Aug. 29, 1944. J. BARAB 2,357,068

BLASTING CARTRIDGE

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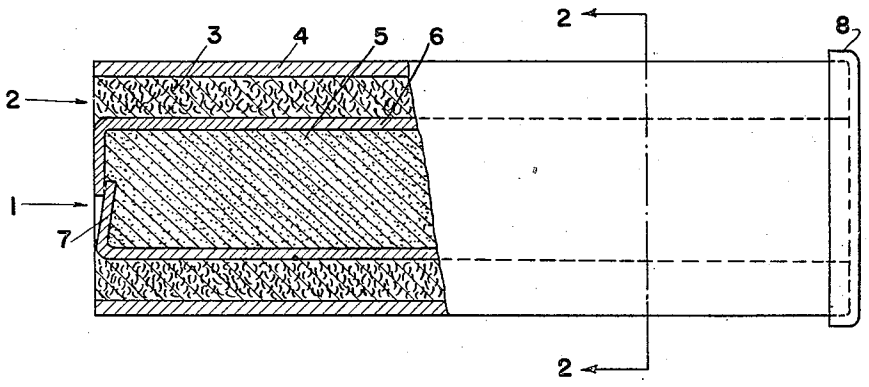


FIG.-1

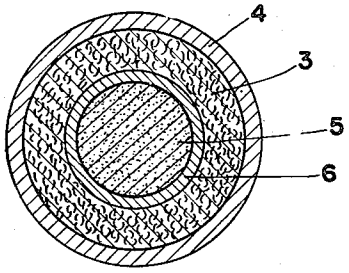


FIG.-2

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BLASTING CARTRIDGE

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10 Claims. (Cl. 102—24)

This invention relates to an improved blasting cartridge and to methods of production thereof. It relates more particularly to a blasting cartridge embodying a cushioning sheath which is especially advantageous in the mining of coal.

It is the principal object of this invention to provide a blasting cartridge enclosed in a sheath comprising a compressible cushioning material and a flame-quenching or cooling salt. The cushioning material acts to absorb the initial shattering shock produced by firing the explosive. The cooling salt exerts a cooling or quenching effect on the gases and flame produced, thereby reducing hazards in the mine.

The sheathing of a blasting cartridge with a compressible cushioning material in accordance with this invention is of particular importance for explosive cartridges to be used in coal mining. After the initial shock from the explosive has been absorbed by the cushioning material, the expanding gases released by the explosion search out the cleavage planes of the coal. The result is a pushing action which breaks up the structure in such a manner that large, firm lumps are formed. Without the cushioning material, a much larger amount of pulverized coal is produced.

The improvement in blasting cartridge described in accordance with this invention may be accomplished with any desired form of explosive, but will be found most advantageous in connection with, for example, permissible dynamites of various types. The shattering effect of such explosives when fired in direct contact with coal is very undesirable. Use of permissible explosives in the process further reduces the liability of ignition of combustible gas mixtures and coal dust.

The improved explosive cartridge which provides the advantages related above in the mining of coal may be produced in accordance with the present invention by surrounding the cartridge with a sheath comprising a non-combustible compressible material, such as, for example, expanded mica pellets or a combustible compressible material such as, for example, balsa, bagasse, cork, etc., and a flame quenching salt such as, for example, sodium bicarbonate, plaster of Paris, borax, calcium fluoride, etc. The sheath comprising the above ingredients may desirably be preformed to fit around the cartridge. The sheath may take the form of castings of semi-circular sections which may be fitted around the cartridge. It may be a tube prepared by extrusion of a composition comprising the above ingredients. It may take the form of a blanket of the compressible cushioning material containing a layer of cooling salt between two layers of the cushioning material. The sheath may likewise consist of a tube of corrugated shape comprising the above ingredients, the advantage of corrugations being the added air cushioning effect provided by the air pocketed therein. Also, the sheath may consist of an annular space provided around the explosive cartridge by means of, for example, an outside paper. The compressible cushioning substance and the cooling salt may then be loaded in the form of pellets, powder or granules into the annular space between the cartridge and the surrounding outside paper.

Having now indicated in a general way the nature and purpose of this invention, there follows a more detailed description of preferred embodiments thereof with reference to the accompanying drawing in which Fig. 1 represents a cushioning sheath partially in section and containing an explosive cartridge, and Fig. 2 is a view of the cushioning sheath of Fig. 1, on line 2—2.

Referring now to the drawing, the assembled article of this invention comprises a blasting cartridge 1 surrounded by a cushioning sheath 2 comprising a packed, homogeneous material 3 retained in position by a surrounding tube 4. The explosive cartridge 1 comprises an explosive composition 5 wrapped in paper 6 which is crimped 7 at the end.

If desirable, a cap 8 may be placed over either or both ends of the assembly. The cap will be found desirable when a unitary explosive charge is manufactured. The cap may be placed on the end of the cushioning sheath as shown in Fig. 1 and either be composed of a sheet of material such as cardboard or the like or composed of the compressible admixture 3 which surrounds the explosive cartridge. If it is desirable, the cap may be formed in the shape of a plug and inserted in the end of the sheath 2 proper. In such instances the sheath 2 will be slightly longer than the explosive cartridge which is to be used. The plug may be retained by any adhesive, taping or similar expedient.

The thickness of the cushioning sheath may be varied to provide varied amounts of cushioning effect. A thickness of about ⅛ inch to about ¾ inch is desirable for most purposes. Thus, a sheath to fit around a 1¼" x 8" dynamite cartridge will be about $1\frac{5}{32}$ inches inside diameter and about $1\frac{9}{32}$ inches to about $1\frac{29}{32}$ inches outside diameter. The sheath may be of about the same length as

the cartridge and may be open at both ends to provide propagation of the explosion to another cartridge. The ends of the cartridge may, however, be closed with plugs or discs of the sheathing composition. With the latter arrangement propagation of the explosion to another cartridge is greatly reduced. This arrangement is preferable where only one cartridge is used in a borehole.

The compressible cushioning material and the flame-quenching or cooling salt may be fabricated into the sheath by moistening the dry composition, then molding and drying the sheath. A binding agent may be incorporated to bind the ingredients together. The binding agent may also be a cooling salt, such as plaster of Paris. Other binding agents, such as, for example, sodium silicate, dextrin, clay, etc. may be used.

In the cushioning sheath it will be desirable to include about 10% to about 30% of compressible material and about 40% to about 90% of flame-quenching salt. The binding material added will be coordinated to give the desired cohesion and to facilitate packing.

To illustrate the sheathing of an explosive cartridge to provide the cushioning and flame quenching or cooling effects described, the following examples are cited:

Example I

A mixture consisting of 65% by weight of sodium bicarbonate, 20% by weight of Balsa pulp and 15% by weight of clay was moistened with an equal weight of a 10% by weight aqueous solution of sodium bicarbonate. This composition was molded into semi-circular half-sheaths about 8 inches in length and of such size that two of the half-sheaths join to give a sheath of about 1⅜ inches inside diameter and about 1⅞ inches outside diameter. The mold was lined with paper. About 95 grams of wet composition were required for a half-sheath. The molded half-sheaths were dried for about 20 hours on dowels at a temperature of about 130° F. The dowels and inner paper were then removed from the half-sheaths and the latter dried further in air.

Two of the half-sheaths prepared as described above were then sealed around a 1¼" x 8" dynamite cartridge with the aid of mucilage. Strips of gum kraft paper were sealed over each end of the sheathed dynamite cartridge. The latter was then dipped in paraffin.

Example II

A mixture of 85 parts of sodium bicarbonate, 15 parts by weight Balsa and 30 cc. of a dextrin solution was packed into an annular sheath and dried for about one day at a temperature of about 120° F., a dynamite cartridge inserted and the unit dipped in paraffin.

Example III

A mixture comprising 80 parts by weight sodium chloride, 20 parts by weight bagasse was moistened with 50 cc. of aqueous sodium silicate. This composition was formed into a sheath, dried and an explosive cartridge inserted thereinto.

Example IV

A mixture consisting of 75 percent by weight of sodium bicarbonate, 25 percent by weight of cork, 10–25 mesh, and 35 cc. of a binder solution containing dextrin was mixed and then extruded through a nozzle inside a prefabricated paper shell having a dowel inside to provide an annular space of ¼ inch thickness. The extruded tube had a length of about 8 inches. It was dried in an oven at a temperature of about 150° F. for about 20 hours with the dowel inside. The dowel was then removed and a 1¼" x 8" dynamite cartridge was inserted in the extruded tube, the ends sealed with gum kraft paper and the sheathed cartridge dipped in paraffin.

Example V

A mixture consisting of 20 percent by weight of bagasse and 80 percent by weight of plaster of Paris was pelleted by moistening the dry composition and agitating the mixture while it was setting. After drying for about 5 hours at a temperature of about 130° F. the dry pelleted material was poured into the annular space between a 1¼" x 8" dynamite cartridge and an outer paper shell 1¾ inches in diameter. The paper on the ends was folded over and the sheathed cartridge dipped in paraffin.

The sheaths prepared as described in the above examples after drying are semi-rigid and have sufficient strength to withstand any normal handling necessary in manufacture and use. The sheaths have a cellular, favose structure which gives the cushioning action desirable and produces lump material in blasting operation such as coal mining.

In the above examples, each end of the sheathed cartridge may be fitted with a plug or disc of the cushioning composition used. The plug or disc may have a thickness equal to the thickness of the cushioning sheath, for example, about ⅛ inch to about ¾ inch. It may have a diameter equal to that of the dynamite cartridge itself, in which case it may fit into the end of the sheath. It may, if desirable, have a diameter equal to the outside diameter of the cushioning sheath, in which case it will fit over the end of the sheath. The plug or disc may be secured at each end by any convenient means such as, for example, by sealing with gum kraft paper.

When used in coal mining the sheathed, cushioned cartridge produced as described in the above examples will provide an improved quality and quantity of lump coal over that obtained with an unsheathed and uncushioned cartridge.

It will be appreciated that the above details and examples are given merely for the purposes of illustrating my invention and are not intended to limit the invention. Moreover, many variations in the compositions and procedures employed may be made without departing from the scope of the invention.

This application is a continuation-in-part of my application, Serial No. 225,342, filed August 17, 1938, now U. S. Patent No. 2,277,059.

What I claim and desire to protect by Letters Patent is:

1. An improved blasting assembly including an explosive cartridge surrounded by a preformed, annular, tubular sheath comprising from about 10% to about 30% of a carbonaceous material selected from the group consisting of balsa, bagasse and cork and from about 40% to about 90% of a flame-quenching salt, said sheath characterized by a semi-rigid, cellular, favose structure which is adapted to provide a cushioning action for the initial explosive shock.

2. An improved blasting assembly including an explosive cartridge surrounded by a preformed, annular, tubular sheath comprising from about 10% to about 30% of a carbonaceous material selected from the group consisting of balsa, bagasse

and cork, a binder, and from about 40% to about 90% of a flame-quenching salt, said sheath characterized by a semi-rigid, cellular, favose structure which is adapted to provide a cushioning action for the initial explosive shock.

3. An improved blasting assembly including an explosive cartridge surrounded by a preformed, annular, tubular sheath comprising from about 10% to about 30% of a carbonaceous material selected from the group consisting of balsa, bagasse and cork, dextrin, and from about 40% to about 90% of a flame-quenching salt, said sheath characterized by a semi-rigid, cellular, favose structure which is adapted to provide a cushioning action for the initial explosive shock.

4. An improved blasting assembly including an explosive cartridge surrounded by a preformed, annular, tubular sheath comprising from about 10% to about 30% of a carbonaceous material selected from the group consisting of balsa, bagasse and cork, and from about 40% to about 90% of sodium bicarbonate, said sheath characterized by a semi-rigid, cellular, favose structure which is adapted to provide a cushioning action for the initial explosive shock.

5. An improved blasting assembly including an explosive cartridge surrounded by a preformed, annular, tubular sheath comprising from about 10% to about 30% of balsa and from about 40% to about 90% of a flame-quenching salt, said sheath characterized by a semi-rigid, cellular, favose structure which is adapted to provide a cushioning action for the initial explosive shock.

6. An improved blasting assembly including an explosive cartridge surrounded by a preformed, annular, tubular sheath comprising from about 10% to about 30% of bagasse and from about 40% to about 90% of a flame-quenching salt, said sheath characterized by a semi-rigid, cellular, favose structure which is adapted to provide a cushioning action for the initial explosive shock.

7. An improved blasting assembly including an explosive cartridge surrounded by a preformed, annular, tubular sheath comprising from about 10% to about 30% of cork and from about 40% to about 90% of a flame-quenching salt, said sheath characterized by a semi-rigid, cellular, favose structure which is adapted to provide a cushioning action for the initial explosive shock.

8. An improved blasting assembly including an explosive cartridge surrounded by a preformed, annular, tubular sheath comprising from about 10% to about 30% of balsa and from about 40% to about 90% of sodium bicarbonate, said sheath characterized by a semi-rigid, cellular, favose structure which is adapted to provide a cushioning action for the initial explosive shock.

9. An improved blasting assembly including an explosive cartridge surrounded by a preformed, annular, tubular sheath comprising from about 10% to about 30% of bagasse and from about 40% to about 90% of sodium bicarbonate, said sheath characterized by a semi-rigid, cellular, favose structure which is adapted to provide a cushioning action for the initial explosive shock.

10. An improved blasting assembly including an explosive cartridge surrounded by a preformed, annular, tubular sheath comprising from about 10% to about 30% of cork and from about 40% to about 90% of sodium bicarbonate, said sheath characterized by a semi-rigid, cellular, favose structure which is adapted to provide a cushioning action for the initial explosive shock.

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