March 21, 1933. S. A. NEIDICH 1,902,573

METHOD FOR FORMING TUBES OF CELLULOID AND THE LIKE

Filed Jan. 18, 1929

FIG. I.

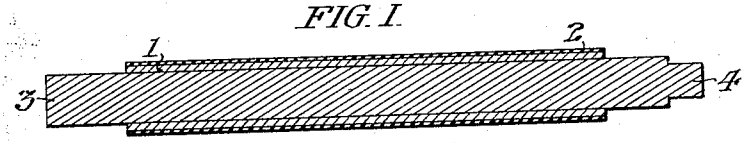


FIG. II.

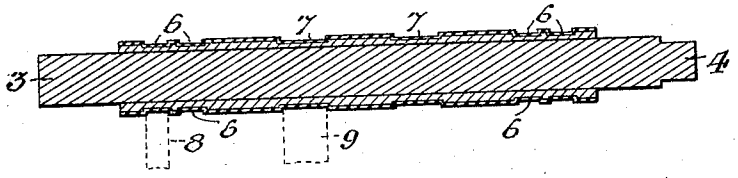


FIG. III.

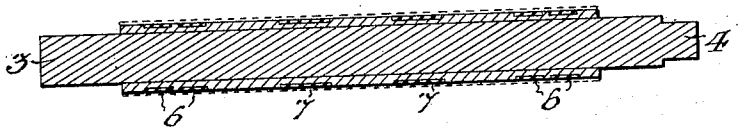


FIG. IV.

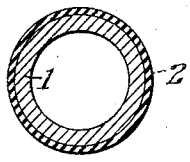


FIG. V.

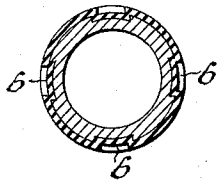
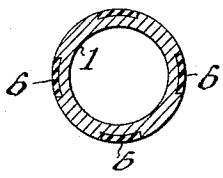


FIG. VI.



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Patented Mar. 21, 1933

1,902,573

UNITED STATES PATENT OFFICE

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METHOD FOR FORMING TUBES OF CELLULOID AND THE LIKE

Application filed January 18, 1929. Serial No. 333,356.

My invention is applicable to products of cellulose, such as celluloid, cellulose nitrate, cellulose acetate, and similar materials, to produce a mosaic structure upon the outer surface thereof of different kinds or colors of material.

There is a commercial demand for tubes of mosaic structure for the bodies and caps of fountain pens, pencils, and the like. Ordinarily, such mosaic effect is produced in the manufacture of the material by aggregating pieces of the different materials and pressing them together in a softened state. When hardened, such an aggregate is cut to form rods which are bored to form tubes. Such methods and means of manufacture are obviously very costly; the cost of such raw mosaic material being more than five times that of the ordinary celluloid or the like of uniform texture or color. Moreover, it is, of course, impossible to precisely predetermine the location of the different materials in a tube to be formed from such an aggregate; and particularly to predetermine the location of any pattern with reference to the circumference of the tubes.

It is the object and effect of my invention to not only materially lessen the cost of manufacture of such mosaic tubes but to precisely predetermine the location of the different materials upon the outer surfaces of the tubes.

As hereinafter described, it is characteristic of my invention that a tube is formed of inner and outer laminations of materials which are different either in color or texture. Such tubes may be conveniently formed by rolling sheets of celluloid and the like upon mandrels, while the sheets are in a softened state owing to the presence of a suitable solvent; so that the successive convolutions of the sheets thus rolled cohere and, when the solvent evaporates or is otherwise removed, the tubes are thus hardened.

For example, acetone is a suitable solvent for celluloid and cellulose nitrate, and ethyl acetate, or a mixture of alcohol and ether, are suitable solvents for cellulose acetate.

In such a process of manufacture of the tubes; the inner and outer laminations may be part of a continuous sheet or formed of separate sheets. However, tubes with respectively different outer and inner laminations may be otherwise formed, for instance, by rendering the laminations tubular, independently of each other, and subsequently slipping one over the other. In the latter method, if the outer tubular lamination be in an expanded condition when applied to the inner tubular lamination; it may be caused to shrink thereon, in inseparable relation, as it hardens.

My invention includes the various novel features of procedure and means for forming tubes hereinafter more definitely specified.

In said drawing; Fig. I is a longitudinal sectional view of a laminated tube of celluloid and the like upon a mandrel.

Fig. II is a sectional view, similar to Fig. I, but showing selected regions of an outer lamination of the tube forced into an inner lamination; thus imbedding portions of the outer material in the inner material.

Fig. III is a longitudinal sectional view, similar to Figs. I and II, but with the portions of the outer laminations which are not thus imbedded, eliminated.

Fig. IV is a transverse sectional view of the tube shown in Fig. I, but on a larger scale.

Fig. V is a transverse sectional view of the tube shown in Fig. II, but on a larger scale.

Fig. VI is a transverse sectional view of the tube shown in Fig. III, but on a larger scale.

Referring to Fig. I; the tube of celluloid or the like includes inner and outer laminations, respectively indicated at 1 and 2, of suitable materials, which are different in texture or color; for instance, the inner lamination 1 may be what is known as "pearl" celluloid and the outer lamination be plain black or gold colored celluloid. Said tube is temporarily rigidly connected with the mandrel 3, conveniently by frictional engagement therewith. Said mandrel is preferably a cylinder which is flattened at the end 4 for engagement in a turning mechanism similar to an ordinary lathe.

Said mandrel 3, with the tube thereon, is rotated, preferably while the tube is in a sof-

tened state, while selected regions 6 and 7 of the outer lamination 2 are forced into imbedded position in the inner lamination 1. Such imbedding operation may be conveniently effected by cameo rollers 8 and 9 of suitable dimensions. Such rollers may be pressed toward the axis of the mandrel 3 manually or by mechanical means such as are ordinarily available for the operation of knurling rollers. However, smooth annular bands may be thus imbedded by smoothly cylindrical rollers or by pressure of the smooth face of any suitable tool.

Referring to Fig. III; the portions of the outer lamination 2 which are not thus imbedded and which are indicated in dotted lines in that figure, may be removed by any suitable means; for instance, by the operation of grinding said tube during its rotation by said mandrel 3.

The effect of the several operations above described is to form a tube of mosaic effect in which portions 6 and 7 of the outer lamination 2 are imbedded in the outer surface of the tube in contrast with the adjoining portions of the material 1.

In accordance with my invention as above exemplified, the location of the various elements of the mosaic structure upon the outer surface of the tube may be precisely predetermined and the pattern thereof may, of course, be infinitely varied.

Moreover, the portions of the tube material to be imbedded may be maintained in a plastic state, during that operation, by either preheating the tube or heating the implement for making the impression.

Therefore, I do not desire to limit myself to the precise details of the procedure, or means for effecting the same, above described, as it is obvious that various modifications may be made therein without departing from the essential features of my invention, as defined in the appended claims.

I claim:

1. The method of forming a tube of celluloid and the like, with a smoothly cylindrical inner surface formed of a single material, and a smoothly cylindrical outer surface formed of a plurality of materials in an exterior mosaic structure; which includes forming a tube of smoothly cylindrical laminations of different materials, forcing different regions of an outer lamination into an inner lamination, sequentially thus imbedding the same sequentially, without deforming the interior surface of said tube; and thereafter separating from the embedded portions and eliminating the portions of the outer laminations which are not thus embedded.

2. A method as in claim 1; wherein the material of the tube is maintained in a plastic state during the operation of impressing it.

3. A method as in claim 1; wherein the tube is rotated during the embedding operation, and the latter effected progressively, circumferentially.

4. A method as in claim 1; wherein the tube is rotated during the embedding operation, and force is applied at the regions to be imbedded, by a rotary die element which is rotated at the same speed as the tube.

5. A method as in claim 1; wherein rotary die means for impressing the tube are heated.

6. A method as in claim 1; wherein the surplus material is in unitary tubular form at the conclusion of the embedding step but, thereafter is removed by abrasion, while the tube is rotated.

7. The method of forming a tube of celluloid and the like with a smoothly cylindrical inner surface formed of a single material, and a smoothly cylindrical outer surface formed of a plurality of materials in an exterior mosaic structure; which includes forming an inner tube of one material, forming an outer tube in contact with said inner tube of a different material, and forcing a region of the outer tube into the material of the inner tube by forcing a roller against the outer tube while rolling said outer and inner tubes together, without deforming the interior surface of said tube; thus embedding said region of the outer tube in the inner tube; and thereafter separating from the embedded portions and eliminating the portions of the outer tube which are not thus embedded, by eroding the surplus material which is to be removed.

8. The method of forming a tube of celluloid and the like with a smoothly cylindrical inner surface formed of a single material, and a smoothly cylindrical outer surface formed of a plurality of materials in an exterior mosaic structure; which includes covering a rigid rotary mandrel with a tube of one material and covering that tube with another tube of a different material; maintaining both of said tubes in a softened state by the presence of a suitable solvent; and pressing a portion of the outer tube into the material of the inner tube while rotating said mandrel and tube, and maintaining the inner surface of the inner tube smoothly uniform by said mandrel; and eliminating the portions of the outer tube which are not thus embedded; whereby, the deformation of the inner tube is limited to its outer surface.

9. The method of inlaying a tube of celluloid and the like, with a smoothly cylindrical inner surface formed of a single material, and a smoothly cylindrical outer surface formed of a plurality of materials in an exterior mosaic structure; which includes supporting the inner surface of said tube upon a rigid mandrel and thereby preventing deformation of said inner surface while deforming the outer surface of said tube by imbedding the inlay material therein; whereby, the deformation of the tube thus inlaid is limited to the outer surface thereof.

10. A method as in claim 9; wherein the material of the tube is maintained in a plastic state during the operation of inlaying it.

11. A method as in claim 9; wherein the material of the tube is maintained in a plastic state during the inlaying operation by the presence of a suitable solvent.

12. A method of forming a tube of celluloid and the like, with a smoothly cylindrical inner surface formed of a single material, and a smoothly cylindrical outer surface formed of a plurality of materials in an exterior mosaic structure; which includes supporting the interior of the tube to be inlaid by a rigid mandrel, fitting over that tube a tube of inlay material in an expanded condition; causing said outer tube to shrink upon said inner tube and thereafter forcing a portion of the outer tube into the material of the inner tube while retaining the inlay material in unitary tubular form and while supporting the inner surface of the inner tube against deformation, by said mandrel; and thereafter separating and removing the outer portions of the outer tube of inlay material which are not thus forced into the inner tube.

In testimony whereof, I have hereunto signed my name at Burlington, New Jersey, this 15th day of January, 1929.

SAMUEL A. NEIDICH.