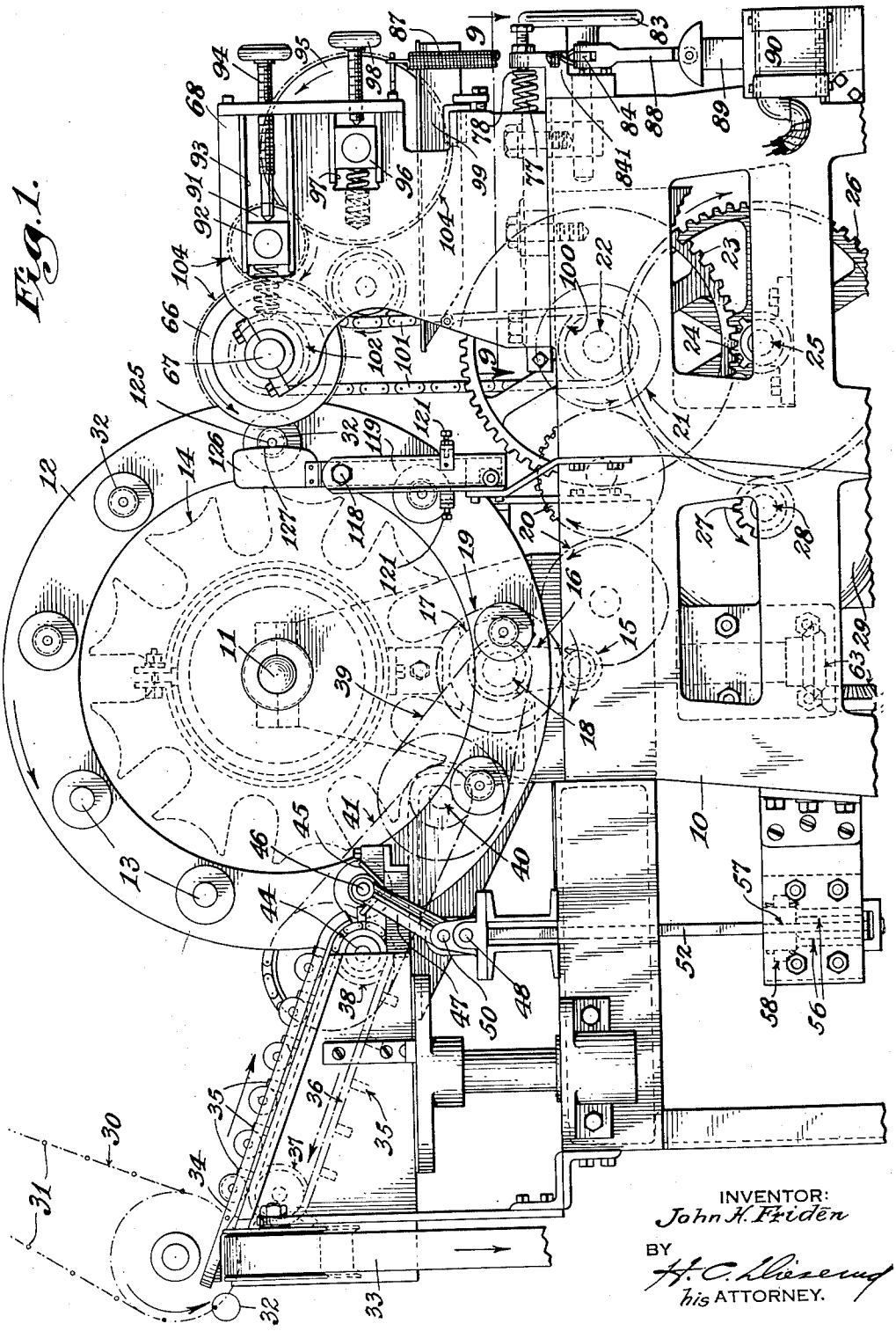
May 24, 1938. J. H. FRIDÉN 2,118,599

TUBE COATING MACHINE

Filed April 10, 1936 9 Sheets-Sheet 1

Fig. 1.



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May 24, 1938. J. H. FRIDÉN 2,118,599

TUBE COATING MACHINE

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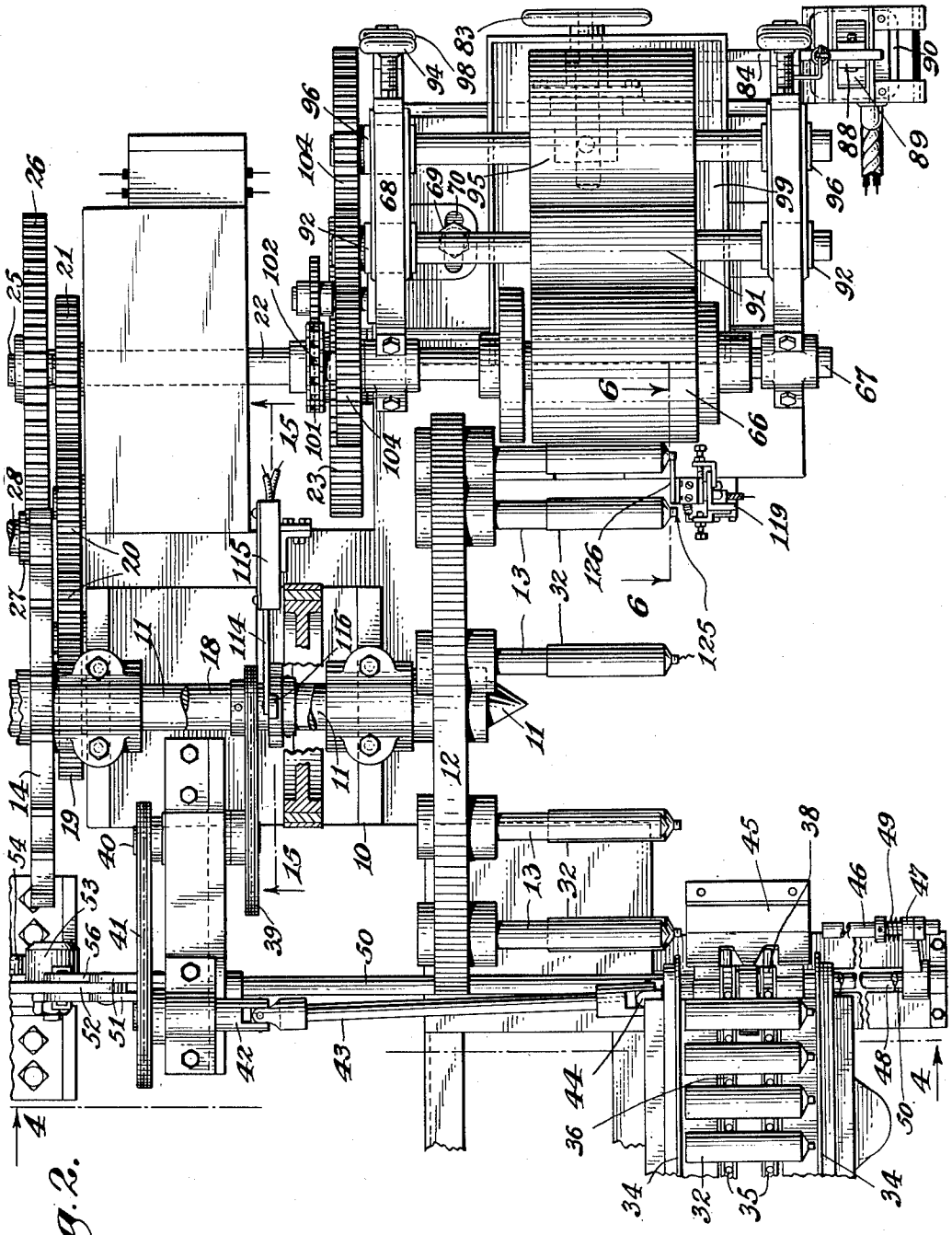


Fig. 2.

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May 24, 1938. J. H. FRIDÉN 2,118,599

TUBE COATING MACHINE

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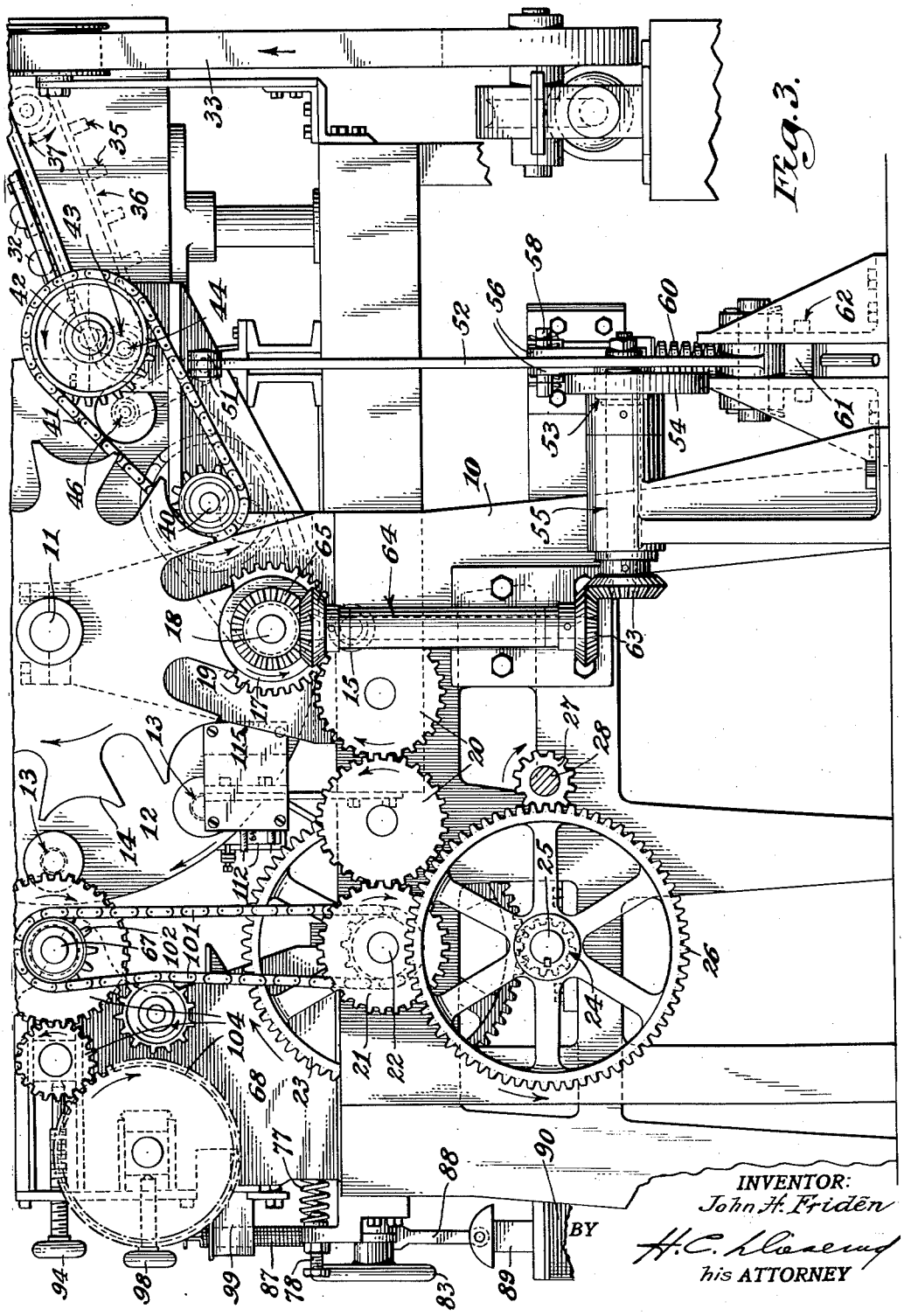


Fig. 3.

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May 24, 1938. J. H. FRIDÉN 2,118,599

TUBE COATING MACHINE

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Fig. 4.

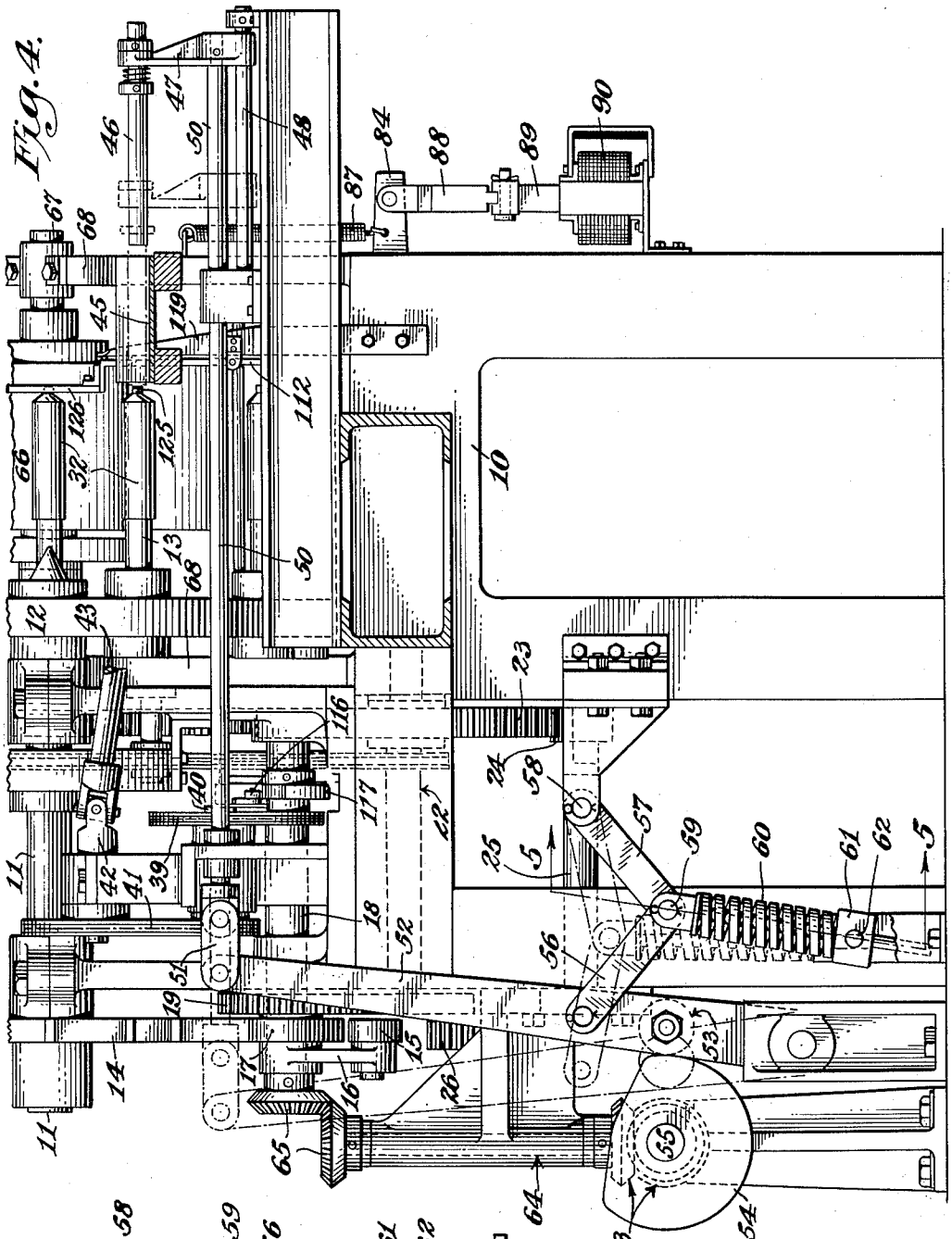
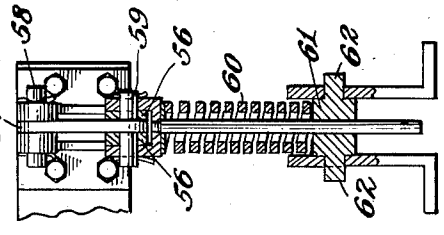


Fig. 5.



INVENTOR:
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May 24, 1938. J. H. FRIDÉN 2,118,599

TUBE COATING MACHINE

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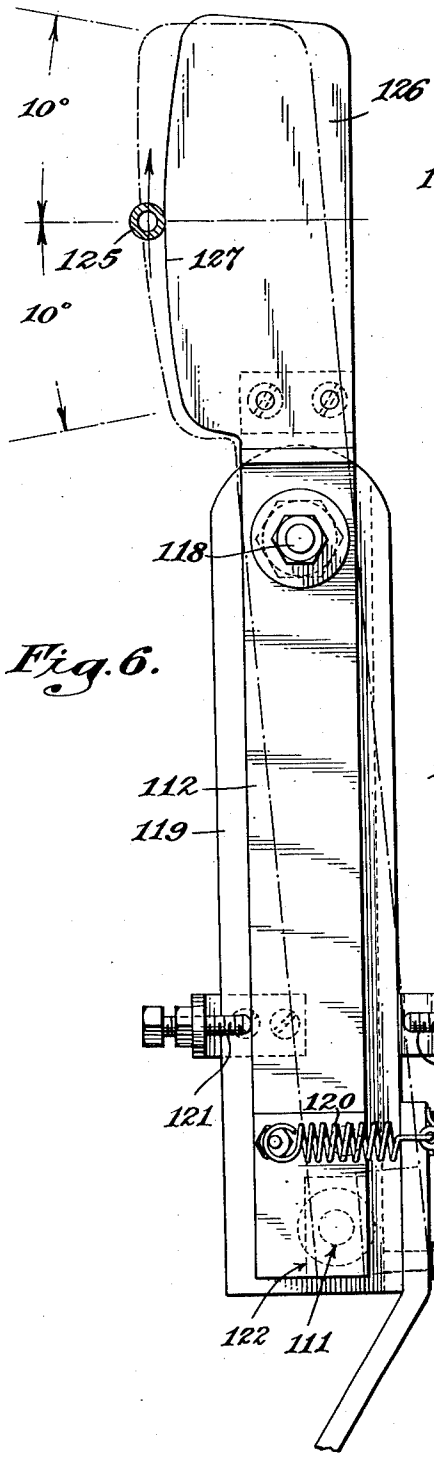


Fig. 6.

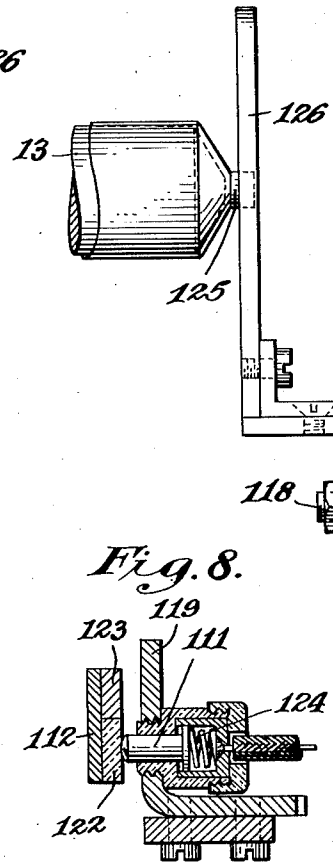
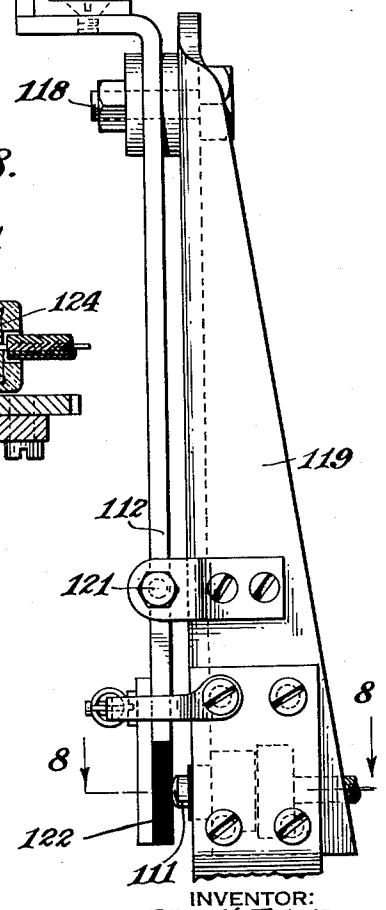


Fig. 8.

Fig. 7.



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May 24, 1938. J. H. FRIDÉN 2,118,599

TUBE COATING MACHINE

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Fig. 9.

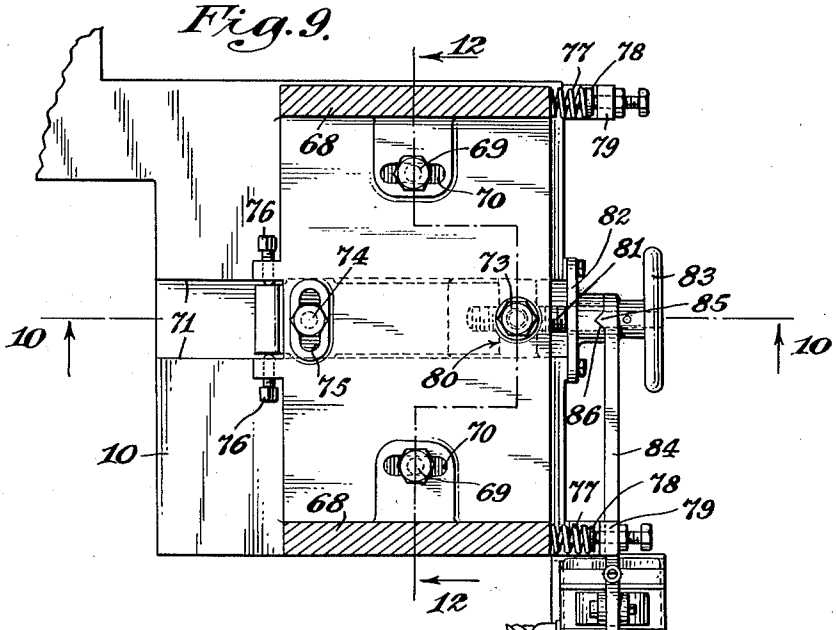


Fig. 10.

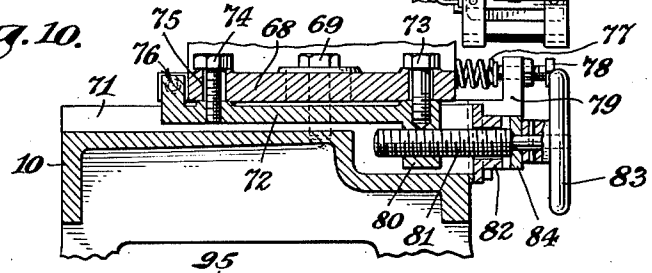
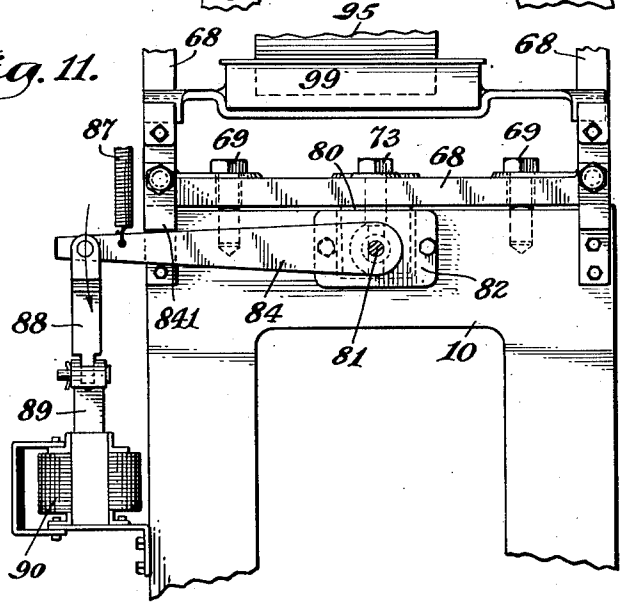


Fig. 11.



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May 24, 1938. J. H. FRIDÉN 2,118,599

TUBE COATING MACHINE

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Fig. 12.

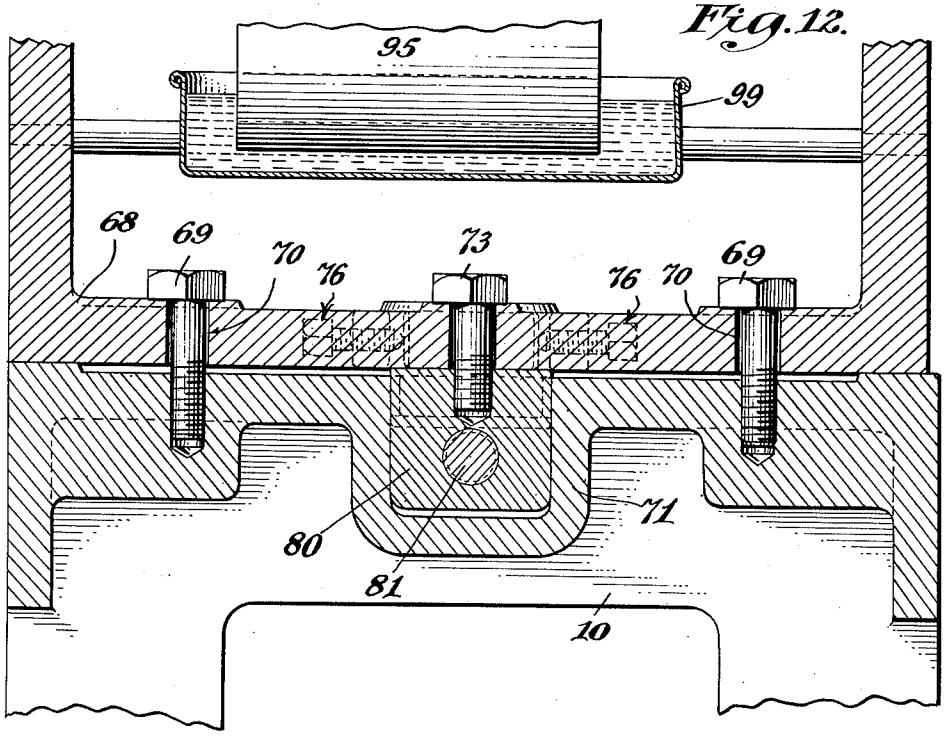


Fig. 13.

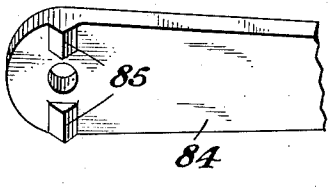
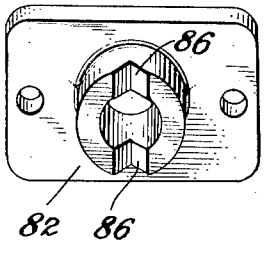


Fig. 14.



INVENTOR:
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May 24, 1938. J. H. FRIDÉN 2,118,599

TUBE COATING MACHINE

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Fig. 15.

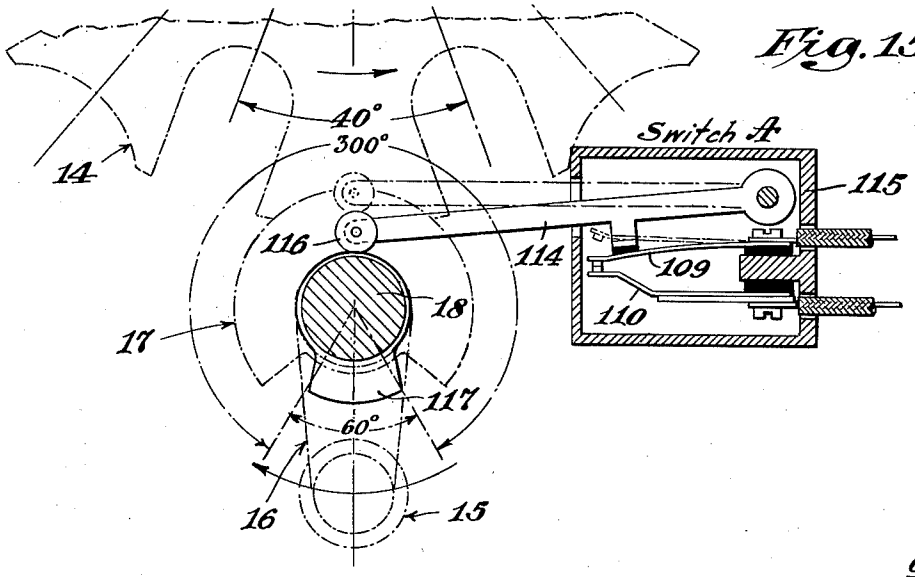
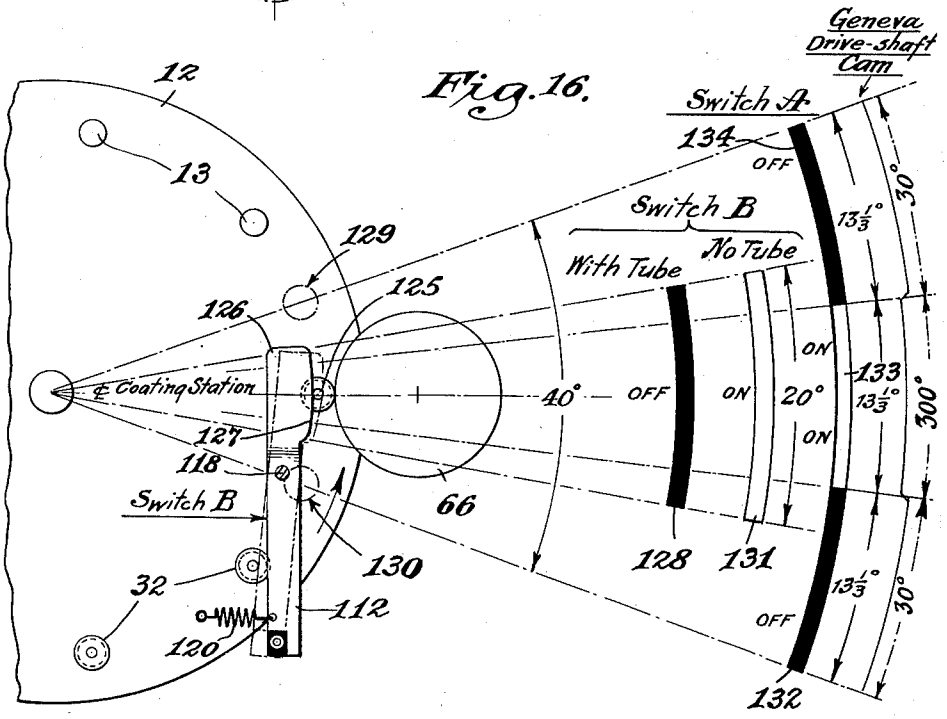


Fig. 16.



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May 24, 1938. J. H. FRIDÉN 2,118,599

TUBE COATING MACHINE

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Fig. 17.

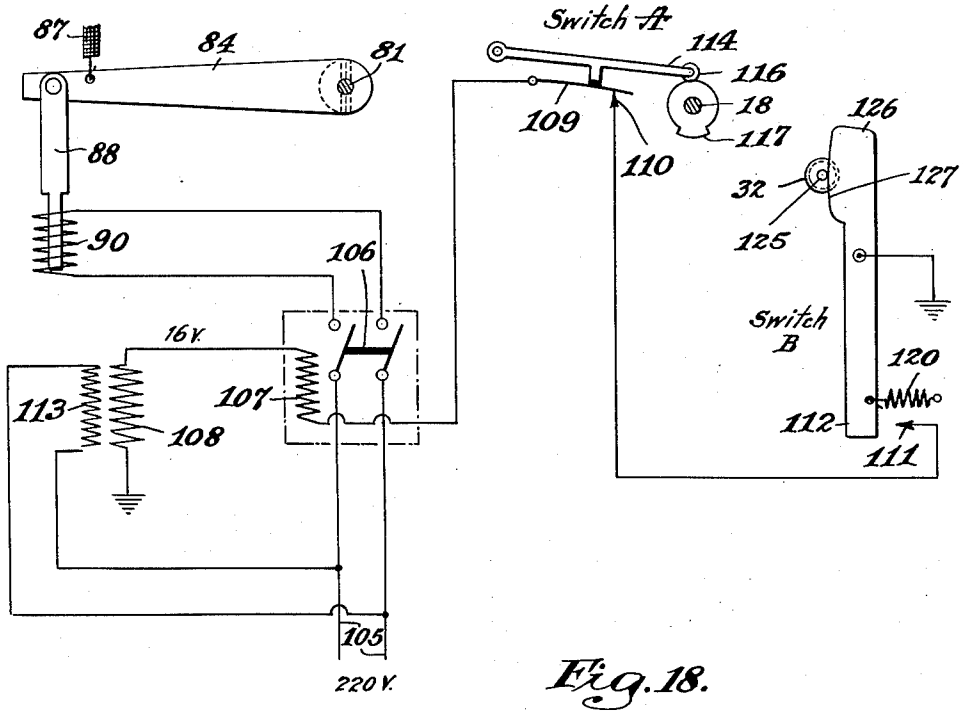
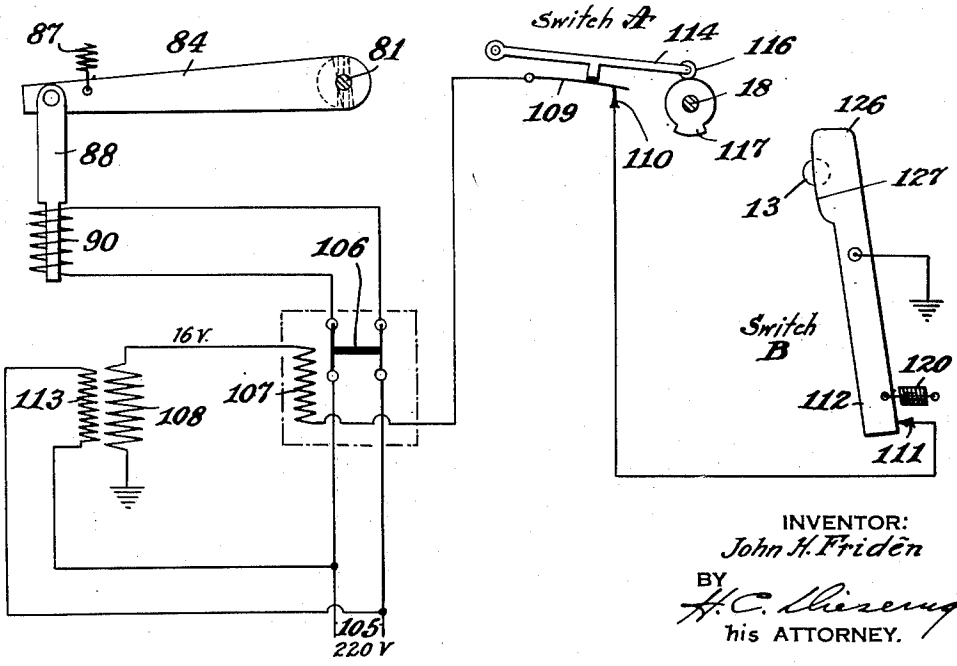


Fig. 18.



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Patented May 24, 1938 2,118,599

UNITED STATES PATENT OFFICE

2,118,599

TUBE COATING MACHINE

John H. Fridén, Maplewood, N. J., assignor to The Sun Tube Corporation, Hillside, N. J., a corporation of New Jersey

Application April 10, 1936, Serial No. 73,682

17 Claims. (Cl. 91—50)

This invention relates to improvements in machines for applying a coating substance to hollow, cylindrical members, such as collapsible tubes and the like. In machines of this character the member or tube is ordinarily placed upon a spindle which is brought into cooperation with a coating or printing roller by relative movement between the spindle and roller. When engaged the tube and roller rotate at the same peripheral speed to transfer the coating substance or ink from the roller to the tube. The roller ordinarily has a soft, flexible surface formed of a rubber composition or the like and is pressed against the tube with sufficient pressure to effect a proper transfer of the coating substance.

When reference is made to a coating substance herein it should be understood to mean any substance applied to the outer surface of the member either in part or in whole and when applied in part it may suitably form any desired design. Collapsible tubes are frequently subjected to three separate coating operations of this character. The first coat is ordinarily a base coat of enamel or the like applied to substantially the entire cylindrical surface of the tube. To this there is usually applied a coating of ink of one or more colors, forming any chosen design and generally including certain printed matter. The design in this case is carried by a metal plate or cylinder from which it is transferred by a soft roller of the type mentioned. Finally, many tubes are given an outer protective coating of lacquer or the like. The present invention has to do with the application of any one of these coatings.

In the operation of an ordinary coating machine it will be apparent that if a tube is not present upon the spindle when it is brought into cooperative relation with the coating roller, the coating substance will be transferred to the spindle inasmuch as the roller is ordinarily compressed by the tube to a greater extent than the thickness of the tube wall. This necessitates wiping of the spindle to remove the coating or the coating will in part be transferred to the interior surface of the next tube and may cause difficulty in removing the tube.

A primary object of the present invention has been to eliminate this objectionable coating of the spindle in the absence of a tube. To accomplish this end there is provided simple and effective means for withdrawing the coating roller from its active position whenever a tube is absent from the spindle as the spindle and roller are being brought into cooperative relation and for retaining the roller out of active position during the required interval. In its more specific aspects the invention involves the provision of electrical means for quickly withdrawing the roller as an empty spindle on a rotatable, multi-spindle support is carried into coating position, the roller remaining withdrawn until the spindle is shifted sufficiently out of such position.

A feature of the invention is the provision of a dual control over the devices for withdrawing the coating roller, one control being exercised directly by the tube or other article to be coated and the other control being exercised by a portion of the main operating mechanism. These controls are so timed in their operations that the roller will remain constantly in its coating position so long as tubes are mounted on the successive spindles being presented at the coating station; on the other hand the coating roller is withdrawn in ample time and is held withdrawn for a sufficient period to prevent coating of an empty spindle presented at the coating station.

Another feature of the invention is the provision, in conjunction with the foregoing, of particularly effective, automatic devices for applying tubes to the spindles of the machine.

Other features and advantages will appear from the detailed description of an illustrative embodiment of the invention, which will now be given in conjunction with the accompanying drawings, in which:

Figure 1 is a front elevation of the upper portion of a coating machine embodying the invention;

Figure 2 is a plan view of the machine, certain parts being broken away to better illustrate other portions of the machine;

Figure 3 is a rear elevation of the lower portion of the machine;

Figure 4 is a view partly in side elevation and partly in section, taken along the broken line 4—4 of Fig. 2;

Figure 5 is a detail view illustrating a certain toggle construction and is taken along the line 5—5 of Fig. 4;

Figure 6 is an enlarged detail view of a switch member, taken along the line 6—6 of Fig. 2;

Figure 7 is a side elevation of the switch member shown in Fig. 6;

Figure 8 is a horizontal section along the line 8—8 of Figure 7;

Figure 9 is a horizontal section through a portion of the machine, taken along the line 9—9 of Fig. 1;

Figure 10 is a vertical section along the line 10—10 of Fig. 9;

Figure 11 is a view taken from the right side of Fig. 1, showing in elevation a portion of the coating unit and devices for shifting the same;

Figure 12 is an enlarged, vertical section through the coating unit, taken along the broken line 12—12 of Fig. 9;

Figure 13 is a detail showing in perspective a portion of an arm for shifting the coating unit;

Figure 14 is a perspective view of a cam-plate cooperating with the arm of Fig. 13;

Figure 15 is a vertical section along the line 15—15 of Fig. 2, the Geneva driving mechanism being indicated in dot and dash lines in relation to the switch structure;

Figure 16 is a diagram illustrating the timing of a pair of control switches;

Figure 17 is a diagram of the electric circuits controlled by the switches, and

Figure 18 is a similar diagram with certain of the parts in a shifted position.

Referring now to the drawings, particularly Figures 1, 2, 3 and 4, the invention is shown applied to a coating machine of the type illustrated in my pending application Ser. No. 56,467 filed December 28, 1935. The machine comprises a main frame 10 provided with suitable bearings adjacent its top to support a shaft 11. Adjacent its forward end this shaft has secured thereto a rotatable head 12 provided near its periphery with a series of axially extending spindles 13. The latter may be of any suitable construction and may either be fixed with relation to the head or rotatable on the head. Adjacent the rear end of the shaft 11 there is secured a Geneva wheel 14 arranged to tbe operated by a roller 15 carried by a Geneva operating arm 16. The arm 16, together with a locking disc 17, is carried by a shaft 18 which is constantly rotated during the operation of the machine. For this purpose shaft 18 carries a gear 19 meshing with one of a pair of idler gears 20, the other of which meshes with a gear 21 secured to a shaft 22. This shaft also carries a large gear 23 which meshes with a pinion 24 secured to a shaft 25. Another large gear 26 secured to this shaft meshes with a pinion 27 secured to a shaft 28, which is constantly driven by any suitable means, such as a motor 29. It will be seen that through the train of mechanism just described the head 12 will be rotated step by step in a counter-clockwise direction (Fig. 1), as indicated by the arrow, thus carrying the spindles 13 from one station to another. The Geneva mechanism serves to lock the head in a definite position between the successive stages of movement.

The machine is preferably provided with means for automatically supplying tubes to the spindles 13. For this purpose the mechanism more fully illustrated in the above-mentioned pending application may suitably be employed. Briefly, this mechanism comprises a chain 30 (Fig. 1) having a series of spaced pins 31, each adapted to carry a collapsible tube 32. Chain 30 serves to convey the tubes from any suitable point at which they were last handled or operated upon to the coating machine. As the tubes are carried around the lower supporting sprocket, shown in dot and dash lines in Fig. 1, they are brought successively into engagement with a belt 33 which strips them from the pins and directs them into a channel formed by suitable guides 34. This channel is held at a suitable inclination so that the tubes tend to roll by gravity toward the lower end in a direction transverse to the movement of the belt 33. In descending between the guides 34, the tubes are retarded by pins 35 carried by a pair of chains 36 traveling around sprockets 37 at their upper ends and sprockets 38 at their lower ends. The lower sprockets 38 are rotated continuously at a suitable speed, in synchronism with the operation of the head 12, by means of a chain 39 connected between a sprocket secured to the shaft 18 and a sprocket secured to a stub shaft 40. Another sprocket secured to shaft 40 drives a chain 41, which in turn drives a sprocket secured to a shaft 42. The latter is connected by a universal joint with a shaft 43 which, through another universal joint, is connected with a shaft 44 to which the sprockets are secured.

As the chains 36 are continuously advanced by the means just described, the tubes 32 are brought successively to a position in which they may drop by gravity into a trough 45 suitably positioned to retain the tube with its axis in direct line with the axis of one of the spindles 13 when the head 12 is stationary. Upon each step of movement of the head 12 a plunger 46 is reciprocated in line with and through the trough 45 for the purpose of forcing a tube from the trough onto an alined spindle. Plunger 46 is carried by an arm 47 slidably mounted on a rod 48. A spring 49 normally urges the plunger in the direction of the spindle until stopped by a collar secured to the plunger. This spring may be compressed slightly in the course of applying a tube to the spindle or it may simply be in the nature of a safety device to prevent breakage of the parts in the event that some foreign matter, or the like, should interfere with the proper application of a tube to the spindle.

The mechanism for reciprocating the plunger 46 is best illustrated in Figs. 3, 4 and 5. For this purpose a rod 50 attached to the arm 47 is slidably mounted in bearings carried by the main frame. The opposite end of the rod is connected by a link 51 with the upper end of a lever 52 rockably supported at its lower end upon the main frame. At an intermediate point the lever 52 carries a roller 53 adapted to engage the periphery of a cam 54 secured to a shaft 55. For the purpose of holding the roller against the cam, one link 56 of a toggle is connected to the lever 52 and the other link 57 of the toggle is connected at 58 to a part of the main frame. The joint 59 of the toggle is acted upon by a spring 60 which at its lower end bears upon a block 61 rockably mounted upon the main frame by means of trunnions 62. Spring 60 tends to straighten the toggle and thereby forces the roller 53 against the cam. An advantage of this construction is that the force of the spring remains substantially uniform or may increase as the spring becomes extended. This is due to the fact that the toggle acts at a greater mechanical advantage as the spring becomes extended. In this way the application of appropriate pressure to the tube by means of the plunger 46 throughout its stroke is insured. For the purpose of rotating the cam 54 in synchronism with the operation of other portions of the machine, the shaft 55 has secured thereto one of a pair of meshing, bevel gears 63, the other of which is secured to a vertical shaft 64. The upper end of this shaft is connected through bevel gears 65 with the shaft 18.

It will be clear from the foregoing that upon each revolution of the shaft 18 the head 12 will be shifted one step to carry a new spindle 13 into alinement with the trough 45. The actual movement of head 12 takes place during about one-third of the revolution of shaft 18. During

the period that the head is stationary the plunger 46 is operated to apply a tube to the spindle, in the manner explained. As the head 12 is rotated counter-clockwise (Fig. 1) through a succession of steps, a tube applied to one of the spindles will be brought into engagement with a coating roller 66 at the opposite side of the machine. This roller is carried by a shaft 67 supported in suitable bearings on an auxiliary frame 68. As best shown in Figs. 9 and 12, the auxiliary frame is supported by the main frame 10 and is held on the main frame by a pair of screws 69 passing through elongated slots 70 in the auxiliary frame. This attachment of the auxiliary frame is such that it may be shifted readily to a slight extent relative to the main frame in the direction of the slots 70. A trough or guide channel 71 is formed in the top of the main frame 10 beneath the center of the auxiliary frame and slidingly receives a block 72 secured to the auxiliary frame. This block at its rear or righthand end (Figs. 9 and 10) is pivotally attached to the auxiliary frame by a screw 73. A screw 74 carried by the block at its forward end passes through an elongated slot 75 in the auxiliary frame. This allows for a slight angular adjustment of the block 72 with respect to the auxiliary frame. The precise position of the block with relation to the frame may be suitably determined by a pair of set-screws 76 having screw-threaded engagement with lugs on the auxiliary frame and engaging a forwardly and upwardly projecting portion of the block. The purpose of this adjustment is to enable absolute alinement of the surface of the coating roller with the surface of the tube on the spindle 13. If these surfaces are not correctly alined, it will be apparent that an uneven or otherwise improper application of the coating will result.

A pair of springs 77, one at each side of the auxiliary frame 68, serves to urge the auxiliary frame toward the left (Figs. 9 and 10) with relation to the main frame. These springs are compressed between the auxiliary frame and the ends of adjusting screws 78. The adjusting screws are carried by brackets 79 suitably secured to the main frame 10. By appropriate adjustment of the screws the tension of the springs 77 may be varied, as desired. For the purpose of shifting the auxiliary frame in the opposite direction, i. e., toward the right in Figs. 9 and 10, the block 72 is provided with a downwardly extending nut portion 80 at its right end, having screw-threaded engagement with a screw 81 extending through an opening in a plate 82 secured to the main frame. The outer end of the screw 81 is provided with a hand-wheel 83 by which the screw may be rotated to accurately adjust the normal position of the block 72 and the auxiliary frame with relation to the main frame. Between the hub of the wheel 83 and the plate 82 is mounted an arm 84 having a pair of V-shaped projections 85, one at each side of the pivot of the arm, arranged to cooperate with V-grooves 86 in a hub of the plate 82. Normally, the projections 85 will coincide with the grooves 86. However, when the arm 84 is rocked, in a manner to be explained, the projections ride out of the V-grooves and thus serve to cam the arm rearwardly or toward the right in Figs. 9 and 10, carrying with it the wheel 83, the screw 81 and hence the entire auxiliary frame. Adjacent the outer end of the arm 84 there is attached a spring 87 whose other end is connected with the main frame and tends to hold the arm 84 against a stop 84' (Fig. 11), this being also the position of the arm indicated in Figs. 9 and 10. Near the outer end of the arm 84 there is attached a link 88 whose lower end is connected with the armature 89 of a solenoid 90. Whenever this solenoid is energized, in the manner to be explained, the arm 84 is rocked against the action of spring 87 to retract the auxiliary frame and the coating roller.

Cooperating with the roller 66 is another smaller roller 91 having trunnions supported by blocks 92 slidable in a slot or guideway 93 provided in the auxiliary frame. Adjusting screws 94 are provided to determine the positions of the blocks 92, the screws acting against springs which tend to urge the blocks outwardly. By appropriate adjustment of the screws 94, the roller 91 may be properly alined and a desired connection may be had between the resilient surfaces of the rollers 66 and 91. A large roller 95, having its trunnions mounted in blocks 96, slidable in guideways 97 in the auxiliary frame, engages the surface of the roller 91. Adjusting screws 98 are provided for varying the positions of the ends of the roller 95 to insure proper alinement of this roller and to maintain the desired contact between it and the roller 91. Roller 95 has its lower portion surrounded by a pan 99 carried by the auxiliary frame and adapted to retain the coating substance. Any suitable means may be provided for maintaining an appropriate level of the coating liquid in the pan. Preferably a pump will be employed to maintain continuous circulation of the coating substance between the pan and a reservoir into which the excess may descend through an overflow pipe. The pump and overflow arrangement are well known and are therefore not illustrated. It will be apparent that as the rollers 66, 91 and 95 are rotated, in the directions indicated by the arrows in Fig. 1, the coating substance will be picked up by the roller 95, passed to the transfer roller 91 and applied by the latter to the surface of the roller 66. A very even layer or film of the coating substance is in this way provided on the surface of the roller 66 and is in part transferred by the latter to the outer surface of the tube on the adjacent spindle 13.

For the purpose of rotating the coating rollers, a sprocket 100 secured to the shaft 22 is connected by a chain 101 with a sprocket 102 carried by the shaft 67 of the roller 66. A series of intermeshing gears 104 secured to the shafts of the three rollers are of appropriate size to insure rotation of the rollers at the same peripheral speeds.

Inasmuch as the roller 66, as well as the rollers 91 and 95, is formed of a soft, resilient material, such as rubber or a composition commonly employed in the transfer of coating substances, it is apparent that this roller would engage the surface of a spindle 13 brought into the coating position, opposite the roller, in the event that a tube were missing from the spindle. This would result in the transfer of a coating to the spindle, which in turn would be transferred to the interior of a tube subsequently applied to the spindle, which, obviously, would be objectionable. According to the present invention, therefore, means are provided for retracting the auxiliary frame 68 through the operation of the solenoid 90 whenever a spindle without a tube is brought opposite the roller 66. Referring to Figs. 17 and 18, it will be seen that the solenoid 90 is adapted to be placed in circuit with a suitable source of current 105 whenever a switch 106 is operated.

Switch 106 is operated by a relay coil 107 connected in series with a transformer coil 108, a switch arm 109, a contact 110, another contact 111, and another switch arm 112. When the two switch arms are in engagement with the contacts 110 and 111, respectively, a circuit is completed through the relay 107, one side of the circuit being grounded. Current is supplied to the circuit by the transformer coil 108, whose primary or high voltage coil 113 is connected with the current source 105. Figure 18 shows the position of the parts with the switches A and B closed and the relay 107 energized to close the switch 106. Figure 17, on the other hand, shows the switch B open and the switch 106 correspondingly inoperative.

As best shown in Figure 15, the switch arm 109 is operated by a lever 114 pivoted within the switch box 115 and having at its other end a roller 116 cooperating with a cam 117 secured to the shaft 18. The lever 114 will fall by gravity into the position indicated in full lines or it may, if desired, be urged into this position by a spring. When the cam 117 strikes the roller during the rotation of the shaft 18, the lever will be lifted into the dotted-line position indicated, thus allowing the switch arm 109 to spring away from the contact 110.

Switch B comprises the arm 112, previously mentioned, which is pivotally mounted at 118 on a bracket 119 secured to the frame. A spring 120 connected between a stud on the arm 112 and a lug on the frame tends to rock the arm 112 into the dotted-line position indicated in Fig. 6. A pair of set screws 121 may be provided to determine the limits of movement of the arm 112. The lower end of the arm has a portion of its surface formed of or covered with insulating material 122. The balance of the arm, however, is formed of good conducting material, as indicated at 123 in Fig. 8. Accordingly, it will be seen that when the arm is in the full-line position (Figs. 6, 7 and 8), the contact 111 will engage the insulating material and the switch will be open. When the arm swings into the dotted-line position, however, the contact will engage the conducting surface and the switch will hence be closed. A spring 124 may be provided within a suitable housing to urge the contact 111 outwardly against the arm 112.

The position of the arm 112 is determined by the presence or absence of a tube on the spindle 13. When a tube is present on the spindle, its neck 125 extends into the plane of a portion 126 at the upper end of the arm 112. This upper portion of the arm is formed with an arcuate face 127 substantially concentric with the shaft 11 when the arm is in the full-line position of Fig. 16. The face or edge 127 is normally, however, in the dot and dash position, indicated in Figs. 6 and 16, due to the action of the spring 120. When the neck 125 of a tube is brought into a position opposite the roller 66, it will produce a camming action upon the arm and rock it into the full-line position. This, in effect, serves to open the switch. Should no tube be present on the spindle, no camming action upon the lever 112 will take place since no part of the spindle extends into the plane of the portion 126. Accordingly, the spring 120 will remain effective to keep the switch closed. The lever 112 might be so constructed and arranged that the switch would be held continuously open so long as the successive spindles brought to the coating station were provided with tubes. However, as shown, the preferred construction is such that the lever is rocked by the spring 120 each time a tube is carried away from the coating station and it is then returned to the full-line position by the next tube.

The operation of the switches A and B is such that when the tubes are provided on each of the spindles 13, presented at the coating station throughout a continuous period of operation, the solenoid 98 will not be operated and the roller 66 will remain in its operative position continuously. However, should a tube be missing from a particular spindle, the roller 66 will be retracted as the spindle is swung through the last portion of its movement, about 6⅔°, and will remain retracted so long as the empty spindle remains opposite the roller and until it is carried about 6⅔° to the opposite side of the roller. The appropriate timing of the switches for this purpose is illustrated diagrammatically in Fig. 16. The regular stationary positions of the spindles 13 and tubes 32 are indicated in full lines. Let us assume now that the movement of the head 12 is about to begin to carry the spindles into the next station, i. e., through an arc of 40°. Considering the tube on the center line of the coating station, as this is moved through the first 10°, its neck will retain the arm 112 in its shifted position and thus hold switch B in the "off" position, as indicated by the upper half of the black segment 128. As the tube continues through the next 10° of movement to the position designated 129, the arm 112 will be swung into and maintained in the "switch-on" position. This will bring the next tube into the position indicated at 130. As this next tube shifts through the next 10°, the arm 112 will still remain in the "switch-on" position but as the new tube commences the final 10° of its movement toward the center line of the coating station, it will engage and shift the arm to the "off" position. Should no tube be present on the spindle as it is moved through the 20° arc defined by the face 127, the arm 112 will remain continuously in its "switch-on" position, as indicated by the white segment 131 of the diagram.

The operation of switch A is indicated by the three aligned segments 132, 133 and 134. Considering the position of the parts when the new tube has reached the position 130, roller 116 will be resting upon the center line of the cam 117. This means that the lever 114 will be raised and the switch A will be in the "off" position. Now, as the tube progresses toward the center line of the coating station, the cam 117 will retain the switch in the open or "off" position during the next 13⅓° of movement of the tube, which corresponds with about 30° of movement of the cam. This is illustrated by the segment 132. During the last 6⅔° of movement of the spindle, or about the next 30° of movement of the cam, the roller 116 will drop to the inner portion of the cam and thus shift the switch into the "on" position. At this point the rotation of the head 12 will have stopped and it will remain in its new station during about the next 240° of rotation of the shaft 18 and cam 117. Throughout this period the switch A will remain in the "on" position. Now, at the beginning of the next step of movement of the head 12, the switch A will remain in the "on" position during the first 6⅔° of movement of the head, or about 30° rotation of the cam 117. This "on" condition of switch A is represented by segment 133 which corresponds with 300° of movement of the Geneva arm. At the beginning of

the next 13⅓° movement of the head, or about 30° movement of the cam, the latter will lift the roller 116 into the elevated position and will hold it there, with the switch in the "off" condition, as indicated by segment 134. This brings us back to the point where the roller is at the center line of the cam 117 and the next tube or spindle has reached the position 130 so that the same cycle is ready to be repeated. It should be observed, in connection with the foregoing, that the Geneva arm imparts a variable speed movement to the Geneva wheel which is most rapid at the time the cam 117 is acting upon the roller 116. This accounts for the fact that a 30° movement of the arm at one part of its cycle imparts about 13⅓° movement to the head and at another part of the cycle imparts only about 6⅔° movement to the head.

The thing to be observed from the diagram is that when tubes are present on all of the spindles 13 as they are brought opposite the coating roll, one or the other of the switches A and B will be open at all times so that the solenoid will not be energized. On the other hand, when no tube is present on a particular spindle, the solenoid will be energized as this spindle approaches within 6⅔° of the center line of the coating station and will remain energized so long as the spindle remains in this position and until it moves 6⅔° away from this position. This will insure amply against the coating of the empty spindle.

It will be understood that the particular degrees specified in the foregoing discussion have been given simply by way of illustration and will vary according to the details of the construction. The operation of the switch A need not, and probably will not, in any particular case take place precisely at the instants specified. It is primarily important that the "off" position of this switch will overlap with the "off" position of switch B when there is a tube present and also that the "on" positions of the two switches will coincide over a sufficient portion of the arc of movement of a spindle when no tube is present to avoid any possible contact between the spindle and the roller 66.

The operation of the machine is believed to be clear from the foregoing. However, it may be briefly summarized as follows:

Tubes delivered to the coating machine by the chain 30 are removed by the belt 33 and deposited against the pins 35 on the chains 36. One by one they are dropped into the trough 45 and are forced by the plunger 46 onto the successive spindles 13 as the latter are brought one by one into line with the trough. Upon each successive step of movement of the head 12 a tube or spindle will be brought opposite the roller 66. If a tube is present on the spindle, the roller will revolve in contact with it and will transfer a coating to its surface, but if an empty spindle is presented at the coating station, the auxiliary frame 68 will be retracted by the solenoid 90 as the spindle approaches within, say, 6⅔° of the center line of the coating position. The frame remains retracted so long as the empty spindle is at the coating station and until it has moved, say, 6⅔° away from the center line of the coating station. The coated tubes may be removed from the spindles either manually or automatically and applied in any convenient way to another chain for conveying them to any suitable drying point.

While an illustrative form of the invention has been described in considerable detail, it will be understood that numerous changes in the construction and arrangement of the parts may be made without departing from the general principles and scope of the invention. The terms and expressions employed herein have been used as terms of description and not of limitation.

What I claim is:

1. In a machine of the class described, an intermittently rotatable head, article retaining means on said head, a roller for applying a coating to articles on said head as they are brought to and held at a certain position, and means for disabling said coating applying roller when the article retaining means is brought to and held at said position without an article.

2. In a machine of the class described, a roller for applying a coating to articles to be coated, a plurality of rotatable means for retaining articles to be coated, means for bringing said retaining means successively into position opposite said roller, and means for disabling said roller whenever an article is absent from one of said retaining means as it is brought opposite said roller.

3. In a machine of the class described means for applying a coating to articles to be coated, means for conveying articles to be coated into operative relation to said coating means, means for operating said conveying means, and means controlled at successive intervals by the articles and by the operating means for disabling said coating means.

4. In a machine of the class described means for applying a coating to articles to be coated, means for conveying articles to be coated into operative relation to said coating means, means for operating said coating means and said conveying means, means for disabling said coating means, and means operated by the articles and by said operating means for controlling the operation of said disabling means.

5. In a machine of the class described coating means, a plurality of spindles adapted to retain hollow articles to be coated, means for supporting said spindles and shifting the same to and from a position adjacent said coating means, means for operating said supporting means to shift said spindles, disabling means for said coating means, and means controlled at successive intervals by said operating means and by the presence or absence of articles on said spindles as they approach said position for operating said disabling means.

6. In a machine of the class described coating means, a plurality of spindles adapted to retain hollow articles to be coated, means for supporting and shifting said spindles to and from a position adjacent said coating means, means for rendering said coating means ineffective, a solenoid for operating said last mentioned means, a switch for controlling the operation of said solenoid, operating means for said supporting and shifting means, and means controlled jointly by articles on said spindles and by said operating means for operating said switch.

7. In a machine of the class described coating means, a plurality of spindles adapted to retain hollow articles to be coated, means for supporting said spindles and shifting the same to and from a position adjacent said coating means, means for rendering said coating means ineffective, a solenoid for operating said last mentioned means, a main operating means for shifting said supporting means, and means for controlling said solenoid comprising a switch operated by articles on said spindles and a switch operated by said main operating means.

8. In a machine of the class described coating means, a plurality of spindles adapted to retain hollow articles to be coated, means for supporting said spindles and shifting the same to and from a position adjacent said coating means, means for rendering said coating means ineffective, a solenoid for operating said last mentioned means, a main operating means for shifting said supporting means, and means for controlling said solenoid comprising a switch operated by articles on said spindles and a switch operated by said main operating means, said switches being operated in timed relation to prevent operation of said solenoid so long as the spindles have articles thereon as they are brought to the coating position.

9. In a machine of the class described means for operating the machine through a predetermined cycle, a spindle for supporting an article to be coated, a coating roller, means for bringing said spindle and coating roller relatively toward and away from each other on successive cycles of operation of the machine, and means for rendering the coating roller ineffective whenever an article is absent from said spindle as the spindle and roller are moved relatively toward each other.

10. In a machine of the class described means for operating the machine through a predetermined cycle, a spindle for supporting an article to be coated, a coating roller, means for bringing said spindle and coating roller relatively toward and away from each other on successive cycles of operation of the machine, and means controlled jointly by said operating means and by an article on said spindle for rendering the coating roller ineffective whenever an article is absent from said spindle as the spindle and roller are moved relatively toward each other.

11. In a tube coating machine a rotatable head, spindles on said head for supporting tubes to be coated, a coating roller, means for intermittently rotating said head to carry said spindles successively opposite said roller, means for continuously rotating said roller, and means for retracting said roller to an ineffective position whenever a spindle without a tube is brought opposite the roller.

12. In a tube coating machine a rotatable head, spindles on said head for supporting tubes to be coated, a coating roller, means for intermittently rotating said head to carry said spindles successively opposite said roller, means for continuously rotating said roller, means for retracting said roller to an ineffective position, and means controlled jointly by said first mentioned means and by the presence or absence of a tube from a spindle as it is brought opposite said roller for operating said retracting means.

13. In a tube coating machine a rotatable head, spindles on said head for supporting tubes to be coated, a coating roller, means for intermittently rotating said head to carry said spindles successively opposite said roller, means for continuously rotating said roller, means for retracting said roller to an ineffective position, and means for controlling said last mentioned means comprising a member engageable by tubes on said spindles but out of the path of the spindles themselves.

14. In a machine of the class described a rotatable head, spindles on said head for supporting tubes to be coated, means for delivering tubes to a point adjacent said head, means for automatically applying said tubes to said spindles, means for intermittently rotating said head to carry said spindles successively to a coating station, a coating roller at said station for applying a coating to tubes on said spindles, common means for operating said tube applying means, said head rotating means and said coating roller, and means for rendering said coating roller ineffective when an empty spindle is presented at said coating station.

15. In a machine of the class described a rotatable head, spindles on said head for supporting tubes to be coated, means for delivering tubes to a point adjacent said head, means for automatically applying said tubes to said spindles, means for intermittently rotating said head to carry said spindles successively to a coating station, a coating roller at said station for applying a coating to tubes on said spindles, common means for operating said tube applying means, said head rotating means and said coating roller, and means for rendering said coating roller ineffective when an empty spindle is presented at said coating station, said last mentioned means being controlled jointly by said common operating means and by the presence or absence of a tube from a spindle presented at the coating station.

16. In a machine of the class described coating means, a plurality of spindles adapted to retain hollow articles to be coated, means for supporting said spindles and shifting the same to and from a position adjacent said coating means, continuously operating means for driving said supporting means to shift the spindles one after another to and from said position, means for rendering said coating means ineffective, a solenoid for operating said last mentioned means, and switch means for controlling the operation of said solenoid, said switch means being controlled at least in part by the articles on said spindles and being constructed and arranged to cause said solenoid to be energized only when a spindle without an article thereon is brought to said position adjacent the coating means.

17. In a machine of the class described a spindle for supporting an article to be coated, coating means, continuously operating means for shifting said spindle toward and away from said coating means, continuously operating means for operating said coating means to apply a coating to an article brought toward said coating means, and means controlled at least in part by the article on said spindle constructed and arranged to render said coating means ineffective only when said spindle reaches a position closely adjacent said coating means without an article thereon.

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