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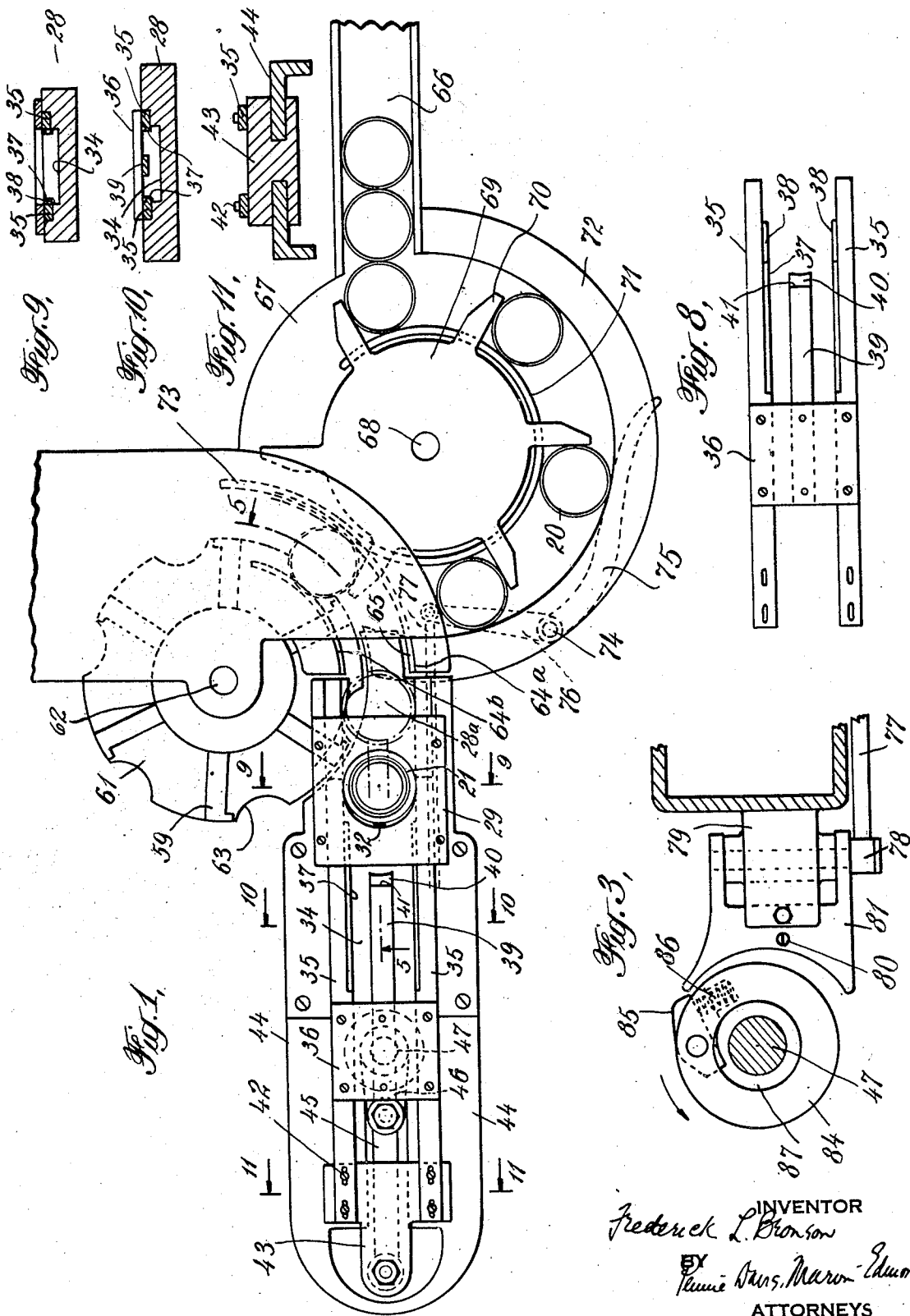
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2,309,929

APPARATUS FOR APPLYING CAPS TO CONTAINERS

Filed Nov. 7, 1939

4 Sheets-Sheet 1



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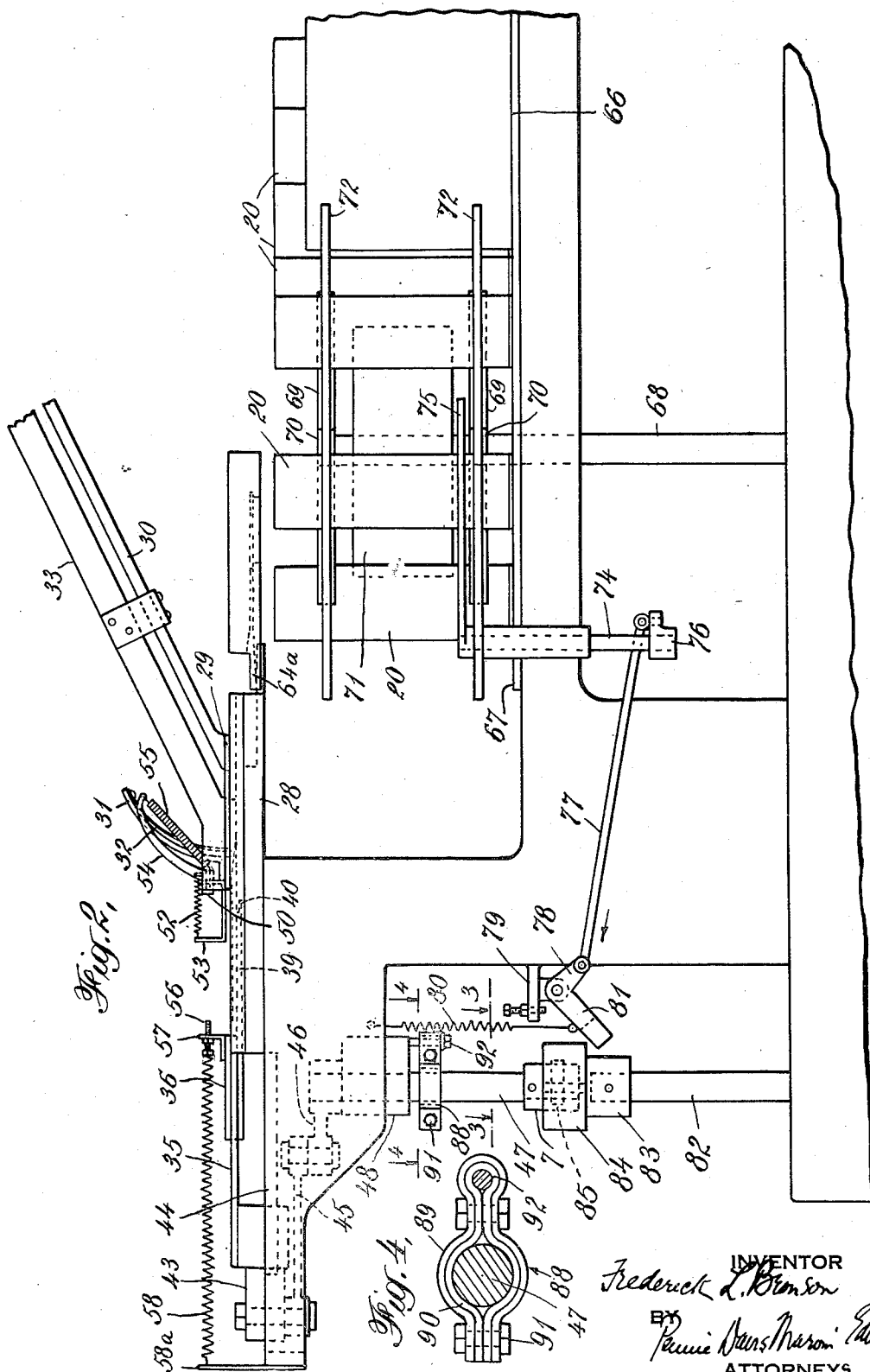
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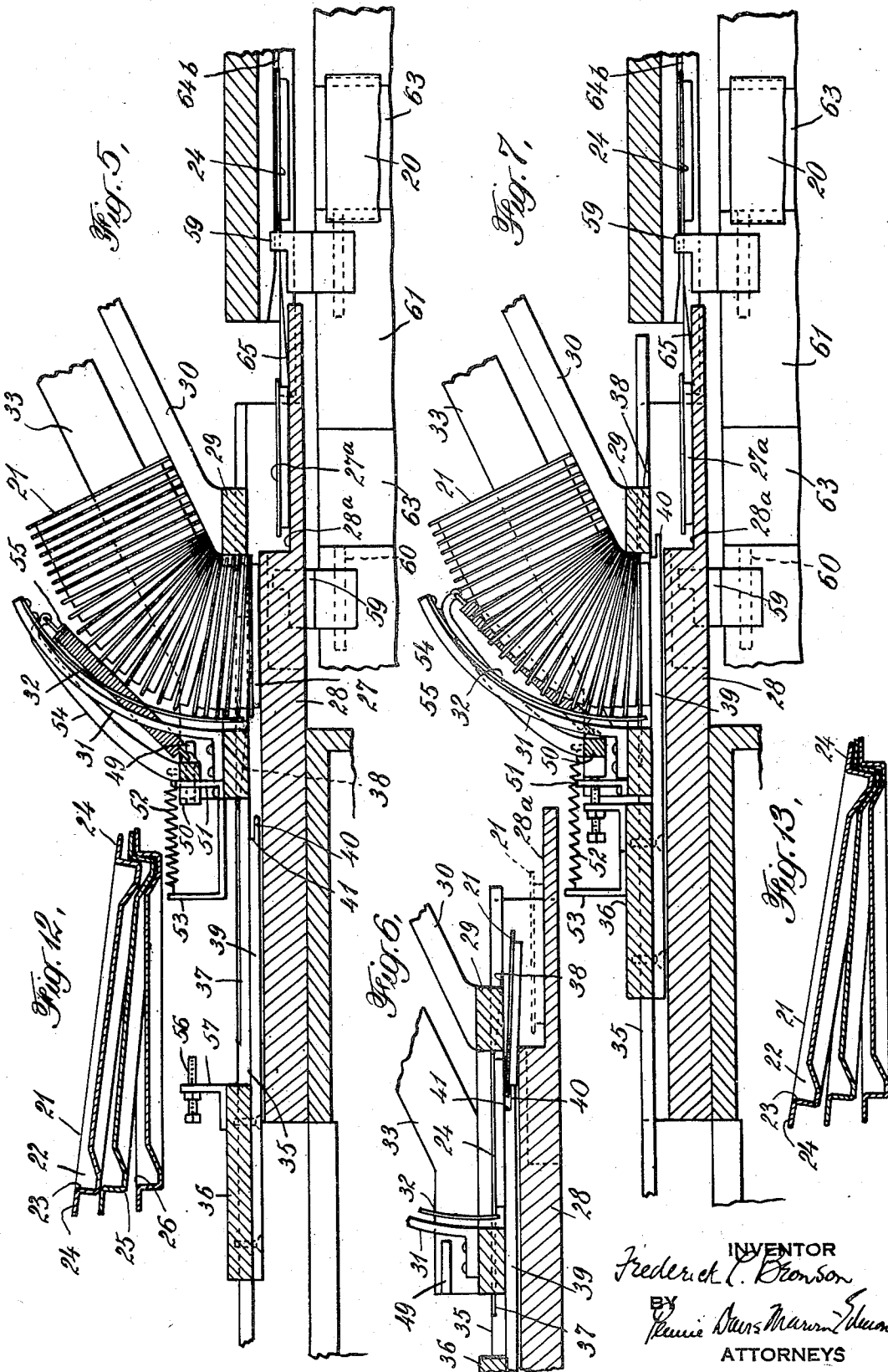
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Fig. 14,

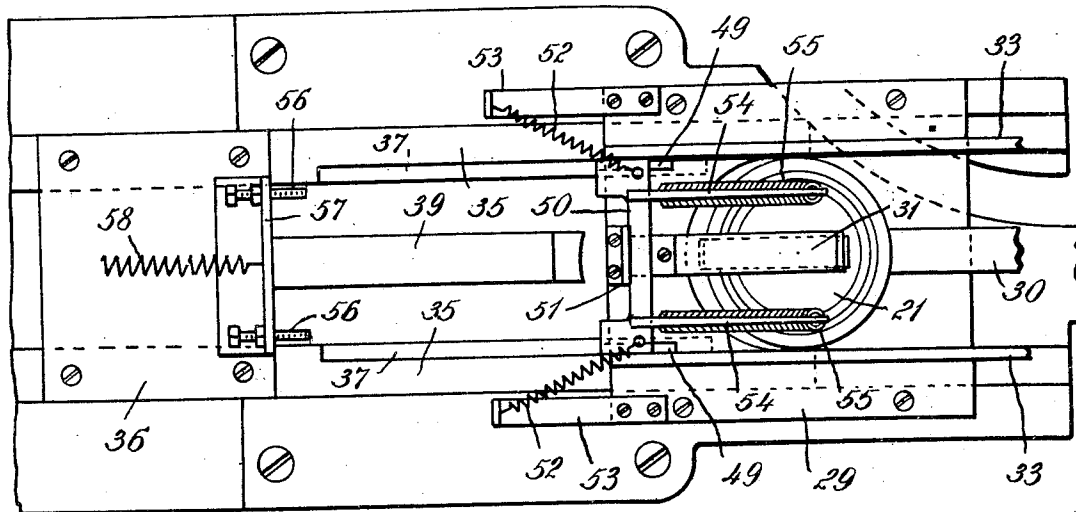


Fig. 15,

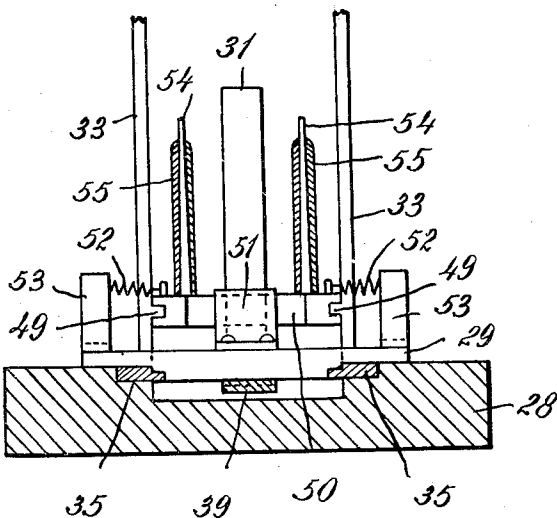
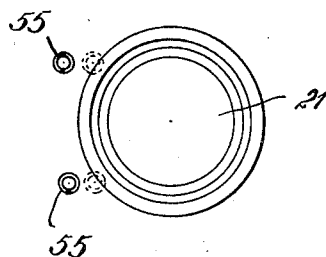


Fig. 16,



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APPARATUS FOR APPLYING CAPS TO CONTAINERS

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6 Claims. (Cl. 226—88.1)

This invention relates to the closing of the ends of containers which include a body of cylindrical or other form and end caps which have depressions entering the ends of the body and fitting snugly against the inner surface thereof. Since the depressions of such caps are of substantially uniform outer diameter from end to end, the caps will not nest together and when the caps are piled one upon another in a vertical stack in the usual manner, in order that they may be fed successively therefrom, they have a tendency to become jammed together and that interferes with the operation of the feeding mechanism.

The present invention is directed to the provision of a novel apparatus by which caps of the type mentioned, that is, caps having depressions of substantially uniform outer diameter, may be readily fed from a stack to mechanism by which the caps may be applied to the container body. The new apparatus permits operation at a high output rate without any considerable interruption because of jams.

The machine of the invention may be employed in connection with containers of various sorts, but, for purposes of explanation, an embodiment of the principles of the invention suitable for the closing of containers for lubricating oils will be illustrated and described in detail. One such container invented by me comprises a body formed of a strip of paper wound convolutely to cylindrical form, the body being lined with a material which is impervious to oil and the convolutions of the body being secured together by adhesive material appropriate for the purpose. At its ends, the body is closed by metal end caps, each of which has a deep channel inward from its rim with the outer wall of the channel normal to the plane of the cap and of a diameter permitting the channeled portion to enter the end of the body with a snug fit. To secure the cap in place, it is inserted in the body and the margin of the cap is then turned down and crimped against the outer surface of the body. Preferably, the inner surface of the body adjacent the end is given a coating of a sealing material before the cap is inserted and a similar coating may be applied to the outer surface of the body, if desired.

Machines are now available for inserting caps in such containers and crimping them in place and in such machines, the caps are supplied in the form of a stack. The bottom caps in the stack are then successively withdrawn and delivered to a station, to which containers are delivered by

a suitable mechanism, the caps and containers lying in alignment at the station. Insertion of a cap into each container may then be accomplished by raising the container while the cap is held stationary, after which the crimping may be done at a succeeding station by conventional devices.

The capping machine described is generally satisfactory but cannot be operated at a desirable output rate for applying the caps of the containers above referred to. The reason for this is that, since the depressed portions of the caps are to fit snugly within the containers, these portions are cylindrical, and hence, when the caps are stacked, they do not nest. Instead, each cap is supported by contact of the lower outer edge of its depressed portion with the inner edge of the rim of the cap beneath and with such limited contact, the caps become displaced and offset in the stack. As a result, the mechanism by which the bottom caps are removed from the stack does not work well and the caps do not feed regularly to that mechanism. The machine accordingly operates with numerous interruptions caused by jamming of the caps, and its output rate is low.

The machine of the present invention makes it possible to feed caps of the type described rapidly and regularly to the crimping station in alignment with the containers to be capped. In the new machine, the caps are supplied in the form of a stack with the bottom cap resting on a horizontal support. The stack extends vertically for a short distance and then turns to lie at an angle to the vertical, the caps in the inclined portion of the stack resting on their edges on a sloping support. With this arrangement, the caps in that part of the stack extending from the horizontal support through the turn nest together along one edge and fan out, but such nesting does not cause the caps to be tightly wedged or jammed together because only part of the weight of the caps in the sloping portion of the support is borne by the nested caps.

At one side of the stack is a feeding device which in one form, may include a moving member having parts by which the caps above the bottom one are periodically lifted free from the latter, after which the bottom cap is advanced by the member to conveying means which transfer it to the crimping station. On the return movement of the member, the stack moves down so that the bottom cap again rests on the horizontal support ready for the next operation of the device. In their operation, the lifting parts cause

a displacement of certain of the caps, but since the caps are not tightly wedged or jammed together, the shifting of the caps in the feeding operation does not result in the production of jams which would prevent the caps from being freely fed.

For a better understanding of the invention, reference may be made to the accompanying drawings in which:

Fig. 1 is a plan view of the new machine with parts removed;

Fig. 2 is a view of the machine in side elevation with parts omitted;

Figs. 3 and 4 are sectional views, with parts omitted, on the lines 3—3 and 4—4, respectively, of Fig. 2;

Fig. 5 is a developed sectional view on the line 5—5 of Fig. 1;

Fig. 6 is a fragmentary sectional view similar to Fig. 5 but with parts omitted and others in different positions;

Fig. 7 is a view similar to Fig. 5, showing the parts in different positions;

Fig. 8 is a plan view of the feeding slide;

Figs. 9, 10, and 11 are sectional views on the lines 9—9, 10—10, and 11—11, respectively, of Fig. 1;

Figs. 12 and 13 are sectional views of the bottom caps in the stack showing their different positions during the operation of the machine;

Fig. 14 is a plan view on an enlarged scale of certain parts of the machine;

Fig. 15 is a sectional view on the line 15—15 of Fig. 14; and

Fig. 16 is a diagrammatic plan view illustrating the action of certain parts of the mechanism.

In the operation of the new machine, the non-nesting caps are arranged in a stack in which the caps near the lower end are caused to lie with their edges close together at one side of each cap and with their edges at the opposite side spread apart, so that the caps referred to are fanned out and have their edges at one side of the stack spaced apart a substantial distance. The caps in the stack above those thus fanned out are supported on their edges on a surface which is preferably sloping, so that as caps are removed from the bottom of the stack, those above will move down by gravity. Removal of bottom caps successively from the stack is then effected by raising all the caps above the bottom one, after which the latter is shifted laterally from its original position. Thereafter the stack is lowered and yielding pressure is preferably applied to the caps in the lower portion of the stack to insure their partial nesting along one side and thus produce the fanning out mentioned.

The machine illustrated in the drawings is intended for use in capping containers consisting of a cylindrical body 20 and top and bottom end caps 21 ordinarily made of sheet metal. Each cap is formed with an annular depression 22 in its outer surface and the outer wall 23 of the depression is of cylindrical shape so that it will fit snugly into the end of the body in close contact with the inner surface thereof. Beyond the depression, the cap is formed with a flat flange 24 which is adapted to be crimped down over the end edge of the body and against the outer wall thereof.

Since the outer wall of the depression of the caps described is of substantially cylindrical formation, it will be apparent that these caps cannot nest together all around and when they are placed one upon the other, the bottom edge 25

of the outer cylindrical wall of the depression of one cap rests upon the inner edge 26 of the flange of the cap beneath. Because of the limited contact between the two caps, the caps are easily displaced laterally and if they were to be supplied to a feeding mechanism in the form of a vertical stack, their tendency to be laterally displaced would cause them to jam in any guideway for holding the stack in position.

In the new machine, the caps are supplied in a stack with the bottom cap 27 resting upon the upper surface of a horizontal support 28. Above the support 28 is a plate 29 having an opening through which the stack extends, and projecting upwardly at an angle from the top of the plate at one side of the opening is a support 30. The caps directly above the bottom cap are displaced laterally (to the left in Fig. 5) so that along one edge, the annular depression in each cap above the bottom one slips down into the depression in the cap next beneath, and the caps have this relation through the turn and for a slight distance up the sloping support 30. While caps supported in this manner may be fed for considerable periods without interruption, it may be desirable in some instances to provide additional means for preventing jams and for this purpose, a curved arm 31 is secured to the top of the plate 29 at the side of the stack opening opposite to that from which the support leads. A spring member 32 is attached to the inner face of the upper end of the arm and extends down in the opening through the plate. The position of the spring member is such that the edges of the nested caps directly above the horizontal support make contact with the member while their opposite edges lie out of contact with the vertical wall of the opening through the plate. The spring member resists too great lateral displacement of the caps and tends to hold them against becoming nested too deeply.

The support 28 is provided with a central channel 34 in its upper face (Fig. 9), and this channel is formed with recesses in its lateral faces near the top thereof in which are received lifting members 35 connected by a plate 36. Each lifting member is provided with a rib 37 projecting inwardly along the lower edge thereof, the rib terminating in a wedge-shaped forward end 38. The ribs are so spaced that, upon advance of the lifting members, the ribs will pass under and engage the under surface of the flange 24 of the cap next above the bottom in the stack.

Extending forward from the under surface of the plate 36 is a feeding member 39 which lies between the lifting members 35, the forward end 40 of the feeding member being reduced in thickness and terminating at a vertical shoulder 41. The length of the thin end 40 of the feeding member is slightly greater than the width of a flange 24 on a cap, and the feeding member is so positioned that when the feeding member is advanced, the front end thereof will engage the side wall of the depression in the bottom cap in the stack. The feeding member is considerably shorter than the lifting members, the shoulder 41 lying to the rear of the wedge-shaped ends 38 of ribs 37.

The lifting members, connecting plate, and feeding member together constitute a feed slide which is reciprocated during operation of the machine. For this purpose, the lifting members are connected by slot and bolt connections 42 to a block 43 which has slots in its opposite vertical faces in which are received the edges of suitable

supporting and guiding members 44. The block is connected by a bolt to a link 45 which is in turn connected to a crank 46 on a vertical shaft 47 mounted in suitable bearings 48. On rotation of this shaft, the crank and link function to reciprocate the block and the feed slide.

In the forward movement of the slide, the wedge-shaped ends 38 of the ribs 37 pass over the bottom cap 27 in the stack and engage the under surface of the flange 24 of the cap next above. As the slide continues to advance, the cap thus engaged is raised by the wedging action of the ends 38 and, in its upward displacement, the caps immediately above it become fitted closely together along one edge, as indicated in Fig. 13. In this action, the caps are displaced laterally against the action of the spring member 32 and their displacement is consequently controlled by the latter so that they retain their relative positions and cannot become jammed. When the slide has advanced to a point at which the flange of the cap next above the bottom is resting on the flat upper surfaces of the ribs 37, the bottom cap 27 is free and it is then engaged by the end of the feed member 39 and moved from beneath the stack. Just beyond the bottom of the stack the support 28 is of decreased thickness, as indicated at 28a, and the advancing feed member moves the bottom cap forward from the higher level of the support to the lower level.

In some cases, it may be desirable to provide additional means to prevent the caps in the stack from becoming jammed or wedged together, so that they will not feed properly and for this purpose, the inner faces of the side rails 33 are provided with horizontal ribs 49 which enter channels in the sides of a slide 50. The slide is normally held against a stop 51 extending upward from the plate 29 by springs 52 which are connected to pins on the slide and to other pins secured to extensions 53 from the plate 29. Projecting upward from the slide and lying on opposite sides of the curved arm 31 are curved arms 54. Each arm 54 carries a spring 55 connected to its ends and extending across the concavity of the arm. The slide 50 is moved away from the stop by being engaged by adjustable stops 56 on the feed slide, each stop consisting of a bolt threaded through a bracket 57 attached to the plate 36 of the feed slide. As the feed slide advances, the engagement of the stop 56 with slide 50 causes the latter to move forward until the springs 55 engage the edges of the caps 21 in the stack, as illustrated in Fig. 16. Springs 55 are relatively taut and their engagement with the stacked caps causes the caps to be shifted so that jams are broken up. When the feed slide is returned, the slide 50 is moved back against the stop 51 by springs 52, and when it is in that position, the springs 55 are out of contact with the edges of the caps.

The return movement of the feed slide may be effected by the shaft 47 through crank 46 and the associated parts previously described, but if desired, the return movement of the feed slide may be accelerated. For this purpose, a spring 58 is attached at one end to the bracket 57 on plate 36 and at the other end to a post 58a extending upward from the supporting and guiding members 44. When such a spring is employed, shaft 47 will be driven through a clutch which will permit shaft 47 to overrun the driving means therefor, so that the spring 56 may hasten the return movement of the feed slide.

To the rear of the thinner portion of the sup-

port 28 and beneath the higher level thereof, the support is cut away to permit the passage of radial arms 59 pivoted on pins 60 in recesses in the upper end of a drum 61 mounted on a vertical shaft 62, the drum being formed with curved recesses 63 in its outer surface. As the shaft 62 rotates each arm is brought to a position in which it engages the cap 27a on the lower level 28a of the support and advances the cap to spaced guides 64a, 64b which lead way from the surface 28a along a curved path concentric with the axis of shaft 62. The forward ends of the upper surfaces of these guides incline upwardly from the upper surface of the support 28a as indicated at 65, and the guides are spaced apart a distance such that they engage the under surface of the flange 24 of a cap being advanced by an arm 59.

The can bodies are supplied by being moved on their ends along a guideway 66 and this guideway leads to a curved plate 67 through which extends a shaft 68 on which are mounted plates 69 provided with aligned radial arms 70. As each can body moves into the path of travel of the arms 70, it is engaged by a pair of the arms and moved along the plate 67 between inner and outer guide rails 71, 72. The path of travel of the can bodies is such that they are advanced by the arms to a position in which they enter the curved recesses 63 in the drum 61 on the shaft 62 to be carried along the curved end 73 of guide rail 71 with the drum. Each can body in a recess 63 in the drum lies directly beneath a cap being moved along the curved guides 64a, 64b by an arm 59 and the cap and body are thus brought into alignment and advanced to a crimping station where the cap is seated in the body and the flange of the cap crimped in position. The mechanisms for inserting the cap in place and crimping on the flange are of conventional construction and form no part of the present invention.

In order to insure that the feed mechanism will not feed a cap if a can body is missing from the series being advanced by the arms 70, a vertical shaft 74 is mounted adjacent the path of travel of the bodies with the arms 70, and the shaft is provided with a crank 75 which may be swung into the path of the bodies. The shaft is also provided with a collar 76 connected by a link 77 to one arm of a bell crank lever 78 which is pivotally mounted on a bracket 79 attached to a suitable part of the mechanism. A spring 80, attached to the other arm 81 of the bell crank lever, tends to swing the lever in a clockwise direction so that the crank 75 will be moved inwardly into the path of the advancing can bodies. So long as there is a body in position in front of each pair of arms 70, the crank is held outward by the bodies against the action of the spring, but whenever a body is missing from the series, the crank may be moved inwardly by the spring and the bell crank lever swung clockwise at the same time.

The shaft 47 driving the feed mechanism is in turn driven by a continuously rotating shaft 82 provided with a collar 83 on its upper end. Attached to the collar is a clutch member 84 containing a pawl 85 normally pressed inward by a spring 86. In its inner position, the inner end of the pawl enters a recess in a collar 87 fast on a shaft 47, so that a driving connection is established between shaft 47 and shaft 82. The arm 81 of the bell crank has a bifurcated end so formed that when the bell crank is swung clockwise by spring 80, the end of the arm 81

lies in the path of the projecting outer end of the pawl 85 and causes the pawl to be swung so that its inner end is released from the notch in the collar 87. The driving connection between shafts 82 and 47 is thus broken and shaft 47 is brought quickly to rest by a continuously acting brake 88 consisting of a strap 89 provided with a friction lining 90 held in contact with shaft 47 by bolts 91, the brake being secured against rotation of the shaft by means of bolt 92 attached to a suitable part of the mechanism.

In the new feeding mechanism, the greater part of the caps in the stack rest on their edge flanges on the sloping support which takes a large part of their weight. The caps in the vertical portion of the stack and through the turn are displaceable laterally relatively to one another and this displacement is resisted and controlled by the resilient member 32, when the latter is used. Also, the second slide with its coiled springs may be used, if desired to restore any caps which have become displaced so far that a jam might develop. By fanning out the stack as described, the feeding of the bottom member from the stack may be carried on rapidly and without interruption and the new feed mechanism thus makes possible the rapid and regular supply to a crimping station of caps of a construction which could not previously be fed at a high speed except with repeated interruptions.

I claim:

1. In apparatus for feeding caps, the combination of a support for a stack of caps, resilient means spaced from the support, certain of the caps in the stack having their edges in engagement with the support and others having their edges engaging the resilient means, a second support on which the bottom cap in the stack rests, means operable to engage the cap next to the bottom in the stack and to displace said cap and adjacent higher caps to free the bottom cap, means for moving the bottom cap, after being thus freed, from beneath the stack, and means operable upon each action of said displacing and feeding means to engage caps in the stack above the bottom cap and separate such of said caps as may be jammed together.

2. In apparatus for feeding caps, the combination of a support for a stack of caps, resilient means spaced from the support, certain of the caps in the stack having their edges in engagement with the support and others having their edges engaging the resilient means, a second support on which the bottom cap in the stack rests, means operable to engage the cap next to the bottom in the stack and to displace said cap and adjacent higher caps to free the bottom cap, and means operating after displacement of said caps to engage and move the bottom cap, after being thus freed, from beneath the stack, and resilient means operable upon each action of said displacing and feeding means to engage caps in the stack above the bottom cap and separate such of said caps as may be jammed together.

3. In apparatus for applying caps to containers, the combination of a support on which rests the bottom cap of a stack, a second support lying above and at an angle to the first, the stack making a turn above the first support and the second support being engaged by caps resting on their edges, means operable to engage the cap next to the bottom in the stack and to displace said cap and adjacent higher caps to free the

bottom cap, means operable after displacement of said caps to engage and move the bottom cap, after being thus freed, from beneath the stack, and means operable after each action of the engaging and moving means to engage the edges of caps in the stack above the bottom cap and separate such of said caps as may be jammed together.

4. In apparatus for applying caps to containers, the combination of a support on which rests the bottom cap of a stack, a second support lying above and at an angle to the first, the stack making a turn above the first support and the second support being engaged by caps resting on their edges, means operable to engage the cap next to the bottom in the stack and to displace said cap and adjacent higher caps to free the bottom cap, means operable after displacement of said caps to engage and move the bottom cap, after being thus freed, from beneath the stack, and resilient means operating after operation of said moving means to engage the edges of caps in the stack above the bottom cap and separate such caps as may have become jammed.

5. In apparatus for feeding caps from a stack, the combination of a support on which rests the bottom cap of the stack, a second support extending upwardly from the first support at an angle, certain of the caps in the stack resting on their edges on the second support and the caps fanning out above the bottom cap in the stack, means disposed at the opposite side of the stack from the second support and engaging the edges of certain of the caps in the stack to prevent their displacement, means operable from the side of the stack opposite to that on which the second support lies to engage the cap next to the bottom in the stack and to displace said cap and adjacent caps above it to free the bottom cap, means operating after displacement of said caps to engage the freed bottom cap and to advance it positively from beneath the stack, and means acting after displacement of the freed bottom cap to engage the edges of the caps remote from the second support with a yielding action to separate such of said caps as may have been jammed together.

6. In apparatus for feeding caps from a stack, the combination of a support on which rests the bottom cap of the stack, a second support extending upwardly from the first support at an angle, certain of the caps in the stack resting on their edges on the second support and the caps fanning out above the bottom cap in the stack, means disposed at the opposite side of the stack from the second support and engaging the edges of certain of the caps in the stack to prevent their displacement, means operable from the side of the stack opposite to that on which the second support lies to engage the cap next to the bottom in the stack and to displace said cap and adjacent caps above it to free the bottom cap, means operating after displacement of said caps to engage the freed bottom cap and to advance it positively from beneath the stack, and a slide carrying a pair of coiled springs movable into engagement with the edges of the caps remote from the second support to separate such caps as may have been jammed together, such slide being operable by said displacing and feeding means after displacement of the freed bottom cap.

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