May 30, 1950

S. E. BANKS

2,509,902

LABELING MACHINE FOR CYLINDRICAL BOTTLES AND LIKE ARTICLES

Filed June 2, 1948

6 Sheets-Sheet 1

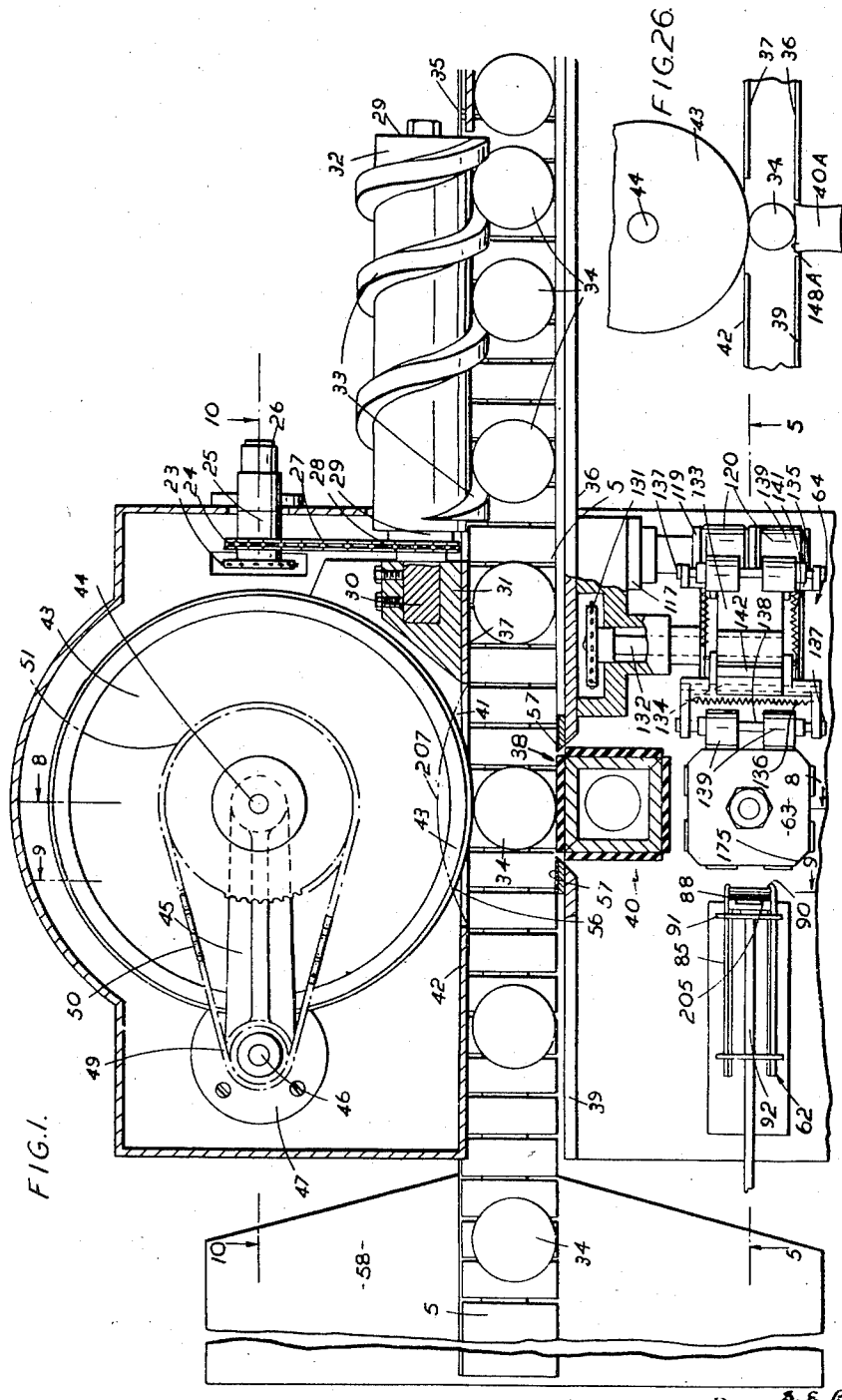


FIG. 1.

FIG. 26.

Inventor

S. E. Banks

By

Watson, Cole, Grindle + Watson

Attorney

May 30, 1950

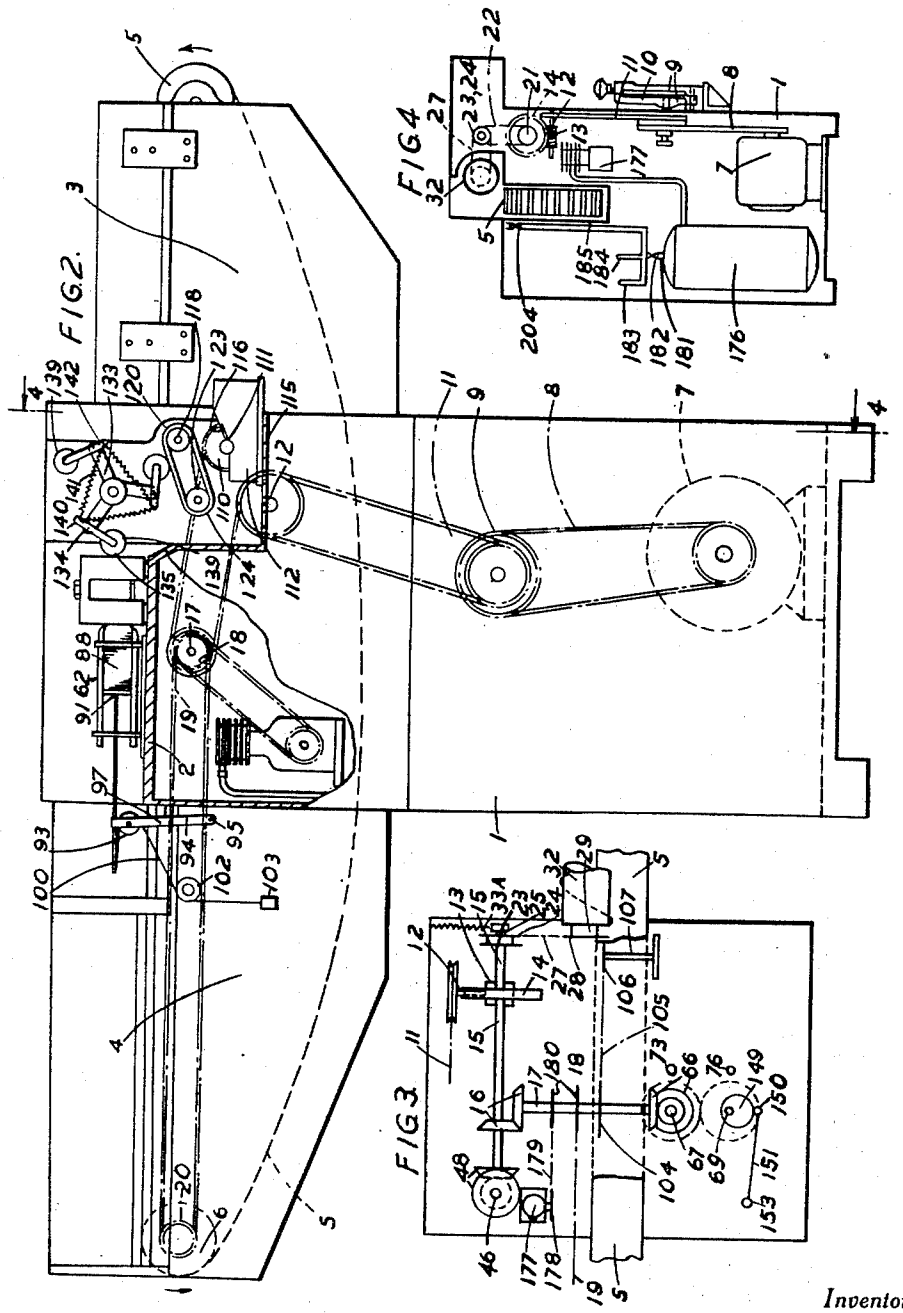
S. E. BANKS

2,509,902

LABELING MACHINE FOR CYLINDRICAL BOTTLES AND LIKE ARTICLES

Filed June 2, 1948

6 Sheets-Sheet 2



Inventor

S. E. Banks

By

Watson, Cole, Grindle + Watson

Attorney

May 30, 1950 S. E. BANKS 2,509,902

LABELING MACHINE FOR CYLINDRICAL BOTTLES AND LIKE ARTICLES

Filed June 2, 1948 6 Sheets-Sheet 3

FIG. 5.

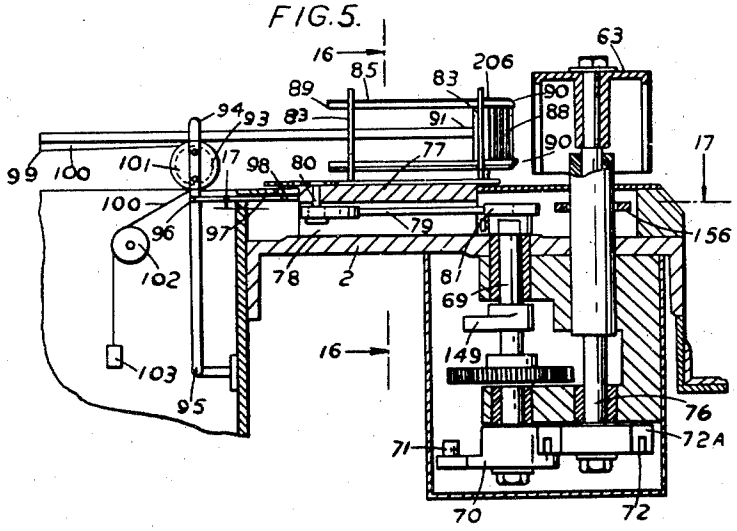


FIG. 6.

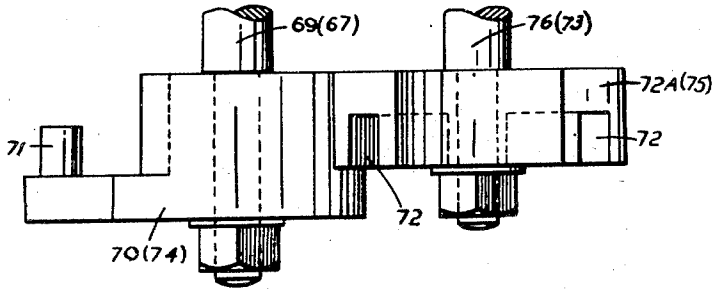
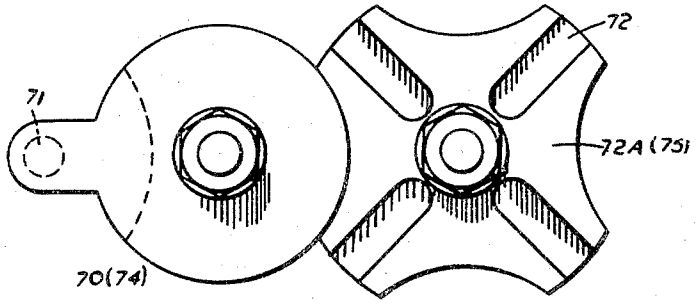


FIG. 7.



Inventor
S. E. Banks
By
Watson, Cole, Grindle & Watson
Attorney

May 30, 1950 S. E. BANKS 2,509.902

LABELING MACHINE FOR CYLINDRICAL BOTTLES AND LIKE ARTICLES

Filed June 2, 1948 6 Sheets-Sheet 4

FIG.8.

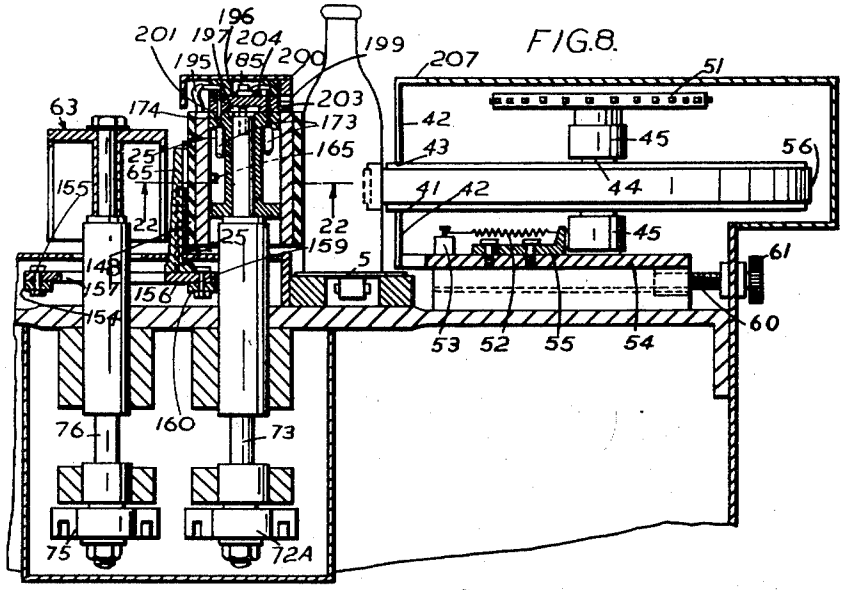


FIG.9.

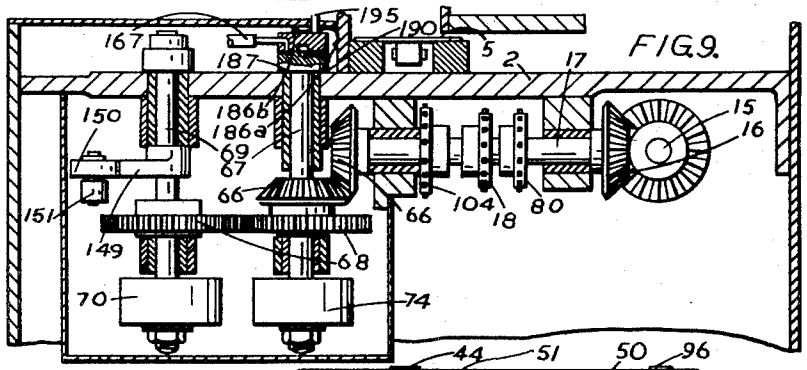
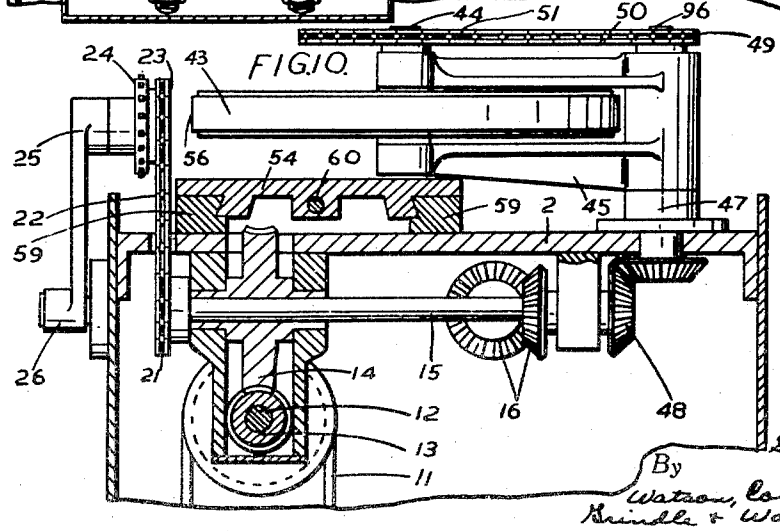


FIG.10.



Inventor
S. E. Banks
By
Watson, Cole, Grindle & Watson
Attorney

May 30, 1950 S. E. BANKS 2,509,902

LABELING MACHINE FOR CYLINDRICAL BOTTLES AND LIKE ARTICLES

Filed June 2, 1948 6 Sheets-Sheet 5

FIG. 11.

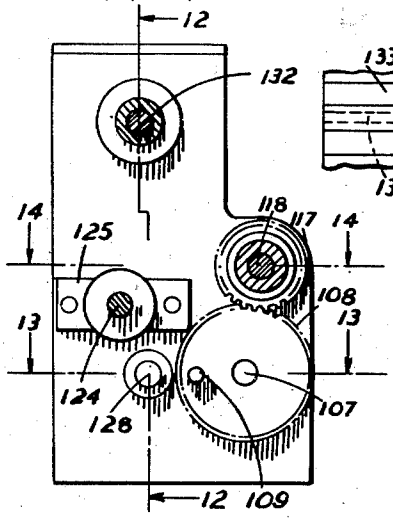


FIG. 12.

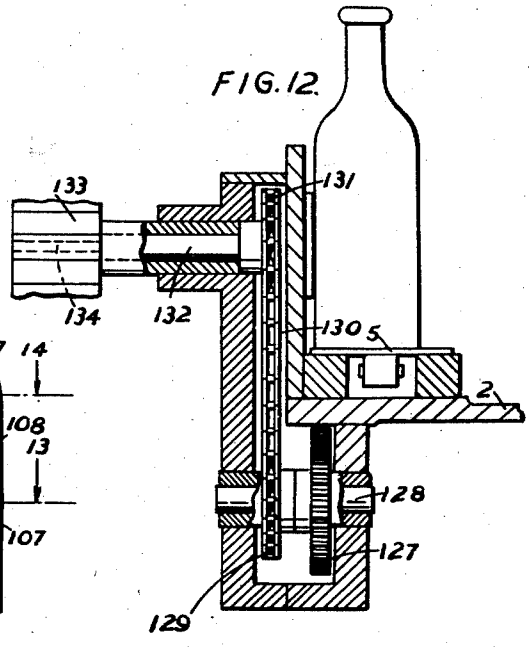


FIG. 13.

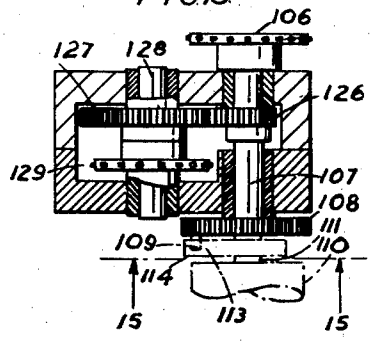


FIG. 14.

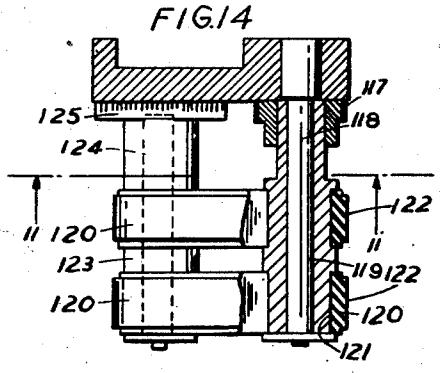


FIG. 15.

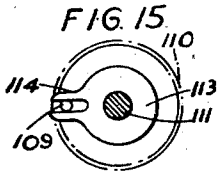
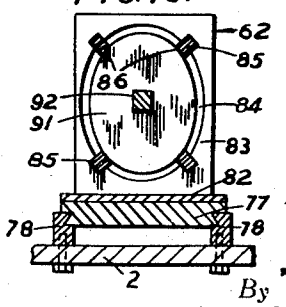


FIG. 16.



Inventor
S. E. Banks
By
Watson, Cole, Grindle & Watson
Attorney

May 30, 1950 S. E. BANKS 2,509,902

LABELING MACHINE FOR CYLINDRICAL BOTTLES AND LIKE ARTICLES

Filed June 2, 1948 6 Sheets-Sheet 6

FIG. 17.

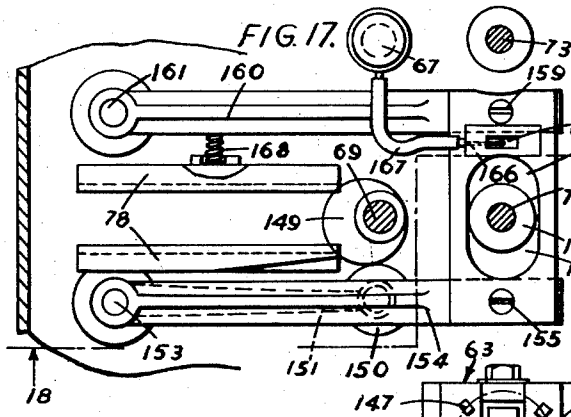


FIG. 19.

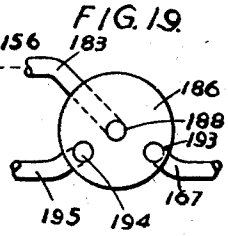


FIG. 18.

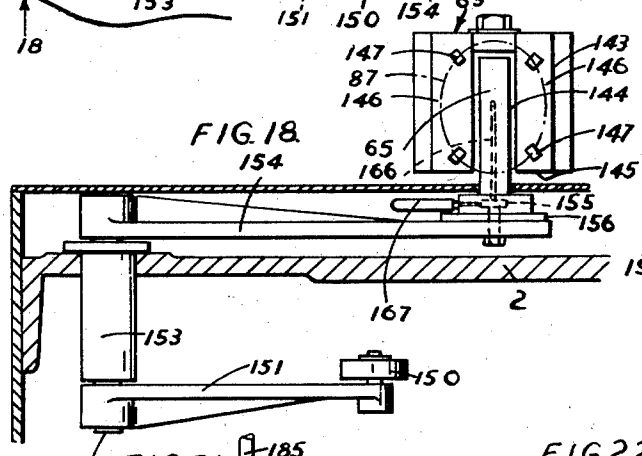


FIG. 20.

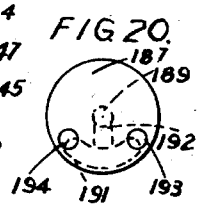


FIG. 21.

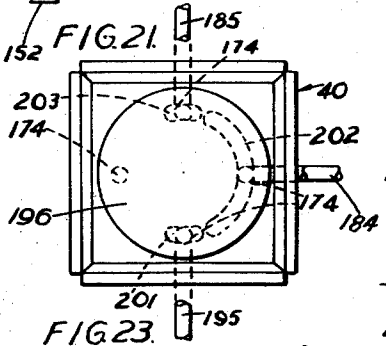


FIG. 22.

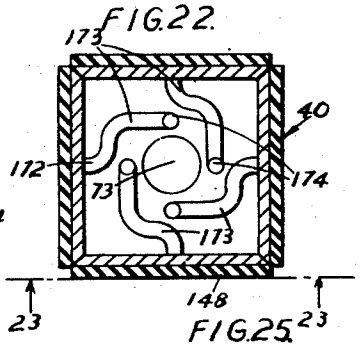


FIG. 23.

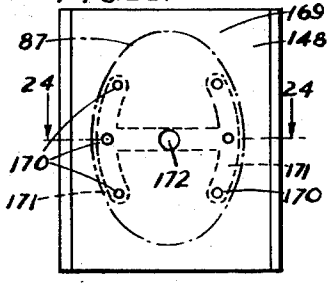


FIG. 24.

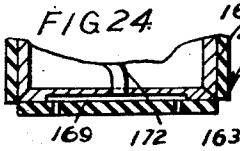
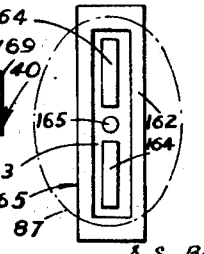


FIG. 25.



Inventor
S. E. Banks
By
Watson, Cole, Grindle & Watson
Attorney

Patented May 30, 1950

2,509,902

UNITED STATES PATENT OFFICE

2,509,902

LABELING MACHINE FOR CYLINDRICAL BOTTLES AND LIKE ARTICLES

Sydney E. Banks, Sheffield, England

Application June 2, 1948, Serial No. 30,664
In Great Britain June 20, 1947

26 Claims. (Cl. 216—54)

1

This invention relates to labelling machines for cylindrical bottles and the like articles (hereinafter generally referred to as bottles), its object being to provide a machine capable of applying labels accurately to bottles fed at a high rate through the machine.

According to the present invention, a labelling machine for cylindrical bottles and like articles comprises means to apply gum to one face of a label, a delivery plate with suction openings, means to transfer the label, gummed-side out, to the delivery plate, for the label to be held by suction applied to its non-gummed face, and means to roll an article over the delivery plate to apply the label to the article.

A pick-up plate may be used to receive a label from a label-stack, the side of the pick-up plate first receiving the gum that is to be applied to the label, and a labelling machine so provided comprises an apertured pick-up plate, means for intermittently rotating the plate into different positions, means disposed opposite one such position of the plate for applying gum to the plate on each side of the aperture, a label stack disposed opposite another position of the plate, a delivery plate disposed opposite yet another position of the plate, means to move the label stack towards the gummed pick-up plate to apply a label to the plate, a transfer pusher movable through the aperture in the pick-up plate towards the delivery plate when the pick-up plate, with attached label, is opposite the delivery plate, means to move the pusher through the aperture, suction openings in the delivery plate to provide for holding to the delivery plate a label transferred from the pick-up plate, a conveyor for cylindrical articles, means for intermittently rotating the delivery plate between the position opposite the pick-up plate and a position alongside the conveyor, and means to roll an article on the conveyor over the delivery plate to apply the label to the article.

The delivery plate may be hollowed to a curve struck about the centre of a drum or wheel serving to roll the bottle over the plate, especially if the bottle tends to slip on the surface of the plate, as when the bottle is damp with condensation. For many purposes, however, the plate may be flat. The rim of the wheel is surfaced to have a driving grip on the bottle, e.g. with rubber, rubberised or similar resilient material, as also are the surfaces of the transfer pusher and the delivery plate. The peripheral speed of the drum is substantially twice the rate of feed of the bottles.

It is preferable to apply suction to the transfer

2

pusher, to ensure accurate positioning of the label on the delivery plate, as well as to assist in removing the label from the gummed faces of the pick-up plate. Means may be provided to reduce the suction when the delivery plate lies alongside the conveyor; this facilitates removal of the label by the bottle rolled over the face, and also lessens the amount of air drawn into the system after the label has been removed from the face.

A resilient mounting of the wheel for rolling the bottle over the delivery plate enables the wheel to recede and return as the bottle passes into and out of the nip formed by the rim of the wheel and the plate.

The bottle is in rotation before it reaches the delivery plate, and for this purpose a wall alongside the conveyor leads smoothly to the plate and is resiliently surfaced to avoid slipping of the bottle.

The invention will now be described in greater detail with reference to the accompanying drawings, in which

Figure 1 is a plan of the machine;

Figure 2 is a front elevation;

Figure 3 is a diagrammatic plan of the main driving mechanism;

Figure 4 is a diagrammatic section on the line 4-4 of Figure 2;

Figure 5 is a section on the line 5—5 of Figure 1;

Figure 6 is a front elevation, and Figure 7 an underneath plan of a Geneva-stop mechanism;

Figure 8 is a section on the line 8—8 of Figure 1;

Figure 9 is a section on the line 9—9 of Figure 1;

Figure 10 in a section on the line 10-10 of Figure 1;

Figure 11 is a sectional detail of Figure 2, taken on the line 11—11, of Figure 14;

Figure 12 is a section on the line 12—12 of Figure 11;

Figure 13 is a section on the line 13—13 of Figure 11;

Figure 14 is a section on the line 14—14 of Figure 11;

Figure 15 is a section on the line 15—15 of Figure 13;

Figure 16 is a section on the line 16—16 of Figure 5;

Figure 17 is a sectional plan on the line 17—17 of Figure 5;

Figure 18 is a section on the line 18—18 of Figure 17;

Figures 19 and 20 are diagrammatic plans of one valve gear;

Figure 21 is a diagrammatic plan of another valve gear;

Figure 22 is a diagrammatic section on the line 22—22 of Figure 8;

Figure 23 is an elevation taken in the direction 23—23 of Figure 22;

Figure 24 is a section on the line 24—24 of Figure 23;

Figure 25 is an elevation in the direction 25—25 of Figure 8, to a larger scale; and

Figure 26 is a diagrammatic plan of a modification of Figure 1.

Referring to Figures 1 and 2, the machine comprises a central base 1 supporting a base plate 2 above and below which are housed the principal units of mechanism. Front and rear extensions 3 and 4 from the base 1 are generally flush with the plate 2 and provide for the feed and delivery of the bottles. A chain conveyor 5 is carried by the sprockets 6, passing across the parts 2, 3 and 4 in a level path and returning below the plates.

The drive is provided by a motor 7 in the base 1 through a V-belt 8, variable V-pulleys 9 controlled by a lever 10 to adjust the speed of the machine as a whole, and V-belt 11 to a cross shaft 12 and thence through a worm 13 and worm wheel 14 to a longitudinal shaft 15 (Figure 3). Bevel gears 16 transmit the drive to a second cross shaft 17. The conveyor 5 is driven by a sprocket 18 and chain 19 from the shaft 17 to a sprocket 20 connected to the sprocket 6 at the delivery end. At the feed end of the shaft 15 a sprocket 21 (Figure 10) is connected by a chain 22 to a sprocket 23 secured to a sprocket 24, both sprockets being rotatable at the upper end of an arm 25 pivoted at 26.

The sprocket 24 is connected by chain 27 to a sprocket 28 on a sleeve 29 rotatable on a stub axle 30 secured in a block 31. The sleeve 29 has secured to it a worm feed device 32 having the pitch of its thread 33 increasing from the feed end towards the delivery end of the machine. The chain 27 is held taut by a spring 33A connected to the arm 25.

Bottles 34 are led to the conveyor 5, e. g. in succession from automatic filling and stoppering machines, and pass between a wall 35 (Figure 1) ending at the worm feed 32 and a wall 36 parallel to and extending beyond the worm feed. The speed of the conveyor 5 determines the speed with which the bottles 34 pass through the operative part of the machine in the area occupied by the plate 2, and the worm feed 32 determines the spacing of one bottle from the next and also the timing of the bottles through the operative part of the machine, by holding back the bottles where the pitch of the thread 33 is shortest and gradually allowing them to acquire the speed of the conveyor 5 as the pitch increases. The result is that bottles 34 follow each other at a predetermined spacing and at a definite speed from the delivery end of the worm feed 32, from which point they are guided by the extension of the side wall 36 and an opposing wall 37. At the end of the wall 36 is a gap 38 on the far side of which is a short plate 39, and the gap is intermittently closed by one side of a rotatable delivery box 40. A corresponding but larger gap 41 faces the gap 38 between one end of the wall 37 and the end of a similar wall 42.

Referring particularly to Figures 1 and 8, it will be seen that the gap 41 is substantially opposite the mid-height of the delivery box 40 and is deep enough to allow the rim of a feed wheel 43 to protrude towards the delivery box. The wheel 43 is carried by a shaft 44 in horizontal swinging arms 45 pivoted about the axis of a vertical shaft 43 carried in a bearing 47 on the plate 2 (Figure 10). The shaft 15 drives the shaft 46 through bevel gears 48 and the upper end of the shaft 46 carries a sprocket 49 driving through a chain 50 a sprocket 51 on the shaft 44 to drive the periphery of the wheel 43 at twice the linear speed of the bottles as they pass the delivery box 40. The arms 45 lie substantially parallel to the conveyor 5 and a spring 52 (Figure 8) connected to the lower arm 45 and anchored at 53 to a slide 54 urges the arms 45 and the wheel 43 towards the delivery box, the movement being limited by a stop 55.

The rim of the wheel is recessed to receive a facing 56 of rubber, slightly protruding so as to provide the only contact with the bottles 34. The ends of the plates 36 and 39 adjacent the gap 38 are faced with rubber 57, and the sides of the delivery box 40 are also resiliently faced, as will be described fully below.

The wheel 43 protrudes through the gap 41 until the stop 55 limits the approach to the delivery box 40 to an amount somewhat less than the diameter of the bottles. The arrival of a bottle at the feed end of the gap 38 thus brings the bottle into contact with the rubber rim 56 and the rotation of the wheel 43 (clockwise in Figure 1) causes the bottle to rotate anticlockwise across the gap, making contact at a line on the side of the box 40 for the time being closing the gap. The wheel 43 swings slightly about the axis of the shaft 46 against the pressure of the spring 52, the spring keeping the bottle in firm contact with the wheel 43 and the box 40, but gently enough to lessen the risk of bottle breakage. Each bottle is thus caused to roll over a side of the box 40, until, under the continued movement of the conveyor 5, it passes out of contact with the wheel 43 and proceeds to the delivery end of the machine, where a wide table 58 extends to each side of the conveyor to allow the accumulation of a large number of labelled bottles ready to be placed in crates.

The slide 54 is carried by guides 59 (Figure 10) on the plate 2 and may be adjusted towards and away from the delivery box 40 by a screw 60 ending in a knob 61. The slide carries with it the stop 55, thus determining the approach of the wheel 43 towards the box 40; also the walls 37 and 42, determining the width of the channel through which bottles are carried by the conveyor 5 pass the box 40; and also the block 31 carrying the worm feed 32. The machine may thus be adjusted to take different diameters of bottles by rotation of the knob 61.

Labels are presented to the bottles by the delivery box 40 and are supplied from a label feed device 62 to the sides of a pick-up box 63, which sides are provided with gum by a gumming device 64. Labels are transferred from the pick-up box 63 to the delivery box 40 by a pusher 65.

Drive to delivery box, label feed, pick-up box, and pusher

The shaft 17 drives through bevel gears 66 66, a vertical shaft 67 which is connected by spur gears 68 with another vertical shaft 69 (Figure 9). The foot of the shaft 67 carries the driving member 74 of a Geneva-stop mechanism, the pin 71

entering the radial grooves 72 in the other member 72A of the Geneva-stop mechanism carried on the foot of a shaft 73 at the top of which is mounted the delivery box 40. The foot of the shaft 69 also carries the driving member 70 of a Geneva-stop mechanism, the corresponding driven member 75 being at the foot of a vertical shaft 76 at the top of which is mounted the pick-up box 63. The Geneva-stop mechanisms bring the delivery box 40 and the pick-up box 63 to rest in the positions shown in Figure 1, the precise timing being explained below. The Geneva-stopss and associated mechanisms may run in oil to preserve their accuracy over long periods. When at rest, opposite sides of the pick-up box register with the label feed 62 and the gumming device 64.

Label feed

The label feed comprises a slide 77 carried by guides 78 (Figure 10) from the plate 2, a connecting rod 79 pivoted at 80 to the slide being driven by a crank pin 81 at the top of the shaft 69 (Figure 5). A plate 82 resting on the upper face of the slide 77 carries two upright plates 83 each with a central aperture 84 generally conforming to the shape of the label to be applied, the plates 83 being connected by four bars 85 protruding into the apertures 84 sufficiently for their inner edges 86 to touch the outline of a label 87, shown in the present instance as oval in shape. A stack 88 of such labels is charged between the ends 89 of the rods 85 and pushed towards the claw ends 90 of the rods lying in proximity to the pick-up box 63. The claw ends are bent slightly inwards so as to resist movement of the stack 88 along the bars 85. Behind the stack is placed a pusher 91, shaped to correspond with the labels 87, carried by a square pusher rod 92 resting on the periphery of a non-rotatable pulley 93 carried on the end of an upstanding lever 94 pivoted at 95. At an intermediate point, the lever 94 is pivoted at 96 to a link 97 pivoted at 98 to the slide 77. The rod 92 extends beyond the pulley 93 and at its free end 99 is connected to a cord 100 passing round the pulley 93 in a groove 101, and, after making at least one full circuit of the pulley, passing over a guide 102 to end in a weight 103.

The reciprocation of the slide 77 by the crank pin 81 moves the bars 85 and the label stack 88 carried by them a fixed distance at each stroke towards the pick-up box 63. The pivot point 96 of the lever 94 is moved by the same amount but the upper end of the lever carrying the fixed pulley 93 is moved by a greater distance, in proportion to the ratio provided by the lever. The cord 100 is held firmly in the groove 101 of the pulley 93 by the weight 103 and the movement of the slide 77 towards the pick-up box 63 causes the cord 100 to urge the rod 92 connected to the pusher 91 towards the stack 88 at a greater rate than that at which the stack is being moved towards the pick-up box 63. Similarly, when the slide 77 moves away from the pick-up box, the pulley 93 moves at a correspondingly greater rate than the rod 92, thus slackening the cord, which slips round the pulley and relieves the pressure of the pusher 91 on the label stack. The purpose of this arrangement will appear below.

Gumming device

On the shaft 17 a sprocket 104 drives through a chain 105 a sprocket 106 (Figure 13) on a shaft 107 carrying a spur gear 108, a pin 109 protruding from the face of the gear. A gum roller 110 is carried on a shaft 111 across a gum trough 112.

The shaft 111 is in line with the shaft 107 and a plate 113 on the shaft 111 has a fork 114 to embrace the pin 109, thus providing for the driving of the gum roller 110, and, with the fork 114 brought to the horizontal position shown in Figure 15, enables the gum trough 112 to be slid out to the right from its support 115 for cleaning purposes. A scraper blade 116 removes surplus gum from the surface of the roller 110.

The spur gear 108 meshes with a spur pinion 117 (Figure 14) rotatable on a stub shaft 118 and secured to a driving sleeve 119 for two rubber belts 120 fitting in grooves 121 in the sleeve and presenting projecting faces 122 to receive gum from contact of the roller 110 with the lower runs of the belts. A second sleeve 123 rotatable on a stub axle 124 supports the other ends of the two belts, the axle 124 being carried in a bearing 125 spaced from the shaft 118 sufficiently to keep the belts 120 taut.

Between the sprocket 106 and the spur gear 108 the shaft 107 carries a pinion 126 meshing with a spur gear 127 on a shaft 128 carrying a sprocket 129, driving through a chain 130 (Figure 12) a sprocket 131 on a driving shaft 132 over-hanging the belts 120. A 3-armed spider 133 is carried on the shaft 132 and each arm of the spider has a transverse pivot 134 on each end of which is pivotally mounted a Z-lever 135, the levers 135 being urged together by a spring 136. Between adjustable pivot points 137 in each pair of arms 135 is mounted a spindle 138 parallel to the shaft 132, a pair of rubber rollers 139 spaced in accordance with the spacing of the belts 120 being secured on each spindle 138. The arms 135 project beyond the pivots 134 to provide attachments at 140 for two sets of three springs 141 arranged in the form of a triangle. The tendency of the springs 141 is to urge the rollers 139 outwards from the shaft 132, the movement being limited by stops 142.

Referring to Figure 2, the rotation of the gum roller 110 is counter-clockwise and of the sleeves 119, 123 clockwise. The belts 120 thus pick-up the controlled amount of gum supplied by the roller 110. The rotation of the spider 133 is clockwise to carry each pair of rollers 139 in turn along the upper (inclined) run of the belts 120, but in the opposite direction to the motion of the belts. The yielding of the springs 141 allows each pair of rollers 139 to follow a length of the upper run of the belts to drive the rollers at an increased speed and cause them to pick up gum from the belts. The contact of the rollers 139 with the yielding parts of the belts 120 between the supporting sleeves 119, 123 provides for accurate transfer of gum from the belts to the rollers.

Pick-up box

Each of the four sides 143 of the pick-up box 63 has a central slot 144 extending through the bottom edge 145 of the sides. On each side of the slot the side 143 has attached to it vertical strips 146 of rubber wide enough to extend beyond the two edges of a label 87 (Figure 18). The two strips 146 are spaced correspondingly to the two rollers 139 of each of the three pairs of rollers carried by the spider 133, and when the box 63 is at rest a pair of rollers that has just received gum from the belts 120 is carried up the strips 146 of the side of the box 63 next to the gumming device, the spider 133 being rotated at ⅓ of the speed of the Geneva-stop drive member 70 rotating the box 63. The springs 141 allow the rollers 139 to follow the side of the box 63 as they are

carried round by the spider 133. The independent mounting of each arm 135 of a pair enables each roller 139 of a pair to make correct contact with the corresponding strip 146.

In each side of the box holes 147 just large enough to permit entry of the claw ends 90 of the bars 85 of the label feed 62 pass through the rubber 146 and the metal backing of the box. After the rollers 139 have applied gum to the rubber strips 146 of the pick-up box 63, operation of the Geneva-stop mechanism connecting the shafts 69 and 76 rotates the box 63 by successive ¼-revolutions to bring the gummed side through an idle position and then into a position opposite the label feed. The box remains at rest after each ¼-revolution.

Operation of label feed device

When at rest opposite the label feed device 62, the gummed side of the box has the label stack carried towards it by operation of the crank pin 81, the claw ends of the rods 85 entering the holes 147, and the pusher 91 acting on the rear of the stack presses the label 87 at the forward end of the stack 88 into close contact with the gummed strips 146.

As indicated above, the extra leverage of the arms 94 of the rod 92 presses the labels 87 in the stack 88 and ensures intimate contact of the foremost label with the face of the pick-up box. The labels are placed in the stack with their blank sides facing the pick-up box position, and the pressure exerted through the stack causes the rear of the foremost label to adhere to the gummed strips 146. On return of the slide 77, the increased speed of the rod 92 relieves the pressure on the pusher 91 rapidly from the stack, and in doing so, prevents the label now adhering to the pick-up box from being nipped in the claw ends of the rods 85 and being pulled away from the pick-up box by the receding label stack.

This avoids a difficulty arising if the edges of the labels in the stack are not quite in line, when a protruding edge of the foremost label might be folded back by a claw over the edge of the next label, and held there, were the pressure on the stack not relieved as just described.

After retraction of the label feed device 62 the pick-up box moves through another ¼-revolution to bring the side 143 carrying the label opposite one of the sides 148 of the delivery box 40 lying parallel to the face of the pick-up box.

Pusher mechanism

On the shaft 69 is secured a cam 149 (Figures 5 and 17) of simple eccentric form operating through a follower 150 a lever 151 secured to the lower end of a shaft 152 mounted in a bearing 153 carried by the plate 2 (Figure 18). Above the plate 2 the shaft 152 carries a lever 154 pivoted at 155 to a flat link 156 slotted at 157 to pass round the pick-up box shaft 76 and its upper bearing 158. The link 156 is pivoted at 159 to a lever 160 pivoted at 161 on the plate 2, the levers 151 and 160 and the link 156 forming a parallel linkage. Under the operation of the cam 149, the link 156 is movable between the pick-up box shaft 76 and the delivery box shaft 73 in a direction substantially parallel to the plane through the axes of these shafts.

Near the pivot 159 the pusher 65 upstands from the link 156 in a position in line with the slot 144 in the face of the box 63 adjacent the box 40. On the side towards the box 40 the pusher is faced with rubber 162 (Figure 25) having a central gap 163 slightly less in height than the length of the label 87, and within the gap two inset "islands" 164 of rubber are secured, flush with the rubber 162. Between the insets a suction passage 165 emerges, the passage being connected by a vertical passage 166 within the pusher 65 leading to a flexible tube 167 by which suction may be applied to the pusher.

When the pick-up box 63 is rotating, the pusher 65 lies within the box because the cam 149 has pushed the link 156 towards the shaft 76. After the box 63 has come to rest, the cam 149 allows a spring 168 (Figure 17) acting between one of the label feed slides 78 and the lever 160 to push the link 156 towards the delivery box shaft 73, and the pusher passes through the slot 144 in the side 143 of the pick-up box 63 bearing the label 87 to carry the label towards the side 148 of the delivery box 40. The width of the pusher 65 and of the slot 144 and the distance between the faces 143 and 148 of the two boxes are such that the pusher removes from the gummed strips 146 the sides of the label 87 previously adhering to the strips. The suction applied by the passage 165 to the space within the gap 163 surrounding the islands 164 causes the central ungummed portion of the label 87 to be held to the pusher, the islands preventing undue sucking in of the central strip of the label and thus enabling the label to lie substantially flat across the rubber face 162 of the pusher, with the gummed edges protruding to each side of the pusher.

The suction ensures that the label is positioned on the pusher, irrespective of any tendency for one side to adhere more strongly to the side of the pick-up box than the other, and to be accurately positioned on the delivery-box, and, in turn, on the bottle.

Delivery box

The pusher carries the label thus detached from the pick-up box 63 to the side 148 of the delivery box, the front (ungummed) face of the label being next to the delivery box. Each side 148 is covered with resilient material 169 (described more fully below) pierced with six holes 170 disposed in conformity with the shape of the label (Figure 23) and connected by channels 171 behind the covering 169 to a passage 172 connected by a tube 173 to one of four nipples 174 by which suction is applied just as the label 87 is placed against the covering 169. Suction is cut off from the pusher (by valve mechanism described below) and the label is left adhering to the side 148 of the delivery box 40, with the gummed face of the label 87 outwards. The Geneva-stop mechanism on the shafts 67, 73 carries the delivery box 40 through two successive ¼-revolutions to bring the side 148 carrying the label 87 into the gap 38 opposite the rubber-rimmed wheel 43. The delivery box 40 comes to rest just before the bottle 34 reaches the gap 38 filled by the side 148 of the delivery box. The bottle is then rolled by the wheel 43 over the rubber surface 57 at the end of the wall 36 so that the bottle is rotating when it reaches the now-stationary side 148 and picks up the label by the adhesion of the gum on the sides of the label facing the bottle. When the bottle is released from the pressure of the wheel 43, the continued movement of the conveyor 5 carries the bottle 34, with label attached, to the delivery table 58.

As shown in Figure 1, the corners 175 of the pick-up box 63 are cut away, and this, with slight out-of-phase operation of the Geneva-stop mech-

anisms, enables the boxes 63 and 40 to rotate through successive ¼-revolutions without interference between each other, giving rapid rotary movements separating fairly long stationary periods for the application of gum and of labels to the pick-up box and for the transfer of labels by the pusher 65 from the pick-up box to the delivery box, and for rolling of the bottles 34 over the delivery box to receive the labels.

Suction mechanism

Suction to the pusher 65 and the sides 148 of the delivery box 40 is supplied from a tank 176 (Figure 4) connected to a suction pump 177 driven by sprocket 178 and chain 179 from a sprocket 180 on the shaft 17 (Figure 3). A common outlet 181 from the tank 176 is controlled by a cock 182 leading to three branch connections 183, 184, and 185. The branch 183 leads to the stationary upper member 186 (Figure 9) of a valve 187 at the upper end of the shaft 67. The member 186 is held down by a spring finger 186A, which also embraces a pin 186B to prevent the member rotating. The branch 183 is connected to a central passage 188 (Figure 19) registering with a central passage 189 (Figure 20) in the lower member 190 of the valve, the member 190 being secured to the shaft 67. A curved passage 191 in the member 190 communicates with the passage 189 through a passage 192 and is rotated by the shaft 67 over ports 193, 194 in the face of the upper member 186. The port 193 is connected by the flexible tube 167 to the pusher 65. The port 194 is connected by a flexible tube 195 to a valve 196 above the delivery box 40.

The valve 196 (Figure 8) is mounted concentric with the shaft 73 by a disc 197 at the upper end of the shaft and is held against rotation by a pin 198 entering a slot 199 in a member 200 bridging the gap 38 at which the sides 148 of the box 40 are presented. On the under face of the valve 196 (Figure 21) are three ports 201, 202, and 203 arranged round part of the circle containing the connecting passage of the four nipples 174 within the box 40. The flexible pipe 195 is connected to the port 201 nearest to the pick-up box 63. 201 is a short port slightly separated from the elongated port 202 disposed above a nipple 174 in the position reached by the first ¼-revolution of a side 148 of the box 140 in its movement away from the pick-up box 63 towards the gap 38. The port 203 is a short port slightly separated from the port 202 and is disposed above a nipple 174 in the position nearest the gap 38.

The port 202 is connected to the flexible branch 184 and the port 203 is connected to the branch 185, a throttle valve 204 being arranged in the branch 185, so that a reduced amount of suction is available at the port 203, as compared with the suction available at the ports 201, and 202.

The operation of the valves 187 and 196 is as follows: The rotation of the lower half 190 of the valve 187 brings the passage 191 connected via 192, 189, 188, and 183 to the receiver 176 into communication with the port 193 connected by the flexible pipe 167 to the pusher 65 just before the pusher is carried through the slot 144 in the side of the pick-up box 63 to carry a label 87 towards the delivery box 40. This provides the suction to hold the label to the pusher 65 during detachment of the label from the box 63, and the suction is maintained until the passage 191 also communicates with the port 194 in the upper half 186 of the valve to apply suction via the pipe 195 and the port 201 to the side 148 of the delivery box 40 facing the pusher 65. Suction is thus momentarily applied to both faces of the label, and is then broken from the pusher to leave the label adhering to the delivery box. As the box rotates, the label is retained through two ¼-revolutions of the box by the elongated port 202 maintaining suction on the label 174, the gap between the ports 201, 202, being bridged by the nipple inlet as the box 40 rotates. Similarly, the gap between the ports 202 and 203 is bridged as the box brings the side 148 carrying the label into the gap 38, but, as the nipple 174 leaves the port 202, the lesser amount of suction supplied by the branch 185 through port 203, comes into operation, and the label 87 is left adhering less strongly to the side 148 of the box, so as not unduly to resist transfer of the label 87 to the bottle 34 by the contact of the gummed sides of the label to the bottle.

Moreover, the throttle valve 204 limits the amount of air that is sucked through the holes 170 in the side of the delivery box while that side remains stationary after removal of the label by the bottle. When the delivery box next rotates, the nipple 174 belonging to that side moves to a blank portion of the valve 196 to cut off ingress of air into the suction system.

Miscellaneous details

The side 148 of the delivery box should not encourage the bottle to slip under the rolling pressure applied by the wheel 43. For dry bottles, thick rubber sheet is very satisfactory. Cork-impregnated rubber may also be used, this material also being useful if the bottles are damp, as by condensation; but for damp bottles it is preferred to use rubber covered with chamois leather, or sponge rubber, the latter yielding slightly to the curve of the bottle to discourage slipping. As an alternative, the delivery box 40A may have curved sides 148A struck about the axis of the shaft 44 carrying the wheel 43, as shown in Figure 26. This reduces the tendency of a bottle to slip when it is being rolled over the delivery box, especially if the bottles are damp.

The pick-up box and delivery box should be of light construction to enable them to partake of the rapid intermittent movements necessary for high output without unduly stressing the mechanism.

A vertical slot 205 (Figures 1 and 5) is formed in the front face of the pusher 91 of the label feed device 62, for the insertion of a U-spring 206 of flat strip when the pusher carries the rear of the exhausting label stack 88 beyond the foremost plate 83. The spring 206 maintains the pressure on the stack while the pusher is withdrawn for the insertion of further labels, the spring being withdrawn after replacement of the pusher. By these means, the stack may be replenished without stopping the machine. As the labels are gradually consumed, the weight 103 causes cord 100 to slip round the pulley 93 to enable the pusher 91 to follow the rear of the stack.

As shown in Figures 1 and 8, a cut-away portion 207 of the cover for the wheel 43 is formed opposite the delivery box 40. This ensures that if a bottle 34 arrives by accident at the labelling position while the box 40 is still turning, the bottle will not be crushed. The wheel 43 would, of course, be pushed back against the spring 52.

For shapes of label other than oval, the bars 85 of the label feed device 62 and the holes 147 in the pick-up box 63 would be appropriately positioned, and the pusher 91 would be shaped to cor-

respond. For wider labels, the slots 144 in the sides of the pick-up box 63 may be made wider, the pusher 65 being correspondingly wider.

The label feed device 62, pusher 65 and pick-up box 63 may be readily interchanged for different sizes of labels. The sets of holes 170 in the delivery box 40 may also be spaced wider apart for wider labels, as by interchanging the sides of the box, or the complete box may be interchanged. In general, a bigger bottle requires a bigger label; and also a worm 32 with larger pitch, though a single worm 32 suffices for different sizes of bottles within the limits of its pitch.

Although the gumming device has been shown with three pairs of rollers 139, with a rate of rotation appropriate to their use with a four-sided pick-up box 63, a different number of rollers could be used, say four, with appropriately adjusted rate of rotation.

What I claim is:

1. A labelling machine for cylindrical bottles and like articles comprising means to apply gum to one face of a label, a delivery plate with suction openings, means to transfer the label, gummed-side out, to the delivery plate, for the label to be held by suction applied to its non-gummed face, and means to roll an article over the delivery plate to apply the label to the article.

2. A labelling machine as in claim 1, wherein the means for rolling an article over the delivery plate comprises a wheel.

3. A labelling machine as in claim 2, comprising a resilient mounting for the wheel to enable the wheel to recede and return as the bottle passes into and out of the nip formed by the rim of the wheel and the delivery plate.

4. A labelling machine as in claim 2, comprising means to vary the width of the nip formed by the rim of the wheel and the delivery plate to accommodate articles of different diameters.

5. A labelling machine for cylindrical bottles and like articles, said machine comprising an apertured pick-up plate, means for intermittently rotating the plate into different positions, means disposed opposite one such position of the plate, for applying gum to the plate on each side of the aperture, a label stack disposed opposite another position of the plate, a delivery plate disposed opposite yet another position of the plate, means to move the label stack towards the gummed pick-up plate to apply a label to the plate, a transfer pusher movable through the aperture in the pick-up plate towards the delivery plate when the pick-up plate, with attached label, is opposite the delivery plate, means to move the pusher through the aperture, suction openings in the delivery plate to provide for holding to the delivery plate a label transferred from the pick-up plate, a conveyor for cylindrical articles, means for intermittently rotating the delivery plate between the position opposite the pick-up plate and a position alongside the conveyor, and means to roll an article on the conveyor over the delivery plate to apply the label to the article.

6. A labelling machine as in claim 5, comprising means for applying suction to the transfer pusher just before the pusher moves through the aperture in the pick-up plate.

7. A labelling machine as in claim 6, wherein the means to apply suction to the pusher and the delivery plate operate to apply suction simultaneously to both faces of the label, and means are provided to break the suction at the pusher to leave the label adhering to the delivery plate.

8. A labelling machine as in claim 5, wherein the means for rolling an article over the delivery plate comprises a wheel.

9. A labelling machine as in claim 8, comprising a resilient mounting for the wheel to enable the wheel to recede and return as the bottle passes into and out of the nip formed by the rim of the wheel and the delivery plate.

10. A labelling machine as in claim 8, comprising means to vary the width of the nip formed by the rim of the wheel and the delivery plate to accommodate articles of different diameters.

11. A labelling machine as in claim 5, wherein the delivery plate is surfaced with resilient material.

12. A labelling machine as in claim 5, comprising a gumming device having a driving shaft, rollers on spindles parallel to the shaft, springs urging the rollers outwards from the shaft, and belts to receive gum, the gumming device being disposed so that the rollers move along the gummed belts as the shaft is rotated, and then along the side of the pick-up plate, the springs yielding to permit the rollers to follow the belts and the plate.

13. A labelling machine as in claim 5, wherein the label stack has a pusher for the labels, means being provided to move the pusher towards and away from the pick-up plate at a speed greater than the speed of the stack towards and away from the plate.

14. A labelling machine as in claim 13, comprising, as means for moving the label pusher, a lever, a non-rotatable grooved pulley secured to the end of the lever, a pusher rod resting on the periphery of the pulley, and a weighted cord connected to the free end of the rod and passing round the groove in the pulley, means being provided to move an intermediate point of the lever at the same speed as the label stack.

15. A labelling machine for cylindrical bottles and like articles, comprising a pick-up box, the sides of which are apertured, a delivery box, the sides of which have suction openings, a conveyor for cylindrical articles, means for intermittently rotating the boxes so that a side of one is brought opposite a side of the other, and a side of the delivery box is brought alongside the conveyor, means for applying gum to each side of the pick-up box in turn, a label stack, means to move the label stack towards the pick-up box to apply a label to each gummed side in turn, a transfer pusher movable through the aperture in the side of the pick-up box opposite a side of the delivery box, means to move the pusher through the aperture to transfer a label from the pick-up box to the delivery box, means to apply suctions to the openings in the side of the delivery box to which the label has been transferred, and means to roll an article on the conveyor over the side of the delivery box alongside the conveyor to apply to the article a label held by suction to that side of the box.

16. A labelling machine as in claim 15, comprising means for applying suction to the transfer pusher just before the pusher moves through an aperture in a side of the pick-up box.

17. A labelling machine as in claim 16, wherein the means to apply suction to the pusher and the delivery box operate to apply suction simultaneously to both faces of the label, and means are provided to break the suction at the pusher to leave the label adhering to the delivery box.

18. A labelling machine as in claim 15, wherein the means for rolling an article over the delivery box comprises a wheel.

19. A labelling machine as in claim 15, comprising a resilient mounting for the wheel to enable the wheel to recede and return as the bottle passes into and out of the nip formed by the rim of the wheel and the delivery box.

20. A labelling machine as in claim 18, comprising means to vary the width of the nip formed by the rim of the wheel and the delivery box to accommodate articles of different diameters.

21. A labelling machine as in claim 15, wherein the delivery box is surfaced with resilient material.

22. A labelling machine as in claim 15, comprising a gumming device having a driving shaft, rollers on spindles parallel to the shaft, springs urging the rollers outwards from the shaft, and belts to receive gum, the gumming device being disposed so that the rollers move along the gummed belts as the shaft is rotated, and then along the side of the pick-up box, the springs yielding to permit the rollers to follow the belts and the side of the pick-up plate.

23. A labelling machine as in claim 15, wherein the label stack has a pusher for the labels, means being provided to move the pusher towards and away from the pick-up box at a speed greater than the speed of the stack towards and away from the side of the pick-up plate.

24. A labelling machine as in claim 23, comprising, as means for moving the label pusher, a lever, a non-rotatable grooved pulley secured to the end of the lever, a pusher rod resting on the periphery of the pulley, and a weighted cord connected to the free end of the rod and passing round the groove in the pulley, means being provided to move an intermediate point of the lever at the same speed as the label stack.

25. A labelling machine as in claim 5 wherein the transfer pusher is faced with resilient material.

26. A labelling machine as in claim 15 wherein the transfer pusher is faced with resilient material.

SYDNEY E. BANKS.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
787,744	Fisher et al.	Apr. 18, 1905
1,981,278	Mudd	Nov. 20, 1934