

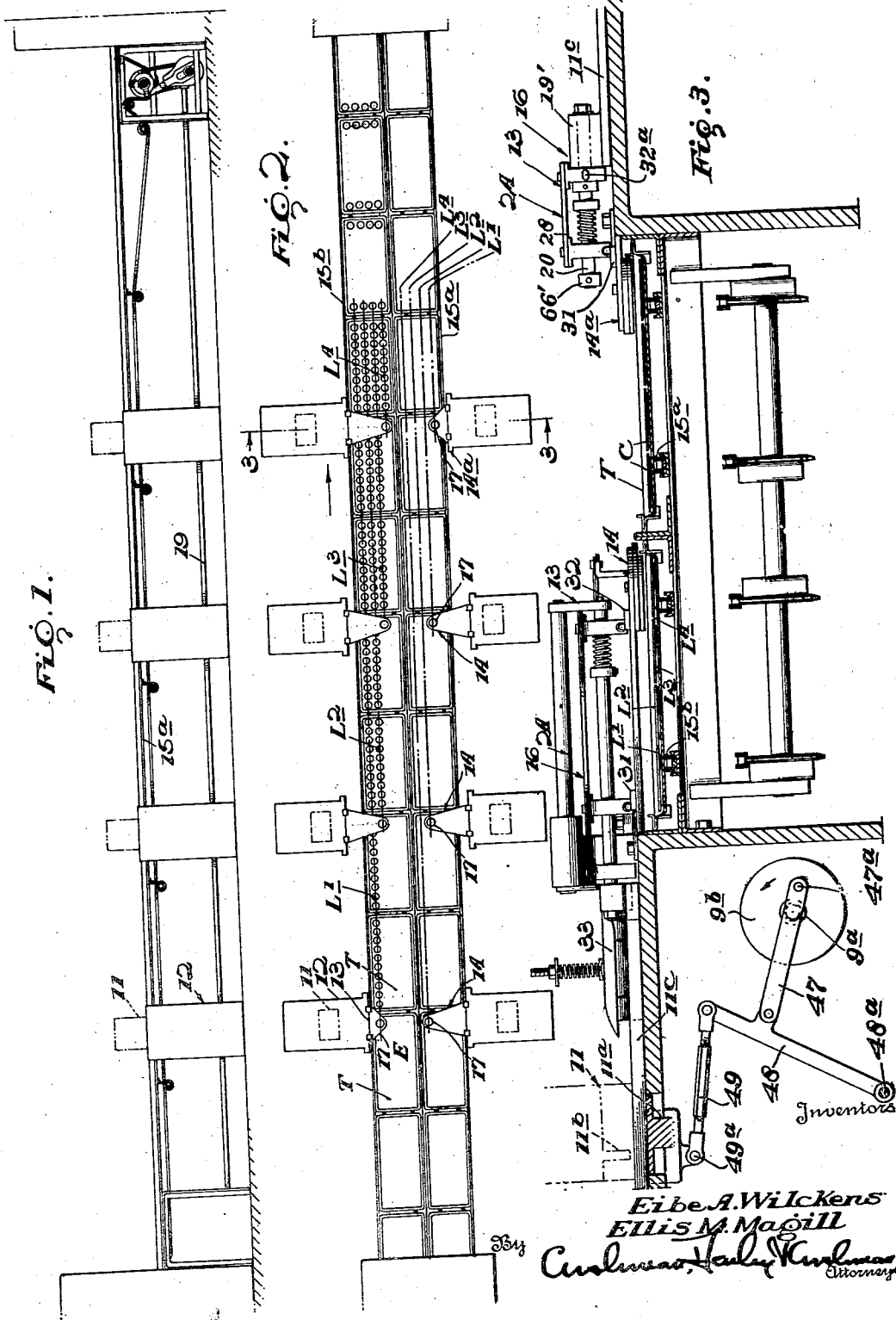
Oct. 8, 1946.

E. A. WILCKENS ET AL
CONVEYER LOADING MECHANISM

2,408,838

Filed Dec. 23, 1941

5 Sheets-Sheet 1



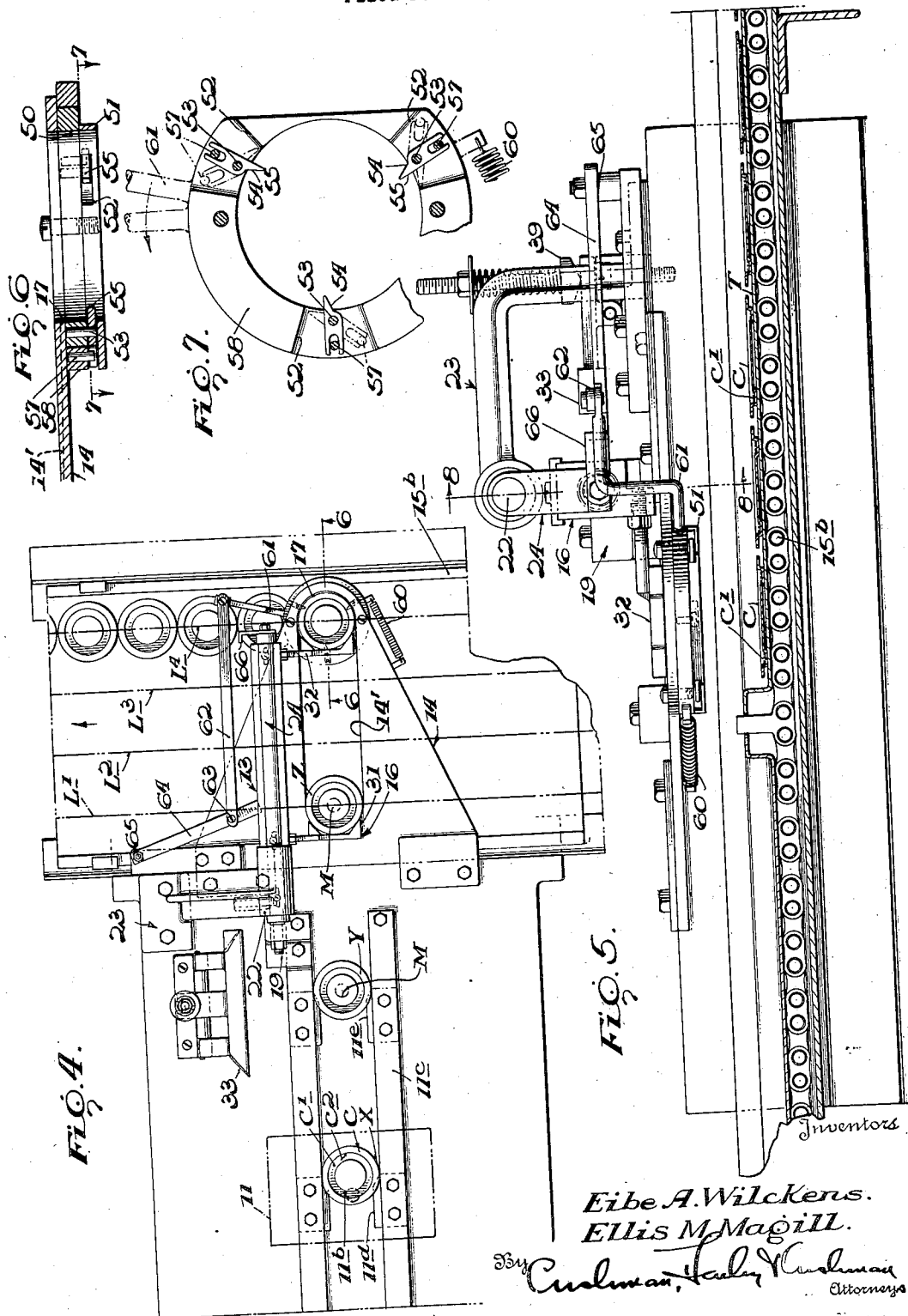
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5 Sheets-Sheet 2



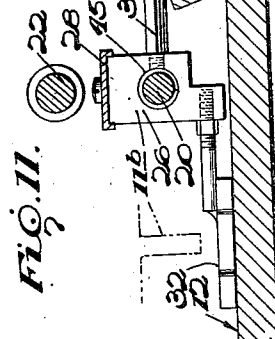
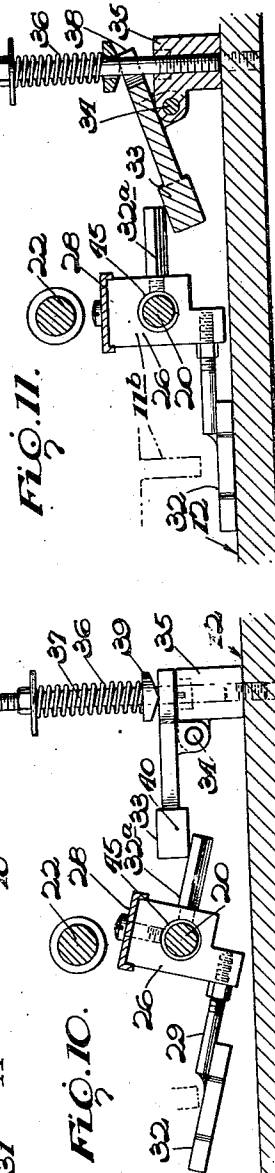
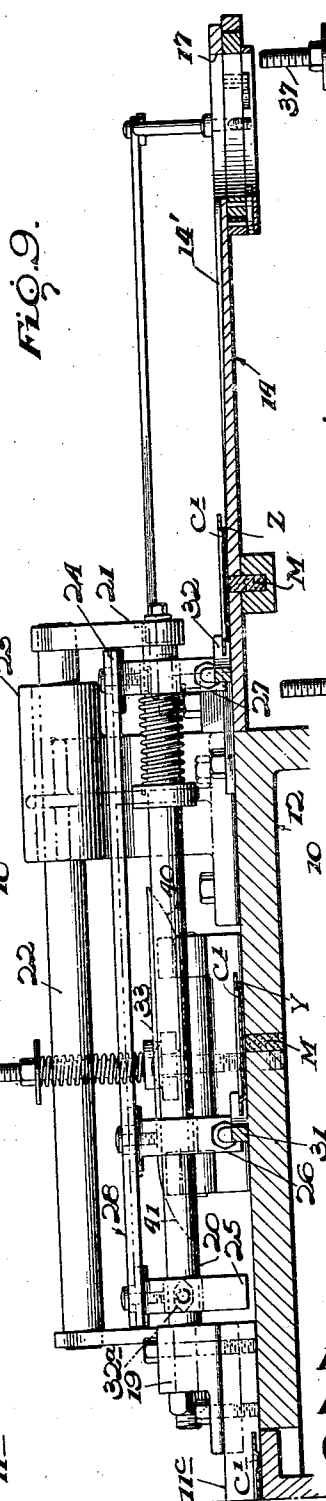
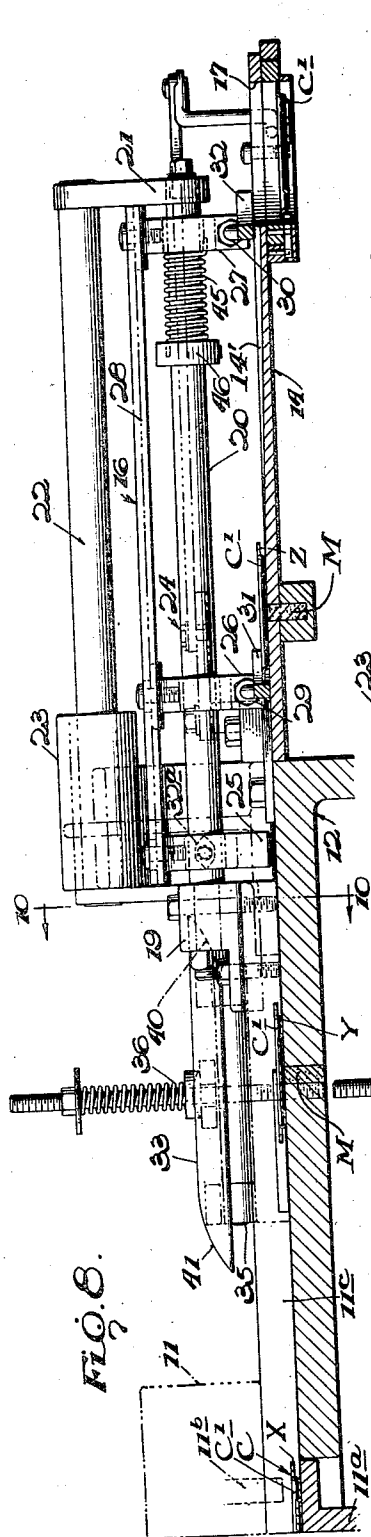
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5 Sheets-Sheet 3



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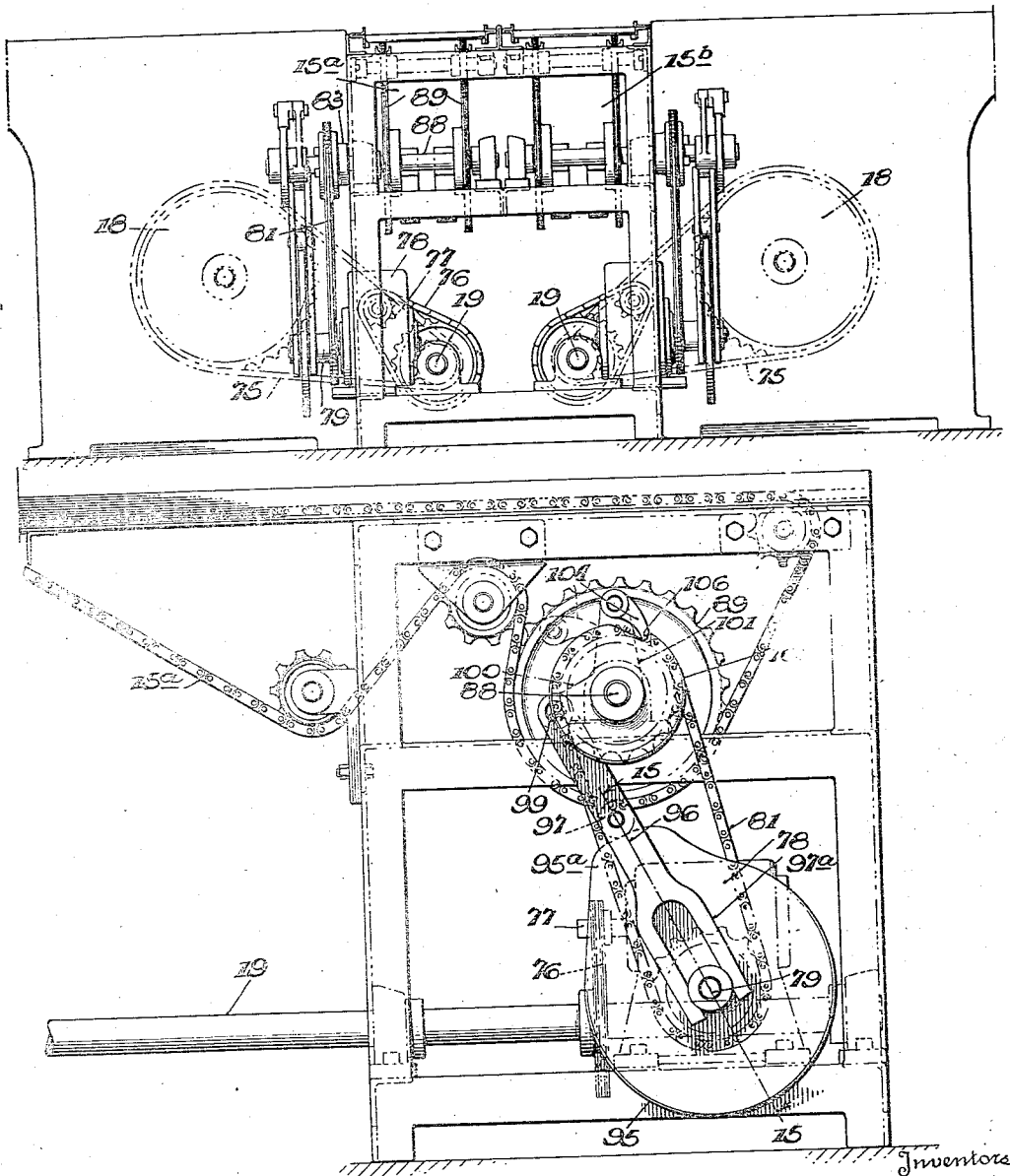
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5 Sheets-Sheet 4

FIG. 12.



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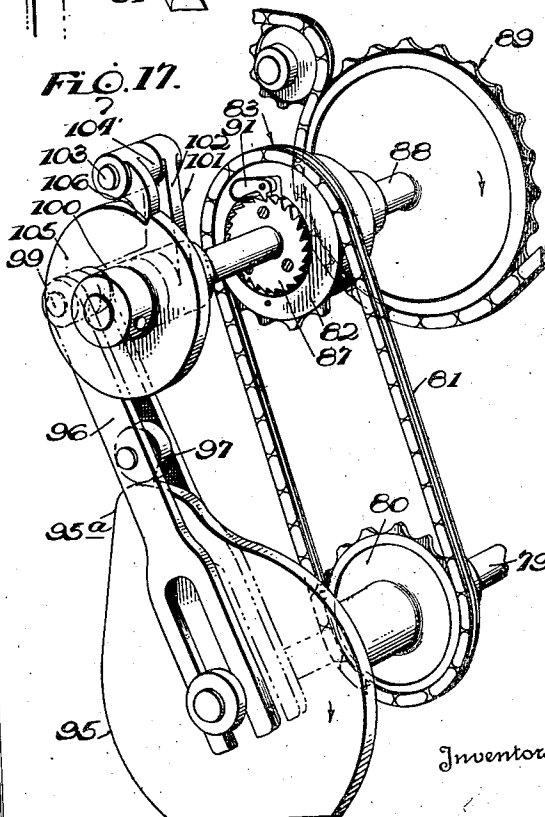
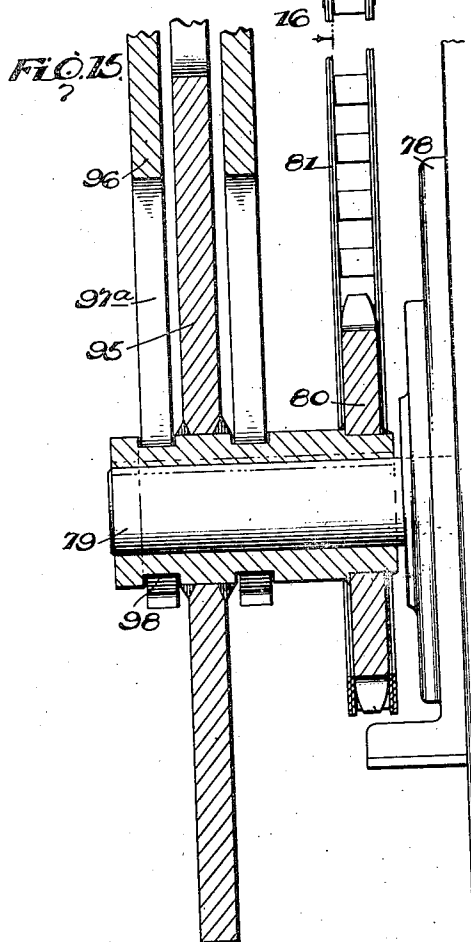
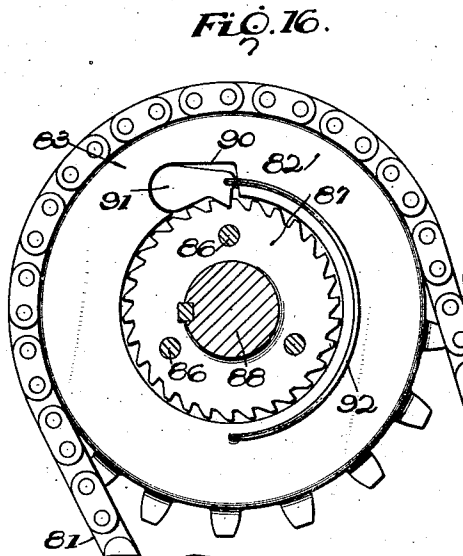
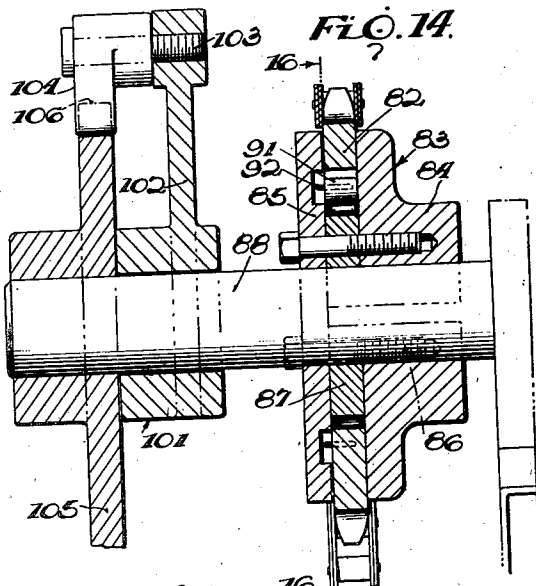
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5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE

2,408,838

CONVEYER LOADING MECHANISM

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14 Claims. (Cl. 226—2)

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The present invention comprises a conveyer loading mechanism and, more particularly, a mechanism for placing cap blanks or the like in properly spaced relationship upon a moving conveyer.

Certain types of containers are sealed by applying thereto a cap of substantially planar form and of an outside diameter larger than the bottle mouth, closing being performed by bending the edge of the cap down around the bottle mouth so that the bent-down portion forms the cap skirt or flange. A cap of this type is disclosed in the patent to George W. Booth, No. 1,956,217, issued April 24, 1934, for Container closure, and is hereinafter referred to as a disc-type cap.

During manufacture, some disc-type caps are coated on their container contacting surface with a latex or similar compound in liquid form adapted to be subsequently baked or otherwise treated to form a resilient liner. In such cases, care must be exercised to prevent the caps from nesting or overlapping while the compound is still soft because, due to their very flat form, an overlapped relationship will enable the lining compound of one cap to contact with and adhere to the other cap. In addition, if the lining is applied in the form of an annular ring to a shallow annular groove formed in the cap body, nesting or overlapping will mar the form of the lining so that, when the cap is applied to a container, the lining may not properly contact with the container mouth.

The necessity of keeping coated disc-type caps from nesting until the lining or coating hardens, coupled with the fact that their extremely light weight and smooth metal construction causes them to move about when even very slightly disturbed, has made the rapid handling of freshly lined caps extremely difficult. More particularly, for high rate of production, it is desirable to place the freshly coated caps in close juxtaposition on a moving conveyer for subsequent baking. Positioning of the caps in close order on a moving conveyer, of course, requires that each cap be exactly positioned at the proper point on the conveyer, without possibility of any cap so moving during or after the transfer that it will slide upon an adjacent cap.

An additional difficulty arises because in some cases it is desirable to subject the caps, after baking to harden the coating, to a spray of a liquid which dries to form a hard, smooth film. If such spraying is performed while the caps are upon the conveyer, which is the most desirable procedure, the conveyer has a hard smooth film formed upon it. Thus, caps subsequently placed upon the conveyer are even more apt to slide with respect to each other.

A still further difficulty arises from the fact that it is frequently desirable to place the liquid coating containing caps within shallow trays car-

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ried by a moving conveyer, rather than directly upon a conveyer, so that each tray will support a large number of caps during baking. Such trays are provided with upstanding side and end walls and the delivery of caps must be so controlled that none of the caps will land upon a tray end wall. If the caps are sprayed after baking while still in trays, the trays likewise become coated with a smooth film which enables even a slight jarring to shift caps within the tray.

An important object of the present invention is to provide an apparatus whereby caps or similar articles can be placed upon and moved with a conveyer in such manner that there will be no possibility of an article being placed in or moved to an undesired position.

As one means to attain the above object, the invention preferably includes an arrangement to insure that articles will drop directly downwardly without any tendency to move laterally.

If the caps or other articles are to be placed in trays including upstanding edge walls, as referred to above, the invention contemplates so regulating the movement of the conveyer that at proper time intervals its travel will be accelerated so that the tray edge will move clear of the depositing mechanism before a cap can fall upon the tray edge.

An important object of the present invention is to provide a conveyer drive of such construction that the conveyer movement will be synchronized with the cap depositing mechanism to accelerate the movement of the conveyer at predetermined time intervals, thereby insuring that the caps will be spaced further apart with respect to the conveyer at predetermined intervals.

In order to prevent the caps from sliding relative to the conveyer, the manner of accelerating the movement of the latter must be so regulated that it will have no abrupt change of speed.

Another object of the invention is to provide a conveyer drive mechanism of such design that it will not jar the articles to cause them to shift position upon the conveyer.

It has heretofore been proposed to move can ends to and from a viscous liner inserting mechanism by means of a reciprocating slide operated by a rotary crank mechanism. A rotary crank mechanism has the characteristic of decelerating a reciprocating member at the dead center portions of its stroke and, in order to prevent this effect from retarding the movement of the can tops, it has been customary to lengthen the stroke of the reciprocating element and have it contact with a can end only during the portion of its stroke which is not subject to dead center deceleration.

Such an arrangement is not feasible with shallow disc-type caps because the sudden contact of a reciprocating pusher with the cap causes the liquid lining material to be thrown out of its

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proper position in the cap. Can ends are not subject to this difficulty because they are provided with deep liner receiving grooves and an overhanging edge flange.

We have discovered that by using the entire stroke of a rotary crank operated reciprocating pusher and having it contact with a cap at the moment it is at one dead center position, the pusher will engage the cap while moving at minimum speed and then accelerate. This prevents sudden movement of the cap from a stationary position and thereby avoids displacement of the liquid liner. Also, the pusher engages the cap during its entire forward stroke, with the result that the latter portion of the cap movement is decelerated, avoiding too sudden stopping of the cap.

In addition, in order to prevent overtravel of the extremely light disc-type caps, the present invention preferably includes a means to stop the cap at the position to which a pusher moves it. This means is preferably a magnetic device exerting sufficient force to stop movement of a cap but which does not have sufficient strength to prevent further movement of a cap by a second pusher.

Summarizing what has been stated above, it will be observed that an object of the invention is to insure that disc-type caps will be so moved that the lining material will not be disturbed or displaced and the caps will be stopped at the desired point.

Another object of the invention is to provide an assembly of article feeding mechanisms with a conveyer which will enable articles to be readily placed in rows upon a moving conveyer, the entire assembly occupying a minimum floor space.

The object last set forth is attained by moving the articles to the conveyer along lines at an angle to the latter. Each line of articles is handled by a feeding mechanism so positioned with respect to the conveyer that it places articles in a row extending longitudinally of the conveyer. To minimize the space required for loading the conveyer, articles may be placed thereon from opposite sides with the feeding mechanisms so arranged that while they are directly opposed so that articles will be placed at the desired points in synchronism with the conveyer movement, the feeding mechanisms will not interfere with each other.

Other objects and advantages of the invention will be apparent from the accompanying drawings wherein:

Figure 1 is a side elevation diagrammatically showing the apparatus of the present invention in side elevation;

Figure 2 is a plan view of the apparatus;

Figure 3 is a transverse section on the line 3—3 of Figure 2;

Figure 4 is a plan view of a cap feeding mechanism;

Figure 5 is an end view of the structure shown in Figure 4, Figure 5 showing such structure as it appears when viewed from the right with respect to Figure 4;

Figure 6 is a transverse sectional view on the line 6—6 of Figure 4;

Figure 7 is a horizontal sectional view on the line 7—7 of Figure 6;

Figure 8 is a vertical sectional view on the line 8—8 of Figure 5 showing one position of the cap feeding mechanism;

Figure 9 is a view similar to Figure 8 showing the cap feeding mechanism in another position;

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Figure 10 is a vertical sectional view on the line 10—10 of Figure 8 showing the cap pushing element in the position it assumes during return movement;

Figure 11 is a view similar to Figure 10, but showing the cap pushing element in the position it assumes during cap feeding movement;

Figure 12 is an end view of the apparatus looking from the right with respect to Figure 1 and showing the conveyer driving mechanism;

Figure 13 is a side elevation of the conveyer drive mechanism looking from the left with respect to Figure 12;

Figure 14 is an enlarged vertical sectional view of the driven shaft of the conveyer drive mechanism;

Figure 15 is an axial sectional view on the line 15—15 of Figure 13;

Figure 16 is a sectional view on the line 16—16 of Figure 14, and

Figure 17 is a perspective view, with portions omitted, of the driving mechanism.

The construction and operation of the apparatus of the present invention when used to handle disc-type caps C of the type hereinbefore referred to may be generally described as follows:

Cap blanks C of the form shown in section in Figure 5 and in plan in Figure 4 have a layer C¹ of a latex or similar compound in a liquid or viscous state placed in their annular grooves C² by a liner applying or coating mechanism of well-known type diagrammatically shown in Figures 3 and 4 and designated by the numeral 11. The mechanism 11 may be generally described as comprising a vertically movable spinning element 11a (Figure 8) to support and rotate a cap C at position X while a jet of lining compound is directed into the same from above by a nozzle 11b. The liner inserting or coating mechanism 11 also includes a horizontally reciprocable pusher 11c (Figure 4) including cap engaging shoulders 11d and operated in a novel manner as hereinafter set forth. On one feeding stroke of pusher 11c (to the right in Figure 4) shoulders 11d move a cap to the spinner 11a. The pusher 11c then retracts and on its next feeding movement a second set of shoulders 11e will engage the cap at position X to advance it to position Y, while the first shoulders 11d will move a new cap to position X for coating.

The mechanism 11 operates in such manner as hereinafter referred to that the shoulders 11e may get immediately behind the cap at position X on return movement of pusher 11c.

As best shown in Figures 1 and 2, each coating mechanism 11 is mounted upon a support or table 12 carrying the nozzle 11b and its pusher 11c as well as an associated cap feeding mechanism 13 of the present invention. Referring to Figures 3 and 4, each cap feeding mechanism 13 comprises a plate member 14 which overlies a conveyer 15a or 15b and has its upper surface in the same plane as the upper surface of table 12. Caps placed at position Y in Figure 4 by the pusher 11c are moved by pushing elements 16 included in the present invention to an aperture or cut-out 17 in plate 14 to drop onto one of the conveyers or into trays T supported on the conveyers.

The mechanism best shown in Figures 5 and 6 supports articles in aperture 17 for a moment and then drops them directly downwardly toward the conveyer.

As is best indicated in Figures 2 and 4, each mechanism 13 will drop caps in a longitudinally

extending row upon the moving conveyor or trays. For example, the mechanism 13 illustrated in Figure 4, which is the upper mechanism shown at the right in Figure 2, drops caps through the aperture 17 in a row L⁴, which is the innermost line of caps placed on the conveyor 15b. The ability of the mechanism 13 of Figure 4 to place caps in the row L⁴ is due to the fact that the plate 14 of this mechanism is of such length as to extend entirely across the conveyor 15b. Naturally, the position of the aperture 17 with respect to the width of the conveyor finally determines the row extending lengthwise of the conveyor 15b on which the caps will drop.

As shown in Figure 2, by positioning alongside the conveyers 15a and 15b a number of mechanisms 13, each associated with a cap lining mechanism 11, a number of rows of caps may be placed on the conveyor or in trays carried by the latter.

Figures 2 and 3 illustrate how two conveyers 15a and 15b may be positioned alongside each other, each conveyor receiving four lines of caps.

In the event that the caps are to be placed in trays T, the conveyers 15a and 15b will be provided with tray-engaging ears or lugs as shown in Figure 5 and may be driven by the mechanism generally indicated in Figures 14 to 17. This mechanism causes the movement of the conveyers to be accelerated at intervals so that the end walls E of two adjacent trays will move past the apertures 17 intermediate the dropping of two caps in regular sequence. In order that this mechanism may be practicable with the use of a series of cap feeding mechanisms 13, it is necessary to space the aperture 17 of each mechanism by a distance either corresponding to the length of a tray, plus the space between adjacent trays, or multiples of that distance.

The specific construction of the apparatus is as follows:

The drive mechanism for the conveyers 15a and 15b includes motors 18, one for each conveyor, and these motors, through suitable gearing, drive shafts 19 extending lengthwise of the conveyers. As indicated in Figure 1, each shaft 19 extends through the cap lining mechanism and cap feeding mechanism supports 12 to drive the liner mechanisms in synchronism with the associated conveyor. As hereinafter set forth, the cap feeding mechanisms 13 are connected to the lining mechanisms to be operated therefrom.

A cap feeding mechanism of the present invention is shown in plan in Figure 4 and it will be noted that the plate member 14 is provided with an aperture or cutout 17, the latter being of an outline substantially corresponding to that of a cap C. Referring to Figures 4 and 9, the reciprocable pusher 11c which moves caps to position Y has a bracket 19a secured to one end thereof, which bracket is horizontally apertured to carry a rod 20 projecting forwardly with respect to member 11c. The outer end of rod 20 has fixed thereto an arm 21 also secured to the outer end of a second rod 22 slidably supported in a guide block 23 fixed to the supporting table 12. The elements 21, 22, and 23 thus form a substantially U-shaped carrier element 24 as best disclosed in Figure 8 and adapted to reciprocate with the pusher 11c.

The rod 20 of carrier 24 has a pushing element 16 mounted thereon, element 16 comprising three blocks 25, 26, and 27 mounted on rod 20 for swinging movement in a vertical plane. The blocks are spaced along rod 20 but are rigidly connected together by a bar 28 secured to the

upper surface of each block as indicated in Figures 8 and 10 so that they will swing about the rod 20 in unison. Referring to Figures 9 and 10, the blocks 26 and 27 include laterally extending arms 29 and 30, respectively. Arm 29 has a pusher finger 31 secured thereto, the form of this finger in top plan being illustrated in Figure 4. Arm 30 has a similar pusher finger designated by the numeral 32 secured thereto. It will be noted that the fingers, in plan, are of such form as to embrace a portion of the periphery of a cap C.

The block 25 of pushing element 16 has a rearwardly projecting arm 32a secured thereto and, as best shown in Figure 8, this element has its upper and lower faces beveled at the ends thereof to be substantially diamond-shaped. During the reciprocation of the carrier 24 and the pushing element 16 carried thereby, the follower 32a will engage a cam plate 33 in the manner indicated in Figures 10 and 11. More particularly, during movement of carrier 24 and pushing element 16 with pusher 11c to the right with respect to Figure 8, i. e., on cap feeding movement, the fingers 31 and 32 of pushing element 16 will be held downwardly in contact with the surface of table 12 and plate element 14 as illustrated in Figure 11. During the return movement of carrier 24, that is, movement to the left with respect to Figure 8, the fingers 31 and 32 will be lifted upwardly from the surfaces 12 and 14 at the proper moment so that they may move above caps C at positions Y and Z on surfaces 12 and 14 to get behind the caps at these positions in preparation for a cap feeding movement.

The swinging or rotating movement of the pushing element 16 about the rod 20 of carrier 24 is controlled by follower 32a and cam plate 33 by the following construction: As best indicated in Figures 8 and 11, cam plate 33 is provided with downwardly extending lugs or ears which coincide with ears on a trunnion 35 fixed to the surface of table 12, the two pairs of ears being pivotally connected by a pin 34. Rearwardly of its pivot 34, or to the right in Figures 10 and 11, a spring 36 acts upon the upper surface of cam plate 33 to urge it to the horizontal position illustrated in Figure 10, spring 36 being mounted on a stud 37 threaded in the trunnion 35 and passing through a slot 38 in the rear edge of the cam plate. A rocker 39 may be interposed between the lower end of spring 37 and the upper surface of plate 33.

As shown in Figure 8, the right-hand or forward end 40 of cam plate 33 is beveled from its upper edge downwardly and rearwardly so as to present a substantial knife edge at the upper corner of the cam plate. The rear end 41 of the cam plate 33 is beveled from its lower edge and upwardly and forwardly so as to present a knife edge at its lower corner.

The pushing element 16 is urged to the downward position illustrated in Figure 11 by a coil spring 45 having one end thereof secured to the outer block 27 and the other end secured in a collar 46 locked on guide rod 20.

By the arrangement described above, when the carrier 24 is moving to the right with the carrier from the position illustrated in Figure 9, the undersurface of follower 32a forming part of the pushing element will ride up the incline 41 at the inner end of cam plate 33 with the result that the latter will be tilted downwardly as shown in Figure 11 against the action of spring

36. Such turning movement of cam 33 must occur because contact of the fingers 31 and 32 with the surface of support 12 or plate 14 prevents pushing element 16 from swinging on carrier 24. The fingers 31 and 32 will thereby be held in contact with the surfaces of elements 12 and 14 to move caps C across these surfaces toward the aperture 17 in plate 14. After the follower 32a has moved off the right-hand end of cam plate 33 as viewed in Figures 8 and 9, the cam plate 33 will swing to the position illustrated in Figure 10 and the torsion spring 45 will then act upon the pusher 16 to hold the fingers 31 and 32 in contact with surfaces 12 and 14.

On return movement of the pushing element 16 and carrier 24, the fingers 31 and 32 will initially remain in contact with the plate 14 but before either finger can move back against a cap at positions Y or Z in Figure 8, the cam follower 32a will move beneath the downwardly inclined end surface 40 of cam 33. Since the right-hand portion (Figure 10) of cam 33 is in contact with block 35 and cannot move downwardly, the pusher must rotate in a clockwise direction as viewed in Figures 10 and 11 to thereby cause the pusher fingers 31 and 32 to be lifted out of engagement with the surfaces of elements 12 and 14 and ride over caps at stations Y and Z. However, as soon as follower 32a has ridden from beneath the outer end of cam plate 33, pushing element 16 may move in a counter-clockwise direction (Figure 11) under the action of torsion spring 45 so that fingers 31 and 32 will come in contact with the surfaces of elements 12 or 14. By this time, the fingers will have reached such position that they will be behind caps at stations Y and Z. Obviously, on the next forward movement of pusher 16, the cap at station Z will be advanced by finger 32 to the aperture 17 and the cap at station Y will be advanced by finger 31 to position Z. Simultaneously, a cap will be advanced from position X in Figure 4, the position at which it was coated, to position Y by the pusher 11c to which the pushing element 16 of the present invention is secured.

The manner of reciprocating the pusher 11c and thereby reciprocating the fingers 31 and 32 is diagrammatically shown at the lower left-hand portion of Figure 3. Referring to this view, a shaft 9a driven from shaft 9 has a disc 9b fixed thereto and a link 47 is pivoted to disc 9b at a point 47a. Link 47 is pivotally connected to a lever 48 pivoted at fixed point 48a and the upper end of lever 48 is pivotally connected to one end of a link 49 pivoted at 49a to slide on pusher 11c. Hence rotation of shaft 9a imparts a crank effect to link 47 to thereby reciprocate pusher 11c.

The arrangement described in the preceding paragraph is so designed that the pusher 11c will have a stroke only very slightly longer than the distance between the centers of positions X and Y or Y and Z or Z and aperture 17. More particularly, the stroke of 11c is equal to any of the distances stated above, plus a sufficient distance to provide a very slight overtravel at the left-hand end of its stroke in Figure 3. This overtravel insures that a cap engaging pusher will always be behind a cap before beginning its cap moving stroke.

However, each stroke of slide 11c begins when link 47 has a dead center relation with respect to shaft 9a and the above-mentioned overtravel is extremely slight. Therefore, at the moment any cap engaging element such as 11c, 31 or 32

contacts with a cap, such element will not have reached the maximum speed imparted by the crank effect between shaft 9a and pivot 47a. Hence, the cap will not be so suddenly moved from a stationary position that the liquid or viscous lining C¹ will be jarred from groove C². Furthermore, because the feeding stroke of each cap engaging element 11c, 31 and 32 terminates exactly at a point to cause a cap to stop at positions Y, Z and aperture 17, respectively, the latter portion of the movement of a cap is decelerated so that it will not stop so suddenly that lining material C¹ will be jarred from groove C².

The manner of arranging the stroke of a crank operated pusher described above is extremely important in the handling of disc-type caps because of the tendency of the liquid to move out of groove C² and perhaps upon the table surfaces over which the caps slide. Obviously, any lining material which gets upon the cap flange interferes with its proper application to a container. Also, if any lining material gets upon the surfaces such as 14 over which the caps are to slide, movement of the caps is impeded.

As best shown in Figure 9, inserts M of magnetic material are set in plate 14 and the upper surface of table or support 12 at positions Y and Z to prevent overtravel of caps when they reach these points. The use of such article stopping means with the handling of extremely light metal caps is highly important because if a cap should overtravel past position Y, for example, finger 31 would engage it while the finger is moving at a faster speed than it has during the initial portion of its stroke and the lining material might be displaced from cap groove C².

In order to insure that caps do not overtravel with respect to aperture 17, a groove such as 14' may be provided in plate 14, this groove increasing in depth from its point of origin near position Z to the aperture so that a cap reaching aperture 17 will strike the far edge of the aperture.

The cap feeding arrangement illustrated in Figures 8 and 9 corresponds to that shown in Figure 4 and is therefore intended to move caps to an aperture 17 in a plate 14 aligned with the innermost row L⁴ along which caps will be dropped upon a conveyer. A cap feeding device used to drop caps along the next row L³ (Figure 4) would have its aperture 17 aligned with that row, the support 12 being correspondingly positioned backwardly from conveyer 15a as illustrated in Figure 2.

A cap feeding device intended to drop caps in the row L² would be mounted on a support 12 positioned still further from the edge of conveyer 15a as shown in Figure 2 so that the associated aperture 17 would be above row L².

If row L¹ is spaced from row L⁴ a distance corresponding to the stroke of the pushing slide 11c, the mechanisms 13 shown at the upper left and lower right hand portions of Figure 2 for positioning caps in rows L¹ may be of the form shown at the right in Figure 3. That is, only one feeding finger 31 is provided and this moves caps from a position corresponding to position Y in Figure 4 and over a short plate 14a having its aperture 17 at a point which would correspond to position Z in Figure 4. Rod 20 of the mechanism under discussion would be mounted in a bracket 19' on slide 11c and would be so short that a guide rod 22 would not be required.

It will be noted that by positioning two feeding mechanisms 13 directly opposite each other, the conveyer receives a maximum number of caps

within a minimum floor area. However, an important contributing factor to the success of this arrangement is that of having a mechanism 13 which places caps on a row near one conveyer edge positioned opposite one which places caps in a row further from the other conveyer edge since interference between opposite mechanisms is thereby prevented. Furthermore, the positioning of mechanisms directly opposite each other enables them to place caps upon the conveyer in synchronism at properly spaced points lengthwise of the conveyer. That is, if the mechanisms were staggered along opposite sides of the conveyer, but still spaced by a tray length, plus the distance between the adjacent trays, or a multiple thereof as is required in loading trays, the area occupied by the feeding or loading mechanisms would be correspondingly increased.

In order to assure that caps will drop directly downwardly through the aperture 17 without possibility of becoming tilted during their following movement, mechanism is provided to hold each cap for an instant in the aperture 17 and then permit it to drop. Naturally, if the caps were simply pushed to aperture 17 and permitted to then fall while still having a forward moment, they would have a tendency to tilt during falling and might not drop in the exactly desired spot upon the conveyer.

The mechanism for holding the caps for an instant in the aperture 17 is best illustrated in Figures 4 to 7. Referring to Figure 6, it will be observed that plate 14 has a ring 50 secured to its undersurface, the ring having an inner diameter corresponding to the diameter of the aperture 17 in the plate. An annular plate 51 is secured to ring 50, plate 51 also having a bore there-through of the same size as the inner diameter of ring 50. The upper surface of plate 51 is notched at several equidistantly spaced points as indicated at 52. Small vertical pins 53 are mounted in ring 50 with their lower ends extending into the notches 52. Cap supporting members 54 of the form best shown in Figure 7 are rotatably mounted on the pins. Each supporting member 54 has a tang 55 at its inner end and the outer ends of the members 54 are slotted to receive vertical pins 57 mounted in a collar 58 surrounding ring 50.

As is indicated in Figure 7, rotation of collar 58 with respect to fixed ring 50 will cause the supporting members 54 to be simultaneously swung from one limit position to the other. Collar 58 is urged in a clockwise direction with respect to Figure 7 by a coil spring 60 extending between the ring and the plate 14. In such position, the tangs 55 will be held within the bore 17 as shown in solid lines in Figure 7 so that they may support a cap therein. In order to change the position of the members 54 from that just described, collar 58 has an arm 61 secured thereto and pivotally connected to a link 62. Link 62 is pivotally connected at 63 to a lever 64 pivoted at 65 to the support 12. It will be noted from Figure 4 that lever 64 extends into the path of a trip 66 secured to the outer end of the reciprocating carrier 24.

In operation, assuming that while the tangs 55 are in the normal position shown in solid lines in Figure 7, on feeding movement of elements 16 and 24, a cap will be dropped upon the tangs. On return movement of carrier 24 and pushing element 16, the trip 66 will strike lever 64 to swing the latter to a position substantially parallel with the line of movement of conveyer

15b, thereby moving link 62 to the left in Figure 4 to rotate collar 58 in a counter-clockwise direction against spring 60. Such rotation of collar 58 will cause the members 54 to be swung so that the tangs 55 projected within the aperture 17 will be withdrawn into the cut-outs 52, permitting the cap supported by the tangs to drop upon conveyer 15b or upon the trays T supported thereon.

Immediately trip 66 moves out of contact with lever 64, as when carrier 24 starts another cap feeding movement, spring 60 will cause the members 54 to swing so that their tangs 55 will project into the aperture 17 in readiness to receive the cap which is being advanced by the pushing element 16.

It will be observed that because the tangs support the cap perfectly horizontally, and because all of the tangs simultaneously move from beneath the cap, the latter can only drop directly downwardly and without any tilting such as might cause them to slide with respect to the conveyer or trays upon which they fall.

In the device shown in Figure 3 for placing caps on row L¹, a collar 65' on rod 22 performs the function of trip 66.

Figures 12 to 17 illustrate the drive mechanism for the conveyors 15a and 15b. This mechanism comprises the subject matter of our application for Drive mechanisms, Serial No. 623,036, filed October 18, 1945, as a division of the present case. Subject matter disclosed but not claimed in the present case may be claimed in said divisional application. Each conveyor has its own drive means, the two being identical except that their positions are reversed so that both must drive their conveyers in the same direction. In view of the similarity of the two conveyor drives the drive of only one is described in detail herein, namely, the drive on the conveyor 15a shown at the left in Figure 12.

It will be obvious that in some instances one wide conveyor could be used instead of two arranged in tandem.

Conveyor 15a is driven from the motor 18 acting through a drive chain 75. Chain 75 engages a sprocket on the shaft 19 which, as hereinbefore explained, drives the various cap lining and cap feeding mechanisms positioned alongside the conveyor 15a. A large sprocket on shaft 19 drives a chain 76 engaging a sprocket upon the shaft 77 of a speed reduction unit 78. The speed reduction unit includes a shaft 79 which comprises the driving shaft for the conveyor 15a.

As best shown in Figures 13 to 17, shaft 79 has a sprocket wheel 80 fixed thereto which drives a sprocket chain 81 passing about a sprocket wheel 82 forming part of an overrunning clutch mechanism 83. Clutch mechanism 83 includes two housing elements 84 and 85, one on each side of and free of sprocket wheel 82. The two housing members are secured together by bolts 86 which extend through a ratchet wheel 87 to hold the latter to the housing members. Housing members 84 and 85 and ratchet wheel 87 are keyed to the driven shaft 88 which carries a pair of large sprocket wheels 89 which directly engage the conveyor 15a.

As illustrated in Figure 16, the sprocket wheel 82 is recessed as indicated at 90 to receive a pawl 91 normally held in engagement with the teeth of ratchet wheel 87 by a spring 92.

The arrangement described immediately above comprises the normally effective driving means for the conveyor. That is, assuming that the

sprocket chain 81 is moving in the direction of the arrow illustrated in Figure 17 to rotate sprocket wheel 82 in a corresponding direction, the pawl 91 will act upon the ratchet wheel 87 to rotate shaft 88. It will be noted that the sprocket wheel 82 included in overrunning clutch mechanism 83 only has an operative connection with shaft 88 by reason of the action of pawl 91, sprocket wheel 82 otherwise being independent of shaft 88. Obviously, so long as pawl 91 is in driving engagement with ratchet wheel 87, conveyer shaft 88 will rotate at a predetermined speed controlled by sprocket chain 81.

In order to intermittently accelerate the speed of movement of the conveyer 15a, the driving shaft 79 has a cam 95 fixed thereto as shown in Figures 15 and 17 and this cam is engaged by a follower 96 including a roller 97 to bear on the periphery of cam 95. Follower 96 may include fork elements 97 to engage the hub 98 of cam 95. Hub 98 is keyed to shaft 79 and may also carry the sprocket wheel 80.

The follower 96 is pivotally connected as at 99 to one arm 100 of a bell crank 101 freely mounted on the driven shaft 88. The other arm 102 of bell crank 101 has a stud 103 secured in its outer end on which a pawl 104 is pivotally mounted. Pawl 104 bears upon a ratchet element or ratchet wheel 105 secured to the driven shaft 88. In the present arrangement ratchet wheel 105 is provided with a single tooth 106.

The operation of the cam 95 and the elements actuated thereby including the pawl 104 is as follows: During the time that the low portion of cam 95 is moving beneath the roller 97 of the follower 96, bell crank 101 will be in such position that pawl 104 will be at the point shown in dotted lines in Figure 13. Ratchet element 105 will be rotating beneath the pawl 104 in a clockwise direction with shaft 88 since the latter shaft is at that time being driven through chain 81 by pawl 91 of Figure 16.

However, when the rise 95a of cam 95 moves beneath roller 97, follower 96 will be lifted to the position shown in Figure 13 to rotate bell crank 101 in a clockwise direction with respect to Figures 13 and 17 and thereby move pawl 104 to the position shown in solid lines in Figure 13. An instant before this lifting movement of the follower 96 begins, the tooth 106 of ratchet 105 will have rotated beneath the pawl 104 so that the face of the pawl is now in engagement with the tooth. As a result, the lifting movement of the follower will cause pawl 104 to act on tooth 106 to rotate the ratchet 105 in a clockwise direction. Since the ratchet is fixed to shaft 88, which is the conveyer driving shaft, the conveyer will be correspondingly moved at an accelerated speed. This rotation of shaft 88 will be entirely independent of sprocket wheel 82 and sprocket chain 81 because the ratchet wheel 87 included in the overrunning clutch element 83 will simply rotate beneath pawl 91.

The above-described rotation of shaft 88 through cam 95 and pawl 104 will terminate at an instant when the pawl 91 of the overrunning clutch has dropped into engagement with a tooth of ratchet wheel 87 so that there will be no pause in the driving of the conveyer shaft 88. Furthermore, the contour of the rise 95a on cam 95 is such that the movement of bell crank 101 in a clockwise direction will begin with a gradually accelerated speed and will terminate at a gradually decelerated speed. It therefore results that no jerking will be imparted to the movement of

the conveyer 15a such as might cause caps to slide about the same. Nevertheless, cam 95 will advance the conveyer 15a at a sufficiently rapid speed that between the time that the cap feeding mechanism has placed the last cap in a tray T and before it can then drop a succeeding cap, the end walls of the trays will have moved past the cap dropping apertures 17 and the succeeding cap will therefore drop into the following tray T entirely clear of the leading end wall of that tray.

It will be understood that if the caps or other articles are to be placed directly upon a conveyer, instead of in trays, the cam 95 and the mechanism associated therewith may be eliminated and the conveyer may be directly driven.

The general operation of the entire apparatus has been set forth in the opening portion of this specification and the detailed operation of each of the various mechanisms included in the invention has been stated in connection with the description of the specific construction of these mechanisms.

The terminology used in the specification is for the purpose of description and not of limitation, the scope of the invention being indicated by the claims.

We claim:

1. In an apparatus of the character described, a conveyer, a plate element above the conveyer having a cut-out therein substantially corresponding to the outline of the articles being handled, means to move articles on the plate to the cut-out so that they will drop upon the conveyer, means associated with the cut-out to support articles within the same, and means to intermittently move said last-named means out of article supporting position to enable the articles to drop upon the conveyer.

2. In an apparatus of the character described, a conveyer, a plate element above the conveyer having an aperture therein, means to move articles on the plate to the aperture so that they will drop upon the conveyer, means associated with the aperture to support articles within the same, and means to intermittently move said last-named means out of article supporting position to enable the articles to drop upon the conveyer, said means being operatively connected to said article moving means.

3. In combination, a conveyer, a series of article feeding mechanisms at one side of the conveyer and reciprocably movable along lines extending at an angle to the line of conveyer movement to move articles to the conveyer, said mechanisms being so positioned with respect to the edge of the conveyer that each will place articles in a row extending longitudinally of the conveyer and spaced transversely with respect to the rows placed thereon by the other mechanisms of said series, a second series of said feeding mechanisms on the opposite side of the conveyer, one feeding mechanism of the first series being directly opposite a feeding mechanism of the second series, the respectively opposed mechanisms of each series being arranged to place articles in rows which are respectively spaced at different distances from the edges of the conveyer so that the strokes of the opposed reciprocating mechanisms will not overlap.

4. In an apparatus of the character described, conveyer means to receive and support articles in rows extending longitudinally thereof, and a series of mechanisms spaced along the path of the conveyer each adapted to place articles in one longitudinal row on the conveyer, each of

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said mechanisms including a plate element spaced above the conveyer and having a cut-out therein, means to move articles to the cut-out to drop through the latter to the conveyer, the cut-outs of the plate elements being positioned in alignment with the rows of articles upon the conveyer.

5. In an apparatus of the character described, a plate element having a cut-out therein, means at the cut-out to support articles therein and movable to a non-supporting position, means to move articles along said plate element to the cut-out, said last-named means being operatively connected to said article supporting means to control the position of the latter.

6. In an apparatus of the character described, a plate element having a cut-out therein, means at the cut-out to support articles therein and movable to a non-supporting position, reciprocable means to move articles along said plate element to the cut-out, an operating connection between said reciprocating means and said article supporting means whereby movement of the former in one direction will move the latter to non-supporting position, and means to urge said article supporting means to supporting position.

7. In an apparatus of the character described, a plate element, a carrier element reciprocable above said plate element to have an article feeding stroke and a reverse stroke, an article feeding element pivoted on said carrier on a line extending parallel to the line of movement of the carrier, said article feeding element being so mounted with respect to said carrier element as to remain in contact with said plate element on the article feeding stroke of said carrier element, and a cam positioned directly in the path of movement of the article feeding element with said carrier to swing the former on its pivot to lift it from contact with said plate element during the reverse stroke of said carrier element.

8. In an apparatus of the character described, an article supporting plate, an article engaging element reciprocable above said plate, said element being pivotally mounted to swing in a plane transversely of its line of reciprocation, and a cam positioned directly in the path of movement of said element to press the latter toward the plate during movement in one direction and to lift the element away from the plate during movement in the opposite direction.

9. In an apparatus of the character described, a moving conveyer, a plate element above the conveyer having an aperture therein, a reciprocable element movable transversely of the conveyer, an article feeding element pivotally carried on said reciprocable element to move articles to the aperture, means to hold said feeding element adjacent the plate during article advancing movement and to lift the same from the plate during retracting movement.

10. In an apparatus of the character described, a moving conveyer, a plate element above the conveyer having an aperture therein, a carrier element reciprocable above said plate element along a line substantially transverse with respect to the movement of the conveyer, an article feeding element pivoted on said carrier on a line extending parallel to the line of movement of the carrier, and means to hold said article feeding element in contact with the plate element during article feeding movement and to lift said feeding element from said plate during retracting movement.

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11. In an apparatus of the character described, a moving conveyer, a plate element above the conveyer having an aperture therein, a carrier element reciprocable above said plate element along a line substantially transverse with respect to the movement of the conveyer, an article feeding element pivoted on said carrier on a horizontal line extending parallel to the line of movement of the carrier, a spring connection between said carrier element and article feeding element to urge the latter in contact with the plate during article feeding movement, and means in the path of movement of the article feeding element with respect to the conveyer to relatively vary the position of the latter with respect to the plate during article feeding and retracting movements, respectively.

12. In an apparatus of the character described, a moving conveyer, a support over which received metal articles may move to be delivered to said conveyer, magnetic means on said support intermediate the point at which it receives articles and the point from which it delivers articles to hold an article stationary, and article-engaging means to feed articles to said magnetic means and then move them to the delivery point.

13. A tray loading apparatus comprising a conveyer to support trays in a series lengthwise of the conveyer, a series of article feeding mechanisms spaced longitudinally along one run of the conveyer and movable along lines extending at an angle to the line of conveyer movement to deposit articles in trays on the conveyer, said respective mechanisms being spaced different distances from the longitudinal center-line of the conveyer so that each mechanism will place articles in a row extending longitudinally of the conveyer and spaced transversely of the conveyer with respect to the rows placed thereon by the other of said mechanisms, said feeding mechanisms being so spaced with respect to each other longitudinally of the conveyer and their feeding operations being so synchronized with respect to each other and to the normal movement of the conveyer that an article will be simultaneously deposited by each mechanism at a corresponding point lengthwise of each one of a plurality of trays.

14. A tray loading apparatus comprising a conveyer to support trays in a series lengthwise of the conveyer, a series of article feeding mechanisms spaced longitudinally along one run of the conveyer and movable along lines extending at an angle to the line of conveyer movement to deposit articles in trays on the conveyer, said respective mechanisms being spaced different distances from the longitudinal center-line of the conveyer so that each mechanism will place articles in a row extending longitudinally of the conveyer and spaced transversely of the conveyer with respect to the rows placed thereon by the other of said mechanisms, said feeding mechanisms being so spaced with respect to each other longitudinally of the conveyer and their feeding operations being so synchronized with respect to each other and to the normal movement of the conveyer that an article will be simultaneously deposited by each mechanism at a corresponding point lengthwise of each one of a plurality of trays, and means to accelerate the movement of the conveyer after a feeding mechanism has placed a full row of articles in a tray.

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