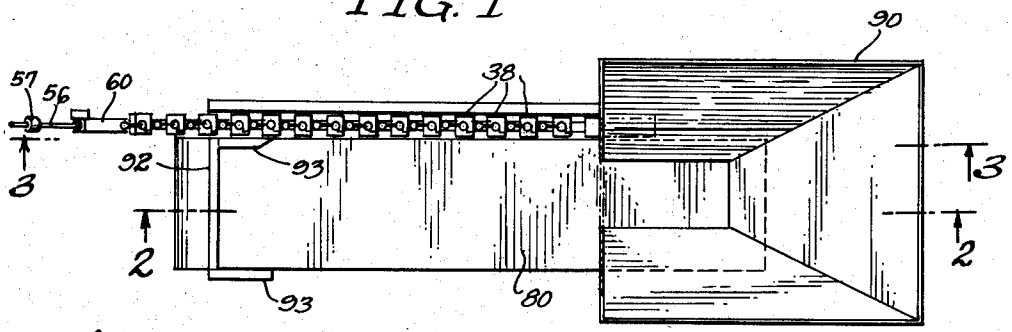
Sept. 3, 1963 J. C. PORCELLI 3,102,332

APPARATUS FOR CLOSING A NOZZLE OR SPOUT WITH A CAPTIVE CAP

Filed April 29, 1960 3 Sheets-Sheet 1

FIG. 1



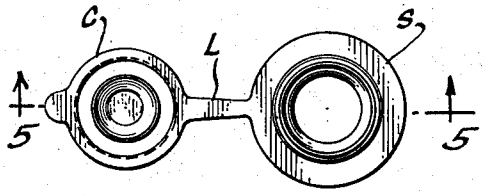


FIG. 4

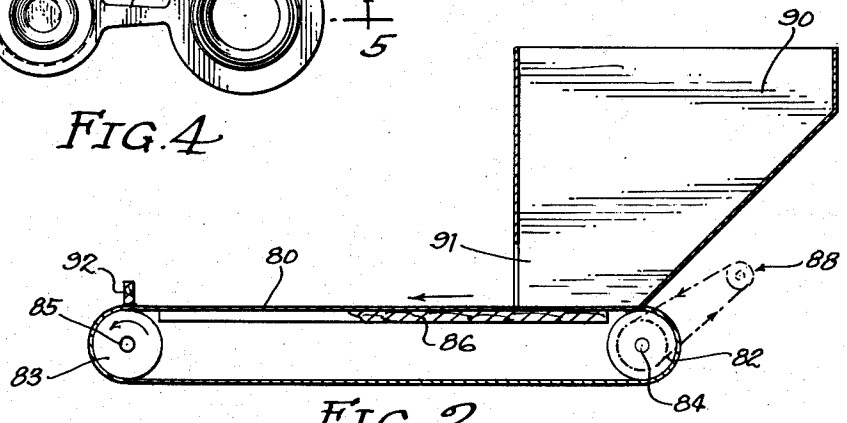


FIG. 2

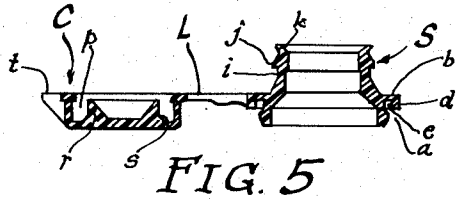


FIG. 5

FIG. 3

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APPARATUS FOR CLOSING A NOZZLE OR SPOUT WITH A CAPTIVE CAP

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FIG. 7

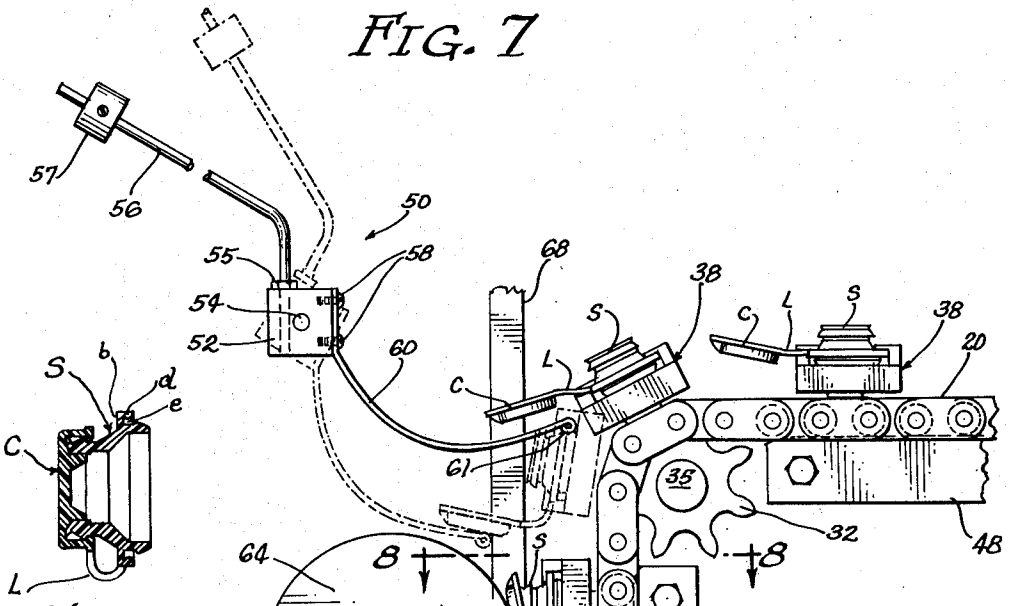


FIG. 6

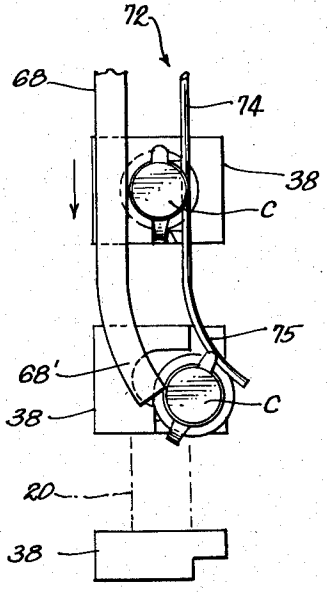


FIG. 9

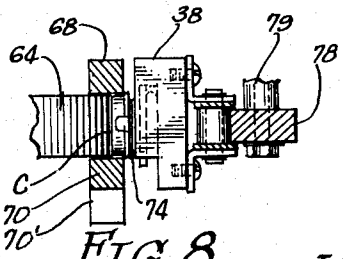


FIG. 8

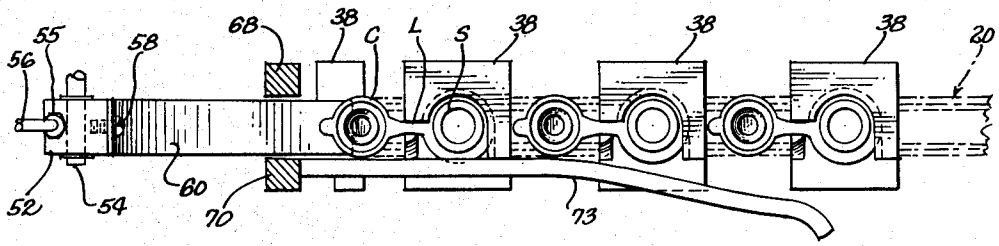
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APPARATUS FOR CLOSING A NOZZLE OR SPOUT WITH A CAPTIVE CAP

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FIG. 10



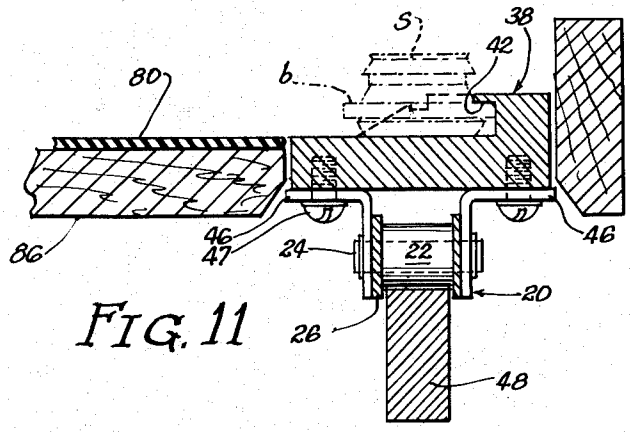


FIG. 11

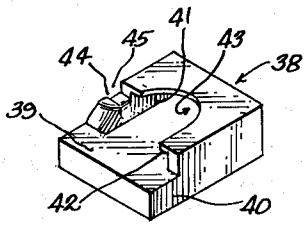


FIG. 12

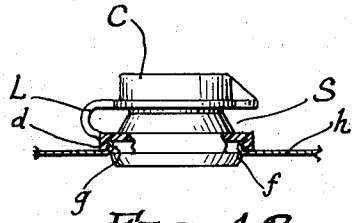


FIG. 13

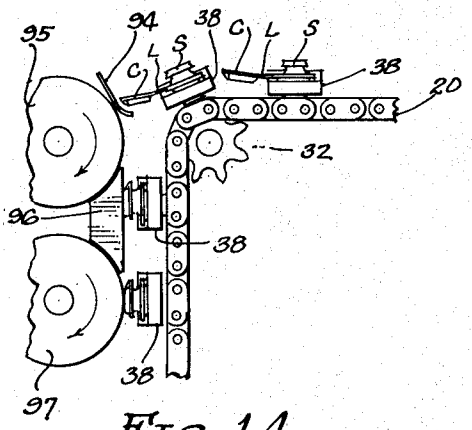


FIG. 14

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Patented Sept. 3, 1963

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APPARATUS FOR CLOSING A NOZZLE OR SPOUT WITH A CAPTIVE CAP

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Filed Apr. 29, 1960, Ser. No. 25,678
7 Claims. (Cl. 29—208)

This invention relates to an apparatus for closing a nozzle or spout with a captive cap.

The use of a nozzle with a captive cap has come into prominence. The nozzle or spout and cap are permanently connected or joined together by a flexible connecting hinge or connecting strip and are all made preferably of plastic material. The cap cannot be lost or switched and is repeatedly applied to the nozzle for closing same. The cap holds back to permit free pouring and snaps into place easily to form a liquid-tight fit with the nozzle.

The spout or nozzle is initially secured to a container without requiring the use of any soldering elements or the like and is initially applied to the container after the container is filled with the liquid or ingredients through the container opening. After the container is initially filled at the factory the foregoing spout is applied thereto. Thus, it is advisable that the cap be secured to the spout in a uniformly closed or seal-tight fit before the spout is secured to the container.

The cap, nozzle and connecting hinge are molded preferably of plastic material in a single operation in an injection molding machine and when it is discharged from the machine the cap is generally spaced from the spout, but connected thereto by the flexible connecting member. Therefore, an object of this invention is to provide a method and apparatus for moving the cap in relation to the spout and uniformly closing the spout in a seal-tight fit with said cap so that same is ready as a unit for connection to a container.

Heretofore, such units (spout and captive cap) have been closed by manually applying the cap to the spout. This was a slow, tedious, time-consuming and expensive procedure, aside from being unsanitary. In addition, due to physical and human factors, a large percentage of the caps while positioned in partially closed position were not uniformly closed in a seal-tight fit, hence did not provide an effective and uniform seal. This was not discovered in many instances until after the unit was applied to the can or container, therefore, the nozzle of the can or container was not properly sealed when shipped.

All of the foregoing disadvantages are eliminated by this invention. The caps are effectively applied to form a uniform and seal-tight fit with the nozzle and the speed has been increased immeasurably, with a consequent reduction in costs.

Other objects will become apparent as this description progresses.

In the drawings:

FIGURE 1 is a top plan view showing the general layout of the apparatus of this invention.

FIGURE 2 is a view partly in cross-section taken on lines 2—2 of FIGURE 1.

FIGURE 3 is a view partly in section taken on lines 3—3 of FIGURE 1.

FIGURE 4 is a plan view of the spout and cap which is adapted to be closed by means of the apparatus of this invention.

FIGURE 5 is a cross-sectional view taken on lines 5—5 of FIGURE 4.

FIGURE 6 is a cross-sectional view showing the spout and cap of FIGURE 5 in closed position.

FIGURE 7 is an enlarged end elevational view of the portion of the apparatus which performs the operation of closing the cap on the spout.

FIGURE 8 is a cross-sectional view taken on lines 8—8 of FIGURE 7.

FIGURE 9 is an elevational view taken on lines 9—9 of FIGURE 7, with one of the guide bars eliminated for purpose of clarity.

FIGURE 10 is an enlarged top plan view showing the spout cap units in the holders wherein they are conveyed to the cap closing operation.

FIGURE 11 is an enlarged sectional view taken on lines 11—11 of FIGURE 3.

FIGURE 12 is a perspective view of one of the spout supporting members or holders into which the spout is inserted and wherein it is carried throughout its travel in the machine.

FIGURE 13 is a view partly in cross-section showing the manner in which the spout and cap are applied to a container, and

FIGURE 14 is a side elevational view of a modification showing a modified construction for uniformly closing the cap on the spout.

The base or frame forming the supporting structure of the machine is not shown in the drawings and has been eliminated for the purpose of clarity of disclosure. The construction to be described is supported on a suitable framework or base so that it is elevated from the floor or ground.

Generally, the construction comprising this invention includes an endless chain or belt which carries spout supporting members or holders into which the spout is inserted and whereby the spout and cap are moved as a unit to the portion of the machine which performs the operation wherein the spout is uniformly closed by the cap to form a seal-tight fit, after which same is discharged from the machine in this closed seal-tight condition.

The machine includes an endless roller chain generally indicated at **20**, formed of the usual rollers **22** supported on cross-pins **24** connected to spaced side links **26**, which links are connected to adjacent links. At one end, as best seen in FIGURE 3, the chain **20** is in engagement with an enlarged sprocket gear **28**, which sprocket gear is mounted on a horizontal shaft **29**, in turn supported on the framework of the machine. The sprocket gear **28** is driven by any conventional drive means, diagrammatically illustrated by the numeral **30** in FIGURE 3.

The forward end of chain **20** is in engagement with smaller upper and lower idler sprocket gears, designated by the numerals **32** and **34**, respectively, which are suitably supported on horizontal shafts **35** and **36**, respectively. Said shafts are secured to the framework. The axes of said shafts are vertically alined and are spaced from each other, as best shown in FIGURE 7, so that the chain **20** moves from its upper horizontal position to a vertical position and then continues substantially horizontally rearwardly to the drive sprocket gear **28**.

The gears **32** and **34** are smaller in diameter than the gear **28**. The purpose of providing the small diameter for gears **32** and **34** is so that the cap will be extended out to be intercepted by the rocker arm as the spout cap unit goes around the radius of gear **32**. Said gears **32** and **34** also provide a vertical travel for the chain **20**.

Secured to the chain **20** in spaced relation are the spout supporting members or holders generally designated by the numeral **38**. One of said supporting members or holders is shown in perspective in FIGURE 12, and also shown in section in FIGURE 11. The supporting member or holder **38** is formed preferably of aluminum or lightweight material and has a generally rectangular shaped base or lower portion **40**, and extending upwardly thereof is a generally U-shaped upstanding vertical wall **41**, which is provided with an overhanging lip or ledge **42** for a portion thereof so that it forms with the wall a pocket **43** to receive the spout. The side for-

ward portion **44** of the wall **41** has no overhanging lip **42** and is gradually tapered and recessed or slotted as at **45** to receive a portion of the connecting link of the spout cap unit.

The vertical wall **41** and the overhanging ledge **42** do not extend to the front of the base **40** of the holder and thereby the front of the base has an open surface **39** so that the spout cap unit may be slid therein to occupy the position best shown in FIGURE 10. Automatic means may be provided for feeding the spout cap unit so that they engage the holders **38**.

The supporting members **38** on the chain **20** are spaced from each other so that the spout, generally identified as S, is positioned on the holder **38** with the connecting link, generally identified as L, extending over the forward side wall, with a portion of the link L confined in the recess **45** of the side wall, and the cap, generally identified as C, extending forwardly of the holder member **38** in the space between the next adjacent carrying holder and directly over the exposed portion of the endless chain, as best shown in FIGURE 10.

The supporting members or holders **38** are secured to the roller chain **20**, as best shown in FIGURE 11. A pair of right angle brackets **46** spaced from each other are secured to the underside of the nozzle supporting member **38** by threaded bolts **47**, and each of the legs of said brackets **46** is provided with a pair of openings which are secured to two adjacent cross-pins **24** on the roller chain, said brackets **46** being secured on the cross-pins **24** by any conventional means, such as washers or by peening the ends of the pins.

The pins **24** are part of the conventional roller chain, except that in the positions where they support the supporting members **38** they are of greater length than normally to accommodate the L-shaped brackets. Thus, as the endless chain **20** moves along it carries the nozzle supporting member **38** therewith.

As best shown in FIGURES 7 and 11, a longitudinally extending support bar **48** is positioned below the top horizontal travel of the chain **20** and said bar is suitably supported on the frame of the machine. This bar supports the chain as it moves horizontally along the top of the machine.

Pivotally or rockably supported adjacent the front end of the machine, and best shown in FIGURE 7, is a rocker unit, generally indicated by the numeral **50**, which includes a square-shaped block **52** which is pivotally or rockably supported on a horizontal shaft **54**, in turn which is secured to the framework of the machine (not shown).

Secured to the block as at **55** and extending upwardly and forwardly thereof is an arm **56** having a counterweight **57**. Secured to the block as at **58** is a rearwardly extending arcuate shaped arm **60**, the outer end of said arm being rounded as indicated at **61**. The arm **60** is in alinement with the endless roller chain so that the cap of the spout cap unit is engaged thereby as same moves with the endless belt from its horizontal to its generally vertical position. The counterweight **57** normally maintains the arcuate shaped arm in the position shown in full lines in FIGURE 7.

The underside of the arm **60** has a felt padding **62** to cushion the engagement of arm **60** with roller **64**. As the spout cap unit moves forwardly with the endless chain **20**, the cap C will be positioned over the forward end of the arm **60**, as shown at the top in FIGURE 7, and as said spout cap unit moves downwardly the cap C will engage the top of the arm **60** and cause the rocker **50** and arm **60** to pivot so that the arm moves downwardly, as shown in the dotted line positions in FIGURE 7, until the arm **60** engages a large roller **64** which limits its downward movement, and as the spout cap unit continues downwardly the cap will be caused to slip down past the arm **60** and move inwardly against the top of the spout S.

As best shown in FIGURE 7, the roller **64** is mounted on a horizontal shaft **65**, which shaft is supported on the framework, not shown. The roller **64** is power driven to rotate clockwise and engages the cap, as shown in FIGURE 7.

As the cap C moves past the rocker arm **60** it will be first seated against the neck of the spout and as the spout cap unit continues its movement downwardly the cap C will engage the roller **64** which is power driven, which roller in turn will push the cap on the spout and cause the cap to uniformly close the spout and form a sealtight fit therewith, as shown by the spout cap unit positioned below the roller **64** in FIGURE 7.

As the supporting member **38** continues to move downwardly with the endless chain, the spout cap unit will be discharged from the supporting holder **38**, as will now be described, into a suitable storage receptacle, not shown. The supporting holder **38** will then continue with the endless chain horizontally and then upwardly and then horizontally across the top where additional spout cap units are inserted as same is moved across the top.

Extending on opposite sides of the roller **64** are a pair of vertical guide bars **68** and **70**, best shown in FIGURE 8, one of which is also shown in FIGURE 7. As the cap C in its initial extended position is moved forwardly, as shown at the top in FIGURE 7, it is positioned between the guide bars **68** and **70** and as the cap continues its movement from a horizontal to a vertical movement wherein it moves to its initial closing position and then to its final sealing position it is likewise confined in position between the two vertical guide bars **68** and **70**. The lower end of the guide bars terminate below the roller **64**, as shown in FIGURE 7, and the lower ends of said guide bars curve inwardly as at **68'** and **70'** from a vertical plane, as best shown in FIGURE 9.

As the spout cap unit engages the lower end of the guide bars it will push or slide the spout cap unit out of the supporting holder **38** as the front portion **39** of said holder is unobstructed. The sealed spout cap unit drops into a storage container or the like, not shown. FIGURE 9 shows one of the guide bars **68**, however, the companion bar **70** has been omitted for the purpose of illustrating a wire guide member **72** positioned adjacent guide bar **70**.

The wire guide member, generally designated at **72**, is best shown in FIGURES 8, 9 and 10. The wire guide member **72** starts at the upper end of the machine, as best seen in FIGURE 10, and runs horizontally as at **73** so that it is positioned to lie adjacent and over the front end **39** of the base of the supporting holder **38** to prevent the spout cap unit from moving out of the holder during its travel. The wire guide member **72** then is bent to extend vertically as at **74** and is thus positioned adjacent the guide bar **70**, as best shown in FIGURE 8. Thus, the wire guide **72** will still retain the spout cap unit as same moves vertically with the supporting holder **38**. At the lower end the vertically extending wire guide is curved as at **75** so that it will not interfere with the discharge of the spout cap unit from the holder **38**, as previously explained.

A vertically extending backup bar **78**, best shown in FIGURES 7 and 8, is suitably secured to the frame (not shown) by fastening member **79**. This bar is positioned in horizontal alinement with the roller **64** rearwardly of the vertical travel of the endless roller chain. As the endless chain **20** moves vertically in relation to the roller **64**, the cap C engages the roller **64** and the backup bar **78** will prevent the endless roller chain from moving rearwardly, thus, any pressure applied to the cap by the roller **64** is maintained by reason of the backup bar. Since the roller chain includes rollers between the links, the rollers will roll over the backup bar and therefore will not interfere with the continued movement of the roller chain.

Positioned to the front of the endless roller chain and the mechanism described is an endless belt **80**, best shown in FIGURES 1 and 2, which travels around spaced rollers

82 and 83, of which roller 82 is a drive roller. Each of said rollers is supported on a horizontal shaft 84 and 85, respectively, which in turn is secured to the framework, not shown. Directly under the top horizontal travel of the endless belt is a horizontal table support 86 over which the endless belt moves, the table support in turn being secured and supported by the frame.

The shaft 84 which carries the drive roller 82 is driven by a suitable drive mechanism gnerally indicated at 88 and shown diagrammatically in FIGURE 2, for the purpose of moving the endless belt.

Positioned and secured to the frame over endless belt 80 and to one side thereof, as best shown in FIGURES 1 and 2, is a hopper 90 having inwardly sloping walls leading to a discharge outlet 91 at the bottom thereof directly over the endless belt 80.

The spout cap units to be closed and sealed with the present invention are deposited in the hopper 90 and as the endless belt 80 rotates, the spout cap units at the bottom of the hopper are moved outwardly thereof on the endless chain 20. The operator is stationed forwardly of the endless belt so that as the spout cap units come out of the hopper the operator may then position them in the holders 38 on the endless chain as the chain is moving continuously forward. Adjacent the front end of the horizontal travel of the endless belt is a transverse end barrier 92 with two side bars 93 to prevent the forward travel of the nozzle cap units on the belt.

It will be understood that the spout cap units may be oriented and automatically fed to the holders 38, thus eliminating the need of an operator.

FIGURE 14 shows a modified method and apparatus. In this modification the rocker arm 60 previously described is eliminated. In lieu therefor there is a stationary finger 94 which is secured to the frame and extends in the path of the travel of cap C. The cap C is engaged by the stationary finger 94 as the cap moves from its horizontal to its vertical travel.

The rollers 95 and 97 are power driven and are spaced from each other. A stationary flat plate 96 is positioned between the rollers. After the cap is moved to cover the nozzle through engagement of the stationary finger 94 and the cap moves past the finger 94, it will engage roller 95 and at about the axis of roller 95 the cap has been pressed on the spout to a uniform closing and seal-tight fit. The plate 96 which also engages the cap prevents the cap from disengaging itself from the nozzle. The lower roller 97 serves to effect a seal-tight fit of the cap on the nozzle, if for any reason an imperfect fit has previously been formed.

The specific construction of the spout cap unit which is herein illustrated forms no part of this invention and same is in commercial production and sale.

The spout and cap unit is formed preferably of polyethylene or similar plastic material which is semi-resilient. The spout S has a body portion *a* provided with an annular shoulder *b* and a downwardly extending lip *d* which forms an annular recess *e* to accommodate the upwardly and outwardly cured flange *f* surrounding the opening *g* formed in the top of the can or container *h*. The spout S is thus secured to the container in a seal-tight fit.

The neck *i* of the spout is provided with an annular shoulder *j* and also with a tapering seat *k* on the inside wall of the neck at the top thereof. A flexible strap *l* extending from the body *a* connects the cap C. The cap has a circumferential bead *o* to engage the shoulder *j*. The cap has an annular recess *p* and a cylindrical side wall *r*. The upper end of the cylindrical side wall *r* is tapered complementary as at *s* to the tapering seat *k*. The cap has a tab *t* at the front thereof. The captive cap may be repeatedly used for closing the spout.

It will be understood that while a specific spout cap unit has been described, that this invention is not limited thereto but is applicable to any other type of spout cap unit.

In positioning the spout S in the holder 38, a portion of the annular shoulder *b* of the spout fits under the ledge 42 and is confined in the recess 43, as best seen in FIGURE 11, with the front portion of the shoulder exposed. The upper end or neck of the spout is exposed so that the cap may be secured to it, as previously described.

At present, the nozzle and cap as a unit is ejected from the injection molding machine with the cap and nozzle positioned with respect to each other, as best shown in FIGURE 4, however, they may be positioned in other relative positions if desired. The spout cap unit in this condition is inserted into the holder 38 for the purpose of uniformly closing and sealing the cap on the spout as previously described so that it assumes the sealtight position shown in FIGURE 6.

FIGURE 13 shows the spout cap unit secured to a can or container after the can has been filled through the top of the can opening. Thus, after the can has been filled the spout is secured thereto with the cap in sealed position and the can is ready for shipment. The material or metal of the can adjacent the opening is curved upwardly and is secured within the annular recess of the spout by conventional means forming no part of this invention.

The apparatus herein described for uniformly closing and sealing captive caps on nozzles or spouts is simple, efficient and speedy in that a high rate of caps are thus uniformly closed in a seal-tight fit on the spout.

It will be understood that various changes and modifications may be made from the foregoing without departing from the spirit and scope of the appended claims.

I claim:

1. An apparatus for closing a spout with a captive cap prior to securement of the spout to a container with said cap being permanently joined to said spout by a flexible link, said apparatus including means for supporting and moving a spout and a captive cap as a unit with the flexible link extended to space the cap laterally of the spout, means supported by said apparatus and extending in the path of movement of said unit and engaging said unit for bending said flexible link and moving said cap to cover the spout opening, and means for automatically pressing said cap on said spout to form a seal-tight fit therebetween.

2. An apparatus for closing a spout with a captive cap prior to securement of the spout to a container with said cap being permanently joined to said spout by a flexible connector, said apparatus including a conveyor, a plurality of holders carried by said conveyor, each said holder adapted to retain the spout of a spout and captive cap unit while said unit is being conveyed, means supported by said apparatus and extending in the path of travel of said unit and engaging said cap as said unit is moving for bending said flexible connector and moving said cap to cover the spout opening, and means for seating said cap on said spout to form a seal-tight fit therebetween as said unit is being conveyed.

3. An apparatus for closing a spout with a captive cap prior to securement of the spout to a container with said cap being permanently secured to said spout by a flexible connector, said apparatus including means for forwardly carrying a spout and a captive cap as a unit, with the flexible connector extended to space the cap laterally of the spout, means supported by said apparatus and extending in the path of travel of said unit and engaging said unit as said unit is moving for bending said flexible connector and moving the cap to cover the spout opening, and means for uniformly seating said cap on said spout to form a seal-tight fit therewith as said unit is carried forwardly.

4. An apparatus for closing a spout with a captive cap prior to securement of the spout to a container with said cap being connected to said spout by a flexible connector, said apparatus including means for supporting a spout and a captive cap as a unit and for carrying same with

the flexible connector extended and the cap disposed laterally of the spout, pivotally mounted means supported by said apparatus and extending in the path of travel of said cap and engaging the cap for bending said flexible connector and moving said cap over the spout opening, and means for pressing said cap over said spout to form a seal-tight fit therewith.

5. An apparatus for closing a spout with a captive cap prior to securement of the spout to a container with a flexible connector permanently joining said spout and cap, said apparatus including means for supporting and moving a spout and a captive cap as a unit with the cap extended away from the spout, a pivotally supported member supported by said apparatus and extending in the path of movement of said cap and engaging the cap for flexing said flexible connector and moving said cap to cover said spout opening, roller means for pressing said cap in relation to said spout to form a seal-tight fit therewith, and means for discharging said unit from said apparatus when in sealed condition.

6. An apparatus for closing a spout with a captive cap prior to securement of the spout to a container with said cap being permanently joined to said spout by a flexible connector, said apparatus including a continuous conveyor, means for moving said conveyor, a plurality of holding members carried by said conveyor, each holding member adapted to support the spout of a spout and captive cap unit while said unit is being conveyed, means for conveying said unit first in a horizontal direction and then in a vertical direction, pivotally supported means on said apparatus extending in the path of travel of said unit for engaging said cap to bend said flexible connector and move said cap to cover the spout opening, rotatable means adapted to press said cap during the vertical movement of said unit so that said cap forms a seal-tight fit with said nozzle, and means for discharging said unit from said holding member in a sealed condition.

7. An apparatus for closing a spout with a captive cap prior to securement of the spout to a container with said cap being permanently joined to said spout by a flexible connector, said apparatus including a conveyor adapted to carry a plurality of spout and cap units with each of the caps extending away from its respective spout, said conveyor being adapted to carry said units first in a horizontal direction and then in a vertical direction, means engaging said cap while said unit is moving in a vertical direction, said means including a rocker arm adapted to bend said flexible connector and move said cap to a closing position over the spout opening, means including a roller adapted to engage the cap and press said cap in a seal-tight fit on said spout, and means adapted to move said unit from said conveyor after said cap has been sealed with respect to said spout.

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