

Dec. 25, 1951

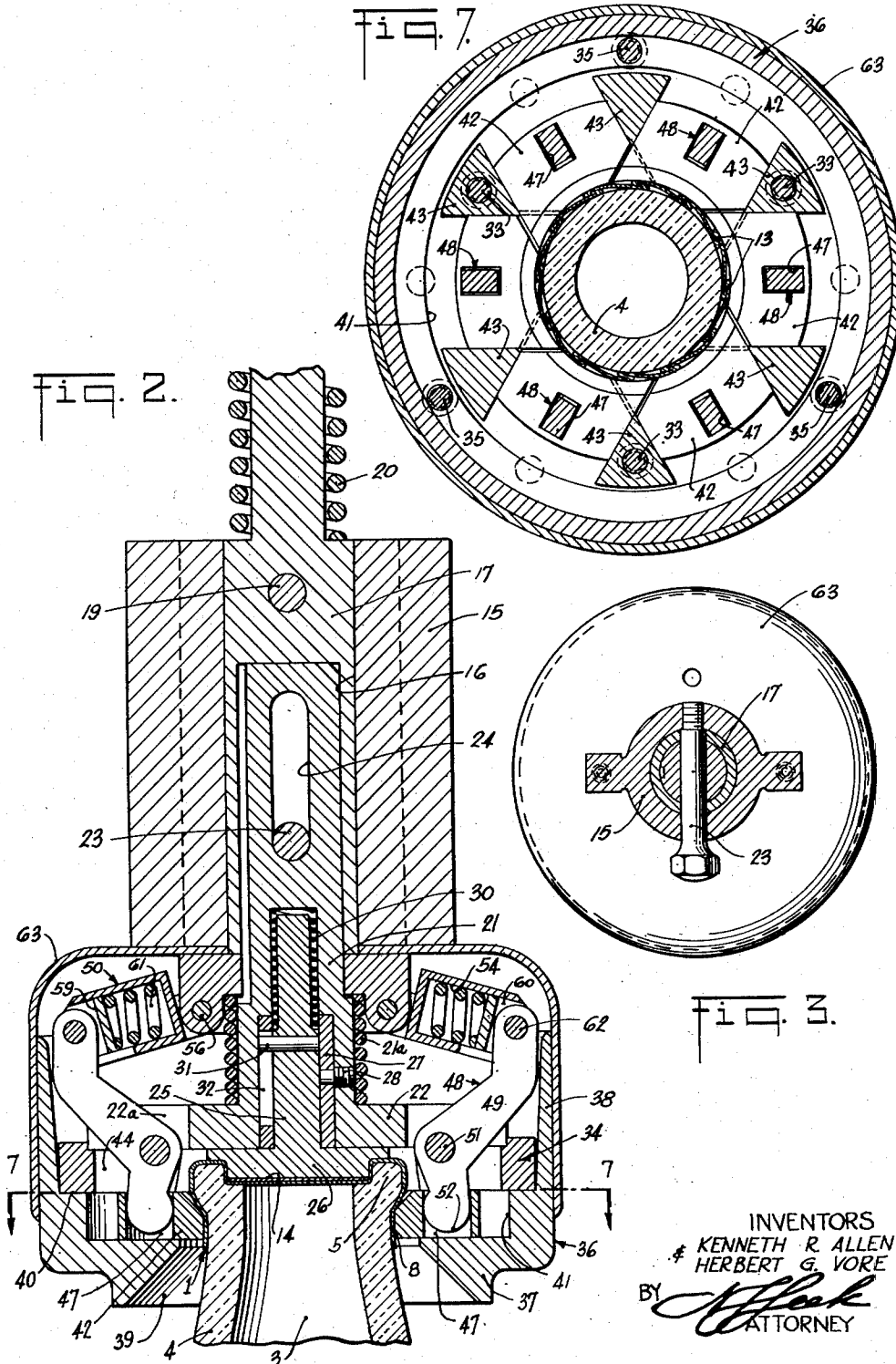
K. R. ALLEN ET AL

2,579,775

CAPPING HEAD

Filed April 24, 1946

3 Sheets-Sheet 2



Dec. 25, 1951

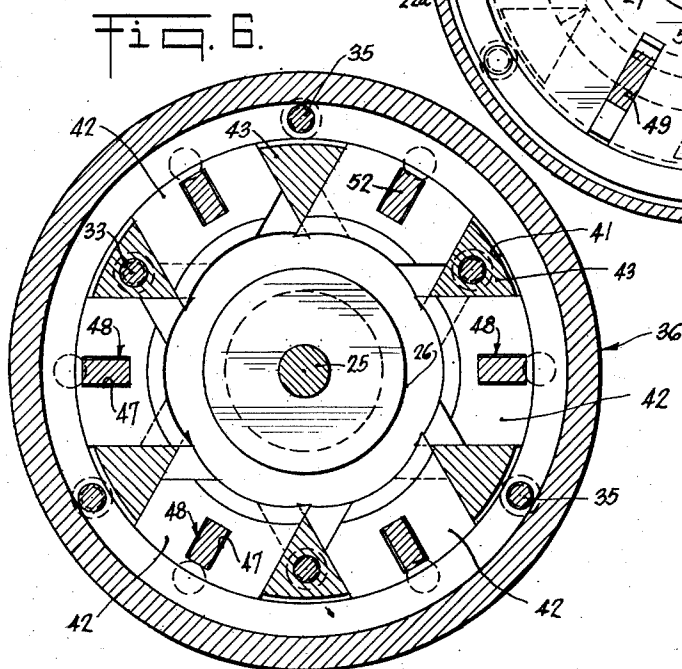
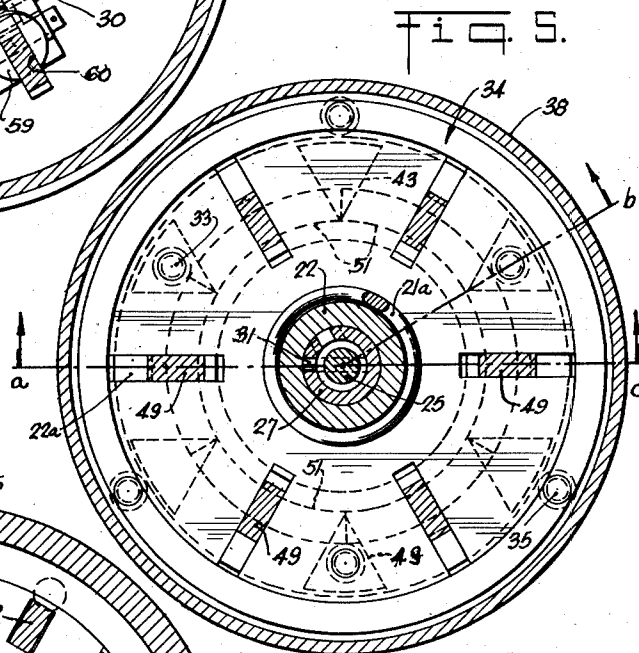
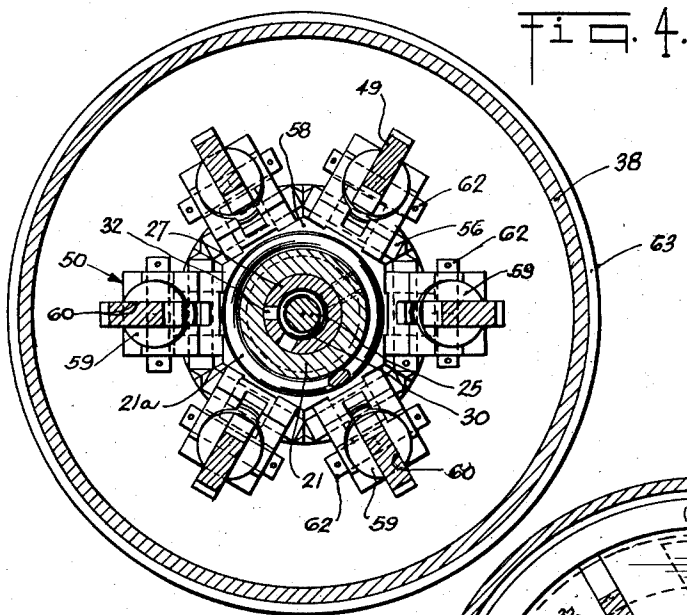
K. R. ALLEN ET AL

2,579,775

CAPPING HEAD

Filed April 24, 1946

3 Sheets-Sheet 3



INVENTORS
KENNETH R. ALLEN
HERBERT G. VORE
BY  ATTORNEY

UNITED STATES PATENT OFFICE

2,579,775

CAPPING HEAD

Kenneth R. Allen, Ridgewood, and Herbert G. Vore, Forest Hills, N. Y., assignors to American Seal-Kap Corporation of Delaware, Wilmington, Del., a corporation of Delaware

Application April 24, 1946, Serial No. 664,616

5 Claims. (Cl. 226—86)

1

2

This invention relates to mechanism for clamping and sealing flexible skirted hood caps about the mouth of containers such as milk bottles and is an improvement on the apparatus disclosed in the patent to C. W. Goodwin No. 2,325,160.

Capping heads of this type are especially adapted for use with standard rotary filling and capping machines used in combination with a hood cap dispensing and conditioning apparatus such as disclosed in the patent to Goodwin et al. No. 2,325,163. These capping heads are designed to firmly clamp and seal flexible skirted hood caps, such as that shown in the patent to Clark and Vore No. 2,353,879. These caps comprise a central bore closing diaphragm which is adapted to fit snugly into the mouth of a bottle and seat on the internal ledge thereof, an annular pouring lip housing of channel-shaped cross section adapted to extend over the pouring lip, and an outwardly extending fluted skirt adapted to be contracted and secured about the neck of the bottle beneath the beaded pouring lip. The fluted skirt has a band of thermoplastic adhesive about the outer surface near the lower edge thereof which securely seals the overlapping pleats of the skirt together after they have been contracted and clamped about the neck of a bottle.

These capping heads are generally mounted in a rotary turret, above bottle-supporting and elevating stools, which is incorporated into a bottle-filling machine and operates in timed relation therewith. Nested stacks of caps with the adhesive band in a dry hard condition are placed in the magazine of a cap dispensing and conditioning apparatus from which they are successively withdrawn as needed by a suitable picker mechanism. The picker mechanism deposits the caps in a conditioning chamber through which they are conveyed by suitable mechanism and discharged at a cap applying station which is located in the path of the filled bottles as they are being transferred from the filler to the capping turret. As the caps are being conveyed through the conditioning chamber, heat is focused on the band of adhesive which renders it soft and tacky for proper sealing. At the cap applying station the caps are deposited loosely over the mouths of the bottles as they pass the station on their way to the capping turret. In the capping turret the bottles are carried around in a circular path on the stools. As the bottles are carried around, they are elevated by the stools and the mouths of

the bottles with the caps loosely applied thereto are forced up into the capping heads. The upward movement of the bottles into the capping heads operates mechanism which causes an annular series of jaws to move radially inward and clamp the skirts of the caps about the necks of the bottles. The jaws hold the skirts firmly against the necks of the bottles until the adhesive cools and sets securely sealing the caps in place, after which the bottles are lowered out of the capping heads and discharged from the turret.

It is the upward pressure of the bottles upon the mechanism within the capping heads which causes the jaws to move radially inward to clamp the skirts of the caps about the necks of the bottles. This radially inward pressure of the jaws around the necks of the bottles must be relatively high in order to properly seal the caps on the bottles, but the upward pressure of the bottles against the jaw operating mechanism in the capping heads must be held within a certain limit to avoid breakage of the bottles. The necks of bottles frequently vary in size and contour so that means must be provided in the jaw-operating mechanism to compensate for this variation. Also the height of bottles varies so that compensating means must be provided to take care of this variation in height, as otherwise improper sealing of the caps and/or bottle breakage will result.

The principal object of the present invention is to provide in a capping head of this character improved means through which a lower upward pressure of a bottle against the jaw-operating mechanism will result in a relatively high radially inward pressure of the jaws against the neck of the bottle.

Another object of this invention is to provide in a device of this character improved means for compensating for the variation in size and contour, or out-of-roundness, of bottles.

Other and more limited objects of the invention will be apparent from the following specification and the accompanying drawing forming a part thereof wherein:

Fig. 1 is a vertical sectional view through our improved capping head showing the various parts thereof in their initial position ready to receive a loosely capped bottle and securely seal the cap thereon, the plane of the section being indicated by the line *a—b* on Fig. 5.

Fig. 2 is a vertical sectional view similar to Fig. 1 showing the various parts in their final positions firmly holding and clamping a cap in

3

and about the mouth and neck of a bottle, the plane of the section being indicated by the line *a-c* on Fig. 5;

Fig. 3 is a horizontal section taken on the line 3-3 of Fig. 1;

Fig. 4 is a horizontal section taken on the line *d-d* of Fig. 1 looking in the direction indicated by the arrows 4-4;

Fig. 5 is a horizontal section taken on the line *d-d* of Fig. 1 looking in the direction indicated by the arrows 5-5;

Fig. 6 is a horizontal section taken on the line 6-6 of Fig. 1 showing the jaws in open position ready to receive a bottle with a cap loosely applied thereto; and

Fig. 7 is a section similar to Fig. 6 taken on the line 7-7 of Fig. 2 showing the jaws contracted and firmly clamping and holding a cap skirt around the neck of a bottle.

The capping head of the present invention is designed to firmly seat a skirted hood cap 1 against an annular shoulder 2 in the mouth 3 of a bottle and to tightly fold, clamp and hold the flexible skirt of the cap about the neck 4 of the bottle beneath the beaded pouring lip 5 thereof. The cap 1 may be formed from a circular blank of sheet material, such as paper which has been suitably treated to impart sufficient rigidity thereto to permit shaping in suitable dies. The cap may be preformed and shaped in the manner disclosed in the aforesaid Clark and Vore Patent No. 2,353,879. This patent shows a preformed cap having a central depressed diaphragm 6 which is adapted to fit snugly in the mouth 3 of a bottle and to seat on the annular shoulder 2 therein, an annular channel-shaped section 7 which is adapted to cover the beaded pouring lip 5 which surrounds the mouth of the bottle, and a pleated flexible flaring skirt 8 which is adapted to be contracted and sealed about the neck 4 of the bottle beneath the beaded pouring lip 5 thereof.

The channel-shaped section is provided with inner and outer substantially parallel side walls 9 and a ring-shaped top wall 10 which bridges the side wall 9 and has a plurality of equally spaced strengthening ribs 11.

The skirt 8 flares downwardly and outwardly from the outer wall 9 and is provided with pairs of crease or fold lines 12 which extend generally radially outward from the outer wall 9. The crease or fold lines of each pair are scored for folding in opposite directions so that when the skirt 8 is contracted downwardly and inwardly against the neck of the bottle the surplus material of the skirt is folded along the crease lines into pleats 13 (Fig. 7). A disc 14 is frictionally held within the inner wall 9 against the diaphragm 6. This disc bears the necessary printing and reinforces the diaphragm and exerts a seating pressure against the inner wall of the bottle. There is a band of thermoplastic adhesive around the outer surface of the skirt which holds the pleats 13 together after they have been folded in against the neck of the bottle as indicated in Fig. 7.

The capping head embodying the present invention includes a slide 15 which is reciprocally mounted in suitable guides in the capping turret of a filling and capping machine. The slide 15 has a central bore 16 therein in which a stem 17, having a bore 18 in the lower end thereof, is rigidly secured by a pin 19. A spring 20 around the upper end of the stem 17 normally holds the slide 15, and the mechanism carried thereby, in its lowermost position within its guides. The

4

spring 20, as will be described more fully hereinafter, is provided to regulate the end pressure on a bottle as it is raised into the capping head and to compensate for any variation in the height of the bottles being capped.

The upper end of an arbor 21, which is formed integrally with a pressure plate 22 is slidably mounted in the bore 18 in the spindle 17. A pin 23, which is carried by the slide 15, extends through a vertically elongated slot 24 in the arbor 21 and prevents the arbor turning about its axis and limits the downward movement thereof. The pressure plate 22, and the mechanism secured thereto, is normally yieldingly held in its lowermost position as shown in Fig. 1 by a spring 21a. The stem 25 of a cap seating plunger 26 is slidably mounted in a bushing 27 which is secured by a set screw 28 in an axial bore 29 in the pressure plate 22 and arbor 21 thereof. The plunger 26 is normally urged to its lowermost position as indicated in Fig. 1 by a coiled spring 30 in the bore 29, and a pin 31 carried by the stem 25 and extending into a vertical slot 32 in the bushing 27 limits the downward movement of the plunger.

The pressure plate 22 is secured by studs 33 to a segment plate 34 which in turn is secured by studs 35 to a forming ring 36. The forming ring 36 comprises a base 37 and an upwardly extending sleeve 38 open at its upper end. A downwardly and outwardly flaring opening 39 is provided in the base 37 for the entrance of bottles, having a skirted hoop cap loosely applied thereto, into the capping head. The segment plate 34 rests on an annular shoulder 40 between the base 37 and the sleeve 38 so as to provide a circular chamber 41 therebeneath in which a plurality of interengaging jaw segments 42 are slidably mounted for radially inward and outward movement. The segment plate 34 has a plurality of triangular bosses 43 on the underside thereof which project down into the chamber 41 against the base 37 and guide the jaw segments 42 in their inward and outward movement. The pressure plate 22 has a plurality of outwardly extending radial slots 22a therein which are disposed in alignment with inwardly extending radial slots 44 in the segment plate 34. There is an annular semi-circular groove 45 formed in the upper surface of the segment plate 34 which registers with a similar groove 46 in the lower surface of the pressure plate 22.

Each of the jaw segments 42 has a rectangular aperture 47 therethrough which is in alignment with the slots 22a and 44 in the pressure plate 22 and segment plate 34 respectively. The jaw segments 42 are moved radially inwardly and outwardly by a plurality of toggles 48, there being one toggle for each jaw segment. Each toggle consists of a lever 49 and an expansible and contractable link 50. The levers 49 are rotatably mounted intermediate their ends upon arcuate pins 51 which are disposed within the opposed registering grooves 45 and 46 in the pressure plate 22 and segment plate 34. The lower ends of the levers 49 are rounded as indicated at 52 and extend into the rectangular apertures 47 in the jaw segments 42. Each of the links 50 consists of a block 53, having a bore 54 therein which is open at one end. A pair of ears 55 is secured to and extends outwardly from the closed end of each block. The ears 55 are pivotally secured by pins 56 to lugs 57 projecting downwardly from an apertured ring 58 which surrounds the arbor 21 beneath the slide 15.

5

A block 59, which is slotted as indicated at 60, is slidably mounted in each of the bores 54 and a spring 61 is also disposed within each bore 54 between the block 59 and the closed end of the bore 54. The upper ends of the lever 49 are pivotally secured to the blocks 59 within the slots 60 by pins 62.

A cup-shaped shell 63 into which the sleeve 38 telescopes is secured to the lower end of the slide 15 by screws 64, and together with the sleeve 38 encloses the operating mechanism of the capping head.

Operation

In operation a hood cap having a flexible flaring skirt properly conditioned for sealing is first loosely applied to the mouth of a bottle. The bottle with the hood cap loose thereon is then elevated by suitable mechanism into the capping head. As the bottle is elevated it engages the plunger 26 and raises it against the pressure of the spring 30 until it contacts the underside of the pressure plate 22, after which the plunger 26, pressure plate 22, segment plate 34, forming ring 36, and all the mechanism secured thereto and carried thereby, are raised in unison against the pressure of the spring 21a from the position shown in Fig. 1 to the position shown in Fig. 2 by the further upward movement of the bottle. As the pivots 51 for the levers 49 are carried up with the pressure plate 22 and segment plate 34, the upper ends of the levers will be moved outwardly which will move the lower ends thereof inwardly. The inward movement of the lower ends of the levers 49 will move the jaw segments 42 radially inward from the position shown in Figs. 1 and 6 to the position shown in Figs. 2 and 7 which folds and clamps the skirt 8 of the cap 1 firmly about the neck of the bottle under the beaded pouring lip 5 as is clearly shown in Figs. 2 and 7. The bottle is held in its elevated position, with the jaw segment 42 holding the cap skirt clamped firmly against the bottle neck, a sufficient time for the band of adhesive to cool and set, thus securely sealing the cap about the mouth of the bottle, after which the bottle is lowered out of the capping head. As the bottle is lowered and removed from the capping head, the springs 21a and 30 will return the various parts to their initial position, as shown in Fig. 1, ready for capping the next bottle presented thereto.

As a bottle with a cap loosely applied thereto is being elevated, carrying with it the pressure plate 22 and attached mechanism, the jaw segments 42 will fold and clamp the cap skirt against the bottle neck before the bottle has reached the limit of its upper movement. After the jaws have clamped the skirt against the bottle neck, the levers 49 will remain stationary, and during the further upward movement of the bottle, the spring 61 will be compressed, thus contracting and shortening the links 50. Due to the toggle action of the jaw operating levers 49 and links 50 during the final upward movement of the bottle and the mechanism elevated thereby, a very high pressure will be exerted by the jaw segments against the folded cap skirt. The magnitude of this pressure is dependent upon the compressibility of the spring 61 and, as will readily be apparent, the high radially inward pressure of the jaws against the cap and bottle neck is induced by a relatively low axial pressure upon the bottle.

In addition to limiting the radially inward

6

pressure of the jaws around the bottle neck, the springs 61 also function to compensate for any variation in the size and contour, or out-of-roundness, of the bottle necks, by allowing some of the jaw segments to move radially inward a greater distance than others. This is due to the fact that none of the springs 61 will be compressed until the jaw segment associated therewith engages and presses the cap skirt against the bottle neck and stops its inward movement.

As previously stated bottles of the same capacity frequently vary in height. To compensate for this variation the slide 15 and spring 20 are provided so that, if there is any further upward movement of a bottle after the pressure plate 22 and mechanism secured thereto have reached the limit of their upward movement in the shield 63, the whole capping head will then move on upward as a unit against the pressure of the spring 20.

While the capping head of the present invention has been generally described herein as used in connection with an automatic filling and capping machine, it is equally adapted for manual operation. Also the bottles could remain stationary and the capping head be moved down over the bottle. All that is necessary for the proper operation of the capping head is a relative vertical movement between the bottle and the capping head.

From the foregoing it will be apparent to those skilled in this art that we have provided a very simple and efficient mechanism for accomplishing the objects of our invention, and it is to be understood that we are not limited to the specific construction shown and described as various modifications may be made thereto within the scope of the appended claims.

What is claimed is:

1. A capping head for applying a flexible skirted hood cap to the mouth of a bottle comprising a forming ring having a centrally disposed opening therethrough through which a bottle having a flexible skirted hood cap loosely applied to the mouth thereof is adapted to be inserted, a plurality of jaw segments circumferentially arranged about the inner end of said opening and mounted to slide radially on said ring and a plurality of toggle mechanisms connected to actuate said jaw segments, said toggle mechanisms each comprising a pivoted lever connected to one of said jaw segments and an extensible and contractable link connected to said lever to actuate same, a support pivotally connected to said links, said support and ring being mounted for relative movement toward each other to actuate said toggle mechanisms in response to the insertion of a bottle through said opening to thereby simultaneously move said jaw segments radially inward to fold and clamp the flexible skirt of said cap against the neck of said bottle, said links each comprising a block having a bore, a plunger slidable in said bore and a resilient member in said bore opposing the inward movement of said plunger.

2. A capping head, as set forth in claim 1, in which said resilient member comprises a coiled spring.

3. A capping head for applying a flexible skirted hood cap to the mouth of a bottle comprising a forming ring having a centrally disposed opening therethrough through which a bottle having a flexible skirted hood cap loosely applied to the mouth thereof is adapted to be inserted, an

7

annular chamber in said forming ring about the inner end of said opening, a plate secured to said forming ring above said opening, a plurality of jaw segments circumferentially arranged about the inner end of said opening within said chamber and adapted to slide radially inwardly and outwardly, a plurality of guides projecting downwardly from said plate into said chamber between said jaw segments to guide said segments during their radial movement, a plurality of radially extending slots through said plate intermediate said guides, and a plurality of toggle mechanisms which are rendered operative by the insertion of a bottle through said opening to simultaneously move said jaw segments radially inwardly to fold and clamp the flexible skirt of said cap against the neck of said bottle, each of said toggle mechanisms comprising a lever pivotally secured to said plate with the lower end thereof extending down through said slot into engagement with a jaw segment thereunder, and an expansible and contractable link having one end thereof pivotally connected to the upper end of said lever and the other end thereof pivotally connected to a stationary support, said links each comprising a block having a central bore, a plunger slidable in said bore and a resilient member in said bore opposing the inward movement of said plunger.

4. A capping head for applying a flexible skirted hood cap to the mouth of a bottle comprising a forming ring having a centrally disposed opening therethrough through which a bottle having a flexible skirted hood cap loosely applied to the mouth thereof is adapted to be inserted, an annular chamber in said forming ring about the inner end of said opening, a plate secured to said forming ring above said opening, a plurality of jaw segments circumferentially arranged about the inner end of said opening within said chamber and adapted to slide radially inwardly and outwardly, a plurality of guides projecting downwardly from said plate into said chamber between said jaw segments to guide for said segments during their radial movement, a plurality of radially extending slots through said plate intermediate said guides, and a plurality of toggle mechanisms, which are rendered operative by the insertion of a bottle through said opening to simultaneously move said jaw segments radially inwardly to fold and clamp the flexible skirt of said cap against the neck of said bottle, each of said toggle mechanisms comprising a lever pivotally secured to said plate with the lower end thereof extending down through said slot into engagement with a jaw segment thereunder, and an expansible and contractable link having one end thereof pivotally connected to the upper end of said lever and the other end

8

thereof pivotally connected to a stationary support, said links each comprising a pivoted block having a longitudinal bore open at one end, a block slidably mounted in said bore and pivotally connected to the upper end of said lever, and a spring disposed within said bore between the closed end of said bore and the inner end of said slidably mounted block.

5. A capping head for applying a flexible skirted hood cap to the mouth of a bottle comprising a slide having an axial bore therein, an arbor slidably mounted in said bore, a plate secured to the projecting end of said arbor, a forming ring secured to said plate, a chamber within said forming ring beneath said plate, an opening through the base of said forming ring communicating with said chamber, a plurality of jaw segments circumferentially arranged in said chamber about the upper end of said opening, a shield secured to said slide and telescopically engaging said forming ring, and a plurality of toggle mechanisms rendered operative by the upward movement of said plate to simultaneously move said jaw segments radially inwardly to fold and firmly clamp the flexible skirt of said cap against the neck of said bottle, the upward movement of said plate being induced by a bottle having a flexible skirted hood cap loosely applied thereto being elevated through said opening into engagement with said plate, said toggle mechanisms each comprising a lever pivotally secured to said plate with the lower end thereof operatively engaging a cooperating jaw segment, and an expansible and contractable link having one end thereof pivotally connected to the upper end of said lever and the other end thereof pivotally connected to a stationary support, said links each comprising a block having a central bore, a plunger slidable in said bore, and a resilient member in said bore opposing the inward movement of said plunger.

KENNETH R. ALLEN
HERBERT G. VORE.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,087,251	Gough	July 20, 1937
2,189,628	Corsi	Feb. 6, 1940
2,325,160	Goodwin	July 27, 1943
2,416,001	Goodwin	Feb. 18, 1947

FOREIGN PATENTS

Number	Country	Date
179,075	Germany	Nov. 27, 1906