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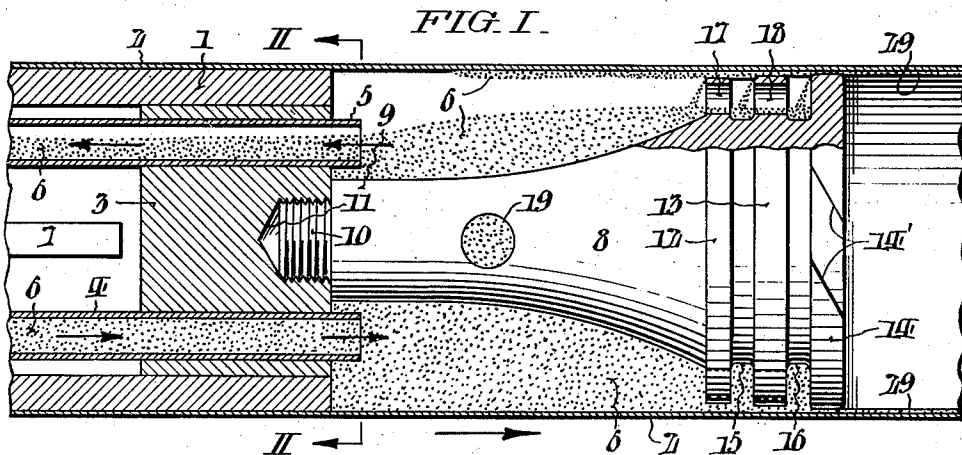
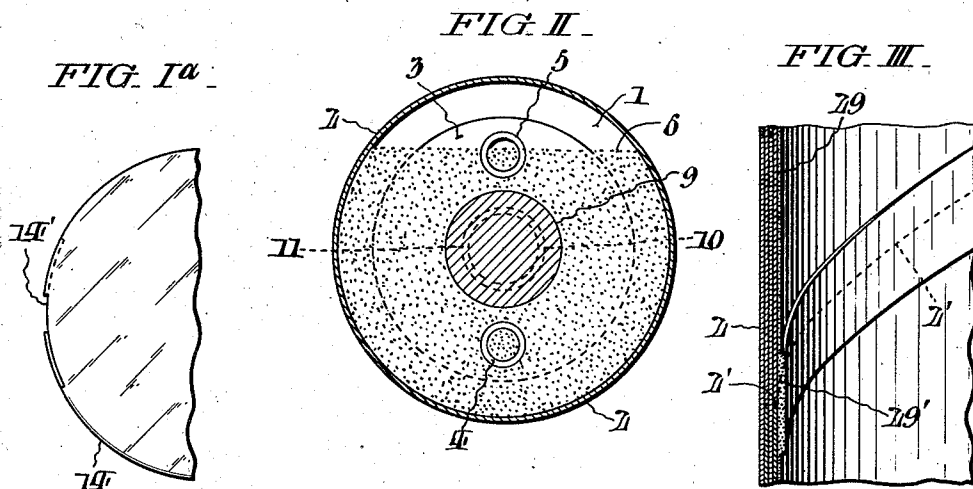
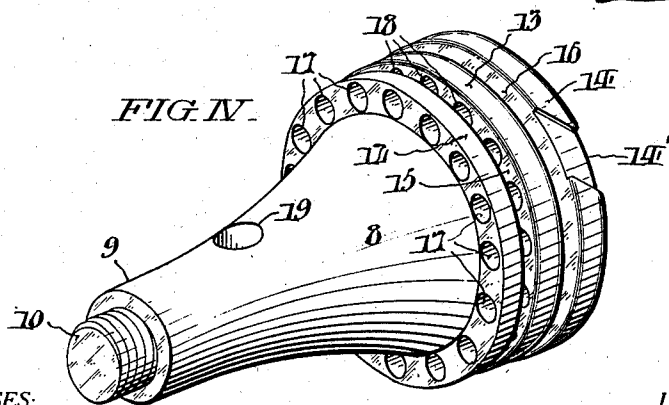
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2,194,701

COATING APPLICATOR AND SMOOTHING ATTACHMENT

Filed June 7, 1938

2 Sheets-Sheet 1



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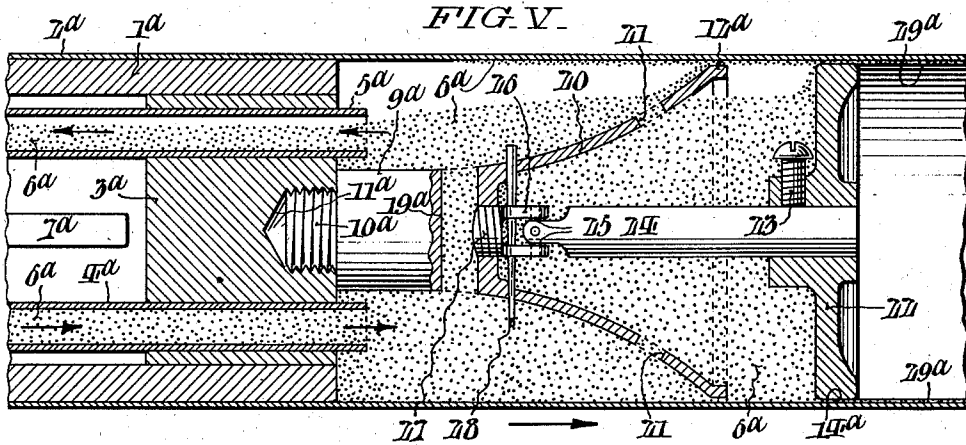
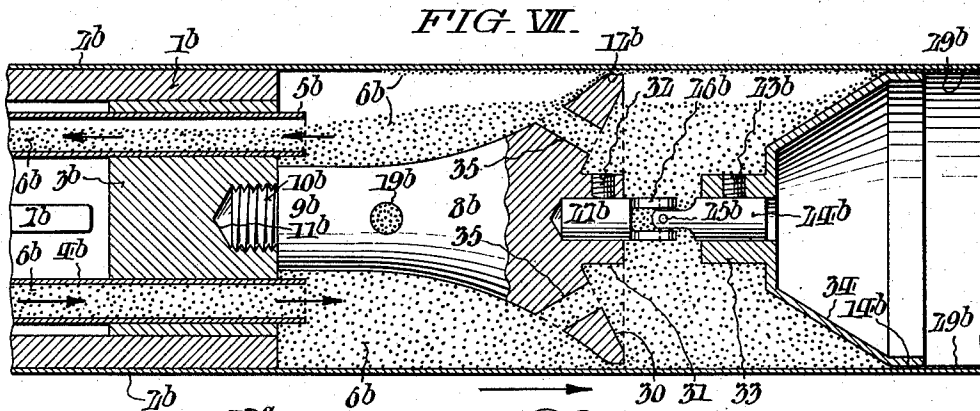
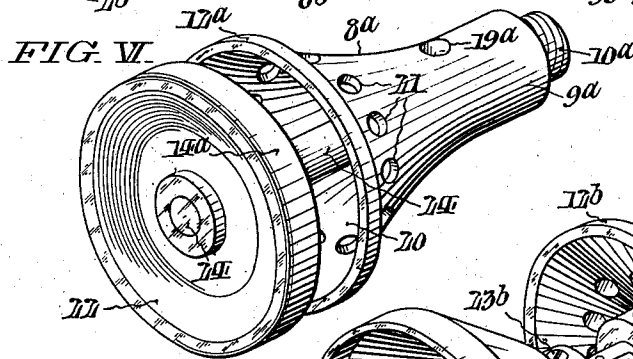
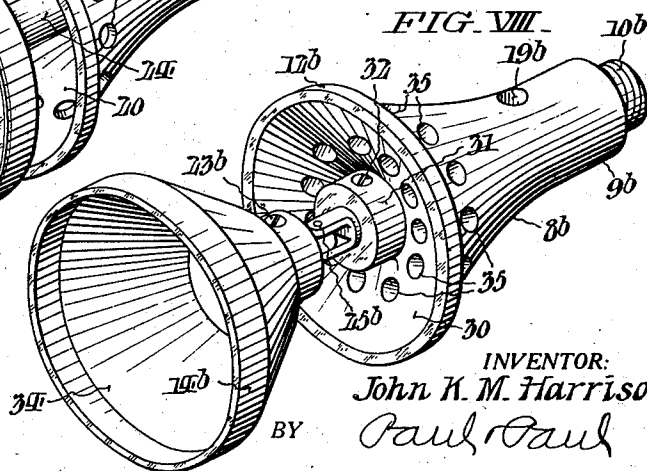
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COATING APPLICATOR AND SMOOTHING ATTACHMENT

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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COATING APPLICATOR AND SMOOTHING
ATTACHMENT

John K. M. Harrison, Ogontz, Pa.

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11 Claims. (Cl. 91—30)

This invention relates generally to means for coating and smoothing the interior surface of tubing lined with a desirable proofing or preservative medium as such tubing leaves the forming means.

More particularly, the instant invention primarily aims to provide a novel applicator and smoothing attachment for connection to the free end of mandrels on which spirally wound paper, fiber or other analogous material, tubes are produced for subsequent severance into predetermined length as container bodies.

Another object of the present improvements is the provision of a combined applicator and smoothing attachment for the mandrels of spiral tube winding machines whereby the coating medium is more efficiently applied and expansively reduced to the desired thickness.

A further object is the provision of a combined circular applicator and smooth device for mandrel-end attachment, whereby spirally wound tubes of the above indicated type are evenly lined with any desirable proofing substance and are finished-off with a continuously smooth interior surface; or with a slightly thicker reinforce following the inner ply seam of said spirally wound tubes to prevent leakage thereat as well as for general strengthening purposes.

A still further object refers to the provision of a novel attachment, of the indicated type, whereby the coating material is amply applied initially, and is subsequently smoothed down or reduced to predetermined thickness, while said coating material and the surplus accumulating incident to the smoothing operation are maintained in constant circulation to prevent "clogging" of the attachment during use.

With the above recited objects in view, and others of a tributary nature, this invention consists in certain novel and peculiar features of construction and organization of parts as hereinafter fully described and claimed; and in order that the same may be fully understood, reference is to be had to the accompanying drawings illustrating practical embodiments of said invention.

In the drawings, corresponding parts are identified by like reference characters with differentiating exponents and other characters in the modified forms, where necessary, to avoid confusion and unnecessary repetitive matter.

Fig. I is a longitudinal section through the free end of a tube forming mandrel with a preferred type of the combined applicator and smoothing

device of this invention attached thereto, said device having a minor portion broken out for purposes of clarity.

Fig. Ia is a fragmentary detail view hereinafter fully explained.

Fig. II is a transverse section on the plane II—II in Fig. I.

Fig. III is a broken interior and part sectional view of a tube wherein the coating is slightly increased in thickness along the inner ply seam.

Fig. IV is a perspective view of the combined applicator and smoothing device detached from the tube forming mandrel.

Fig. V is a similar section to Fig. I of a modified form of the invention.

Fig. VI is a perspective view of the combined applicator and smoothing device shown in Fig. V.

Fig. VII is a sectional illustration corresponding with Figs. I and V, but including a further modified form of the combined applicator and smoother device of this invention; and,

Fig. VIII is a perspective view of said last mentioned device.

Referring more in detail, the reference numeral 1 designates a tubular stationary mandrel for the production of spirally-wound laminated or multi-ply paper or other appropriate material tubing 2; said mandrel having the free end closed in by a substantial plug 3. Extending longitudinally through the mandrel 1, with projection outwardly beyond the plug 3, are flow and return pipes 4, 5 respectively, for an appropriate thermoplastic coating medium 6, conveniently maintained at the requisite temperature for easy application to the interior surface of the tubing 2, 35 by a conventional electric heater 7. Preferably, although not essentially, the flow pipe 4 is lowermost, with the return pipe 5 uppermost; and the heater 7 axially coextensive with the mandrel 1, so that the coating medium 6 is kept sufficiently fluent at all times for continuous or uninterrupted circulation.

The combined applicator and smoothing device, as shown in Figs. I-IV, consists of a solid member including a coniform body 8, the narrower portion of which merges into a shank 9, having a diametrically reduced screw-threaded extension 10, for securing engagement in a correspondingly tapped bore 11, coaxial of the mandrel plug 3. The larger or outer end of the coniform body 8 is of substantially increased cylindrical character and circumferentially grooved to provide a coating flange 12 with relatively spaced smoothing flanges 13 and 14, all of which are of predetermined differential diameter and 55

width; while the intervening grooves 15, 16 are, preferably, of the same dimension. In practice the diametric dimension of the flange 13 over 12 may be only an increase of five or six thousandths of an inch, while the increase between the diameter of the flange 14 and the flange 13 is preferably restricted to one or two thousandths of an inch. On the other hand, the bottoms of the grooves 15, 16 register with a common dimension. It is also to be observed that the flanges 12, 13 are pierced by circumferentially spaced holes 17, 18, respectively, for passage therethrough of surplus coating material removed or extruded by the flanges 12, 13 and 14, as the tube 2 spirally progresses, in the direction of the arrow below Fig. I, off the stationary mandrel 1. A hole 19 is conveniently provided through the coniform body 8, for insertion or application of a suitable implement for attaching or removing said body from the mandrel 1, in an obvious manner.

In the modified form of the invention shown in Figs. V and VI, the coniform body portion 8a is hollowed out to bell-shape at 20, while its outer surface extends to the coating flange 12a; and said bell-shape is provided with a circumferential series of spaced holes 21 for passage of the coating material 6a, in a manner similar to that of the holes 17, 18 of the previously described form of the invention. It is also to be remarked that in this modification of the invention, there is provided what may be termed as a "flexible" smoother, preferably in the form of a disk 22 adjustably secured, by a set-screw 23, to the outer end of a connecting rod 24, in turn attached by an universal-joint 25, to a fork bearing 26 screw-threaded at 27 axially into the bell shape 20, said bearing 26 being conveniently locked in position by a drift pin 28 in an obvious manner. By adjusting the disk 22 lengthwise of the rod 24, it will be clearly apparent that the desired thickness of the smoothed-out, or finished, coating film 29a (also indicated in Fig. I as 29 and VII as 29b) can be incrementally predetermined, or gauged, by outward or inward movement of said disk.

Referring now to the modification of Figs. VII and VIII, the coniform body portion 8b is solid with an annular recess 30 in its larger end defining a boss 31, which is axially bored for the reception and attachment, by a set screw 32, of a forked bearing 26b with an universal joint 25b, and short rod 24b to which is adjustably fixed the shank portion 33 of a bell-shaped spreader 34, as by fastening means 23b. It is also to be remarked that the coniform body portion 8b is provided with angularly directed coating-flow passages 35.

From the foregoing description it will be readily understood that as the spirally wound tube 2 progresses from off the mandrel 1, in the direction of the arrows underlying Figs. I, V and VII, onto the larger end of the coniform applicator device 8, 8a or 8b, with coating material 6, 6a or 6b being forced by way of the flow pipe 4 into the space intervening the base or applicator flange 12, 12a or 12b, and the mandrel outer end, and apply same continuously to and around the interior surface of the tube 2. At the same time, any excess accumulation of the coating 6, 6a or 6b, will be drawn away, as by an appropriate suction, from the intervening space through the return pipe 5 for recirculation and subsequent use. Continued progression of the tube 2 in the direction of the arrows

aforesaid advances the coated inner surface of the tube 2, 2a or 2b, onto the smoothing flanges 13, 14 or 14a, 14b with incidental formation of the finished film 29, by slight expanding action. Incidentally all surplus of the coating medium 6, 6a or 6b removed by the smoothing flanges 13 and 14, or 14a, 14b, will be automatically drawn through the respective holes 18, 17, 21 or 35, back into the main volume intervening the coniform base and the mandrel end, for recirculation and later use as aforesaid. It is to be observed also that the circumferential edges of all the flanges 12, 13, 14, 12a, 12b, and 14a, 14b are slightly rounded so as to avoid the formation of any spiraling undulation or edge in the film 29 throughout the length of tubing 2 interiorly coated as hereinbefore set forth. In actual practice, tubes 2 are produced, by the combined applicator and smoothing means of this invention, with a film like inner surface coating or lining 29 devoid of any defective "spots" or projections.

Referring back again to Figs. I-IV, the smoothing flange 14 may be provided with an inclined groove 14', say, of about three- to five-thousandths of an inch in depth, said groove being designed to form a slightly greater thickness reinforcement 29' of the coating 29 following the contour of the inner ply seam 2' of the tubing 2, as best understood from Figs. Ia and III. It is also to be remarked the reinforcement 29' is about a half-inch wide and evenly distributed to each side of the ply seam 2'.

From the foregoing it is thought the merits and advantages of this invention will be clearly apparent to those conversant with the kindred art; and while different forms of said invention have been described in detail, the same are not to be considered as limitative, inasmuch as minor deviations may be effected without departing from the spirit and scope of the invention as more concisely expressed in the following claims and the prior art proscribes.

Having thus described my invention, I claim:

1. In winders for producing strip material tubing on a suitable mandrel, the combination of a coating substance applicator and smoother means at the mandrel let-off end, said means comprising a coniform member having a coater portion with the base outwards, and a relatively spaced rigid means of differential size to the coater portion for smoothing and reducing the applied coating to the desired thickness.

2. In winders for producing strip material tubing on a suitable mandrel, the combination of a coating substance applicator and smoother device at the mandrel let-off end, said means comprising a circular coater with the base outwards, relatively spaced smoothing means of differential size for smoothing and reducing the applied coating to the desired thickness, and means affording flow and return of the coating substance to and about the device.

3. In winders for producing strip material tubing on a suitable mandrel, the combination of a coating substance applicator and smoother device at the mandrel let-off end, said means comprising a circular coater with the base outwards, relatively spaced smoothing means of differential size for smoothing and reducing the applied coating to the desired thickness, means affording flow and return of suitable coating substance to and from the space intervening the coater body and mandrel end, and means permitting surplus coating substance extruded by the

smoothing to return to the intervening space aforesaid.

4. In machines for making spirally wound tubing from paper and analogous strip material, the combination with the mandrel, on which such tubing is formed, of a lining-substance applicator and smoother device comprising a coniform body for axial alignment with the mandrel, spaced walls of differential size in advance of the coniform body base and defining with the adjoining end of said mandrel an intervening clearance; and means affording flow of the lining-substance to, and its return from, the intervening clearance aforesaid.

5. In machines for making spirally wound tubing from paper and analogous strip material, the combination with the mandrel, on which such tubing is formed, of a lining-substance applicator and smoother device comprising a coniform body for axial alignment with the mandrel, spaced walls of differential size in advance of the coniform body base and defining with the adjoining end of said mandrel an intervening clearance; means providing for flow and return of the lining-substance to and around the coniform body as well as said flanges, and means whereby surplus coating-substance extruded by the respective flanges is returned to the clearance aforesaid.

6. A coating applicator and smoothing device, for fixed alignment at the let-off end of a tube forming mandrel, comprising a coniform body having spaced differential flanges at the base portion and defining with the confronting mandrel extremity an intervening annular clearance, one of said flanges functioning as the applicator of a suitable coating substance to the interior surface of the tube as it advances from the mandrel, the other of said flanges serving to smooth-out and reduce the coating thickness to predetermined degree, circumferentially spaced apertures through the coniform applicator body,

and means feeding the coating substance to the attachment as well as enabling removal of any surplus coating substance extruded by the coniform flanges for re-use.

7. A coating application and smoothing device as defined in claim 6, wherein the coniform body includes an applicator flange with relatively spaced plural smoothing flanges of differential diameters about its base portion, said applicator flange and the adjoining smoothing flange having circumferentially spaced holes therethrough, and the smaller end of the coniform body is provided with a screw-threaded extension for engagement in a complementally threaded axial orifice in the mandrel end.

8. A coating applicator and smoothing device as defined in claim 6 wherein the outer or smoothing flange is formed with an inclined shallow groove designed to slightly increase the thickness of coating along and flankingly of the tubing inner ply seam.

9. A coating applicator and smoothing device as defined in claim 1 wherein the means for smoothing and reducing the applied coating comprises a disk, and coupler means including an universal joint connecting said disk axially to the coniform member.

10. A coating applicator and smoothing device as defined in claim 1 wherein the coniform member is of substantially bell-shape section, the smoothing and reducing means is in the form of a disk, and a suitable coupler including an universal joint connecting said bell-shape section and disk axially together in spaced relation.

11. A coating applicator and smoothing device as defined in claim 1 wherein the smoothing portion is of bell-shape section, and connector means including an universal joint couple the shank of such section axially to the coniform body.

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