

March 1, 1938.

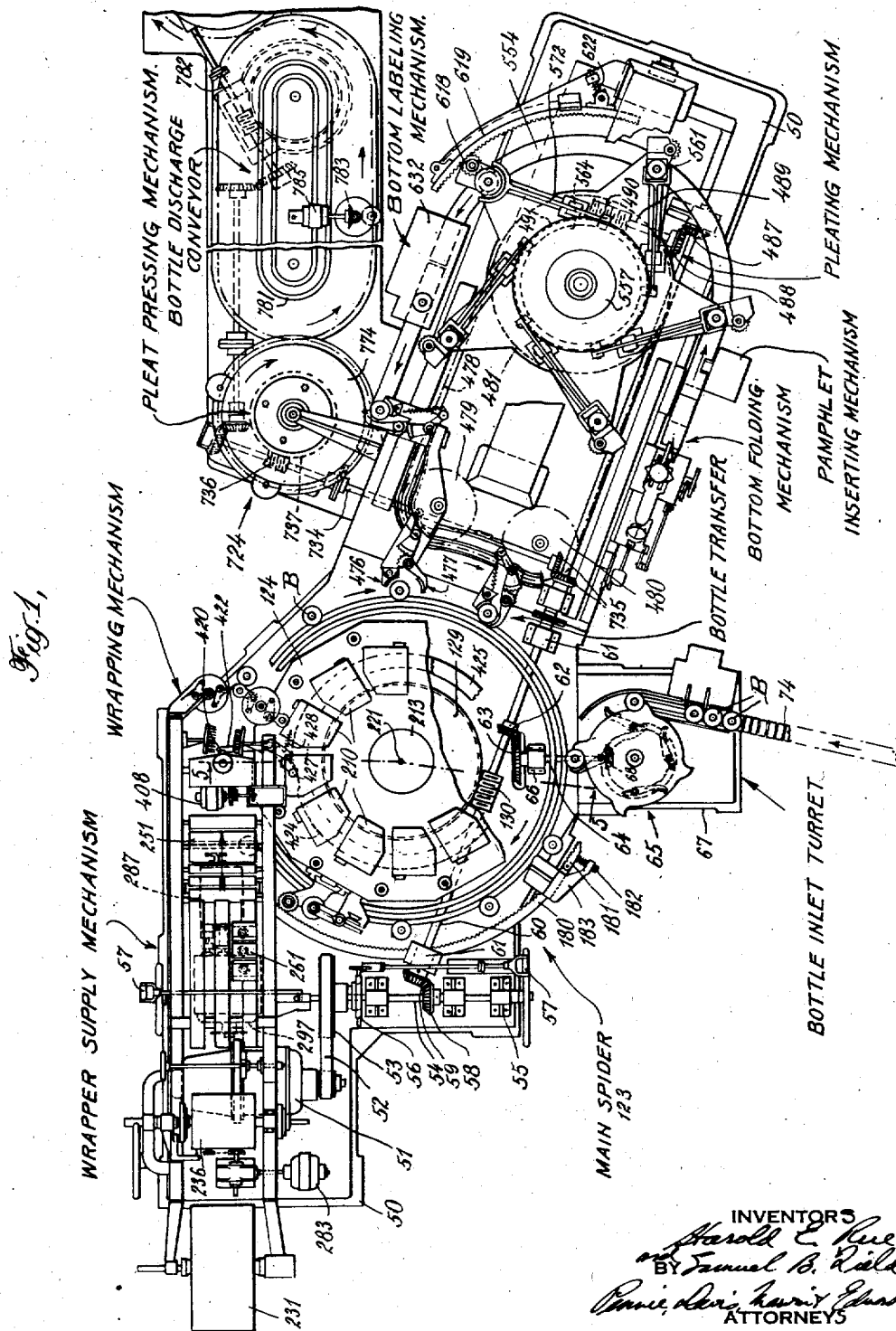
H. E. RUE ET AL

2,109,505

WRAPPING MACHINE

Filed July 24, 1934

22 Sheets-Sheet 1



March 1, 1938.

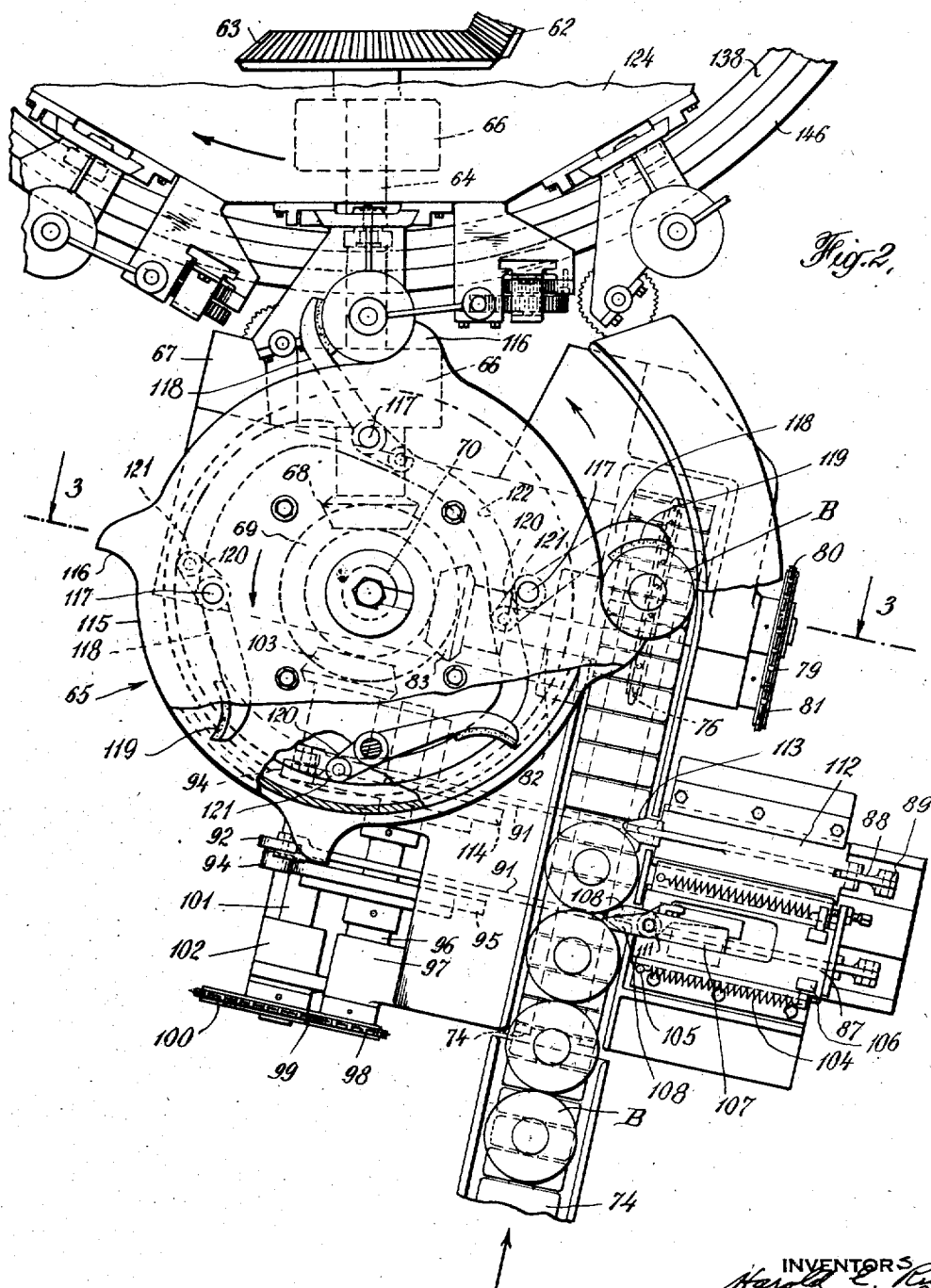
H. E. RUE ET AL

2,109,505

WRAPPING MACHINE

Filed July 24, 1934

22 Sheets-Sheet 2



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March 1, 1938.

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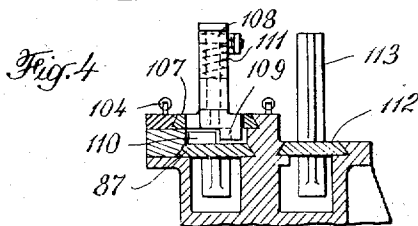
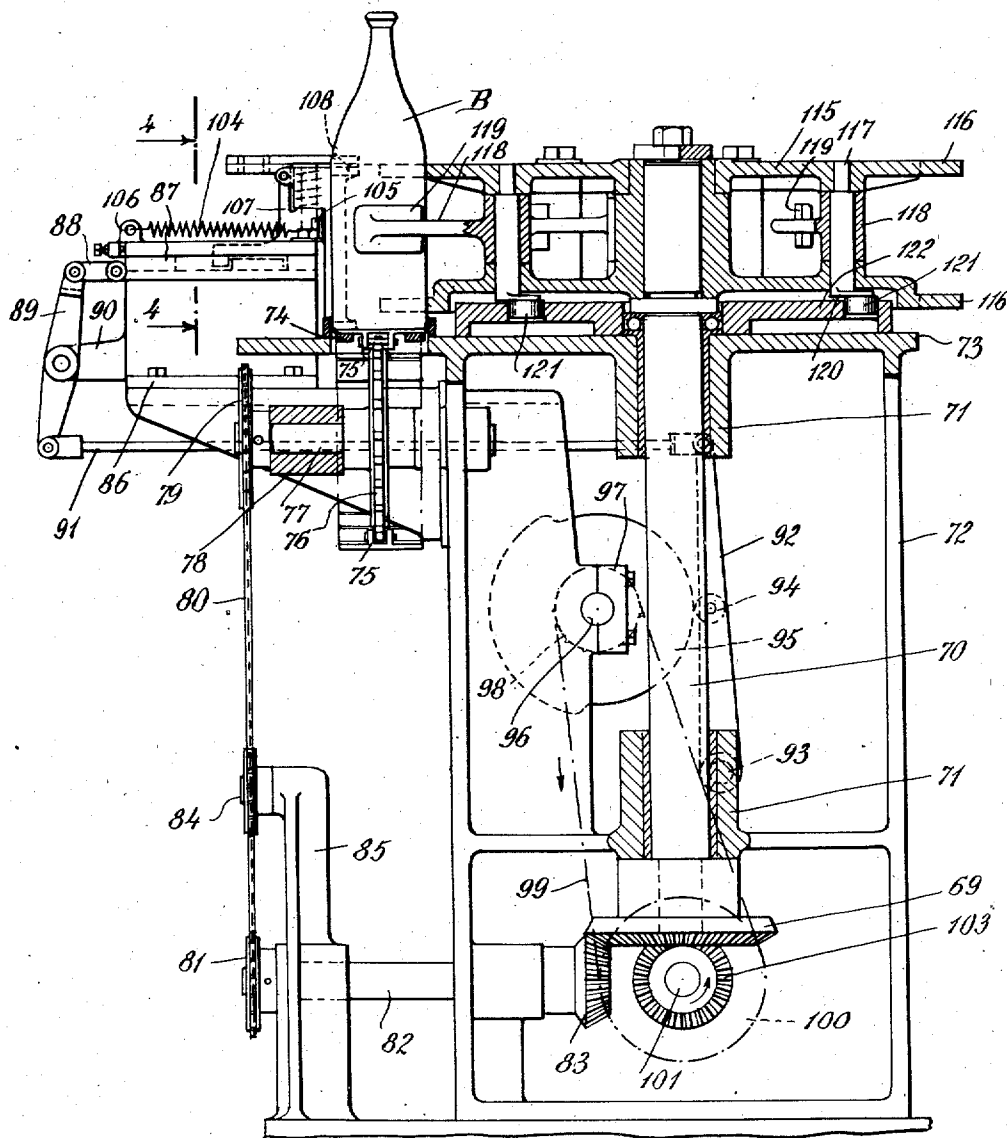
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Fig. 3,



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March 1, 1938.

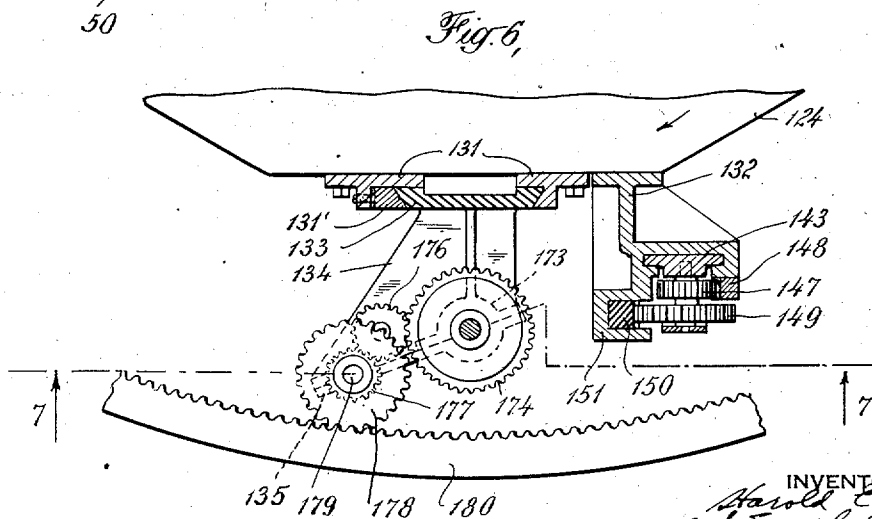
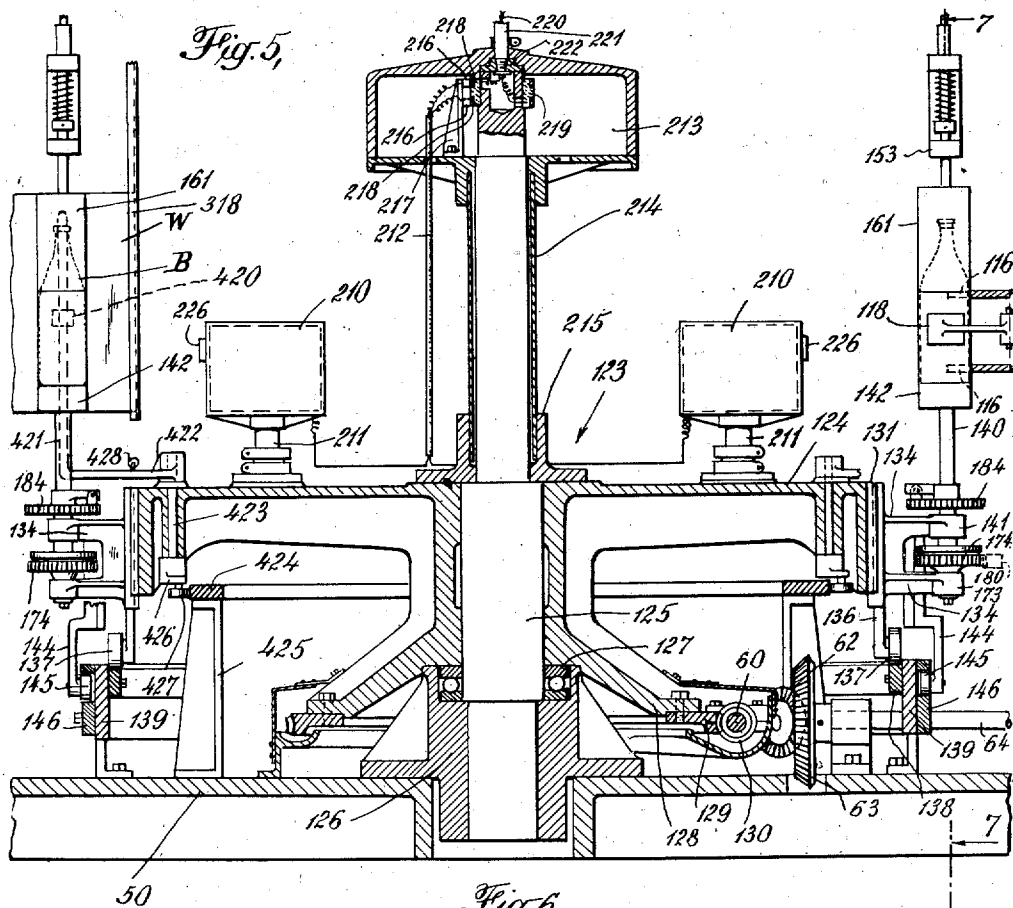
H. E. RUE ET AL

2,109,505

WRAPPING MACHINE

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22 Sheets-Sheet 4



INVENTORS
Harold E. Rue
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March 1, 1938.

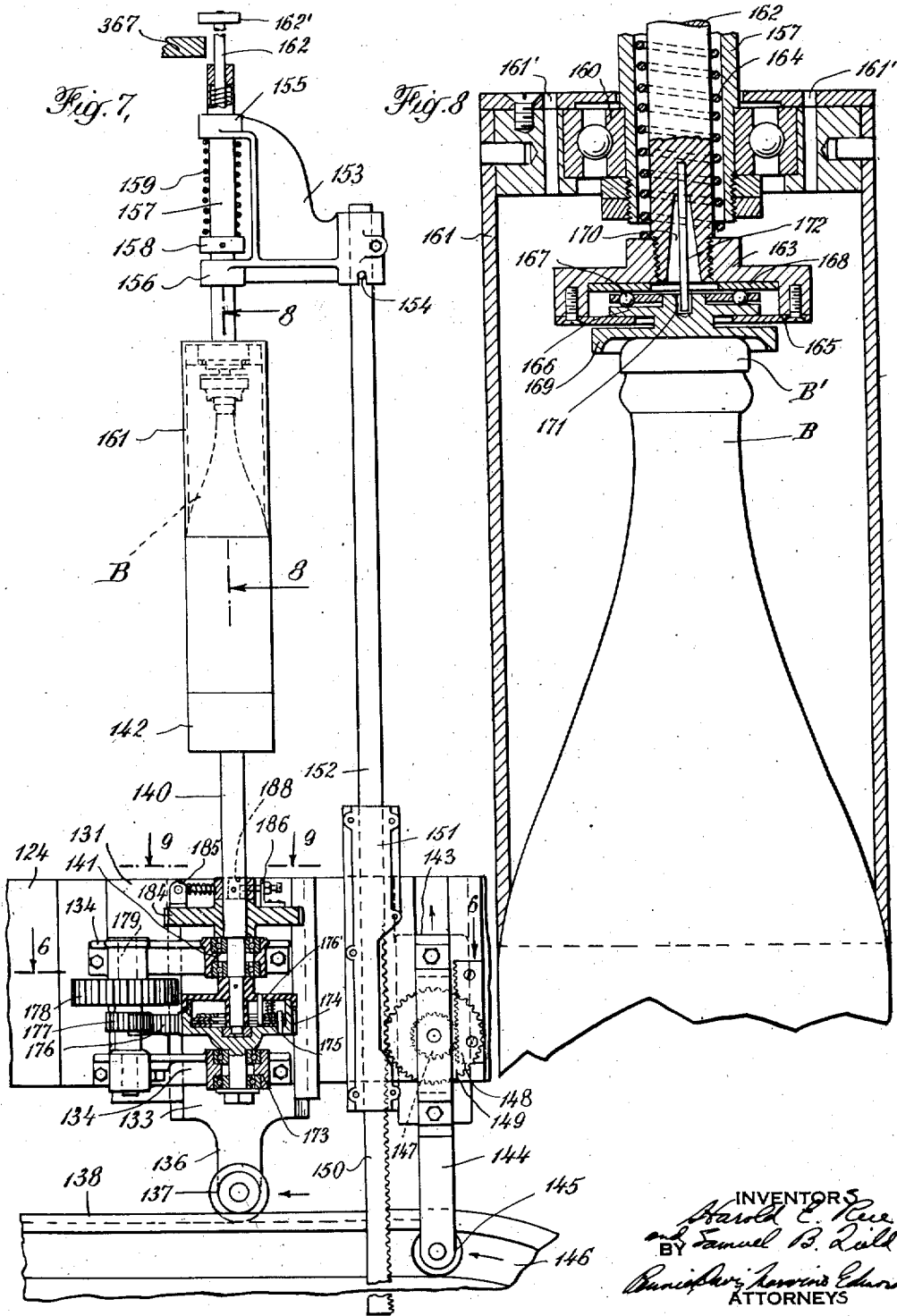
H. E. RUE ET AL

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WRAPPING MACHINE

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March 1, 1938.

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WRAPPING MACHINE

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Fig. 9,

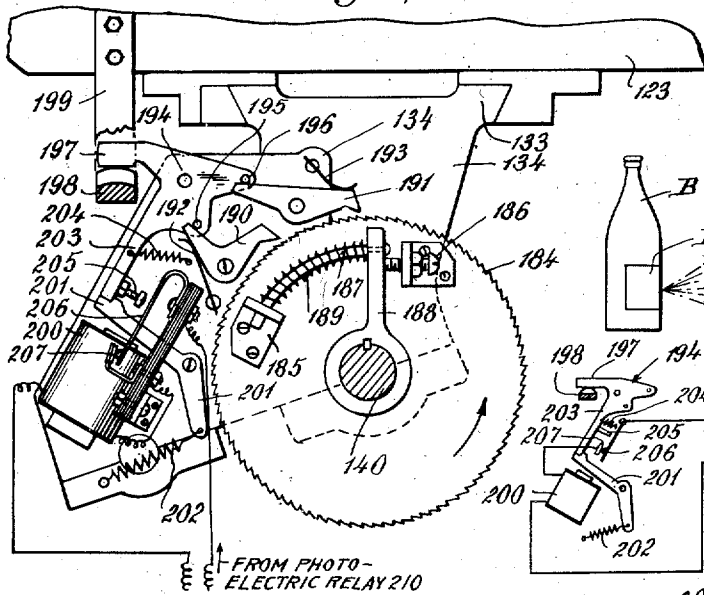


Fig. 10,

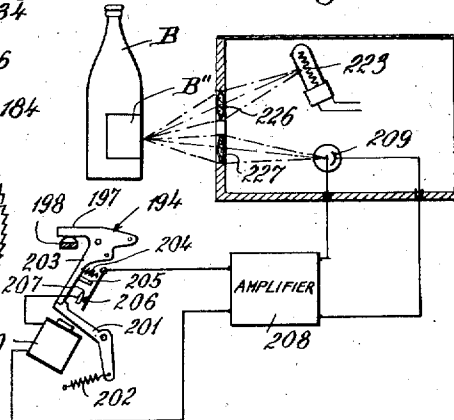


Fig. 24,

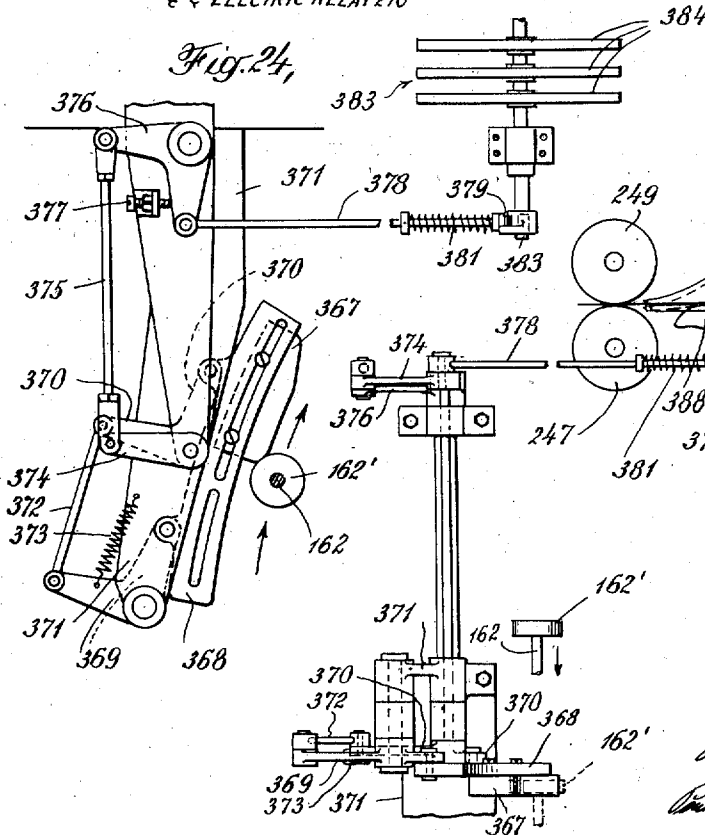
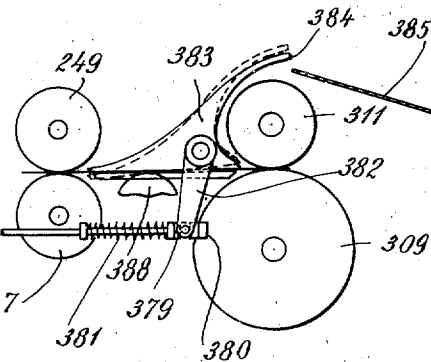


Fig. 25,



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March 1, 1938.

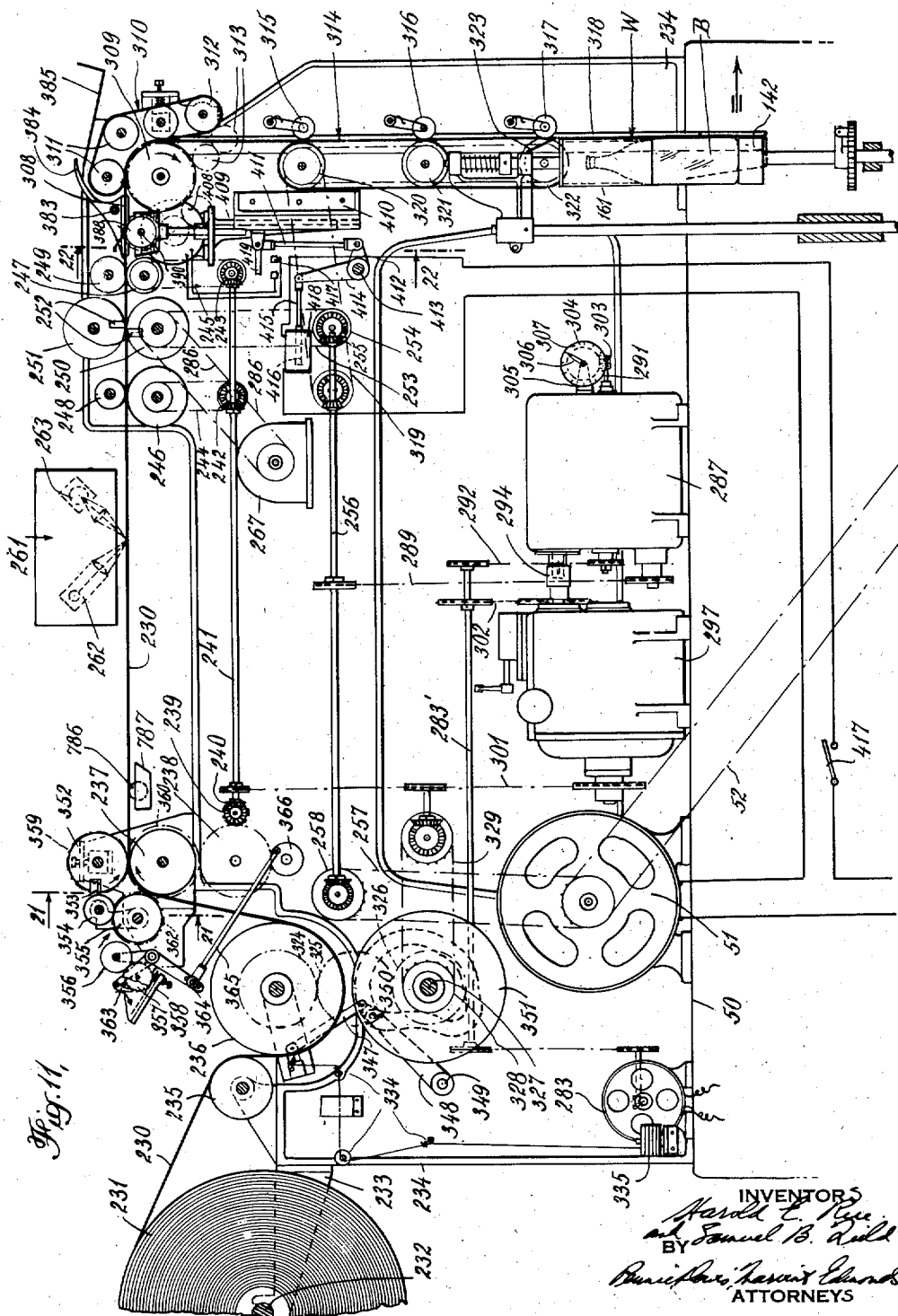
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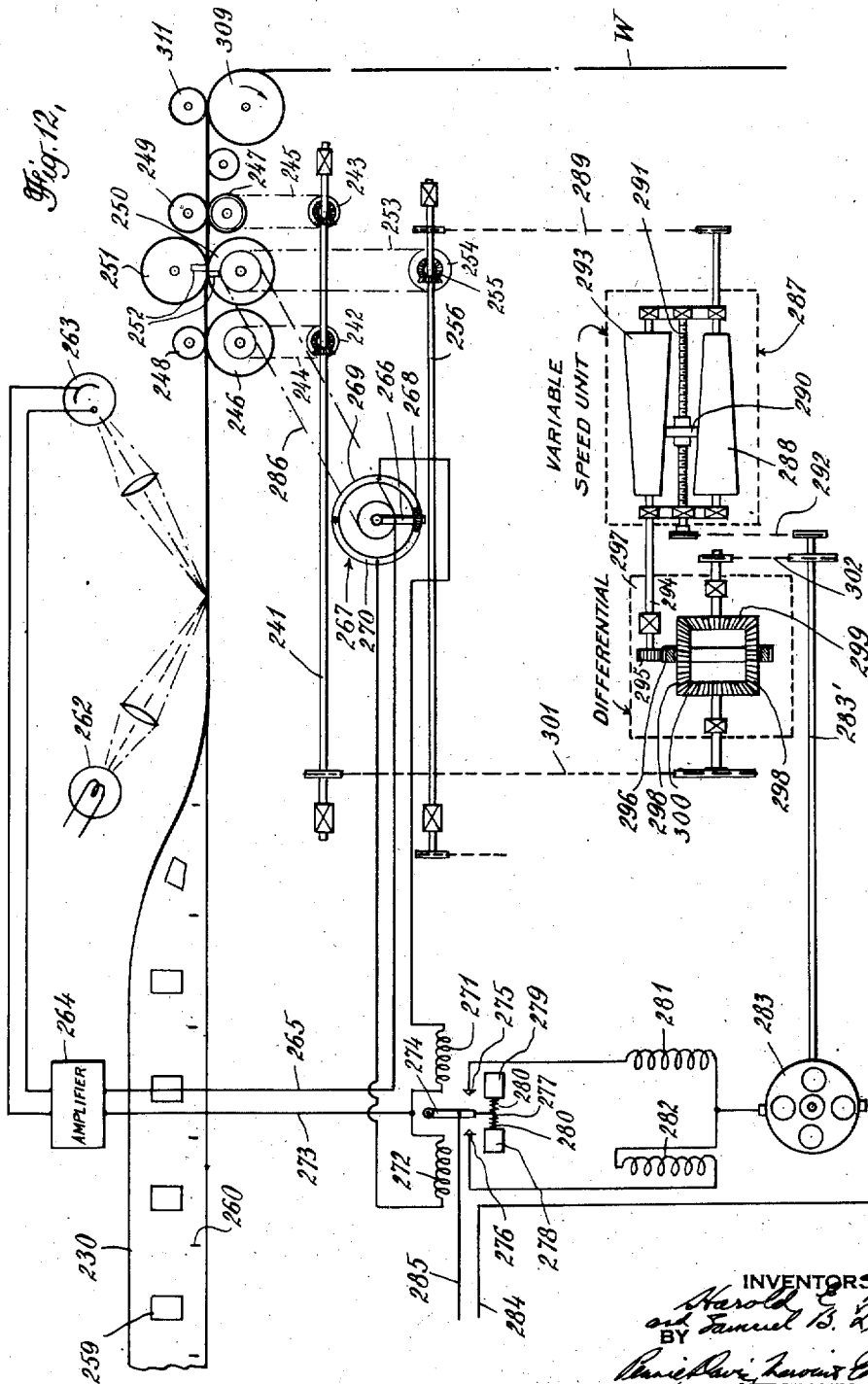
H. E. RUE ET AL

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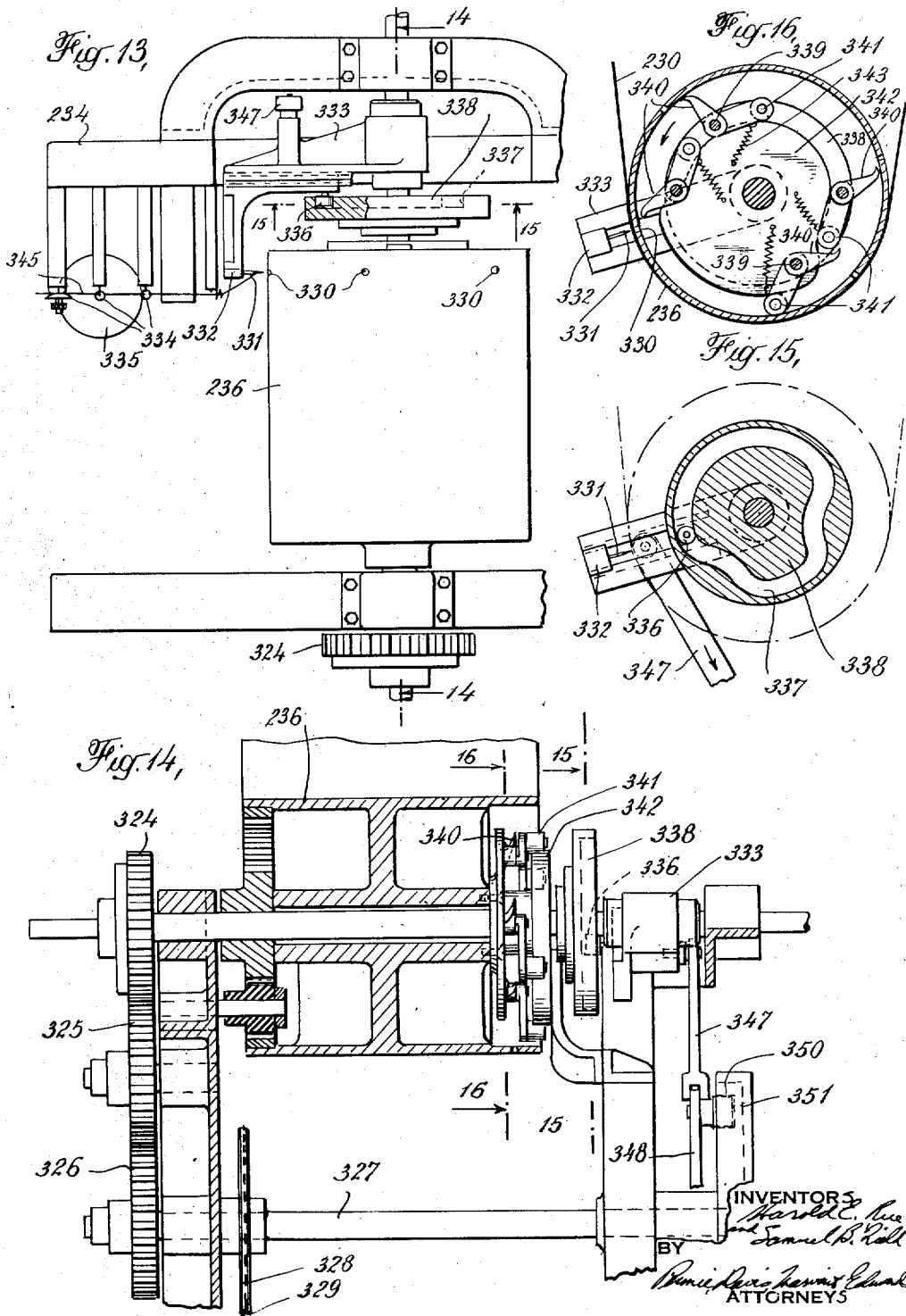
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WRAPPING MACHINE

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22 Sheets-Sheet 9



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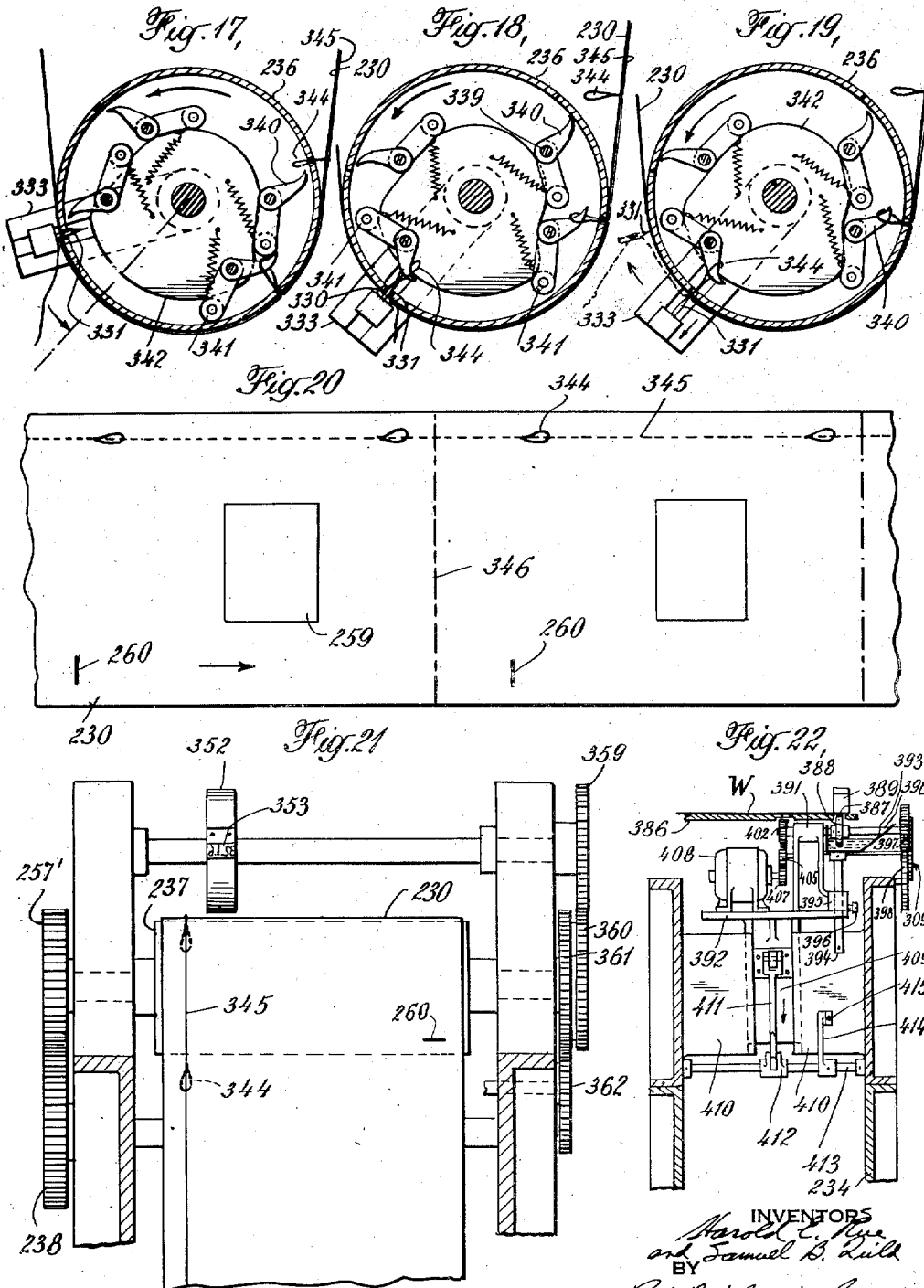
H. E. RUE ET AL

2,109,505

WRAPPING MACHINE

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22 Sheets-Sheet 10



INVENTORS
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March 1, 1938.

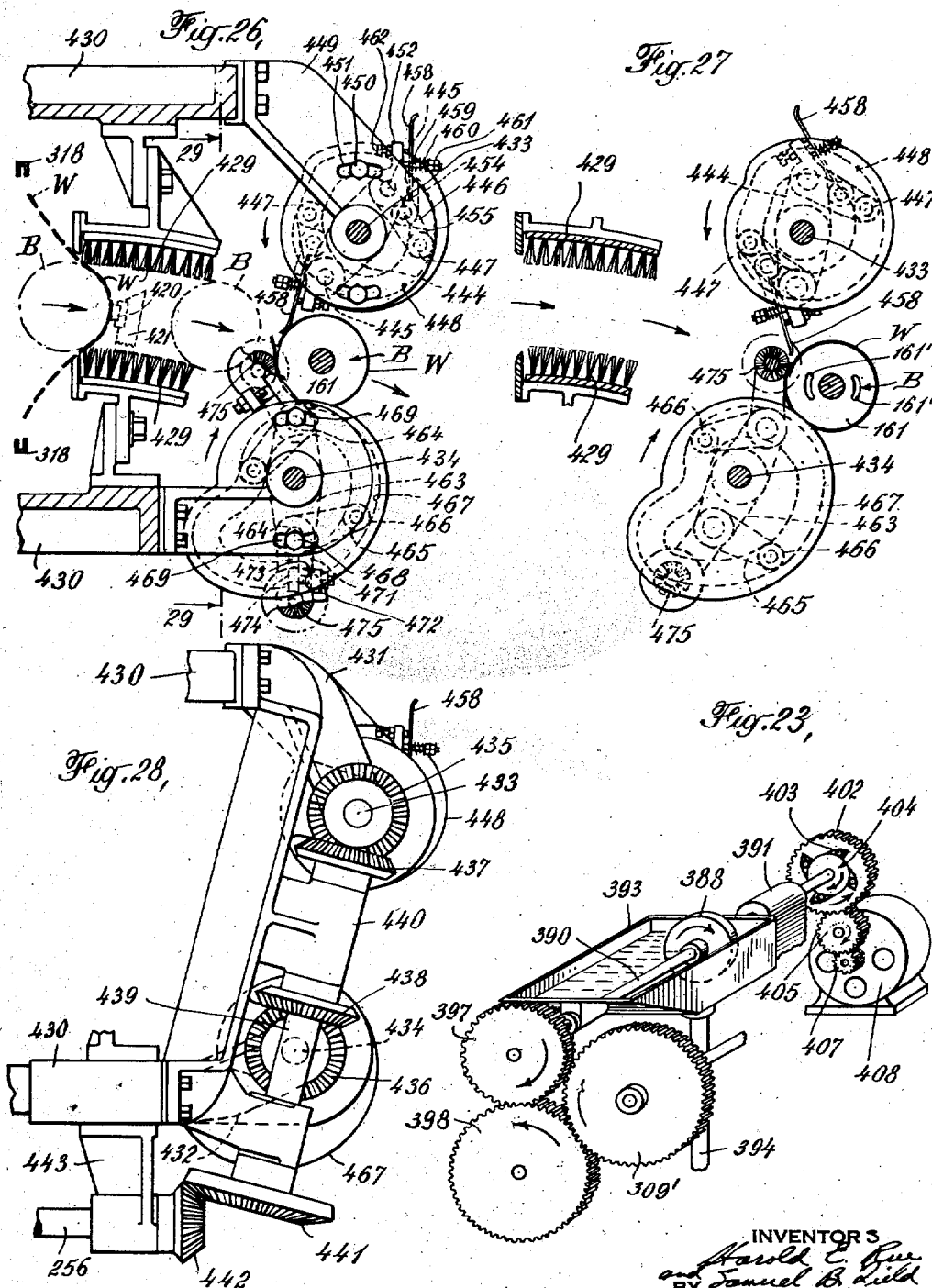
H. E. RUE ET AL

2,109,505

WRAPPING MACHINE

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22 Sheets-Sheet 11



INVENTOR S
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March 1, 1938.

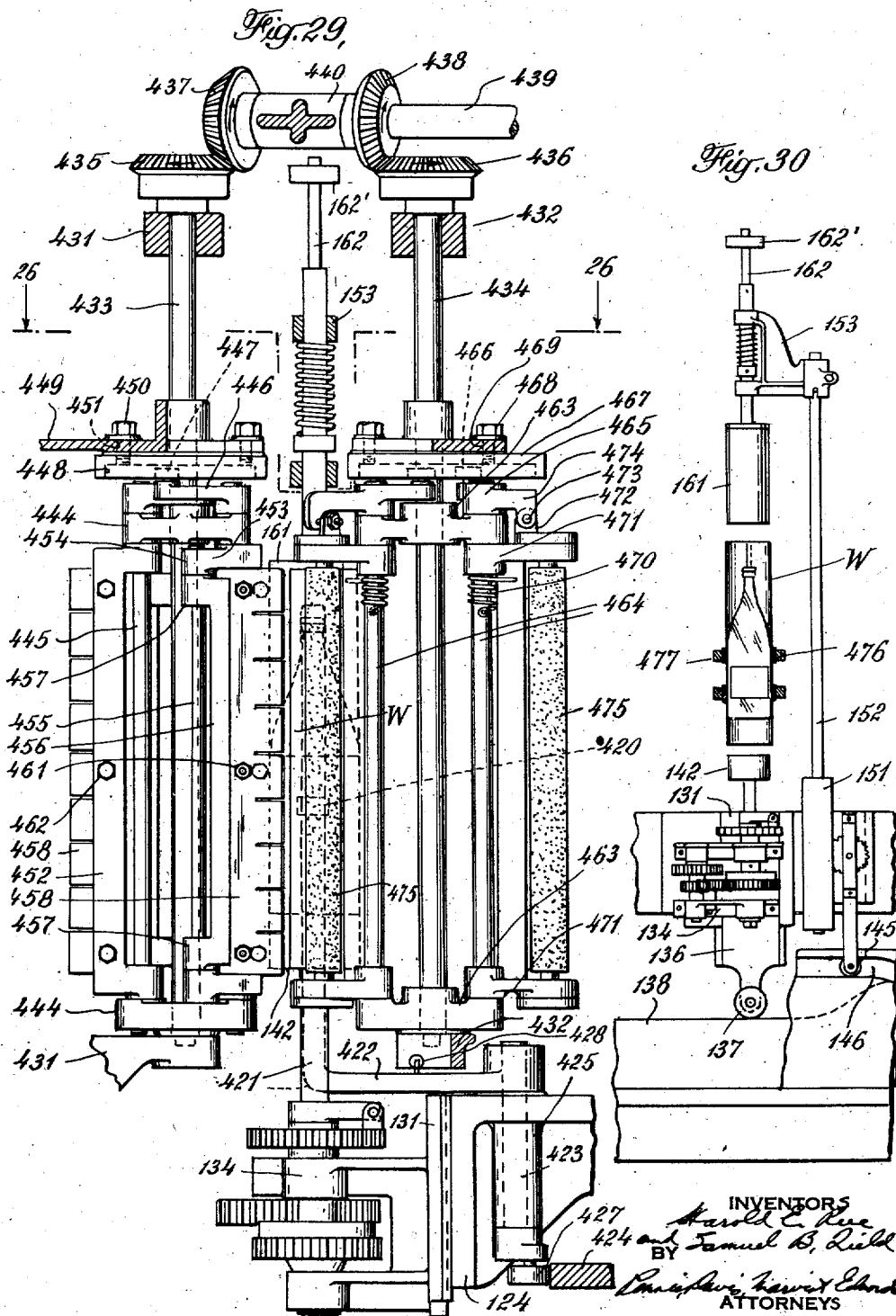
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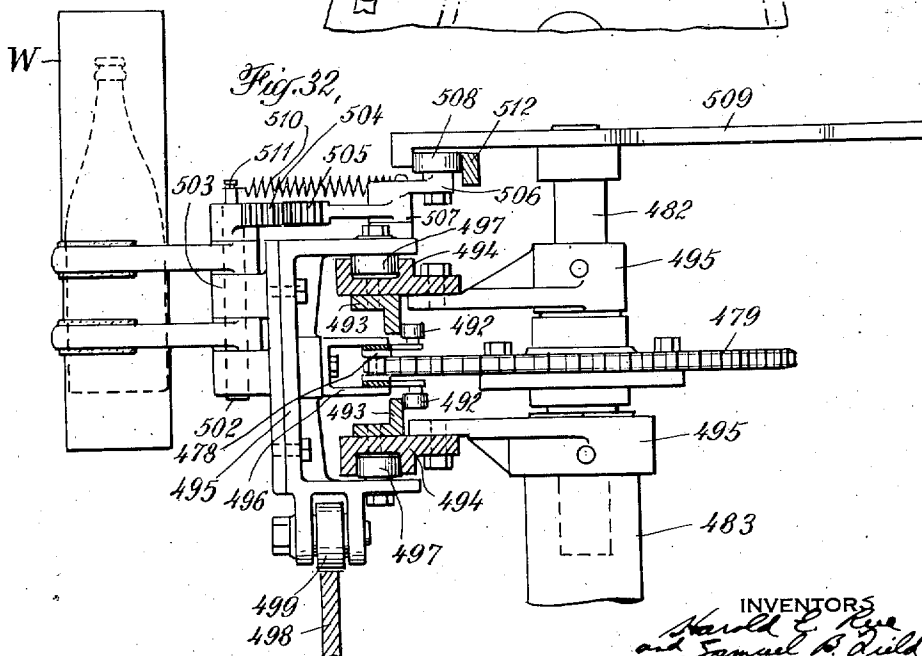
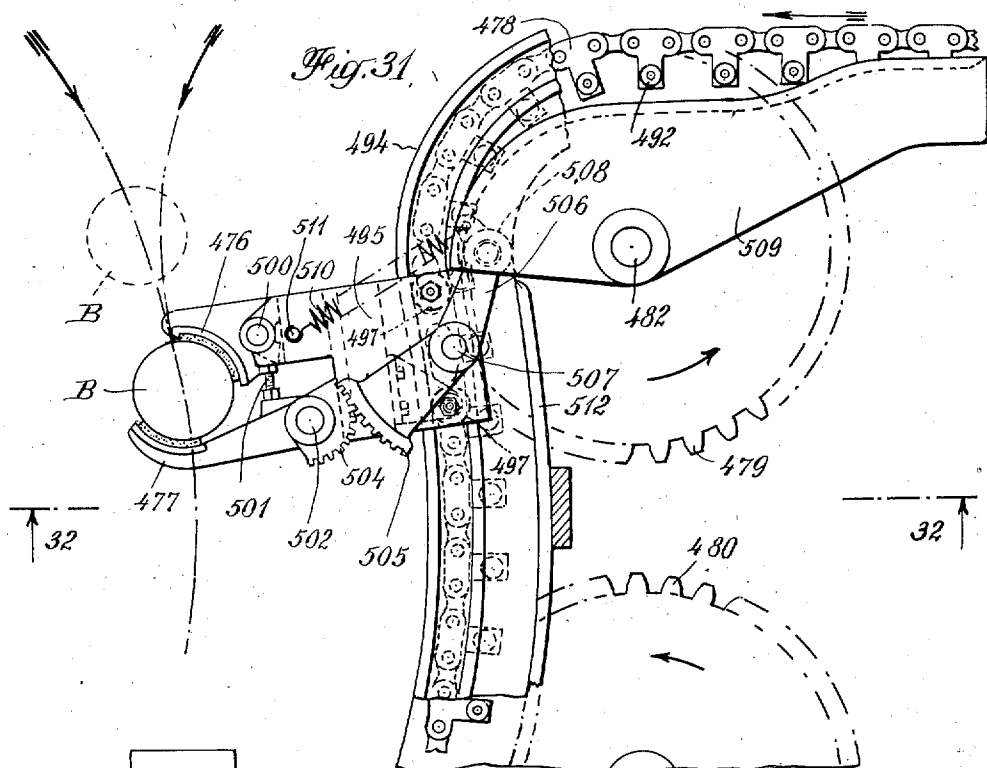
H. E. RUE ET AL

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WRAPPING MACHINE

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22 Sheets-Sheet 13



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March 1, 1938.

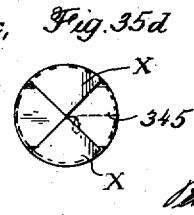
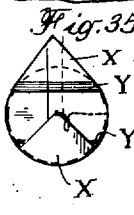
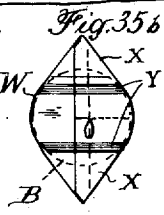
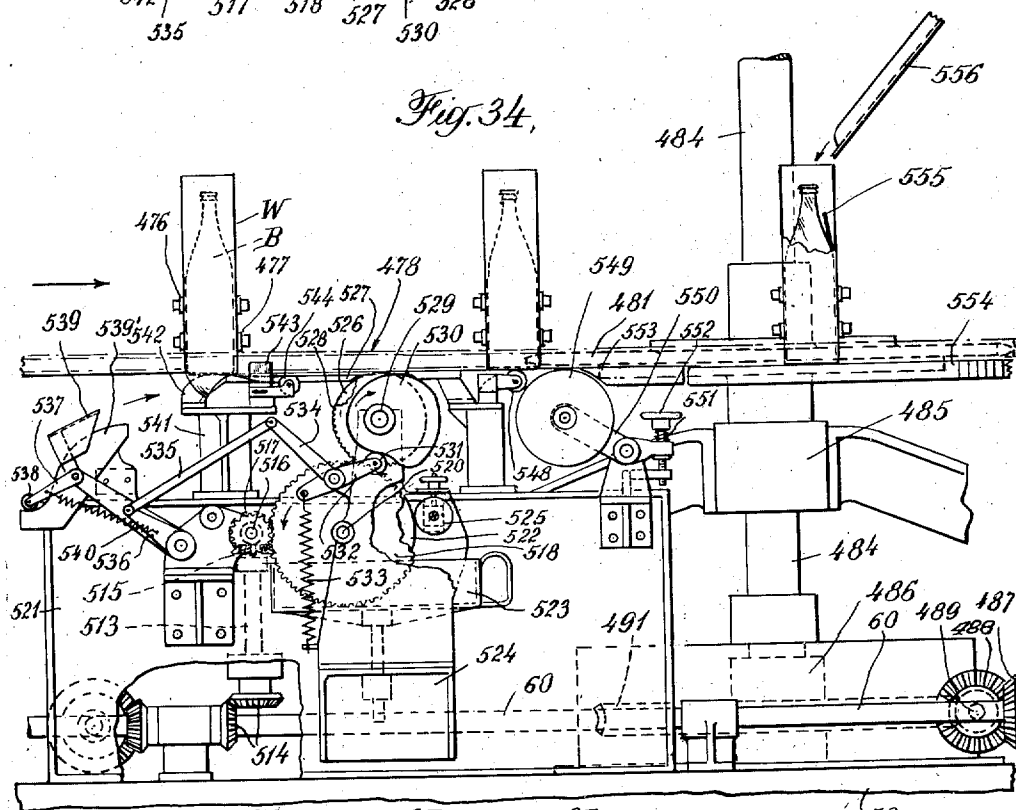
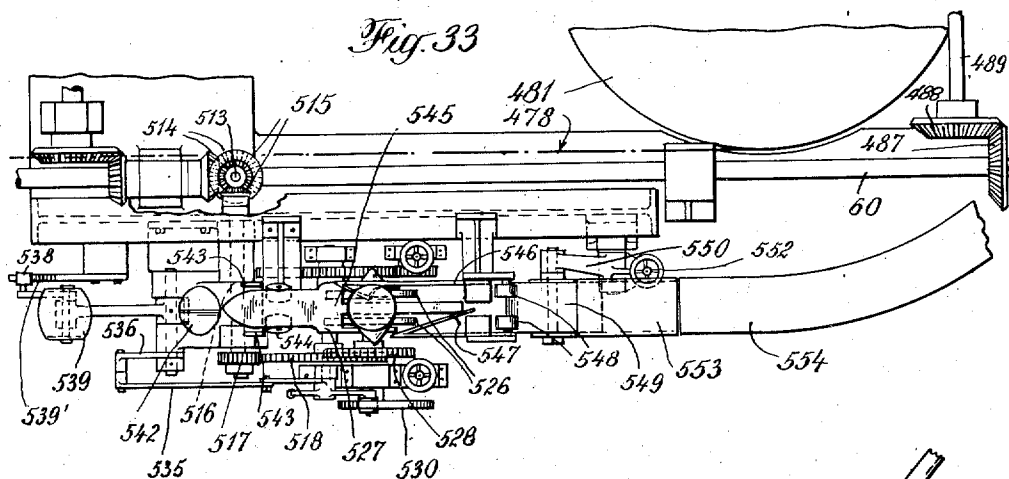
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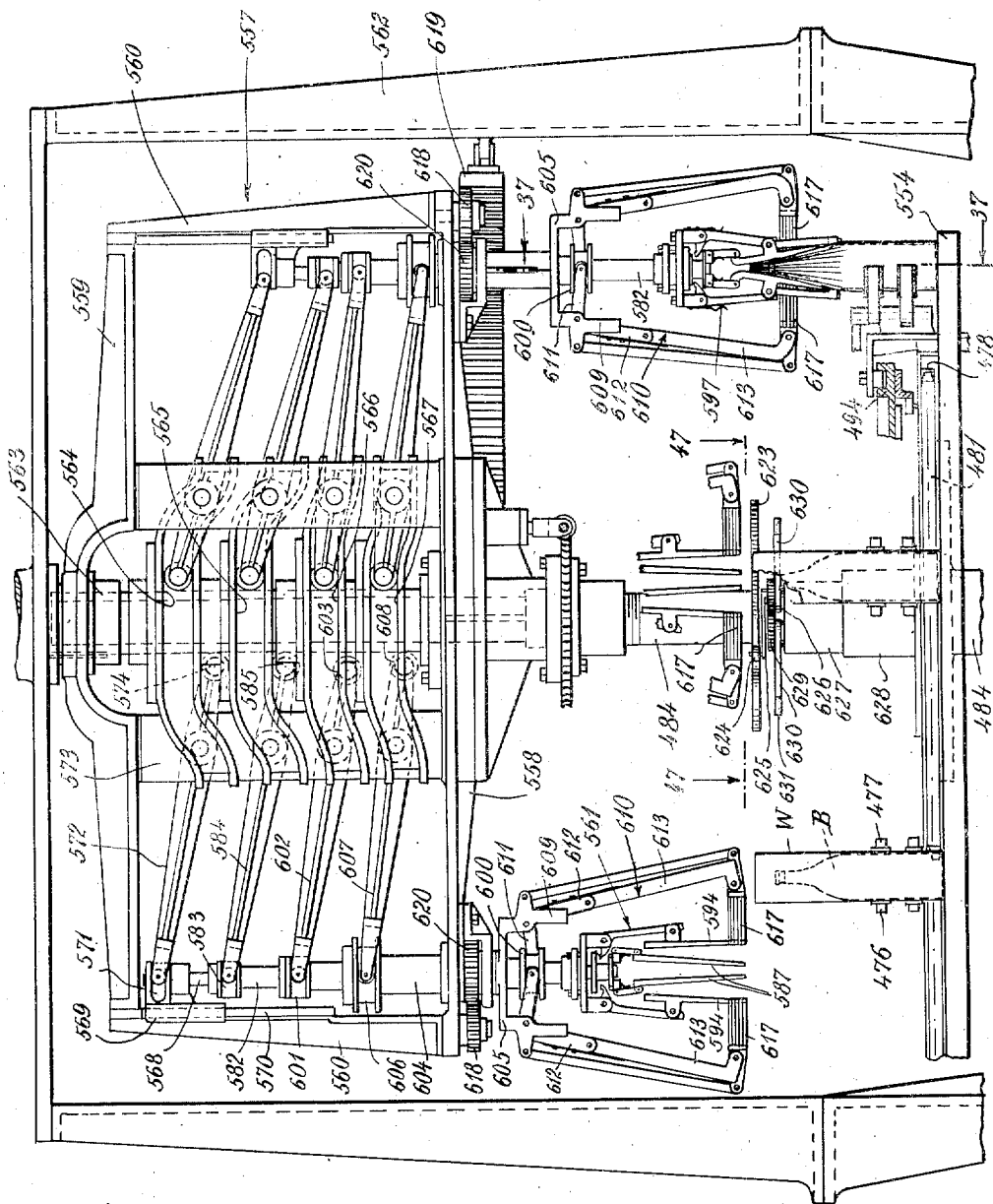


Fig. 36,

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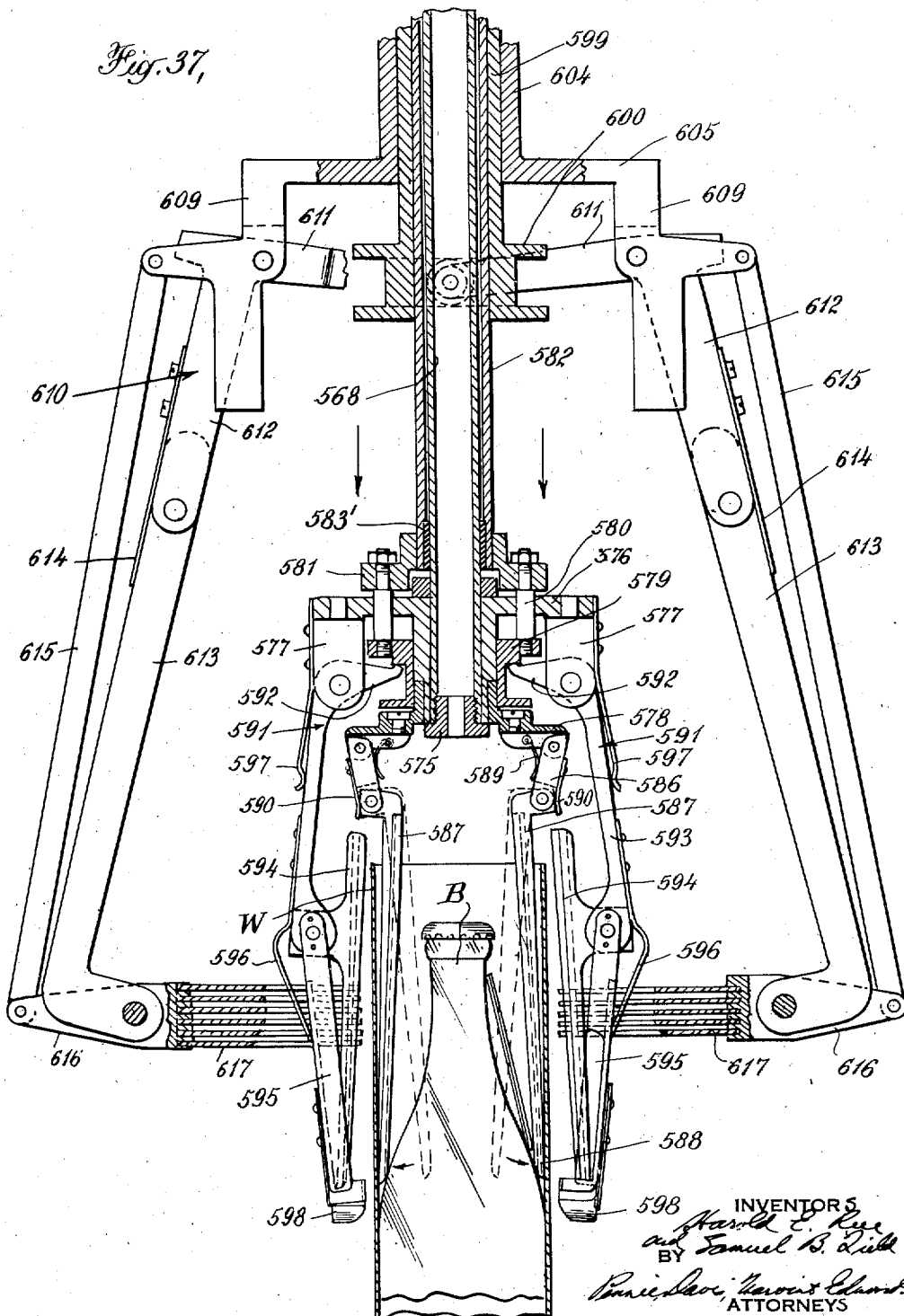
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March 1, 1938.

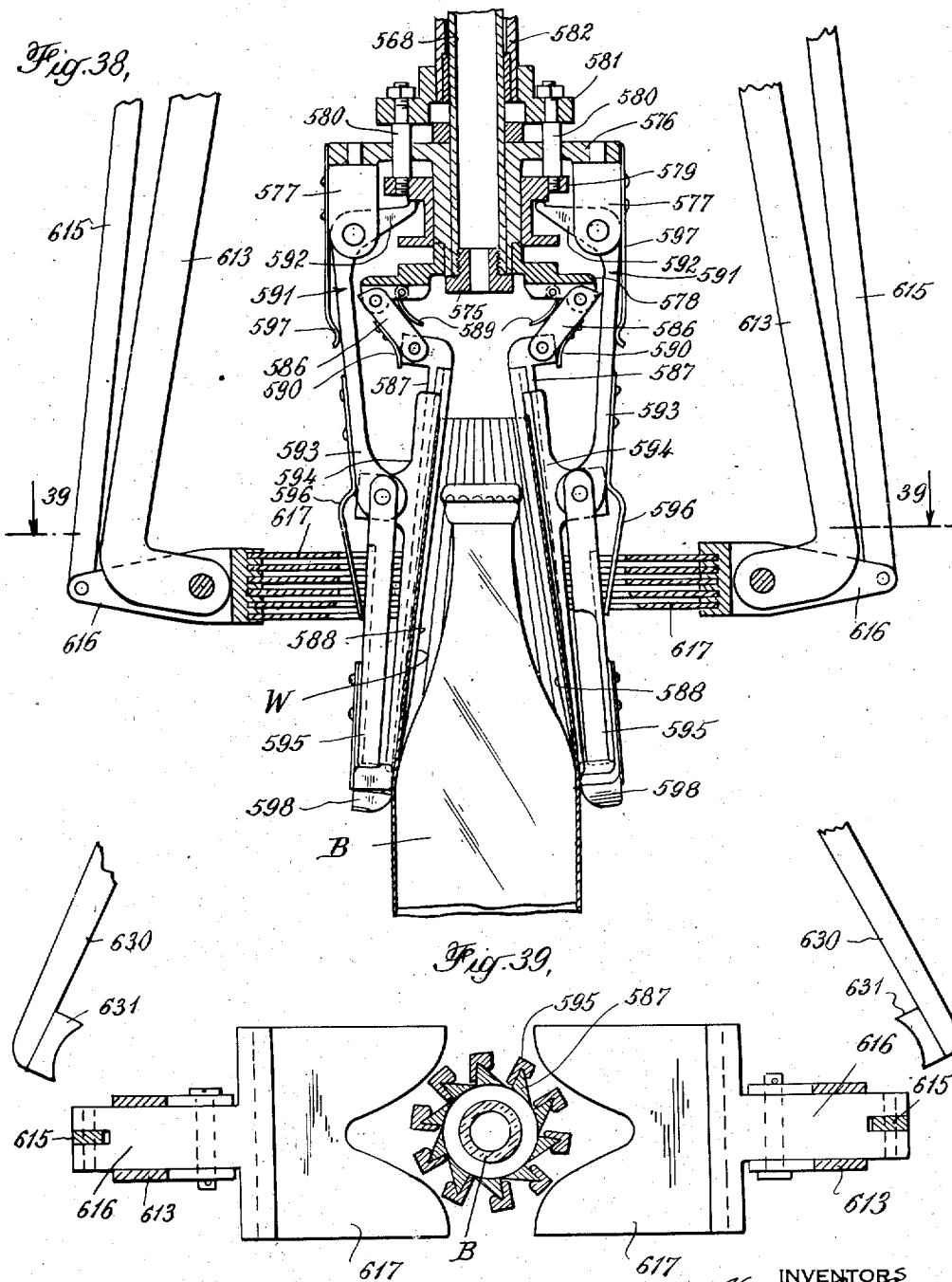
H. E. RUE ET AL

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WRAPPING MACHINE

Filed July 24, 1934

22 Sheets-Sheet 17



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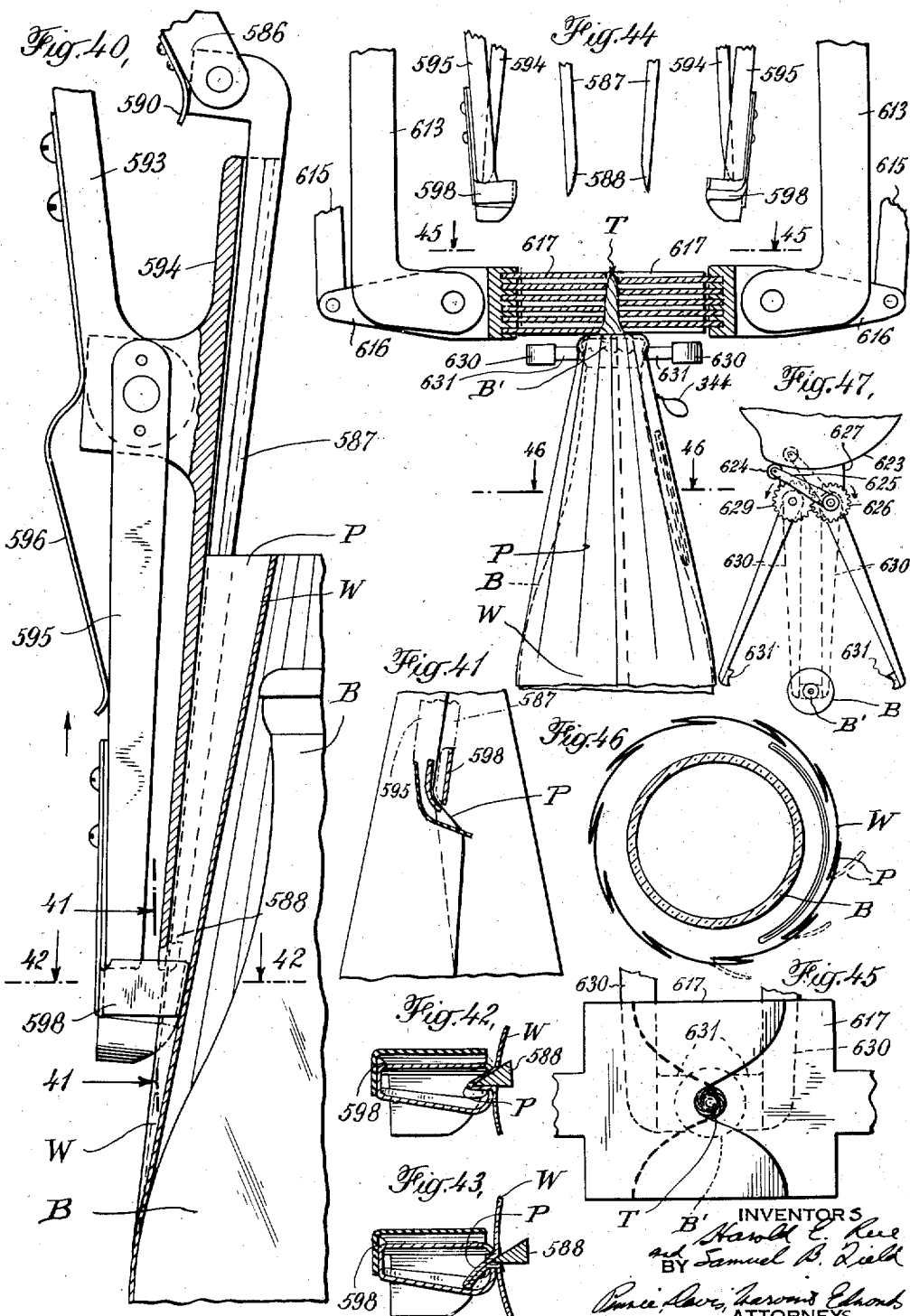
H. E. RUE ET AL

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WRAPPING MACHINE

Filed July 24, 1934

22 Sheets-Sheet 18



INVENTORS
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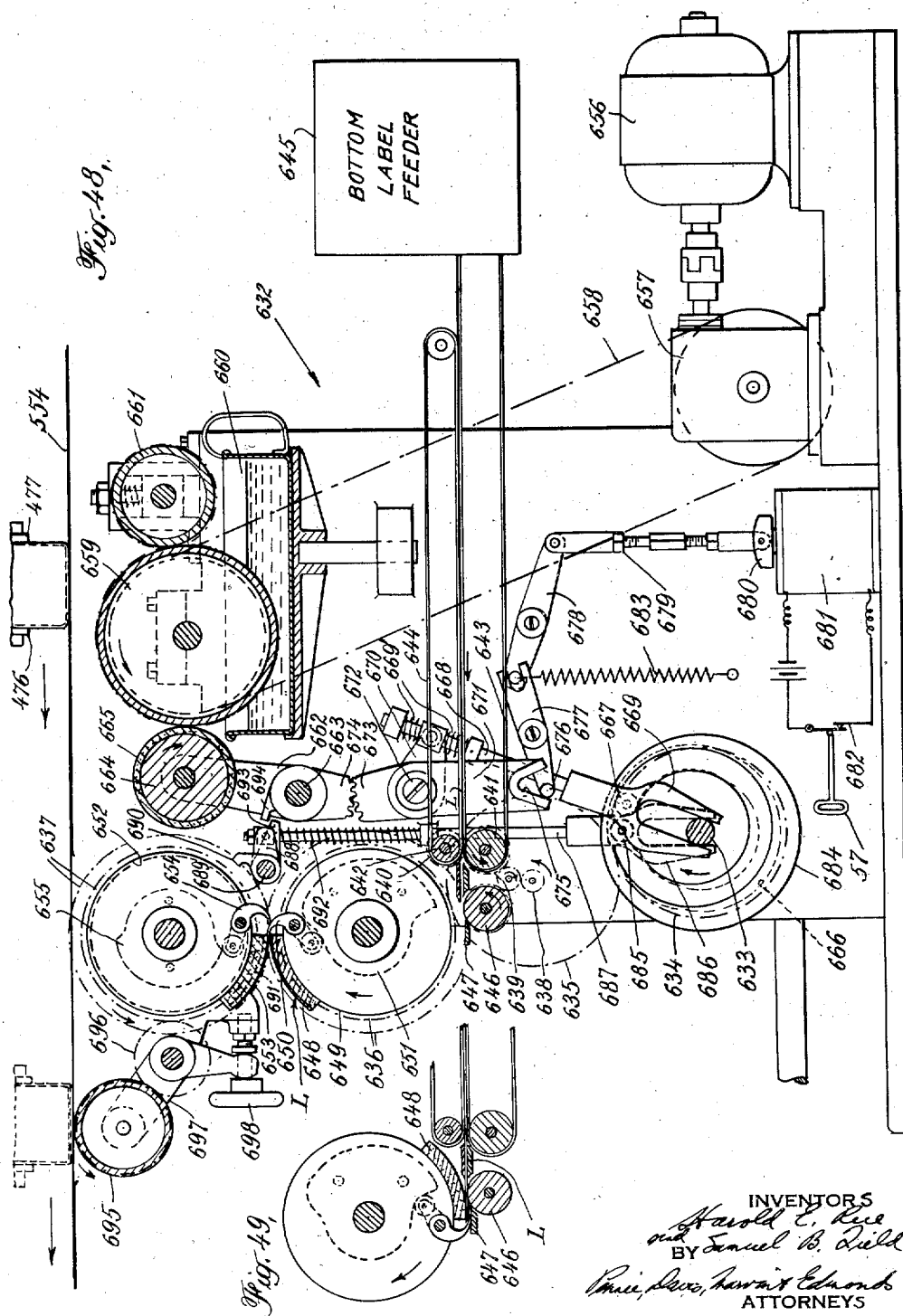
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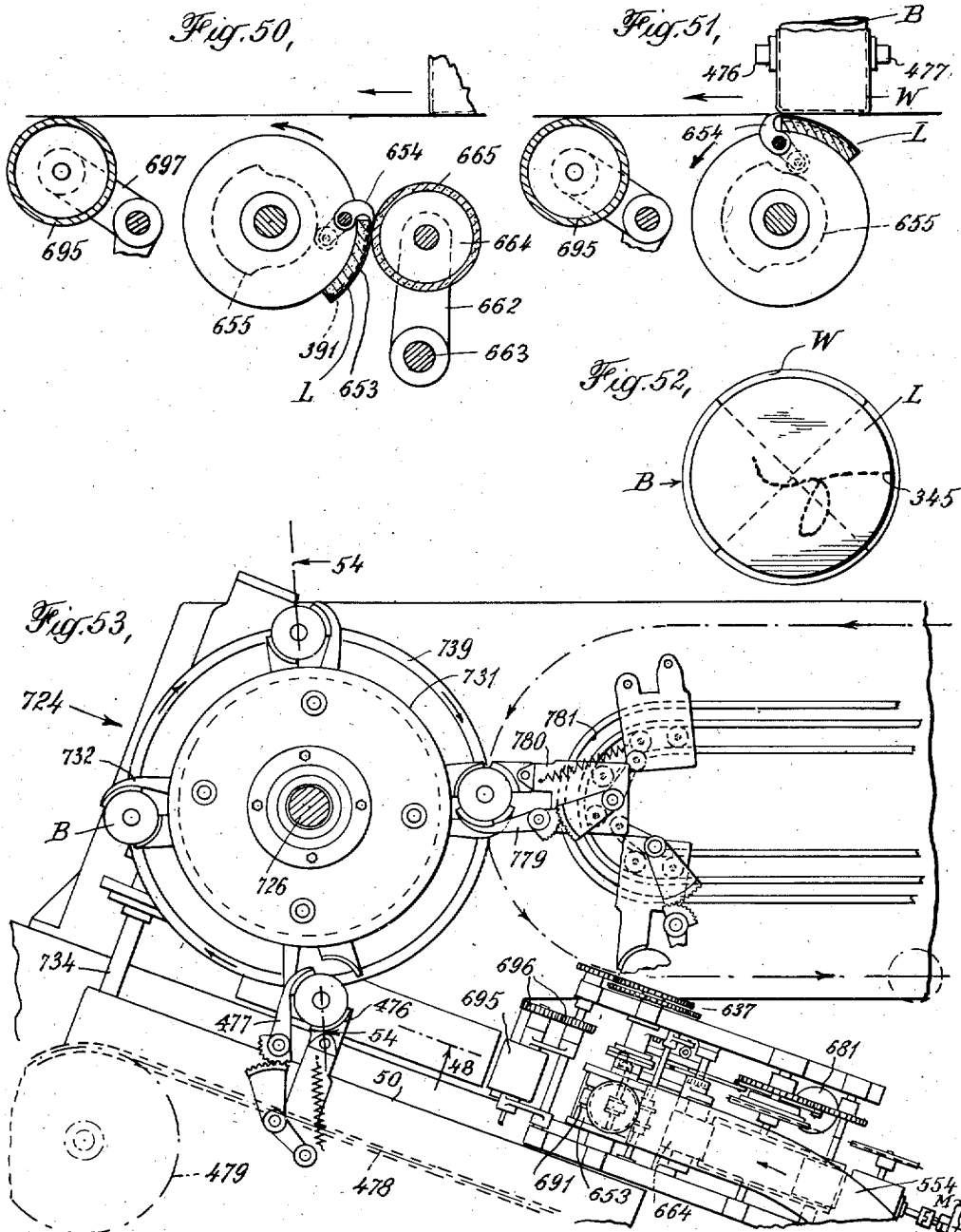
H. E. RUE ET AL

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WRAPPING MACHINE

Filed July 24, 1934

22 Sheets-Sheet 20



INVENTORS
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March 1, 1938.

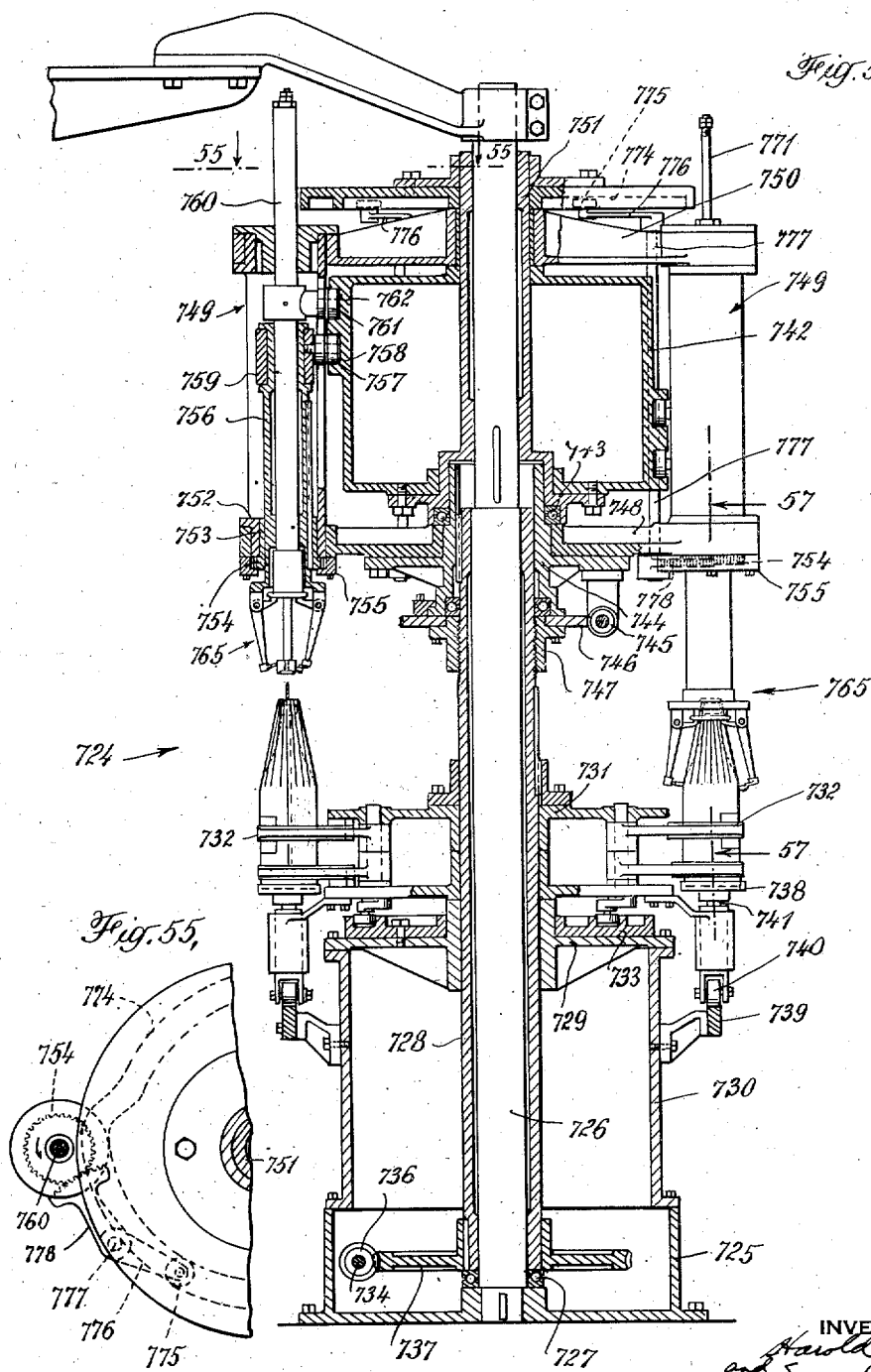
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WRAPPING MACHINE

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22 Sheets-Sheet 21



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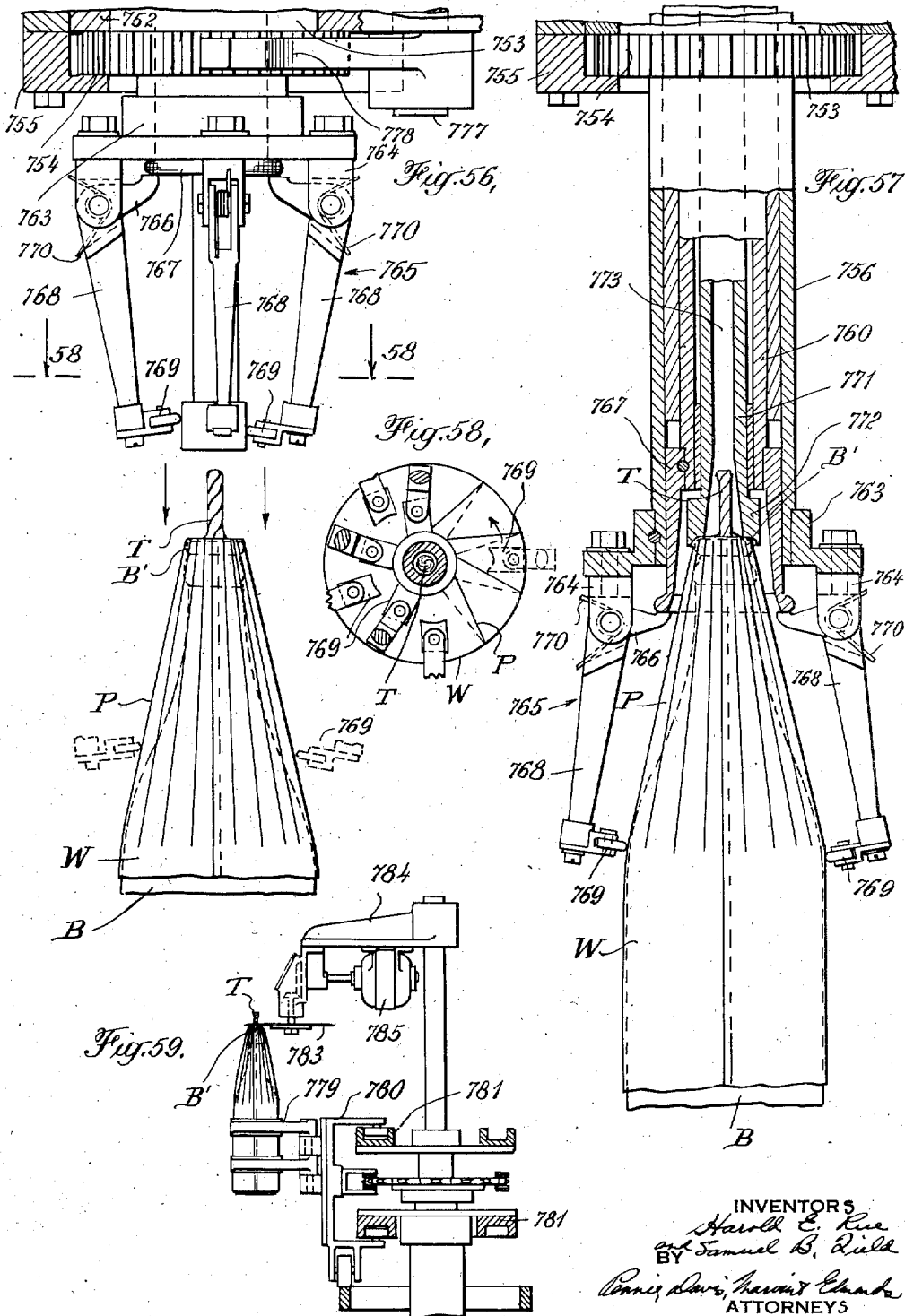
H. E. RUE ET AL

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WRAPPING MACHINE

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22 Sheets-Sheet 22



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UNITED STATES PATENT OFFICE

2,109,505

WRAPPING MACHINE

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Application July 24, 1934, Serial No. 736,632

40 Claims. (Cl. 93—2)

This invention relates to wrapping machines and has particular reference to a machine for wrapping bottles to provide a distinctive, sanitary, and protective enclosure therefor, although the machine may be employed with equal facility to wrap articles other than bottles.

In accordance with the invention, a machine is provided which performs the steps of cutting the wrapper sheets from a web of paper or the like, controlling the cutting mechanism to provide wrappers of prescribed size and dimensions regardless of atmospheric or other external conditions, providing the web of wrapping material with a pull cord whereby the finished package may be opened to expose the article contained therein, gumming the edge of the wrapper sheet, placing a wrapper in position for assembly with each article presented to the wrapping station, ejecting surplus wrapper sheets upon failure of the supply of articles to be wrapped, feeding articles in succession to the successive wrapper sheets, orienting the articles automatically to align the labels or other markings on the articles with the inscriptions or other markings on the corresponding wrapper sheets, wrapping the wrapper sheets around the articles and sealing the gummed edges thereof, supporting the wrapper sheets over irregular portions and beyond the ends of the articles during the wrapping and sealing step, inserting a booklet, coupon or the like within each partially completed wrapper adjacent the pull cord so that the coupon or booklet will be released when the package is opened by the pull cord, folding and securing one end of the wrapper, regularly pleating the other end of the wrapper to cause it to conform substantially to general shape of the irregular portions of the article, securing the pleated portion of the wrapper over the corresponding end of the article, and then ejecting the wrapped article in neatly wrapped condition.

In the particular embodiment of the invention, the web of paper from which the wrapper sheets are formed is drawn from a roll to a stitching station where a pull cord is looped at periodic intervals through the paper so that when the wrapper sheets are severed from the web each wrapper sheet is provided with two spaced loops, one forming a handle for the pull cord and the other being so located that it is sealed within one of the folded ends of the wrapper to anchor the pull cord. The stitching mechanism moves with the web during the stitching operation so that the movement of the web is not interrupted to perform the stitching operation. The stitched sheet

is then carried by pull-off rolls to the cutting station where the web is severed at periodic intervals into the separate wrapper sheets, each of which is provided with the pull cord having the two loops located as described. The severing mechanism is controlled accurately to provide wrapper sheets of proper dimensions under all conditions by optical precision mechanism, which detects variations in the positions of inscriptions, indices or the like, which are printed or otherwise formed upon the wrapper web. If the web has stretched or shrunk due to atmospheric conditions, or the web has slipped, the altered position of the indices thereon is detected by the optical mechanism and the latter responds to control the speed of the pull-off rolls which feed the severing mechanism. This precision mechanism includes a photo-electric cell which preferably adjusts a variable speed device in the drive of the wrapper web feed rolls so as to increase or decrease their speed in accordance with the variation in the spacing of the indices or markings on the wrapper web to which the photo-electric cell is responsive.

The stitched web is gummed along one edge by means of a mechanism having a glue supply roll which rotates continuously in the glue, whether or not the machine is operated, the continuous machine drive of the roll being transferred by an automatic clutch to a separate motor when the machine stops, so that the glue cannot dry upon the roll and is moist and ready for use at all times.

The gummed wrapper sheets are successively conducted downwardly and supported in an upright position over the spider of the machine upon which the articles to be wrapped are fed successively to the station at which the wrapper sheets are supplied by the mechanism described. The articles to be wrapped are positioned on the spider by an inlet turret having cam-actuated gripper jaws which successively remove the articles from the supply and place them upon rotatable supports mounted at intervals on the rotating spider. As the spider rotates, upper hold-down devices actuated by a cam engage the upper ends of the articles in such a way that the articles are clamped between these devices and the supports.

The upper hold-down devices are provided with floating heads which are permitted substantial lateral movement in all directions so that manufacturing deformities of the corresponding article are compensated for without straining the parts of the machine or the article to accommodate these deformities. If the article has an irregu-

lar shape, such as a bottle, the upper hold-down mechanism is preferably provided with a mandrel or sleeve which descends to enclose the converging neck of the bottle and render the surface to be wrapped uniformly cylindrical in form. The sleeve or mandrel, the regularly-shaped lower portion of the bottle, and the lower support for the bottle are uniform in dimension and all surfaces of each lie flush with respect to each other, so that a uniform surface is provided around which the wrapper may be wiped and a support is provided for the seam of the wrapper throughout its length during the sealing operations.

In order that the wrapper sheet may coincide with the label on the corresponding article, or with the embossings thereon, or with other indices, markings, projections, or the like, which distinguish one portion of the article from another, each article is oriented to place it in proper angular position with respect to the wrapper in which it is to be wrapped. The orienting of each article is performed by rotating the support upon which the article is mounted relatively to the supporting spider through an angle which is determined optically by a detector responsive to a predetermined index, projection, embossing, groove, label or other distinguishing portion of the article. Assuming that some portion of the label of the article, or one edge of the label on the article is the optical index to which the detector responds, a photo-electric cell adjusted to respond to this index, or the like, controls the mechanism for rotating the support upon which the article is mounted. As the index portion of the label on the article passes into the field of view of the photo-electric cell, the latter responds to actuate an electrical control device which arrests the rotation of the corresponding article support, which is rotated by operative connection with the spider.

Under proper operating conditions, each article-holding device in the spider is supplied with an article by the inlet turret, but in the event that one of the article-holding devices is not supplied with an article by the inlet turret the downward movement of the corresponding upper article-holding device is extended beyond the point where it would ordinarily engage the upper end of the article and a detent provided thereon is placed in the path of a feeler which, through operative connections with plows, moves the plows into the path of the wrapper sheets so that the plows abstract as many wrapper sheets from the supply of wrapper sheets as correspond to the number of empty article-holding devices. If the supply of articles is resumed, a following article-holding device will contain an article, and the feeler will not be actuated by the detent of the device, so that the plows are withdrawn from the path of the next wrapper, which is accordingly supplied to the wrapping station for assembly with the appropriate article to be wrapped. The ejected wrapper sheets are laid upon a tray by the plows and cannot clog the machine.

As the successive articles are brought into engagement with the corresponding wrappers which are successively presented in upright position at the assembling station, each wrapper is withdrawn by the corresponding article from the wrapper holding guides and is held against the leading face of the corresponding article by a finger which is actuated by a cam. Thereafter, brushes, located on either side of the path of movement of the article, smooth the trailing ends

of the wrapper into parallel positions. Cam-actuated sealing members, providing a left and right movement, wipe the wrapper around the article, fold the gummed edge of the wrapper over the ungummed edge thereof and then apply pressure to the resulting seam to tightly seal the same. During the wrapping and sealing operations the wrapper is uniformly supported by the bottom support of the article, the mandrel which surrounds the irregular portion of the article and the regular portion of the article, so that the wrapper may be tightly and smoothly wrapped around the article and the seam firmly and uniformly sealed throughout its entire length.

The partially wrapped articles are removed from the spider by a transfer mechanism having cam-actuated gripper jaws which grip and hold the article around its regular portion while the mandrel, upper hold-down device and lower supporting device are withdrawn by cams from the opposite ends of the partially completed wrapper. The article is carried by the moving transfer mechanism to the next station, where the projecting lower end of the wrapper is regularly folded and glued in folded position under the bottom of the article with one of the loops of the pull-cord anchored within the folds. The continuously moving transfer mechanism carries the partially wrapped article to a pamphlet, coupon, or other article supply device, which deposits within the open upper end of the wrapper immediately behind the pull-cord thereof, a pamphlet, coupon, or other article.

The continuously moving transfer mechanism then carries the article to a synchronously moving pleating mechanism having a plurality of sets of pleating fingers which descend and regularly pleat that portion of the wrapper which projects above the shaped portion of the article. In accordance with prescribed movements procured by cams, each set of the pleating fingers grips and creases a portion of the wrapper so that the upper portion of the wrapper is folded into upwardly-diverging regular pleats all directed in the same direction and laid substantially evenly over the irregular portion of the article. Following creasing members on the pleating fingers crease the folds of the pleats during the withdrawal of the fingers, so that tight pleats are formed. That portion of the pleated end of the wrapper projecting beyond the extreme upper end of the article is then gathered between converging jaws which rotate to twist the wrapper end tightly over the end of the article so that the wrapper and pleats thereof are drawn tautly over the article. While being continuously advanced by the transfer mechanism, a label or sticker of a shape conforming to the bottom of the article is glued thereto to finish the bottom and the article is transferred by the transfer mechanism to a pleat-pressing mechanism.

The pleat-pressing mechanism comprises a self-contained unit having holding fingers for securing the individual articles on supports which continuously advance while pressing fingers descend to resiliently encircle the article adjacent the lower narrow ends of the pleats and then move with a wiping motion along the article to firmly and smoothly press down the pleats from the beginning thereof to the upper end of the article while it is being held securely in position on its support. During this pleat pressing operation, the articles are advanced to a discharge conveyor which removes them and conveys them to other mechanism where additional operations are

performed thereon or to a packing table, or the like, depending upon requirements. During the time that the articles are being conveyed from the machine, the pigtail or twist remaining at the upper end of the article is preferably severed substantially flush with the upper end of the article, although, if desired, the twist may be retained.

It will be seen that the wrapping machine of this invention is fully automatic in operation, carries on the various steps continuously without interrupting the movement of the articles, whereby high speed and large production volume are obtained, and provides each article with a finished, tailored wrapper, which lends distinction and individuality to the product, provides a sanitary enclosure for the article and renders the article tamper-proof because the wrapper is so uniformly and securely formed that it cannot be opened without detection. Although the machine performs many steps during the complete wrapping operation, all of them are not essential when wrapping articles of shapes other than bottles, and any number or various combinations of the several steps may be utilized to perform various functions according to requirements, simply by employing such elements of the machine as are necessary to perform these steps.

For a more complete understanding of the invention, reference may be had to the accompanying drawings, in which

Fig. 1 is a plan view of the complete automatic wrapping machine of this invention;

Fig. 2 is a plan view of the bottle inlet turret;

Fig. 3 is an axial section thereof, as seen along the line 3—3 of Fig. 2;

Fig. 4 is a transverse section through the inlet gate mechanism thereof, as seen along the line 4—4 of Fig. 3;

Fig. 5 is an axial section through the main spider, as seen along the line 5—5 of Fig. 1;

Fig. 6 is an enlarged section of the bottle support mechanism of the main spider, as seen along the line 6—6 of Fig. 7;

Fig. 7 is a vertical section through the bottle holding mechanism of the main spider, as seen along the line 7—7 of Fig. 6;

Fig. 8 is an enlarged axial section through the bottle mandrel, as seen along the line 8—8 of Fig. 7;

Fig. 9 is an enlarged plan view of the bottle spotting mechanism, as seen along the line 9—9 of Fig. 7;

Fig. 10 is a schematic diagram of the control circuit of the optical bottle spotting mechanism;

Fig. 11 is a side elevation of the wrapper supply mechanism, including certain electrical connections;

Fig. 12 is a schematic diagram of the optical control circuit of the wrapper supply mechanism, together with a diagrammatic representation of certain mechanical elements thereof;

Fig. 13 is a plan view of the wrapper sheet stitching mechanism;

Fig. 14 is an axial section thereof, as seen along the line 14—14 of Fig. 13;

Fig. 15 is a transverse section therethrough, illustrating the needle control cam, as seen along the line 15—15 of Fig. 14;

Figs. 16, 17, 18 and 19 illustrate various operating positions of the cord stitching and looping mechanism, as seen in section along the line 16—16 of Fig. 14;

Fig. 20 is a face view of a length of the stitched wrapper sheet web;

Fig. 21 is an enlarged view of the wrapper sheet printing mechanism;

Fig. 22 is a vertical section through the wrapper supply mechanism, as seen along the line 22—22 of Fig. 11, showing the wrapper sheet gluing mechanism;

Fig. 23 is a perspective view of the gluing mechanism, and illustrates the drive thereof;

Figs. 24 and 25 are plan and side views, respectively, of the unused wrapper ejecting mechanism;

Fig. 26 is an enlarged plan view of the mechanism for wrapping and sealing the wrapper around the bottles;

Fig. 27 illustrates the condition of this mechanism during the sealing of the wrapper seam;

Fig. 28 is a plan view of the driving means for the wrapping mechanism;

Fig. 29 is an elevation of the wrapping mechanism and its appurtenant parts as seen along the line 29—29 of Fig. 26;

Fig. 30 is an elevation illustrating the transfer of the partially wrapped bottle and the retraction of the bottle holding means;

Fig. 31 is a plan view of the bottle transfer mechanism;

Fig. 32 is a horizontal section thereof, as seen along the line 32—32 of Fig. 31;

Figs. 33 and 34 are respective plan and side views of the bottom folding mechanism;

Figs. 35a, b, c, and d, illustrative the several steps of the bottom folding operation;

Fig. 36 is an elevation of the wrapper-pleating mechanism, as viewed from the right-hand end of the machine according to Fig. 1;

Figs. 37 and 38 are axial sections through one of the pleating heads, as seen along the line 37—37 of Fig. 36, showing the mechanism in different positions;

Fig. 39 is a transverse section through the pleating mechanism as seen along the line 39—39 of Fig. 38, showing the arrangement of the pleating fingers and of the gathering and twisting jaws;

Fig. 40 is an enlarged view of the pleating mechanism equipped with the pleat creaser;

Fig. 41 is a vertical section through the pleat creaser as seen along the line 41—41 of Fig. 40;

Figs. 42 and 43 are transverse sections through the pleat creaser, as seen along the line 42—42 of Fig. 40, and illustrate the action of the creaser;

Figs. 44 and 45 illustrate the operation of the twister jaws;

Fig. 46 is a transverse section through the wrapped bottle as seen along the line 46—46 of Fig. 44, and shows the arrangement of the wrapper pleats;

Fig. 47 is a plan view of the pleat gripper which comes into action during the twisting operation;

Fig. 48 is a vertical section through the bottom label applying mechanism, as seen along the line 48—48 of Fig. 53;

Figs. 49, 50, and 51 illustrate the several steps in the bottom label applying operation;

Fig. 52 is a bottom view of a bottle with the label applied;

Fig. 53 is a plan view of the bottom label applying mechanism, the pleat pressing mechanism, and the bottle discharge conveyor;

Fig. 54 is an axial section through the pleat pressing mechanism, as seen along the line 54—54 of Fig. 53;

Fig. 55 is a horizontal section taken along the line 55—55 of Fig. 54 and illustrates the mechanism for spinning the pleat pressing head;

Fig. 56 is an enlarged elevation of the pressing fingers and illustrates their relation to the bottle before the pressing operation begins;

Fig. 57 is an axial section of one of the pressing heads, as seen along the line 57—57 of Fig. 54, and illustrates the mechanism at the bottom of the pleat pressing stroke of the pressing fingers;

Fig. 58 is a horizontal section through the pleat pressing head as seen along the line 58—58 of Fig. 56; and

Fig. 59 is an elevation of the pigtail severing mechanism.

The main drive

Referring to Fig. 1 of these drawings, numeral 50 designates the bed of the machine on which is mounted a driving motor 51 connected by belt 52 to the pulley 53 of a drive shaft 54 journaled in suitable brackets 55 on the bed of the machine. In the drive shaft 54 is a clutch 56 which may be engaged and disengaged by one of the handles 57 to start or stop the machine. Drive shaft 54 is fitted with a bevel gear 58 which meshes with and drives bevel gear 59 on diagonal line shaft 60, which extends substantially the length of the machine and is journaled in suitable brackets 61 mounted on the bed 50.

The bottle feed

This line shaft 60 is fitted with a bevel pinion 62 which meshes with and drives a bevel gear 63 mounted on shaft 64 which drives the mechanism of the inlet turret 65. Shaft 64 is suitably journaled in brackets 66 secured to the bed 50 of the main machine and on the base 67 of the inlet turret 65, as is illustrated in Figs. 1, 2 and 3. The inner end of shaft 64 is fitted with a bevel gear 68 which meshes with and drives a bevel gear 69 on the vertical spindle 70 of the inlet turret 65, as is shown especially in Fig. 3. The spindle 70 is journaled in bearings 71 mounted on the frame 72 of the inlet turret 65.

Running through a slot in the table 73 of the inlet turret and substantially flush therewith is an endless conveyor 74 having the drive chain 75, which passes over sprocket 76 at the discharge end, this sprocket being mounted on a short shaft 77 journaled in suitable brackets 78 on the frame 72. The other or inlet end of the conveyor 74 passes over the usual idler sprocket, not shown. The shaft 77 of sprocket 76 carries a second sprocket 79 over which passes the drive chain 80 driven by a sprocket 81 mounted on drive shaft 82 journaled in bracket 85 and frame 72 and fitted with a bevel gear 83 which meshes with and is accordingly driven by the bevel gear 69 of the spindle 70. An idler sprocket 84 is mounted on bracket 85 and maintains the driving chain 80 tight. By means of this driving mechanism the endless feeder conveyor 74 is driven continuously toward the inlet turret 65 as indicated by the arrow in Fig. 1.

The articles to be wrapped in the machine of this invention are either manually or automatically fed to the feeder conveyor 74 which conveys them continuously to the inlet turret 65. Assuming that the articles to be wrapped are beverage bottles, feeder conveyor 74 may be connected to and receive the discharge of the last machine which operates on the bottles, such as the sterilizer, labeler, or the like. These bottles, designated B in Figs. 1, 2 and 3, are advanced by the conveyor 74 until the leading bottle engages a timing mechanism which functions

to admit bottles one by one to the inlet turret at properly timed intervals. This mechanism comprises two gates, the first of which constitutes the inlet gate and the second the outlet gate. These gates are mounted on a plate 86 secured by brackets to the frame 72. The inlet gate includes a slide 87 which is connected by link 88 to a rocker 89 pivoted on a bracket 90 of plate 86 and oscillated by a link 91, which is connected to a lever 92 pivoted at its opposite end at 93 and carrying the cam-following roller 94. The cam-following roller 94 bears against the edge of disc cam 95 secured on shaft 96 journaled in bracket 97 on the frame 72. This shaft 96 carries a sprocket 98 at its free end over which passes a chain 99 driven by a sprocket 100 mounted on shaft 101 journaled in bracket 102 of frame 72 and fitted with a bevel gear 103 driven by bevel gear 69 of the spindle 70. It will be seen that since cam 95 is continuously rotated by the mechanism just described, inlet gate slide 87 will be alternately projected toward the conveyor 74 and withdrawn therefrom. Constant pressure of the cam-following roller 94 against cam 95 is maintained by a coil spring 104 which is connected at one end to a pin 105 on the plate 86 and at the other end to a lug 106 on the gate slide 87.

Superimposed over the gate slide 87 is a secondary slide 107 on which is vertically pivoted the feeler 108 which normally projects over the conveyor 74 in the path of the bottles B advancing thereon. As illustrated in Fig. 4, the lower end of the feeler 108 carries a detent 109 which, when the feeler 108 is oscillated about its vertical pivot, moves into or out of the path of a dog 110 on the upper surface of the slide 87 which is oscillated continuously by cam 95 in the manner described. A spring 111 normally holds detent 109 disengaged from dog 110 so that feeler 108 normally remains in forward position over the conveyor in the path of the bottle B. The feeler 108 is so arranged that when it is engaged by a bottle B it is swung above the vertical pivot to place its detent 109 in the path of the dog 110 of inlet gate slide 87 so that at the next retracting movement of the slide 87 by its cam 95, dog 110 will engage detent 109 to retract slide 107 and consequently feeler 108 out of the path of the bottle B, whereby the bottle B is advanced by the conveyor. During the time that the cam 95 is oscillating inlet gate slide 87 and before the dog 110 of the latter engages the detent 109 of the feeler 108, the latter stops the bottle B on the conveyor, so that the conveyor slips under the bottle until the proper moment of admission of the bottle is determined by cam 95. With this arrangement, which is operated jointly by the cam 95 and the bottle B, the bottle cannot slip past the gate at the wrong time, such as when the gate is in its retracted position, since the bottle cannot pass until it has actuated feeler 108 and feeler 108 will not release the bottle until the appropriate time, which is determined by cam 95.

Each bottle B which is released by the inlet gate just described is not admitted at once to the inlet turret 65, but its further movement is also timed by the outlet gate which includes the slide 112 mounted in plate 86 carrying the stop member 113 projecting over the conveyor 74 and into the path of the bottle B being advanced by the conveyor. The outlet gate slide 112 is oscillated by a mechanism similar to that which oscillates the inlet gate except that its cam 114 is displaced

180° angularly with respect to cam 95, although the two cams are of identical configuration. Accordingly, the feeler 109 of the inlet gate and the stop 113 of the outlet gate oscillate in opposite directions, so that a bottle passed by the inlet gate is stopped by the outlet gate which releases it at the proper time to permit conveyor 74 to advance it to the loading position of the inlet turret 65.

Mounted on the upper end of inlet turret spindle 70 so as to rotate therewith is a spider 115, formed with two decks, each of which has a plurality of radial fingers 116 forming peripheral pockets, the fingers 116 of one deck being vertically aligned with those of the other deck. Pivoted between the two decks of the spider 115 is a series of vertical pins 117 on which are secured a plurality of grippers 118 equal in number to the radial fingers 116 and cooperating severally therewith. The grippers 118 are each provided at their free ends with a cushion jaw 119 of sponge rubber or the like. The lower end of each pivot pin 117 is provided with a crank 120 which is fitted with a cam-following roller 121 cooperating with a stationary cam 122 mounted on the table 73 of the frame 72. As the spider 115 rotates the cam rollers 121 follow the configuration of cam 122 so that grippers 118 are alternately oscillated toward and away from their corresponding fingers 116. Accordingly, as the conveyor 74 advances a bottle B released by outlet gate 113, one of the fingers 116 engages the rear surface of the bottle and, at the approximate tangent point of the conveyor with the spider 115, the corresponding gripper 118 is actuated by cam 122 to engage its jaw 119 with the leading face of the bottle. The bottle B, so gripped, is then carried bodily by the spider 115 through an angle of approximately 90° when the cam 122 again actuates gripper 118 to release the bottle B, whereupon the bottle B is released. The following bottles are released at properly timed intervals by the gate mechanism and are then carried by the conveyor to the point where they are transferred one by one by the spider 115 in the manner described.

The main spider

As illustrated especially in Fig. 5, the spider 115 of the inlet turret transfers the bottles B bodily to another part of the machine which may be identified as the main spider 123. This main spider 123 includes the substantially octagonal platform 124 journaled on a vertical shaft 125, seated in a step plate 126 mounted on the bed 50 of the machine. The spider 123 is rotatably supported by a thrust bearing 127 seated in the step 126 and has an integral lower flange 128 which carries a worm wheel ring 129 continuously driven by a worm 130 on like shaft 60, as illustrated in Figs. 1 and 5.

The bottle holders

Each of the twelve vertical faces of the platform 124 of the main spider 123 is fitted with a pair of vertical guides 131 and the bracket 132, shown in section in Fig. 6. One of the guides 131 is provided with an adjustable guide plate 131', whereby the play between the slide 133 and the guides 131 may be taken up. The slide 133 has a pair of integral horizontal webs 134 which cooperate with a vertical bearing plate 135 to form bearings for a plurality of vertical shafts, as is illustrated in Figs. 5, 6 and 7. Slide 133 is provided with a downward extension 136 carry-

ing a cam roller 137 which rides upon a crown cam 138 secured to vertical cam rail 139 which is bolted to the bed 50 of the machine (Fig. 5). As shown in Fig. 7, the configuration of the crown cam 138 is such that as the spider 123 rotates, slide 133 is reciprocated vertically in its guides 131.

Journaled in bearing 141 on the upper web 134 of slide 133 is a vertical shaft 140 carrying at its upper end the bottle support 142, which is equal in diameter to the cylindrical portion of bottle B. The configuration of cam 138 is such that the upper surface of bottle support 142 is positioned by its slide 133 substantially level with the bottom of the bottle B transferred by the inlet turret spider 115, so that when the cam 122 causes the spider to release the bottle, it rests upon the bottle support 142, as is shown especially in Figs. 5 and 7.

Slidable in suitable guides on bracket 132 is a slide 143 having a lower extension 144 fitted with a cam-following roller 145, which engages crown cam 146 mounted upon cam rail 139. Journaled on slide 143 is a pinion 147, which meshes with a stationary rack 148 mounted upon bracket 132, and which carries the integral spur gear 149 engaging a vertical rack 150 slidably mounted in a guide 151 on bracket 132. This gearing arrangement serves to multiply the movements of the slide 143 so that the vertical reciprocation of rack 150 is several times that of the slide 143, whereby a crown cam 146 of smaller throw and consequently less slippage may be employed. For example, as cam 146 lowers slide 143, pinion 147 rolling along rack 148 is rotated in a counter-clockwise direction which, through larger integral spur gear 149, lowers rack 150 a greater amount, and vice versa when cam 146 raises slide 143. As shown especially in Fig. 7, the rack 150 forms part of the vertical rod 152 which carries at its upper end the bracket 153, which is prevented from turning on the rod 152 by means of a pin-and-notch 154. Bracket 153 is provided with the two spaced lugs 155 and 156, through which slides a tube 157 having a collar 158 and normally urged downwardly by a coil spring 159 located between collar 158 and upper lug 155.

Rotatably supported by a ball bearing 160 on the lower end of tube 157 is a cylindrical sleeve or mandrel 161, whose diameter is equal to the outside diameter of the cylindrical portion of the bottle B and to the diameter of the bottle support 142. As is illustrated in detail in Fig. 8, the inner lower edge of the sleeve or mandrel 161 is tapered to conform substantially to the slope of the shoulder of the bottle B adjacent the cylindrical portion thereof, so that the sleeve fits snugly over the shoulder of the bottle B when the former is placed over the upper end of the bottle. Thus the cylindrical portion of the bottle B and the outer surfaces of the sleeve or mandrel 161 and bottle support 142 form a smooth cylinder of uniform diameter and of a vertical length substantially equal to the length of the wrapper sheet whereby a sheet of wrapping material wrapped around this assembly is supported co-extensively thereon and a support for its overlapping edges is provided during sealing, as will be explained later. The upper end of the sleeve or mandrel 161 is provided with arcuate air vent slots 161', the purpose of which will also be described later. Slidable through tube 157 is a rod 162 carrying on its lower end a cup 163 between which and the upper end of tube 157

extends a coil spring 164 which normally urges the rod 162 in a downward direction. The upper end of rod 162 carries the roller 162' having a function to be described. The open or lower end of the cup 163 is provided with a cover plate 165 and the chamber so formed in the cup contains a disc 166 which is slidable laterally within the chamber on ball bearings 167 interposed between it and a bearing plate 168 in the bottom of the cup 163. Formed integrally with disc 166 and extending through the enlarged opening of cover plate 165 is a recessed cap plate 169 which is adapted to engage the cap or other closure B' of the bottle B. Secured at one end in the bottom of conical socket 170 formed in the lower end of rod 162 and extending at its other end into a central bore 171 of cap plate 169 is a quill or short length of spring wire 172, which serves to maintain cap plate 169 centered, although permitting lateral movement of the latter in response to deformities or manufacturing irregularities in the several bottles which the cap plate 169 engages during operation. Not infrequently bottles are distorted or deformed during manufacture, so that the necks thereof are not always perfectly symmetrical or centered with respect to the cylindrical portion of the bottle and in the absence of the centering arrangement described to compensate for these mis-shapen bottles the holding mechanism of the bottles might be injured. Also, because of the floating cap plate 169, the bottles are always accurately centered with respect to the sleeve or mandrel 161, regardless of their irregularities or deformities.

The cam 146 is so shaped that immediately after the bottle B has been transferred from inlet turret 65 to the bottle support 142, the rod 152 is lowered to drop the sleeve or mandrel 161 over the neck of the bottle and the cap plate 169 engages cap B' of the bottle B, floating laterally with respect to mandrel 161 to accommodate any misalignment of cap B' with the cylindrical portion of bottle B. The springs 164 and 159 of the cap plate 169 and the mandrel 161, respectively, urge these parts resiliently against the corresponding portions of the bottle B so that the latter is firmly but flexibly held on bottle support 142.

The bottle orienting mechanism

Journalled in bearings 173 on the lower web 134 of slide 133 and concentrically with bottle supporting spindle 140 is a spur gear 174. This spur gear 174 carries one element of a constantly engaged multiple disc friction clutch 175, the other element of which is carried by a disc 176' pinned to the lower end of spindle 140, so that rotation of gear 174 results in rotation of spindle 140. Journalled on lower web 134 and meshing with spur gear 174 is an idler pinion 176 which meshes with pinion 177 secured to spur gear 178 journalled on a jack shaft 179 journalled in both webs 134 of slide 133. As illustrated in Fig. 6, spur gear 178 is adapted to engage and rotate along a curved stationary rack 180 mounted on the bed 50 of the machine as the main spider 123 revolves. As shown especially in Fig. 1, the inlet end of stationary rack 180 is provided with a pivoted segment 181 which is adjustable by a screw and spring combination 182 supported on a base bracket 183, so that the time of engagement of the gear 178 with the rack 180 may be advanced or retarded. Accordingly, as the main spider 123 is rotated in a clockwise direction as seen from above, bottles B placed on the successive supports

142 by the inlet turret are rotated in a counter-clockwise direction, as the gears 178 corresponding thereto engage the circular rack 180. As each bottle B and its bottle support 142 is rotated in this way, the corresponding sleeve or mandrel 161 rotates relatively to the supporting tube 157 on the ball bearing 160.

Journalled on the bottle supporting spindle 140 is a ratchet wheel 184, and on this ratchet wheel 184 are spaced stops 185 and 186, the latter being adjustable. Slidable through an opening in stop 185 is a curved rod 187 mounted on the end of a lever 188 pinned to spindle 140. Between the lever 188 and stop 185 and encircling curved rod 187 is a recoil spring 189 which normally urges the ratchet 184 in a counter-clockwise direction, as seen in Fig. 9, so that lever 188 and adjustable stop 186 are normally in engagement.

Two pawls 190 and 191 are pivoted on the upper web 134 of slide 133 and are urged into contact with ratchet wheel 184 by corresponding leaf springs 192 and 193, respectively. Two pawls are provided so that one of them will always be in latching position opposite a notch in ratchet wheel 184. The pawls 190 and 191 are normally held disengaged from ratchet wheel 184 by a lever 194 pivoted on the upper web 134 of slide 133. This lever 194 is provided with abutments 195 and 196 which are respectively adapted to engage pawls 190 and 191. The lever 194 is provided with an extension 197 adapted to be engaged by trip detent 198 mounted on the end of a bracket 199 secured on main spider 123 when the bottle support 142 is in its lowermost position, so that abutments 195 and 196 move the respective pawls 190 and 191 out of engagement with the ratchet wheel 184, as shown in Fig. 9. An electromagnet 200 is also mounted in the upper web 134 of slide 133 in cooperative relation with a pivoted arm 201 which, when the magnet is de-energized, is urged by spring 202 into latching engagement with latch 203 on lever 194 so as to hold the pawls 190 and 191 disengaged from ratchet wheel 184 against the tension of their respective springs 192 and 193 and spring 204 on latch 203 when the detent 198 trips lever 194. It will be seen that when slide 133 is raised clear of detent 198, so that lever 194 is free to move and if magnet 200 is then energized, it disengages arm 201 from latch 203, so that spring 204 swings latch 203 to the right as seen in Fig. 9, whereby pawls 190 and 191 are released to engage and stop ratchet wheel 184. As latch 203 swings to the right, an adjustable pin 205 thereon strikes contact spring 206 to disengage it from contact 207. As is illustrated diagrammatically in Fig. 10, contacts 206—207 are in series with magnet 200 so that the latter breaks its own circuit, which is held open until latch 203 is reset by detent 198, whereby arm 201 engages latch 203 and holds it in the position illustrated in Fig. 9, allowing contacts 206—207 to reclose the circuit of magnet 200. Resetting of this mechanism by detent 198 takes place when the slide 133 is lowered by its cam 138, as will be explained later.

As illustrated diagrammatically in Fig. 10, magnet 200 and normally closed contacts 206—207 lie in the output circuit of the amplifier 208 of photo-electric cell 209. The amplifier 208 and the connections of the photo-electric cell 209 are conventional and need not be further described. The photo-electric cell 209 is set to respond to the change in the intensity of the light reflected by the bottle B as the edge of the label B' moves out of the field of view of the photo-electric cell

209. For example, since the light I_b reflected by the surface of the bottle B is of less intensity than the light I_L reflected by the label B', the photo-electric cell 209 will respond to the decrease of $I_L - I_b$ in the intensity of the reflected light. This means that as the bottle B is rotated on the bottle supporting spindle 140 by the engagement of gear 170 with stationary rack 180 as the main spider 123 rotates, photo-electric cell 209 will not respond to light reflected from the bottle B until the trailing edge of the label B' moves out of the field of view of the photo-electric cell 209. Thereupon the photoelectric cell responds to actuate magnet 200 which accordingly releases the pawls 190 and 191 in the manner previously described. The pawls 190 and 191 accordingly engage and stop the rotation of ratchet wheel 184, although gear 178 continues to be driven because of its contact with rack 180. This results in slippage of friction clutch 175 until gear 178 runs off of rack 180. The shock of the sudden stopping of the ratchet wheel 184 by pawls 190 and 191 is absorbed by recoil spring 189, the driven lever 188 compressing the spring 189 until the momentum of rotation of the bottle-supporting spindle 140 is absorbed by the spring, so that there can be no injury to the relatively light parts of this mechanism. This arrangement also prevents the bottle from turning in its support when the latter is stopped suddenly by pawls 190 and 191. When this sudden shock is absorbed by the spring 189 the energy stored therein is released to return the ratchet wheel 184 to the position shown in Fig. 9, that is, with stop 186 and lever 188 in engagement. This results in a slight reverse movement of the bottle-supporting spindle 140 and this reverse movement restores bottle-supporting spindle 140 and bottle B to the exact angular position at which the pawls 190 and 191 came into action as a result of the energization of photoelectric cell 209, and these pawls continue to hold the bottle in this angular position until disengaged by resetting detent 198 upon lowering of the bottle support 142 following removal of the bottle therefrom in a manner to be described.

A photoelectric device of the type described is provided for each of the bottle-supporting spindles 140 on the main spider 123, so that each bottle on the main spider is spotted in the same angular position, which is determined optically in accordance with the position of the label or other visual index to which the photocell is set to respond. These photoelectric devices are illustrated at 210 in Figs. 1 and 5 and are fixed on suitable standards 211 secured to the table 124 of the main spider 123. These devices 210 are supplied with electrical energy by a cable 212 which leads from a housing 213 supported by a sleeve 214 enclosing the axis 125 of the main spider 123 and supported on the table 124 of the main spider 123 by a bearing plate 215. Two wires of the cable 212 are connected to brushes 216 supported on a bracket 217 within housing 213 and severally engaging two stationary slip rings 218 mounted on a collar 219 on the stationary upper end of axis 125 of main spider 123. These slip rings 218 are in turn connected to a feeder cable 220 passing through a stationary conduit 221 mounted in cap 222 of axis 125.

Enclosed in the housing of each of the photoelectric devices 210 with the photoelectric cells 209, amplifiers 208 and the remaining elements of the corresponding amplifier and photoelectric cell circuits is a suitable source of light 223 the

rays of which are converged by the lens 226 into a fine pencil which is directed upon the surface of the corresponding bottle B mounted on the bottle support 142. The light reflected by the bottle B and/or its label B' is collected by the lens 227 and directed upon the sensitive element of the photoelectric cell 209, as is illustrated diagrammatically in Fig. 10. As aforementioned, the photoelectric cell 209 does not respond to the light reflected separately by the surfaces of the label or bottle, but only to a change in the intensity of the reflected light to energize the electrical devices including magnet 200, which releases pawls 190 and 191 to mechanically stop the rotation of the bottle at that instant, the several bottles being rotated through varying angles depending upon the relative angular position of their labels when the bottles are placed on the corresponding bottle support 142 of the inlet turret 65. The purpose of this spotting of each bottle is to align the label thereon with the label on the wrapper so that the two labels lie superimposed, as will be described in greater detail later.

The wrapper sheet supply

The bottles B supported on corresponding bottle supports 142 with their neck portions enveloped by the mandrels or sleeves 161 are advanced successively by rotation of the main spider 123 toward the position where the bottles and the wrapper sheet are placed in cooperative relation for the wrapping operation, the bottles being properly spotted or oriented in accordance with the action of the optical spotting or orienting mechanism previously described, so that the label on each bottle is aligned with the label or other matter printed or otherwise applied on the surface of the wrapper sheet. This alignment of bottle and wrapper labels is of especial importance if transparent or semi-transparent wrapping material is employed, since a bottle label displaced with respect to the wrapper label will be visible through the wrapper and an unattractive package results. The wrapper label is also spotted lengthwise of the wrapper sheet before it is cut, so that the bottle and wrapper labels not only align laterally but also vertically of the bottle. This lengthwise spotting of the label will be described in connection with wrapper feeding mechanism.

As shown in Fig. 11, the web of paper 230, from which the wrapper sheets are to be severed, is drawn from a roll 231 rotating on a rod 232 supported by cantilever brackets 233 mounted on the frame 234 associated with the bed 50 of the machine. The web 230 passes over idler roll 235, the drum 236 of the stitching mechanism, to be described, and feed roll 237 which is driven by gear 238 meshing with a pinion formed integrally with bevel gear 239 driven by bevel gear 240 on shaft 241. Shaft 241 also drives sprockets 242 and 243 which, by means of respective chains 244 and 245, drive feed rolls 246 and 247, respectively. These feed rolls 246 and 247 cooperate with corresponding rolls 248 and 249 to draw the web 230 between them, rolls 248 and 249 being driven synchronously with rolls 246 and 247 and frictionally engaging them. Located between the two sets of web drawing rolls 246-248 and 247-249 are two cutter rolls 250 and 251 having cooperating shear knives 252 which sever the web 230 into appropriate lengths to form the separate wrapper sheets. Cutter rolls 250 and 251 are connected together by means not shown. The lower cutter roll 250 is connected by a chain 253

to a sprocket 254 driven by bevel gears 255 from a shaft 256, which in turn is driven by main drive motor 51 by chain 257 and bevel gears 258.

The optical wrapper sheet cutter control

The web 230 is provided at spaced intervals with labels, reading or advertising matter 259 which, as aforementioned, should lie in superposition with the label B' on the bottle B, especially if the material of which the web 230 is formed is transparent or semi-transparent, so that the appearance of the package will not be marred by displaced bottle and wrapper labels. It is for this reason that the bottles are oriented by the optical spotting mechanism previously described and also that the separate wrapper sheets must be severed from the web 230 in such a way that the labels 259 thereof lie in the proper vertical position with respect to the label or bottle; i. e., the wrapper sheets must be cut from the web 230 so that the labels 259 thereof always bear the same fixed relation to the labels on the successive bottles. In order to secure this uniformity in wrapper sheets, the labels thereon must bear a fixed relation to the cutters, but this relation is not constant in actual practice because the web 230 from which the wrapper sheets are cut, being a continuous flexible web, does not bear the labels 259 at uniformly spaced points, due to irregularities in printing or unavoidable variations in the texture and density of the paper, atmospheric conditions, etc., whereby the web lengthens, shortens, wrinkles, etc., a moist atmospheric condition lengthening the web 230 and increasing the distance between the successive labels 259, and a dry atmospheric condition shortening the web 230 to decrease the distance between the successive labels 259. Thus, the web 230 bearing the labels 259 is apt to vary to such an extent that, unless compensating means is provided, the labels 259 will fail to accurately register with the labels B' on the corresponding bottles B. Such compensating means is provided in the present machine for adjusting the feed of the web 230, so that despite any irregularities due to atmospheric conditions, printing, and the like, the web is always properly cut. This compensation is accomplished by varying the feed of the web 230 with respect to the cutter rolls 250 and 251 to accommodate any variations resulting from any cause. Optical means are provided for detecting these variations and an index, to which the means is responsive, is provided at spaced intervals on the web 230 and preferably comprises a spot 260 which should be approximately $\frac{1}{8}$ to $\frac{1}{4}$ of an inch in the direction of travel of the web 230 and approximately $\frac{1}{2}$ to 1 inch transversely of the web 230, as illustrated in Figs. 12 and 21, the former drawing having the web distorted out of its normal feeding plane for the purpose of illustrating the relationship between the registering spot 260 and the labels 259 and the optical detector.

Before describing the optical registering mechanism in detail a brief summary of its operation will be helpful. The spot 260 on the web 230 bears definite relation to the point at which the severing of the web by the cutter rolls 250 and 251 is to take place. The rotation of the cutter rolls is constant, that is, they are driven directly from the main driving motor 51 of the machine and this constant rotation of the cutter rolls is employed as the index or base according to which the adjustment of the feed of the web is regulated. The cutter rolls 250—251 are accord-

ingly employed to actuate a selector switch which is synchronized with the operation of a photoelectric detector which registers any variation in the position of the index spots 260 on the web 230 and adjusts a pilot motor which in turn speeds up or slows down the web-drawing rolls 246—248 and 247—249 until the correction is made as determined by the photoelectric detector, which accordingly stops the corrective adjustment.

The optical registering mechanism is illustrated schematically in Fig. 12 and adjusts the speed of shaft 241 from which the rolls 237, 246 and 247 are driven. Located above the web 230 and suitably mounted on the frame 234 is a scanning head 261 including a source of light 262 which directs a pencil of light on the surface of the web 230 in the path of the registering spots 260. The pencil of light is reflected with substantially uniform intensity upon the sensitive element of the photoelectric cell 263, except when one of the registering spots crosses the incidence point of the light pencil on the web 230. The consequent decrease in the normal intensity of the light reflected from the surface of web 230 causes the photoelectric cell 263 to give an electrical impulse which is amplified by a suitable conventional amplifier 264, one of the output leads 265 of which is connected to the brush 266 of the selector switch 267. The selector switch 267 includes an insulating segment 268 and two arcuate conducting segments 269 and 270 on either side of the insulating segment 268. Conducting segments 269 and 270 are connected respectively to coils 271 and 272 of a polarized relay, the central tap of which is connected to the other output lead 273 of the amplifier 264. The pivoted armature 274 of the polarized relay may swing into engagement with either stationary contact 275 or contact 276 and the end thereof is connected to a link 277 carrying the plungers of the two dash pots 278 and 279 which retard the return of the armature 274 out of contact with either contact 275 or 276 under the influence of springs 280. Contacts 275 and 276 are connected to respective series field windings 281 and 282 connected in parallel to one brush of pilot motor 283 the other brush of which is connected to one side of the power line by wire 284, while the other side of the power line is connected by wire 285 to armature 274 of the polarized relay.

Pilot motor 283 is reversible, rotating in one direction when one of the field windings is energized and in the opposite direction when the other winding is energized. The brush 266 of selector switch 267 is connected by chain 286 to cutter roll 250 and accordingly is driven at the same angular speed as the cutter roll.

If one of the registering spots 260 of the web 230 passes the pencil of light of the scanning head 261 at the instant that selector brush 266 lies on insulating segment 268, the impulse developed in the photoelectric cell 263 by the interruption of the pencil of light by the spot 260 has no effect on pilot motor 283. However, if the selector brush 266 lies on conducting segments 269 or 270 when the pencil of light is interrupted by one of the registering spots 260, indicating that the web 230 is being incorrectly fed to the cutter rolls 250—251, a circuit to one of the windings 271 or 272 of the polarized relay is completed so that the armature 274 is moved into engagement with either contact 275 or 276 to energize winding 281 or 282 of pilot motor 283 to cause the latter to rotate through an angle which is determined

by the period of time that the corresponding polarized relay contact remains closed. Inasmuch as the impulse set up by the photoelectric cell 263 is only momentary and the circuit of pilot motor 283 must be maintained a longer period of time in order that the motor may move through an appreciable angle, dash pots 278 and 279 are provided which hold the corresponding relay contact closed a predetermined period of time during which pilot motor 283 may move through the appropriate angle, the time that either of the dash pots holds the circuit closed being less than the time it takes the selector brush 266 to move off of the corresponding segment 269 or 270. Dash pots 278 and 279 are adjustable to provide the proper time lag and other alternative holding means, such as holding circuits for the polarized relay, may be provided with equal facility, the mechanism just described being merely an exemplification of one mode of detecting variation in the feed of the web 230 and of driving a prime mover, motor 283, to provide a movement for compensating for this variation. The motor 283 is rotated step-by-step each time the selector switch 267 rotates for as many times as is necessary to bring spot 260 in registration with the cutters, which takes place when response of photocell 263 to a spot 260 takes place at the time that selector brush 266 engages insulating segment 268.

The corrective movements of pilot motor 283 actuate mechanism for regulating the speed of rotation of the web-drawing rolls 246—248 and 247—249, so as to feed the web 230 either faster or slower to compensate for the variation in the feed detected by the optical registering means. This mechanism includes a variable speed unit 287, shown diagrammatically in Fig. 12, one conical roll 288 of which is driven from power shaft 256 by a chain and sprocket combination 289 and the friction speed transmitting disc 290 of which is adjustable along the lead screw 291 by pilot motor 283 through the chain and sprocket connection 292 driven by shaft 283'. Shifting of the friction disc 290 longitudinally of conical driving element 288 in either one direction or the other, depending upon the direction of rotation of pilot motor 283, results in a variation in the speed of rotation of the driven conical element 293 of the variable speed unit 287 in a manner readily understood. The shaft 294 of driven element 293 of the variable speed unit carries a pinion 295 which meshes with and drives the ring gear 296 of the differential 297. Normally, when no adjustment in the feed of the web 230 is being made, the bevel pinions 298 journaled in ring gear 296 of the differential 297 roll around stationary bevel pinion 299 and transmit equivalent rotation to bevel pinion 300 which, through chain and sprocket combination 301 rotates shaft 241 to drive web-drawing rolls 246—248 and 247—249 in the manner described. However, if the scanning head 263 detects a variation in the feed of the web 230 the corrective movement communicated by the compensating pilot motor 283 to the variable speed unit 287, accordingly drives the differential 297 at a different speed to either speed up or slow down the movement of the web 230. Superimposed upon this corrective movement is a follow-up movement introduced by pilot motor 283 into the differential 297 by means of chain and sprocket combination 302 connected to bevel pinion 299 of the differential. This follow-up movement slightly changes the ratio of speed between the cutter rolls 250—251 and the

web-drawing rolls 246—248 and 247—249. Thus, the compensating movement comprises both a step-by-step action, which moves the paper slightly forward or backward before the next cut, and a second or follow-up action, which changes slightly the ratio of speed between the cutter and web-drawing rolls.

The shaft of the lead screw 291 of the variable speed unit 287 projects out of the casing thereof and is fitted with a worm 303 which drives a worm wheel 304 journaled on a bracket 305 and actuating pointer 306 over scale 307, as illustrated in Fig. 11. The scale 307 is graduated to indicate the length of the wrapper sheets severed by the cutter rolls 250—251. This indicator accurately indicates the length of the wrapper sheets at any time, since that dimension is determined by the speed at which the web 230 is fed to the cutter rolls 250—251, and inasmuch as the variable speed unit 287 determines the speed of the feed of the web 230.

The separate wrapper sheets severed from the web 230 by the cutter rolls 250—251 are directed through guides 308 and are drawn between feed roll 309 and belt 310, the latter passing over pulleys 311 and being driven by roller 312. Belt roller 312 and feed roll 309 are driven from shaft 241 by gears 313 at the same rate of speed as the web 230 is advanced. The direction of movement of the wrapper sheets is changed by roll 309 and belt 310 from horizontal to vertical, and the sheets directed downwardly by roll 309 and belt 310 are caught between belt 314 and spring-pressed rolls 315, 316 and 317 and projected rapidly downwardly between guides 318 to a position directly over the main spider 123 and in centered relation with respect to the leading bottle B on the corresponding bottle support 142. The belt 314 is driven by a chain and sprocket combination 319 connected to shaft 256 and the belt 314 passes over pulleys 320, 321 and 322 suitably journaled in the frame 234. A pair of spring fingers 323 associated with guides 318 frictionally engage the successive wrapper sheets as they descend and brake the rebound thereof so that they come to rest over the main spider 123 without buckling in guides 318. A wrapper sheet, designated W, is illustrated in position for cooperative relation with bottle B, in Fig. 5. The length of the wrapper sheet W is substantially equal to the height of the composite cylinder formed by the bottle support 142, the cylindrical portion of the bottle B, and the mandrel or sleeve 161, and the wrapper sheet W is positioned in the guides 318 so that its upper and lower edges substantially align with the upper and lower end of the composite cylinder, as is illustrated in Figs. 5 and 11.

Wrapper pull cord stitching mechanism

Before the separate wrapper sheets W are delivered into position for cooperative relation with the corresponding bottle B mounted on the main spider 123, several other operations are performed thereon. The first operation performed on the web is that of stitching a pull cord, which is employed by the user for opening the finished wrapper to gain access to the bottle B. This operation is performed on stitching drum 236. As shown in Figs. 11 and 14, the stitching drum 236 is driven by a spur gear 324 which meshes with an idler gear 325 driven by a spur gear 326 secured on shaft 327, which also carries the sprocket 328 driven by a chain 329 connected by gearing to an idler sprocket of chain 301, so that the stitching mechanism is synchronized with the movement

of the web 230, being driven from the same source.

The stitching drum 236 is provided at spaced points with apertures 330, as shown in Figs. 13, 16, 17, 18, and 19. Adapted to pass through the apertures 330 is a threaded needle 331 mounted on a crosshead 332 slidable in an arm 333 pivoted concentrically with drum 236. The cord threaded through the needle 331 passes through guides 334 on the frame 234 from a cop or spool 335 mounted on bed 50. The crosshead 332 carrying needle 331 is provided with a follower 336 which engages the groove 337 of a cam 338 mounted concentrically with drum 236 and rotating therewith to drive needle 331 through the web 230 and one of the apertures 330 in the drum 236, as illustrated in Figs. 16 to 19. Mounted on fixed pivots 339 within the drum 236 are a plurality of fingers 340 having trailing rollers 341 which follow the contour of stationary cam 342 as the drum 236 rotates in the direction of the arrow in Fig. 16. The rollers 341 are held into engagement with the contour of cam 342 by springs 343, as shown in Fig. 16. The contour of cam 342 is such that, as the needle 331 drives the cord through the web 230, the adjacent finger 340 is inserted into the loop of the cord as indicated in Figs. 17 and 18 and elongates the loop 344 as shown in Fig. 19. Each successive finger 340 cooperates with one of the apertures 330 in the drum 236, so that as the needle 331 is projected through an aperture 330 the loop is formed and elongated by the corresponding finger 340. Accordingly, as the web 230 leaves the stitching drum 236 loops 344 project at spaced intervals from one surface thereof while the cord 345 overlies the other surface thereof, as shown in Fig. 20. The apertures 330 in the drum 236 and corresponding fingers 340 are spaced different distances apart so that the loops 344 are arranged in substantially closely spaced pairs lengthwise of the web 230. It is between the more closely spaced loops 344 that the severing of the web takes place, as indicated by the severing line 346 in Fig. 20.

Inasmuch as the stitching drum is rotating continuously, it is necessary that the needle 331 move with the drum 236 during the stitching operation. To this end the arm 333, on which the needle 331 is mounted, is connected by link 347 to the end of a lever 348, which is pivoted at one end 349 on the frame 234 and has a cam follower 350 intermediate its ends which engages a cam 351 mounted upon the rotating shaft 227. Accordingly, as the drum 236 rotates cam 351 causes needle 331 to move with the drum 236, as shown in Figs. 17, 18, and 19, Fig. 17 showing the position of the needle 331 during the initial insertion thereof, Fig. 18 showing the needle 331 in the cord-looping position, and Fig. 19 showing the needle 331 in the withdrawing position at the beginning of its return stroke and in phantom after the return stroke in accordance with the contour of cam 351. Also, as shown in Fig. 20, the cord 345 is laid over one side of the web 230 between stitching operations, so that the loops 344 projecting from the other surface of the web 230 are connected by cord 345, the cord being drawn from the spool or cop 345 in a manner readily understood.

The wrapper sheet printing mechanism

It is frequently desirable to have contemporary data on packages, such as dates indicating the day when the packing of the package was completed, or the like, a series or serial number, or

the like. Mechanism for impressing dates or the like on the wrapper sheets is also provided in the present machine. This mechanism is illustrated in Figs. 11 and 21 and includes a printing roll 352 having printing characters 353 which impress on the web 230 passing over feed roll 237, a date, serial number, or other legend at spaced intervals such that each wrapper sheet W, after it is severed from the web 230, bears this data. Engaging the printing roll 352 is an ink transfer roll 354 which in turn is engaged by ink transfer roll 355 which in turn is engaged by ink transfer roll 356 engaging the ink roll 357 immersed in ink fountain 358. Printing roll 352 is driven by gear 359 meshing with gear 360 on feed roll 237 which is fitted with another gear 257' driven by gear 238 from drive shaft 241 in a manner previously described. Feed roll 237 carries a third gear 361 which drives the gear 362 of transfer roll 355. Transfer rolls 354 and 356 are frictionally driven by contact with driven roll 355. The ink roll is driven step by step so as to feed ink slowly to transfer roll 356. The end of the ink roll is fitted with a ratchet wheel which is engaged by a pawl 363 mounted on a bell crank lever 364 pivoted on frame 234 and connected by link 365 to crank gear 366 meshing with and accordingly driven by gear 238, as shown in Fig. 11.

Unused wrapper sheet ejector

In order that the machine will not become clogged with wrapper sheets fed to wrapping position when there is no bottle in position to be wrapped by the corresponding wrapper sheet, means responsive to the absence of a bottle is provided for ejecting the wrapper sheets which are not used. If a bottle B is not placed on one of the bottle supports 142 the subsequent movement of yoke 153 by its cam 145 will result in the overflow or excessive downward movement of mandrel 161 and cap plate 169 since there is no bottle in position to stop this movement. It will be recalled that when a bottle is in position on bottle support 142 the engagement of mandrel 161 with the bottle and cap plate 169 with bottle cap B' causes compression of springs 159 and 164, respectively; but if these springs are not compressed in this fashion they urge mandrel 161 and cap plate 169 downwardly beyond their normal position. Rod 162 also descends with cap plate 169 if no bottle is in position and consequently the roll 162' at the upper end of the rod 162 is lowered into position for engagement with shoe 367 which normally lies below and out of engagement with roll 162' when a bottle is in position on the corresponding bottle support 142. This arrangement is shown in Figs. 7 and 25. The shoe 367 is adjustable lengthwise along a plate 368 which is pivoted on the ends of parallel bell crank levers 369 and 370 pivoted on a bracket 371 supported on the bed 50 adjacent the edge of the main spider 123. The opposite ends of the bell cranks 369 and 370 are connected by a link 372 so that the bell cranks 369 and 370 move in parallel relation. A spring 373 extending between bracket 371 and bell crank 369 urges shoe 367 resiliently into the path of roller 162' of the bottle support. A lever 374 is secured to the pivot of bell crank 370 and is connected by link 375 to a second bell crank 376 pivoted on bracket 371 and engaging an adjustable stop 377 which limits the movement of shoe 367 by spring 373. The free end of bell crank 376 is connected to one end of link 378, the other end of which carries a slider 379 normally urged against an abutment

380 on link 378 by a shock-absorbing spring 381. This slider 379 is connected to one end of a lever 382 secured at its other end to a plow 383 pivoted transversely of the frame 234 immediately above the path of the wrapper sheets feeding between rolls 247—249 and guides 308, as shown in Fig. 11. The plow 383 is fitted with a guide 384 overlapping a tray 385 mounted above the wrapper sheet feed belt 310, as shown in Figs. 11 and 25. Plow 383 is normally held by spring 373 out of the path of the wrapper sheets. However, if there is no bottle on one of the bottle supports 142 so that roller 162' is lowered from its normal position, shown in Fig. 25, to the lower position, shown in phantom, it will engage shoe 367 as indicated in Fig. 25 and displace the same to depress plow 383 so that it projects into the path of the wrapper sheet which is being transmitted to the wrapping station. The wrapper sheet is accordingly ejected by the plow 383 and travels over guide 384 into tray 385 instead of being transmitted to the wrapping station where it and subsequent wrapper sheets would very likely clog the machine, since no bottles are provided for association with these wrapper sheets. It is noted that this wrapper ejecting mechanism responds to each successive bottle support, so that as soon as the supply of bottles is replenished the plow 383 will remain out of the path of the wrapper sheets and a wrapper sheet will be supplied at the proper time to the first bottle which follows the gap in the supply of bottles to which the unused wrapper ejecting mechanism responded by disabling the wrapper sheet feeding mechanism.

The wrapper gluing mechanism

Located behind the unused wrapper ejecting mechanism just described is the mechanism for applying glue, paste or gum to one longitudinal edge of the wrapper sheet or for moistening the previously gummed edge of the wrapper sheet, depending upon the nature of the wrapping material which is supplied to the machine. The gluing mechanism is placed behind the unused wrapper ejecting mechanism, so that unused wrappers will not be gummed and stick together when ejected.

This gluing mechanism is illustrated in Figs. 11, 22 and 23, and includes a platform 386 over which the separate wrapper sheets W are advanced by the feed rolls 247—249. This platform has a slot 387 near one edge through which projects the glue-applying roll 388. A spring finger 389 mounted on the platform presses the corresponding longitudinal edge of the wrapper sheet W against the glue roll 388 so that glue is transferred evenly from the glue roll to the corresponding longitudinal edge of the wrapper. The glue roll 388 is secured to a shaft 390 journaled in a bracket 391 mounted on a platform 392 as shown particularly in Fig. 22. Also supported by the platform 392 is the glue trough 393 mounted on a rod 394 passing slidably through an extension 395 on a platform 392 and vertically adjustable thereon by means of a set screw 396, whereby the elevation of the glue trough 393 with respect to the glue roll 388 may be varied. The shaft 390 carries at one end a gear 397 which meshes with idler gear 398 which is driven by feed roll gear 399'. As is indicated by arrows in Fig. 23, these gears are arranged to rotate glue roll shaft 390 in a clockwise direction, as seen in Figs. 11 and 23, so that the glue

roll 388 rotates in the direction of movement of the wrapper sheet being gummed thereby.

The opposite end of glue roll shaft 390 is fitted with a gear 402 provided with an overrunning clutch of the ball and wedge type, the balls 403 of which drive center element 404 and glue roll 388 in a clockwise direction when the outer element 402 is driven in that direction. The clutch gear 402 meshes with a pinion 405 which is driven by a pinion 407 on the shaft of motor 408 supported on platform 392. Platform 392 is carried by a vertical slide 409 slidable in guides 410 mounted on frame 234. Pivoted at one end on slide 409 is a link 411 which is connected at its other end to a lever 412 secured on shaft 413 journaled transversely of the frame 234, as shown especially in Figs. 11 and 22. A second lever 414 is secured to shaft 413 and its free end is connected by link 415 to the armature 416 of solenoid 418 suitably mounted on the frame 234. Solenoid 418 is in the circuit of the main driving motor 51 and accordingly is normally energized when the main motor 51 is operating. The armature 416 of solenoid 418 is consequently held down so that through the linkages described platform 392 is in elevated position and glue roll 388 projects through slot 387 in platform 386 to gum wrapper sheets W passing over platform 386 in the manner described. However, when the operation of the machine is stopped by opening switch 417 in the circuit of main motor 51, as illustrated in Fig. 11, solenoid 418 is de-energized and gluing mechanism platform 392 drops downwardly in slides 409. Since idler gear 398 is mounted on platform 392, idler gear 398 is disengaged from feed roll gear 399'. The withdrawal of the glue roll in this way prevents a wrapper from sticking to the glue roll by drying of the glue when the machine is stopped.

The circuit of motor 408 preferably includes normally open contacts 417' which are closed by a brush 419 carried by a slide 409, as illustrated in Fig. 11, so that as the machine stops motor 408 is energized to drive the glue roll 388 so that it remains moist at all times and the glue will not dry thereon as would be the case if it stopped rotating. As illustrated in Fig. 23, rotation of gear 397 in a clockwise direction results in clockwise rotation of glue roll 388, but inasmuch as the clutch in gear 402 is disengaged by rotation of central element 402 in a clockwise direction, gear 402 does not rotate; consequently, motor 408 may be connected directly to glue roll 388 but will not be affected by the normal rotation of the driving gear 397. However, when the gluing mechanism platform 392 is lowered the rotation of gear 397 is halted and motor 408 becomes energized, whereupon gear 402 is driven in a clockwise direction and through the medium of the balls 403 picks up the central element 404 and rotates the glue roll. As an alternative arrangement, motor 408 may be continuously energized, but it will not be effective in driving the glue roll until the gear 397 is stopped because the latter rotates the shaft 390 and the glue roll at a higher speed than the gear 402 is rotated by motor 408, thus maintaining the clutch balls 403 out of driving position when the machine is running.

The bottle wrapping mechanism

The successive wrapper sheets W are delivered in vertical position to guides 318 which are located over the main spider 123 in the path of the bottles B supported between the sleeve or

mandrel 161 and the bottle support 142, as illustrated in Figs. 5 and 11. As before mentioned, the height of the composite cylinder formed by bottle support 142, the cylindrical portion of bottle B, and the sleeve 161 is substantially equal to the length of the wrapper W and the upper and lower ends of this composite cylinder, and the upper and lower ends of the wrapper W, as the latter is supported vertically in guides 318, are substantially aligned. Also, because of the operation of the optical spotting or orienting mechanism, the label B'' on the bottle B aligns laterally with the label 259 on the wrapper W. Also, because of the operation of the optical precision cutting mechanism, the wrapper W is cut so that its label 259 aligns vertically with the label B'' on the bottle B. Accordingly, as the bottle B is advanced by rotation of the spider 123 it engages the rear or inner surface of wrapper W in such a way that the labels B'' and 259 of the bottle and wrapper respectively are substantially accurately superimposed.

Approximately at the time that the composite cylinder including bottle B, bottle support 142 and mandrel or sleeve 161 engages the inner or rear surface of wrapper W held in vertical position in guides 318, a holding finger 420 engages the outer surface of the wrapper W and holds it against the leading face of the bottle B, as is illustrated in Figs. 1, 5, 26, and 29. This holding finger 420 is fitted with a friction surface, such as a rubber pad or the like, and is mounted on the upper end of a vertical arm 421 secured on the end of a horizontal crank 422 which is secured on a vertical shaft 423 journaled on the main spider 123, as shown in Figs. 5 and 29. A holding finger 420 is provided for each bottle support 142, but is normally held out of engagement therewith by a cam 424 supported on brackets 425 on the bed 50 of the machine. A crank 426 is secured on the end of shaft 423 and carries a roller 427 which engages cam 424 to hold the finger 420 normally out of engagement with the bottle B. A spring 428 connected at one end to crank 422 and at the other end to the main spider 123, holds roller 427 in constant engagement with cam 424 and also resiliently as illustrated in Fig. 26, when the cam 424 releases the finger 420 at approximately the time when bottle B engages wrapper sheet W. This cam 424 is illustrated in plan in Fig. 1, and is circular in shape except for a depression which begins adjacent the wrapping station and terminates slightly beyond the wrapping station, whereby the finger 420 is moved and held against the wrapper sheet W to hold it against the bottle B in a manner readily understood.

As the bottle moves against wrapper sheet W held in guides 318 it carries the wrapper W with it, withdrawing the vertical edges of the wrapper from the guides 318, as is illustrated in Figs. 5 and 26. The composite cylinder, including bottle B, bottle support 142 and mandrel or sleeve 161 carries the wrapper W between stationary brushes 429 supported on a bracket 439 overhanging the edge of the main spider 123 and suitably supported on the bed 50 of the machine. As the bottle and associated wrapper move between the brushes 429 the wrapper W is wiped halfway around the bottle, being supported evenly on the cylindrical portion of the bottle, the sleeve or mandrel 161, and bottle support 142 during the wiping operation performed by brushes 429. This action is illustrated in Fig. 26, and as the bottle and associated wrapper

leave brushes 429 the vertical edges of the wrapper trail substantially parallel.

As the bottle and associated wrapper pass from between the brushes 429 they encounter left and right actuated folding and sealing means, illustrated in Figs. 26 to 29, inclusive. This mechanism is supported on frame 430 by pairs of brackets 431 and 432. Journaled in brackets 431 is a vertical shaft 433. Journaled in brackets 432 is a vertical shaft 434. The upper ends of shaft 433 and of shaft 434 are fitted with respective bevel gears 435 and 436 which are driven in opposite directions by respective bevel gears 437 and 438 secured on horizontal shaft 439 journaled in a bracket 440 secured on frame 430. On end of shaft 439 is fitted with a bevel gear 441 which meshes with a bevel gear 442 keyed on one end of horizontal drive shaft 256 extending along frame 234, as shown in Fig. 11. The free end of drive shaft 256 is journaled in a bracket 443 mounted on a frame 430, as shown in Fig. 28.

Secured at spaced points on shaft 433 is a pair of double arm levers 444, in corresponding ends of which are journaled two vertical shafts 445. Secured to the upper ends of shafts 445 are two cranks 446 having cam-following rollers 447 at their free ends. These rollers engage in the groove of a stationary cam 448 secured on the under side of horizontal web 440 of frame 430 through which shaft 433 passes. The cam 448 is adjustable angularly with respect to shaft 433 by loosening supporting studs 450 and adjusting them in arcuate slots 451 in the web 449.

A laterally extending bar 452 is journaled by end lugs 453 on each of the shafts 445. Extending from lugs 453 in a direction substantially opposite from bar 452 are ears 454 between which extends a rod 455. A vertically extending bar 456 is journaled by end lugs 457 on rod 455. Extending laterally from and secured on bar 456 is a thin, slotted flexible steel blade 458. This blade is flexibly connected to bar 452 by studs 459 secured on bar 452 and extending through holes in blade 458. The connection between blade 458 and bar 452 is resilient because of a coil spring 460 mounted on each stud 459 between blade 458 and an adjusting nut 461 on the stud. Three of these studs are provided for each blade 458 and the relative position of blade 458 with respect to bar 452 is determined by set screws 462 threaded through bar 452 and engaging blade 458 with their ends, as illustrated especially in Figs. 26 to 29, inclusive.

As shaft 433 is rotated the double cranks 444 thereon cause rollers 447 to follow the contour of cam 448 which is so shaped that the blades 458 are oscillated toward the bottle being wrapped so as to lay the trailing edge of the wrapper W against the surface of the composite cylinder formed by the bottle support 142, the cylindrical portion of bottle B and the sleeve or mandrel 161, in the manner illustrated in Fig. 26. The flexible mounting of the blade 458 causes it to press the edge of the wrapper resiliently against the composite cylinder so that the wrapping material is not injured and is laid smoothly and evenly in position, this action of the blade taking place while the bottle is in motion, the blade being projected and withdrawn in accordance with the contour of cam 448. In order to fold the wrapper in this manner on each of the relatively closely spaced bottles without driving the blade 458 at excessive speed, two blades are provided which

fold the left-hand trailing edge of the wrappers of alternate bottles.

Secured at spaced points on shaft 434 are double-armed levers 463. Journaled in the ends of levers 463 are vertical shafts 464. Fixed on the upper end of each shaft 464 is a lever 465 having a cam-following roller 466 which engages stationary cam 467 secured to the web 449 of frame 430 by means of studs 468 which pass through arcuate slots in the cam 467 so that the angular position of the latter may be adjusted within limits determined by the lengths of slots 469. Mounted on each shaft 464 and resiliently secured thereto by a coil spring 470 is a pair of lateral levers 471 the upper one of which has an upward extension 472 carrying a set screw 473, the end of which engages an abutment 474 on cam-following crank 465. Journaled between cranks 471 is a roller 475 having a friction surface, such as bristle, rubber or the like. The spring 470 normally urges set screw 473 in contact with abutment 474.

As shaft 434 rotates, the double-armed levers 463 bodily swing shafts 464 through a circular path, as seen from above, and cam 467 oscillates rollers 475 inwardly and outwardly. The movement imparted to rollers 475 immediately follows the movement imparted to blades 458 so that as blade 458 lays the left-hand edge of the wrapper around the bottle and is being withdrawn, the corresponding roller 475 wipes the right hand trailing edge of the wrapper around the bottle and lays the gummed edge in overlapping relation with the left-hand edge of the wrapper placed on the surface of the bottle by corresponding blade 458. Cam 467 is so shaped that rollers 475 are caused to dwell on the seam so as to seal it tightly along the entire length of the composite cylinder formed by the bottle support 142, the cylindrical portion of bottle B and the sleeve or mandrel 161, which forms a smooth and uniformly cylindrical support for the wrapper sheet during the wrapping and sealing operations. The relative movements of the blades 458 and the corresponding rollers 475 are illustrated graphically in Figs. 26 and 27. As in the case of the blades 458, two rollers 475 are provided in order that the sealing of the wrapper may be accomplished with appropriate rapidity without requiring excessive speed of movement of the rollers 475.

After the sealing operation is completed, cam 424 withdraws wrapper-holding finger 420 out of contact with the wrapper, its function having been completed when the wrapper is wrapped around the composite bottle cylinder in the manner described.

The wrapped bottle transfer

After the wrapper is formed into a cylindrical envelope with the seam completely sealed from top to bottom the top and bottom ends of the wrapper must be completed by folding them around the bottle. This requires removal of the bottle support 142 and of the sleeve or mandrel 161, but before these forms can be removed the bottle must be adequately supported. Mechanism for supporting the bottle in this fashion is illustrated in Figs. 30, 31, and 32.

As the wrapped composite bottle cylinders are advanced by the main spider 123, that portion of the wrapper W surrounding the cylindrical portion of the bottle B is gripped by two jaws 476 and 477 faced with cushions of resilient friction material, such as sponge rubber or the like. A

plurality of sets of these jaws 476 and 477 are carried by an endless chain 478 passing over idler sprockets 479 and 480 and a large driving sprocket 481, shown especially in Figs. 1, 33 and 34. Idler sprockets 479 and 480 are journaled on short vertical shafts 482 mounted on suitable standards 483 secured to the bed of the machine, as illustrated in Fig. 32. Driving sprocket 481 is secured on a vertical shaft 484 journaled in a yoke 485 secured to bed 50 of the machine and in a step bearing 486 mounted on the bed 50 of the machine as illustrated in Fig. 34. As shown especially in Figs. 1, 33 and 34, the extreme end of line shaft 60 is fitted with a bevel gear 487 which meshes with and drives a bevel gear 488 secured on cross shaft 489 having a worm 490 which meshes with and drives a worm wheel 491 secured to vertical shaft 484 which carries the large driving sprocket 481, whereby endless flexible chain 478 is driven in a counter-clockwise direction as seen from above in Figs. 1 and 31.

As shown especially in Figs. 31 and 32 each of the links of the chain 478 is fitted with a pair of vertical rollers 492 which engage rails 493 as the chain passes over idler sprockets 479 and 480. These rails hold the links of the chain 478 rigid and are secured to cams 494 mounted on brackets 495 secured on the stationary shafts 482 of the idler sprockets 479 and 480.

The chain 478 carries at spaced points relative frames 495 which are secured to a link of chain 478 by means of a yoke 496, as shown in Fig. 32. These frames 495 carry rollers 497 which engage in guides 494 which serve to brace the frames 495 against lateral tilting while a rail 498 mounted on the bed 50 of the machine supports the weight of the frame 495 which is fitted with a roller 499 traveling along the upper edge of rail 498.

The single jaw 476 is rigidly fixed on frame 495 although it is angularly adjusted with respect thereto about a pivot 500 by means of set screw 501, so that the relation between jaws 476 and 477 may be varied. Set screw 501 also serves as a stop for jaw 477, as is shown in Fig. 31. The jaw 477 is made in two parts which are secured on a shaft 502 journaled in lugs 503 on frame 495. Also secured on shaft 502 is a gear sector 504 which meshes with a gear segment 505 on one end of a bell crank lever 506 which is pivoted at 507 on frame 495. The free end of bell crank lever 506 is provided with a roller 508 which follows the contour of stationary cam 509 secured on the upper end of stationary shaft 482, as shown in Figs. 1, 31 and 32. A spring 510 connected at one end to the free end of bell crank 506 and at the other end to a pin 511 on frame 495 holds the roller 508 in contact with cam 509 and also urges jaw 477 toward jaw 476. As the chain 478 travels in a counter-clockwise direction as indicated by the arrow in Fig. 31 the rollers 508 of the movable jaws 477 of each of the sets of gripper jaws engages cam 509 the contour of which is such that the jaws 476 and 477 are first opened widely as indicated in Fig. 1, so that a partially wrapped bottle supported on bottle support 142 may pass between the jaws, the movement of the jaws and the bottle being synchronized with respect to each other. As the rear fixed jaw 476 engages the rear surface of the bottle, cam 509 releases jaw 477 so that spring 510 may close the latter on the front surface of the partially wrapped bottle, so that the latter is securely gripped between the jaws 476 and 477, as is illustrated particularly in Figs. 30 and 32. As an aid to spring 510, a rail or shoe 512 is engaged by roller 508 to hold the jaws rigidly

clamped on the surface of the partially wrapped bottle so that under no conditions, such as vibration of the machine, will the jaws release the partially wrapped bottle. Although the partially wrapped bottle is still supported on the bottle support 142 while being gripped by jaws 476—477 the path of the jaws coincides with the path of the partially wrapped bottle, so that there is no strain on the inter-engaging parts.

With the partially wrapped bottle securely held by the jaws 476—477 in the manner described, as illustrated in Figs. 30, 31 and 32, the bottle support 142 and the sleeve or mandrel 161 are withdrawn from the corresponding portions of the wrapper W which they supported during the wrapping and sealing operation. To this end cam 138 controlling the bottle support 142 lowers the slide 131 carrying the bottle support 142 so that the latter is withdrawn from the lower end of the partially wrapped bottle. It is at this time that the latch 203 of the bottle orienting mechanism is reset by the engagement of its extension 197 with stationary resetting detent 198 which lies in the path of the extension 197 when the bottle support 142 is lowered in the manner described. At substantially the same time that bottle support 142 is lowered the roller 145 of the supporting means of sleeve 161 rides up on cam 146 so that sleeve 161 is withdrawn from the upper end of the partially wrapped bottle. It has been found that unless the air vent slots 161', shown in Fig. 8, are provided in the upper end of the mandrel or sleeve 161, the latter tends to drag on the wrapper and buckle it because of the suction created within the wrapper by the withdrawing movement of the sleeve or mandrel 161. The partially wrapped bottle B supported by gripping jaws 476—477, as illustrated in Fig. 32, is then carried by further movement of flexible chain 478 from the spider 123 around idler sprocket 480 in a direction away from the main spider 123. The bottle support from which the partially wrapped bottle has been removed is then raised slightly so that it is in position to receive a new bottle from the inlet turret 65 in the manner described.

The bottom folding mechanism

As indicated in Fig. 1, the bottom folding mechanism is located on the straight-a-way portion of the conveyor chain which, with its gripping fingers 476 and 477, carries the individual partially wrapped bottles B in suspended position. The details of the construction of the bottom folding mechanism are illustrated in Figs. 33 and 34. This mechanism is driven by a vertical shaft 513 suitably journaled in the frame and connected by bevel gears 514 to horizontal drive shaft 60. The upper end of vertical shaft 513 is connected by bevel gears 515 to a horizontal stub shaft 516 suitably journaled in the frame and having at its free end a spur pinion 517 which meshes with and drives a large spur gear 518 rotating in a vertical plane on a stub shaft 520 journaled in sub-frame 521. Also mounted on shaft 520 so as to rotate therewith is a glue transfer roll 522, the lower edge of which is immersed in hot glue in glue pan 523 which is adjustably mounted on a bracket 524 on sub-frame 521. Surplus glue is removed from the glue roll 522 by a squeegee roll 525. This transfer roll 522 applies glue to two smaller glue rolls 526, which are spaced apart and project through slots in platform 527.

Meshing with gear 518 so as to be driven thereby is a second gear 528 which drives glue rolls 526

and carries on its shaft 529 a disc cam 530. Engaging the profile of this cam 530 is a roller 531 mounted on one end of a lever 532 pivoted intermediate its ends on sub-frame 521, and connected at its other end to a spring 533 secured to bracket 524 so as to constantly urge roller 531 into engagement with cam 530. Secured rigidly to lever 532 is a second lever 534, the free end of which is connected by a link 535 to a lever 536 pivoted at one end on sub-frame 521. Pivoted at the free end of lever 536 is a bell crank 537, one end of which carries a roller 538 which follows the profile of cam 539 mounted on sub-frame 521, while the other end of bell crank 538 carries a plow 539 having a substantially U-shaped cross-section. The roller 538 is urged into constant contact with the profile of cam 539 by a spring 540.

Suitably supported on a bracket 541 on sub-frame 521 is a stationary plow 542, which is also substantially U-shaped in cross-section and co-operates with moving plow 539 in a manner to be described.

The aforementioned platform 527, which is located in alignment with stationary plow 542, is substantially flat on its upper surface but has a downwardly converging lower surface with which cooperate vertical guides 543 and rollers 544. Also, the right-hand end 545 of platform 527 is flared laterally as seen in Fig. 33.

In operation, the trailing edge of the cylindrical wrapper W which projects below the bottom of the bottle B as it is carried by fingers 476 and 477, is engaged by the plow 539 which is advanced by cam 539 in a manner readily understood and given a downward wiping movement as it advances by cam 539, so that the trailing edge of the lower end of the wrapper W is folded inwardly against the bottom of the bottle B, the movements of plow 539 being synchronized with the movement of the bottle. This condition of the wrapper is illustrated graphically in Fig. 35a. As the bottle B is further advanced by fingers 476 and 477, the leading edge of the depending wrapper engages stationary plow 542 which folds the former rearwardly until it overlaps the trailing edge in the manner illustrated in Fig. 35b, leaving two laterally depending ears X. As the bottle is further advanced, the ears X are engaged by vertical guides 543 which direct the ears X inwardly toward the converging side walls of the platform 527 while rollers 544 flatten and press these ears X against the converging side walls of platform 527 in a manner readily understood. The flattened depending ears X are then spread apart by the flaring portion 545 of platform 527 (Fig. 35b), so that as the infolded wrapper overlying the bottom of the bottle engages the glue rolls 526, two lines of glue Y are applied thereto without smearing the ears X.

Following the platform 527 are two successively acting guides 546 and 547, which slope in such a way that the ears X are successively folded inwardly, first one, as illustrated in Figure 35c, and then the other, as illustrated in Fig. 35d, each ear being held down by the corresponding strip of glue Y, as it is pressed down by stationary rollers 548 aligned with glue rollers 526. Further pressure is applied by a large pressure roller 549 mounted on a bell crank 550 pivoted on sub-frame 521 and urged in an upward direction by a spring 551 engaging the free end of bell crank 550 and adjustable by hand wheel 552 in a manner readily understood. The completely folded and glued bottom surface of the

pletely folded and glued bottom surface of the 553 and its curved continuation 554, while the glue hardens.

While the bottle is on platform 554 a pamphlet of instructive or advertising material is dropped into the open upper end of the wrapper W, preferably behind the pull cord, so that it lies between the neck of the bottle and the inner surface of the wrapper adjacent the pull cord. Accordingly, as the wrapper is subsequently ripped open by means of the pull cord, the pamphlet or booklet 555 will fall out, attracting the attention of the user. Mechanism for supplying the pamphlet or booklet 555 by means of a chute 556 is of any suitable construction, such as a folding machine, the discharge of which is synchronized with the movements of the partly wrapped bottles so that the pamphlet 555 is directed down chute 556 at the proper time to lodge within the wrapper in the manner described, and to this end the folding machine may be driven by horizontal shaft 60 in a manner readily understood.

Wrapper pleating mechanism

The wrapper pleating mechanism is located at the right hand side of the machine as indicated in Fig. 1, and, as is shown particularly in Fig. 36, and is driven by vertical shaft 484 to the upper end of which is keyed the spider 557 comprising lower and upper wheels 558 and 559 connected together by braces 560. The arms of the wheels 558 and 559 carry a plurality of pleating heads 561, five being employed in the machine of the size illustrated. A cage or frame 562 supports the upper end of shaft 484 and depending from this frame is a bushing 563 surrounding shaft 484 and supporting four superimposed crown cams 564, 565, 566 and 567 which remain stationary as the spider 557, with its pleating heads 561, rotates with shaft 484.

Each pleating head 561 includes a central tube 568, the upper end of which is provided with a slide 569 which moves upwardly and downwardly upon a guide 570 on the corresponding spider brace 560. The slide 569 is provided at its upper end with a collar 571 with which cooperates the bifurcated end of a lever 572 pivoted intermediate its ends on a bar 573 extending between wheels 558 and 559 so as to rotate with spider 557. The free end of this lever 572 is provided with a cam-following roller 574 which cooperates with upper crown cam 564, lever 572 being arranged substantially tangentially to the cam in the manner illustrated in Fig. 1, so that as the spider 557 rotates cam 564 oscillates lever 572 to move slide 569 upwardly and downwardly on guide 570 and with it the tube 568. The tube 568 carries at its lower end the operating mechanism of the pleating head which moves as a unit upwardly and downwardly with the contour of cam 564 in the manner described. The lower end of tube 568 is fitted with a flanged plug 575 and supported on this plug and journaled on the outer surface of tube 568 is a spool 576, the upper flange of which is fitted with spaced clevises 577 and the lower flange of which supports a flat ring 578.

Slidable on the outer surface of spool 576 between its flanges is a collar 579 supported by bolts 580 slidable through the upper flange of spool 576 and secured to a ring 581 mounted upon the lower end of a sleeve 582 telescoped on tube or shaft 568, so as to slide axially thereof on bushings 583 carried by the sleeve 582. This

sleeve 582 is provided at its upper end with a spool 583 which is engaged by the bifurcated end of a lever 584 pivoted on bar 573 intermediate its ends and provided at its free end with a roller 585 which follows the contour of cam 565, so that not only does sleeve 582 follow the general movements of tube 568, but has superimposed on the movements of the latter a movement of its own afforded by the variation in contour of cam 565 as compared to the contour of cam 564.

Pivoted at spaced intervals on the edge of ring 578, which is secured on the lower flange of spool 576, is a plurality of short links 586, each of which carries a long tapering finger 587 of triangular section, as is illustrated in Fig. 39, there being ten of such fingers in this instance for each pleating head. As is illustrated particularly in Fig. 37, the pointed tips 588 of the fingers 587 are curved outwardly so as to be blunt. A leaf spring 589, secured on the ring 587, engages each of the links 586, so as to urge them in a radially outward direction, while another leaf spring 590, carried by each link 586, engages the blunt upper end of the corresponding finger 587, so as to tend to hold it in proper position, which is substantially parallel to the corresponding link 586, as is indicated in dotted lines in Fig. 37 and in left-hand pleating head 561 of Fig. 36, the fingers 587 converging slightly in a downward direction.

Suspended from each clevis 577 is a bell crank lever 591, the inner or short arm 592 of which engages the collar 579, while the long arm 593 thereof pivotally carries an outer finger 594 provided with a downwardly converging V-shaped groove on its inner surface which corresponds to the V-shaped section of the corresponding inner finger 587, one of these outer fingers 594 being provided for each inner finger 587, the two fingers of each set being positioned, when in inoperative position, as is indicated in Figs. 36 and 44. Although each outer finger 594 swings more or less loosely upon the lower end of bell crank lever 591, the lower end thereof is positioned by a lever 595 suspended from bell crank lever 591 and urged radially inwardly by a leaf spring 596 carried by bell crank lever 591, as is shown in Figure 37. Also bell crank lever 591, with its outer finger 594, is urged in a radially inward direction by leaf spring 597, so that its inner arm 592 remains in constant contact with the upper flange of collar 579 and its position is determined by the axial position of collar 579.

In operation, the two sets of inner and outer pleating fingers 587 and 594 are suspended above and in axial alignment with a partially wrapped bottle B as it is carried around on platform 554 by the corresponding set of gripping fingers 477 and 476. When in this position cam 564 comes into operation to lower the entire pleating head 561 so that inner fingers 587 extend within the open upper end of the wrapper W while outer fingers 594 depend outside of the wrapper. As the pleating head 561 is lowered, the rounded tips 588 of inner pleating fingers 587 follow the contour of the neck of the bottle B cam-fashion, so that they are spread radially from the position shown in dotted lines in Fig. 37 to the position indicated in solid lines, which is the lowermost position and is such that the tips 588 of the pleating fingers 587 lodge firmly in the space between the shoulder of the bottle B and the inner surface of the wrapper W. During this positioning of the inner pleating fingers 587, outer pleating fingers 594 are inactive except that they follow the vertical movement of the inner pleating

fingers 587, also being carried by the pleating head 561 which moves as a unit. However, upon the positioning of the inner pleating fingers 587 in the manner described, cam 565 comes into action to elevate sleeve 582 slightly with respect to inner tube 568, so that collar 579 is raised to permit leaf spring 597 to move bell crank lever 591 inwardly and with it the outer pleating finger 594, which accordingly engages the outer surface of the wrapper and presses it inwardly around the downwardly tapering V of inner finger 589 with its V-grooved inner surface so as to press the paper of the wrapper W into a V-shaped pleat P which, due to the divergence of the complementary V surfaces of the fingers in an upward direction flares upwardly, as is illustrated particularly in Figs. 40 and 44. Because there are ten cooperating sets of pleating fingers, ten uniformly-shaped, tailored pleats P are simultaneously formed in the upper portion of the wrapper W.

After forming the pleats P in the upper end of the wrapper W the fingers are withdrawn by cam 564, inner fingers 587 again following the contour of the neck of the bottle so as to disengage the inner surface of the paper, but outer fingers 594 remaining in contact with the outer surface of the wrapper W and following the upwardly converging shape thereof, being still pressed inwardly by corresponding springs 597.

The lower end of each of the depending levers 595 carried by corresponding bell crank levers 591 carries a creaser 598, which is illustrated in greater detail in Figs. 40 to 43, inclusive. During the pleating operation, the inner finger 587 forces the wrapper material in the slot of the creaser 598 which is formed of box sections, as illustrated in Fig. 42, and as the creaser 598 rises with the corresponding outer pleating fingers 594, the pleat P of the wrapper embraced thereby is creased and, because the pleat P widens from bottom to top, more of it is embraced by the creaser in the manner illustrated in Fig. 43. The slot in the creaser is so directed that it lays the creased pleat in the direction that the pleats P are laid by the pleating fingers, as illustrated in Fig. 39, so that they will all be directed in the same direction, i. e., in a counter-clockwise direction, as seen from above, or in the section of Fig. 46, whereby a person grasping a wrapped bottle with the right hand will not catch his fingers in the pleats P, as would likely be the case if the pleats were directed in the opposite direction, i. e., in a clockwise direction. The creaser 598 also assists in drawing the upper end of the wrapper into substantially the conical shape afforded by the widening of the pleats from bottom to top.

Telescoped over the sleeve 582 and slidable axially thereof, is a second sleeve 599 having at its lower end a collar 600, and a second collar 601 at its upper end, in which engages the bifurcated end of lever 602 pivoted intermediate its ends on bar 573 and carrying at its free end a roller 603 which follows the contour of cam 566 as the spider 557 rotates. Slidable on the outer surface of second sleeve 599 is a third sleeve 604, carrying at its lower end the plate 605 and at its upper end the collar 606, with which engages the bifurcated end of lever 607 pivoted intermediate its ends on bar 573 and having at its free end the roller 608 which follows the contour of cam 567 as spider 557 rotates.

The plate 605 on the lower end of the third or outer sleeve 604 is provided with a pair of diametral depending lugs 609. Pivoted on each of

these lugs 609 is a bell crank lever 610, the short arm 611 of which engages with lower collar 600 on second sleeve 599, while the long arm 612 thereof pivotally carries a lever 613 which is held in substantial alignment with arm 612 by a leaf spring 614 carried by the latter. Also pivoted on each of the lugs 609, is a long link 615 which is pivotally connected at its lower end to the outer end of a clevis 616 pivoted on lever 613 and carrying at its inner end a series of superimposed plates 617 provided at their free ends with registering V-shaped notches, as is shown particularly in Fig. 39. The two sets of plates 617 are maintained in horizontal position for all angles of levers 612 by links 615 and are located diametrically opposite each other but are staggered with respect to each other, so that when they are brought together they intermesh, i. e., the plates of one set pass between the plates of the other set, as is indicated in Figs. 44 and 45.

During the pleating operation just described, cam 567 does not lower plates 617 as far as cam 564 lowers the pleating fingers, the relative positions of the plates 617 with respect to the pleating fingers during the pleating operation being illustrated in Figs. 37 and 38. Also, during the pleating operation cams 566 and 567 operate together, i. e., there is no movement of the plates 617 with respect to the pleating fingers, the relative positions of the plates 617 with respect to the pleating fingers being shown particularly in Fig. 39. However, as the pleating fingers are withdrawn, cam 566 lifts second sleeve 599 axially with respect to third or outer sleeve 604, so that bell crank levers 610 are moved radially inwardly to cause the plates 617 to intermesh and their V-notches to embrace the pleated upper end of the bottle wrapper. Subsequent elevating movement of outer sleeve 604 by cam 567 causes the plates 617 to wipe and gather the upper ends of the pleats P until they are crimped between the intermeshing plates 617 over the cap of the bottle as is indicated at T in Figs. 44 and 46.

The rotating spider 557 and the bottle carrying fingers 476 and 477 move in unison during the time the pleating operation takes place, and after the pleating head 561 is withdrawn and when the upper end of the wrapper is gathered by plates 617 as illustrated in Fig. 44, a pinion 618 carried by the lower wheel 558 of the spider 557 engages and rolls along a rack 619 carried by the frame 562, as shown in Figs. 1 and 36. This causes pinion 618 to rotate in a clockwise direction as seen from above. Pinion 618 meshes with a gear 620 splined on outer or third sleeve 604, so that the latter is rotated rapidly in a counter-clockwise direction, so that the plates 617, which have gathered the surplus portion of the wrapper above the cap of the bottle, twist it into a tight pigtail T, as shown in Figs. 44 and 45. The rapid rotation of the plates 617 in a counter-clockwise direction, which is the direction in which the pleats P are turned, as shown in Fig. 46, causes the pleats to be drawn tightly over the upper end of the bottle and the pigtail T to be tightly formed. Upon completion of the pigtail, which takes place when pinion 618 runs off of rack 619, cam 567 lifts plate 617 out of engagement with the pigtail T. The rack 619 is adjustable radially by means of the screw 622 connected at one end thereof, as shown in Fig. 1, so that the spin of the plates 617 may be varied as to duration and beginning. This operation is repeated in succession by each of the other four pleating heads 561 which cooperate with the suc-

cessive bottles advanced over the platform 554 by the fingers 476 and 477 of the conveyor chain.

In order to prevent any tendency of the twisting plates 617 to twist the pleats bodily around the bottle neck so that they are askew and not parallel to the axis of the bottle, they are held during the last or tightening stage of the twisting operation by mechanism illustrated in Figs. 36, 39, 44, 45 and 47. This holding mechanism includes a cam 623 secured on shaft 484 so as to rotate therewith, and engaged by a roller 624 carried by one end of a lever 625 secured to gear 626 journaled on a stationary bracket 627 supported by collar 628. The gear 626 meshes with a second gear 629 journaled on bracket 627, so as to rotate in the opposite direction from gear 626. Each gear carries an arm 630 having a jaw 631 at its free end, the inner face of which is shaped to conform to the curvature of the bottle B adjacent its cap B', as is illustrated particularly in Figs. 45 and 47.

This holding mechanism is located at the point where the twisting operation occurs, as is indicated in Figs. 36 and 47, the cam 623 being shaped so that arms 630 carrying the jaws 631 are retracted to clear the bottles and pleating mechanism during the pleating operation, as is indicated in Fig. 47. However, after the pleating fingers 587 and 594 have been retracted and plates 617 have begun the twisting operation, cam 623 moves the lever 625 radially inwardly to rotate gear 626 in a clockwise direction, as seen in Fig. 47, causing corresponding arm 630 to be moved inwardly to engage its jaw 631 with the wrapped bottle adjacent the cap B' thereof, as seen in Fig. 44. At the same time gear 629 is rotated in a counter-clockwise direction by meshing gear 626, so that its arm 630 is also moved inwardly to engage its jaw 631 with the bottle simultaneously with the first jaw 631. In this way, the wrapper is prevented from twisting during the twisting operation indicated in Figs. 44 and 45. After the twisting operation is completed cam 623 again withdraws jaws 631 into the retracted position illustrated in Fig. 47 in readiness for the next bottle which is presented thereto by carrying fingers 476 and 477.

Bottom labeling mechanism

In the course of being carried by fingers 476 and 477 the wrapped bottles B are next fitted with a bottom label L (Fig. 52) by mechanism identified by numeral 632 in Fig. 1 and shown in detail in Figs. 48 to 51, inclusive. This mechanism is driven in synchronism with the remainder of the machine by a shaft 633 connected to shaft 60 by bevel gears or the like, not shown. Shaft 633 carries a spur gear 634 driving a train of gears 635, 636 and 637. Gear 635 carries a pinion 638 which drives gear 639 which in turn drives gear 640. Gears 639 and 640 carry pulleys 641 and 642, respectively, over which pass respective engaging belts 643 and 644, the engaging courses of which move in the same direction, i. e., to the left, as seen in Fig. 48. A series of circular labels L are introduced between these belts at uniformly spaced intervals by a picker or label feeder 645 of conventional construction.

The advance of these labels L by belts 643 and 644 is such that a label is supplied to roller 646 and support 647 each time rubber pad 648 on drum 649 of gear 636 engages roller 646. Overlapping the leading edge of pad 648 and carried by drum 649 is a hook finger 650 which is actuated by a stationary cam 651 in such a way that as

pad 648 engages a label on roller 646, finger 651 is inserted between the leading edge of label L and support 647 to grip the label to pad 648, as is illustrated particularly in Fig. 49.

Carried by gear 637 is another drum 652 also having a soft pad 653 which is so located as to periodically coincide with pad 648 as the drums 649 and 652 rotate together. Also, drum 652 is fitted with a hook finger 654 actuated by stationary cam 655 to grip the label L and transfer it to pad 653 as finger 650 releases it.

Mounted on the bed plate of the machine is a small motor 656, independently energized, which, through reduction gearing 657 and chain 658, drives a glue roll 659, which is partially immersed in glue pan 660 and is engaged by a squeegee roll 661 which removes surplus glue therefrom. Supported on an arm 662 pivoted on shaft 663 is a glue transfer roll 664 having a pad 665 and oscillated between glue roll 659 and pad 653 so as to transfer glue from glue roll 659 to the label L carried by pad 653. The proper timed oscillation of transfer roll 665 is effected by mechanism controlled by a cam 666 carried by gear 634 and which actuates roller 667 so as to axially oscillate rod 668 guided by yoke 669 spanning shaft 633. Connected resiliently to rod 668 between springs 669' is the end of a lever 670 secured on a bar 671 pivoted intermediate its ends at 672 and having a gear segment 673 at its upper end which meshes with gear segment 674 on arm 662. It will be seen that as rod 668 is oscillated axially by cam 666, it oscillates bar 671 which in turn oscillates arm 662 to bring glue transfer roll 664 alternately into engagement with glue roll 659 and the label L on pad 653 to apply glue thereto.

The lower end of bar 671 is provided with a V notch 675 in which is adapted to engage a pin 676 on the free end of a lever 677 pivoted intermediate its ends and loosely engaging the end of another pivoted lever 678 connected at its other end by link 679 to the armature 680 of solenoid 681. This solenoid is controlled by a switch 682 actuated by main clutch arm 57 (Fig. 1) in such a way that it is opened when the machine is stopped. Opening of switch 682 deenergizes solenoid 681, so that spring 683 pulls down levers 678 and 677 so that pin 676 is thrust into V notch 675 to cam bar 671 into a center position, the resiliency of springs 669' permitting this action regardless of the position of cam 666. This movement is imparted by bar 671 to arm 662, which is also moved to center position and with it transfer roll 664. In this way surplus glue is not transferred to a label which may happen to have stopped in gluing position. Also, motor 656 continues to rotate glue roll 659 so that the glue will not dry thereon, but will be fresh for the next gluing operation. Restarting of the machine with clutch lever 57 closes switch 682 to energize solenoid 681 and disengage pin 676 from notch 675. Springs 669' then restore the glue transfer roll 664 to its original position.

Provision is made for preventing gluing of pad 653 in the event that the label supply fails. This safety mechanism includes a second cam 684 on gear 634 having a follower roller 685 on yoke 686 piloted on a shaft 633. The yoke 686 carries a rod 687 loosely connected at its upper end to bell crank 688 pivoted at 689 and carrying a pair of feeler fingers 690 which are urged into grooves 691 on pad 653 by spring 692 and are oscillated into engagement with a label L on pad 653 by cam 684, the timing of which is such that fingers 690 are urged against the label and are with-

drawn for engagement with the next succeeding label. Bell crank 688 has an abutment 693, which, if fingers 689 are not stopped by a label but drop into grooves 691, is projected into the path of a dog 694 on arm 662 to prevent it from bringing transfer roll 665 into engagement with the bare pad 653. Withdrawal of fingers 689 by cam 684 causes abutment 693 to be retracted from dog 694 to allow gluing of the next label if it is in position on pad 653.

As the pad 653 carries the label L around in an upward direction, fingers 476 and 477 advance a bottle B in timed relation therewith so that glued label L is applied accurately to the bottom of the bottle B, as is illustrated in Fig. 52, fingers 654 being released by cam 655 and the pad 653 resiliently pressing the label in place, as is illustrated in Figs. 50 and 51. An electrically heated pressing roll 695, rotated from gear 637 by gear 696, presses the label L in place, the roll 695 and gear 696 being journaled on arms 697 adjustable by screw 698 to vary the pressure of the hot roll 695 on the label L. The bottle B with the bottom label L applied is then carried by transfer fingers 676 and 677 to the next operation, which is the pressing down of the neck pleats of the wrapper.

Pleat pressing mechanism

The pleat pressing mechanism 724 is illustrated in detail in Figs. 54 to 58, inclusive, and is located adjacent the final course of the conveyor chain following the bottle labeling mechanism, as indicated in Fig. 1. It is supported on a base 725 and revolves around a center column 726, which is keyed to the base 725 to prevent rotation thereof. Journaled on column 726 and supported at its lower end on a step bearing 727, is a sleeve 728 which is journaled intermediate its ends in a cam plate 729 supported by a cam drum 730 mounted non-rotatably on base 725.

Supported by the cam plate 729 and keyed to sleeve 728 so as to rotate therewith is a spider 731 carrying a plurality of sets of gripping fingers 732, which are actuated by a cam 733 secured to cam plate 729 in the same way that the gripping fingers 476 and 477 of the bottle transfer mechanism and fingers 118 of the bottle inlet turret 65 are operated, so that a detailed description of the operating mechanism of these fingers 732 is not necessary, it being sufficient to state that they cooperate synchronously with fingers 476 and 477 of the transfer mechanism to remove the wrapped bottles from the fingers 476 and 477 as the latter open to release the bottles. To this end the spider 731 is driven in synchronism with the transfer mechanism by a transverse shaft 734 driven from drive shaft 60 by bevel gears 735 and having a worm 736 which meshes with worm wheel 737 keyed to the lower end of the sleeve 728. The arrangement of these shafts is illustrated in Fig. 1. Thus the transfer mechanism fingers 476 and 477 cooperate precisely with the gripping fingers 732 to transfer the bottles to the latter from the conveyor chain.

Aligned axially with the gripping fingers 732 and below them is a cup-shaped bottle support 738, which is normally retracted from the bottle during the transferring movement thereof from the transfer mechanism in order that the bottle will clear the flange of the cup-shaped support 738. This withdrawal of the support 738 is effected by a crown cam 739 supported on cam drum 730 and connected by a roller 740 carried by an axially resilient plunger 741 mounting the bottle support 738. The con-

tour of cam 739 is such that immediately after a bottle is gripped and supported by fingers 732 the corresponding cup 738 is raised to support and partially embrace the bottom of the bottle during its passage through the pleat pressing mechanism 724.

Splined to the upper portion of column 726 is a second stationary cam drum 742. This cam drum 742 rests upon a thrust bearing 743 supported by a collar 744 splined on sleeve 728 and connected by a worm 745 to a worm wheel 746 secured upon a nut 747 threaded upon the outer surface of sleeve 728. Secured to collar 744 is a plate 748 which is connected by a plurality of spaced housings 749 to an upper plate 750 journaled upon the hub 751 of the upper cam drum 742. The entire assembly, including cam drum 742, upper and lower discs 748 and 750 and housings 749, may be raised or lowered at will with respect to the bottle support 738 by rotating worm 745 which adjusts the axial position of nut 747 along the threaded portion of sleeve 728.

Supported by and partially enclosed in housings 749, of which there are four in the machine of the size illustrated, are the individual pleat pressing heads 765, which are aligned axially with the corresponding sets of gripping fingers 732 and corresponding bottle supports 738. The vertical relationship between the pressing heads 765 and the bottle supports 738 is adjustable by means of worm 745 in the manner described, so as to accommodate bottles of different heights, although any slight variation in heights of the several bottles is compensated for automatically by the axially resilient plunger 741 between each bottle support 738 and its cam following roller 740.

Located within each of the housings 749 is a tubular support 752 in the lower end of which is journaled a sleeve 753 having a spur gear 754 at its lower end, this gear being shrouded by a bearing plate 755. Splined within sleeve 753 is a tube 756 carrying on its upper end a lateral roller 757 which cooperates with crown cam 758 on upper cam drum 742. The roller 757 is mounted on a ring 759 in which the tube 756 is journaled so that the latter may rotate with respect to the former. Telescoped within tube 756, axially slidable therewith and non-rotatable therein, is an inner tube 760 having at its upper end a cam-following roller 761 which cooperates with crown cam 762 on upper cam drum 742.

As is illustrated particularly in Figs. 55 and 56, the lower end of outer tube 756 carries a collar 763, on the rim of which are supported at equally spaced intervals a plurality of clevises 764. Pivoted in each of these clevises 764 is a bell crank lever 768, the short arm 766 of which is directed radially inwardly and engages the lower edge of a sleeve 767 secured to the lower end of inner tube 760. The long arm 768 on each bell crank lever 768 extends downwardly and carries at its lower end a loosely pivoted shoe 769 having a concave inner surface, machined smoothly and having rounded edges. As is illustrated particularly in Figs. 56 and 58, the levers 768 are not arranged exactly radially, but are slightly inclined from the radius in a counter-clockwise direction, which serves to cause the faces of the shoes 769 to be offset from the radius so that they drag or trail when they are rotated in a counter-clockwise direction on the wrapped bottle in a manner to be described, whereby their pressing or smoothing action is augmented. A spring 770 extending between each bell crank lever 768 and

its corresponding clevis 764 urges the short arm 766 of bell crank lever 768 into constant engagement with the lower edge of sleeve 767 and shoes 769 radially inwardly. Also, as shown in Fig. 58, alternate shoes 769, i. e., half, or five, of them, are positioned further radially inwardly than the remainder, so that they engage the pleats first.

Slidable axially in inner tube 760 and normally urged downwardly by a light spring, not shown, is a centering pin 771 having a disc 772 at its lower end which is shaped to conform to the wrapped cap B' of the bottle B and which has an axial opening 773 which accommodates the pigtail T of the wrapper when the disc 772 rests upon the wrapped bottle in the manner illustrated in Fig. 57.

Secured to the upper end of the hub 751 of stationary upper cam drum 742 is a disc cam 774 with which engages a roller 775 on the end of a crank 776 secured on a vertical shaft 777 journaled in discs 748 and 750 and having at its lower end a gear sector 778, which meshes with the gear 754 which is splined to the outer tube 756 of the corresponding pleat pressing head 765, as is shown particularly in Figs. 54, 55, and 56.

In operation, the fingers 732 of the pleat pressing mechanism transfer the wrapped bottles from the gripping fingers 476 and 477 of the transfer mechanism and align them with the successive pressing heads 765 and bottle supports 738, the latter being raised by cam 739 to support the bottles during the pressing operation, in the manner described. After the bottle B is properly seated in the bottle support 738 cam 758 lowers the pressing head 765 so that disc 772 on centering pins 771 resiliently engages the cap B' of the bottle and properly centers it, the pigtail T extending up into the passage 773 in centering pin 771, as is illustrated in Fig. 57.

As the pressing head 765 is lowered, cam 762 cooperates with cam 758 to move inner tube 760 substantially in unison with tube 756, except that cam 762 superimposes a slight additional movement of inner tube 760 on the movement of outer tube 756 so that sleeve 767 is projected slightly to press downwardly on short arms 766 of bell crank 768 and spread shoes 769 apart so that they clear the bottle and remain disengaged therefrom until they reach the position indicated in dotted lines in Fig. 56, i. e., about two-thirds of the way down the pleats with the five shoes located between the pleats instead of on them, as is illustrated in dotted lines in Fig. 58. Cam 762 then raises inner tube 760 slightly to release the pressure of sleeve 767 on bell crank levers 768 to permit springs 770 to cause the shoes 769 to encircle and engage the wrapper W between the pleats P.

With the shoes 769 resiliently engaging the wrapper W in accordance with the pressure applied thereto by springs 770, a slight counter-clockwise turn (16°) is imparted to the pressing head 765 to move the shoes 769 up on the pleats in the direction in which the pleats are directed. This arrangement prevents the shoes from catching in the pleats and snagging them. This rotation of the shoes 769 is effected by cam 774 which actuates lever 776 to impart a lateral movement to sector 778, which, through gear 754, rotates outer tube 756 with respect to inner tube 760 and sleeve 759, which carries its cam-following roller 757.

With the shoes 769 in engagement with the pleats P in this way, cam 758 lowers the pleating head to move the shoes 769 to the bases or lower

ends of the pleats, after which the cam again raises the head to draw the shoes up the pleats from bottom to top to complete the pressing operation. At the end of this upward movement, cam 774 again turns the pleating head counter-clockwise through a small angle (36°) to shift the shoes 769 to the alternate pleats and cam 758 lowers and then raises the pleating head to press these pleats down in the same way, the length of this stroke extending the entire length of the pleats.

After the pleat pressing operation, the pressing heads 765 are raised by their respective cams 758 and 762 out of contact with the wrapped bottles B while cam 739 retracts the bottle supports 738 from the bottles so that they may be transferred from the pleat pressing mechanism to the gripping fingers 779 of a conveyor chain 780, shown in Figs. 1 and 53, fingers 779 of which are operated by cam 781 in the same way that the gripping fingers of the bottle in the inlet turret 65, the bottle transfer mechanism, and the pleat pressing mechanism 724 are operated. This conveyor chain is driven in synchronism with the pleat pressing mechanism by shafts 782 connected to shaft 734 which drives the pleat pressing mechanism. The conveyor chain 780 serves as a discharge for the complete wrapping machine disclosed herein, and may be employed to convey the wrapped bottles to any other mechanism for further operations, to a packing table or machine, or the like, depending upon requirements.

In the course of the transfer of the wrapped bottles by the conveyor chain 780, the pigtail T thereof is preferably severed at a point close to the upper surface of the bottle cap B' as is illustrated in Fig. 59. The pigtail severing mechanism includes a circular knife 783 journaled in a support 784 and driven by a small electric motor 785 mounted on the support 784 and energized by any suitable source of power.

Summary of operation

Although the operation of the several mechanisms of the new apparatus will be readily understood from the foregoing description, the operation of each will be briefly reviewed and correlated.

Beginning with the wrapper sheet supply, illustrated in Figs. 1 and 11 to 23, inclusive, the wrapper sheet web 230 is drawn from supply roll 231 (Fig. 1) over stitching drum 236 (Figs. 13 to 19, inclusive) where needle 331 oscillated radially through holes 330 in the drum 236 by cam 337 (Fig. 15) is also moved with the drum by cam 351 (Fig. 14) as the drum rotates, so that the movement of the web is continuous during the stitching operation. The needle 331 accordingly penetrates the web 230 at spaced points to drive cord 345 through it so that except for the spaced points the cord overlies the underside of the web as seen in Fig. 11. As the cord is stitched through the web, looping fingers 340 engage the loop 344 of the cord at the eye of the needle 331 to enlarge it and hold it as the needle 331 is withdrawn and travels along the cord laying it on the wrapper web to the next stitching point, after which the looping finger 340 for that particular loop 344 is released as complete. These movements of the looping fingers 340, which come into operation successively, are effected by stationary cam 342 (Figs. 16 to 19, inclusive) and produce the loops 344 on the upper surface of web 230 in the arrangement shown in Fig. 20.

The stitched web 230, with the loops 344 ex-

tending upwardly from the surface bearing the labels or printed matter and the cord 345 lying along its lower surface, is drawn over roll 237 by pull-off rolls 246—248 (Fig. 11). As the web 230 passes over roll 237 it is printed with a date or other identifying matter, the printing roll 352 being inked by a ratchet-driven ink roll 356, oscillated by crank wheel 366 into periodic engagement with ink transfer roll 355, in turn engaged by ink roll 354 which inks the type 353 of printing roll 352 (Figs. 11 and 21).

As the web 230 leaves the roll 237 the cord 345 overlying its under surface is secured thereto by adhesive applied by roll 786 dipping into stationary adhesive pot 787 and rotated by contact with the web 230 (Fig. 11). The adhesive is preferably melted paraffin maintained in fluid condition by heating means in or around pot 787, although other cementing means may be employed if desired.

The web 230 is provided on its upper surface (Figs. 12 and 20) at regularly spaced intervals with the optical index marks 260, which bear a definite relation to labels 259, although if desired the label 259 or some other mark selectively visible to photo-electric cell 263 may be employed instead. The photo-electric cell 263 responds optically to the interruption by the indices 260 of the light reflected from web 230, and if these interruptions occur while the brush 266, driven by web-severing roll 250, is in engagement with dead segment 268 of selector switch 267, to which photo-electric cell 263 is connected as shown in Fig. 12, nothing happens, indicating that the web is being correctly severed at the proper point with respect to indices 260. However, if the optical impulse occurs when selector brush 266 is on either segment 269 or 270, corresponding magnet 271 or 272 is energized to draw armature 274' in the corresponding direction to reverse the field 281—282 of the pilot motor 283, which rotates in the corresponding direction to adjust the variable speed device 287 to increase or decrease the speed of shaft 241 which drives the pull-off rolls 246—248, so that the proper relation will be maintained between the indices 260 and the cutters 252, the photo-electric control system just described continuously adjusting the feed of the web if necessary. Thus, changes in the length of the web due to atmospheric conditions, or slight errors in the printing of the web, or the like, are automatically compensated for by this optical registering mechanism, so that uniformity of the wrapper sheet W is insured at all times.

As the wrapper sheets W are severed from web 230 by the cutters 252, the leading edges thereof are engaged and advanced by feed rolls 247 and 249, the speed of which is the same as the speed of the pull-off rolls 246—248, so that the web will not buckle or be torn, and the wrapper sheet W is fed to the gluing mechanism which applies glue, or applies moisture to the glue if previously supplied, to one edge thereof (Figs. 11, 22 and 23) in a manner readily understood. The glue roll 283 is withdrawn by solenoid 411 when the machine stops and is restored to operative position when the machine starts (Fig. 11), and a separate motor 408 is energized in response to the withdrawing of the glue roll to maintain rotation of the glue roll 283 when the machine stops, so that glue will not dry thereon.

The rolls 247—249 then feed the glued wrapper sheet W between belt 310 and roll 309, which change its direction of movement from horizontal to vertical and transfer it to driven belt 314

which rapidly projects it downwardly between guides 318 (Figs. 5, 11 and 26), which hold it extended by its vertical edges over the main spider 123 in readiness for association with the bottle to be wrapped (Figs. 1, 5 and 26). This is the action if there is a bottle ready for wrapping. If no bottle is present, the corresponding wrapper sheet W is withdrawn in a manner to be described.

The bottles B to be wrapped are advanced by conveyor 74 to the inlet turret 67 (Figs. 1 to 4, inclusive) where the leading bottle actuates the feeler 108 of inlet gate 87 to latch the latter to the slide 87 which is reciprocated at timed intervals by cam 95 to withdraw the gate from the path of the bottle. Thus, the presence of a bottle B is necessary to the opening of the gate 87, but the gate does not open to admit the bottle until the proper time determined by cam 95. As the bottle passes the gate, feeler 108 is released thereby and unlatches the gate 87 which is returned by its spring 104. The resilient return movement of the gate 87 accordingly prevents the breakage of bottles by the gate. A similar gate 113, timed with the other mechanism of the turret, releases the bottles one at a time at proper timed intervals, and is actuated by a cam 114.

The timing of gate 113 is such that as the bottle is released thereby, a gripper 118 is actuated by cam 122 to clamp the bottle against a radial finger 116 on rotating spider 115 so that the bottle is bodily carried around through an angle of about 90° to the position shown in Fig. 2, which locates it directly over and in axial alignment with a bottle support 142 carried by rotating main spider 123. In this position of the bottle B, cam 138 raises support 142 slightly and cam 122 retracts gripper 118, so that bottle B is supported on bottle support 142 and is carried around by spider 123.

As the spider rotates to carry the bottle B away from the inlet turret 67, stationary cam 146 raises rod 144 so that pinion 147 rotates in a counter-clockwise direction to depress rod 152 and lower mandrel or sleeve 161 over the neck of the bottle and engage cap plate 169 with the bottle cap B' (Figs. 5 to 8, inclusive). This cap plate 169 being laterally movable on spring 172, centers itself automatically to compensate for any cant in the bottle neck, while its spring 164 allows it to assume any longitudinal position to compensate for variations in the height of the bottles. The spring 159 urges mandrel or sleeve 161 resiliently onto the bottle neck and since the mandrel and support 142 are of the same diameter as the regular portion of the bottle B, that bottle portion and the mandrel and the support cooperate to form a composite cylinder of uniform diameter from end to end, having a length substantially equal to the vertical length of the wrapper sheet W.

If there is no bottle on bottle support 142, the downward movement of the corresponding cap plate 169 and mandrel 161 continues so that roller 162' at the top of rod 162 is depressed into the plane of stationary cam 367 (Figs. 7 and 25). Accordingly, as the spider 123 rotates, the roller 162' actuates the cam 367. This movement of cam 367 is imparted through links 375 and 378 (Figs. 24 and 25) to plows 383, which are depressed below the plane of movement of the wrapper sheet W so as to scoop out the wrapper sheet corresponding to the empty bottle support 142 and deposit it in tray 385 before it can be car-

ried to the spider 123 by the feed mechanism and thus clog or clutter up the mechanism.

Each bottle B, as it is carried around by main spider 123, is rotated by the engagement of pinion 178 with stationary gear segment 180 and as it is rotated it is scanned by its corresponding optical device 210 mounted on the main spider 123 (Figs. 1, 5, 6 and 10). The optical scanning device 210 is adjusted to respond the instant the edge of the bottle label B' rotates into its field of view to energize the circuit containing magnet 200, which actuates latch 201 to release lever 184 (Figs. 9 and 10) which in turn release pawls 190 and 191, so that their respective springs 192 and 193 urge them into contact with ratchet 184 to stop the rotation thereof and consequently of bottle support 142, bottle B and mandrel 161, since these members are connected thereto by shaft 140.

In order to compensate for the momentum of the rotation of these members, a spring take-up mechanism (Figs. 7 and 9) is provided which allows shaft 140, bottle B and its appurtenant parts to rotate slightly after ratchet 184 is stopped, but after the momentum forces are absorbed by spring 189, the latter restores the bottle B to the exact position in which it was originally spotted by the scanning mechanism 210. This abrupt braking of the rotation of bottle B, while its support 142 is still operatively connected by gear 178 to stationary rack 180, is permitted by disc clutch 175 which slips accordingly.

The orienting of the bottles B is performed individually in this way, no matter what their relative angular position may be as they are transferred haphazardly to the main spider 123. This orienting of the bottles is done to insure that the labels B' thereon are in exact registry with the labels 259 on the wrapper sheets W when the bottles and the corresponding wrapper sheets are brought into cooperative relation for wrapping. Accordingly, no matter how transparent the wrapper sheet W may be, the bottle label B' is either masked by the wrapper label 259 or is in registry therewith to avoid the unattractive appearance of displaced labels on the wrapper and bottle. Since the wrapper sheet label 259 lies in the vertical center of the sheet as it is held vertically between guides 318, the bottle B is oriented, so that its label B' is on the leading face of the bottle as it is carried toward the wrapper sheet W by the main spider 123, the bottle B being held by cam 138 in the proper vertical position such that its label B' is aligned vertically with the wrapper sheet label 259.

With the bottle properly oriented in the manner described, its composite cylinder is brought, by continued rotation of main spider 123, into contact with the wrapper sheet W suspended between guides 318 so as to withdraw it therefrom and carry it forwardly (Figs. 1, 5 and 26). At this moment, cam 424 (Figs. 5 and 29) actuates holding finger 420 to hold wrapper sheet W against the leading face of the composite bottle cylinder, as is shown in Fig. 26, this finger being carried by the main spider and moving with the corresponding bottle cylinder until the wrapper sheet is wrapped around it.

With the wrapper sheet W associated with the bottle cylinder in this way, it is moved between stationary bristle brushes 429, which smooth the sheet W around the composite bottle cylinder so that its side edges trail in substantially parallel relation, as is shown in Fig. 26. In this position, the side edges of the wrapper sheet W are overlapped by left and right moving resilient blades

458 and bristle brushes 476, the former laying the ungummed wrapper edge smoothly on the composite bottle cylinder and holding it there, and the latter laying the gummed edge over the ungummed edge and dwelling for a moment on the resulting seam to press it down.

During this wrapping and sealing operation, the mandrel 161 supports the wrapper and its seam over the neck of the bottle beyond the regular portion thereof, and the bottle support 142 supports the wrapper and its seam beyond the bottom end of the bottle, so that the wrapper sheet W is formed into a tube which tightly and smoothly hugs the composite bottle cylinder from end to end. While this arrangement has been particularly adapted for supporting the wrapper and seam over the converging neck of a bottle and beyond the ends of the regular portion thereof, it may be applied to other articles of irregular shape which are to be wrapped.

With the bottle partially wrapped in this fashion, the ends of the wrapper remain to be folded in, necessitating the withdrawal of the mandrel 161 and bottle support 142 therefrom and the support of the partially wrapped bottle while doing so. This support of the bottle is effected by gripping fingers 476 and 477 which are mounted in pairs on moving conveyor chain 478 and are actuated at the proper time by cams 494 to grasp the bottle around its irregular portion and hold it independently of the support afforded by the mandrel 161 and bottle support 142. While so held by fingers 476 and 477, cams 138 and 146 lower bottle support 142 and raise mandrel 161 respectively, so that they are withdrawn clear of the ends of the wrapper W (Figs. 30 and 32). As bottle support 142 is lowered, lever 194 engages and is reset by stationary detent 198 on spider 123 to release pawls 190 and 191 from ratchet 184 (Fig. 9).

The trailing lower edge of the wrapper of advancing bottle B is tucked under by oscillating plow 539 and overlapped by the leading wrapper edge folded over by stationary plow 542. The ears X so formed are pressed into shape by guides 543 and rollers 544 and are spread by flaring platform 527 while glue is applied at Y to hold down the ears X as they are laid in place by guides 546 and 547. The bottom so folded is pressed flat on platform 554 as the glue sets, and a pamphlet or the like 555, is dropped into the open upper end of the wrapper behind the pull cord thereof (Figs. 33 to 35d, inclusive).

The upper end of the wrapper is then engaged by the descending pleating fingers 587 and 594, which regularly pleat the wrapper from the shoulder of the bottle B to its cap B', directing the pleats in a counter-clockwise direction, while creasers 598 on the outer finger supports lay them flat and crease them as the fingers are withdrawn (Figs. 36 to 43, inclusive). As the pleating fingers are withdrawn, intermeshing plates 617 gather the upper ends of the pleats over the cap B' of the bottle and twist them into a pigtail, jaws 631 moving in to grip the wrapper during the final stage of the twisting operation to prevent the pleats from being twisted out of line (Figs. 39, 44, 45 and 47).

The bottom label L is applied by mechanism which gums the label and disables the gumming mechanism in the event of failure in the label supply. The finished bottom label of the wrapper is ironed in place by hot roll 695 and set by

being carried along in contact with platform 534 (Figs. 48 to 53, inclusive).

The finishing operations on the wrapped package include pressing down the neck pleats and severing of the pigtail T at the top of the package. The wrapping bottles are transferred from the conveyor 478 to the pressing mechanism by gripping fingers 732 before the bottle is released by fingers 476 and 477. A cam 739 raises a support 738 under each bottle, and cam 758 lowers the corresponding pressing head 765 until pressing shoes 769 lie alongside alternate pleats and about two-thirds of the way down them, when cam 774 rotates the shoes up on the pleats and moves them down and then up to press them. Then the remaining pleats are pressed down and the pleating head 765 is retracted (Figs. 54 to 58, inclusive). The bottle is then transferred to the bottle discharge conveyor by its fingers 779 and 780 and while being carried thereby the pigtail T is severed (Fig. 59).

It will be seen that the apparatus of this invention is a completely integrated machine performing a number of steps, each of which may be combined with other steps, but not necessarily all of them, to perform various functions, depending upon requirements. Also, while the machine has been described as particularly adapted for wrapping bottles, it may be applied with equal facility to wrapping other articles or assemblages of articles, and also, it is to be understood that various changes in form and detail lie within the scope of this invention.

We claim:

1. In apparatus for wrapping an article having a body portion and a reduced portion, the combination of means for wrapping a wrapper of flexible material around the body portion of the article with its proximate edges cooperating to form a seam, a support substantially coextensive with the body portion of the article for supporting the wrapper over the reduced portion of the article, and means for withdrawing the support from the wrapper.
2. In apparatus for wrapping an article having a body portion and a reduced portion, the combination of means for wrapping a wrapper of flexible material around the body portion of the article with its proximate edges cooperating to form a seam, a support substantially aligned with the surface of the body portion of the article for supporting the wrapper over the reduced portion of the article, and means for withdrawing the support from the wrapper.
3. In apparatus for wrapping an article having a body portion and a reduced portion, the combination of means for wrapping a wrapper of flexible material around the body portion of the article with its proximate edges cooperating to form a seam, a mandrel at least partially enclosing the reduced portion of the article and having a surface substantially coextensive with the body portion of the article under the wrapper seam for supporting the seam over the reduced portion of the article, and means for withdrawing the mandrel from the wrapper.
4. In apparatus for wrapping an article having a body portion and a reduced portion, the combination of means for wrapping a wrapper of flexible material around the body portion of the article with its proximate edges cooperating to form a seam, a mandrel telescoped over the reduced portion of the article and having a surface substantially coextensive with the body portion of the article for supporting the wrapper over

the reduced portion of the article, and means for withdrawing the mandrel from the wrapper.

5. In apparatus for wrapping an article having a body portion and a reduced portion, the combination of means for wrapping a wrapper of flexible material around the body portion of the article with its proximate edges cooperating to form a seam, supports for opposite ends of the article having surfaces substantially coextensive with the body portion of the article under the wrapper seam for supporting the seam during the sealing thereof, and means for withdrawing at least one of the supports from the wrapper.

6. In apparatus for wrapping an article having a body portion and a reduced portion, the combination of means for wrapping a wrapper of flexible material around the body portion of the article with its proximate edges cooperating to form a seam, a support for the article having a surface substantially coextensive with the body portion of the article for supporting that part of the wrapper which projects beyond the corresponding end of the article, a hollow support telescoped over the reduced portion of the article and having a surface substantially coextensive with the body portion of the article for supporting the wrapper over the reduced portion of the article, and means for withdrawing the supports from the wrapper.

7. In apparatus for wrapping an article having a body portion and reduced portion, the combination of means for wrapping a wrapper of flexible material around the body portion of the article with its proximate edges cooperating to form a seam, a hollow mandrel telescoped over the reduced portion of the article and having a surface substantially coextensive with the body portion of the article for supporting the wrapper over the reduced portion of the article, and means for withdrawing the mandrel from the wrapper, said mandrel having an opening outside of the wrapper communicating with its interior for breaking the suction created within the wrapper by the withdrawal of the mandrel.

8. In apparatus for wrapping an article having a body portion and a reduced portion, the combination of means for wrapping a wrapper of flexible material around the body portion of the article with its proximate edges cooperating to form a seam, a support cooperating only with the reduced portion of the article for supporting the seam of the wrapper thereover coextensively with the body portion of the article during the sealing thereof, and means for relatively moving the support and article into and out of the said cooperative position before and after the sealing operation.

9. In apparatus for wrapping an article, the combination of a support for the article, wiping means for wrapping a wrapper of flexible material around the article with at least one end projecting beyond the corresponding end of the article, and means engaging the exterior and interior surfaces of the projecting end of the wrapper for folding it into regular pleats.

10. In apparatus for wrapping an article, the combination of a support for the article, wiping means for wrapping a wrapper of flexible material around the article with at least one end projecting beyond the corresponding end of the article, and a plurality of members jointly engaging the inner and outer surfaces of the projecting end of the wrapper for folding it closed in reg-

ular pleats converging that end of the wrapper over the corresponding end of the article.

11. In apparatus for wrapping an article, the combination of means for wrapping a wrapper of flexible material around the article with at least one end projecting beyond the corresponding end of the article, a plurality of members engaging the projecting end of the wrapper for folding it closed in regular pleats, means for withdrawing the members from the pleated end of the wrapper, and devices carried by the members for creasing the pleats during the withdrawal of the members.

12. In apparatus for wrapping an article, the combination of a support for the article, wiping means for wrapping a wrapper of flexible material around the article with at least one end projecting beyond the corresponding end of the article, a plurality of folding members embracing the edge of the projecting end of the wrapper for folding it into regular pleats, means for withdrawing the members, and means cooperating with each member for laying the corresponding pleat in the same direction around the article.

13. In apparatus for wrapping an article, the combination of means for wrapping a wrapper of flexible material around the article with at least one end projecting beyond the corresponding end of the article, a plurality of members engaging the projecting end of the wrapper for folding it into regular pleats, means for withdrawing the members, and means cooperating with the said members for creasing the pleats and laying them in the same direction around the article.

14. In apparatus for wrapping an article, the combination of a support for the article, wiping means for wrapping a wrapper of flexible material around the article with at least one end projecting beyond the corresponding end of the article, a plurality of members embracing the edge of the projecting end of the wrapper for folding it into regular pleats, means for withdrawing the members, and independent means cooperating with the members for gathering the pleats around the end of the article.

15. In apparatus for wrapping an article, the combination of means for wrapping a wrapper of flexible material around the article with at least one end projecting beyond the corresponding end of the article, means engaging the projecting end of the wrapper for folding it into regular pleats, means for gathering the pleats around the end of the article, and means for twisting the gathered end of the wrapper over the corresponding end of the article.

16. In apparatus for wrapping an article having a body portion and a reduced portion, the combination of means for wrapping a wrapper of flexible material around the body portion of the article with an extension thereof enclosing the reduced portion, and means embracing the edge of said extension for regularly pleating the wrapper extension over the reduced portion of the article to substantially conform the wrapper to the shape of the reduced portion of the article.

17. In apparatus for wrapping an article having a body portion and a reduced portion, the combination of means for wrapping a wrapper of flexible material around the body portion of the article with an extension thereof enclosing the reduced portion, means for regularly pleating the wrapper extension over the reduced portion of the article, and separate means for gathering the wrapper pleats around the reduced portion

of the article to substantially conform to the contour thereof.

18. In a bottle wrapping machine, the combination of means for wrapping a wrapper of flexible material around the regular portion of the bottle with an extension thereof enclosing the neck of the bottle, a mandrel telescoped over the neck of the bottle and having a surface substantially coextensive with the regular portion of the bottle for supporting the wrapper extension during the wrapping operation, and means for withdrawing the mandrel from the wrapper.

19. In a bottle wrapping machine, the combination of means for wrapping a wrapper of flexible material around the regular portion of the bottle with an extension thereof enclosing the neck of the bottle, a mandrel telescoped over the neck of the bottle and having a surface substantially coextensive with the regular portion of the bottle for supporting the wrapper extension during the wrapping operation, means for withdrawing the mandrel from the wrapper, and means for folding the wrapper extension around the neck of the bottle.

20. In a bottle wrapping machine, the combination of means for wrapping a wrapper of flexible material around the body portion of the bottle with an extension thereof enclosing the neck of the bottle, a mandrel telescoped over the neck of the bottle and having a surface substantially coextensive with the body portion of the bottle for supporting the wrapper extension during the wrapping operation, means for removing the mandrel, and means for folding the wrapper extension into diverging pleats extending from the shoulder toward the mouth of the bottle.

21. In a bottle wrapping machine, the combination of means for wrapping a wrapper of flexible material around the body portion of the bottle with an extension thereof enclosing the neck of the bottle, a mandrel telescoped over the neck of the bottle and having a surface substantially coextensive with the body portion of the bottle for supporting the wrapper extension during the wrapping operation, means for removing the mandrel, and members jointly engaging the outer and inner surfaces of the wrapper extension for pleating it between them.

22. In a bottle wrapping machine, the combination of means for wrapping a wrapper of flexible material around the body portion of the bottle with an extension thereof enclosing the neck of the bottle, a mandrel telescoped over the neck of the bottle and having a surface substantially coextensive with the body portion of the bottle for supporting the wrapper extension during the wrapping operation, means for removing the mandrel, pleating members extending over the edge of the wrapper extension, means actuating said members to pleat the wrapper extension along the neck of the bottle, and means for withdrawing the pleating members from the wrapper.

23. In apparatus for wrapping an article having a reduced end portion, the combination of means for wrapping a wrapper of flexible material around the body of the article with one end thereof extending over but out of contact with the reduced end portion of the article, a plurality of simultaneously acting means for regularly folding the said end of the wrapper to substantially conform to the shape of the reduced end portion of the article, and separate means for pressing down the folds in the said regular folded relationship.

24. In apparatus for wrapping an article, the

combination of means for wrapping a wrapper of flexible material around the article with one end thereof lying out of contact with the corresponding portion of the article, a plurality of simultaneously acting means for regularly pleating the said end of the wrapper in a direction substantially axially of the wrapper, and separate means engaging the pleats for pressing them in said regularly pleated relationship.

25. In apparatus for wrapping an article, the combination of means for wrapping a wrapper of flexible material around the article with one end thereof lying out of contact with the corresponding portion of the article, a plurality of simultaneously acting means for regularly pleating the said end of the wrapper in a direction substantially axially of the wrapper, and separate means reciprocating longitudinally of the pleats for pressing them.

26. In apparatus for wrapping an article, the combination of means for wrapping a wrapper of flexible material around the article with one end thereof lying out of contact with the corresponding portion of the article, a plurality of simultaneously acting means for regularly pleating the said end of the wrapper in a direction substantially axially of the wrapper, and independent means engaging the pleats adjacent their inner ends and moving along them to press them down in the said regular pleated relationship.

27. In apparatus for wrapping an article, the combination of means for wrapping a wrapper of flexible material around the article with one end thereof lying out of contact with the corresponding portion of the article, means for regularly pleating the said end of the wrapper in a substantially axial direction, pressing members engaging the wrapper between the pleats, and means moving said members laterally upon the pleats to urge them in the same lateral direction.

28. In apparatus for wrapping an article, the combination of means for wrapping a wrapper of flexible material around the article with one end thereof lying out of contact with the corresponding portion of the article, means for regularly pleating the said end of the wrapper in a substantially axial direction pressing members engaging the wrapper between the pleats means moving said members laterally upon the pleats, and means for moving the members substantially axially of the wrapper along the pleats to press them down.

29. In apparatus for wrapping an article, the combination of means for wrapping a wrapper of flexible material around the article with one end thereof lying out of contact with the corresponding portion of the article, means for regularly pleating the said end of the wrapper in a substantially axial direction, members engaging the pleats intermediate their ends, and means for reciprocating the members along the pleats to press them down in the said regular pleated relationship.

30. In apparatus for wrapping an article, the combination of means for wrapping a wrapper of flexible material around the article with one end thereof lying out of contact with the corresponding portion of the article, means for regularly pleating the said end of the wrapper in a substantially axial direction, pressing members engaging the wrapper between the pleats, means moving said members laterally upon the pleats, and means for reciprocating the members along the pleats to press them down.

31. In apparatus for wrapping an article, the

combination of means for wrapping a wrapper of flexible material around the article with one end thereof lying out of contact with the corresponding portion of the article, means for regularly pleating the said end of the wrapper in a substantially axial direction, pressing members engaging alternate pleats, means moving said members along the said alternate pleats to press them down, means moving said members laterally to engage the remaining pleats, and means moving the said members along the said remaining pleats to press them down.

32. In apparatus for wrapping an article, the combination of means for wrapping a wrapper of flexible material around the article with one end thereof lying out of contact with the corresponding portion of the article, means for regularly pleating the said end of the wrapper in a substantially axial direction, pressing members engaging successively alternate pleats, and means for moving the members lengthwise of the pleats to press them down.

33. In apparatus for wrapping a bottle, the combination of means for wrapping a wrapper of flexible material around the bottle with an extension thereof surrounding the neck of the bottle, a plurality of simultaneously acting means for longitudinally pleating the wrapper extension to converge its upper end from the shoulder to the mouth of the bottle, and means for smoothing down the pleats in the said regular pleated relationship.

34. In apparatus for wrapping a bottle, the combination of means for wrapping a wrapper of flexible material around the bottle with an extension thereof surrounding the neck of the bottle, means for longitudinally pleating the wrapper extension to converge its upper end from the shoulder to the mouth of the bottle, means for directing all of the pleats in one direction, and separate means for pressing them down in that position.

35. In apparatus for wrapping a bottle, the combination of means for wrapping a wrapper of flexible material around the bottle with an extension thereof surrounding the neck of the bottle, means for longitudinally pleating the wrapper extension to converge its upper end from the shoulder to the mouth of the bottle, separate pressing members engaging the pleats, and means for moving the members along the pleats to press them down in the said regular pleated relationship.

36. In a machine for wrapping an article, the combination of a support for the article, a support for the wrapper, means for relatively moving the support to engage the wrapper and article, means for wrapping the side edges of the wrapper around the article and sealing the resulting longitudinal seam, and movable means supporting at least a portion of the seam of the wrapper during the sealing operation.

37. In a machine for wrapping an article, the combination of a support for the article, a support for the wrapper, means for relatively moving the support to engage the wrapper and article, and successively operating members for wrapping the wrapper around the article, said members including a blade comprising a plurality of resilient sections.

38. In a machine for wrapping an article, the combination of a support for a wrapper, a support for the article movable toward the wrapper support to engage the article with the wrapper, means actuated by the movement of the article

support for rotating the article, a normally dis-
engaged brake therefor, trigger mechanism for
releasing the brake and stopping rotation of the
article, said article having a visible index, and
means responsive to a predetermined position of
the index for actuating the trigger mechanism
to stop the article in that position.

39. In a machine for wrapping an article, the
combination of a support for a wrapper, a sup-
port for the article movable toward the wrapper
support to engage the article with the wrapper,
means actuated by the movement of the article
support for rotating the article, a normally dis-
engaged brake therefor, electro-magnetic means
controlling the brake, said article having a visible
index, and photo-electric means responsive to a
predetermined position of the index for actuating

the electro-magnetic means to stop the article
in that position.

40. In apparatus for wrapping articles, the
combination of means for advancing successive
wrappers, a movable support, a series of articles
mounted on said support for associating with suc-
cessive wrappers, means responsive to the ab-
sence of an article on said support, a plow mov-
able into the path of movement of said wrappers,
and operative connections between the last-
named means and the plow for abstracting the
wrapper corresponding to the absent article with-
out interrupting the operation of the said article
advancing means.

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CERTIFICATE OF CORRECTION.

Patent No. 2,109,505.

March 1, 1938.

HAROLD E. RUE, ET AL.

It is hereby certified that error appears in the printed specification
of the above numbered patent requiring correction as follows: Page 15, first
column, line 1, strike out the syllable and words "pletely folded and glued
bottom surface of the" and insert instead bottle B then engages and slides
along platform; page 20, second column, line 29-30, for "actuate" read actuat-
ed; page 22, first column, line 6, for "wrapping" read wrapped; and that
the said Letters Patent should be read with these corrections therein that
the same may conform to the record of the case in the Patent Office.

Signed and sealed this 31st day of May, A. D. 1938.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.

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