United States Patent [19]

Koehler

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[54] **EXPANSIVE GAS PROTECTIVE DEVICE**

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[52] **U.S. Cl.** ..... **141/82,** 49/445, 61/69 R, 62/64, 141/97, 220/41

[51] **Int. Cl.** **B65b 3/04**

[58] **Field of Search** ..... 49/387, 445; 61/69 R; 62/64, 373; 109/20, 29; 141/35, 51, 82, 86, 97, 236, 390; 220/5 A, 36, 41, DIG. 6; 292/128

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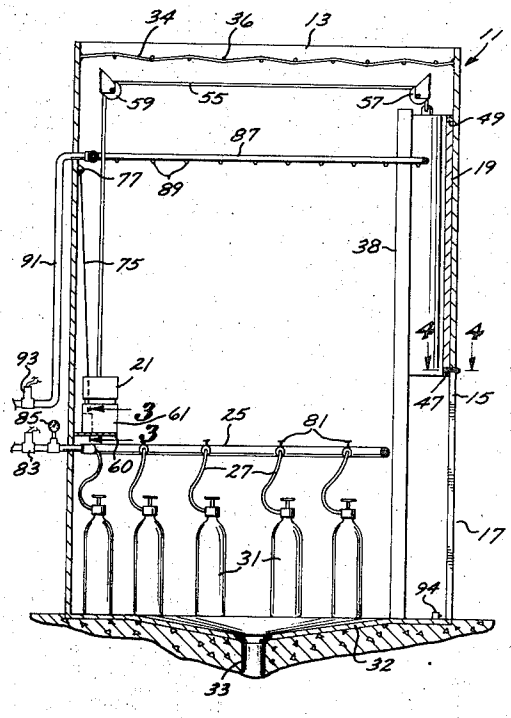
[57] **ABSTRACT**

An expansive gas protective device for use in a personnel work area and including a heavy walled protective vessel formed with a high pressure work piece chamber disposed in the work area and formed with a discharge outlet opening to an area remote from such work area and a doorway opening into such work area and normally covered by a heavy door. A high pressure source includes connector means disposed within the chamber for connection with work pieces located in such chamber. Means is also provided for moving the door between open and closed positions. Thus, work pieces may be placed in such chamber and the connectors connected therewith, the door closed and the high pressure source actuated to pressurize the work pieces. In the event of a failure and rapid expansion of gases in such chamber, the expanding gases will be directed out such outlet to the area remote from the work area and, likewise, any debris or airborne work pieces will also be directed away from the work area to protect personnel working in such area.

6 Claims, 5 Drawing Figures



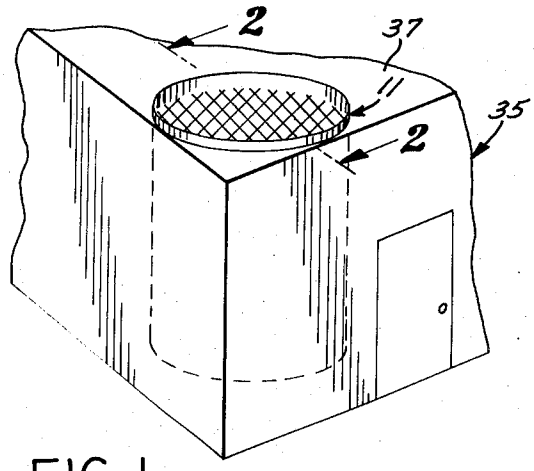


FIG. 1

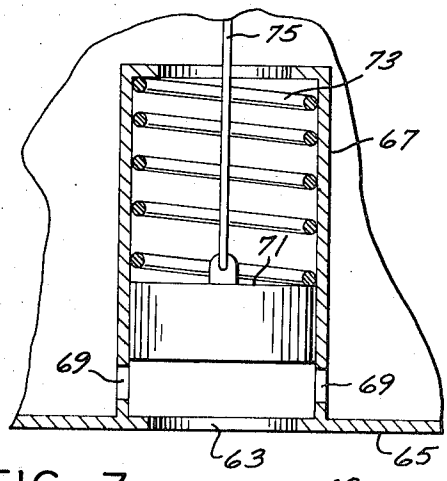


FIG. 3

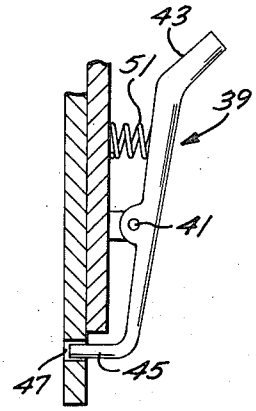


FIG. 4

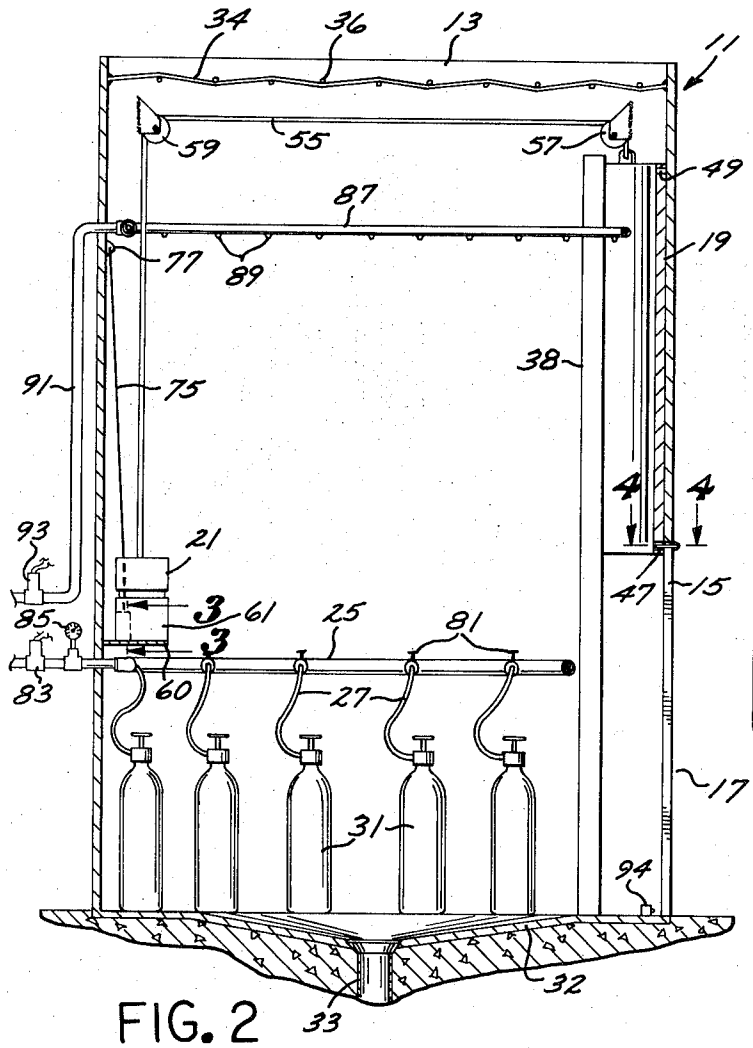


FIG. 2

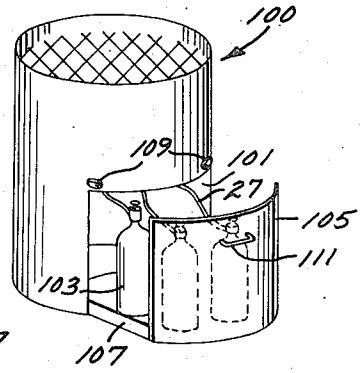


FIG. 5

EXPANSIVE GAS PROTECTIVE DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an expansive gas protective device for housing work pieces, such as scuba diving tanks, during charging thereof to protect adjacent workmen from injury in the case of an explosion.

2. Description of the Prior Art

While many devices have been proposed for shielding workmen from explosives, applicant is not aware of any devices for adequately protecting workmen during charging of scuba diving tanks and the like.

SUMMARY OF THE INVENTION

The expansive gas protective device of present invention is characterized by a heavy walled vessel disposed in a work area and having a door opening into such work area. The vessel is formed with a discharge outlet opening to an area remote from the work area. A high pressure supply includes connector means disposed in the chamber for connection with the work pieces whereby such work pieces may be placed in the chamber and the connectors connected therewith. The door may then be closed and the pressure supply actuated to pressurize the work pieces and, consequently, any equipment failure in the chamber which results in an explosion will result in the expanding gases being directed toward the outlet and away from the work area to protect workmen working therein.

The objects and advantages of the present invention will become apparent from a consideration of the following detail description taken in conjunction with the accompanying drawings.

DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a building having an expansive gas protective device embodying the present invention installed therein;

FIG. 2 is a vertical sectional view, in enlarged scale, taken along the line 2—2 of FIG. 1;

FIG. 3 is a vertical sectional view, in enlarged scale, taken along the line 3—3 in FIG. 2;

FIG. 4 is a horizontal sectional view, in enlarged scale, taken along the line 4—4 of FIG. 2; and

FIG. 5 is a perspective view of a second embodiment of the expansive gas protective device of present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. 1 and 2, the expansive gas protective device of present invention includes, generally, a heavy walled cylindrical vessel 11 formed at its upper extremity with an upwardly opening discharge outlet 13 and in its lower extremity with a radially outwardly opening door 15 which opens into a work area 17. The doorway 15 is normally covered by a heavy door 19 which is counter-balanced by means of a counterbalance weight 21. Disposed within the vessel 11 is an air manifold 25 having a series of connector conduits 27 leading therefrom for connection on their free extremities with scuba diver tanks 31. Consequently, the tanks 31 may be brought into the vessel 11 through the doorway 15 and connected with the respective conduits 27. The door 19 may then be lowered to its closed position and the manifold 25 pressurized to commence filling of the tanks 31. In the event one of the tanks 31 fails the expanding gases released therefrom will be directed upwardly through the discharge opening 13 to avoid danger to workmen working in the work area 17.

It is common practice to fill scuba diving tanks 31 with approximately 70 cubic feet of air at a pressure of 2,400 PSI. When this is done in a sports shop or the like, the surrounding personnel are subjected to a great danger since failure of one of such tanks results in rapidly expanding gases which render surrounding articles airborne and frequently propel the failed tank through the air to form a highly lethal projectile.

The expansive gas protector device of present invention is particularly adapted for installation in a scuba diver's shop 35 (FIG. 1) and may have the upper extremity thereof projecting through the roof 37 of such shop to terminate in the discharge outlet 13 opening above such roof. Obviously, if there are unoccupied areas adjacent the shop 35, such as the edge of a pier or the like, the discharge outlet 13 may open into such area.

The vessel 11 is formed with an integral bottom wall 32 which slopes radially inwardly and downwardly to a central drain opening connected with a downwardly leading drain pipe 33. The upwardly opening discharge outlet 13 is covered by a gridwork of diagonally extending rods 34 and 36 which define interstices having an area smaller than the cross sectional area of the scuba tanks 31 to block egress of such tanks in the case of an explosion.

The vessel door 19 is larger than the doorway 15 to overlap the marginal edges thereof by about 1 inch to prevent such door from being blown out through the opening in the event of an explosion. A pair of tracks 38 extend vertically along the opposite sides of the door and are generally L-shaped in cross section to project radially inwardly along the opposite edges of the door 19 and to then turn and project generally tangential to the wall of the vessel 11 at a distance spaced radially inwardly therefrom a distance equal to the thickness of the door 19 for slideable receipt of the door between such track and vessel wall. Consequently, the door is retained at its opposite edges for free sliding upwardly and downwardly within the tracks 38.

Mounted exteriorly on the wall of the vessel 11 immediately above the door opening 15 is a latch, generally designated 39 (FIG. 4), for selective engagement with the upper and lower extremities of such door. The latch 39 is carried centrally from a pivot pin 41 and is formed on one end with a handle 43 and on its opposite end with an inturned latch keeper 45 which is selectively received in respective radially extending bores 47 and 49 formed in the upper and lower extremities of the door 19. Still referring to FIG. 4, a compression spring 51 is interposed between the wall of the vessel 11 and the handle 43 to bias the latch 39 clockwise to urge such keeper 45 into engagement with the respective bores 47 and 49.

The door 19 is urged to its upper position by means of the counter-weight 21 suspended from a pair of counter-weight cables 55 which are connected on one end with the opposite side of the top end of the door 19 and lead upwardly to thread over respective pulleys

57 mounted at the upper front extremity of the vessel 11 and to then project horizontally rearwardly across the top of such vessel to thread over second pulleys 59 to project downwardly and connect with the opposite ends of the counter-weight 21.

The counter-weight 21 weighs slightly less than the door 19 and an upwardly opening water receiving tank 61 is carried from the bottom thereof and has an outlet port 63 (FIG. 3) formed in the bottom wall 65 thereof. The water tank 61 normally sets on a shelf 60 mounted on the interior of the vessel 11 when the door 19 is in its open position. Formed over the outlet port 63 is a cylindrically shaped valve housing 67 which has a pair of radially projecting ports 69 formed diametrically in opposite sides thereof. Received telescopically in the valve housing 67 is a resilient piston-shaped poppet 71 which is biased downwardly by means of a compression spring 73 to be maintained in alignment with the ports 69 to prevent water escape therethrough to the outlet port 63.

A lanyard 75 is connected with the top of the poppet 71 and leads upwardly through an anchoring bracket 77 mounted to the interior wall of the vessel 11. The lanyard 75 is of sufficient length to draw the poppet 71 to its open position shown in FIG. 3 when the counter-weight 21 is in its full down position to thereby enable any water in the tank 61 to drain therefrom and to enable such poppet to close the ports 69 when the counter-weight 21 is raised to enable such tank to again be filled with water. Obviously, such lanyard may be replaced by an upwardly projecting pin mounted on the shelf 60 and projecting up through the outlet 63 to engage the poppet 71 when the tank 61 is resting on such shelf as shown in FIGS. 2 and 3.

Each of the scuba tank connector conduits 27 have a filling valve 81 connected therewith for controlling entry of air to the respective tanks. The manifold 25 leads from a master valve 83 that is connected with a compressor (not shown) and a pressure gauge 85 is included in the line downstream of such valve 83.

A water cooling manifold 87 projects horizontally across the upper portion of the vessel 11 and includes a plurality of downwardly opening water nozzles 89 for discharge of cooling water over the tanks 31. A supply line 91 leads from an electric water control valve 93 to such manifold 87. A switch 94 is disposed in the path of the closing door 19 to be closed when such door is closed to open such valve.

In operation the door 19 is raised to its open position shown in FIG. 2 and the number of scuba tanks 31 to be filled are placed in the vessel 11 and have the respective supply conduits 27 coupled therewith. The control valve 81 of each respective conduit 27 is turned on and the workmen will then return to the work area 17 surrounding the vessel 11.

The workmen may then depress the handle 43 (FIG. 4) of the latch 39 to retract the bolt 45 from the bore 47 to free the door 19 for lowering. Such door will lower under its own weight and will drop to a closed position in covering relationship over the doorway 15 to bring the bolt bore 49 into alignment with the bolt 45 thereby resulting in the latch rotating clockwise to re-engage such bolt with the bore 29 to lock the door in its closed position. Closure of the door 19 closes the switch 94 to turn on the water valve 93 and introduce cooling water to the water manifold 87 to spray such cooling water from the nozzles 89 to maintain the tanks 31 cool during filling thereof. The air supply valve 83 is also turned on to commence pressurization of such tanks.

A portion of the cooling water sprayed from the nozzle 89 enters the upwardly opening water tank 61 and will be retained therein since the valve poppet 71 is in sealing relationship over the ports 69 (FIG. 3). The tank 61 will hold about 20 pounds of water and provides sufficient weight to, when coupled with the weight of the counter-weight 21, overbalance the door 19 thus resulting in such door being urged towards its open position once the tank 61 is filled.

In the event of one of the high pressure tanks 31 failing and releasing high pressure gas therefrom, such gas will be retained within the walls of the vessel 11 to be directed upwardly out through the discharge outlet 13 and away from the work area 17. Further, if such expanding gas renders the failed tank or other tanks airborne, the flying tanks and the debris resulting from the failure will be mainly retained beneath the gridwork formed by the grid bars 34 and 36 to prevent escape to the surrounding area.

After the tanks 31 are fully pressurized, the likelihood of failure thereof is substantially less than during pressurization thereof so opening of the door 19 and entry of personnel into the vessel 11 is relatively safe. The door 19 is opened by depressing the handle 43 (FIG. 4) to retract the bolt 45 from the bore 49 to free such door for opening. Since the water in the water tank 61 is of sufficient weight, when coupled with the counterweight 21 to overbalance the door 19, such door will be carried upwardly by such counter-weight 21 and tank 61 to open the doorway 15. Opening of the door 19 opens the switch 94 to de-energize the valve 94 and discontinue water flow to the nozzles 89. Downward travel of the water tank 61 and counter-weight 21 is limited by such water tank coming to rest on the shelf 60 to limit upward travel of such door to align the bore 47 with the latch bolt 45 to engage such bolt therewith and lock the door 19 in its open position shown in FIG. 2.

Resting of the tank 61 and counter-weight 21 on the shaft 60 tightens the valve lanyard 75 to draw the valve poppet 71 (FIG. 3) upwardly to the position shown in FIG. 3 to open the ports 69 for communication of water from the tank 61 to the outlet port 63 for drainage of such water to enable the door 19 to overbalance the combination tank 61 and counter-weight 21 for automatic closure once the latch 39 is again depressed. The individual control valves 81 may then be closed and the coupling hoses 27 disconnected from the respective tanks 31.

The expansive gas protective device shown in FIG. 5 is similar to that shown in FIGS. 1 and 2 except that it includes a doorway 101 which is relatively small for receipt of scuba tanks 103. A door 105 is provided for selective closing of the doorway 101 and is carried on the front extremity of a drawer 107 which is itself carried on rollers which roll on parallel tracks for convenient sliding inwardly and outwardly with respect to the doorway 101. Latches 109 are provided for closing the door 105 and such door includes hand-grasp handle 111 for convenient opening and closing thereof.

The expansive gas protective device shown in FIG. 5 operates substantially the same as that for the device shown in FIG. 1 except that the door 105 need not be counter-weighted. The scuba tanks 103 are placed di-

rectly on the drawer **107** when it is in its open position and the conduits **27** connected with such tanks. Thereafter, the door **105** may be pushed to roll the drawer **107** radially inwardly to close such door and the latches **109** may be secured to lock the door in position. The tanks **103** may then be pressurized and the latches **109** subsequently unlatched and the door **105** opened to withdraw the tanks **103** from the vessel **100.**

From the foregoing, it will be apparent that the expansive gas protective device provides a convenient and highly reliable means for protecting personnel working in the area of scuba tanks being pressurized and wherein the heavy door thereof is easily opened and closed.

I claim:

1. An expansive gas protective device for use in a work area for filling work-pieces and comprising:

a heavy walled protective vessel formed with a high pressure work piece chamber disposed in said work area and having a discharge outlet opening toward an area remote from said work area, said chamber including an access doorway disposed in said work area;

a high pressure source including connector means disposed in said chamber for connection with said work pieces;

a door for covering said access doorway;

counter-balance means connected with said door for urging it towards its open position and including a counter-balance fluid tank having an outlet port therein;

valve means controlling flow from said outlet port;

counter-balance fluid supply means for providing fluid to said tank; and

means for moving said door between an open and a closed position.

2. An expansive gas protective device as set forth in claim **1** that includes:

spray means for spraying cooling fluid into said chamber and wherein;

said tank is disposed in the path of fluid sprayed from said spray means and is open on the top side thereof for receipt of said fluid.

3. An expansive gas protective device as set forth in claim **2** that includes:

a fluid supply line leading to said spray means;

fluid control means in said line and responsive to closing of said door to deliver fluid to said tank and opening of said door to discontinue fluid delivery to said tank.

4. An expansive gas protective device as set forth in claim **1** wherein said:

counter-balance means includes a counter-balance weight having a weight slightly less than the weight of said door and said tank has sufficient capacity to hold a sufficient quantity of said fluid to, when coupled with the weight of said counter-balance weight, overbalance said door.

5. An expansive gas protective device as set forth in claim **4** that includes:

means responsive to opening of said door to open said valve means and responsive to closing of said door to close said valve means.

6. An expansive gas protective device as set forth in claim **4** that includes:

spray means for spraying cooling fluid into said chamber and wherein;

said tank is disposed in the path of fluid sprayed from said spray means and is open on the top side thereof for receipt of said fluid.

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