Nov. 5, 1946. C. Z. MONROE 2,410,587

MECHANISM FOR PARTIALLY CLOSING CONTAINERS

Filed Jan. 14, 1943 3 Sheets-Sheet 1

FIG. 1.

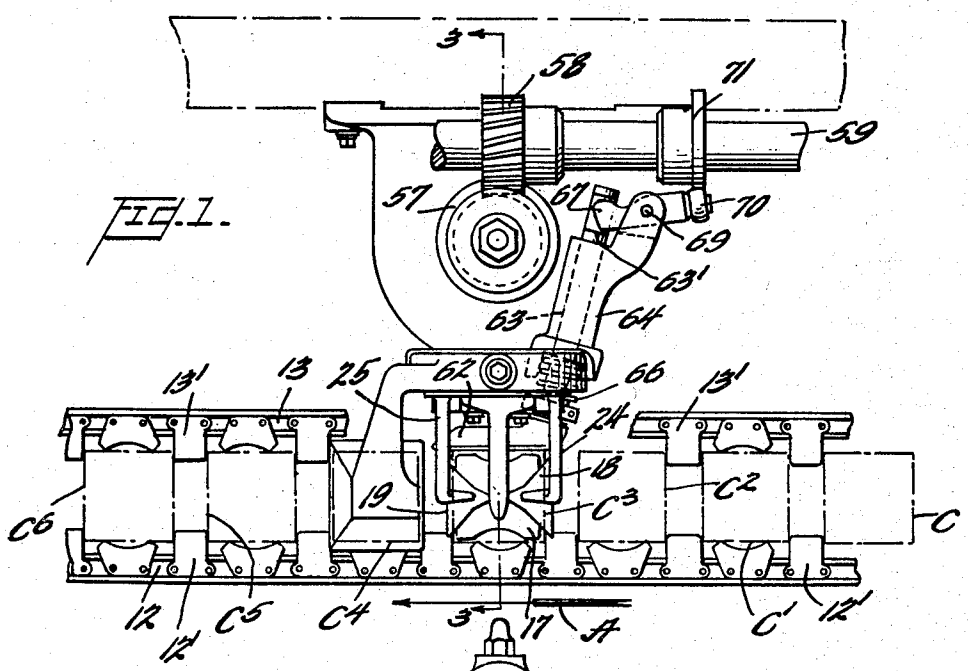
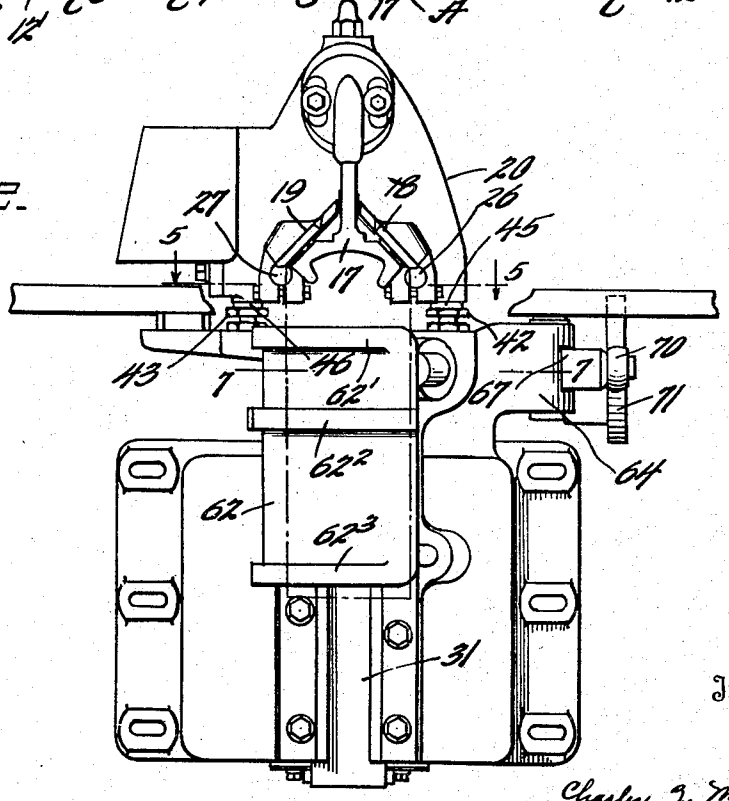


FIG. 2.



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Filed Jan. 14, 1943 3 Sheets-Sheet 2

FIG. 3.

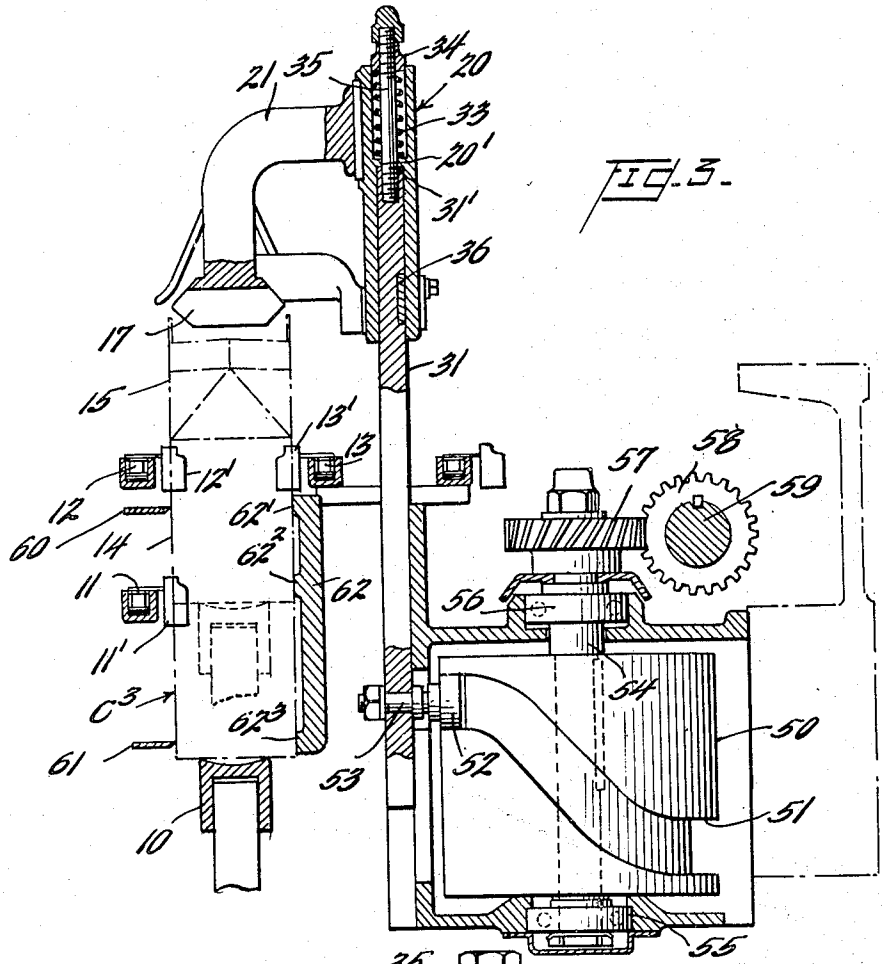
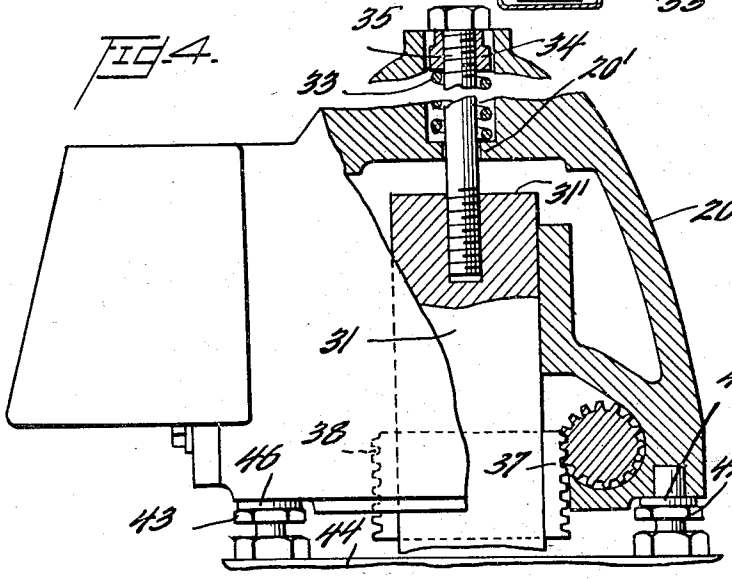


FIG. 4.



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Filed Jan. 14, 1943 3 Sheets-Sheet 3

FIG. 5.

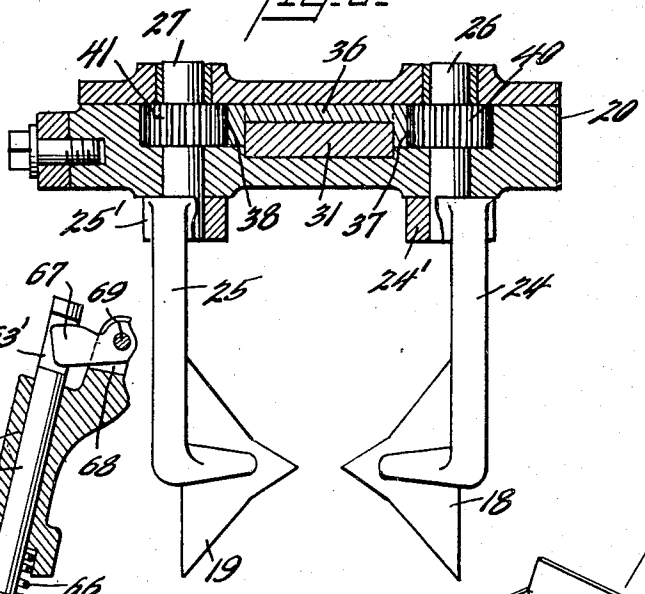


FIG. 7.

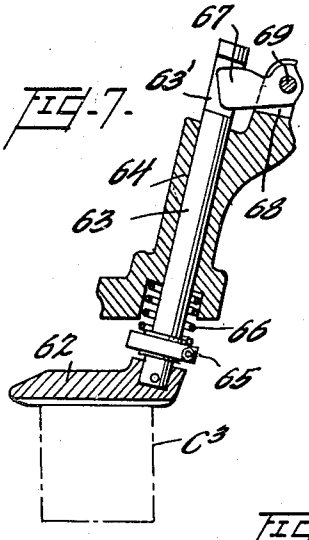


FIG. 8.

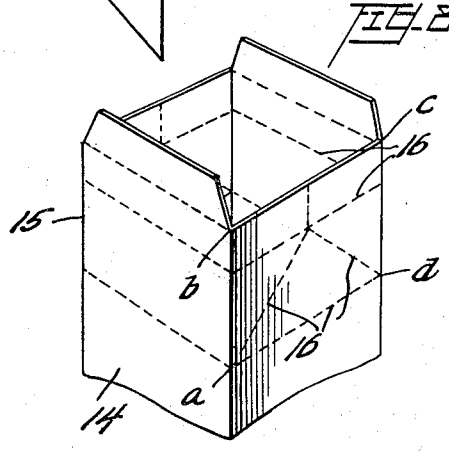


FIG. 6.

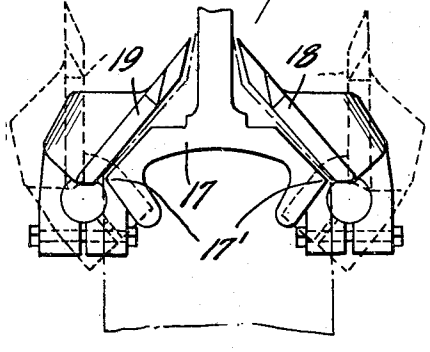
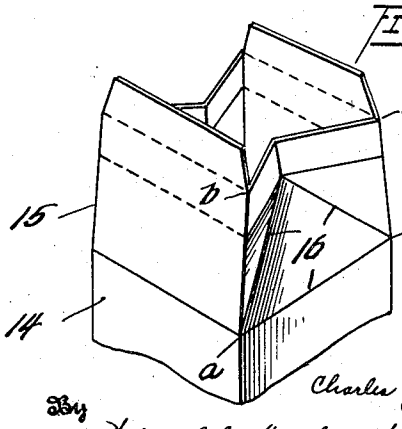


FIG. 9.



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UNITED STATES PATENT OFFICE

2,410,587

MECHANISM FOR PARTIALLY CLOSING CONTAINERS

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Application January 14, 1943, Serial No. 472,377

6 Claims. (Cl. 93—36.8)

1

The present invention relates to mechanisms for folding containers and comprises an improvement upon mechanisms previously provided for accomplishing the partial folding of the foldable end closures of paper containers, such for instance as that which comprises the subject matter of Patent No. 2,144,283, issued January 17, 1939, in the name of R. D. Bennett.

The container folding means disclosed in the patent referred to is primarily intended for use in partially folding or collapsing the foldable upper end closures of tubular paper containers of the type shown and claimed in Patent No. 2,047,891, granted July 14, 1936, to Henry T. Scott. The container disclosed in that patent includes a body portion which is polygonal in transverse section, a flat bottom, and a top closure which comprises a plurality of flat interconnected panels which are relatively folded with respect to each other during the closing operation, certain terminal panels being brought together in parallel relationship and secured in such relationship to form a relatively stiff transverse closure rib. The container is particularly suitable for use in the dispensing of liquids such for instance as milk and, to prevent penetration of the liquid into the paper fibers, the entire container is, after it has been squared out and its bottom closed, coated interiorly and exteriorly with a liquid-proofing composition such as paraffin or a paraffin-containing substance. After having been coated and charged with its liquid contents the container top must, of course, be closed. It has been found advantageous to effect this top closing operation in two stages, the container top being acted upon and partially closed just prior to the introduction of the charge of liquid which it is to retain, the final closure being effected after completion of the charging operation.

The mechanism heretofore provided for effecting the preliminary or partial folding operation upon a container of the type described in the Scott patent referred to has functioned successfully in actual practice, but various of its component elements have been redesigned, and these elements have been rearranged, to render the mechanism still more efficient in operation. Heretofore the partial folding mechanism has included a mandrel adapted to be inserted into each successive container brought into position to be acted upon, the mandrel of the Bennett patent described being collapsible so that it occupies a relatively small volume when being inserted into and withdrawn from the open mouth of the container, being expanded after having

2

been positioned within the container so as to interiorly support the upper margins of the container side walls during the container upper end folding operation. The expansible and contractable mandrel necessarily involves, however, the use of relatively movable parts which must be inserted into the container and, for the sake of cleanliness and sanitation, it is desirable that any device which must necessarily be inserted into a container after sterilization embody no relatively movable parts so that there is no need for lubrication, and to eliminate the possibility that either lubricant or dirt of any kind be dislodged from the mandrel and deposited within the container. In accordance with the present invention the partial folding mechanism includes a solid mandrel which fits rather closely within the container after insertion and, in order that the mandrel may be withdrawn after partial closing of the upper end of the container, an improved clamping means for engaging and firmly holding the body of the container during the mandrel withdrawing operation, is provided.

As a further safeguard against contamination of the interior of the containers which are successively presented to the partial folding mechanism, the power driven actuating means for such mechanism is positioned well below the elevation of the upper ends of containers upon which partial folding operations are being accomplished. When so positioned it is impossible for the driving means for the folding mechanism to cast lubricant or other dirt into the open mouth of the container being acted upon, which is a feature of very considerable practical advantage in the packaging of foodstuffs, such for instance as milk.

In addition to the novel rearrangements and redesign of certain of the essential elements of the folding mechanism additional features are provided, not previously employed. The conveyor for advancing the containers includes, in lieu of container body gripping devices, means for pushing containers along a trackway and, in order that the container may be properly positioned with respect to the container upper end and folding mechanism, and securely held in such position during folding and during withdrawal of the supporting mandrel, a mechanism for laterally clamping each container body as it is moved into position to be acted upon, is provided. Such mechanism includes a movable clamping member and means for moving this member into and out of clamping position which comprises a yieldable or resilient element, the resistance of which may

be varied as desired, the inclusion of the resilient element in the clamping means insuring uniformity of clamping pressure and preventing damage to containers with which it is brought into engagement.

Other novel features of advantage are embodied in the improved mechanism, all of which will be hereinafter described. One form of such mechanism is illustrated in the accompanying drawings by way of example.

In the drawings:

Figure 1 is a top plan view of the mechanism, a portion of a supporting frame being indicated, and also portion of a conveyor for bringing containers into, and removing containers from, position to be acted upon by such mechanism;

Figure 2 is a front elevation of the mechanism of Figure 1, the frame and conveyor, however, not being illustrated in this view;

Figure 3 is a section on line 3—3 of Figure 1;

Figure 4 is a side elevation of portion of the mechanism shown in Figure 2, partly broken away, on an enlarged scale in order that the nature of certain of the component elements of the mechanism may be more clearly perceived;

Figure 5 is a section on line 5—5 of Figure 2;

Figure 6 shows in elevation, and on an enlarged scale, the actual folding instrumentalities of the folding mechanism, the folding fingers being illustrated in their two extreme positions by the use of full and dotted lines;

Figure 7 is a horizontal section, taken approximately on line 7—7 of Figure 2, showing details of the clamping means;

Figure 8 is a perspective view of the upper end or closure portion of a tubular paper container to be acted upon by the improved folding mechanism; and

Figure 9 is a similar view showing the condition of the foldable upper end portion of the container after the partial folding operation has been accomplished.

In Figures 1 and 3 portions of a container conveying mechanism are illustrated, likewise a series of containers which are being intermittently advanced by such conveyor in the direction of the arrow A (Figure 1) these containers being shown in chain lines and indicated at C, C', C^2, C^3, C^4, C^5, and C^6. The container which occupies the position C^3 is so placed that its foldable upper end may be acted upon and partially folded by the folding mechanism and those to the left of this position have already been acted upon and are proceeding toward the container charging mechanism in the event, as is usually the case, that the partial folding mechanism comprises one element of a complete automatic machine for squaring out, coating, charging, and sealing containers. The conveyor is of the intermittently acting type and the containers move forwardly with a step-by-step motion, halting only briefly between movements to give the partial folding mechanism opportunity to perform its stated functions while the container is stationary. While the details of the conveyor may be varied widely without departure from the invention, and need not be specifically described, it may be said that an essential feature of the conveyor is the container support 10, which is in the nature of an elongated horizontally disposed trackway, this trackway being vertically adjustable so that that conveyor can be utilized to transport containers of various heights, for instance occupying the position in which it is shown in full lines in Figure 3 when containers of quart

capacity are being processed, and occupying the position in which it is shown in dotted lines in this figure when containers of pint capacity are being processed.

For advancing containers intermittently in the manner described three conveyor chains are employed, portions of which are shown in the drawings, and indicated by the numerals 11, 12, and 13, respectively. Each conveyor chain carries a series of laterally projecting pusher elements 11', 12' and 13', respectively, three of which are adapted to engage the rear panel of the body portion of each of the several containers and to push these containers forwardly, the container bodies, however, being rather loosely engaged by the pushers instead of being tightly confined as heretofore. The body portion 14 of each container is square in transverse section and the upper end closure portion 15 of each container is likewise square in cross or horizontal section as the container approaches the folding mechanism, as indicated in Figure 8. The collapsible upper end of each container comprises a plurality of panels defined by scorings, such as indicated at 16 in Figures 8 and 9. The scorings 16 which define the boundaries of the interconnected relatively foldable panels of one part of the foldable container top, the corners of which part are indicated by the letters *a*, *b*, *c* and *d* in Figures 8 and 9, are so located that, by the application of a folding finger, this previously flat area of the top closure may be collapsed, as shown in Figure 9.

In order to insure that the upper end portion of the side wall panel just below the section *a*, *b*, *c*, *d* of the top may be interiorly supported during the collapsing operation just mentioned a mandrel 17 must be inserted into the container body during the folding or collapsing operation and so positioned as to insure that its opposed parallel edges 17' are positioned immediately adjacent the scorings intermediate the collapsible panels and the container body, one such scoring extending from *a* to *d*. By reference to Figure 6 the mandrel and the folding fingers can be more readily perceived, the folding fingers being indicated by the numerals 18 and 19, respectively, the folding fingers being shown in dotted lines in their inoperative positions and in full lines in the extreme positions to which they are moved during the folding operations. The container, of course, includes an opposed top section which is exactly similar to the section defined by the letters *a*, *b*, *c* and *d* and hence the two folding fingers which perform the collapsing operations are identical in structure. These fingers and the precise manner in which they act upon the several panels of the container upper end closure are fully described in the Bennet patent previously referred to.

The mandrel and folding fingers, which comprise the container engaging portions of the partial folding mechanism are, of course, bodily movable from the positions in which they are shown in Figure 3, just above the open mouth of the container C^3, downwardly to the positions in which they are shown in Figure 6 and, after the completion of the partial folding operation, are again moved upwardly to the position of Figure 3, the solid mandrel 17 being withdrawn through the partially closed upper end of the container. The means for accomplishing this bodily movement of the folding elements, and for accomplishing their relative movements during the folding operation, will be now described.

A folding element carrier is indicated at 20 and the mandrel 17 is mounted on and supported by this carrier, a bracket member 21 being provided for this purpose, the upper end of the bracket being rigidly connected to the carrier 20 and the mandrel 17 being rigidly affixed to the lower end of the bracket. The opposed folding fingers 18 and 19 are mounted, respectively, upon the outer ends of folding finger supporting arms 24 and 25. These arms are horizontally disposed and are in parallelism. The inner end of each arm is provided with an enlargement as clearly shown in Figures 5 and 6, each enlargement being provided with a cylindrical recess to receive the cylindrical outer end of a short shaft, these shafts being indicated at 26 and 27, respectively, and being rotatably mounted in correspondingly shaped aligned recesses formed in the carrier 20. The enlargements 24' and 25' of the folding finger supporting arms are provided with kerfs extending inwardly to the recesses which receive the outer ends of the short shafts 26 and 27 and, by means of fastening elements such as screws or bolts bridging these kerfs (which appear in Figure 6), the frictional engagement of each enlargement with the shaft upon which it is mounted may be made as great as necessary. By releasing the securing devices, angular adjustment of each folding finger supporting arm about the axis of its supporting shaft may be effected.

A carrier supporting member is indicated at 31, this supporting member being vertically disposed and rectangular in horizontal section, its upper end entering a vertically extending similarly shaped recess in the carrier 20, the carrier being slidable on the supporting member, however, so that the carrier and member may move relatively to each other in a vertical direction. Normally the upper end surface of the supporting member, which is indicated at 31', is maintained in tight engagement with a transverse or bridging portion 20' of the carrier, a coiled compression spring 33 housed in a recess in the upper end of the carrier normally acting upwardly upon nut 34, which is tied to the upper end of the supporting member 31 by a stud 35, and downwardly upon the transversely extending bridging element 20' of the carrier. It will be perceived that upward sliding movement of the carrier relatively to the member 31 will result in compression of spring 33 and that, when the force tending to produce such relative movement is removed, spring 33 will act to restore contact between carrier portion 20' and the end surface 31' of the support.

Toward the upper end of the supporting member 31, and at a point within the slideway formed in the carrier 20 to receive it, the supporting member is horizontally cut away or grooved out to receive the horizontally extending web 36 of a rack member, this member carrying at its ends racks 37 and 38, respectively, the rack member with the toothed racks being movable vertically with the supporting member 31 at all times. The teeth of oppositely facing racks 37 and 38 mesh with the teeth of pinions 40 and 41 which are concentric and preferably integral with the short shafts 26 and 27, respectively, upon which the folding finger supporting arms, and the folding fingers, are carried. With this arrangement it follows that relative vertical movement of the carrier 20 and the carrier support 31 brings about rotation of shafts 26 and 27 and hence angular movement of arms 24 and 25 about the axes of shafts 26 and 27, and swinging movements of the

folding fingers toward or away from each other, depending upon the relative direction of relative movement of the carrier and supporting member.

Means is provided for bringing about such relative movement of the carrier and its support when the folding fingers have been lowered to operative position and this means comprises stops or abutments, indicated at 42 and 43, these stops being adjustably supported upon a portion of the frame, indicated at 44 in Figure 4, and being so located as to lie in the path of movement of hardened contact elements 45 and 46 mounted in the carrier member 20. The means for vertically reciprocating the support 31 causes this member to rise and fall in synchronism with the movements of the conveyor, elevating the carrier at the completion of each partial folding operation and lowering the carrier with the folding instrumentalities thereon as soon as a fresh container is placed in position to be operated on, the descending carrier striking the stops just described at the proper instant but the support continuing its downward movement for some further distance, spring 33 being compressed and pinions 40 and 41 being rotated during the continued downward movement of the racks 37 and 38, the folding fingers being thereby caused to swing on their operative oscillations. Return or upward movement of the supporting member 31 results in expansion of spring 33, which acts to thrust downwardly the carrier 20 with respect to the support 31 until the upper end surface 31' of the support is again in contact with portion 20' of the carrier, rotation of the folding fingers to inoperative positions occurring during this period. After end surface 31' strikes carrier portion 20' the carrier and support move upwardly together and the mandrel and folding fingers are lifted to inoperative positions simultaneously.

The means provided for effecting the vertical movements of the supporting member 31 may be varied, but in any event will be positioned below the elevation which is normally occupied by the mouth of each successive container being acted upon by the folding fingers. I prefer to employ, to effect the vertical movements of the supporting member 31, a cylindrical cam such as illustrated at 50, this cam being rotatable about a vertical axis and having a track 51 within which is located the cam follower 52 mounted upon a stud 53 which extends through an aperture formed in the supporting member. Cam 50 is fixed upon a vertically disposed shaft 54 mounted in suitable bearings 55 and 56 supported by the frame of the machine, the upper end of shaft 54 being provided with a gear 57 the teeth of which mesh with those of a mating gear 58 fixed upon drive or power shaft 59. With a driving mechanism such as that described rapid reciprocation of the supporting member 31 and speedy movements of the folding fingers may be effected in a comparatively noiseless manner and without substantial vibration.

During the time that each container is in the position indicated by the numeral C^3, and the folding instrumentalities are active, the body of the container is firmly clamped. Stationary guides 60 and 61 extend longitudinally of the conveyor and together comprise the stationary portion of the container centering and clamping mechanism. The movable portion of the clamping mechanism includes the clamping plate 62 provided with horizontally extending container engaging ribs 62', 62^2, and 62^3, the upper and lower ribs being horizontally opposite the upper

and lower guides 60 and 61 respectively and the intermediate ribs 62' being substantially opposed to the conveyor chain 11. All three of the ribs will be effective to clamp and center a container in the event that the container is relatively tall, such for instance as that shown in Figure 3, the upper two ribs will be effective in the event that pint instead of quart containers are passed through the machine, and the uppermost rib 62', with the opposing member 60, will be effective to center and clamp even the shortest container.

The clamping plate 62 is fixed on the end of a horizontally disposed reciprocatable rod 63 which is slidably supported in a bore formed in portion 64 of the machine frame. Adjustably clamped on rod 63 is a collar 65 and this collar comprises the adjustable abutment of a coiled compression spring 66 the opposite end of which is seated in a cylindrical recess formed in the casing part 64. The opposite end of the reciprocatable rod 63 is slotted, as at 63', to receive one arm of a lever 67 which extends through a slot 68 formed in a projecting portion of the frame part 64, a pivot 69 passing through the frame portion and through the lever 67, mounting this lever for pivotal movement about a vertical axis intermediate its ends. As shown in Figure 1, the end of lever 67 which is remote from rod 63 is provided with a roller 70 this roller lying in the plane of a cam 71 fixed upon the shaft 59 previously referred to. Spring 66 normally acts upon rod 63 in such direction as to cause this rod to rotate lever 67 in a counterclockwise direction (Figure 1), the roller 70 being thus maintained in contact with cam 71 at all times. Cam 71 is so shaped, however, that it will cause rocking movement of lever 67, and retraction of rod 63, whenever it is desired to release a container which has been acted upon by the folding instrumentalities of the mechanism, the spring returning the clamping plate to clamping position, however, to center and secure a container body, as soon as a partially folded container body has been removed and a fresh one positioned to be acted upon.

In carrying out the invention minor changes may, of course be readily made and the design and arrangement of the component elements of the mechanism modified to suit varying circumstances, all without departure from the teaching of the invention.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. Apparatus for partially folding the foldable end closures of paper containers comprising, in combination, means for supporting a container with its foldable end in a predetermined position to be acted upon, two container end folding elements, and mechanism for moving said elements into position to act upon the foldable end of a container so supported, causing said elements to move relatively to each other to effect the folding of the container end, and thereafter removing the same from the proximity of the container end, said mechanism including a power driven actuating part located at all times below the position occupied by a container end when such end is being folded, a member operatively connected to and extending upwardly from said part, a carrier mounted upon said member for limited movement relatively thereto, means mounting said elements on said carrier whereby both move bodily with the carrier and are relatively movable with respect to each other, a connection between one element and said member whereby said element is actuated when said carrier is caused to move relatively to said member, a stop for limiting the movement of said carrier and causing relative movement of the carrier and member when the carrier reaches a predetermined point in its downward travel, and means for restoring the carrier to its original position on said member when said member moves upwardly.

2. The combination set forth in claim 1 in which one of said elements comprises a container entering mandrel and the second element comprises a folding finger adapted to press against and inwardly deflect portion of the foldable end of the container.

3. The combination set forth in claim 1 in which one of said elements is connected to a pinion, said pinion being rotatably supported by the carrier, said member being provided with a rack the teeth of which mesh with those of the pinion, whereby relative movement of the carrier and member causes rotation of the pinion and actuation of the connected element.

4. The combination set forth in claim 1 in which said means comprises a spring one end of which bears on the carrier and the other end on the said member.

5. Apparatus for partially folding the foldable upper end closure portions of paper containers, comprising, a solid mandrel and a folding finger, means for introducing the mandrel into a container and withdrawing the same therefrom after the end has been partially folded, and means for momentarily clamping the container body while the mandrel is being withdrawn and thereafter promptly releasing the same.

6. Apparatus for partially folding the foldable upper end closure portions of paper containers comprising, a solid mandrel and a folding finger, means for introducing the mandrel into a container, and withdrawing the same therefrom after the end has been partially folded, container clamping means for momentarily clamping and holding a container body while the mandrel is being withdrawn and thereafter promptly releasing the same, and mechanism for actuating said container clamping means and mandrel in synchronism.

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