Jan. 14, 1958 G. H. DIMOND 2,819,577

SPINDLE ARRESTER FOR CAPPING MACHINES

Filed June 7, 1956 3 Sheets-Sheet 1

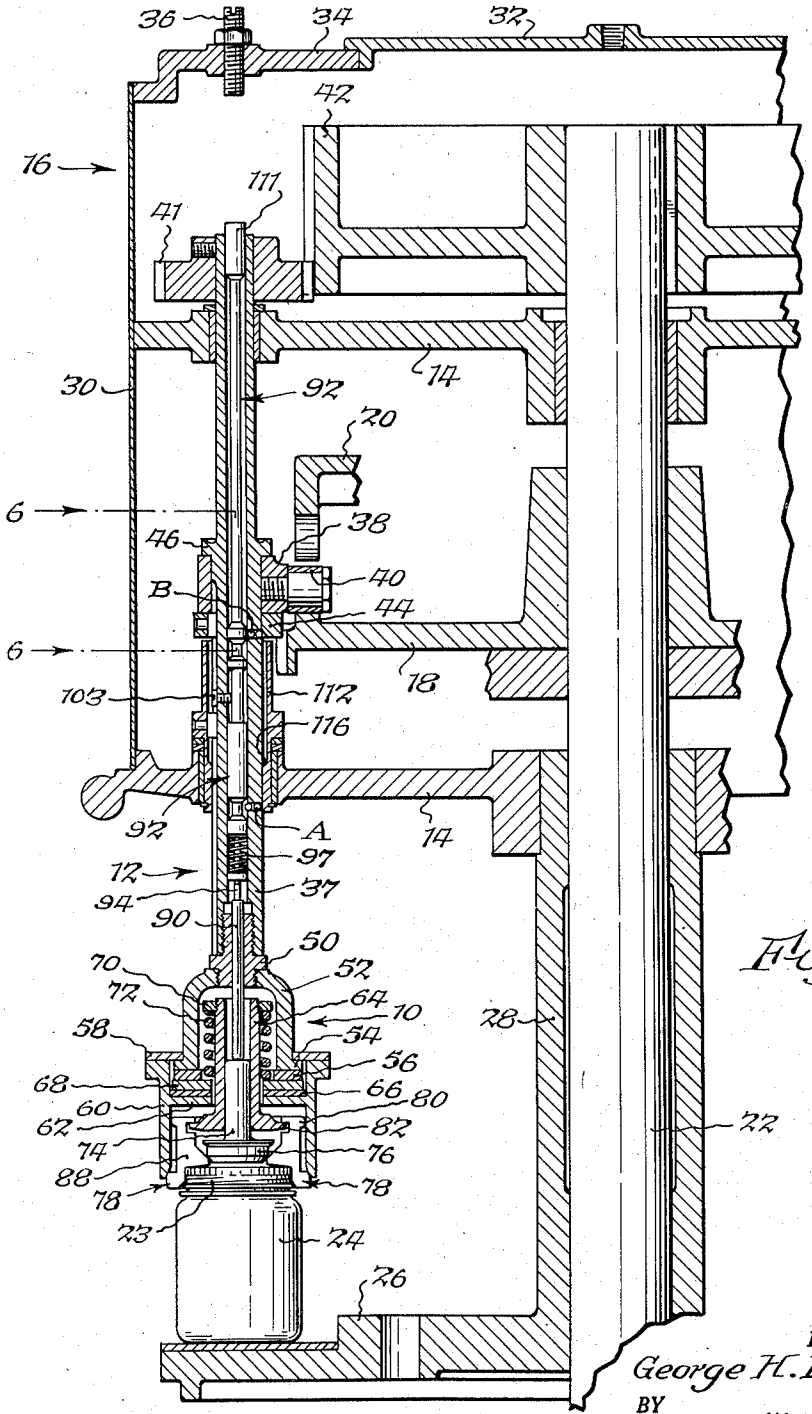


Fig. 1.

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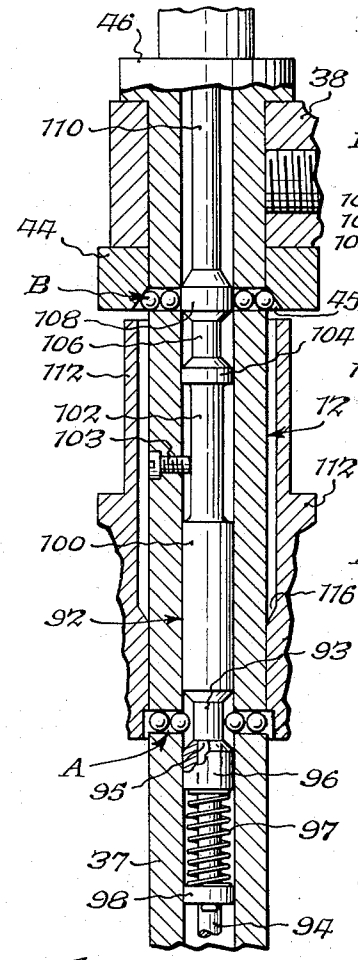
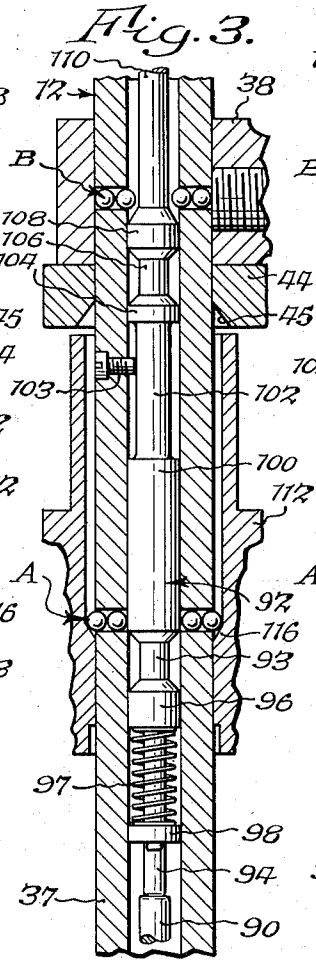


Fig. 2.

Fig. 3.



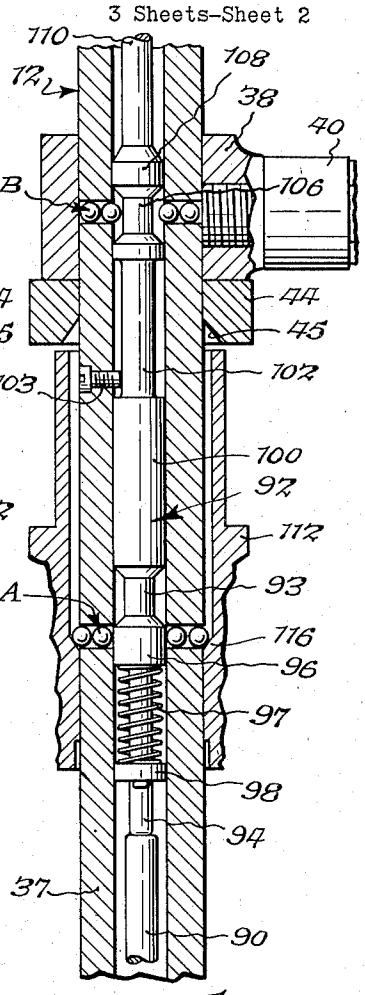


Fig. 4.

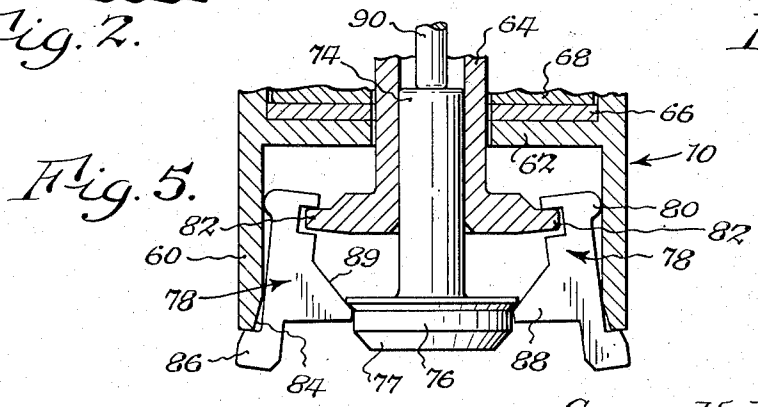


Fig. 5.

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SPINDLE ARRESTER FOR CAPPING MACHINES

Filed June 7, 1956 3 Sheets-Sheet 3

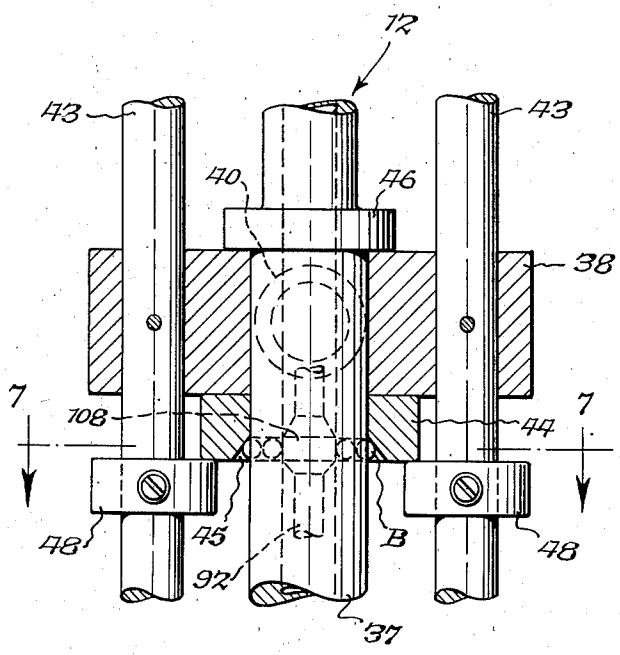


Fig. 6.

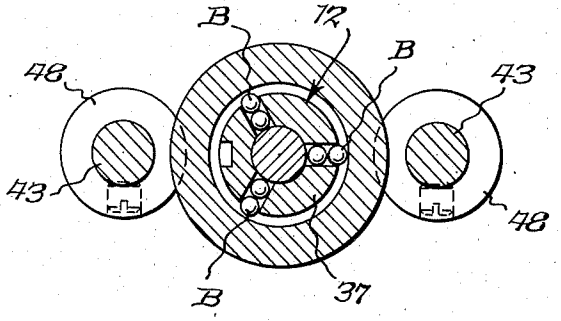


Fig. 7

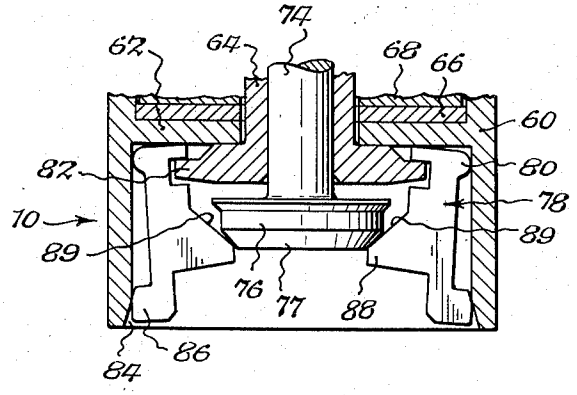


Fig. 8.

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SPINDLE ARRESTER FOR CAPPING MACHINES

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Application June 7, 1956, Serial No. 589,928

5 Claims. (Cl. 53—317)

This invention relates generally to new and useful improvements in container capping machines and particularly seeks to provide a continuously operable capping machine in which each chuck-carrying spindle assembly thereof is so constructed as to prevent its reaching its normal lowermost position for cap-applying purposes, whenever for any reason no cap is carried by its associated capping chuck during the capping portion of a cycle of operation.

United States Letters Patent No. 1,773,960, issued August 26, 1930, to R. N. Cundall, is illustrative of the general type of rotary capping machines in connection with which this invention is particularly useful.

It has been observed that during the operation of capping machines of this character there are some instances when a capping chuck fails either to pick up a cap or to retain it long enough to be applied to a container. These conditions may arise either due to a temporary exhaustion of the supply of caps or to a misalignment of the cap in the chuck jaws. In the majority of cases this condition is of little consequence since the machine will operate as before and will go through the capping cycle even though no cap is present. However, where the machine is to be used for the capping of filled containers where the contents are right up to the top, such as cold cream jars, mustard jars or the like, and no cap is present during the time that cap-applying operations would normally take place, the chucks would be brought down into contact with the contents and disturb the upper surfaces thereof, and cause the chucks to become covered with the material contacted.

A capping machine constructed in accordance with this invention will still operate continuously but will prevent the capping chucks from contacting the containers or their contents whenever no cap is present during the cap-applying portion of a cycle of operation.

Accordingly, it is an object of this invention to provide a capping machine having an improved spindle construction adapted to arrest downward movement of the spindle at a position substantially above the normal cap-applying position whenever no cap is present in the capping chuck carried by the spindle while still permitting the machine to operate continuously.

A further object of this invention is to provide a capping machine including a capping chuck and spindle having means for arresting the spindle and chuck during the downward capping stroke only when no cap is present in the chuck.

A still further object is to provide a capping machine including a capping chuck and spindle having a control rod located within the spindle and movable relatively thereto in response to the relative position of the jaws of the capping chuck and to displace stops to a position which prevents downward movement of the spindle and chuck into contact with a container when no cap is present in the chuck.

A still further object is to provide for a capping machine a chuck and spindle assembly which is simple in design, rugged in construction and economical to manufacture.

With these and other objects in view, the nature of which will be more apparent, the invention will be more fully understood by reference to the drawings, the accompanying detailed description and the appended claims.

In the drawings,

Fig. 1 is a fragmentary vertical section through the turret of a capping machine, showing the operating mechanism for a single capping chuck and spindle assembly constructed in accordance with this invention;

Fig. 2 is an enlarged vertical section of a portion of the spindle assembly shown in Fig. 1 and shows the position of the control rod when the chuck is in position for applying a cap to a container;

Fig. 3 is a view similar to Fig. 2 but with the control rod in the position attained when no cap is picked up by the chuck and the spindle is arrested at a position substantially above the cap-applying position;

Fig. 4 is a view similar to Fig. 3 but with the control rod in the position attained when a cap was picked up but has become dislodged prior to its application to the container and the spindle is arrested substantially above the cap-applying position;

Fig. 5 is an enlarged vertical section of the capping chuck jaws in the position they assume when no cap has been picked up corresponding to the positions of the spindle parts shown in Fig. 3;

Fig. 6 is an enlarged fragmentary side elevation partly in section of the spindle, cam yoke and yoke guiding rods taken on the line 6—6 of Fig. 1;

Fig. 7 is a horizontal section taken on the line 7—7 of Fig. 6; and

Fig. 8 is an enlarged vertical section of the capping chuck jaws in the position they assume when a cap has been picked up but has been dislodged corresponding to the positions of the spindle parts in Fig. 4.

Referring to the drawings in detail, the invention as embodied therein comprises a capping chuck generally designated 10 which is mounted on the lower end of a spindle generally designated 12 reciprocably carried in suitable bearings in two spindle plates 14, 14 in a rotary turret, generally designated 16, of a capping machine (a portion of which is shown in the drawings).

The capping chuck 10 is reciprocated under the control of a cylinder cam 18 and a spring loaded presser cam 20 which are held in a fixed position on and arranged concentrically about a main stationary post 22 affixed to the base of the machine (not shown).

The turret 16 includes two or more of the capping chucks 10 and spindles 12 arranged symmetrically around the periphery of the spindle plates 14 to apply a cap 23 to each successively presented container 24 which is continuously advanced therebelow on a table 26 having an elongated hub portion 28 freely mounted on the post 22. The turret 16 is provided with a cylindrical cover 30 supported by and secured to the lower spindle plate 14 and has its top covered by a disc 32 and an annulus 34. The annulus 34 carries a plurality of vertically adjustable studs 36 which extend downwardly therefrom and normally contact the upper end of the respectively associated spindles 12 to cock the capping chucks 10 in a manner to be described more fully hereinafter.

Each spindle assembly 12 includes a spindle sleeve 37 which carries a yoke 38 which is slidably positioned thereon and is provided with a roller cam follower 40 extending radially inwardly therefrom into operative association with the cylinder cam 18 and the presser cam 20 which effect the desired reciprocation of the spindles and their associated capping chucks as the turret is rotated.

In addition to the reciprocatory motion imparted to each spindle assembly 12 and the capping chuck 10 carried thereby, continuous rotary motion is imparted thereto by the meshing of the teeth of a small pinion 41 affixed to the upper end of the spindle sleeve 37 with the teeth of a large gear 42 affixed to the stationary post

22. The depth of the gear 42 is sufficiently great to insure continuous meshing with the pinion 41 during reciprocation of the spindle assembly 12.

Each spindle cam follower 40 is constrained to radial position during its vertical movement by a pair of upright guide rods 43, 43 slidably engaging the plates 14, 14 on opposite sides of the spindle sleeve 37 and fixed to the yoke 38. A thrust collar 44 having a frusto-conical recess 45 on its lower face is positioned adjacent the lower edge of the yoke 38 and is retained there by collars 48 fixed to the rods 43, but slidably mounted on and keyed to rotate with the spindle sleeve 37. Upward movement of the yoke 38 under the influence of the cam 18 will raise the spindle assembly 12 as soon as the yoke contacts the bottom of a flange 46 on the spindle sleeve 37. The spindle assembly 12 is free to move downwardly under the influence of gravity whenever the cam causes the yoke to move downwardly.

The chuck 10 is connected to the lower end of the spindle assembly through the medium of a flanged hub 50 which is threaded into the lower end of the spindle sleeve 37. The chuck 10 comprises a bell-shaped member 52, the top of which is threaded onto the flanged hub 50 and the bottom of which is provided with an outwardly extending flange or lip 54. The bottom annular surface of the bell-shaped member 52 rests against a ring 56. An annular ring 58 encompasses the bell-shaped member 52 and rests on the lip 54. The ring 58 is affixed to a nose piece 60 which extends downwardly from the outer periphery thereof and is provided with an internal thin annular wall 62 intermediate the ends thereof and having a central opening through which an elongated plunger sleeve 64 extends. The annular wall 62 supports a friction ring 66 which in turn supports a clutch pressure plate 68 immediately beneath the ring 56. The top of the plunger sleeve 64 is provided with a spring-retaining nut 70 which retains a compression spring 72 between it and the plate 68.

The connection between the bell-shaped member 52 and the other portions of the chuck includes two pairs of vertical pins and radial slots not shown and forms an Oldham's coupling, permitting the lower members to move radially from side to side to account for any misalignment of a cap or a container. Rotation of the spindle frictionally rotates the chuck through the friction ring 66 under the influence of the spring 72 in a known manner.

A stripper shaft 74 is slidably positioned within the plunger sleeve 64 and has a bottom disc portion 76 having its lower edge bevelled as at 77. The chuck jaws 78 comprise three members of similar configuration which are symmetrically disposed within the nose piece 60.

The chuck jaws 78 have rounded pivot lobes 80 thereon which bear against the inner surface of the nose piece 60 and keep the upper ends of the jaws seated on a lip 82 formed on the bottom of the plunger sleeve 64 while allowing the lower ends to pivot outwardly in order to be opened sufficiently to grasp a cap therein. The inner lower end of the nose piece 60 is beveled at 84, and outwardly extending ledges 86 on the lower outer edges of the chuck jaws bear against this beveled surface as the jaws are retracted into the nose piece.

Extending inwardly from the middle portion of each chuck jaw is a cam projection 88 whose upper surface 89 is beveled downwardly toward the center of the chuck and against which bears the correspondingly beveled lower edge 77 of the bottom disc portion 76 of the stripper shaft 74. The lower surfaces of the projections 88 form a seat against which the top of a cap bears when one is engaged by the chuck.

Positioned immediately above the stripper shaft 74 is an intermediate control rod 90 which extends upwardly therefrom through the hollow central portions of the plunger sleeve 64 and the flanged hub 50 and the spindle sleeve 37.

An upper control rod generally indicated 92 (see Figs. 2–4) is slidably carried within the spindle sleeve 37 above the intermediate control rod 90 and is actuated by the movement of the stripper 74 and the intermediate control rod 90 in response to a change of position of the chuck jaws 78. It is the function of this upper control rod 92 and its associated elements to prevent the chuck 10 from reaching its normal lowermost position during the cap-applying portion of a cycle of operation whenever no cap is held by the chuck.

The control rod 92, near its lower end, is turned down as at 93 with a bevelled step to a diameter approximately equal to that of the intermediate control rod 90, and at its lower end is further turned down as at 94 with a right angle abutment step 95 to a somewhat smaller diameter. A collar 96, having its upper face bevelled in opposition to the bevel at the upper end of the rod portion 93, is slidably mounted on the reduced diameter rod portion 94 and is yieldably maintained in contact with the abutment 95 by a compression spring 97 which extends between it and a washer 98 affixed to the rod portion 94.

The control rod 92 maintains its full diameter as at 100 for some distance above the turned down portion 93 and is again turned down to a reduced diameter as at 102 in order to provide space for the inwardly projecting end of a retaining screw 103 which prevents the control rod from dropping out of the spindle sleeve 37 whenever the chuck is detached therefrom. Above the reduced diameter portion 102 the control rod is again turned down as at 106 with bevelled shoulders to the same diameter as the rod portion 93 and for the same length. The control rod again maintains its full diameter for a short distance as at 108 after which it is turned down with a bevelled shoulder to a reduced diameter as at 110 for substantially all of the remainder of its length and terminates in a short length 111 of full diameter.

The spindle sleeve 37 is provided with two sets of radially disposed passageways, a lower one A and an upper one B, each passageway of which contains two freely fitted metal balls. An arrester sleeve 112 mounted in the lower spindle plate 14 slidably embraces the spindle 12 and is keyed to rotate therewith and extends from a position adjacent the bottom of the lower spindle plate 14 to a position slightly below the yoke 38 when the latter is in its lowermost position. The upper two-thirds of the arrester sleeve is counterbored to a diameter substantially greater than the outside diameter of the spindle sleeve 37 and is provided at the bottom of the counterbore with a beveled ledge 116 which forms an abutment against which the balls in the passageways A become lodged when they are displaced from the passageways in a manner to be described more fully hereinafter. On the occasion that the large diameter portion 108 of the control rod 92 is adjacent the passageways B (see Fig. 2), the frusto-conical recess 45 of the thrust collar 44 will be moved downwardly during the cap-applying portion of the spindle cycle and will contact the top of the outermost balls which have been displaced by the control rod outwardly in the radial passageways and transmit downward pressure to the capping chuck 10 under the influence of the presser cam 20 acting through the yoke 38.

Referring to Figs. 1 and 2, when a cap has been engaged by the chuck jaws 78 and then moved into a capping position above the container 24 the chuck jaws will be retracted about three quarters of the way into the nose piece 60 and the control rod 92 will assume the relative position inside the spindle sleeve 37 as shown by these two figures. In this position the cap has already been applied to the container 24 and the chuck 10 is about to become disengaged from the cap. The balls at A were free to move against the reduced diameter section 93 and thus did not arrest the spindle 12 in its downward cap-applying stroke.

Referring to Figs. 3 and 5, the control rod **92** and the capping jaws **78** of the capping chuck **10** are shown in the position they assume when the chuck **10** fails to pick up a cap. In this case the stripper shaft **74** and the intermediate rods **90** and the control rod **92** assume a lower position in relation to the spindle **12** in comparison to when a cap is engaged by the chuck because as a result of the jaws **78** failing to contact a cap they together with the stripper shaft **74** are not displaced upwardly relative to the nose piece **60**. The large diameter portion **100** of the control rod **92** is disposed adjacent the passageways A and causes the balls in these passageways to become displaced outwardly so that the outside ones project into the counterbore of the arrester sleeve **112**. This positioning of the balls occurs in the previous capping cycle when the capping chuck jaws are re-cocked as the upper part **111** of the control rod **92** is moved into contact with the stud **36** during the highest upward movement of the spindle **12**. The balls at A remain in the displaced position during the period that the spindle moves downwardly toward its normal lowermost limit of movement for cap-applying purposes and they prevent the spindle from reaching its normal lowermost limit as a result of their coming into abutting contact with the ledge **116**.

The yoke **38** will continue to move downwardly after the spindle has been stopped in its downward movement because the balls at B are free to move inwardly toward the reduced diameter section **110** out of the way of the thrust collar **44** and the yoke. The yoke **38** will move relative to the spindle **12** to its normal lowermost position as if a cap were being applied. Thus downward movement of the spindle **12**, with the control rod **92** in the positions indicated in Figs. 3 and 5 will be stopped at a point substantially above the normal cap-applying position.

Referring to Figs. 4 and 8, the control rod **92** will assume this higher relative position with respect to the spindle sleeve **37** when a cap has been initially picked up but has dropped from the chuck **10** prior to its being applied onto a container. When the capping chuck does engage a cap initially so that the jaws **78** close around the cap and move upwardly in the nose piece **60**, but it thereafter becomes dislodged, the jaws will then be retracted by the spring **72** still further into the nose piece. This additional upward movement of the jaws **78** will cause the stripper shaft **74** to become displaced upwardly a further distance relative to the spindle **12**, causing the control rod **92** to move correspondingly upward. Thus with the control rod **92** in the position shown in Fig. 4 the balls at A become displaced outwardly by the collar **96**. The spring **97** is designed to cushion the impact of the collar **96** as it is moved into contact with the balls at A as the spring **72** abruptly forces the control rod **92** upwardly when the chuck is disengaged from an applied cap or when a cap suddenly drops out of the chuck. On the subseqeunt downward cap-applying stroke of the spindle **12** the balls at A become lodged on the beveled ledge **116** and arrest downward movement of the spindle at the same position as when the chuck **10** missed picking up a cap. The balls at B may move inwardly in the passages because the reduced diameter section **106** is adjacent their location. The thrust collar **44** and the yoke **38** may therefore slide downwardly on the spindle **12** past the balls unhindered.

The operation of the machine is as follows:

Mechanisms (not shown) are provided to successively feed caps onto a moving cap disc or table (not shown). The turret **16** which is constantly rotated moves each capping chuck **10** through a path which intersects the path of travel of the cap **23**, and the cam follower **40** moving over the surface of the cam **18** is lowered to permit the spindle **12** to move downwardly under the influence of gravity and cause the chuck **10** to engage a cap beneath the cam projections **88** of the capping jaws **78**. As the chuck **10** moves downwardly over the cap the cap which rests on a table exerts an upward force against the bottom of the stripper **74** which moves upwardly until the cap contacts the surface of the jaws **78** beneath the cam projections **88** to cause the jaws to move upwardly and inwardly to firmly engage a cap and to simultaneously cause the stripper shaft **74** to move upwardly by the closing action of the beveled top surfaces **89** of the cam projections **88** upon the corresponding beveled bottom surfaces **77** of the disc portion **76** of the stripper shaft **74**. When the cap is fully engaged by the capping jaws **78** the cam follower **40** is moved upwardly under the influence of the cam **18**, and the top surface of the yoke **38** through the flange **46** on the spindle **12** moves the spindle upwardly slightly.

Mechanisms in the machine (not shown) become effective to move the container **24** into alignment with the chuck **10**, and the latter is permitted to move downwardly over the container **24** under the influence of gravity as the yoke **38** is moved downwardly under the influence of the cam **20**. Since the spindle is constantly rotating due to the meshing of the pinion **41** with the gear **42** the cap **23** is screwed onto the container **24** as it is lowered downwardly thereover. The lower portions of the chuck **10** are driven through the friction ring **66** under the compression of the spring **72** so that the nose portion and jaws of the chuck will stop turning after the cap has been applied to the container sufficiently tight to overcome the contact friction of the ring **66** and the nose piece **60**. At this time the thrust collar **44** bears against the balls at B which have been displaced outwardly by the increased diameter portion **108** of the control rod **92** (in the normal operation) so that under the influence of the presser cam **20**, downward cap-seating pressure is applied to the chuck **10**.

The chuck jaws **78** then become disengaged from the capped container as the spindle assembly is raised by the cam **18** and are retracted rapidly into the nose piece **60** by the action of the spring **72** which raises the plunger sleeve **64**, the jaws **78**, the stripper shaft **74** and the control rods **90** and **92**. However, the balls in lower passageways A are now below the ledge **116** and cannot be outwardly displaced when first struck by the collar **96** as it surges upwardly in response to the snap action of the jaws. It has been found that if the collar **96** is formed integrally with the rod **92** there will be destructive peening of the collar and scoring of the sleeve **112**. Therefore the collar **96** has been made slidable on the control rod **92** and the relief spring **97** is provided to eliminate such troubles.

As the spindle assembly is raised further by the cam **18** and approaches its uppermost position the top of the control rod **92** contacts the stud **36** and is moved downwardly relative to the spindle **12** and thereby causes the stripper shaft **74** to move the jaws **78** downwardly and outwardly until the outside ledge **86** of the jaws hooks over the end of the nose piece **60** (see Fig. 5). This compresses the spring **72** as the plunger sleeve **64** is moved downwardly by the jaws **78** and thus cocks the chuck in an open position.

When no cap is picked up during the initial portion of the capping cycle the jaws **78** will remain in an open or cocked position as shown in Fig. 5. This is so because no cap contacts the stripper shaft **74** to move it and the jaws **78** upwardly into a cap-engaging position. Thus with the control rod **92** in the position shown in Fig. 3 when the spindle **12** is reciprocated first upwardly slightly and then downwardly under the influence of the cam **18** the balls at A which have bene displaced by the large diameter portion **100** of the control rod **92** contact the beveled ledge **116** and prevent further downward movement of the spindle **12**. The balls at B are free to move inwardly against the area of reduced diameter **110** which is aligned with these passages and permit the yoke **38** and the thrust collar **44** to move downwardly relative to the

stopped spindle 12 in a normal cycle under the influence of the cams 18 and 20.

When a cap has been initially picked up by the capping chuck 10 but is dropped before the capping chuck is moved into alignment with a container 24 the dropping of the cap will cause the chuck jaws 78 to move upwardly in the nose piece 60 a greater amount than when the cap was present in the jaws (see Fig. 8). The control rod 92 will then assume the position shown in Fig. 4 and the balls at A will be displaced so that they contact the bevelled ledge 116 and arrest the downward movement of the spindle 12 above the cap-applying position the same as if no cap had been picked up. The balls are displaced in this instance by the collar 96 which is positioned adjacent the passageways A. The balls at B are free to move into contact with the portion of the control rod of reduced diameter at 106 and do not protrude beyond the outside wall of the spindle sleeve 37 so that the uninterrupted downward movement of the yoke 38 and the thrust collar 44 is permitted.

In the event that a cap has been picked up and retained by the capping chuck and no container is present for capping, then the cap will be dislodged from the chuck during the capping cycle when the control rod contacts the stud 36 and the jaws are cocked in an open position. A suitable container and chute are arranged to catch caps thus ejected.

The invention provides a completely automatic means for permitting the continued operation of a capping chuck and spindle in a rotary capping machine without contacting the contents of a container or the container itself or without jamming of the machine mechanism in the event that either no cap has been picked up by the chuck during a capping cycle or a cap has been picked up but has become dislodged before the chuck arrives at a cap-applying position.

It is, of course, to be understood that various details of arrangements and proportions of parts may be modified within the scope of the appended claims.

I claim:

1. In a container capping machine wherein is provided a vertically reciprocable capping spindle provided at its lower end with a capping chuck having a plurality of cap-engaging jaws, and means for cyclically reciprocating said spindle whereby to move said chuck to and away from its cap-applying position; the combination of means effective when no cap is engaged by said chuck for arresting downward movement of said spindle before said chuck reaches its cap-applying position while still permitting said spindle-reciprocating means to function, and means responsive to a change of position of the jaws of said chuck for actuating said arresting means.

2. In a container capping machine wherein is provided a vertically reciprocable capping spindle provided at its lower end with a capping chuck having cap-engaging means, and means for cyclically reciprocating said capping spindle to move said chuck to and away from a cap-applying position superimposing a container; the combination of means effective when no cap is engaged by said chuck for arresting downward movement of said spindle before said chuck reaches its cap-applying position while still permitting said spindle-reciprocating means to function, said last named means including an abutment positioned adjacent the exterior of said spindle, a control rod slidably mounted within said spindle for axial movement with respect thereto, outwardly displaceable means carried by said spindle and movable by said control rod into alignment with said abutment when no cap is engaged by the cap-engaging means of said chuck, and means responsive to a change of poistion of said cap-engaging means for actuating said spindle movement-arresting means.

3. In a container capping machine wherein is provided a vertically reciprocable capping spindle provided at its lower end with a capping chuck having cap-engaging means, and means for cyclically reciprocating said capping spindle to move said chuck to and away from a cap-applying position superimposing a container; the combination of means effective when no cap is engaged by said chuck for arresting downward movement of said spindle before said chuck reaches its cap-engaging position while still permitting said spindle-reciprocating means to function, said last named means including a collar slidably positioned on said spindle and connected to said spindle-reciprocating means, an abutment positioned adjacent the exterior of said spindle, a control rod slidably mounted within said spindle for axial movement with respect thereto, first outwardly displaceable means carried by said spindle and movable by said control rod into alignment with said collar when a cap is positioned in said chuck and being applied to a container whereby said collar exerts downward pressure on said spindle under the influence of said reciprocating means, second outwardly displaceable means carried by said spindle and movable by said control rod into alignment with said abutment when no cap is engaged by the cap-engaging means of said chuck, and means responsive to a change of position of said cap-engaging means for actuating said spindle movement-arresting means.

4. In a container capping machine wherein is provided a constantly rotating and cyclically vertically reciprocating hollow capping spindle, means for rotatably and reciprocably supporting said spindle, a hollow capping chuck having pivoted jaws therein, spring means to close said jaws, and stripper shaft means to open said jaws contacting said jaws and movable vertically relative to the other parts of said chuck in response to the change of position of said jaws within said chuck, and means for cyclically moving a cap and then a container into operative association with said capping chuck, the combination of: a control rod slidably positioned within said spindle and movable into and out of an arresting position, a control rod extension slidably positioned within said chuck and said spindle extending from the bottom of said control rod to said stripper shaft means and movable vertically therewith along with said control rod relative to said spindle in response to the positioning of said jaws within said chuck, a plurality of balls arranged in radially extending passageways in said spindle and being displaceable by said control rod to project beyond the outside walls of said spindle when said control rod is in an arresting position, and means contacting said balls when they project beyond the outside walls of said spindle to stop the downward movement of said spindle.

5. A container capping machine comprising a continuously rotating turret, means for advancing a series of containers and successively presenting them to said turret in properly timed operative association therewith; a plurality of constantly rotating vertically reciprocable capping spindles mounted in said turret each provided at its lower end with a capping chuck having a plurality of cap-engaging jaws, and means associated with said turret for constantly rotating and for cyclically reciprocating said spindles whereby to rotate said chucks and move them to and away from their cap-applying position; means effective when no cap is engaged by said chucks for arresting downward movement of said spindles before said chucks reach their cap-applying position while still permitting said spindle-rotating and reciprocating means to function; and means responsive to a change of position of the jaws of said chucks for actuating said arresting means.

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