May 1, 1962 G. H. DIMOND 3,031,822

CHUCK FOR CAPPING MACHINES

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Fig. 1.

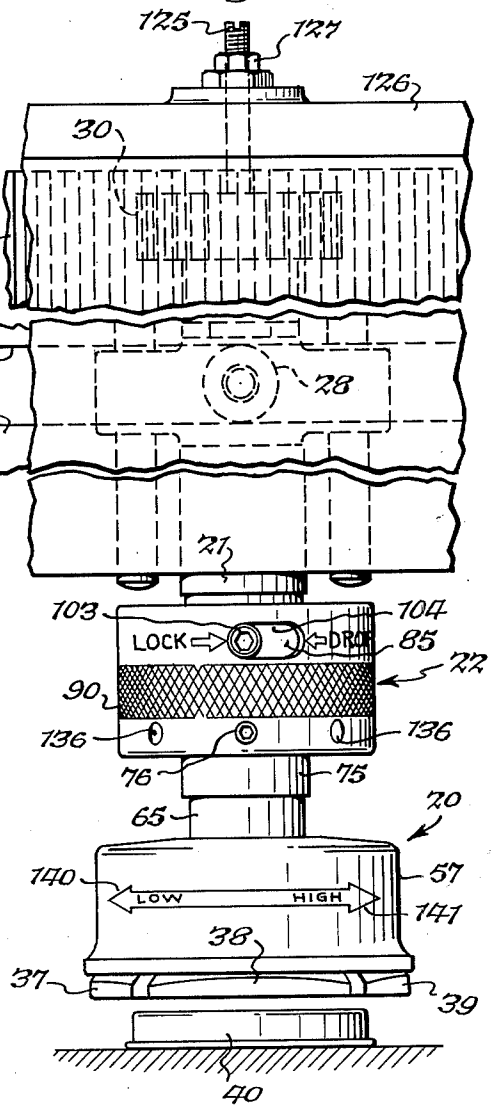
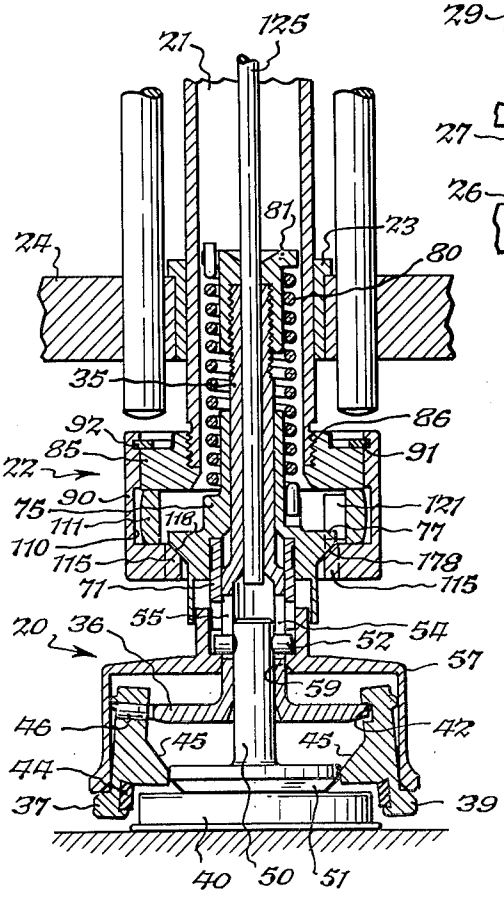


Fig. 2.



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Fig. 5.

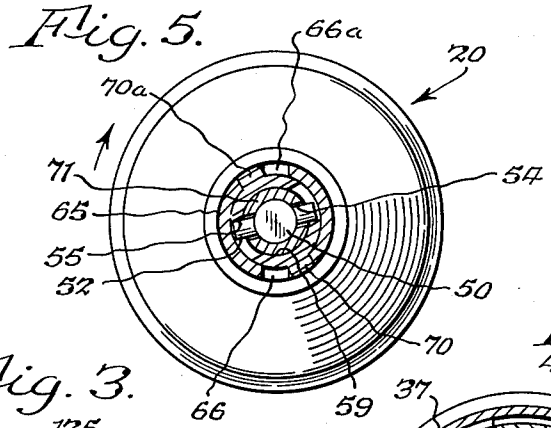


Fig. 6.

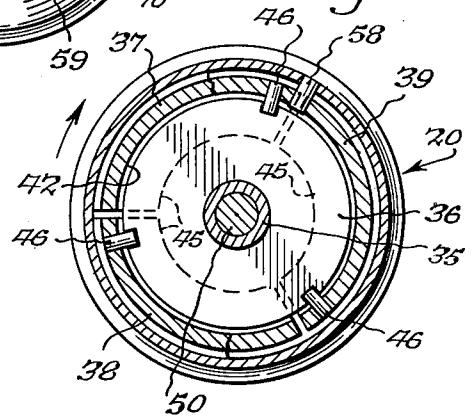


Fig. 3.

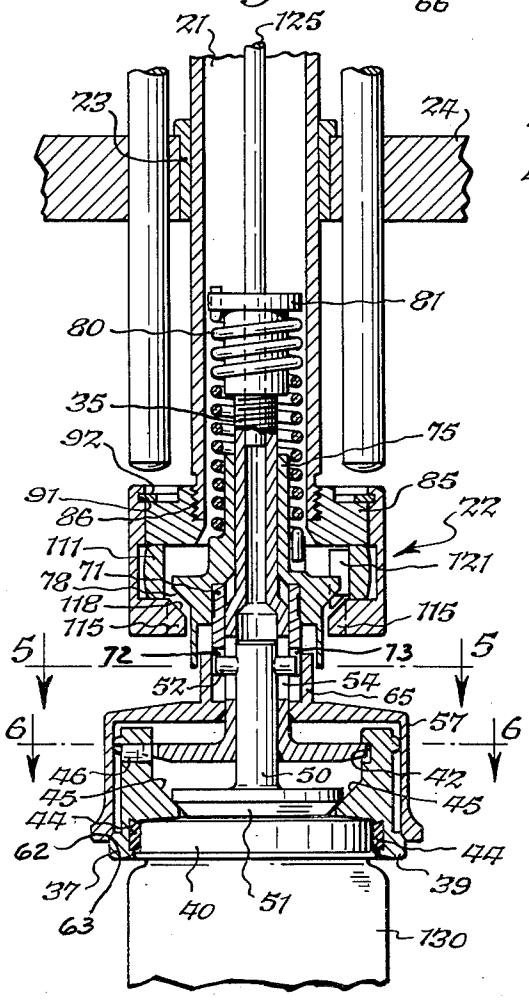
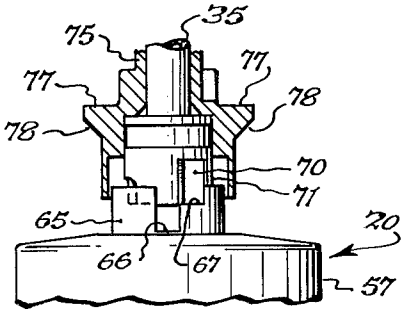


Fig. 4.



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CHUCK FOR CAPPING MACHINES

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Fig. 8.

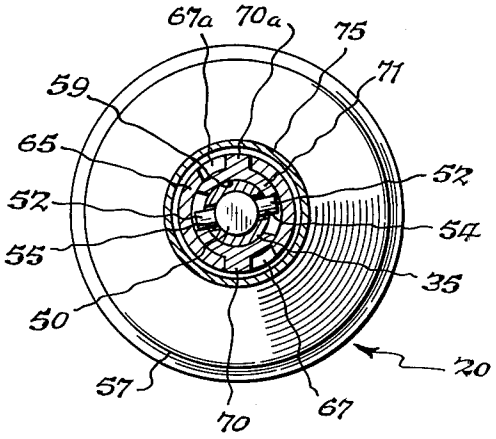


Fig. 7.

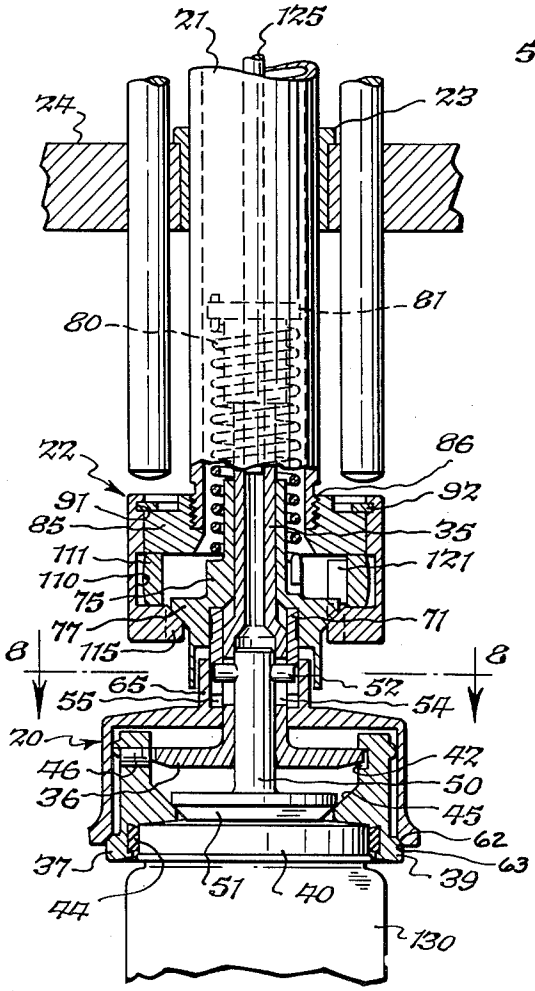
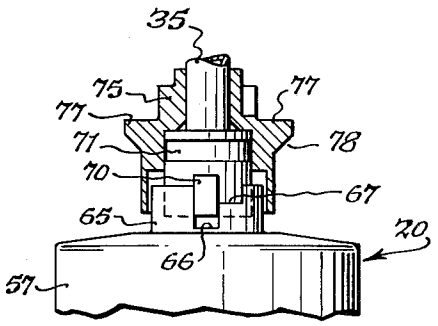


Fig. 9.



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CHUCK FOR CAPPING MACHINES

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Fig. 12

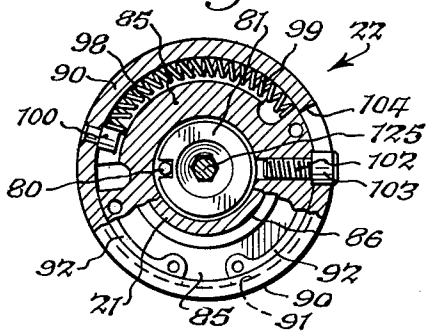


Fig. 13.

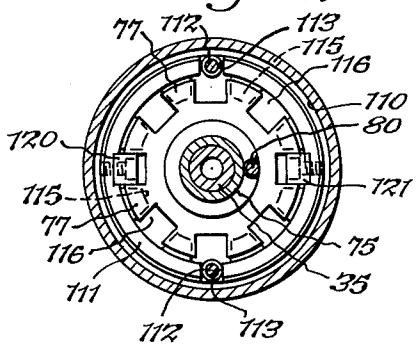


Fig. 10.

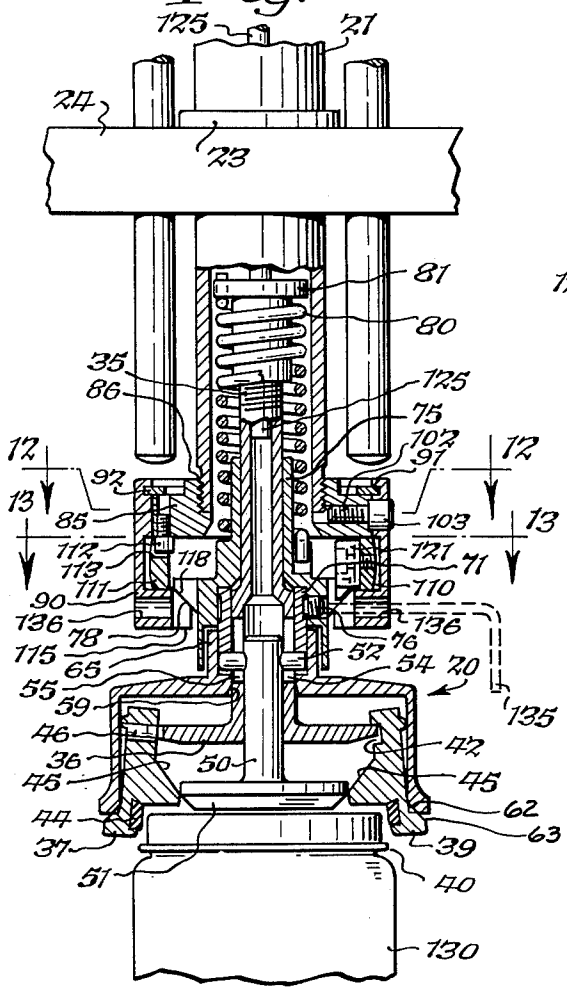


Fig. 14.

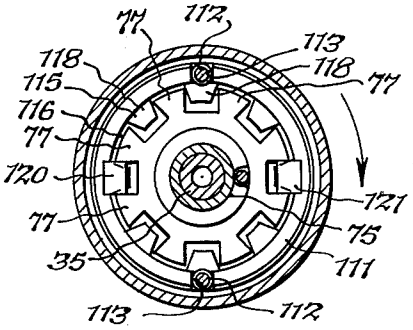
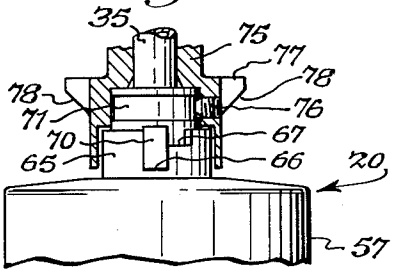


Fig. 11.



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CHUCK FOR CAPPING MACHINES

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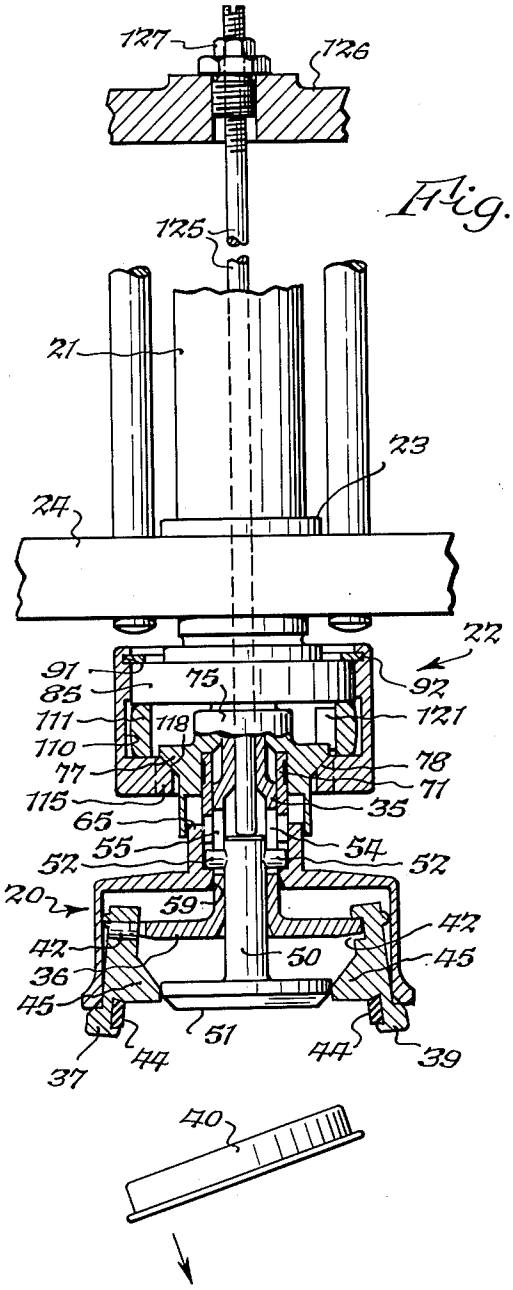
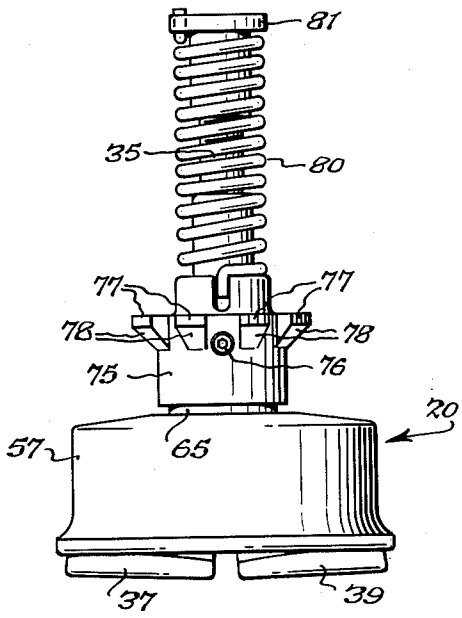


Fig. 15.

Fig. 16.



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United States Patent Office 3,031,822 Patented May 1, 1962

3,031,822

CHUCK FOR CAPPING MACHINES

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Filed Feb. 21, 1961, Ser. No. 90,710
17 Claims. (Cl. 53—317)

This invention relates to closure-applying apparatus and more particularly to such apparatus which is adapted to place screw-type closure elements on successive containers presented therebeneath.

Closure-applying apparatus of the type to which the present invention is directed, while of general application, is particularly suited for use with a capping machine having a rotating turret to which the bottles, cans or other containers to be closed are sequentially advanced. The apparatus customarily is supported adjacent the periphery of the turret and is reciprocally movable with respect thereto by suitable means, such as a cylindrical cam, for example, mounted on the machine. The machine also includes means for rotating the closure-applying apparatus about its axis, so that, as a screw-type container cap or other closure element gripped by the apparatus engages a container presented therebeneath, it is screwed in place. For a more detailed discussion of representative capping machines useful in connection with the invention, reference may be had, for example, to Patent 2,076,631, issued April 13, 1937, to H. E. Gantzer.

Heretofore, closure-applying apparatus previously employed for this purpose have exhibited several disadvantages. For example, it frequently is desirable to apply each closure element to the corresponding container with a predetermined degree of tightness, and many such previous apparatus have proved deficient in this respect. Additionally, difficulties heretofore were encountered in insuring proper alignment between successive containers and their closure elements during the element applying operation. Furthermore, in apparatus of the type heretofore employed, the gripping and release of the closure elements at the appropriate points in the operation cycle often was not effected with a satisfactory degree of accuracy and reliability.

One general object of this invention, therefore, is to provide a new and improved closure-applying apparatus which is particularly adaptable for placing a screw-type closure element on a container presented therebeneath.

More specifically, it is an object of this invention to provide such apparatus which is adapted to apply the closure element to the container with a predetermined degree of tightness.

Another object of this invention is to provide an apparatus of the character indicated which insures proper alignment between the closure element and its corresponding container as the element is applied thereto.

A further object of this invention is to provide a closure-applying apparatus of the foregoing type in which the closure element is positively gripped and affirmatively released at particular points in the operation cycle.

Still another object of this invention is to provide a closure-applying apparatus utilizing comparatively simple mechanical elements, which apparatus is economical to manufacture and thoroughly reliable in operation.

In one illustrative embodiment of this invention, there is provided an apparatus for applying a screw-type closure element to a container which includes a rotary, vertically reciprocable hollow spindle which is disposed above the container in substantial alignment therewith. An elongated sleeve is carried within the spindle and is provided at its lower end with jaw means for receiving the closure element. Surrounding the sleeve is an elongated

coil spring which is affixed at one end to the sleeve and at the other end to a coupling assembly secured to the spindle. This assembly serves to hold the spindle and sleeve together but permits relative movement therebetween. The coil spring is arranged to control the operation of the jaw means as well as to perform various other functions in the operation cycle in a manner such that, as the rotating spindle reciprocates, the jaw means firmly grasps the closure element, applies it to the container and thereafter releases the element.

In accordance with one feature of the invention, the coil spring is pretorsioned and permits relative rotary movement between the jaw means and the spindle upon the application of the closure element to the container with a predetermined degree of tightness. During this relative rotary movement, the spring operates the jaw means to release the closure element and thereby complete the closure-applying operation. In addition, in certain particularly advantageous embodiments, the torsion in the spring is adjustable in a rapid and straightforward manner to vary the tightness between successive closure elements and their containers.

In accordance with another feature of the invention, in certain embodiments, the configuration and arrangement of the coupling assembly is such that the sleeve and jaw means, while being movable as a unit both laterally as well as axially with respect to the spindle, tend to seek the axial center thereof. As a result, the closure element and container are accurately aligned during the element-applying operation.

In accordance with a further feature of the invention, in certain good embodiments, the jaw means affirmatively releases those closure elements which are properly applied to the corresponding containers but continues to grasp closure elements not screwed down onto their containers. These latter elements are discharged from the jaw means at a later point in the operation cycle.

The present invention as well as further objects and features thereof will be understood more clearly and fully from the following description of a preferred embodiment thereof, when read in conjunction with the accompanying drawings in which:

FIGURE 1 is an elevational view of an apparatus for applying closure elements to containers in accordance with a preferred embodiment of the invention, together with cooperating components of a representative capping machine useful therewith;

FIGURE 2 is a vertical sectional view of the apparatus;

FIGURE 3 is a vertical sectional view similar to FIGURE 2 but showing certain parts in different relative positions;

FIGURE 4 is a fragmentary view, partially in section and partially in elevation, of a portion of the apparatus in the position shown in FIGURE 3;

FIGURE 5 is a sectional view taken along the line 5—5 in FIGURE 3;

FIGURE 6 is a sectional view taken along the line 6—6 in FIGURE 3;

FIGURE 7 is a view, partially in section and partially in elevation, generally similar to FIGURE 3 but with certain parts shown in still other relative positions;

FIGURE 8 is a sectional view taken along the line 8—8 in FIGURE 7;

FIGURE 9 is a fragmentary view similar to FIGURE 4 but showing a portion of the apparatus in its FIGURE 7 position;

FIGURE 10 is a view in general similar to FIGURE 7 but showing certain parts of the apparatus in still further relative positions;

FIGURE 11 is a fragmentary view similar to FIGURES

4 and 9 but showing a portion of the apparatus in its FIGURE 10 position;

FIGURE 12 is a sectional view taken in general along the line 12—12 in FIGURE 10, with certain parts omitted for purposes of clarity;

FIGURE 13 is a sectional view taken along the line 13—13 in FIGURE 10, with certain parts omitted for purposes of clarity;

FIGURE 14 is a sectional view also taken along the line 13—13 in FIGURE 10, with certain parts omitted and other shown in different relative positions;

FIGURE 15 is a view in general similar to FIGURE 10 but with certain parts shown in still other relative positions and also showing a representative closure element as it is discarded from the apparatus in cases in which there is no corresponding container therefor; and

FIGURE 16 is an elevational view of a portion of the apparatus.

Referring initially to FIGURES 1 and 2 of the drawings, there is shown a closure-applying apparatus comprising a capping chuck 20 which is supported at the lower end of a vertically disposed hollow spindle 21 by means of a coupling mechanism 22. The spindle 21 is reciprocably movable along its axis in suitable bearings, such as the bearing 23, carried by a pair of spindle plates 24, only one of which is visible in the drawings. As will be understood, these spindle plates form a part of the turret of a capping machine (not shown herein but illustrated, for example, in the aforementioned Gantzer Patent 2,076,631) and constantly rotate therewith. The reciprocable motion of the spindle 21 is controlled by a cylindrical lower cam 26 which is concentric with the machine turret and is operatively engaged by a roller follower 28 mounted on the spindle. If desired, an upper, holding cam 27 may be spaced above a portion of the lower cam 26 and spring-biased downwardly into engagement with the follower 28. The cam 26 is suitably prevented from rotational movement, so that the follower 28 and attached spindle 21 move upwardly and downwardly along the spindle axis as the spindle plates rotate. In addition, the spindle is constantly rotated about its axis as it moves around the turret by a stationary spur gear 29 mounted thereon and a meshing spur gear 30 affixed to the spindle above the follower 28.

The capping chuck 20 includes an elongated sleeve 35 which extends upwardly into the spindle 21. The sleeve 35 is maintained in substantially coaxial relationship with the spindle 21 by the coupling mechanism 22 but is movable both axially and laterally with respect thereto, for purposes that will become more fully apparent hereafter. The lower portion of the sleeve protrudes beneath the spindle and is flared at its lower end to form a horizontal annular disc 36. As best shown in FIGURES 1 and 6, three chuck jaws 37, 38 and 39 surround the disc 36 and extend downwardly therefrom in position to receive a container cap 40 or other closure element located therebeneath. Each of these jaws is provided with an arcuate groove 42 (FIGURE 3) adjacent its upper portion which accommodates the peripheral edge of the disc 36 and permits pivotal movement of the jaw between a closed position (the position shown in FIGURES 3 and 6) and an open position (the position shown in FIGURES 1, 2, 10, 15 and 16). In the jaw-closed position of FIGURES 3 and 6, the lower portion of each jaw is in grasping engagement with the cap 40, while upon movement of the jaws to their open position they pivot outwardly about the edge of disc 36 to release the cap. Particularly in cases in which the caps are fabricated from a plastic or other relatively fragile material, each of the jaws 37, 38 and 39 advantageously includes an arcuate, cap-engaging portion 44 adjacent its lower end which is made of a relatively resilient material such as rubber. In addition, each jaw is provided with an integrally formed projection 45 thereon which extends in an inward direction and, in the jaw-closed position, rests on the top of the cap 40. To prevent the jaws from rotating relative to the disc 36 abouts its axis, each jaw includes a pin 46 extending inwardly into a mating recess in the disc periphery.

Axially positioned within the lower portion of the sleeve 35 is a stripper rod 50 having an enlarged, beveled foot 51 at its lower end which is disposed beneath the annular sleeve disc 36. The diameter of the foot 51 is slightly greater than that of the space between the jaw projections 45 when the jaws 37, 38 and 39 are in their closed position, so that, upon downward movement of the foot relative to the jaws, the beveled portion of the foot engages these projections and urges the jaws outwardly toward their open position. The stripper rod 50 is supported by a transverse pin 52 adjacent the upper end thereof which extends outwardly on either side of the rod through two oppositely disposed apertures 54 and 55 in the sleeve 35. These apertures are axially elongated to permit vertical, reciprocable movement of the rod and its attached foot 51 with respect to the sleeve 35. The ends of the pin 52 extend through the apertures 54 and 55 and, in the position shown in FIGURE 2, rest on the upper surface of a bell-shaped member 57. The member 57 surrounds the jaws 37, 38 and 39 and is prevented from rotational movement with respect thereto by a stud 58 (FIGURE 6). The bell-shaped member includes an axial aperture 59 through which the sleeve 35 slidably extends. The inside diameter of member 57 is such that, in its lowermost position relative to the jaws 37, 38 and 39 (the position shown in FIGURE 3), an internal, forty-five degree chamfer 62 on member 57 engages a corresponding external chamfer 63 on the lower portion of each of these jaws to hold them closed.

Extending upwardly from the bell-shaped member 57 is an integrally formed hub 65. This hub is disposed around the axial aperture 59 but is of a slightly greater inside diameter to provide clearance for the stripper rod pin 52. As best shown in FIGURES 4, 5 and 8, portions of the hub 65 are cut away on opposite sides to form a first pair of stepped ledges 66 and 67 and a second pair of stepped ledges 66*a* and 67*a*. The ledges 66 and 66*a* extend horizontally adjacent the lower portion of the hub 65, while the ledges 67 and 67*a* similarly extend in a horizontal plane and are spaced above and immediately adjacent their corresponding ledges 66 and 66*a*. In the position shown in FIGURE 4, a lug 70 rests on the ledge 67, while a lug 70*a* rests on the ledge 67*a*. These lugs extend outwardly on opposite sides of a sleeve 71 and are integrally formed therewith. The sleeve 71 is slidably and rotatably disposed around the chuck sleeve 35 adjacent the pin 52 for the stripper rod 50 and includes a pair of oppositely disposed saddle notches 72 and 73 in its lower surface which accommodate this pin.

Surrounding the sleeve 71 and extending upwardly therefrom around the chuck sleeve 35 is a coupling member 75. The member 75 is substantially in the form of a hollow cylinder but, as best shown in FIGURE 16, is provided with a series of radial, outwardly projecting bayonet lugs 77 which are equally spaced immediately above the lower periphery thereof. Each of these lugs includes an under surface 78 extending upwardly from member 75 at an angle with respect to the horizontal. An adjustable set screw 76 serves to maintain the coupling member in fixed relationship with the sleeve 71.

One end of an elongated coil spring 80 is mounted in a mating slot in the coupling member 75 immediately above the bayonet lugs 77. This spring is disposed around member 75 and the chuck sleeve 35 and is similarly secured at its opposite, upper end to a cap member 81 fixedly secured to the upper end of the sleeve 35. The spring 80 is precompressed to urge the chuck sleeve, the jaws 37, 38 and 39 and the bell-shaped member 57 upwardly relative to the coupling member 75 and the sleeve 71 and is also pretorsioned in a direction to urge the chuck sleeve, jaws and bell-shaped member in a clockwise direction, as viewed in FIGURE 5 (the direc-

tion of rotation of the spindle 21) relative to the coupling member and the sleeve 71. These relative motions normally are prevented by the engagement between the lugs 70 and 70*a* and one or the other pair of corresponding ledges 66 and 66*a* or 67 and 67*a*. In addition, with the jaws 37, 38 and 39 open and the lugs 70 and 70*a* on the upper ledges 67 and 67*a*, the compression in the spring 80 biases the jaws upwardly relative to the bell-shaped member 57 to urge the jaws toward their closed position, for purposes that will become more fully apparent hereafter.

As indicated heretofore, the coupling mechanism 22 serves to interconnect the spindle 21 with the capping chuck 20. The mechanism 22 includes a hub 85 which is internally threaded to accommodate external threads 86 on the lowermost portion of the spindle and thereby maintain the hub and spindle in fixed relationship with each other. Disposed around the hub 85 and extending downwardly therefrom is a coupling collar 90 which is provided with an annular groove 91 in the upper portion of the inner cylindrical surface thereof. A split retaining ring 92 is positioned in the groove 91 and is spring biased outwardly for retention in the groove. The ring 92 rests on the upper surface of the hub 85.

An arcuate groove 98 (FIGURE 12) is cut into the outer cylindrical surface of the hub 85. This groove extends around the hub periphery for approximately one hundred and forty-five degrees and accommodates a coil spring 99. One end of the spring 99 butts against one end of the groove, while the other spring end is in contact with a pin 100 which extends into the groove 98 from the coupling collar 90. With this arrangement, the spring 99 tends to move the pin 100 and the collar 90 in a counterclockwise direction, as viewed in FIGURE 12, relative to the hub 85. This relative movement is limited by a stud 102 which extends outwardly from the hub 85 and includes a head portion 103 disposed in a horizontally elongated slot 104 in the collar 90.

The inner cylindrical surface of the collar 90 is provided with an annular groove 110 (FIGURE 10) which is substantially wider than the ring groove 91 and is spaced therebeneath. A floating ring 111 is loosely positioned in the groove 110 and has an outside diameter which is less than the diameter of groove 110 to permit the ring to move laterally with respect to the collar 90 and the hub 85. The ring 111 is prevented from rotating relative to the hub 85 by pins 112 which are fixedly secured to the hub and extend downwardly therefrom into mating notches 113 (FIGURES 13 and 14) in the upper surface of the ring.

The lower portion of the coupling collar 90 includes a series of inwardly extending bayonet lugs 115 which are spaced apart around the periphery thereof to define keyways 116 therebetween. The upper surface 118 of each of the lugs 115 extends downwardly from the collar 90 at an angle with respect to the horizontal. The lugs 115 correspond with the bayonet lugs 77 on the coupling member 75, and in the operative position of the apparatus (the position shown in FIGURE 13, for example), the lower surfaces 78 of the lugs 77 are oriented above the upper surfaces 118 of the lugs 115 to prevent the chuck assembly 20 from dropping from beneath the coupling mechanism 22. In this position, the lugs 77 are prevented from rotating relative to the lugs 115 by a pair of oppositely disposed lugs 120 and 121 which extend between adjacent lugs 77. The lugs 120 and 121 are fixedly secured to the inner cylindrical surface of the floating ring 111 and are angularly spaced ninety degrees from the oppositely disposed pins 112. With this arrangement, the chuck 20 is movable in an axial direction with respect to the spindle 21 between a lowermost relative position with the lugs 77 resting on the lugs 115 and an upper relative position with the lugs 77 in engagement with the lower surface of the hub 85. The chuck 20 also is movable laterally with respect to the spindle 21 as a result of the floating ring 111.

During the capping operation, the spindle 21 is constantly rotated by the spur gears 29 and 30 about its axis, to similarly rotate the coupling mechanism 22 and the capping chuck 20. As a result of the angularly extending surfaces 78 and 118 on the bayonet lugs 77 and 115, respectively, the rotating chuck 20 tends to seek the axis of the spindle 21 and is thus normally maintained in vertical alignment therewith. At the start of the operation cycle, the apparatus is in the position shown in FIGURES 1 and 2, with the lugs 77 resting on the lugs 115. In this position, the pin 52 for the stripper rod 50 rests on the upper surface of the bell-shaped member 57, and the lugs 70 and 70*a* (FIGURES 4 and 5) on the sleeve 71 rest on the upper ledges 67 and 67*a* of the hub 65. In addition, the foot 51 at the lower end of the stripper rod is positioned between the chuck jaws 37, 38 and 39 to hold these jaws in their open position against the compression in the coil spring 80.

As indicated heretofore, the rotating spindle 21, the coupling mechanism 22 and the chuck 20 also vertically reciprocate as a result of the action of the cam 26 (FIGURE 1) and the follower 28. The spindle, coupling mechanism and chuck move relative to an axially stationary rod 125 which extends upwardly from within the chuck sleeve 35 and is affixed at its upper end to a turret top plate 126, as by a nut 127. As the chuck 20 moves downwardly to its FIGURE 2 position, the foot 51 at the lower end of the stripper rod 50 engages the upper surface of the container cap 40 therebeneath, thus arresting further downward movement of the stripper rod. The remaining parts of the chuck continue their downward movement for a short distance, and the inwardly extending projections 45 on the chuck jaws 37, 38 and 39 move beneath the foot 51. The compression in the coil spring 80 thereupon urges the sleeve 35 and the attached jaws in an upward direction relative to the coupling member 75, the sleeve 71, the lugs 70 and 70*a* and the bell-shaped member 57, and the internal chamfer 62 on the member 57 engages the external chamfers 63 on the jaws 37, 38 and 39 and, by a sort of collet action, urges these jaws to their closed (FIGURE 3) position to firmly grasp the cap 40 therebetween.

After the container cap 40 is picked up by the chuck jaws 37, 38 and 39, the apparatus moves downwardly toward a container 130 positioned therebeneath, and the cap 40 engages the threaded upper end thereof. The spindle 21 and the attached coupling mechanism 22 continue to move downwardly a short distance, with the result that the bayonet lugs 115 of mechanism 22 become spaced beneath the bayonet lugs 77. At this time in the operation cycle, the various parts of the apparatus are in the positions shown in FIGURES 3–6. The container 130 is suitably prevented from rotary movement (by means not shown but illustrated, for example, in the aforementioned Gantzer Patent 2,076,631), while as indicated heretofore, the spindle 21 is constantly rotated about its axis to similarly rotate the coupling mechanism 22, the member 75, the coil spring 80, the sleeve 35, the attached jaws 37, 38 and 39 and the cap 40 gripped thereby. These components rotate in a clockwise direction, as viewed in FIGURES 5 and 6, to screw the cap onto the container. The bell-shaped member 57 likewise rotates in this direction, and the torsion in the coil spring 80 urges the hub 65 of member 57 clockwise relative to the lugs 70 and 70*a* on the sleeve 71 to maintain these lugs on their corresponding upper ledges 67 and 67*a*.

As the container cap 40 is tightened onto the container 130, the resistance to rotation of the chuck jaws 37, 38 and 39 increases. During the initial portion of the cap-applying operation, this resistance is overcome by the torsion in the spring 80, and the jaws continue to rotate to screw the cap in place. At the time the cap 40 is applied to the container 130 with a predetermined degree of tightness, depending upon the amount of torsion in

the spring 80, the rotational movement of the cap 40, the jaws 37, 38 and 39, the sleeve 35 and the bell-shaped member 57 is arrested. The spindle 21, the coupling mechanism 22, the member 75, the sleeve 71 and the lugs 70 and 70*a* thereon, however, continue to rotate in a clockwise direction, as viewed in FIGURE 5, against the torsion in the spring 80, and these lugs move off their corresponding ledges 67 and 67*a* and rotate to positions above the ledges 66 and 66*a* to thereby permit relative vertical movement between the lugs, the sleeve 71 and the coupling member 75 on the one hand and the ledges and the bell-shaped member 57 on the other. The axial expansive bias of the coil spring 80 thereupon urges the sleeve 71 and the member 75 downwardly toward the positions shown in FIGURES 7 and 9 until the bayonet lugs 77 on member 75 engage the bayonet lugs 115 on the collar 90. Substantially simultaneously with the termination of this downward movement, the lower surface of the sleeve 71 contacts the stripper rod pin 52 to hold the foot 51 in approximately the same position as that shown in FIGURE 3. At this time in the operation cycle, the lugs 70 and 70*a* are oriented at a level intermediate their corresponding ledges 66 and 66*a* and 67 and 67*a*, as best shown in FIGURE 9. Immediately thereafter, the continuing expansion of the spring 80 urges the sleeve 35, the disc 36, the chuck jaws 37, 38 and 39 and the bell-shaped member 57 upwardly until the lugs 70 and 70*a* engage the ledges 66 and 66*a*. As the jaws move upwardly past the now axially stationary foot 51, the jaw projections 45 bear against the foot to rapidly move the jaws outwardly to their open position and thereby release the cap 40 on the container 130. As the jaws open, the chamfers 63 thereon in engagement with the chamfer 62 on the bell-shaped member 57 urge the bell-shaped member in an upward direction relative to the stripper rod 50 by a reversal of the collet action referred to heretofore. This inverse collet action continues until the upward motion of the ledges 66 and 66*a* is arrested by the lugs 70 and 70*a*, at which time the chamfer 62 is oriented above the chamfers 63 and the jaws are in their fully-open (FIGURE 10) position and have released the applied cap. The release of the cap takes place independently of the cam 26, which dwells at this point to permit the cap to be released at the desired time solely under the control of the coil spring 80.

Thereafter, the stationary cam 26 (FIGURE 1) and the follower 28 on the spindle 21 move this spindle, the coupling mechanism 22 and the capping chuck 20 in an upward direction away from the capped container 130. During this upward movement, the stripper rod 50 engages the axially stationary rod 125 to prevent further upward movement of rod 50 and the attached foot 51. Immediately thereafter, the upward motion of the bell-shaped member 57 and the ledges on the hub 65 is arrested by the stripper rod pin 52, which at this time engages the upper surface of the bell-shaped member, and the member 57 prevents further upward movement of the jaws 37, 38 and 39 and the sleeve 35. The spindle 21, the coupling mechanism 22, the member 75, the sleeve 71 and the lugs 70 and 70*a* thereon, however, continue to move upwardly a short distance against the axial expansive bias in the coil spring 80 until the lugs 70 and 70*a* are carried to the level of the upper ledges 67 and 67*a*. The torsion in the spring 80 then rotates the sleeve 35, the disc 36, the jaws 37, 38 and 39, the bell-shaped member 57 and the hub 65 in a clockwise direction, as viewed in FIGURE 8, relative to the sleeve 71 to position the ledges 67 and 67*a* under the corresponding lugs 70 and 70*a* and thus condition the chuck 20 for the receipt of a succeeding container cap and the application thereof to a corresponding container. The relative positions of the various components of the conditioned chuck are best shown in FIGURE 15.

The arrangement is such that each time the stripper foot 51 engages a container cap upon downward movement of the chuck 20, the jaws 37, 38 and 39 automatically close under the control of the coil spring 80 to firmly grip the cap. The thus gripped cap is then moved into position to be applied to a corresponding container. Should a particular container be properly located beneath the cap, the chuck 20 screws the cap in place with a predetermined degree of tightness, and the jaws 37, 38 and 39 automatically move to their open position by reason of the coil spring 80 to release the thus applied cap.

In cases in which no container is located beneath the chuck 20 as it descends, the jaws 37, 38 and 39 remain closed and continue to grip the cap until such time as the chuck approaches its uppermost (FIGURE 15) position. At this time, the upwardly moving stripper rod 50 is engaged by the axially stationary rod 125 to prevent further upward movement of the foot 51. The jaws 37, 38 and 39 continue to carry the cap upwardly, and the foot 51 engages the jaw projections 45 to urge the jaws to their open position, thereby releasing the cap. Should the cap remain between the jaws, the foot 51 contacts the upper cap surface to affirmatively eject the cap from the chuck.

The extent to which the coil spring 80 is pretorsioned, and hence the degree of tightness with which the container caps are applied to the corresponding containers, is readily adjustable in a rapid and straightforward manner. To accomplish this adjustment, the various component parts of the apparatus are moved to the relative positions shown in FIGURE 10, and a suitable tool, such as an Allen wrench 135, for example, shown schematically in FIGURE 10 by dotted lines, is inserted through one of a plurality of radially extending openings 136 in the coupling collar 90 to loosen the set screw 76 and thereby permit relative rotational movement between the sleeve 71 and the coupling member 75. Upon loosening this set screw, it is desirable to grasp the bell-shaped member 57 and the collar 90 to prevent the spring 80 from running down. In cases in which the caps are to be applied relatively loosely to their containers, the bell-shaped member 57 is rotated relative to the collar 90 in the direction indicated by the "Low" arrow head 140 (FIGURE 1) to similarly rotate the stepped ledges on the hub 65, the lugs 70 and 70*a*, the sleeve 71, the chuck sleeve 35 and the upper end of the spring 80 and thereby reduce the spring torsion. The set screw 76 is then tightened to hold the sleeve 71 in its new position. Should it be desired to increase the torsion in the spring 80 and thereby increase the degree of tightness between the caps and their containers, the bell-shaped member 57 is rotated relative to the collar 90 in the direction of the "high" arrow head 141, and the screw 76 is thereafter tightened to maintain this increased torsion in the spring.

As the rotating chuck 20 applies a particular cap to its container, the thus adjusted spring 80 opposes the resistance to rotation of the cap to a greater or lesser extent, as the case may be, and the lugs 70 and 70*a* move off their upper ledges 67 and 67*a* to open the jaws 37, 38 and 39 at a correspondingly later or earlier point in the operation cycle to release the cap when it is screwed onto the container with the selected degree of tightness. With this arrangement, the apparatus is adjustable to permit a wide variation in the tightness with which successive caps are applied to their containers.

As indicated heretofore, the coupling mechanism 22 permits vertical movement of the chuck 20 with respect to the spindle 21 and also enables lateral movement of the chuck relative to the spindle by reason of the floating ring 111. This arrangement is particularly advantageous in situations in which the containers being capped vary slightly in size or in their orientation relative to the spindle. Thus, for example, should a particular container be somewhat greater in height than the containers 130 shown in the drawings, the downward motion of the chuck 20 is arrested as the cap gripped by the chuck

jaws strikes this container, while the spindle 21 and the attached coupling mechanism 22 continue to move downwardly until they reach their lowermost, cap-applying position. In cases in which a container is slightly out of line with the descending spindle, the chuck moves in a lateral direction as the gripped cap strikes the container to properly align the cap therewith. The elongated rod 125 is sufficiently limber to accommodate this lateral chuck movement.

To remove the capping chunk 20 from its spindle 21, such as for maintenance purposes, to substitute a chuck of different dimensions to accommodate different size caps, etc., the coupling collar 90 is manually rotated in a clockwise direction relative to the spindle 21 and the hub 85 from the position shown in FIGURE 13 (the "Lock" position) to that shown in FIGURE 14 (the "Drop" position). This rotational movement is opposed by the coil spring 99 (FIGURE 12). The bayonet lugs 115 move with the collar 90, while the bayonet lugs 77 on the coupling member 75 remain stationary as a result of the lugs 120 and 121 on the floating ring 111. The rotation of the collar is arrested by the elongated collar slot 104 and the stud 102 in the hub 85, at which time the bayonet lugs 77 are in vertical alignment with the keyways 116 between the lugs 115. The collar 90 is manually maintained in its "Drop" position, and the complete chuck assembly 20 (FIGURE 16) is removed from the coupling mechanism 22 and the spindle 21. An alternate chuck is then substituted for the chuck 20 and is secured in place by rotating the coupling collar 90 in a counterclockwise direction relative to the spindle until the collar reaches its "Lock" position and is again arrested by the collar slot 104 and the stud 102.

The terms and expressions which have been employed are used as terms of description and not of limitation, and there is no intention in the use of such terms and expressions, of excluding any equivalents of the features shown and described, or portions thereof, it being recognized that various modifications are possible within the scope of the invention claimed.

What is claimed is:

1. In an apparatus for applying a closure element to a container, the combination of a rotary, vertically reciprocable spindle disposed above said container in substantial vertical alignment therewith, means including an elongated member carried by said spindle and rotatably movable with respect thereto, jaw means mounted adjacent the lower end of said elongated member for receiving said closure element, a coil spring disposed around said elongated member and having one end secured thereto and the other end prevented from rotary movement with respect to said spindle, means for moving said spindle in a downward direction to position the closure element received by said jaw means in engagement with the container therebeneath, means for rotating said spindle, to rotate said spring, said elongated member and said jaw means and thereby apply said closure element to said container, said spindle rotating relative to said elongated member and said jaw means against the torsion in said spring upon the application of said closure element to said container with a predetermined degree of tightness, and means responsive to said rotational, relative movement for releasing said closure element from said jaw means.

2. In an apparatus for applying a closure element to a container, the combination of a rotary, vertically reciprocable spindle disposed above said container in substantial vertical alignment therewith, means including an elongated sleeve carried by said spindle and rotatably movable with respect thereto, jaw means mounted adjacent the lower end of said sleeve for receiving said closure element, a pretorsioned coil spring disposed around said sleeve and having one end secured thereto and the other end in substantially fixed relationship with said spindle, means for vertically reciprocating said spindle, movement of said spindle in a downward direction positioning the closure element received by said jaw means in engagement with the container therebeneath, means for rotating said spindle, to rotate said spring, said sleeve and said jaw means and thereby apply said closure element to said container, said spindle rotating relative to said sleeve and said jaw means against the torsion in said spring upon the application of said closure element to said container with a predetermined degree of tightness, and means controlled by said spring and responsive to said rotational, relative movement for releasing said closure element from said jaw means.

3. In an apparatus for applying a closure element to a container, the combination of a rotary, vertically reciprocable spindle disposed above said container in substantial vertical alignment therewith, means including an elongated member carried by said spindle and rotatably movable with respect thereto, jaw means mounted adjacent the lower end of said elongated member for receiving said closure element, said jaw means being movable between an open and a closed position, a coil spring disposed around said elongated member and having one end secured thereto and the other end prevented from rotary movement with respect to said spindle, operating means controlled by said spring for moving said jaw means between said positions, means for lowering said spindle to position said jaw means in juxtaposition with said closure element, said operating means thereupon moving said jaw means from said open position to said closed position to firmly grasp said closure element, and to thereafter position the gripped closure element in engagement with the container therebeneath, and means for rotating said spindle, to rotate said spring, said elongated member and said jaw means and thereby apply said gripped closure element to said container, said spindle rotating relative to said elongated member and said jaw means against the torsion in said spring upon the application of said closure element to said container with a predetermined degree of tightness, said operating means being responsive to said rotational, relative movement for moving said jaw means to said open position, to release said closure element.

4. In an apparatus for applying a closure element to a container, the combination of a rotary, vertically reciprocable spindle disposed above said container in substantial vertical alignment therewith, means including an elongated member carried by said spindle and rotatably movable with respect thereto, jaw means mounted adjacent the lower end of said elongated member for receiving said closure element, said jaw means being movable between an open and a closed position, a compressed and pretorsioned coil spring disposed around said elongated member and having one end secured thereto and the other end prevented from rotary movement with respect to said spindle, operating means controlled by the compression in said spring for moving said jaw means between said open position and said closed position, means for vertically reciprocating said spindle, movement of said spindle in a downward direction positioning said jaw means in juxtaposition with said closure element, said operating means thereupon moving said jaw means from said open position toward said closed position to firmly grip said closure element, continued downward movement of said spindle positioning the closure element gripped by said jaw means in engagement with the container therebeneath, and means for rotating said spindle, to rotate said spring, said elongated member and said jaw means and thereby apply the gripped closure element to said container, said spindle rotating relative to said elongated member and said jaw means against the torsion in said spring upon the application of said closure element to said container with a predetermined degree of tightness, said operating means being responsive to said rotational, relative movement for

moving said jaw means to said open position, to release said closure element.

5. In an apparatus of the character set forth in claim 4, in combination, means for varying the initial angular position of said elongated member with respect to said spindle, to thereby adjust the torsion in said spring and hence the degree of tightness with which said closure element is applied to said container.

6. In an apparatus for applying a closure element to a container, the combination of a rotary, vertically reciprocable spindle disposed above said container in substantial vertical alignment therewith, means including an elongated sleeve carried by said spindle and reciprocably movable with respect thereto, jaw means mounted adjacent the lower end of said sleeve for receiving said closure element, said jaw means being movable between an open and a closed position, a compressed coil spring disposed around said sleeve and having one end secured thereto and the other end prevented from rotary movement with respect to said spindle, the compression in said spring urging said sleeve and the jaw means mounted thereon in an axial direction relative to said spindle to move said jaw means toward said closed position and firmly grip the closure element received thereby, means for moving said spindle in a downward direction to position the closure element gripped by said jaw means in engagement with the container therebeneath, means for rotating said spindle, to rotate said spring, said sleeve and said jaw means and thereby apply the gripped closure element to said container, and means controlled by said spring and responsive to the application of said closure element to said container with a predetermined degree of tightness for moving said jaw means to said open position, to release said closure element.

7. In an apparatus for applying a closure element to a container, the combination of a rotary, vertically reciprocable spindle disposed above said container in substantial vertical alignment therewith, means including an elongated sleeve carried by said spindle and reciprocably movable with respect thereto, jaw means mounted adjacent the lower end of said sleeve for receiving said closure element, said jaw means being movable between an open and a closed position, a compressed coil spring disposed around said sleeve and having one end secured thereto and the other end in substantially fixed relationship with said spindle, operating means including a bell-shaped member surrounding said jaw means for moving the same between said positions, means for moving said spindle in a downward direction to position said jaw means in juxtaposition with said closure element, the compression in said spring thereupon urging said sleeve and said jaw means in an upward direction relative to said spindle and said bell-shaped member to move said jaw means toward said closed position and firmly grip said closure element, and to thereafter position the gripped closure element in engagement with the container therebeneath, and means for rotating said spindle, to rotate said spring, said sleeve and said jaw means and thereby apply said gripped closure element to said container, said operating means being responsive to the application of said closure element to said container with a predetermined degree of tightness for moving said jaw means to said open position, to release said closure element.

8. In an apparatus for applying a closure element to a container, the combination of a rotary, vertically reciprocable hollow spindle disposed above said container in substantial vertical alignment therewith, an elongated sleeve reciprocably carried within said spindle and protruding therebeneath, jaw means supported at the lower end of said sleeve and movable between an open and a closed position for receiving and releasing said closure element, a bell-shaped member disposed around said jaw means including an opening through which said sleeve extends, coupling means secured to said spindle for maintaining said spindle and said sleeve in substantially coaxial relationship with each other, a compressed coil spring disposed around said sleeve and affixed at one end thereto and at the other end to said coupling means, the compression in said spring urging said sleeve and the jaw means carried thereby in an upward direction relative to said coupling means and said bell-shaped member to bias said jaw means toward said closed position, operating means for moving said jaw means to said open position against the compression in said spring, means for vertically reciprocating said spindle, movement of said spindle in a downward direction positioning said jaw means in juxtaposition with said closure element, the compresson in said spring thereupon urging said sleeve and said jaw means upwardly relative to said spindle and said bell-shaped member to move said jaw means to said closed position and thereby firmly grip said closure element, continued downward movement of said spindle positioning said gripped closure element in engagement with said container, and means for rotating said spindle, to similarly rotate said coupling means, said spring, said sleeve and said jaw means and thereby apply said closure element to said container, said operating means being effective upon the application of said closure element to said container with a predetermined degree of tightness for moving said jaw means to said open position to thereby release said closure element.

9. In an apparatus for applying a closure element to a container, the combination of a rotary, vertically reciprocable hollow spindle disposed above said container in substantial vertical alignment therewith, an elongated sleeve reciprocably carried within said spindle and protruding therebeneath, an axially movable member disposed within said sleeve in vertically reciprocable relationship therewith, jaw means supported at the lower end of said sleeve and movable between an open and a closed position for receiving and releasing said closure element, said jaw means when in said open position being in engagement with said axially movable member and when in said closed position being oriented therebeneath, a bell-shaped member disposed around said jaw means including an opening through which said sleeve extends, coupling means secured to said spindle for maintaining said spindle and said sleeve in substantially coaxial relationship with each other, a compressed coil spring surrounding said sleeve and affixed at one end to the upper portion thereof and at the other end to said coupling means, the compression in said spring urging said sleeve and the jaw means carried thereby in an upward direction relative to said coupling means and said bell-shaped member to bias said jaw means toward said closed position, means for positioning said axially movable member in engagement with said jaw means, to thereby move the same to said open position against the compression in said spring, means for vertically reciprocating said spindle, movement of said spindle in a downward direction carrying said axially movable member into engagement with said closure element, said jaw means thereafter moving beneath said axially movable member to said closed position to thereby firmly grip said closure element, continued downward movement of said spindle positioning said gripped closure element in engagement with said container, and means for constantly rotating said spindle, to similarly rotate said coupling means, said spring, said sleeve and said jaw means and thereby apply said closure element to said container, the compression in said spring urging said sleeve and said jaw means upwardly relative to said axially movable member in response to the application of said closure element to said container with a predetermined degree of tightness, to move said jaw means to said open position and thereby release said closure element.

10. In an apparatus for applying a screw-type closure element to a container, the combination of a rotary, ver-

tically reciprocable hollow spindle disposed above said container in substantial vertical alignment therewith, an elongated sleeve reciprocably carried within said spindle and protruding therebeneath, said sleeve including a vertically elongated aperture adjacent the lower portion thereof, an element engaging member disposed within said sleeve in vertically reciprocable relationship therewith and having a lateral extension thereon extending through said aperture, jaw means supported at the lower end of said sleeve and movable between an open and a closed position for receiving and releasing said closure element, said jaw means when in said open position being in engagement with said element engaging member and when in said closed position being oriented therebeneath, a bell-shaped member disposed around said jaw means including an opening through which said sleeve extends, coupling means secured to said spindle for maintaining said spindle and said sleeve in substantially coaxial relationship with each other, a compressed coil spring disposed around said sleeve and affixed at one end to the upper portion thereof and at the other end to said coupling means, the compression in said spring urging said sleeve and the jaw means carried thereby in an upward direction relative to said coupling means and said bell-shaped member to normally maintain said jaw means in said closed position, an elongated, axially stationary rod disposed within said sleeve above said element-engaging member, means for vertically reciprocating said spindle, movement of said spindle in an upward direction carrying said element engaging member into engagement with said elongated rod, continued upward movement of said spindle carrying said jaw means into engagement with said element engaging member to move said jaw means to said open position against the compression in said spring, movement of said spindle in a downward direction carrying said element engaging member into engagement with said closure element, said jaw means thereafter moving beneath said engaging member to said closed position to thereby firmly grip said closure element, continued downward movement of said spindle positioning said gripped closure element in engagement with said container, and means for constantly rotating said spindle, to similarly rotate said coupling means, said spring, said sleeve and said jaw means and thereby screw said closure element onto said container, the compression in said spring urging said sleeve and said jaw means upwardly relative to said element engaging member in response to the application of said closure element to said container with a predetermined degree of tightness, to move said jaw means to said open position and thereby release said closure element.

11. In an apparatus for applying a closure element to a container, the combination of a rotary, vertically reciprocable hollow spindle disposed above said container in substantial vertical alignment therewith, an elongated sleeve rotatably carried within said spindle and protruding therebeneath, jaw means supported at the lower end of said sleeve and movable between an open and a closed position for receiving and releasing said closure element, a bell-shaped member disposed around said jaw means including an upstanding hub having an opening through which said sleeve extends, a portion of said hub being cut away to define a pair of ledges thereon, coupling means secured to said spindle for maintaining said spindle and said sleeve in substantially coaxial relationship with each other, said coupling means being provided with an outwardly extending projection in engagement with one of said ledges, a pretorsioned coil spring disposed around said sleeve and affixed at one end thereto and at the other end to said coupling means, the torsion in said spring tending to rotate said sleeve, said jaw means and said bell-shaped member relative to said coupling means in a direction to maintain said projection on said one ledge, means for vertically reciprocating said spindle, movement of said spindle in a downward direction carrying said jaw means into engagement with said closure element, means for thereafter moving said jaw means from said open position to said closed position to firmly grip said closure element, continued downward movement of said spindle positioning said gripped closure element in engagement with said container, means for constantly rotating said spindle, to similarly rotate said coupling means, said spring, said sleeve and said jaw means and thereby apply said closure element onto said container, said spindle and said coupling means rotating relative to said sleeve and said jaw means against the torsion in said spring upon the application of said closure element to said container with a predetermined degree of tightness, to move said projection off said one ledge and onto the other ledge, and means responsive to the movement of said projection onto said other ledge for moving said jaw means to said open position, to thereby release said closure element.

12. In an apparatus for applying a screw-type closure element to a container, the combination of a rotary, vertically reciprocable hollow spindle disposed above said container in substantial vertical alignment therewith, an elongated sleeve reciprocably and rotatably carried within said spindle and protruding therebeneath, an element engaging member disposed within said sleeve in vertically reciprocable relationship therewith, jaw means supported at the lower end of said sleeve and movable between an open and a closed position for receiving and releasing said closure element, said jaw means when in said open position being in engagement with said element engaging member and when in said closed position being oriented therebeneath, a bell-shaped member disposed around said jaw means including an upstanding hub having an opening through which said sleeve extends, a portion of said hub being cut away to define a pair of ledges thereon, means for preventing relative rotary movement between said bell-shaped member and said jaw means, coupling means secured to said spindle for maintaining said spindle and said sleeve in substantially coaxial relationship with each other, said coupling means being provided with an outwardly extending projection in engagement with one of said ledges, a compressed and pretorsioned coil spring disposed around said sleeve and affixed at one end to the upper portion thereof and at the other end to said coupling means, the compression in said spring urging said sleeve and the jaw means carried thereby in an upward direction relative to said coupling means and said bell-shaped member to bias said jaw means toward said closed position, said element engaging member normally being positioned in engagement with said jaw means to hold the same in said open position, the torsion in said spring tending to rotate said sleeve, said jaw means and said bell-shaped member relative to said coupling means in a direction to maintain said projection on said one ledge, means for vertically reciprocating said spindle, movement of said spindle in a downward direction carrying said element engaging member into engagement with said closure element, said jaw means thereupon moving beneath said engaging member to said closed position to firmly grip said closure element, continued downward movement of said spindle positioning said gripped closure element in engagement with said container, and means for constantly rotating said spindle, to similarly rotate said coupling means, said spring, said sleeve and said jaw means and thereby screw said closure element onto said container, said spindle and said coupling means rotating relative to said sleeve and said jaw means against the torsion in said spring upon the application of said closure element to said container with a predetermined degree of tightness, to move said projection off said one ledge and onto the other ledge, the compression in said spring urging said sleeve and said jaw means upwardly relative to said element engaging member as said projection moves off said one

ledge, to move said jaw means to said open position and thereby release said closure element.

13. An apparatus of the character set forth in claim 12, in which said outwardly extending projection is rotatably movable with respect to said spindle, relative rotary movement of said projection similarly rotating said bell-shaped member, said jaw means and said sleeve to vary the torsion in said spring and hence the degree of tightness with which said closure element is screwed onto said container.

14. An apparatus of the character set forth in claim 12, in which said coupling means includes means for maintaining said sleeve in detachable relationship with said spindle.

15. In an apparatus for applying a screw-type closure element to a container, the combination of a rotary, vertically reciprocable hollow spindle disposed above said container in substantial vertical alignment therewith, an elongated sleeve reciprocably and rotatably carried within said spindle and protruding therebeneath, an element engaging member disposed within said sleeve in vertically reciprocable relationship therewith, jaw means supported at the lower end of said sleeve and movable between an open and a closed position for receiving and releasing said closure element, said jaw means when in said open position being in engagement with said element engaging member and when in said closed position being oriented therebeneath, a bell-shaped member disposed around said jaw means including an upstanding hub having an opening through which said sleeve extends, a portion of said hub being cut away to define a pair of stepped ledges thereon, coupling means secured to said spindle for maintaining said spindle and said sleeve in substantially coaxial relationship with each other, said coupling means being provided with an outwardly extending projection in engagement with one of said ledges, a compressed and pretorsioned coil spring disposed around said sleeve and affixed at one end to the upper portion thereof and at the other end to said coupling means, the compression in said spring urging said sleeve and the jaw means carried thereby in an upward direction relative to said coupling means and said bell-shaped member to bias said jaw means toward said closed position, said element engaging member normally being positioned in engagement with said jaw means to hold the same in said open position, the torsion in said spring tending to rotate said sleeve, said jaw means and said bell-shaped member relative to said coupling means in a direction to maintain said projection on said one ledge, an elongated, axially stationary rod disposed within said sleeve above said element-engageable member, means for vertically reciprocating said spindle, movement of said spindle in an upward direction carrying said element engaging member into engagement with said elongated rod, movement of said spindle in a downward direction carrying said element engaging member into engagement with said closure element, said jaw means thereafter moving beneath said engaging member to said closed position to thereby firmly grip said closure element, continued downward movement of said spindle positioning said gripped closure element in engagement with said container, and means for constantly rotating said spindle, to similarly rotate said coupling means, said spring, said sleeve and said jam means and thereby screw said closure element onto said container, said spindle and said coupling means rotating relative to said sleeve and said jaw means against the torsion in said spring upon the application of said closure element to said container with a predetermined degree of tightness, to move said projection off said one ledge and onto the other ledge, the compression in said spring urging said sleeve and said jaw means upwardly relative to said element engaging member as said projection moves off said one ledge, to move said jaw means to said open position and thereby release said closure element.

16. An apparatus of the character set forth in claim 15, in which said bell-shaped member maintains said jaw means in its said closed position to continue to grip a closure element improperly applied to a container upon the upward movement of said spindle, said jaw means moving to said open position to release the improperly applied closure element as the upward movement of said element engaging member is arrested by said elongated rod.

17. In an apparatus for applying a screw-type closure element to a container, the combination of a rotary, vertically reciprocable hollow spindle disposed above said container in substantial vertical alignment therewith, an elongated sleeve reciprocably and rotatably carried within said spindle and protruding therebeneath, said sleeve including a vertically elongated aperture adjacent the lower portion thereof, an element engaging member disposed within said sleeve in vertically reciprocable relationship therewith and having a lateral extension thereon extending through said aperture, jaw means supported at the lower end of said sleeve and movable between an open and a closed position for receiving and releasing said closure element, said jaw means when in said open position being in engagement with said element engaging member and when in said closed position being oriented therebeneath, a bell-shaped member disposed around said jaw means including an upstanding hub having an opening through which said sleeve extends, a portion of said hub being cut away to define a pair of stepped ledges thereon, means for preventing relative rotary movement between said bell-shaped member and said jaw means, coupling means secured to said spindle for maintaining said spindle and said sleeve in substantially coaxial relationship with each other but for permitting relative axial and lateral movement therebetween, said coupling means being provided with an outwardly extending projection in engagement with the lower of said ledges, a compressed and pretorsioned coil spring disposed around said sleeve and affixed at one end to the upper portion thereof and at the other end to said coupling means, the compression in said spring urging said sleeve and the jaw means carried thereby in an upward direction relative to said coupling means and said bell-shaped member to normally maintain said jaw means in said closed position, the torsion in said spring tending to rotate said sleeve, said jaw means and said bell-shaped member relative to said coupling means in a direction to urge said projection toward the upper of said ledges, an elongated, axially stationary rod disposed within said sleeve above said element-engageable member, means for vertically reciprocating said spindle, movement of said spindle and said coupling means in an upward direction carrying said element engaging member into engagement with said elongated rod to arrest further upward movement of said engaging member, continued upward movement of said spindle carrying said jaw means into engagement with said element engaging member, to move said jaw means to said open position against the compression in said spring, and carrying said bell-shaped member into engagement with the lateral extension on said element engaging member to arrest further upward movement of said bell-shaped member and said sleeve, so that, as said spindle and attached coupling means continue their upward movement, the projection on said coupling means is urged onto said upper ledge by the torsion in said spring, movement of said spindle in a downward direction carrying said element engaging member into engagement with said closure element, said jaw means thereafter moving beneath said engaging member to said closed position to thereby firmly grip said closure element, continued downward movement of said spindle positioning said gripped closure element in engagement with said container, and means for constantly rotating said spindle, to similarly rotate said coupling means, said spring, said sleeve and said jaw means and thereby screw said closure

element onto said container, said spindle and said coupling means rotating relative to said sleeve and said jaw means against the torsion in said spring upon the application of said closure element to said container with a predetermined degree of tightness, to move said projection off said upper ledge, the compression in said spring urging said

sleeve and said jaw means upwardly relative to said element engaging member as said projection moves off said upper ledge, to position said projection on said lower ledge and to move said jaw means to said open position, thereby releasing said closure element.

No references cited.