# United States Patent [19]

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[54] **OPEN ENCLOSURE FOR EXPLOSIVE CHARGE**


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

[58] **Field of Search** ..... 220/3, 83, 63; 206/3; 86/1; 89/1, 36; 109/26, 49.5; 150/.5, 1



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[57] **ABSTRACT**

There is disclosed herein a device for partially enclosing explosives, such as bombs, to allow such explosives to be disposed of relatively safely. An exemplary device is an enclosure which may be considered as essentially an elastic container, for absorbing and directing the explosive forces, and may be substantially cylindrical dna open therethrough and formed from a number of laminations of suitable material, such as fiberglass. A support member may be provided in the enclosure for holding the explosive charge from intimate contact with the enclosure. The support member may be in the form of a net or curtain suspended in the enclosure, foam material within the enclosure, or the like. The structure of the enclosure is such that if the bomb explodes the enclosure delaminates rather then breaking apart in the form of flying fragments.


**11 Claims, 4 Drawing Figures**

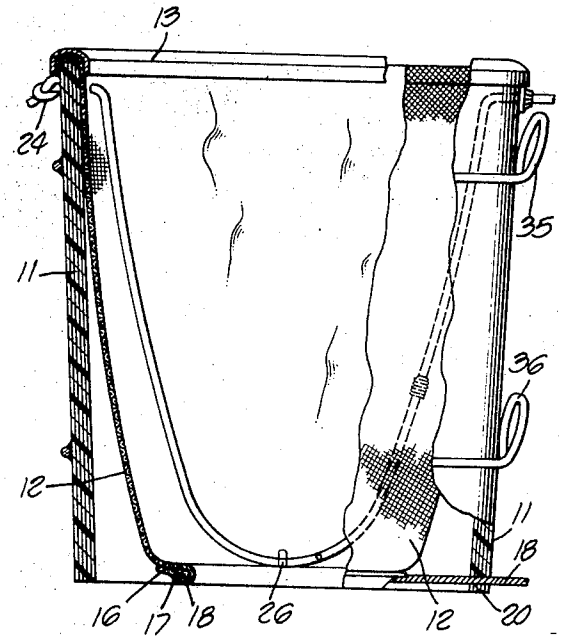


FIG. 1.

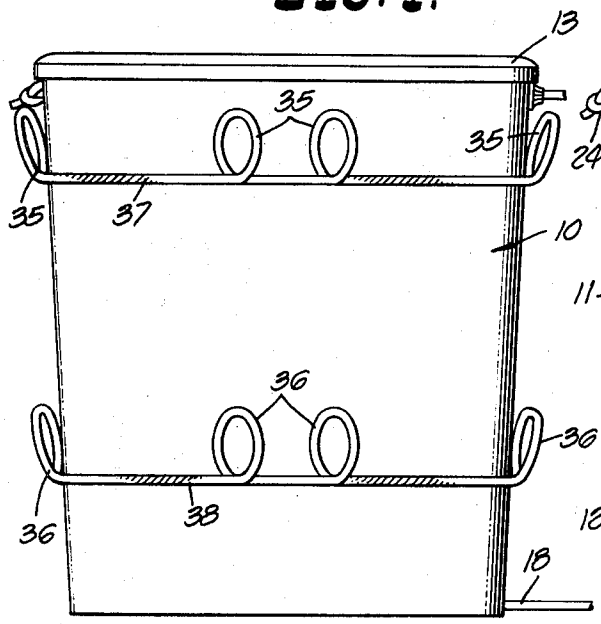



FIG. 2.

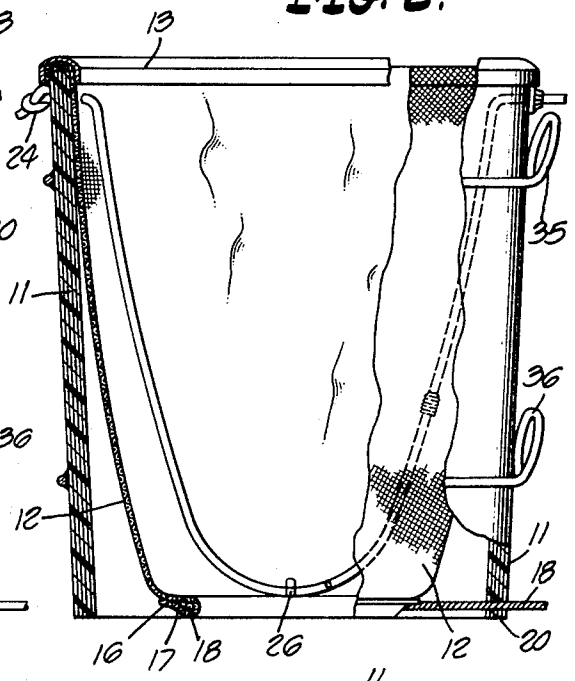
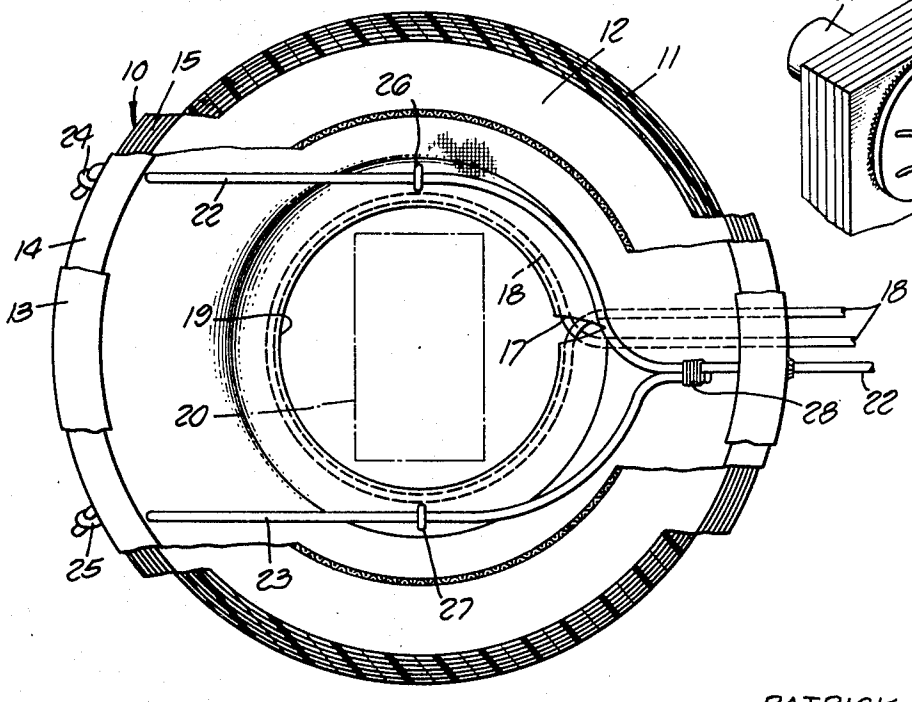



FIG. 3.



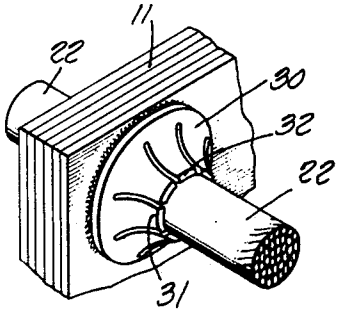




FIG. 4.

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# OPEN ENCLOSURE FOR EXPLOSIVE CHARGE

This invention relates to the art of explosive disposal, and more particularly to an enclosure or container in which an explosive charge may be detonated, or transported for detonation, relatively safely.

The disposal of explosives, such as bombs, is extremely hazardous and requires great care and expertise on the part of the individuals involved. Usually, protective garments are worn which are cumbersome and make handling of the explosive charge somewhat awkward. The explosive is placed in a type of container which, in the event the charge prematurely detonates, can create flying fragments from the container or its appendages resulting in substantial danger to surrounding persons and equipment.

The present invention is directed to a novel enclosure or container for at least partially enclosing an explosive charge so that its forces can be absorbed and particularly directed, and which allows the charge to be detonated, or transported for detonation, relatively safely. It may be considered as a fail-safe device inasmuch as it does not itself form a projectile when the explosive is detonated.

Accordingly, it is a principal object of the present invention to provide a new enclosure or container for an explosive charge.

An additional object of this invention is to provide a laminated enclosure or container construction which is open at both ends and which includes supporting means therein for supporting an explosive charge within the enclosure.

Another object of this invention is to provide a novel laminated container and supporting means for supporting an explosive charge within the container but out of intimate contact with the container.

A further object of this invention is to provide a bomb disposal enclosure of laminated construction which tends to delaminate in the event of detonation of the bomb.

These and other objects and features of the present invention will become better understood through a consideration of the following description taken in conjunction with the drawing in which:

FIG. 1 is an elevational view of an enclosure or container according to the present invention;

FIG. 2 is a cross sectional view of the device of FIG. 1;

FIG. 3 is a plan view of the device; and

FIG. 4 is a fragmentary view of a portion of the device.

Briefly, in accordance with the concepts of the present invention, a device is provided for enclosing an explosive charge which is constructed so as to absorb and direct the forces upon detonation of the charge. An exemplary enclosure or container is tubular, such as substantially cylindrical. A net, curtain, or other suitable support, is coupled with the container, such as being hung from the upper rim thereof, and provides a support for the explosive charge within the container but out of contact with the container. The net may be open at the bottom so that the container and net may be placed over the charge. A draw string, or the like, is coupled with the bottom of the net to close the net under the charge such that the container can then be lifted to transport the charge for detonation. Alternatively, the support can take other forms, such as plastic foam, foam rubber, cardboard, or the like within the container to keep the charge out of contact with the container. Additionally, means may be provided for raising the net after the same is closed under the charge to raise the charge to an intermediate point between the ends of the container.



The container is a laminated construction, such as from ballistic fiberglass. Upon detonation of the explosive charge, the wall of the container tends to delaminate rather than the material fragmenting or shattering. Because of this action, the force of the explosive can be suitably absorbed, and restrained to a vertical direction without any significant danger to surrounding personnel or equipment. A typical example container is approximately 27 inches in diameter and 27 inches deep, although different shapes and sizes may be used, such as from approximately the size of a wastebasket for use in buildings, up to many feet in diameter for use on a trailer. A container of this nature layed up of 24 ounce fiberglass woven roving with nine laminations has been found to be suitable, although different materials as well as a different number of laminations, such as up to about twenty, can be used. It is desired that the container be of minimum weight for portability reasons, and not have affixed thereto rigid members such as metal handles which may form dangerous projectiles.

Turning now to the drawing, an exemplary enclosure or container **10** in according to the concepts of the present invention is illustrated. The container is tubular and open therethrough, such as substantially in the form of a cylinder having a wall **11** which has a slight draft. That is, the diameter at the top of the cylinder is slightly larger than the diameter of the bottom of the cylinder to allow the same to be readily removed from a mold when the cylinder is manufactured as will be discussed subsequently. The typical draft is approximately 3°. However, this is merely for convenience of manufacture, and it is not necessary that the container be in this precise form, and can have other shapes such as frustoconical, precisely cylindrical, and so forth.

A net **12** of nylon or other suitable material, is suspended within the container and extends downwardly to the bottom end thereof. The net may be suspended from the top rim of the wall **11** by laying the top edge **14** of the net over the top edge **15** of the wall and then snapping on a rim **13** which preferably may be made of plastic.

The lower end of the net **12** is stitched at **16** to form a casing **17** for receiving a drawstring **18.** The drawstring **18** is used to close the lower open end **19** (note FIG. 3) after the container has been placed over an explosive charge as indicated diagrammatically at **20.** The ends of the drawstring **18** may merely extend outwardly from the bottom of the container or extend through a slot **20** at the bottom of the wall **11** of the container as illustrated in FIG. **2.** The ends of the drawstring preferably extend a number of feet from the container so that they may be pulled with relative safety when closing the bottom of the net under the explosive charge or bomb **20.**

Additionally, means may be provided for raising the net **12** within the container, after the opening **19** of the net has been closed under the charge **20,** so as to raise the charge upwardly about one-third to one-half from the bottom of the container. The purpose of the net or other suitable support, is to maintain the explosive

charge out of the intimate contact with the container, and preferably just about centered in the container. In any event, the supporting structure should be of lightweight material which will not significantly fragment upon detonation of the charge. The means for raising the net noted above, may include lightweight ropes or strings 22 and 23 which extend through holes near the upper edge of the wall 11 and are knotted at 24 and 25 as seen in FIG. 3. These ropes extend through respective loops 26 and 27 and are secured together at 28 by string, twine, or the like. The loops 26 and 27 may be a part of the net 12 or other suitable hooks, preferably formed of a fabric or other relatively non-fragmentable material may be used. The end of the rope 22 extends through an opening in the upper end of the wall 11 at the other side of the container so that the rope may be pulled to raise the net 12. Any suitable means, as for example a resilient slotted member 30 as shown in FIG. 4 bonded to the wall 11 by a resin, may be provided through which the rope 22 extends so that when the rope is pulled to raise the net the rope will be retained or locked in position. This can be accomplished with the member 30 wherein the leaves 31 thereof tend to cause the edges 32 of the leaves to prevent the rope 22 from pulling back into the container.

A suitable handle or handles may be provided on the exterior wall 11 of the container. For example, handles may be formed by several loops 35 and 36 of respective ropes 37 and 38. The ropes 37 and 38 are secured to the periphery of the container by resin used in laying up the container, with the loops 35 and 36 hanging free.

An exemplary container is approximately 27 inches high and twenty-seven inches in diameter. In this case, the bottom of the net 12 may be raised approximately 9 inches by pulling the rope 22 so as to support the explosive charge 20 in the approximate center of the container for detonation, or for transporting the charge for later detonation. However, the container may be constructed in other sizes, such as from waste basket size up to a number of feet in diameter, such as 7 to 8 feet for use as a trailer mounted container. The container is formed of a number of layers or laminations of material, such as ballistic fiberglass, in a manner to be described subsequently.

In the use of a container according to the present invention, the container is placed over the explosive and the drawstrings 18 are pulled so as to close the bottom of the net under the bottom of the charge. The charge and net can then be raised by pulling the rope 22 to suspend the charge substantially in the middle of the container. The charge can then be detonated, or the container can be suspended when the charge is detonated. In many instances it is desirable to transport the container, from, for example a building, to a safer location, such as out of doors, before the charge is detonated.

A suitable tool can be hooked into the loops 35 and 36 for moving or even dragging the container. The ends of the drawstring 18 can be held while the container is being moved, or they can be tied close to the container to maintain the opening 19 in the bottom of the net 12 closed, or suitable means such as the member 30 may be provided for the drawstrings to insure that the charge is not released from the container. In pulling the container after the charge 20 has been secured therein as described above, for example, one person may hook a rope or rod into one of the loops 36 and pull the container and another person following may restrain the container with a rope or rod hooked in an upper loop 35. Alternatively, suitable rods may be threaded through loops 35 on opposite sides of the container to support the container intermediate the ends of the rod. In this case, the container can be carried by two people holding the ends of the rods in a stretcher-like fashion.

As an example of the construction of a suitable container, the same may be formed by laying up a number of sheets of 24 ounce fiberglass woven roving, such as that distributed by Thalco Company of Santa Ana, California, and made by Uniglass Industries, a Division of United Merchants, Shelby, North Carolina and as more specifically described and illustrated in said first named application (Lyon & Lyon Docket No. 132/189). Pieces of the woven roving approximately 12 inches wide are cut on a bias and laid in a flower-petal configuration on a form or mold. After several such pieces have been laid in this manner, a circular band or roving is wrapped around the assembly. The sequence of laying the elongated pieces and then encircling them with the circular band is performed several times resulting in essentially nine laminations. A resin is applied in a conventional manner, and any suitable resin may be used, such as polyester resins identified as Koppers 60–60–5 or Diamond Schamrock 6631. Undirectional roving can be used but it is more difficult to handle than the woven roving.

Upon detonation of the explosive charge, it has been found that the container at least partially delaminates rather than fragmenting. The container retains its laminar characteristic inasmuch as the fiberglass is stronger than the bonding agent, thus allowing the laminations to separate in absorbing the explosive forces. This delamination soaks up a lot of force. The structure is thus a resilient structure rather than a strong rigid structure, and is in a sense springy. The container may be considered to be a plastic spring formed in a suitable shape which does not fragment or shatter significantly under explosive concussion, along with a support which functions to maintain the charge out of intimate contact with the interior of the container.

It is believed that fiberglass rovings called "gray goods" are particularly useful in laying up a container according to the present invention. This type of roving has not been laundered and still contains starch and/or other impurities. Because of this it partially resists impregnation of resins and provides a less rigid structure which in turn tends to delaminate somewhat easier. Inasmuch as the principal purpose of the present container is to provide a surround for an explosive charge which can absorb forces upon detonation of the charge without significant fragmentation, and suitably direct the forces of the charge away from surrounding persons, equipment, and so forth, it is believed that in some cases a structure which more easily delaminates will more suitably absorb such forces in a safer manner. Additionally, there are explosives which have a faster burning rate than typical blasting geletin and the like, such as high speed military explosives. These tend to burn so fast that parts of the explosive may shear through a container before the container has a chance to delaminate. Accordingly, it is believed desirable in some cases to partially delaminate the container by first detonating a small charge, such as one stick of blasting geletin, before the container is used on fast burning charges.

Arrangements other than the net can be used for picking up the bomb within the container, the principal criteria being that such means should not be constructed of a material which will significantly fragment upon detonation of the charge, at least for many uses of the container.

As other alternatives, one container with a supporting means therein, such as a net, may be nested within another container and arranged with a space between the two containers to accommodate larger explosive charges. Furthermore, a laminated container as described herein may be lined on the inside with a metal, such as titanium or steel, or a ceramic material. This arrangement may be useful for high speed explosives which generate fragments that travel faster than those from typical home-made bombs. In this case, the outer laminations prevent the liner from fragmentation.

The present embodiments of this invention are to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims therefore are intended to be embraced therein.

What is claimed is:

1. A container for facilitating disposal of an explosive charge by absorbing and directing the force of a detonation within said container comprising

a tubular body which is fully open at both ends and throughout its length, said body being formed of a plurality of laminations of resilient material said body having sufficient strength to absorb and direct the detonation of an explosive charge within said body without appreciable fragmentation, and

support means of light weight material coupled with said body for supporting an explosive charge within said body and completely out of intimate contact with said wall.

2. A container as in claim 1 including substantially non-fragmentizable handle means secured to the periphery of said body.

3. A container as in claim 2 wherein said handle means is in the form of arcuate members.

4. A container as in claim 1 wherein said wall is substantially cylindrical and is formed of a plurality of layers of glass fibers and resin.

5. A container as in claim 1 wherein said support means is a net extending within said wall and coupled with the upper end of said body.

6. A container as in claim 5 wherein said net has a closable end near the bottom end of said body for allowing the container to be positioned over an explosive charge and said end of said net to be closed under said charge.

7. A container as in claim 5 wherein said support means includes means for raising said net and an explosive charge held thereby upwardly within said body.

8. A container for facilitating disposal of explosive charge by absorbing and directing the force of a detonation within said container comprising

a body for enclosing an explosive charge, said body being tubular and fully open throughout its length, and being molded of a plurality of laminations of resilient material and a bonding agent said body having sufficient strength to absorb and direct the detonation of an explosive charge within said body, and

support means of light weight material within said body and coupled thereto, the lower extremity of said support means extending downwardly within said body for receiving and supporting an explosive charge for maintaining the charge completely out of intimate contact with said body.

9. A container as in claim 8 wherein

said support means is of substantially non-fragmenting material, and

said resilient material is glass fibers and said bonding agent is resin.

10. A container as in claim 9 wherein

said support means has an open end near the bottom of said body for allowing the container to be positioned over an explosive charge and which is closable under said charge, and said support means includes means for closing said open end thereof.

11. A container for facilitating disposal of an explosive charge by absorbing and directing the force of a detonation within said container comprising

a hollow body for enclosing an explosive charge, said body being substantially cylindrical and fully open throughout its length and being molded of a plurality of laminations of ballistic resisting material and a bonding agent, and

support means of light weight material coupled to and extending within said body for supporting an explosive charge therein, said support means being in the form of a net with a lower end thereof extending downwardly within said body and having a closable opening at said lower end which may be placed over said charge and closed for supporting said charge within said body and for maintaining said charge completely out of intimate contact with said body.

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