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2,337,033

CLOSURE CAP FEEDING APPARATUS

Filed May 31, 1940

3 Sheets-Sheet 1

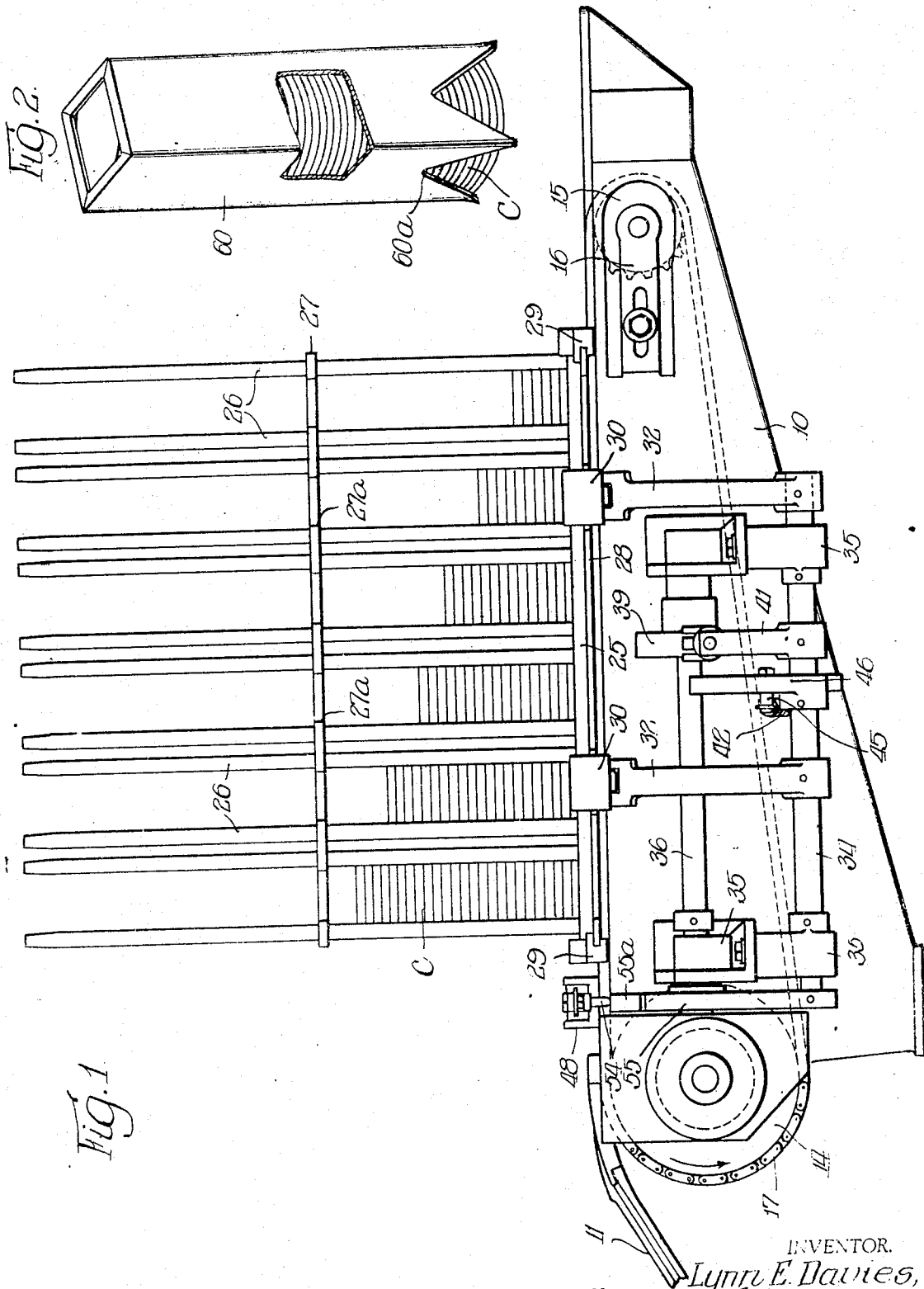


Fig. 1

Fig. 2

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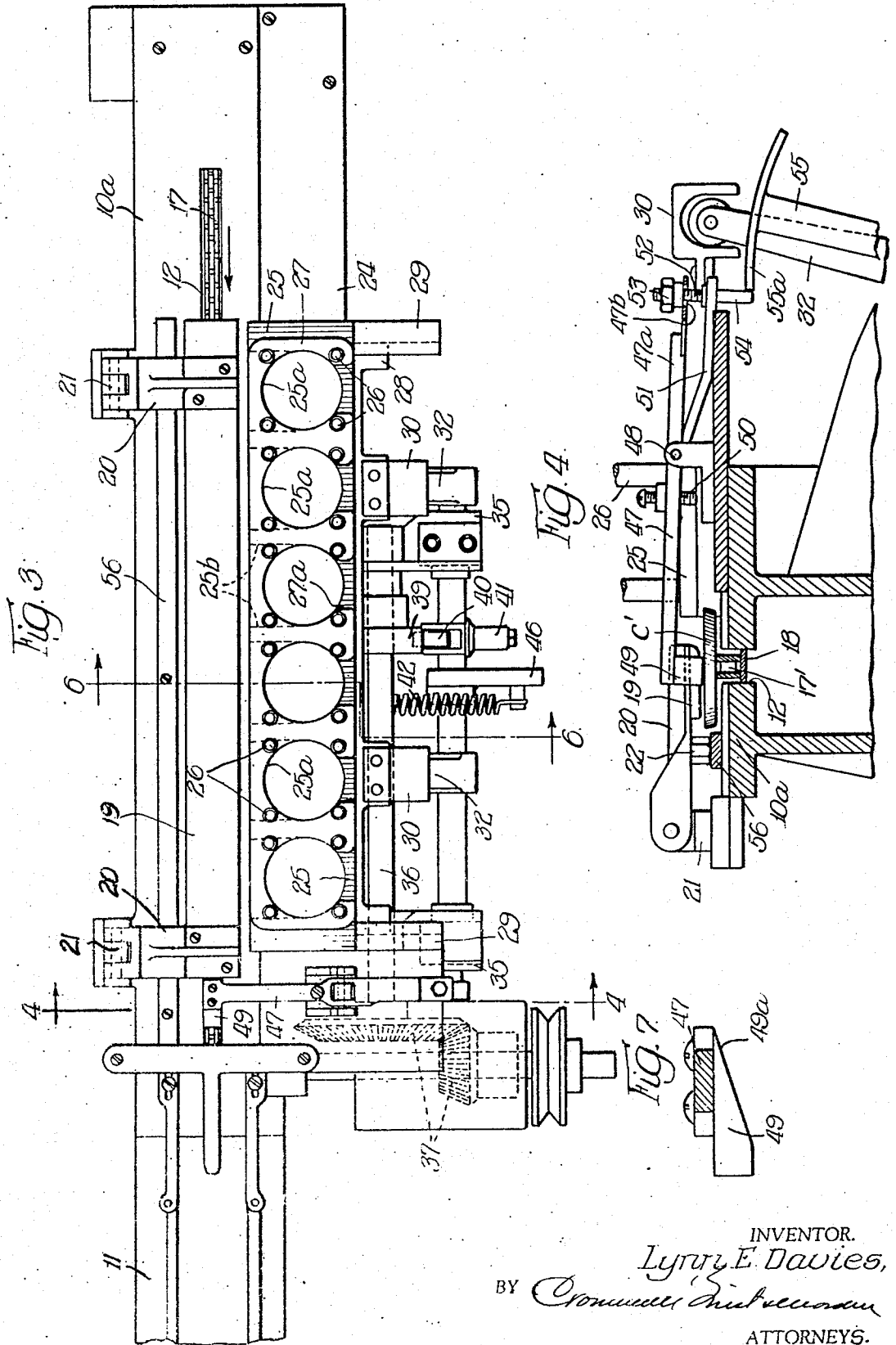
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CLOSURE CAP FEEDING APPARATUS

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3 Sheets-Sheet 2



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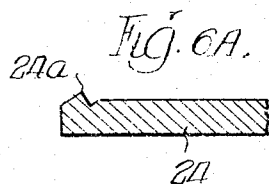
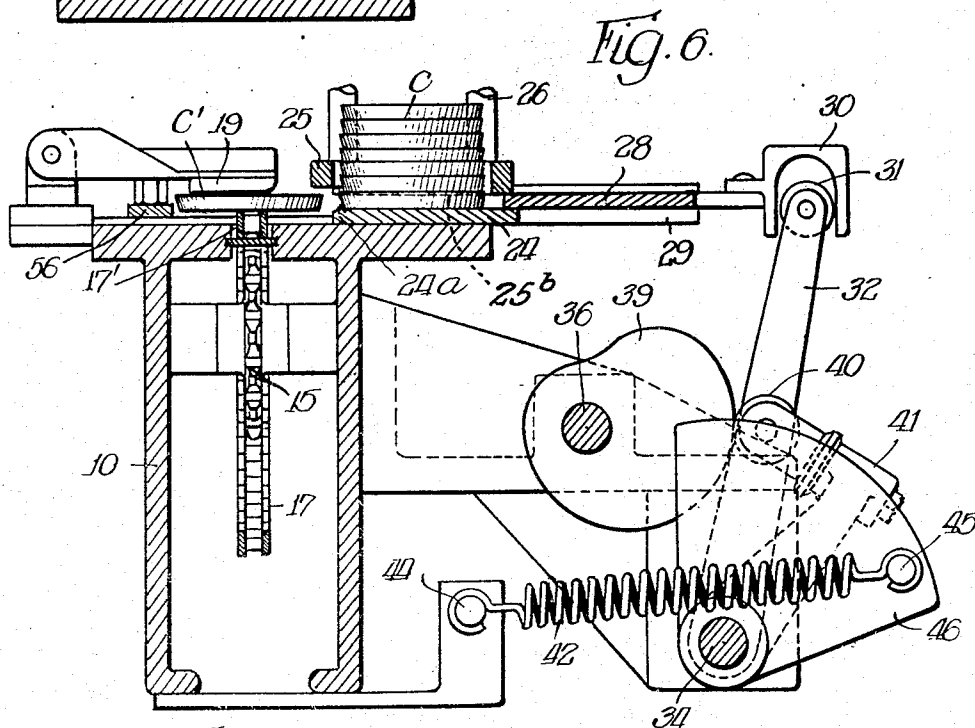
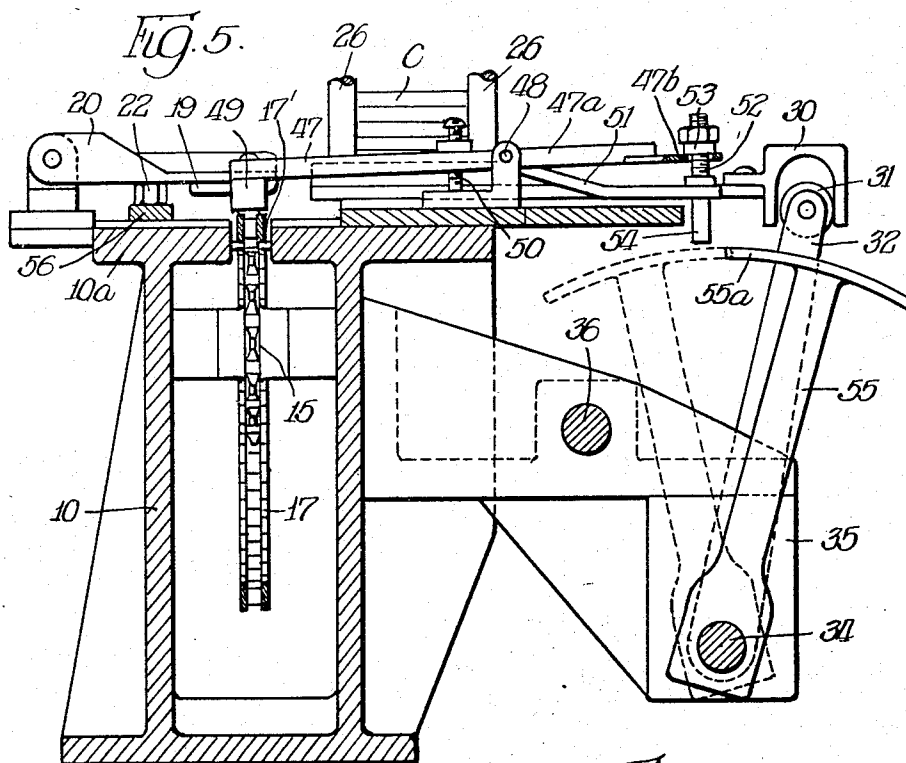
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CLOSURE CAP FEEDING APPARATUS

Filed May 31, 1940

3 Sheets-Sheet 3



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2,337,033

CLOSURE CAP FEEDING APPARATUS

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Application May 31, 1940, Serial No. 338,101

13 Claims. (Cl. 226—88.1)

This invention relates to apparatus for applying closure caps to packing vessels such as jars, cans, bottles or the like, and pertains particularly to automatically operating means for feeding closures simultaneously from a plurality of stacks in proper arrangement and disposal for application to a plurality of packing vessels or for movement to position where they may be applied to packing vessels.

A general object of the invention is the provision of such apparatus which is simple in character, which may be applied to capping machinery of various kinds, which will operate with certainty and speed and with consumption of but little power, which may be adapted to caps of various sizes, which may be easily filled with caps, which will operate to feed from one or any number of stacks of caps within its stack capacity, which is adapted to prevent jamming and mutilation of caps, and which is entirely safe and fool-proof.

Other objects of the invention will be pointed out or indicated hereinafter or will be apparent to one skilled in the art upon an understanding of the invention or its employment in actual use.

For the purpose of aiding in an explanation of the invention, I show in the accompanying drawings forming a part of this specification, and hereinafter describe, one embodiment of it which has proved quite successful in practice. It is to be understood, however, that this is presented merely by way of illustration and is not to be construed in any fashion for the purpose of limiting the appended claims short of the true and most comprehensive scope of the invention in the art.

In said drawings,

Fig. 1 is a side elevational view of a machine embodying my invention;

Fig. 2 is a perspective view of one of the stacking tubes which is utilized for charging the machine with stacks of caps;

Fig. 3 is a top or plan view of the machine shown in Fig. 1;

Fig. 4 is a transverse sectional view on approximately line 4—4 of Fig. 3 but on a larger scale than Fig. 3;

Fig. 5 is a sectional view on line 4—4 of Fig. 3 but showing the parts in a relationship different from that of Fig. 4;

Fig. 6 is a transverse sectional view on approximately line 6—6 of Fig. 3, and Fig. 6A is an enlarged detail of same; and

Fig. 7 is a side elevational view of the detecting foot of the interlocking device.

There are various types of capping machines or closure applying machines in which the caps or closures are fed from the bottom of a stack or stacks for application to the vessels, and the present invention is adapted for use with various different types of such apparatus. One type of capping apparatus to which the present invention is applicable is that shown in the patents to W. P. White Nos. 1,920,539 and 2,011,891, in which type the closures are fed in a series, one after another, to the capping station where they are applied one by one to respective vessels which are moved past the capping station in a series, and it is in connection with that type of capping machine that I will now describe the embodiment of the invention which is illustrated in the drawings.

The present machine comprises a foundation casting or body frame 10 on which the various operating parts are mounted, which frame is adapted to be mounted in association with the upper end of a sloping runway or cap chute 11 forming a part of the capping machine, which chute leads to the cap applying station past which the vessels are moved to receive the closures.

The frame has a top plate portion 10a adapted to occupy an approximately horizontal position, and this top plate portion is provided with a longitudinal slot 12 which extends nearly its entire length. Journaled on the frame are a pair of sprocket wheels 14 and 15, the latter being journaled in bearings which are carried on slides 16 which are adjustable longitudinally of the frame to move the sprocket wheel 15 toward or from the sprocket wheel 14. A sprocket chain 17 is entrained on the sprocket wheels 14 and 15, and the location of said wheels is such that in its upper flight, which runs approximately horizontal and parallel with the top plate 10a, it will travel in the slot 12 but project slightly above the upper surface of the plate 10a, substantially as illustrated at 17' in Figs. 4, 5 and 6, being supported in that position, intermediate the sprocket wheels, by a bar 18 upon which the upper flight rides.

A top guide bar or hold-down strip 19 is carried on arms 20 which are hinged on brackets 21 in such relationship that said top guide bar 19, when in its inward or lowered position, is over the slot 12 and sprocket chain, being maintained at a suitable elevation thereabove by adjustable stop members 22 upon which the arms 20 come to rest.

Upon the top plate 10a, at one side of the slot 12, is mounted the cap rest 24 which is in the

nature of a hardened plate having a smooth upper surface disposed in a horizontal plane, and rigidly mounted on the frame, but spaced above this plate 24, is the stack rack which comprises an apertured bottom plate 25, the apertures 25a of which are of a form and size to accommodate passage of the closures or caps for which the device is designed, and rigidly upstanding posts or rods 26 disposed in such relationship to retain stacks of the intended caps in vertical positions concentric with the respective apertures. These rods are braced in position by a plate 27 apertured to permit the caps to pass and having parts between the posts notched out into the apertures as indicated at 27a. As seen in Fig. 3, this stack rack extends horizontally along and adjacent the inward margin of the hold-down bar 19 when the latter is in its lowered or operative position as shown in said figure.

Movably supported in position to slide upon the upper surface of the cap plate 24 and to move across it below the rack plate 25, is a pusher bar 28. This pusher bar is supported and guided in grooved guide members 29 which are rigidly affixed to the frame 10, and at its outward side it carries yoke members 30 which embrace rollers 31 that are carried on the upper ends of arms 32. These arms are keyed to a rocking shaft 34 which is journaled in brackets 35 extending from the frame 10.

Also journaled on the frame is an operating shaft 36 which is rotated continuously through the medium of suitable driving mechanism 37 which is actuated from a suitable source of power. The drive shaft 36 carries a cam 39 upon the periphery of which rides a roller 40 carried on a rocker arm 41 which is fixed rigidly on the rocker shaft 34. Said roller 40 is journaled in bearings which are adjustable angularly relative to the arm 41. A spring 42 is anchored at one end to the frame at 44 and at the other end at 45 to a crank member 46 which is fixed to the rocker shaft 34, the relationship being such that the spring 42 acts constantly in a direction to rotate the shaft 34 and swing the pusher arms 32 inwardly or toward the stack rack. Such movement of the rocker shaft 34 and arms 32 is controlled by the cam 39 through the medium of its cooperation with the roller 40, and rocking of shaft 34 in the opposite direction, viz., so as to swing the pusher arms 32 outwardly or away from the stack rack, is induced by the action of cam 39 on the roller 40 incident to rotation of shaft 36. Inward movement of the pusher arms 32 moves the pusher bar 28 inwardly between the cap plate 24 and rack plate 25 and toward the sprocket chain 17, and movement of the parts in this direction is induced entirely by the spring 42, wherefore the parts may be stopped at any intermediate position in the course of their inward movement. The vertical clearance between the rack plate 25 and cap plate 24 is slightly less than the height of the closure cap for which the device is designed, excepting in an area at each stack between the apertures 25a and the inner margin of plate 25 corresponding to that defined by the dotted lines 25b in Fig. 3, in which areas the clearance is slightly greater than the height of the closure cap, this providing guide ledges along lines 25b which keep juxtaposed caps apart from each other. The thickness of the pusher bar 28 is such as to permit its moving inwardly across plate 25 but prevents caps which are seated upon it from dropping completely out of the apertures 25a. Along its inner margin the

plate 24 has an upstanding ledge 24a with antilclinal upper surfaces sloping toward the pusher bar and toward the conveyor chain, the clearance between this ledge and the superjacent portion of plate 25 being sufficient to permit passage of a cap between them. Consequently, when pusher bar 28 is moved inwardly, any closure caps resting on the plate 24 will be pushed laterally inward off of it by the pusher bar, and they will slide up and over the ledge 24a and finally reach a position upon the upper flight of the sprocket chain 17' and below the hold-down bar 19, viz., the position indicated at C' in Fig. 6. In this movement the caps are guided by the depending ledges 25b. Incident to this displacement of the caps from cap plate 24, inward movement of the immediately superjacent caps will be prevented by their engagement against the inner walls of the openings in the rack plate 25, and they will be supported by the interposed pusher bar 28 against descending. When the pusher bar is withdrawn outwardly from below the stacks, the superimposed caps will feed downwardly until the lowermost reaches plate 24, the lowermost cap in each stack being guided into proper positions by the depending ledges 25b and the upstanding ledge 24a.

The sprocket wheel 14 is rotated constantly in the direction indicated by the arrow in Fig. 1, through the medium of the driving mechanism 37, with the result that the upper flight of the sprocket chain 17' is caused to travel continuously toward the discharge end of the apparatus at the cap chute 11. As a result, the closure caps which are fed onto the chain as above described are carried by it to the cap chute in a series one after another, and there released so that they will slide down the inclined chute to the capping apparatus by gravity.

The timing of the chain drive and the actuating shaft 36 is such that caps can be fed from the stacks at a rate considerably exceeding the normal demands of the capping machine so that any abnormal demand of the capping machine may be adequately met. Consequently, in order to safeguard the caps and the apparatus in event the space alongside the cap rack is not completely cleared of caps before an ensuing feeding operation of feed bar 28, I provide the detecting and interlocking features illustrated in Figs. 4 and 5.

Adjacent the discharge end of the apparatus I place a detector lever 47 which is rockably mounted on a bracket 48. At its inner end, which extends over the chain 17, it carries a depending foot portion 49 which in side elevation appears as shown in Fig. 7, having the wedge-shaped or gradually inclined lower surface 49a presented in the direction from which the caps approach it. The weight distribution of the lever is such that the foot portion 49 tends to drop toward the chain 17 but it is restrained from dropping into contact with it by engagement of an adjustable stop member 50 with the bottom flange of the bracket 48. The outer arm 47a of the lever carries a slotted plate 47b, and a stop carrier 51 is hingedly mounted at 48 so that it may be swung toward and from the arm portion 47a. The stop carrier carries a screw 52 which is movable freely up and down through the slot in plate 47a and on this screw is an adjustable nut 53 adapted to engage said plate. Thus the stop carrier 51 may swing upwardly independently of lever 47, but cannot swing downwardly when the arm 47a is in elevated position. On the stop carrier 51 is mounted a de-

pending stop member 54 which, in its lowered position, that is, when the foot member 49 is elevated and carrier 51 is down, lies in the path of an arcuate plate 55a carried by a swinging stop arm 55. This stop arm 55 is rigidly keyed to the rocking shaft 34.

By virtue of the arrangement, therefore, when the foot member 49 is held in an elevated position, as by a closure cap beneath it, as illustrated in Fig. 4, inward swinging movement of the stop arm 55 will be limited by stop member 54. The foot member 49 is raised from its lowered position by the camming action of caps which are pushed under its sloping surface 49a by the feeding action of the chain. This will prevent further rocking movement of the rocking shaft 34 in the feeding direction, that is, in the direction to move the pusher bar 28 toward the chain 17, and hence the feeding of caps from the stack rack will be prevented until the obstruction below the foot member 49 is removed and the detector lever 47 allowed to resume its release position, illustrated in full lines in Fig. 5, wherein the stop carrier is held elevated and the stop member 54 is out of the path of the plate 55a. When the stop member 54 is in elevated position, therefore, the stop arm 55 is permitted to swing to and from the dotted line position shown in Fig. 5, and permit normal feeding operation of the pusher bar 28, the stop 54 riding on plate 55a incident to this movement if foot member 49 is raised while stop arm 55 is in an inward position.

Because of the timing of the shaft 36, this arresting of the feeding action may take place several times before the chain is completely cleared of caps after the prior feeding action. Under such conditions, any closure caps which are resting on the chain will not be marred or injured, as the chain slides freely beneath them.

The stroke of the pusher bar 28 is long enough, of course, to push the caps over the ledge 24a. Overthrow of the caps is prevented by a guide rail 56. The top guide bar 19, which is retained at an elevation just clear of the caps on the chain, performs the function of preventing caps' overriding one another incident to the feeding movement of the chain. Due to the hinged mounting of the top guide bar 19 at 21, it may be swung outwardly very quickly to afford free access to the cap feeding space between the stack rack and guide rail 56, and permit said space to be cleared instantly of any obstruction.

As a convenient means for charging the stack rack with closure caps, I provide charging tubes 60 of the sort illustrated in Fig. 2. This is a thin walled metal tube of size to slide downwardly over a group of four stack guide posts 26, and its internal area is such as to accommodate a stack of caps and also receive said posts in its corners. To facilitate charging of the tubes, the caps may be disposed in stacked rows in cartons, each carton containing a number of stacks alongside one another, and the tube may be telescoped onto one of these rows or stacks of caps in the carton. The walls of the tube are provided with flaring notches 60a at their lower ends, so that the converging margins may enter diagonally between the series of caps in adjacent rows and separate them, thus permitting the tube to slide in easily. Then the finger of the operator is inserted through one of the notches 60a below the lowermost cap in the stack, to hold the caps against sliding out of the tube. Then the lower or notched end of the tube is inserted over the upper ends of the four stack guide posts 26 of

the stack guide and the tube is slid down until its lower end comes to rest upon the brace plate 27, the caps still being retained in it by the operator's finger. The notch 27a accommodates the operator's finger when the lower end of the tube reaches the plate 27, and permits him to move his finger downwardly to lower the stack of caps from the tube until it reaches the remnant of the stack already in the guide or approaches closely to the plate 25. Thereupon the operator withdraws his finger to release the stack which is in the tube and the tube 60 is withdrawn upwardly off of the guide posts, leaving the stack of caps in desired position between the latter. It will be apparent, therefore, that this charging operation may be accomplished very quickly.

The operation of the apparatus has been described above part-by-part and will now be summarized. It will be understood, in the first place, that the operating shaft 36 is timed with the mechanism of the capping machine in such fashion as to synchronize the operation of the two mechanisms sufficiently closely to insure an adequate supply of caps to the capping machine being maintained at all times. Incidental or momentary variations in the operation of the capping machine and the feeding apparatus are accommodated by the intermediate supply of caps which is maintained on the sloping cap chute 11 ahead of the capping machine, and by the non-positive feed of the caps by the chain 17. The feeding apparatus being charged with caps as above described, either in all or less than all of the stack guides, continuous rotation of operating shaft 36 effects cyclical operation of the feeding mechanism through the medium of cam 39, which, by its action on roller 40 of rocker arm 41, rocks shaft 34 outwardly against the influence of spring 42 and controls the rate of the inward rocking movement of said shaft. Incident to such rocking action of the shaft 34, the pusher arms 32 are oscillated to slide the pusher bar 28 inwardly and outwardly across the cap plate 24. Incident to the inward movement of the pusher bar, its inner margin engages the marginal portion of the caps resting on the plate 24, and pushes said caps inwardly off of said plate and to positions upon the upper flight of the chain 17. As such lowermost caps are thus pushed from under the stack, the pusher bar 28 is substituted for them as support for the superimposed caps, and when the pusher bar is retracted from under the area of the rack, the caps in the stack slide downwardly until the lowermost come to rest upon the plate 24.

Meanwhile the chain 17 is being driven continuously, so that when the caps are moved onto it as above described, they may be carried along by it below the top guide bar 19. Upon reaching the cap chute, the caps slide down it by gravity. As stated above, cyclical operation of the pusher bar 28 is timed with respect to the speed of the capping machine so as to be susceptible of supplying it at a rate exceeding its normal demand. However, so long as any cap or other obstruction remains below the detecting member 49, the complete inward rocking movement of the shaft 34 and pusher arms 32, and hence inward movement of the pusher bar 28, will be precluded because of engagement of the upper end portion of the rocking stop arm 55 against the stop member 54. Of course, the detecting member 49 may be of an elongated form as to extend the full length of the rack plate 25 alongside the top guide bar 19, so that a

cap anywhere on the chain will forestall further feeding action of the pusher bar 28. For most purposes, however, it is necessary merely to place the detecting member 49 at the discharge end as illustrated. The stack guide may be replenished in the manner above explained while the machine is in operation, and even though the replenished guide is not completely empty of caps.

I claim:

1. In apparatus for feeding caps, in combination, a stack rack for guiding a stack of closure caps, an endless conveyor chain running alongside same, a guide bar extending longitudinally of the chain and spaced above the same a distance exceeding the height of one cap but less than the height of two, means for driving said chain continuously, and cyclically operating means for feeding caps laterally and successively from the stack rack onto said chain below the guide bar.

2. In apparatus for feeding caps, in combination, a stack rack for guiding a plurality of stacks of closure caps in collateral relationship, an endless conveyor chain running alongside same, means for driving said chain continuously, a guide bar overlying and extending longitudinally of the chain and spaced above it a distance to accommodate the height of one cap but less than the height of two, and means for feeding caps simultaneously from different stacks onto said chain below the guide bar.

3. Apparatus for feeding closure caps comprising, in combination, a stack rack for guiding a stack of closure caps, a reciprocating pusher bar operable to displace the lowermost cap of the stack, a rocker shaft operatively connected with the pusher bar, cyclically operating means for actuating the rocker shaft to move the pusher bar away from the rack periodically and to control its movement in the feeding direction, yielding pressure means for moving the feeding bar in the feeding direction, a stop arm fixed to the rocker shaft, a movable stop for cooperation with said stop arm, and automatically operated means for moving said stop into the path of the stop arm to preclude cap feeding operation of the pusher bar independently of said cyclically operating means.

4. Apparatus for feeding closure caps comprising, in combination, a stack rack for guiding a plurality of collaterally associated stacks of closure caps, an endless conveyor arranged to run alongside the stack rack, means for driving said conveyor continuously, a top guide bar disposed above the conveyor at a distance greater than the height of one cap but less than the height of two caps and extending longitudinally alongside the several stacks, and cyclically operating means timed with said conveyor for feeding caps simultaneously from different stacks onto the conveyor below said top guide bar.

5. Apparatus for feeding closure caps comprising, in combination, a stack rack for guiding a plurality of stacks of closure caps, an endless conveyor arranged to run alongside the stack rack, means for driving said conveyor continuously, a top guide bar disposed over and adjacent the conveyor and extending longitudinally thereof, and cyclically operating means for periodically feeding caps simultaneously from the stacks onto the conveyor below said top guide bar, said top guide bar being movably mounted to permit its being instantaneously removed from over the conveyor.

6. In apparatus for feeding closure caps, in combination, a plurality of stack guides arranged in a row for guiding stacks of caps in vertical direction, a cap plate disposed below and spaced from said guides, a reciprocable pusher bar movable between the stack guides and cap plate to displace caps simultaneously from the latter and incidentally support the superimposed caps, a rocker shaft, rocker arms operatively connecting said shaft with said pusher bar, a spring for rotating the rocker shaft in direction to swing the rocker arms toward the stack rack, a drive shaft, means for rotating said drive shaft continuously, and means operable by said drive shaft for rocking said rocker shaft in the opposite direction against the pressure of said spring.

7. In cap feeding apparatus having a stack guide for receiving and guiding a stack of closure caps, a filler tube adapted to hold a stack of closure caps, said filler tube being slidable longitudinally into coaxial stack guiding relationship with said stack guide and having an end opening through which the stack may pass endwise in either direction and having its wall notched to form diagonally extending margins at said end opening.

8. In a closure cap feeding device having a stack guide for receiving a stack of closure caps, a filler tube adapted to hold a stack of closure caps for charging said guide, said filler tube having an end opening through which the stack may pass endwise in either direction and its walls at said opening notched to provide converging end margins.

9. In apparatus for feeding closure caps, in combination, a pusher for feeding caps from a stack, actuating means for reciprocating said pusher, a rocking member movable to stopping position by a cap after it has been fed from the stack, a stop movable to stopping position with said rocking member, and a stop arm connected with the actuating means and movable into engagement with said stop when the latter is in stopping position to preclude feeding movement of the pusher, said stop being movable by said rocking member to a position out of the path of said stop arm, said rocking member being biased to unstopping position and the stop having loose connection with it so as to permit the stop to remain in unstopping position when the rocking member is moved to stopping position, the stop arm having a portion for supporting the stop in unstopping position when the rocking member is moved to stopping position in the course of movement of the stop arm past the stop.

10. In apparatus for feeding closure caps, in combination, a stack rack for guiding caps vertically in a stack, a support upon which the lowermost cap of the stack rests, a pusher operable to remove the lowermost cap laterally from the stack, guide elements depending above said support in position to preclude lateral movement of the lowermost cap in any but the direction of feed, and a ledge projecting upwardly from said support in the path of the lowermost cap, said ledge formed to permit movement of the cap across it when the cap is propelled by the pusher.

11. In apparatus for feeding closure caps, in combination with a stack rack comprising vertically extending guide elements arranged to guide an upright stack of closure caps and affording a lateral passage between said elements into the stack receiving space, of a filler tube adapted to hold a plurality of closure caps in stacked rela-

tionship for delivery into the stack rack, said tube having portions adapted to receive portions of the guide elements into guiding relationship with stacked caps in the tube in coaxial relationship with the stack receiving space of the rack, said tube having an end opening through which the stacked caps therein may pass freely from the tube within the stack receiving space of the rack when the tube is in coaxial relationship aligned therewith.

12. In apparatus for feeding closure caps, in combination, a stack rack for guiding a plurality of stacks of closure caps in collaterally spaced relationship, continuously operating bearing-off means extending alongside the stack rack, a guide bar overlying said bearing-off means at a distance exceeding the height of one cap but less than the height of two, cyclically operating feed means for feeding caps laterally and simultaneously from a plurality of said stacks onto said

bearing-off means below said guide bar, and guide means for maintaining the fed caps out of contact with one another in the course of their lateral feed movement from the stacks onto the bearing-off means.

13. In apparatus for feeding closure caps, in combination, a stack rack comprising vertically extending guide elements arranged to guide a stack of closure caps and affording a lateral passage throughout its height into the stack receiving space, and a filler tube adapted to hold a stack of closure caps while they are in guiding cooperation with said guide elements, said tube having fitting cooperation with said guide elements to maintain the tube in longitudinal alignment with the stack receiving space, said tube having an end opening through which the stack may freely pass endwise when the filler tube is withdrawn longitudinally from the stack rack.

LYNN E. DAVIES.

CERTIFICATE OF CORRECTION.

Patent No. 2,337,033.

December 21, 1943.

LYNN E. DAVIES.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 5, first column, line 10, claim 11, before "therewith" strike out "aligned"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 14th day of March, A. D. 1944.

Leslie Frazer

(Seal)

Acting Commissioner of Patents.