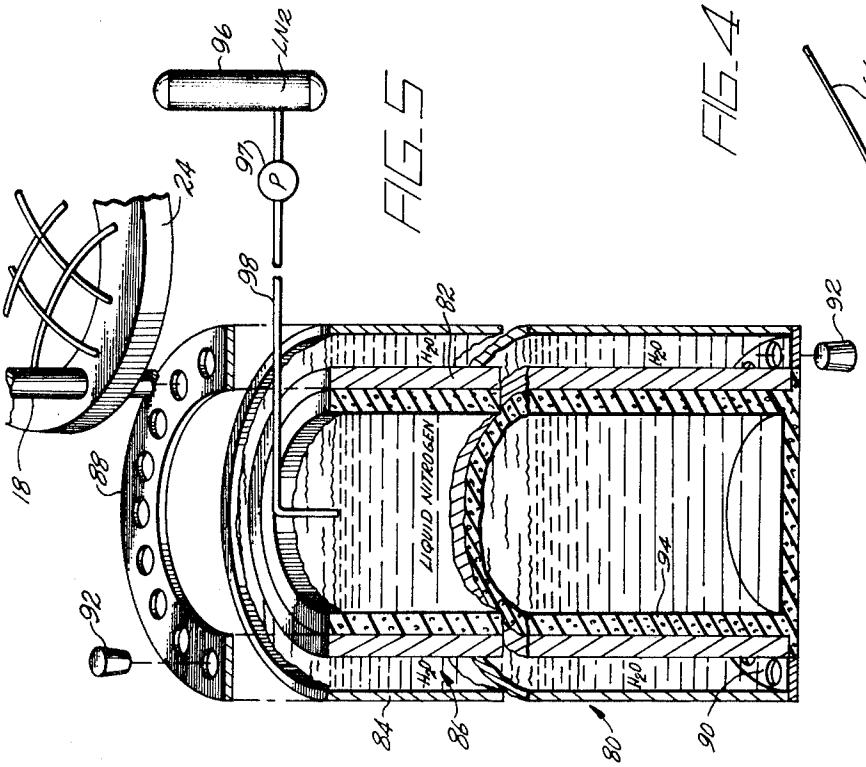
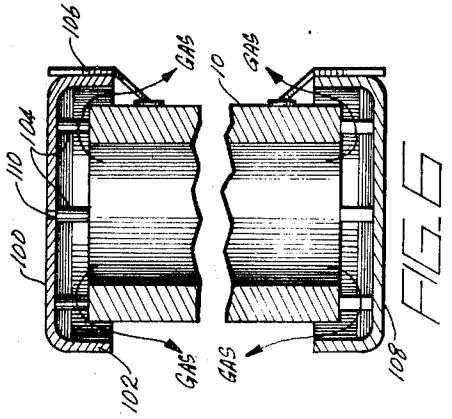


FIG. 6



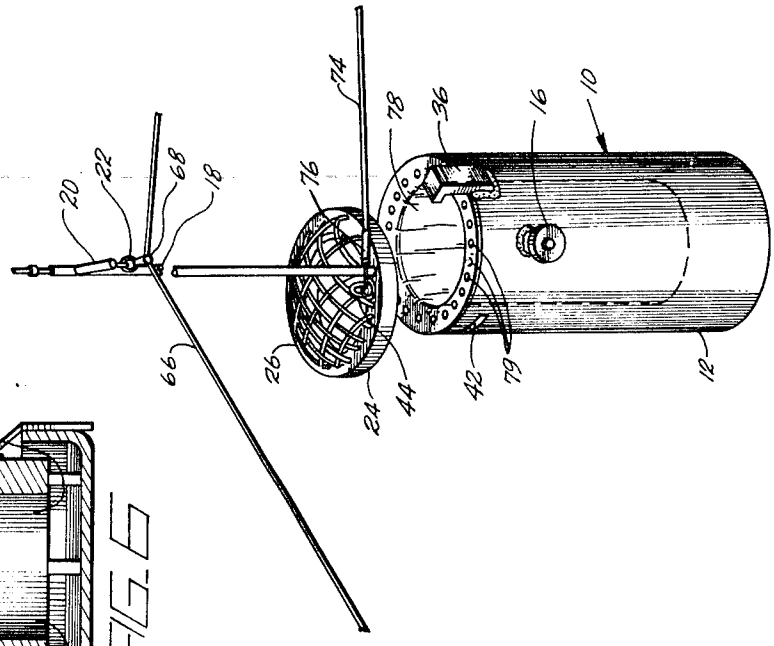


FIG. 6

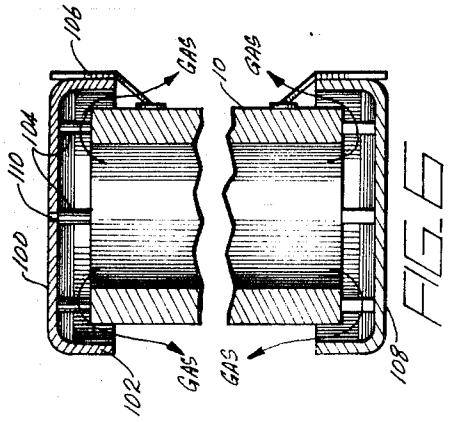


FIG. 5

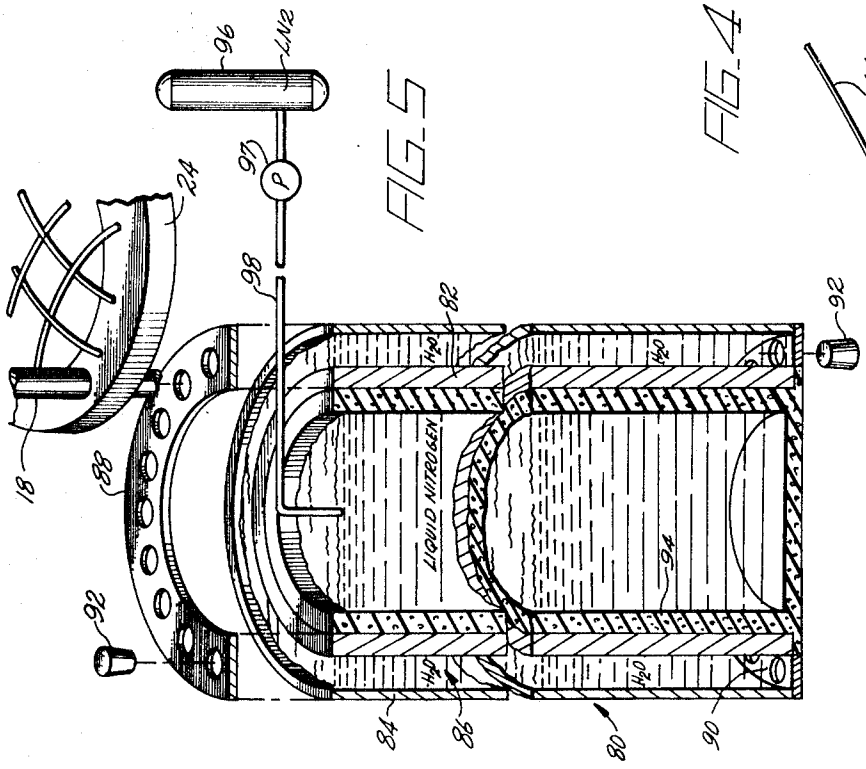
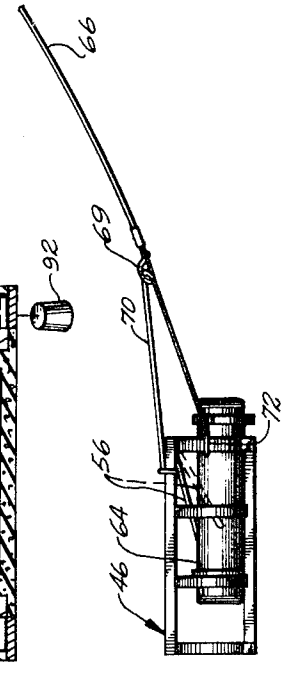


FIG. 4



BOMB RECOVERY AND SHIELD APPARATUS

BACKGROUND OF THE INVENTION

The invention relates to public safety equipment, and more particularly to a remote controlled system for moving a bomb to the inside of an explosion-proof shield that prevents serious injury if the bomb subsequently explodes.

The recent increase in militant bombings has made it necessary to develop devices for aiding policemen, firemen, and the like in recovering potentially explosive bombs and removing them in such a way that serious injury does not occur if the bomb explodes. Generally speaking, most militant pipe bombs are "low-order" explosives in which an explosion propels deadly shrapnel in a multiplicity of directions at supersonic velocities. In "high-order" explosives, the explosion occurs with such force that the pipe is virtually annihilated, creating essentially no shrapnel of any substantial mass. However, the pressure and temperature generated within the pipe by a high-order explosive can approach 3,000,000 psi at 2000°K. The persons responsible for removing a bomb must always assume that the bomb may be activated without warning by a timer, or set off by a triggering device, such as a mercury switch, in response to slight movement of the bomb. Thus, extreme care must be used in handling all bombs.

The prior art systems for handling potentially explosive bombs unfortunately require the workman to be dangerously close to the bomb, and usually require him to make physical contact with the bomb. In some prior art procedures, the operator works from behind a protective shield stationed relatively close to the bomb. The inherent danger in this procedure is the strong chance the operator will be struck by shrapnel ricocheting around or even penetrating the shield if the bomb explodes. Worse still is the danger that the percussion from the shock wave of detonation will injure or kill him despite the shield because of his proximity (usually within 15 or 20 feet) to the uncovered bomb.

SUMMARY OF THE INVENTION

This invention provides a remote controlled system for the safe handling and disposal of militant bombs.

Briefly, the invention includes a shell having an explosion-resistant body, and a cage shaped to slip over the bomb and adapted to retain the bomb inside it. Guide means secured to the cage are controlled to slip the cage over the bomb to pick it up and provide guided movement of the bomb to the interior of the shell for safe disposal. Preferably, the interior of the shell is large enough to provide an air insulation gap (at least two to three times the diameter of the bomb) between the bomb and the inner wall of the shell.

In a preferred form of the invention, an elongated post is secured to the body of the shell. The guide means includes an elongated line having one end secured to the cage, and a sheave secured to a portion of the post supported above the open end of the shell. The line is reeved over the sheave, with its other end extending to a point remote from the shell and cage. Thus, the operator can handle the bomb from a safe distance by pulling on the line to slip the cage over the bomb and guide the cage and bomb in one continuous and quick motion to the inside of the shell.

Preferably, the shell has an openable and closeable lid which is remotely controlled by a second line for covering the open end of the shell after the bomb is safely inside. One form of the lid includes an open mesh screen to allow the escape of gas if an explosion occurs. In another form, the lid can be suitably spaced from the top of the shell to provide an adequate gas escape.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other aspects of the invention will be more fully understood by referring to the following detailed description and the accompanying drawings in which:

FIG. **1** is an elevation view showing a tubular bomb shield;

FIG. **2** is a perspective view showing a bomb pick-up device for slipping over a bomb and moving it to the inside of the bomb shield;

FIG. **3** is a perspective view showing a wheel cart for carrying the bomb shield;

FIG. **4** is a perspective view showing the bomb recovery and shield apparatus in use recovering a bomb;

FIG. **5** is a fragmentary sectional perspective view showing an alternate embodiment of the tubular bomb shield; and

FIG. **6** is a fragmentary sectional elevation view showing an alternate embodiment of the lid covering the bomb shield.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. **1**, a bomb shield or "blast tube" **10** includes a tubular, open ended shell **12**. Preferably, the shell has relatively thick walls made of a rigid, high strength material such as steel. The shell ideally has walls which are about 1 ½ inches thick so the shell is capable of withstanding explosions caused by low order and propellant explosives and common high order explosives. Preferably, the shell is made from a gun barrel casing having an interior large enough to enclose the type of pipe bombs which are commonly encountered during use.

During normal use, the shell stands upright on feet **14** secured to the bottom angular lip of the shell by suitable means such as welding. Outwardly projecting cylindrical handles **16** are welded to opposite sides of the shell outer wall.

An elongated upright post **18** is welded to the upper annular lip of the shell. The top of the post carries an outwardly extending, horizontal boom **20** projecting over the hollow interior of the shell. Preferably, the boom is located about 2 ½ feet above the top of the shell. The boom supports a downwardly extending eye **22** positioned centrally over the hollow interior of the shell.

A lid **24** is mounted to pivot about a point on the upper lip of the shell. Lid **24** includes a ring-shaped metal body **25** having a size matching that of the tubular shell. The opening in the lid is covered by an open mesh screen **26** preferably made of woven wire rope. The end portions of the wire ropes extend through separate holes (not shown) drilled through the lid and project below an annular shoulder **27** formed in the inner periphery of the bottom annular lip of the lid. Each end of the wire rope is swedged below shoulder

27 to firmly hold the wire ropes in place. The wire ropes are shaped and interwoven to form the hemispherical open mesh netting illustrated best in FIG. 1.

A similar hemispherical shaped open mesh netting 28 made of woven wire rope covers the opening at the bottom of the shell. The ends of the bottom wire ropes extend through holes (not shown) drilled through an annular lip 29 extending inwardly into the interior of the shell at its bottom. The ends of the wire rope above shoulder 29 are swedged to hold the wire ropes in place.

A bore 30 extends through the body of the lid, with a narrowed lower portion 31 of post 18 extending up through bore 30 so the lid pivots from an open position shown in FIG. 1 to a closed position covering the opening at the top of the shell. The narrowed part of the post forms a shoulder immediately above the upper lip of the lid to prevent the lid from sliding axially on the post.

A spacer 32 between the upper lip of the shell and the bottom of the lid provides a narrow annular space between the lid and the top of the shell when the lid is closed. The purpose of this space will be described in detail below. A downwardly projecting lug 34 on the side of the lid opposite its pivotal connection acts as a support for the opposite side of the lid when it is closed.

A pair of upwardly projecting steel locking dogs 36 are welded to opposite sides of the shell outer surface so as to extend above the upper lip of the shell. Preferably, dogs 36 are spaced 120° apart. Each dog has a respective shoulder 38 projecting inwardly toward the opening in the shell and positioned so that the lid makes a relatively tight friction fit under the dogs when the lid is closed.

A third steel locking dog 39 welded to the outer surface of the lid projects downwardly below the lid. Locking dog 39 has an inwardly projecting shoulder 40. When the lid is closed shoulder 40 makes a sliding fit in a notch 42 formed in the outer surface of the shell. Preferably, notch 42 is spaced 120° from each steel dog 36, so that the lid is locked at three equidistantly spaced points when closed.

An upwardly projecting eye 44 is welded to the upper annular lip of lid 24. The purpose of the eye will be described in detail below.

FIG. 2 shows a bomb pick-up device or cage 46 for use in conjunction with blast tube 10. Pick-up device 46 comprises a skeleton framework which includes a U-shaped base frame 48. The ends of several longitudinally spaced apart, downwardly opening hoop segments 50 are secured to the parallel legs of base frame 50, one hoop segment being secured to the open end of the U, and a pair of other hoop segments being secured to intermediate portions of the U. An inverted V-shaped end piece is secured above the cross-piece of the U at the other end. A longitudinally extending bar 52 is rigidly fixed to the tops of the hoop sections and the apex of the end piece. A relatively stiff elongated steel leaf spring or bomb retainer clip 56 secured to the underside of the hoop segment above the open end of the U projects downwardly and rearwardly into the interior portion of the pick-up device.

Alternatively, the skeleton framework may be modified in a suitable manner to support an open-ended bag (not shown) or other similar receptacle for slipping over the bomb.

The use of the blast tube 10 and bomb pick-up device 46 is best understood by referring to FIGS. 3 and 4. Blast tube 10 preferably is transported to the site of the bomb on a wheel cart 58. The wheels of the wheel cart preferably are those from a motorcycle, and include hand brakes (not shown) for controlling movement of the cart so that one man can operate it. The blast tube hangs in the wheel cart by handles 16 which rest in upwardly opening stirrups or gimbal hangers 60 secured to the sides of the cart frame. The wheel cart has an elongated handle (not shown) secured to a rear cross-piece 62 of the frame for wheeling the blast tube to the bomb site. The handle also may have an extension (not shown) adapted for towing the wheel cart behind a vehicle. Other equipment for removing the bomb (to be described in detail below), together with bomb pick-up device 46, may be carried in hand by a workman or secured by suitable means to the wheel cart frame.

A bomb 64 is approached by a workman (not shown), usually wearing a conventional protective suit. The workman pushes the wheel cart to a point close to the bomb, say 10 to 15 feet from the bomb. The wheel cart is tipped forward, using its handle, to release the blast tube from engagement with gimbal hangers 60 to set the blast tube on the ground adjacent to the bomb. (Alternatively, the blast tube can remain on the cart during use. This mode of operation will be described in further detail below.)

After the blast tube is placed adjacent to the bomb, lid 24 is pivoted to its fully open position illustrated in FIG. 4. An elongated bomb position control tension line 66 passing through a swivel pulley 68 is releasably secured to the pick-up device, preferably by a clip 69 at the end of the line attached to another line 70 which forms a yoke for attachment to the pick-up device. The yoke has snap ring fasteners 72 to releasably clip tension line 66 to the pick-up device. Swivel pulley 68 is releasably clipped by suitable fastening means to eye 22 on the boom of post 18, so that tension line 66 extends from the pick-up device, through the pulley, to a point remote from the bomb site. A lid position control tension line 74 is releasably secured to eye 44 on the lid by a snap ring fastener 76 fitted through the eye.

Tension lines 66 and 74 are preferably 150 ft. to 200 ft. long, and each line is wound on a separate spool (not shown) or the like to facilitate ease of handling during the preliminary stages of the bomb recovery. Both tension lines are then strung out to a safe position. Alternatively, the lines are played out ahead of time from the remote position, preferably by a second workman, as the other workman wheels cart 58 to the bomb recovery site. This latter method is quick and substantially prevents the chance of pulling line 66 too soon while unwinding.

Bomb pick-up device 46 is placed on the ground adjacent to the bomb, on the side of the bomb opposite the blast tube, with the longitudinal axis of the pick-up device being aligned approximately with that of the bomb. The size of the pick-up device is such that the lateral distance between the longitudinal legs of base frame 48 is less than the diameter of the bomb. Thus, when tension line 66 is pulled, the pick-up device slips over the bomb, with the longitudinal legs of the base frame being closely spaced from the adjacent sides of the bomb.

The bomb pick-up device initially can be placed next to the bomb by the workman in charge of the bomb recovery. However, if there is a likelihood that the bomb contains a timing device, which makes approaching the bomb extremely dangerous, the pick-up device may be placed on the ground at a safe distance from the bomb. Thereafter, tension line **66** can be dulled, while standing in another safe position, to guide the bomb pick-up device over the bomb. Alternately, device **46** can be placed over bomb **64** by hand without disturbing the bomb.

As the tension line **66** is guided to pull the pick-up device over the bomb, spring steel clip **56** is urged upwardly from its original position (shown in phantom line in FIG. **4**) by its contact with the bomb. Thus, the clip exerts a downward force on the top of the bomb to retain the bomb within the pick-up device. After the bomb is inside the pick-up device, tension line **66** is pulled to immediately move the bomb from its position on the ground to the edge of the blast tube, then being raised to a position (not shown) hanging directly above the opening to the blast tube. At this point, clip **69** at the end of the tension line engages pulley **68** and thereby acts as a stop to limit further pulling of the tension line. (A scoop device (not shown) may be used in conjunction with the blast tube to aid guiding the pick-up device up the side of the tube.) The operator then slackens tension line **66** to lower the bomb into the blast tube.

During movement of the bomb, end piece **51** prevents the bomb from slipping out the end of the pick-up device. The bomb will not slide out the opposite end of the device because the cap of the bomb catches on the end of spring clip **56**, and the longitudinal legs of base frame **48** are spaced sufficiently close to each other to prevent the bomb from slipping out the bottom of the pick-up device.

As shown in FIG. **4**, an upwardly opening cloth bag **78** or other similar receptacle may be hung in the upper portion of blast tube **10** to receive the bomb and hold it in the center of the blast tube so as to maintain an air insulation gap between the bomb and the inner wall of the tube. Preferably, the blast tube is of a size that provides an air gap of at least two to three times the diameter of the bomb. Bag **78** may be secured to the blast tube by various suitable means, such as screws **79**, which releasably attach the top of the bag to the upper lip of the tube.

When the bomb is safely inside the tube, the operator pulls on tension line **74** to pivot the lid to its closed position under the locking dogs. Locking dog **39** on the lid acts as a stop by abutting against the side of the blast tube as its lower shoulder engages notch **42**. This indicates to the operator that the lid of the blast tube is completely closed. The space between the lid and upper lip of the blast tube allows line **66** to remain attached to the bomb when the lid is closed. Thus, line **66** may be used later to aid in removing the bomb from the shell.

Thus, with the bomb safely inside the blast tube, the operator can approach the blast tube with substantially reduced risk of injury. Flying shrapnel from an explosion of a propellant or low-order explosive will be retained inside the tube by wire rope top **26** and bottom **28**. High pressure gas resulting from an explosion is controlled because it vents through the open mesh top and bottom. In an explosion caused by a high-order explosive, the open mesh top and bottom allow controlled ventilation of resultant gaseous particles. The upper portion of the wire rope top and bottom usually will separate by severing during such an explosion, but tests have shown that the swedged end portions of the wire rope maintain a secure connection to the lid and bottom of the blast tube. Since the wire rope remains intact with the tube, it does not create shrapnel. The wire rope members that become severed are easily replaced by interweaving new ones with the remaining members. The spherical configuration of the top and bottom makes replacement of the wire rope members a relatively easy task.

After the bomb is disposed in the blast tube, the wheel cart may be used to pick up the blast tube and transport the bomb away from the recovery site.

It is recognized that certain modifications of the above described bomb recovery and shield apparatus may be made without departing from the scope of the invention. For example, the blast tube may be modified in such a way that the pick-up device and bomb are drawn through the opening at the bottom of the tube. In this instance, the feet **14** and wire rope screen **28** at the bottom of the tube are modified to swing open together to allow bottom access and remote closing capability. The post **18** can be shortened so that swivel pulley **68** is positioned immediately above the opening at the top of the tube, with the lid being bolted in its closed position. Thus, lid position control tension line **74** may be eliminated from the top but used on the bottom.

In using this modification of the blast tube, the operator pushes the wheel cart and blast tube to a position close to the bomb. The blast tube remains mounted on the cart, with the cart being positioned so that the bottom of the blast tube is spaced sufficiently above the ground to provide clearance for pulling the pick-up device through the opening in the bottom of the tube. After the wheel cart and blast tube are properly positioned, the pick-up device and tension line **66** are extended down through the hollow interior of the tube and out the bottom of the tube. After the pick-up device is aligned properly with the bomb, the operator pulls on tension line **66** to slip the cage over the bomb and engage spring clip **56** with the bomb. Thereafter, as the tension line is pulled the bomb is drawn into the open bottom of the blast tube to a position safely inside the tube. Line **74** is used to close the bottom lid. The tension line may then be secured to post **18** or boom **20** to hold the bomb inside the blast tube as it is transported by the wheel cart from the recovery site.

Various modifications of the post and boom also may be developed without departing from the scope of the invention. For example, the post or boom may be rotatable to allow the bomb to be picked up clear of the blast tube, with continued pulling of the tension line rotating the post or boom against a stop (not shown) to position the bomb directly over the opening in the blast tube. Another possible modification of the post and boom to accomplish the same function would be a telescoping boom (not shown) with the tension line being pulled along the longitudinal axis of the boom.

FIG. 5 shows a modified blast tube 80 which includes a metal tubular inner shell 82 disposed concentrically inside a metal tubular outer shell 84, with an annular void 86 being formed between the inner and outer shells. An upper perforated ring 88 is rigidly secured to the upper edges of the inner and outer shells so as to cover the top of the annular void. Similarly, a lower perforated ring 90 is rigidly secured to the bottom edges of the inner and outer shells to cover the bottom of the annular void.

One of the purposes of blast tube 80 is to provide a device capable of shielding the blast from a high-order explosive, while reducing the overall weight of the device sufficiently so it can be more easily handled by a single workman. Preferably, the wall thickness of inner tubular shell 82 is about 1 inch, and the wall thickness of outer tubular shell 84 is about ¼ inch. Both shells preferably are constructed of steel, the preferred source of the shells being standard oil well drill casing. Blast tube 80 provides about a 25 lbs. to 50 lbs. reduction in weight when compared with a blast tube having a wall thickness of from 1 ½ inches to 2 inches.

Annular void 86 is filled with an energy-absorbing medium, such as water (as shown in FIG. 5). Because of the reduced wall thickness of the blast tube, the energy-absorbing medium is used to dissipate energy escaping through the wall of the inner shell from an explosion in the blast tube. Separate corks 92 are releasably disposed in the perforations of upper and lower rings 88 and 90 to contain the energy-absorbing medium within the annular void. In the event a substantial amount of energy is absorbed by the water during an explosion, the corks will separate from their respective perforations to provide further means for dissipating the energy.

The annular void may be filled with a variety of energy-absorbing media, such as plastic foam, expanded metal such as honeycomb metal, balsa wood, sand, and the like.

The interior surface of the inner shell 82 is lined with a removable layer of insulation 94, which also covers and seals the bottom opening of the inner shell. During use of blast tube 80, a source of liquid nitrogen (shown schematically at 96) is delivered to the bomb site. After the bomb is moved to the inside of the blast tube, the interior of the tube is filled with liquid nitrogen by a pump 97 which forces the liquid nitrogen through a line 98 leading from liquid nitrogen source 96, at a point remote from the bomb, to the interior of the blast tube. The purpose of the liquid nitrogen is to freeze the bomb to deactivate the explosive material contained in it. Moreover, if the bomb is activated by a triggering device powered by batteries, for example, the liquid nitrogen freezes all chemical activity in the batteries and thereby prevents the bomb from being activated.

Other temperature-reducing media may be used in place of the liquid nitrogen, but liquid nitrogen is preferred because of its relatively low cost, chemical stability, and effectiveness in deactivating explosives. Preferably, insulation 94 is a foam insulation material, such as polystyrene. The purpose of the insulation is to prevent the steel inner shell 82 from contacting the liquid nitrogen which could lower the temperature of the steel sufficiently to make it brittle and thereby reduce its explosion-resistant characteristics. The insulation also reduces evaporation of the liquid nitrogen. Other insulation materials may be used, without departing from the scope of the invention, as long as they are capable of providing a good temperature insulation barrier between the interior of the blast tube and inner shell 82.

In the event a bomb is heavily insulated, the freezing process may not be effective to deactivate the bomb. However, the presence of the blast tube itself obviously will prevent serious injury in the event the bomb explodes.

FIG. 6 shows a modified form of the blast tube in which the opening at the top of the tube is covered with a downwardly opening oversized metal lid 100. The lid has a bottom annular rim 102 which is spaced laterally from the side of the blast tube, the underside of the lid being spaced from the top of the blast tube by vertical support legs 104 resting on the upper lip of the tube. The lid swings to the side by means of a suitable hinge 106 at its side. The blast tube also has an identical hinged lid 108 at the bottom, the hinge at the bottom allowing lid 108 to open in the event the bomb is drawn through the bottom of the tube. Both lids provide an escape path for venting gas, as represented by the arrows in FIG. 6.

In using the blast tube of FIG. 6, lid 100 swings open by means of a remote controlled tension line (not shown) such as line 74, so the recovered bomb may be loaded through the top of the blast tube. To allow loading through the bottom of the tube, lid 100 includes an opening 110 in its top through which line 66 passes. Each lid includes suitable remote controllable locking means (not shown), such as locking dog 39 and notch 42, located on the side of the tube opposite the hinge.

Thus, the bomb recovery and shield apparatus of this invention provides the following advantages:

1. The operator of the apparatus does not come into contact with the bomb;
2. There is only a short time lag from the time the bomb is moved to the time the bomb is safely inside the blast tube;
3. The movement of the bomb into the blast tube is done remotely; and
4. The entire bomb recovery system may be operated by one person.

I claim:

1. Apparatus for moving a bomb and shielding its explosion, the apparatus comprising a shell having an explosion-resistant body with a hollow interior and at least one open end, a cage shaped to fit around the bomb and adapted to retain the bomb inside it, a support extending over the open end of the shell, guide means secured to the cage and coupled with the support for moving the cage around the bomb and cooperating with the support to provide guided movement of the cage and bomb through the open end of the shell to its interior.

2. Apparatus according to claim 1 in which the support comprises an elongated post secured to the body of the shell.

3. Apparatus according to claim 1 in which the guide means comprises an elongated tension line for releasably securing a first end of the line to the cage, and a sheave secured to the portion of the support over the open end of the shell, the line being reeved over the

sheave with its second end extending to a point remote from the shell and cage, whereby the line can be shortened by drawing it over the sheave to raise the cage and bomb over the open end of the shell, the line being paid out thereafter to lower the cage and bomb into the shell.

4. Apparatus according to claim 1 in which the shell is an open-ended tubular body.

5. Apparatus according to claim 1 including an openable and closeable lid covering the open end of the shell.

6. Apparatus according to claim 5 in which the lid includes an open mesh screen.

7. Apparatus according to claim 4 including an openable and closeable lid covering the open end of the shell, and in which the end of the shell opposite the lid includes an open mesh screen.

8. Apparatus according to claim 5 in which the lid pivots between its open and closed positions, and including a line secured to the lid for pulling the lid from its open position to its closed position.

9. Apparatus according to claim 8 in which the shell includes dogs under which the lid is moved to hold the lid in a fixed position over the open end of the shell.

10. Apparatus according to claim 1 including mounting feet secured to one end of the shell.

11. Apparatus according to claim 1 in which the cage includes a spring biased retaining clip in its interior adapted to engage the bomb and retain it inside the cage.

12. Apparatus according to claim 1 including a carriage, and means for releasably mounting the shell to the carriage.

13. Apparatus according to claim 1 including a source of a temperature-reducing medium, and means for delivering the temperature-reducing medium from said source to the interior of the shell.

14. Apparatus according to claim 13 in which the temperature-reducing medium is liquid nitrogen.

15. A device for picking up a bomb having a substantially cylindrical shape, the device including an enclosure having an elongated outwardly opening slot formed in its bottom, the slot being bounded on opposite sides by substantially parallel walls, the enclosure also having an exterior retaining wall portion above the slot bounded at the bottom by the parallel walls which form the sides of the slot, the retaining wall portion having a hollow interior shaped to enclose the bomb and a bomb-receiving opening to the hollow interior above the open end of the slot, the bomb-receiving opening being shaped to pass over the bomb to contain the bomb in the hollow interior, the walls at the side of the slot being laterally spaced apart by a distance sufficient to allow the walls to slide lengthwise adjacent to the sides of the bomb as the enclosure passes over the bomb, the walls of the slot being spaced apart by a distance less than the diameter of the bomb so that the walls are closely spaced from the side of the bomb when the bomb is contained inside the hollow interior, and an elongated retaining member projecting into the hollow interior and adapted to engage the bomb and retain it inside the enclosure.

16. Apparatus according to claim 15 in which the retaining member is a leaf spring arranged to be engaged by the bomb as the enclosure passes over it to apply a biasing force to the bomb for holding the bomb inside the enclosure.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,721,201 Dated March 20, 1973

Inventor(s) WILLIAM A. BOLLER

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 5, line 8, reads "dulled", should read --pulled--.

Col. 8, lines 53-54, (Claim 1) reads "a support extending over the open end of the shell, guide" should read --a support, and guide--.

Col. 8, lines 64-66, (Claim 3) reads "tension line for releasably securing a first end of the line to the cage, and a sheave secured to the portion of the support over" should read --tension line having a first end releasably secured to the cage, and a sheave secured to the support over-- ;

Col. 9, line 1, (Claim 3 cont'd) reads "sheave with its second end extending" should read --sheave with a second end thereof extending--;

Col. 9, line 5 (Claim 3 cont'd) reads "paid out" should read --payed out--.

Col. 9, lines 20-21 (Claim 8) reads "a line secured to the lid for pulling the lid from its open position to its closed position.", should read --a tension line secured to the lid for use in moving the lid between its open position and its closed position.--

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,721,201 Dated March 20, 1973

Inventor(s) WILLIAM A. BOLLER

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 10, lines 17-18 (Claim 15)	reads " shaped to pass over the bomb to contain the bomb in the hollow interior," should read --shaped to pass around the bomb to enclose the bomb within the hollow interior,--
Col. 10, lines 21-22, (Claim 15 cont'd)	reads "adjacent to the sides of the bomb as the enclosure passes over the bomb," should read --adjacent to the opposite sides of the bomb as the enclosure passes around the bomb,--
Col. 10, lines 24-25, (Claim 15 cont'd)	reads "the side of the bomb when the bomb is contained inside" should read --the opposite sides of the bomb when the bomb is enclosed inside--.

Cancel the original sheet one and substitute the corrected sheet one, as shown on the attached sheet.

Signed and sealed this 27th day of August 1974.

(SEAL)
Attest;

McCOY M. GIBSON, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

PATENTED MAR 20 1973

3,721,201

SHEET 1 OF 2

FIG. 1

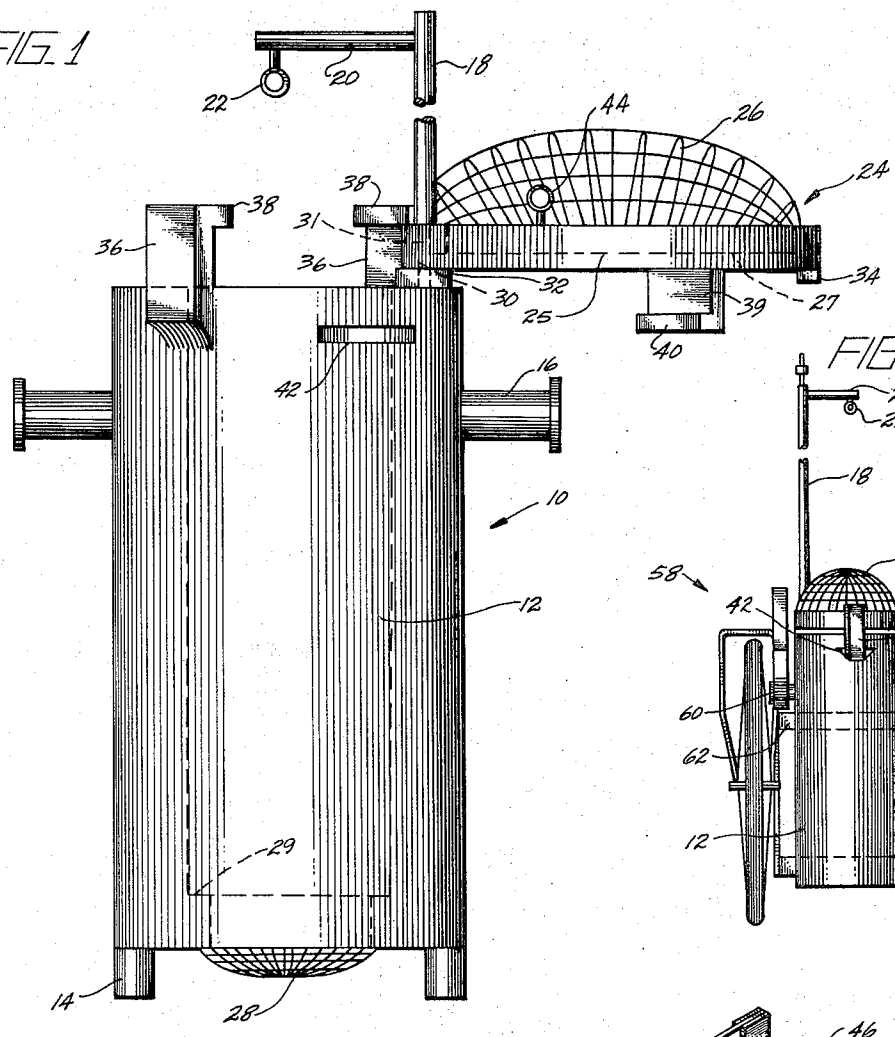
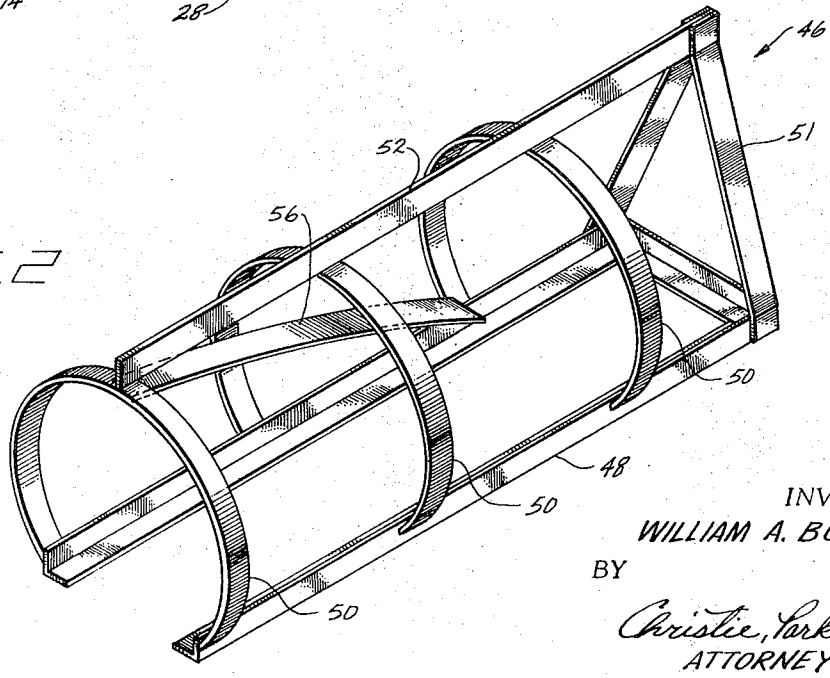


FIG. 3

FIG. 2



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