

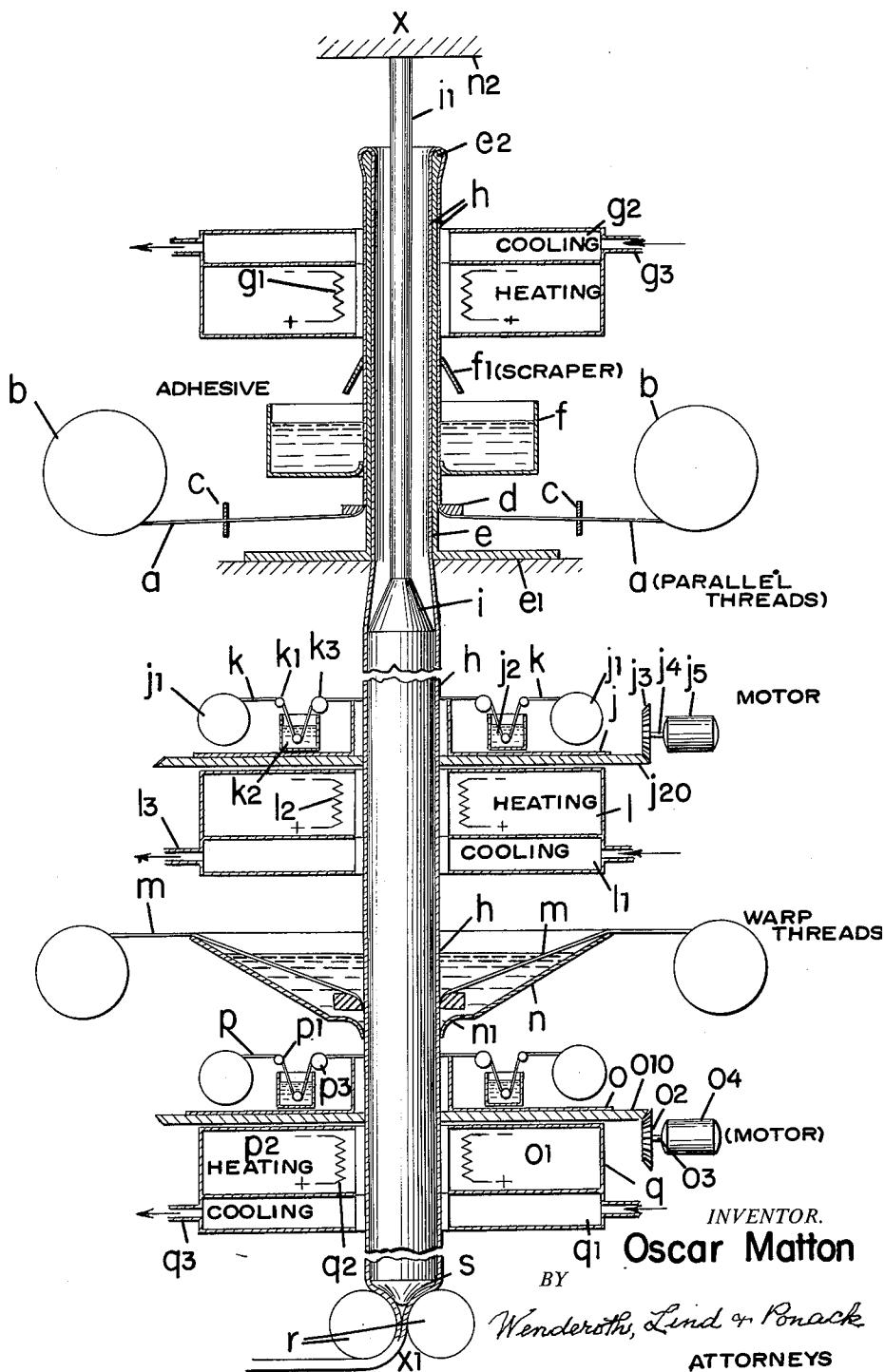
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METHOD AND MEANS FOR MANUFACTURING TUBULAR FLUID TIGHT HOSES

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METHOD AND MEANS FOR MANUFACTURING TUBULAR FLUID TIGHT HOSES

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3 Claims. (Cl. 156-169)

The present invention provides a method and means for the manufacture of fluid-tight hoses, especially fire hoses.

The hoses used for fire-fighting for example are generally manufactured from a woven textile sheath which provides the mechanical strength of the hose. Fluid-tightness may be afforded in various ways, especially by the introduction and adhesion inside the textile sheath either of a non-porous tube consisting of a textile liner impregnated with latex or plastic material, or of a tube of rubber or plastic material, or again by lining the textile sheath with latex or plastic material.

These various ways generally necessitate complicated and expensive equipment and numerous manipulations in the course of manufacture.

Articles made from woven material are twisted or stretched more or less according to the methods of manufacture used.

When the materials of which the fluid-tight liner and the textile sheath are made do not have the same coefficient of elasticity, the internal liner may become detached under high pressure.

The textile sheath must be handled with care, for if a warp thread is damaged, there is danger of the sheath bursting.

The present invention has for its main object to provide an improved hose in which these disadvantages are avoided, the improved hose not consisting of a woven textile sheath, but being made in a continuous length by means of threads or wires intimately interconnected by natural or synthetic rubber or by plastic material.

According to the invention, the hose is made up of threads disposed in the direction of the length of the hose to be manufactured, forming as it were the generatrices of a cylinder, and of other threads disposed transversely to form spirals around the longitudinal threads, all the threads being connected together by rubber or plastic material.

Other characteristics, objects and advantages of the invention will hereinafter appear from the following description, which relates only to one form of embodiment given simply by way of non-limitative example, other shapes, styles and arrangements being possible without departing from the scope of the invention as defined in the appended claims.

Reference is made in the description to the accompanying drawing, which represents diagrammatically and in axial longitudinal section preferred means for carrying out the improved method of manufacture.

In this description, the threads disposed in the direction of the length of the hose will be called the warp threads, by analogy with the art of weaving, and the threads disposed in the direction perpendicular thereto will be called the weft threads, although there is essentially no weaving action and interwoven threads are not employed.

Warp threads a coming from supply-spools b , disposed around the axis $x-x'$ of the device, are uniformly distributed, by means of an annular comb c , along radii of a circle, the centre of which is situated on the axis $x-x'$. These threads, which are drawn along continuously, as explained hereinafter, next pass under an annular guide d , surrounding a vertical cylinder e having a base plate e_1 fixed to the frame of the apparatus. The cylinder e is of

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external diameter slightly less than the internal diameter of the hose to be manufactured. The warp threads a are drawn parallel with the generatrices of the cylinder, and cover its entire surface; they pass upwardly through the middle of a tank f containing an adhesive, for example an emulsion of synthetic rubber. On issuing from the liquid in the tank, the threads pass through a scraper f , which regulates the thickness of the adhesive layer deposited on the threads.

The bundle of coated threads next travels upwards into a heating zone g , constituted, in the example represented by an enclosure heated by internal electric resistances g_1 . From this heating zone, the bundle of threads passes into a drying or cooling zone g_2 , constituted in the example represented by another enclosure adjacent to the first, and into which cold air is introduced by way of a duct g_3 .

The coating operation followed by heating and air-cooling can be repeated a number of times along the cylinder e , in order to obtain a coherent and fluid-tight film of any desired thickness, forming a continuous tube, as indicated at h .

The tube h thus formed, which is to constitute the internal fluid-tight wall of the hose, arrives at the top of the cylinder e , the upper edge e_2 of which is thickened and rounded. The tube is turned inside out by folding back over this edge and it returns down the interior of the cylinder, wherein it fits over a mandrel i coaxial with the cylinder e . This mandrel is held at the top by a rod i_1 fixed to the frame n_2 of the device.

In order to facilitate the sliding of the tube h upon the mandrel i , talc or other lubricant is introduced through the open top of the cylinder e .

Around the mandrel i and concentric therewith there is rotatably mounted a plate j , suitably set in rotation, for example as represented by means of a gear wheel j_{20} meshing with a bevel pinion j_3 carried by the shaft j_4 of a motor j_5 .

The plate j carries a plurality of spools j_1 on which the weft threads k are wound. This plate, acting like a shuttle, deposits the weft threads around the tube h as it rotates about the latter, these threads being laid in the manner of a binding. The ratio between the speed of rotation of the plate j and the speed of linear movement of the tube h determines the weft density, as it may be called, by its resemblance to a weaving operation.

The weft threads are guided by a system of rollers k_1, k_2, k_3 , so as to pass down into a tank j_2 , containing for example an emulsion of synthetic rubber, with which they become coated.

In certain cases, it may be advantageous to vary the tension of the weft threads k . In order to regulate this tension, the rollers k_3 over which the threads pass may be braked or otherwise controlled so as to exert a higher or lower traction upon the threads, this control being dependent upon the rotation of the plate j .

The tube, bearing the weft threads wound upon its exterior, then passes into a heating zone l , maintained at a desired heat by electric resistances l_2 , and into a drying or cooling zone l_1 , to which cold air is supplied through one duct and from which the air is discharged through another duct l_3 .

The following operation consists in passing a fresh layer of warp threads m (similar to the warp threads a) into a bath m_1 , wherein they are coated with latex emulsion for example and in bringing these coated warp threads m by means of a ring n against the exterior of the tube h under manufacture. After the tube has passed down through a scraper n_1 , it is given a second layer of weft threads by means of a second shuttle-like plate o , driven in rotation by means similar to those described for the shuttle plate j ; in this way, there are laid around the warp threads m , other weft threads p which have been

coated by passage over rollers p_1, p_2, p_3 in a tank o_1 containing emulsion for example. The whole then passes into a heating zone q provided with electrical resistances q_2 , and into a drying or cooling zone q_1 , supplied with cold air which is discharged through a duct q_3 .

The second shuttle plate o may be rotated in a direction opposite to that of the first shuttle plate j ; for example, as represented, in the case of the plate o , the engagement of the gearing o_{10} and the pinion o_2 carried by the shaft o_3 of the motor o_4 may be reversed.

According to the thickness of the hose to be obtained and the desired qualities of strength, flexibility and so on, the above operation may be repeated several times.

The finished hose will be passed between draft rollers r situated at the end s of the mandrel i , this end being shaped, as shown in the drawing, to facilitate the sliding of the finished hose.

In the case where it is desired to avoid crushing the hose, the draft rollers r may be replaced by other means such as slideways or the like, provided with grippers between which the hose is engaged and drawn along.

It will be understood that since the invention maintains the warp threads straight, the twist resulting from weaving is thus avoided.

Furthermore, as these threads are coated in the course of manufacture of the hose and are worked and fixed under tension, the stretching of the hose after manufacture is practically nil.

It is naturally possible to use, for the warp threads or a part thereof, metal wires, for example made of stainless steel, or synthetic threads having high resistance to tension.

Any torsion which the hose tends to assume can be reduced or practically annulled by the use of threads having torsions in different directions.

As the hose may consist of a plurality of layers of warp and weft threads, its resistance to abrasion is considerably increased. Should an outer thread be accidentally cut, the remaining strength of the hose will still be acceptable.

The uniform distribution of the warp and weft threads increases the strength and permits of reducing the weight of material used, for the same result.

Apart from the advantages of quality of the finished product, the invention facilitates the manufacture of almost all kinds of hoses, whether flexible, semi-rigid or rigid, at relatively low cost.

In the example as described and represented, the apparatus is arranged with its axis vertical. It will be understood that the manufacture can also be carried out on a horizontal axis according to the same method.

What I claim is:

1. A method of making a tubular hose, comprising the steps of laying a plurality of parallel threads as generatrices of a cylinder with said threads lying parallel to the axis of said cylinder, coating said threads with an adhesive medium, heating said coated threads for solidifying said adhesive medium, turning said coated threads inside out after solidification of said adhesive medium so that said coated threads form the interior of said hose, winding a plurality of threads spirally around the exterior of said parallel threads when turned inside out, coating said spirally wound threads with an adhesive medium, and heating said spirally wound and coated threads for solidifying said last named adhesive medium thereon.

2. A method of making a tubular hose, comprising the steps of laying a plurality of parallel threads as generatrices of a cylinder with said threads lying parallel to the axis of said cylinder, coating said threads with an adhesive medium, heating said coated threads for solidifying said adhesive medium, turning said coated threads inside out after solidification of said adhesive medium so that said coated threads form the interior of said hose, winding a plurality of threads spirally around the exterior of said parallel threads when turned inside out, coating said spirally wound threads with adhesive medium, heating said spirally wound and coated threads for solidifying said last named adhesive medium thereon, laying a second plurality of parallel threads outside said spirally wound and coated threads after solidification of the adhesive thereon, coating said second plurality of parallel threads with adhesive medium, heating said second plurality of parallel threads for solidifying said last named adhesive thereon, winding a second plurality of threads spirally around said second plurality of parallel threads, coating said second plurality of spirally wound threads with adhesive medium, and heating said second plurality of spirally wound threads after being coated with said last named adhesive medium for solidifying said last named adhesive medium thereon.

3. Means for making a tubular hose, comprising in combination a hollow and open-ended cylinder, a plurality of thread-holding spools arranged around said cylinder, means for guiding threads from said spool for laying along the exterior of said cylinder as generatrices of its surface with said threads lying parallel to the axis of said cylinder, a tank for an adhesive medium, said cylinder and the threads laid along its exterior extending through said tank for coating said threads with said adhesive medium, a heating zone around said cylinder for drying out the adhesive medium coating said threads, means for drawing said coated and heated threads along said cylinder towards one end thereof, said end of said cylinder being rounded for passage of said threads inwardly to the interior of said cylinder, a mandrel coaxial with said cylinder, said threads passing along said mandrel after leaving the other open end of said cylinder, means for winding threads spirally around said mandrel and around said threads passing therealong, means for coating said spirally wound threads with an adhesive medium, and means for heating said spirally wound and coated threads for drying out said last named adhesive medium thereon.

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