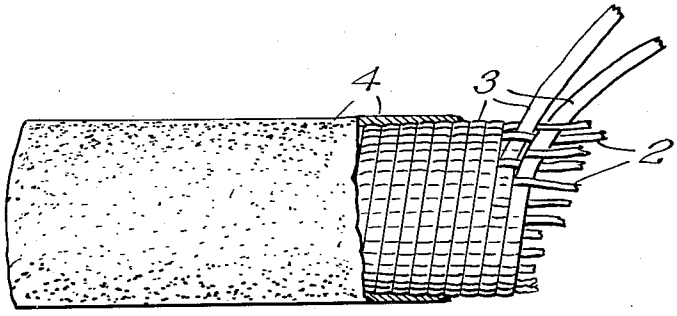
Sept. 4, 1934. J. A. KENNEDY 1,972,523

NONPOROUS VACUUM AND PRESSURE TUBING

Original Filed May 19, 1930



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Patented Sept. 4, 1934 1,972,523

UNITED STATES PATENT OFFICE

1,972,523

NONPOROUS VACUUM AND PRESSURE TUBING

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Original application May 19, 1930, Serial No. 453,718. Divided and this application May 23, 1933, Serial No. 672,442

5 Claims. (Cl. 137—90)

Th present invention is a division of my copending application Serial No. 453,718 and is directed particularly to the product made by the method disclosed and claimed in the prior application.

This invention relates to a new and improved tubing for vacuum and pressure purposes containing no rubber in its structure, which is a substitute for, and for many purposes superior to, rubber hose and tubing.

One of the more particular objects of the invention is to provide a tubing of the type above stated, which will be adaptable to use in the operating of automobile windshield wipers by vacuum from the engine. To adequately serve such purpose, the tubing must be impervious to penetration and resistant to attack and modification by water, oil, gasolene, outside weather conditions, etc.; must be able to withstand a substantial vacuum or pressure without leaking and continue in such use in exposed places under rough treatment for a considerable period of time; must be sufficiently flexible to permit bending in relatively sharp curves without collapsing or seriously obstructing its bore; and must have an ornamental or pleasing finish and appearance so that, when used in positions exposed to view, it will harmonize artistically with the color and finish of the automobile or other structure to which it is applied.

An embodiment of the invention is illustrated in the single figure of the drawing. This figure shows a fragment of my improved tubing partly in section to illustrate the elements thereof.

The improved tubing is preferably, though not necessarily, made in accordance with the method disclosed in the above identified application. The tube is preferably of seamless formation consisting of a woven tubular structure 1 including flexible cotton warp strands 2 and one or more helical weft or filling strands 3 of round, hard-twisted kraft paper or other suitable material having desired qualities of strength and stiffness. These elements are closely combined by known methods of circular weaving to produce the tube 1 having any desired dimensions. In its process of manufacture, the elements of the tube are treated with a liquid preserving compound. A suitable compound for this purpose is so-called "linseed oil baking varnish", a known composition made of synthetic resin and vegetable oil, such as linseed oil and China wood oil, which is convertible into a dry, inert, flexible condition by heat in the presence of air. The preserving compound may be applied either from the interior or from the exterior of the tube. If applied from the interior, it can be introduced through a hollow mandrel about which the tube is woven. If applied from the outside, such application can be made by passing the completed tube through a bath of compound, with immersion of the tube in the bath for a sufficient interval to allow penetration of the compound through the walls of the tube to the interior bore thereof. This impregnating compound may form a light coating on the interior of the tube when applied from the inside and some of the material will fill up the interstices between the intersecting warp and filling strands.

The compound incorporated in the tube structure renders the same substantially or approximately non-porous. But, to improve the non-porous characteristics of the tube structure as a whole, I incorporate therein an outer covering of flexible cellulosic lacquer having a smooth non-porous and continuous outer surface. Various known preparations of nitro-cellulose, or other cellulose compounds, with solvents and emollient oils may be used. I prefer to use nitro-cellulose containing a suitable content of castor oil (which is an essentially non-drying oil) to keep it flexible, dissolved in any suitable solvent. The lacquer coating is preferably subjected to the treatment disclosed in my above identified copending application, whereby heat and pressure is applied by a heated die so as to compact the coating, thus closing up the pores or pin holes formed by the escape of the volatilized solvent through the skin which forms first on the coating during the drying thereof. Such outer lacquer covering, designated at 4 in the drawing, is applied in several stages. In practice, I have found that satisfactory results will be secured by applying seven thin coats of lacquer and subjecting each to heat and pressure so as to form a dense and impervious coat. The lacquer coating contributes various essential desirable features to the finished tubing. One of the most important of these is to render the tubing air-tight. Practice has shown that tubing of my invention will withstand differences between external and internal pressure up to fifteen pounds per square inch.

Another essential feature of the lacquer coating is to render the tube impervious to attack by elements and various substances with which it may come in contact. Exhaustive tests have proven that the tubing fulfills these requirements to a very high degree. The lacquer coat imparts a high luster and pleasing appearance to the tube

and it may be given any color desired, by the addition of dyes or pigments. This is of advantage when the tubing is to be used as windshield wiper tubing because the color of the tube can be made to harmonize with the color scheme of the interior of a car where the tube is exposed to view.

The tubing of my invention is well suited for use in environments where it will be exposed to oil, gasoline and water. The impregrating coating penetrating into the tube is capable of resisting attack by gasoline and oil. And the outer flexible lacquer coating renders the tube non-porous and is resistant to destructive action of oil and water such as are apt to be spattered thereon when the tube is used in the environment of an automobile engine. Thus, my improved tubing is well suited for use in operating windshield wipers of automobiles or in similar environments where the old forms of rubber tubes previously used are rapidly deteriorated or destroyed in use with the result of rendering the apparatus to which they are attached, such as a windshield wiper or the like, inoperative.

Various modifications may be made by those skilled in the art without departing from the invention as defined in the appended claims.

What I claim is:—

1. Tubing for vacuum and pressure purposes, comprising a flexible seamless woven tube, an impregnating coating of oil and gasoline resisting compound on and penetrating into the tube, and an outer covering of cellulosic lacquer carrying a fraction of castor oil to keep it flexible and having a smooth non-porous and continuous outer surface.

2. Tubing for vacuum and pressure purposes comprising a flexible seamless woven body tube, an oil and gasoline resisting coating of linseed oil baking varnish on and penetrating into the tube, and a relatively thick outer covering comprising a plurality of coats of nitrocellulose lacquer carrying a fraction of castor oil to keep it flexible and having a smooth, compact, non-porous and continuous outer surface.

3. Tubing for vacuum or pressure purposes comprising a flexible tube having longitudinal cotton warp strands and interwoven twisted paper filling strands, an oil and gasoline resistant compound coating the interior of the tube, impregnating the warp and filling strands and extending into the interstices therebetween, and an outer covering of flexible cellulosic lacquer carrying a fraction of castor oil to keep it flexible and having a smooth non-porous and continuous outer surface.

4. Tubing for vacuum and pressure purposes comprising a flexible seamless tube of interwoven cotton and twisted paper strands, an impregnating coating of an oil and gasoline resistant compound on and penetrating into the tube and an outer covering of flexible cellulosic lacquer carrying a fraction of castor oil to keep it flexible and having a compact non-porous outer surface.

5. Tubing for vacuum and pressure purposes, comprising a flexible seamless woven tube, an impregnating coating of oil and gasoline resisting compound on and penetrating into the tube, and an outer covering of cellulosic lacquer carrying a fraction of a non-drying oil to keep it flexible and having a smooth non-porous and continuous outer surface.

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