Dec. 26, 1933. J. A. KENNEDY 1,940,868

COMPOUND TUBULAR FABRIC

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Fig. 1.

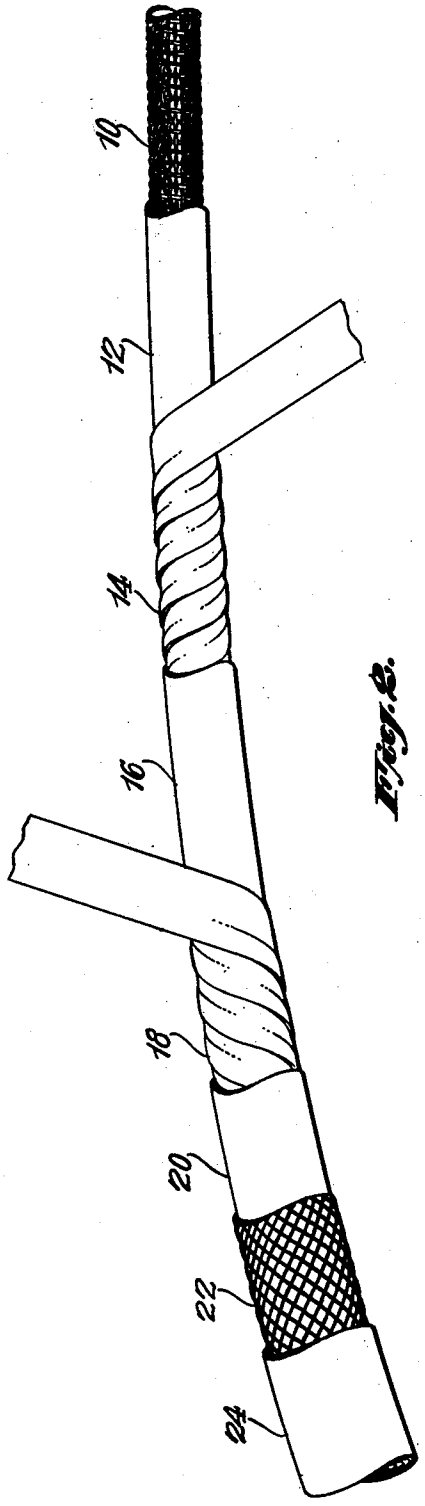


Fig. 2.



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COMPOUND TUBULAR FABRIC

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4 Claims. (Cl. 137—90)

This invention relates to improvements in tubular fabric and is adapted to provide an improved structure having air-tight, liquid-tight, oil and water-tight qualities. These qualities are secured without the necessity of incorporating rubber compounds and similar vulcanizable materials in the tube structure. The invention will be fully apparent from the following specification when read in connection with the accompanying drawing.

In the drawing:—

Fig. 1 is an elevation with portions broken away in the interest of clearness to reveal different parts of the structure of the tubing;

Fig. 2 is a longitudinal section on an enlarged scale revealing the characteristics of different strata of the tube.

Referring in detail to the drawing, the tube comprises an innermost hollow woven core indicated at 10 which is made up of a series of longitudinally extending cotton warp strands and interconnected helical woof strands preferably formed of twisted paper. The inner core 10 is preferably treated with suitable material so as to be substantially oil-proof. Over the core, there is a layer or stratum 12 of plastic compound which in use is adapted to always remain in its plastic condition. This compound is preferably, though not necessarily, formed of the following ingredients:—a resin, non-drying oil, and a solvent including coal tar and petroleum base. This material seals the interwoven core 10 and fills the interstices on the exterior of the interwoven warp and woof strands. Over the layer 12, there is a paper wrapping, indicated at 14. This wrapping is preferably helically wound over the plastic layer 12, the different convolutions of the wrapping overlapping. The wrapping partially absorbs or becomes somewhat permeated with the composition. Over the wrapping, I apply another layer 16 of plastic material of the same sort as that used for the layer 12 and over this there is another wrapping of helically wound paper, as indicated at 18. This wrapping 18 is in turn covered with another layer of plastic compound, as indicated at 20. Over this assemblage, I provide a braided, woven or knitted jacket, as indicated at 22.

This jacket may be of cotton or similar fabric applied by known types of braiders, knitters or circular looms. The jacket will absorb and become partly impregnated with the compound forming the layer 20. Over the outside of the jacket, I apply a coating of lacquer as indicated at 24.

The tubular structure formed of the various layers described has great flexibility and is suitable for use in handling water, oil, gas or other liquids. It can also be used for an air conduit and is sufficiently non-porous to be used for vacuum apparatus and the structure of the inner core in combination with the paper wrappings endows the structure with sufficient strength to resist collapse under vacuum. A particular feature of the invention resides in the use of the plastic layers 12, 16 and 20 which are interposed between substantially flexible strata of the tube structure. The plastic compound renders the structure impervious to air, oil, moisture, etc. The fact that this compound retains its plasticity is of particular advantage in flexible tubing of the kind described because under bending strains the plastic compound serves as sort of a lubricant to facilitate a relative movement of the different parts of the structure. For example, when the overlapped paper strips move relatively, they are relieved of strains because of the lubricating action of the compound. The lubricating function is also of advantage to prevent undue wear between the interconnected warp and woof strands of the core 10 and the woven or braided strands of the outer jacket 22. The outer lacquer coating 24 is of peculiar importance in a structure including such layers of plastic material, the lacquer serving to prevent the infiltration of foreign matter through the jacket 22 which might attack the underlying plastic compound 20.

The lacquer 24 also gives a neat finish to the jacket and offers resistance to penetration by water, oil, gasoline and other hydrocarbons. While not limited thereto the lacquer coating 24 is preferably a cellulosic compound, such material being suitable because it can be readily flexed without cracking or chipping off. The lacquer coating is applied in the form of a thin solution so that its body somewhat permeates or interlocks with the braided or stranded structure of the jacket, thus upon drying and hardening of the lacquer the jacket is somewhat stiffened so as to offer an appreciable resistance to collapse. This stiffness, however, does not approach rigidity because of the flexibility of the lacquer coat. In practice, the jacket can be dented, but it will resume its normally round contour after the denting pressure is relieved. For example, the tube can be pressed out flat between one's fingers and upon removal of the pressure the round shape will be resumed. This quality of the tube's ability to return to the original contour after

having been collapsed is also due in part to the incorporation therein of the plastic compound and its lubricating characteristics coupled with its elasticity.

The interconnected strands of the inner core 10 are oil-proofed with a suitable compound so as to render them substantially non-absorbent, in order to prevent said strands from acting like a wick. Thus the strands will have no tendency to act as vehicles for carrying the compound 12 through the core or to the interior wall thereof.

While I have described quite specifically a tubular member having two helical wrappings of paper and three layers of plastic material it will of course be understood that I am not limited to any precise number of layers, it being within my invention to have a greater or lesser number of paper layers also different numbers of plastic intermediate layers, it being apparent that various modifications and substitution of equivalents 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. A flexible tube of the character described comprising an inner woven core, including interconnected longitudinally extending warp strands and helical filling strands, a filler impregnated throughout the wall structure of said core and substantially completely satisfying the absorptive capacity thereof, an adhesive plastic layer of water repellent material over said core, a wrapping over the layer and an outer jacket of interconnected strands enclosing the assemblage and an impervious lacquer coating enveloping jacket forming an hermetic seal to prevent the infiltration of substances which might attack said layer.

2. A flexible tube comprising an inner core of interconnected longitudinal warp strands and helical filling strands, one set of strands being of cotton thread or the like and the other set being twisted paper, a filler impregnated throughout the wall structure of said core and substantially completely satisfying the absorptive capacity thereof, a plurality of overlapped paper wrappings, flexible layers of a water repellent plastic compound interposed between said paper wrappings and with similar plastic compound interposed between the innermost paper wrapping and the flexible core, and an outer jacket having an impervious coating forming an hermetic seal to prevent the infiltration through the jacket of foreign matter which might attack the underlying plastic compound.

3. A tube of the character described comprising a flexible woven core of cotton and twisted paper strands, a filler impregnated throughout the wall structure of said core and substantially completely satisfying the absorptive capacity thereof, a paper wrapping, a layer of water repellent plastic compound between the core and said wrapping, another such layer of plastic compound over said wrapping, an outer jacket of interconnected strands having an impervious enveloping sheathing of lacquer forming an hermetic seal for the underlying compound.

4. A flexible tube including a fibrous inner sleeve, a filler impregnated throughout the wall structure of said inner sleeve substantially completely satisfying the absorptive capacity thereof, an outer fabric sleeve concentric with said inner sleeve, a continuous seamless sheathing comprising water repellent material between said inner and outer sleeves and enveloping said inner sleeve, the inner and outer surfaces of said sheathing being bonded to the adjacent surfaces of said inner and outer sleeves respectively, and a continuous seamless sheathing comprising water repellent material enveloping said outer sleeve and bonded to the exterior surfaces thereof, said sheathings providing hermetic seals at the inner and outer surfaces of said outer sleeve.

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