

Aug. 9, 1938.

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2,126,556

MANUFACTURE OF TUBULAR PAPER STRUCTURE

Filed May 31, 1935

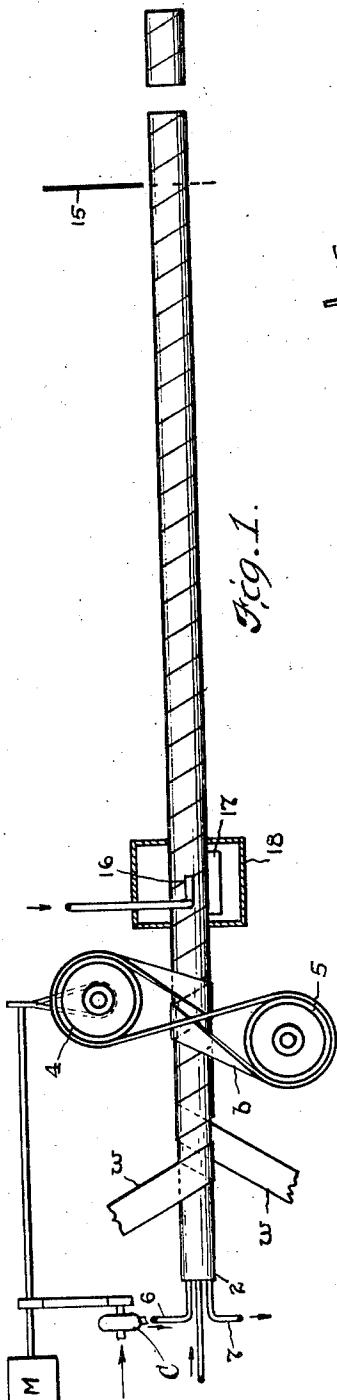


Fig. 1.

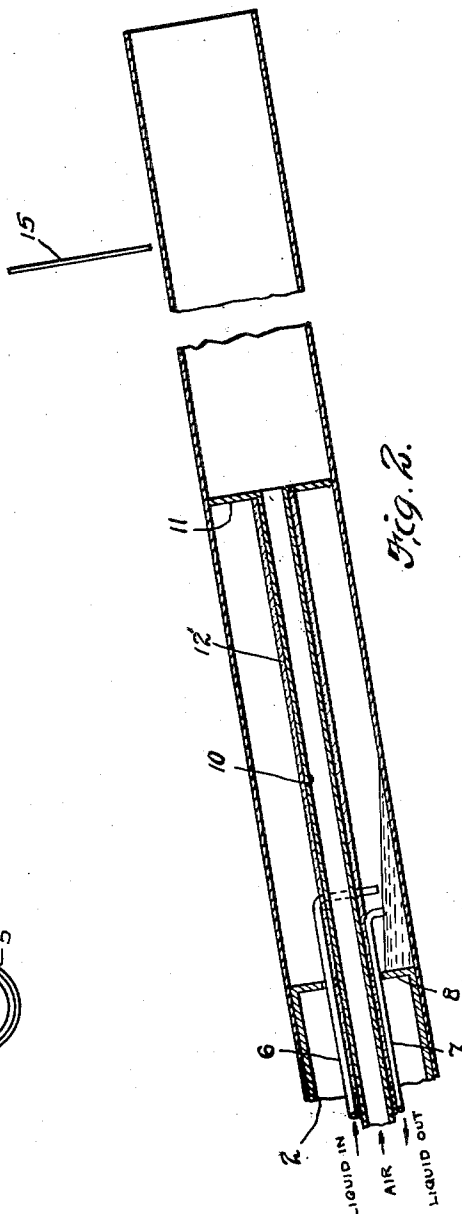


Fig. 2.

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2,126,556

MANUFACTURE OF TUBULAR PAPER
STRUCTURE

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Application May 31, 1935, Serial No. 24,311

10 Claims. (Cl. 91—55)

This invention relates to production of tubular paper articles; and it is among the objects of the invention to facilitate rapid manufacture of tubular structures having sufficient strength and also resistance to out-flow of liquid contents to serve as containers. Other objects and advantages will appear as the description proceeds.

To the accomplishment of the foregoing and related ends, the invention, then, comprises the means hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawing setting forth in detail several illustrative embodiments of the invention, these being indicative however, of but a few of the various ways in which the principle of the invention may be employed.

In said annexed drawing:—

Fig. 1 is a plan view showing an embodiment of the invention, parts being broken away for simplification; and Fig. 2 is an enlarged scale fragmentary vertical section.

Referring more particularly to the drawing, there is shown a hollow mandrel 2, which is supported on framing of such detail as may be desired, and upon which a tubular structure is progressively formed by supply of webs *w* of paper-like stock, these being preferably laid on spiral-wise, and overlapping, as supplied from suitable mounted spools, the detail of which is immaterial here and not shown. At the forward side of the web lay-on is a means for pressing and rotating the tubular structure formed, and this may include for instance belts *b* wrapping about the tube, and suitably driven, as by pulleys 4, 5. Extending within the hollow mandrel 2 is a conduit or pipe 6 for introducing sizing liquid within the interior to contact with the walls of the tube as formed. The end of the pipe 6 may terminate in a sprayer head as desired, or may be of simple opening form, the function in any case being to supply a sizing such that it adequately distributes upon the inner wall of the tube. It is thus seen that the tube axially rotating and continuously advancing is subjected to a supply of sizing internally. If the rate of supply be accurately correlated with the rate of movement of the tube, and this is practical by the employment of a supply pump which is driven in step with the main drive of the machine, the sizing is used up, or rather carried away on the inside surface of the tube, as fast as supplied. For instance, pump C may be driven from the shaft operated by the motor M which also has driving connections to the shaft of pulley 4, etc. To advantage however, a drain connection or over-flow pipe 7 may be also ap-

plied, and by provision of a dam 8, a constant level of sizing may be assured, irrespective of supply feed rate, the liquid being drawn off to the maintained level, and being pumped back through the supply pipe. By mounting the mandrel such that the tube extends at an incline to the horizontal, the pool of liquid may be attained in extent as desired.

Depending somewhat upon the character of the sizing, the setting may be more or less rapid. It is desirable however, to incorporate a conduit 10 which extending through from the end of the mandrel may supply a setting blast to rapidly assure sufficient setting or hardening of the sizing on the tube wall to allow severing. Depending upon the particular sizing, cold or heat may be thus applied, and preferably a blast stream of heated air is employed, this being brought into contact with the interior wall of the tube just beyond the point of sizing application. By provision of a deflector 11, back-rush of air into the sizing zone is prevented, and each zone is sufficiently isolated to best perform its function without interfering with the other. A jacketing or lagging 12 of heat insulation is desirable also, in order to prevent undue action upon the sizing before ready for setting.

In operation, webs of paper-like material *w* are supplied spiral-wise from supply-spools, and pressure and rotation is applied to the laminating structure by the belts *b*, the tube being progressively laid up and advanced in axial rotation. Sizing liquid is supplied through the pipe 6, and sprays onto or flows on the inner wall of the rapidly rotating and advancing tube, forming a layer thereon. With the over-flow 7, the constant level of liquid is maintained. Beyond the sizing zone, a stream of heated air as introduced through the conduit 10 is encountered, and the sized surface is rapidly set, so that by the time it reaches the cut-off saw 15, the tube may be severed into lengths as desired. In some cases, a sizing of the same or different composition is also applied to the exterior walls of the tube just beyond the pressing and driving belts *b*, and this may be accomplished by some suitable means such as a spray pipe 16 that discharges on top, such that the sizing is applied to the rotating and advancing tube wall. Any excess may be removed by a scraper or roller 17 in the tank 18.

Other modes of applying the principle of the invention may be employed, change being made as regards the details stated in any of the following claims, provided however, the means stated

in any of the following claims, or the equivalent of such, be employed.

I therefore particularly point out and distinctly claim as my invention:—

- 5 1. Apparatus for making a tubular paper structure, comprising a hollow mandrel, means for continuously forwarding a tubular paper body thereover and beyond, an inlet connection through said mandrel for supplying sizing liquid, and
10 means for limiting the extent of axial flow of the liquid, said means including means for mounting the mandrel with its discharge end rising on an incline to the horizontal.
- 15 2. Apparatus for making a tubular paper structure, comprising a hollow mandrel, means for continuously forwarding a tubular paper body thereover, means for mounting said mandrel with its discharge end rising on an incline to the horizontal, an inlet connection for supplying sizing liquid through the interior of said mandrel in excess of the tube-coating needs, a dam for maintaining a pool of liquid beyond the end of the mandrel, and an over-flow for holding a constant level in the pool.
- 20 3. Apparatus for making a tubular paper structure, comprising a hollow mandrel, means for continuously forwarding a tubular paper body thereover and beyond, an inlet connection through said mandrel for supplying sizing liquid, and a
30 connection for admitting a gaseous setting blast, and means for limiting the extent of axial flow of the liquid, said means including means for mounting the mandrel with its discharge end rising on an incline to the horizontal.
- 35 4. Apparatus for making a tubular paper structure, comprising a hollow mandrel, means for continuously forwarding a tubular paper body thereover and beyond, an inlet connection through said mandrel for supplying sizing liquid,
40 means for limiting the extent of axial flow of the liquid, said means including means for mounting the mandrel with its discharge end rising on an incline to the horizontal, and means for supplying sizing liquid to said tubular body exteriorly.
- 45 5. Apparatus for making a tubular paper structure, comprising a hollow mandrel, means for continuously forwarding a tubular paper body thereover and beyond, an inlet connection through said mandrel for supplying sizing liquid
50 through the interior of said mandrel, a deflector beyond said inlet connection, means for limiting the extent of axial flow of the liquid, said means including means for mounting the mandrel with its discharge end rising on an incline to the horizontal, and a pipe through said hollow mandrel and opening beyond said deflector for supplying air.
6. Apparatus for making a tubular paper structure, comprising a hollow mandrel, means for continuously forwarding a tubular paper body thereover and beyond, an inlet connection through said mandrel for supplying sizing liquid, means for limiting the extent of axial flow of the liquid, said means including means for mounting the mandrel with its discharge end rising on an incline to the horizontal, and means for coordinating the supply of liquid and the forwarding of the tubular body.
7. Apparatus for making a tubular paper structure, comprising a hollow mandrel, means for continuously forwarding a tubular paper body thereover and beyond in axial rotation, an inlet connection through said mandrel for supplying
20 sizing liquid, means for limiting the extent of axial flow of the liquid, said means including means for mounting the mandrel with its discharge end rising on an incline to the horizontal, a deflector beyond said liquid inlet connection, a
25 pipe through said hollow mandrel and opening beyond said deflector for supplying air, and a sizing applicator beyond the forming means to contact with the tubular body exteriorly.
8. In the making of a tubular paper structure, continuously forwarding a tubular paper body,
30 axially rotating such body, applying liquid to the interior while controlling the extent of liquid flow by rotating the body on an incline to the horizontal and supplying the liquid at the lower end, and
35 setting the sizing.
9. In the making of a tubular paper structure, continuously forwarding a tubular paper body, axially rotating such body on an incline to the horizontal, supplying sizing liquid at the lower
40 interior of such body in excess of the tube-coating needs, drawing off surplus liquid, setting the sizing, and severing the tubular body into uniform lengths.
10. In the making of a tubular paper structure, continuously forwarding a tubular paper body,
45 axially rotating such body, supplying sizing liquid to the interior of such body, maintaining a constant pool of such liquid in the interior by rotating the body on an incline to the horizontal, and
50 forcing heated air into the sized portion.

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