July 30, 1957 F. REMINGTON ET AL 2,800,872

HIGH SPEED COLLAPSIBLE TUBE FINISHING MACHINE

Filed Aug. 22, 1950 5 Sheets-Sheet 1

Fig. 1

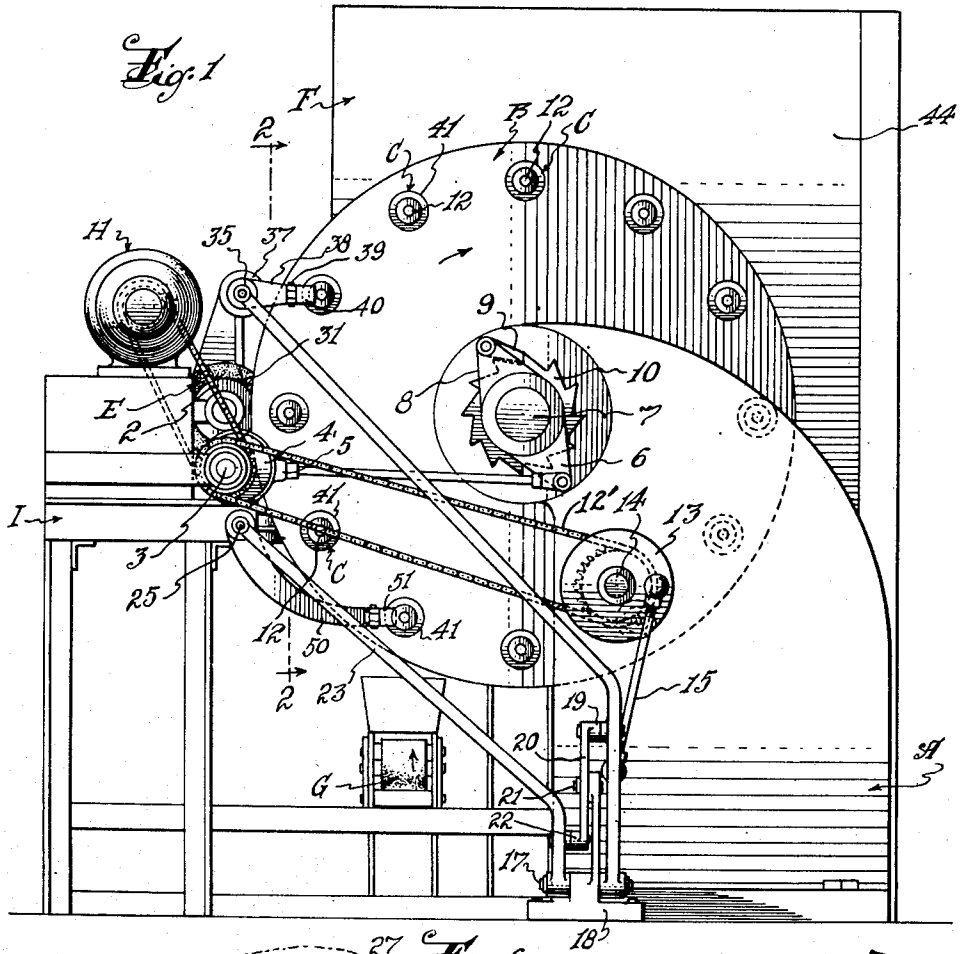


Fig. 6

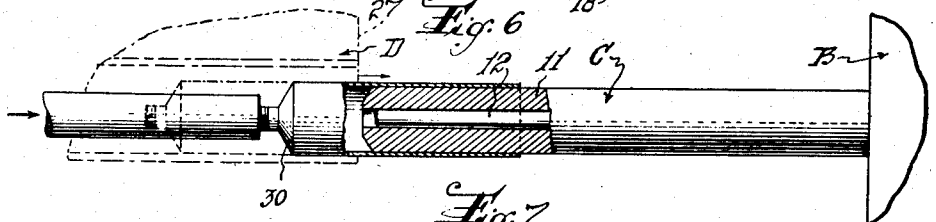
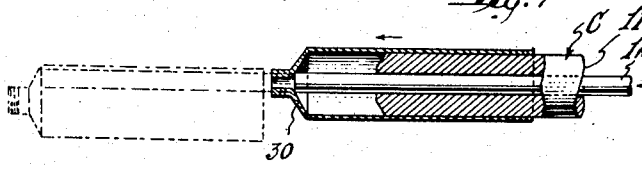


Fig. 7



Inventors:
Frederic Remington
& Richard A. Tartaglia

BY
Harry B. Cook,
Attorney.

July 30, 1957 F. REMINGTON ET AL 2,800,872

HIGH SPEED COLLAPSIBLE TUBE FINISHING MACHINE

Filed Aug. 22, 1950 5 Sheets-Sheet 2

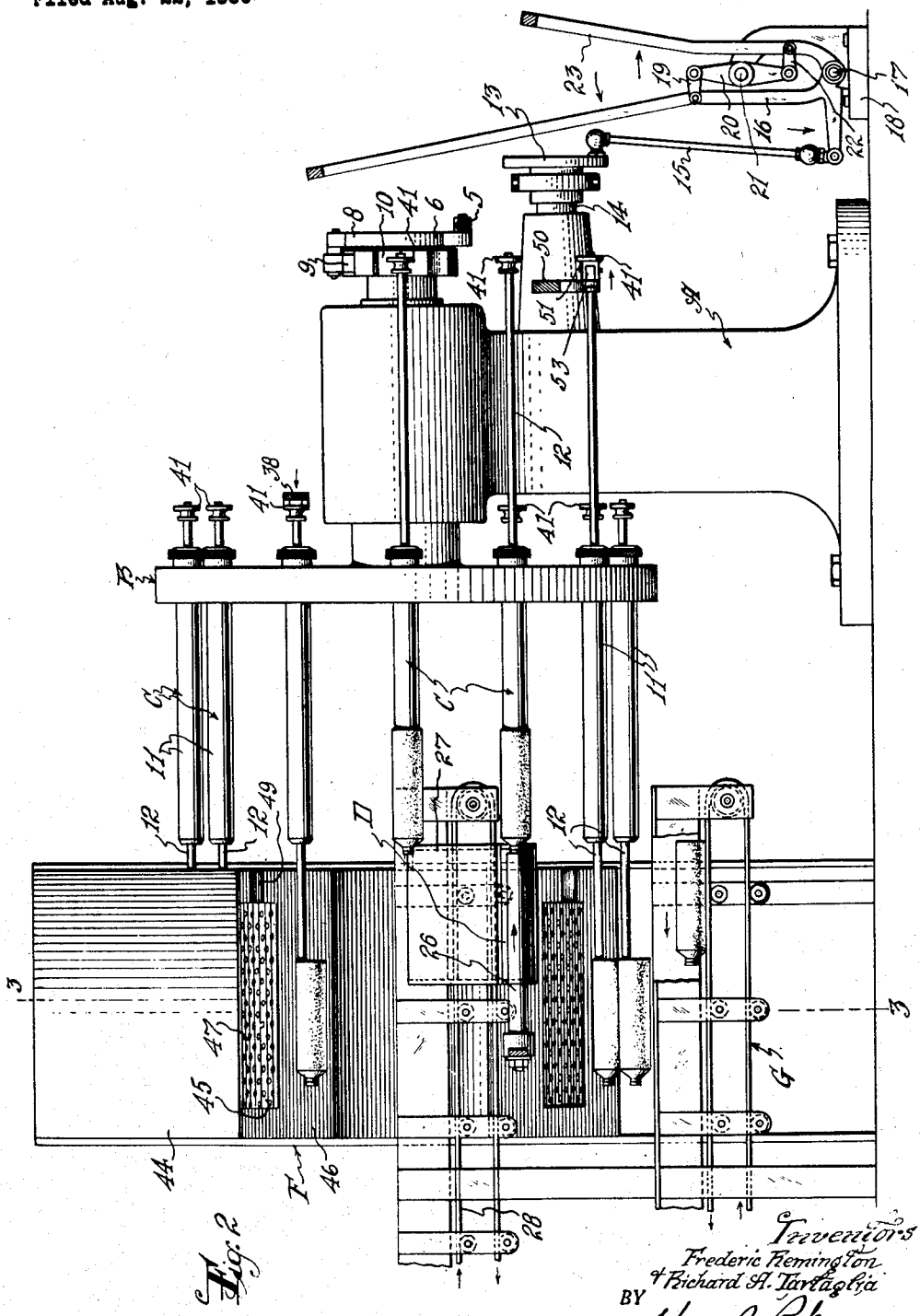


Fig. 2

Inventors
Frederic Remington
& Richard A. Tartaglia
BY
Harry B. Cook,
Attorney.

July 30, 1957 F. REMINGTON ET AL 2,800,872

HIGH SPEED COLLAPSIBLE TUBE FINISHING MACHINE

Filed Aug. 22, 1950 5 Sheets-Sheet 3

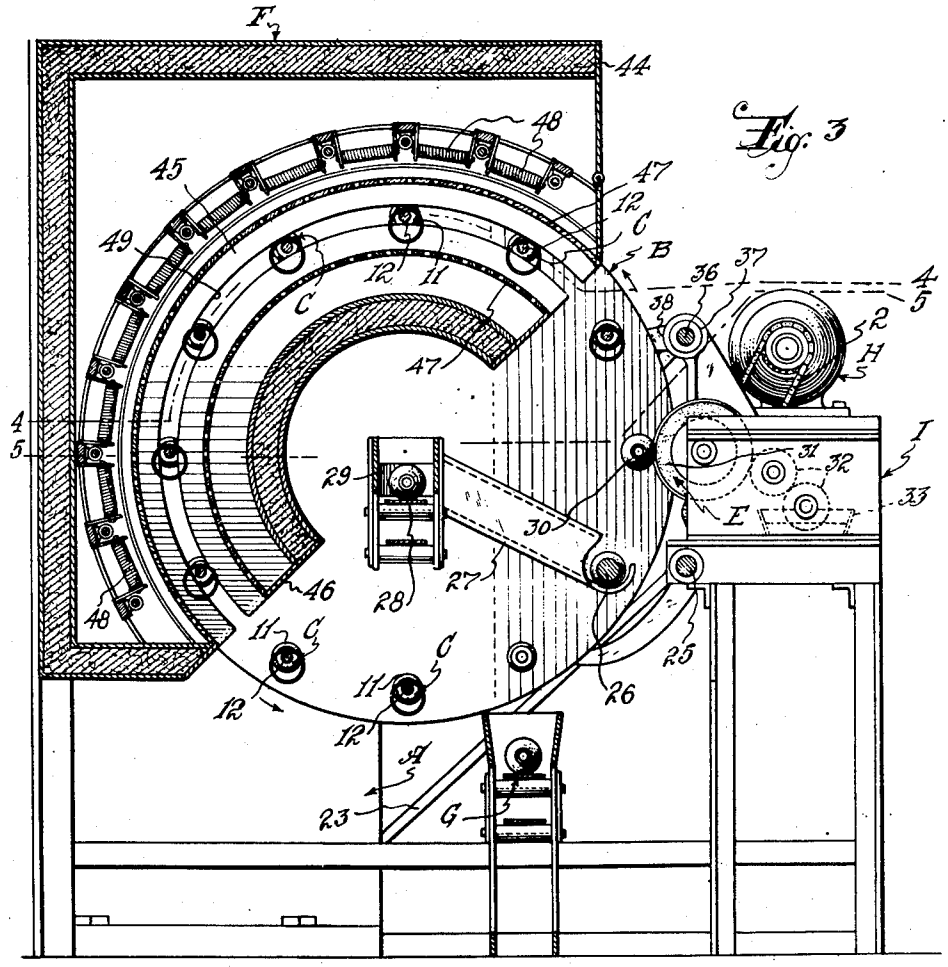


Fig. 3

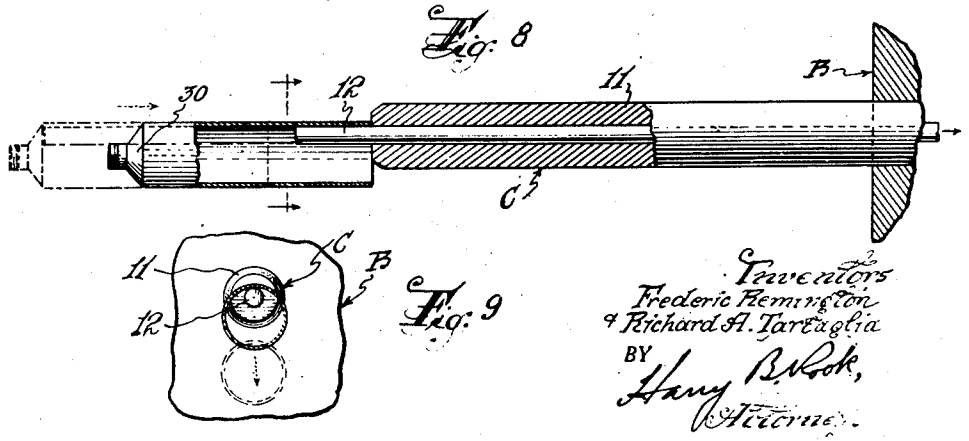


Fig. 8

Fig. 9

Inventors
Frederic Remington
& Richard A. Tartaglia
BY
Harry B. Brook,
Attorney.

July 30, 1957 F. REMINGTON ET AL 2,800,872

HIGH SPEED COLLAPSIBLE TUBE FINISHING MACHINE

Filed Aug. 22, 1950 5 Sheets-Sheet 4

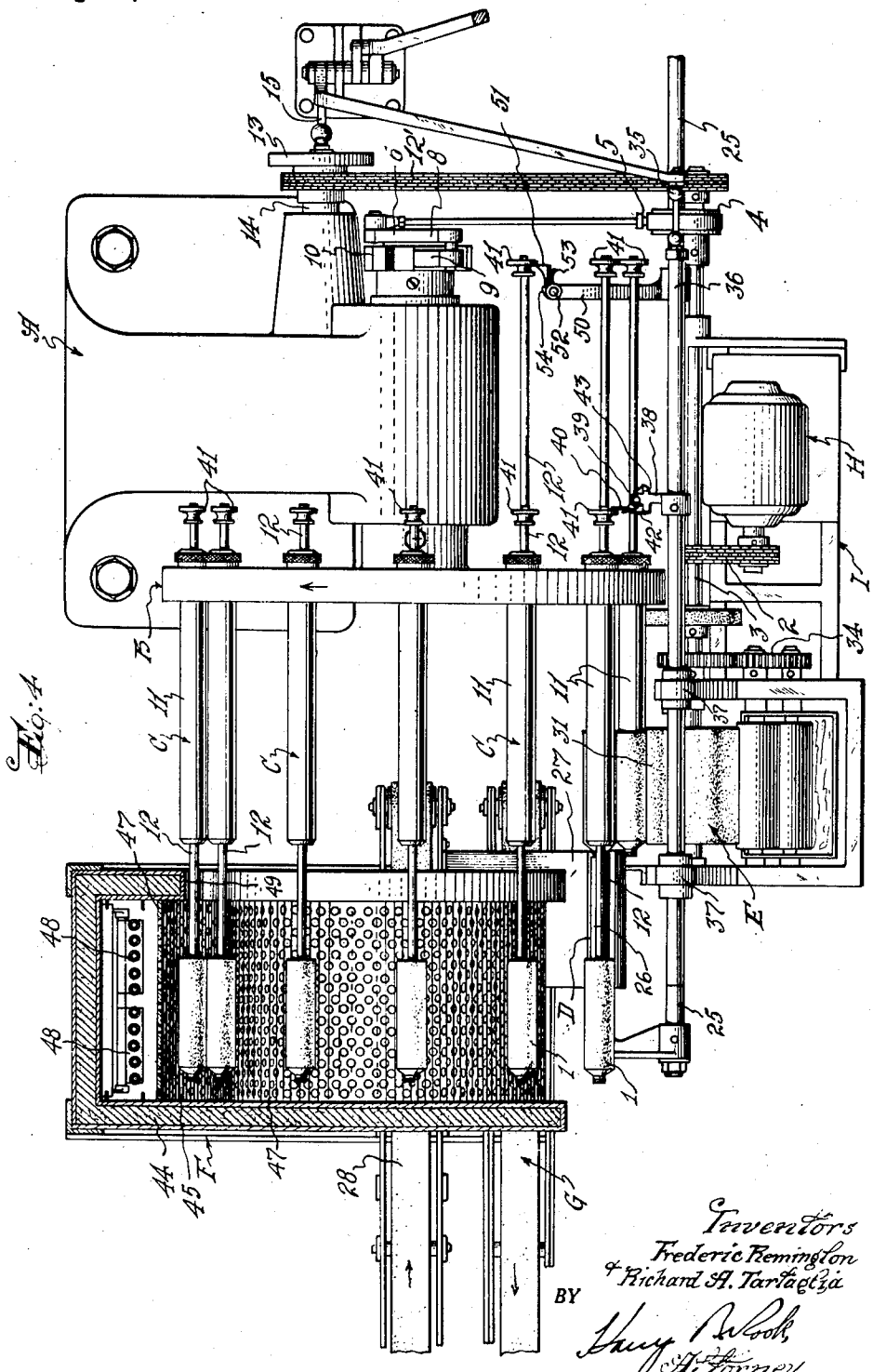


Fig. 4

Inventors
Frederic Remington
& Richard A. Tartaglia
BY
Harry D. Cook
Attorney.

July 30, 1957 F. REMINGTON ET AL 2,800,872

HIGH SPEED COLLAPSIBLE TUBE FINISHING MACHINE

Filed Aug. 22, 1950

5 Sheets-Sheet 5

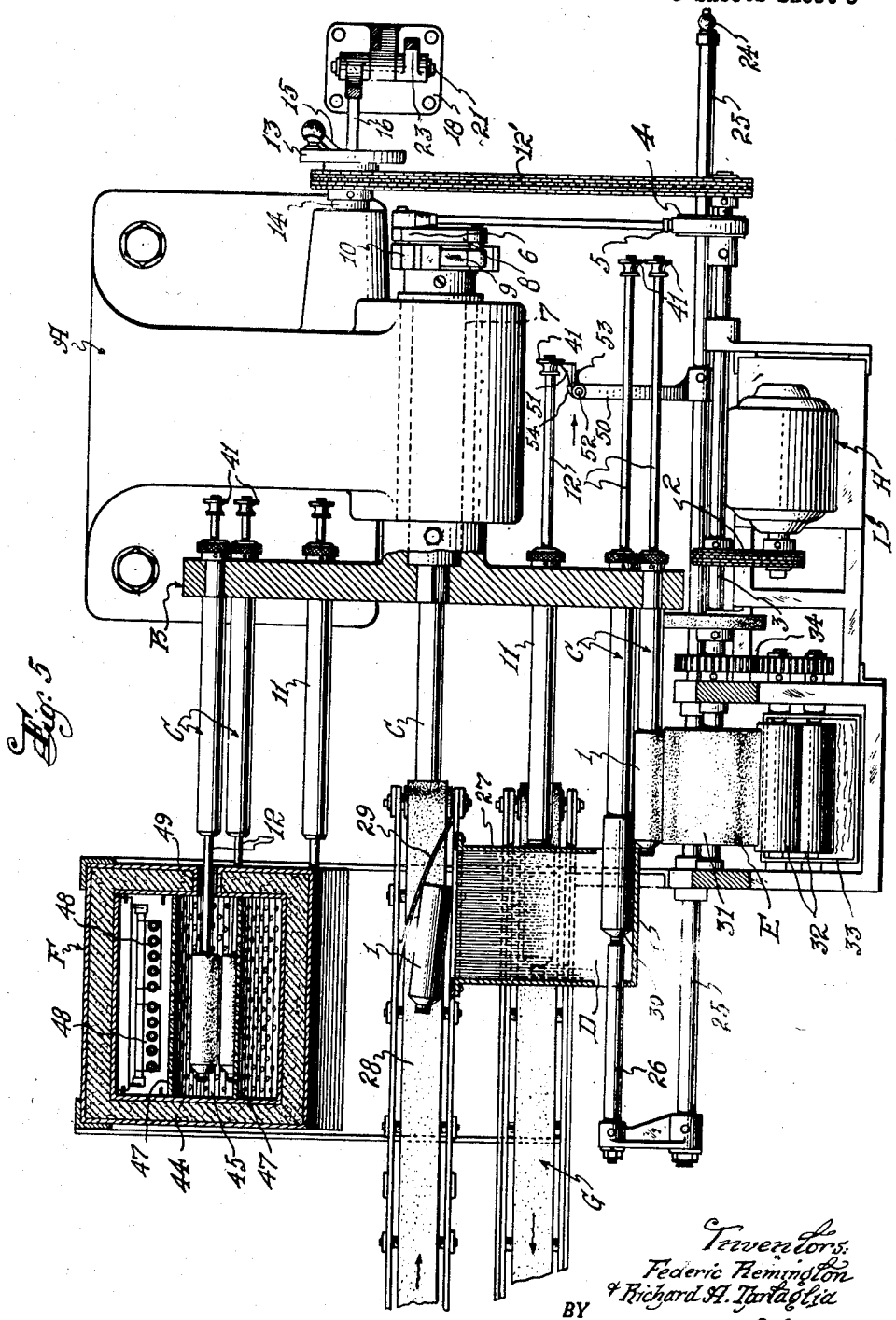


Fig. 5

Inventors:
Federic Remington
& Richard A. Tartaglia
BY
Harry B. Cook,
Attorney.

United States Patent Office 2,800,872
Patented July 30, 1957

2,800,872

HIGH SPEED COLLAPSIBLE TUBE FINISHING MACHINE

Frederic Remington, Elizabeth, and Richard A. Tartaglia, East Orange, N. J., assignors to Peerless Tube Company, Bloomfield, N. J., a corporation of New Jersey

Application August 22, 1950, Serial No. 180,765

2 Claims. (Cl. 118—58)

This invention relates in general to machines for handling tubes while they are being treated, and more particularly the invention concerns the coating, printing or lacquering and subsequent drying of collapsible tubes.

According to one known practice in the collapsible tube industry, the tubes are mounted on mandrels or spindles that are carried by a rotating turret or carrier disc so that the tubes are moved successively into operative relation to a coating mechanism or a printing mechanism or a lacquering mechanism, after which the tubes are removed from said spindles and transported to a drying machine where the tubes are individually placed on supporting pins and moved by a conveyor through a drying chamber. This is a slow and expensive procedure.

A prime object of the present invention is to provide a machine of the general character described which shall embody novel and improved features of construction whereby a layer of substance capable of hardening by drying can be applied to a tube and then dried, in one continuous operation without removing the tube from its supporting spindle, whereby, for example, all of the finishing operations on a collapsible tube, such as coating or printing or lacquering and then drying, can be carried out at many times higher speed and at substantially lower cost than have been possible heretofore.

Another object of the invention is to provide such a machine which shall include a novel and improved tube-supporting spindle comprising two portions upon one of which the tube shall be firmly supported for presentation to one treating mechanism such as a coating, printing or lacquering mechanism, and to the other of which the tube can be easily shifted for movement of the tube to another treating mechanism, for example, through a drying chamber with adequate space to facilitate quick circulation of air both inside and outside the tube.

A further object is to provide such a tube-supporting spindle which shall include a main or body section to nicely slidably receive the tube, and a secondary section, for example, a coaxial pin of substantially smaller diameter or aggregate volume than the space within the tube and projectable beyond the free end of the body section so that the tube can be slid from the body section onto said projecting portion of the secondary section.

Still another object is to provide novel and improved means for actuating said pins of the tube-supporting spindles for holding the tubes during presentation to one treating mechanism, e. g., the drier, and for automatically stripping or removing the tubes from the pins and spindles.

Other objects of the invention are to provide a machine of the character described which shall be relatively simple and inexpensive in construction and reliable in operation; and to obtain other advantages and results that will be brought out by the following description in conjunction with the accompanying drawings, in which

Figure 1 is an end elevational view of a machine embodying the invention;

Figure 2 is a vertical sectional view, approximately on the plane of the line 2—2 of Figure 1;

Figure 3 is a transverse vertical sectional view, approximately on the plane of the line 3—3 of Figure 2;

Figure 4 is a horizontal sectional view, approximately on the plane of the line 4—4 of Figure 3;

Figure 5 is a similar view, approximately on the plane of the line 5—5 of Figure 3;

Figure 6 is an enlarged composite sectional and side elevational view of one of the tube-supporting spindles and a tube, showing the manner of applying the tube to the body portion of the spindle;

Figure 7 is a similar view, showing the manner of removing the tube from the main portion of the spindle onto the spindle pin;

Figure 8 is a view similar to Figure 6, showing the manner of stripping or removing the tube from the spindle pin, and

Figure 9 is a transverse vertical sectional view, approximately on the plane of the line 9—9 of Figure 8.

Specifically describing the illustrated embodiment of the invention, the machine includes a suitable frame which as shown comprises a standard A in which is mounted for rotation a turret or carrier disc B which is rotated in the direction indicated by the arrow in Figure 1 by any suitable means, so that the tube-supporting spindles C carried by the turret can be moved in proper timed relation successively to different operating stations. The nature of these operating stations and the number of spindles may be varied but for the purpose of illustration, there are twelve spindles and at one station a partially completed collapsible tube 1 is applied to one of the spindles from a charging hopper D, while at another of said stations the tube is operated upon or treated by suitable mechanism, for example a coating mechanism E, and thereafter the tubes are conveyed through a drier F and thence to a station where the tubes are automatically stripped or removed from the spindles and deposited on a take-off or unloading conveyor G.

As above indicated, any suitable driving mechanism may be utilized, but as shown an electric motor H is mounted on an auxiliary frame I and has a chain and sprocket connection 2 with a drive shaft 3 which is journaled in bearings in said frame and carries an eccentric 4 which is connected by an eccentric strap and connecting rod generally designated 5 to a crank arm 6 that is rotatably mounted on the stub shaft 7 by which the turret B is journaled in the standard A. Another crank arm 8 movable with the arm 6 carries a pawl 9 which cooperates with a ratchet 10 fast-connected to the shaft 7, whereby upon rotation of the drive shaft 3, the pawl and ratchet mechanism 9, 10 will rotate the turret in steps each of which is equal to the distance between two adjacent spindles C.

Each of the spindles C comprises a cylindrical tubular main or body portion 11 which is mounted to rotate about its axis at one end in the turret disc; and coaxial with and longitudinally slidable through said main portion is a pin 12 of such length that its end may project from opposite ends of the main portion and one end may be extended beyond the free end of the main portion a distance substantially greater than the length of the tube 1 being handled. In accordance with the invention, each pin 12 is disposed within the corresponding main portion with one end disposed flush or inwardly of the free end of said main portion when the spindle reaches the station at which the tubes are applied to the spindles, and the tubes are nicely slidably slid onto the main portions 11 of the spindles and remain there while the tubes are presented to the mechanism E, after which the pins 12 are projected from the main portions of the spindles so as to push the tubes off said main portions and cause them to drop onto

the projecting ends of the pins, whereupon the tubes suspended from said pins are conveyed through the drier F and thence to the unloading or discharging station. The pins 12 are of substantially smaller diameter than the main cylindrical portions 11 of the spindles so that there is a large clearance or space between the pins and the tubes while they are passing through the drier, as best illustrated in Figures 5 and 7, thereby to ensure free and adequate circulation of warm air for drying either or both the inner end outer surfaces of the tubes without undue heating and consequent expansion of the spindles and resultant difficulty in removing the tubes which would be the case were the tubes conveyed through the drier while mounted on the main portions of the spindles.

Any suitable means may be utilized for applying the tubes to the spindles and for actuating the tube supporting pins 12, but there is shown a chain and sprocket connection 12' between the drive shaft 3 and a crank disc 13 rotatably mounted on a stub shaft 14 projecting from the standard A; and the crank disc 13 is connected by a link 15 to one arm of a bell crank lever 16 which is pivotally mounted at 17 on a bearing bracket 18. The other arm of said bell crank lever is pivotally connected by a short link 19 to a lever 20 which is pivotally mounted at 21 intermediate its ends on said bracket 18 and has its other end pivotally connected by a link 22 to another lever 23 one end of which is pivotally connected by the pivot pin 17 to the bracket 18. With this construction, it will be noted that the lever 16 will be oscillated by the crank disc and chain and sprocket drive 12 from the drive shafts 3, and simultaneously the other lever 23 will be oscillated but in the opposite direction.

The lever 23 is elongated and has a ball and socket connection 24 with a drive rod 25 which is horizontally reciprocably mounted in the auxiliary frame I and has a horizontal pusher arm 26 into axial alinement with which each of the spindles C is moved at the station where the tubes are applied to the spindles. The drive rod 25 is reciprocated in timed relation to the movement of the spindles by the turret B so that upon movement in one direction it will engage the neck end of one of the partially finished tubes 1 at the bottom of the charging chute or hopper 27 and slide said tube onto the main portion 11 of the spindle that is then in alinement with the pusher arm, as shown in Figure 5. The tubes are fed into the chute 27 by an endless conveyor 28, the tubes being deflected from the conveyor into the chute by a deflector plate 29 and then falling by gravity to the bottom of the chute in alinement with the pusher arm 26. Upon movement of the drive rod 25 in the other direction, the pusher arm is moved out of the chute to provide a clearance for the next tube to drop into charging position.

As usual, the sliding of the tube onto the main portion of the spindle is limited by abutment of the shoulder 30 of the tube with the end of said main portion, and the tube nicely fits the spindle so as to rotate therewith. After each tube has been applied to the spindle at the charging station, it is moved on the next step of movement of the turret into operative relation to the mechanism E which in the present instance is shown as a coating mechanism comprising a drum 31 with which the tube is moved into contact for applying a coating to the exterior of the tube, and to which the coating material is applied by rollers 32 from a fountain or pan 33 in known manner. The drum 31 and rollers 32 are driven by a gear train 34 from the drive shaft 3.

From the drum 31, the tube is moved on the next step of movement by the turret to a position where the tube supporting pin 12 is projected from the main portion of the spindle to prepare the tube for passage through the drier F. For actuating the pin, the second-mentioned arm of the bell crank lever 16 is connected with a ball and socket joint 35 to a push rod 36 which is horizontally reciprocable in bearings 37 on the auxiliary frame I and has an arm 38 to which is pivotally connected at 39 a

finger 40 to cooperate with a head 41 on each tube-supporting pin as the latter moves into alinement with said finger. Said finger is normally influenced by a spring 42 against a stop 43 to hold the finger for abutting engagement with the head 41 of the pin 12, the spring permitting movement of the finger in the other direction to slip past the heads 41 upon movement of the rod 36 in the other direction. Upon movement of the push rod 36 in one direction or to the left in Figure 4, the finger 40 abuts one side of the head 41 and pushes the corresponding tube supporting pin 12 so that the free end of the latter engages the shoulder 30 of the corresponding tube 1 and thereby pushes the tube off the main portion of the spindle onto the projecting end of the pin as shown in Figure 7 where the beginning of the movement is shown in solid lines and the tube suspended on the pin is shown by dot and dash lines.

It will be noted that the tubes hang loosely on the pins 12 so that there is a large clearance between the tubes and the pins to ensure free circulation of air within the tubes to facilitate the drying of the coating on the tubes and at the same time to prevent excessive heating of the tubes. After the tubes have been coated or otherwise treated as above described, and while they are suspended from the projecting ends of the pins 12, they are conveyed through the drier F which comprises a heated insulated housing 44 having an arcuate channel or passage 45 therethrough concentric with the turret B, and opening at its ends through the front wall 46 of the housing, said channel being of a radius and of a length and width to permit passage of the tubes 1 therethrough as they are moved by the turret. The construction of the drier may be varied, but preferably said channel is formed by the two perforate arcuate plates 47 and electrical heating elements 48 are mounted within the housing between the outermost arcuate plate 47 and the walls of the housing, so that air may circulate freely into and out of the channel and around the tubes. One side of the channel is closed while the side facing the turret has an arcuate slot 49 of approximately the same radius as and concentric with the path of movement of said spindles about the axis of rotation of the turret, and being of a width slightly greater than the diameter of the tube supporting pins 12. The heaters 48 may be connected in a circuit and controlled in any suitable manner, but preferably they are arranged in an arcuate row approximately equidistantly spaced from the outer arcuate plate 47.

With this construction, it will be seen that the tubes will enter the upper end of the drying chamber 45 with the pins 12 extending through said slot 49 and will be moved into the channel in succession, emerging from the lower end of the channel in position to be removed from the spindles and deposited on the unloading or take-away conveyor G.

As each tube reaches a station immediately above said conveyor G, the tube-supporting pin 12 is retracted so that the end of the tube is moved to abut the free end of the main portion 11 of the spindle, as shown in Figure 8; and upon continued retraction of the pin the pin will be completely withdrawn from the tube so that the latter will drop by gravity upon the take-off conveyor. In Figure 8 the position of the tube during the drying operation is shown by dot and dash lines while the tube is shown as partially stripped from the pin by solid lines.

In Figure 9 the tube is shown by dot and dash lines as dropping by gravity from the pins.

While the means for retracting or withdrawing the tube-supporting pins 12 may be widely varied, it has been shown as comprising an arm 50 rigidly mounted on the drive rod 25 and having a finger 51 pivotally mounted at 52 thereon and normally influenced by a spring 53 against a stop 54 so that upon movement of the drive rod 25 in one direction or to the right in Figure 4, said finger will abuttingly engage the head 41 of each tube supporting pin 12 as the latter reaches its unloading position

above the take-off conveyor G and thereby pull the tube-supporting pin in the direction opposite to that in which it is moved by the finger **40** to strip the tube from said pin. The spring **53** will permit the finger **51** to slip by the heads **41** upon movement of the drive rod in the opposite direction.

From the foregoing, it will be observed that the invention provides a machine and method whereby all of the finishing operations on the collapsible tube, for example the operations of coating the tube and drying the coating can be performed in one continuous operation at high speed and at low cost. Furthermore, the invention provides a spindle by which a tube can be supported in two different positions relatively to the turret and can be moved automatically from one position to the other, thereby facilitating the handling and working of tubes.

While the invention has been shown as embodied in certain specific structural details, it should be understood that this is primarily for the purpose of illustrating a preferred embodiment of the invention and that the construction and machine may be widely varied within the spirit and scope of the invention.

Having thus described the invention, what we claim is:

1. A machine for handling collapsible tubes during treatment thereof, comprising a turret rotatable about an axis and having a spindle projecting therefrom parallel to the axis of rotation, said spindle including a main cylindrical section to nicely slidably telescopically receive and support a tube and a secondary section comprising a pin slidable coaxially and longitudinally in said main section with one end portion projectable beyond the corresponding end of said main section and adapted to abut a portion of a tube on said spindle to push said tube off said main section on to said projecting end portion of said pin, a coating mechanism and a heated drying chamber disposed at the side of said turret beyond the end of said main section of the spindle and spaced along the path through which said spindle is moved by the turret for operating successively upon a tube on said spindle, means adjacent one point in said path for pushing a tube onto said main section for presentation to said coating mechanism, means adjacent another point in said path for longitudinally sliding said pin while the pin is located between said mechanism and said drying chamber to project one end of the pin beyond the corresponding end of the main section and push the tube off said main section on to said pin for movement through the drying chamber, and means for sliding said pin to retract said end portion thereof into said main section after said pin has passed said drying chamber so that as the pin is retracted one end of said tube abuts the adjacent end of the main section to strip the tube from the pin.

2. A tube finishing machine comprising two spaced mechanisms for treating a tube, a supporting spindle having a main section to nicely slidably receive and support a tube and a secondary section of smaller cross-sectional area throughout its length than said tube to receive and support a tube from the main section with large clearance between said secondary section and said tube, means connected to one end of said main section for bodily moving said spindle laterally to present it first to one and then to the other of said mechanisms while the tube is mounted on said main section and on said secondary section of the spindle, respectively, the second-mentioned mechanism being spaced axially of said spindle from the first-mentioned mechanism and from the other end of said main section of the spindle and being spaced from the first-mentioned mechanism in the direction of travel of the spindle so that said main section will move only through said first-mentioned mechanism and only the secondary section will move through said second-mentioned mechanism, and means for moving said secondary section into a position beyond the other end of said main section and coaxial therewith, said means being operative while said spindle is between said mechanisms for shifting said tube endwise directly from said main section to said secondary section of the spindle, said means for moving said spindle comprising a turret rotatable about an axis and having said spindle projecting therefrom parallel to said axis of rotation, the first mentioned mechanism including an element closely adjacent the path of movement of a tube on said spindle for applying to said tube a substance capable of hardening upon drying, and the second mechanism comprising a drier including a heated chamber having in its walls, entrance and exit openings and an arcuate slot connecting them for passage of said spindle, said slot being concentric with and of a radius equal to that of the path of movement of said spindle about said axis of rotation of said turret.

References Cited in the file of this patent

UNITED STATES PATENTS

296,506	Baldwin	Apr. 8, 1884
1,947,171	Prussing	Feb. 13, 1934
2,072,840	Temple	Mar. 2, 1937
2,085,389	Purinton	June 29, 1937
2,108,443	Prussing	Feb. 15, 1938
2,118,599	Friden	May 24, 1938
2,324,890	Temple	July 20, 1943