Aug. 27, 1968 S. J. SILBERMAN 3,398,751

APPARATUS FOR FEEDING PARTICULATE MATERIAL AND FORMING ROD THEREFROM

Filed Oct. 27, 1965 3 Sheets-Sheet 1

Fig. 1.

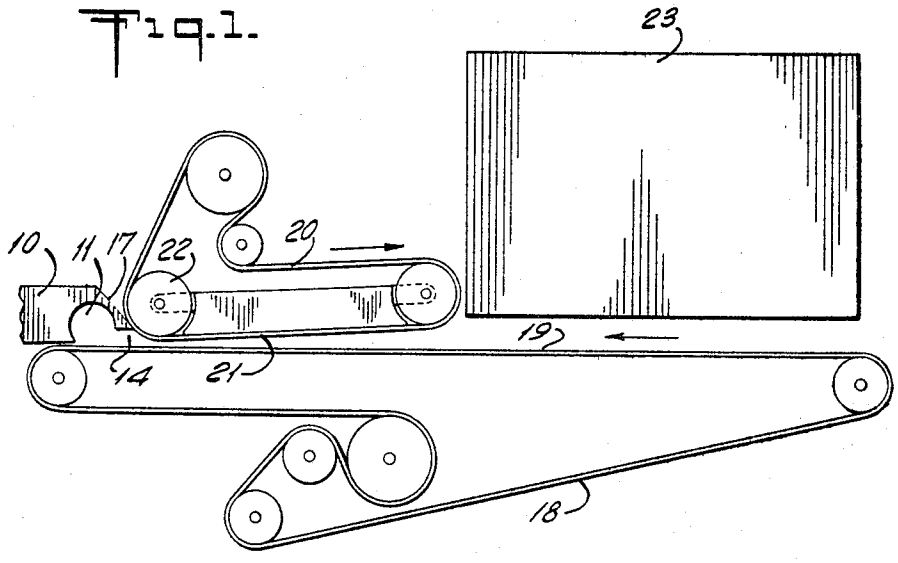
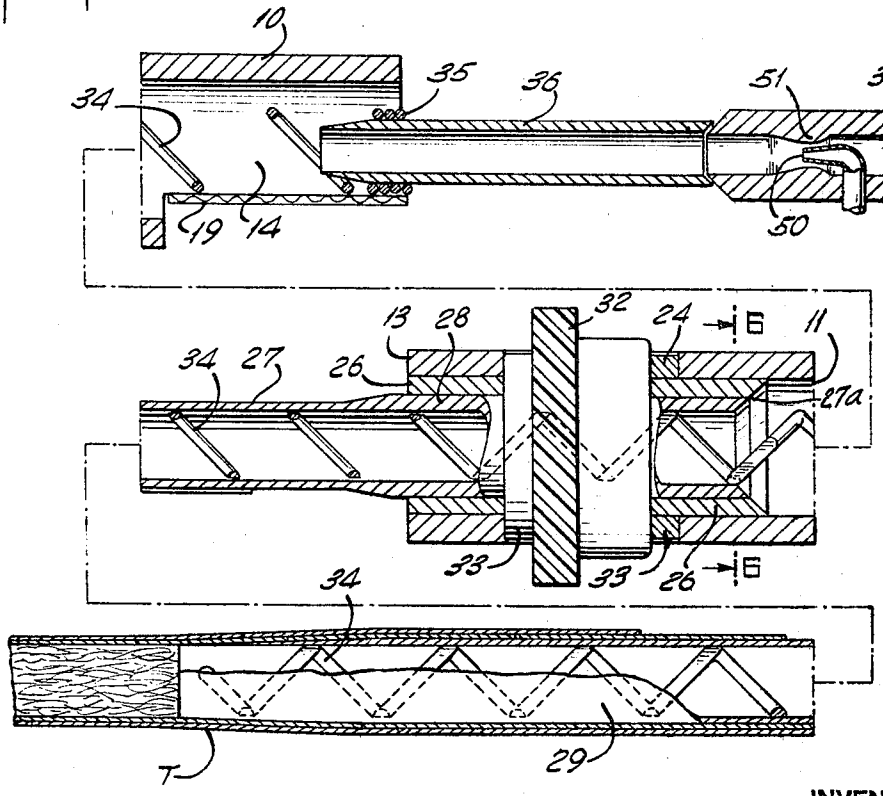


Fig. 3.



INVENTOR
SAMUEL J. SILBERMAN
BY
William R. Liberman
ATTORNEY

Aug. 27, 1968 S. J. SILBERMAN 3,398,751

APPARATUS FOR FEEDING PARTICULATE MATERIAL AND FORMING ROD THEREFROM

Filed Oct. 27, 1965 3 Sheets-Sheet 2

Fig. 2.

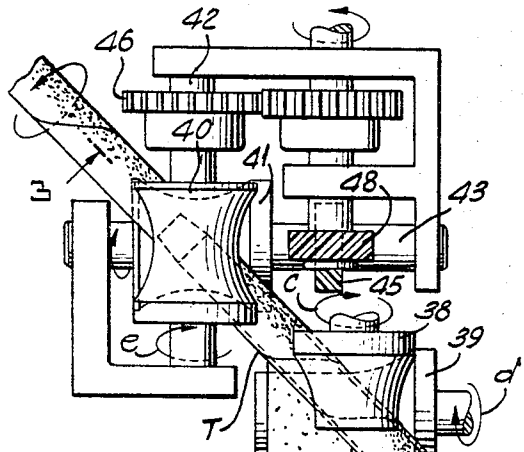
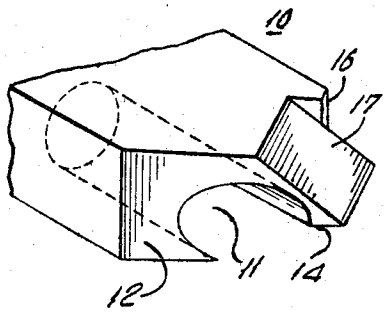


Fig. 5.



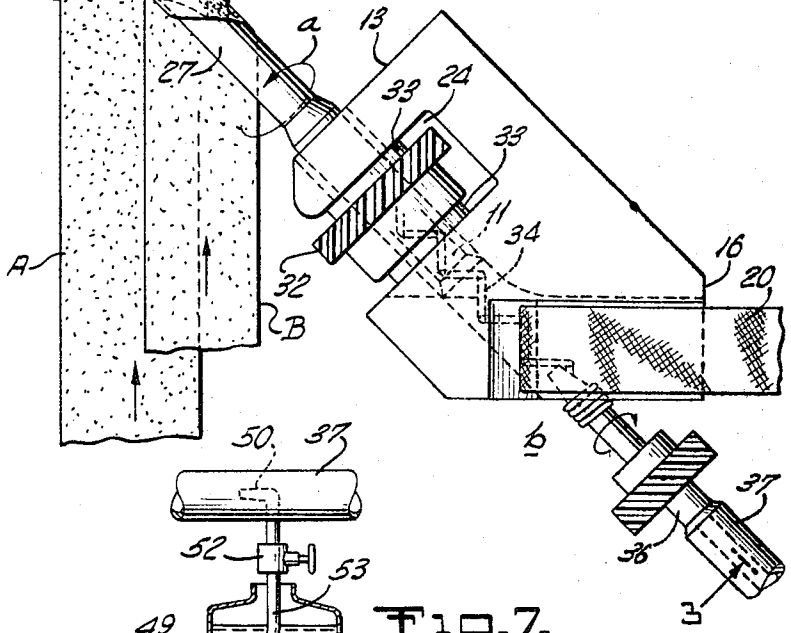


Fig. 6.

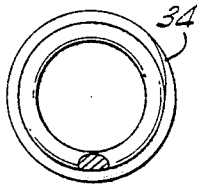
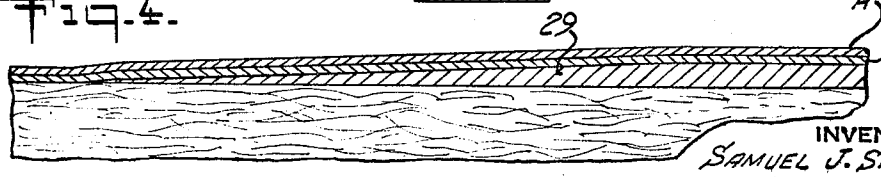


Fig. 7.

Fig. 4.



INVENTOR
SAMUEL J. SILBERMAN
BY
William R. Liberman
ATTORNEY

Aug. 27, 1968 S. J. SILBERMAN 3,398,751

APPARATUS FOR FEEDING PARTICULATE MATERIAL AND FORMING ROD THEREFROM

Filed Oct. 27, 1965 3 Sheets-Sheet 3

Fig. 9.

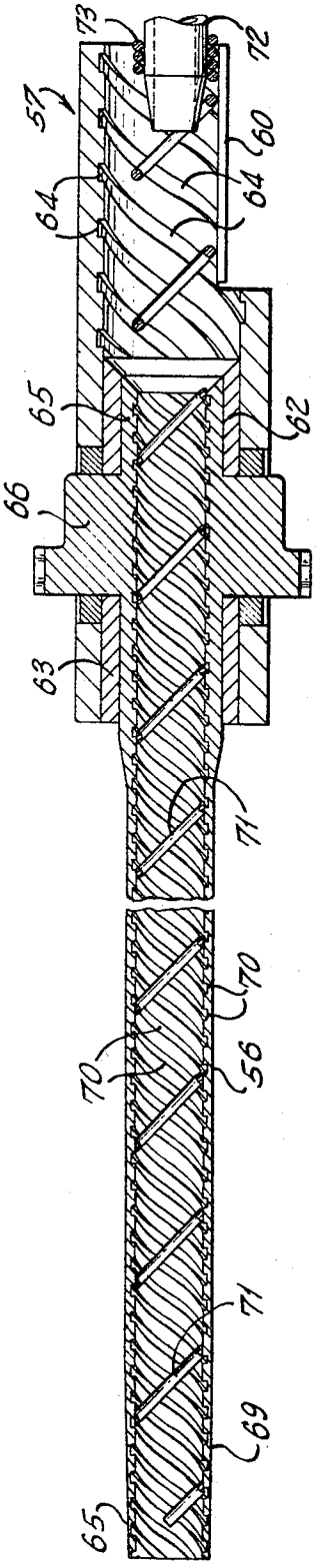


Fig. 10.

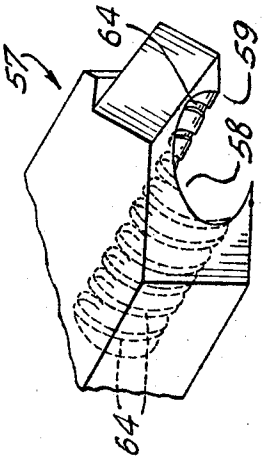
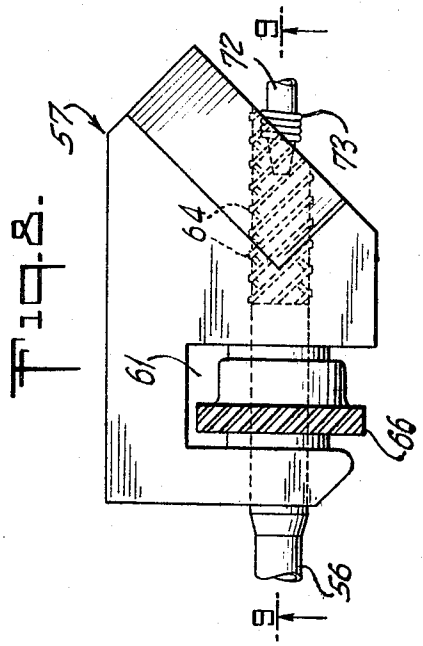


Fig. 8.



INVENTOR
SAMUEL J. SILBERMAN
BY
William R. Silberman
ATTORNEY

United States Patent Office 3,398,751 Patented Aug. 27, 1968

3,398,751

APPARATUS FOR FEEDING PARTICULATE MATERIAL AND FORMING ROD THEREFROM

Samuel J. Silberman, 885 Park Ave., New York, N.Y. 10021

Filed Oct. 27, 1965, Ser. No. 505,342
13 Claims. (Cl. 131—59)

ABSTRACT OF THE DISCLOSURE

A cigar producing machine includes a body member having a longitudinal bore and a side opening through which filler tobacco is fed. An internally threaded feed tube extends into the body member bore and is rotated in a direction opposite to that of the thread pitch. Driven concave canted rolls engage the feed tube outer face to advance along the feed tube a helically wound tube of binder and wrapper bands fed at an angle to the feed tube. A moisture injecting nozzle projects into the body member bore and supports and rotates in a direction opposite to that of the feed tube, a wire feed screw which extends along the length of the feed tube.

The present invention relates generally to improvements in feeding and forming devices and it relates in particular to an improved apparatus for the continuous production of elongated rods of tobacco bound or wrapped in helically applied bands.

Many types of mechanisms have been proposed for the automatic continuous production of a rod of filler tobacco which is bound or wrapped in one or more helically wound bands of tobacco. The continuously produced rod is formed in various thicknesses, wrapped and cut into predetermined lengths for use as cigars or cigarillos or the like. A major problem encountered in the production of tobacco products in the above manner is the lack of uniformity of the end product, and specifically the inability to control properly the density and compactness of the filler tobacco. In order that wrapped tobacco rod-producing machines operate in a satisfactory manner it is necessary that the filler tobacco be fed, formed, advanced and wrapped so as to be of a uniform compactness, and that the end product, such as the cigar, cigarillo or the like have an easy and consistent draw and a good feel. The methods and mechanisms employed in the feeding of tobacco in the conventional cigarette making equipment has not been found suitable in the manufacture of cigar type products in which the tobacco core is covered by a helically wound band. These methods and mechanisms, when employed in the manufacture of the aforesaid cigar type products, do not produce a uniformly packed filler of the desired density and otherwise leave much to be desired.

It is, therefore, a principal object of the present invention to provide an improved device for feeding and compacting a particulate material.

Another object of the present invention is to provide an improved apparatus for the continuous production of cigars, cigarettes and the like.

Still another object of the present invention is to provide an improved mechanism for feeding filler tobacco to a continuous cigar producing machine.

A further object of the present invention is to provide an improved mechanism for forming and advancing a rod of filler tobacco attendant the binding and wrapping thereof in at least one helically arranged band.

Still a further object of the present invention is to provide an apparatus of the above nature characterized by its versatility, adaptability, ruggedness and dependability.

The above and other objects of the present invention will in part be specifically pointed out hereinabove, and in part will become apparent from a reading of the following description taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is a front fragmentary elevational view of an apparatus embodying the present invention;

FIG. 2 is an enlarged fragmentary top plan view thereof;

FIG. 3 is an enlarged sectional view taken along line 3—3 of of FIG. 2;

FIG. 4 is a fragmentary longitudinal sectional view of the leading end of the former nozzle;

FIG. 5 is a fragmentary perspective view of the feed block;

FIG. 6 is a sectional view taken along line 6—6 of FIG. 3;

FIG. 7 is a fragmentary elevational view of the inlet air humidifying device;

FIG. 8 is a top plan fragmentary view of another embodiment of the present invention;

FIG. 9 is a sectional view taken along line 9—9 in FIG. 8; and

FIG. 10 is a fragmentary perspective view.

In a sense, the present invention contemplates the provision of an apparatus for producing a helically wrapped rod of a particulate filler material, said apparatus comprising a feed tube having inlet and discharge openings at trailing and leading ends thereof and an outlet port in the wall thereof, a helical feed screw mounted and extending coaxially thereof, within said feed tube, means for rotating said feed screw, and means for helically winding and axially advancing a band about and along said feed tube in overlapping relationship to said outlet port. Another feature of the present apparatus resides in the combination of the feed tube and the coaxially extending feed screw, and means for rotating the feed tube and the feed screw in opposite directions.

According to a preferred form of the present apparatus, there is provided a feed tube body member having a longitudinal bore formed therein, the trailing section of said feed tube being journalled in the leading end of the bore and the leading section of the feed tube having peripherally spaced ports therein. A side opening is formed in said body member and communicates with the bore, and an endless feed belt has an upper run extending to said side opening for delivering tobacco thereto. A wire feed helix extends for slightly less than or for the full length of the feed tube and the full length of the bore, and registers with the body member side opening, and a rotary nozzle is secured to and telescopes the trailing end of the feed helix and the body member bore and communicates with an adjustable source of water to humidify and moisten the fed tobacco. That part of the feed helix which registers with the bore is of slightly greater diameter than the remainder thereof. Means are provided for rotating the feed tube, and the wire helix and rotary nozzle in opposite directions. Overlapping wrapper and binder bands are fed at an angle to the leading section of the feed tube in overlapping relation to the outlet ports and are helically wound and advanced along and beyond the leading section of the feed tube by a pair of rotating canted rolls engaging the bands along the feed tube. The inner face of the feed tube may advantageously be provided with a helically extending groove of pitch opposite that of the feed helix.

Referring now to the drawings, which illustrate a preferred embodiment of the present invention, reference numeral 10 generally designates a suitably mounted body member having a longitudinal bore 11 formed therein and extending from an angularly extending vertical trailing

face 12 to a transversely extending leading face 13. A passageway 14, formed in the trailing section of body 10 at an angle to bore 11, extending between the trailing section of bore 11 and a trailing face 16 of body 10 transversely to passageway 14. The bottom of passaway 14 is open and a top face 17 of body 10 is tapered downwardly to the trailing face 16 and intersects passageway 14 along a sharp edge at the entrance thereto.

An endless belt 18 is suitably supported by a plurality of rollers at least one of which is positively driven to advance the belt along a substantially horizontal run 19, the leading end of which underlies the body 10. The upper run 19 of said belt 18 lies along the longitudinal medial axis of passageway 14 and delineates the bottom wall thereof and extends transversely beyond bore 11. A second driven endless belt 20 includes a bottom run 21 which advances longitudinally toward the opening to passageway 14 and traverses a lead drum 22 substantially tangent to face 17 of body member 10 and a short distance below the bottom sharp edge thereof. The belt runs 19 and 21 converge toward passageway 14 and advance thereto at about the same rate thereby to compact and feed filler tobacco carried by belt run 19 through passageway 14 toward bore 11, suitable guide plates being provided to maintain belts 18 and 20 along their runs 19 and 21. A tobacco filler feed unit 23 which may be of known construction, is positioned above the trailing section of belt run 19 and deposits filler tobacco to a predetermined level on belt run 19 in any suitable manner.

A slot 24 is formed in body 10 shortly rearwardly of front face 13 and extends across bore 11, a pair of axial bushings 26 registering with bore 11 on opposite sides of slot 24. An elongated feed tube 27 of substantially uniform inside diameter projects forwardly of body 10 coaxially with bore 11, and includes a trailing section 28 of larger outside diameter registering with bore 11 and rotatably engaging bushings 26 and terminating at a point short of passageway 14. A helical gear 32 is secured to the trailing section 28 of the feed tube in registry with the slot 24 and spaced from the opposite faces of the slot 24 by rings 33. Gear 32 is engaged by a driven mating gear to rotate feed tube 27 in a predetermined sense, for example, counterclockwise in the direction of arrow *a* as viewed in FIGURE 2. It should be noted that the trailing face of feed tube 27 and trailing bushing 26 are beveled as at 27*a* to define a funnel shaped opening into feed tube 27.

A feed screw 34 in the form of a wire helix, having a substantially uniform lefthand pitch in the illustrated embodiment, extends coaxially along substantially the full length of feed tube 27 and bore 11, from about the discharge end of feed tube 27 or from a point shortly trailing, advantageously by about ¼", said discharge end to and shortly beyond the rear face 12 of the body member and across passageway 14. The outside diameter of feed screw 34, which registers with feed tube 27, is about equal to the inside diameter of feed tube 27, and that portion which registers with passageway 14 is of somewhat larger diameter. A tubular nozzle 36, coaxial with feed screw 34, telescopes and is affixed to the trailing end thereof which screw is axially contracted, as at 35, the leading end of nozzle 36 terminating at about passageway 14 and the trailing end thereof being disposed rearwardly of body 10. Nozzle 36 is journalled and suitably supported coaxial with feed tube 27 and is rotated at a predetermined speed in a direction opposite that of feed tube 27, clockwise in the illustrated embodiment as indicated by arrow *b*, correspondingly to rotate feed screw 34. The trailing opening in nozzle 36 is coupled by means of a stationary nozzle 37 to a source of moisture.

A first pair of upper and lower canted pressure rollers 38 and 39 respectively are urged toward engagement with the upper and lower surfaces of feed tube section 29 intermediate its ends. The surface of the trailing section of upper roller 38 is of elliptic hyperbolic longitudinal cross-section and the surface of the leading section of the lower roller 39 is of elliptic hyperbolic longitudinal cross-section to engage the surface of the feed tube section 29 along upper and lower longitudinal lines along the far side thereof, the opposite sections of the rollers 38 and 39 along the far side of the feed tube section 29 are cylindrical in shape. Means are provided for positively rotating rollers 38 and 39 clockwise as viewed from their trailing ends and as shown by the arrows *c* and *d* and at a peripheral speed approximately equal to that of the outer face of feed tube section 29. Rollers 38 and 39 are each canted at 45° to feed tube 27 and are canted at 90° to each other.

A second pair of canted upper and lower pressure rollers 40 and 41 respectively are urged toward engagement with the upper and lower surfaces of the leading end of feed tube section 27 and project beyond said leading end. Rollers 40 and 41 are canted at 45° to feed tube 27 and are canted 90° to each other and each are provided with peripheral surfaces of elliptic hyperbolic longitudinal cross-section engaging the feed tube section along longitudinally extending lines and delineating a tubular passageway beyond the leading end of feed tube 27. Upper and lower rollers 40 and 41 are positively driven at peripheral speeds substantially that of the outer face of the feed tube section 29, the upper roller 40 rotating clockwise, as viewed from its trailing end and indicated by the arrow *e*, and the lower roller 41 rotating counterclockwise as viewed from its leading end and indicated by the arrow *f*.

The structure of rollers 38, 39, 40 and 41 and a mechanism which may be employed to advantage for driving these rollers is described in detail in patent application Serial No. 348,951, filed March 3, 1964, in the name of Samuel J. Silberman, now Patent No. 3,238,951. Briefly, rollers 40 and 41, of the configuration described above, are affixed to upper and lower horizontal shafts 42 and 43 respectively, which are canted at 90° to each other and are suitably journaled to corresponding brackets. A main drive shaft 44 is coupled to a drive motor and is parallel to shaft 42. Shaft 44 is coupled to shaft 42 by means of meshing similar gears 46 and 47 affixed to shafts 42 and 44 respectively, and is coupled to shaft 43 by means of meshing similar spiral gears 45 and 48 affixed to shafts 43 and 44.

Suitable means are provided for leading enwrapping bands A and B from supply rolls thereof with their borders overlapping into the bight delineated by bottom roller 39 and feed tube section 29, along the bottom surface of the feed tube section 29 and at an angle thereto. The bands A and B are preferably formed of reconstituted tobacco sheet or film, and define the cigar wrapper and binder respectively, the border B overlying the adjacent border of wrapper A.

Feed tube 27, nozzle 36 and feed screw 34 and rollers 38, 39, 40 and 41 are driven by a common drive motor in the relationship set forth above. Means may be provided for applying labels to the bound and wrapped tobacco rod and cutting it to the desired lengths in the manner set forth in the above-identified Silberman patent application.

In order to humidify the air delivered by the nozzle 36 whereby, in a sense, to condition the tobacco being handled by the present apparatus, there is provided a moisture injecting device including a reservoir or tank 49 containing a supply of water. An injection or spray nozzle 50 is disposed in stationary nozzle 37, and is diverted axially downstream relative to the air flow, the interior of the nozzle 37 in the vicinity of the spray nozzle 50 being constricted, as at 51, to define a venturi. Nozzle 50 is connected by way of a needle valve 52 to a tube 53 which is submerged in the water in reservoir 49. Thus, water is withdrawn from the reservoir 49 at a rate contollable by needle valve 52 and directed against the tobacco.

Considering now the operation of the apparatus de-

scribed above, an oriented filler tobacco of the desired character is deposited by feed unit **23** onto the upper run **19** of belt **18** and is conveyed thereby beneath the lower run **21** of belt **20** where it is compressed and fed in a compressed state through passageway **14** into bore **11**. The tobacco is advanced as a continuously formed rod by the rotating feed screw along the length of bore **11** into and axially through feed tube **27**.

The binder and wrapper bands A and B are helically wound in overlapping relationship on feed tube **27** into a continuous tube T of superimposed bands A and B defining rod wrapper and binder respectively and advanced as a tube T along the length of the feed tube **27** by rollers **38** and **39**. At the discharge end of feed tube **27** tube T is engaged and advanced by rollers **40** and **41** beyond feed tube **27**, the rod of tobacco being continuously fed into the tube T and advanced therewith. Longitudinally spaced peripheral bands may then be applied to the advancing tobacco filled tube which is cut into the desired lengths as earlier set forth. The moisture fed into bore **11** flows forwardly through the feed tube **27** where it is absorbed by the tobacco.

Referring now to the modification of my invention in FIGURES 8 to 10 of the drawings, it will be seen to differ from that first described embodiment primarily in the structure of the feed tube, the associated elements and their relationships being otherwise similar to those of the first embodiment. Reference numeral **56** designates the tobacco feed tube corresponding to feed tube **27**, and reference numeral **57** designates the associated body member corresponding to the body in member **10** of the first embodiment. Body member **57** is of the same general configuration as body member **10** and is provided with a longitudinal bore **58** open along its bottom at the trailing section thereof, and provided at one side with a passageway **59** to permit the lateral feed of tobacco by a conveyer belt **60**. As in the first embodiment, a transverse slot **61** is formed in body member **57** and a pair of axial bushings **63** register with bore **58** on opposite sides of slot **61**.

Formed in the face of bore **58**, trailing the trailing bushing **63**, is a multiple thread **64** in the form of helically extending channels or grooves, preferably of rectangular cross-section and separated by intervening ridges. While four helical grooves are illustrated, a greater or lesser number may be employed.

Feed tube **56** includes a trailing section **65** registering with bushings **63** and carrying a gear **66** which registers with slot **61** and facilitates the rotation of feed tube **56**. Leading section **67** of feed tube **65** terminates in a slightly tapered end **69**. The bore or inner face of feed tube **56** is provided along the full length thereof with a multiple thread **70** in the form of helically extending channels or grooves, preferably of rectangular cross-section and separated by intervening ridges. While four parallel threads are illustrated, a greater or lesser number may be provided.

A helical feed screw **71** in the nature of a wire helix of substantially the same structure as feed screw **34** extends coaxially substantially along the full length of feed tube **56** and bore **58** from a point shortly trailing the discharge end of feed tube **56**, advantageously by about ¼ inch from said discharge end, to and beyond the rear face of body member **57**. The outside diameter of feed screw **71**, which registers with feed tube **56**, is about equal to the inside diameter of feed tube **56**, and that which registers with the passageway **59** is of somewhat larger diameter. A nozzle **72** of the construction and relationship of nozzle **37** and provided with a corresponding rotational drive is coaxial with feed screw **71**, telescopes and is affixed to the axial compressed trailing end **73** thereof whereby rotation of feed screw **71** is effected by rotation of nozzle **72**.

Feed screw **71** is of a pitch opposite to that of threads **70** and **64**. Thus, in the illustrated embodiment, feed screw **71** is left handed and threads **70** and **64** are right handed. Furthermore, feed tube **56** and feed screw **71** are rotated in directions opposite to their respective screw pitches, in the illustrated embodiment the feed tube **56** is rotated counterclockwise and feed screw **71** rotates in clockwise direction.

It should be noted that the rotational speed of feed tube **56** determines the take up rate of the binder and wrapper, as earlier described, and this is determined by the axial speed of the produced cigar. Also effecting the take up rate of the binder and wrapper and its angle to the longitudinal axis of the cigar is the width of the binder or wrapper and the diameter of the cigar. In any event, the angle of pitch of feed tube thread **70** is, highly advantageously, equal to the angle of feed of the binder and wrapper to tube **56** attendant its application to the advancing cigar rod.

In operation, the tobacco is advantageously linearly feed tube **56** without any rotation. This is effected when feed tube **56** and feed screw **71** are rotated so as to produce the same linear advance of a non-rotating point. Thus, if the oppositely threaded feed tube **56** and feed screw **71** are of the same angular pitch, rotation of these in opposite directions at the same rates effects a non-rotational linear advance of the tobacco rod. The advancing tobacco rod, as it leaves the leading end of feed screw **71**, is rotated by feed tube **56** in the direction of rotation thereof so that there is no slippage between the discharged tobacco rod and the axially advancing helically wrapped tobacco and binder. If desired, rotation may be imparted to the tobacco rod advancing along feed tube **56** by adjusting the rotational speed of feed screw **71**.

While there has been described and illustrated a preferred embodiment of the present invention, it is apparent that numerous alterations, omissions and additions may be made without departing from the spirit thereof.

What is claimed is:

1. A feed apparatus comprising an elongated feed tube having inlet and discharge openings at its opposite trailing and leading ends, a tubular nozzle receiving a flow of moistened air and positioned coaxial with and trailing said feed tube and having a leading discharge opening discharging the moistened flow of air at a location trailing and directed toward said feed tube inlet opening, a helical feed screw extending from said nozzle into and along the length of said feed tube and secured to and rotatable with said nozzle, means for rotating said nozzle and feed screw, and means for delivering a material to said feed screw between said nozzle and said feed tube.

2. The apparatus of claim **1**, wherein said feed screw extends substantially to the discharge opening of said feed tube.

3. A feed apparatus comprising a body member having a longitudinally extending bore and a transverse feed opening communicating with said bore, a feed tube coaxial with said bore and having a trailing section registering with said bore and having a trailing section registering with the leading part of said bore and projecting forwardly of said bore, a tubular nozzle receiving a flow of moistened air and positioned coaxial and registering with the trailing part of said bore and having its leading end discharging the moistened flow of air at a location spaced from the trailing end of said feed tube, a helical feed screw secured to and extending from said nozzle across said feed opening and along the lengths of said bore and said feed tube, means for rotating said nozzle and feed screw, and means for delivering material through said feed opening to said feed screw.

4. The apparatus of claim **3**, including means for rotating said feed tube.

5. The apparatus of claim **3**, including a rotatable roller canted relative to said feed tube and substantially engaging the surface thereof.

6. The apparatus of claim **5**, wherein said roller has an elliptic hyperbolic surface substantially engaging the roller of said feed tube along the length thereof.

7. The apparatus of claim 3, wherein said material delivering means comprises an endless driven belt having an upper feed run terminating in the area of said feed opening.

8. The apparatus of claim 3, wherein the diameter of said feed screw extending across said feed opening is greater than the diameter of the feed screw extending along said feed tube.

9. An apparatus for producing a helically wrapped rod of a particular material comprising a feed tube having inlet and discharge openings at trailing and leading ends thereof and a helical thread along the inner face thereof, a helical feed screw coaxially extending within said feed tube, means for rotating said feed screw, means for rotating said feed tube about its longitudinal axis, means for feeding a band to the surface of said feed tube at a predetermined angle to the longitudinal axis of said feed tube to effect the winding of said band about said tube in overlapping relationship, and means for advancing said wound band axially along said tube.

10. The apparatus of claim 9, wherein said predetermined angle of band feed is substantially equal to the angle of pitch of said feed tube thread.

11. The apparatus of claim 10, wherein said feed tube thread and said feed screw are oppositely pitched and

are each rotated in directions opposite to their respective pitches.

12. A feed apparatus comprising an elongated feed tube having inlet and discharge openings at opposite ends thereof and a helical thread along its inside face, means for rotating said feed tube about the axis thereof, means for delivering a material to said inlet opening, a helical feed screw extending along the length of said feed tube from said feed opening, and means for rotating said helical feed screw about its axis, said feed tube thread and said feed screw being oppositely pitched and being each rotated in directions opposite to their respective pitches.

13. The apparatus of claim 12, wherein the advancing rates of said feed tube thread and said feed screw are substantially equal.

References Cited

UNITED STATES PATENTS

242,836	6/1881	Norriss	131—59
1,503,703	8/1924	Moyle	198—215 X
3,058,474	10/1962	Banning	131—59
3,096,772	7/1963	Korber	131—66

HUGH R. CHAMBLEE, *Primary Examiner.*