

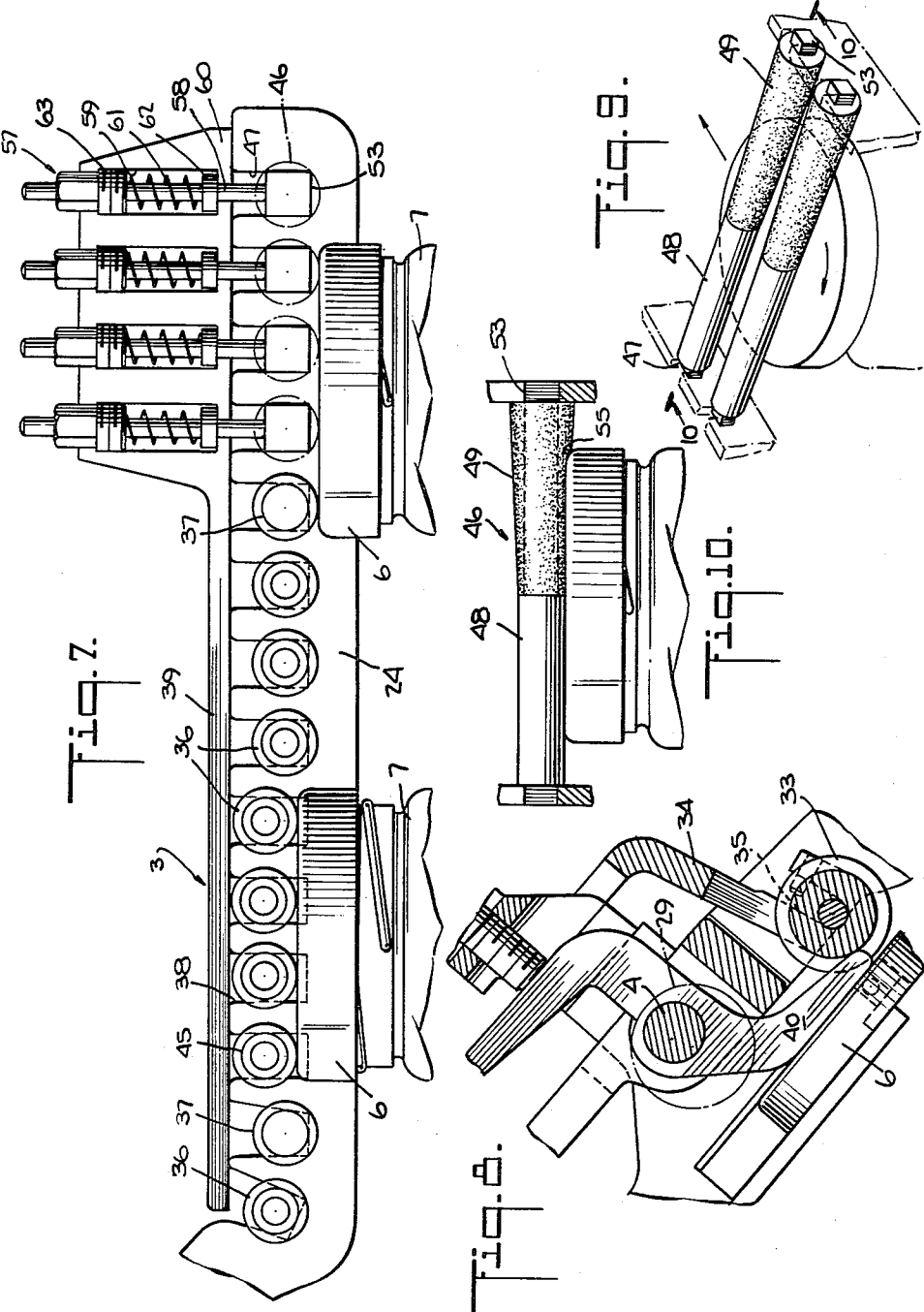
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CAP APPLICATOR

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CAP APPLICATOR

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The present invention relates to the container sealing art and more particularly to a cap applicator adapted to feed and to apply closure caps to containers. Large numbers of containers and particularly glass containers are sealed by high speed machinery with lug-type or threaded-type closures designated as screw-type caps herein. In a typical sealing operation for screw-type caps using high speed sealing machinery there are two principal successive operations which are performed during the sealing. The first of these consists of bringing a closure cap above each container and leveling the cap and lightly twisting it into preliminary engagement with the container threads. This operation is known as the cap application and prepares the cap and the container for the final sealing operation in which the cap is tightly twisted into sealing engagement with the container finish.

The present invention is directed to an improved applicator for performing the first or the cap applying operation. This operation is relatively difficult since it requires a rapid and an accurate positioning of the cap relative to the container with the threads or lugs of the cap positioned so that they correctly engage the container threads.

Several different cap applicators are now used to perform this function, however, these present applicators have proven to be quite critical in operation particularly at higher speeds and they are also difficult to adjust or must be replaced when it is desired to change the sealing machine from one size to another. The present cap applicator has proven effective in applying screw-type caps rapidly to containers while at the same time being simply and quickly adjustable for use with a wide range of cap sizes. In this connection the critical cap twisting portion of the cap applicator operates independently of cap size.

It is, therefore, an object of the present invention to provide an improved cap applicator for a sealing machine.

Another object of the present invention is to provide a relatively simple and effective cap applicator for lug-type or threaded-type closures.

Another object of the present invention is to provide a cap applicator adapted to apply a wide range of closure cap sizes.

Other and further objects of the invention will be obvious upon an understanding of the illustrative embodiment about to be described or will be indicated in the appended claims and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

A preferred embodiment of the invention has been chosen for purposes of illustration and description and is shown in the accompanying drawings, forming a part of the specification, wherein:

FIG. 1 is a side elevational view of the cap applicator according to the present invention;

FIG. 2 is a top plan view of the cap applicator of FIG. 1;

FIG. 3 is a sectional view of the cap applicator taken along line 3—3 of FIG. 1;

FIG. 4 is a sectional view of the cap applicator taken along line 4—4 of FIG. 1;

FIG. 5 is an enlarged detailed view of the lower end portion of the cap applicator;

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FIG. 6 is an enlarged perspective view of the end of the cap chute illustrating a detent pin;

FIG. 7 is an enlarged detailed sectional view of the roller portion of the cap applicator;

FIG. 8 is a sectional view taken along line 8—8 of FIG. 2;

FIG. 9 is a fragmentary perspective view of the cap twisting rollers; and,

FIG. 10 is a sectional view taken along line 10—10 of FIG. 9.

The cap applicator 1 comprises an inclined cap feeding chute 2 having a cap applicator shoe 3 pivotally mounted thereon at 4. The cap applicator 1 is mounted on a sealing machine of the straight line type wherein a conveyor belt having a straight upper run carries a succession of filled containers 5 beneath the cap applicator 1 so that a closure cap 6 is applied to the container threads 7 and is lightly twisted into initial threaded engagement therewith. The cap applicator 1 is mounted by suitable bolts on a bracket member 8 on the sealing machine. Such straight line sealing machines are well known and only such additional details of their construction or operation as are directly related to the cap applicator will be given herein.

The inclined cap chute 2 has a smooth bottom plate 9 and a continuous line of caps 6 is fed onto the upper end of this plate so that they slide downwardly under the force of gravity to the lower or exit end of the chute 2. The caps 6 are aligned and guided down plate 9 by a pair of guide rails 10. These guide rails 10 are adjustably mounted on the bottom plate 9 to permit their spacing to be rapidly adjusted for different closure sizes. As best illustrated in the plan view of FIG. 2, the guide rails 10 converge at the lower end of the cap chute 2 so that the caps 6 are centered above the containers 5 as they are withdrawn from the chute 2 by the moving container 5. The adjustable mounting for the two side rails 10 comprise a guide pin 11 fixedly attached to each rail near its lower end and slidably mounted in a retaining slot 12 formed in the bottom plate 9. The upper end 13 of each of the side rails 10 is pivotally attached to a crosshead 14 by pivot pins 15. The lower end of each of the pivot pins 15 are slidably contained in parallel guide slots 16. Movement of the crosshead 14 lengthwise of the cap chute 2 thus simultaneously moves each of the pins 15 and the upper ends 13 of the side rails 10 lengthwise of the cap chute 2 while the spacing of the lower ends of the guide rails 10 is changed by the resulting movement of each of the guide pins 11 in the inclined guide slots 12. The movement of the crosshead 14 is preferably controlled by a cylindrical sliding guide pin 17 mounted in a cooperating circular guide slot 18 in the steam chest 19. In order to simplify the adjustment of the cap chute to standard closure sizes a series of calibrated positioning holes 20 are provided to set the position of the crosshead 14 and suitable tapered locking pins 21 lock the crosshead 14 at the hole desired. The cap chute is thus easily adjusted for different size caps without changing any parts.

As best illustrated in FIG. 6, each of the guide rails 10 has a detent pin 22 mounted at its lower end in a recess 50 where it is held in place by a set screw 51. Protruding portions 52 of the pins 22 retain the lowermost closure cap 6 in position at the bottom of the cap chute 2 as illustrated in FIG. 3. When the lowermost cap 6 is engaged by the top of a container 5 being moved beneath it on the conveyor, the cap 6 is lifted over the protruding portions 52 and is withdrawn by the container 5 from the chute 2. Support flanges 23 are provided at the lower ends of the guide rails 10 to support the opposite sides of the closure cap 6 while it is resting in position against the detent pins 22.

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In order to guide the lowermost cap 6 in the chute 2 and to urge the cap 6 downwardly against the bottom of the chute 2 and against detent pins 22, a cap pressing shoe 40 (FIG. 8) is pivotally mounted on the lower end of chute 2 on pivot pin 4. The shoe 40 is resiliently held at a position slightly above the top of the cap 6 by spring 42 under the control of adjusting screw 43 (FIG. 5).

The cap applicator shoe 3 which is mounted on the lower end of the cap chute 2 by pivot pin 4 operates to direct each cap into a correct thread engaging position on the container 5 and to thereafter lightly twist the cap thus positioned into a preliminary threaded engagement with the threads 7 of the container 5. The shoe 3 comprises a pair of spaced side arms 24 which terminate adjacent the pivot pin 4 in a suitable bearing 25 (FIG. 4) which is mounted on the pivot pin 4.

The shoe 3 is normally positioned with a slight downward tilt in the direction of conveyor travel as illustrated in FIG. 5 for the application of screw-type caps. The degree of downward tilt is set by the nuts 26 which adjustably position the rearward tongue 27 of the shoe 3 on the stud 28. When it is desired to use the shoe 3 in a horizontal position, which is the case where press-on caps are applied, the nuts 26 are lowered to swing the shoe 3 toward a more horizontal position.

It is also desirable to provide for the adjustment of the height of the shoe 3 to adapt it for handling closure caps having different heights. A height adjustment is provided for by the eccentric 29 on the pivot pin 4. Rotation of the eccentric 29 in bearing 30 of the mounting bracket 31 for the pin 4 provides the necessary height adjustment for the shoe 3. The eccentric 29 is locked in its desired position by the set screw 32 (FIG. 5).

In order to provide for a smooth withdrawal of the lowermost cap 6 from the chute 2 by a moving container 5, a guide roller 33 is mounted on the bracket 34 in mounting slots 35 which permit the roller 33 to raise upwardly as each cap 6 is drawn over detent pins 22 and out of the chute 2. In its preferred embodiment, the roller 33 is a non-magnetic roller having a low inertia to provide for its easy rotation by the caps as the caps 6 move beneath it and out of the cap chute 2. As best illustrated in FIG. 2, the weight of the roller may be reduced by providing a series of spaced grooves 33' in the surface of the roller 33.

A series of smaller cap leveling and lowering rollers 36 and 37 are mounted between the side arms 24 of the applicator plate 3 beyond the roller 33. Each of these rollers 36 and 37 has its opposite ends rotatably mounted in suitable mounting slots 38 formed along the tops of the side arms 24. As will be more fully discussed below, it is desirable that certain of these rollers be magnetized and also that the rollers be easily rearranged to interchange the position of the magnetized and non-magnetized rollers as appears preferable for particular closure sizes and shapes. This adaptability is provided in the preferred embodiment by having each of the slots 38 with an open end so that the rollers may be simply lifted out of the slots 38 and rearranged in whatever order appears desirable. A single locking cover 39 is removably mounted on each side arm 24 by screws 44 to hold the rollers in place after they have been arranged. It is also desirable to provide for vertical movement of the rollers as the caps 6 are moved beneath them and this movement is obtained by providing clearance between the cover 39 and the roller ends 45 as illustrated in FIG. 7.

A preferred arrangement of the rollers is illustrated in FIG. 7. In this arrangement the first and the third through the ninth rollers, in the direction of container travel, are magnetized rollers 36 while the second and tenth rollers are unmagnetized rollers 37. These magnetized rollers 36 first support caps in a generally level position above the container threads and thereafter cause the caps to be lowered downwardly into initial engage-

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ment with the threads. At the outer end of the shoe 3 and beyond the cap leveling and lowering rollers 36 and 37, one or more cap twisting members 46 are preferably mounted in the slots 47. The twisting members 46 preferably have one cylindrical smooth portion 48 and have their opposite side formed with a cover 49 of friction material such as rubber. Members 46 are held against rotation by rectangular end portions 53 so that the friction cover 49 will engage and retard one side only of each cap cover thereby causing the cap 6 to be lightly twisted or coaxed into engagement with the container threads 7. Thus, each cap 6 as it is drawn along under the shoe 3 is first leveled with respect to the container threads and is thereafter gently lowered onto the threads and lightly twisted into engagement therewith.

The preferred shape for the friction cover 49 is the tapered shape as illustrated in FIG. 10. While the friction member 49 may be formed with a cylindrical outer surface which is a continuation of a cylindrical portion 48, the tapered shape provides a more efficient twisting action since the twist force with the tapered member is applied at the outer edge of the cap top adjacent to the most highly compressed portion 55 of the friction member 49. This provides a greater turning torque on the cap and twists it downwardly further than does a cylindrical friction cover.

In order to provide for sufficient pressure between the twisting members 46 and the cap, the friction members 46 preferably are magnetized as illustrated in FIG. 5 by the insertion of magnets 56 into their hollow centers or by magnetizing the steel portion of the members. An alternate embodiment is illustrated in FIG. 7 wherein the friction members 46 are held downwardly by spring members 57 comprising pins 58 slidably mounted in apertures 59 in the extension 60 on the cover 39. The spring pressure is set by the springs 61 which are adjustably compressed between flanges 62 on the pins 58 and threaded nuts 63.

For certain caps it is desirable to provide a slight reverse twist before the cap is coaxed onto the container by twisting members 46. The cap applicator may be easily changed to provide this action by inserting a member similar to members 46 in the second set of slots as illustrated at 54 in FIG. 5.

The magnetic nature of the rollers 36 provides another desirable function in addition to the cap supporting function. This function of these magnetic rollers operates as follows to insure correct application of the cap over the container threads so that an undesirable cocking between the caps and the container threads is prevented. As each cap 6 is drawn into initial engagement with the rollers 36, the rollers will first magnetically attract the forward portion of the cap. This holds each cap 6 in a telescoping relationship with container rim above the container threads to insure that the forward portion of the cap threads does not inadvertently lock under a corresponding forward portion of the container threads and thereby cock the cap on the container. As the container 5 continues to move, the magnetized rollers 36 hold the cap level until the cap is lowered onto the container threads by the outermost rollers 36.

It will be seen that an improved cap applicator has been provided which has an accurate and reliable cap applying and coaxing operation capable of applying threaded or lug-type caps at high speeds to containers being fed through a straight line sealing machine. The cap applicator, in addition, is useful with a wide variety of closure sizes and shapes and is particularly useful in sealing machines where the closure style and size are changed from time to time since only a relatively minor adjustment and no replacement parts are necessary to change the cap applicator to operate with a different sized closure. The cap applicator makes novel use of a series of magnetic rollers in performing the critical cap lowering and thread engaging operations and the rollers provided

for this operation may be readily rearranged when desired to adjust the magnetic action for closures of different characteristics.

As various changes may be made in the form, construction and arrangement of the parts herein without departing from the spirit and scope of the invention and without sacrificing any of its advantages, it is to be understood that all matter herein is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim:

1. A cap applicator for applying caps to containers moving therebelow on a moving conveyor belt comprising the combination of means for placing caps on the container tops, a cap leveling means mounted beyond said cap placing means including a plurality of rotatably mounted rollers, and one or more of said rollers being magnetized to support the caps in approximately level position above the tops of the containers.

2. A cap applicator for applying screw caps to containers moving therebelow on a moving conveyor belt comprising the combination of an inclined cap feeding chute, a cap leveling shoe pivotally mounted at the lower end of said chute generally parallel to said conveyor, a plurality of rotatably mounted rollers on said shoe, one or more of said rollers being magnetized to support caps in approximately level position above the tops of the containers, and a cap twisting element mounted on said shoe beyond said rollers having a friction element positioned to engage and retard an off-center portion of the cap tops.

3. The cap applicator as claimed in claim 1 in which said plurality of rollers comprises four or more with at least two of said rollers being magnetized.

4. The cap applicator as claimed in claim 1 in which said rollers are removably and interchangeably mounted on said leveling means.

5. The cap applicator as claimed in claim 2 in which said cap twisting element comprises a fixedly mounted cylinder having one end thereof formed of friction material.

6. A cap applicator for applying screw caps to containers moving therebelow on a moving conveyor belt comprising the combination of an inclined cap feeding chute, a cap leveling shoe pivotally mounted at the lower end of said chute generally parallel to said conveyor, a plurality of rollers rotatably mounted on said shoe beyond said pivotal shoe mounting in the direction of conveyor travel, one or more of said rollers being magnetized to support caps in approximately level position above the tops of the containers, and a friction drag means on said shoe beyond the rollers positioned to frictionally engage and retard an off-center portion of caps being moved thereby.

7. The cap applicator as claimed in claim 6 in which said shoe comprises a pair of spaced side arms extending generally in the direction of conveyor travel and said rollers being removably mounted thereon in upwardly facing slots.

8. A cap applicator for applying screw caps to containers moving therebelow on a moving conveyor belt comprising the combination of an inclined cap feeding chute positioned to present caps to the tops of the moving containers, a cap leveling shoe mounted at the lower end of said chute generally parallel to and spaced above said conveyor, a plurality of non-magnetic rollers rotatably mounted on said shoe, a plurality of magnetic rollers mounted on said shoe to support caps in approximately level position above the tops of the containers, and a cap twisting means mounted on said shoe beyond said rollers having a friction element positioned to engage an off-center portion of the cap tops to twist the caps on the threads of the containers.

9. The applicator as claimed in claim 8 which further comprises a second cap twisting means mounted in advance of said first cap twisting means and having a friction

element positioned to engage an opposite off-center portion of said caps from said first cap twisting means to twist the caps out of engagement with the threads on the containers.

10. The applicator as claimed in claim 8 in which the first roller on said shoe in the direction of conveyor belt travel is a non-magnetic roller.

11. The applicator as claimed in claim 10 in which said mounting for said shoe is a pivotal connection in advance of said first roller, and a cap pressing shoe is resiliently mounted at the lower end of said chute adjacent said first roller to yieldably engage the cap tops as they pass under said first roller.

12. The applicator as claimed in claim 8 in which said friction element comprises a resilient tapered member.

13. The applicator as claimed in claim 8 in which said twisting means is yieldably urged toward the conveyor by a resilient member.

14. A cap applicator for applying screw caps to containers moving therebelow on a moving conveyor belt comprising the combination of, cap feeding means, a cap leveling member mounted beyond said cap feeding means, a non-magnetic roller yieldably mounted on said member, a magnetic roller yieldably mounted on said member, and an elongated cap twisting means mounted on said member beyond said rollers in the direction of conveyor travel.

15. The applicator as claimed in claim 14 in which said twisting means comprises a magnetized member.

16. The applicator as claimed in claim 14 in which said twisting means is yieldably urged toward the conveyor by resilient means.

17. The applicator as claimed in claim 14 in which said twisting means is tapered and is formed of resilient material.

18. A cap applicator for a sealing machine for applying caps to containers carried therethrough on a moving conveyor comprising the combination of an elongated inclined cap chute having its lower end positioned above the conveyor to present a cap to each container on the conveyor, a magnetic cap leveling shoe mounted on the end of said chute at a height to engage and level the caps on each container, a pair of spaced cap guide rails on said chute, and rail spacing means interconnecting said rails and adapted to simultaneously move both rails laterally of the chute to vary the distance therebetween.

19. The cap applicator as claimed in claim 18 in which each of said rails is movably mounted at its upper end on parallel guide means and movably mounted at its lower end on angularly related guide means whereby simultaneous movement of the upper ends of said rails in one direction along said parallel guide means moves the lower ends of the rail apart and movement in the opposite direction moves the lower ends toward one another.

20. The cap applicator as claimed in claim 19 in which said rails are interconnected by a crosshead, and said crosshead is movably coupled to said chute by a guide adapted to confine the motion of the crosshead to a direction lengthwise of said chute.

21. A cap applicator for a sealing machine for applying caps to containers carried therethrough on a moving conveyor comprising the combination of an elongated inclined cap chute having its lower end positioned above the conveyor to present a cap to each container on the conveyor, a cap leveling shoe mounted on the end of said chute at a height to engage and level the caps on each container, a pair of spaced cap guide rails on said chute, rail spacing means interconnecting said rails and adapted to simultaneously move both rails laterally of the chute to vary the distance therebetween, a plurality of cap engaging rollers mounted on said shoe, and one or more of said rollers being magnetized.

22. A cap applicator for applying screw caps to containers moving therebelow on a moving conveyor belt comprising the combination of an inclined cap feeding

chute positioned to present caps to the tops of the moving containers, a cap leveling shoe mounted at the lower end of said chute generally parallel to and spaced above said conveyor, a plurality of non-magnetic rollers rotatably mounted on said shoe, a plurality of magnetic rollers mounted on said shoe to support caps in approximately level position above the tops of the containers, a first cap twisting means mounted on said shoe beyond said rollers having a friction element positioned to engage an off-center portion of the cap tops to twist the caps onto the threads of the containers, a second cap twisting means mounted in advance of said first cap twisting means and having a friction element positioned to engage an opposite off-center portion of said caps

from said first cap twisting means to twist the caps out of engagement with the threads on the containers, said first and second cap twisting means comprising roller-like elements fixedly mounted parallel with said rollers, and said friction elements comprising a rubber outer layer along a portion of the roller-like elements.

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