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ABSTRACT

A blast hole liner is formed from a length of flexible tubing sized to be received in a blast hole. The tubing is formed with first and second longitudinally extending opposed gussets. Preferably the gussets are arranged symmetrically about a centerline of the liner. The gussets have inner creases which are spaced apart or abut one another, so that the lay-flat width of the flexible tubing is from 20% to 50% less than that of ungusseted tubing of the same diameter. The liner can be formed from an extruded material containing LDPE or HDPE, a co-extrusion of different materials, or a woven fabric.
Blast hole liner

BACKGROUND OF THE INVENTION

This invention relates to a blast hole liner and to a method of lining blast holes.

In surface mining operations blasting is generally carried out by drilling a pattern of holes into a geological formation. The holes are filled with explosive, typically in liquid or gel form, which is detonated to break up the rock of the formation.

When cracks are present in the geological formation, explosive pumped down the holes can leak into the cracks, affecting blasting. The cracks may be formed due to previous blasts nearby, or may be formed naturally. When such cracks are encountered, blasters commonly line the holes from top to bottom using a plastic liner that is supplied in roll form.

One problem encountered with this technique arises from the need to stock a number of different sizes of liner for use with holes of different diameters. Another problem is that the liner tends to snag and jam as it is lowered down the hole in use.

It is an object of the invention to provide an alternative blast hole liner.

SUMMARY OF THE INVENTION

According to the invention there is provided a blast hole liner comprising a length of flexible tubing formed with at least one longitudinally extending gusset and sized to be received in a blast hole.

The blast hole liner may include first and second longitudinally extending opposed gussets formed in the flexible tubing.
The first and second opposed gussets are preferably arranged symmetrically about a centerline of the liner.

In a preferred embodiment, inner creases of the first and second opposed gussets are spaced apart or abut one another so that the lay-flat width of the flexible tubing is from 20% to 50% less than that of un-gusseted tubing of the same diameter.

The tubing of the blast hole liner may comprise an extruded material containing LDPE or HDPE, a co-extrusion of different materials, or a woven fabric, for example.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view of a prior art blast hole liner in roll form;

Figure 2 is a perspective view of a blast hole liner in roll form according to an example embodiment of the present invention;

Figures 3 to 5 are schematic side views of a blast hole showing how the blast hole liner of Figure 2 is deployed in the blast hole in use; and

Figure 6 is a schematic side view of the same blast hole, showing explosive being pumped into the deployed blast hole liner.

DESCRIPTION OF A PREFERRED EMBODIMENT

The present invention aims to provide a blast hole liner which is versatile and easy to use. Currently, blast hole liners are used which comprise
recycled LDPE tubing. The tubing is provided in rolls, in a lay-flat form. A length of tubing of the appropriate size is unrolled and fed down a blast hole to line it. A prior art blast hole liner comprising a roll 10 of LDPE tubing 12 in a lay-flat configuration is shown in Figure 1.

A disadvantage of the liners available currently is that a range of differently sized liners is needed to accommodate a corresponding range of standard hole diameters, meaning that mines need to stock a range of liners of different size. Common blast hole diameters range from 89mm to 349mm. For example, a 171mm blast hole diameter typically requires a prior art liner comprising lay-flat tubing of 270mm width, and so on.

The existing blast hole liners are lowered down the holes as a flat tube, and tend to get stuck and jam in the hole when lowered, in particular as the lay-flat width of the liner is greater than the diameter of the hole.

The present invention provides a blast hole liner comprising gusseted tubing which, when folded into a lay-flat configuration, is substantially narrower than conventional lay-flat tubing. In a preferred embodiment, the gusseted tubing has a pair of opposed gussets which reduce the width of the tubing, in its flattened configuration, by about 20% to 50%.

A blast hole liner according to an example embodiment of the present invention is shown in Figure 2, and comprises a roll 14 of gusseted tubing 16. The tubing 16 used may be manufactured from an extruded material containing LDPE or HDPE, a co-extrusion of different materials, or woven fabric such as woven polypropylene, for example. A combination of two or more of the above materials can be used. The main requirements are flexibility, adequate strength and imperviousness to the explosive material used.

The tubing 16 is formed in a lay-flat configuration, with a pair of inwardly extending gussets 18 and 20 at opposed longitudinal edges thereof. Respective inner creases 22 and 24 of the gussets 18 and 20 abut one
another, or are spaced apart from one another, along the length of the tubing 16. In some cases, the creases 22 and 24 could overlap.

Taking conventional lay-flat tubing as a starting point, by creating gussets with inner creases which abut one another along the centreline or longitudinal axis of the lay-flat tubing, the lay-flat width of the gusseted tubing is reduced by half. If the inner creases of the gusseted tubing do not abut one another but are spaced apart somewhat, the reduction in width of the gusseted tubing compared with the width of prior art lay-flat tubing will be somewhat less. In the preferred embodiment, the lay-flat width of the gusseted tubing is from 20% to 50% less than that of un-gusseted tubing of the same diameter.

By way of example, a length of gusseted tubing according to the invention, corresponding to a length of lay-flat tubing having a width of 320mm, is provided with a pair of symmetrical gussets of maximum size (i.e. with their inner creases abutting). This reduces the lay-flat width down to approximately 160mm, suitable for use in holes with diameters ranging from approximately 140mm to 200mm. To cover this range normally, mines would typically be required to stock five different widths of lay-flat tubing. The narrower 160mm gusseted tubing can also be fed into the blast holes much more easily due to the reduced width thereof.

Thus, it will be appreciated that a relatively small range of different sizes of the gusseted blast hole liner can replace a relatively large number of conventional lay-flat blast hole liners. A range of liners according to the invention made from 200mm, 300mm and 400mm lay-flat tubing and provided with gussets as described above can cover the range of blast hole diameters from 89mm to 349mm.

Figures 3 to 6, which are not to scale, show schematically how the blast hole liner of the present invention is used in a typical application.
In Figure 3, a roll 14 of a woven-type gusseted blast hole liner, comprising a tube 16 with opposed dual gussets, is shown above a blast hole 26. A blaster makes a knot 28 about a meter from the free end 30 of the tube 16. A quantity of sand, drill cuttings or other particulate material 32 is fed into the tied end and another knot 34 is tied at the end of the tube 16. This creates a weight at the end of the liner which makes it easier to lower the tubing down the blast hole, as shown in Figure 4.

Once the weighted end of the liner has been lowered to the bottom of the hole 26, it can be cut, as shown in Figure 5, and a nozzle 36 at the end of a hose 38 connected to the outlet of a pump 40 is used to fill the liner with explosive 42. Once the required quantity of explosive has been filled into the liner, the upper end of the liner can be closed and a detonator can be fitted in a conventional way.

The described invention is relatively simple to manufacture but is surprisingly advantageous in use compared with prior art blast hole liners.
CLAIMS

1. A blast hole liner comprising a length of flexible tubing formed with at least one longitudinally extending gusset and sized to be received in a blast hole.

2. A blast hole liner according to claim 1, including first and second longitudinally extending opposed gussets formed in the flexible tubing.

3. A blast hole liner according to claim 2 wherein the first and second opposed gussets are arranged symmetrically about a centerline of the liner.

4. A blast hole liner according to claim 3 wherein inner creases of the first and second opposed gussets are spaced apart or abut one another so that the lay-flat width of the flexible tubing is from 20% to 50% less than that of un-gusseted tubing of the same diameter.

5. A blast hole liner according to any one of claims 1 to 4 comprising an extruded material containing LDPE or HDPE, a co-extrusion of different materials, or a woven fabric.