United States Patent [19]

Brown

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[54] **SHAPED CHARGE ENCLOSURE APPARATUS**

[75] Inventor: **Claude H. Brown,** Arlington, Tex.

[73] Assignee: **Jet Research Center, Inc.,** Arlington, Tex.

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[52] U.S. Cl. ..... **102/24 HC**

[51] **Int. Cl.** **F42b 3/08**

[58] **Field of Search** ..... 102/24 HC, 56

[56] **References Cited**

UNITED STATES PATENTS

2,833,214	5/1958	Spencer	102/24 HC
3,119,178	1/1964	Owen et al.	102/24 HC
3,252,418	5/1966	Terrioux	102/24 HC
3,276,369	10/1966	Bell	102/24 HC
3,613,582	10/1971	Levamaki et al.	102/24 HC

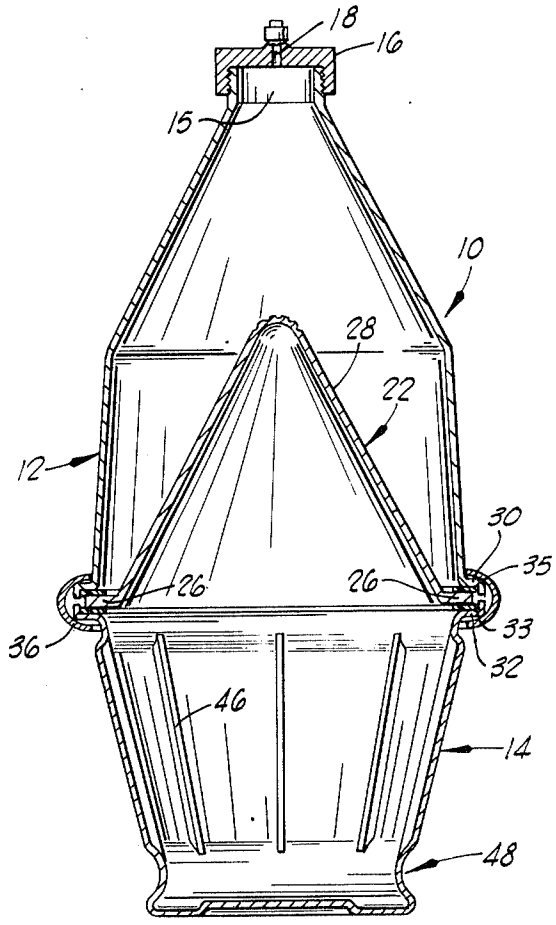
Primary Examiner—Verlin R. Pendegrass

Attorney—John H. Tregoning et al.

[57] **ABSTRACT**

The present invention relates to an improved enclosure apparatus for containing a shaped explosive charge which includes a top enclosure member, a bottom standoff member and a shaped liner positioned therebetween. The liner, enclosure member and standoff member each include annular flange portions and means for clamping the flange portions together are attached thereto so that a fluid tight seal between the liner, enclosure member and standoff member is provided.

6 Claims, 4 Drawing Figures



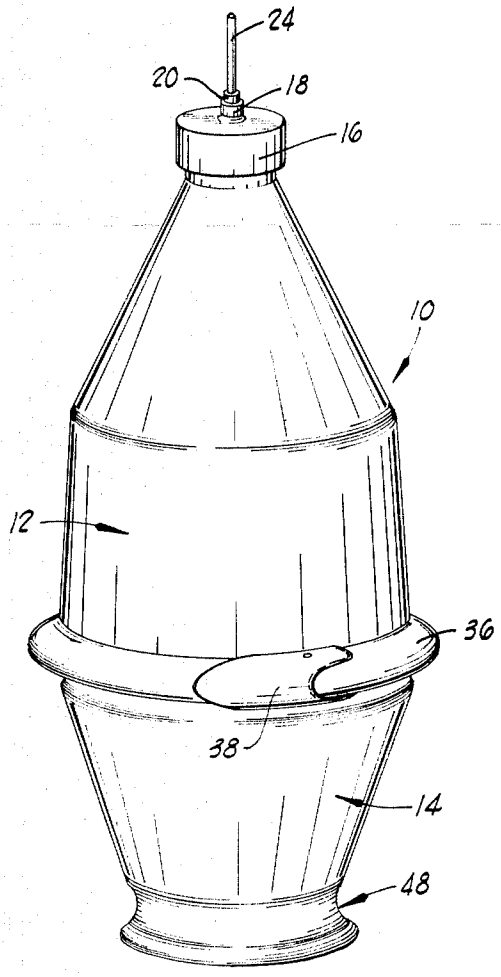


FIG. 1

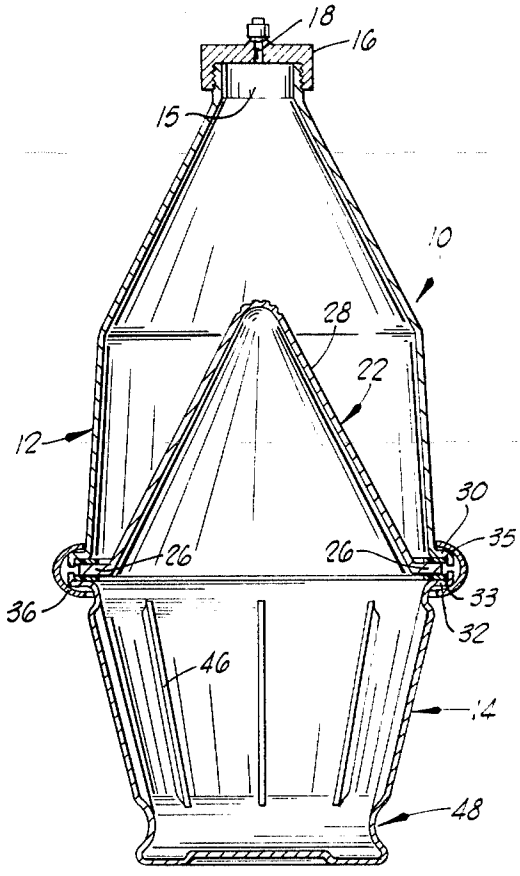


FIG. 2

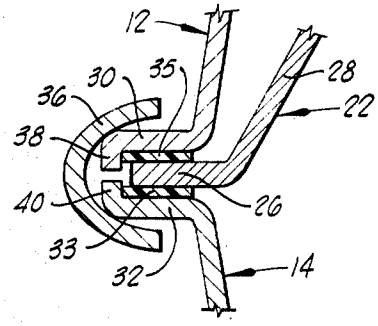


FIG. 3

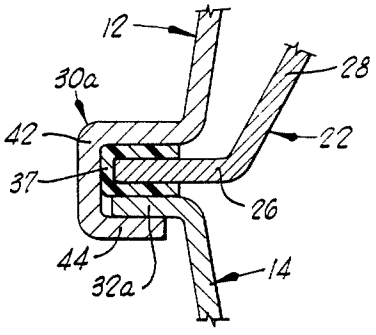


FIG. 4

SHAPED CHARGE ENCLOSURE APPARATUS

Shaped explosive charges are utilized for a variety of purposes. For example, in the formation of trenches or ditches to receive pipelines and the like both on land and underwater, shaped explosive charges have been used successfully. Generally, several shaped explosive charges are placed in a predetermined pattern over the portion of the earth to be excavated and substantially simultaneously detonated. A portion of the energy from the exploding charges is directed downwardly due to the shape of the charges so that a plurality of openings are formed and the earth or rock between the openings fractured.

Shaped charges utilized for excavation are generally of circular cross section with the shaped bottom portion taking the form of an upright cone. This configuration results in a major portion of the energy released upon detonation of the charge to be directed downwardly. In order to bring about the most effective utilization of the energy or force created, the conical surface is generally located interiorly of the charge and is positioned a short distance from the ground surface. Thus, container apparatus used for such shaped charges have heretofore included a standoff portion positioned directly below a conical retainer or liner above which the explosive material is contained.

By the present invention an improved enclosure apparatus for containing and forming explosive charges into the desired shape is provided for use both on land and below the surface of the water, which enclosure apparatus includes a top enclosure member, a shaped liner and a closed bottom standoff member, and which is readily assembled whereby a fluid tight seal between the various parts results.

Broadly described, the improved shaped charge enclosure apparatus of the present invention is comprised of a top enclosure member, a bottom enclosed standoff member and a shaped liner positioned between the top and bottom enclosure members, which liner includes an annular flange portion. Each of the top and bottom enclosure members include annular flange portions for coating with and supporting the annular flange portion of the liner, and sealing means for bringing about a fluid tight seal between the liner flange and the annular flanges of the enclosure and standoff members are provided.

Preferred embodiments of the enclosure apparatus of the present invention are illustrated in the drawings made a part of this disclosure wherein:

FIG. 1 is a perspective view of the shaped charge enclosure apparatus;

FIG. 2 is a side elevational view of the apparatus of FIG. 1 taken in cross-section;

FIG. 3 is an enlarged view of a portion of the apparatus illustrated in FIG. 2; and

FIG. 4 is an enlarged view of an alternate form of apparatus similar to that shown in FIG. 3.

Referring to the drawings, and particularly to FIGS. 1 and 2, the improved enclosure apparatus for containing a shaped explosive charge is illustrated and generally designated by the numeral **10**.

The apparatus **10** is comprised of a top enclosure member **12** and a lower enclosure or standoff member **14**. Positioned between the enclosure and standoff members **12** and **14** is a liner **22**. The apparatus **10** may be formed of metal or plastic material and is circular in horizontal cross-section. The top enclosure member **12** is generally conical in vertical cross-section and an opening **15** is provided at the apex or top of the enclosure member **12** for filling the apparatus **10** with explosive materials. A cap **16** is threadedly or otherwise removably connected over the opening **15**. An aperture **18** is provided in the cap **16** for receiving a conventional detonator **24** and an elastomer sealing member or other suitable sealing means **20** is provided for preventing leakage between the detonator **24** and the cap **18**.

The liner **22** includes an annular flat flange portion **26** attached to the shaped portion **28** thereof. The enclosure member **12** includes an annular flat flange portion **30** connected thereto for coacting with the annular flat flange **26** of the liner **22**, and the enclosure member **14** includes an annular flat flange portion **32** connected thereto for coacting with the flange **30** of the member **12** and supporting the flange **26** of the liner **22**. Sealing means are provided positioned between the upper and lower horizontal flat surfaces of the flange portion **26** of the liner **22** and the flange portions **30** and **32** of the enclosure members **12** and **14** respectively. The sealing means can take a variety of forms, eg., as shown in FIGS. **2** and **3**, the sealing means can be comprised of a pair of annular elastomer gasket members **33** and **35** positioned between the annular flange portions of the liner **22** and the enclosure members **12** and **14**. Preferably, however, the sealing means is comprised of a single elastomer member **37** of U-shape in cross-section positioned around the outer peripheral edge of the annular flange **26** of the liner **22** as shown in FIG. **4**. The preferred elastomer gasket member **37** is formed in a manner such that it fits over the peripheral edge of the annular flange **26**, and continuous portions thereof lie on both sides of the flange **26** between the flanges of the enclosure and standoff members **12** and **14**. While a variety of elastomer materials may be utilized, the sealing means is preferably formed of neoprene having a thickness of approximately 1/16 inch and a Durometer hardness of 60 ± 5.

In one form of the present invention (FIGS. 1–3), the annular flange portions of the liner **22** and the enclosure members **12** and **14**, and the sealing means utilized are clamped together by means of a clamp ring **36** which includes a conventional latching and tightening device **38**. The clamp ring **36** is formed of a diameter and shape such that when it is tightened, the flanges **30** and **32** of the enclosure and standoff members **12** and **14** respectively are clamped together against the sealing means and the annular liner flange **26** to form a fluid tight seal therebetween. In the form of the invention shown in FIGS. **2** and **3**, the annular flanges **30** and **32** of the enclosure and standoff members **12** and **14** preferably include complimentary annulets **38** and **40** respectively, which annulets face each other and form vertical annular shoulders for positioning the annular flange portion **26** of the liner **22** and preventing the gasket members **33** and **35** from flowing outwardly when they are compressed between the flanges **26**, **30** and **32**.

Referring now to FIG. **4**, an alternate form of connection between the enclosure and standoff members **12** and **14** and liner **22** of the present invention is illustrated. In this embodiment, the members **12** and **14** and liner **22** are held together and sealed by a portion of the top enclosure member annular flange **30***a* which is

folded and crimped over the peripheral edges of the annular flange **26** of the liner **22** and the annular flange **32***a* of the standoff member **14.** That is, the annular flange **30***a* of the enclosure member **12** is formed so that a portion **42** thereof is folded downwardly over the peripheral edges of the gasket member **37** and annular flange **32***a* of the enclosure member **14** with a portion **44** thereof folded or crimped inwardly into contact with the bottom surface of the annular flange **32***a* of the member **14.** As will be understood, in this embodiment of the invention the clamp ring **36** is not required.

A plurality of the improved enclosure apparatus of the present invention can be shipped in disassembled condition to a location of use. Upon assembly of the apparatus **10,** a liner **22** having the desired shape is fitted with elastomer sealing means, preferably the U-shaped gasket member **37** described above and illustrated in FIG. **4,** and positioned on the top of a standoff member **14** of the desired height. The top enclosure member is positioned on the liner and the apparatus **10** is clamped together in a manner described above.

As previously described, the standoff member **14** positions the charge contained within the apparatus **10** a desired distance above the surface of the strata to be fractured. When the enclosure apparatus **10** is utilized beneath the surface of a body of water, the space below the charge must remain substantially water-free and for this reason the standoff **14** is enclosed. The enclosed standoff **14** must withstand the water pressure exerted on it without collapsing and reinforcing the ribs **46** (FIG. **2**) are provided within the member **14** for providing strength thereto. As shown in FIGS. **1** and **2,** the standoff member **14** is preferably formed in a shape which includes an annular indentation **48** in the outside surface thereof. This shape facilitates the attachment of ballast such as a concrete block to the member **14** so that the apparatus **10** has a negative buoyancy and can readily be submerged beneath the surface of a body of water.

The apparatus **10** is preferably formed of a plastic material such as polyethylene having a thickness of approximately 1/10 of an inch. For underwater use, the polyethylene is weighted to increase its specific gravity to a level greater than that of the water. The addition of barium sulfate in an amount of about 15 percent by weight to the polyethylene increases its specific gravity to about 1.05. Upon detonation of the explosive material the resulting weighted polyethylene fractures remain beneath the surface of the water.

After assembly of the apparatus **10,** the cap **16** is removed from the enclosure member **12** and the space within the enclosure member **12** and the liner **22** is filled with an explosive material. A detonator **24** is fitted through the cap **16** and the cap **16** is secured onto the enclosure member **12.**

The improved shaped charge enclosure apparatus of the present invention is particularly advantageous for use in areas which are relatively inaccessible in that the apparatus may be assembled just prior to use, thereby avoiding the necessity of shipping preassembled charges. Once assembled as described above, the apparatus may be placed beneath the surface of water without fear of failure due to leakage.

While specific embodiments of the present invention have been described herein for purposes of disclosure, numerous changes in the shape and arrangement of the various parts may be made by those skilled in the art which are encompassed within the spirit of this disclosure and by the appended claims.

What is claimed is:

1. A quick assembly enclosure apparatus for a shaped explosive charge comprising:

an enclosure member having an annular flange extending generally laterally of the enclosure apparatus;

a standoff member having an annular flange extending generally laterally of the enclosure apparatus;

a liner having an annular flange extending generally laterally of the enclosure apparatus, said liner being positioned between said enclosure and standoff members with the flange thereof disposed between the flanges of said members;

sealing means disposed between the flange of said enclosure member and the flange of said liner and between the flange of said standoff member and the flange of said liner; and,

means for selectively clamping the flanges of said members together axially of the enclosure apparatus to compress said sealing means and to thereby provide a fluid tight seal.

2. The apparatus of claim **1** wherein said selective clamping means includes:

a generally C-shaped ring opening radially inwardly to receive the laterally extending flanges of said members; and,

manually operable lever means carried by said ring, said lever means being pivotable about a point adjacent one end thereof from a first position wherein said ring may be positioned to receive said laterally extending flanges to a second position wherein said ring may be compressed together to pressurally engage the flanges of said members.

3. The apparatus of claim **1** wherein said enclosure and standoff members are formed of a plastic material.

4. The apparatus of claim **1** wherein said sealing means comprises a generally C-shaped elastomer gasket member positioned around the outer peripheral edge of the flange of said liner with a portion thereof between the flange of said enclosure member and the flange of said liner and with a portion thereof between the flange of said liner and the flange of said standoff member.

5. The apparatus of claim **4** wherein said gasket member is formed of neoprene.

6. The apparatus of claim **1** wherein the flanges of said enclosure and standoff members each terminate in an annulet extending generally axially of the enclosure apparatus a distance not greater than about one-half the thickness of the flange of said liner, said annulets facing each other to assist in maintaining the position of said liner and said sealing means relative to said enclosure and standoff members during the assembly of the enclosure apparatus.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,777,663 Dated December 11, 1973

Inventor(s) Claude H. Brown

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

In Figure 3, the numeral "38" should be changed to read --39--.

In Column 2, line 56, the numeral "38" should read --39--.

Signed and sealed this 9th day of April 1974.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

FORM PO-1050 (10-69)

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* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334.

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