Dec. 25, 1962 J. R. ALLGOOD ETAL 3,069,993

VENTILATOR BLAST CLOSURE

Filed June 7, 1960 2 Sheets-Sheet 1

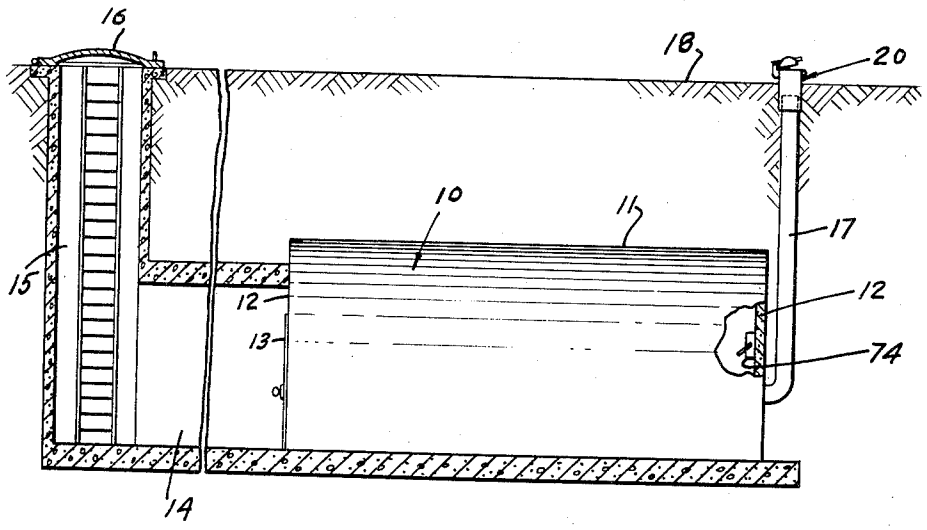
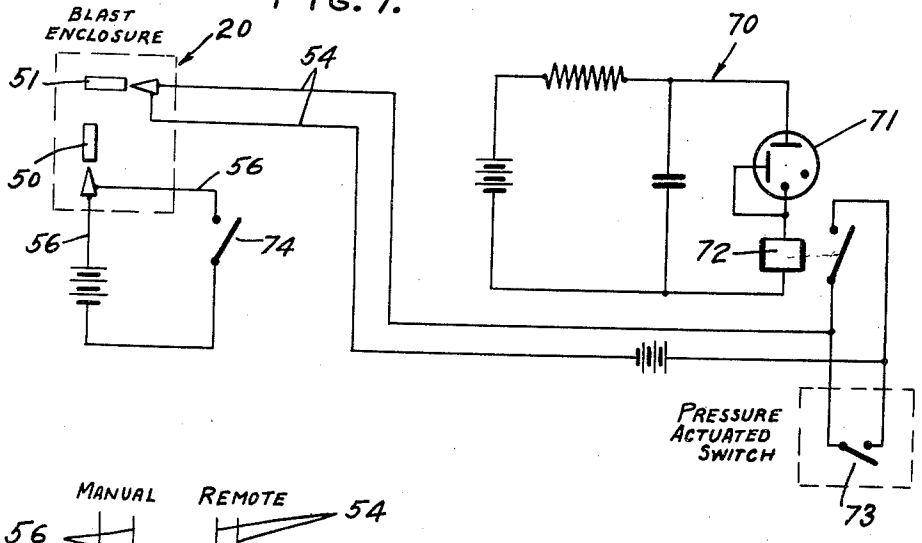


FIG. 1.

FIG. 7.



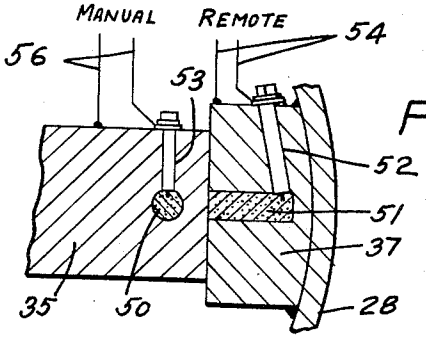


FIG. 6.

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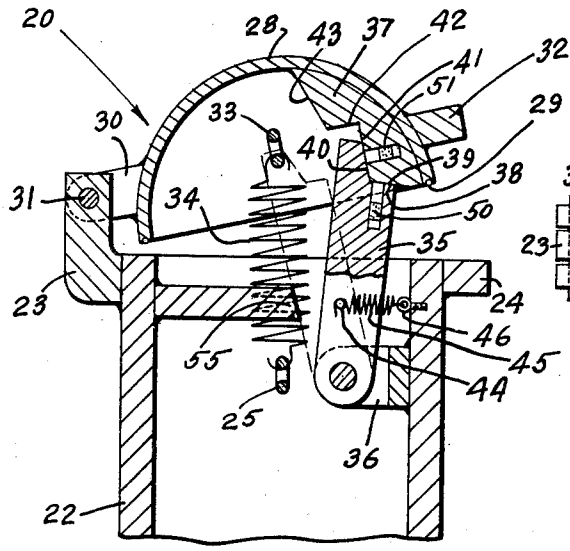


FIG. 2.

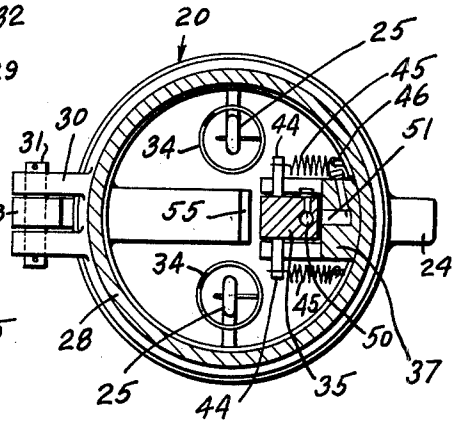


FIG. 4.

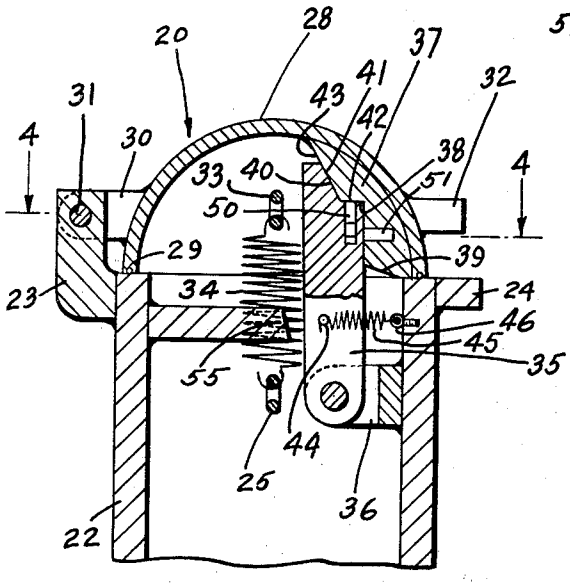


FIG. 3.

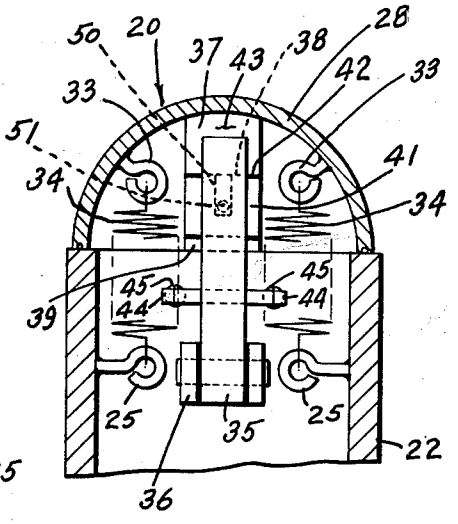


FIG. 5.

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VENTILATOR BLAST CLOSURE

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Filed June 7, 1960, Ser. No. 34,596

3 Claims. (Cl. 98—119)

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

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

This invention relates generally to the ventilation of underground personnel shelters for use in the vicinity of possible nuclear bomb attacks and specifically to a ventilating closure which may be primarily actuated by the bomb blast itself.

One of the most important considerations in the design of underground shelters for use in the protection of personnel from nuclear attacks is adequate ventilation. Normally, such ventilation may be provided by one or more ventilation pipes or ducts reaching from the shelter to the surface of the ground above. In the event of the explosion of an atomic bomb within effective ranges of the shelters, some provision must be made to immediately seal-off the above ground ventilation duct opening. Such sealing-off provision should, for maximum protection, be triggered by functions of the blast itself, either light or pressure. When the worst effects from the nuclear bomb have passed on over the location of the shelter, some means must be provided for opening the closure device from inside the shelter as the surface would still be dangerous from radioactive fallout or other effects from the bomb. A certain amount of pressurization from bottled air or oxygen could be provided in the shelter to prevent the ingress of infected air through the ventilation duct.

The object of this invention, therefore, is to provide a ventilator blast closure for the ventilating ducts of underground bomb shelters which closure may be actuated remotely.

A further object of this invention is to provide such ventilator blast closure with means so that it may be automatically actuated into the closing position by a function or effect of the nuclear blast itself.

Another object of this invention is to provide a ventilator blast closure that may be opened remotely from within the underground shelter.

Other objects and advantages of this invention will be appreciated in conjunction with the following detailed description and accompanying drawing wherein:

FIGURE 1 is a partially cross-sectional elevation of the underground shelter showing the ventilation duct and the blast closure therefor;

FIG. 2 is a cross-sectional side elevation of the invention showing the device in open position;

FIG. 3 is a similar view showing the device in the closed position;

FIG. 4 is a sectional plan view taken on the line 4—4 of FIG. 3;

FIG. 5 is a cross-sectional front elevation;

FIG. 6 is a detail view of a portion of the invention; and

FIG. 7 is a schematic diagram of the electrical circuitry used in the invention.

With reference to FIG. 1 showing the general arrangement, the underground shelter 10 may be constructed of reinforced concrete with a hemispherical roof 11 and end walls 12. A heavy door 13 is provided in one of the end walls which opens from the shelter into a protected horizontal passage 14 which, in turn, communicates

with a laddered vertical shaft 15. This latter shaft or passage may be covered with a heavy cover 16 which may be hinged or otherwise arranged for being secured in place by the last person descending shaft 15.

A ventilating duct 17 communicates with the interior of the shelter through the other end wall 12 and is extended upwardly until it rises just below the surface 18 of the ground over the shelter. The blast closure 20 is placed over the upper end of the duct 17 and may be flush with the surface 18 or extend slightly above it as shown. The blast closure 20 may be secured to the duct by welding or other mode of fastening or may be held in place by securely tamping the earth around it.

With reference now to FIGS. 2 to 6, inclusive, blast closure 20 comprises a hollow cylindrical standpipe 22 and a hinged hemispherical lid 28 adapted to fit snugly over the end of the pipe 22 and be sealed thereto. O-ring 29 is fitted into the lower edge of the lid 28 for providing the seal between the lower edge of the lid and the upper machined surface of the pipe 22. Hinge bar 23 may be welded or otherwise suitably secured to the upper end of the pipe 22. Hinge 30 may be so secured to the lid 28 so as to cooperate with the hinge bar 23. Hinge pin 31 holds the two hinge parts together. Lug 32 is welded or secured to the lid opposite the hinge 30 and may be used to lift the lid manually or, in conjunction with lug 24, may be used to clamp the lid onto the top of pipe 22 as during periods of non-use of the shelter.

Diametrically opposed hook eyes 33 are welded or otherwise suitably secured to the inside of the lid on a line normal to the line passing through hinge 30 and the lug 32. Corresponding hook eyes 25 are secured to the walls of the pipe 22. Secured to and stretched between corresponding hook eyes 33 and 25 are two heavy tension springs 34. These springs are heavy enough and are under sufficient tension to hold the lid securely in sealing relationship with the top of the pipe 22 under the effects of the high pressure from the bomb blast and also from the negative pressure phase when the external pressure is reduced to a low level and the pressurized air in the shelter would otherwise tend to force the lid open.

Trigger 35 is provided to hold the lid 28 open against the tension of the springs 34. This trigger is pivotally supported by hinge 36 which may be welded to the inside wall of the pipe 22. Trigger and its associated hinge are installed in line with the diametrical line established by hinge bar 23 and lug 24. The upper end of the trigger is notched, as shown, to conform to a similar notch in the trigger sector 37 which latter part is welded on to the inner wall of the lid 28. Thus, the horizontal surface 38 on the upper portion of the trigger cooperates with the lower horizontal surface 39 of the trigger sector 37 and the corresponding inclined vertical surfaces 40 and 41 mate to hold the lid open. When the trigger is forced into the vertical position as will be explained later, the surfaces previously mentioned disengage and trigger surface 38 is disposed adjacent to sector horizontal surface 42 and trigger inclined surface 40 engages sector inclined surface 43.

Trigger 35 is provided with a crossbar 44 to the ends of which are secured two tension springs 45. The other ends of these springs 45 are secured to small hook eyes 46 which may be threaded into holes in the inner side of the pipe 22. These springs 45 urge the trigger outwardly so that when the lid is raised from the closed position (FIG. 3) to the open position (FIG. 2), the trigger moves outwardly to engage the lower surfaces of the trigger sector in the lid so as to hold it open.

Two bores are provided in the trigger and trigger sector for holding explosive charges 50 and 51. The bore for

the explosive charge 50 in the trigger is formed normal to the trigger horizontal surface 38. The bore for the explosive charge 51 in the trigger sector of the lid is formed normal to the sector inclined vertical surface 41. Thus, when the lid is in the open position (FIG. 2) and explosive charge 51 is set off, the expanding gases or the shock wave from charge 51 impinges on trigger inclined surface 40 and forces the trigger to the left against the stop 55 as shown by the dotted lines. The springs 34 then force the lid down on top of the pipe 22 in sealing relationship. When it is desired to open the blast closure from the closed position (FIG. 3), explosive charge 50 in the trigger is set off and the expanding gases or the shock wave from charge 50 impinges vertically against the horizontal sector surface 42 thus forcing the lid upward. As the latter occurs, the trigger swings to the right under the influence of the tension springs 45 to engage sector lower surface 39, and the lid is held open again. After the emergency has passed, lid 28 may be manually opened and the expanded explosive charges 50 and 51 may be replaced.

One type of circuitry which may be used for exploding the explosive charges 50 and 51 is schematically indicated in FIG. 7. The circuit comprises a photoelectric relay circuit 70 including a photoelectric tube or cell 71 and the normally open switch relay 72. A pressure actuated normally open switch 73 may be provided in parallel with relay 72. As either or both switches are closed, electric current is introduced into the detonating cap of charge 51 and it is then exploded. It is understood, of course, that, though not shown, photoelectric cell 71 and pressure actuated switch 73 are located on the ground surface in the proximity of the buried shelter with leads leading into the shelter or the pipe 22 and connected to the closing explosive charge 51. The circuit for exploding the opening charge 50 merely includes a source of E.M.F. and a normally open manually operated switch 74.

FIG. 6 suggests one possible way of electrically exploding the charges 50 and 51. Additional side bores 52 and 53 are provided in sector 37 and trigger 35 which intersect the bores holding the charges 51 and 50. Electrical detonating caps may be placed therein and connected to the leads 54 and 56. Other methods of electrically setting off the explosive charges 50 and 51 may be utilized.

Having thus described and illustrated a preferred embodiment of our invention, we do not intend to be limited thereby. Many modifications may suggest themselves to those skilled in the art. It is considered that all such modifications may well fall within the spirit of our invention and the scope of the appended claims wherein we claim as new and desire Letters Patent thereon:

1. A blast closure for the ventilating ducts of underground protective shelters located in the vicinity of high order explosive blasts comprising, in combination:

a hollow standpipe adapted to fit over the upper end of said ventilating duct;

a lid hingedly pivoted on the upper end of said standpipe and adapted to sealingly engage said upper standpipe end;

resilient means for holding said lid in sealing relationship with said upper standpipe end;

a trigger sector secured to the lower inner side of said lid, said trigger sector having a notched configuration consisting of two upper and lower substantially horizontal surfaces and two upper and lower substantially vertical surfaces;

a trigger pivotally supported in the interior of said standpipe and extending substantially vertically thereof, the upper end of said trigger having a notch consisting of one substantially horizontal surface and one substantially vertical surface, said trigger surfaces mating with the corresponding surfaces on said trigger sector whereby when said trigger notch mates with the lower surfaces of said trigger sector, said lid is held in the open position and when said trigger notch mates with the upper surfaces of said trigger sector, said lid is positioned in sealing engagement with the upper end of said standpipe;

a bore in said trigger sector normal to the lower of said substantially vertical surfaces;

an explosive cartridge contained in said bore; and

means responsive to said high order explosive blast for actuating said explosive cartridge whereby said trigger is forced away from said trigger sector and said lid is forced into sealing engagement with the upper end of said standpipe.

2. A blast closure as claimed in claim 1 further characterized by said trigger having a bore normal to the substantially horizontal surface of said trigger notch;

an explosive cartridge contained in said trigger bore;

manually operated electrical means located in said underground structure for actuating said explosive cartridge; and

resilient means connected between said trigger and the interior wall of said standpipe for forcing said trigger toward said standpipe wall whereby, when said lid is in closed position and said trigger notch mates with the upper surfaces of said trigger sector, said lid will be forced open by the explosion of said explosive cartridge, and said trigger notch will be moved to mate with the lower surfaces of said trigger sector and said lid will be held in open position.

3. A blast closure as claimed in claim 1 wherein said means responsive to said high order explosive blast include light and pressure responsive devices sensitive to the phenomena of light and pressure waves created by said high order explosive blast.

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