

Feb. 3, 1931.

G. O. FROSTAD

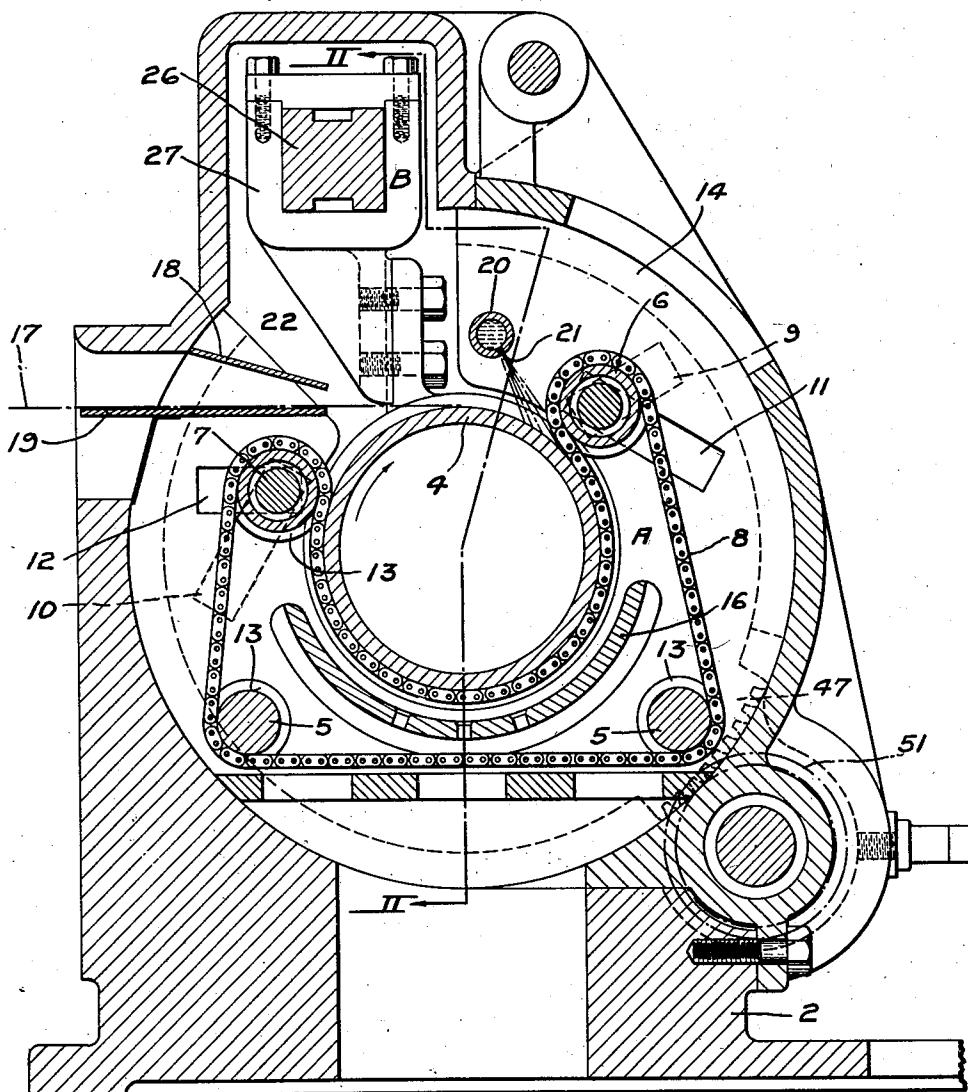
1,790,909

TUBE WINDING MACHINERY

Filed March 27, 1928

3 Sheets-Sheet 1

Fig. 1



INVENTOR

George O. Frostad
By Ayres, Stubbins
Parmer,
His attorneys

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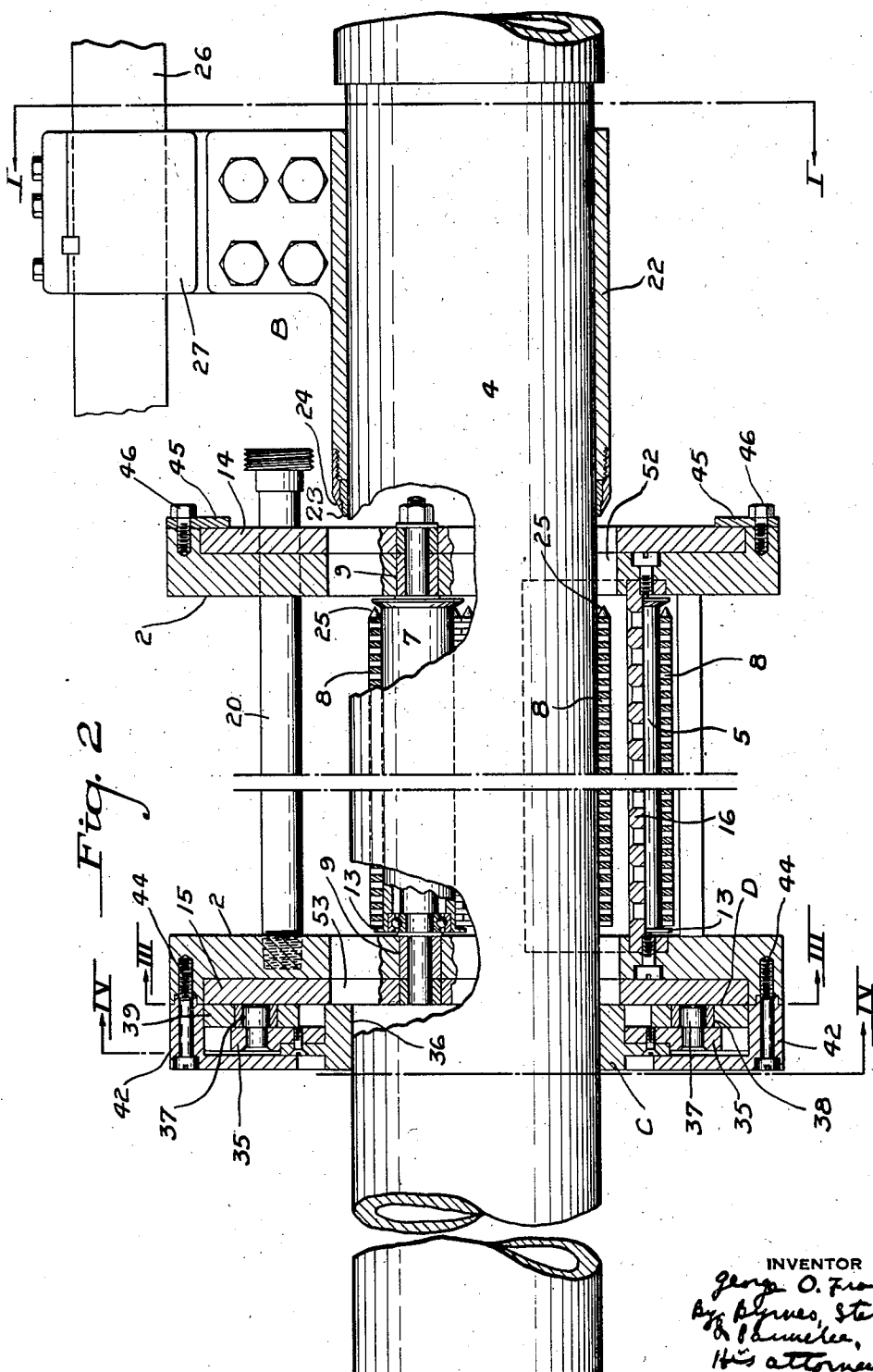
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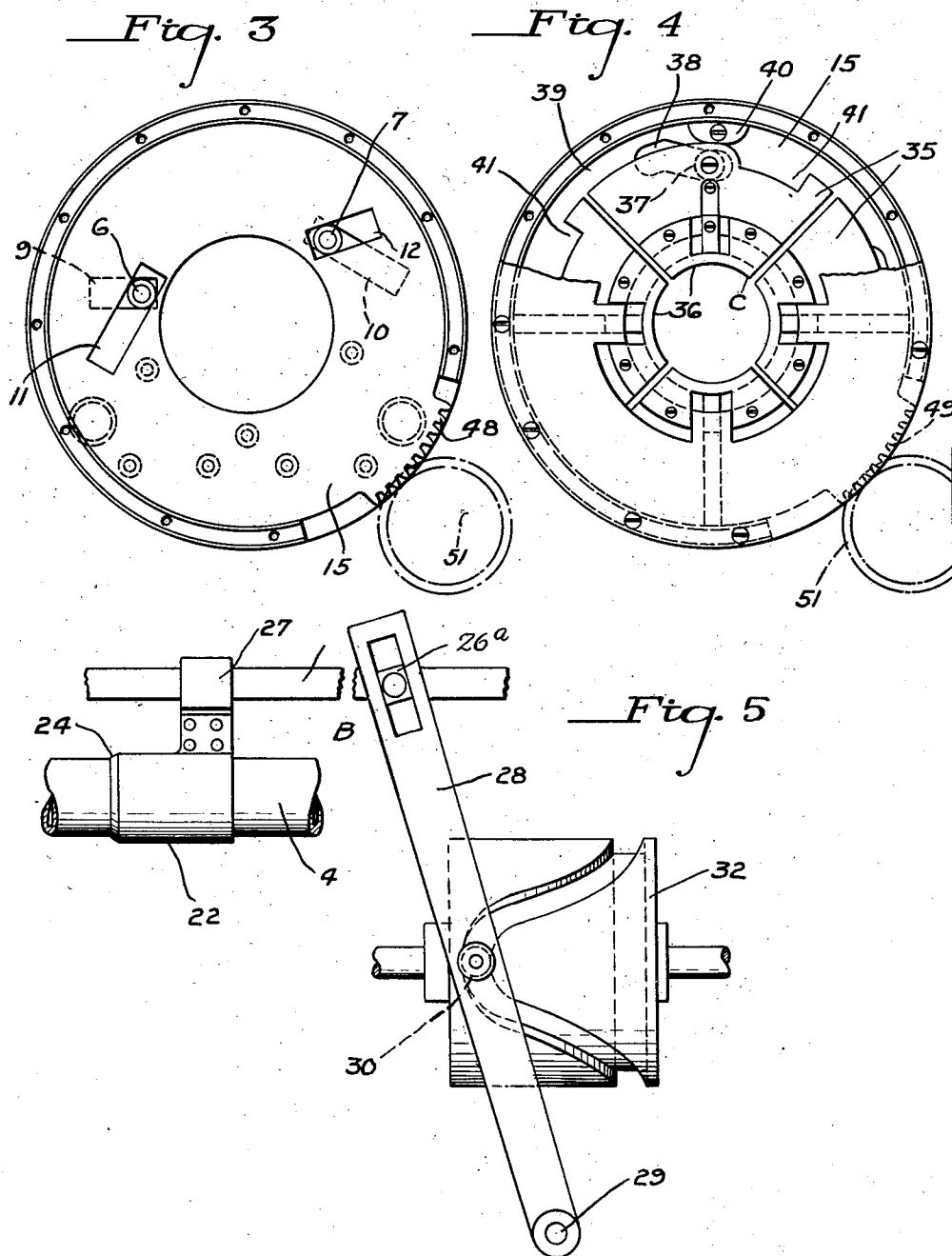
G. O. FROSTAD

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TUBE WINDING MACHINERY

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3 Sheets-Sheet 3



INVENTOR
George O. Frostad
By Byrnes, Stebbins &
Parmer
His attorneys.

UNITED STATES PATENT OFFICE

GEORGE ODIN FROSTAD, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO THE NATIONAL PAPER CAN COMPANY, OF MILWAUKEE, WISCONSIN, A CORPORATION OF WISCONSIN

TUBE-WINDING MACHINERY

Application filed March 27, 1928. Serial No. 264,980.

My invention relates to tube winding machinery, and particularly to machinery for forming the body portions of cylindrical members.

5 In the manufacture of cylindrical bodies, such for example as the bodies for paper cans, it has been customary to wind a strip of material upon a mandrel and then eject the shaped material over the end of the mandrel.
10 A pressure device at least partially surrounds the mandrel for holding the material in tight engagement therewith during the winding operation. The pressure device is released during the ejecting operation.
15 Such a machine is shown and described in the Hulbert Patent No. 1,380,103, issued May 31, 1921.

20 Since the mandrel is overhung and is subjected to considerable lateral stresses during the pressing operation, I provide a releasable bearing for the outer end of the mandrel. The bearing is constituted by a plurality of segments moved in synchronism with the movement of the ejecting mechanism and the release of the pressing device.

25 During the feeding of the material to the mandrel, it has heretofore been customary to spray it with a coating solution that also serves as a binder for the finished cylinder.

30 A pressing foot has been provided for directing the material, after having been sprayed, between the mandrel and the pressing device. The pressing foot is operated in accordance with the movement of the mandrel, and it therefore constitutes an additional machine element requiring special adjustment.

35 By directing the stream of coating material onto the fabric at the line of engagement between the mandrel and the pressing device, I am able to utilize the kinetic energy of the coating material for directing the material into engagement with the pressing device and the mandrel, thereby eliminating the pressing foot heretofore employed.

40 The accompanying drawings illustrate the present preferred embodiment of the invention, in which,—

45 Figure 1 is an end view, partially in elevation and partially in section, of a portion of

a tube winding machine taken along the section line represented diagrammatically by the section line I—I in Figure 2, it being understood that the machine frame is omitted from the showing in Figure 2;

Figure 2 is a face view, partially in elevation and partially in section, of the mandrel and pressing device taken along the section line II—II of Figure 1;

Figures 3 and 4 are end views of the mechanism shown in Figure 2 taken along the section lines III—III and IV—IV respectively; and

Figure 5 is a fragmentary view of the ejector mechanism.

Referring to Figures 1 and 2, I have provided a machine base 2 on which is mounted a mandrel 4 that cooperates with a pressing device A, an ejector B, a releasable bearing C and a mechanism D for releasing the pressing device A and bearing C during a portion of the operation of the ejector B. One end of the mandrel 4 is supported by a fixed bearing and driven by a gearing, not shown.

50 The pressing mechanism A comprises a pair of rollers 5 fixed in the frame 2 and relatively movable rollers 6 and 7 around which an endless chain 8 extends and engages the outer surface of the mandrel 4. The ends of the rollers 6 and 7 are carried by roller bearings on shafts carried by blocks in slots 9 and 10 formed in the machine frame 2 and extend into slots 11 and 12, respectively, formed in plates 14 and 15 at opposite ends of the pressing mechanism A and constituting a portion of the release mechanism D. A shield 16 is disposed below the mandrel 4 and between the loops of the chain 8 for preventing the latter from engaging when the chain is slackened in a manner hereinafter described.

55 Paper 17 is delivered to guide plates 18 and 19 mounted in the frame 2 in position to insure a tangential relation between the paper 17 and the surface of the mandrel at their line of initial engagement. A paper feeding mechanism is shown and described in the patent to Hulbert No. 1,380,105 dated May 31, 1921. A sprayer 20 is disposed above the mandrel 4 and is provided with openings 21 for delivering liquid binder, such as paraffin, 100

to the paper as it is fed between the surface of the mandrel 4 and the chain 8. By directing the liquid binder against the paper at the time of its engagement with the chain 8, I am able to thoroughly coat the ends of the paper with the impregnating material and also to utilize the kinetic energy of the material as it strikes the paper for smoothing the latter and directing it into the space between the chain 8 and the outer surface of the mandrel 4 without the use of a mechanical pressing foot.

Referring to Figures 2 and 5, the ejector B comprises a stripper 22 mounted for longitudinal movement along the mandrel 4. The forward end of the stripper is provided with a rotatably mounted ring 23 within tapered nose 24 for engaging tapered projections 25 mounted on the inner edge of the chain 8. The other edge of the chain is blunt and engages flanges 13 on the rollers to prevent displacement of the flexible member along the mandrel. This insures that the stripper 22 will move the chain 8 out of its way during the ejecting operation and that the ring 23 will engage and turn with the tube being ejected. The stripper 22 is secured to a rod 26 by a clamping frame 27. The rod 26 moves in guides (not shown) formed in the machine frame and is pivotally connected by a sliding block 26a to one end of a lever 28. The lever 28 is connected by a pivot 29 to the frame 2. Intermediate the ends of lever 28 it is provided with a roller 30 seated in a barrel cam 32 driven in synchronism with the mandrel 4 by gearing mechanism, not shown. By this construction the stripper 22 is moved longitudinally of the mandrel 4 at the proper intervals of time for ejecting the shaped tubes from the machine.

Referring to Figures 2 and 4, the releasable bearing C comprises a plurality of segments 35 each provided with a bearing surface 36 and a roller 37 extending into a cam slot 38 in a ring 39 that bears against one face of the plate 15. The ring 39 is provided with hardened lugs 40 normally bearing against the outer edges of the plates 35 and adapted to be seated in depressions 41 under conditions hereinafter described. The use of lugs bearing on machined surfaces insures a more precise engagement of the mandrel 4 by the bearing C, than is possible where rollers are utilized for positioning the bearing. A flange 42 is secured by screws 44 to the machine frame 2 for housing the plate 15, ring 39 and bearing segments 35. A ring 45 is secured to the other end of the frame 2 by a bolt 46 for securing the plate 14.

The plates 14 and 15 and the ring 39 are provided with segmental gears 47, 48 and 49, respectively, that engage pinions 51. The pinions 51 are connected through gearing, not shown, with the mandrel 4 so that they operate to move the cooperating gear seg-

ments at the proper time to release the chain 8 and the bearing C. The plates 14 and 15, the ring 39 and the pinions 51 may be provided with retrieving springs as is shown in the Hulbert Patent No. 1,380,103, or the pinion 51 may be positively driven in a reverse direction as may be desired. In either event, the pinions 51 actuate the plates 14 and 15 and the ring 39 at a predetermined period in the operation of the tube winding machine for releasing the chain and bearing and for tensioning them at the desired period.

In the operation of the machine, the paper 17 is fed between the guides 18 and 19 and into engagement between the chain 8 and the outer surface of the mandrel 4, as is shown in Figure 1. After the required number of revolutions of the mandrel 4, the paper strip is entirely wound about the mandrel and coated with the binding material. A number of subsequent revolutions of the mandrel 4 take place during which the paper is tightly wound about the mandrel and the adjacent edges thereof adhere by reason of the binding material. After a predetermined number of revolutions of the mandrel 4, the pinions 51 are actuated to turn in a clockwise direction, as viewed in Figure 1, and counterclockwise as viewed in Figures 3 and 4. The movement of the pinions 51 causes the plates 14 and 15 and the ring 39 to turn relatively to the axis of the mandrel 4 with the result that the chain 8 and the bearing C are released.

Movement of the plates 14 and 15 causes the slots 11 and 12 to be moved relatively to the axes of the rollers 6 and 7, respectively. The movement of the rollers along the slots 11 and 12 forces them outwardly in the slots 9 and 10, respectively. The outward movement of the rollers 6 and 7 releases the tension on the chain 8 and permits it to fall away from the mandrel 4 and to engage the guide 16. At the same time movement of the ring 39 causes the rollers 37 to travel rearwardly and upwardly in the slots 38, thereby lifting the plates 35 and the attached bearing surfaces 36 which frees the mandrel 4. During this movement the cams 40 lie in the depressions 41. The amount of the movement of the rollers 6 and 7 and the bearing segments 36 is determined by the width of the tube being formed and by the radial depth of the stripper 22.

After the bearing C and the chain 8 are released the barrel cam 32 forces the roller 30 forwardly and turns the lever 28 in a counterclockwise direction about the fulcrum 29.

The movement of the lever 28 is transferred to the stripper 22 and the latter moves outwardly of the mandrel 4 through an opening 52 in the plate 14 and the frame 2 to engage the inner edge of the tube. Should the chain 8 still adhere to the tube the engagement be-

tween the tapered face 24 on the stripper 22 and the tapered projections 25 on the chain 8, causes the latter to be moved outwardly and above the surface of the stripper 22. As the stripper 22 engages the end of the finished tube, the latter is moved outwardly along the mandrel 4 through an opening 53 in the plate 15 and frame 2 and past the released bearing C.

After the tube has been ejected, the stripper 22 moves backwardly by reason of the continued revolution of the hub 32, and the plates 14 and 15 and the ring 39 are turned in a reverse direction to cause the bearing segments 36 to again engage the mandrel 4 and the chain 8 to be tensioned.

I have provided a tube winding machine in which a releasable bearing supports an overhanging forming mandrel during the winding and pressing of the strip of paper into a tubular form. During the period when the tube is being ejected from the mandrel the bearing is released in synchronism with the release of the pressing device cooperating with the mandrel so that the tube may be slipped off from the mandrel within the bearing.

I also provide a series of camming plates and driving mechanism therefor that are simple, of few parts and are readily assembled. By using hardened lugs in engagement with the bearing segment, I secure a more precise and positive engagement between the mandrel and bearing than is possible by the use of rollers alone. In the present machine the ejector is driven from a barrel cam through a lever motion that is materially simpler than the spiral grooves heretofore employed.

While I have shown and described my invention in connection with a tube winding machine for manufacturing paper cans and the like, it is to be understood that the machine is capable of application to other uses and in connection with the winding of other materials, and that the use of the machine for such purpose is contemplated without departing from the scope of the appended claims.

I claim:

1. In a winding machine, a mandrel, means for pressing material against the mandrel, means for removing material from the mandrel, a bearing for the mandrel and interconnecting means between the bearing and the several means for releasing the pressing means and the bearing during the operation of the material removing means.

2. In a winding machine, a mandrel, means for pressing material against the mandrel, means for removing material from the mandrel, a bearing for the mandrel and interconnecting means between the mandrel, the bearing and the several means for releasing the pressing means and the bearing during

the operation of the material removing means.

3. In a winding machine, a mandrel, a releasable bearing therefor, means for removing material from the mandrel, and interconnected means for controlling the movement of the bearing in accordance with the movement of material removing means.

4. In a winding machine, a revolving mandrel, a segmental bearing therefor, and means for imparting relative radial movement between the mandrel and the bearing segments in accordance with the movement of the mandrel.

5. In a winding machine, a mandrel, a bearing therefor, and means for varying the relative positions of the bearing and mandrel in accordance with the rotation of the mandrel.

6. In a winding machine, a mandrel, a releasable bearing therefor, a material stripper cooperating with the mandrel, and means for actuating the stripper and the bearing in accordance with the rotation of the mandrel.

7. In a winding machine, a mandrel, a releasable bearing therefor, means for removing material from the mandrel, and means for operating the bearing and material removable means in a predetermined sequence and in accordance with the movement of the mandrel.

8. In a machine of the character described, a revolving mandrel, a releasable bearing therefor; and means for actuating the bearing in accordance with the movement of the mandrel.

9. In a segmental bearing a plurality of bearing segments having notches along their outer edges, a ring having a plurality of lugs thereon for cooperation with the several notches, and interconnecting means between the ring and the bearing segments for biasing the edges of the segments against the lugs and for imparting radial movement thereto when the lugs engage the several notches.

10. In a winding machine, a mandrel, means for feeding material thereto, means for exerting a pressure over at least a portion of the surface of the mandrel, and means for applying a liquid to the material at the place of engagement between the material and pressing means and the mandrel.

11. In a winding machine, a mandrel, means for feeding material thereto, means for exerting a pressure over at least a portion of the surface of the mandrel, and means for applying liquid to the material and utilizing the kinetic energy of the liquid for assisting in the feeding movement of the material into engagement with the mandrel and the pressing device.

12. In a winding machine, a mandrel, means for pressing material about the mandrel, and means for directing a spray in the

direction of the mandrel and pressing device at the place of engagement between the pressing device and mandrel.

13. In a machine structure, a shaping mandrel, a releasable bearing therefor movable to its released position for permitting the passage of a shaped body along the surface of the mandrel, and means effective upon operation of the machine for releasing the bearing.

14. In a machine structure, the combination with a shaping mandrel adapted for the movement of material longitudinally thereof, of a releasable bearing movable into its released position in accordance with the movement of the material along the mandrel, and means operable in accordance with such movement for releasing the bearing.

15. In a winding machine, a rotatable mandrel, a bearing member movable into and out of operative position relative to the mandrel, means for automatically effecting such movement in co-ordination with movement of the mandrel and separate means for holding the member in operative position.

16. In a winding machine, a rotatable mandrel, a bearing member movable into and out of operative position relative to the mandrel, cam means for effecting such movement in synchronism with the movement of said mandrel and separate means for holding the member in operative position.

17. In a winding machine, a mandrel, a flexible member extending around the mandrel, and a stripper movable longitudinally of the mandrel, the stripper normally occupying a position along the mandrel beyond the flexible member but adapted to move between the mandrel and the flexible member, the flexible member having an edge so formed as to permit easy passage of the stripper thereunder, the other edge being blunt, and stop means cooperating with the blunt edge to prevent displacement of the flexible member along the mandrel.

18. In a winding machine, a rotatable mandrel, a stripping device encircling said mandrel and movable longitudinally thereof, and means for controlling the movement of said stripping device in accordance with the rotation of said mandrel.

19. A winding machine comprising a rotatable mandrel, a tubular stripping member mounted on said mandrel and comprising a relatively rotatable ring inserted between the body of said stripping member and the mandrel at the forward end thereof for engaging a tube mounted on said mandrel and rotatable therewith, and means for actuating the stripping means in accordance with the rotation of the mandrel.

20. A winding machine comprising a rotatable mandrel, a cylindrical stripping member movable only longitudinally of the mandrel, a relatively rotatable tube engag-

ing ring inserted at the forward edge of said stripping means and means for imparting movement to said stripping means whereby upon the advancement of the stripping means said ring engages material wound on the mandrel and turns therewith during an ejecting operation.

21. A winding machine comprising a rotatable mandrel, a plurality of bearing segments for supporting a portion of said mandrel, a relatively rotatable member, means for moving said member in accordance with movement of said mandrel, and interconnecting means between the bearing segments and the movable member for imparting radial movement to the bearing segments upon movement of the movable member for permitting the withdrawal of a tube formed on said mandrel between the separated bearing segments.

22. A winding machine comprising a rotatable mandrel, a plurality of bearing segments for supporting a portion of said mandrel, a relatively rotatable ring, means for moving said ring in accordance with movement of said mandrel, and interconnecting means between the bearing segments and the movable ring for imparting radial movement to the bearing segments upon movement of the movable ring for permitting the withdrawal of a tube formed on said mandrel between the separated bearing segments.

In testimony whereof I have hereunto set my hand.

GEORGE ODIN FROSTAD. 100

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