Feb. 26, 1935. W. PRUSSING 1,992,634

COLLAPSIBLE TUBE MECHANISM

Filed May 22, 1931

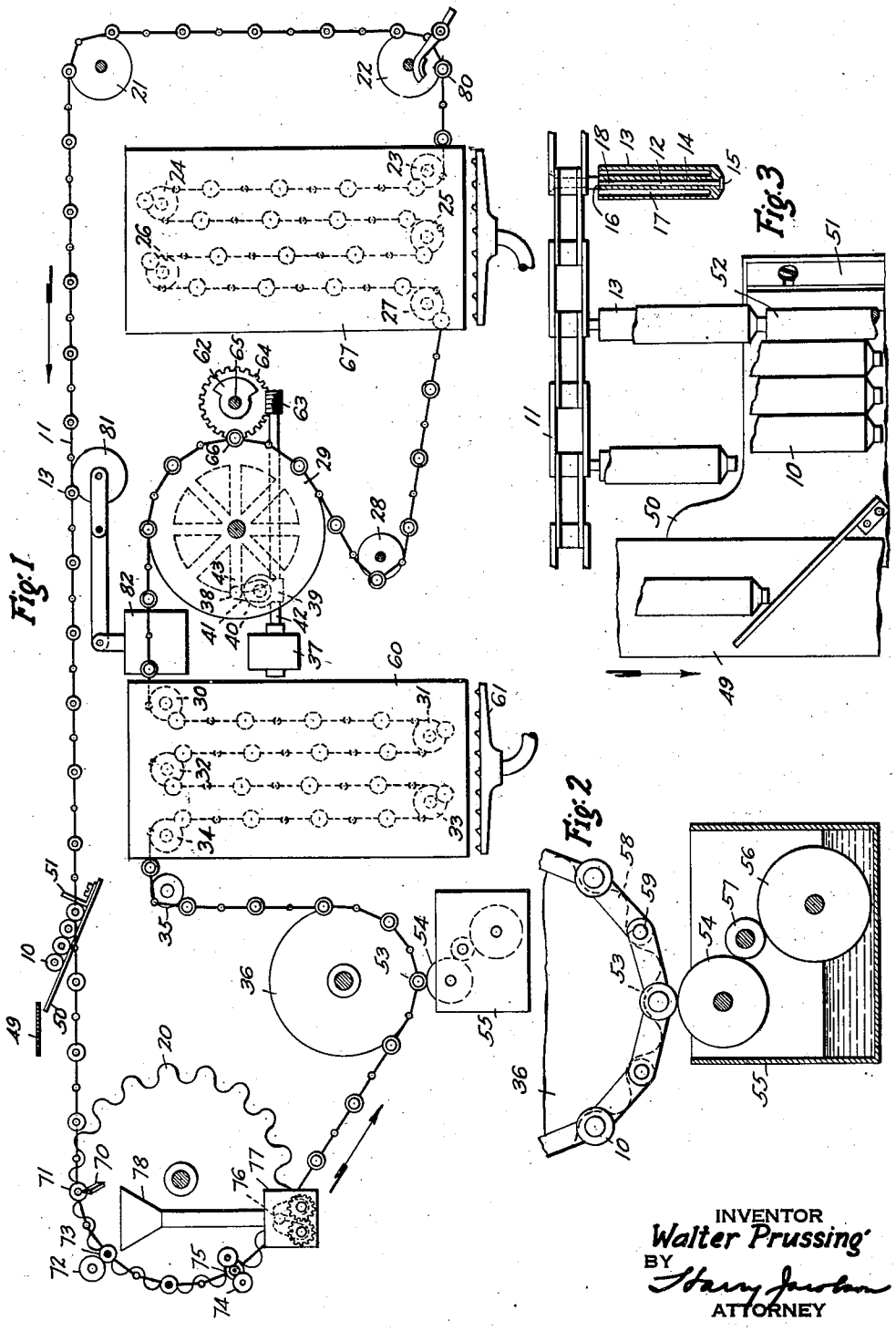


Fig. 1

Fig. 3

Fig. 2

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Patented Feb. 26, 1935 1,992,634

UNITED STATES PATENT OFFICE

1,992,634

COLLAPSIBLE TUBE MECHANISM

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Application May 22, 1931, Serial No. 539,287

15 Claims. (Cl. 29—33)

This invention relates to machines for operating upon collapsible tubes such as are used to contain tooth-paste and the like, and is particularly applicable to mechanism for automatically advancing such tubes for the performance of all of the various finishing operations thereon.

It has been customary heretofore in the manufacture of collapsible tubes to extrude the tubes in a suitable press, from which the tubes are then discharged, and carried automatically or manually to a machine wherein the tube is trimmed and threaded. The tube has then, in most cases, been manually dismounted, and manually capped, though in some cases, the capping operation may be performed on the trimming machine. The capped tube may be dismounted from the capping machine either manually or automatically, and is then customarily carried by an operator to the mandrel of an enamelling machine where the enamelling operation is performed. The enamelled tube is then usually again handled in order that it may be suitably dried, and after it has been dried, it must be again mounted, usually manually, on the mandrel of a printing machine and then again dried. All of these operations have usually required a considerable amount of manual handling of the tube or as is shown and described in my previous application for patent for Method and mechanism for making collapsible tubes, Serial No. 395,332, filed July 25th, 1928, the tube is automatically dismounted from one mechanism and remounted on another mechanism.

It will be understood, therefore, that when the comparatively fragile and easily damaged tube is mounted and dismounted either manually or automatically a considerable number of times, the danger of injury thereto is much greater than would be the case if the tube, when once mounted on a suitable mandrel, were subjected to the various operations thereon without further manipulation.

My invention therefore contemplates the provision of advancing means suitable for properly supporting the tube and for carrying the tube into position for the various finishing operations thereon, once the tube has been mounted on said means, without the necessity for at any time removing the tube from the advancing means, until it has been completely finished.

My invention further contemplates the provision of a means and a method for so supporting, advancing and operating upon the tube that the tube need not be removed from its support until it is completed, that is, until the unfinished tube, once mounted, has been trimmed, threaded, capped, enamelled, dried, printed and again dried.

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

Fig. 1 is an elevation of typical mechanism embodying my invention in more or less diagrammatic form.

Fig. 2 is a similar elevation and partial section of a portion of the enamelling mechanism shown in Fig. 1, illustrating how the tube is properly positioned for the performance of one of the finishing operations thereon.

Fig. 3 is a top plan view, showing one of the supporting mandrels on the conveyor chain in section, and showing further, the means for mounting a collapsible tube on to one of the mandrels.

In that practical embodiment of my invention which I have illustrated by way of example, I prefer to utilize a conveyor chain supplied with suitable mandrels, as the means for supporting the tube 10, and for advancing the tube to the various stations where the desired finishing operations may be performed thereon. The chain 11 consists of suitable links pivoted together at their ends in a manner which is well known. Certain of the pivot pins 12 for the links, however, may be of greater diameter and length than the remaining pins, and are extended beyond the side of the chain to a sufficient extent to serve as the support for the mandrel 13 revolubly mounted thereon. As illustrated in Fig. 3, the mandrel is of the proper length and diameter to fit into and to engage the interior surface of a tube and to support the tube 10, and is provided with a central opening as 14 for the reception of the bearing pin 12. Said pin is suitably secured at one end to the chain and at the other end, is provided with an adjusting nut 15 to prevent accidental displacement of the mandrel thereon, but to allow the removal of the mandrel and the substitution of a mandrel of a different size to receive a tube of different diameter. A suitable shoulder as 16 is provided near the other end of the pin, whereby adjustment of the nut 15 maintains the mandrel revolubly in proper position between said shoulder and the nut.

It will be understood that the mandrel may be made hollow as at 17 for the purpose of reducing the weight thereof and for economy. It will further be understood that the supporting portion 18 of the pin 12 may be made of a separate piece, if desired, and may be provided with

a head and screwed into the remainder of the pin 12, which may be made hollow for that purpose, or that said pin 12 may be made of a single piece, if desired. A series of mandrels 13 in proper spaced relation are arranged on the similarly spaced pins 12 secured to the chain. The chain may be driven in any suitable manner intermittently, and guided into various positions to move in various directions and through various paths as by means of a series of sprocket wheels 20 to 36 inclusive.

I have therefore shown means for driving the sprocket 29 intermittently, so that the chain and the mandrels therein are halted at the proper time and in the proper positions accurately, to permit the operations to be performed upon the tube while the chain is at rest. As illustrated, said means includes the motor 37 driving the Geneva pin 38, as by means of the worm 39 and worm wheel 40, through the crank 41 mounted on the worm wheel shaft. The worm 39 is driven in turn through a motor shaft 42. The pin 38 operates in succession in each of the radial Geneva slots 43 whereby the sprocket wheel 29 is intermittently rotated through an exact predetermined angle to bring the various mandrels simultaneously into position for the various finishing operations. I prefer to arrange the various tube finishing mechanisms, such as the trimming and threading tools, the capping devices and the enamelling and printing rollers, adjacent the points where the various sprocket wheels engage the chain and hold it while at rest against possible displacement during the respective operations. The slack in the chain may be taken up by a suitable idler sprocket 81 under the influence of the weight 82, so that the chain is taut at the operating stations.

In order to mount the tubes on the mandrels 13, the capped tubes 10 may be supplied to a suitable inclined plate as 50, as by means of a suitable belt 49 extending to the discharge part of the extruding press hereinbefore mentioned. The tubes are arranged in a row on the belt or plate and roll until halted by the adjustable angle stop 51 in the manner illustrated in my co-pending application for patent for Automatic tube finishing and advancing machine, filed March 28, 1931, Serial No. 526,025. A rod as 52, suitably reciprocated at the proper time, engages the end of the last tube of the row aligned on the supporting member 50, and when the mandrel 13 is in alignment with said tube, pushes the tube upon the mandrel, it being understood that the chain 11 is halted at this time by the disengagement of the pin 38 from the slot 43 in which it has been operating.

At the same time that a tube is being mounted upon the mandrel 13, other finishing operations may be performed simultaneously upon tubes supported by other smilar mandrels on the chain. For example, a suitable neck trimming tool 70 such as is well known in the art, may be used to trim the neck of the tube on the mandrel 71. At the same time, a trimming roller 72 may be trimming the open end of the tube on the mandrel 73, thereby cutting the tube to the proper length. Threading rolls as 74 may be operated to thread the neck of the tube on the mandrel 75. The trimming and threading mechanism are of the type which are well known in the art and which are illustrated, for example, in my said co-pending application Serial No. 526,025. A cap may be applied to the threaded neck of the tube on the mandrel 76 as by means of suitable capping mechanism 77 such as is shown, for example, in the patent to Konigsberg, No. 1,679,865, dated August 7, 1928, and in which suitable caps are supplied to the hopper 78.

At the same time, one of the mandrels as 53 (Fig. 1) has been brought into position to be enamelled by the enamelling roller 54 of the enamelling machine. Said roller receives enamel in the usual manner from the enamel box 55, through the enamel-supplying rolls 56 and 57, driven by suitable means well known in the art and hence unnecessary to be described or shown. As shown in Fig. 2, the sprocket wheel 36, as well as the similar wheel 20, are provided with suitably shaped teeth 58 adapted to enter between the pin 12 and the link pivot 59, and to control the position of the chain on the rotation thereof, without engaging or interfering with the mandrel or with the tube thereon.

It will further be understood that the remaining sprocket wheels are provided with similarly shaped teeth for the same purpose. On the engagement of the tube 10 on the mandrel 53 by the enamelling roller 54, the tube together with the mandrel which supports it are rotated by the action of the roller 54 about the pin portion 18 for just sufficient time to coat the entire tube with enamel. Similarly, the capping mechanism, the threading rolls and the open end trimming roll rotate the tube while it is being operated upon. Suitable means, not shown but well understood, may be provided for rotating the mandrel 71 during the neck trimming operation.

By means of the sprocket wheels 30 to 35 inclusive, the chain with the wet enamelled tubes on the mandrels thereof are carried through the heated drier 60 which is suitably heated by any suitable means such as the heater 61. It will be understood that the number of sprocket wheels in the drier, and the length of chain carried therein is such that the wet tube is maintained within the drier 60 for a sufficient time to thoroughly dry the tube. The dry tube is then carried over the sprocket wheel 29 into position to be printed by the printing plate 62. Said plate is continuously rotated as by means of the worm 63 on the motor shaft 42, said worm engaging the worm wheel 64 on the printing plate shaft 65. It will be understood that the movement of the chain 11 and the position and rotation of the printing plate 62 are so synchronized and arranged that said printing plate engages the tube which has been halted at the printing position indicated by the numeral 66, to print the plate just before the next intermittent movement of the chain 11 occurs, and while the other operations previously described are being performed on the other tubes carried by other mandrels.

It will further be understood that the printing plate is so arranged that if there should be no tube on the mandrel, the printing plate does not print since it is then spaced from the mandrel a distance equal to the thickness of the tube. After the tube is printed, the chain is carried about the sprockets 23 to 28 inclusive, and enters the drier 67 which is similar to the drier 60 and hence need not be further described. The tubes now being finished may be inspected and then removed from the mandrels after leaving the drier, at any suitable point such as at the mandrel 80, in advance of the mounting member 50, the removal being accomplished manually, if desired, or automatically, such as by means of the dismounting arm illustrated in my co-pending application

Serial No. 526,025, or by the mechanism illustrated in my said application for patent for method and mechanism for making collapsible tubes, hereinbefore referred to.

It will be seen that I have shown and described simple and efficient means and a method for completing the various operations upon a collapsible tube necessary to finish it, without handling the tube or dismounting it from the support on which it is once placed, thereby producing a mechanism and method which is economical, efficient, and which greatly reduces possibilities of waste and damage, and which are entirely automatic in their operations.

While I have shown and described certain specific embodiments of my invention, I do not wish to be understood as limiting myself thereto since I intend to claim my invention as broadly as may be permitted by the state of the prior art and the scope of the appended claims.

I claim:

1. In mechanism for operating upon thin metal collapsible tubes, a conveyor chain including a series of links pivotally secured together, spaced pins serving as pivots for, and securing the links together, and projecting beyond the links, a mandrel revolubly mounted on each of the pins and adapted to fit into and to support a tube, means for intermittently advancing the chain, and means for engaging the tube on a mandrel for rotating the tube and the mandrel and for performing a finishing operation upon the tube while the chain is at rest.

2. In mechanism for operating upon thin metal collapsible tubes, a conveyor chain, spaced transversely extending pins forming part of the chain and projecting beyond at least one side of the chain, a mandrel revolubly mounted on each of the pins and adapted to have its exterior surface fit into the interior of and to support a collapsible tube, means for intermittently advancing the chain and for halting each of the mandrels thereon in succession at a series of predetermined positions, and means for simultaneously operating upon a series of tubes supported by the mandrels to perform finishing operations upon the tubes, including means for rotating the tube and the mandrel and for coating the surface of the tube while the chain has been halted and a given mandrel is brought to rest at one of said predetermined positions.

3. In mechanism for operating upon thin metallic collapsible tubes, a conveyor chain, a series of revoluble sprocket wheels engaging said chain and effective to change the direction of the movement thereof and to hold taut that part of the chain engaged thereby, means operatively connected to at least one of said sprocket wheels for intermittently rotating the sprocket wheels and thereby advancing the chain through a predetermined distance step by step, a series of spaced tube-supporting rotatable mandrels carried by the chain and intermittently advanced thereby, reciprocatory means for mounting tubes in succession on successive mandrels, a drier surrounding a portion of the chain for drying tubes carried by the mandrels, means arranged in advance of the drier and adjacent a sprocket wheel for coating the surface of a tube carried by the mandrel while the chain and mandrel are at rest, and means adjacent a sprocket wheel for performing at least one additional finishing operation upon the tube while the tube remains on the mandrel.

4. In mechanism for operating upon thin metallic collapsible tubes, an intermittently advancing conveyor chain, a series of revoluble mandrels carried by the chain and arranged on one side of the chain, and each adapted to fit into the interior of and to support a collapsible tube until the tube is completely finished, reciprocatory means for mounting a tube on the mandrel, and means for performing a series of finishing operations in succession upon the tube between movements of the chain.

5. In mechanism for operating upon thin metallic collapsible tubes, a series of spaced mandrels, each adapted to fit into and to support a tube, flexible means for supporting and intermittently advancing the mandrels, means for changing the path of movement of and for maintaining taut parts of said supporting and advancing means, reciprocatory means for mounting tubes on the mandrel, means for performing a series of finishing operations upon the tube to complete the tube while it remains on the mandrel on which it is mounted, including means for coating and drying the tube, and means for dismounting the completed tube.

6. In mechanism for operating upon thin metallic collapsible tubes, an endless flexible member, means for intermittently advancing the member including a Geneva mechanism, a series of spaced cylindrical mandrels on the member, each shaped and proportioned to engage the interior surface of a tube and to support the tube, means for mounting a tube on one of the mandrels while the member is at rest, and means for simultaneously performing finishing operations upon the tubes carried by other mandrels, including means for coating the exterior surface of the tube, and means for drying the tube while it is retained on the mandrel on which it has been originally mounted.

7. In mechanism for operating upon thin metal collapsible tubes, a conveyor chain, a series of spaced pins secured to the chain and each extending transversely thereof beyond the side of the chain and serving as a pivot and connection for the chain links and as a support for a mandrel, a cylindrical mandrel revolubly mounted on each of the pins, and shaped and proportioned to fit the interior surface of and to support a tube, means for removably retaining the mandrel on the pin, a series of sprocket wheels engaging the chain, and changing the direction of the movement thereof and maintaining parts of the chain taut, means operatively connected to at least one of said sprocket wheels for intermittently advancing the chain including a Geneva movement, reciprocatory means for mounting a tube on one of the mandrels while the chain is at rest, means for simultaneously operating upon the tube on another mandrel to perform a finishing operation thereon, means for taking up the slack in the chain to prevent displacement of the mandrel out of its proper position during said operation, and means for simultaneously performing other finishing operations upon the tubes on other mandrels to finish the tubes successively, while each tube is retained on the mandrel on which it is mounted by said reciprocatory means.

8. In mechanism for operating upon thin metal collapsible tubes, a conveyor chain, spaced pins secured to said chain and projecting transversely thereof and beyond the side of the chain, and a mandrel adapted to fit the interior surface of, and to support a tube, removably and revolubly mounted on each of the pins.

9. In mechanism for operating upon thin metal

collapsible tubes, a conveyor chain, spaced pins secured to said chain and projecting transversely thereof and beyond the side of the chain, a mandrel adapted to fit the interior surface of and to support a tube, removably and revolubly supported by each of the pins, means for supporting a row of tubes with the open ends of said tubes adjacent the outermost ends of the mandrels, a stop on said supporting means for aligning the last tube of the row coaxially of a mandrel and a reciprocatory rod for pushing upon the other end of the tube and for mounting the tube on the mandrel.

10. In mechanism for operating upon thin metal collapsible tubes, an intermittently movable conveyor chain, a series of spaced revoluble mandrels supported by said chain beyond the side of the chain, means for supporting a row of tubes with the open ends thereof adjacent the outermost ends of the mandrels, a stop cooperating with said means for aligning the last tube of the row coaxially of one of the mandrels, and means for pushing upon the open end of the tube for mounting the tube upon the mandrel with which it is aligned while the chain is at rest.

11. In mechanism for operating upon thin metal collapsible tubes, a conveyor chain, spaced revoluble mandrels carried by said chain, means for intermittently advancing the chain, means for mounting a tube on each of the mandrels, and means for operating in succession upon each of the tubes carried by each of the mandrels to finish said tubes while each tube is retained by the mandrel on which it is mounted by the mounting means.

12. In mechanism for operating upon thin metal collapsible tubes, a conveyor chain, spaced tube-supporting mandrels revolubly mounted on the chain, means for intermittently advancing the chain and for maintaining parts of the chain taut, means for taking up the slack in the chain, and means arranged at the taut parts of the chain for simultaneously performing finishing operations upon the tubes on the mandrels while the chain is at rest.

13. In mechanism for operating upon collapsible tubes, a conveyor chain, means for intermittently advancing said chain, a series of spaced tube-receiving mandrels on said chain, each of said mandrels comprising an axially arranged elongated bearing member secured to the chain and projecting transversely of and beyond the chain, and a cylindrical mandrel revolubly supported on the bearing member, means for mounting a tube on the mandrel, means for coating the tube while the chain is at rest, said coating means engaging the surface of the tube and rotating the tube and the supporting cylindrical member therefor about the bearing member, means surrounding a portion of the chain for drying the coated tube, means for printing the tube while the chain is at rest, and means for drying the printed tube.

14. A single machine for mounting, finishing and dismounting collapsible tubes comprising an endless flexible conveyor belt, revoluble sprocket means for intermittently moving said conveyor belt, a plurality of tube mounting mandrels in spaced relation to each other secured to said belt, means in fixed spaced relation to said sprockets for mounting, finishing, and dismounting said tubes with respect to said mandrels while said belt is at rest, said tube finishing means including means for trimming, tube cutting means, threading means, capping means, enamelling means, means for drying said enamel, printing means, and means for drying said printing, said tube finishing means being arranged adjacent the sprockets and adjacent that part of the belt engaged by the sprockets to operate upon the mandrel-held tubes where the belt is supported by the sprockets.

15. A single machine for mounting, finishing and dismounting collapsible tubes comprising an endless conveyor belt, means for supporting and intermittently moving said conveyor belt, a plurality of tube mounting mandrels in spaced relation to each other secured to said belt, means in fixed spaced relation to said belt-supporting means for mounting, finishing and dismounting said tubes with respect to said mandrels while said belt is at rest, said tube finishing means being arranged adjacent the belt supporting means to operate upon the tubes while the mandrels are supported against movement under pressure thereon, and including trimming means, tube cutting means, threading means, capping means, enamelling means, means for drying said enamel, printing means, and means for drying said printing.

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