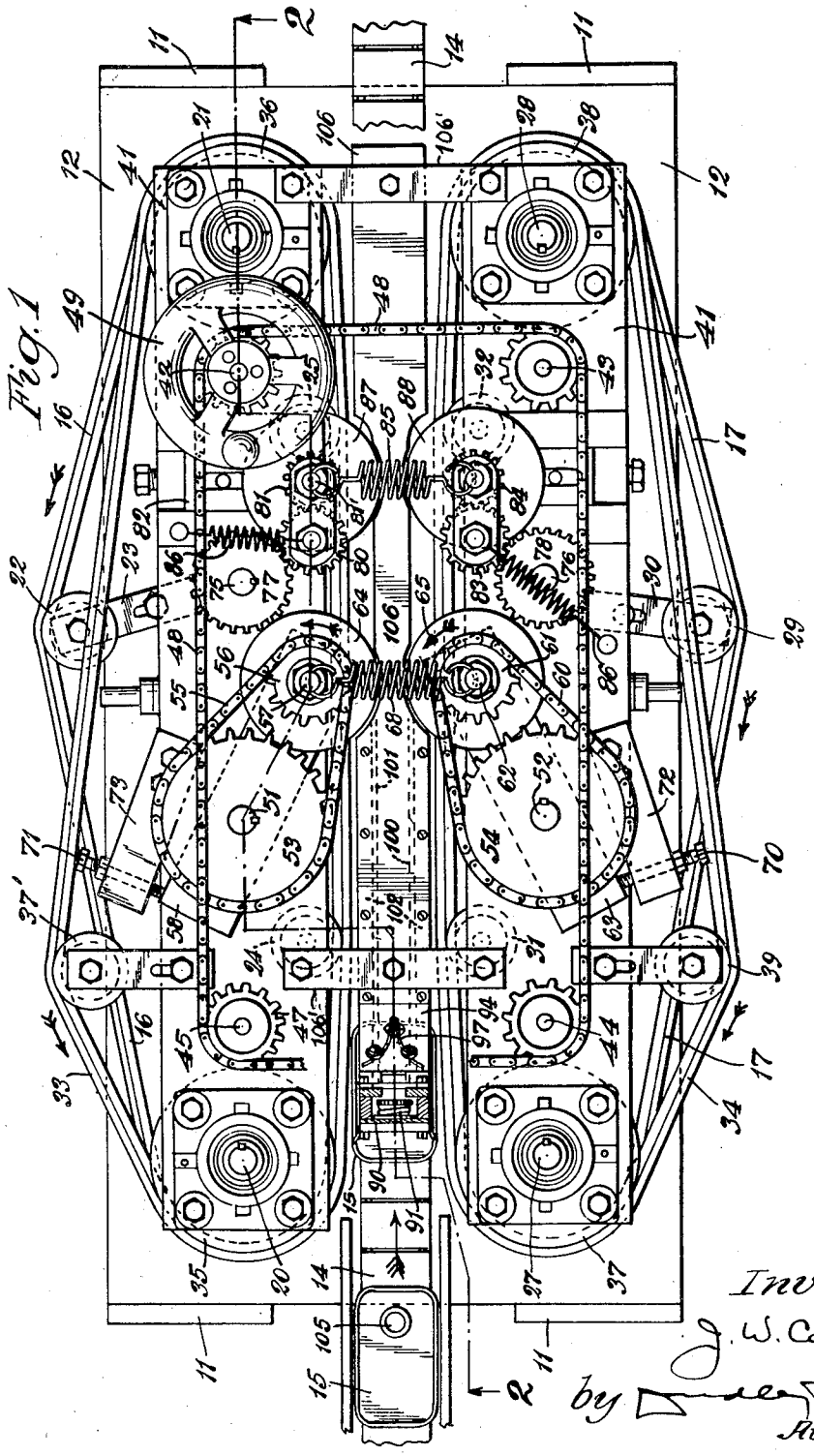
Jan. 27, 1948. J. W. CAMERON 2,435,127

CAPPING MACHINE

Filed May 19, 1945 3 Sheets-Sheet 1

Fig. 1



Inventor
J. W. Cameron
by
Attorney

Jan. 27, 1948. J. W. CAMERON 2,435,127

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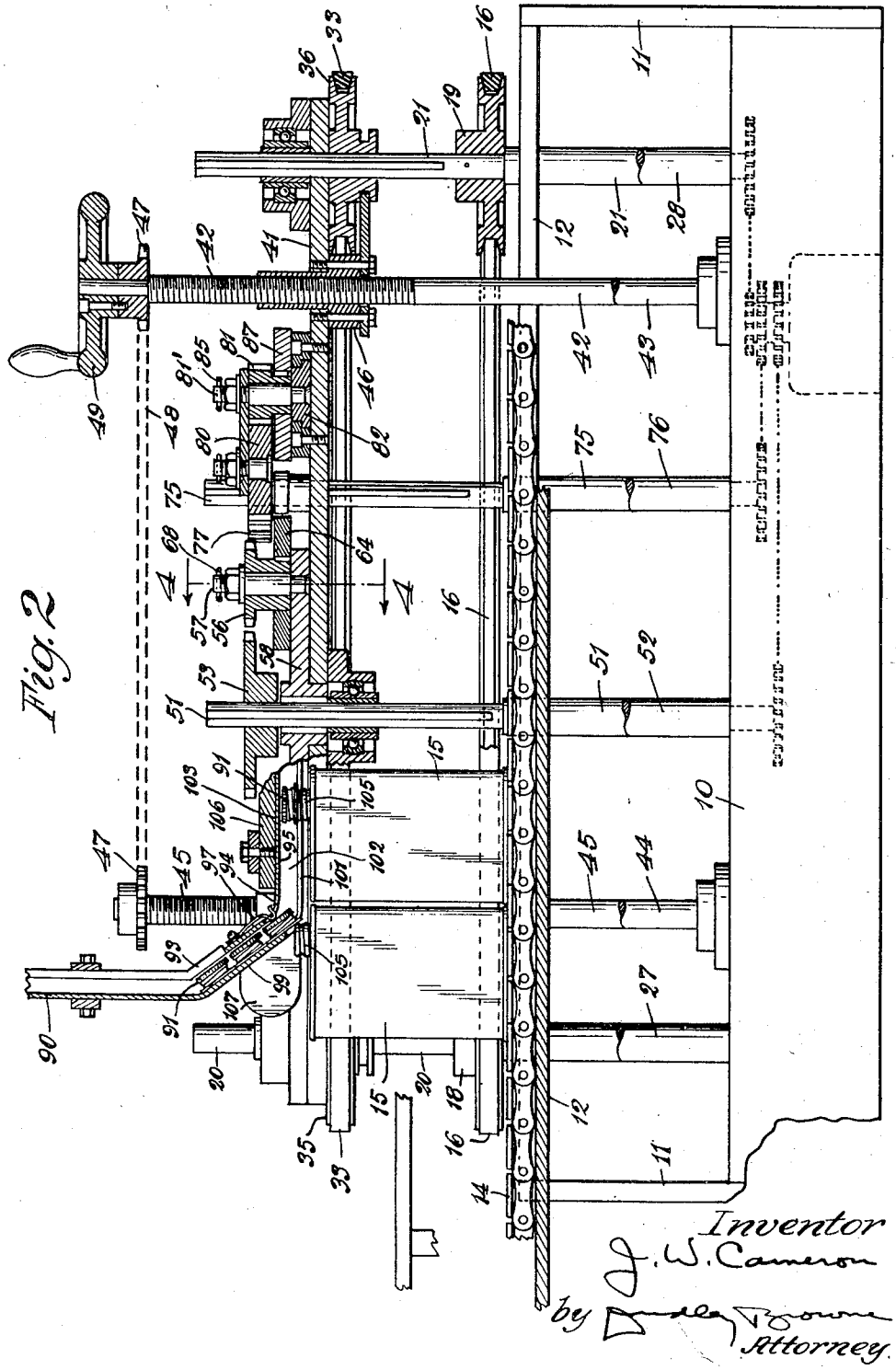


Fig. 2

Inventor
J. W. Cameron
by Dudley Browne
Attorney

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Fig. 3

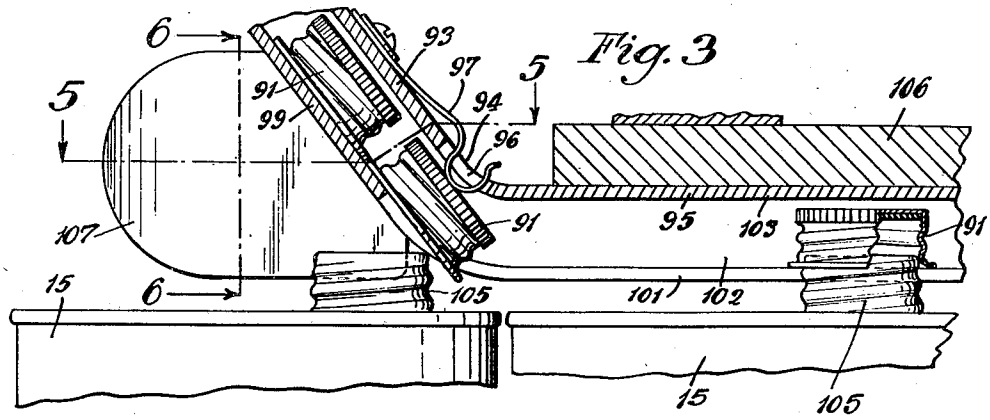


Fig. 4

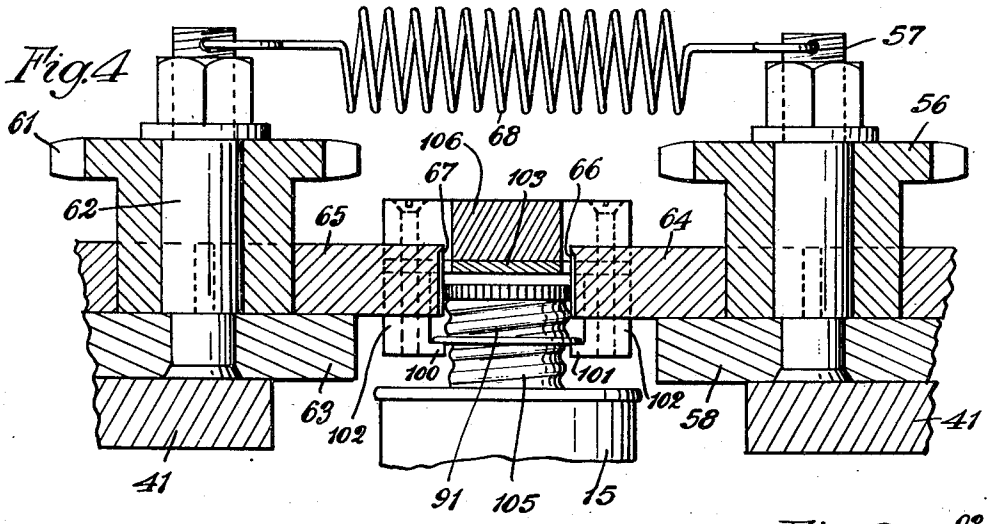


Fig. 5

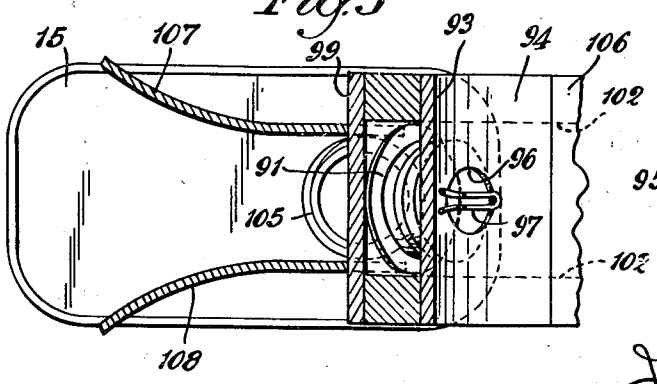
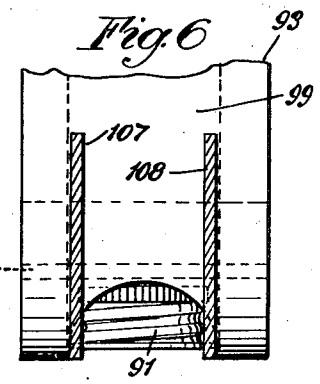


Fig. 6



Inventor

J. W. Cameron

by Linden & Browne Attorney

Patented Jan. 27, 1948

2,435,127

UNITED STATES PATENT OFFICE

2,435,127

CAPPING MACHINE

Joseph W. Cameron, Chicago, Ill., assignor to Boyle-Midway Inc., Chicago, Ill., a corporation of Delaware

Application May 19, 1945, Serial No. 594,786

4 Claims. (Cl. 226—88)

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This invention relates to a capping machine and particularly to a machine for spinning or threading caps on the threaded neck of a container. In capping machines, it is customary to provide a series of sorted caps, each one of which may be engaged by the upwardly projecting neck of a container, with such caps being spun around with respect to the necks to lock the same in position.

Furthermore, capping machines of the above types permit capping at only a moderately rapid rate. Owing to improvements in container filling and handling, maximum production is limited at the present time by the operating speed of capping machines. If capping at a high rate of speed is attempted with prior machines, it is found that missing is apt to occur, some containers going through uncapped. Inasmuch as machines of this type generally feed capped containers into a packing station, one or more uncapped containers may result in serious loss or damage. If the contents within the container are harmless, the loss of such contents may result only in spoilage of a packaging carton and discoloration of other containers. If the contents are corrosive, then extensive and serious damage is possible.

It is clear that the necessity for close supervision of the machine defeats the very object of low-cost quantity production. Hence, it has been customary to operate capping machines at moderate speeds. If greater capping capacity is necessary, additional capping machines have generally been provided.

The invention hereinafter described provides an improved capping machine which is capable of operation at sustained high speed with the certainty that every container going through will be perfectly capped. By virtue of the invention, a capping machine may be run at a sufficiently high speed to take care of the output of standard container filling machines now available on the market. Inasmuch as machines of this character are relatively costly, it follows that a high speed capping machine permits of the more efficient utilization of container filling machines, and thus tends to reduce the over-all cost of container handling.

The invention herein provides a capping machine wherein the containers are handled in a conventional manner. The containers are moved continuously along a horizontal conveyor, the containers being so disposed that the threaded necks over which the caps are to be fitted project

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upwardly. A chute in which a series of caps is disposed is provided, the chute being so arranged relatively to the line of conveyor travel and so constructed that certain engagement of container neck with a cap results.

In addition, the invention provides a pair of generally horizontal rails, said rails being adapted to support the cap just above and surrounding but not resting on a container neck after selection of a cap by the container neck. The rails provide vertical support for the cap, while the telescoping of the container neck into the cap constrains the cap to follow the container in its travel toward tightening wheels. The cap chute is so disposed that in normal machine operation it is impossible for a cap to be released from the chute except by engagement with a container neck, and once this engagement is effected, adequate support for the cap is provided by the rails so that the two are maintained in telescoped relation until the cap tightening operation.

The invention also provides a cap guide disposed along and above the rails at such a height as to prevent the derangement of any cap but not to offer resistance to its normal forward movement with the container.

The caps are thus moved forward by but not supported on the advancing containers and at the same time each cap is maintained in an alined horizontal position over the neck of its respective container.

This control over the cap permits the machine to operate on closely spaced containers at a rate of speed substantially higher than has hitherto been considered possible for sustained accurate capping.

In order that the invention may be more fully understood, reference will now be made to the drawings.

Figure 1 is a plan view of a capping machine embodying the invention. Figure 2 is a sectional elevation along line 2—2 of Figure 1. Figure 3 is a side elevation, partly in section, of the cap chute at the delivery end. Figure 4 is a sectional detail on 4—4 of Figure 2, showing a cap being turned on a container neck. Figure 5 is a section on line 5—5 of Figure 3. Figure 6 is a section on line 6—6 of Figure 3.

Referring first to Figures 1 and 2, the machine comprises bed 10 from which arise a plurality of supports 11. Supports 11 carry base plate 12 above which is disposed the major portion of the capping machine. Disposed above base plate 12

is conveyor 14 extending longitudinally of the machine substantially at the center thereof. Conveyor 14 may extend as far as necessary beyond either end of the capping machine, so that containers 15 may be picked up at one end of the machine, in this particular instance the left-hand end, and discharged at the other end of the machine. Conveyor 14 may be of any type desired having a suitable width for accommodating containers 15.

Above conveyor 14 at any desired distance are lateral endless belts 16 and 17. Belt 16 is threaded around a pair of driving pulleys 18 and 19 carried on vertical drive shafts 20 and 21 extending upwardly from bed 10. Disposed within bed 10 may be suitable motors and gears for driving shafts 20 and 21 at equal speeds in counterclockwise direction as seen in Figure 1. Idler pulley 22 is rotatably supported on bracket 23, adjustably mounted on base plate 12, and is provided for controlling the belt tension. Belts 16 and 17 may be of any flexible material such as canvas, rubber or rubberized fabric, leather, or any composition material. Guide pulleys for belt 16 adjacent conveyor 14 are provided. These pulleys (located below a similar pair numbered 24 and 25) are above conveyor 14 and so disposed that belt 16 is guided to a position where the belt may engage the side of container 15.

Similarly, belt 17 has pulleys corresponding to pulleys 18 and 19 for belt 16, these pulleys being keyed to vertical shafts 27 and 28 also extending downwardly to bed 10 to be suitably driven in a clockwise direction. Belt 17 has tensioning idler pulley 29 adjustably mounted on bracket 30 carried by base plate 12. In addition, belt 17 has guide pulleys located below a similar pair indicated by 31 and 32 opposite the guide pulleys for belt 16.

Vertically spaced from belts 16 and 17 are endless belts 33 and 34. Belt 33 is disposed around pulleys 35 and 36 keyed to shafts 20 and 21 respectively. Tensioning idler 37', similar to idler 22 for belt 16, is provided. A pair of guide pulleys 24 and 25 are provided, these being above the corresponding pulleys for belt 16.

Belt 34 is disposed around pulleys 37 and 38 keyed to shafts 27 and 28 respectively. Tensioning pulley 39 and individual guide pulleys 31 and 32 are provided for this belt.

Vertical shafts 20, 21, 27 and 28 are slidably journalled in suitable bearings supported by top plate 41. The various pulleys cooperating with upper belts 33 and 34 are disposed adjacent the lower side of top plate 41. The capping machine is adapted to accommodate desired sizes of containers by providing means to adjust top plate 41 vertically. As shown here, such means consist of four standards 42 to 45 inclusive. These standards are rotatably supported in bed 10 and have threaded upper portions. Top plate 41 carries a threaded sleeve structure for each standard, one such sleeve 46 being shown in section in Figure 2 around standard 42. The free ends of rotatable standards 42 to 45 inclusive carry sprockets 47 rigidly keyed thereto with sprocket chain 48 passing around all four sprockets. One of the standards, such as 42, may carry hand wheel 49, whereby all four standards may be rotated simultaneously and equally. Thus, top plate 41 may be maintained level and adjusted to any desired height.

Extending upwardly from bed 10 are shafts 51 and 52 carrying sprockets 53 and 54 respectively above top plate 41. Sprocket 53 has chain 55 adapted to transmit power to driven sprocket 56. Sprocket 56 is mounted to permit play around shaft 51 and, to this end, is rotatably secured to pin 57 carried on supporting block 58 pivotally mounted on shaft 51. Sprocket 54 is similarly provided with chain 60 engaging sprocket 61 rotatably mounted on pin 62 carried by block 63.

Sprockets 56 and 61 carry cylindrical wheels 64 and 65 having a larger diameter than the sprockets. Wheels 64 and 65 have outer surfaces 66 and 67 (Fig. 4) milled, embossed, roughened or otherwise mutilated to frictionally engage a threaded cap for turning the same. Coil spring 68 having its end threaded through suitable apertures in pins 57 and 62 urges wheels 64 and 65 toward each other. Wheels 64 and 65 are driven at equal speeds and in the same direction, so that opposing wheel surfaces travel in opposite directions at equal speeds. To prevent wheels 64 and 65 from contacting each other, limiting stop bolts 70 and 71 adjustably mounted in fixed blocks 72 and 73 are provided.

Additional vertical shafts 75 and 76 carry gears 77 and 78 above top plate 41. Gear 77 meshes with floating gear 80 which, in turn, meshes with gear 81 mounted for movement in a line perpendicular to the line of travel of the containers. Thus, gear 81 may be carried by a suitable block having pin 81' operating in guides 82. Similarly, gear 78 meshes with floating gear 83 which, in turn, meshes with gear 84 mounted similarly to gear 81. Coil spring 85, between the pins carrying gears 81 and 84, urges these gears toward each other. Additional springs 86 suitably anchored to the machine engage the pins supporting gears 80 and 83 to retain them in their respective gear trains. Thus, the gear train loading may be controlled.

Gears 81 and 84 each carry friction wheels 87 and 88 respectively, these being generally similar to wheels 64 and 65. The purpose of these latter wheels is to provide a final tightening for the threaded cap. The tension and frictional engagement with the threaded cap may be adjusted to accomplish this.

Rigidly secured to top plate 41 is a cap chute, generally indicated as 90. Chute 90 may connect with a hopper, not shown, of well-known construction. The chute itself is shaped to provide a generally rectangular conduit along which sorted caps 91 may slide. The chute is so dimensioned as to maintain the caps in their sorted position. Chute 90, as indicated, is generally vertical and merges into inclined chute portion 93 at a short distance above top plate 41. The length of inclined portion 93 may vary within wide limits, but it is preferred that it be long enough to accommodate a small number of caps. Inclined chute portion 93 extends down toward conveyor 14 and forwardly along the line of container travel. Inclined portion 93 terminates in a cap delivery end 94. This end portion provides a curved junction between the chute and a generally horizontal cap guide 95.

In accordance with the invention herein, inclined chute 93 makes an angle of about 45 to 60 degrees with the horizontal. Best results have been obtained where the angle is adjusted to 52 degrees, although it is to be understood that some variation around this figure is possible. Cap delivery end 94 at the end of chute 93 is fabricated to provide slot 96 in what may be termed the top wall of the chute. Spring finger 97 suitably retained on the outside of chute 93 projects through slot 96 and is adapted to rest on top of

a container cap positioned within the interior channel. The pressure of spring finger 97 is sufficient to retain a cap in position against free movement out of chute 93 against the force of the sliding caps aligned within chute 90 and inclined chute 93. However, a cap may be pulled out from the delivery end against spring pressure.

Chute 93 has its bottom portion 99 formed as a solid wall. However, at delivery end portion 94, bottom wall 99 gives way to a pair of side rails 100 and 101. Side rails 100 and 101 curve around downwardly and form supports for caps released from delivery end 94 and within cap guide 95. Side walls 102 and top 103 are provided to form an enclosure for caps.

Guide rails 100 and 101 have their upper supporting surfaces adjusted so that the rail supporting plane is somewhat below the open end of a container neck as the container passes through the machine on conveyor 14. Between guide rails 100 and 101, a space just sufficient to accommodate caps is provided.

As is evident in Figure 3, the curvature of delivery end 94 is such that a cap, retained in the end, has a part thereof projecting outside of the region enclosed by the guide. By virtue of the adjustment of delivery end 94 with respect to the horizontal path of travel of container necks, a cap retained in delivery end 94 has its lower projecting part in position to be engaged by the neck 105 of an advancing container. As a container 15 moves to the right, as seen in Figure 3, cap 91 is edged forward to telescope the engaging neck and moved into the cap guide. Rails 100 and 101 may be formed integral with sides 102, and these sides may be maintained in predetermined adjusted position by bolts supported from support bar 106 above top plate 103. Support bar 106 may be carried by cross blocks 106' bolted to the machine and retaining the two parts of top plate 41 in position. It is preferred to have cap guide 94, together with the adjacent curved section, integral with and abutting the end of inclined chute 93. Thus, adjustments to adapt the cap guide to various sizes of caps may be made and, if necessary, different sizes of chutes may be used.

Side rails 100 and 101 may extend along the container path any desired distance short of cap spinning wheels 64 and 65. Top wall 103 of the cap guide is preferably disposed such a distance above the top faces of rails 100 and 101 as to clear any engaged cap advancing with a container toward cap spinning wheels 64 and 65. However, guide top 103 is sufficiently close to the head of a cap so that substantial tilting of the cap out of its normal position is prevented. Thus, top plate 103 maintains an engaged cap in position over a container neck. Top plate 103 may extend beyond cap spinning wheels 64 and 65 in the direction of container travel as far as desired. Support bar 106 may extend to the very end of the capping machine. Thus, containers and caps are protected from dirt or grease.

A pair of side guides 107 and 108 (Figure 5) of sheet material may be carried from any suitable point such as from chute 93 to guide necks 105 of the container into cap engaging position.

The operation of the machine may be briefly reviewed. Top plate 41 is adjusted by turning hand wheel 49 to accommodate containers of a predetermined size. Inasmuch as the cap feeding chutes are rigid with respect to top plate 41, it is assumed that the cap feeding means is adjusted so that the caps are disposed in position relative to the container as shown in Figure 3.

Conveyor belt 14 is moved in the direction shown by the arrows, while endless belts 16, 17, 33 and 34 are also moved at the same speed as conveyor belt 14. These conveyors move in the direction indicated by the arrows and serve to aid containers 15 in their travel through the machine. When a container is in the position shown in Figure 3 just prior to engaging a cap, further travel of the container will force a cap out from delivery end 94 against the friction due to spring finger 97 and permit the cap to rest on guide rails 100 and 101 while telescoped over neck 105 of the container. The container and engaged cap then move forward between wheels 64 and 65. Assuming that right-hand threads are used on neck 105 and cap, wheels 64 and 65 will be driven in the direction indicated by the arrows (Figure 1). The speed of rotation of wheels 64 and 65 may vary within wide limits and depends on such factors as the speed of travel of a container past the wheels, relative diameters of cap and wheels, thread pitch, number of threads for a cap, and the like. Inasmuch as the wheels are spring pressed against a cap, no great precision is required. The caps may have a milled edge as desired, although this is generally provided for the convenience of the user rather than for the machine. As shown here, the capping machine has two sets of cap turning wheels. Thus, the first set of wheels 64 and 66 may turn the caps down loosely, and the second set may give them an additional twist to tighten the caps in position. However, the number of pairs of cap engaging wheels is not critical and may be varied to suit conditions.

Referring again to Figure 3, as each container comes along, there will be a cap waiting for it under spring 97. Due to the angle of attack between the cap and container neck, as the forward edge of the container neck engages the protruding cap part in its path, spring finger 97 will tend to force the rear portion of a cap down against the neck. Spring finger 97 not only functions as a friction retaining means to prevent free feeding of caps, but also cooperates with delivery end 94 and the curved part of the guide rails to position a cap on a container neck. By having the chute at the angle indicated, a portion of a cap under spring finger 97 will always project below the curved outline of the cap guide and be in a position to definitely engage the forward portion of a container neck. The influence of gravity on the positioning of each cap on a container neck is negligible. Thus, a sort of cam action occurs with a cap being definitely positioned over a container neck. By virtue of this action, high speed capping is possible. No cap is released by the spring finger unless a container is in a position to receive the same and, once a cap is released, it remains in position ready to be twisted on by friction or other means. Conversely, no container can pass chute 94 without picking up a cap so long as the supply of caps is maintained.

What is claimed is:

1. In a capping machine, a horizontally movable conveyor for supporting containers, each container having a threaded neck projecting upwardly from the body thereof, said neck adapted to have a correspondingly threaded cap spun thereover, a cap chute extending downwardly toward said conveyor and forwardly with reference to container travel and terminating in a cap delivery portion disposed in the path of travel of the threaded neck of each uncapped container, means for retaining a cap at said delivery end

against free cap movement out of said delivery end, said retained cap having a part thereof in the path of travel of a container neck and engageable thereby for cap removal from said chute delivery end, a substantially horizontal guide into which the threaded container necks project for a portion of container travel on said conveyor, said guide having its cap receiving end adjacent the delivery end of said chute to receive caps therefrom and having means upon which an engaged cap may rest and slide to travel along with its associated container, and means at the end of said guide for spinning said cap over its associated container neck.

2. In a capping machine, a horizontally movable conveyor for supporting containers, each container having a threaded neck projecting upwardly from the body thereof, said neck adapted to have a correspondingly threaded cap spun thereover, a cap chute extending downwardly toward said conveyor and forwardly along the line of container travel and terminating in a cap delivery end in the path of travel of the container necks, means for retaining a cap at said delivery end in position to be engaged by a container neck, said retaining means being yieldable to permit a container to continue forward with its engaged cap over said threaded neck, a pair of horizontal guide rails extending from said delivery end along the path of container travel and defining an open space between said rails along which said container necks travel, said container necks projecting upwardly between said rails with the rims of said necks being disposed above the tops of said rails, each of said caps being so shaped as to rest on said rails while moving forwardly with its engaging container, and means at the end of said rails for spinning each cap over the neck of its engaged container.

3. In a capping machine, a horizontally movable conveyor for supporting containers thereon, each container having a threaded neck projecting upwardly from the container body, said threaded neck being adapted to have a correspondingly threaded cap spun thereon, a cap chute extending downwardly toward said conveyor and forwardly along the line of container travel and terminating in a cap delivery portion in the path of horizontal travel of a container neck, means for retaining a cap at said delivery end against free cap movement out of said delivery end, said retained cap having a part thereof in the path of travel of a container neck and engageable thereby for cap removal from said delivery end, a substantially horizontal guide extending from said delivery end along the path of container travel, said guide including a pair of guide rails and a top

plate, said guide rails defining an open space between them along which container necks travel with the rims of the container necks lying above the rail surface, said caps being so shaped as to rest on said rails while telescoping with an engaging container neck to move said cap forwardly, said guide top plate being spaced above the path of travel of a normally engaged cap but being close enough to prevent said cap from tilting out of engagement with a container neck, and means in the path of travel of an engaged cap and beyond said guide rails but below said top plate for spinning said cap over said neck.

4. In a machine adapted to apply and tighten threaded caps on containers having upstanding necks: a conveyor, a cap chute, a cap guide and cap-spinning means, said conveyor being adapted to advance containers continuously through the machine while restraining the containers from turning, said cap chute being adapted to present and releasably retain a succession of caps in an inclined position in the path of the necks of advancing conveyors whereby each container removes one cap from the chute, said cap guide being alined with and extending from said cap chute to said cap-spinning means and being adapted to slidably support a succession of caps each telescoped over but not resting on a container neck, and including guide means overlying the path of travel of said caps to prevent the caps from becoming disengaged from the container necks as the containers are advanced to the cap-spinning means.

JOSEPH W. CAMERON.

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