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G. R. WYMAN

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MANUFACTURE OF PAPER TUBES

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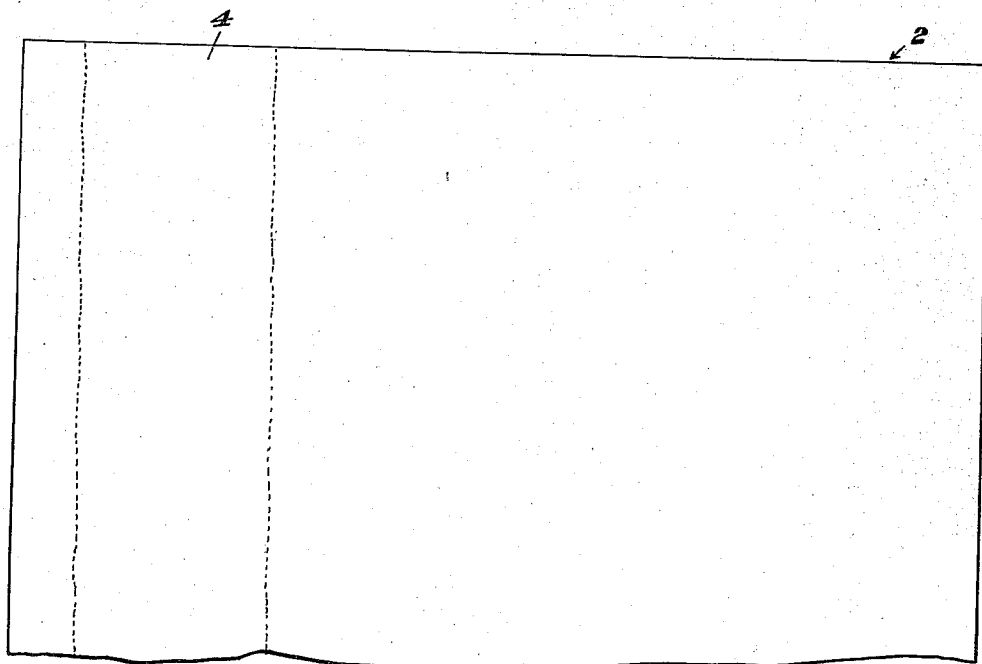


Fig. 1

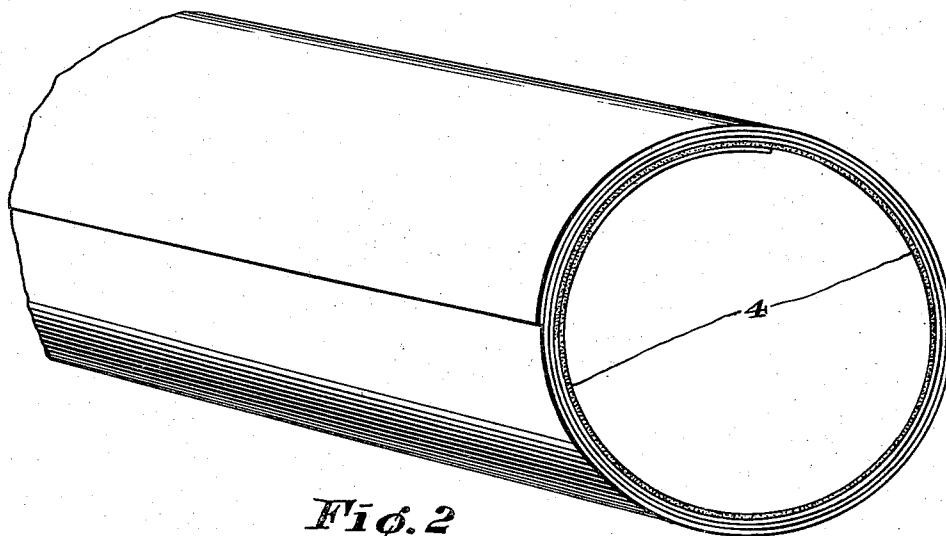


Fig. 2

INVENTOR
George R. Wyman
BY
H. Kirkpatrick
ATTORNEY

UNITED STATES PATENT OFFICE

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MANUFACTURE OF PAPER TUBES

George R. Wyman, East Walpole, Mass., assignor
to Bird & Son, Inc., East Walpole, Mass., a corporation of Massachusetts

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11 Claims. (Cl. 93—94)

This invention relates to the manufacture of paper tubes employed in making shot shells and has for its object to provide a novel and superior charproof and water-proof wound paper tube for such purpose.

Despite many efforts in the past to provide an improved satisfactory tube for the manufacture of shot shells, the tubes in general use today are the same as they have been for decades and involve the winding upon a mandrel of a sheet of paper, usually a strip of paper with beveled margins or edges, to form a tube of four or more convolutions of paper. In the winding operation to secure adherence between layers, starch paste or the like is applied and then the tubes are dried, brought to size, and water-proofed by immersing them for a half hour or more in melted paraffin wax.

The past suggestions, patented and unpatented, to improve such tubes have included the application, with or without the paraffin wax treatment or saturation, of various other water-proofing and treating agents (or combinations thereof) such as polymerizable oil, petrolatum, lacquer, lacquer plasticizer, varnish, various resins, castor-oil, etc., but such suggestions have not stood the test of actual commercial practice and use due to inability to meet the severe conditions of use, the added expense and time involved in attempting to utilize them in practical manufacture of shells, or both. To whatever extent they have been or may be useful such efforts may, in some cases, be employed in connection with the present invention, though they are not at all necessary.

For the most part, such suggestions have involved the addition of a supplementary material, sometimes as a coating, to one or more layers of the paper in the shell, sometimes on the inside layers to minimize powder burning and sometimes to one of the intermediate layers. Various finishes have been added to the outside layer both for the purpose of water-proofing and to provide a more attractive shell.

The present invention, as distinguished from the known or commercially used expedients to minimize charring and to secure a water-proof shell, involves the provision of a novel tube blank or strip of paper having integrally combined therein papers of different character and physical characteristics whereby the novel shells made therefrom are satisfactory with respect to both non-charring and water-proofing qualities.

In the drawing which illustrates the preferred form of the invention:—

Fig. 1 is a plan view of the blank of this invention having indicated thereon the area of the anti-charring stripe; and

Fig. 2 is an enlarged perspective view of a paper shot shell tube made from the blank of Fig. 1.

In the manufacture of the completed blank, generally designated 2, shown in Fig. 1, the paper strip or tube blank is provided integrally with a harder and denser longitudinal stripe 4 so that a stripe of a width sufficient to form a complete non-laminae convolution of the shell is formed of such harder and denser paper, the primary function of which convolution in the finished shell is to resist the charring or pricking-through action of the burning powder. Preferably such convolution is the inner one 4 of the finished tube as shown in Fig. 2 and which contacts directly with the burning powder and gases, and in this way a smoother interior surface may be presented to the shot, wadding and the like so as when fired to minimize the resultant friction due to their movement along the inside of the shell and to eliminate splitting and blowing off of the outermost wadded end of the shell. By providing a paper of this dual character and localizing the harder section thereof to the convolution or convolutions necessary to inhibit charring, the balance of the paper employed in the shell may be left in open and porous condition so as to receive and hold a relatively large amount of the water-proofing agent, usually and preferably melted paraffin wax, and thus provide in the same shell an adequately water-proofed tube plus the anti-charring portion to resist the powder burns, etc. as above described. The paraffin water-proofing treatment will, of course, have some effect upon and enter, though to a lesser degree, the denser and smoother anti-charring convolution but, due to the smaller size of the pores in such harder portion, a lesser, though, nevertheless, a substantial amount of water-proofing material will enter therein which is important in the finished shell.

In the preferred practice of making the blank of the invention there is provided in connection with a cylinder paper machine of usual construction and type, an additional cylinder which serves to provide as a part of the formed and adherent layers of pulp, an additional stripe of pulp sufficient in width to form one complete non-laminar convolution of the finished shell plus a small overlap. This stripe is located relatively close to one edge of the moving web of pulp so that by the usual wet press wherein the

wet and relatively weak web of pulp while carried and supported on a moving felt belt is passed between a pair or pairs of press rolls which press and serve to greatly reduce the amount of water in the moving web. Thus, the additional narrow stripe of pulp becomes integrally incorporated and combined with the remainder of the sheet and is also more firmly condensed because of the added thickness of the added pulp stripe presented to such press. The paper thus formed and wet pressed is passed through the drier rolls and brought to the usual calender, where, as in the wet press, because of the additional thickness of the added narrow stripe of pulp, the calender pressure is greater and the paper in the corresponding area is more heavily calendered and thereby condensed to a materially denser condition than the adjoining portions of the strip, and also receives a smoother finish from the calender rolls.

The additional stripe of pulp may be the same, or different in character than that of the remainder of the paper and, of course, may include various other constituents than ordinary pulp, the word "pulp" being generically used to include any or all materials from which paper is commonly made. Preferably such stripe is formed of relatively shorter and further hydrated fibres with or without an additional filler or fillers, for example, clay, starch, or resinous materials.

In a typical commercial example of the paper blanks of this invention, the characteristics of the anti-charring stripe as compared with the adjacent section of the blanks were as follows:—

	Anti-charring portion	Adjacent portion
40 Caliper.....	0.0060"	0.0059"
Density.....	57.5 lbs./cu. ft.	47 lbs./cu. ft.
Density compared with that of water.....	0.92	0.75
Schopper tensile strength.....	14.87 kilos	12.68 kilos
Mullen fracture test.....	57 lbs.	50 lbs.
Densometer test (air permeability/sq. in.).....	165 secs.	123 secs.
45 Saturation (paraffin).....	25.3%	28.3%

As a result of providing a paper blank made in accordance with this invention and making of tubes and cartridge shells therefrom, as above described, the shells, as practice has demonstrated, are rendered substantially free from undesirable or dangerous charring of the same during firing, as well as free from splitting or blowing off and other undesirable characteristics of typical present day commercial shells.

Having described my invention what I claim is:—

1. A paper shot shell tube comprising a single piece of water-proofed paper including an integral anti-char homogeneous portion of relatively denser paper wound in a series of layers with said denser portion forming one of said layers.

2. A paper shot shell tube comprising a single piece of water-proofed paper including an integral inner anti-char homogeneous portion of relatively denser paper wound in a series of layers with said denser portion forming one of said layers.

3. A paper shot shell tube comprising a single piece of water-proofed paper including an integral anti-char homogeneous portion of relatively denser paper wound in a series of layers with said denser portion forming one of said layers and containing lesser water-proofing than the other of said layers.

4. A paper shot shell tube comprising a single piece of water-proofed paper including an inner anti-char homogeneous portion of relatively denser paper wound in a series of layers with said denser portion forming one of said layers and containing lesser water-proofing than the other of said layers.

5. A wound paper shot shell tube comprising a single piece of paraffin saturated paper including an integral anti-char homogeneous portion of relatively denser paper wound in a series of layers with said denser portion forming one of said layers and with lesser paraffin therein than the other of said layers.

6. As an article of manufacture, a paper shot shell tube blank having displaced from the median longitudinal center line thereof an integral narrow longitudinal anti-char stripe of relatively denser paper of sufficient width to form one complete non-laminar convolution of a finished shell.

7. As an article of manufacture, a paper shot shell tube blank having near one edge thereof an integral narrow longitudinal anti-char stripe of relatively denser paper of sufficient width to form one complete non-laminar convolution of a finished shell.

8. As an article of manufacture, a paper shot shell tube blank having near one edge thereof an integral narrow longitudinal anti-char stripe of relatively denser and smoother paper of sufficient width to form one complete non-laminar convolution of a finished shell.

9. As an article of manufacture, a paper shot shell tube blank of open and porous paper having near one edge thereof a narrow longitudinal anti-char stripe of relatively denser paper of sufficient width to form one complete non-laminar convolution of a finished shell.

10. In the manufacture of paper tubes for shot shells the method of protecting their tubing against charring which comprises providing a blank principally of untreated open and porous paper having integral therewith a relatively non-laminar narrow stripe of denser and smoother paper, winding the blank in a tubular form in a series of layers so that said denser paper forms a layer thereof, and then saturating in a water-proofing material the tube thus formed.

11. In the manufacture of paper tubes for shot shells the method of protecting their tubing against charring which comprises providing a blank principally of untreated open and porous paper having integral therewith a relatively narrow non-laminar stripe of denser and smoother paper, winding the blank in a tubular form in a series of layers so that said denser paper forms an inner layer thereof, and then saturating the same in paraffin.

GEORGE R. WYMAN.