

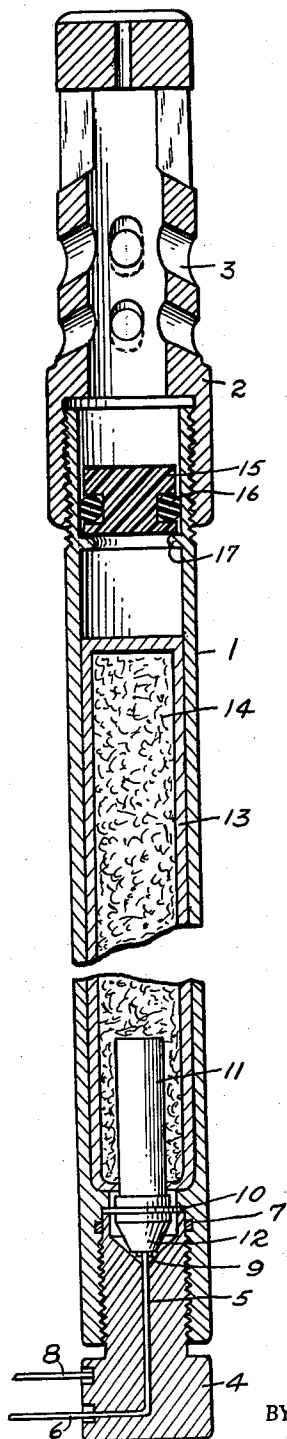
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BLASTING DEVICE

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BLASTING DEVICE

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1 Claim. (Cl. 102—25)

This invention relates to blasting devices of the kind in which a charge of non-detonating gas-producing materials, together with a suitable initiating means, is enclosed in a rigid cylindrical container provided with a closure member adapted to release the gases from the container at a predetermined pressure so that a blasting effect is produced in a borehole, the body of the container being sufficiently strong to withstand the pressure developed and being capable of re-utilisation. The gas-producing charge may comprise a slow burning explosive such as blackpowder or other composition capable of undergoing non-detonating gas-producing thermal decomposition when initiated by merely local heating or any other suitable gas-producing material such as, for example, a highly compressed or liquefied or solidified gas.

In blasting devices of this kind the gas release member usually takes the form of a rupturable mild steel disc sealing the end of the container, which may be of reduced bore, from a venting cap which is screwed thereto and thereby holds the rupturable disc in position. A gas-tight seal is achieved by having a resilient gasket on one or both sides of the disc and screwing the venting cap down tightly. Occasionally it happens that as a result of a faulty gasket or of the venting cap not being tightly screwed down an effective seal is not obtained. Because of this an efficient blasting effect may not be achieved. Another serious disadvantage associated with such leaks in the system is that the escaping gases pass between the threads of the container and those of the venting cap and in so doing cause rapid corrosion to take place as a result of which the life of the device is seriously reduced.

It has now been found that this disadvantage can be overcome and a good seal together with an efficient blasting effect achieved by using a bursting disc which provides its own seal and which is independent of the joint of the container with the venting cap.

According to the present invention the improved blasting device of the kind in which a charge of non-detonating gas-producing material together with a suitable initiating means is enclosed in a rigid cylindrical container closed or fitted with a gas tight closure at one end and fitted at the other end with a venting cap separated from the container by an expendable bursting disc is characterised in that the bursting disc is in association with at least one O-ring of resilient material and of such external diameter as to fit tightly against the internal surface of the cylindrical container and in that it is such a unitary structure with at least one of said O-rings that at least one of said O-rings forms an effective seal under pressure.

Preferably at least one O-ring which forms a unitary structure with the bursting disc is in a depression in the surface which separates the two end surfaces of the bursting disc.

If desired at least one O-ring which forms a unitary structure with the bursting disc is in a depression in an extension of the exposed surface which separates the two end surfaces of the bursting disc.

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The unitary structure of the bursting disc and an O-ring may also result from the O-ring being held in position in the separation which is formed by the bursting disc being sandwiched between two rings each of greater external diameter than the diameter of the bursting disc.

The bursting disc may be a steel disc provided at its periphery with a portion of sufficiently increased thickness to enable it to provide a housing for the O-ring. Alternatively the bursting disc may be of a filled or unfilled synthetic resin in which case it may be of uniform overall thickness. If desired, however, the circumferential annular section of the disc may be of greater thickness than the bulk of the disc. Filled synthetic resin discs are preferred on account of their ease of manufacture, cost and manner of bursting. Generally the diameter of the bursting disc should preferably be such that it is a sliding fit in the container so that on the application of pressure by the generation of gas the O-ring forms an effective seal.

The combined bursting disc and seal may be inserted into the cylindrical container so that it is located in position by an abutment on the side away from the gas-producing charge, for example, it may be so positioned that the end of the venting cap serves to locate it. Alternatively, it may merely be positioned in the tube near such an abutment so that on the generation of pressure it is first moved against the said abutment before the O-ring comes into action. It is preferred, however, that the disc and tube should be so arranged that on screwing on the venting head the disc is located, without being subjected to pressure, between an abutment such as a shoulder in the tube and in the venting head. Any of the known types of venting head may be used in the blasting devices of the invention there being no need for any modification thereof. In the type of pressure-resisting container normally used the end of the container is of reduced bore and thus provides a shoulder to act as a seating for the bursting disc. In the pressure-resisting containers used in accordance with the invention there is no need for such a reduction of bore and in fact an increase in bore is in some instances preferred for example to enable a shoulder to be formed within the container to assist in positioning the bursting disc. An advantage of having containers of uniform bore or having an enlarged bore near the end is that closely fitting packed gas-producing charges can be used thus allowing a considerable saving in the time cycle of use.

The O-ring may be made of any suitable resilient material such as a rubber or neoprene which will withstand the temperature and pressure occurring for the time which is taken to build up the bursting pressure within the rigid container.

In the drawing, there is shown a blasting device with one embodiment of the bursting disc. Element 1 is a high tensile steel container, 2 is a venting head having ports 3. Firing head 4 includes positive insulated leading wire 5, a positive terminal 6, a gasket 7, a negative terminal 8, a positive terminal ball contact maker 9, a flanged copper ring 10, a fireproofed cardboard cylinder 11 containing a heating charge such as black powder actuated by an electric fusehead (not shown), and a wooden plug 12 through which a positive lead passes from the ball contact maker 9 to said electric fusehead. Element 13 is a fireproofed cardboard container for the main charge 14 and element 15 is a bursting disc formed of a laminated paper-filled phenolic resin which forms a pressure-tight seal by means of a rubber O-ring 16. Numeral 17 designates an exemplary internal, annular shoulder constituting an abutment for retaining the disc 15, as indicated.

The invention is also illustrated by the following example.

Example

Into a pressure-resisting container of capacity 3,000 cc. similar to that illustrated in the diagrammatic drawing there is inserted a gas-producing charge consisting of 20 oz. of a composition comprising 49% by weight ammonium nitrate, 34% by weight magnesium nitrate hexahydrate and 17% by weight woodflour together with a chemical heating charge consisting of 4 oz. of a composition comprising 60% by weight guanidine nitrate, 31.5% by weight potassium persulphate, 8% by weight cuprous chloride and 0.5% by weight mineral jelly, and a safety igniter. A nylon bursting disc of diameter 1.871 inches and 0.5 inch thick with a groove containing a rubber O-ring of diameter 0.125 inch on its circumferential surface is inserted into the end of the tube near the venting head where the internal diameter is 1.875 inches. The safety igniter is fired and the device vents after 3.6 seconds at a pressure of 12.4 tons/sq. in. without leakage of gas prior to bursting.

What we claim is:

In a reutilizable blasting device of the kind including a pressure resisting cylindrical container open at one end, a venting head secured to said one end of said container and having an internal annular shoulder disposed adjacent said one end of said container, and a non-detonating, gas-producing charge therein wherein said con-

tainer is adapted to vent at a predetermined pressure by rupture of a bursting disc, the improvement which comprises a bursting disc fitted in said container and having an O-ring positioned around the periphery of said disc and in engagement with the peripheral cylindrical surface of said disc, said O-ring being in engagement with said container and of an external diameter larger than the internal diameter of said container whereby prior to the generation of the venting pressure a gas-tight seal is effected by the frictional engagement of said O-ring to said container, and said container having an internal annular abutment therein, said abutment being positioned a greater distance away from the shoulder on said venting head than the thickness or axial dimension of said bursting disc.

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