Jan. 5, 1932. W. PRUSSING 1,839,438

METHOD AND MECHANISM FOR MAKING COLLAPSIBLE TUBES

Filed July 25, 1928 3 Sheets-Sheet 1

Fig. 1

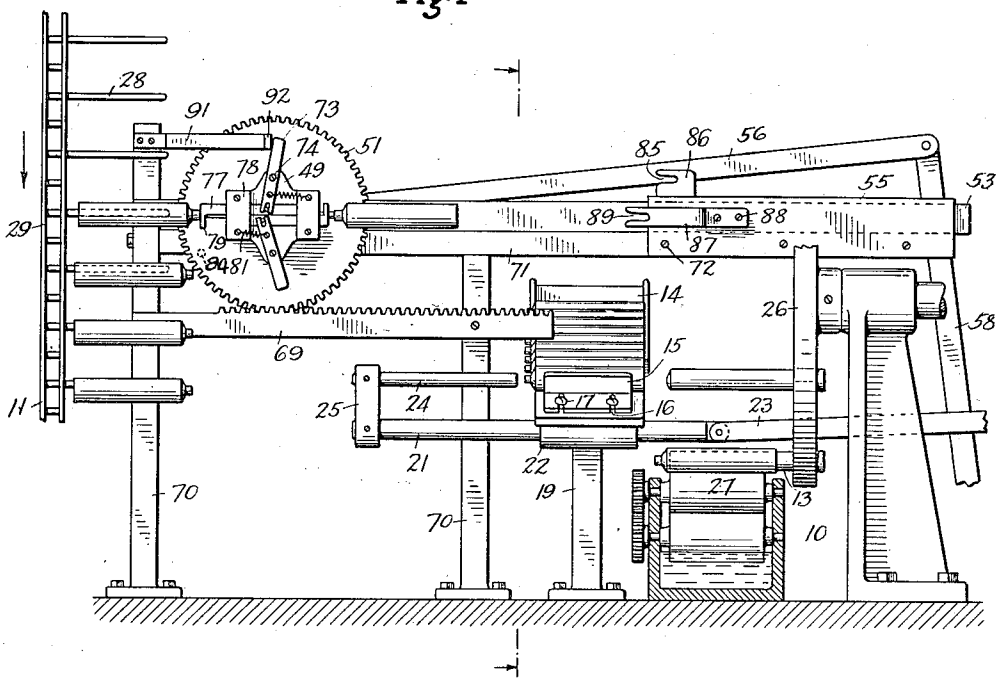
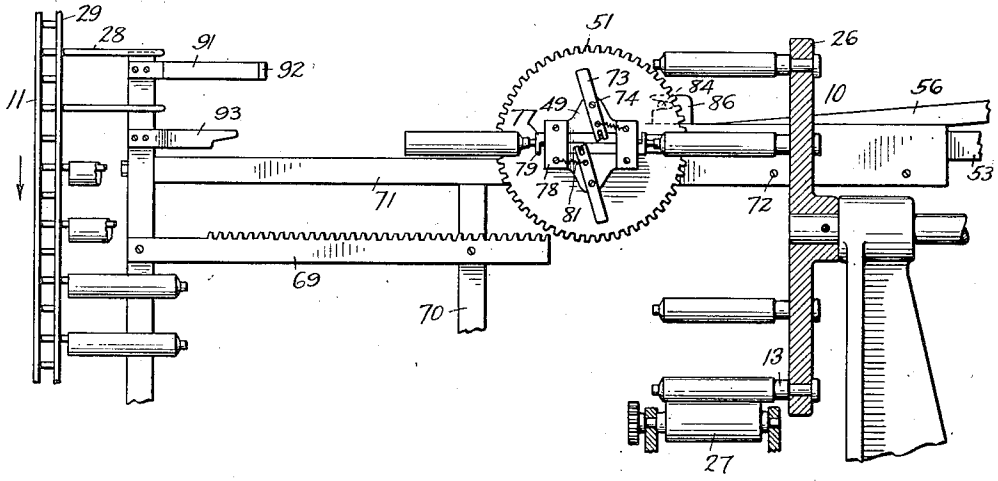


Fig. 2



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METHOD AND MECHANISM FOR MAKING COLLAPSIBLE TUBES

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Fig. 3

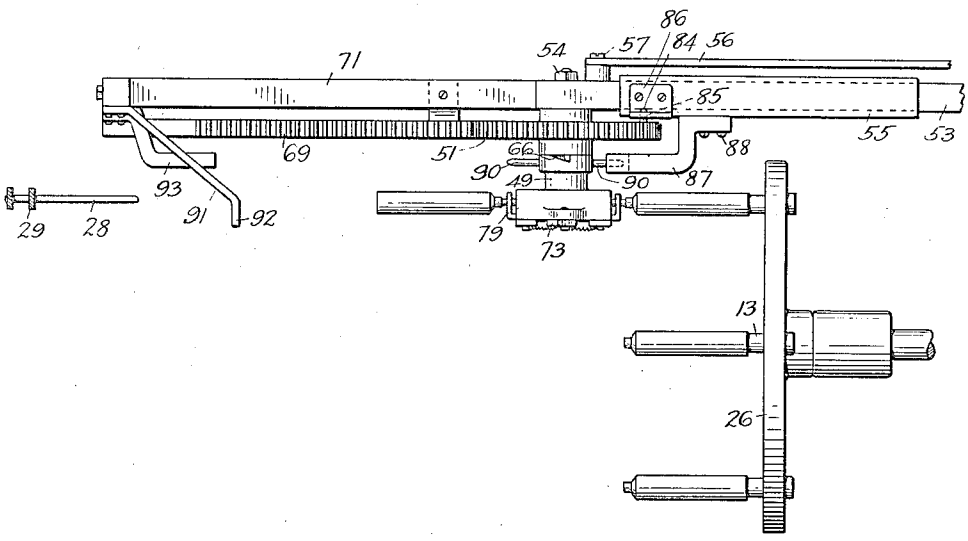
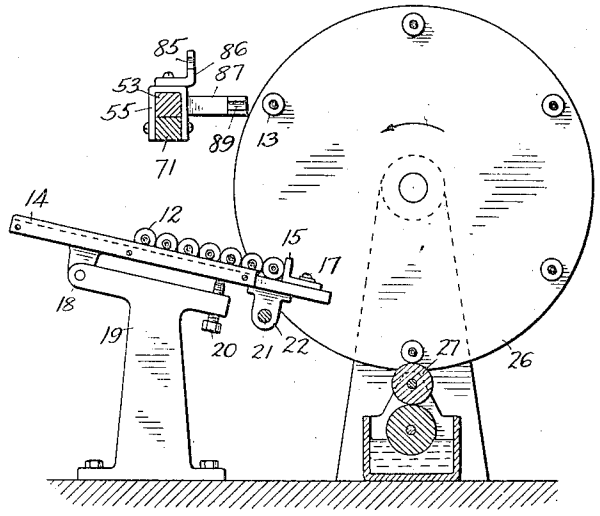


Fig. 4



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METHOD AND MECHANISM FOR MAKING COLLAPSIBLE TUBES

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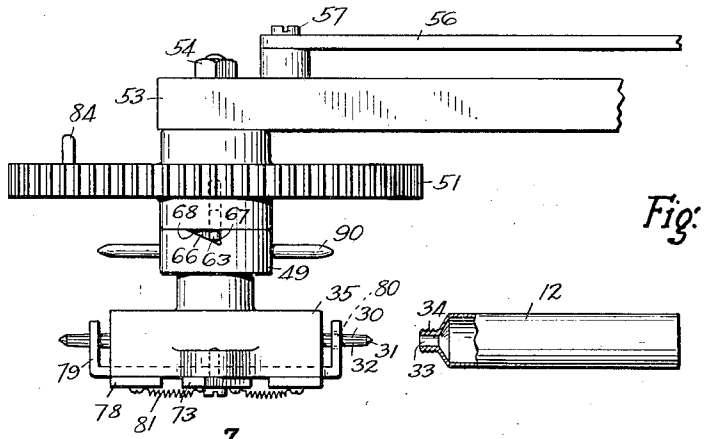


Fig: 5

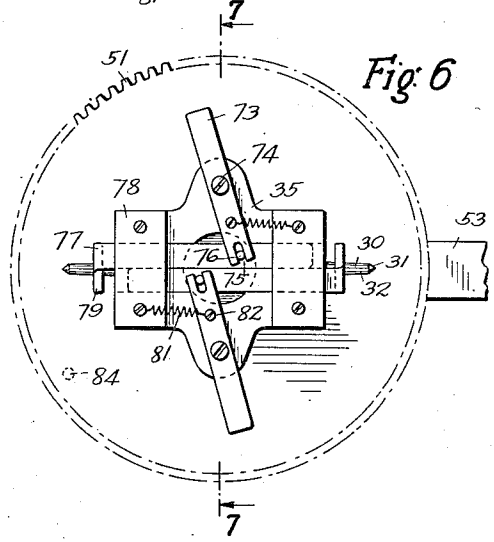


Fig: 6

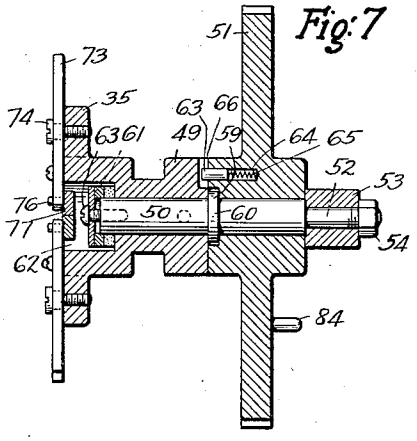


Fig: 7

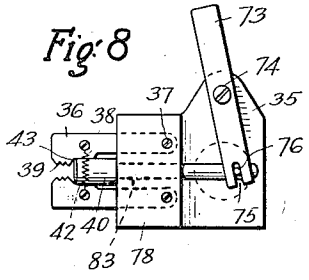


Fig: 8

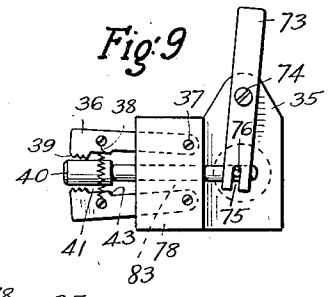


Fig: 9

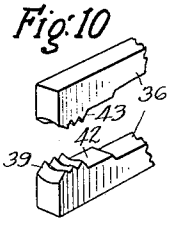


Fig: 10

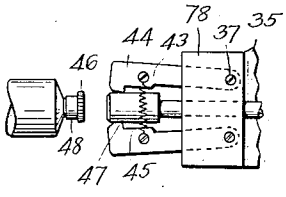


Fig: 11

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UNITED STATES PATENT OFFICE

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METHOD AND MECHANISM FOR MAKING COLLAPSIBLE TUBES

Application filed July 25, 1928. Serial No. 295,332.

This invention relates to machines for operating upon thin and easily deformable collapsible tubes for transferring said tubes automatically from one point or support therefor to another, and from one mechanism to another, and relates further to the method of enamelling, drying and printing said tubes. My invention is applicable to all types of collapsible tubes, whether made with "ribbon" or round openings, or whether said tubes have had caps mounted thereon or not.

My invention contemplates the provision of means for automatically moving the tubes about for enamelling, drying and printing, whereby handling and manual transfer thereof are eliminated, so that the tubes are not subjected to danger of deformation and the labor and risks of handling are greatly reduced. My invention further contemplates the provision of an improved method for handling tubes during the enamelling, printing and drying operations, whereby the cost of the various operations is reduced, the danger mentioned is avoided, and the floor space formerly needed for stacking and transferring the tubes is rendered unnecessary.

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

Fig. 1 is a front view of my improved machine as it appears in position for transferring tubes from an enamelling machine to a drying conveyor.

Fig. 2 is a similar view of the same, showing another position of the parts.

Fig. 3 is a top plan view of my improved machine.

Fig. 4 is a side view and partial section thereof.

Fig. 5 is an enlarged top plan view of the tube withdrawing and transfer mechanism, showing one form of the tube engaging means.

Fig. 6 is an enlarged front view of the same.

Fig. 7 is a vertical section of the same, taken on the line 7—7 of Fig. 6.

Fig. 8 is a front view of another form of the tube engaging member designed to grip the threaded neck of a tube.

Fig. 9 is a similar view of the same, showing the jaws separated by the tube discharging plunger.

Fig. 10 is a perspective view of the threaded tube engaging jaws.

Fig. 11 is a front view of a modified form of tube engaging means designed to grip a capped tube.

It will be understood that my improved mechanism may be used in connection with various machines for operating upon tubes, but that in the form illustrated, said mechanism is designed for the purpose of removing a tube from a chute on to which the tubes are fed in any suitable manner, transferring the tube to the holding means of an enamelling machine, then to a suitable conveyor. While on the conveyor, various operations may be performed on the tube such as drying, printing, etc.

In that practical embodiment of my invention which I have illustrated in connection with enamelling mechanism, the enamelling mechanism has been designated generally by numeral 10, and the tube conveyor designated generally by numeral 11.

Referring now to Figs. 1 and 4, I have there shown the mechanism for mounting the tubes automatically on the mandrel 13 of the enameller 10. Said mechanism includes a chute or runway 14 to which the tubes are fed so that the necks thereof face away from the mandrel 13. An adjustable stop in the form of an angle member 15 is provided with slots 16 in one flange thereof so that said stop may be adjusted with relation to the chute. For this purpose, the headed bolts 17 pass through the slots 16 into the chute, and on the tightening thereof, maintain the stop in adjusted position. The adjustment of the stop is advisable in order to accommodate the mechanism to feed tubes varying in diameter, and to enable the lowermost tube on the chute to be aligned coaxially with the mandrel 13 on which it is to be mounted. Toward this end, it is also advisable to adjust the chute itself. Said chute is therefore hinged or pivoted as at 18 to the chute support 19, an adjusting screw 20 serving to raise or lower the lower end of the chute as may be desired

A reciprocating rod 21 is journalled in the bearing 22 depending from the chute, said rod being operated through the medium of the link 23, which is operated by a cam, crank or any other well known means which need not be shown or described in detail. For engaging the neck end of the tube to push said tube on to the mandrel when the rod 21 is reciprocated, I provide a rod or bar 24, mounted above the operating rod 21 and connected thereto as by means of the connection 25.

On the reciprocation of the rod 21, the rod or bar 24 removes the lowermost tube on the chute by pushing said tube toward the mandrel 13, the open end of the tube allowing said tube to be pushed into place on the mandrel. Said rod 24 meanwhile prevents the remaining tubes on the chute from rolling down against the stop 15 until said rod has been withdrawn by the return stroke of the rod 21. The collapsible tube 12 having been mounted automatically by the means just described, upon the revoluble mandrel 13 of the enameller 10, the enamelling operation is performed thereon. Said mandrel is journalled in the face plate 26 for rotation therein, so that the printing roller 27 may print the tube mounted on the mandrel during the rotation thereof when the mandrel is brought by intermittent movement of the face plate into printing position, as is well understood. The face plate 26 is rotated by any suitable means to bring the various mandrels and the tubes thereon into position wherein the tube, after being printed, may be removed from the mandrel, and mounted on a suitable transferring holder as illustrated in Fig. 3.

In said position, which I will refer to hereinafter as the "mounting" position, my improved mechanism engages the tube, and withdraws it from the mandrel. The mechanism is then operated to forward the tube into the dismounting position illustrated in Fig. 1, and finally pushes the tube off the engaging means therefor on to a suitable holding pin as 28 on the conveyor chain 29.

The means for engaging the tube and withdrawing it from the mandrel varies somewhat, dependent upon the type of tube which is operated upon. Where tubes having externally threaded necks and circular openings in the necks are used, a serrated member entering the neck opening may be used. Where "ribbon" openings are formed in the necks of the tubes, a pair of movable jaws is used to engage the threaded neck, while if the tubes are capped, a similar pair of jaws is used. Each of said tube engaging means will now be described in detail.

The means for engaging and holding an uncapped threaded tube having a circular opening in the neck during the transfer thereof, consists preferably of a conical tube engaging member 30, terminating in a conical point 31 and serrated by means of the longitudinal teeth 32 formed in the surface of said member and preferably disposed along elements thereof. The length and diameter of the tube engaging member 30 is such that the member may readily enter the circular opening 33 in the neck 34 of the tube, the teeth 32 cutting into the inside surface of the neck to a sufficiently slight extent to mount the tube firmly on said member without materially defacing the neck. The tapered conical point 31 insures the entrance of the member 30 into the neck in proper alignment therewith, so that the tube is not damaged even though the alignment is not perfect. The tube may readily be removed from the member 30 by pushing the neck of the tube toward the end of the member. Said member 30 is mounted on the supporting block 35, adapted to be reciprocated for transferring the tube from mounting position to dismounting position, as will be more fully described hereinafter.

In that form of tube wherein a "ribbon" or rectangular opening is made in the neck 34 for the discharge of the contents, I prefer to provide a pair of gripping jaws 36 for engaging the threaded neck of the tube. Said jaws are each pivoted to the block 35 as at 37 and are spring-pulled toward each other as by means of the tensioned spring 38 secured to said jaws. Near the free ends thereof, the jaws 36 are threaded as 39 to correspond with the threads of the neck of the tube. A rod 40 is arranged between the jaws 36 and is of such diameter that when retracted to the position shown in Fig. 8, the jaws are allowed to close on to the neck of the tube, the rod at this time lying in the enlarged opening 41 between the jaws. Connecting the side 42 of said opening with the threads 39 of each jaw, is a bevelled cam surface 43.

As the rod 40 is moved from its retracted position toward the threads, the end of the rod engages the cam surface 43 and forces said jaws apart to allow the discharge of the tube by the rod. As the jaws and rod in this discharging position reach the mounting position, the neck of the tube pushes the rod 40 back into its retracted position and at the same time enters the space between the jaws. When the rod has passed the cam surface 43, the jaws are brought together by the spring 38 and thereby clamped upon the threaded neck.

If capped tubes are to be operated upon, (Fig. 11), similar jaws 44, similar to the jaws 36 are provided, but the sides 45 differ from the sides 42 in that the cam surface 43 is made at the inner ends of the sides 45, and said sides 45 are spaced apart, in the retracted position of the rod 40, a distance sufficient to receive the enlarged head 46 of the cap, while the ends 47 of the jaws engage the smaller flanges 48 of the cap. The rod 40 is of about the same diameter as the head 46 so that the

jaws may be properly spread to allow the entrance therebetween and removal therefrom of the cap head.

It will be understood that the tube engaging member 30, or the tube engaging jaws 36 or 44 may be duplicated on each side of the block 35, such duplication of the member 30 being clearly shown in Figs. 1, 2, 3, 5 and 6, wherein a pair of diametrically opposed members 30 are arranged on said block for the purpose of enabling the transfer mechanism to operate comparatively slowly. A single member 30 or a single pair of tube engaging jaws may be used instead, if desired, the only difference being that to attain the same production, the mechanism would be speeded up. In the description of transfer mechanism which follows, it is assumed that two sets of such tube engaging devices are provided on the block 35, though Figs. 8 to 11 inclusive illustrate the use of a single pair of jaws instead of duplicate pairs.

The mounting of the tube engaging devices on the support 49 therefor, and the means for reciprocating the support will now be described.

The member 30 may be permanently secured to, and extends from the support 49, which is in turn sufficiently loosely mounted on the shaft 50 for rotation thereabout and at times movable bodily therewith in a manner soon to be described. As above pointed out, a similar member 30 may project from each side of the support 49, (Figs. 1, 2, 3, 5 and 6), or a single pair or duplicate pair of jaws 36 or 44 may be pivoted thereto. The shaft 50 also carries the gear wheel 51, which is loosely mounted thereon, said shaft having a reduced extremity 52, to which is secured one end of the slidable bar 53 as by means of the nut 54. The grooved guide 55 slidably supports the bar 53 for proper horizontal movement, said bar being pivotally connected at its other end to the link 56, as by means of the screw 57. Reciprocation of the operating bar 53 is effected by any suitable means, such as the link 58 connected at one end to any suitable source of power, not shown, and at its other end, to the link 56.

In order to prevent relative movement of the gear 51 and the support 49 and consequent displacement of the parts longitudinally of the shaft, while at times allowing relative rotation of said parts, the gear 51 is suitably recessed as at 59 to receive the collar 60 of the shaft 50, suitable washers as 61 being secured in the recess 62 of the support as by means of the screw 63 threaded into the front end of said shaft. Said washers engage the support 49 with sufficient friction normally to prevent rotation of said support on the shaft unless the support is positively rotated by a suitable connection to the gear 51.

Since both the gear 51 and the support 49 are rotatable on the shaft 50, means are provided for operatively connecting said gear and said support during the stroke of the bar 53 from dismounting to mounting position. Said means consists preferably of a ratchet and pawl connection shown in a simplified form and as illustrated, comprises the pawl or pin 63 mounted in the hole 64 of the gear 51 and urged by the spring 65 into its extreme forward position. On the stroke of the bar 53 just referred to, said pin enters the tooth or notch 66 of the support 49, said notch being in the nature of a tooth having a straight side 67 and an inclined side 68, whereby the rotation of the gear wheel in one direction is transmitted to the support, while its rotation in the other direction causes no rotation of the support.

For rotating the gear 51 at predetermined intervals, a stationary rack 69 meshing with said gear is supported in proper position by any suitable means such as the standards 70. Said standards serve also to support the horizontal main guide 71, which in turn supports the grooved guide 55 for the gear operating bar 53, whereby the weight of the transfer mechanism is carried by said main guide.

The grooved guide 55 is secured to the main guide 71 as by suitable fastening means 72 and guides the bar 53 in its reciprocating movement. The rack 69 is made of considerably less length than that sufficient to reach from the mounting position where the tubes are engaged by the tube engaging members, to the dismounting position where the tube is discharged from said members, for the purpose which will appear more fully hereinafter.

The means for dismounting the tube from the various tube engaging devices will now be described, that for the conical engaging member 30 being referred to first.

Pivotally mounted on the front face of the support 49 is a lever 73, secured to the support for oscillation thereon, as by means of the screw 74, the inner end of said lever being slotted as at 75 for the reception of a pin 76. Said pin projects forwardly of the slide 77, which is mounted for reciprocation in the recess 62 of the support 49, being maintained in place by the plates 78, secured to the front face of the support and forming therewith a guiding means in which the slide 77 may be reciprocated. At the outer end thereof, said slide terminates in a rearwardly arranged extension or projection 79, apertured as at 80 for the passage of the tube engaging member 30. It will be understood that on the oscillation of the lever 73, the slide 77 is moved longitudinally of the tube engaging member 30 so that if a tube is mounted on said member, outward movement of the slide toward the end of member 30 causes said slide to engage the end of the tube neck and to push the tube off said member. A spring 81 secured to the pin 82 of the lever 73 and to the sup-

port urges said slide toward its retracted position.

The mechanism illustrated in Figs. 8 to 11 inclusive for engaging the neck end of the tube externally is similarly mounted on the support 49, similar means being there used for discharging the tube. In place, however, of the slide 77, the rod 40 is sildably mounted in a suitable journal 83 in the support 49, the pin 76 projecting from said rod into engagement with the lever 73. The spring 81 becomes unnecessary in this construction and hence is omitted, reliance being had upon the spring 38 for maintaining the jaws in their proper positions. It will be seen that movement of the rod 40 outwardly toward the ends of the jaws by the lever 73, opens the jaws and allows the rod to discharge the tube.

For insuring the proper alignment of the tube-engaging members in the mounting position thereof, a suitable pin as 84 projects rearwardly from the gear wheel 51 and is arranged to enter the slot 85 of an aligning stop 86, which is mounted on the grooved guide 55. In that form of my invention wherein a double stroke of support 49 is required to transfer the tube, a duplicate aligning support is provided on the other side of the gear, if desired.

While the support 49 is rotatably mounted on the shaft 50, it is held thereon with sufficient friction by means of the screw 57 and the washers 61 so that said support maintains any position on said shaft to which it may be set, unless positively moved therefrom. It will be understood, therefore, that where duplicate tube engaging means are used, during one part of the stroke of the bar 53, the gear and support do not move together and that proper alignment of the gear 51 as by means of the aligning pin 84 and the aligning stop 86 may not necessarily align the support 49 in the proper position to allow certain of the tube engaging means to engage the neck 34 of the tube, and that the support should be independently aligned. For that reason, I provide an additional aligning stop 87 secured to the guide 55 as by means of the screws 88 and provided with a slot as 89 for the reception of the aligning pin 90 projecting from the support 49.

For operating the lever 73 to cause it to remove the tube from the tube engaging pins or member, I prefer to provide a lever engaging stop 91 having a projection 92 extending into the path of the outer end of said lever. I also prefer to provide a second aligning stop 93 for engaging the pin 90 and holding said pin whereby rotation of the member 49 during the dismounting operation of the lever 73 is prevented.

It will be understood that if only one of the tube engaging devices be used instead of a duplicate pair, the ratchet and pawl connection between the gear 51 and the support 49 may be omitted and the rack 69 shortened at both ends, so that the tube is first drawn off the mandrel in mounting position, then rotated toward dismounting position, the tube engaging means being rotated and reciprocated back empty to the mounting position, ready to engage the next tube. The aligning means may also be dispensed with if desired.

The operation of the means for removing the tubes from the chute or runway 14, mounting the tubes on the mandrel of the enamelling machine, enamelling the tube and transferring the enamelled tube to the conveyor is as follows:

The tubes having been fed to the chute 14 with the necks thereof turned away from the enameller 10, the lowermost tube on the chute is pushed by the rod 24 on the reciprocation of said rod on to the mandrel 13, the face plate being at this time stationary. Said face plate now being rotated, the mandrel 13 is brought into enamelling position and the inking roller 15 rotates in contact with said tube and enamels it, after which the face plate again moves the tube to the mounting position indicated in Fig. 3 where the face plate is temporarily halted for the withdrawing operation. In this position, the link 58 has carried the bar 53 towards its position at the extreme right and the aligning stop 86 has engaged the pin 84 of the gear 51 which is off the rack 69. The stop 87 has also engaged the pin 90 whereby rotation of both the gear 51 and the support 49 is prevented and the parts become properly aligned, the spring pressed pin 63, by its engagement with the tooth 66, serving to operatively connect the gear and the support so that these parts rotate as a unit in their movement into mounting position, as will be later again referred to.

The pin 84 having entered the slot 85 of the aligning stop 86, the support 49 is thereby aligned in such position that in the case where the tubes have circular neck openings, the conical point 31 of the member 30 registers with the neck opening 33 of the tube.

In such mounting position, the member 30 therefore has entered the neck 34 and has been wedged into engagement with the neck. The parts are now in position to be withdrawn to the left for removing the tube from its mandrel. This is accomplished by the link 56 which is now moved toward the left carrying with it the bar 53 and the parts connected thereto including the shaft 50, the gear 51 and support 49.

The pin 63 now slides over the inclined side 68 of the notch 66 so that rotation of the gear 51 causes no rotation of the support 49, the latter member being mounted on the shaft 50 with sufficient friction to effect this purpose. No rotation of the gear 51 occurs,

however, until said gear has been moved toward the left a sufficient distance to engage the teeth of the rack 69. The length of said rack and the diameter of the gear are so proportioned in this construction, that the gear rotates a half revolution during its reciprocatory stroke from the mounting to the dismounting position and rotates back the same amount in the opposite direction on its stroke from dismounting position to mounting position. The support 49 rotates through the same angle, on the stroke from left to right and does not rotate on the stroke from right to left. It will be remembered, however, that where only one tube engaging device is mounted on the support 49, rotation of said support occurs on both strokes. Continuing the description for the duplicate tube engaging devices, that tube 12 which has been mounted on that member 30 which was on the right of the support in the mounting position, is carried longitudinally to the left without rotation on the withdrawing stroke of the support 49 into the position indicated in Fig. 1, in which the tube remains at the extreme right of the support.

The movement of the conveyor chain 29 is so synchronized with the movement of the transfer mechanism, that the pin 28 of the conveyor moves into proper position to receive any tube 12 which may be on the left pin 30, as the transfer mechanism moves towards dismounting position. During the latter part of the movement toward the left of the transfer mechanism, the stop 91 engages the uppermost one of the levers 73 and during the continuance of the movement of said mechanism, said lever is thereby caused to rotate about its pivot 74, moving the slide 77 toward the left along the member 30 and thereby pushing the left tube 12 off said member and on to the pin 28. At the same time, the stop 93 engages the left pin 90, and prevents rotation of the support 49 when the lever 73 is operated.

The link 56 is now drawn toward the right, thereby releasing the lever 73 from the stop projection 92 and allowing the slide 77 to be drawn back to its initial position under the influence of the spring 81. During that part of the reciprocating movement or stroke toward the right of the gear 51, said gear is rotated a half revolution in a clock-wise direction as viewed in Fig. 1, together with the support 49, whereby the tube on the right of the support is rotated into position at the left of the support, and the empty left member 30 is rotated into position at the right ready to enter another tube on a mandrel 13.

This rotation continues until the gear 51 leaves the rack 69, whereupon further rotation ceases, due to the frictional engagement of the support 49 with the shaft 50, the parts being brought into the position shown in Fig. 1, and aligned as hereinbefore described, while the right empty member 30 engages another tube. The operation described is, of course, automatically repeated so long as tubes are supplied to the mandrels.

Where the tube engaging jaws 36 or 44 are used for externally engaging the neck or cap of a tube, the operation is substantially the same.

The jaws, however, arrive at the mounting position spread apart by the rod 40 which is in its extended position. Movement of the support 49 toward the tube causes the end of the tube to engage the rod 40 and to push said rod into retracted position. When said rod passes the cam surface 43, the jaws are urged toward each other by the spring 38 and are thereby clamped upon the neck or the cap of the tube, as the case may be, whereupon the withdrawing operation into dismounting position may proceed, as above described, in connection with the tube engaging member 30.

In the dismounting position, the lever 73 is operated by the stop 91 as hereinbefore described, thereby pushing the rod 40 between the tube engaging jaws and discharging the tube on to one of the pins 28 of the conveyor chain 29.

It will be seen that I have provided a method for preventing deformation and injury of collapsible tubes during the enamelling of the tubes, said method consisting of automatically transferring the tubes from place to place during the various operations thereon. It will also be seen that I have provided simple and efficient mechanism for transferring frail, collapsible tubes for the various operations thereon and that said mechanism may be used for transferring tubes for various types of operations during the manufacture of said tubes. While I have shown and described specific embodiments of my invention, I do not intend to be understood as limiting myself to the structure herein shown and described since I intend to claim my invention as broadly as may be permitted by the state of the prior art and the terms of the appended claims.

I claim:

1. In mechanism of the character described, a rack, a reciprocating gear slidable thereon, a pair of oppositely disposed and directed tube-engaging members, a support for said members, a ratchet and pawl connection between the support and the gear, and spring-pulled slides carried by the support and each coacting with one of the tube-engaging members for stripping the tube therefrom.

2. In a tube transfer mechanism for advancing soft metal, collapsible tubes each having an open end thereon, a pair of spaced elongated supports each adapted to be inserted into the open end of a tube, and arranged with their axes parallel, a pair of

oppositely disposed tube engaging members, and means for reciprocating said members, for causing one of said members to engage a tube to withdraw the tube from one support therefor on one of the reciprocatory strokes of said means, to disengage and dismount a tube from the other of said members at the end of said stroke and to mount it on the other support, and on the opposite stroke to rotate the first-mentioned member with the tube thereon into dismounting position while simultaneously rotating the other of said members into tube mounting position, comprising a rack, a reciprocatory and oscillatory gear engaging the rack, means for supporting said members, means for operatively connecting the support to the gear to rotate the support on said opposite stroke, and slidable members on the support for operating the tube-engaging members.

3. In a tube transfer mechanism, a cylindrical revoluble mandrel adapted to pass into the open end of a tube and to engage the inner surface of a tube, a conveyor chain, a pin outstanding from the chain at substantially right angles to the direction of movement of the chain and adapted to enter the open end of the tube to support the tube, said pin being spaced from the mandrel, means for withdrawing a tube from the mandrel, including a pair of oppositely disposed similar devices for engaging the neck of the tube, a pivot for and arranged between said devices, and a slidable member for disengaging said devices from the neck of the tube, and means for operating said withdrawing means to move said tube-engaging devices axially of the mandrel for a predetermined distance in a straight line path toward the pin to cause one of said devices to engage and withdraw a tube from the mandrel and simultaneously to cause the other tube-engaging device to mount a tube on the pin and to become disengaged from said tube, said operating means rotating said tube-engaging devices about said pivot to interchange the position thereof on the next movement of the withdrawing means and simultaneously moving said devices toward the mandrel.

4. In mechanism of the character described, a revoluble cylindrical mandrel adapted to enter the interior of a collapsible soft metal tube through the open end thereof and to contact with the inner surface of, and to support, the tube rotatably thereon, a member for gripping the tube near the neck end thereof while the tube is on the mandrel, means for reciprocating said member axially of the mandrel to withdraw the tube from the mandrel for a predetermined distance on one of the reciprocatory strokes of the member, means for swinging said member when said member is reciprocated toward the mandrel by said reciprocating means on the next stroke, and a slidable member for engaging the end of the tube to disengage the tube-engaging means from the tube and to dismount the tube on the third reciprocatory stroke of said member.

5. In a transfer mechanism for thin, soft metal, collapsible tubes open at at least one end and having a neck thereon, a pair of similar tube-engaging elements, a support for said elements pivoted at a point between the elements, means for reciprocating said support in a straight line path during the tube-withdrawing stroke and for rotating said support about its pivot through an angle of approximately 180° on the other stroke, a spring-pressed member reciprocatory in the direction of the reciprocation of said elements and arranged to push upon the neck end portion of the tube engaged by said elements to disengage the tube from said elements at the end of the withdrawal stroke of the support, one of said elements engaging a tube at the beginning of the withdrawal stroke, while the positions of said elements is inter-changed at the end of the opposite stroke to permit the disengagement of the tube at the end of the next withdrawal stroke.

6. In a transfer mechanism for thin, soft metal, collapsible tubes open at at least one end and having a neck thereon, a revoluble mandrel for revolubly supporting a tube, a conveyor, a tube-supporting pin projecting from and beyond said conveyor, and reciprocatory and oscillatory means including a pair of similar tube-engaging elements, one of said elements axially withdrawing a tube from the mandrel on one stroke of said means while the other element simultaneously mounting the tube on said pin, means for disengaging said last-mentioned element from the tube so mounted on the pin, said reciprocatory and oscillatory means interchanging the positions of said elements on the other stroke of said means toward the mandrel.

7. In mechanism of the character described, a cylindrical revoluble mandrel for revolubly supporting a tube, a movable pin adapted to enter the tube for supporting and advancing the tube after it has been removed from the mandrel, means for engaging a tube on the mandrel, means for reciprocating said engaging means in a straight line path for withdrawing the tube from and axially of the mandrel on one stroke, means for rotating the engaging means to carry said engaging means from a position adjacent the mandrel to a position adjacent the pin on the opposite stroke, and a member slidable axially of the mandrel for disengaging the tube from the engaging means after said tube has been mounted on the pin.

8. In mechanism of the character described, a revoluble mandrel adapted to enter the open end of a tube for supporting the tube, a tube-engaging member, means for first moving

said member axially of and away from the mandrel after it has engaged a tube thereon, for then simultaneously rotating said member through an angle of approximately 180° and for moving said member toward the mandrel after the tube has been disengaged from the mandrel, to arrange the tube in a diametrically opposite position, and means for disengaging the tube from the engaging member after the position of the tube has been reversed.

9. In mechanism of the character described, a support, oppositely disposed duplicate elements projecting from said support and each adapted to engage a tube, a pivot for said support between the elements, means for moving said support axially of said elements in one direction to a position wherein the tube is dismounted from one of said elements, for rotating said support a half turn and simultaneously moving said support in the other direction to mounting position, and means for aligning said support and the element from which the tube has been disengaged in mounting position.

10. In mechanism of the character described, reciprocatory tube-engaging and withdrawing means slidable from tube-receiving to tube-discharging position, means for rotating said reciprocatory means on the return stroke thereof to reverse the position of said reciprocatory means, and means for disengaging the tube engaged by said reciprocatory means on the third stroke thereof.

11. In mechanism of the character described, a rack, a gear engaging said rack, means for reciprocating said gear along and relatively to the rack, a pair of similar oppositely disposed tube-engaging elements, a support for said elements, a pivot for the support, and means for operatively connecting the support to the gear for reversing the support diametrically on alternate reciprocatory strokes of the gear.

12. In mechanism of the character described, a revoluble mandrel adapted to enter the open end of a thin soft metal, collapsible tube for revolubly supporting the tube, a reciprocating gear, a rack adapted to engage said gear, a pair of oppositely disposed tube-engaging members supported by said gear, and means for operatively connecting the tube-engaging members to the gear on each alternate stroke of the gear for inter-changing the positions of said members on said alternate strokes.

13. In mechanism of the character described, means for advancing a tube including a cylindrical revoluble mandrel insertable into the open end of the tube, a reciprocating tube-engaging member for gripping the tube near the other end thereof and for first advancing the tube in a straight line path, means for then rotating the member on the reciprocation thereof in the opposite direction toward the mandrel, means for thereafter disengaging the member from the tube on the next movement of said member in a straight line path, and a pin arranged with the axis thereof in the direction of said path for receiving the tube on the disengagement thereof from said member.

14. In mechanism of the character described, a revoluble cylindrical mandrel insertable into the open end of a thin collapsible tube for revolubly supporting the tube, a pin arranged with the axis thereof parallel to the mandrel and spaced from the mandrel, and means for transferring the tube from the mandrel to the pin comprising a pair of similar tube engaging elements, and means for moving said elements in a straight line path away from the mandrel and toward the pin and for inter-changing the positions of said elements while moving said elements toward the mandrel and away from the pin.

15. In mechanism of the character described, means for advancing a thin collapsible tube including a revoluble mandrel insertable into the open end of the tube, a reciprocating member adapted to receive the other end of the tube, means for moving said member to withdraw the tube from the mandrel, means for then rotating the member through an angle of approximately 180°, means for then again moving the member in a straight line path to carry the tube to a position wherein the tube may be dismounted from said member, and means for dismounting the tube from said member at the dismounting position.

16. In mechanism of the character described, reciprocatory tube-receiving and withdrawing means slidable from tube-receiving to tube-discharging position, means for rotating said reciprocatory means on the return stroke thereof to reverse the position of said reciprocatory means, and means for dismounting the tube from said reciprocatory means on the third stroke thereof.

WALTER PRUSSING.