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McKee

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[54] **EXPLOSIVE CARTRIDGE**

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[52] **U.S. Cl.** ..... **102/24 R**

[51] **Int. Cl.²** **F42B 3/00**

[58] **Field of Search** ..... 102/24 R

[56] **References Cited**

UNITED STATES PATENTS

1,543,850	6/1925	Holderer	102/24
2,378,223	6/1945	Johnson	102/24
3,122,096	2/1964	Wick	102/24
3,323,455	6/1967	Griffith	102/24

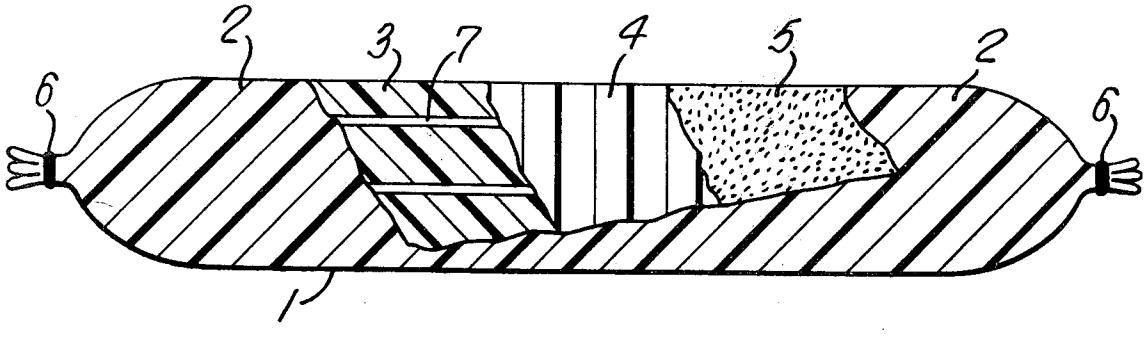
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[57] **ABSTRACT**

A plastic film wrap for an explosive cartridge is provided which consists of a laminate of at least two films, the inner laminate close to the explosive comprising a stiffened film having longitudinal areas of weakness therein and the outer laminate comprising a resilient thin film. Upon application of pressure to the cartridge, the laminated film will separate at the areas of weakness.

4 Claims, 2 Drawing Figures



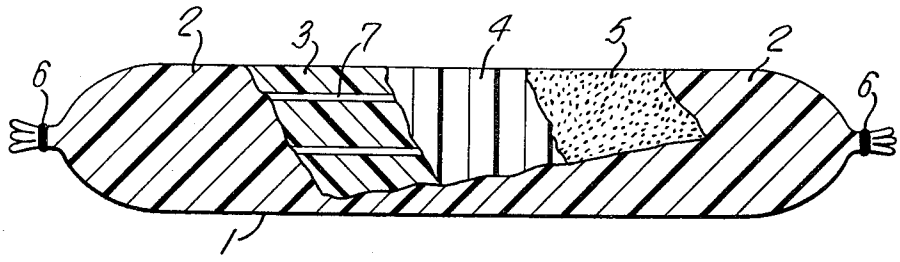


FIG. 1

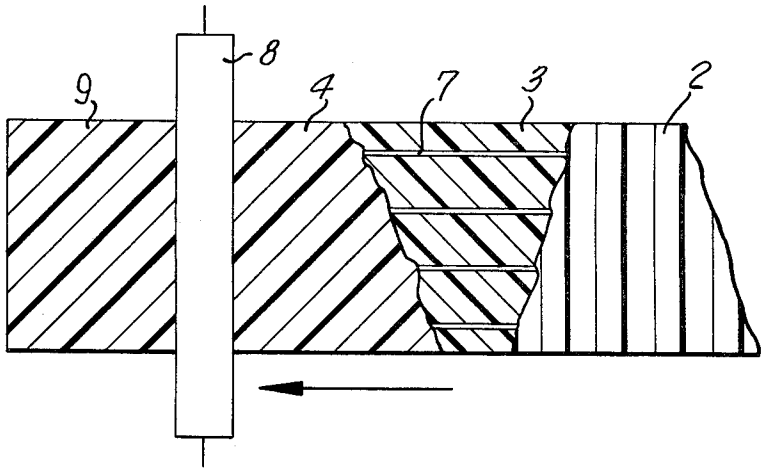


FIG. 2

EXPLOSIVE CARTRIDGE

This invention relates to a novel explosive cartridge. In particular, the invention relates to an improved small diameter cartridge for blasting explosives wherein the wrapping comprises a water-resistant plastic film material.

Traditionally, small diameter explosive cartridges, that is cartridges of 3 inch or less diameter have comprised a cylindrical wrap of convolutely or spirally wound paper, closed at both ends and filled with an explosive composition. Such cartridges adequately served the needs of the industry so long as the explosive composition was compounded to avoid exudation of explosive oils or was dry in consistency. With the advent of water-bearing slurry explosive mixtures, these paper wrapped cartridges were generally no longer suitable because of the deterioration caused by the water present in the explosive mixtures. To solve this problem the industry turned to new packaging methods and to novel cartridges, which cartridges generally comprise a hollow tube of thin-walled plastic closed at both ends and filled with an explosive mixture.

While the use of plastic film-wrapped cartridges has been generally successful in the industry, these cartridges have not been without some disadvantages. If the film wrap employed is unduly thin, the cartridges tend to become out-of-round during periods of storage and hence are difficult to load into narrow, circular boreholes. Similarly, thin plastic film wrap tends to result in limp cartridges which, because of lack of stiffness, "hang up" on projections along the wall of the borehole. Where a thicker and hence stiffer film wrap is employed, the problems of limpness and flattening of the cartridges are avoided but the additional problem of lack of tampability is introduced. By tampability is meant the property of the cartridges to expand circumferentially and nearly completely fill the borehole diameter with explosives when the cartidges are struck on their end in the borehole with a tamping rod. The use of thicker and stiffer plastic film wrap generally results in small diameter cartridges which resist tamping, thereby preventing the achievement of optimum borehole loading density and desirable close coupling of the explosive with the surrounding rock.

It is the object of the present invention to provide an improved, stiff, tampable, plastic film-wrapped small diameter explosive cartridge.

The improved explosive cartridge of the invention comprises a substantially rigid thin-wall plastic tube closed at both ends and containing a blasting explosive composition, the said thin-wall tube comprising a laminate of at least two films, the outermost film of the laminate comprising a resilient thin film of thermoplastic material and the innermost film of the laminate comprising a stiffener film, the said inner stiffener film having longitudinal areas of weakness therein along which the said film will separate upon the application of pressure. Preferably, the thin-wall plastic tube of the cartridge will comprise a laminate having an inner and an outer pliable, thin thermoplastic film having a bonded stiffener film therebetween, the stiffener having longitudinal areas of weakness therein.

The improved cartridge of the invention may be more fully understood by reference to the accompanying drawing wherein:

FIG. 1 is a longitudinal partly cut-away view of a preferred embodiment of an explosive cartridge of the invention, and

FIG. 2 is a plan view of the film laminate used in the cartridge of FIG. 1.

Referring to FIGS. 1 and 2 of the drawing, there is shown an explosive cartridge 1 containing an explosive composition 5 and secured at its ends by ties or clips 6. The cartridge wrapping or sheath comprises an inner pliable film layer 4 in contact with explosive 5, a stiffener film layer 3 having longitudinal areas of weakness 7 therein, and outer pliable film layer 2. Film layers 2, 3 and 4 are bonded together to form a laminate structure.

Referring particularly to FIG. 2, there is shown pliable films 2 and 4 and a stiffener film 3 therebetween having longitudinal areas of weakness 7 therein. In manufacture, the overlayed composite of films 2, 3 and 4 is moved in the direction of the arrow against the pressure of roller or pressure plate 8 where a bonding of the films is achieved to form a laminate 9. Appropriate adhesives may be used between the films and/or heat may be applied at roller or plate 8 to aid in lamination. Finished film 9 may then be made into a tube by known methods, which tube formation may be combined with an explosives filling and end sealing operation.

If desired, a two layer laminate may be suitable for use as the sheath in the cartridge of the invention, in which case the inner pliable film layer 4 may be eliminated.

The film suitable for use as the pliable layers 2 and 4 is preferably a polyethylene film having a thickness of between about 0.75 and 2.0 mils. The stiffener film layer 3 may be of any generally unpliable material such as, for example, regenerated cellulose, cellulose acetate, polyester, paper, polypropylene and the like. Stiffener layer 3 must essentially have therein longitudinal areas of weakness 7 lying in the direction of the length of the cartridge. These areas of weakness may comprise slits or cuts which penetrate the full thickness of the film 3. Alternately, they may comprise lines of side-by-side perforations, or they may merely comprise a scoring or indentation which reduces the thickness of the film. The choice of a suitable type of weakened area will depend on the material of construction used for the film layers and the strength desired in the wall of the finished cartridge.

When the filled cartridge is placed in the bottom of a borehole and the pressure of a tamping rod is applied to the end of the cartridge, outward spreading of the explosive contents 5 towards the borehole wall causes pliable inner and outer film layers 4 and 2 to stretch. Mid-layer stiffener 3 will simultaneously rupture along the areas of weakness 7 thus permitting further stretching of films 4 and 2 allowing the circumferential expansion of the cartridge to take place.

It will be obvious that a wide range of constructions are possible with the cartridge of the invention. Combinations of very thin and pliable inner and/or outer layers with a relatively rigid stiffener layer are possible. Similarly, moderately pliable inner and outer layers may be combined with a moderately unpliant stiffener. Where the explosive content is itself a stiff composition, for example, a crosslinked aqueous slurry explosive, a generally less stiff sheath construction will be suitable. A judicious choice of film types and thick-

nesses will result in an optimum construction for the end result desired. In addition, the employment of one, two or more longitudinal areas of weakness in the stiffener layer will result in cartridges of greater or lesse ruptureability. Thus the selection of appropriate film thicknesses together with the number and types of areas of weakness along the cartridge permits the suitable tailoring of the final package.

What I claim is:

1. A cylindrical explosive cartridge adapted to expand circumferentially upon application of pressure upon an end of the cartridge comprising a substantially rigid thin-wall plastic tube closed at both ends and containing a blasting explosive composition, the said thin-wall tube comprising a laminate of at least two films, the said films being bonded together over substantially all of their areas of contact, the outermost film of the bonded laminate comprising a resilient thin film of thermoplastic material and the contiguous film of the bonded laminate comprising a stiffener film of less resilience than said outer film, the said contiguous stiffener film having longitudinal areas of weakness therein.

2. An explosive cartridge as claimed in claim **1** wherein the said bonded laminate comprises an inner and outer resilient thin film having a stiffener film therebetween and bonded to each of said inner and outer films, the said stiffener film having longitudinal areas of weakness therein.

3. An explosive cartridge as claimed in claim **1** wherein the said resilient thin film is a polyethylene film having a thickness of between about 0.75 and 2.0 mils and the said stiffener film is selected from regenerated cellulose, cellulose acetate, polyester, paper and polypropylene.

4. An explosive cartridge as claimed in claim **1** wherein the areas of weakness in said stiffner film comprise penetrating cuts, lines of perforations or indentations or combinations of these.

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