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TUBULAR PAPER MACHINERY

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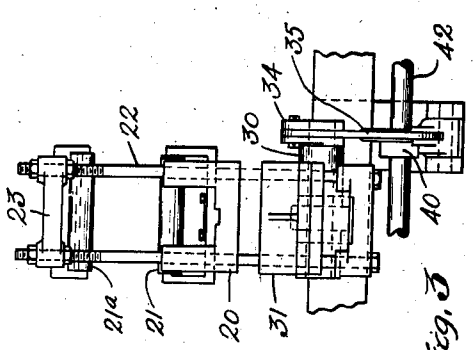


Fig. 3

Fig. 1

Fig. 2

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TUBULAR PAPER MACHINERY

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6 Claims. (Cl. 93—81)

This invention relates to paper tube making machinery, and more particularly mechanism in which the tube structures are laid up on a mandrel or former; and it is among the objects of the invention to provide a construction making possible a mandrel or former which can be quite long if desired and yet firmly supported. A further object is the provision of a construction in which the support for one end of the mandrel can be released from engagement, and thereby facilitate discharge of the formed tubes such as may be desired.

To the accomplishment of the foregoing and related ends, the invention, then, comprises the features hereinafter fully described, and particularly pointed out in the claims, the following description and the annexed drawing setting forth in detail certain illustrative embodiments of the invention, these being indicative however, of but a few of the various ways in which the principle of the invention may be employed.

In said annexed drawing:

Fig. 1 is a plan view showing an embodiment of the invention; Fig. 2 is an enlarged vertical sectional view taken on a plane substantially indicated by line II—II, Fig. 1; and Fig. 3 is a side elevational view of the structure shown in Fig. 2.

The tube forming mechanism may vary somewhat as to its detail, depending upon particular conditions and requirements, and in general may involve a mandrel or former 2, which is mounted for rotation and carried by suitable framing which may be supported on the base 3 and may involve standards 4, 4, with mounting for the drive shaft 5 carrying said mandrel. The shaft 5 may be driven or rotated in suitable arrangement, as for instance from the drive motor M, with reduction gearing mechanism 6 in chain or belt drive 7 to a counter-shaft 8, through gearing 9, 10; and further counter-shafts and gearing 11, 12, actuate the gearing 13 on the shaft 5, as need not be further detailed for the present purposes. Arranged in relation with the mandrel 2 is a means for supplying stock for the winding of tubular shapes onto the mandrel 2, and the precise construction as to this may vary, one convenient form involving rollers 15, by which a web of paper may be fed to and from an adhesive-applying roll 16, and thence over a feed table F to the mandrel 2, where for instance a convolutely wound tubular body is to be formed. Irrespective of the detail of the mandrel drive and manner of applying the tube-forming stock thereto, whether in convolute or spiral arrangement, the present invention is more particularly concerned with the association of a rotatable mandrel having its driving end connected with a source of power and being mounted in supports of relatively fixed character, while the free end of the mandrel extending therefrom is provided with supporting means of a character adaptable to steady and support such free end against whipping around or undue vibration, even though at high speed operation. And more particularly for instance, such support means S may include a lower yoke 20, Fig. 2, carrying mandrel-engaging rollers 21 which are of suitable character to distribute the carrying surface of contact, and the yoke is vertically reciprocable, as on rods 22. Cooperating also with the mandrel is an upper yoke 23 secured to the rods 22, and provided also with mandrel-engaging roller means 21*a*. The rods 22 carrying the upper yoke 23, and slidable through guides 24 in the lower yoke, are joined by a lower cross head 25. In the space between the lower head 25 and the lower yoke 20, a rocker cam 26 is arranged, which with its raise between the head 25 and yoke 20 holds the yokes against the mandrel 2, in opposition to the spreader springs *c*, but at controlled times is turned to occasion the separation of the upper and lower yokes 23, 20 away from the mandrel 2, as for the discharge of the tubing length or a convolutely wound tube which has been prepared on the mandrel in front thereof. Desirably, the cam 26 may contact above with a shoe-extension 27 from the lower yoke 20, and by means of a threaded stem 28 and a set nut 29, the position of the shoe 27 may be adjusted closely in accordance with the desired range of movement to be had by the action of the cam. For the operation of the cam, one suitable construction may involve carrying the cam on a stub shaft 30 which may be mounted in a frame member 31 extending between longitudinal frame beams 32 which may be of channel type if desired, and extending from the cam shaft 30 is a lateral crank 34 which is connected by link 35 to a rocker arm 36 pivoted at its end 37 to the framing 38. Suitable means for operating the rocker arm 36 is provided, as for instance a cam 40 contacting with a roller 41 on the arm 36. The cam 40 may be carried by shaft 42 extending longitudinally in the machine, and suitably driven at desired rate from the gear head end. Advantageously, where convolute wound products are to be had, the shaft 42 may also, near its driving end, carry a cam for operating an ejector collar at the drive end of the mandrel 2. Since the detail of this is immaterial to the present invention, it suffices to here merely point out that the opening of the rest-support means S may thus be timed with the movement of a formed tube as pushed along on the mandrel to thereby make room for a new winding operation, a finished tube being discharged.

The operation of the device will be clear from the foregoing. With the mandrel in rotation as driven by the motor M, the paper web of suitable stock for the particular product in view, for in-

stance usually kraft stock, chestnut board, chip board, etc., or higher grade paper for special products as desired, is passed over the feed rolls 15 and the adhesive applicator roll 16, and is forwarded to the mandrel 2, which provided with a suitable gripper, at the beginning of the operating cycle closes down on the fed end of the paper web, and thence with the further turning of the mandrel the sheet stock is wound into tube form in whatever number of layers is desired, whereupon a cutter in the mechanism of the feed table F severs the web ready for the next tube. The ejector collar 14 thereupon reciprocates (as operated by any suitable mechanism, whose detail is immaterial here) and pushes the tube axially sufficiently to clear a space on the mandrel for the next tube, and simultaneously the cam 40 operated by the common shaft, forces the arm 36 downwardly for the actuation of the cam 26, thereby releasing the rest-support. Since the head 25 carries, through the intermediary of the rods 22, the upper yoke 23, the latter is correspondingly separated upwardly from the mandrel 2, assisted by spreader springs c, while the yoke 20 is separated downwardly therefrom, thus affording clearance all around for the discharge of the tube being pushed along. Optionally, further finishing of the outer surface of the tube may be provided for as may be desired, for instance a surfacing-liquid applicator A may be arranged at this point, as need not be further detailed for the present purposes.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims, or the equivalent of such, be employed.

I therefore particularly point out and distinctly claim as my invention:

1. In tube making apparatus, a mandrel having a free end permitting discharge of tubes formed, means for rotating the mandrel, means for applying a web of paper to the mandrel, drive and support means for one end of the mandrel, and support-rest means for supporting the other end of the mandrel, said means including a lower yoke, mandrel-engaging rollers on said yoke, an upper yoke, mandrel-engaging roller means thereon, a pair of slide rods supporting said upper yoke and passing in guide relation through the lower yoke and through fixed guides below, springs between said yokes on said slide rods, a lower cross head secured to said slide rods, a cam between said lower yoke and said cross head for holding and permitting release of said yoke members with respect to the mandrel, an adjustable shoe-extension from said lower yoke whereby said cam movement may be coordinated, a shaft carrying said cam and being mounted in the framing below said lower yoke, a rock-arm pivotally mounted on the framing, a link connecting said rock-arm and said cam shaft, and cam-means for intermittently actuating said rock-arm and spreading said yokes to allow discharge of the tube.

2. In tube making apparatus, a mandrel having a free end permitting discharge of tubes formed, means for rotating the mandrel, means for supplying paper for wind-up on the mandrel, drive and support means for one end of the mandrel, and support-rest means for supporting the other end of the mandrel, said means including a lower yoke, mandrel-engaging rollers on said yoke, an upper yoke, mandrel-engaging roller means thereon, a pair of slide rods supporting said upper yoke and passing in guide relation through the lower yoke and through fixed guides below, springs between said yokes on said slide rods, a lower cross head secured to said slide rods, a cam between said lower yoke and said cross head for holding and permitting release of said yoke members with respect to the mandrel, a shaft carrying said cam and being mounted in the framing below said lower yoke, a rock-arm pivotally mounted on the framing, a link connecting said rock-arm and said cam shaft, and cam-means for intermittently actuating said rock-arm and spreading said yokes to allow discharge of the tube.

3. In tube making apparatus, means for forming paper tubes, including a mandrel; drive and support means for one end of the mandrel; and support-rest means for the other end of the mandrel, including a lower yoke, mandrel-engaging means on said yoke, an upper yoke, mandrel-engaging means thereon, a pair of slide rods supporting said upper yoke and passing in guide relation through the lower yoke and through fixed guides below, springs between said yokes on said slide rods, a lower cross head secured to said slide rods, a cam between said lower yoke and said cross head for holding and permitting release of said yoke members with respect to the mandrel, a shaft carrying said cam and being mounted in the framing below said lower yoke, a rock-arm pivotally mounted on the framing, a link connecting said rock-arm and said cam shaft, and means for intermittently actuating said rock-arm and spreading said yokes to allow discharge of the tube.

4. In tube making apparatus, means for forming paper tubes, including a mandrel; drive and support means for one end of the mandrel; and support-rest means for the other end of the mandrel, including a lower yoke, mandrel-engaging means on said yoke, an upper yoke, mandrel-engaging means thereon, a pair of slide rods supporting said upper yoke and passing in guide relation through the lower yoke and through fixed guides below, a lower cross head secured to said slide rods, a cam between said lower yoke and said cross head for holding and permitting release of said yoke members with respect to the mandrel, and means for intermittently actuating said cam.

5. In tube making apparatus, means for forming paper tubes, including a mandrel; drive and support means for one end of the mandrel; and support means for the other end of the mandrel, including upper and lower yokes transverse of the axis of the mandrel and having mandrel-engaging means, and cam-means for intermittently drawing said yokes toward the mandrel.

6. In tube making apparatus, means for forming paper tubes, including a mandrel; drive and support means for one end of the mandrel, and support-rest means for the other end of the mandrel, including a yoke under the mandrel and having mandrel-engaging means, counter-steadying means to engage the mandrel above, and means for forcing said yoke and said counter-steadying means in intermittent movement toward and away from the mandrel.

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