

April 15, 1941.

C. R. JOHNSON ET AL.
EXPANSIBLE COVER

2,238,058

Filed May 22, 1940

2 Sheets-Sheet 1

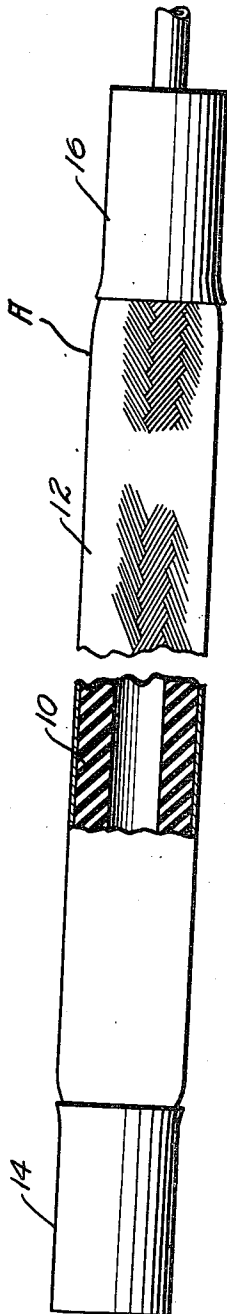


Fig. 1

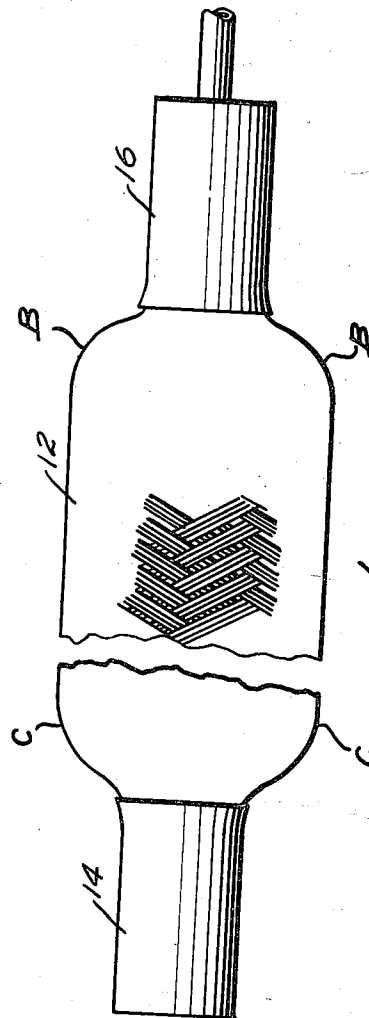


Fig. 2

CHARLES R. JOHNSON
ROBERT C. PIERCE
INVENTORS.

BY

W. J. Johnson

ATTORNEY.

April 15, 1941.

C. R. JOHNSON ET AL

2,238,058

EXPANSIBLE COVER

Filed May 22, 1940

2 Sheets-Sheet 2

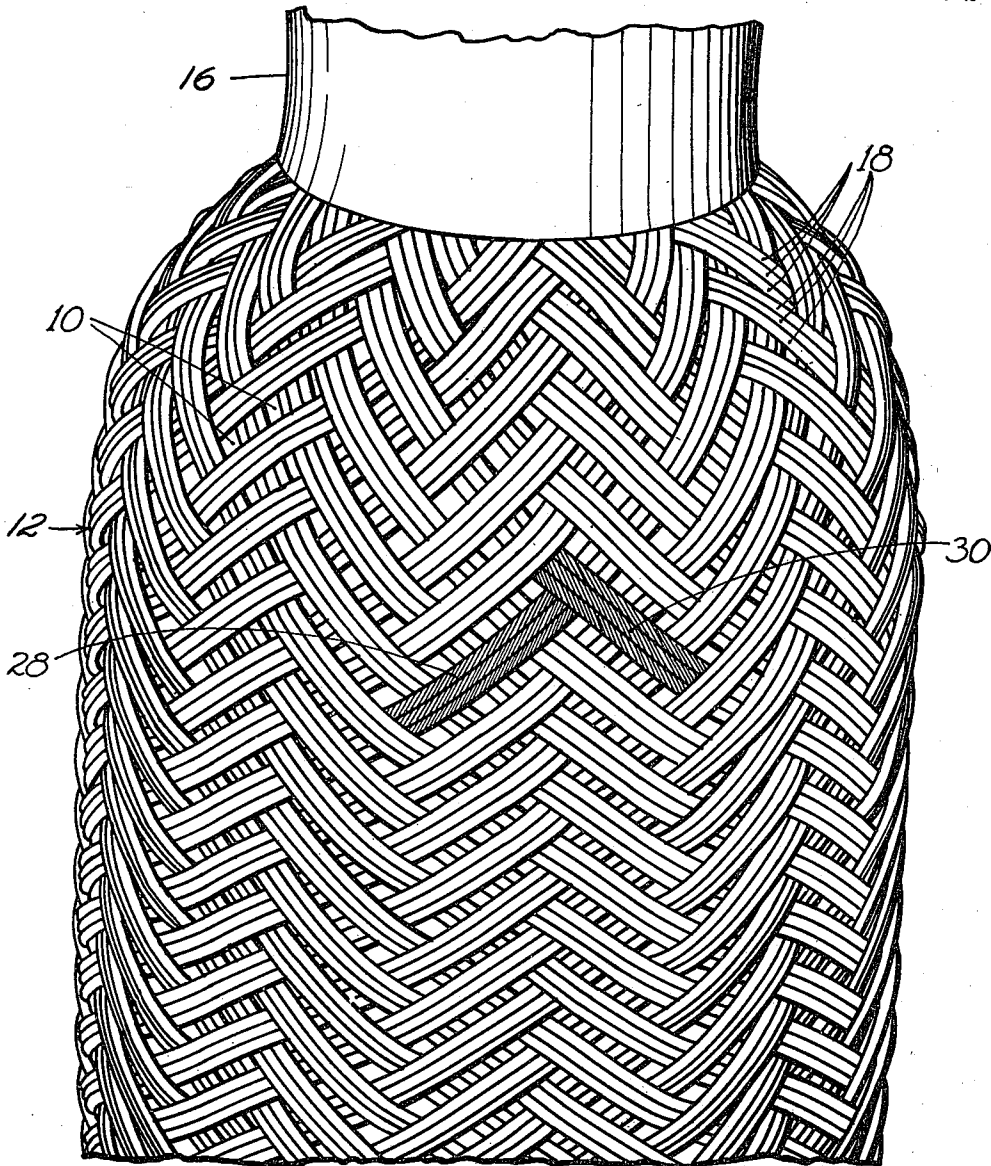


Fig. 3

CHARLES R. JOHNSON
ROBERT C. PIERCE
INVENTORS

BY

Chas. R. Johnson

ATTORNEY.

UNITED STATES PATENT OFFICE

2,238,058

EXPANSIBLE COVER

Charles R. Johnson, Glenn Mills, Pa., and Robert C. Pierce, Niles, Mich., assignors of one-half to E. I. du Pont de Nemours & Company, Wilmington, Del., a corporation of Delaware, and one-half to National-Standard Company, Niles, Mich., a corporation of Michigan

Application May 22, 1940, Serial No. 336,530

3 Claims. (Cl. 96—26)

This invention relates to expansible and contractible, braided wire covers, and is illustrated as embodied in a cover for a rubber tube or bag adapted to be expanded by oil or other fluid under pressure to break down coal from a seam in a mine, the whole assembly being usually referred to as a mining tube or cartridge.

It has been found in actual operations in mining or breaking coal by means of such tubes or cartridges that the front vertical surface of the seam of coal usually breaks first, thus permitting the front end of the cartridge to expand to its maximum. The braided wire structure at this point consequently tends to become permanently "set," and when this occurs an area of bulging or so-called "ballooning" of the tube results, thus increasing its normal unexpanded diameter at this point and making it difficult or impracticable to reinsert the tube in a borehole.

An object of our invention is to improve generally upon the construction of expansible and contractible covers for mining tubes or cartridges.

A further object of our invention is to increase the strength and durability of such covers.

A still further object of our invention is to eliminate bulging or so-called "ballooning" of certain areas or portions of such covers.

We have found that the disadvantages commonly inherent in braided wire structures for this purpose, such as "ballooning" and irregular openings in the braid, can be overcome by employing a variable pitch near the ends of the tube or cartridge with the result that when the braided wire structure tends to become permanently "set" the tube or cartridge when inflated does not increase its normal and unexpanded diameter above or beyond that of the center and main portion of the tube or cartridge.

In normal braiding of the wire with the same pitch throughout, the substantially diamond-shaped openings are approximately the same throughout the straight portion of the expanded cartridge, but these openings become larger and irregular in size at the points represented at A in Figure 1 of the accompanying drawings. This permits the rubber to extrude through the enlarged openings, sometimes resulting in rupture of the tube at this point. In a braided wire structure in which the normal pitch is from 26 inches to 33 inches, for example, we have found that these inherent disadvantages can be eliminated by gradually reducing the pitch at the points marked B and C in Figure 2 to about 24 inches. In this manner the openings are re-

duced in size, thus eliminating rubber failures. In other similar structures corresponding reductions in pitch may be made in order to maintain uniform openings throughout the full length of the cartridge when the tube is fully expanded.

While we prefer to provide the variable pitch at each end of the braided wire cover, we may of course provide this variable pitch with its accompanying advantages only at the front end or portion of the cartridge where "ballooning" is most likely to occur.

It will therefore be seen that when the braided structure of stranded wires is constructed in this manner the diamond-shaped openings appearing between the structures are smaller where "ballooning" is most likely to occur (indicated at B and C, Figure 2) so that when pressure is applied internally to the completed cartridge, the pitch of the inter-braided sets of strands will change to give the maximum protection for the inner tube and reduce to a minimum the extrusion of rubber through the openings between the strands. The stranded wire structure at this point also becomes firmly "set" upon repeated expansions of the cartridge so that when the pressure is released the cover assumes in its normal position a diameter equal to that of the main portion.

The above and other objects and features of the invention will be apparent from the following description of the illustrative embodiment in the accompanying drawings, in which:

Figure 1 is an elevational view of one of our novel cartridges with a portion cut away to show the inner tube, and illustrating at A a portion of the cover fully "set";

Figure 2 is an elevational view of the cartridge of Figure 1 fully expanded by fluid pressure;

Figure 3 is a substantially full size view of one end of the cartridge in the expanded condition showing in detail the inter-relationship of the strands in the main or central portion of the cover in contrast with the variable pitch shown at B.

The invention is illustrated in the drawings and described below, as embodied in a coal-mining expansible and contractible "cartridge" of the type described in Patent No. 2,041,950, granted to one of us (R. C. Pierce), May 26, 1936; it relates more particularly to the cover of such a cartridge.

In the form shown, the cartridge includes an inner tube or bag of rubber, adapted to be expanded by hydraulic pressure which may exceed 2,000 pounds per square inch and which is pro-

ected by an expansible and contractible metallic cover comprising a novel tubular wire braid structure 12 having end fittings 14 and 16 secured thereto.

The term "pitch," as applied to the sets of strands in the foregoing description, is axial pitch, which is the distance on the center axis in which said distance the strands make one complete circumference of the wire cover or structure. "Pitch" may also be defined as the length of the strands required to make one complete circumference of the braided wire cover or structure.

The tubular braid 12 is made up by carrying alternately over and under each other diagonally around the braid sets of wire strands 18, there being preferably three strands in each set, and each of the sets preferably extending alternately over and under three of the other sets. In order to secure maximum protection for the rubber tube 10 when under pressure and expanded, the pitch of the sets of strands 18 with respect to the braid is preferably different adjacent the ends from what it is in the central body portion of the cover; for example at the ends it may have a pitch of 24 inches while the central body portion has a pitch of 29 inches when the cartridge is not under pressure.

The wires of the strands 18 are all wound in the same direction and at the same pitch. It is important that the wires of the strands extending around the braid to the right should be wound to the left in their strands (see Figure 3 at numeral 28) and the wires of the strands extending around the braid to the left should be wound to the right (see Figure 3 at numeral 30) so that the strands all tighten as the pressure is applied

inside the cartridge, as described in the application of one of us (R. C. Pierce), Serial No. 267,636, filed April 13, 1939.

While we have shown and described certain specific embodiments of our invention, it is to be understood that we do not intend to be limited except as indicated in the following patent claims.

We claim:

1. An expansible cover, suitable for reinforcing articles such as mining cartridges and the like, comprising sets of strands each of which sets consists of at least three strands and each of which sets is carried alternately over and under at least three of the other sets to form a tubular expansible braid and having end fittings to which the ends of the braid are secured, the pitch of the sets of strands in passing around the braid being less adjacent said end fittings than in the central body portion of the braid.

2. An expansible cover comprising a tubular braid formed of metal wire strands extending over and under each other diagonally around the braid, and end fittings secured to the ends of the braid, the pitch of the strands in passing around the braid being less adjacent the end fittings than in the central part of the braid.

3. An expansible cover, suitable for reinforcing articles such as mining cartridges and the like, comprising sets of strands carried over and under each other to form a tubular expansible braid and having end fittings to which the ends of the braid are secured, the pitch of the sets of strands in passing around the braid at least at one end being less than the pitch in the main body portion of the expansible cover.

ROBERT C. PIERCE.
CHARLES R. JOHNSON.