Aug. 22, 1961 J. HOHL ET AL 2,996,865

CONTAINER CLOSING APPARATUS

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Fig. 1.

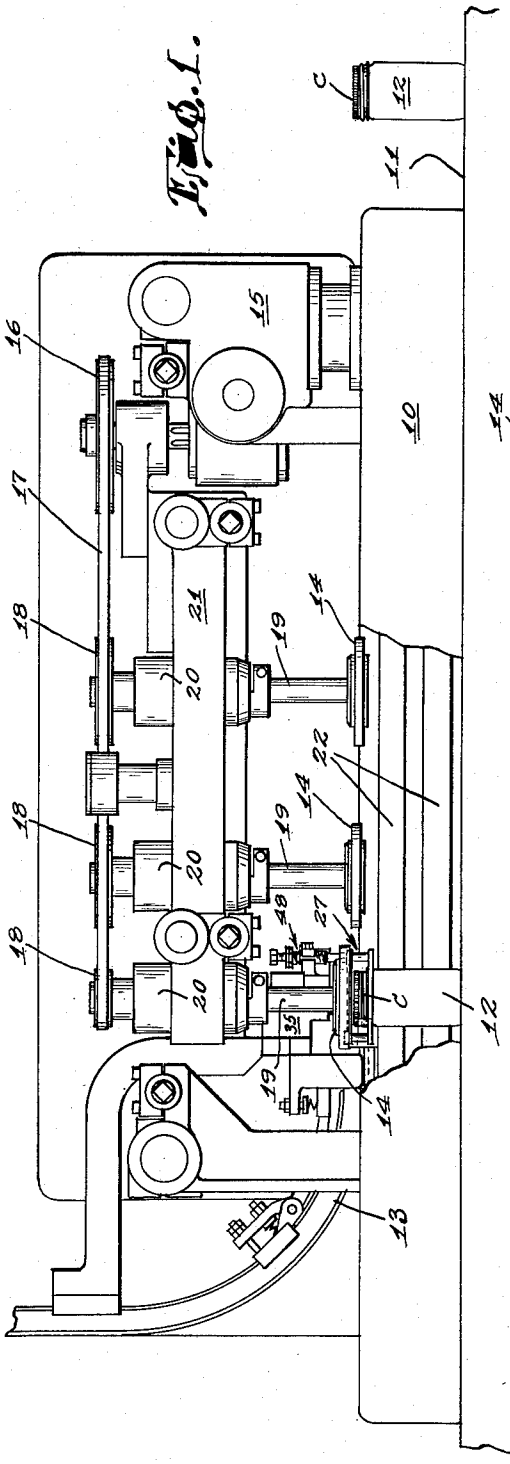


Fig. 2.

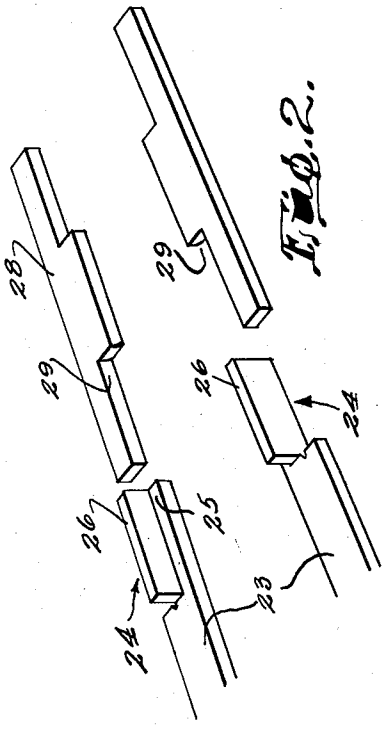
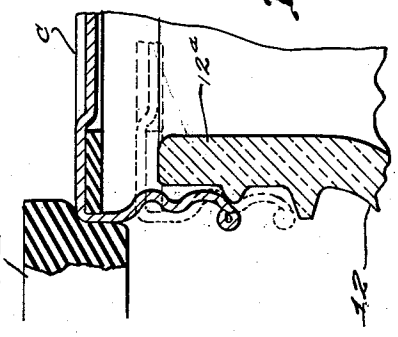


Fig. 3.



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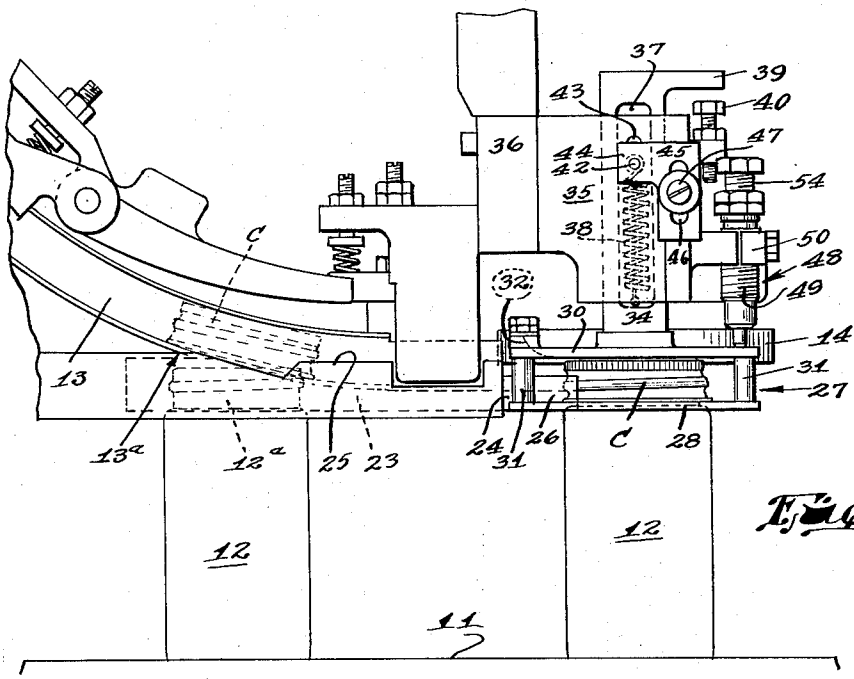


FIG. 3.

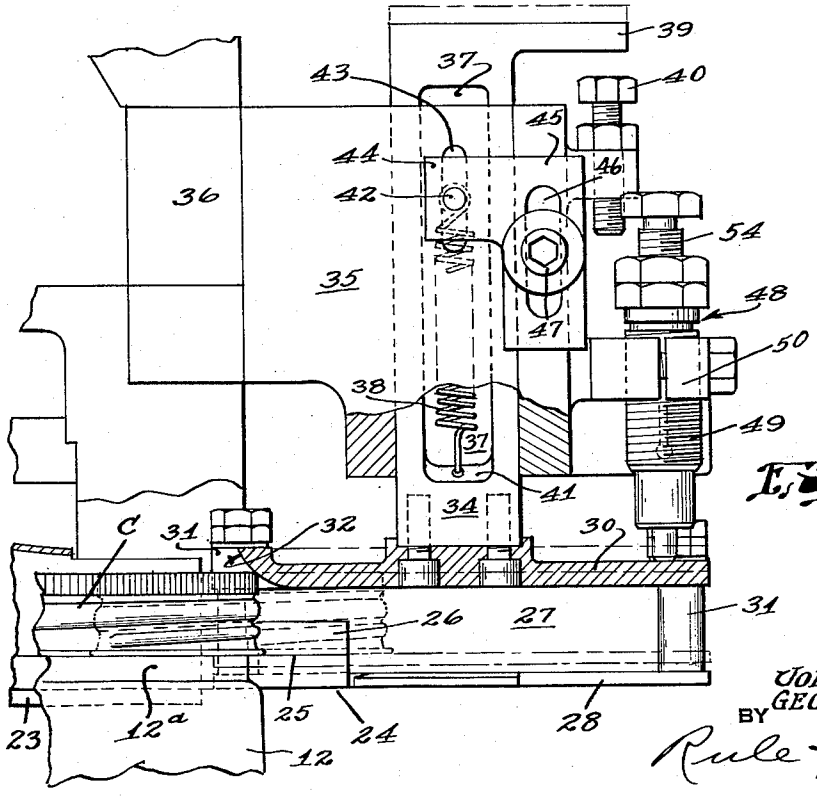


FIG. 4.

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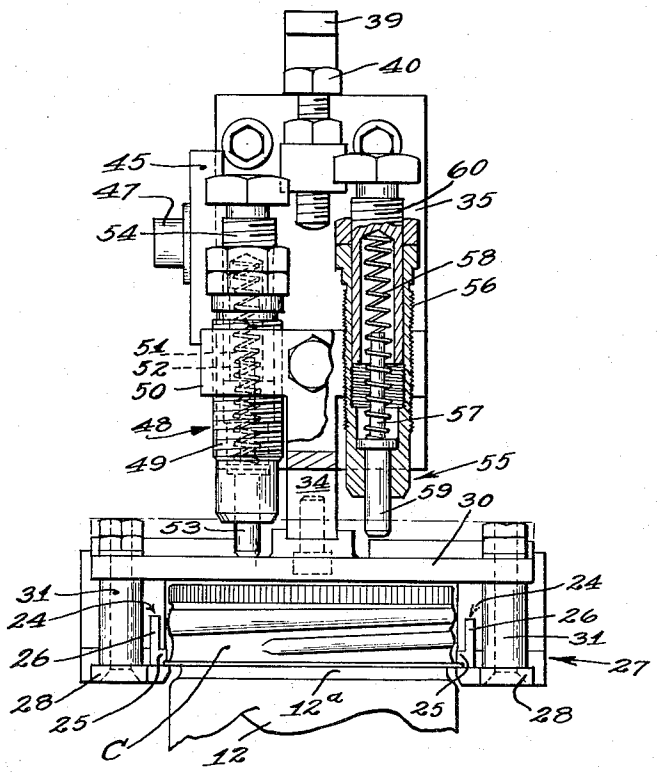


Fig. 5.

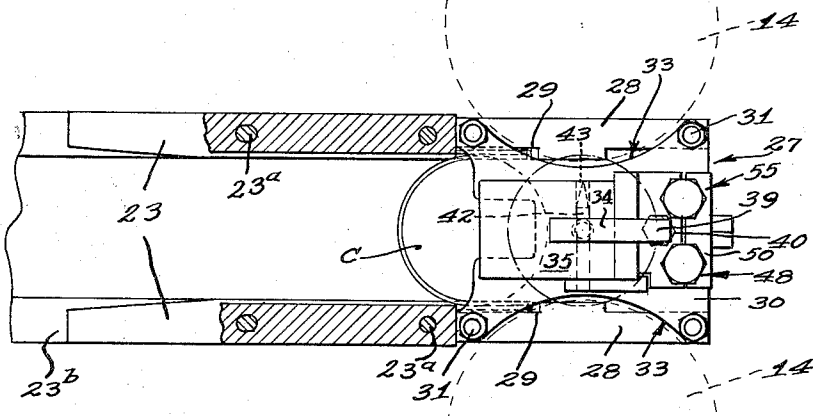


Fig. 6.

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2,996,865
CONTAINER CLOSING APPARATUS

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Filed Sept. 2, 1958, Ser. No. 758,232
9 Claims. (Cl. 53—315)

Our invention relates to improvements in container closing apparatus and more particularly to apparatus for applying screw-threaded or lug-type closure caps to bottles, jars and similar receptacles, at high speed.

In the application of skirted screw-threaded or lug-type closure caps to bottles and jars, one of the serious problems encountered concerns the matter of proper relationship between the closure caps and jars at the moment of initial engagement between the screw-threads or lugs of the closures and jars. If the angular relationship between the ends of the threads or lugs of the closure cap and jar is improper and/or the closure cap is not level, it, in all probability, cannot be effectively, or in any event, completely, affixed to the receptacle. Rather, the threads are mis-matched and "cocked caps" result. Such is an experience almost everyone has had from time to time in the home in reapplying screw-threaded and lug-type closures to bottles and jars. Frequently also the closure cap becomes tightly locked in a "cross-threaded" or "cocked" position and can be removed only with great difficulty. Almost invariably the above conditions are directly attributable to the closure cap being in a non-level position, i.e. with its panel portion in a plane other than normal to the container axis at the time of initial interengagement of the threads or lugs of the cap and container. Such conditions simply cannot be tolerated in automatic mechanized high-speed filling and closing of jars, for very obvious reasons.

An object of our invention therefore is the provision of novel means for overcoming the above noted objections and practically insuring proper positioning of the closure caps and their threads, relative to those on the jars, preparatory to their initial application to the receptacles.

A furher object of our invention is the provision of a novel form of cap leveler which positively controls the initial positioning of the closure cap relative to its jar, as well as during its movement axially downwardly onto the jar, preparatory to thread or lug interengagement.

Another object of our invention is the provision of a closure cap leveler which momentarily supports closure caps out of actual contact with, but partially telescoped over, the jars, levels such closure caps and then quickly lowers them so that spinning-rolls which are associated with the leveler may rotate the caps and thread them onto the jars.

It is also an object of our invention to provide a novel closure cap leveler and spinning-rolls arrangement which will momentarily support a closure cap in a level position partially telescoped over a threaded jar neck and then quickly lower and concurrently rotate the cap at high speed and thereby thread it upon the jar.

Likewise it is an object of our invention to provide a closure cap leveler and resilient spinning rolls arrangement in which the closure cap, during its first stage of threading onto the jar, moves downwardly to a position out of engagement with the rolls and is thereby saved from scuffing, marring etc.

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

In the drawings:

FIG. 1 is a front elevational view of a container closing apparatus incorporating our invention.

FIG. 2 is a fragmentary detail perspective view illustrating the construction of the fixed guide-rail extensions and the closure cap supporting bars of the leveler with these elements spaced apart longitudinally in the interest of clarity with respect to the specific structure of each.

FIG. 3 is an enlarged fragmentary front elevational view showing the cap leveler positioned near the discharge end of an inclined closure cap chute.

FIG. 4 is an enlarged front elevational view of the leveler with parts broken away and shown in section.

FIG. 5 is an end elevational view of the leveler with parts broken away and shown in section.

FIG. 6 is a plan view of the leveler with parts of the adjacent fixed guide-rails shown in section.

FIG. 7 is a fragmentary detail sectional view showing the relationship between the cap, jar, and spinning-roll at the moment cap rotation begins.

In the illustrated embodiment of our invention, it comprises part of an apparatus including a base **10**, an endless continuously moving horizontal conveyor **11** for transporting filled jars **12** or similar receptacles, past a closure cap delivery chute **13** and a series of pairs of spinning-rolls **14**. The first pair of rolls; i.e., those at the left-hand end of FIG. 1, are termed primary spinning-rolls in that they first engage the caps and are intended to initially thread, if not completely, affix the closure caps C upon the jars. The other spinning-rolls perform a cap tightening function when additional tightening is required. All of these rolls are driven in the proper direction and at the desired speed by a motor (not shown) operating through a speed reducer **15**, a pulley **16**, a belt **17** and sheaves **18**, one each of which is secured to the upper end of a vertical shaft **19**. One of the spinning-rolls **14** is secured to the lower end of each shaft **19**, the latter being journaled in a bearing **20** carried by the frame **21**. Steadying belts **22** firmly engage the sides of the jars **12** at diametrically opposed points to hold them against rotation during threading of the closure caps thereon. This structure is illustrated and claimed in a copending application, Serial Number 755,051 filed August 14, 1958, titled "Container Closing Apparatus" in which John Hohl, one of the applicants herein, appears as the sole inventor applicant.

At the lower end **13a** of the closure cap chute **13** the closure cap C becomes partially telescoped over the jar neck **12a** (FIG. 3) and immediately moves into sliding supporting contact with a pair of fixed side guide rails **23**. These rails **23** (FIG. 6) are secured by bolts **23a** or similar fasteners to the frame **23b** (FIG. 3) and at their forward ends (FIGS. 2, 3 and 4) are provided with longitudinal extensions **24** each including a horizontal ledge **25** and an upstanding side wall or flange **26**. These side walls or flanges restrict lateral movement of both the cap and jar as is apparent. The extensions **24** project well into a leveler or cage **27** which functions to level the closure cap and so hold it during the initial stages of application to a jar. Thus proper initial thread engagement between the closure cap and jar is assured.

The leveler or cage **27** comprises a pair of parallel horizontal cap supporting bars **28** which are spaced apart transversely of the path of travel of the caps. Each such bar (FIGS. 2 and 6) has an inside corner notch **29** of substantial length to accommodate the corresponding fixed rail extension **24** in the fashion best shown in FIG. 6. In FIG. 2 these rails and bars are shown spaced apart longitudinally in an effort to more clearly reveal their individual structure. Relative longitudinal movement one toward the other will operatively position the rails and bars, as illustrated in FIGS. 4 and 6. A top plate **30** spaced above the bars **28** and rigidly connected thereto by vertical corner posts **31** functions to hold closure caps against excessive upward movement on their jars. Additionally, this top plate (FIGS. 3 and 4) has a cam surface **32** on its lower surface at the

entrance end of the leveler, or cage, for engagement with a closure cap C as it enters the leveler. The purpose of this feature will become apparent presently. Arcuate recesses 33 in opposed longitudinal edges of the top plate are provided to accommodate segments of the primary spinning-rolls 14 at the left-hand end of the apparatus in FIG. 1.

This leveler is mounted for free limited vertical movement with the cap-supporting bars 28 at all times disposed horizontally. A slide 34 rises from the top plate 30 (FIGS. 3–6) and extends upwardly through a slide-way 35 or housing which is carried by a fixed support 36. The slide is formed with a vertical longitudinal slot 37 of substantial length to accommodate a coil pull spring 38 and at its extreme upper end a lateral finger 39 is provided for contact with an adjustable stop 40. This stop is carried by the slide-way or housing 35 and adjustably limits downward movement of the leveler. The coil spring 38 is anchored at its lower end to the adjacent end wall 41 of the slot 37 in the slide and at its upper end is attached to a pin 42 which projects through a slot 43 in the housing and thence into the slot 37 of the slide from an arm 44, the latter being an integral part of a bracket 45. This bracket (FIGS. 3 and 4) is slidable vertically on the housing 35, there being a slot 46 and screw 47 for effecting the desired vertical adjustment. Raising or lowering the bracket 45 and with it the pin 42, correspondingly adjusts the operating position of the leveler or cage.

The coil spring 38 normally yieldingly suspends the leveler and except for devices now to be described, would elevate the cap supporting bars 28 to a level well above the ends of the fixed side guide rails 23. Accordingly a coil expansion spring device 48 (FIGS. 3–5) is mounted upon the slide-way or housing 35 and in opposition to the coil pull spring 38 holds the leveler in such position that the bars 28 normally are slightly below the plane of the fixed guide rails 23. This spring device 48 consists of a vertical cylinder 49 threadedly mounted for axial adjustment in the arm 50 of the slide-way or housing 35. Within this cylinder is a coil spring 51 which yieldingly holds a plunger rod 52 in such position that a downwardly projecting end 53 exterior to the cylinder 49 normally constantly contacts the upper side of the leveler. Axial adjustment of the internal sleeve 54 regulably controls the pressure of the spring 51 upon and the lowermost position of the plunger rod 52 and thereby determines the normal relationship between the bars of the leveler and the fixed guide rails.

Upward movement of the leveler is limited by a vertically adjustable yieldable stop 55 (FIG. 5). This stop is identical structurally with the coil expansion spring device 48 but is mounted at a higher elevation than the latter. This stop includes a vertical cylinder 56 or housing threaded through one end of the arm 50. A plunger rod 57 is mounted for axial movement in the cylinder and under pressure of a coil spring 58 is yieldingly held in its lowermost position with a projecting end 59 disposed below the cylinder 56 for engagement with the leveler, when the latter is elevated. The spring also cushions stopping of the leveler's upward travel. A sleeve 60 threaded into the cylinder is adjustable to control the cushioning characteristics of the stop.

In operation, a jar 12 advances with the conveyor 11 moving from left to right in FIG. 1. As the jar moves beneath the cap chute 13 it pulls a closure cap C from the bottom end of the latter and gravity then causes partial telescoping of the cap over the jar neck substantially to the extent indicated in full lines in FIG. 7. The fixed side guide rails physically support the closure cap with its top portion or panel above and out of contact with the jar. The cap moves along with the jar and at the entrance to the leveler 27 the cap engages the cam surface 32. Continued forward travel of the cap and jar elevates the leveler to the dotted line position of FIG. 4 so as to bring the bars 28 into horizontal alignment with the fixed guide rails 23. Thus the closure cap C readily moves onto said bars 28. Such entry of the closure cap into the leveler elevates the latter and thereby compresses the spring 51 (FIG. 5) to an appreciable extent and the spring 58 of the stop 55 to a somewhat lesser degree. The advancing movement of the jar and closure cap is exceedingly rapid, being on the order of several hundred per minute and as a consequence compression of the springs 51 and 58 just referred to occurs substantially concurrently with movement of the cap onto the bars 28 and into contact with the spinning-rolls 14. As shown in FIG. 7 only the extreme upper area or upper fraction of the threaded attaching skirt of the cap actually engages and compresses the rolls' periphery. Moreover the cap engages only the lower area of the spinning-rolls. At this stage the cap is completely free of the fixed guide rails 23. Immediately, under the influence of gravity and pressure of the springs 51 and 58 the leveler lowers quickly. This, being accompanied by rotation of the closure cap and with the latter held perfectly level, insures high speed accurate attachment of the closure cap to the jar. Because of the fact that only the upper fraction of the cap compresses only a lower fraction of the spinning-rolls (FIG. 7) the inherent "fight-back" characteristics of the rubber tend to push the cap downwardly out of contact with the rolls. Thus we utilize the weight of the leveler, the two springs 51 and 58 and the just described "fight-back" characteristics of the rubber in lowering the leveler concurrently with threading of the cap onto the jar.

The spinning-rolls 14 (FIG. 7) occupy such position, normally, in relation to the leveler that when the latter is lowered, the upper side of the closure cap C is in a plane lower than the under side of said rolls. Thus contact between the cap and spinning rolls is broken and there can be neither any scuffing of the lacquer coating of the cap nor needless wearing or abrasion of the rolls' periphery.

In the event the closure cap has not been affixed with sufficient tightness in the position of the leveler 27 such cap may be rotated further by the successive tightening-rolls 14. Beyond these rolls the jar is removed from the conveyor 11 for casing or cartoning and shipment.

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

We claim:

1. In apparatus for affixing a screw-threaded skirted closure cap to a jar having an upstanding externally screw-threaded mouth-forming neck, a horizontal continuously moving conveyor for supporting the jar in an upright position and advancing it through closure cap pick-up and cap-applying zones, a closure cap chute having a discharge end in the pick-up zone from which the advancing jar removes a cap and partially telescopes it over the neck as the jar moves through the pick-up zone, a pair of horizontally spaced-apart fixed guide-rails extending longitudinally of the conveyor supporting the cap against bodily downward movement as the jar and cap advance together from a pick-up zone to and into the cap-applying zone, a pair of spinning-rolls in said cap-applying zone, said rolls being spaced apart horizontally transversely of the path of travel of the closure cap and rotating continuously about substantially vertical axes in a common horizontal plane and at such elevation that they contact only an annular zone in the upper fraction of the cap skirt and contact a peripheral portion of the top of the cap, a cap leveler mounted for free vertical movement in said cap-applying zone and having a pair of horizontal spaced-apart cap supporting bars onto which a closure cap moves directly from the fixed guide-rails for engagement with the spinning-rolls, coil spring means suspending the leveler and normally supporting the bars in position to admit a cap to the leveler, yielding means operable to overcome the counterbalancing effectiveness of

said coil spring and thereby positively initiate lowering of the leveler and therewith a closure cap supported thereon after entry of cap thereinto to effect interengagement of the screw-threads of the jar and closure cap.

2. Apparatus as defined in claim 1, the leveler normally being positioned with its cap-supporting bars at a level slightly below the cap-supporting surface of the fixed guide-rails and cam means forming a part of the leveler and engageable with a closure cap entering the latter to elevate the leveler and bring said supporting bars into substantial horizontal alignment with the fixed guide-rails.

3. The apparatus defined in claim 1, said leveler lowering means being an expansion coil spring device which is momentarily placed under tension by elevation of the leveler, cam means engageable with a closure cap entering the leveler for elevating the latter and a yielding adjustable stop for regulably controlling the limit of upward movement of the leveler.

4. In apparatus for affixing a screw-threaded skirted closure-cap to a jar having an upstanding externally screw-threaded mouth-forming neck, means for advancing a jar with a cap partially telescoped over the neck along a horizontal path through a closure-cap affixing zone, a pair of fixed side guide rails for slidingly supporting the telescoped closure-cap as the cap and jar approach and enter said zone; the improvement comprising a closure-cap leveler mounted for vertical movement in said cap-affixing zone and having inlet and exit ends, said leveler having a pair of horizontal parallel cap-supporting bars extending along the path of travel of the closure cap and jar, a top plate above and parallel with said bars for holding the closure cap against excessive independent bodily movement upwardly, said plate having a downwardly facing cam surface at that end in proximity to the inlet end of the leveler, spring means yieldingly suspending the leveler and urging it upwardly toward a position in which the bars would be in a plane above the side guide rails, an adjustable coil expansion spring device constantly contacting the leveler and operating in opposition to said spring means for yieldingly so positioning the leveler that the cap-supporting bars are in a horizontal plane below that of the fixed side guide rails, said leveler adapted to be elevated by the closure cap moving over the cam surface incident to entry into the leveler and thereby concurrently placing the spring device under compression, said coil spring device together with the mass of the leveler moving the latter and a closure cap therein downwardly substantially incident to movement of the cap onto the leveler bars, stops for limiting both upward and downward movement of the leveler and a pair of resilient rotating spinning-rolls in said zone engageable with diametrically opposed areas of the closure cap skirt just in advance of initial downward movement of the leveler and cap.

5. Apparatus as defined in claim 4, the spinning-rolls rotating about substantially vertical axes and in such a common horizontal plane that they can contact the closure cap skirt only in an annular area lying in a minor upper fraction thereof.

6. Apparatus as defined in claim 4, the stop for limiting upward movement being yieldable vertically and means for adjusting the stop vertically to thereby regulably predetermine the uppermost position of the leveler.

7. Apparatus as defined in claim 4, the coil expansion spring device being a vertical cylinder mounted for axial adjustment over the leveler, a plunger rod positioned in part within the cylinder and having one end projecting below said cylinder and a coil spring yieldingly holding the projecting end of the plunger rod in continuous contact with the leveler.

8. Apparatus as defined in claim 4, the closure cap leveler having a slide rising therefrom and a slide-way receiving said slide, said spring means being a coil spring connecting the slide and slide-way and means for adjusting the vertical position of the slide.

9. Apparatus as defined in claim 4, a slide rising from the leveler and formed with an elongated vertical slot, a slide-way receiving said slide, said spring means being a coil spring positioned within and anchored at one end to the lower end wall of the slot, an arm-carrying bracket mounted for vertical adjustment on the slide-way and a pin carried by the arm and connected to the upper end of said coil spring.

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