Feb. 15, 1938. W. PRUSSING 2,108,443

COLLAPSIBLE TUBE ENAMELING MACHINE

Filed April 12, 1934 3 Sheets-Sheet 1

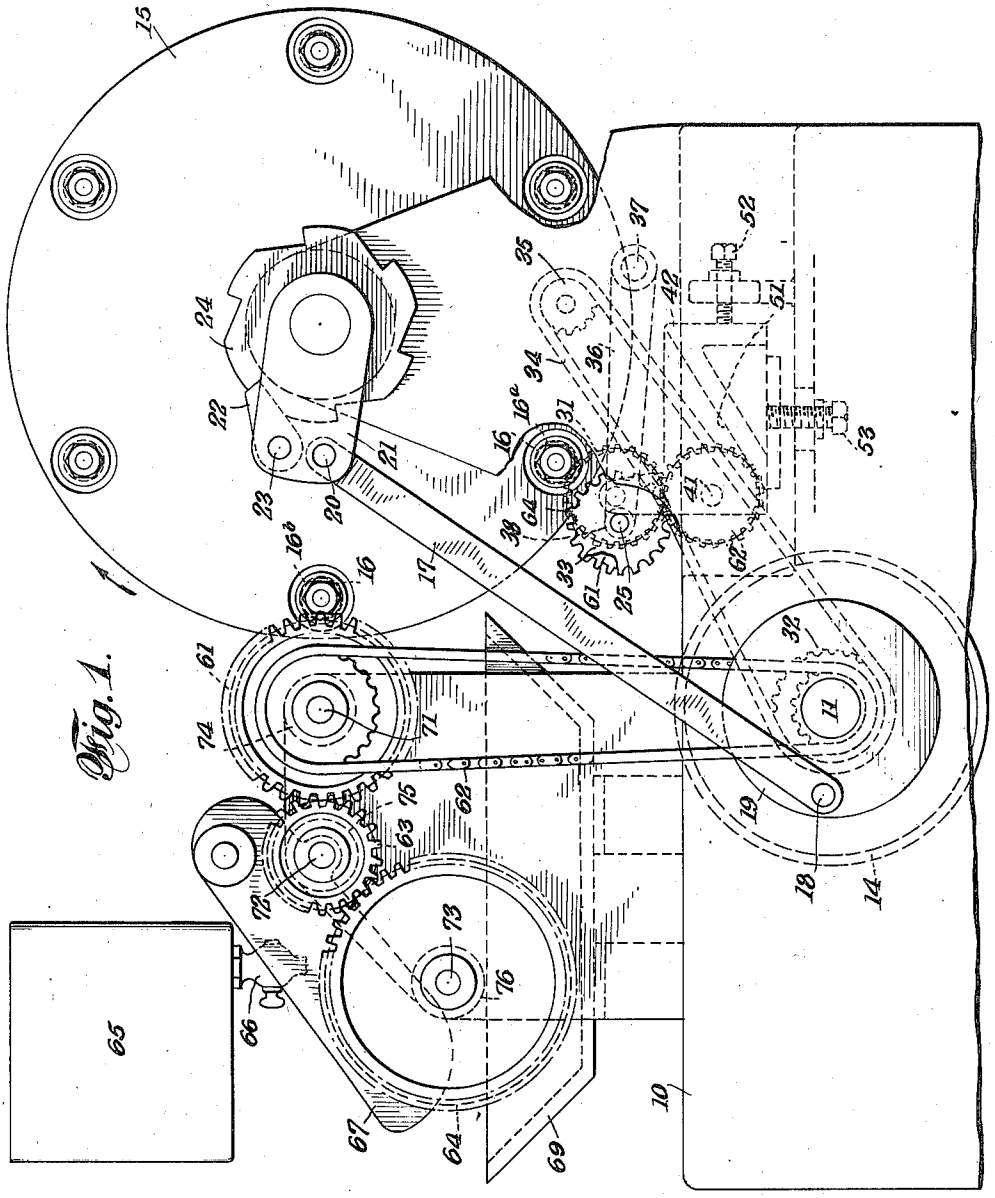

Fig. 1.

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Fig. 2.

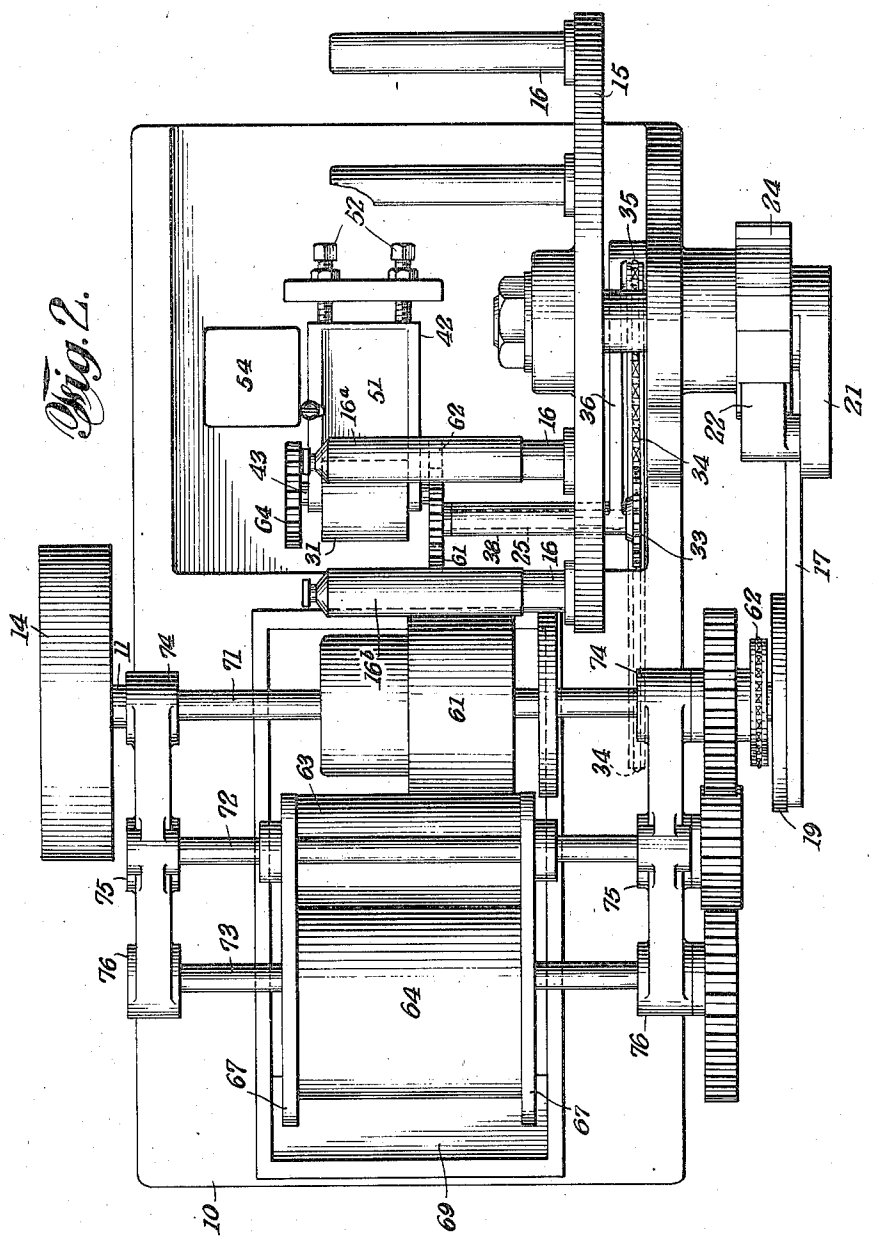

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Fig. 3.

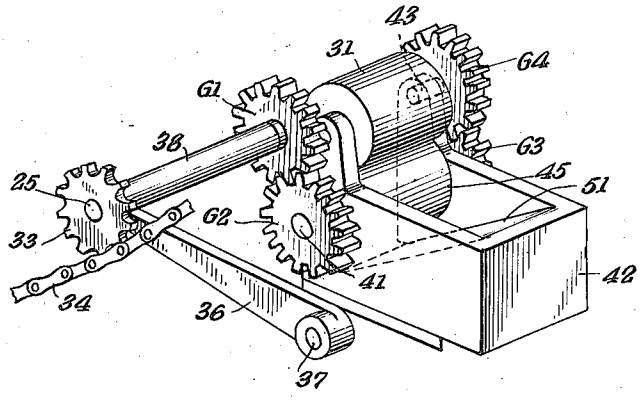


Fig. 4.

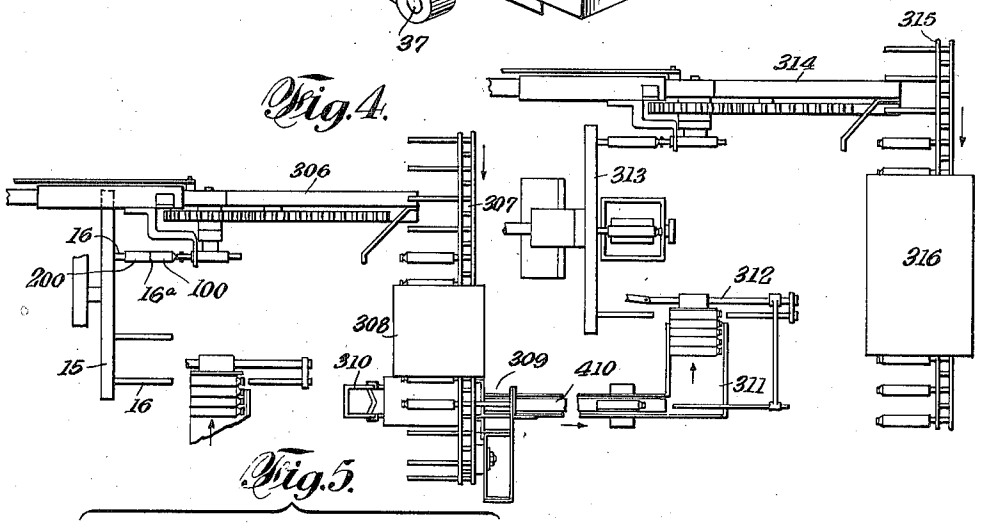
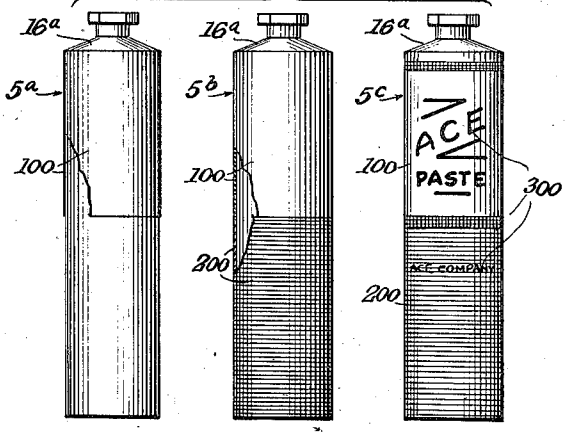


Fig. 5.



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COLLAPSIBLE TUBE ENAMELING MACHINE

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Application April 12, 1934, Serial No. 720,170

5 Claims. (Cl. 91—50)

This invention relates to machines for enameling and printing upon thin metal collapsible tubes such as those used to hold shaving cream, face cream, tooth paste and the like.

Since tubes of this type are easily dented or otherwise damaged, it is desirable to perform as many operations thereon as possible, automatically, to avoid the manual handling of the tubes which results in the greatest factor of expense, damage and waste.

My invention contemplates the provision of a single machine adapted to enamel or varnish one part of a collapsible tube with one color of enamel or coating and while such coating is still wet to varnish or enamel another part of the same tube with a different color or coating, whereby the tube is prepared for printing, it being understood that satisfactory printing cannot be done directly upon the tube.

One object of my invention is to apply at different stations in the same machine, separate coatings of enamel or varnish to different areas of a collapsible tube. Another object of my invention is to adjust the enamel applying roller or means in and out of contact with the collapsible tube or toward and from the replaceable mandrel which supports the tube to suit different sizes of collapsible tubes, and to make such adjustment to vary the thickness of the coating. Applied to a specific case, my invention provides in a single machine, means for applying enamel of one color to one part of a collapsible tube and while the first coating is still wet, applying at a different station varnish or enamel of a different color to another part of the tube, thereby applying in one machine operation two different or separate coatings to different parts or areas of the collapsible tube. The machine is adapted to space, abut or overlap such separate coatings as desired.

In the specific embodiment of my invention as herein disclosed, the machine applies a coating of enamel of selected color to the surface of approximately half of the tube and an abutting but not overlapping coating of clear varnish to the remaining surface of the tube. In this instance, the purpose of the varnish is to form a coating upon which a printing operation may be performed thereafter. Such printing may be of a still different color and may be applied in a separate operation to either or both of the coatings applied by my enameling machine, thus providing automatically, a three-color process in fewer machine steps than has heretofore been accomplished.

In the specific embodiment of my invention herein disclosed, an intermittently moving mechanism brings the collapsible tube to be coated with enamel or varnish into contact with a continuously rotating varnish-applying roller of less length than the length of the collapsible tube. The varnish applying roller rotates the tube which is mounted on a rotatable mandrel and applies a coating of varnish to about half the length of the tube. The tube is then brought by the intermittently moving mechanism to another station where the remaining length of the tube is brought into contact with a continuously rotating enamel applying roller which rotates the tube and applies enamel to such remaining length of the tube, abutting the coating of varnish previously applied by the varnish applying roller.

My invention further contemplates removing the enameled and varnished tube from the multi-color enameling machine, advancing and drying the wet enameled tube, then re-mounting the tube upon a printing machine which prints upon the surfaces of the enamel coatings previously applied by my multi-color enameling machine, and then drying the printed tube.

Such printing step of my process may be performed partly according to the disclosure in connection with Fig. 1 of my Patent No. 1,947,171, granted February 13th, 1934.

The various objects of my invention will be clear from the description which follows, and from the drawings, in which,

Fig. 1 is an elevation of my collapsible tube enameling machine.

Fig. 2 is a plan view of the machine shown in Fig. 1.

Fig. 3 is a perspective view of the adjustable mechanism for the enamel or varnish applying roller of the enameling machine shown in Figs. 1 and 2.

Fig. 4 is a top plan view of tube coating mechanism showing diagrammatically the various means assembled in their cooperative relation for automatically enameling, transferring, drying and printing.

Fig. 5 is a perspective view of the tube in various stages of the operation, tube 5*a* showing the tube in the first stage, tube 5*b* showing the tube in the second stage, and tube 5*c* showing the finished tube.

In that practical embodiment of my invention which I have illustrated by way of example, and referring particularly to Figs. 1 and 2, there is shown a collapsible tube enameling machine which is provided with a main drive shaft 11

journalled in the frame 10 and driven from a pulley 14. A turret 15, carrying a plurality of horizontally and rotatably mounted tube-receiving mandrels 16, is intermittently moved by the main power shaft 11 by means of a link or connecting rod 17 pivoted at 18 to a plate 19 secured to the main shaft 11. It will be understood that the mandrels 16 are replaceable by larger or smaller mandrels when tubes of a different size are to be coated, in a manner well known in the art. The connecting link 17 is connected by the pivot 26 to a pawl carrier 21. A pawl 22, pivoted at 23 to the pawl carrier 21, engages the ratchet wheel 24 operatively secured to and mounted co-axially with the turret 15.

Accordingly, the mandrels 16 are intermittently moved from station to station in a clockwise direction as viewed in Fig. 1. The shaft carrying the turret 15 and the main drive shaft 11 are rotatably supported by the frame 10 of the machine.

A continuously rotating varnish-applying roller 31 is driven by intermediate mechanism from the main shaft 11. Said mechanism is so designed as to permit adjustment of the roller 31 toward and from the mandrel 16 when coating of larger or smaller tubes is to be done. The intermediate mechanism therefore includes a sprocket 32 mounted upon the main shaft 11 and driving the sprocket 33 by means of a chain 34 running loosely over an idler 35.

The shaft 25, carrying the sprocket 33 at one end and the gear G1 at its other end, is rotatably mounted in the sleeve 38 extending from the swingable sprocket-adjusting arm 36. Said arm is pivoted to the frame 10 as at 37, whereby its weight together with weight of the parts carried thereby is sufficient to maintain the sprocket 33 in engagement with the chain 34, whereby the sprocket 33 is rotated by the chain. The chain 34 runs loosely over the sprocket 32 and idler 35, permitting the sprocket 33 secured to the swingable arm 36 to be adjusted when the distance of the roller 31 from the center of the mandrel 16 is to be changed. The gear G1 meshes with a gear G2 and in operation is adapted to be moved slightly around the circumference of the gear G2 to shift its point of contact therewith according to the manually adjusted position of the gear G2, of the enameling roller 31, and of the supporting and driving parts therefor. The gear G2 is secured to a shaft 41 which is journalled in a slidably movable frame 42.

Secured to the shaft 41 at the end opposite to the end to which the gear G2 is attached, is another gear G3. The gear G3 meshes with a gear G4 secured to the shaft 43 which is journalled in the slidable frame 42, and carries the coating roller 31.

The roller 31 is adapted to be moved toward and from the mandrel 16 to carry the roller into and out of contact with a collapsible tube as the tube 16a mounted on a mandrel, regardless of the size of the tube or of the mandrel. Such adjustment of the roller is effected by the adjustable screws 52. It will be observed that as the varnish applying roller 31 is moved toward or away from the mandrel, the gear G1 resting upon the gear G2 assumed a different point of contact therewith without interrupting the rotation of the varnish applying roller 31.

The varnish applying roller 31 is of a length less than the length of the collapsible tube 16a to which it is adapted to apply a varnish coating 100 in this instance on the upper half surface adjacent the capped end of the tube 16a.

Varnish is applied to the varnish applying roller 31 by means of a wedge or printer's fountain 51 disposed adjacent a transfer roller 45 mounted on the shaft 41, and receiving varnish from the fountain. Varnish adhering to the roller 45 is transferred to the varnish applying roller 31 and from there, to the surface of the collapsible tube on the mandrel. The varnish applying wedge 51 together with the shaft 41, the gear G3 and roller 45 thereon, as well as the gear G4 and the roller 31 are all adapted to be moved as a unit toward and away from the mandrel by means of the adjusting screws 52, and being adapted to be clamped in place by the set screw 53. The thickness of the film of varnish may also be controlled by the adjusting screws.

It will be seen that the roller shaft 43 may be adjusted relatively to the sprocket and gear shaft 25 so that an operative drive of the roller 31 is attained even though the gears G1 and G4 are out of alignment. The wedge 51 is supplied with varnish from the varnish tank 54.

Another roller 61 herein referred to as an enamel-applying roller is adapted to apply a coating of enamel 200 to the lower half of the collapsible tube preferably abutting but not overlapping the varnish coating 100 which had previously been applied to the upper half of the tube 16a in this instance. The enamel applying roller 61 is adapted to be adjusted in the usual manner relatively to the mandrel and is driven by a belt 62 from the main power shaft 11. Enamel is supplied to the enamel applying roller 61 through rollers 63 and 64 operating by a suitable geared connection.

The roller 64 is supplied by gravity with enamel from the enamel reservoir 65 through the valve 66 which may be adjusted to supply a proper quantity. The roller 64 in turn transfers enamel to the roller 63 and thereafter, to the enamel applying roller 61. A splash shield 67 may be secured to the frame 10 to prevent enamel from splashing other parts of the machine. Also, a drip pan 69 may be provided to catch any enamel that may fall from the rollers 61, 63, and 64 or other parts of the enameling apparatus. The rollers 61, 63 and 64 are secured respectively to the shafts 71, 72 and 73 journalled in bearings 74, 75, and 76 respectively.

In operation, the intermittently-moving turret 15 moves the revoluble mandrels 16 from station to station. A collapsible tube as tube 16a to be enameled is placed on one of the mandrels 16 and is moved automatically into contact with the varnish applying roller 31 where, by friction, the varnish-applying roller 31 rotates the collapsible tube 16a mounted on the revoluble mandrel 16 and applies a coating of varnish 100 to the upper half of the collapsible tube. The length of the varnish applying roller 31 is such as shown in Fig. 2 that the collapsible tube 16a is varnished to the desired length. In the specific embodiment herein described, the area of the collapsible tube that is varnished is approximately the upper half although it is understood that by modifying the dimensions of the varnish applying roller 31, the area of the tube to be coated may also be varied. The turret 15 is then moved by the pawl and ratchet and connecting rod mechanism 19 to 23 inclusive, heretofore described, into the next station where the remaining length of the tube as tube 16b is then brought into contact with the continuously rotating

enamel-applying roller 61 which frictionally rotates the tube 16b and applies the enamel coating 200 to the remaining length of the tube, in this instance, abutting the coating of varnish 100 previously applied by the varnish applying roller 31. Thereafter, the turret 15 is moved another station by means of the pawl and ratchet mechanism 19 to 23, where the tube now enameled with two different coatings 100 and 200 may be removed or transferred automatically to my printing machine hereinafter described.

The enameling machine may be adjusted to accommodate different sizes of tubes. Thus, for that purpose, the varnish applying roller 31 may be moved toward or away from the mandrel 16 by means of the swingable sprocket 33 and slidable roller mechanism carried by the adjustable frame 42 heretofore described.

While I have shown and described a single enameling machine which is adapted to apply varnish to a part of the tube at one station and enamel to another part of the tube at another station, it will be understood that my machine is adapted to apply other types of coatings at different stations in the same machine to different areas of a collapsible tube to prepare a two-color coating on the tube, which coating when dry is adapted to be printed as desired.

In Fig. 4, there is illustrated a complete enameling, printing and drying mechanism, such as is shown in Fig. 1 of my Patent No. 1,947,171, which is adapted to print indicia 300 with printing ink on top of either or both of the enamel or varnish coatings 100 and 200 previously applied by the enameling machine shown in Figs. 1 and 2. It being impractical to print fine indicia with enamel, and being equally impractical to print such indicia directly on the metal of the tube, a base of enamel or varnish is first provided on the tube, thereby making it possible to print the tube accurately with hair line characters. My enameling machine as shown in Figs. 1 and 2 applies one coating 100 to one part of the tube and another coating 200 to another part of the tube, all in the same machine, and my printing machine as shown in Fig. 4 prints indicia 300 accurately on top of either or both of the two coatings 100 and 200 previously applied, thus providing a three-color process in fewer operations than heretofore employed, with resultant saving in time and expense and damage in handling of tubes by reason of the fewer number of handling operations involved in my process. The resultant product may be the three-color tube illustrated in Fig. 5 which in this instance, has a coating of green enamel 200 on the lower half of the tube, an abutting but not overlapping coating of clear and transparent varnish 100 on the upper or capped half of the tube resulting in the natural color of the tin of which the tube is made, and on top of both of said coatings 100 and 200, the indicia 300 of black printing ink defining the descriptive lettering and providing a black band covering and overlapping the juncture between the enamel and varnish coatings 100 and 200 previously applied.

Referring to Fig. 4, there is shown a top plan view of an apparatus which is similar to that shown in Fig. 1 of my Patent No. 1,947,171 and which is adapted to successively enamel in two colors, dry, print and again dry a series of collapsible tubes.

Said apparatus comprises a series of instrumentalities operatively connected and cooperating to produce a completely finished and printed tube automatically. The instrumentalities derive their movement from a source of power, not necessary to be shown nor described in detail. The article produced is a three-color printed collapsible tube 5c. In the description which follows, certain sub-mechanisms are briefly described by reference to corresponding parts of such mechanisms shown in Fig. 1 of Patent No. 1,941,171, such parts bearing corresponding reference characters and being incorporated herein by reference.

In Fig. 4, at the extreme left side, there is shown diagrammatically, the series of mandrels 16 mounted on the turret 15 previously described in connection with Figs. 1 and 2. Mounted on one of the mandrels 16 is shown one of a series of tubes such as the tube 16a which has been enameled and varnished at different parts by my enameling machine described in connection with Figs. 1 and 2 hereof. The enameled tube 16a is removed from the mandrel 16 of the enameling mechanism of Figs. 1 and 2 and transferred by a transfer mechanism 306 (as shown also in Fig. 1 of my Patent No. 1,947,171) to the pins of a conveyor 307 moving in the direction of the arrow of Fig. 4. The wet enameled and capped tube 16a is carried through a heated driver 308 for sufficient time to thoroughly dry the enamel or varnish whereafter the capped and enameled tube is removed from the pins of the conveyor 307 by the removal mechanism 309 and dropped into a suitable chute 310.

At the bottom of the chute 310 is arranged a suitable belt 410 which receives the capped and enameled tube 16a and carries said tube in the direction of the arrow to a suitable feed plate 311, from which the transfer mechanism 312 forwards the tube onto the mandrels of the printing mechanism 313 which prints suitable lettering and designs as shown in Fig. 5 upon the two coatings of enamel 100 and 200 previously applied by my enameling machine shown in Figs. 1–3 and of which the turret 15 is shown in Fig. 4.

The tube 16a, thus enameled and printed, is removed from the mandrel of the printing mechanism 313 by a transfer mechanism 314 similar to the mechanism 306, which places the wet printed tube 16a on the pins of a conveyor 315 which moves in the direction of the arrow and passes into the drier 316 to dry the wet ink on the tube whereafter the tube may, if desired, be lacquered as by means of a lacquering mechanism not shown herein but described in my Patent No. 1,947,171.

The specific construction of the transferring, drying and printing mechanism is herein only briefly described, but is fully described in my Patent No. 1,947,171 to which reference is made for details.

In Fig. 5, there is shown the finished product produced by my enameling mechanism shown in Figs. 1–3 and the printing mechanism shown in Fig. 4. Tube 5a shows the coating of varnish 100 as it has been applied to the upper half of the tube by the varnishing roller 31.

Tube 5b shows the abutting coating of enamel 200 as it has been applied by the enameling roller 61 to the lower half of the tube. Tube 5c shows the tube 16a having the indicia 300 applied as by the mechanism shown in Fig. 4 upon the varnish coating 100 and the enamel coating 200 and also applied in this instance to the juncture of the two coatings 100 and 200 in the form of a band. It will be understood that the coatings 100 and 200 may be applied to different parts of

the surface of the tube as a collapsible metal tube and may be of different materials or colors and that the indicia 300 may be of lettering or designs upon either or both of the coatings 100 and 200.

It will be seen that I have provided a mechanism which operates completing automatically for providing separate enamel coatings to different parts of each tube of a series of tubes and for printing upon either or both of such enamel coatings and that the various steps are carried out in one continuous process, it being necessary only to supply enamel, varnish, and ink to the respective mechanisms.

While I have shown and described a specific embodiment of my invention, it is understood that I do not intend to be limited thereto but desire to claim my invention as broadly as may be permitted by the scope of the appended claims and the state of the prior art, and that such modifications as may occur to a person skilled in the art are to be construed as being within the scope of the appended claims.

I claim:

1. In a machine for preparing a collapsible metal tube for the printing of indicia thereon, means including a first roller of length less than the length of said tube for applying colored opaque coating material to the entire cylindrical surface of one part of said tube, means spaced from said first-mentioned means and including a second roller of length less than the length of said tube and of a length equal to the remaining length of the cylindrical surface of said tube for applying separate transparent coating material capable of being imprinted with indicia to the entire cylindrical surface of the remaining part of said tube, means including a single rotatable turret for moving said tube between the aforesaid coating applying means, means for adjusting the position of said second roller relatively to a tube to be coated, and means for rotating said second roller including a plurality of gears carried by the adjusting means, and a swingable gear mounted independently of the adjusting means and in driving contact with one of the plurality of gears in all positions thereof.

2. In a machine for enameling a collapsible tube, means for rotatably supporting said tube, an enameling roller, means for supplying enamel to said roller, adjustable means for moving said roller toward and from said tube, and means including gears carried by said adjustable means and operatively connected to said roller, and a gear engaging one of said gears and mounted on a swingable arm independently of said adjustable means for continuously rotating said roller irrespective of the position of said roller.

3. In a machine for coating collapsible tubes including a single turret carrying a plurality of revoluble tube-holding mandrels, a varnish-applying roller, means including a second roller for supplying varnish to the varnish-applying roller, adjustable means for moving the rollers toward and from the turret, and means for rotating the varnish-applying roller including a chain, a sprocket wheel driven by the chain, a shaft for the wheel, a first gear on the shaft, said sprocket wheel, shaft and first gear being swingable together as a unit, a second shaft for said second roller, a second gear at one end of said second shaft engageable with said first gear, a third gear on the other end of said second shaft, a fourth gear adapted to rotate said varnish-applying roller and engageable with the third gear whereby said first gear and the remaining gears cooperating therewith are adapted to continuously rotate said varnish-applying roller irrespective of the adjusted position of said varnish-applying roller and said remaining gears.

4. In a machine for coating collapsible tubes, a single turret, a plurality of revoluble tube-holding mandrels on said turret, means for applying varnish to the tubes on the mandrels comprising a frame adjustable toward and from the center of the turret, a varnish-receiving roller carried by the frame, a first gear mounted coaxially of the roller beyond one end thereof for rotation with the roller, a second gear mounted coaxially of and beyond the other end of the roller for rotation therewith, a varnish-applying roller receiving varnish from the receiving roller, a third gear mounted beyond one end of the applying roller and in operative engagement of the first gear, said rollers and said gears being carried by said frame, a shaft mounted independently of the frame, a fourth gear carried by the shaft and engaging said second gear, means for driving said shaft, said shaft together with said fourth gear being swingably mounted for pivotal movement as a unit about an axis other than the axis of the shaft on the adjustment of said frame, while said fourth gear remains in engagement with said second gear.

5. In a collapsible tube enameling machine, means including a reservoir for opaque coating material and transfer rollers for coating the entire cylindrical surface of part of the length of a tube, similar means for coating the remaining cylindrical surface of the tube with a transparent coating of material adhering to the tube surface and to which a printing coating adheres, means for adjusting each of said aforesaid coating means to permit the coating of tubes of various sizes, gearing carried by one of said adjusting means and operatively connected to said second-mentioned coating means to rotate said second-mentioned coating means, a gear in operative engagement with said gearing, and a swingable arm carrying said gear whereby said gear cooperates with said gearing to operate the second-mentioned coating means irrespective of the adjustment of the coating means and said gearing by said adjusting means.

WALTER PRUSSING.