Oct. 14, 1958 S. L. HARMON ET AL 2,855,736

METHOD OF AND APPARATUS FOR CLOSING BOTTLES AND JARS

Filed April 19, 1957 5 Sheets-Sheet 1

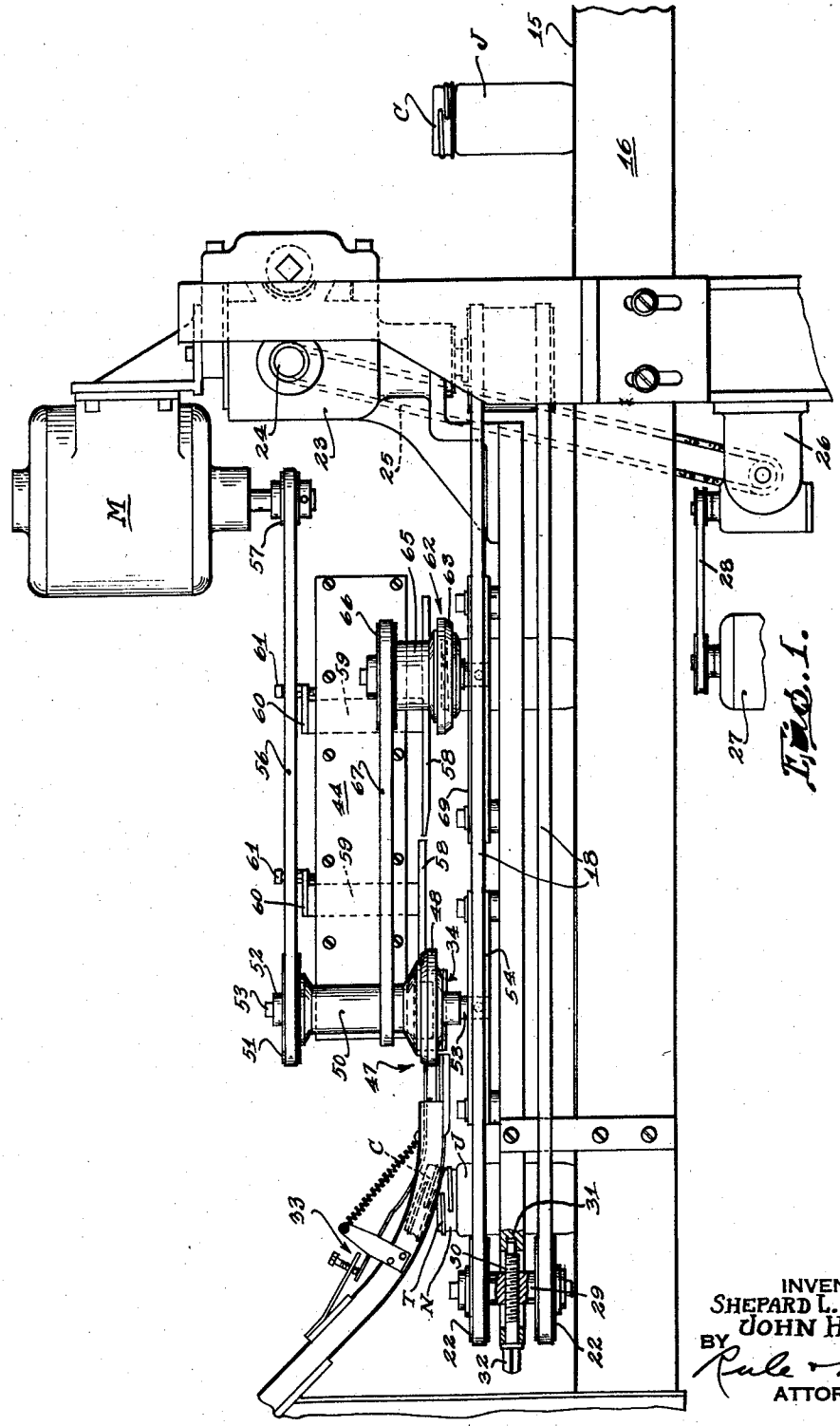


Fig. 1.

INVENTORS
SHEPARD L. HARMON
JOHN HOHL
BY Rule & Hoge
ATTORNEYS

Oct. 14, 1958 S. L. HARMON ET AL 2,855,736

METHOD OF AND APPARATUS FOR CLOSING BOTTLES AND JARS

Filed April 19, 1957 5 Sheets-Sheet 2

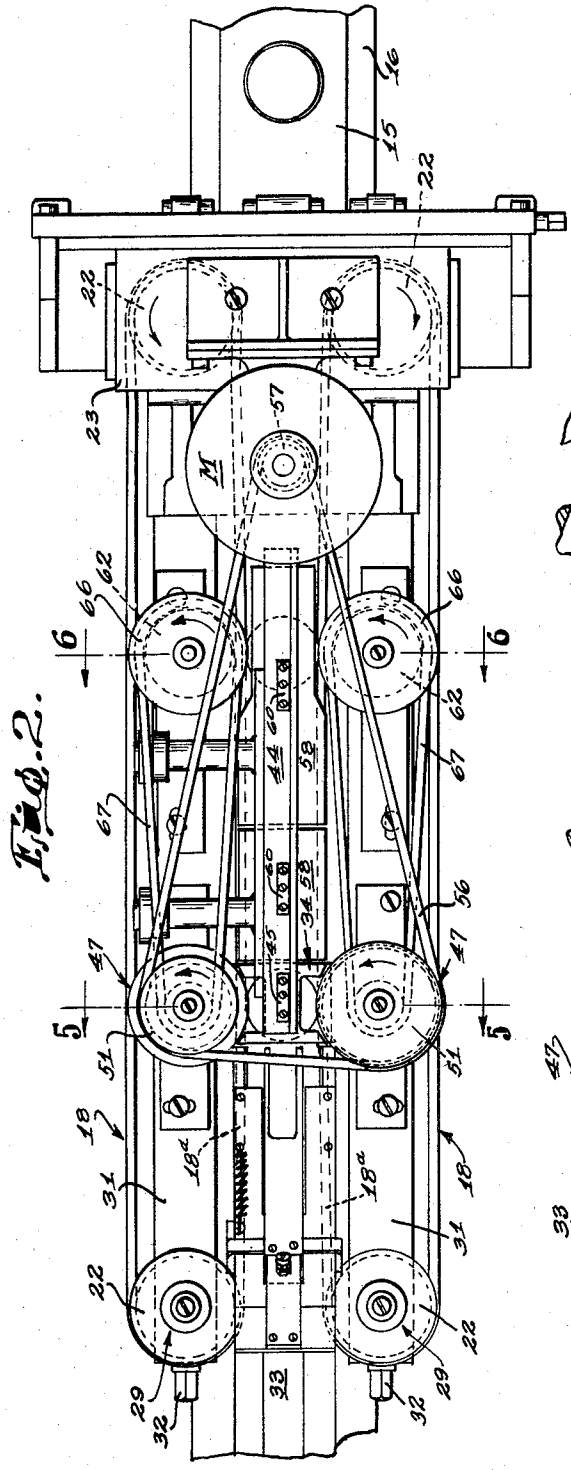


Fig. 2.

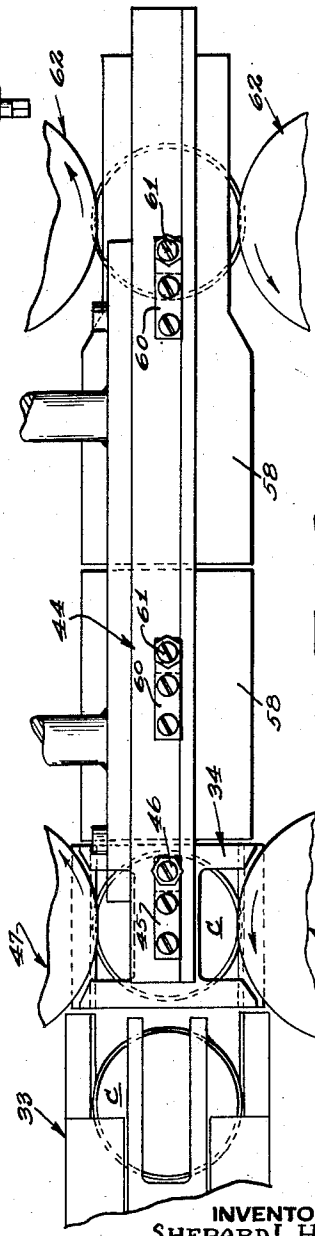


Fig. 3.

INVENTORS
SHEPARD L. HARMON
JOHN HOHL
BY
Rule & Hoge
ATTORNEYS

Oct. 14, 1958 S. L. HARMON ET AL 2,855,736

METHOD OF AND APPARATUS FOR CLOSING BOTTLES AND JARS

Filed April 19, 1957 5 Sheets-Sheet 3

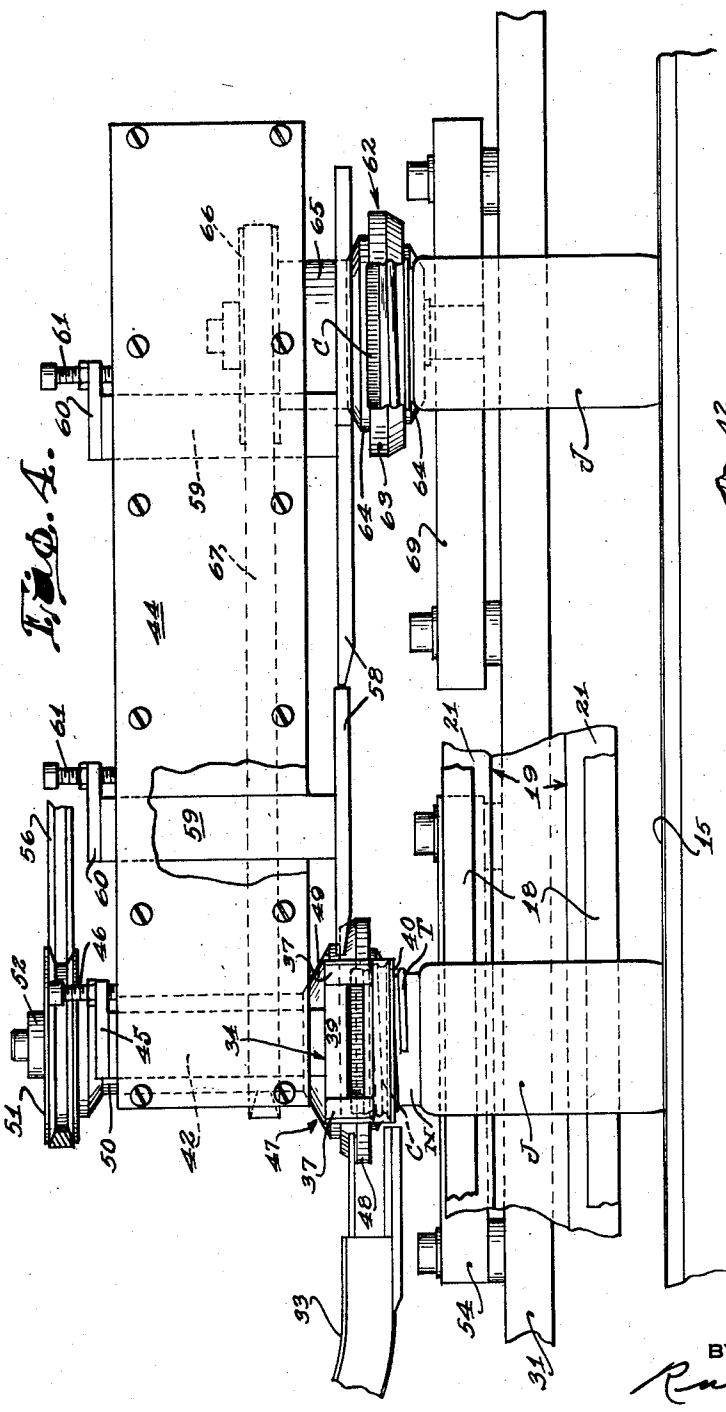


Fig. 4.

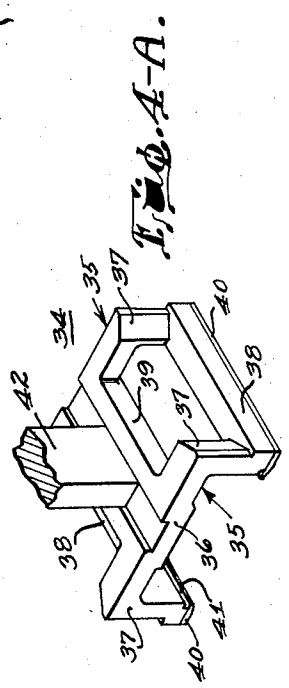


Fig. 4-A.

INVENTORS
SHEPARD L. HARMON
JOHN HOHL
BY
Rule & Hoge
ATTORNEYS

METHOD OF AND APPARATUS FOR CLOSING BOTTLES AND JARS

Filed April 19, 1957 5 Sheets-Sheet 4

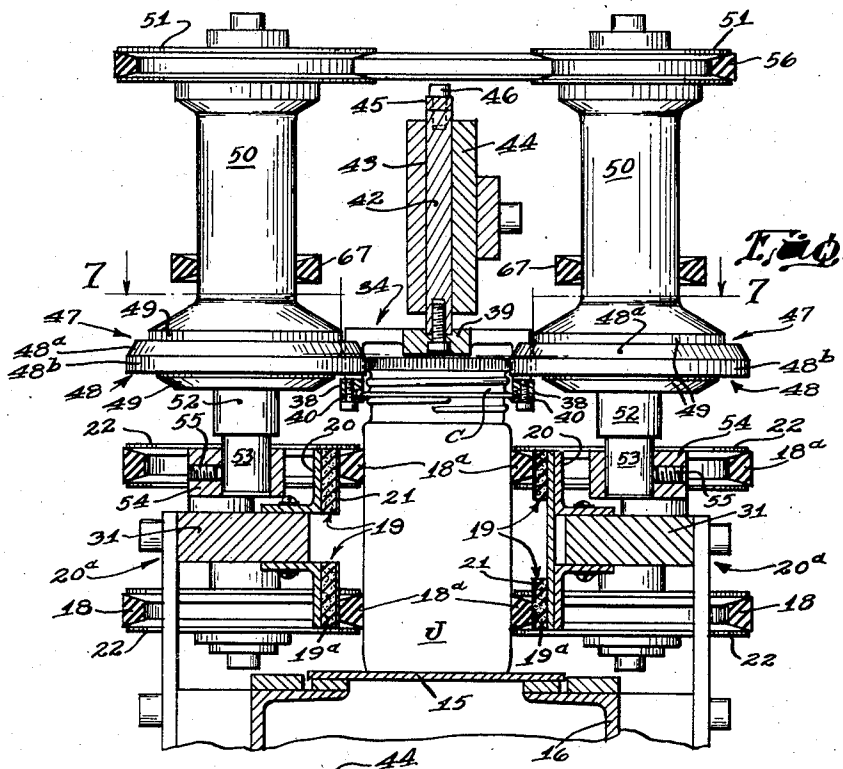


Fig. 5.

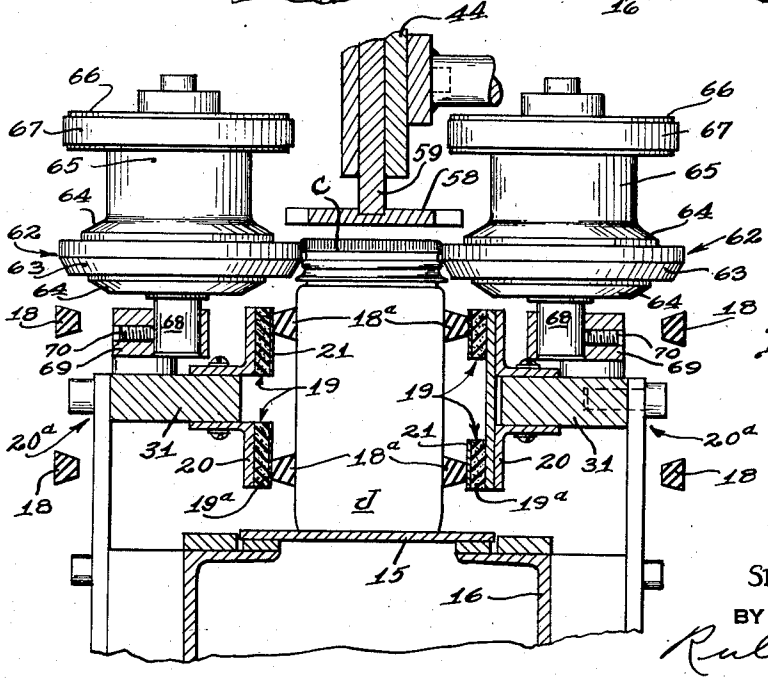


Fig. 6.

INVENTORS
SHEPARD L. HARMON
JOHN HOHL
BY
Rule & Hoge
ATTORNEYS

Oct. 14, 1958 S. L. HARMON ET AL 2,855,736

METHOD OF AND APPARATUS FOR CLOSING BOTTLES AND JARS

Filed April 19, 1957 5 Sheets-Sheet 5

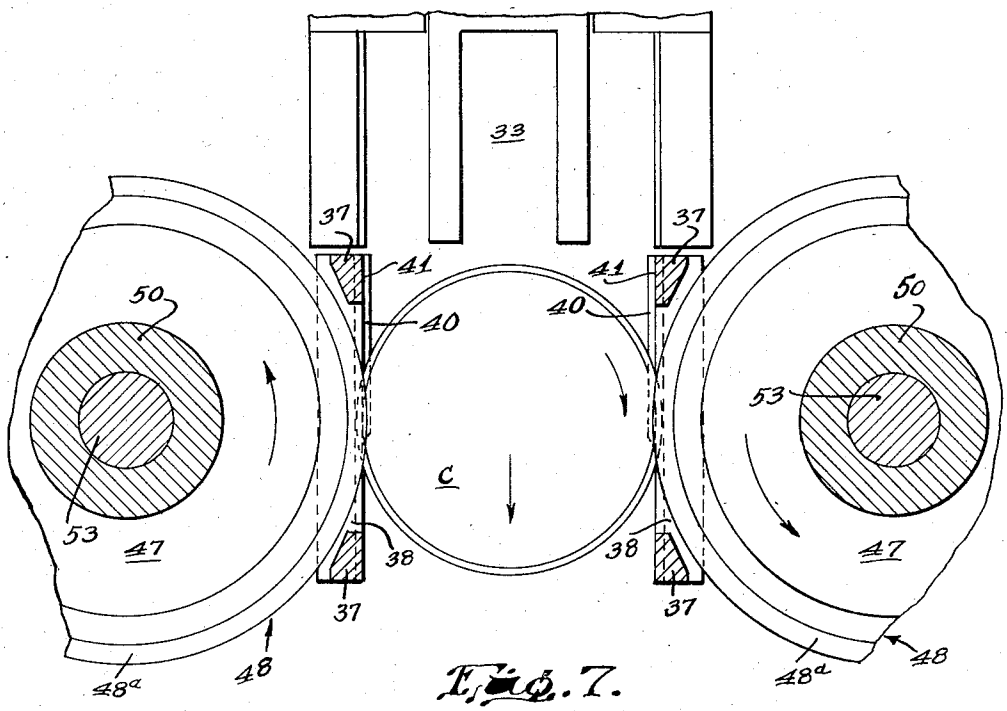


FIG. 7.

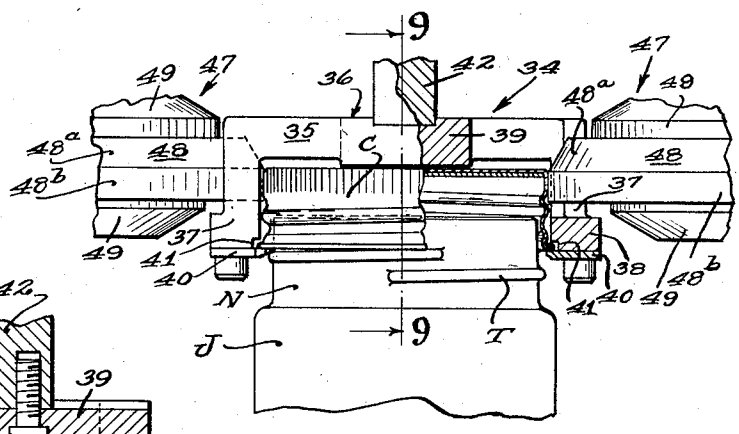


FIG. 8.

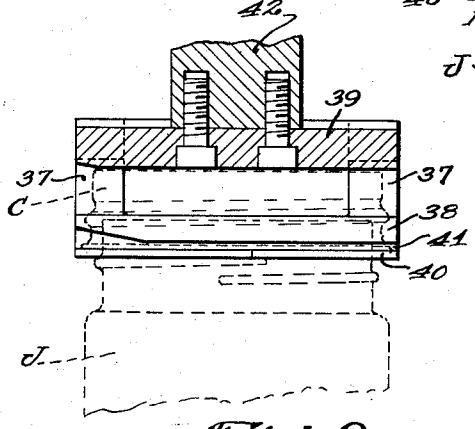


FIG. 9.

INVENTORS
SHEPARD L. HARMON
JOHN HOHL
BY
Rule & Hoge
ATTORNEYS

United States Patent Office 2,855,736 Patented Oct. 14, 1958

2,855,736

METHOD OF AND APPARATUS FOR CLOSING BOTTLES AND JARS

Shepard L. Harmon and John Hohl, Toledo, Ohio, assignors to Owens-Illinois Glass Company, a corporation of Ohio

Application April 19, 1957, Serial No. 653,955

14 Claims. (Cl. 53—38)

The present invention is an improved method of and apparatus for affixing screw-threaded and lug-type closure caps to containers such as glass bottles and jars in which neck portions are formed with threads or lugs designed for holding engagement with the lugs or threads of the closure caps.

An object of our invention is the provision of a novel method and automatic means for assembling such closure caps and containers without interrupting normal high-speed travel of containers and closure caps through the apparatus involved.

A further object of our invention is the provision of novel means for threading closure caps on bottles and jars, such utilizing both gravity and kinetic energy produced and stored momentarily in the closure caps by spinning them rapidly about their axes, to effect actual threading of the closure caps upon the containers.

A further object is the provision in apparatus of the above character of a novel closure cap leveling device and pair of closure cap spinning rolls of such construction and so operated that initially a closure cap is telescoped over a threaded container neck without actually having supporting contact therewith, then is rotated at a high speed about its axis and simultaneously propelled laterally forward in the direction of travel of and at the same speed as the container or bottle upon which it is to be threaded solely by reason of the action of gravity and kinetic energy.

It is also an object of our invention to provide novel supplementary closure cap tightening means which functions following the initial cap threading operation to further tighten the closure caps, where necessary.

Other objects will be in part apparent and in part pointed out hereinafter.

In the drawings:

Fig. 1 is a fragmentary side elevational view of closure cap applying means incorporating our invention.

Fig. 2 is a top plan view of the apparatus shown in Fig. 1.

Fig. 3 is a fragmentary detail plan view of the central longitudinal portions of the apparatus shown in Fig. 2.

Fig. 4 is an enlarged fragmentary side elevational view showing the closure cap spinning rolls and leveling device.

Fig. 4A is a perspective view of the leveling device.

Fig. 5 is a sectional elevational view taken substantially along the line 5—5 of Fig. 2.

Fig. 6 is a sectional view taken substantially along the line 6—6 of Fig. 2 omitting a showing of the belts outside of the framework.

Fig. 7 is an enlarged sectional plan view taken substantially along the line 7—7 of Fig. 5.

Fig. 8 is a sectional elevational view showing on an enlarged scale the leveling device and spinning rolls also illustrated in Fig. 5.

Fig. 9 is a sectional elevational view taken substantially along the line 9—9 of Fig. 8.

Our invention (Figs. 1 and 2) in its broadest aspects, comprises an endless continuously moving horizontal conveyor which is intended to support bottles or jars J in normal upright positions and carry them at high speed through a succession of stations or zones in which they pick off closure caps from a conventional type inclined cap chute; these closure caps then being leveled in relation to the containers and supported partially telescoped over the container necks. While so positioned on the container necks and out of actual supporting contact with the rim end thereof, so that the threads of the caps and containers are spaced apart axially, spinning rolls function to impart both high-speed rotary movement to each closure cap about its own axis and lateral advancing movement such that the cap moves along the path of travel of the conveyor with the container and consequently leaves the influence of both the leveling device and spinning rolls. Thereupon the cap is free to drop by gravity and due to the inertia or kinetic energy stored in the spinning closure cap, it threads itself onto the container neck. The apparatus also includes means for preventing complete upward separation and displacement of a closure cap from a container in the event it should not be secured to the container in the zone provided for this purpose. It also incorporates supplementary rolls positioned beyond the normal cap affixing zone or station which function to rotate the closure caps where necessary to effect further tightening and thereby insure reliable hermetic sealing of the containers.

Specifically, the apparatus comprises an endless horizontal conveyor 15 which is mounted upon a supporting frame 16, said conveyor being driven continuously in a direction from left to right in Fig. 1, by a power unit (not shown). Since the bottles or jars are intended to be sealed by means of conventional screw-threaded or lug-type closure caps, they are formed to include diametrically reduced neck portions N having external screw threads T thereon for holding engagement with threads or functionally equivalent projections formed on the attaching skirt of a standard closure cap C.

According to the operation of our invention, it is desirable to hold the bottles or jars against rotation about their individual axes as the conveyor 15 transports them through the closing apparatus to the end that the closure caps themselves may be rotated and thereby threaded onto the jars. For the purpose of so holding the bottles or jars and positively retaining them in upright positions, we have provided a steadying or gripping belt arrangement comprising a pair of vertically spaced horizontal belts 18 arranged at each side of the conveyor 15 in such fashion that the interior reaches 18a of each said pair of belts (Figs. 2, 4, 5 and 6) will have firm gripping engagement with the jars at longitudinally or vertically spaced points of their bodies. These may be conventional V-belts which are obtainable in the open market. They are formed of material capable of effective frictional engagement with the containers. Those interior reaches 18a (Figs. 5 and 6) which contact the jars are backed up by means of cushioning strips 19 secured to carriers 20, there being suitable resilient facing sheets 21 for contact with the belts. The strips 19 may well include a sponge rubber pad 19a or some equivalent material and the facing sheets 21 which contact the holding belts preferably are formed of very light gauge sheet brass or like material. The carrier members 20 are mounted upon brackets 20a which are secured to the frame 16. These steadying belts are trained over pairs of pulleys 22. One pair of these pulleys, specifically those shown at the righthand end of the unit in Fig. 1, having driving connection to gear boxes 23 (Figs. 1 and 2), there also being a common horizontal shaft 24 extending through these two boxes and at one end operatively connected by means of a sprocket chain or the like 25 to a source of power in-

cluding a speed reducer **26** and motor **27**. A belt **28** connects the speed reducer and motor. Each of the other two pulleys may well be mounted upon a carrier **29** (Figs. 1 and 2) and this carrier in turn is adjustable lengthwise of the conveyor by means of an adjusting screw **30**, which is threaded through the carrier **29** and fixed against independent axial movement in the frame **31**. An adjusting head **32** at one end of the screw **30** facilitates axial adjustment of same and consequent regulable control of the tension of the steadying belts **18**.

As has been explained briefly heretofore, the filled jars J (Figs. 1 and 2) pick up closure caps C almost immediately upon entry into space between the pairs of steadying belts **18**. Thus the containers are firmly held upright. An inclined cap chute **33** of conventional or any preferred form, guides the closure cap C in succession to the pick-up station or zone, where it supports each cap in a slightly inclined position with a lower forward portion of the skirt disposed in the path of travel of the neck N of the jars. Thus as a jar moves through this zone, it pulls a closure cap C out of the discharge end of the chute into a position vertically and axially aligned with the jar. Immediately this closure cap assumes a position wherein it is telescoped over the neck of the jar, but spaced out of actual supporting contact with the rim of said neck by means of a leveling device **34** which also prevents immediate interengagement between the screw threads on the closure cap and jar.

This leveling device **34**, in addition to performing the function just stated, supports the closure caps C in such fashion that they may be rotated or spun about their individual axes at high speed and in such manner that they are also propelled forwardly over the conveyor **15** and move in register with the jars which they are intended to hermetically seal. Structurally the leveling device **34** (Fig. 4A) comprises a pair of longitudinally spaced channel members **35** which are substantially inverted U-shaped in cross-section. Each channel member comprises a transverse horizontal head section **36** and a pair of depending side arms **37**, the lower ends of which are connected by side rails **38** to the lower ends of similar arms of the second channel member **35**. Medial portions of the head sections **36** of the channel members are interconnected by a longitudinal bar **39** which has a relatively wide lower surface intended to closely overlie the closure cap panel portions as they travel through the leveling device. Each of the side rails **38** has its inner lower corner cut away and this together with an attached strip **40** provide a longitudinal channel or guideway **41** to accommodate the curled lower edge of the closure cap skirt portions. Thus the closure caps are supported independently of, but telescoped a short distance over the necks of the containers as they move through the leveling device. A vertical suspension bar **42** preferably of rectangular cross-section rises from the leveling device and is slidingly received in a guideway **43** formed in a supporting frame **44**. A lateral finger **45** and adjusting screw **46** carried thereby provide means for adjusting the leveling device vertically as required by the height of the containers being capped.

Preferably, and as best shown in Figs. 7 and 9, the strips **40** on the leveling device extend from the inlet end thereof only to a point about midway the length of the device where actual physical support of the closure caps by means of the leveling device terminates. While each closure cap is still supported by the leveling device, it is rotated about its vertical axis at a very high speed and as stated heretofore, in such manner that it is also propelled forwardly in the direction of travel of and at the same speed as the container over the neck of which the closure cap is partially telescoped. Such closure cap rotation is effected by means of spinning rolls **47**.

These spinning rolls **47** are arranged one at each side of the line of travel of the containers and closure caps and are positioned with their axes of rotation disposed vertically. Each of these rolls (Figs. 1 and 5) may well be a rubber disk **48** clamped between a pair of collars **49**, the upper of which collars has an elongated hub **50** rising axially therefrom and carrying a driven pulley **51** at its upper end. This hub is hollow and fits over a sleeve **52** which is rotatably mounted upon a vertical supporting rod **53**, the latter being anchored in the frame member **54** and removably held therein by means of a set-screw **55** or such fastener. The peripheral portion of each rubber disk **48** preferably is contoured in cross-section to include an inwardly inclined upper section 48^a and straight cylindrical lower section 48^b which actually engages only the usual knurled upper portion of a closure cap skirt for reasons which will become apparent presently. The peripheral portion of these spinning rolls (Figs. 5, 7 and 8) contact the closure cap skirts by overlying the side rails **38** of the leveling device and projecting a short distance inwardly of these rails. The axes of these spinning rolls are so positioned relative to the exit ends of the cap supporting strips **40** of the leveling device that said exit ends are in close proximity to, but between the exit end of the leveling device **35** as a whole and a straight transverse line connecting said axes. Thus closure caps are supported in the leveling device only for a period of time long enough to permit the spinning rolls to rotate them about their axes at very high speed.

Rotation of the spinning rolls **47** is obtained by means of a motor M (Figs. 1 and 2) and a belt **56** which is trained over a pulley **57** on said motor and the two pulleys **51** just above the spinning rolls. Both rolls rotate counter-clockwise in order to impart clockwise rotation to the closure caps which travel therebetween. One of these pulleys, specifically the uppermost pulley **51** in Fig. 2, and the corresponding spinning roll rotate at a substantially higher speed than the other pulley and roll, to the end that the heretofore explained forward propulsion of the closure caps at the same speed of travel as the jars J may be obtained. Thus each closure cap continues to rotate more or less freely about its own axis out of braking contact with the container neck, preparatory to actual threading of same onto its container. Because the container and closure cap move together, as explained, the container does not function to prematurely slow down rotation of the closure cap. Consequently the inertia or kinetic energy stored in the closure cap as a result of high-speed rotation thereof effects threading of the cap onto the container as the latter and its spinning closure cap move beyond the influence of the leveling device and spinning rolls.

Because of the possibility that an occasional closure cap may not thread itself onto a container and be disposed toward upward displacement, we provide stop or baffle plates **58** (Figs. 1, 2 and 4) which are positioned horizontally over and extend lengthwise of the conveyor **15**. Each of these stop plates is secured to the lower end of a vertical suspension bar **59** which extends upwardly through the supporting frame **44**. A lateral finger **60** on each bar **59** carries a set screw **61** which is adjustable to regulably control the position of the corresponding stop plate **58**. Thus closure caps cannot be displaced upwardly to such extent that they will become entirely separated from their containers.

Although the above apparatus rather effectively secures the closure caps in place, it may, under some circumstances, be desirable to further tighten the caps. For this purpose, we provide a pair of tightening rolls **62** (Figs. 1, 4 and 6) one at each side of the path of travel of the capped jars. These rolls and their mountings may well be the same as the spinning rolls **47**, the exception being that the hub is shorter and the rubber disks are inverted. Each disk **63** is clamped between a pair of collars **64**,

the upper of which has a hub 65 rising therefrom and carrying a pulley 66. This pulley has a belt 67 trained thereover and the belt runs over the hub portion of the nearest spinning roll 47. A vertical supporting rod 68 for each tightening roll is secured at its lower end in a longitudinalally adjustable carrier bar 69 by means of a set-screw 70. Adjustment of the longitudinal position of the bar 69 regulates the tension of the belt 67.

Briefly reviewed, the operation involves continuous movement of jars in upright positions along the conveyor 15. At the bottom end of the cap chute a closure cap is picked up and assumes a partially telescoped position over the threaded jar neck but out of actual contact with the neck rim and with the screw threads or lugs of the cap and jar spaced apart axially a short distance. Such relative positioning is effected by the leveling device which supports the closure cap as explained heretofore. During the very short interval of supporting the caps in the leveling device, the spinning rolls impart high-speed rotation to said caps and simultaneously propel the caps forwardly with the containers. Immediately upon leaving the supporting influence of the leveling device, the closure caps, while still spinning rapidly, begin to lower by gravity until their threads or lugs engage those of the jar. Due to kinetic energy, the closure caps continue rotation until they are threaded onto the containers. In the event the caps are not quite tight enough, the tightening rolls will impart some slight degree of clockwise rotation to the caps so that they effectively seal their containers.

Because the spinning rolls engage only the upper knurled portion of the closure cap skirts and the squeezing pressure is substantial, the closure caps as they make their exit from the leveling device and rolls tend to move downwardly rather quickly so that they are threaded onto the containers in a relatively short space of time and a minimum of travel along the conveyor.

Modifications may be resorted to within the spirit and scope of the appended claims.

We claim:

1. The method of affixing a screw-threaded closure cap to an externally screw-threaded neck of a container which consists in moving the container while in an upright position at a substantially constant speed along a horizontal path, bringing a screw-threaded closure cap into telescoping relationship to the neck while supporting it out of contact with the rim end of the neck, spinning the closure cap about its axis at high speed while so supported and simultaneously imparting lateral movement to the closure cap in such direction that it advances along the path of travel of and with the container and discontinuing supporting the closure cap and utilizing gravity and the kinetic energy stored in the closure cap to effect threading of the same upon the container neck.

2. The method defined in claim 1 together with the step of positively imparting a rotating force to the closure cap following dissipation of the stored kinetic energy to thereby further tighten the cap upon the container neck.

3. The method of affixing a screw-threaded closure cap to an externally screw-threaded neck of a container which consists in moving the container while in an upright position at a substantially constant speed along a horizontal path through closure cap receiving, spinning and affixing zones, bringing a screw-threaded closure cap into telescoping relationship to the neck while supporting it out of contact with the rim end of the neck during travel through the receiving and spinning zones, spinning the closure cap about its axis at high speed and simultaneously imparting lateral movement to the closure cap in such direction that it advances along the path of travel of and with the container and continues its spinning motion, and discontinuing supporting the closure cap and utilizing gravity and the kinetic energy stored in the closure cap to effect threading of the same upon the container neck.

4. Apparatus for affixing skirted screw-threaded closure caps to containers having externally screw-threaded necks, comprising a horizontal conveyor for supporting containers in upright positions and advancing them through closure cap receiving, spinning and affixing zones, means in the receiving zone for telescoping closure caps over the container necks, a leveling and supporting device in the receiving and spinning zones for supporting telescoped closure caps independently of and out of physical contact with the rim of the container necks, a closure cap spinning roll positioned at each side of the path of travel of the containers with its axis disposed vertically, said rolls being rotatable about their vertical axes and peripherally engageable with diametrically opposed skirt portions of the closure caps while the latter are telescoped over the container necks, means for rotating the rolls at high but different rates of speed to thereby rapidly spin the closure caps on their axes in a plane above the thread on the container necks, that roll which is rotating at the higher speed being positioned to also positively propel closure caps generally in the direction of travel of and at the speed of the containers beyond the influence of the leveling and supporting device, whereby to utilize gravity and kinetic energy in effecting actual threading of the closure caps onto the containers in the affixing zone while the containers continue movement through said zone.

5. Apparatus as defined in claim 4 and a pair of rotatable tightening rolls positioned in proximity to the affixing zone for driving engagement with skirt portions of closure caps.

6. Apparatus as defined in claim 4, the leveling and supporting device comprising an inverted channel-like member providing a guideway for closure caps overlying and disposed longitudinally of the conveyor and opposed shelves for slidingly supporting closure caps in the guideway and extending in a direction parallel to and above the conveyor.

7. Apparatus as defined in claim 4, each spinning roll being formed with a resilient rubber-like peripheral portion of lesser axial dimension than the height of the closure skirt and positioned for engagement only with an upper peripheral area of the skirt.

8. Apparatus as defined in claim 6, the guideway being open at its opposite ends to provide closure cap receiving and discharge openings and the opposed shelves extending from the receiving opening to a point intermediate the discharge opening and an imaginary straight transverse line connecting the axes of rotation of the spinning rolls.

9. Apparatus as defined in claim 4, a horizontal baffle plate immediately overlying the path of travel of the closure caps beyond the leveling device and means for regulably controlling the elevation of the baffle plate.

10. Apparatus as defined in claim 5 and means whereby power for rotating the tightening rolls is derived from the closure cap spinning rolls rotating means.

11. Apparatus for affixing skirted screw-threaded closure caps to containers having externally screw-threaded necks, comprising a horizontal conveyor for supporting containers in upright positions and advancing them continuously through closure cap receiving, leveling, spinning and attaching zones, cushioned means for holding the containers against rotation about their individual axes while on said conveyor, a closure cap delivery chute overlying a portion of the conveyor in the receiving zone, means whereby a container moving past said chute picks off a closure cap and positions the latter partially telescoped over the container neck, a closure cap leveling device operable to support a cap telescoped over but out of contact with the container neck rim portion, means for rotating the closure cap rapidly about its axis while supported in the leveling device and simultaneously propelling the cap away from said device in the direction of travel of the containers, whereby to utilize gravity and kinetic energy in effecting threading of the closure cap onto the container.

12. Apparatus as defined in claim 11, said closure cap rotating means comprising a pair of opposed spinning

rolls rotatable about individual vertical axes and means for rotating them in a counter-clockwise direction.

13. Apparatus as defined in claim 12, the leveling device comprising horizontal supporting means extending from a point near the cap chute only to a point in proximity to an imaginary straight line connecting the axes of rotation of the spinning rolls.

14. Apparatus as defined in claim 11, and horizontal stop plates overlying the conveyor beyond the leveling device and positioned at an elevation immediately above the path of travel of the propelled closure caps.

No references cited.