

UNITED STATES PATENT OFFICE

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LAMINATED TUBULAR STRUCTURE

No Drawing.

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My invention has to do with the provision of a wide variety of tubular articles, ranging from small conduits to kegs, drums and larger containers, by cementing together plies of material; and my invention has for one of its objects, the provision of a new material and new structure for such articles.

Another object of my invention is the provision of articles of this class, which shall be waterproof in their nature, while at the same time retaining considerable resilience, and a structure which is strong, tough and durable and to a large degree moisture-proof.

It is still another object of my invention to facilitate and cheapen the manufacture of such articles.

These and other objects of my invention, I accomplish by that series of steps, and that product, of which I shall now describe a preferred embodiment.

Broadly speaking, I form my tubular articles by pasting together a felted stock comprising fibers and heat plastic waterproofing binder, of which binder, asphalt is an example. The adhesive may be any desired, but for reasons hereinafter to be explained, I prefer to use asphalt or some adhesive substance of the same general nature as the waterproofing substance in the felted stock.

The felted stock which I prefer to use is a web made on a paper machine from what I have termed a bituminous pulp, which means a pulp of fibers beaten or otherwise prepared for felting on a screen, in which pulp there is a heat plastic, waterproofing material, generally in very fine subdivision, but held in the pulp in some association with the fibers, whereby the pulp is relatively stable. This association probably is not a saturating association, and it may not be a coating association in the pulp; but whatever its nature, the pulp will be homogeneous, feltable stock, which may be handled like ordinary heavy stock in the paper making instrumentalities, and which will have wide range of proportion of waterproofing substance to fiber by weight.

There are several ways of making bituminous pulps of this character. An application of Harry C. Fisher, Serial No. 314,551 filed

Oct. 23, 1928, and an application of Earl P. Stevenson and Harry A. Buron Serial No. 316,611 filed Nov. 1, 1928, both teach procedures resulting in feltable pulps, in which the bituminous content may run as high in some instances as 80% by weight in the finished felted stock. In order that my invention may be better understood, I will now describe an exemplary procedure for making a pulp of this character. Into a mixing machine, which may be of the Werner-Pfleiderer type, I introduce say 40 parts by weight of wetted fibrous material, which may be waste papers, and to this I add 60% by weight of asphaltic material, which may vary considerably in its characteristics. I then operate my mixer, keeping steam in the jacket thereof so as to heat its contents to the point where the asphalt is a non-solid, and by a rotation of the mixer blades, I bring about an association of the fibers to the asphaltic material. During the mixing operation, and under the influence of heat, some water will be evaporated from the stock, and I preferably maintain the water content of the stock so as to prevent drying out, and I do not continue my mixing to the point where a homogeneous plastic compound is obtained, in which substantially all of the fibers are coated with the binder. Stopping short of this point, I add more water to my mixer, and continue the rotation of the blades. The compound very rapidly breaks down, and comes into a loose suspension in the water, which facilitates the emptying of the mixer, and the transferring of the stock to a beating engine.

It is to be noted that the mixing operation, particularly with bitumen in a gummy condition, liberates the fibers to a very great extent, and renders a subsequent beating operation easy.

Having transferred the stock to a heating engine, I beat it as I would ordinary paper stock to fit it for felting upon a screen, and having done this, with or without further refining, I may transfer it to the stuff chest of a paper making machine, and felt it into a web thereon, as is done with ordinary stock. The machine used may be of any type desired, but will ordinarily be a Fourdrinier machine or

a cylinder mold machine, depending somewhat on the thickness of the sheet desired.

The association of the bituminous material and the fibrous stock is such that the felted mass upon the screen will contain substantially all of the pulp solids of any appreciable size; and there will be very little of the bituminous material to be found in the white water.

After drying, the stock will be a black felted substance in which, in the example used, the bitumen will form approximately 60% by weight of the whole, and the fibrous material 40%. Depending upon the quantity of bitumen used, the sheet may be more or less impervious; but it will be water-resistant. In some products a degree of porosity is desirable as contributing both to their insulating characteristics and to their flexibility. The characteristics of the felted stock may be varied by a control of the proportion of the bitumen present, a control of the characteristics of the bitumen used, a control of the character of fiber, and a control of the beating or refining stage.

In following my invention, I take felted stock of this character, bands or webs and form a tubular article therefrom, preferably by winding the web about a form, either convolutely or spirally, in plies, and pasting the several laminations together with a suitable adhesive, for which purpose I prefer to use asphalt. In this manner I get an article of the desired thickness, and strength, which not only is formed itself of a bitumenized web, but is pasted with bitumen. Where the web is porous, the adhesive seals it against the entrance of air or moisture from the outside.

In the manufacture of long lengths of tubing or conduits of comparatively small diameter, I prefer to take strips of the felted stock, and wind the strips spirally about a mandrel, as is done in making tubes of paper, applying bitumen in the place of ordinary adhesive, after which the tubes may be cut to the length desired. During the forming operation, they may be externally coated with bitumen, if desired, or after the forming operation, they may be dipped into a bath of a coating substance. In forming larger articles, such as kegs, drums, and barrels, and the like, particularly where greater wall thickness is desired, I may wind convolutely and paste a web about a mandrel until the desired thickness has been built up. I may further, if desired, compact the mass through the use of heat and pressure, and it is to be noted that particularly where the proportion of bitumen is great with relation to the proportion of fibrous ingredient, the substance of the felted web has somewhat the characteristics of a bituminous plastic, in the sense that it may be molded under heat and pressure. It has also largely the characteristics of a felted web, so that in general it will be lighter,

tougher, and more flexible than a molded plastic. Tubular structures of my material may be additionally reinforced as by riveting or the like, and they may have incorporated in their structures, webs or layers of other substances than the felted product of the bituminous pulp hereinabove described. They also may have incorporated in their structure, corrugated or deformed webs adapted to provide dead air cells in the finished structure, where an insulating material is desired.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. Tubular stock comprising layers of the felted product of a bituminous pulp as defined, spirally wound and cemented with additional bitumen, said structure coated on the outside with bitumen.

2. That process of manufacturing laminated articles which comprises forming a pulp of fibrous material in which asphalt exists in a stable dispersion in uncoated particles of minute size, felting said pulp upon a screen so as to form a web, drying said web, winding said web about a mandrel and adhesively securing the plies of the article so formed with asphalt.

3. That process of manufacturing laminated articles which comprises forming a pulp of fibrous material in which asphalt exists in a stable dispersion in uncoated particles of minute size, the amount of asphalt present being greater by weight than the amount of fibrous material, felting said pulp upon a screen so as to form a web about a mandrel and adhesively securing the plies of the article so formed with asphalt.

4. A laminated tubular structure formed of a continuous web of a felted product of a bituminous pulp as described, said web wound upon itself and the laminations cemented together with additional bitumen.

5. Tubular stock comprising layers of the felted product of a bituminous pulp as described, spirally wound and cemented together with additional bitumen.

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