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Holstein

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[54] **CAPPER CHUCK DEVICE**

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[73] Assignee: **Cherry-Burrell Corporation,** Chicago, Ill.

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[52] **U.S. Cl.** **53/317,** 53/331.5, 53/367

[51] **Int. Cl.** **B67b 3/20,** B65b 7/28

[58] **Field of Search** 53/331.5, 350, 365, 329, 53/306, 287, 281, 367, 317

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Assistant Examiner—Horace M. Culver
Attorney, Agent, or Firm—Fitch, Even, Tabin & Luedeka

[57] **ABSTRACT**

A capper chuck device for applying a rotatable closure cap to a container wherein closure cap retaining jaws are movable by a toggle linkage arrangement to retain a closure cap therebetween responsive to an externally applied force, and wherein adjustable torque transfer means are adapted to release the jaws from the closure cap after a predetermined rotational torque has been applied to the cap in assemblying it onto the container.

18 Claims, 10 Drawing Figures

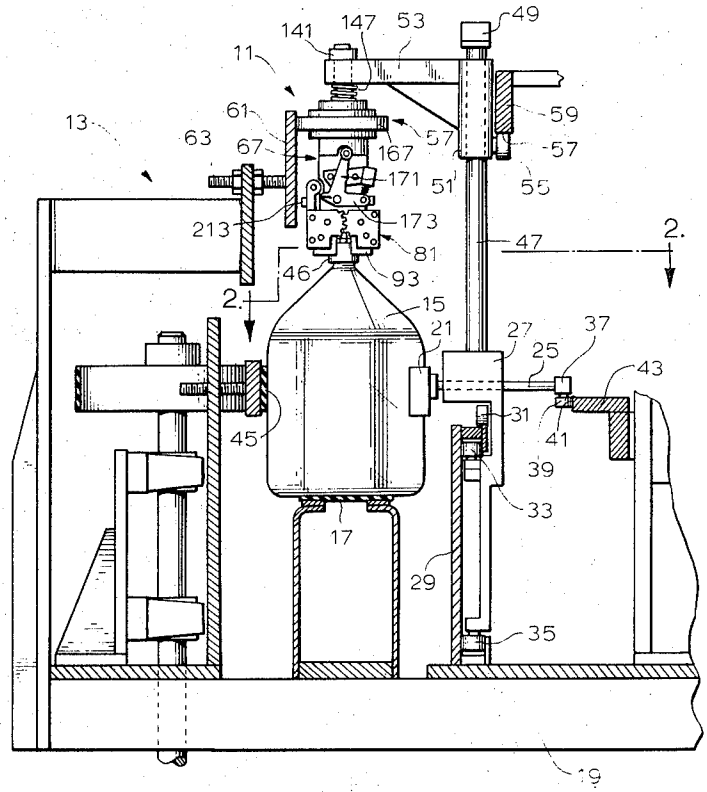


FIG. 1

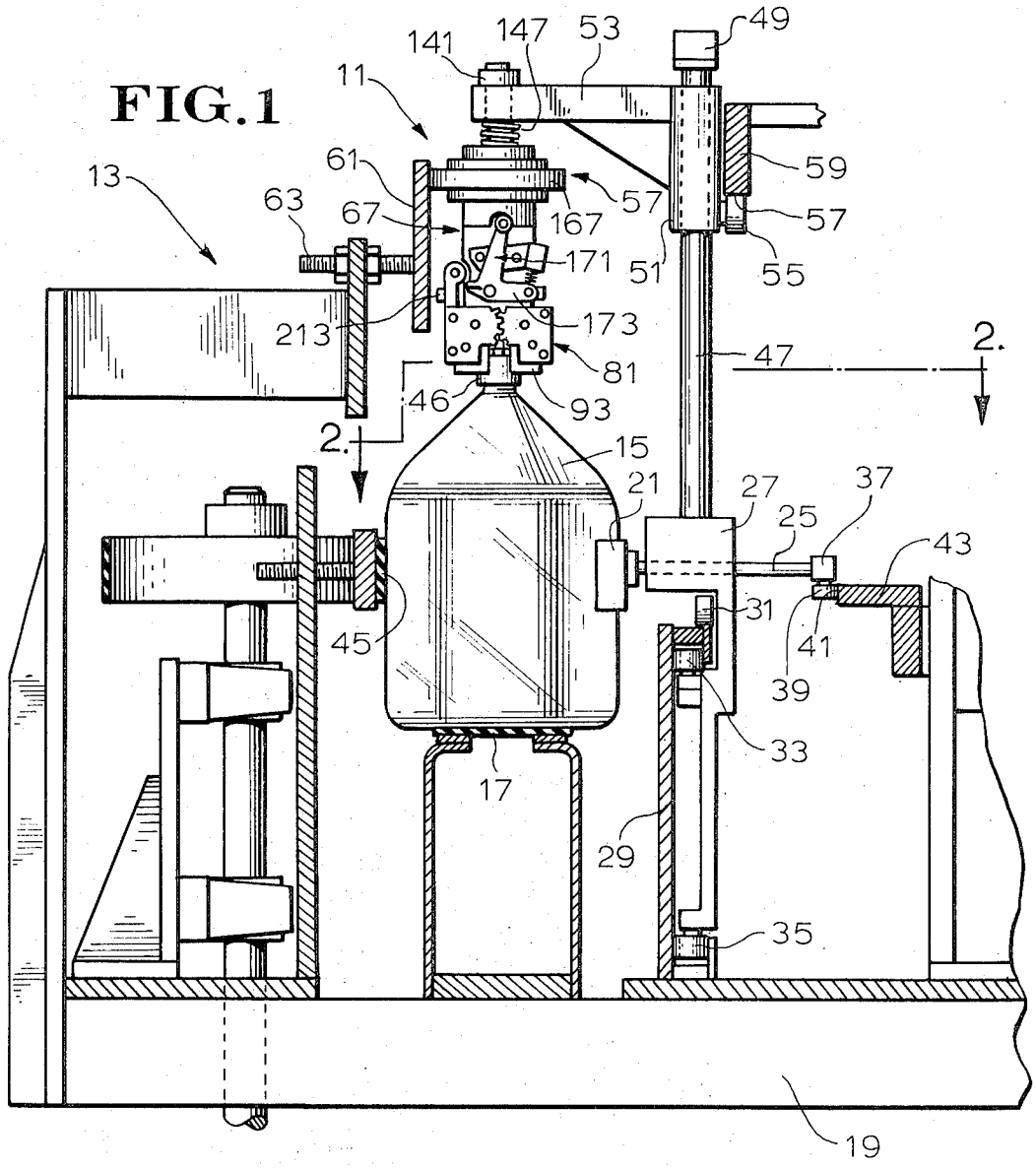
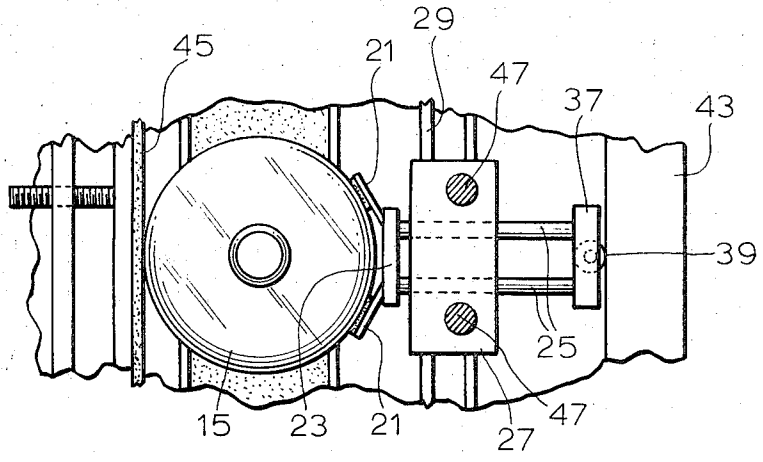

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FIG. 2


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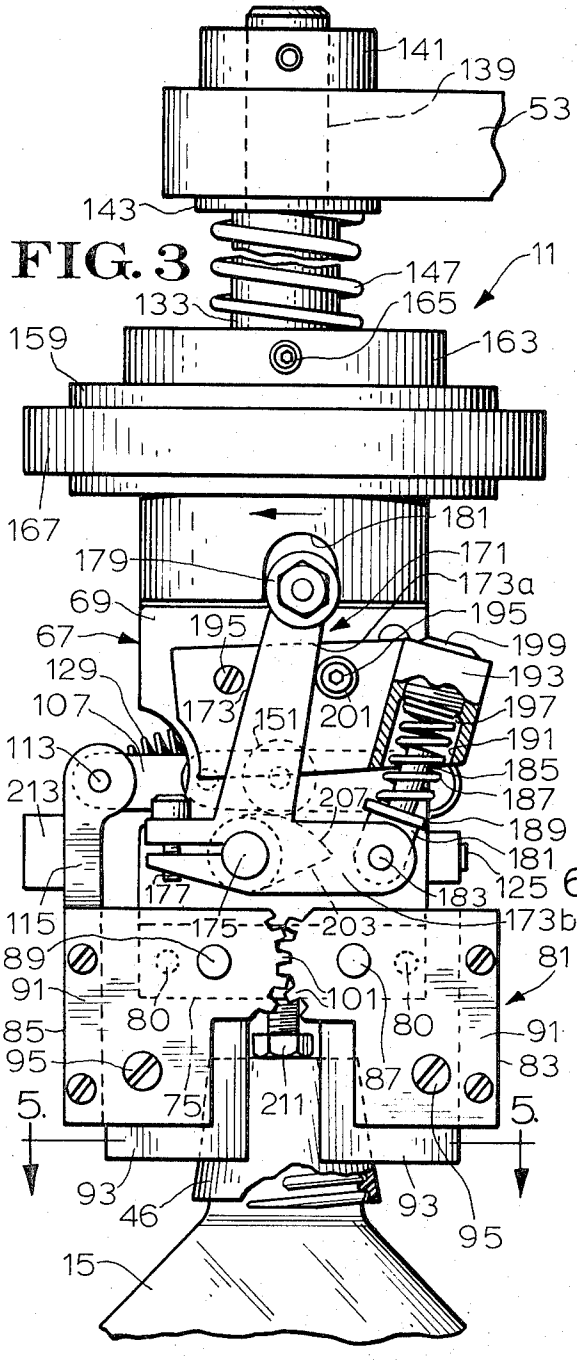


FIG. 3

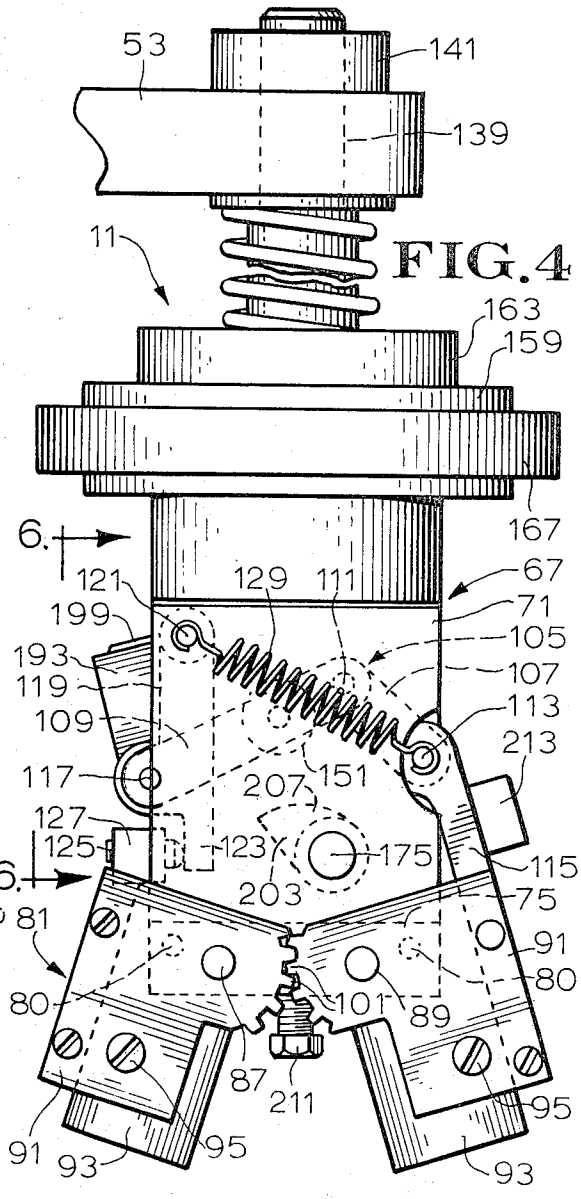


FIG. 4

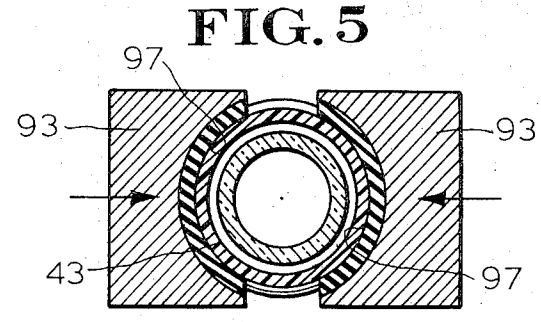


FIG. 5

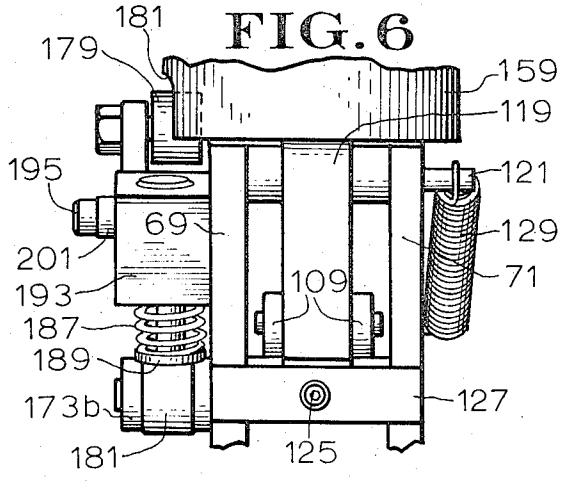


FIG. 6

FIG. 7

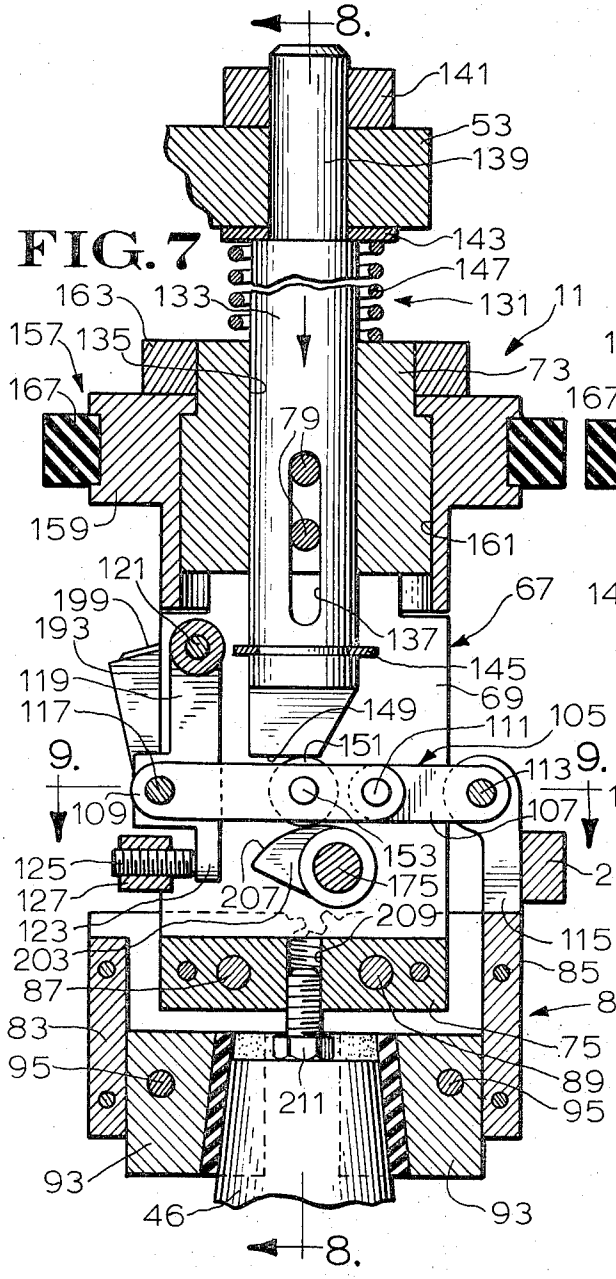


FIG. 8

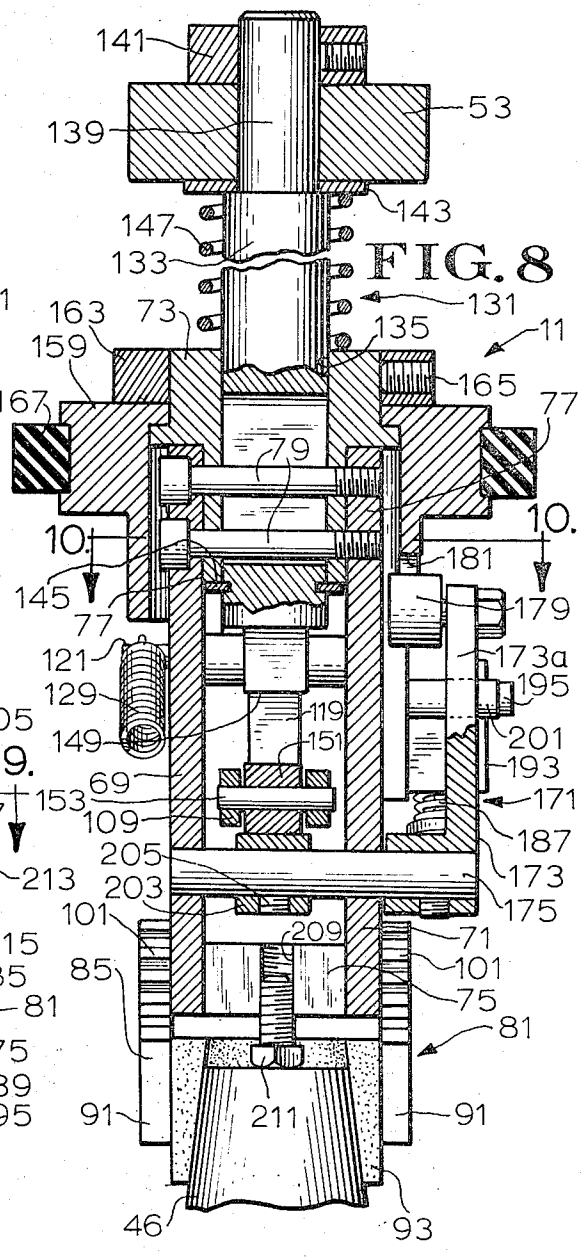


FIG. 9

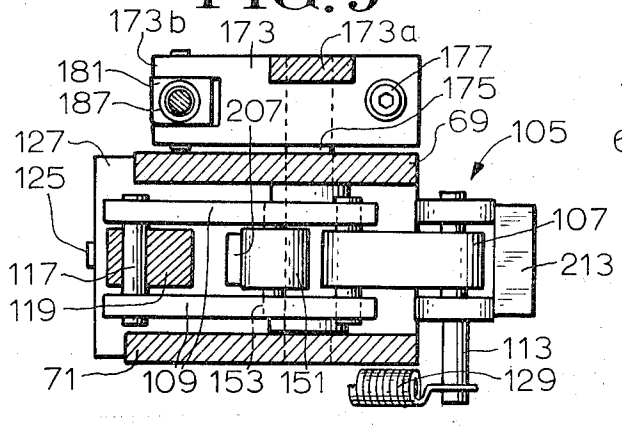
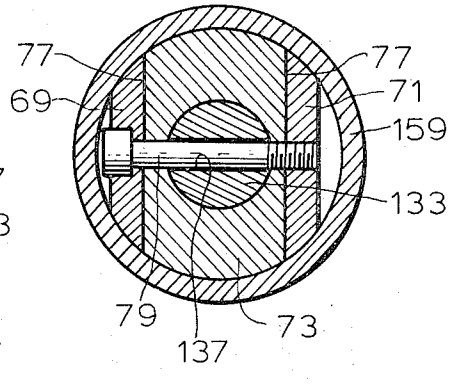


FIG. 10



CAPPER CHUCK DEVICE

The present invention relates generally to closure applying apparatus for applying rotatable-type closure caps to containers and the like, and more particularly to an improved capper chuck device having novel mechanism for releasing a closure cap in response to a predetermined rotational torque applied to the closure cap when assemblying it onto a container.

In applying closure caps of the type having internal threads or lugs to containers which have cooperable external thread or lug conformations to receive the closure caps thereon, the closure caps are conventionally picked up and supported by a closure cap applying device, generally termed a capper chuck, preparatory to movement of a container into position adjacent the capper chuck. The container and capper chuck may then be maintained in a relatively stationary work position or simultaneously moved along a path during which the closure cap is rotated and brought into engagement with the container to apply the cap to the container. It is important that the sealing torque be great enough to firmly secure the closure caps onto the associated containers, but at the same time not so great that the caps cannot be readily removed. Moreover, it is important that each successive closure cap be applied with substantially the same sealing torque.

The present invention provides an improved capper chuck device for applying rotatable-type closure caps to containers and has for one of its primary objects the provision of novel means for effecting release of a closure cap after a predetermined rotational torque has been applied thereto in assembling the cap onto a container.

Another object of the present invention is to provide a closure cap applying chuck employing movable jaw means to firmly engage a closure cap during rotation to secure the cap onto a container, the chuck having novel toggle linkage mechanism cooperative with the jaw means to effect release thereof in response to a predetermined rotational torque applied to the closure cap.

Another object of the present invention is to provide a capper chuck device as described which includes a housing rotatable about its longitudinal axis and a drive sleeve rotatably supported on the housing and operable through a torque transfer arm to effect rotation of the housing in response to driving rotation of the drive sleeve, the torque transfer arm being also cooperable with the toggle linkage mechanism to effect release of the closure cap gripping jaw means when a predetermined rotational torque is reached between the drive sleeve and the housing.

Still another object of the present invention is to provide a capper chuck as described wherein the torque at which release of the jaw means is effected is adjustable so as to accommodate different closure cap mounting requirements.

Further objects and advantages of the present invention, together with the organization and manner of operation thereof, will become apparent fromthe following detailed description of a preferred embodiment of the invention when taken in conjunction with the accompanying drawings wherein like reference numerals designate like elements throughout the several views and wherein:

FIG. 1 is a partial elevational view of a closure cap assemblying system employing a capper chuck in accordance with the present invention;

FIG. 2 is a horizontal sectional view taken generally along the line 2—2 of FIG. 1, looking in the direction of the arrows;

FIG. 3 is an enlarged elevational view of the capper chuck shown in FIG. 1, the upper actuating rod being foreshortened for purposes of illustration;

FIG. 4 is an enlarged elevational view of the capper chuck of FIG. 3, but showing the opposite side of the capper chuck;

FIG. 5 is a sectional view taken generally along the line 5—5 of FIG. 3, looking in the direction of the arrows;

FIG. 6 is a partial side view taken generally along the line 6—6 of FIG. 4;

FIG. 7 is a longitudinal sectional view of the capper chuck illustrated in FIG. 4, but showing the actuating rod depressed to effect closing of the closure cap retaining jaws;

FIG. 8 is a longitudinal sectional view taken generally along the line 8—8 of FIG. 7, looking in the direction of the arrows;

FIG. 9 is a horizontal sectional view taken generally along the line 9—9 of FIG. 7; and

FIG. 10 is a horizontal sectional view taken generally along the line 10—10 of FIG. 8.

Referring now to the drawings, and in particular to FIGS. 1 and 2, a capper chuck device in accordance with a preferred embodiment of the present invention is indicated generally at 11. The capper chuck 11 is illustrated, by way of example, as being employed in a closure cap assemblying arrangement indicated generally at 13. The closure cap assemblying arrangement 13 is of the "straight-line" type wherein a plurality of containers, one of which is indicated at 15, are sequentially conveyed along a generally straight-line support plate surface 17. The support plate 17 is mounted on a suitable base frame structure 19 so as to provide a generally horizontally disposed surface upon which the containers 15 move in a predetermined path during the capping operation. The closure cap assemblying arrangement 13, per se, forms no part of the present invention and will only be briefly described herein to illustrate one arrangement for moving containers 15 along a predetermined path for cooperation with capper chucks 11 for applying closure cap elements to the containers.

The closure cap assemblying arrangement 13 includes pairs of container engaging fingers 21, each pair of fingers being supported on a bracket 23 carried on a pair of horizontally disposed support rods 25 which are longitudinally slidable within a support block 27. The cap assembling arrangement 13 may include a plurality of the support blocks 27 each of which is movable along a path defined by a track member 29 through suitable roller bearings, such as indicated at 31, 33 and 35, rotatably carried by the associated support block 27. The track member 29 may be generally oval, when considered in plan view, and has a straight-line portion paralleling the path of travel of the containers 15 as defined by the support plate surface 17. The support rods 25 are normally urged by suitable biasing means (not shown) in a direction wherein the container engaging fingers 21 are spaced from the peripheral surface of a container 15 moving along the support surface 17. The

ends of each pair of support rods **25** opposite the associated support block **27** are secured to a connecting member **37** which carries a rotatable roller **39** adapted to engage a cam surface **41** on a control block **43** suitably secured to the base frame structure **19.** The cam surface **41** has a plan profile configuration which causes each pair of container engaging fingers **21** to engage the peripheral surface of a container **15** as the container is moved through the closure cap assemblying arrangement **13** so as to urge the associated container against a movable endless flat drive belt **45** supported by the base frame structure **19.** The drive belt **45** is driven at a linear speed and causes the containers and the associated container engaging fingers **21** to be moved along the support plate **17** without rotational movement of the containers about their longitudinal axes.

The capper chuck **11** in accordance with the present invention is particularly adapted to apply a closure cap, such as indicated at **46,** on a container **15** of the type having an external thread or lug conformation on an upper neck portion of the container. The external conformation on each container **15** is adapted to receive a closure cap **46** thereon which has a cooperating internal thread or lug configuration to allow the closure cap to be secured on the container by effecting relative rotation between the closure cap and the associated container. The closure cap assemblying arrangement **13** includes means for suporting one or more capper chucks **11** such that each capper chuck overlies a container **15** as the container is moved through the assemblying arrangement **13** for applying a closure cap **46** to the container. To this end, a pair of vertical support rods **47** are secured in parallel upstanding relation to each support block **27,** the upper ends of each pair of rods **47** being connected through a connecting block **49.** A support bracket **51** is slidable along each pair of support rods **47** and is urged upwardly by suitable means (not shown) toward the associated upper connecting block **49.** The support brackets **51** are slidable downwardly on the associated rods **47** against the biasing means. Each support bracket **51** carries a generally horizontal support arm **53** which serves to support one capper chuck **11** as will be described more fully hereinbelow. Each of the support brackets **51** has a cam follower roller **55** rotatably supported thereon for engagement with a cam surface **57** on a cam block **59** which is suitably supported by the base frame structure **19.** As will become more apparent hereinbelow, the configuration of the cam surface **59** is such that each support bracket **51** and the associated support arm **53** and capper chuck **11** will be selectively moved downwardly on the associated support rods **47** during assembly of a closure cap **46** onto an associated container **15.**

The closure cap assemblying arrangement **13** includes a vertically disposed friction plate **61** which serves to effect rotation of each of the capper chucks **11** about its longitudinal axis during movement along the path defined by the support plate **17,** as will be described more fully below. The friction plate **61** is supported by the base frame **19** on horizontal adjustment screws **63** for lateral adjustment relative to a vertical plane containing the longitudinal centerline of the container support plate **17.** Each of the movable support blocks **27** with its associated container engaging fingers **21,** support bracket **51,** support arm **53,** and capper chuck **11** defines a movable work station for a single container **15** during assembly of a closure cap **46** onto the container as the container is moved along the path defined by the support plate surface **17.**

With reference to FIG. **1,** taken in conjunction with FIGS. **3–10,** the capper chuck **11** includes housing means, indicated generally at **67,** comprising a pair of parallel generally rectangularly shaped side plates **69** and **71** which are maintained in fixed spaced relation by an upper spacer block member **73** and a lower pressure plate **75.** The upper spacer block member **73** has a stepped generally cylindrical outer peripheral surface provided with parallel flat surfaces **77** (FIGS. **8** & **10**) along a portion of the longitudinal length thereof to abut the inner opposing surfaces of the side plates **69** and **71.** A pair of cross bolts **79** maintain the side plates **69** and **71** in assembled relation to the spacer block **73,** while screws **80** secure the lower ends of the side plates to the pressure plate **75.**

The housing means **67** supports closure cap retaining jaw means, indicated generally at **81,** comprising a pair of opposed jaw members **83** and **85** which are pivotally mounted on the spaced side plates **69** and **71** of the housing means **67** by pivot shafts **87** and **89,** respectively. Each of the jaw members **83** and **85** includes a pair of generally identically shaped jaw side plates **91** which have a chuck jaw **93** secured therebetween by screws **95,** each pair of jaw plates **91** being spaced apart sufficiently to slidingly engage the opposite outer surfaces of the spaced side plates **69** and **71** of the housing means **67.** As illustrated in FIG. **5,** the jaw chucks **93** have concave surfaces **97** therein of a configuration corresponding to a portion of the peripheral surface of a selected closure cap element **46** to be applied to the container **15.** In the illustrated embodiment, the concave surfaces **97** in the jaw chucks **93** are tapered to engage the frusto-conical shaped closure cap element **46.** As will become apparent hereinbelow, the jaw members **83** and **85** are movable between an open position adapted to receive a closure cap element **46** between the concave surfaces **97** of the associated jaw chucks **93,** and a closed position wherein the surfaces **97** each engage a portion of the annular peripheral surface of the closure cap element **46** to firmly retain the closure cap element between the jaw members.

The jaw members **83** and **85** are connected such that movement of one of the jaw members **83** or **85** effects a simultaneous moveent of the other jaw member in an opposite rotational direction about its pivot axis. With reference to FIGS. **3** and **4,** each of the jaw side plates **91** has spur gear teeth **101** integrally formed thereon which intermesh with the spur gear teeth on the opposing jaw side plate **91.** It will be understood that the intermeshing teeth **101** on the opposing jaw side plates **91** of the jaw members **83** and **85** are located to insure that the angular relation of each of the opposing jaw members relative to the longitudinal axis of the capper chuck **11** is identical to the angular relation of the opposing jaw member throughout movement of the jaw members. It will also be understood that the spur gear teeth **101** need not be formed integral with the respective jaw side plates **91,** but rather, could comprise separable spur gears or gear segments which are affixed to the side plates **91.** If desired, the intermeshing gear teeth **101** need only be applied to the opposing jaw side plates **91** on one side of the capper chuck **11.**

The cappper chuck **11** includes linkage means, indicated generally at **105,** which interconnects the jaw

means 81 to the housing means 67 and is operable between a first position effecting movement of the jaws 83 and 85 to their open positions and a second over-center position effecting movement of the jaw members 83 and 85 to their closed positions retaining a closure cap element 46 therebetween. The linkage means 105 comprises a toggle linkage arrangement having a first toggle linkage member 107 and a second toggle linkage member 109 which are pivotally interconnected through a connecting pin 111. The end of the toggle linkage member 107 opposite the connecting pin 111 is pivotally connected through a connecting pin 113 to the upper end of a jaw arm 115 which is affixed between the jaw side plates 91 of the jaw member 85. The toggle linkage member 109 comprises a pair of parallel spaced links which have their ends opposite the connecting pin 111 pivotally connected through a connecting pin 117 to a grip adjustment arm 119, which in turn, is pivotally connected to and between the spaced side plates 69 and 71 of the housing means 67 through a cross shaft 121. The grip adjustment arm 119 has a lower end portion 123 adapted to abut an adjustable stop screw 125 which is threadedly received in a cross block 127 affixed to and between the side plates 69 and 71, as illustrated in FIG. 7.

The connected linkage members 107 and 109 are movable between a first generally collapsed position, as shown in FIG. 4, and a second over-center position wherein the axis of the connecting pin 111 passes from a position above a plane containing the axes of the connecting pins 113 and 117 to a position slightly below such plane, as shown in FIG. 7. The jaw members 83 and 85 are open when the linkage members 107 and 109 are in their collapsed position, and are closed when the linkage members 107 and 109 are in their over-center position. The stop screw 125 serves to limit movement of the grip adjustment arm 119 in a clockwise direction about its pivot axis 121, as considered in FIG. 7, and provides means for adjusting the relative closed positions of the jaw members 83 and 85. The connecting pin 113 and the cross shaft 121 extend outwardly from the side plate 71 and are interconnected by a tension spring 129 having its opposite ends suitably connected to the pin 113 and cross shaft 121. The tension spring 129 biases the jaw members 83 and 85 to their open positions.

The capper chuck 11 includes operating means, indicated generally at 131, which is cooperable with the housing means 67 and is adapted to move the toggle linkage members 107 and 109 of the linkage means 105 from their first or collapsed position to their second or over-center position during a capping operation. The operating means 131 includes a cylindrical operating shaft 133 which is longitudinally slidable in a suitable longitudinal cylindrical bore 135 in the spacer block member 73 of the housing means 67. The operating shaft 133 has an elongated slot 137 therethrough to receive the cross bolts 79 and allow relative longitudinal movement between shaft 133 and the housing means 67.

The upper end of the operating shaft 133 has a reduced diameter portion 139 which is slidably received through a suitable opening in the support arm 53. The reduced diameter portion 139 of the shaft 133 is rotatable about its longitudinal axis relative to the support arm 53 but is fixed longitudinally by an annular retaining ring 141 which is mounted on the upper end of shaft 133 and secures the arm 53 against an annular washer 143 abutting a radial shoulder formed at the lower end of the reduced diameter shaft portion 139. An annular stop ring 145 is fixedly received in an annular groove in the lower end of the operating shaft 133 and serves to abut the lower surface of the spacer block 73 and limit downward movement of the housing means 67 on the shaft 133 due to gravity when the capper chuck 11 is carried along by the support arm 53 in non-operating position. A coil compression spring 147 is disposed about the operating shaft 133 and has its opposite ends abutting the upper surface of the spacer block member 73 and the lower surface of the annular washer 143 to bias the housing means 67 downwardly on the operating shaft 133 or, alternatively, to provide selective resistance to movement of the housing means 67 toward the support arm 53 during a capping operation. In this manner, the support arm 53 serves to support and carry the capper chuck 11 in the closure cap assemblying arrangement 13.

The lower end of the operating shaft 133 has a generally horizontal actuating surface 149 thereon which is adapted to engage a roller member 151 rotatably carried on a cross shaft 153 secured to and between the spaced links comprising the linkage member 109. By effecting longitudinal movement of the operating shaft 133 relative to the housing means 67, as by upward movement of the housing means 67 on shaft 133 when the toggle linkage members 107 and 109 are in their collapsed position, the lower end surface 149 on the operating shaft 133 will engage the roller 151 and move the toggle linkage members 107 and 109 from their collapsed position to their over-center position. During such movement, the lower end 123 of the grip adjustment arm 119 will abut the stop screw 125 and cause the jaw members 83 and 85 to move to their closed positions. Inward movement of the adjustable stop screw 125 relative to the cross block 127 serves to effect greater inward movement of the jaw members 83 and 85 toward each other, while outward movement of the stop screw 125 establishes a greater spacing between the jaw members when in their closed positions. The adjustable stop screw 125 thus provides means for varying the spacing between the gripping jaw members 83 and 85 when in their closed positions to regulate the gripping pressure on a closure cap element 46.

With the operating shaft 133 being slidably received through an opening in the support arm 53, the operating shaft 133 and the associated housing means 67 and jaw means 81 of the capper chuck 11 are rotatable about the longitudinal axis of the operating shaft 133. To effect such rotational movement of the capper chuck 11, the capper chuck includes drive wheel means, indicated generally at 157, supported by the housing means 67 for rotational movement about the longitudinal axis of the housing means. The drive wheel means 157 comprises an annular drive wheel 159 having a stepped cylindrical internal bore 161 which is slidingly received over the aforenoted stepped outer peripheral surface on the block member 73. The drive wheel 159 is maintained in fixed longitudinal relation on the housing means 67 by an annular lock ring 163 secured to the block member 73 by a set screw 165, as shown in FIG. 8. The drive wheel 159 has an annular rubber friction element 167 received in a suitable annular groove in the drive wheel. With reference to FIG. 1, the aforementioned friction plate 61 of the closure

cap assembling arrangement **13** is positioned so as to selectively engage the outer peripheral surface of the friction element **167** and effect rotational movement of the drive wheel **159** about its longitudinal axis as the capper chuck **11** is carried by the associated support arm **53** along a path parallel to the friction plate **61.**

With reference to FIG. **3,** taken in conjunction with FIGS. **6, 7** and **8,** the capper chuck **11** includes torque transfer means, indicated generally at **171,** adapted to effect rotation of the housing means **67** and associated jaw means **81** about the longitudinal axis of the housing means **67** upon driving rotation of the drive wheel means **157.** As will become more apparent hereinbelow, the torque transfer means **171** is adapted to effect rotation of the housing means **67** in response to driving rotation of the drive wheel mens **157,** but is responsive to a predetermined resistance to rotation of the jaw means **81** when in their closed positions to effect collapse of the toggle linkage means **105** and effect movement of the jaw members **83** and **85** to their open positions whereby to release a closure cap element **46** retained between the jaw members. The torque transfer means **171** includes a torque transfer arm **173** which is affixed on the end of the cylindrical shaft **175** by means of a lock screw **177.** As shown in FIG. **8,** the shaft **175** extends through suitable openings in the spaced side plates **69** and **71** of the housing means **67** such that the longitudinal axis of the shaft **175** is normal to the planes of the side plates. The torque transfer arm **173** has a generally upstanding arm portion **173***a* and a generally horizontally disposed arm portion **173***b* which together form a bell-crank. The upper end of the arm portion **173***a* rotatably supports a follower roller **179** which is received within a semicircular recess **181** in the drive wheel **159,** as shown in FIG. **3.** In this manner, rotational movement of the drive wheel **159** relative to the housing means **67** will effect a pivotal movement of the transfer arm **173** about the axis of the support shaft **175.**

The arm portion **173***b* of the torque transfer arm **173** pivotally supports a spring guide **181** through a pivot pin **183.** The spring guide **181** has a reduced diameter end portion **185** which is received upwardly within a coil compression spring **187.** The lower end of the spring **187** abuts an annular washer **189** on the spring guide **181** and the upper end of the spring is received within a cylindrical bore **191** in a torque adjustment bracket **193** which is affixed to the outer surface of the side plate **69** of the housing means **67,** such as by mounting screws **195.** The upper end of the compression spring **187** abuts a circular plate **197** in the bore **191.** The plate **197** engages the lower end of an adjustment screw **199** which is threadedly received in a tapped opening in the torque adjustment bracket **193** so as to be generally axially aligned with the axis of the spring **187.** In this manner, the compression spring **187** may be adjusted to selectively bias the torque transfer arm **173** about its pivot axis **175** in a clockwise direction, as considered in FIG. **3,** and thus selectively resist rotation of the transfer arm **173** in a counterclockwise direction.

A tubular sleeve **201** is supported by the right-hand mounting screw **195** in a position such that the outer peripheral surface of the sleeve is engagable with the arm portion **173***a* of the torque transfer arm **173** to limit the extent of clockwise rotation of the torque transfer arm and establish "zero" positions for the torque transfer arm and the drive wheel **159** relative to the housing means **67.** The force acting on the torque transfer arm **173** from the compression spring **187** is initially adjusted to normally position the torque transfer arm in engagement with the stop sleeve **201** and resist counterclockwise movement of the torque transfer arm about its pivot axis **175** until a predetermined torque is applied to the torque transfer arm from the drive wheel **159** as will become apparent hereinbelow.

The shaft **175** has a trip cam **203** affixed thereon intermediate the spaced side walls **69** and **71** of the housing means **67.** The trip cam **203** has a cam surface **207** thereon adapted to engage the peripheral surface of the roller member **151** carried by the toggle links **109** when collapsed as in FIG. **7** upon rotation of the shaft **175** in a clockwise direction. When a predetermined torque differential is reached between the drive wheel **159** and the housing means **67,** such as when rotation of the jaw means **81** and housing means **67** is resisted, rotation of the shaft **175** through movement of the torque transfer arm **173** will cause the trip cam **203** to rotate and raise the roller member **151** whereby to move the toggle linkage members **107** and **109** to positions wherein the axis of the connecting pin **111** is raised above a plane containing the axes of the connecting pins **113** and **117.** Thereafter, the tension spring **129** urges the toggle linkage members **107** and **109** to their collapsed positions with a resulting opening of the jaw members **83** and **85** to release a closure cap element **46** retained therebetween.

The capper chuck **11** includes means for engaging the upper surface of a closure cap element **46** and establishing a predetermined position of the closure cap element within the jaw members **83** and **85** when the jaw members are closed to retain a cap element preparatory to assemblying the closure cap element onto the external thread or lug conformation on a container. To this end, the pressure plate **75** has a threaded opening **209** extending through the center thereof, which threaded opening receives the threaded shank of a closure cap positioning bolt **211.** The head portion of the bolt **211** may be adjusted relative to the lower surface of the pressure plate **75** and serves to provide means against which the upper flat surface of a closure cap element **46** abuts when the closure cap element is initially received and retained between the jaw members **83** and **85.**

The capper chuck **11** also includes an emergency cap release member **213** which is mounted on the jaw arm **115,** as best shown in FIGS. **7** and **9.** The emergency cap release member **213** rotates with the jaw means **81** during a closure cap applying cycle and is movable with the associated jaw arm **115** between its open position, as shown in FIG. **4,** and its closed positions, as shown in FIG. **7.** The closure cap assemblying arrangement **13** includes abutment means (not shown) supported adjacent the path of the capper chucks **11** for engaging the release member **213** and preventing rotation of any capper chuck **11** which has picked up a closure cap but has not applied it to a container as the capper chuck is moved along the path of the container support plate **17.** For example, should a capper chuck **11** pick up a closure cap **46** and thereafter not be mated with a container for receiving the closure cap thereon, the loaded capper chuck will move along the path of the support plate **17** without applying and releasing the associated

closure cap. Thereafter, when the capper chuck is returned to the closure cap receiving station, it will not be ready to receive a new closure cap between its gripper jaws. By providing abutment means on the assembling arrangement **13** for engagement with a release member **213** when its associated jaw arm **115** remains in a closed position after the chuck has passed along the support plate **17**, rotation of the capper chuck housing means **67** will be prevented, the associated torque transfer arm **173** will be caused to rotate due to rotation of the drive wheel means **157** relative to the fixed housing means **67**, and the gripper jaws will open to release the closure cap. Such abutment means is positioned so as not to engage the emergency cap release member **213** of a capper chuck **11** when the associated jaw arm **115** is in an open position. It will be understood that the release member **213** may take alternative forms and be mounted in alternative positions on the housing means **67**, while being adapted to accomplish the intended purpose.

Having thus described a preferred embodiment of a capper chuck **11** in accordance with the present invention, its operation will now be described. As noted, the capper chuck **11** is carried by the support arm **53** which receives the upper end **139** of the operating shaft **133** therethrough in supporting relation. Preparatory to receiving a closure cap element **46** between the jaw members **83** and **85**, the jaw members are disposed in their open positions, as shown in FIG. **4**. As the caper chuck **11** is carried along by the support arm **53** in non-operating position, the housing means **67** and elements mounted thereon rest on the stop ring **145** on the lower end of the operating shaft **133**. The capper chuck **11** is carried by the support arm **53** through a closure cap element pick-up station wherein a closure cap element, such as **46**, is carried by a conventional pin conveyor (not shown) into a position to substantially axially align the longitudinal axis of the closure cap with the longitudinal axis of the capper chuck.

When such alignment of the closure cap **46** and capper chuck **11** is achieved, the support arm **53** is caused to move downwardly by the control cam surface **57** as the capper chuck and associated cap element are moved through the closure cap assemblying arrangement **13**, the support arm **53** being moved to a position wherein the closure cap positioning bolt **211** engages the upper flat surface of the closure cap element **46**. With the closure cap element **46** being prevented from moving downwardly by the aforenoted pin conveyor, further downward movement of the support arm **53** cause the operating shaft **133** to move longitudinally downwardly relative to the housing means **67** such that the lower end surface **149** on the operating shaft engages the roller member **151** and moves the toggle linkage members **107** and **109** from their collapsed position, as shown in FIG. **4**, to their downward over-center position, as shown in FIG. **7**. Simultaneously, the jaw members **83** and **85** are moved to their closed positions to engage the outer peripheral surface of the closure cap element **46** and retain the cap element between the jaw chucks **93**. After the jaw chucks **93** pick up a closure cap element, the support arm **53** is raised slightly relative to the housing means **67** such that the housing means is again supported on the stop ring **145** on the lower end of the operating shaft **133**.

After picking up and retaining a closure cap element **46** between the jaw chucks **93**, the capper chuck **11** is carried by the support arm **53** to a station wherein a container **15** is moved into engagement with the container engaging fingers **21** disposed below the support arm **53**. The container engaging fingers **21** are positioned to insure that the upper threaded neck portion of the container **15** is axially aligned with the axis of the closure cap element **46** retained between the gripping jaws of the capper chuck **11**. As the container **15** to be capped is initially moved into contact with the container engaging fingers **21**, it is moved along the support plate **17** in underlying relation to the associated capper chuck **11**. Substantially simultaneously with alignment of the threaded neck portion of the container **15** with the closure cap **46** carried by the associated capper chuck **11**, the drive wheel **159** on the capper chuck engages the friction plate **61** and initiates rotation of the capper chuck about its longitudinal axis due to the torque transfer arm **173** as aforedescribed. As the capper chuck **11** initially begins such rotation, the support arm **53** carrying the capper chuck **11** is again moved downwardly by the control cam surface **57** to a position wherein the closure cap element **46** carried by the jaw chucks **93** of the capper chuck makes initial contact with the threaded neck portion of the container and, through initial rotation of the capper chuck, begins to thread downwardly onto the container. Thereafter, the support arm **53** is moved further downwardly to allow full threaded engagement of the closure cap element **46** onto the threaded neck portion of the container **15**.

As the capper chuck **11** and associated container **15** are moved along the straight-line path of the support plate **17** within the closure cap assemblying arrangement **13**, and the closure cap **46** is threaded snugly onto the container **15**, a resistance to rotation of the jaw means **81** and housing means **67** is reached when the closure cap element is completely threadedly secured onto the container **15**. At this time further rotational movement of the drive wheel **159** on the capper chuck through engagement with the friction plate **61** causes the torque transfer arm **173** to rotate the shaft **175** in a counterclockwise direction, as considered in FIG. **3**, against the force of the compression spring **187**. As noted, the compression force of the spring **187** is adjusted through the adjustment screw **199** to resist such rotation of the torque transfer arm **173** until a predetermined rotational torque is reached between the drive wheel **159** and the jaw means **81**. This predetermined rotational torque may be varied in accordance with the torque or tightness desired in applying the closure cap elements onto the containers. Once the compression force of the spring **187** is set for a given capping operation, each successive closure cap element will be applied to its associated container with a substantially identical torque or tightening force.

When the predetermined rotational torque is reached in assemblying a closure cap element **46** onto its associated container **15**, rotation of the torque transfer arm **173** and shaft **175** will cause the trip cam **203** to engage the roller member **151** and move the toggle linkage members **107** and **109** to positions wherein the axis of the connecting pin **111** passes above a plane containing the axes of the connecting pins **113** and **117**. Thereafter, the tension spring **129** causes the toggle linkage members **107** and **109** to move to their substantially collapsed position with a resulting opening of the jaw members **83** and **85** whereby to release the closure cap

element **46**. The capper chuck **11** is then carried by the support arm **53** back to the closure cap element receiving station preparatory to applying another closure cap to a container.

While the caper chuck **11** has been described as being employed in a generally "straight-line" closure cap assemblying arrangement **13**, it will be understood that the principles applied in the capper chuck **11** could be readily employed in turret-type closure cap assemblying systems as are well known in the closure cap applying art.

Thus, while a preferred embodiment of the present invention has been illustrated and described, it will be obvious to those skilled in the art that changes and modifications may be made therein without departing from the invention and its broader aspects. Various features of the invention are defined in the following claims.

What is claimed is:

1. A capper chuck device for applying a closure element to a container by relative rotation between the closure element and the container, comprising, in combination, housing means, jaw means supported by said housing means for movement between an open position adapted to receive a closure element therein and a closed position to firmly retain the closure element, linkage means interconnecting said jaw means and said housing means and operable between a first position effecting movement of said jaw means to said open position and a second position effecting movement of said jaw means to said closed position, operating means supported by said housing means and adapted to selectively move said linkage means from its said first to its said second positions in response to an externally applied force, said housing means defining a longitudinal axis about which the chuck device is rotatable to rotate said jaw means and apply a closure element retained by said jaw means onto a container supported to receive the closure thereon, and release means supported by said housing means and being responsive to a predetermined rotational torque applied to said jaw means to effect return movement of said linkage means to its said first position whereby to release said jaw means from the closure element.

2. A capper chuck device as defined in claim **1** wherein said jaw means includes at least two closure element gripping jaws pivotally supported by said housing means.

3. A capper chuck device as defined in claim **2** wherein said linkage means is interconnected between said housing means and one of said gripping jaws, and including means interconnecting said gripping jaws in a manner to effect simultaneous movement thereof upon actuation of said linkage means.

4. A capper chuck device as defined in claim **3** wherein said means interconnecting said gripping jaws includes intermeshing gear teeth means.

5. A capper chuck device as defined in claim **1** wherein said linkage means comprises toggle linkage means having one end pivotally connected to said jaw means and the other end pivotally connected to said housing means, said toggle linkage means including a pair of pivotally connected linkage members normally biased to a substantially collapsed position, said linkage members being movable to an over-center position relative to said collapsed position by said operating means to effect closing of said jaw means, said release means being responsive to said predetermined rotational torque to move said linkage members from their said over-center position toward their said collapsed position whereby to allow return of said jaw means to their said open position.

6. A capper chuck device as defined in claim **1**, and including means for adjusting said predetermined rotational torque required to effect movement of said linkage means to its said first position and release a closure element after applying same to a container.

7. A capper chuck device as defined in claim **1**, and including means to adjust the extent to which said jaw means close when in their said closed position.

8. A capper chuck device as defined in claim **5**, and including a drive sleeve supported by said housing means for rotation relative to said housing means about the longitudinal axis thereof, said release means including a torque transfer arm supported by said housing means and cooperable with said drive sleeve to effect rotation of said housing means when said drive sleeve is subjected to an external rotational drive force, said release means including a trip cam operable by said torque transfer arm and selectively engagable with said toggle linkage means to initiate movement of said toggle linkage means from its said second toward its said first positions when said predetermined rotational torque is reached in applying a closure cap to a container.

9. A capper chuck device as defined in claim **8** wherein said release means includes means biasing said torque transfer arm to resist rotation of said drive sleeve relative to said housing means in a direction to apply a closure element onto a container.

10. A capper chuck device as defined in claim **9** wherein said means biasing said torque transfer arm is adjustable to vary the biasing force.

11. A capper chuck device as defined in claim **10** wherein said jaw means includes a pair of opposed gripping jaws pivotally supported by said housing means, said toggle linkage means being connected to one of said gripping jaws, and including means interconnecting said gripping jaws to effect simultaneous but oppositely directed movement thereof upon movement of said toggle linkage means, and means biasing said gripping jaws toward their said open positions.

12. A capper chuck device as defined in claim **11** including means limiting the extent to which said jaws close when moved to their said closed positions.

13. A capper chuck device as defined in claim **1** including closure element positioning means supported by said housing means for engagement by the upper surface of a closure element when received between said jaw means.

14. A capper chuck device as defined in claim **1** wherein said operating member comprises an operating shaft supported by said housing means for longitudinal movement relative to and along the longitudinal axis of said housing means, and including means biasing said operating shaft longitudinally outwardly from said housing means.

15. In a capper chuck device having pivotally supported closure element gripper jaws normally biased to open positions to receive a closure element therebetween and movable to closed positions retaining the closure element therebetween in response to an external force applied to an operating member, the device being rotatable about its longitudinal axis to apply a ro-

tatable closure element retained between the jaws onto a container; the improved combination therewith of rotational torque responsive release means to release the gripping jaws from the closure element when a predetermined resistance to rotation of the closure element onto a container is encountered, said release means including toggle linkage means cooperative with the gripping jaws and movable by said operating member from a first substantially collapsed position wherein the gripping jaws are disposed in their open positions to a second position wherein the gripping jaws are disposed in their closed positions, said release means including means to effect movement of said toggle linkage means from its said second to its said first position when said predetermined resistance to rotation of the closure element is encountered.

16. The combination of claim **15** wherein said release means includes means for adjusting the rotational torque at which the gripper jaws will release a closure element retained therebetween during application of the closure element to a container.

17. The combination of claim **15** wherein said capper chuck includes housing means having said gripper jaws pivotally supported thereon and having a drive wheel supported thereon for rotation relative to said housing means about the longitudinal axis of the capper chuck, and wherein said torque responsive means includes a torque transfer arm supported by said housing means and interconnecting said drive wheel and said housing means to effect rotation of said housing means and gripping jaws upon rotation of said drive wheel, said torque transfer arm furthur interconnecting said drive wheel and said toggle linkage means such that said toggle linkage means is moved from its said second toward its said first positions when a predetermined rotational torque is reached between said drive wheel and said housing means due to resistance to rotation of said jaws.

18. A capper chuck device as defined in claim **1** wherein said housing means includes means adapted for selective engagement by an external abutment during rotation of said housing means with its said jaws means in a closed position, said engagement by said external abutment being operative to prevent rotation of said body means and effect movement of said jaw means to said open position thereof.

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