W. E. LINDSAY.

MACHINE FOR SEALING BOTTLES.

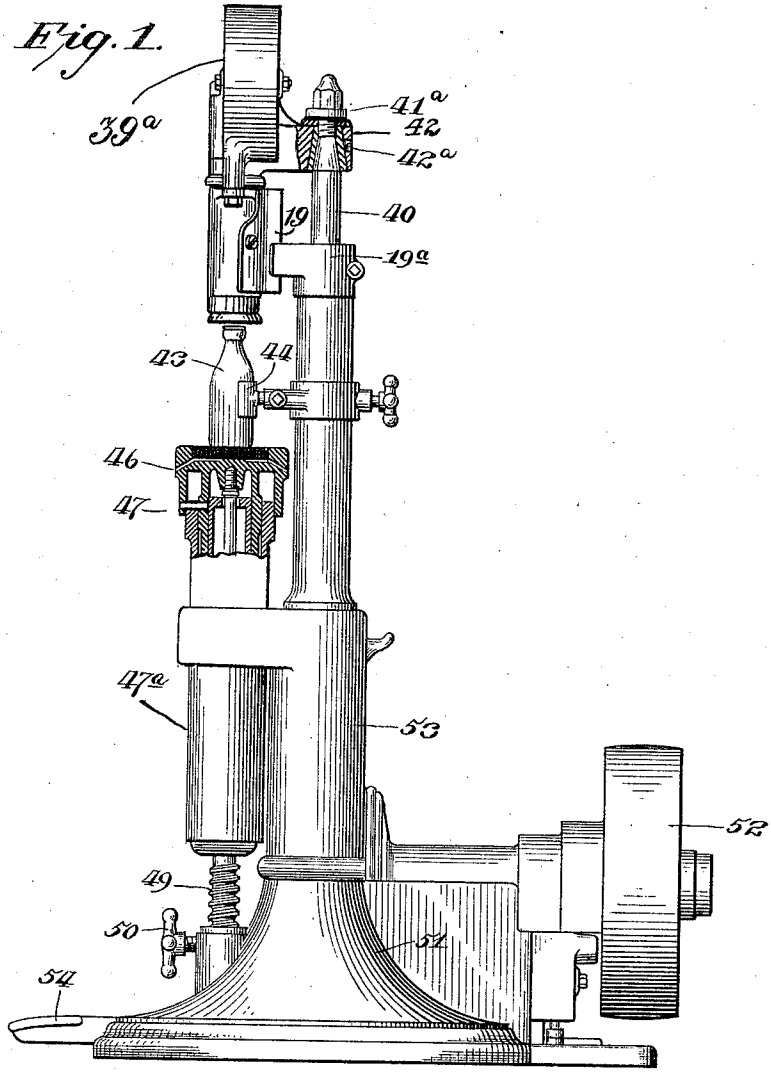
APPLICATION FILED APR. 20, 1909.

1,018,575.

Patented Feb. 27, 1912.

3 SHEETS—SHEET 1.

Fig. 1.



INVENTOR

William Edward Lindsay

BY H. V. Heuton

ATTORNEY

WITNESSES

H. H. Gamble.

E. M. Ware

W. E. LINDSAY.

MACHINE FOR SEALING BOTTLES.

APPLICATION FILED APR. 20, 1909.

1,018,575.

Patented Feb. 27, 1912.

3 SHEETS—SHEET 2.

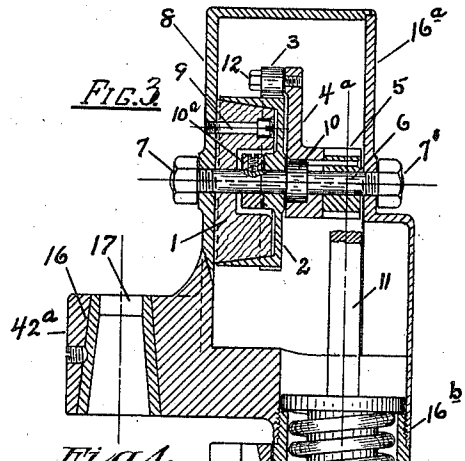


Fig. 3.

Fig. 4.

Fig. 6.

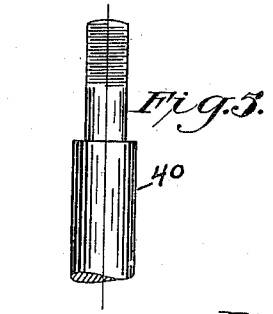


Fig. 5.

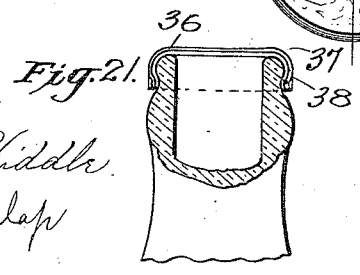


Fig. 21.

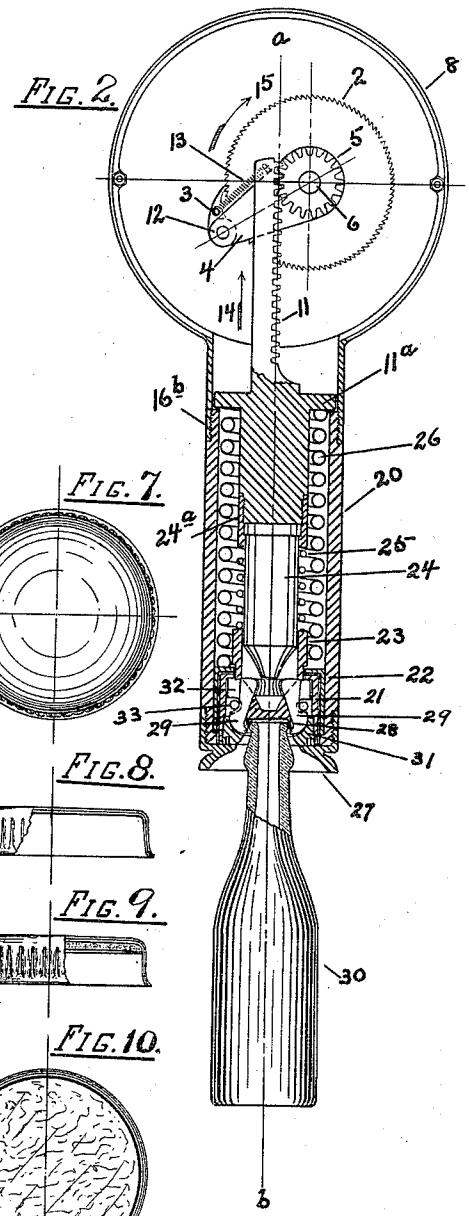


Fig. 2.

Fig. 7.

Fig. 8.

Fig. 9.

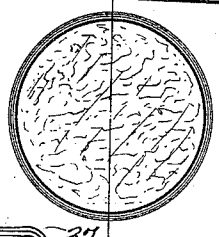


Fig. 10.

WITNESSES:

A. M. Biddle

R. A. Dunlap

INVENTOR.

William Edward Lindsay.

BY

H. V. Heuton

ATTORNEY.

W. E. LINDSAY.

MACHINE FOR SEALING BOTTLES.

APPLICATION FILED APR. 20, 1909.

1,018,575.

Patented Feb. 27, 1912.

3 SHEETS—SHEET 3.

FIG. 11.

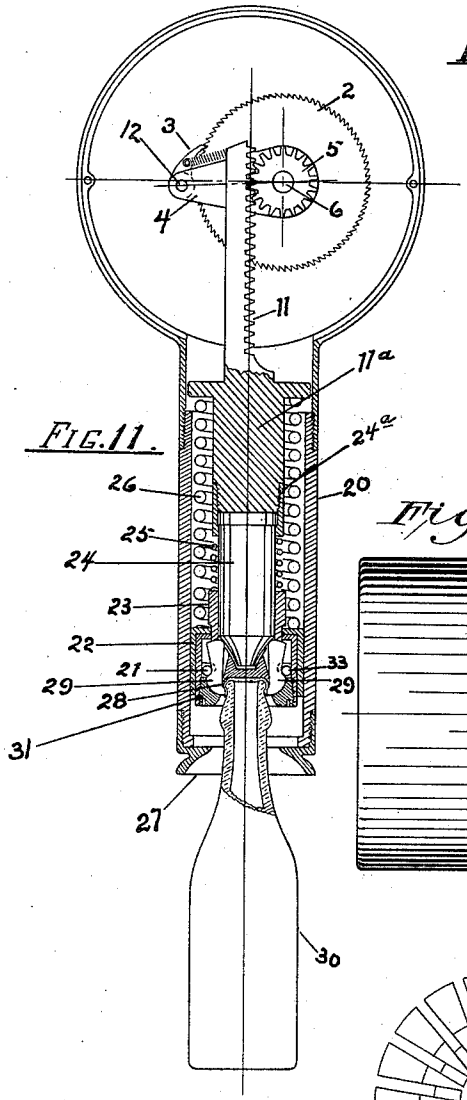


FIG. 14.

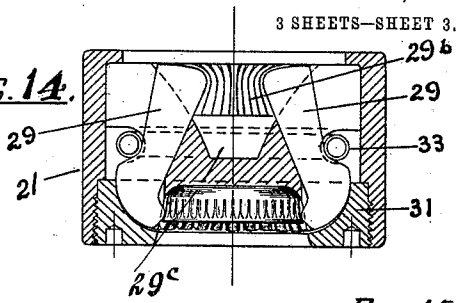


FIG. 13.

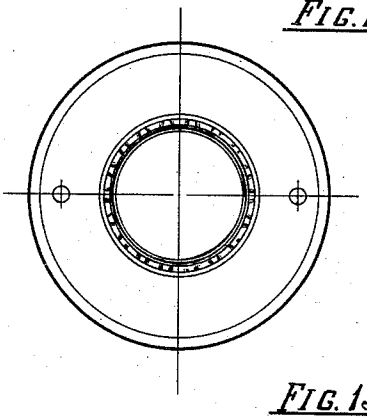


Fig. 12.

FIG. 15.

FIG. 16.

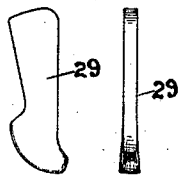


FIG. 17.

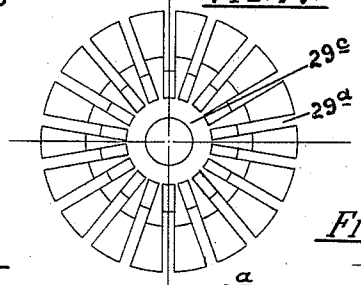


FIG. 19.

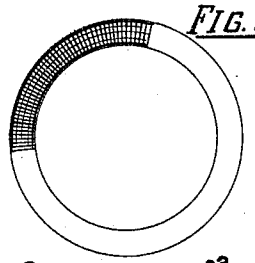


FIG. 20.

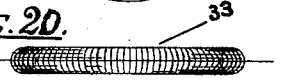
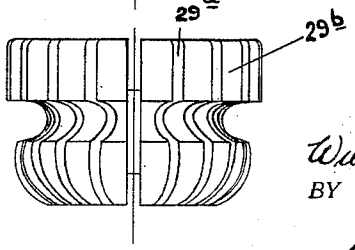


FIG. 18.



WITNESSES:

A. M. Biddle

R. A. Dunlap

INVENTOR.

William Edward Lindsay.

BY

H. V. Hutton

ATTORNEY.

UNITED STATES PATENT OFFICE.

WILLIAM EDWARD LINDSAY, OF BALTIMORE, MARYLAND, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE PERFECT BOTTLE CAP COMPANY, OF BALTIMORE, MARYLAND, A CORPORATION OF DELAWARE.

MACHINE FOR SEALING BOTTLES.

1,018,575. Specification of Letters Patent. Patented Feb. 27, 1912.

Application filed April 20, 1909. Serial No. 491,157.

To all whom it may concern:

Be it known that I, WILLIAM EDWARD LINDSAY, a citizen of the United States, residing in the city of Baltimore, State of Maryland, have invented certain new and useful Improvements in Machines for Sealing Bottles, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to machines for sealing bottles with metallic caps, the bottles being of the class having a projecting annular rib forming a shoulder beneath the lip of the bottle; and the caps being of the class having a crown portion adapted to rest on the bottle lip, and a depending continuous annular flange adapted to be bent into locking engagement with the aforesaid annular shoulder of the bottle head.

My invention in that class of machines has for its several objects, to minimize and substantially overcome the bottle-crushing tendency in effecting the locking contact and to compensate for irregularities in the peripheral contour of the bottle head, and for variations in the length or height of a series of bottles to be capped.

To these ends my invention consists of cap-setting mechanism comprising means to compensate for variations in the length or height of a series of bottles to be capped; means to guidingly support the flange of the cap while being bent; means operating to distribute the radial closing pressure thereon to compensate for irregularities in the contour of the bottle head, and means operating to minimize and substantially overcome the bottle-crushing tendency in bending the flange, by drawing down the flange to bring its extreme skirt or rim into a plane below the annular shoulder and applying the bending pressure to said rim to force it under the shoulder. Heretofore sealing caps have been applied to such bottles in two general ways, in one of which the flange of the cap was initially corrugated for a portion of its depth, thereby providing alternating inner ribs and outer ribs, and the sealing operation was mechanically affected by applying pressure to the several outer ribs of the corrugation to force the upper ends of the inner ribs thereof under the overhanging annular shoulder below the lip of the bottle. My invented machine operates to effect a locking contact by a method which differs essentially therefrom, and while best exemplified in applying to such a bottle a specific form and character of metallic cap, shown herein for illustration, is applicable to setting other forms of metallic sealing caps of ordinary character consisting of a crown portion with integral annular flange whether corrugated or plain, and of sufficient depth to be bent into locking contact with the annular shoulder of the bottle.

In the drawings illustrating my invention:—Figure 1 is a side elevation, partly in section, of the complete machine. Fig. 2 is a front elevation partly in section, of capping head 39ª and its actuating mechanism, showing a bottle in position therein ready to be sealed. Fig. 3 is a side elevation partly in section from the left side of the machine, of the capping head, the actuating mechanism and part of the spring-controlled plug-actuating rack. Fig. 4 is an elevation of the preferred form of column shaft. Fig. 5 is an elevation of a modified form of column shaft. Fig. 6 is a fragmentary sectional view of a modified form of supporting bracket with bushing for use with the modified form of column shaft shown in Fig. 5. Figs. 7, 8, 9 and 10 are respectively a plan view, side elevations partly broken away and partly in section, and under-view, of the metallic cap in its preferred form. Fig. 11 is a front elevation, partly in section, of the capping head, corresponding to Fig. 2, with this difference, that the latter shows the position of the parts at the beginning of the operation of sealing the cap, while Fig. 11 shows the position of the same at the end of the operation, with the cap sealed on the bottle head. Figs. 12, 13 and 14 are respectively a side elevation, a plan view and a detached sectional view of the sealing tool portion of the capping head. Figs. 15 and 16 are end and side elevations of one of the sealing fingers. Figs. 17 and 18 are plan and side elevations of the slotted spool which guides the sealing fingers. Figs. 19 and 20 are respectively a plan and side elevation of the endless annular spiral spring which resiliently holds the sealing fingers in normal position in the slotted spool. Fig. 21 is a vertical sectional view of the cap and the head end of the bottle, showing the sealing

operation completed with the rim of the flange drawn down over the lip of the bottle and the skirt of the flange drawn under the annular shoulder of the bottle.

Referring now to said drawings, there is shown in Fig. 1 an elevation, partly in section, of a bottle-capping machine comprising, my removable capping-head indicated at 39ª, with its supporting bracket 42, the supporting frame and its contained driving mechanism, including its bottle-supporting device. The supporting frame consists, speaking generally, of a base support 51 for a column 53, wherein is mounted a shaft 40 actuated through appropriate geared shafting, driving wheel 52, and clutch governed by a foot treadle 54. As said supporting frame, including its driving mechanism and bottle-supporting device, as shown in said Fig. 1 are well known in the art, no further description is necessary, the mode of operation of the machine, as a whole, in capping a bottle being that the driving mechanism, through the shaft 40, causes the capping head 39ª to descend upon the head of the bottle 43, (by which a cap is placed on it) causing a downward resilient movement of the bottle-supporting movable head 46. As shown the bottle supporting head 46 is made a fixed element relatively to the barrel 47ª by means of a pin 47 fixedly connecting said parts, or said head and barrel may be fixedly secured together in any desired manner.

I will now describe in detail the construction and mode of operation of my new capping head; by a reference first to Fig. 3 wherein 42ª indicates the recessed bracket arm supporting the capping head on the actuating shaft 40 in the column 53 of the supporting frame. In the tapered recess 16 of said bracket is mounted a tapered bushing 17 conforming to the tapered portion 40ª of the shaft 40, (Fig. 4), the screw-threaded end 40ᵇ thereof projecting above the top of the bushing when the parts are operatively assembled, and secured in place by a cap nut 41ª (Fig. 1). If however in any machine of the type of frame shown in Fig. 1, there should be a cylindrical ended shaft 40 such as shown in Fig. 5, then the bushing 16 is to be cylindrical interiorly as shown at 18 in Fig. 6 to conform thereto.

Preferably cast with the bracket 42ª is one side of the casing 8 of the capping head, the opposite side or cover-plate being indicated at 16ª; and the latter has a depending and partially circular end, extending to the plane of the flange on the bracket 42ª, completing a cylinder which is internally threaded at 16ᵇ to receive the threaded end of the barrel 20 wherein is operatively supported the shouldered plunger end 11ª of the rack 11. This rack extends upward within the casing, its teeth coacting with pinion 5 on the face of a ratchet-arm 4, which is mounted on shaft 6 extending transversely through the casing and secured on the outside of the opposite walls thereof by a pair of nuts 7, 7′, whereby it is slightly movable endwise for an adjustment purpose to be presently stated. The arm 4 is mounted rotatably upon shaft 6 between the collar 10 and gear 5, (Fig. 3) and it carries upon a stud 12 on its outer end a pawl 3 which engages the teeth of the ratchet wheel 2 and is held in contact therewith by a small spring 13. Also upon the shaft 6 is mounted a friction block 1 fastened to the internal wall 8 of the shell by screws 9 and having a tapered periphery embraced by a like tapered internal surface of the ratchet wheel 2, the ratchet wheel being mounted on shaft 6 between collars 10 and 10ª. Hence a slight movement of the ratchet wheel parallel to its axis to or from the friction block will increase or decrease the frictional resistance, and hence is made adjustable on the shaft 6 as before stated. The adjustment referred to is effected to increase the resistance mentioned by loosening nut 7′ and tightening the nut 7, and the reverse to lessen the resistance.

Motion is communicated to the ratchet 2, through its pinion 5 by means of the rack 11, the lower end of which forms a vertically-movable shouldered plunger 11ª working in the barrel 20; and the action of the mechanism above described is such that when a lifting force is applied to said plunger carrying the rack, as indicated by the arrow 14 (Fig. 2) its upward movement is resisted by a certain, predetermined and constant force due to the frictional resistance between the tapered surfaces of the friction block and ratchet wheel. When this constant and predetermined resistance is exceeded, then the ratchet wheel will turn upon the friction block in the direction of the arrow 15 (Fig. 2), whereupon the rack, carrying with it the pinion 5 and pawl arm 4, will return to initial position. When both nuts are tightened against their seats upon the shell 8 and cover-plate 16ª, all variation of position of the contacting tapered surfaces of the friction block and ratchet wheel is prevented and the frictional resistance becomes constant and fixed.

The capping head 39ª is guided in vertical movement by means of the guide rib 19 mounted on outside of the barrel 20, and working between the leaves or wings of a guiding bracket 19ª on the column 53 of the supporting frame of the machine. Both ribs are obviously detachable to suit different shapes or dimensions of the guiding bracket 19ª on the frame.

Within the barrel 20 of the capping head is contained the sealing or capping mechanism proper and its actuating members. The latter comprise a sectional plug 24, the

upper end of which is set in a screw ring 24[a] on the base of the actuating plunger 11[a] before described, and the lower cylindrical end of which is guided in a ring 23. A light spring 25 encircles the upper end of the sectional plug, and is mounted between the rings 24[a] and 23 and acts upon the latter, keeping it in position upon the ends of the sealing fingers 29. A heavy spring 26 is mounted between the shoulder and flange of the plunger 11[a] and the top of the flanged rings 22 and 21 and serves to exert the initial sealing pressure before the sealing fingers 29 are brought in contact with the conical end of the sectional plug 24. Within the flanged sleeve or ring 21 the sealing fingers 29 are mounted. These are shown in Figs. 15 and 16, a plurality of them being arranged together in the slots 29[a] of a spool 29[b] constructed as shown in Figs. 17 and 18, and they are encircled by a spiral spring 33 (Figs. 19 and 20) as indicated in Fig. 14. The series of sealing fingers 29 are seated at their lower ends in a bearing ring 31 the inner surface or seat of which is curved to conform to the shape of the lower end of the sealing fingers, and cause said fingers to rock about a point as a center, and at same time permit a slight downward movement of them.

The bearing ring 31 is screwed into the open end of the flanged ring or casing 21 which, as shown in elevation, plan view and section in Figs. 12, 13 and 14, incloses the guide spool, the sealing fingers, the encircling spring and the bearing therefor, and the aforesaid curved face bearing ring for the lower ends of the rocking sealing-fingers. The collapsible plug 24 in its downward movement enters the central opening 29[c] in the spool 29[b] and rocks the fingers 29 inwardly, in a sealing direction, the upward movement of the plug 24, plus the withdrawal of the sealed bottle head operating to cause a return of the sealing fingers to initial position. The plug 24 which operates the sealing fingers 29 is constructed in sections as shown to provide for irregularities in the contour of the periphery of the bottle head which in some instances approximate an ellipse or pear shape. Using an actuating plug so sectionally constructed, when the ends of any sealing fingers are brought into contact with a high point in the irregular outline of the bottle head, the contacting segment or sections of the plug will yield and without interfering with a continued movement which causes the remaining fingers to close over the low portions of the periphery of the bottle head. This variation in the contour of the bottle is, relatively, very slight but is frequently sufficient, with some capping machines, to prevent making an effective seal if the pressure be applied circumferentially and evenly in a true circle, but in my device described, the sectional actuating plug for the sealing fingers automatically adjusts itself to such irregularities in the manner stated.

Upon the extreme lower end of the barrel 20 is screwed a ring with an annular flaring lip 27 (see Fig. 2) which serves the double purpose of guiding the bottle to the sealing fingers supported by the bearing ring 31, and also of firmly supporting the latter and the adjunctive moving parts, in proper operative relation.

The form of cap I prefer to use is shown detached in Figs. 7 to 10, and also in position on the bottle in the former showing the cap in position to be sealed and the latter showing it in sealed condition. The machine is adapted to seal upon a bottle having an annular rib below the lip, a metallic cap having a depending annular flange, by bending the skirt or rim of the flange to force indented ribs on or near the said rim under the annular rib of the bottle head. The form of cap shown has a flaring rim on the flange and the sealing mechanism shown is capable of not only forcing inwardly a series of indented ribs, previously formed in the cap flange, but of also forming such ribs as well, simultaneously with the bending of the flange rim.

An obvious change in the proportion and contour of the sealing fingers and of the bearing ring therefor, to conform to the particular initial form of the cap to be sealed upon the bottle is all that is necessary to widen the range of use of my sealing device to comprehend most metallic caps of the general character stated.

The operation of the machine is as follows:—Referring to Fig. 2 the sealing mechanism is shown in initial position, with the cap on the bottle head, ready to be sealed thereon, and the bottle resting on the support 46 (Fig. 1) and brought into initial contact with the mouth of the capping head of the machine. The first movement of the combined mechanism is a downward movement of the capping head, as a whole, which operates to carry upward the movable sealing mechanism within the barrel; though the opposite bottle support and capping head may be provided with means to effect this contact by a reverse movement of those elements, that is to say by a lifting of the bottle support, as a substitute for the first movement, but which however I do not deem the best method. As the capping head continues to move downward the sealing fingers and their direct-actuating and adjunctive parts before described are carried upward within the barrel, being so moved by contact with the top of the bottle and the cap therein, thus compressing the large spiral spring, until the bearing edges of the sealing fingers are brought into

contact with the conical surface of the sectional actuating plug. The result of this action of the parts, to compress the large spiral spring, is to apply the preliminary sealing pressure on the crown of the cap bringing its paper lining or the compressible sealing disk therein into a "sealing contact" so-called, with the lip of the bottle, and this is not only a predetermined pressure to adapt the machine to seal bottles of varying lengths, effected by adjustment of the friction device before described controlling the vertical reciprocation of the rack, and is maintained, unimpaired, throughout the remainder of the sealing process; but it is preliminary to and distinct from the further movement downwardly of the capping head, the adjustment aforesaid being such that when said sealing contact of the crown is effected the flange of the cap is in such position relatively to the annular rib on the bottle that the continued and further downward movement of the capping head and consequent rocking movement of the sealing fingers is such as to cause the latter to open outwardly at their upper ends by the entrance, into the opening of their supporting spool, of the conical end of the sectional plug and a consequent closing inward of the points of said fingers at their lower ends, upon the skirt of the flange of the cap, each finger making an indentation therein forming an indented point or rib which projects under the annular rib of the bottle, thus forming a "locking contact" so-called, of the cap with the bottle head, as shown in Fig. 11, and completes the sealing operation. The reverse movement of the parts effects a withdrawal of the sealing fingers from said locking position and restores them and their adjuncts to initial position shown in Fig. 2, when the capped bottle is readily removed from the machine, which is then ready for the operation to be repeated on another bottle. It is obvious however that the form or contour of the sealing fingers, and the relative proportion of the adjunctive parts, may be such as to cause the rim of the cap flange to be merely bent or tucked under the annular rib on the bottle; and also it will be observed that the sealing pressure which effects this part of the operations is exerted over the entire surface of the curved bottle lip, hence not only making a sealing contact at the mouth edge of the lip but over the entire curved surface of the lip down to the annular rib at the base of the same. It is further to be observed that the spring-governed guiding ring 23 rests upon the upper ends of the sealing fingers, holding the latter in operative position under their sealing movement. The sealing fingers having curved surfaces seating in a corresponding curved bearing in the bearing ring 31, have a tendency to rotate about a point on their outer faces as a center, with a slight downward movement, the effect of which is to draw on the metal on the crown of the cap, radially, outward to its circumferential edge, and lessening its area by causing it to conform to the curved shape of the lip of the bottle, and this change of conformation of the cap crown, in the sealing process, tends to increase the resistance of the sealed cap to displacement on the bottle head by force of gases emanating from the contents of the bottle.

It is further to be observed that when adjusting the machine to suit bottles of varying lengths, it is effected by regulating the height of the supporting platform as a whole by means of screws 49 and 50, see Fig. 1, and the friction device as aforesaid, so that a proper seal will be made upon the shortest bottle in the lot, the frictional resistance being adjusted to yield at a pressure just sufficient to seat the crown of the cap and bring the skirt of the cap flange into position for locking contact; hence when a longer bottle is capped the frictional device yields automatically, and prevents an increased force being exerted on the sealing fingers by allowing all the sealing mechanism within the barrel to recede upward to accord with the increased length of bottle.

It is finally to be observed that the construction and principle of operation of the machine, especially of the elements which directly contact with the cap over the bottle head, are such that there is very little and practically no tendency to crush and break the latter, mainly because the closing pressure of the sealing fingers on the skirt of the cap flange is distributed and balanced by its application all around the neck of the bottle and in opposite arcs of the same radial line of contact; and this effect is aided by shaping the sealing fingers at their extreme lower ends to effect a locking contact in a plane slightly below the lowest plane of the annular rib on the bottle head and where the glass is less liable to be fractured.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:—

1. In a bottle-sealing machine the combination with a series of sealing fingers, of a slotted holder therefor wherein said fingers are adapted to be independently rocked, and a vertically disposed reciprocating tapering plug, longitudinally divided into independently movable sections, said plug being adapted to enter a central recess in said slotted holder and contact with the upper ends of said sealing fingers to rock them.

2. In a bottle sealing machine the combination with a longitudinally-divided tapering plug, of a series of sealing fingers, in annular arrangement, adapted to be rocked, a slotted holder therefor, and means to

cause said tapering plug to enter said holder and rock said fingers.

3. In a bottle sealing machine the combination with an annular sealing jaw longitudinally-divided into a series of independently-movable fingers, adapted to be rocked, a vertically movable holder therefor, resilient means to pivot said fingers intermediate their length in the holder, means to enter said holder and rock said fingers, and guiding means for the lower ends of said fingers.

4. In a bottle sealing machine, the combination with a series, in annular arrangement, of independently pivoted sealing fingers, a holder therefor in which said fingers are adapted to be rocked, means adapted to enter an aperture in said holder and contact with the upper ends of said fingers to rock them, means to impart a vertical reciprocating motion to said holder, and a ring having a curved interior wall with which the lower ends of said sealing fingers are guided in their rocking movement.

5. In a bottle-sealing machine the combination with a series of sealing fingers, in annular arrangement, a slotted holder therefor in which said fingers are adapted to be rocked, a tapering plug adapted to enter said holder and contact with the upper ends of said fingers to rock them, means to impart a vertical reciprocating motion to said plug, and a ring having a curved interior wall by which the lower ends of said sealing fingers are guided in their rocking movement.

6. In a bottle sealing machine, an annular sectional sealing tool comprising a series of independently rocking fingers, a holder therefor, and resilient means to support said fingers in the slotted holder, the combination therewith of means to guide a bottle head with an unsealed cap thereon to the basal ends of the rocking fingers, and means to rock said fingers by outward movement of their upper ends, said means consisting of a reciprocating plug longitudinally divided into independently movable sections adapted in number and arrangement to individually rock said sealing fingers and automatically yield in respect of any of its segmental sections and relatively thereto when the full rocking movement of any finger in the series corresponding thereto shall be less than normal due to an irregularity in the contour of the bottle head upon which a cap is being sealed.

7. In a bottle sealing machine, comprising a plurality of sealing fingers having curved basal ends and arranged in annular series, a vertically-sliding casing therefor, a slotted holder for said fingers within the casing, resilient means to support said fingers within the holder and permit a rocking movement thereof, a guiding ring for the lower ends of the fingers adapted to cause them to move inwardly below their pivotal support, and a reciprocating plug composed of a plurality of actuating sections each operating independently but simultaneously to rock its corresponding sealing finger in the series.

8. In a bottle sealing machine, a capping head comprising a plurality of sealing fingers, in series, a slotted holder in which they are mounted to have a rocking movement, independently of each other, a containing casing for said elements, means on the lower end of said casing adapted to guide the lower ends of the fingers on their inward rocking movement, a barrel in which said containing casing is slidingly mounted, guiding means on the lower end of said barrel to direct the bottle head to the seating mechanism, and means vertically reciprocating within said barrel adapted to rock said sealing fingers by a descending contact with their upper ends.

9. In a bottle sealing machine an annular series of independent sealing fingers, a holder therefor adapted to permit an independent rocking movement of each finger, means to contact with the upper end of each sealing finger and effect such rocking movement of each in the same arc under normal conditions, said means comprising a plug longitudinally divided into independently movable sections adapted to balance the radial pressure applied to the flange of the cap by the sealing fingers as a series to compensate for irregularities in the peripheral contour of the bottle head.

10. In a bottle sealing machine a plurality of sealing fingers, in annular series, a holder therefor, resilient means to support said fingers therein and to permit their rocking movement, a casing for said elements, an inclosing barrel for said casing, the casing, together with its contained elements having movement relative to the barrel, means to restore said parts to normal position, and means operating to rock the fingers by contact with their upper ends and fixed means within said casing operating as a guide and an abutment for the lower ends of the fingers on their rocking movement to cause them to have a drawing down action on the metal of the cap crown and portions of the flange adjacent thereto.

11. In a bottle sealing machine, a supporting frame comprising a fixed bottle support, a vertically reciprocating shaft in said frame, means to actuate said shaft, a capping head comprising an independently reciprocating plunger, a spring keeping it normally elevated, cap-bending mechanism actuated by said plunger, and means to adjustably control the descending pressure imparted thereto by the plunger, said means comprising a rack on the upper end of the

plunger, a co-acting ratchet arm and friction wheel, a shaft on which said wheel is mounted, means to impart an endwise adjusting movement thereto on said shaft, and a fixed friction block with which said friction wheel is adapted to be brought into greater or less resistant contact.

12. Mechanism for bringing the closure and body parts of a container into assembled relation with each other comprising a movable pressure assuming member and a slip-friction-grip means normally operative during the working thrust of said mechanism, and normally inoperative during the reverse thrust of said mechanism, to oppose movement of said member relatively to said means, substantially as described.

13. Coacting means, movable one toward and from the other, for bringing the closure and body parts of a container into assembled relation to each other, one of said means comprising a gripped member, a gripping member gripping the first member, and a pressure-transmitting member free to move in one direction relatively to the gripped member and interlocked with said gripped member against movement relatively thereto in the substantially opposite direction, substantially as described.

14. Coacting means, movable one toward and from the other, for bringing the closure and body parts of a container into assembled relation to each other, one of said means comprising a gripped member, a gripping member gripping the first member, the gripped member being rotary, and a pressure transmitting member free to move in one direction relatively to the gripped member and interlocked with said gripped member against movement relatively thereto in the substantially opposite direction, substantially as described.

In testimony whereof, I have hereunto affixed my signature this 29th day of March A. D. 1909.

WILLIAM EDWARD LINDSAY.

Witnesses:
A. M. BIDDLE,
R. A. DUNLAP.