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CAP SELECTING AND FEEDING MEANS

Harry A. Drew, West New York, N. J., assignor to
Victor Industries Corporation, Brooklyn, N. Y., a corporation of New York

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This invention relates to mechanism for feeding tubular caps closed at one end and particularly to the means for delivering such caps for collapsible tubes in predetermined positions to a capping station.

The present invention contemplates the provision of agitating and selecting means whereby a sufficient quantity of tubular caps dropped heterogeneously into a hopper are turned into a required position as with the closed end thereof at the rear, and successively fed at regular intervals without interruption toward other mechanism for performing other operations such as mounting the respective caps on collapsible tubes at relatively high speed.

The invention further contemplates the provision of dependable and rapidly acting means for engaging the successive caps and delivering a cap to a “straight” chute if the cap is in its required position or delivering it to a reversing or twisted chute if the cap is in a reversed position.

The invention further contemplates the provision of simple cap agitating means entering the hopper cap and operated by the revolvable cap selecting and forwarding mechanism.

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

Fig. 1 is a rear elevational view with some parts broken away, of the hopper and the cap selecting and advancing means.

Fig. 2 is a vertical sectional view thereof taken on the line 2—2 of Fig. 1.

Fig. 3 is a top plan view and horizontal sectional view taken on the line 3—3 of Fig. 2, the hopper being omitted, of the chute support.

Fig. 4 is a front elevational view of Fig. 3 partly broken away to show the chutes.

Fig. 5 is a vertical sectional view of the support for the chutes taken on the line 5—5 of Fig. 4.

Fig. 6 is a bottom plan view partly in section of the caps controlling the point of discharge of the caps.

Fig. 7 is a rear elevational view of the recessed cap-selecting wheel showing two of the selecting arms, the remainder being omitted for clarity.

Fig. 8 is a horizontal sectional view of the selecting wheel, the selecting arm being shown in dash-dot lines in the position assumed thereby when the cap is in the required position in the recess.

Fig. 9 is a perspective view of the cam controlling the discharge of the cap into the reversing chute.

Fig. 10 is a similar view of the cam controlling the discharge of the cap into the straight chute.

In that embodiment of the invention illustrated, the shaft 12 for operating the mechanism is supported (Fig. 2) in suitable bearings arranged in the cross members 13, 14 carried by the upright spaced angle members 15 and 16. Said shaft is intermittently rotated as by means of the chain 17 passing around the sprocket wheel 18 on the shaft, the chain being intermittently driven in any suitable manner. Near its front end, the shaft 12 carries the selecting wheel 19 provided with a plurality of inwardly extending cap-receiving recesses 20 in its periphery. The front plate 21 suitably secured to the shaft closes off the front sides of the recesses to retain the caps therein against falling out sideways after the caps have been dropped into the recesses from the hopper 22.

For pivotally supporting a selecting arm 23 in a radial position across each recess, each of a series of radial plates as 24 (Figs. 7 and 8) is secured at its front edge to the rear face of the wheel 19 and is fitted into a slot 25 in the inner end portion of the oscillatory arm 23. The inner edges of the plates are fixedly secured together by the ring 26 on the shaft 12, while a suitable pivot pin 27 passes through the inner end of the arm and through the corresponding plate 24, whereby the arm may oscillate on the relatively fixed plate as a guide between the full line and dash-dot line positions thereof shown in Fig. 8. A spring holding pin 28 through the arm crosses the slot 25 and holds the rear end of the spring 29 inserted into the slot around the pin, said spring passing through a suitable hole 30 in the wheel and normally pulling the arm toward the wheel, the front ends of the springs for the various arms being secured together in circumferential spaced relation by the wire retaining ring 31. As best seen in Fig. 8, each of the selecting arms carries near its outer end part, a cap-engaging pin 32 in position to enter the recess 20 at about the center thereof, or if a cap is in the recess to enter the recess or threaded interior of the cap 33 provided the cap is in a reversed position, that it, with its open end in front of the pin. Should the cap be in the required position with the closed end at the rear, the pin engages the closed end as will be explained in more detail hereinafter in connection with the explanation of the control cams 34 and 35 and the by-passing of the straight delivery chute 36 by the reversed caps into the reversing delivery chute 37.
The means for insuring the supply of a cap to a sufficient number of consecutive recesses 20 to insure an adequate supply of caps at the delivery point such as a capping station as the wheel 19 rotates, will now be described. Said means include the hopper 22 for caps, the lower end of the hopper communicating with the relatively short upper chutes 38, 39 and 40 which conduct the caps to the selecting wheel. The hopper is yieldingly and removably secured to the fixed chute support 41 as by the lowermost chordal parts thereof into the respective parts of the grooves 42 in the top surface of the support and maintaining the edges in the grooves by suitable spring latches. The chute support receives the upper part 48 of a leg of each of the angle members 16 and is secured thereto as shown in Figs. 1 and 2. As best seen in Fig. 1, the latch handle 43 at the upper part of the hopper is provided with an upper edge or shoulder 44 urged by the spring 45 into engagement with the fixed cross bar 46 secured to the angle members 47. Similarly, as seen in Fig. 2, the lower part of the hopper is held by similar latches engaging the under side of the cross member of the chute support 41. Extending from the hopper through and to a point below said support are the cap shutes 33, 35 and 46, each of which communicates with a different recess 20 of the selecting wheel when the wheel is at rest whereby caps dropping out of the hopper fall into one of the chutes and thence into a recess. Means are provided for agitating the caps in the chute entrances to prevent jamming of the caps therein. As best seen in Figs. 1 and 4, said means takes the form of a series of spaced parallel upright rods 50 each secured at its lower end to the horizontal web 51 of the rod holder 52 and reciprocating into and out of the discharge opening of the hopper, on the reciprocation of the holder, the rods moving loosely in suitable holes 53 in the chute support. The web 51 is cut away at intervals to permit the fixed chutes to extend therepast and is provided with a front plate 54 extending downwardly from its front edge and having a cam notch 55 therein, being also provided with a rear plate 55 upwards from its rear edge. The rear plate 55 reciprocates in the space between the front faces of the chutes and the U-shaped guide member 57 secured to the chute support as shown in Figs. 3 and 5. Secured to the front plate 54 and shaped to fit and to reinforce the cam notch 55 is the cam plate 56 which is engaged successively by the circumferentially spaced cam rollers 59 carried by the selector wheel and alternately raising the rod holder 52 and rods 58 and permitting them to drop under their own weight a number of times on each revolution of the wheel 18, thereby to keep the caps at the bottom of the hopper in motion and to insure feeding of a cap into each chute.

Since the lateral dimensions or thicknesses of the chutes 38, 39 and 40 are about the same and the same as that of the cap 23, the hollow open end of any tubular cap may become arranged at the front of the recess 20 or at the rear thereof, it being required that it be at the front for the purpose of screwing the cap automatically on to a collapsible tube by suitable means such as the mechanism for capping collapsible tubes disclosed in copending application Serial Number 228,829 filed May 29, 1951, and to which reference is hereby made for a fuller disclosure of the reversing chute 37 and of the means for advancing the cap from the chutes 36 and 37. The selecting arms 23 are therefore designed in connection with the control cams 34 and 35 to cause a cap which is in the required position with its closed end at the rear, to drop into the so-called "straight" chute 36 and one which is in the reversed position shown in Fig. 8 to by-pass the straight chute and to drop into the reversing chute 37 which is twisted 180° and consequently reverses the position of the cap as it drops there through. As shown in Figs. 1 and 6, both cams 34 and 35 are adjoined to the rear face of the reversing sheet 59 which is secured to the angle member 16 and which as shown covers the rear sides of all of the recesses 20 except two and also partly covers the adjacent recesses in advance of and succeeding the uncovered recesses, said sheet having a suitable central opening therein for that purpose. The cam 34 has an inner edge groove 61 therein and a rearwardly and downwardly inclined cam surface 62 as is viewed in Fig. 1, the groove for the purpose of by-passing the chute 36 with a cap in reversed position and the latter for controlling the release of the cap if it is in its required position.

In operation, the selecting wheel rotates in a counter-clockwise direction as viewed in Fig. 1, so that the pins 32 of the selecting arms ride on the rear face of the cover sheet 59 for the greater part of the revolution of the wheel. However, as an arm 23 passes the chute 36, the pin 32 thereof drops off the inwardly projecting edge 63 of the overhanging part of the cover sheet which projects into the greater part of the edge portion of the sheet opening. The spring 33 urges the pin 32 into the cover sheet 59 and as the arm thereof is reversed the closed end of the cap is at the rear, as is required, the front end of the pin then drops on to the closed end surface of the cap in the recess and the arm 23 remains in an inclined position relatively to the rear surface of the wheel as shown by the dash-dot lines of Fig. 8, while the pin presses the cap against the front plate 21 and holds it in its recess. As the wheel continues its rotation, the outer end of the arm 23 rides along the inclined surface 62 of the cam 34, thereby removing the pin from and freeing the cap, which then drops by gravity downwardly and outwardly from the chute 36 while the wheel is at rest with a recess at the entrance to said chute. As the wheel makes its next movement, the end of the arm 23 rides along the rear face of the rearwardly yieldable by-pass clip 64. (Fig. 9) the free end 55 of which normally rests on the inclined cam surface 65 of the second control cam 35. From the clip 64, the end of the arm rides on to the rearmost face 67 of the cam 35 into a position wherein the front end of its pin 32 is just behind the cover sheet 59, whereby on the next movement of the wheel 19, as the arm end moves off the cam 35, its pin moves on to the rear face of the inwardly extending part 56 of the cover sheet 59 past the shoulder 69 and remains on said part 68 until it passes the shoulder 63 of said sheet on the next revolution of the wheel.

Should the cap be in a reversed position in its recess 20 as in Fig. 8 with its open end arranged at the rear, the pin 32 of the arm passing the shoulder 53 moves under the action of its spring 26 into the threaded inferior of the cap to assume the full line position thereof shown in Fig. 8 in which the Serial Number 228,829 file date 59. As the end of the arm 23 moves with the wheel toward the chute 35, it enters the groove 61 of the cam 34, the pin preventing the cap from falling out of its recess and thereby by-
passing the chute 36. On the next movement of the wheel, the end of the cap-holding arm 23 rides on to the cam surface 65 of the cam 35 and moves rearwardly enough to withdraw the pin completely from the cap. When the cap reaches the entrance to the reversing chute, the end of its arm 23 is on the rearmost surface 67 of said cam 35 having snapped past and reaching a position above the yielding free end 65 of the clip 64. The thus freed cap drops out of its recess into the reversing chute 37 and is turned around by said chute in the same relative position as the cap falling through the chute 36. On the next movement of the wheel, the pin 32 moves on to the rear face of the cover sheet 60, remaining on the part 68 thereof for a time as already explained.

It will be seen that I have provided simple and dependable means for agitating and delivering caps to the cap-feeding chutes, that said means is effective to feed caps in one position into one chute and those in a reversed position to a reversing chute at a different point, that by reason of the provision of a wheel with a plurality of recesses therein and a plurality of chutes, the feed chutes are easily maintained full enough to permit continuous further operation without danger of an insufficient supply of caps and that the mechanism is well adapted to perform its intended functions.

While a certain specific embodiment of the invention has herein been shown and described, various obvious changes may be made therein without departing from the spirit of the invention defined by the appended claims.

I claim:

1. In mechanism of the character described, a rotatable recessed member provided with cap-receiving recesses, pins rotatable with said member and each urged to enter a recess adjacent thereto, a fixed plate having a hole therein in part of one diameter and in part of a larger diameter to provide an inwardly extending flange on the inner surface thereof, the flange engaging and normally maintaining the pins out of the recesses and permitting a pin to engage the cap inserted into a recess when the member reaches a predetermined position relatively to said means, and means to remove a pin from the cap at either one of two different points dependent on the position of the cap in the recess.

2. In mechanism of the character described, an upright rotatable wheel having marginal cap-receiving recesses therein, a spring-pulled arm across each recess and pivoted at the inner end thereof to the wheel, a cap-engaging pin at the outer end part of each arm and a relatively fixed plate covering the rear part of all but two of the recesses, said plate having an opening therein exposing said two recesses and parts of the recesses adjacent thereto, said plate being engaged by the pins to maintain the pins out of the recesses until a pin reaches the opening on the rotation of the wheel.

3. The mechanism of claim 2, means at the lower part of the wheel to remove the pin from a cap in an exposed recess to release the cap for discharge by gravity at one point when the cap is in a predetermined position in the exposed recess, and means to remove the pin from a cap arranged in reversed position in a recess succeeding the exposed recess thereby to release the reversed cap by gravity at a different point.

4. In mechanism of the character described, an upright rotatable wheel having cap-receiving recesses therein, means for intermittently rotating the wheel about a horizontal axis, laterally movable pins carried by the wheel and each having one position when engaging a cap in a required position in the recess, each of said pins having a different position when engaging a cap in a reversed position in the recess, a first means moving the pin and releasing at one point for discharge by gravity those caps which are in the required position and by-passing those caps in the reversed position, a second means moving the pins and releasing at a different point for discharge by gravity those caps not released by the first means, and means maintaining the pins out of the recesses after the pins have passed the second means and for part of each rotation of the wheel to permit caps to enter the recesses without engaging the pins.

5. The mechanism of claim 4, the first and second pin-moving means comprising arms on the wheel and carrying the respective pins and fixed caps in the path of the outer ends of the arms and adjacent each other.

6. In mechanism of the character described, an upright intermittently rotating selecting wheel provided with a plurality of peripheral recesses each adapted to receive a tubular cap having a closed end and an open end, the cap entering the recess either in a first position wherein the closed end is at the rear in a second position wherein the closed end is at the front, means for intermittently rotating the wheel, a pin for each recess arranged to enter and to leave the adjacent recess thereto, an arm carried by the wheel and each carrying one of the pins, a first fixed control cam in the path of the pins and adjacent the lower part of the wheel to remove a pin from contact with a cap in the first position thereby to release the cap for discharge by gravity from its recess, a second control cam in the path of the pins and adjacent the first cam to remove the pin from contact with a cap in the second position to release the cap not released by the first cam, and fixed means engaging selected pins during a selected part of a rotation of the wheel and maintaining the pins out of the corresponding recesses thereafter, said means permitting the pins to engage caps entering the remaining recesses.

7. The mechanism of claim 6, the first cam having a groove therethrough for the free reception and passage of the end of the arm when the pin of the arm is in the open end of a cap thereby to by-pass the release point for caps in the first position.

8. The mechanism of claim 7, the second cam having a rearwardly inclined cam surface engaging the end of the arm passing through the groove of the first cam to move said end away from the wheel and away from a cap engaged thereby.

9. The mechanism of claim 6, a radial plate for each arm on the rear face of the wheel each arm being pivoted at the inner end thereof to the wheel, and a spring for each arm urging the outer end of the arm toward the wheel.

10. The mechanism of claim 6, a cap hopper, substantially upright chutes leading from the hopper to selected recesses of the wheel where the wheel is at rest, a fixed upright discharge chute adjacent the first cam and arranged to receive the cap in the first position and a fixed upright twisted discharge chute adjacent the second cam and arranged to receive the cap in the second position.

11. The mechanism of claim 10, agitating rods between the chutes and adapted to enter the
hopper, an agitating cam fixed to the rods and spaced rollers on the wheel engaging and reciprocating the agitating cam a number of times on each rotation of the wheel.

12. In mechanism of the character described, an upright intermittently rotatable cap-advancing wheel having spaced cap-receiving recesses in the edge thereof and passing therethrough, a cap-retaining plate fixed to the wheel and closing the front sides of the recesses, a relatively fixed rear plate having an opening therein exposing the rear sides of a number of consecutive recesses, the rear sides of the remaining recesses being substantially covered by the rear plate, spring-pulled arms carried by and radially of the wheel, there being an arm for each recess, a pin at the end part of each arm riding on the rear face of the rear plate during the major part of a revolution of the wheel and engaging a cap in an exposed recess when at the opening of the rear plate, means at the lower part of the wheel for removing a pin from a cap arranged in a required position in the recess to discharge by gravity the cap at one point and means adjacent the first mentioned means for removing the pin from a cap reversed relatively to the required position and for discharging the reversed cap by gravity at a different point.

13. The mechanism of claim 12, a hopper, cap agitating means entering the hopper and means for reciprocating the agitating means including a plurality of spaced cam rollers on the wheel and a cam reciprocated bodily by the rollers a number of times on each rotation of the wheel.

14. In mechanism for delivering tubular caps, each having a closed end, into a required position with the closed end at the rear, a cap hopper, an upright intermittently revolvable selecting wheel provided with a plurality of peripheral recesses each adapted to receive a cap, means intermittently rotating the wheel about a substantially horizontal axis, a plurality of upright cap chutes leading from the hopper to a corresponding number of different recesses in the wheel when the wheel is at rest and delivering caps falling by gravity through the chutes into the various recesses, upright cap-agitating rods reciprocating between the chutes and adapted to enter the hopper, means actuated by the wheel for reciprocating the rods, a radial spring-pulled selecting arm for each recess, each of the arms having a longitudinal slot in the inner end thereof, a radial plate for each arm on the rear face of the wheel and engaging the slot of the corresponding arm, a pivot on each arm, a pin near the outer end of each arm arranged to enter the adjacent recess and to maintain a cap therein during part of the revolution of the wheel, a first control cam in the path of the pin adjacent the lower part of the wheel and adapted to engage and to raise the outer part of the arm to remove the pin from the cap when the pin rests on the closed end of the cap thereby to release the cap and to permit discharge of the cap by gravity from its recess when the wheel is at rest, a fixed straight chute adjacent the first control cam and in position to receive the cap released thereby, a second control cam beyond the first cam and adapted to engage and to raise the outer end of the arm to remove the pin from the other open end of the cap to release the cap not released by the first cam, a fixed upright twisted reversing chute adjacent the second cam for receiving the cap and reversing the position of the cap released by the first cam, and means interposed between the pins and those recesses of the wheel located between the reversing chute and the first mentioned cap chutes for maintaining the pins out of said last mentioned recesses thereby to permit a cap to enter a recess before said recess passes the first mentioned chutes.

15. The cap delivering mechanism of claim 1, the means for reciprocating the agitating rods comprising a plurality of circumferentially spaced apart cam rollers carried by the wheel and a plate having a cam notch therein secured to the rods and reciprocating therewith and in the path of the rollers, the cam being reciprocated a number of times during each revolution of the wheel.

HARRY A. DREW.

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