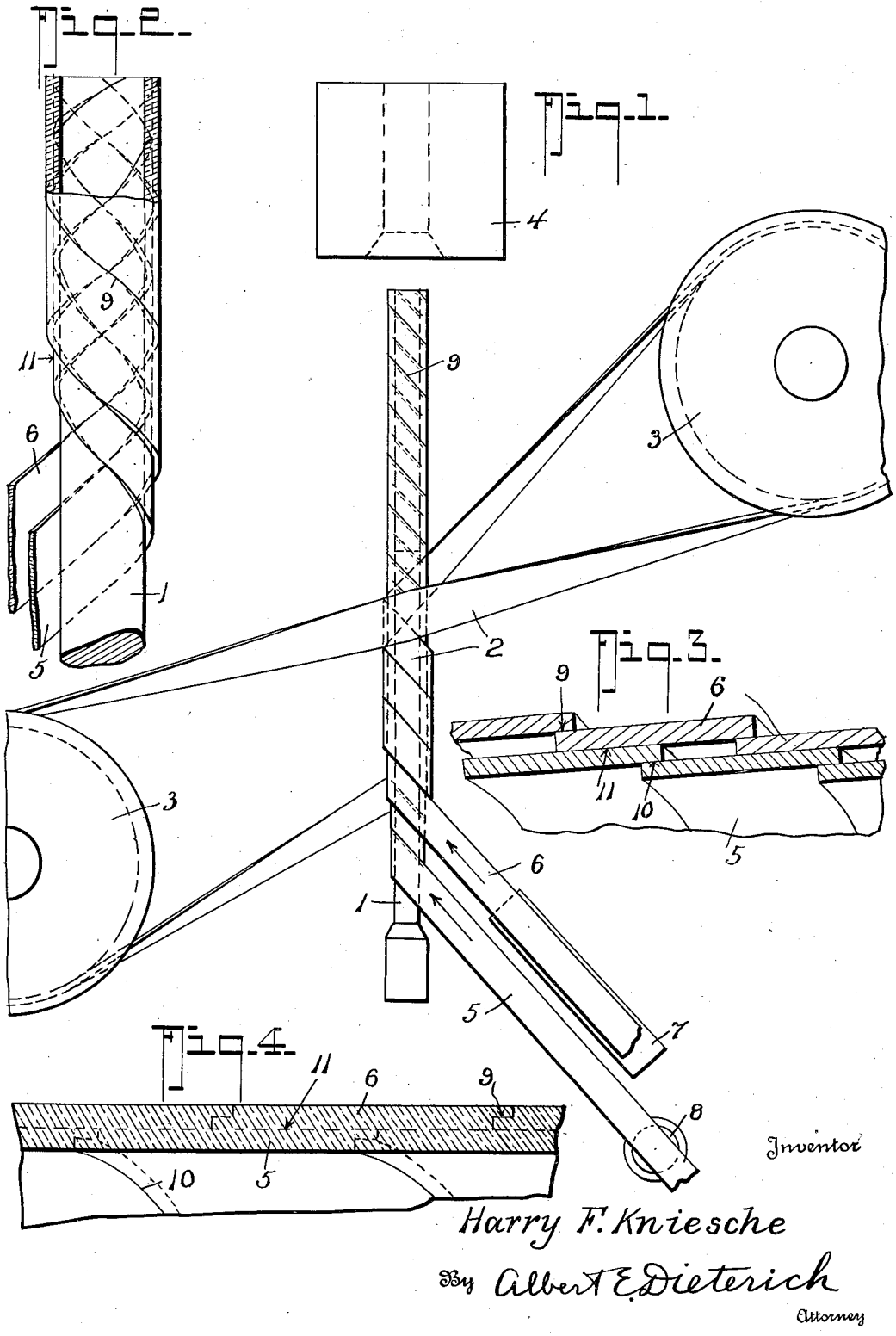
March 24, 1936. H. F. KNIESCHE 2,035,320

METHOD OF MANUFACTURING CELLULOSE TUBES

Filed March 5, 1934



Inventor

Harry F. Kniesche

By Albert E. Dieterich

Attorney

Patented Mar. 24, 1936 2,035,320

UNITED STATES PATENT OFFICE

2,035,320

METHOD OF MANUFACTURING CELLULOSE TUBES

Harry F. Kniesche, Baltimore, Md., assignor to Joseph Shapiro, Baltimore, Md.

Application March 5, 1934, Serial No. 714,189

2 Claims. (Cl. 93—80)

The invention relates to the manufacture of tubes made by spirally winding strips on a mandrel, as for instance so-called drinking "straws". Such straws are usually made of paper strips glued together and subsequently paraffined to render the straws water resistant.

My invention has for an object to make the straws of acetate cellulose material such as "Kodapak", or other similar material to produce a non-absorbent, transparent, moisture-proof, non-hygroscopic and resilient tube, and a method of making the same at atmospheric temperatures without the use of heat to cause adhesion between the overlapping parts of the material used. Most "Cellophane" sheets are not self-adhesive under heat, save perhaps in a very limited degree. An especially prepared "Cellophane" sheet must be used if the overlapping parts are to be united materially by the application of heat, and practice has demonstrated that such adhesion is not always permanent; the tube often leaks and often unwinds in places.

My invention includes a new method of making cellulose tubes without the application of heat in a manner to cause the overlapping or contacting surfaces of the strips of material being wound to merge into one another and thereby produce an integral structure which will not separate or part and will be free from leakage spots.

Further it is an object to provide a new method of making cellulose tubes whose inner and outer surfaces are substantially true cylinders, i. e., they are free from ridges or steps, such, for instance, as is shown in Figure 4 of Letters Patent No. 1,944,970.

Further it is an object to provide a method of making a tube of the kind described in which the parts are united by the use of a liquid at atmospheric temperatures which is a solvent for the material of the strips and will cause the overlapping surfaces to merge into one another to effect an integral union without mechanical adhesion, as is the case with ordinary paper straw strips held together by glue; it is a further object to provide a method for merging the overlapping surfaces into an integral structure by a chemical union which does not alter the transparency of the tube while actually causing the overlapping parts to become one.

Further the invention has for its object to provide a method for making the tube in such a way that excess solvent will not become deposited on the inside of the tube to cause it to stick to the mandrel while being spun.

In the drawing, Figure 1 is a diagrammatic view illustrating the method of manufacturing my tube.

Figure 2 is an enlarged detail view of a portion of a tube wound on the mandrel.

Figure 3 is an enlarged detail longitudinal section showing how the two strips are laid and before the pressure of the spinning belt and the action of the solvent has squeezed and united them together.

Figure 4 is an enlarged detail longitudinal section showing how the two strips become merged into one.

In the drawing, 1 represents the ordinary mandrel of a straw spinning machine, 2 the spinning belt, and 3 the belt driving pulleys.

5 and 6 are the two strips of "Kodapak," or other similar material, the strip 5 being first wound on the mandrel and comprising the inner layer, and the strip 6 being wound over the inner layer and staggered with relation thereto to form the outer layer, the two layers in the completed structure being merged into a single body as an integral layer of double thickness. The strip 5 before passing around the mandrel 1 is passed over wick 8 saturated with a suitable lubricant-solvent-neutralizer such, for example, as glycerine. The strip 6 before being passed around the strip 5 where it is wound on the mandrel, passes over the solvent applying roller 7 to which the solvent is delivered in any approved way, as, for instance, from a pot such as the glue-pots of well-known straw spinning machines. A thin film of solvent is therefore applied to the under side of the strip 6 and as that strip is wound on the strip 5 around the mandrel by the spinning belt 2 it dissolves the contacting surfaces of the strips 5 and 6, causing them to run into one another or merge, thereby substantially obliterating any surface of demarcation between the inner and outer layers; see Figures 2 and 3. Care should be taken to use a solvent whose action is quickly terminated, as for example, a more or less highly volatile solvent. The solvent used will, of course, depend in a measure on the chemical composition of the cellulose strip being used. I have found that the use of ethyl-acetate in dilute form acts satisfactorily with "Kodapak." Should the solvent work down between the lapping edges 10 of the strip 5 toward the mandrel 1 the glycerine encountered by the solvent will serve to neutralize it. At the same time the solvent at the leakage points just referred to will cause the edge surfaces 10 at those points to merge into one. Also the pressure of the spinning belt will assist this merging action not only

at the surfaces 11 between the outer and inner layers, but also at the edge surfaces 9 and 10 of the strips.

The straw of my invention made by the method described shows but very faintly the spiral markings where the edges 9 overlap and this is also true with respect to the edges 10. The longitudinal surface lines where surfaces 11 are merged are practically obliterated in the finished straw.

In order to hasten the completion of the solvent function the tube as it leaves the mandrel may be run through a drier 4 of any suitable construction and kind.

A tube made in accordance with my invention is of relatively great strength in comparison with its weight and, due to its spirals being united by chemism through the use of a more or less volatile solvent, its resistance to deformation is greatly increased over the "Cellophane" straw made in accordance with Letters Patent No. 1,944,970, hereinbefore referred to; when my tube is subjected to mashing pressure it will immediately return to its normal cylindrical form when the pressure is released. Furthermore, by making the tube of a plurality of layers (two or more) very much thinner strips of cellulose material may be employed, and because of the lapping of the inner and the outer strips, together with the chemical union thereof, all possibility of leakage is avoided.

While I have described my invention herein as particularly adapted to the manufacture of drinking straws, it is obvious that it may be adapted for making tubes of larger diameter and for other purposes. I therefore do not wish it to be understood that my invention is to be limited to the manufacture of drinking straws.

What I claim is:

1. The continuous process of making integral tubes from transparent cellulose material which comprises winding superposed strips of material about a mandrel and simultaneously causing the contacting surfaces of said strips to merge into an integral mass at atmospheric temperatures by the interposing of a liquid solvent between the surfaces to be merged and applying to the inner surface of the tube a film of a solvent neutralizing lubricant.

2. The continuous process of making integral tubes from transparent cellulose material which comprises winding superposed strips of material about a mandrel, simultaneously causing the contacting surfaces of said strips to merge into an integral mass at atmospheric temperatures by the interposing of a liquid solvent between the surfaces to be merged, applying to the inner surface of the tube a film of a solvent neutralizing lubricant and passing the tube from the mandrel through a suitable drier.

HARRY F. KNIESCHE.