Dec. 12, 1967 D. F. FITZGIBBON, JR 3,357,193

TEMPORARY CLOSURE DEVICE FOR BLASTING HOLES AND THE LIKE

Filed Feb. 4, 1966

Fig. 1

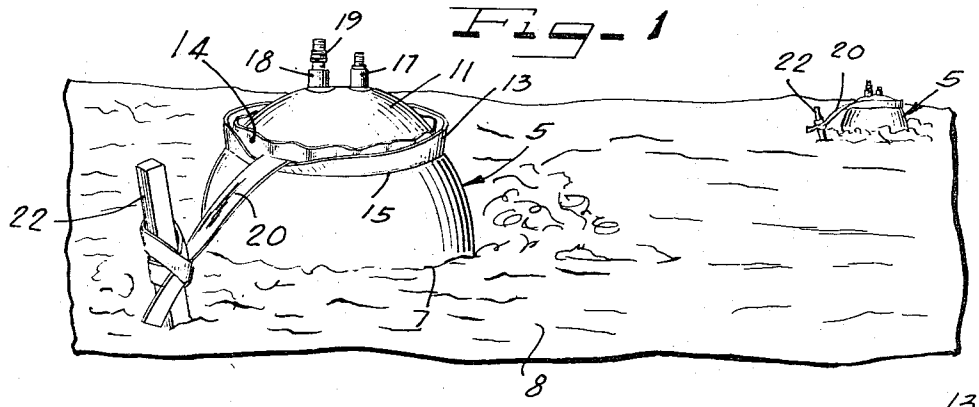


Fig. 2

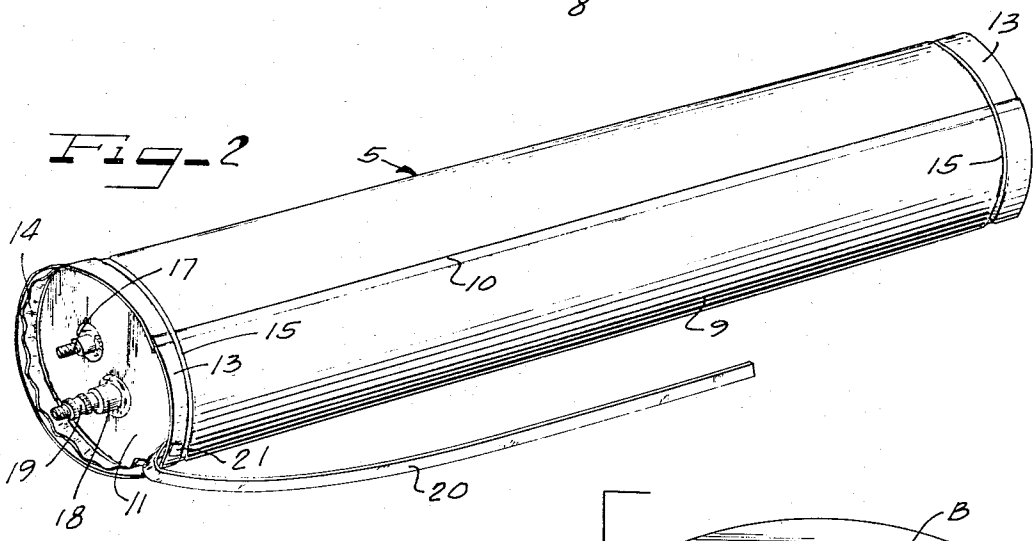


Fig. 4

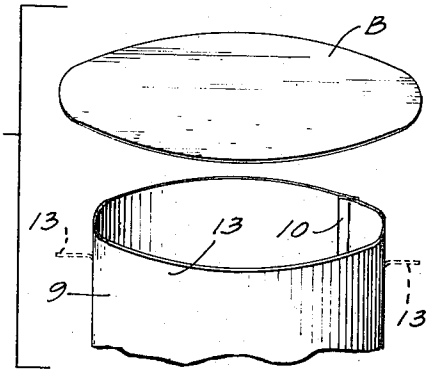
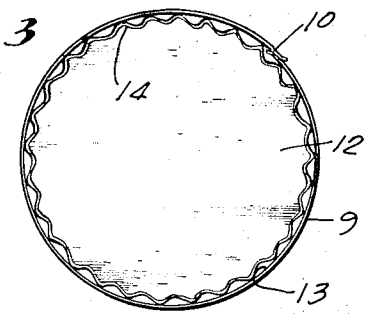


Fig. 3



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United States Patent Office 3,357,193
Patented Dec. 12, 1967

3,357,193

TEMPORARY CLOSURE DEVICE FOR BLASTING HOLES AND THE LIKE

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Filed Feb. 4, 1966, Ser. No. 525,168
2 Claims. (Cl. 61—35)

This invention relates to improvements in devices for temporarily closing blasting holes and the like, and more particularly concerns an inflatable, reusable container for this purpose.

In various blasting operations a number of spaced explosive-receiving holes must be drilled into the formation to be shattered. Such holes are generally several feet deep, and often must remain idle for some time while additional holes are being drilled, while other work is being done before the blasting is called for, while operations at the site are temporarily suspended for weather or other reasons, and the like. During such idle periods debris, sludge, loose dirt, water, snow, and the like, may enter the hole, or even cover the hole. During severe freezing weather an ice collar may form over the outer end of the hole.

Accordingly, it is an important object of the present invention to provide a new and improved device for temporarily closing holes, such as blasting holes, which are liable to incursions of or blockage by undesirable material.

Another object of the invention is to provide a new and improved temporary closure device for blasting holes and the like comprising an inflatable, reusable container made entirely from resilient sheet material.

A further object of the invention is to provide a new and improved temporary closure device of the character described which is readily inflatable from a fully collapsed condition to a distended hole-closing condition and is partially deflatable in service manipulation for insertion and removal in respect to holes of larger than the normal diameter of the container.

Another object of the invention is to provide a new and improved temporary closure device of the character described including means for leashing or anchoring the device against dropping into a deeper hole than the length of the device.

Yet another object of the invention is to provide a new and improved method of closing a blasting hole or the like.

Other objects, features and advantages of the present invention will be readily apparent from the following detailed description of a preferred embodiment thereof taken in conjunction with the accompanying drawing, in which:

FIGURE 1 is a perspective view representing a blasting area and showing two closure devices according to the present invention in use;

FIGURE 2 is an isometric view of one of the inflatable, reusable hole-closing containers showing the same in a partially inflated condition;

FIGURE 3 is a rear or lower end view of the container of FIGURE 2; and

FIGURE 4 is a fragmentary exploded assembly view showing one end of the tubular container body and one of the end closure disks to be sealingly attached thereto.

According to this invention, a temporary closure device 5 in the form of an inflatable, reusable container is inserted into a hole 7 such as a blasting hole to receive explosives and drilled in a blasting area comprising a rock formation 8, or the like. Often a substantial number of the blasting holes 7 are drilled in the formation and

must for some reason stand idle, so that there is a liability of incursion of debris, rain water, snow, ice, and the like. Merely laying a board or other type of cover across the open end of the hole will generally not prevent rain water from entering or frost from developing an ice collar, especially adjacent to the outer end of the hole in severely cold weather. Such covers are also liable to easy dislodgement.

Construction of the container 5 is such that it is not only quickly and easily applied in closing relation to a blasting hole or the like, but effectively substantially seals the hole throughout a substantial length thereof, and is quickly and easily removable for reuse in another hole. To this end, the container 5 comprises an elongated tubular body 9 made from resilient sheet material of which a suitable all-weather fairly heavy gauge, air impervious, thermoplastic sheet is especially satisfactory. Sheet material of this kind is readily available and retains its elasticity throughout a temperature range at least such as may be encountered under outdoor weather conditions. Initially the material of the tubular body 9 comprises a rectangular sheet of the material of such length and width as to define, when the longitudinal margins are brought into overlapping relation a tube of the desired diameter and length. An airtight heat seal seam 10 joins the overlapping longitudinal margins. In a practical example, the body 9 has been constructed to afford a tube of about 6½ inches in diameter and about 4 feet in length.

An airtight closure is provided for each opposite end of the tubular body 9, comprising an end closure disk 11 at one end and a similar end closure disk 12 at the opposite end. In a desirable construction, each of the end disks 11 and 12 is made from the same resilient thermoplastic sheet material as the body 9 and initially comprises a flat disk blank B (FIG. 4) of limited larger diameter than the tube diameter of the body 9. Assembly of the disk blank B with its end of the body 9 is desirably effected by uniformly moving the disk into an end margin 13 at the associated open end of the container body by turning up a marginal flange 14 generally normal to the plane of the disk, and may be effected by centering the disk over the end of the margin 13 and thrusting the disk inwardly so that the disk margin 14 telescopes into the body margin 13, with the disk inset relative to the body margin. An airtight joint is then effected by means of an annular continuous heat seal seam 15 which secures the margins 13 and 14 together. The resulting container may be stored and shipped in collapsed, flattened condition and may then be inflated for use.

Means for inflating the container are desirably mounted on one end portion thereof, conveniently on one of the end disks, such as the disk 11. A manually releasable one-way check valve device, such as a valve stem 17 of well known construction may be utilized, of the type commonly used for inflating automobile tires. Such a valve stem has a check valve which is provided with a rod adapted to be depressed when it is desired to deflate the container. For additional convenience, auxiliary to the automatic check valve 17, a second valve stem device 18 is desirably provided which comprises a manually rotatably openable and closeable valve including a tubular rotary stem portion 19. This facilitates rapid deflation of the container, especially in cold weather.

After the hole 7 has been drilled, the closure device container 5 in either uninflated or partially inflated condition is inserted into the hole, with the end portion having the inflating means 17 and 18 projecting outwardly from the hole, and especially outwardly sufficiently to have the heat seal seam 15 spaced from the outer end of the hole. Inflation of the container 5 then is effected to distend the body 9 resiliently until it effects snug and pref-

erably fairly tight engagement with the wall defining the bore of the hole. This results in the body **9** beyond the opposite end margins **13** expanding beyond the diameter of the heat seal seams **15** to the full diameter of the hole bore and throughout the length of the container body **9** between the annular heat seal seams **15**. Thereby, the bore of the hole **7** is effectively closed against entry of water, snow, debris, and the like. Further, since the container body **9** hugs the bore wall, collapse of any soft material defining the bore is resisted. Also, formation of an ice collar over the outer end of the hole in severely cold weather is precluded. Prevention of ice collar formation is also desirably precluded throughout the extent of the frost depth of the area, by having the length of the container such that it extends inwardly beyond the frost line. In most regions, within the temperate zone, at least, a four foot length in the container body **9** is ample to defeat ice accumulation on the wall of the hole bore. Since the material of the closure container **5** is resiliently flexible, damage to the portion thereof protruding beyond the open end of the hole is substantially avoided by the ability of the exposed portion to yield under pressure such as may be imposed by dropping of objects thereagainst, stepping thereon, vehicle wheel pressure, and the like.

To prevent the container **5** from accidentally falling into the hole **7** when deflated, an anchoring leash member **20** is desirably provided. In a convenient, practical construction, the leash member **20** comprises a suitable strip of substantial length of the same plastic material as the body **9** and the end disks **11** and **12**. One end portion of the leash strap **20** is secured as by means of a thermoplastic weld joint **21** to preferably the inner side face of the margin **13** adjacent to the end disk **11** which carries the inflating means. In use, the leash **20** is adapted to be attached to a convenient anchorage adjacent to the hole **7**, such as by tieing it to a stake **22**, or the like. In the field, such stake **22** may accompany the associated closure device **5** from hole to hole. Since the normal diameter of the container body **9** is predetermined to be at least slightly smaller than the diameter of the hole **7**, it is easy to disengage the closure container **5** by deflating it to the normal diameter of the body, without further deflation, so that upon inserting the closure container into another hole only minimal reinflation will effect securement by snug engagement with the bore of the hole.

Another method of making the container **5** is to complete the tubular body **9**, turn the respective end margins **13** from their endwardly extending position as indicated in full line in FIG. 4 to an outwardly extending position as by retroversion or lateral flattening indicated in dash outline. This is entirely feasible because of the excellent elastic flexibility of the sheet material. Then the margins of the respective end disk blanks B are substantially centered and lappingly engaged with the respective margins **13** and permanently sealingly secured by means of the heat seal seams **15**. Lastly, the body margins **13** are returned to the endwardly extending position thereof, facilitated by the resiliency of the body material.

It will be understood that variations and modifications may be effected without departing from the spirit and scope of a novel concept of this invention.

I claim as my invention:

1. A method of closing a blasting hole or the like which comprises:

inserting into the hole an elongated inflatable container of a normal diameter smaller than the hole so as to fit freely into the hole,

maintaining an end portion of the container projecting outwardly from the hole,

inflating the container and thereby distending it into tight engagement with the surrounding wall defining the hole, and

leashing said projecting end portion of the container against accidental dropping of the container into the hole.

2. The method according to claim **1**, in which said container is extended inwardly into the hole beyond the normal frost line in the area containing the hole.

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