This invention relates to a guiding mechanism for directing the applicators or cap extensions of applicator-type closures into the mouths of small-mouth containers traveling in spaced relation on a conveyor and is an improvement over the guiding mechanism of the apparatus disclosed in my Patent No. 2,810,249, dated October 22, 1957.

As described in that patent, the apparatus comprises at least one endless means including thereon spaced placement means which include applicator guide portions in the general form of funnel elements. The apparatus also includes means for moving the endless means so that at least some of the placement means periodically travel in synchronous aligned rotation with the mouths of the spaced containers on the conveyor. The directing means further includes means cooperating with the applicator guide portions of the aligned placement means for periodically creating with the funnel elements thereof funnels having apertures in the bases thereof which permit the applicators of the closures to be directed therethrough into aligned rotation with the mouth of the containers while periodically retaining the body portions of the closures in the funnels.

While the guiding mechanism described above is capable of reliable operation at high speeds, the permissible eccentricity of the cap extension (dip tube, applicator, or other attachment) of the applicator type closure is limited to the diameter of the funnel opening through which it must be lowered which is in turn limited by the practical physical limitations of size and available space. Where the permissible eccentricity of the cap extension is exceeded, jamming of the apparatus can result with a consequent material reduction in the output of assembled container and closure units.

Accordingly, the main object of the present invention is to provide an improved guiding mechanism which will obviate the difficulties due to the above and other limitations.

Another important object of the present invention is to provide an improved guiding mechanism employing jaws having a scissors-like action to envelop the cap extension and eliminate difficulties due to the eccentricity thereof.

Other objects and advantages of the present invention will become apparent during the course of the following description.

In the drawings I have shown several embodiments of the invention. In this showing:

FIGURE 1 is a plan view of the automatic capping or closure applying machine as disclosed in my Patent No. 2,810,249 including the improved apparatus of the present invention for directing the applicators of applicator-type closures into the mouths of small-mouth containers;

FIGURE 2 is an elevational view thereof;

FIGURE 3 is a schematic plan view showing the timing sequence of the machine;

FIGURE 4 is a fragmentary plan view to an enlarged scale of the cap or closure feed assembly;

FIGURE 5 is an elevational view thereof;

FIGURE 6 is a fragmentary plan view of the improved guiding mechanism jaws in open position;

FIGURE 7 is an elevational view thereof showing the position of a cap extension with respect thereto;

FIGURE 8 is a fragmentary plan view of the guide jaws in closed position enveloping an applicator or cap extension just prior to its insertion in a container;

FIGURE 9 is an elevational view thereof;

FIGURE 10 is a fragmentary plan view of a modified form of the apparatus of FIGURE 1;

FIGURE 11 is an end view thereof;

FIGURE 12 is a modified form of the apparatus shown by FIGURE 10; and

FIGURES 13, 14, 15, 16, 17, 18, and 19 are further applications of the principles of the improved guiding jaw mechanism of the present invention.

Applicator Directing Apparatus

Referring to FIGURES 1 and 2 of the drawings, numeral 10 designates a portion of a conveyor for delivering to a timing star 9 and thence to a notched rotary disk or infed timing star 12, containers 11 which are adapted to hold a desired fluid such as nail polish, etc. The timing star 9 serves to hold back the infed line pressure and to release containers to the infed timing star 12 in proper timing to be engaged by a star pocket. The containers are therefore of a type 10 which are adapted to receive applicator type closures including a cap extension 13 (dip tube or other attachment) and a cap or body portion 14 adapted to be pressed into or over the small mouth of a container 11. The disk 12 has a plurality of spaced, container receiving notches 15 therein and a curved guide rail 18 for maintaining the containers on a platform 19 beneath a portion of the disk.

The automatic capping machine of FIGURES 1 and 2 includes an apparatus 20 for directing the applicators 13 of the applicator-type closures 14 into the mouths of the small-mouth containers. This apparatus includes an endless means or disk-type rotor 17 for conveying the containers thereon in spaced relation. The rotor 17 and the disk 12 are driven in a conventional manner in the direction indicated in FIGURE 1 and at suitable speeds in synchronous relation by a motor (not shown) within the base 21 of the apparatus.

The rotor or disc 17 is supported by a casting 17A and a jaw mounting plate 16 is supported above the rotor 17 by means of spacers 16A, all rotatable as a unit. Spaced placement means 22 (FIGURES 6-9 inclusive) which include improved applicator guide portions in the form of co-operating pairs of V-shaped jaws having a scissor-like action, are mounted on the plate 16 adjacent its periphery. Each of the jaws includes an angular extension 23 and a pivoted arm 24 pivoting on pins 25 and driven by an arm 70 which is carried by and suitably keyed or secured to a vertical shaft 72 extending normally of the rotor 17 and rotatable therein. Each arm 24 has a gear sector 26 permanently attached thereto and meshing with the gear sector on a co-operating, adjacent arm and with the gear sector 27 on the arm 70. The latter is the upper arm of a bell crank mechanism and is keyed to a vertical pivot shaft 72 as is a lower arm 73.
Each lower arm carries a cam follower 28 that rides against fixed disc cams 29 and 29A which are fixed to the frame 29B beneath the rotor 17. The cams are shaped so as to periodically oscillate the jaws 23 about their pins 25 to effect their opening and their closing. An intermediate portion of each jaw 23, 24 is curved at the posterior end of the arm 24 and its angular extension 23 so that upon closing, the jaws first envelop a closure extension lowermost into the openings in a star-wheel feed mechanism 33 (FIGURES 4 and 5) rotatably mounted just above a bridging member or bridge 34 spanning a pair of plurality of top supporting uprights 35. The bridge 34 has a cap-extension receiving slot 36 formed therein to guide the cam from the chute 32 around the star-wheel 33 into the arc of rotation of the jaws of a conventional chuck 37 which pick it up and carry it clockwise (FIGURES 1 and 3) toward the exit end I of the apparatus 20.

As set forth in my Patent 2,810,249, the apparatus 20 includes a plurality of chucks 37 arranged in circumferentially spaced relation above the rotor 17. In addition to being rotated in a circular path in synchronous relation with the rotor 17, the chucks are actuated vertically in a predetermined manner by a cam roller 30 confined in a cam track 39 disposed in an upper cylindrical wall of the apparatus 20. In the case of all types of closures except the screw-on type, the chucks do not rotate about their own axes and the mechanism for effecting the same is omitted as are the container gripping jaws.

**Operation**

During the operation of the automatic capping machine and its novel cap extension guiding means, the motor in the base 21 drives the notched rotary star-wheels 9, 12, 13 and a container discharge star-wheel 42 in proper synchronous relation with the rotor 17 so that closures 14 received from the chute 32 are being deposited beneath successive descending chucks 37 at position A while bottles 11 supplied from the conveyor 10 are deposited by the disk 12 in spaced relation on the rotor 17 at position D. The descent of successive ones of the chucks there gripping the closures 14 is controlled by the cam rollers 38 riding in the cam track 39 as stated. The chucks 37 and rotor 17 are supported for rotation about the center of the apparatus 20 by means of a central shaft 45 as set forth in the Patent No. 2,810,249.

At position A (FIGURE 3, see also FIGURES 4, 5, 6, and 7), the guide jaws 23 begin to close as the cam follower 28 has reached the position corresponding to A on the cam plates 29, 29A. Simultaneously, a chuck 37 is descending and it engages a closure 14 at position B which is angularly displaced 45° from position A, as shown in FIGURES 6 and 7. At position C, the guide jaws 23 are completely closed to envelop the cap extension 13 adjacent the cap 14 and the chuck starts to rise with the cap 14 and the extension 13 which is pulled almost through but is never withdrawn from the enveloping circle of the jaws to thus substantially eliminate any excessive eccentricity of the lower extension end.

At position D, as a container 11 enters the turret, it is deposited on the rotor 17 by the disk 12 so as to be in vertical alignment with the cap holding chuck 37 which has just arrived there. The chuck has reached the upper limit of its rise as effected by its cam roller 38 and the lower end of the cap extension 13 is 45° above and in axial alignment with the container top. The container and rotor then move in synchronous relation in a clockwise direction toward position E during which time the closure is suspended by the chuck over the container.

It is to be noted that the guiding jaws 23 overcome the previous eccentricity limitations by enveloping the cap extension 13 in the pocket 30 close to its point of attachment to the cap 14 where the eccentricity is very small. The closing of the jaws confines the cap extension to a diameter of enclosure considerably smaller than the opening in the container 11 which is to receive it. The raising of the cap and its extension by the chuck thus not only straightens the extension but permits the container 11 to enter the machine under the extension.

At position E, as shown in FIGURES 8 and 9, the chuck 37, having carried the container 11 to enter the container 11 and at position F, guidance of the cap extension no longer being required, the guiding jaws begin to open as effected by the cam follower 28 and cam 29, and are fully opened at position G. The jaws now being out of the way, the chuck 37 descends further and presses the cap 14 into or onto the container 11. At position H the chuck begins to rise and the container 11 with its fastened closure 14 is engaged by the star-wheel 42 at position I and removed from the rotor 17 onto a suitable conveyor where the containers are carried to subsequent operations in the package. The successive chucks 37 carrying closures 14 together with successive containe 11 on the rotor 17 are handled as explained above in connection with a single chuck, its closure and associated container.

The apparatus disclosed in FIGURES 10 and 11 for directing the cap extensions of applicator and dip type container is similar to the apparatus of FIGURE 1. Accordingly, corresponding elements are designated by the same reference characters. An endless belt 20 is employed for receiving the containers 11 from the distributing disk 12 (not shown) and carrying them in a spaced relation in a straight line. An endless means in the form of a chain belt 50 has portions extending in a line parallel to the belt 20 and includes around the periphery thereof spaced V-shaped jaw elements 23 secured to various of the chain links by lugs 51. The jaw elements cooperate with the edge of a fixed guide rail 52 which overlies them to form enveloping and guiding jaws for aligning a cap extension 13 with the mouths of the containers 11 as is further explained below.

FIGURE 12 discloses an apparatus very similar to that of FIGURES 10 and 11 except that the guide rail 52 is omitted and a pair of chain belts 50 are employed and synchronously driven with the belt 20. The spacing of the chain belt 50 is such that as a pair of the V-shaped jaw elements 23 approach a container on the delivery end of belt 50, they have no overlapping action and proceed to encompass the cap extension 13 of a cap 14 to form a guide (as in FIGURES 6 and 8) and permit the cap extension to be dropped into the mouth of a container 11. Successive V-shaped jaw elements so cooperate and move along with the containers 11 on the straight line conveyor belt 20. At the exit end of the chain belts 50, the V-shaped jaw elements 23 separate and the containers continue along the belt 20 to another work station where the caps may be pushed into or onto the container mouths.

As shown in FIGURES 13 and 14, the scissor-like action of the enveloping and guiding V-shaped notches of the jaws 23 may be embodied in single unit devices in fixed locations for use on intermittent action machines where containers and closures enter and leave in intermittent motions. As shown, the V-shaped notches of the cooperating jaws 23 may be formed (from position of FIGURE 13 to position of FIGURE 14) by attaching the jaw support members 54 to mechanisms for timed motion in relation to other mechanisms. A similar enveloping and guiding jaw action is obtained as shown in FIGURE 15 by a pair of spaced star-wheels 57 having V-shaped notches 23 which form the pocket 30. As shown in FIGURE 16, a single star-wheel 57 may co-
operate with a guide rail 52 as in FIGURE 10 with flow of the caps along the line of the guide rail. Alternately, the flow can be adjusted so as to be star-wheel to allow time for more pocket duration in which the cap is of curved shape as shown in dotted lines at 58. The form of the invention shown in FIGURES 13 and 14 may also be modified to comprise a pair of co-operating semi-funnel shaped jaws 23 as illustrated in FIGURES 17, 18 and 19. It is to be understood that the forms of my invention herewith shown and described are to be taken as preferred examples of the same and that various changes in the shape, size, material of parts may be resorted to without departure from the spirit of the invention or the scope of the subjoined claims. I claim:

1. An apparatus for directing the extensions of closure caps into the mouths of small-mouth containers traveling in spaced relation on a conveyor comprising: at least one endless means including thereon spaced placement means which include closure cap extension guide portions in the general form of cooperating jaws; means for moving said endless means so that at least some of said placement means periodically travel in synchronous aligned relation with the mouths of the containers while periodically retaining the caps in alignment with said mouths, means cooperating with said cap extension guide portions of said aligned placement means for periodically creating with the jaws thereof encircling jaws including an aperture which engage the caps extension upwardly through the aperture of said encircling jaws to clear the top of the container and to effect movement by said jaws of the lower portion of said extension into said aligned relation.

2. An apparatus as recited in claim 1 wherein said placement means comprises a bridge for the reception of closure caps to be inserted in the containers, a slot is formed in the bridge for the reception of the cap extensions and extends into and conforms to the path of said placement means, and a star-wheel synchronously moves said closure caps along said slot in timed relation to said placement means.

3. An apparatus as recited in claim 1 wherein said endless means is a star-wheel.

4. An apparatus as recited in claim 1 wherein said cooperating means is a star-wheel.

5. An apparatus as recited in claim 4 wherein said endless means is a star-wheel.

6. An apparatus for directing the extensions of closure caps into the mouths of small-mouth containers traveling in spaced relation on a conveyor comprising: at least one endless means comprising a disc including about the periphery thereof spaced placement means which include closure cap extension guide portions in the general form of cooperating jaws; means for moving said endless means so that at least some of said placement means periodically travel in synchronous aligned relation with the mouths of spaced containers on the conveyor; means cooperating with said cap extension guide portions of said aligned placement means for periodically creating with the jaws thereof encircling jaws including an aperture which engage the caps extension upwardly through the aperture of said encircling jaws to clear the top of the container and to effect movement by said jaws of the lower portion of said extension into said aligned relation.
diate their length and move the engaged portion thereof into aligned relation with the mouths of the containers while periodically retaining the caps in alignment with said mouths, means forming a part of said placement means for suspending closure caps and their extensions in vertical alignment with the mouths of said containers, and additional means for feeding said caps to said suspension means and guiding them in the path thereof for suspension engagement thereby and initial suspension in a position to be occupied by a container, said suspending means periodically moving vertically after creation of said encircling jaws by said cooperating means to enable movement of a container into said position and to draw said extension upwardly through the aperture of said encircling jaws to clear the top of the container and to effect movement by said jaws of the lower portion of said extension into said aligned relation.

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