Fig. 2.
AUTOMATIC TUBE CAPPING MACHINE

Ernest M. Monroe, Harrisonburg, Va., and James Smith, Newport, Ark., assignors to Victor Metal Products Corp., Newport, Ark., a corporation of Delaware
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This invention relates to closure applying machines and particularly to devices for capping toothpaste tubes and the like.

In the manufacture of thin walled containers for toothpaste, shaving cream, etc., it has been customary to decorate the thin walled container hereinafter referred to as a tube, and thereafter apply a cap or closure to the tube. The decorated tube is carried through the drying cycle on a conveyor. In order to cap the tube it is customary to remove the tube from the conveyor, place it in a capping device, apply the cap thereto and thereafter replace the tube upon the conveyor. Such operations are time consuming, result is damage to the tube, and do not yield a uniform product.

Accordingly, it is an object of the present invention to provide a tube capping device which will apply the closure to the threaded portion of the tube without removing the tube from the conveyor.

Another object of the present invention is to provide a tube capping device which will be fully automatic and continuous.

A further object of the present invention is to provide a tube capping device which will be compatible with conveyor systems now used in the handling of tubes.

A feature of the present invention is its use of Geneva movements to change the continuous motion of the conveyor device to an intermittent motion to permit cap application.

Another feature of the present invention is its use of a turret head to feed and drive the caps upon the individual tubes.

A further feature of the present invention is its use of a swingable beam to equalize the travel of the conveyor in its passage through the intermittent operating capping device.

A further feature of the present invention is its use of a novel tube clamping device for holding the tube during capping operations.

The invention consists of the construction, combination and arrangement of parts, as herein illustrated, described and claimed.

In the accompanying drawings, forming a part hereof, is illustrated one form of embodiment of the invention, in which drawings similar reference characters designate corresponding parts and in which:

FIGURE 1 is a view in front elevation of a tube capping device made in accordance with the present invention.

FIGURE 2 is a view in side elevation of the tube capping device shown in FIGURE 1.

FIGURE 3 is a fragmentary view somewhat enlarged of the cap feeding section of the device according to the present invention.

FIGURE 4 is a view partly in cross-section taken on line 4—4 in FIGURE 3, looking in the direction of the arrows.

FIGURE 5 is an end view of the capping turret drive section taken from the left of FIGURE 3.

Referring to the drawings, and particularly to FIGURES 1 and 2, 10 indicates a support table having an upstanding frame 11 secured to the top thereof. A beam 12 is pivotally secured to the frame 11 by a bolt 13.

Sprocket wheels 14 and 15 are secured at each end of the beam 12. Additional sprocket wheels 16, 17, 18, 19 and 20, are secured to the frame 11, and form a sinuous path for a line chain 21. The line chain 21 is provided with a series of outwardly extending pins 22 upon which the tubes 23 are placed.

The line chain 21, as shown in FIGURE 1, enters the capping machine from the left and passes around sprocket 16. The line chain 21 may be coming from a drying oven or any other apparatus forming part of the tube manufacturing process. The line chain is led up over sprocket 14, down around sprocket 17, up over sprocket 18, down and around sprocket 19, then up over sprocket 15 on the beam 12, after which it is brought down and around sprocket 20 before it leaves the capping machine. In this manner two loops 29, 30, are formed in the line chain 21 which serve as pickup loops when the tube 23 in the capping station of the machine is brought to rest during the capping operation.

A motor 24 which provides the power for the line chain 21 also drives the automatic capping device. In this manner, synchronization is assured. The motor 24 is in driving engagement with a sprocket wheel 25 by means of a drive chain 26. The sprocket wheel 25 is secured to a shaft 27 which also carries a second sprocket wheel 28.

The sprocket wheel 28 drives a sprocket 29 by means of the chain 30 and sprocket wheel 31. A Geneva drive 32 is secured to the inner end of the sprocket 31.

A Geneva wheel 35 is secured to an elongated shaft 36, above the shaft 31. The Geneva drive 34 turns the Geneva wheel 35 1/8 of a revolution each time the shaft 31 makes a complete revolution. The sprocket wheel 18 is secured to the shaft 36 and advances the line chain 21 with each movement of the shaft 36 to bring one of the pins 22 and the tube 23 thereon into line with the capping station generally indicated at 37.

A guide plate 38 is carried upon the shaft 36 for the purpose of holding the pin 22 in line during the capping operation.

A tube chuck 39 is carried upon the outer end of the shaft 36 and consists of a circular member having transverse flutes 40 in the periphery thereof to receive the tube 23 as it is being capped. The chuck 39 forms a supporting bearing surface beneath the tube and one-half of a jaw arrangement, the other half of which is the tube clamp assembly 41.

The tube clamp assembly 41 consists of a sponge rubber pad 42, carried within a bracket 43. The pad 42 is brought into contact with the tube 23 to hold it securely against the chuck 39. The bracket 43 is secured to a horizontal arm 44 by means of bolts 45. The amount of pressure exerted by the clamp assembly upon the tube can be regulated by adjusting the bolts 45 to increase or decrease the distance of the bracket 43 from the arm 44.

The arm 44 is secured to a block 46, slidably carried between spaced pairs of vertical guides 47, secured to the top of the table 10. The block 46 is controlled by means of a rod 48 driven by a cam 49 secured to the stub shaft 51. As the stub shaft 51 rotates, the cam 49 operates to bring the clamp assembly 41 into contact with the tube 23 as the tube is brought into position upon the tube chuck 39. When the capping operation is finished the cam 49 raises the arm 44 to release the tube 23 so that it may continue its travel out of the capping station.

As the shaft 27 rotates, it turns a large gear 50 which is secured thereto. The gear 50 drives a second gear 51 which is keyed to a small shaft 52 freely carried within a bearing 53, secured to the table 10. A sprocket wheel 54 is also secured to the shaft 52 and drives the chain 55.

The chain 55 drives a second sprocket wheel 56 secured to a shaft 57 freely carried within a bearing 58 secured to the table 10. A cam 59 is keyed to the shaft 57 and...
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3. rotates with it by reason of the movement of the chain 55. A cam follower 60 rides upon the cam 59 and is coupled at its outer end to a link 61 as indicated at 62. The link 61 is pivotally mounted at 63 and as the follower 60 moves in and out, the link 61 rotates back and forth about the pivot point 63. The upper end of the link 61 is coupled to the capping station 37 as indicated at 64. The capping station 37 is slidably mounted upon the table 10 on the ways 65. As the link 61 rotates, therefore, the capping station 37 will be caused to move forward and away from the tube 23 in a predetermined cycle.

The capping station 37, as best shown in FIGURE 3, is mounted upon spaced upright members 66, 67. A hollow shaft 68 is horizontally carried between the upright members 66, 67, and supports upon the end thereof the capping turret 69. The capping turret 69 is substantially wheel shaped and is provided along its periphery with a plurality of cap receiving cavities 70.

In FIGURE 4, by way of illustration there is shown a turret 69 with four cavities to receive caps 71. It will be noted that the caps 71 are fed into the turret 69 by means of a hopper 72. Since a cap 71 fills the cavity 70, only one cap can be released from the hopper 72 at a time. As the turret 69 rotates, the cap 71 slides beneath a plate 73 which keeps it in place until it reaches the capping position indicated at 74.

Each of the turret cavities 70 is provided with a small cap receiving chuck 75. The chuck is freely mounted within the turret 69 by ball bearing 76 and terminates in a bevel gear 77. A driving bevel gear 73 in mesh with each of the bevel gears 77 rotates the chucks 75 and the caps 71 therein thereby driving the caps 71 in the capping position 74 on to the threaded neck 79 of the tube 23. The bevel gear 77 is attached to an elongated shaft 80 which is slipped within the hollow shaft 68, as FIG. 1.

Power to drive the shaft 80 is supplied by a motor 81 mounted upon the table 10. The motor 81 is provided with a pulley 82 secured to the output shaft 83 of the said motor. A belt 84 transfers the rotary power of the motor 81 to one half of a spring loaded clutch 85. The complementary portion 86 of the clutch 85 is secured to the shaft 80. In this manner, it is possible to yieldably control the amount of torque applied to the cap 71 in the capping position 74. The tension on the spring 87 which bears against the clutch 85 can be regulated by means of the collar 88.

The turret 69 is indexed and rotated by the mechanism best shown in FIGURES 1, 2 and 5. A sprocket wheel 89 is attached to the shaft 87 as shown in FIGURE 1. The rotation of the shaft 87 is transferred to a horizontal shaft 90 means of the chain 91. A sprocket wheel 89 with a sprocket wheel 92 secured to the end of the shaft 90. A Geneva driver 93 is attached to the opposite end of the shaft 90. The Geneva driver 93 as best shown in FIGURE 5 engages a Geneva wheel 94 which is attached to the face of the turret 69. As the Geneva driver 93 rotates it indexes the turret 69 one position for each rotation of the driver 93. In this manner, a cap 71 will be brought into the capping position 74 for each rotation of the Geneva driver 93. Therefore, the cap will remain in register with the end of the tube 23 until it can be driven on to the threaded neck 79 by the rotation of the chuck 75.

The operation of the automatic tube capping device will be apparent from the foregoing. The tubes 23 which have been placed upon the pins 22 of the line chain 21 enter the capping device through the motion imparted to the chain 21 by the motor 24. Although the line chain 21 employs an automatic capping device with a continuous motion, the travel through the capping machine is intermittent by reason of the operation of the Geneva wheel 35.

The line chain 21 also leaves the capping station in a continuous movement. Therefore, when the chain 21 is stopped by the Geneva wheel 35, the loop 29 will increase in length and the loop 30 will decrease in length.

This change in the length of the loops 29, 30, is compensated for by the rotation of the beam 12 in a clockwise direction.

It will be noted from an examination of FIGURE 2 that the top of the table 10 is tilted rearwardly so that the pins 23 will retain the tubes 23 therein in their passage through the capping machine. When the tube 23 reaches the capping station the rubber gage of pad 42 of the clamp assembly 41 is brought down upon the surface of the tube 23. The tube is thus firmly held within the capping station. At the same time, the link 61 pushes the tube 23 in the direction of the tube 23 causing the cap 71 to engage the threaded portion 79 of the tube 23. The shaft rotates the bevel gear 78 to spin the cap 71 into place upon the thread 79. The turret 69 is then pulled away from the tube 23 by means of the link 61 and the line chain 21 advanced to bring the next tube into position for capping. As the line chain advances the chain loop 30 will get longer and the loop 29 will become shorter. The beam 12 will thereupon rotate in a counterclockwise direction to compensate for the change of loop length.

From the foregoing it will be seen that there has been provided an automatic tube capping machine capable of applying a threaded cap to a tube without removing the tube from the conveyor chain. The capping machine is able to be inserted in a continuous conveyor system for tubes without interfering with the said conveyor system. Since the tubes are not handled the operation the amount of pressure or torque applied to each cap will be uniform and the possibility of tube damage due to handling will be eliminated.

Having thus fully described the invention what is claimed as new and desired to be secured by Letters Patent of the United States, is:

1. A machine for applying threaded caps to thin walled containers comprising, a continuous conveyor member, a series of elongated container supporting pins on the conveyor member, means to intermittently advance only a portion of the conveyor member through the machine without stopping the entire conveyor, a clamping station, means at said clamping station to hold the container at the stopped portion of its travel, a capping station, means at said capping station to drive the cap upon the container held in the clamping station, means to move the cap driving means of the capping station into and out of engagement with the container and means to release the container from the clamping station whereby successive containers may be capped.

2. A machine for applying threaded caps to thin walled containers comprising, a continuous conveyor member, a series of elongated container supporting pins on the conveyor member, Geneva wheel means to intermittently advance only a portion of the conveyor member through the machine without stopping the entire conveyor, a clamping station means at said clamping station to hold the container at the stopped portion of its travel, a capping station means at said capping station to drive the cap upon the container held in the clamping station, means to move the capping station cap driving means into and out of engagement with the container and means to release the container from the clamping station and advancing caps into the capping station whereby successive containers may be capped.

3. A machine for applying threaded caps to thin walled containers comprising, a table, a frame secured to and extending upwardly to the table, sprocket wheels on the frame, a continuous chain conveyor member engaged by the sprocket wheels, a Geneva wheel means to intermittently advance only a portion of the conveyor member through the machine without stopping the entire conveyor, a clamping station means at said clamping station to hold the container at the stopped portion of its travel, a capping station means at said
capping station to drive the cap upon the container held in the clamping station, means to move the capping station into and out of engagement with the container and means to release the container from the clamping station and advance caps into the capping station whereby successive containers may be capped.

4. A machine for applying threaded caps to thin walled containers comprising, a table, a frame secured to and extending upwardly of the table, sprocket wheels on the frame, a beam pivotally secured to the frame to support one of said sprocket wheels at each end thereof, a continuous chain conveyor member engaged by the sprocket wheels, a series of elongated container supporting pins on the conveyor member, Geneva wheel means to intermittently advance only a portion of the conveyor member through the machine without stopping the entire conveyor, a clamping station means at said clamping station to hold the container at the stopped portion of its travel, a capping station means at said capping station to drive the cap upon the container held in the clamping station comprising, a table, a frame secured to and extending upwardly of the table, sprocket wheels on the frame, a continuous chain conveyor member engaged by the sprocket wheels, a series of elongated container supporting pins on the conveyor member, Geneva wheel means to intermittently advance only a portion of the conveyor member through the machine without stopping the entire conveyor, a clamping station means at said clamping station to hold the container at the stopped portion of its travel, a capping station means at said capping station to drive the cap upon the container held in the clamping station comprising a turret member having a plurality of cavities in the periphery thereof, a cap receiving chuck in each of the cavities and means to rotate the chucks within the cavities, means to move the capping station cap drive means into and out of engagement with the container and means to release the container from the clamping station and advance caps into the capping station whereby successive containers may be capped.

9. A machine according to claim 8 in which the cap receiving chuck in each of the cavities comprises a source of rotary power, a shaft driven by the power source, a bevel gear on the driven shaft, a shaft on each of the chucks and a bevel gear on each of the chuck shafts in mesh with the driven shaft gear.

10. A machine according to claim 8 in which the chuck rotating means comprises a source of rotary power, a shaft driven by the power source, a spring loaded clutch between the said shaft and the bevel gear, a shaft on each of the chucks and a bevel gear on each of the chuck shafts in mesh with the driven shaft gear.

11. A machine for applying threaded caps to thin walled containers comprising, a table, a frame secured to and extending upwardly of the table, sprocket wheels on the frame, a continuous chain conveyor member engaged by the sprocket wheels, a series of elongated container supporting pins on the conveyor member, Geneva wheel means to intermittently advance only a portion of the conveyor member through the machine without stopping the entire conveyor, a clamping station means at said clamping station comprising a fluted circular member rotatably carried by the frame and a reciprocable clamp adjacent the circular member to hold the container at the stopped portion of its travel, a capping station means at said capping station to drive the cap upon the container held in the clamping station, means to move the capping station cap drive means into and out of engagement with the container and means to release the container from the clamping station and advance caps into the driving station whereby successive containers may be capped.

References Cited in the file of this patent

UNITED STATES PATENTS

1,754,461 Cundall Apr. 15, 1930
2,610,779 Fousse Sept. 16, 1952
2,991,607 Menheneott July 11, 1961