Dec. 25, 1951 J. SIMPSON 2,579,976

HIGH-SPEED COVER FEED

Filed Jan. 24, 1949 4 Sheets-Sheet 1

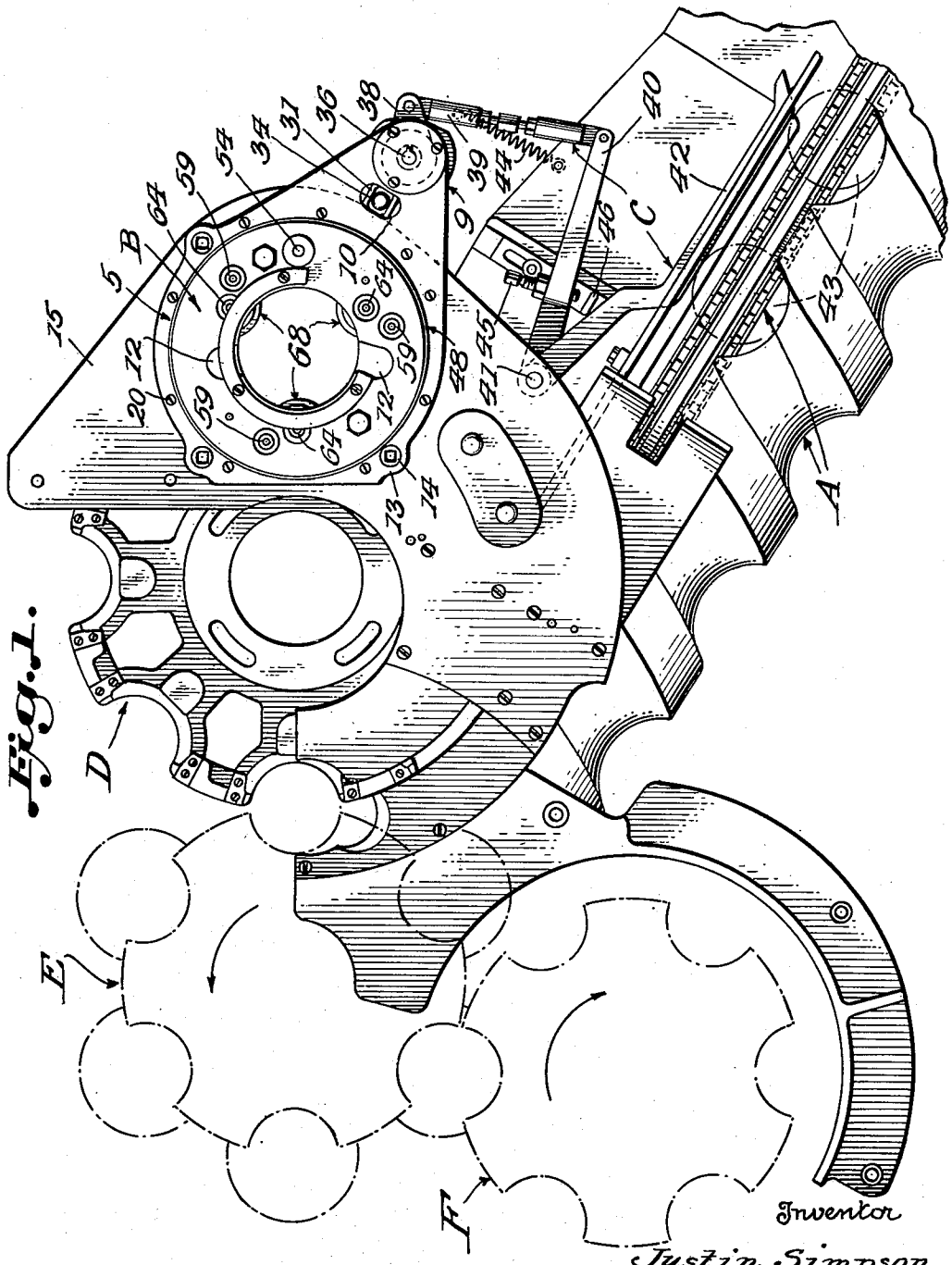


Fig. 1.

Inventor
Justin Simpson,

By
Mason, Porter, Miller & Stewart
ATTORNEYS

Dec. 25, 1951 J. SIMPSON 2,579,976

HIGH-SPEED COVER FEED

Filed Jan. 24, 1949 4 Sheets-Sheet 2

Fig. 2.

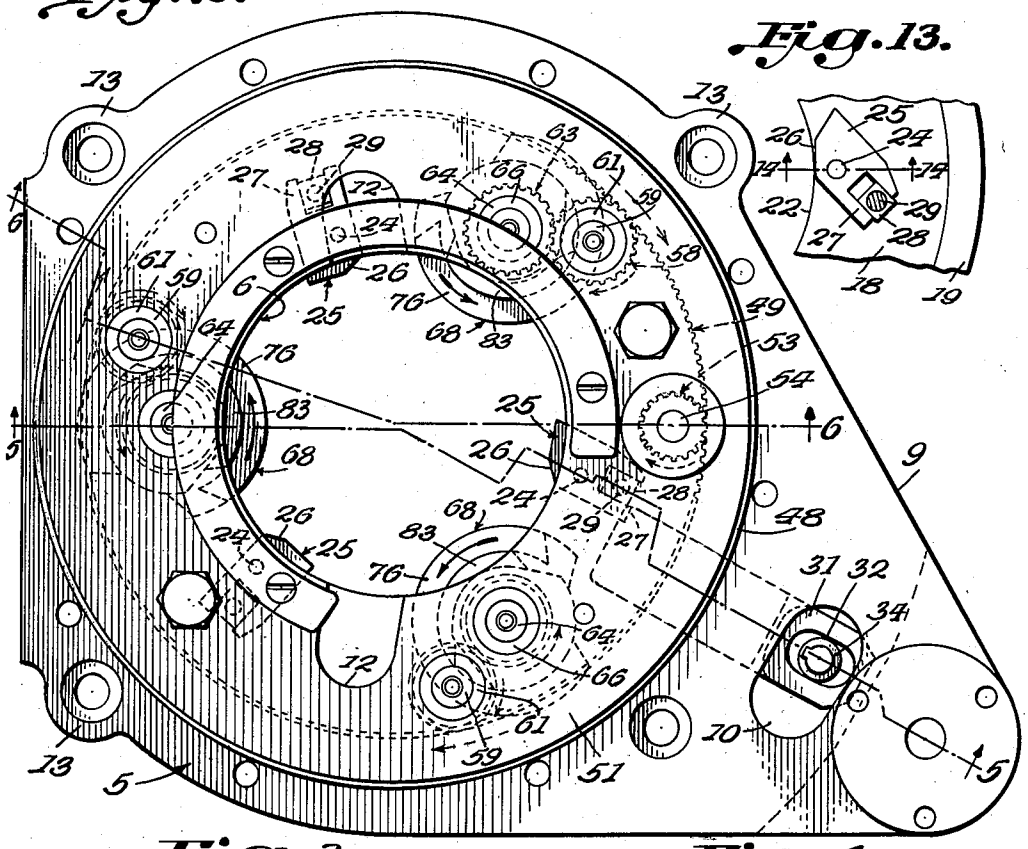


Fig. 13.

Fig. 3.

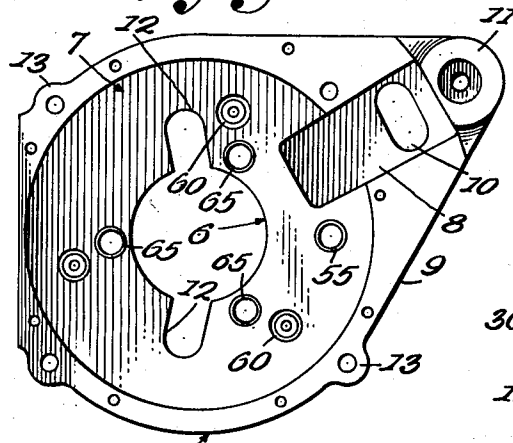


Fig. 4.

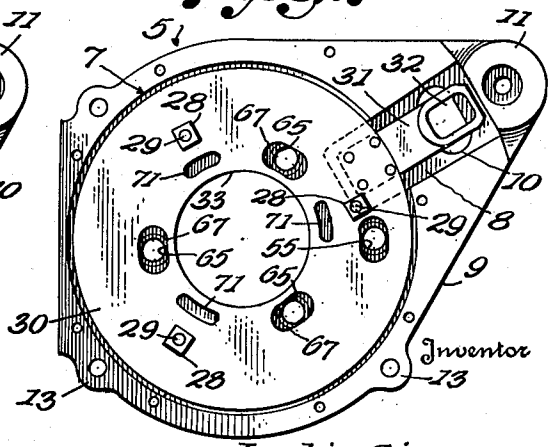


Fig. 14.



Inventor
Justin Simpson,
By
Mason, Porter, Miller & Stewart
ATTORNEYS

Dec. 25, 1951 J. SIMPSON 2,579,976

HIGH-SPEED COVER FEED

Filed Jan. 24, 1949 4 Sheets-Sheet 3

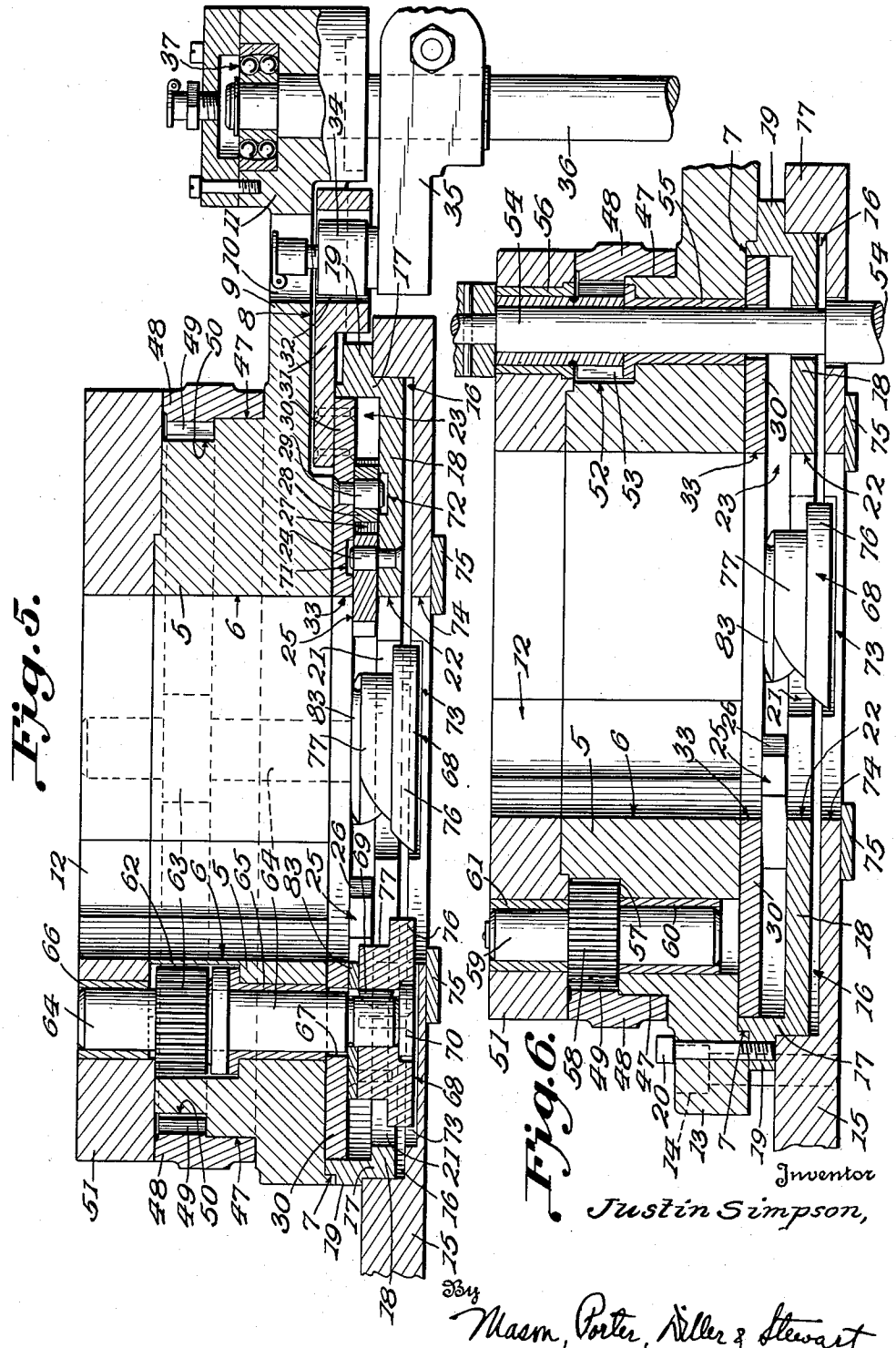


Fig. 5.

Fig. 6.

Inventor
Justin Simpson,

By
Mason, Porter, Miller & Stewart
ATTORNEYS.

Dec. 25, 1951 J. SIMPSON 2,579,976

HIGH-SPEED COVER FEED

Filed Jan. 24, 1949 4 Sheets-Sheet 4

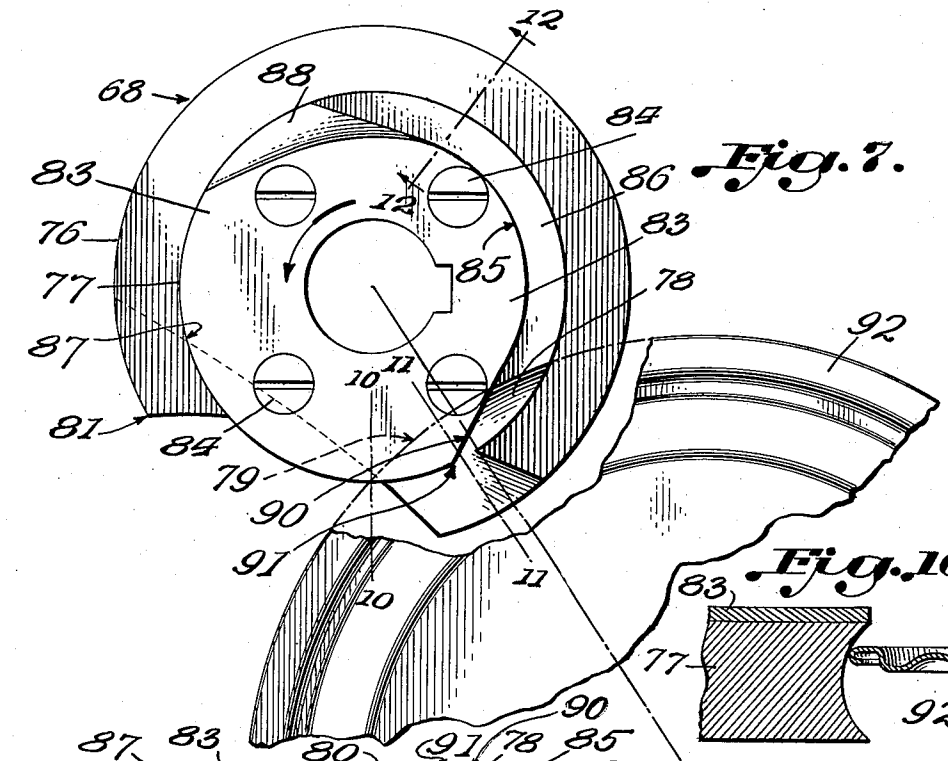


Fig. 7.

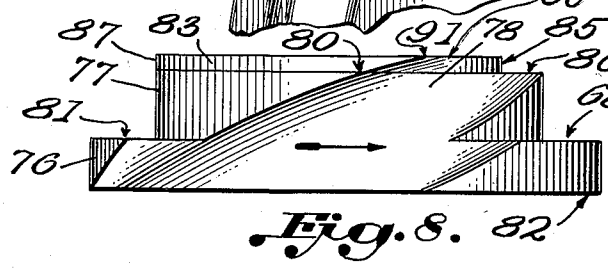


Fig. 8.

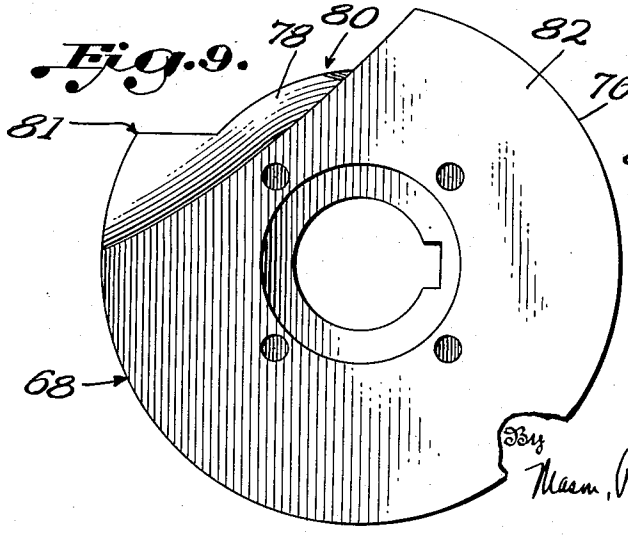


Fig. 9.

Fig. 10.

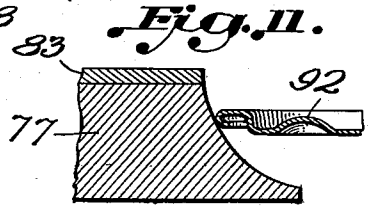


Fig. 11.

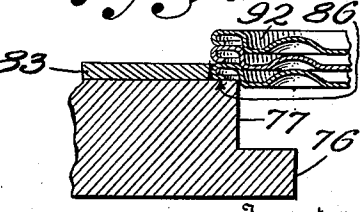


Fig. 12.

Inventor
Justin Simpson,

By
Mason, Porter, Diller & Stewart
ATTORNEYS

Patented Dec. 25, 1951

2,579,976

UNITED STATES PATENT OFFICE

2,579,976

HIGH-SPEED COVER FEED

Justin Simpson, Elmhurst, Ill., assignor to Continental Can Company, Inc., New York, N. Y., a corporation of New York

Application January 24, 1949, Serial No. 72,328

17 Claims. (Cl. 113—114)

1

The invention relates generally to the art of packaging products in cans and primarily seeks to provide a novel cover feeding means capable of positively, rapidly and unfailingly depositing covers one by one from a stack in position for being received by transfer devices which place them in proper association with the cans to be covered thereby.

More specifically the invention seeks to provide a novel cover feed means capable of operating positively and accurately at exceptionally high speeds and in which are included cooperating rotary feeder screws of novel design, and novel means for discontinuing the feeding of the covers whenever there is a break in the continuity of the feeding of complementary cans, and for automatically resuming the feeding of covers when cans for receiving the covers are again fed. Cover feeds employing rotary feed screws have been provided heretofore, and no-can, no-cover feed controls also have been used, but such feeds and controls have not been entirely satisfactory because of lack of adaptability to the high speed demands in the more modern closing machines, and the controls referred to have been found somewhat objectionable because they required a declutching of drive connections and a resultant stopping of the feed screws. Also, known feed screws were so designed as to cause objectionable jiggling and bouncing of covers in the stack, not infrequently causing jams, and they were so coordinated with the cooperating control devices as to require delayed control timing in which a given fed can would effect the release of a cover to be applied on a succeeding can. It is a purpose of the present invention to provide novel cover feed and control means of the character stated wherein all said objectionable features are avoided.

An object of the invention is to provide in cover feed means of the character stated cooperating feed screws which are rotated continuously and which are so constructed and arranged that they effect the feeding of the covers one by one accurately, rapidly and positively and without any lifting action effective to jiggle the stack or bounce covers thereof.

Another object of the invention is to provide cover feed means of the character stated in which each feed screw includes a single high pitch part helix groove effective to positively feed the covers downwardly, each said groove being concaved to conform in shape to the cover edge curl portion engaging therein, horizontally and in line contact, so that the screws cooperate in positively

2

holding each cover horizontally and against tilting as it is being fed downwardly.

Another object of the invention is to provide cover feed means of the character stated in which the single high pitch grooves in the feed screws and the control devices are coordinated so that a cover is deposited as a result of each full rotation of the screws of the multiple complement, and each cover will be fed to be received upon the can which actuated the control devices to make the screws active for feeding that particular cover.

Another object of the invention is to provide cover feed and control means of the character stated wherein are included projectable and retractable supporting lugs which when projected by the control devices incidental to a break in the continuity of feeding of cans will take over the supporting of the stack of covers and permit the screws to rotate ineffectually so long as the break in can feeding continues, and which when again retracted incidental to a resumption of the regular feeding of cans will return the screws to effectiveness in supporting and feeding the covers of the stack.

With the above and other objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by reference to the following detailed description, the appended claims, and the several views illustrated in the accompanying drawings.

In the drawings:

Figure 1 is a somewhat diagrammatic plan view illustrating the invention in position for feeding covers to a cover and can transfer means which in turn delivers the cover and can complements to a closing machine.

Figure 2 is an enlarged plan view illustrating the cover feed means per se.

Figure 3 is an inverted plan view showing the housing body per se.

Figure 4 is a view similar to Figure 3 and illustrating the lug shifter ring in position in the receiving recess in the bottom of the housing body.

Figure 5 is a vertical cross section taken on the line 5—5 on Figure 2.

Figure 6 is a vertical cross section taken on the line 6—6 on Figure 2.

Figure 7 is an enlarged detail plan view illustrating one of the cover feed screws, a fragment of a cover disposed to engage in the cover feed groove also being shown.

Figure 8 is an edge view of the feed screw

shown in Figure 7, looking toward the cover feed groove therein.

Figure 9 is an inverted plan view of the feed screw shown in Figures 7 and 8.

Figure 10 is a fragmentary vertical edge section taken on the line 10—10 on Figure 7.

Figure 11 is a fragmentary vertical edge section taken on the line 11—11 on Figure 7.

Figure 12 is a fragmentary vertical edge section taken on the line 12—12 on Figure 7, a portion of a stack of covers being shown as resting on the screw shoulder.

Figure 13 is a fragmentary plan view and part horizontal section illustrating one of the stack supporting lugs swung to its normal, retracted position.

Figure 14 is a vertical cross section taken on the line 14—14 on Figure 13.

In the somewhat diagrammatic illustration in Figure 1 there is shown one practical adaptation of the invention as a means for feeding covers into position for being rapidly transferred to a closing machine, along with the complementary cans to be closed thereby. In this illustration, a can feeding means is generally designated A, the cover stack or feed devices are generally designated B, the no-can, no-cover feed control is generally designated C, the can and cover transferring means or turret is generally designated D, and the closing and discharging turrets of a six-spindle closing machine are diagrammatically indicated, the closing turret being generally designated E and the closed can discharging turret being generally designated F. It is to be understood that the closing and discharging turret structures are conventional and form no part of the present invention. The can and cover transferring devices likewise form no part of the present invention, they having been covered in the copending application for U. S. Letters Patent entitled High Speed Cover Transfer Means, filed September 28, 1948, by Justin Simpson and Ralph M. Mero, and identified by Serial No. 51,626, now Patent No. 2,516,653, issued July 25, 1950, and the present application is directed to the cover feeding means per se and the combination thereof with the no-can, no-cover control means.

In the practical development of the invention there is included a housing body 5 having a central cover well 6 which is of a diameter for freely receiving the stack of covers which is to be fed one by one, downwardly, in a manner to be described in detail hereinafter. It will be apparent by reference to Figures 3, 4 and 5 of the drawings that the housing body is provided with a bottom face recess 7 and a deeper radial recess 8, the latter extending into a side enlargement or extension 9 which is equipped with an arcuate slot 10, and also with a bearing hub 11 at its outer end extremity. Finger clearances 12 are provided in the side walls of the housing body well 6, and ear extensions 13 are provided through which the housing may be screw secured as at 14 upon the cover feed bracket or support plate 15. While the cover feeding means shown in detail in Figures 2, 5 and 7 may be supported in any approved manner, and adapted for feeding covers one by one to any suitable receiving means, it is preferred that it be adapted to use in connection with the high speed cover and can feeding and assembling devices disclosed in the previously mentioned copending application for U. S. Letters Patent. For this reason no attempt is made herein to disclose any particular

driving connections for coordinating the operation of the cover feeding devices and the several turrets, these having been disclosed in the said copending application.

It will be apparent by reference to Figures 5 and 6 of the drawings that the cover feed bracket or support plate 15 is equipped with a recess 16 in which to receive the annular upstanding flange 17 of the bottom closure plate 18, and the flange 17 also is equipped with an outwardly extending mounting flange 19 which is interposed between the undersurface of the housing body 5 and the top surface of the plate 15 and is screw secured as at 20 to said housing body in the manner clearly illustrated in Figure 6. The bottom plate 18 is provided with screw clearing cut-outs or recesses 21, and the center opening or edge portion 22 is aligned with the well 6 of the housing body 5 in the manner clearly illustrated in Figures 5 and 6. Within the flange 17 and above the bottom plate 18 there is provided a chamber 23 into which three upstanding pivot pins 24 project from the bottom plate, said pins being riveted or otherwise secured to said plate in the manner clearly illustrated in Figure 5. Three support lugs 25 forming parts of the no-can, no-cover control devices are pivotally mounted on the pins 24, and it will be apparent by reference to Figures 2 and 13 of the drawings that said lugs have cover clearing corner cut-offs 26 at their inner ends, and at their outer ends are forked or slotted as at 27 to receive slide blocks 28 which in turn are vertically bored to receive actuator pins 29 which depend from the actuator ring 30 mounted for oscillation within the chamber 23 in the manner clearly illustrated in Figures 4, 5 and 6 of the drawings. The actuator ring 30 has a radial arm extension 31 attached thereto, and said arm is equipped near its outer end with a radial slot 32. The ring also has a center opening 33 which aligns with the well opening 6 in the housing body 5 in the manner clearly illustrated in Figures 2, 4 and 5 of the drawings.

The radial slot 32 in the actuator ring arm extension is adapted to receive an actuator roller 34 which projects upwardly from a crank arm 35 secured upon a rock shaft 36 which is rockable in a bearing 37 provided therefor in the housing body hub 11. It will be apparent by reference to Figure 1 of the drawings that the shaft 36 also has a crank 38 secured thereon and which is adjustable-link connected as at 39 with a control arm 40 which is pivoted as at 41 upon any suitable support and movable with the control lever 42 disposed to be engaged by cans 43 as they are being fed to the cover and can transferring turret D by the can feeding means A. An anchored spring 44 connected with the link 39 serves to urge the lever 42 against the travelling cans, or into the path of movement of said cans, and an adjustable screw 45 carried by the arm 40 is engageable with stop means 46 for limiting movement of the lever 42 across the can path.

An annular reduction 47 on the housing body 5 provides a clearance for receiving the rotatable ring gear 48, and the inwardly projecting toothed portion 49 of said ring projects into an annular clearance 50 provided on said housing body in the manner clearly illustrated in Figure 5. A cover ring 51 is removably secured on the housing body 5 and projects over and protects the ring gear which is understood to be freely rotatable in its mounting on the housing body. It will be apparent by reference to Figure 5 that the

ring gear 48 and the housing cover ring 51 have the same outside diameter. The housing body 5 is provided with a single clearance at 52 in which to receive a driver pinion 53 which is secured on a driver shaft 54. The shaft 54 is rotatable in a bearing 55 provided therefor in the housing body 5, and in a bearing 56 provided therefor in the cover ring 51. The driver shaft 54 extends below the bracket plate 15, and as previously stated, rotation is continuously imparted to said shaft by any suitable means (not shown). It will thus be apparent that the continuously rotating shaft 54 imparts continuous rotation to the ring gear 48.

The housing body 5 also is provided with three clearances 57 in which to receive idler gears 58, each said idler gear being mounted on an idler shaft 59 which is rotatable in a bearing 60 provided therefor in the housing body 5, and in a bearing 61 provided therefor in the cover ring 51. See Figures 2 and 6. It will be apparent by reference to Figures 2 and 6 of the drawings that the continuously rotating ring gear 48, 49 will impart rotation to the several idler gears 58. The housing body 5 also is equipped with three clearances 62 in which to receive gears 63 disposed to mesh with and be driven by the idler gears 58. The driven gears 63 are fixed on shafts 64 which are rotatable in bearings 65 provided therefor in the housing body 5, and in bearings 66 provided therefor in the cover ring 51. Each shaft 64 extends through the bottom of the housing body 5 and through an arcuate slot 67 in the actuator ring 30 into the chamber 23 whereat each said shaft has a cover feed screw generally designated 68 keyed thereon as at 69 and held against its lower end by a screw secured cap 70. Since the ring gear 48, 49 is continuously rotated and imparts continuous rotation to the several idler gears 58 it will be apparent that the several shafts 64 and the feed screws 68 mounted thereon will be continuously driven.

The oscillatable actuator ring 30 may be provided with an annular clearance 71 for clearing the lug mounting pivot pins 24, and the bottom plate 18 may have a similar annular clearance 72 for accommodating movement of the actuator pins 29 which depend from said actuator plate.

It is to be noted that the floor of the bracket plate 15 may be equipped with clearances 73 in which to receive the several feed screws generally designated 68, and it will be apparent by reference to Figures 5 and 6 that the center opening 74 in said bracket plate aligns with the well opening 6 in the housing body 5. Below the bracket plate 15 are mounted the rails or tracks 75 onto which the covers are individually deposited by operation of the screws 68 and over which said covers may be conveyed in the manner disclosed in the previously mentioned copending application for U. S. Letters Patent.

The feed screws which have been generally designated 68 are illustrated in detail in Figures 7 through 12 of the drawings. By reference to said figures it will be apparent that each screw includes a large base flange 76 and an upstanding central hub 77 which is bored and counterbored to receive the respective shaft 64 and securing cap 70. Each base flange and hub portion has a cylindrical periphery except where it is cut through by a very high pitch part helical feeder groove 78 in the manner clearly illustrated in Figure 8. As viewed from above the feeder groove 78 is concave and so shaped that at any horizontal section thereof it will conform to the external curvature of the edge curl of a cover which

is to be fed thereby or therethrough. The manner in which each cover engages in line contact at its peripheral edge portion in the concavity of the feeder groove of each screw is indicated at 79 in Figure 7. The overhanging corner 80 at the entrance into the feeder groove of the main body of each screw defines one side limit of the groove entrance in said main body, and the corner 81 is provided where the high pitch feeder groove passes downwardly through the flange portion 76. It will be apparent by reference to Figures 8 and 9 that the bottom surface of each screw is smooth and flat as at 82.

On top of each screw hub 77 is mounted a cut-off plate 83, the same being removably secured as at 84 on said hub. It will be apparent by reference to Figures 7 and 8 that each cut-off plate includes a small diameter concentric portion 85 which is smaller than the diameter of the hub 77 so as to leave a ledge or shelf 86 outwardly thereof as a cover edge supporting means disposed to support the covers in the manner clearly illustrated in Figure 12. Each cut-off plate 83 also includes a large diameter concentric portion 87 which is of the same outside diameter as the hub 77 and connects with the small diameter concentric portion 85 through a downward inclined portion 88. The concentric portions 85 and 87 also connect through a tangential overhanging portion 90. The overhang at the tangential portion 90 is shaped to form a continuation of the high pitch feeder groove 78 and serves to provide a cut-off point 91. The covers are designated 92.

In describing the operation of the invention it will be assumed that cans 43 are being properly fed in processional order in the manner illustrated in Figure 1, and that a stack of covers 92 is suitably supported in the well 6 of the housing body 5. The curled peripheral edge portions of the covers will be on the supporting ledges or shelf portions 86 of the several screws opposite the small diameter concentric portions 85 of the top of cut-off plates 83 of said screws in the manner clearly illustrated in Figure 12 of the drawings. It is important to note that the thickness of each top plate 83 is identical to the depth of the edge curl on each cover. As the screws are continuously rotated in the manner previously described, and in the direction indicated by the arrows on Figures 2 and 7, the several top plate points 91 will simultaneously engage over the lowermost cover 92 in the stack, or in other words between said lowermost cover and the remainder of the stack, and separate the lowermost cover from the remainder of the stack. The intersection of the helix groove with the shelf 86 provides the entrance for the cover in the hub 77 and, similarly, the intersection of the helix groove with the bottom surface 82 of the base flange 76 provides the exit for the cover from the feeder screw. The cover thus separated from the remainder of the stack by cut-off action of the several sharp screw points 91 will be quickly and positively forced down through the high pitch part helical feeder grooves 78 and deposited on the receiving rails 75 over which it will be conveyed for assembly on the complementary can. Immediately after the cover has been deposited on the receiving rails 75, the rotation of the screws will bring the flat bottom surface 82 of each screw over the flange of the deposited cover and thereby prevent any rebound of the cover. While this downward feeding of the separated cover is taking place the lowermost cover of the

supported stack and the balance of the stack are lowered onto the several screw ledges 86 by riding down the sloping or downwardly inclined surface 88 on the several top plates 83. It will be understood that just prior to this lowering of the stack down the top plate inclines 88 said stack will have been supported on the ledges provided by the large diameter concentric top plate portions 87 extending between the respective cut-off points 91 and the point at which the respective lowering inclines 88 commence. It will be apparent that since the top plates 83 are of exactly the same thickness as the peripheral edge curls on the individual covers 92 the cut-off points 91 will engage between the covers at the bottom of the stack and effect the desired cutting away or separation of the lowermost cover without any incidental lifting of the overlying covers which would result in an agitation or jiggling of the stack. As previously stated, the three feeder screws are rotated continuously and very rapidly and serve to positively and accurately feed the covers at a very high speed. It is to be understood that during the normal feeding of the covers, or in other words so long as cans are properly being fed into the machine, and covers into position for being received on said cans, the supporting lugs 25 will be retracted out of position for interfering with the normal feeding of covers in the manner illustrated in Figure 1.

Should there be a break in the continuity of the feeding of cans, the displacement of the lever 42 by the infeeding cans would no longer be effective and the spring 44 would serve to move the lever equipment 42, 40 downwardly as viewed in Figure 1, and this would result in a downward movement of the crank 38 and a clockwise rocking of the shaft 36. This rocking of the shaft 36 would be attended by a movement of the crank 35 effective to cause the roller 34 to shift the actuator ring 30 in a counterclockwise direction. This would result in a projection of the lugs 25 into the position illustrated in Figure 2 by reason of the engagement of the actuator pins 29 in the blocks 26 slidably engaging in the forked ends 27 of said lugs. The parts are so timed that this projection of the lugs 25 would take place while the stack of covers 92 is being supported by the top flat surface of the top plates 83, and therefore as the continuously driven screws continue their rotation and the downwardly inclined portions 88 of the top plates 83 come opposite the covers of the stack they would be ineffective to lower the stack and the supporting of said stack would be taken over by the lugs 25 while the feeder screws continue their rotation ineffectively. It will be noted by reference to Figure 5 of the drawings that the top or stack supporting surfaces of the several lugs 25 are on the same horizontal plane as the top surfaces of the several top plates 83 of the feeder screws. By reason of the provision of the single very high pitch feeder groove on each feeder screw, one cover will be fed for each complete rotation of the screws, and thus the parts can be so cooperatively timed that each deposited cover will be fed into position for being received by the particular can which controlled its feeding. As soon as the proper feeding of cans is resumed, the control lever equipment 42, 40 would again be shifted to the position illustrated in Figure 1 and the resulting reverse direction shifting of the actuator ring 30 would bring about a retraction of the stack supporting lugs 25 so that the feeder screws 68 could again take over the proper feeding of covers. It will be understood that when the pivotally mounted stack supporting lugs 25 are shifted to the retracted position about their pivot pins 24 the corner cut-off or angularly cut-off portions 26 of said lugs will be presented toward the peripheral edges of the covers of the stack.

In Figures 10 and 11 of the drawings fragmentary sections taken on the lines 10—10 and 11—11 on Figure 7 illustrate the line contact of a cover within the feeder groove of a single screw in different portions of said groove. As previously described, each cover engages in line contact in the bottom of each screw feeder groove as it is being stripped away from the bottom of the stack and deposited on the receiving rails, and it will be apparent by reference to Figure 10 that the engagement in the groove portion there illustrated will prevent upward tilting of the cover, whereas engagement in the portion of the groove illustrated in Figure 11 will prevent downward tilting of said cover. By reason of this particular engagement of the cover edge portions simultaneously in the feeder grooves in three screws, each said cover is accurately held in horizontal position and against tilting, as it is being fed.

It will also be noted by reference to Figures 7, 8 and 9 of the drawings that the cut-off point 81 is defined in part by the periphery of the large flange 76 and by a sharp undercut edge lying in a horizontal plane at the top surface of the flange 76 and extending in angular relation outwardly from the periphery of the hub 77. The fact that the covers are accurately held in a horizontal plane as they are being fed downwardly through the high pitch part helix groove 78 permits the horizontal, angularly disposed edge merging into the cut-off point 81 to pass over the tops of the covers without ever jamming.

As previously described the spring 44 constantly tends to project the lever 42 into the path of the cans 43 being fed in processional order into the machine, and also to project the lugs 25 into the cover stack supporting position illustrated in Figure 2. So long as the lever 42 is in engagement with the infeeding procession of the cans, the lugs 25 will be held in the retracted position against the action of the spring 44, and whenever a break in the procession of cans occurs the lever 42 will be free to move into the space provided by the break in the can procession and the supporting lugs 25 will be projected in the manner previously described.

While one form of the invention has been shown for purposes of illustration, it is to be clearly understood that various changes in the details of construction and arrangement of parts may be made without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. In apparatus of the character described, the combination of means for feeding cans, means including a plurality of feeder screws for supporting a stack of covers and feeding them one by one from the bottom of the stack for assembly on said cans, each said screw including a stack supporting horizontal portion and a positive feeder groove at least in part helical in shape and leading downwardly away from said horizontal portion, means for continuously rotating said feeder screws, projectable and retractable lugs each including a horizontal stack supporting portion at the same level as the horizontal stack supporting portions of the screws and effective to take over the support of the cover

stack from the feed screws and permit the screws to rotate ineffectually when they are projected and return the support and feeding of the covers of the stack to said screws when they are retracted, and means controlled by engagement of fed cans for alternately projecting and retracting said lugs accordingly as the continuity of feeding of a line of cans adapted to receive the covers is broken and then again resumed.

2. In apparatus of the character described, the combination of means for feeding cans, means including a plurality of feeder screws for supporting a stack of covers and feeding them one by one from the bottom of the stack for assembly on said cans, each said screw including a stack supporting horizontal portion and a positive feeder groove at least in part helical in shape and leading downwardly away from said horizontal portion, means for continuously rotating said feeder screws, projectable and retractable lugs each including a horizontal stack supporting portion at the same level as the horizontal stack supporting portions of the screws and effective to take over the support of the cover stack from the feed screws and permit the screws to rotate ineffectually when they are projected and return the support and feeding of the covers of the stack to said screws when they are retracted, means including a spring for yieldably placing and holding said lugs projected, and means displaceable by contact of cans being fed in procession for retracting the lugs and holding them retracted so long as the cans are fed in unbroken procession but effective to release said lugs for projection each time one or more blank spaces occur in the procession of cans.

3. In apparatus of the character described, the combination of means for feeding cans, means including a plurality of continuously rotated feeder screws for supporting a stack of covers and feeding them one by one from the bottom of the stack for assembly on said cans, projectable and retractable lugs effective to take over the support of the cover stack from the feed screws and permit the screws to rotate ineffectually when they are projected and return the support and feeding of the covers of the stack to said screws when they are retracted, means including a spring for yieldably placing and holding said lugs projected, and means displaceable by contact of cans being fed in procession for retracting the lugs and holding them retracted so long as the cans are fed in unbroken procession but effective to release said lugs for projection each time one or more blank spaces occur in the procession of cans, each said screw including a cut-off portion engageable between the lowermost cover in the stack and the one above the same upon each rotation of the screw for separating the lowermost cover from the rest of the stack and a single very high pitch part helix feeder groove effective for feeding each separated cover downwardly onto a receiving way during less than one complete revolution of the screw, said lugs being disposed with their stack supporting surfaces on the same horizontal plane with the stack supporting surfaces of the screws.

4. In apparatus of the character described, the combination of means for feeding cans, means including a plurality of continuously rotated feeder screws for supporting a stack of covers and feeding them one by one from the bottom of the stack for assembly on said cans, projectable and retractable lugs effective to take over the support of the cover stack from the feed screws and permit the screws to rotate ineffectually when they are projected and return the support and feeding of the covers of the stack to said screws when they are retracted, the covers of the stack having curled peripheral edge portions, each said screw including a cut-off portion engageable between the lowermost cover in the stack and the one above the same upon each rotation of the screw for separating the lowermost cover from the rest of the stack and a single very high pitch part helix feeder groove effective for feeding each separated cover downwardly onto a receiving way during less than one complete revolution of the screw, and a stack supporting ledge portion extending about a part of the circumference of the screw and leading to said feeder groove and the cut-off portion at a level below the top of the screw a distance equal to the depth of a cover edge curl, and said screw also including a gradually descending stack lowering portion leading down from the top of the screw onto the ledge, and means controlled by engagement of fed cans for alternately projecting and retracting said lugs accordingly as the continuity of feeding of a line of cans adapted to receive the covers is broken and then again resumed.

5. In apparatus of the character described, means providing a well in which to receive a stack of covers, a plurality of rotary feeder screws for supporting the stack of covers and feeding the covers one by one from the bottom of the stack, and means for continuously rotating the screws, each said screw including a stack supporting upper surface portion, a cut-off portion engageable between the lowermost cover in the stack and the one above the same upon each rotation of the screw for separating the lowermost cover from the rest of the stack and a single very high pitch part helix feeder groove generally conforming in shape to the peripheral edge curvature of the covers at various horizontal cross sections therethrough and over a material portion of the circumference of each contacting can end and effective for feeding each separated cover downwardly onto a receiving means during less than one complete revolution of the screw.

6. Apparatus as defined in claim 5 adapted for the feeding of covers having curled peripheral edge portions and wherein each screw includes a stack supporting ledge portion extending about a part of the circumference of the screw and leading to the high pitch feeder groove and the cut-off portion at a level below the stack supporting upper surface of the screw a distance equal to the depth of a cover edge curl, and said screw also including a gradually descending stack lowering portion leading down from said stack supporting upper surface onto said ledge.

7. In apparatus of the character described, means providing a well in which to receive a stack of covers, a plurality of rotary feeder screws for supporting the stack of covers and feeding the covers one by one from the bottom of the stack, and means for continuously rotating the screws, each said screw including a central upstanding hub portion and an enlarged base flange extending outwardly beyond said hub portion, said hub portion having a stack supporting upper surface portion, a cut-off portion engageable between the lowermost cover in the stack and the one above the same upon each rotation of the screw for separating the lowermost cover from the rest of the stack and a single very high pitch part helix feeder groove extending through said hub portion

and flange and effective for feeding each separated cover downwardly onto a receiving means during less than one complete revolution of the screw.

8. Apparatus as defined in claim 5 adapted for the feeding of covers having curled peripheral edge portions and wherein each screw includes a stack supporting ledge portion extending about a part of the circumference of the screw and leading to the high pitch feeder groove and the cut-off portion at a level below the stack supporting upper surface of the screw a distance equal to the depth of a cover edge curl, and said screw also including a gradually descending stack lowering portion leading down from said stack supporting upper surface onto said ledge, and said stack supporting upper surface portion, said cut-off portion, and said stack lowering portion all being formed on a plate member comprising a removable attachment at the top of the screw.

9. In apparatus of the character described, means providing a well in which to receive a stack of covers, a plurality of rotary feeder screws for supporting the stack of covers and feeding the covers one by one from the bottom of the stack, and means for continuously rotating the screws, each said screw including a horizontal stack supporting upper surface portion, a cut-off portion engageable between the lowermost cover in the stack and the one above the same upon each rotation of the screw for separating the lowermost cover from the rest of the stack and a single very high pitch part helix feeder groove effective for feeding each separated cover downwardly onto a receiving means during less than one complete revolution of the screw, said feeder groove being concaved to conform in horizontal cross section to the external curvature of the covers which engage therein over a material portion of the circumference of each contacting can end so that the covers can engage in horizontal line contact in the screw grooves and be held horizontally and against tilting therein as they are being fed.

10. Apparatus as defined in claim 5 adapted for the feeding of covers having curled peripheral edge portions and wherein each screw includes a stack supporting ledge portion extending about a part of the circumference of the screw and leading to the high pitch feeder groove and the cut-off portion at a level below the stack supporting upper surface of the screw a distance equal to the depth of a cover edge curl, and said screw also including a gradually descending stack lowering portion leading down from said stack supporting upper surface onto said ledge, each said feeder groove being so shaped as to conform in horizontal cross section to the external curvature of the covers which engage therein so that the covers can engage in horizontal line contact in the screw grooves and be held horizontally and against tilting therein as they are being fed.

11. Apparatus as defined in claim 5 adapted for the feeding of covers having curled peripheral edge portions and wherein each screw includes a stack supporting ledge portion extending about a part of the circumference of the screw and leading to the high pitch feeder groove and the cut-off portion at a level below the stack supporting upper surface of the screw a distance equal to the depth of a cover edge curl, and said screw also including a gradually descending stack lowering portion leading down from said stack supporting upper surface onto said ledge, and said stack supporting upper surface portion, said cut-off portion, and said stack lowering portion all being formed on a plate member comprising a removable attachment at the top of the screw, and each said feeder groove being so shaped as to conform in horizontal cross section to the external curvature of the covers which engage therein so that the covers can engage in horizontal line contact in the screw grooves and be held horizontally and against tilting therein as they are being fed.

12. In apparatus of the character described, the combination of means for feeding cans, a plurality of feeder screws for supporting a stack of covers and feeding them one by one from the bottom of the stack for assembly on said cans, means for continuously rotating said feeder screws, supplementary cover stack supporting members projectable and retractable into and out of stack supporting position, said screws and said supporting members having stack supporting surfaces lying in the same horizontal plane, and each said screw including a positive feeder groove at least in part helical in shape and leading downwardly away from the associated stack supporting surface, means normally tending to project said members for taking over the support of the cover stack from the rotating feeder screws each time there is a break in continuity in the proper feeding of cans and permitting said feeder screws to continue their rotation ineffectually, and means engageable by cans moving with the feeding means for restraining said member projecting means and holding said members retracted.

13. In apparatus of the character described, the combination of means for feeding cans, means including a plurality of feeder screws for supporting a stack of covers and feeding them one by one from the bottom of the stack for assembly on said cans, means for continuously rotating said feeder screws, supplementary cover stack supporting members projectable and retractable into and out of stack supporting position, said screws and said supporting members having stack supporting surfaces lying in the same horizontal plane, and each said screw including a positive feeder groove at least in part helical in shape and leading downwardly away from the associated stack supporting surface, means engaged by cans moving with said feeding means for normally holding the supporting members retracted so that the screws will be effective to support and feed the covers so long as proper feeding of cans continues, and means for projecting said supporting members for taking over the support of the cover stack from the rotating feeder screws each time there is a break in continuity in the proper feeding of cans and permitting said feeder screws to continue their rotation ineffectually.

14. Apparatus as defined in claim 13 in which the projectable and retractable members are pivotally mounted, and in which the member projecting and retracting means includes an oscillatable ring having slot and pin connection with the several members off center with respect to their pivots so that movement of the ring in one direction will retract the members and movement of said ring in the opposite direction will project said members.

15. Apparatus as defined in claim 13 in which the projectable and retractable members are pivotally mounted, and in which the member projecting and retracting means includes an oscillatable ring having slot and pin connection with the several members off center with respect

to their pivots so that movement of the ring in one direction will retract the members and movement of said ring in the opposite direction will project said members, an actuator arm projecting radially from said ring, a rock shaft having a crank and pin connection with the actuator arm, spring means constantly tending to rock the shaft in a direction for effecting a projection of the lugs, and a control lever disposed to be engaged and displaced by passing cans and crank and link connected with the rock shaft for rocking the same in a direction for retracting the members and holding them retracted against the action of the spring means so long as the lever is held displaced by a passing can.

16. In apparatus of the character described, the combination of means for feeding cans, means comprising a plurality of continuously rotated feeder screws for supporting a stack of covers and feeding them one by one from the bottom of the stack for assembly on said cans and including stack supporting surfaces lying in a common horizontal plane, and means for taking over the support of the cover stack from the rotating feeder screws each time there is a break in continuity in the proper feeding of cans and permitting said feeder screws to continue their rotation ineffectually and including stack supporting surfaces lying in the same horizontal plane as the stack supporting surfaces of said screws, each said screw including a cut-off portion engageable between the lowermost cover in the stack and the one above the same upon each rotation of the screw for separating the lowermost cover from the rest of the stack and a single very high pitch part helix feeder groove generally conforming in horizontal cross section to the peripheral edge curvature of the covers and effective for feeding each separated cover downwardly onto a receiving way during less than one complete revolution of the screw.

17. Apparatus as defined in claim 16 in which the covers of the stack have curled peripheral edge portions and each screw includes a stack supporting ledge portion extending about a part of the circumference of the screw and leading to said feeder groove and the cut-off portion at a level below the top of the screw a distance equal to the depth of a cover edge curl, and said screw also including a gradually descending stack lowering portion leading down from the top of the screw onto said ledge.

JUSTIN SIMPSON.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
941,357	Cobb	Nov. 30, 1909
962,316	Cobb	June 21, 1910
1,070,182	Robinson	Aug. 12, 1913
1,092,613	Warme	Apr. 7, 1914
1,126,194	Graham	Jan. 26, 1915
1,128,435	Foote	Feb. 16, 1915
1,158,045	Graham	Oct. 26, 1915
1,161,953	Nelson	Nov. 30, 1915
1,347,295	Sedwick	July 20, 1920
1,348,650	Kronquest	Aug. 3, 1920
1,610,862	Kronquest	Dec. 14, 1926
2,184,029	Wicklund	Dec. 19, 1939