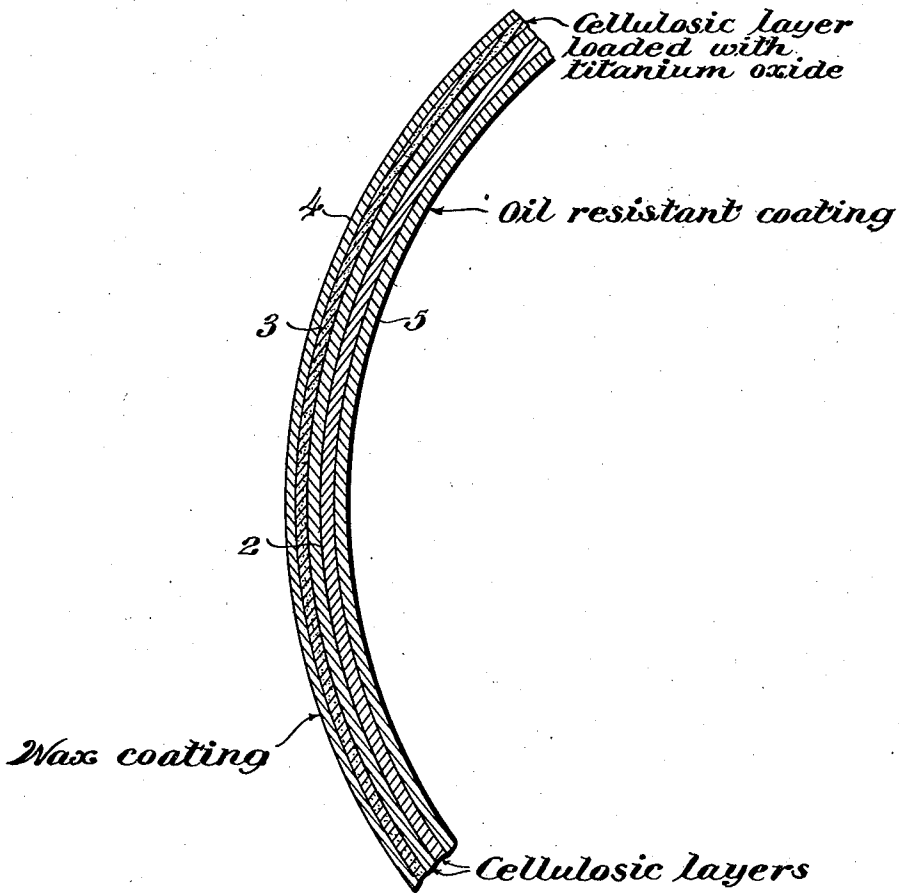


April 2, 1940.

D. C. SPAULDING, JR
TUBULAR PAPER MANUFACTURE

2,196,085

Filed June 30, 1937



Inventor
David C. Spaulding, Jr.

by
Oberlin Limbach & Day
Attys

UNITED STATES PATENT OFFICE

2,196,085

TUBULAR PAPER MANUFACTURE

David C. Spaulding, Jr., Cleveland, Ohio, assignor
to The Standard Oil Company, Cleveland, Ohio,
a corporation of Ohio

Application June 30, 1937, Serial No. 151,205

7 Claims. (Cl. 93—94)

Paper tube production by winding spirally, while satisfactory for such uses as mailing tubes etc., if attempted for products requiring ability to carry such penetrating liquids as oils for instance, has not yielded satisfactory results. Structures for such usage must be internally resistant to capillary penetration of the oil, and in a spirally wound structure there is a line of weakness at every seam, not only being an interruption of continuity of the layer there represented, but the wall structure is in effect reduced to the thickness of the remaining layers, while the undue stress thrown on whatever lining is employed exposes it to leakage at such un-reinforced points sooner or later. In accordance with the present invention, tubular structures may be had, which although primarily employing such material as cellulose, are capable of usage with highly penetrating materials such as oils, under adverse condition.

To the accomplishment of the foregoing and related ends, the invention, then, comprises the features hereinafter fully described, and particularly pointed out in the claims, the following description setting forth in detail certain illustrative embodiments of the invention, these being indicative however, of but a few of the various ways in which the principle of the invention may be employed.

As noted, the sheet cellulose entering into the structure is drawn convolutely into tubular form. That is, the sheet material is wound on itself of a width covering the length of the tube to be produced. While high grades of paper stock may be employed, with the further refinements of the invention pointed out this is in general rendered unnecessary and the stock may be of coarser and commoner grades, as kraft, chestnut board, chip board, etc., kraft being particularly advantageous as allowing formation of a very strong wall without excessive thickness. The sheet cellulose stock may be wound into form by any desired means, provided it is laid down convolutely and suitably built up, the layers being adhered to each other by a suitable adhesive, glue or if preferred any other adhesive giving proper bonding. The outside of the tubular structure is provided with a water-proof character, as referred to in detail below. Advantageously, a cover layer of sheet cellulose of suitable texture is superposed upon the wound-up body. The particular number of layers 2, (see drawing) constituting the body may vary depending upon the diameter of the tube and the nature of the cellulose stock which is employed. Thus, a two

layer wind of twelve point kraft is desirable for tubing of not over four inches diameter. Additional layers of thickness may be employed for larger diameter structures. The cover layer mentioned, being generally called upon to provide a more or less attractive appearance, and desirably also being water-proof, is most advantageously made from higher grade sheet stock. Preferably, this may be a firm stock of rather light weight, and for the final water-proofing a wax coating is most effective, or this may be applied after the cover layer has been put on. Particularly effective water-proofing substances, such as paraffin and the like however have a bad tendency to darken and detract from the appearance of any stock, and it is a further feature of the invention that the cover layer is so treated as to preclude darkening from action of paraffin or like coating materials, or oils. For this, the cover 3 is of a character carrying finely divided mineral filling such as titanium dioxide. Less desirably zinc oxide, lithopone, etc. may be used. While this may be carried by the paper by means of a sizing, preferably the mineral material is embodied directly into the paper during its manufacture, as by being mixed in the beating engine. An amount of such finely divided mineral, as titanium dioxide, in the range of 8.5 per cent to 10 per cent is effective, and where it is applied by being incorporated into the paper fiber, 9 per cent is advantageous. Desirably, the cover layer is of the extent to entirely cover the outside surface, although its advantages may be realized even in cases where for some particular finishing effect for instance it may be desired only on portions of the surface. With a cover of such character furthermore, an additional advantage enters in that if desired, ornamentation or other matter may be provided thereon, depending upon the particular usage in view. If for instance the tubing is of suitable lengths and to be provided with closed ends as oil containers, the cover may carry the printing and the like of a label. In fact, the cover may have the practical function of a label. For the further treatment of the external surface, desirably a water-proofing agent 4 is applied. While a water-proofed stock for the cover could afford some protection, the preferred procedure is to employ the paper stock carrying the mineral particles as before-described, and then a water-proofing treatment is applied to the whole exterior. This may be molten thermoplastic or a wax composition, and may be applied by any suitable means, as ap-

plicator rolls, brushes, etc., and conveniently in the process of manufacture this operation is performed directly in sequence after the forming stage, the tubing being shunted on a support from the forming position to the water-proofing position adjacent.

The tubular structure is provided with an oil-proof internal facing 5. While in some cases this may be had by a special layer of hydrated cellulose, as over-beaten cellulose stock made up in the form of so-called parchmentized paper or the chemically treated parchment types of paper, preferably the oil-proofing is applied by liquid treatment to the internal face of the built-up tubes. With the application of a special paper liner as before mentioned, it would of course be necessary to lay this down on the forming mandrel as the first layer and then adhesively wind the body layers thereon and then the cover layer. With the liquid treatment however, the manufacturing operation is further simplified and ultimate durability of the product is had. For the oil-proofing liquid, a suitable composition effecting such result may be used, and preferably a composition of sodium silicate with a minor proportion of glycerol and small amounts of gum arabic and an alkali metal soap, the liquid being applied to the tubing suitably held on the support, preferably adjacent the external treating location, and being applied by any suitable means, as internal spraying, brushing etc. The tubing is then allowed to set or dry out, and if desired a slightly warm drying air housing may provide the last stage in the treatment of the article while traveling.

The tubular structures, whether of true circular section or other desired cross-section form are of a particularly strong yet light body, and oil-proof, allowing of their use, depending upon the length and size, as conduit connections, or if of short lengths and provided with closed ends making containers, especially advantageously, and the external surface although water-proofed with material inherently tending to cause discoloration or darkening, is of such brilliance as to be applicable for very particular usages.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the

features stated in any of the following claims, or the equivalent of such, be employed.

I therefore particularly point out and distinctly claim as my invention:

1. A method of making cellulose tubing structures, which comprises convolutely winding sheet cellulose in tubular form, winding and adhering thereon sheet cellulose having a filling of titanium dioxide, applying to the outside surface a wax, applying to the inside surface an oil-resistant liquid, and solidifying such applied liquid.

2. A method of making cellulose tubing structures, which comprises convolutely winding sheet cellulose in tubular form, winding and adhering thereon sheet cellulose carrying titanium dioxide, applying to the outside surface a wax, applying to the inside surface an oil-resistant liquid, and solidifying such applied liquid.

3. A method of making cellulose tubing structures, which comprises convolutely winding sheet cellulose in tubular form, adhering thereto a cover label carrying titanium dioxide, applying to the outside surface a wax, applying to the inside surface an oil-resistant liquid, and solidifying such applied liquid.

4. A method of making cellulose tubing structures, which comprises convolutely winding sheet cellulose in tubular form, winding and adhering thereon sheet cellulose carrying titanium dioxide, applying to the outside surface a water-resistant material in liquid state, applying to the inside surface an oil-resistant liquid, and solidifying such applied liquid.

5. A cellulose tubular structure of convolutely wound sheet cellulose having thereon a cover carrying titanium dioxide and outwardly surfaced with wax, and being internally covered by an oil-resistant surface.

6. A cellulose tubular structure of convolutely wound sheet cellulose having a cover with titanium dioxide filling in its structure and outwardly surfaced with wax, and being internally covered by an oil-resistant surface.

7. A cellulose tubular structure, comprising a cellulose body wall having a cover with finely divided titanium dioxide and surfaced with wax, and being internally covered by an oil-resistant surface.

DAVID C. SPAULDING, Jr.