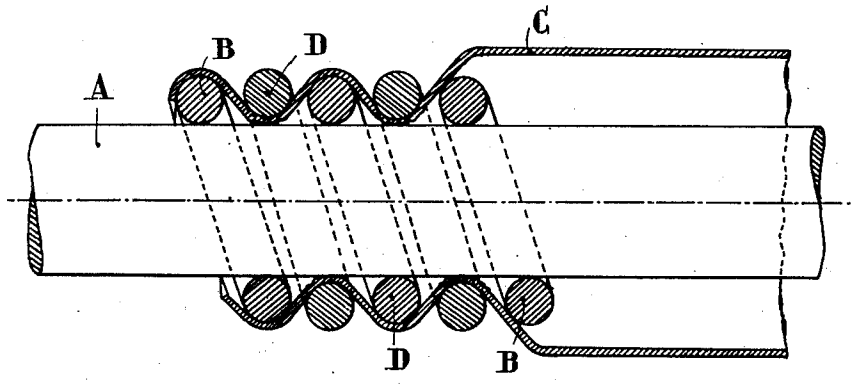
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MANUFACTURE OF FLEXIBLE TUBES

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MANUFACTURE OF FLEXIBLE TUBES.

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Hitherto textile tubes have been generally made either of flexible material such as rubber, leather, or similar material always containing a rubber composition, or made of helical metal bands or strips in which a tight joint between the bands or strips was ensured by means of rubber, or asbestos, or by the pressure of the bands against each other.

Such tubes could be used with satisfactory results for liquids which do not corrode the composition of the tubes, and in cases where the piping is not exposed to vibrations. But for motor cars and aerial machines, that is to say machines exposed to constant vibration, such flexible tubes are not strong enough, and leak, either on account of the vibrations displacing the joints between the metal bands of tubes, or owing to the materials containing rubber gradually disintegrating under the action of hydrocarbons. Moreover, no existing flexible material, the elastic properties of which can be compared with those of rubber, is free from liability to corrosion by hydrocarbons.

This invention relates to the manufacture of a flexible tube that can easily withstand vibrations, owing to its being made without joints, and of a single material which is unaffected by hydrocarbons.

According to this invention the tube is formed of a sheet of cellulose or similar material or a combination of materials of the cellulose group provided that the material used can be rolled into thin sheets similar to sheets of paper.

As regards its chemical properties, the material in question must be entirely insoluble in hydrocarbons.

The joining of the said sheet must be made with the assistance of a glue which is also insoluble in hydrocarbons, for instance a gum-lac glue, the solvent used for preparing the said solution being selected so as to result in a non-brittle layer of glue after drying.

The tube thus obtained although made of thin material, is not a flexible tube. In order to render it flexible, it is passed between two wire springs; one of the springs being mounted in the interior of the tube, and the other spring being wound round the outside of the tube, and the convolutions of the second spring lying between the convolutions of the first spring. Thus the wall of the tube is forced to assume the shape of a sinusoidal curve between the said two springs.

The chief point in this operation consists in arranging a large excess of material between the springs. To that end, a cellulose tube is taken of a diameter slightly greater than the final diameter of the tube to be obtained. By forcing the said larger tube into the convolutions of the inner spring which is of a smaller diameter, the material will be plaited, and in addition there will also be formed in infinite number of minute bellows-like folds which are disposed circumferentially of the depressed portions of the plaits and which, by opening and closing, will enable the finished tube to follow the bending imparted to the two springs, without the cellulose material being torn or broken. It is therefore this special formation of the material in each convolution that enables the cellulose to be formed into a kind of bellows acting in both directions, so that it can follow any required bending of the whole tube.

This tube can be manufactured of the material hereinafter described, and the process of manufacture will be clearly understood by referring to the accompanying drawing which shows the flexible tube in section, in the course of its manufacture.

A rod or mandrel A is used, of a diameter equal to the inside diameter of the tube to be manufactured. Around the said mandrel is first wound the wire B to constitute the inner spring or armature of the tube. This winding is done in a helical line, intervals equal to the diameter of the wire intended to constitute the second spring being left between the successive convolutions.

The spring B being thus wound about the mandrel A, over the same mandrel is placed a cellulose tube C previously prepared in the manner hereinbefore described and having a diameter greater than the diameter of the first winding B. The tube is then forced into the spaces left free between the various convolutions of the spring B, by winding over the tube and in the said spaces a wire D, as shown in the drawing, so as to form the outer spring.

The tube being finished, the mandrel A is withdrawn.

Owing to the said two springs constituting permanent parts of the tube, the latter possesses a great strength.

The inner spring B prevents in fact the

tube from collapsing under the action of atmospheric pressure in the event of a vacuum being produced in its interior.

As regards the outer spring D, it firmly holds the material when a liquid or gas is pumped into the tube under pressure.

Obviously, layers of canvas, or protecting layers of any other desired material, can be applied directly on the cellulose wall, so as to prevent any protuberance of the wire from damaging the cellulose.

The completely finished tube can also be protected by braiding it over with metallic or other thread, by enclosing it into any protective sheath.

The tube according to this invention is suitable for any purpose, and its use is of special importance for piping for hydrocarbons in machines exposed to vibrations such as motor cars, aeroplanes or the like.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

A flexible sheet-cellulose tube, permanently provided with interfitting outer and inner spiral windings of wire forming a multitude of transverse plaits in the tube around the convolutions of both windings, said plaits having an infinite number of minute circumferential, bellows-like folds formed in the depressions of the plaits.

In testimony whereof I affix my signature.

JACQUES POBEREJSKY.