July 6, 1954 J. H. CHURCH ET AL 2,682,834

APPARATUS FOR UTILIZING SHAPED CHARGES

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Fig. 1.

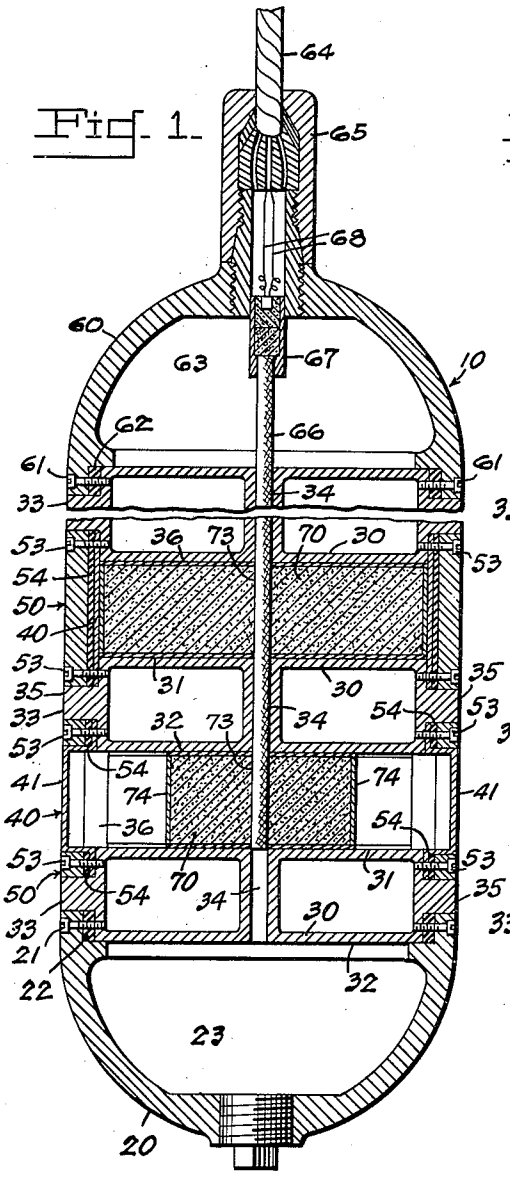
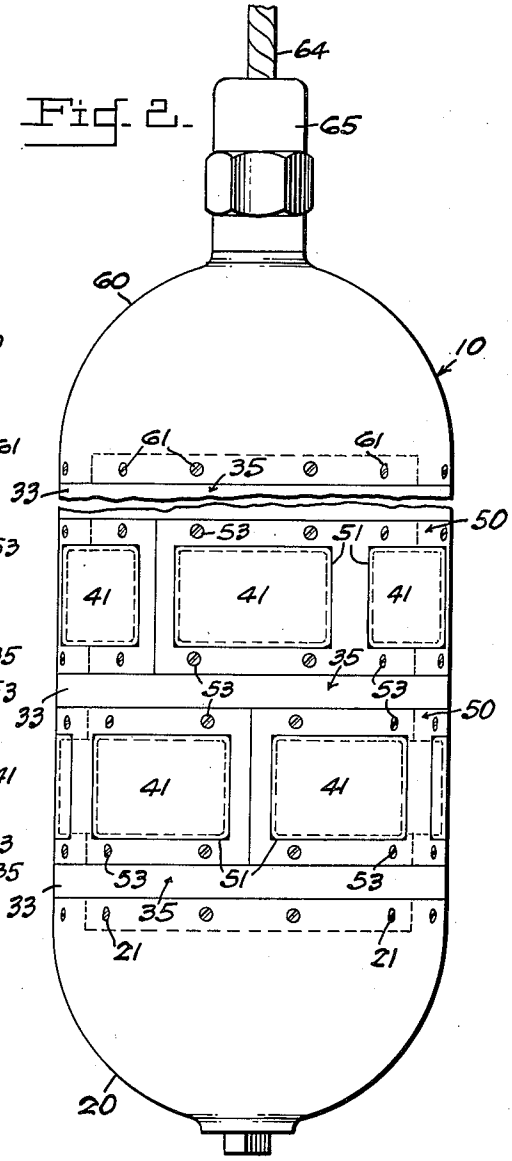


Fig. 2.



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Fig. 3.

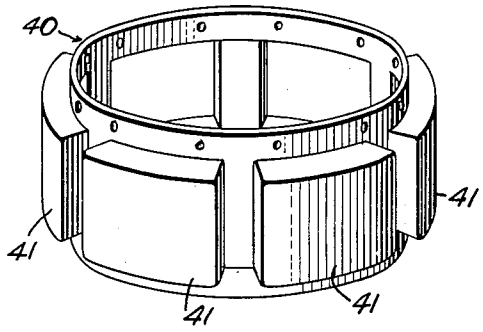


Fig. 4.

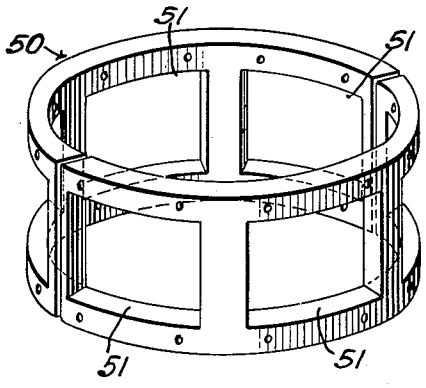


Fig. 5.

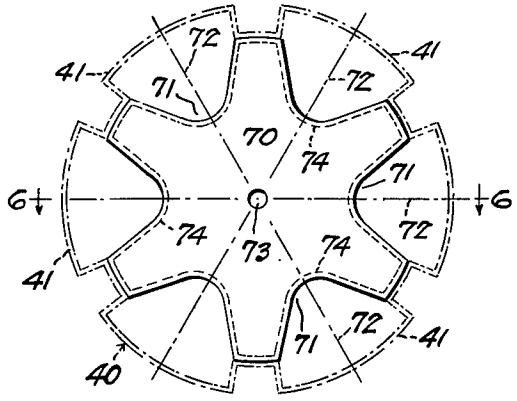


Fig. 6.

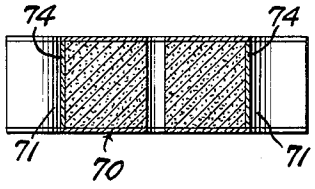
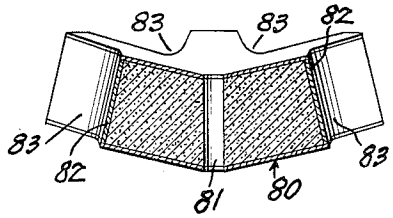


Fig. 7.



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Patented July 6, 1954

2,682,834

UNITED STATES PATENT OFFICE

2,682,834

APPARATUS FOR UTILIZING SHAPED CHARGES

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Application May 4, 1950, Serial No. 159,914

8 Claims. (Cl. 102—20)

(Granted under Title 35, U. S. Code (1952), sec. 266)

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The invention described herein and claimed may be manufactured and used by or for the Government for governmental purposes without the payment to us of any royalty thereon.

This invention relates to an apparatus especially adapted for use in chambering and positioning "shaped" charges in proper relative position with respect to a target, more particularly a target submerged in a liquid medium.

A principal object of our invention is to provide a simple, compact apparatus comprised of interchangeable elements which may be infallibly assembled with comparative simplicity and assurance of proper chambering of the "shaped" charges carried thereby.

Other objects will become apparent from the following description when considered with the appended drawings in which:

Fig. 1 is a longitudinal sectional view through apparatus constructed in accordance with our invention;

Fig. 2 is a fragmentary elevation of the apparatus shown in Fig. 1;

Fig. 3 is a perspective view of a sealing element used in the apparatus of this invention;

Fig. 4 is a perspective view of a cage used in the apparatus of this invention;

Fig. 5 is a plan view of one type of "shaped" charge adapted for use with our apparatus;

Fig. 6 is a sectional view taken upon line 6—6 of Fig. 5; and,

Fig. 7 is a plan view of another type of "shaped" charge adapted for use with our apparatus.

As shown in Fig. 1 our apparatus is generally indicated at 10 and is comprised essentially of a base element 20 similar intermediate members 30, sealing elements 40, cages 50 and a cap element 60.

The intermediate members or discs 30 are hollow generally cylindrical members symmetric about their central axes and are provided intermediate the upper and lower surfaces 31, 32 with radially outward extending flanges 33. We have shown surfaces 31, 32 to be opposed flat surfaces but we contemplate making these surfaces opposed convex, concave, convex-concave, or convex-flat, etc., as more clearly disclosed hereinafter in connection with the charge shown in Fig. 7. The members 30 are formed with axial bores 34 and are arranged in superposed coaxial relation as shown.

The adjacent pairs of intermediate members 30 are joined by the circular sealing elements 40 as indicated in Fig. 1 in fluid sealed relation.

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Each sealing element 40 extends between an adjacent pair of members 30 between the adjacent flanges 33 thereof and is formed with a plurality of protuberant portions or segments 41 here shown in Figs. 1 and 3 to be of generally rectangular configuration but which may be of any desired shape. The protuberances extend radially outward to substantially the cylindrical surfaces 35 of members 30. Sealing elements 40 may be made of any appropriate metallic or non-metallic material that will withstand the pressures which may be externally imposed thereupon through submergence of the apparatus in a fluid medium and which may be easily attacked by the "jets" emanating from the shaped charge encompassed by the element.

Each adjacent pair of members 30 are rigidly interconnected by split circular cages 50 provided with embrasures 51 conforming in internal configuration to the external configuration of protuberances 41 as clearly shown in Fig. 1. The cages 50 may be circumferentially tightened about the sealing elements 40 by any suitable means and affixed to members 30 by stud bolts or similar fasteners 53. The external diameters of cages 50 are such that the outer surfaces of the cages will not project outwardly of the cylindrical surface containing the outer surfaces 35 of flanges 33, and gaskets 54 may be interposed between the cages 50 and sealing elements 40.

The hollow base element 20 of desired external configuration, shown as generally hemi-spherical, is attached to the lowermost member 30 below its flange 33. As shown, this element forms a smooth joint with the contiguous surface 35 of flange 33 and is attached to the member by screws 21. Gasket 22 assures a fluid-tight joint. Element 20 forms a chamber 23 in conjunction with the lowermost surface 32 of the member.

Cap element 60 is conveniently a duplicate of base element 40 and is attached to the contiguous surface of member 30 by screws 61 to form therewith a closed chamber 63.

The apparatus is adapted to be suspended from a cable or similar device 64 by means of the jam nut 65 interconnecting cap 60 and cable 64 by a nipple 65a as shown in Fig. 1.

Each chamber 36 defined by adjacent surfaces of adjacent members 30 and sealing elements 40 is adapted to chamber a shaped charge 70 of the type shown in Fig. 5. The charge 70 comprises a generally circular charge formed with a plurality of radially outwardly-facing cavities 71 arranged symmetrically about the central axis of the charge to give a plurality of "shaped"

charge effects simultaneously in the direction of the respective radial lines of symmetry 72 of the cavities 71 when detonated centrally at 73. Each cavity 71 is provided with a complemental liner 74 of suitable metallic or non-metallic material.

As will be understood the charges 70 are arranged in the chambers 36 so that the protuberances 41 and cavities will be radially aligned in order to assure proper space for formation of the "jets" and it will be noted from Figure 2 that the cavities 71 of one charge 70 may be staggered with respect to the cavities of the next adjacent charge 70 above or below a given charge 70.

If it is desired to attack the target at an angle above or below normal a charge 80 of the form shown in Fig. 7 may be employed by making the surfaces 31 and 32 of members 30 conform thereto. As will be apparent from Fig. 7 charge 80 may be centrally detonated at 81 and be provided with suitable liners 82 for each of the cavities 83 which may be arranged similarly to cavities 71 of charge 70. Charge 80 may be employed in the position shown in Fig. 7 or inverted.

Charges 70 can be simultaneously detonated by a primacord 66 extended through bores 34 of members 30 and bores 73 of charges 70. The primacord can be detonated by the initiator 67 energizable through the leads 68 carried by cable 64 and extended through cap element 60 in fluid tight relation. The primacord may also be utilized to retain charges 70 properly centered in chambers 36.

Chambers 23 and 63 are in communication with chambers 36 through bores 34 and may serve as fluid pressure chambers to equalize pressures within the apparatus.

The sealing elements 40 may be replaceable and the elements 30, elements 50, 60 and 20 made so as to be interchangeable.

It will be observed that charges 70 and 80 are merely shown as types of charges that may be chambered in our apparatus but that we may with equal facility use any other types of circular charges.

We may also use any other system of detonating charges 70 such as individual detonators for each charge either individually or separately energizable as is well understood in the art. In use of the latter system of detonation the control means passing through bores 34, 73 to the individual charge detonators would serve to retain the charges 70 in proper position in chambers 36.

It will be noted that members 30 are shown as being hollow. They may be placed in communication with chambers 23 and 63 if desired. It is contemplated that members 30 may be made as solid elements.

We may also, if desired, fabricate elements 40 as distensible elements and expand them after placement of the apparatus as by fluid generated under pressure in chambers 23 and/or 63 suitably conducted to the cavities 71 as by the means shown in our copending application Serial Number 152,438, filed March 28, 1950, now Patent No. 2,667,836, dated February 2, 1954.

The spacing between adjacent charges 70 or 80 may be varied by fabricating some or all of the members 30 in two parts symmetrical about a medium plane through flange 33 thereof and placing an insert between the two parts of each member thus split to vary the thickness of the member 30 from surface 31 to surface 32, whereby the charges will be vertically spaced in the apparatus accordingly.

We claim:

1. In apparatus for chambering "shaped" charges to be positioned for use against a target comprising in combination, a plurality of circular charge supporting members each provided with intermediate outwardly extending radial flanges arranged in spaced superposed coaxial relation, said charge supporting members each being provided with an axial bore, a circular sealing element formed with a plurality of circumferentially spaced protuberances extending radially outward to substantially the plane containing the outer surfaces of said flanges encompassing the adjacent edge portions of each adjacent pair of members intermediate each adjacent pair of flanges in fluid sealed relation, and a circular cage provided with an embrasure receiving each of said protuberances extending between each adjacent pair of flanges rigidly interconnecting each adjacent pair of circular members interiorly of the plane containing the outer surfaces of said flanges.

2. The apparatus of claim 1 in combination with cap and base elements respectively affixed to the uppermost and lowermost circular members interiorly of a plane containing the outer surfaces of said flanges and cooperating therewith to define upper and lower chambers.

3. In an explosive unit built up from a plurality of alternate first and second elements, each of said first elements comprising a hollow cylinder, each of said second elements comprising a cylindrical band having a diameter substantially equal to said first elements, there being a plurality of circumferentially-spaced generally rectangular protuberances struck outwardly in the wall of said band, a cylindrical cage element having openings in its wall into each of which a respective protuberance extends and fits, said band and cage having substantially the same axial dimension, and means securing the end edges of each band and its cage in overlapping relation with the surfaces of contiguous ones of said first elements, said first elements having integral equatorial projections filling the space between contiguous cages, to form a fair cylindrical outer surface.

4. An explosive unit as recited in claim 3, each said band forming with contiguous first elements a sealed cylindrical chamber, a star shaped explosive charge filling said chamber and having arms corresponding in number with said protuberances, the cavity defined by each contiguous pair of arms being radially aligned with a respective protuberance.

5. An explosive unit as recited in claim 4, said unit comprising at least three of said first elements and at least two of said second elements, the protuberances of one of said second elements being circumferentially offset from those of the other of said second elements.

6. An explosive unit as recited in claim 4, there being a central axial passage extending through all said elements, and a single length of explosive cord extending through said passage.

7. An explosive unit as recited in claim 4, first and second hollow hemispherical end caps, means securing one said cap to the lowermost one of said first elements and means securing the other said cap to the uppermost one of said first elements to form an exteriorly smooth cylinder with hemispherical ends.

8. In a shaped charge unit built up from a plurality of alternate first and second elements, said first elements each comprising a hollow disc, said second elements each comprising a cylindrical band having equiangularly spaced hollow, generally rectangular protuberances, a generally star-shaped solid explosive charge having arms corresponding in number and angular spacing with said protuberances and positioned within said band with the space between contiguous arms radially aligned with a respective protuberance, means securing all said layers together to form a cylindrical unit, said means comprising cylindrical open-ended cage means having an inner diameter substantially the same as the outer diameter of said hollow discs, there being a plurality of openings in the peripheral wall of said cage means into each of which

a respective protuberance extends and fits, the upper and lower edges of said cage means receiving and being secured to respective contiguous ones of said hollow discs to secure the same together.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
2,169,559	Halliburton	Aug. 15, 1939
2,169,671	Walker	Aug. 15, 1939
2,494,256	Muskat	Jan. 10, 1950
2,587,244	Sweetman	Feb. 26, 1952
2,590,366	Atwood	Mar. 25, 1952

FOREIGN PATENTS

Number	Country	Date
146,615	Austria	July 25, 1936