Oct. 13, 1953

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2,655,187

MEANS FOR PRODUCING TUBULAR BODIES FROM WOOD BY COILING UP VENEER SHEETS

Filed March 15, 1950

Fig. 1.

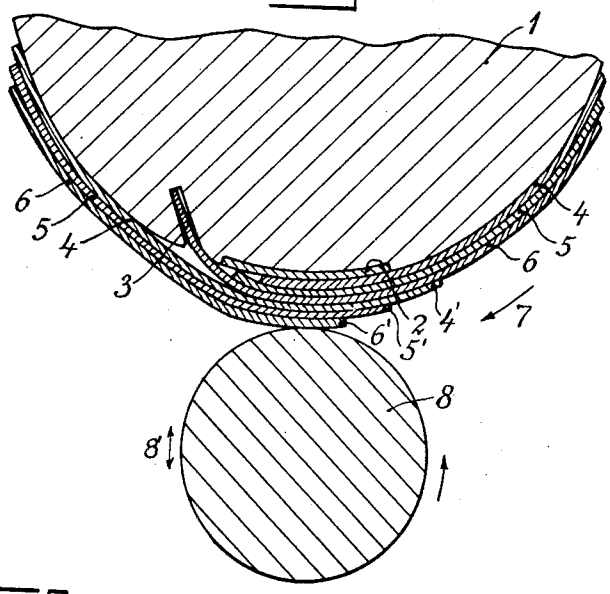
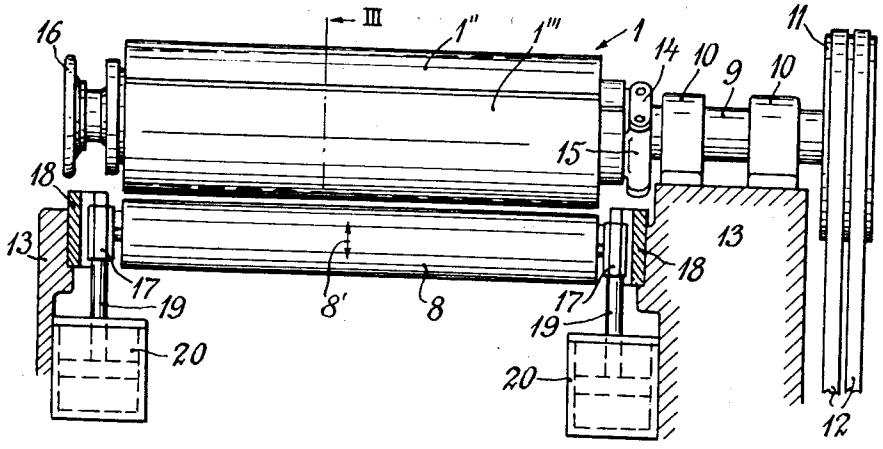


Fig. 2.



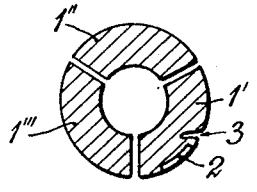


Fig. 3.

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Patented Oct. 13, 1953

2,655,187

UNITED STATES PATENT OFFICE

2,655,187

MEANS FOR PRODUCING TUBULAR BODIES FROM WOOD BY COILING UP VENEER SHEETS

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Application March 15, 1950, Serial No. 149,694
In Norway March 29, 1949

2 Claims. (Cl. 144—268)

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This invention relates to a method and means for producing tubular bodies from wood by coiling up veneer sheets on a core or mandrel, especially tubular bodies of cylindric shape.

It is generally known to produce such wooden tubular bodies of suitable lengths by a coiling process. Such bodies may for instance be used as suction or feed tubes in ventilating plants (such as in mines or mills), in pipe transport plants, for producing cylindric containers to be provided with bottom and cover (such as for powdered and liquid substances and also for other materials of the kind which will corrode sheet metal or iron containers), and in several other fields of technics.

Wooden tubular bodies may be produced by coiling up a veneer ribbon or web having the fibres either in the coiling direction or transverse to same or having a fiber direction which alternates in the coiling direction for making plywood tubes. The fibre direction may eventually form about 45° with the coiling direction and change from section to section of the web so that also in such case the fibre direction of the single layers are perpendicular to one another as in plywood. When using these methods a veneer web is coiled up several times around a core or a mandrel until the desired thickness is obtained. It is also known to stack veneer sheets having alternating fibre direction with an intermediate binder whereupon such pack is bent around the mandrel or core.

The present invention relates to a simple and cheap method for producing veneer tubes and consists in the following steps: After having been provided with a suitable binder two or more veneer sheets having a fibre direction which changes substantially 90 degrees from layer to layer, are placed one upon the other and coiled up on a mandrel before the binder is hardened, so as to overlap, whereupon the binder joining the ends together is hardened by local heating by the application of a high frequency field between the mandrel and a pressure roller.

The invention will be better understood when reading the following description of the drawing in which:

Fig. 1 shows a cross section of the joint of a coiled up tubular body with the adjacent parts of a mandrel and a pressure roller.

Fig. 2 schematically a machine for carrying out the method according to the invention, seen from the side, and

Fig. 3 a cross section of the mandrel taken along line III in Fig. 2.

In Fig. 1 only the part of the mandrel at which

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the joint appears, is shown and designated by 1 and an electrode embedded therein by 2. A slot serving to retain the leading end of the veneer sheet pack is numbered 3. The tubular plywood body to be produced is in the present case made from a stack of three veneer sheets 4, 5 and 6 of which sheets 4 and 6 may have the fibres in the coiling direction as indicated by an arrow 7, and sheet 5 the fibres substantially transverse to said direction. The pressure roller 8 and the electrode 2 will appear on opposite sides of the joint 4', 5', 6' when the veneer pack has been coiled up.

As shown in the drawing, the three layers 4, 5 or 6 have also been displaced relative to each other in the coiling direction so as to form a relatively even joint which may, later on, be smoothed by some suitable tool.

Hence, when using the method according to the invention, a tube is obtained having constant thickness except with respect to the joint and will have twice the number of layers as compared with the other parts of the tube body, see Fig. 1. In very many cases this will be without importance in view of the fact that the production itself will be much cheaper as compared with tubes made by coiling up a veneer web comprising sheets having alternating fibre direction.

In Fig. 2 is shown an embodiment of a machine which may be used for practicing the method according to the invention. The mandrel 1 is built up from three sectors 1', 1'' and 1''', between which normally exists a certain distance in peripheric direction, see especially Fig. 3. According to the further invention, the mandrel 1 is made contractible in the radial direction, so that the coiled up tube may be easily removed from the mandrel after the joint has been bound together by the above described heating treatment. The three sectors 1', 1'', 1''' may be radially displaceable parallel to themselves or, as in the present case, being hinged to the end of shaft 9 by ears 14 fixed to said shaft. The sections 1', 1'', 1''' are each provided with an extension forming on its end a sleeve for a bolt journalled to said ears. This will appear clearly from Fig. 2. The other free end of the mandrel 1 is provided with an adjusting means comprising a hand wheel 16, the shaft of which may be rotatable concentrically to shaft 9 and may have a cam disc or the like formed with three cams of spiral shape.

When turning the hand wheel in one direction, the free ends of the sectors will move inwardly so that the mandrel will attain a frusto-conical shape as indicated in dotted lines.

The shaft 9 is supported by two bearings 10 fixed to the top of the machine frame 13. The right end of said shaft 9 has a pulley 11 driven by belts 12.

In the machine table is arranged a freely rotatable roller 8, the bearings 17 of which are fixed to the free end of each one piston rod 19, the pistons of which slide in cylinders 20 supplied with pressure air. The pipe system therefore is not shown. The bearings 17 are guided by guide pieces 18 fixed to the machine frame 13. Hence, the roller 8 is movable up and down as indicated by double arrow 8'.

When the machine is not loaded, roller 8 will contact the mandrel 1 due to the pressure in the cylinders 20. As soon as veneer sheets are pushed between said mandrel and said roller, last will move in the downward direction and press the veneer sheets together during the coiling operation. The pressure with which the sheets are pressed together will depend upon the air pressure in the cylinders 20.

As shown in Fig. 3 one of the sectors, in the present case sector 1', is provided with a slot 3 which serves to retain the leading end of the veneer pack during the coiling process. The same sector is also provided with a metallic member 2 having a certain dimension in the peripheric direction and extending throughout the whole length of the mandrel. This metallic member serves as an electrode during heating of the joint. The other part of section 1' is made from an insulating material, for instance wood.

The other segments 1'' and 1''' are preferably metallic and may be inwardly heated by some suitable means, for instance by pipe coils supplied with steam or some heated liquid, such as water, oil or "Dowtherm" liquid a heat-transfer medium comprising a mixture of diphenyl and diphenyl oxide, or by a resistance wire connected to the main supply. As a consequence of this heating of the mandrel, also a certain degree of hardening of the binder will take place during the coiling operation. The mandrel may be heated up to 300° centigrade which will not only serve to dry out the veneer sheets but also aid in the hardening process of the intermediate binder.

As already mentioned a high frequency field is applied between electrode 2 and roller 8 as soon as the coiling operation has been finished in order to also harden the binder joining the ends of the veneer pack.

It is an important feature of the present invention that complete hardening of the joint already takes place in the coiling machine, so that it is not necessary to leave a mandrel or a core in the tube and provide same with an outer lapping to be removed when the binder has hardened.

When the high frequency field is applied between the electrode 2 and the roller 8, the joint will be subjected to a dielectric heating so that the binder will very soon become hardened (polymerized). As soon as the high frequency has performed its action, say already after 30 to 60 seconds, the tube may be removed from the mandrel and placed in some other place for further hardening of the binder.

Since the radial pressure exerted on the layers during the coiling operation and the hardening of the joint will disappear when the tube body is removed from the mandrel, it is necessary that the binder has so-called gap-filling properties.

As binders of that kind may be mentioned

urea, phenolic, melamine formaldehyde and similar thermo-setting resins. In certain cases also thermo-plastic resins may be used.

In order to complete the hardening after the tube body has been removed from the mandrel, said body may be placed in a hardening chamber in which it is subjected to heat treatment by high temperature. Eventually the tube body may be provided with another core, or other precautions may be taken to ensure that the tube body will attain its desired shape, for instance circular, oval or rectangular with rounded corners.

Due to the fact that the mandrel is contractible i. e. made so that its circumference is reducible, the tube body may easily be removed from the mandrel after the coiling operation and the heat treatment by high frequency have been performed.

Further, the pressure roller 8 may be provided with brake means so that the veneer pack is stretched and consequently coiled very tight around the mandrel during the coiling operation.

It is said above that sectors 1'' and 1''' of the mandrel 1 may be heated in some suitable way, for instance by steam, water, oil or electricity. The hardening time may be further reduced when the pressure roller 8 is also heated, for instance in the same way as the mandrel.

As appears from Fig. 1, the veneer sheets are displaced relative to each other in the coiling direction, whereby there are obtained tubes having joints as even as possible.

After the binder has been completely hardened in the hardening chamber the joint may be further smoothed by some cutting or grinding tool, at least near the ends of the tubes when same is to be provided with bottom and cover for producing veneer drums and the like.

Containers for special use may be provided with an intermediate metallic layer or with an inner metallic lining, for instance by providing an aluminium sheet between two of the layers 4, 5 and 6 or on the inner side of layer 4. In many cases such metallic layer may be replaced by a paper or a textile sheet.

I claim:

1. A machine for producing tubular wooden bodies from coiled veneer sheets comprising, in combination, an interiorly-heated driven mandrel, a pressure roller having an axis parallel to the axis of the mandrel and being movable radially toward and away from the surface of the mandrel, and means for radially moving the roller and releasably pressing the surface of the pressure roller against the surface of the mandrel, said mandrel being formed from a plurality of longitudinal complementary cylinder segments adapted to be displaced radially relative to the axis of the mandrel for increasing and decreasing the circumference of the mandrel, said cylinder segments being circumferentially adjacent, each of said cylinder segments extending axially of the mandrel for its entire length and being independent of the adjacent cylinder segment one of said cylinder segments being formed from an insulating material and being provided with a longitudinal slot for receiving the end of one of the veneer sheets, and a longitudinal electrode embedded in said insulating cylinder segment adjacent said slot.

2. A machine for producing tubular wooden bodies from coiled veneer sheets comprising, in combination, an interiorly-heated driven mandrel, a pressure roller having an axis parallel to

the axis of the mandrel and being movable radially toward and away from the surface of the mandrel, and means for radially moving the roller and releasably pressing the surface of the pressure roller against the surface of the mandrel, said mandrel being formed from a plurality of longitudinal complementary cylinder segments adapted to be displaced radially relative to the axis of the mandrel for increasing and decreasing the circumference of the mandrel, said cylinder segments being circumferentially adjacent, each of said cylinder segments extending axially of the mandrel for its entire length and being independent of the adjacent cylinder segment one of said cylinder segments being provided with a longitudinal slot for receiving the end of one of the veneer sheets, one end only of said cylinder segments being journalled to a driving shaft, the free end of the mandrel being provided with radial displacement means for radially expanding and contracting the cylinder segments at one end, with the other end as a pivot,

whereby to impart to the peripheral surface of the mandrel a frusto-conical configuration.

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