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PRESSURE BOMB FOR CHEMICAL AND PHYSICAL REACTIONS

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FIG. 1

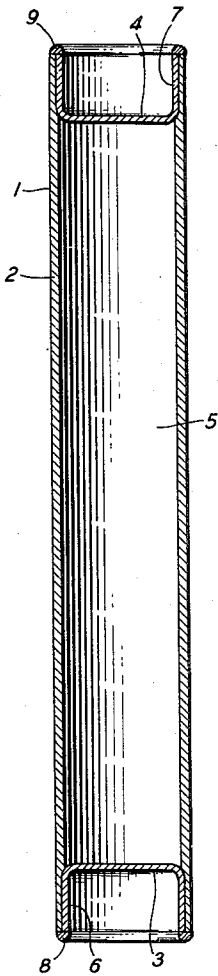
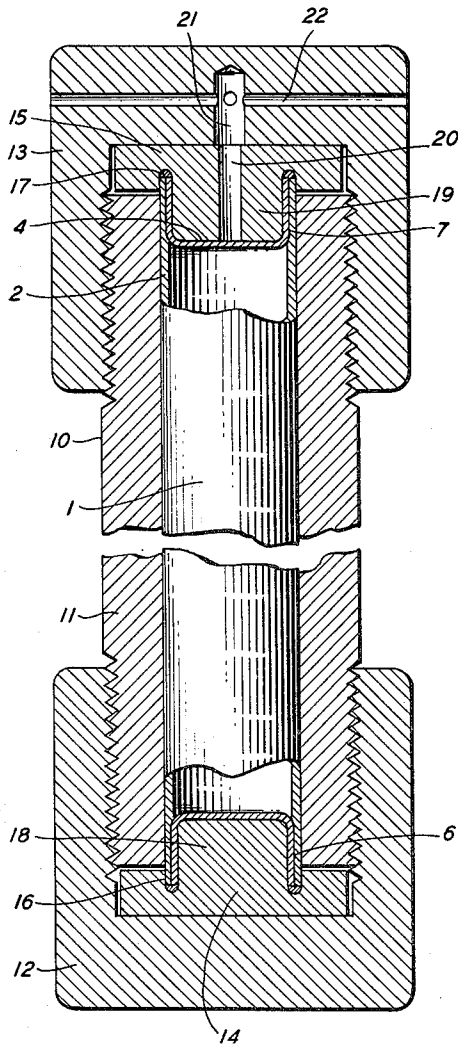


FIG. 2



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PRESSURE BOMB FOR CHEMICAL AND
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2 Claims. (Cl. 23—252)

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This invention relates to pressure resistant bombs for carrying out physical or chemical processes at high pressures.

The bomb of the present invention was designed to provide a simple, economical, dependable and safe apparatus, feasible for carrying out such high pressure processes on a commercial basis. Although designed primarily for the synthetic growing of quartz crystals by a process in which quartz seeds and a nutrient mass of quartz particles are maintained in contact with an aqueous alkaline solution at temperature above the critical temperature of water and at pressures in excess of 10,000 pounds per square inch for periods of several weeks or more, the bomb is obviously adapted for carrying out any physical or chemical process in which a high pressure is generated.

The structure of the bomb is shown in the accompanying drawing, in which:

Fig. 1 is a front elevation in section of an expendable liner for the bomb; and

Fig. 2 is a front elevation in section of the complete bomb containing the liner of Fig. 1.

The liner 1 shown in Fig. 1, which is not of itself capable of withstanding high pressure, is provided to protect the more expensive pressure resistant portion of the bomb from injury by the contents which are undergoing physical or chemical reaction, so that the bomb can be reused many times. The liner is of cheaper construction and may be discarded after each use. The liner 1 is made up of a cylindrical tube 2, into the ends of which are forced two cylindrical cups 3, 4, which serve to form a completely enclosed chamber 5 for containing the substances undergoing treatment. The cylindrical tube 2 and the cups 3, 4 form cylindrical lips 6, 7, the edges 8, 9 of which are securely welded around the circumference thus completely sealing the chamber 5.

In the use of the apparatus, one of the cups is inserted and the corresponding edge is welded. The materials to be treated are inserted in the chamber 5 and then the opposite end of the cylinder is closed with the corresponding cup and the adjacent edges are welded.

The charged liner 1 is contained in a pressure resistant shell 10 as shown in Fig. 2. This shell is made up of a heavy cylindrical tube 11 having caps 12 and 13 screwed on each end. The inner bore of the cylindrical tube 10 is of such size that it snugly fits the cylindrical tube 2 of the liner while permitting easy insertion of the liner.

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Since the pressure generated within the sealed liner during the use of the bomb tends to spread the tube from each of the cups 3, 4 at the lips 6, 7 and thus to break the welds at the edges 8, 9 and permit leakage, reinforcement is provided in the vicinity of the welded edges by means of the retaining caps 14 and 15. These retaining caps are provided with annular recesses 16 and 17 into which the ends of the lips 6 and 7 are forced. The portion 18 and 19 of each retaining cap which fits into the recess of the corresponding cup completely fills this recess and thus supports the cup against the internal pressure. When held in place by the screw caps 12 and 13 of the bomb, the retaining caps 14 and 15 effectively prevent leakage at the welds.

The upper retaining cap 15 is provided with a central bore 20 of such size that at a predetermined safe pressure, higher than the normal operating pressure in the bomb, the portion of the cup 4 opposite the opening in the retaining cap will rupture and release the pressure. In this manner an effective safety release is provided in the event that the pressure within the bomb accidentally becomes excessive. The upper screw cap 13 is provided with a central passage 21 registering with the passage 20 in the retaining cap and opening into radial passages 22 which connect with the atmosphere.

When charged with suitable reactants, such as the quartz growing charge referred to above, the bomb may be placed in a furnace and heated to a temperature such that a high pressure is generated by the fluid contents of the bomb. After the required reaction has taken place, the bomb may be cooled and opened, the contents may be removed from the liner and the liner may be discarded. The outer shell 10 is then ready for reuse with a new liner.

The description of the invention above has been in terms of its specific embodiments and, since modifications and equivalents will be apparent to those skilled in the art, is intended to be illustrative of and not to constitute a limitation upon the invention.

What is claimed is:

1. Apparatus, for containing a fluid in which high pressures are generated by heating, comprising an inner lining vessel, for containing said fluid, formed of a hollow cylindrical tube closed at each end by a cylindrical cup inserted in each end of the tube with the open ends of the cups facing outwardly and with the peripheral edges of the cups flush with the corresponding peripheral edges of the cylindrical tube so as to

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form a projecting cylindrical lip at each end, said cups being welded to said tube around said flush peripheral edges so as to seal the interior of said vessel, a pressure resistant cylindrical tube surrounding said inner vessel so as to protect it against pressure generated therein, pressure resistant caps removably fastened over the ends of said pressure resistant cylindrical tube, and a retaining cap situated at each end of said inner vessel formed of a block having an annular recess snugly fitting over said welded edge and over a portion of said projecting lip adjacent to said welded edge.

2. Apparatus, for containing fluid in which high pressures are generated by heating, comprising an inner lining vessel, for containing said fluid, formed of a hollow tube having an open end closed by a cup inserted in said open end with the open end of the cup facing outwardly and with the peripheral edge of the cup flush with the corresponding peripheral edge of the tube so as to form a projecting cylindrical lip, said cup being welded to said tube around said flush peripheral edges so as to seal the interior of said vessel, a pressure-resistant tubu-

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lar shell snugly enclosing said inner vessel to protect said inner vessel against bursting under the pressure generated within it, and a restraining device within said outer shell for preventing the walls of said lip from spreading under the pressure generated within said inner vessel, said restraining device comprising an inner block-like portion which completely fills the open end of said cup and an outer ring-like portion which fits snugly about the outer surface of said projecting lip, said inner and outer portions defining a recess into which the projecting lip snugly fits.

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