CAPPING HEAD AND MACHINE

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Filed: Aug. 30, 1972

Appl. No.: 285,078

U.S. Cl. 53/201, 53/343, 53/369, 113/30
Int. Cl. B65b 7/28
Field of Search 53/201, 341, 342, 53/343, 368, 369; 113/30

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UNITED STATES PATENTS
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ABSTRACT

A capping head is provided which includes a head body with a throat therein for crimping or otherwise deforming a portion of a closure to affix it to a container and further including an adapter for securing the head on a rotating sleeve on a capping spindle with the adapter providing a rotatable connection between the head and the sleeve so that axial travel of the sleeve will be transmitted to the head without rotating the head. A capping spindle and a capping machine including such a capping head or heads are also provided.

10 Claims, 5 Drawing Figures
CAPPING HEAD AND MACHINE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to capping machines, and in particular to a swallow-on capping head that can be mounted on a spindle in a capping machine which is normally used in the application of roll-on closures.

2. Description of the Prior Art

Capping machines for applying roll-on closures have been in use for many years wherein the skirt of a closure has threads of other impressions formed in it by deformation of the skirt against the finish on a container mouth. One kind of roll-on capping machine has comprised a rotatable turret with a plurality of vertically movable capping spindles mounted therein having pressure blocks for applying top pressure against closures on containers to develop a top seal and/or a side seal, and thread rollers on the spindles which move against the closures' skirts and rotate around the closures to form threads in the skirts. Cappers for applying swallow-on closures, such as crown closures, have also been in use for many years comprising a rotatable turret with vertically movable capping spindles and collars on the spindles which are moved downward against closures on containers to crimp the skirts of the closures under retaining heads on the containers. A swallow-on capper requires only vertical relative movement between the closure skirts and a tool to deform the skirt into affixation with a container, and requires no rotation of the capping head during affixation of a closure. But a roll-on capper, apart from a need for relative vertical movement, requires forming rollers that must be rotated with respect to the closure to form threads in the closure skirt (or otherwise deform the skirt) around its entire circumference.

As disclosed in U.S. Pat. No. 3,660,963, a capping machine has been recently developed which is adapted to receive either roll-on or swallow-on cap applying spindles or heads in outwardly open guideways around the periphery of a rotatable turret so that the capping machine can be adapted to apply either roll-on or swallow-on closures depending on which type of spindles are mounted in the turret. U.S. Pat. No. 2,359,932 discloses a similar machine for receiving both screw-on cap applying heads and corking heads in a rotatable turret. A further disclosure of interest is contained in U.S. Pat. No. 3,470,667 which discloses a capping machine which can be quickly adapted to apply either of two or more forms of swallow-on closures such as crown and convenience type tear-off closures. Such machine includes a plurality of reciprocating plunger units with crimping heads which can be interchangeably connected on the plungers. Additionally, U.S. Pat. No. 3,537,231 discloses a bottle capper which is adapted to have either screw-on or roll-on chucks mounted therein without machine adjustment.

Although the capping machine disclosed in U.S. Pat. No. 3,660,963 has reduced the amount of time required for converting a filling and closing line from the application of crown closures to the application of roll-on closures and vice versa, it is desirable to provide an even quicker change over and also to provide an alternative to that provided by the machine disclosed in U.S. Pat. No. 3,660,963.

SUMMARY OF THE INVENTION

This invention provides a capping head having an adapter for connecting the head to a rotatable sleeve on a capping spindle whereby axial travel of the spindle will be transmitted to the capping head without rotating the capping head.

 Accordingly, an object of the invention is to provide a swallow-on cap applying head which is adapted to be mounted on a roll-on cap applying spindle.

Another object of the invention is to provide a capping machine having at least one spindle mounted thereon which includes a rotating sleeve which is adapted to rotate a swiveling head, when present, and a swallow-on cap applying head mounted on such spindle.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects and advantages of the invention will be more fully understood and appreciated with reference to the following description and the drawings appended hereto wherein:

FIG. 1 is a vertical cross-sectional view through a swallow-on cap applying head of the invention secured on the bottom end of a spindle for applying roll-on closures,

FIG. 2 is a horizontal cross-sectional view through the capping head of FIG. 1 taken along line II—II and showing fragments of adjacent capping heads in a turret assembly,

FIG. 3 is a reduced-size cross-sectional view of a prior art capping machine with a swivel-head mounted on one spindle in the machine,

FIG. 4 is a view similar to FIG. 3, except showing a swallow-on capping head of the invention mounted on the spindle, and

FIG. 5 is a partial side elevational view of the capping machine of FIG. 4 showing two spindles with swallow-on capping heads thereon.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring to FIGS. 1 and 2, a crown head assembly 10 is illustrated which is adapted to be secured on a rotatable sleeve 12 on a spindle 14 which is normally used for applying roll-on closures onto containers. Crown head assembly 10 comprises a head body 16 having a draw ring 18 mounted therein or constricting or crimping the skirt of a crown closure inwardly to affix the closure to a bottle 24 having a head 26 around its mouth, a mounting ring 17 for securing the draw ring in the assembly, and a crown platform 28 secured on the bottom of the head body for holding the crown closure prior to affixation to the bottle. Threaded bolts 19 and 29 may be used to secure mounting ring 17 and crown platform 28 on head body 16. Crown head assembly 10 further includes a knockout plunger 30 and a spring 32 for stripping a crown closure 20 from draw ring 18 after affixation of the closure to the bottle 24. Knockout plunger 30 may have a recess 34 in it to provide clearance for the end of spindle shaft 36 when spring 32 is compressed during capping.
It is a feature of this invention that crown head assembly 10 includes an adapter 42 for connecting the head assembly to spindle sleeve 12 so that the sleeve can freely rotate in the head assembly without rotating the assembly. As stated above, when spindle 14 is used to apply roll-on closures on containers, a headset which is used for such application must be rotated around the closures to deform the entire circumference of the closure skirt against a container, and spindle 12 is provided on the spindle for rotating such headset. With a swage-on or crown applying head, however, the head preferably does not rotate. Due to this difference between the roll-on cap applying headset and the crown cap applying head, and the spindles for receiving such heads, it has been the practice to either completely replace the turret for applying the other form of closures, or to replace spindles for applying one form of closures with spindles for applying the other form of closures in a turret adapted to receive either type of spindle as is disclosed in U.S. Pat. No. 3,660,963. This invention greatly simplifies the change over from the application of roll-on closures to the application of swage-on closures and vice versa by making it possible to simply change the cap applying head on the spindles which remain in the rotatable turret assembly.

Adapter 42 includes a mounting sleeve 44 which may be secured on spindle sleeve 12 by means of threads, keys or the like, a bearing assembly 46 for rotatably connecting the mounting sleeve and head body 16, and a spanner plate 48 which provides means for turning the mounting sleeve to screw it on or off the spindle sleeve. Bearing assembly 46 includes the necessary ball bearings and raceways for providing a rotatable connection between mounting sleeve 44 and head body 16 and is secured between such mounting sleeve and head body by means of retaining rings 50 and 52. Bearing assembly 46 is particularly adapted for accommodating relative rotational movement between mounting sleeve 44 and head body 16 while transmitting axial or vertical movement or travel. Consequently, when a crown cap applying head assembly 10 is secured on a spindle 12, vertical travel of the spindle will be transmitted to the head assembly, but the rotational movement of sleeve 12 will not rotate the head assembly.

FIG. 5 shows that head body 16 of a crown head assembly 10 may be adapted for sliding contact against the head body of adjacent crown head assemblies in a turret assembly to prevent the assemblies from rotating, but not to interfere with relative vertical travel of the adjacent assemblies. Corresponding edge surfaces of crown platforms 28 preferably have a small clearance therebetween, and are not used to prevent rotation of head assemblies 10. In a turret assembly with a plurality of capping spindles with head assemblies 10 thereon mounted in the turret around its periphery, lateral edge surfaces on each head assembly preferably have an included angle therebetween which corresponds to the angle of the arc in the periphery of the turret assembly which is occupied by each such head (FIG. 2). Consequently, the contacting lateral edge surfaces on adjacent head bodies 16 are substantially parallel and slide against one another to prevent rotation of the head assemblies on their respective spindles.

FIG. 2 shows magnet assemblies 58 in capping head 10 including a magnet 59 in each assembly for holding a steel crown cap in position in the assembly for application to a container. Platform 28 has a slot in the side thereof which faces outwardly in a turret assembly for receiving a cap 20 for application to a container.

FIG. 3 illustrates a prior art rotatable turret assembly 60 which is conventionally used for the application of roll-on closures to containers. A spinning headset 62 is attached to spindle 14 in turret assembly 60 for such application. As is conventional, a turret assembly 60 may include any number of stations or mounts around its periphery for receiving spindles 14 with capping heads thereon.

Turret assembly 60 is adapted to be mounted on a base 64 which supports and drives or rotates the turret around a vertical axis. Base 64 may include a support cylinder 66, a drive sleeve 68 for rotating the turret assembly and a platform 70 for supporting bottles on which closures are to be applied. Turret assembly 60 may comprise a center post 72, a turret hub 74, a turret frame 76 with a plurality of outwardly open vertical slots around its circumference in which spindles can be mounted, a lower cam 78, an upper cam 80, a turret support sleeve 82, a drive gear 84, an upper cam support 86 and a nut 88.

Each spindle 14 may comprise a support yoke 90 resiliently mounted on a shaft 36 by means of a coil spring 94 and a housing 96, with a cam follower 98 secured to the top of the yoke. Cam follower 98 is disposed in a cam track 100 in upper cam 80 and follows the up and down path of the track to move yoke 90 up and down as spindle 14 is rotated around the turret and the stationary cam track. In the body of spindle 14, coil spring 94 is supported on housing 96 which is rigidly attached to shaft 36. A nut 102 is threaded on the end of housing 96 to secure yoke 90 thereon, and a nut 104 is threaded on the end of the shaft 36 so that vertical movement of the yoke resiliently acts on the shaft with compression of the spring moving the upper end of the shaft upward through the open center of the yoke. Spindle 14 further includes a drive sleeve 12 with a gear 108 secured thereto mounted on head pressure shaft 36 below housing 96 so that the collar and gear can freely rotate on shaft 36, and a slide 110 over drive sleeve 12 with a cam follower 112 attached to the upper end of the slide and a cone cam 111 attached to the bottom of the slide for camming rollers on headset 62 inwardly against a closure skirt. During capping, gear 108 is continually rotated by drive gear 84, which in turn rotates drive sleeve 12. When a spinning headset 62 is attached to the spindle 14 on drive sleeve 12, rotation of the drive sleeve rotates the headset to roll threads in the skirt of a closure to affix such a closure on a container.

Spinning headset 62 selected for illustration is conventional and need not be described in detail. Essentially, headset 62 comprises a head body 114, at least one thread roller 116, at least one band roller 118, cam rollers 120 for rotating the thread and band rollers, and a system of springs, roller arms, and pivot shafts for moving the thread and band rollers inwardly against a closure skirt and rotating such rollers around the axis of the spindle. Such rotation of headset 62 reforms the skirt of roll-on closure 122 against the mouth of a bottle 124 to secure the closure on the bottle.

FIGS. 4 and 5 illustrate crown cap applying heads 10 mounted on spindles 14 in a turret assembly 60 in accordance with the invention. Turret assembly 60 is substantially identical to the prior art turret assembly illustrated in FIG. 3 except that it has crown cap applying
heads mounted on the spindle 14, and may include means, not shown, for feeding crown closures into the heads for application to bottles or other containers 24. In accordance with this invention, the spinning heads have been removed from each of the spindles 14 in turret assembly 60, along with cone cam 111 from slide 110 (FIG. 3), and a crown cap applying head 10 has been mounted on each such spindle. It is not necessary to remove spindles 14 from the turret assembly 60 to make such change as is required in the machine disclosed in U.S. Pat. No. 3,660,963, and the change can be accomplished in a matter of minutes. Consequently, with this invention a change over from the application of roll-on closures to the application of crown or other swage-on closures results in very little loss of production of a filling and closing line.

In the operation of a capping machine 60 with spindles 14 mounted therein having swage-on cap applying heads 10 thereon, crown caps 20 made of steel can be fed into crown platform 28 on each head assembly and into position in the slot in such platform. Magnets 59 in such platform hold the steel crown caps in position on such platform until they are applied to containers. Upper cam track 100 in cam member 80 moves cam follower 98 which is attached to the upper end of spindle 14 downwardly with the spindle and head assembly 10 mounted thereon to lower crown closure 20 onto bottle 24 and apply top pressure against the closure on the bottle. As spindle 14 and head 10 continue to move downward, bottle 24 with closure 20 thereon resists further downward travel of knock-out plunger 30 so that spring 32 is compressed. As spindle body 16 continues to move downward, draw ring 18 is drawn downward against the skirt of the crown closure to crimp or constrict the closure skirt inwardly against the container mouth and under head 26 on the container mouth, and thereby secures the closure on the container. At the completion of the downward stroke of spindle 14, coil spring 94 on yoke 90 on the spindle body may be slightly compressed to accommodate any variations in the height of bottle 24 to avoid breaking such bottle. After closure 20 has been affixed to bottle 24, upper cam track 100 moves cam follower 98 and spindle 14 with head 10 thereon upwardly and off bottle 24 with the closure thereon. As head moves upwardly, spring 32 in the head forces knock-out 30 downward through draw ring 18 to strip the crimped closure from the draw ring so that container 24 and the closure are not lifted with the head assembly.

During the application of a swage-on closure to a bottle in capping machine 60 with crown cap applying heads 10 mounted on spindles 14, gear 108 and drive sleeve 12 on the spindles are continuously rotated by drive gear 84, but such rotation has no effect on the head assemblies or the application of crown closures to the bottle. Adapter 42 in head assemblies 10 permits drive sleeve 12 to freely rotate within such head assemblies, and the flat lateral edges of each head assembly 10 engages the flat edge surfaces of adjacent head assemblies to prevent rotation of such assemblies. The head assemblies will therefore be moved vertically by drive sleeve 12 to apply crown closures to bottles but will not rotate.

Lower cam track 101 in lower cam 78 also moves lower cam follower 112 up and down as spindles 14 are rotated around the turret assembly 60, but such vertical travel has no effect on the crown cap applying heads 10. Cone cam 111 has been removed from slide 110 to provide sufficient clearance between the bottom of slide and the top of head assembly 10 so that the slide can move up and down on drive sleeve 12 without hitting the top of the head assembly.

To change from the application of swage-on closures to the application of roll-on closures, it is a simple matter to remove crown cap applying heads 10 from spindles 14, mount a cone 111 on the bottom of slide 110, and mount spinning headsets 62 on the bottom of the spindles for applying such roll-on closures. After such spinning headsets have been mounted on spindle 14, capping machine 60 can be operated to apply roll-on closures to bottles in a manner which is known.

It is therefore seen that this invention provides a swage-on cap applying head which can be mounted on a spindle in a rotating turret assembly which is normally used for the application of roll-on closures to bottles. Although a particular turret assembly, spindles and capping heads have been selected for illustration, it will be apparent to those skilled in the art that numerous modifications can be made in such apparatus without departing from the invention. For example, a swage-on cap applying head of the invention may be mounted in a capping machine having only one stationary spindle mounted therein for applying closures to container. The capping head may also be mounted on turrets which have vertical bores therein for receiving spindles rather than outwardly open guideways as in the turret assembly selected for illustration. A variety of swage-on closures such as convenience type tear-off closures or crown closures may also be applied to containers using head assemblies of the invention.

What is claimed is:

1. A swage-on cap applying head adapted to be secured to a spindle which includes a rotatable sleeve for rotating, when present, a spinning headset on the spindle, said head comprising a head body, means for constricting or reforming a portion of a swage-on cap to affix it to a container and an adapter for mounting said head on the rotatable sleeve on a cap applying spindle, said adapter providing a rotatable connection between said cap applying head and said sleeve for transmitting axial travel of the sleeve to the head without rotating the head with the sleeve.

2. A cap applying head as set forth in claim 1 which includes a draw ring and a knockout plunger which can move upwardly in the draw ring against a compression spring during affixation of a closure to a container and downwardly through the draw ring after such affixation to strip the closure from the draw ring.

3. A cap applying head as set forth in claim 1 in which said adapter includes a ball bearing assembly for providing a rotatable connection between said head and said sleeve.

4. In a spindle adapted to be moved axially to apply a closure to a container which includes a rotatable sleeve for rotating, when present, a spinning headset attached to the sleeve, the improvement comprising a swage-on cap applying head secured on the sleeve by means of an adapter which includes a rotatable connecting means between said head and said sleeve for transmitting axial travel of the sleeve to the cap applying head without rotating the head.

5. A spindle as set forth in claim 4 in which said adapter includes a ball bearing assembly for providing
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7. A rotatable connection between said head and said sleeve.

6. In a machine for applying closures to containers including at least one closure applying spindle with a rotatable sleeve mounted therein, means in the machine for moving said spindle vertically, and gear means for rotating said sleeve and, when present, a spinning headset on said spindle, the improvement comprising a swage-on cap applying head mounted on said sleeve by means of an adapter which includes a rotatable connection between said head and said sleeve for transmitting axial travel of the sleeve to the cap applying head without rotating the head.

7. A machine as set forth in claim 6 which includes a rotatable turret with a plurality of said spindles mounted therein.

8. A machine as set forth in claim 6 which includes means for preventing rotation of said cap applying head on said spindle.

9. A machine as set forth in claim 6 which includes a rotatable turret with a plurality of said spindles mounted therein and each said head is in sliding contact with the adjacent heads to prevent rotation of said heads on the spindles.

10. A machine as set forth in claim 4 in which said cap applying head includes a draw ring and a knockout plunger which can move upwardly in the draw ring against a compression spring during affixation of a closure to a container and downwardly through the draw ring after such affixation to strip the closure from the draw ring.