

March 17, 1942.

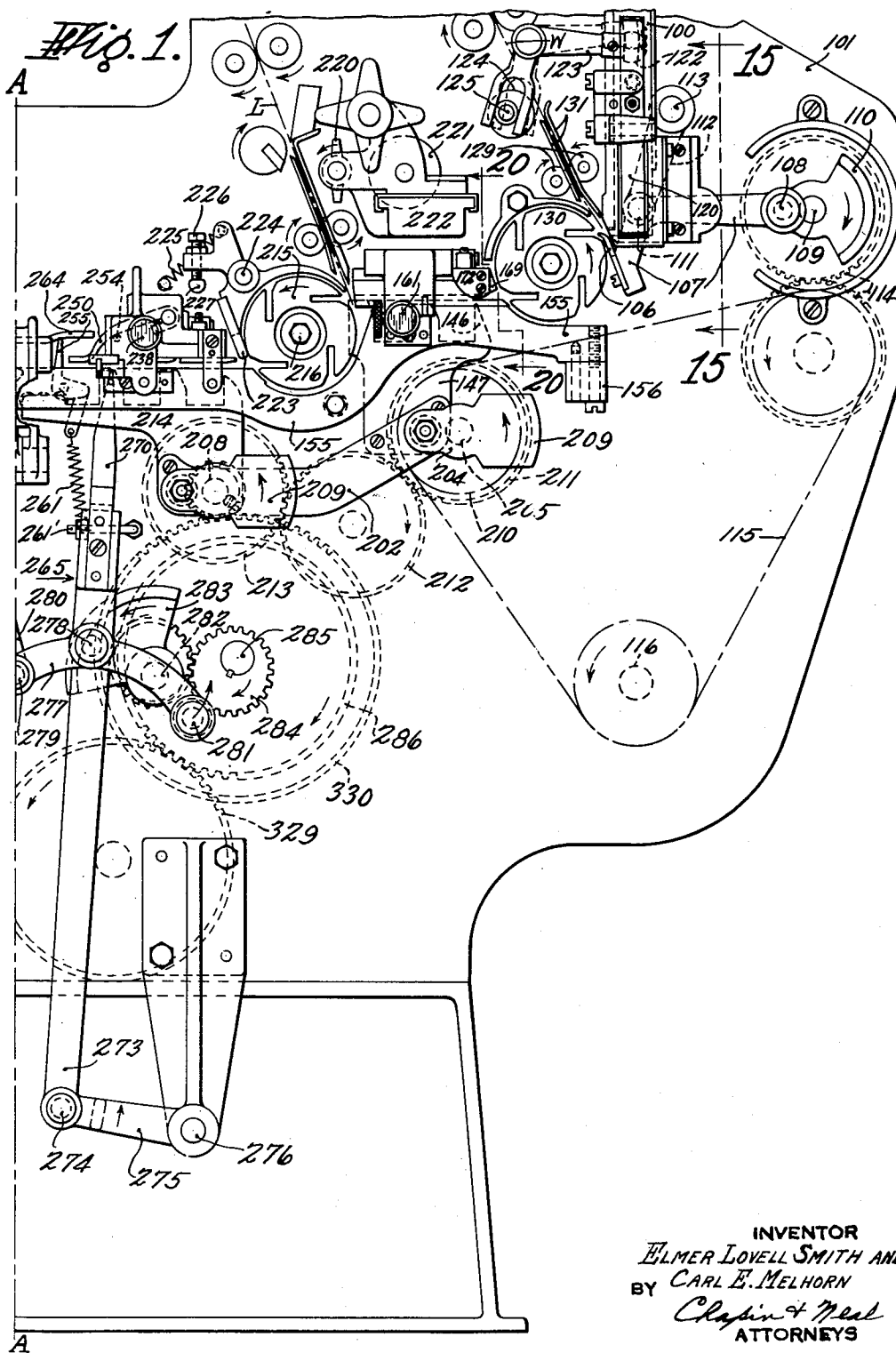
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2,276,744

GUM WRAPPING MACHINE

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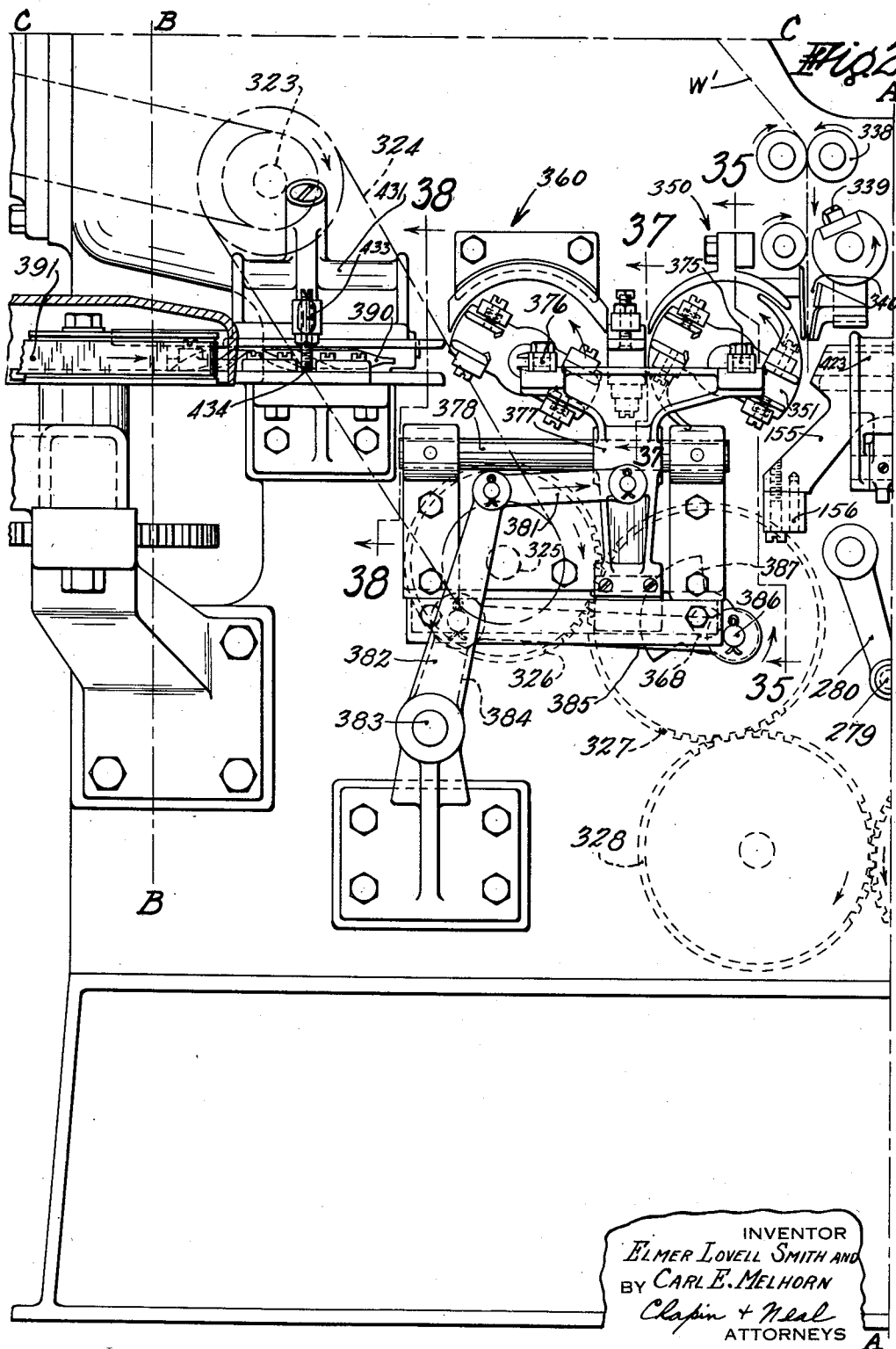
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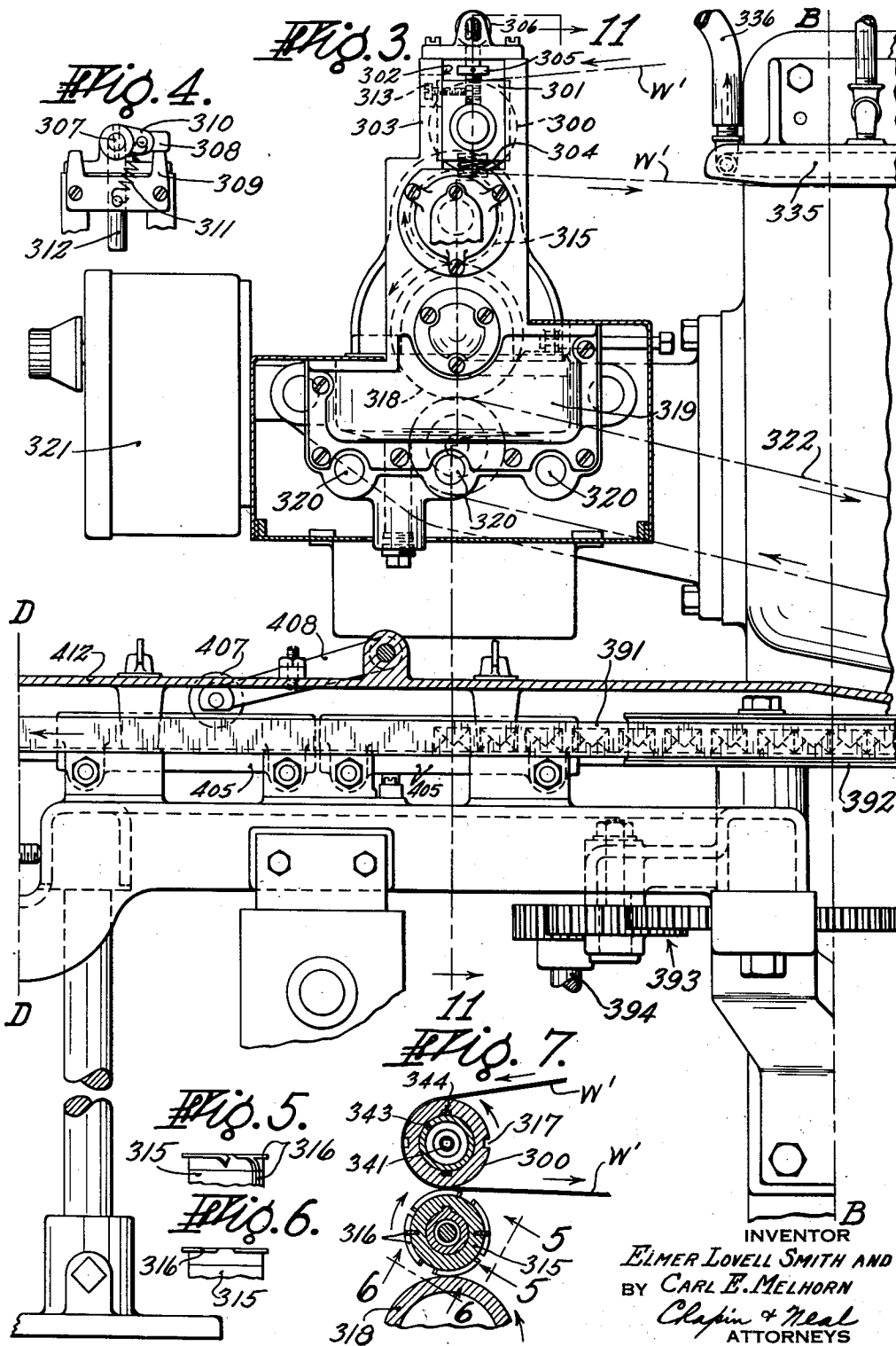
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2,276,744

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Filed Dec. 7, 1939

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E. L. SMITH ET AL
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2,276,744

Filed Dec. 7, 1939

27 Sheets-Sheet 4

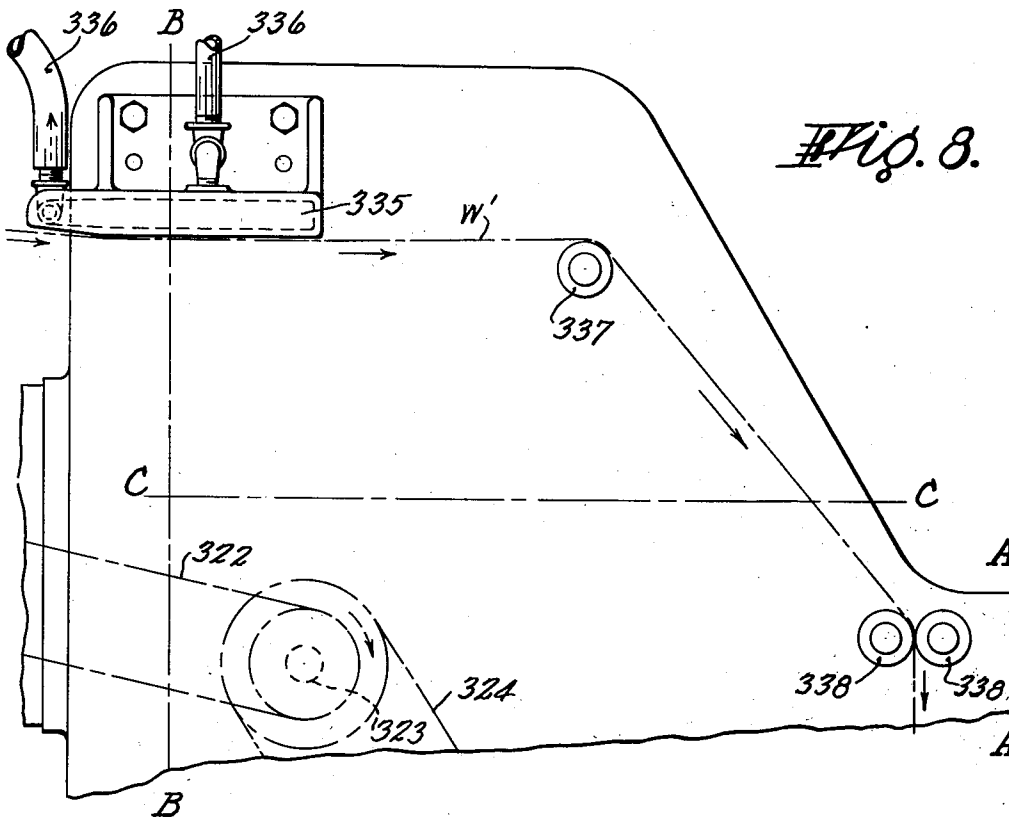


Fig. 8.

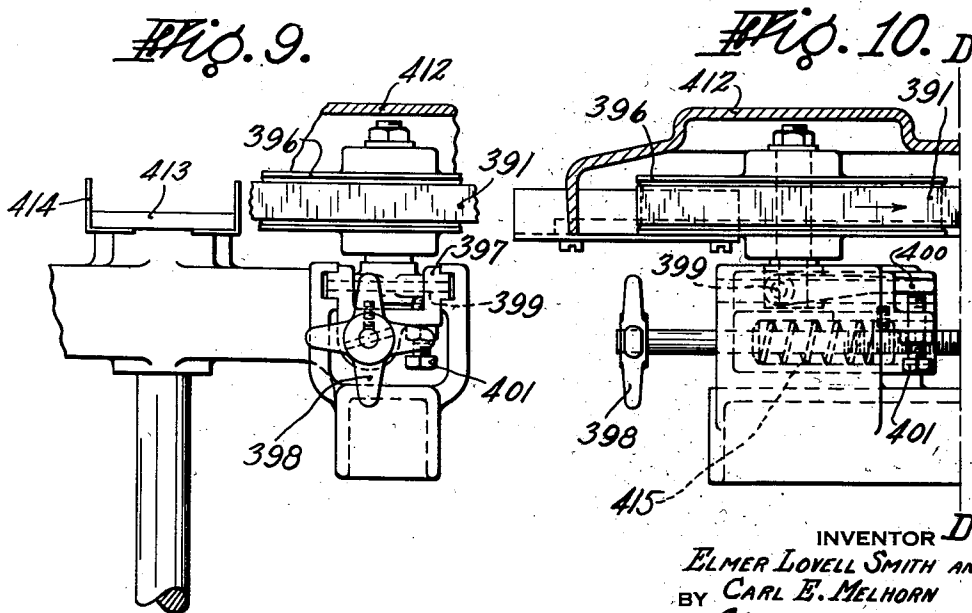


Fig. 9.

Fig. 10. D

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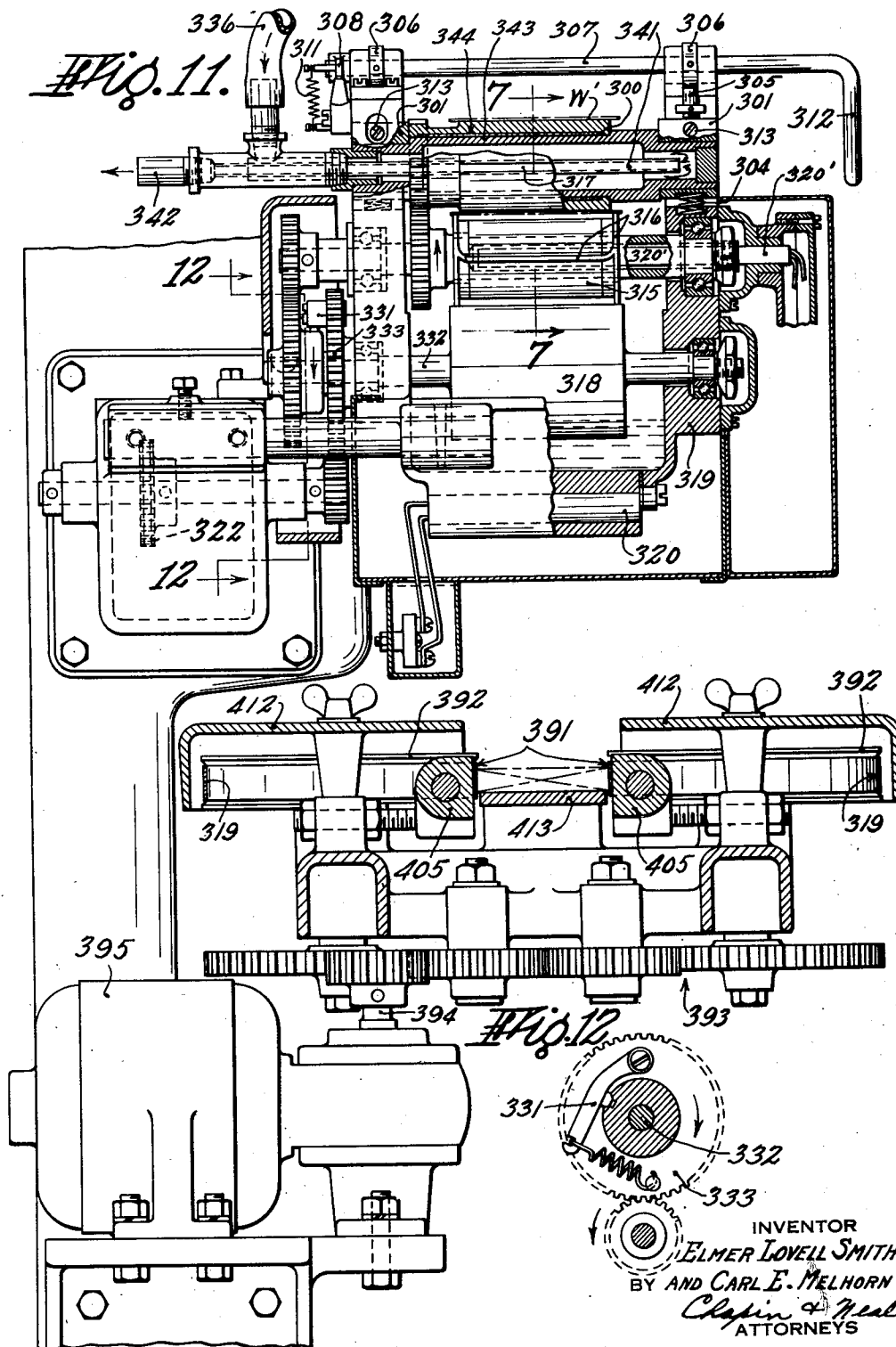
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2,276,744

GUM WRAPPING MACHINE

Filed Dec. 7, 1939

27 Sheets-Sheet 5



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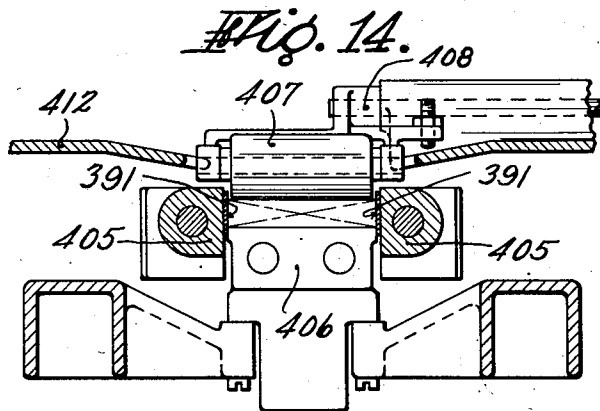
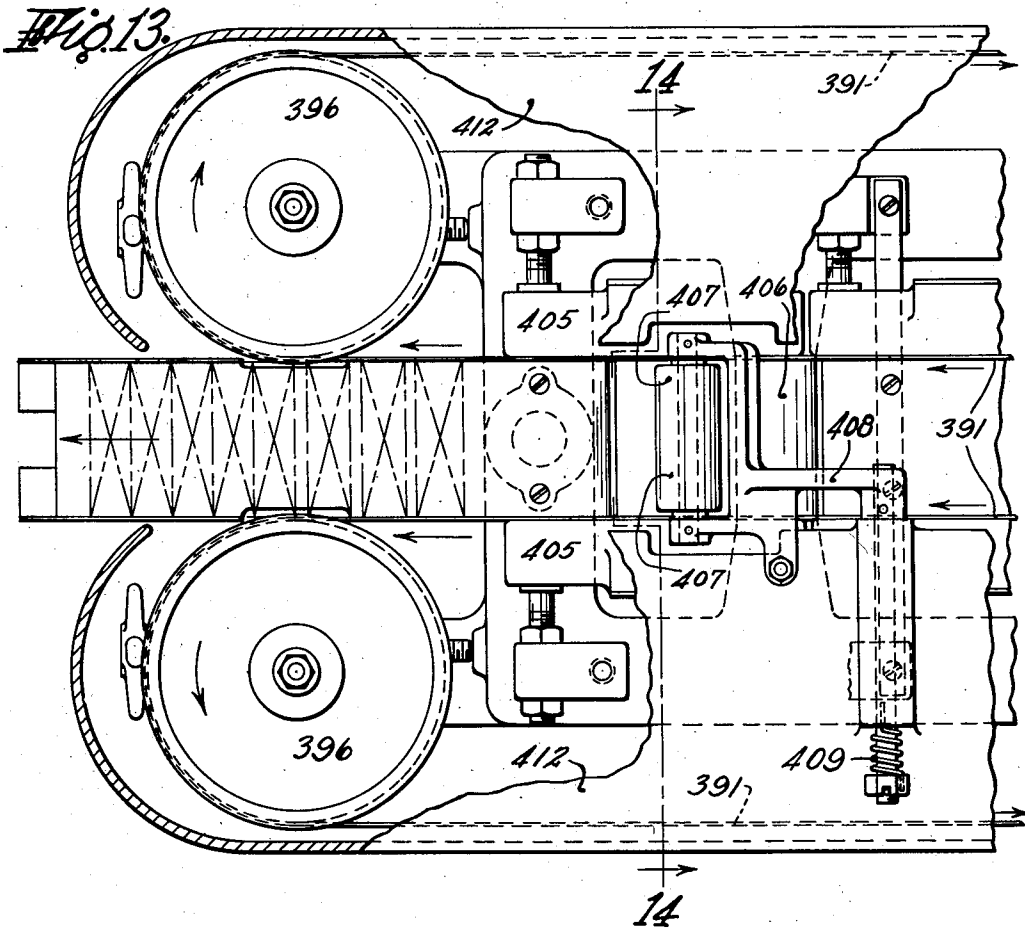
E. L. SMITH ET AL

2,276,744

GUM WRAPPING MACHINE

Filed Dec. 7, 1939

27 Sheets-Sheet 6



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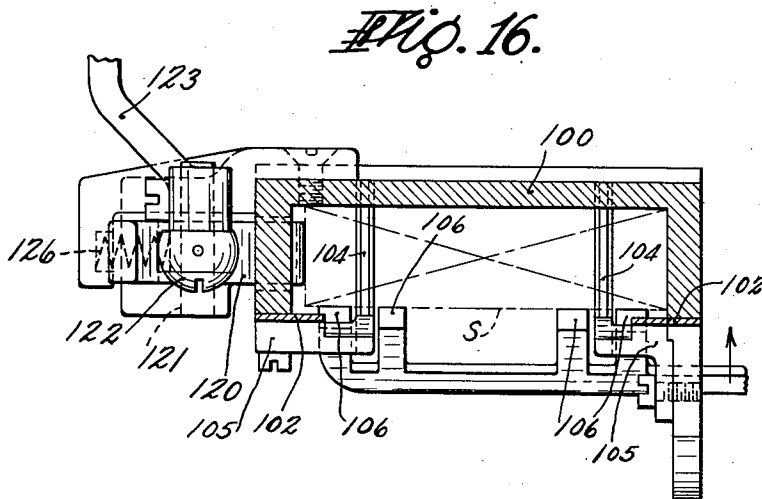
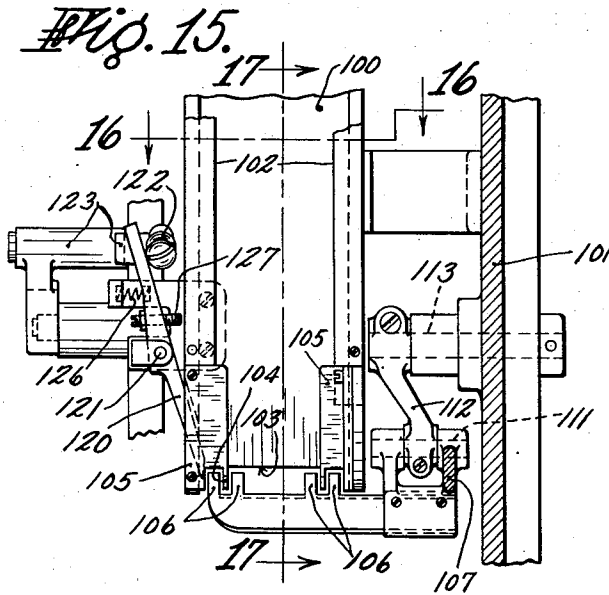
E. L. SMITH ET AL

2,276,744

GUM WRAPPING MACHINE

Filed Dec. 7, 1939

27 Sheets-Sheet 7



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E. L. SMITH ET AL
GUM WRAPPING MACHINE

2,276,744

Filed Dec. 7, 1939

27 Sheets-Sheet 8

Fig. 17.

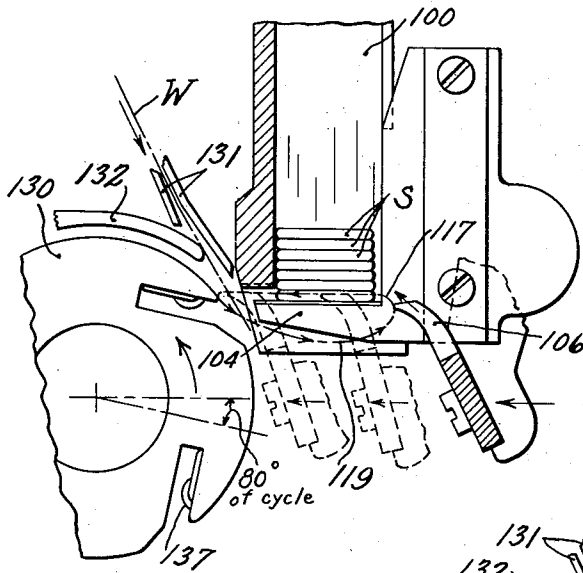


Fig. 18.

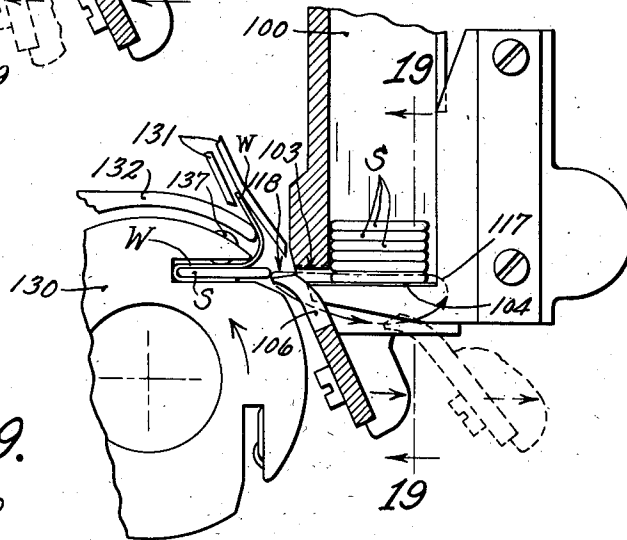
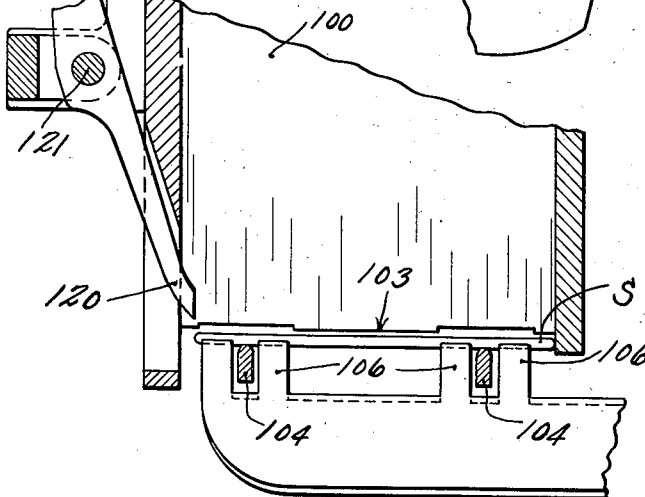


Fig. 19.



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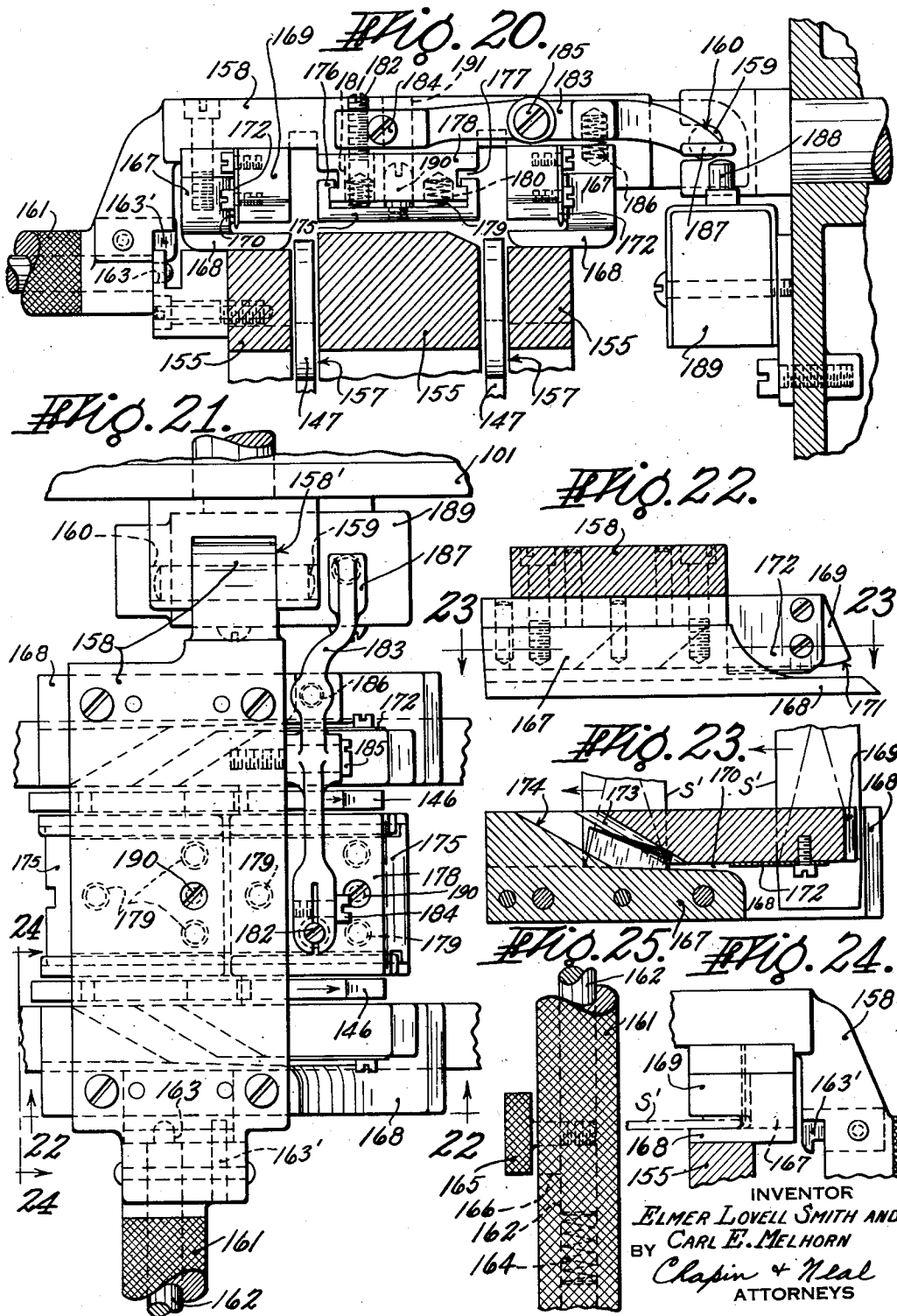
E. L. SMITH ET AL

2,276,744

GUM WRAPPING MACHINE

Filed Dec. 7, 1939

27 Sheets-Sheet 9



March 17, 1942.

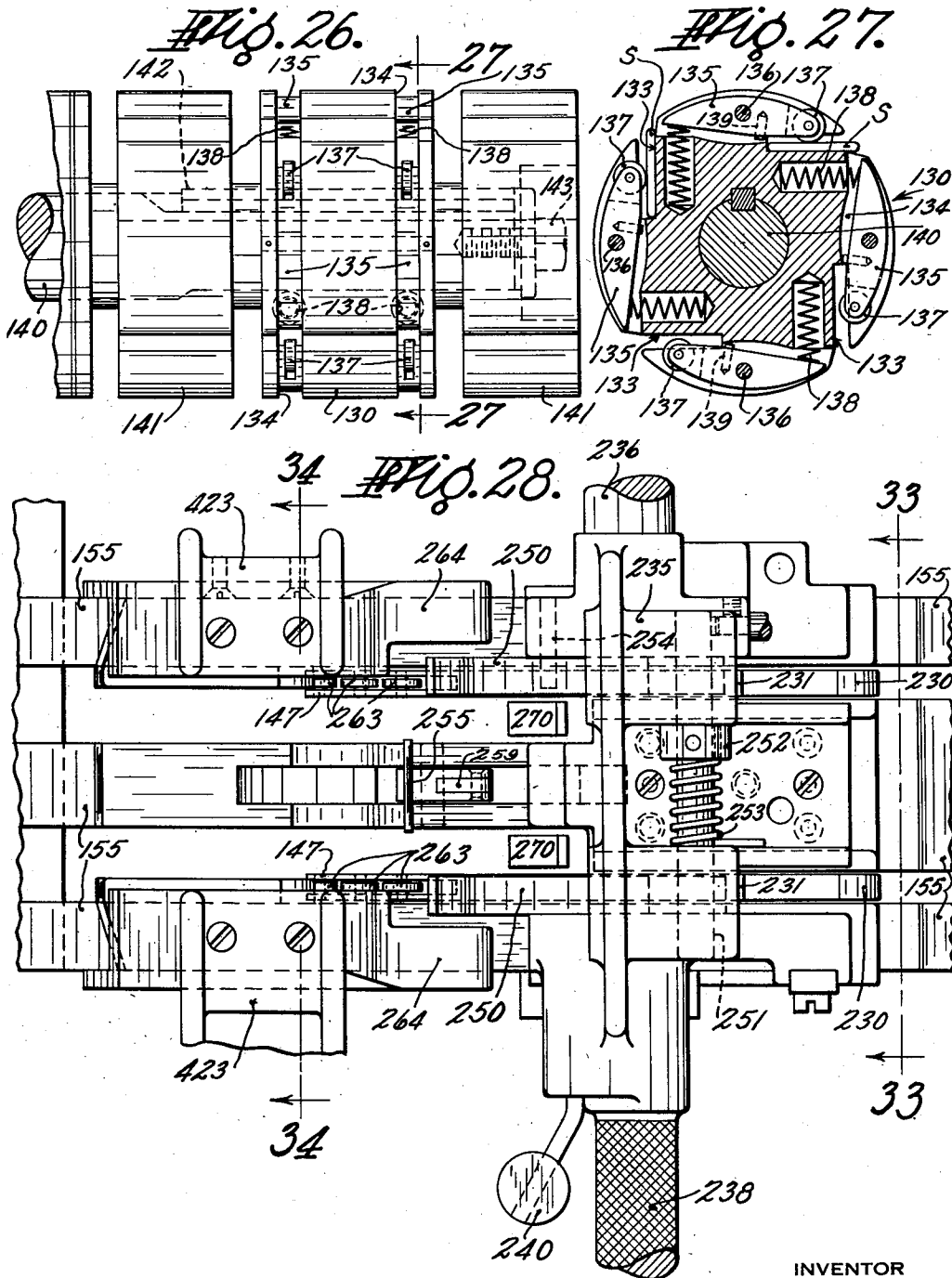
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2,276,744

GUM WRAPPING MACHINE

Filed Dec. 7, 1939

27 Sheets-Sheet 10



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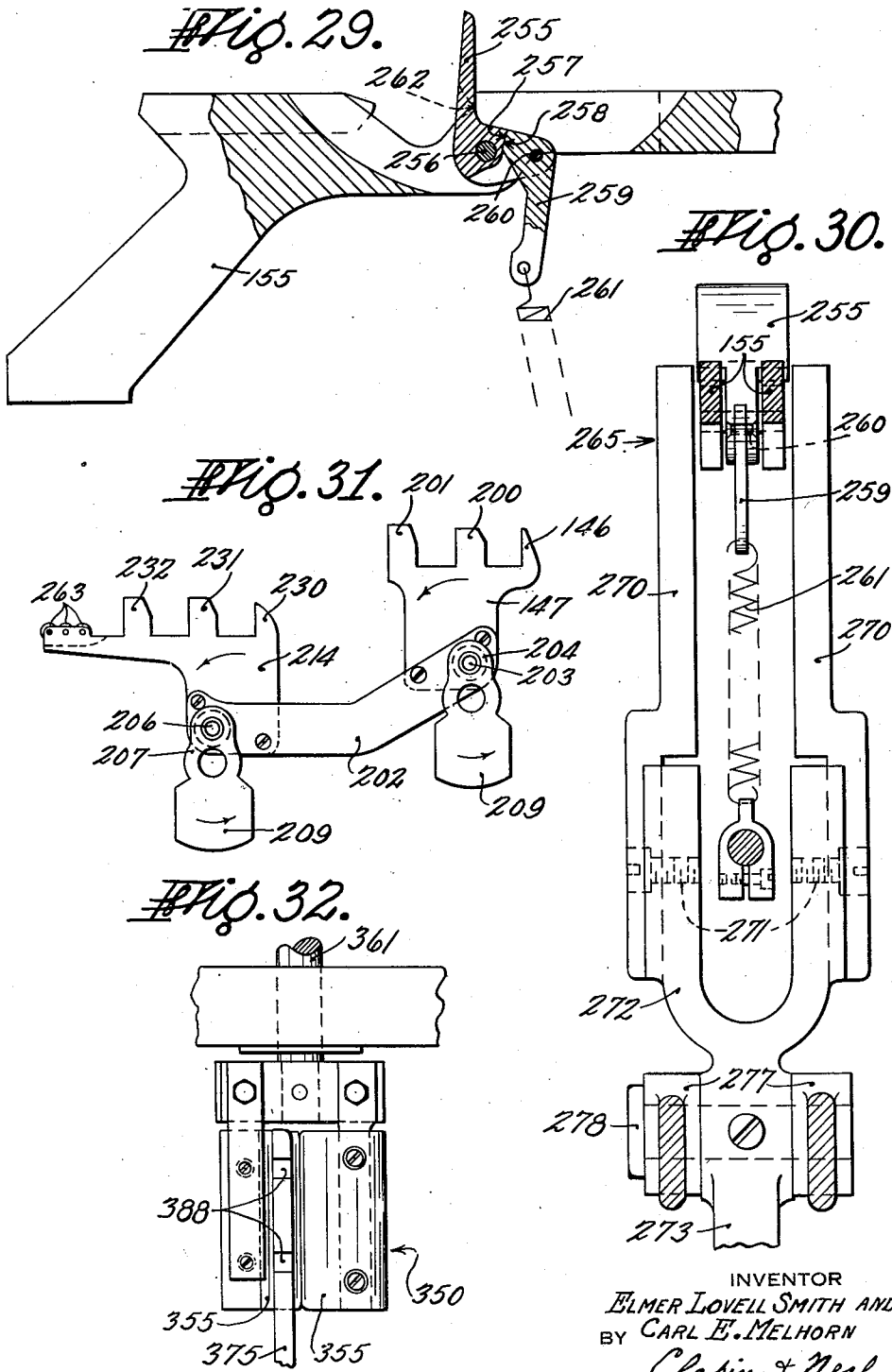
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E. L. SMITH ET AL
GUM WRAPPING MACHINE

2,276,744

Filed Dec. 7, 1939

27 Sheets-Sheet 11



March 17, 1942.

E. L. SMITH ET AL
GUM WRAPPING MACHINE

2,276,744

Filed Dec. 7, 1939

27 Sheets-Sheet 12

Fig. 33.

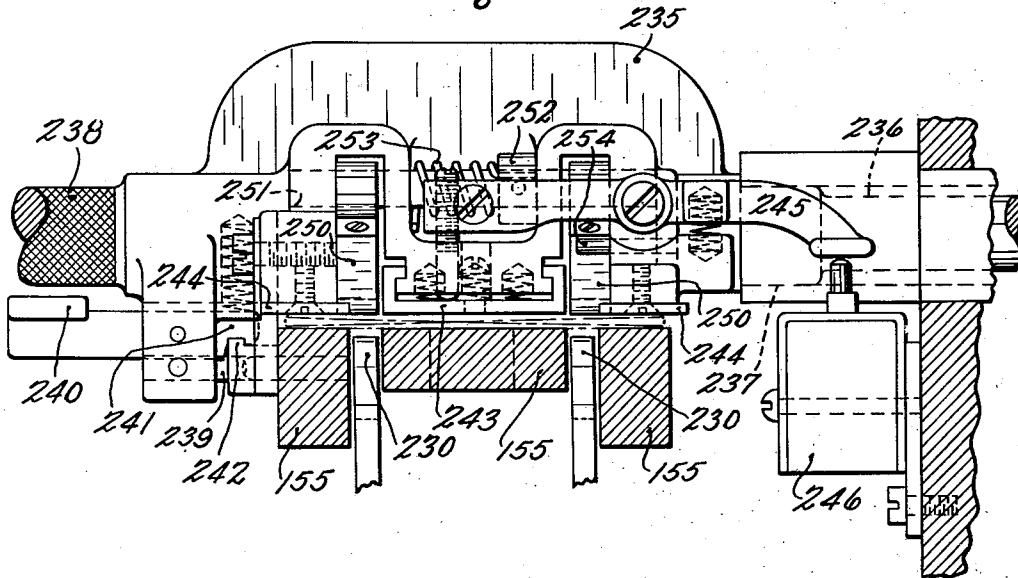
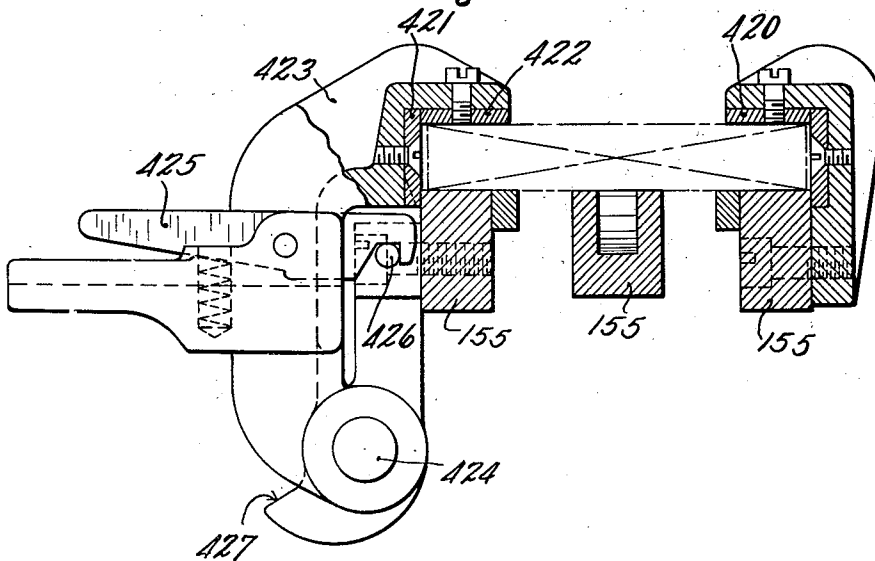


Fig. 34.



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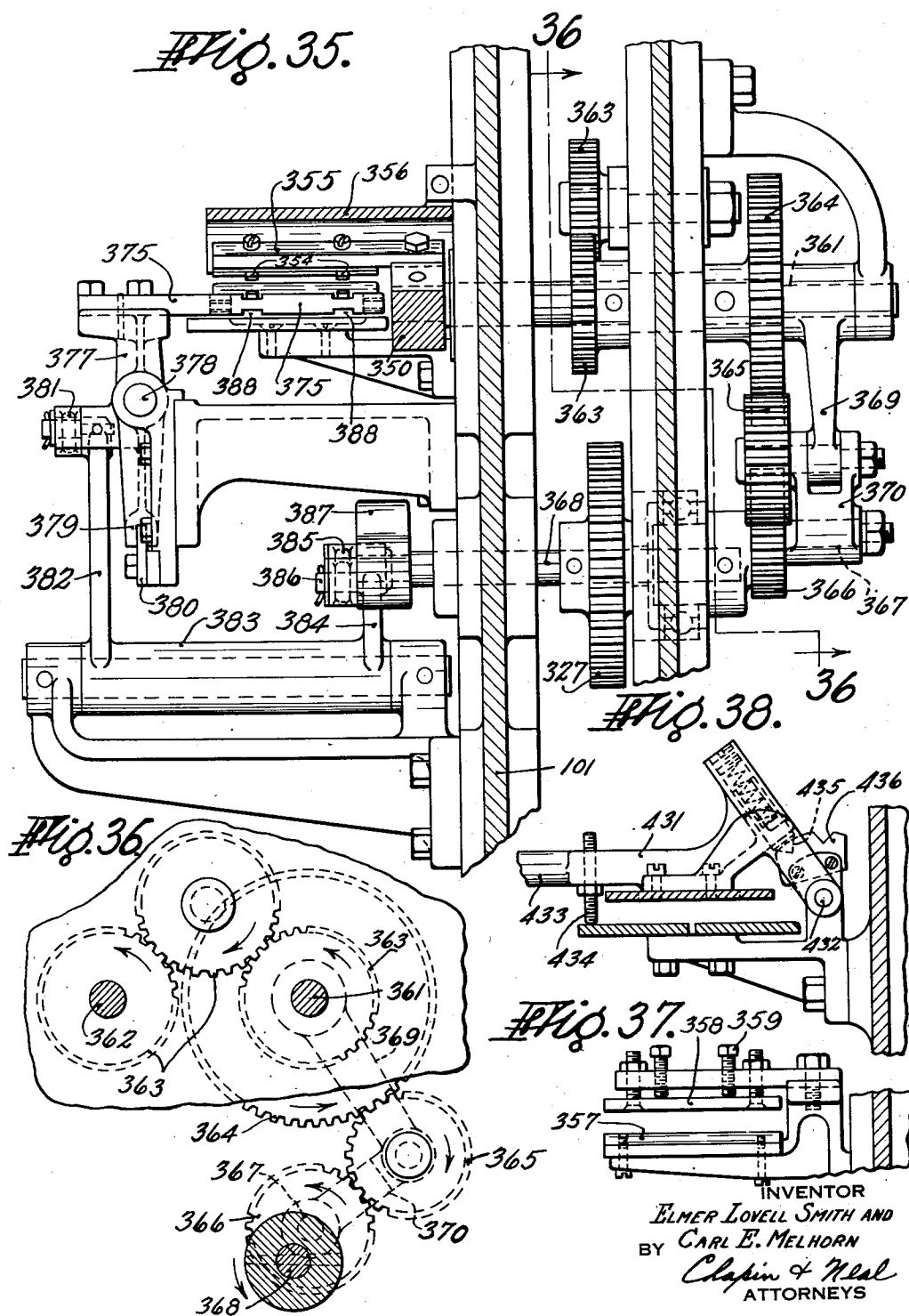
E. L. SMITH ET AL

2,276,744

GUM WRAPPING MACHINE

Filed Dec. 7, 1939

27 Sheets-Sheet 13



March 17, 1942.

E. L. SMITH ET AL

2,276,744

GUM WRAPPING MACHINE

Filed Dec. 7, 1939

27 Sheets-Sheet 14

Fig. 39.

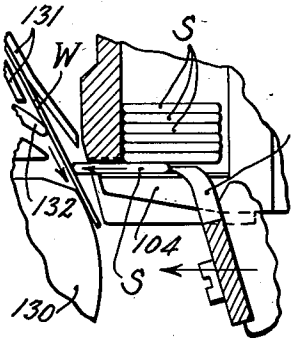


Fig. 40.

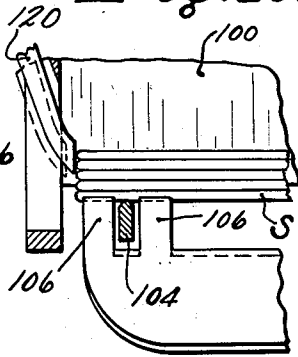


Fig. 41.

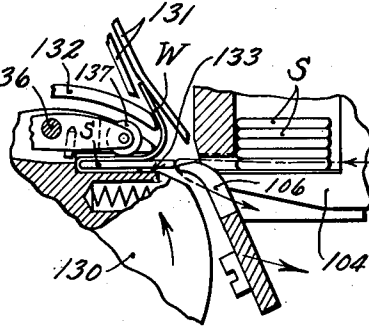


Fig. 42.

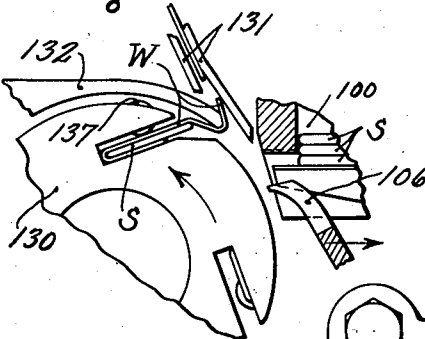


Fig. 43.

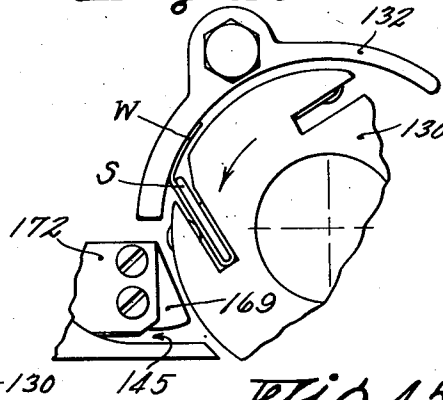


Fig. 44.

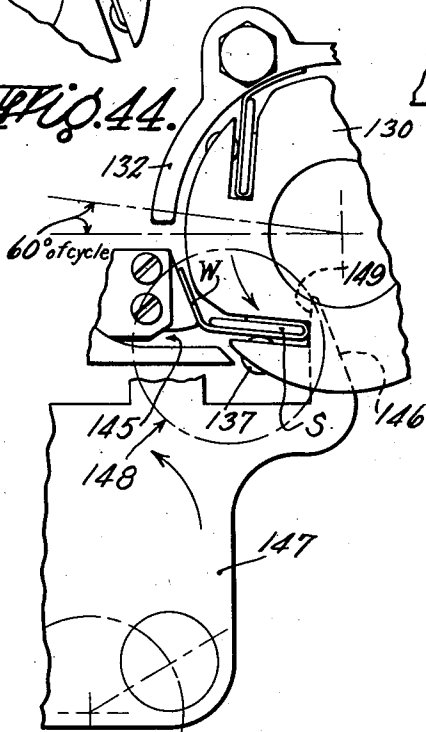
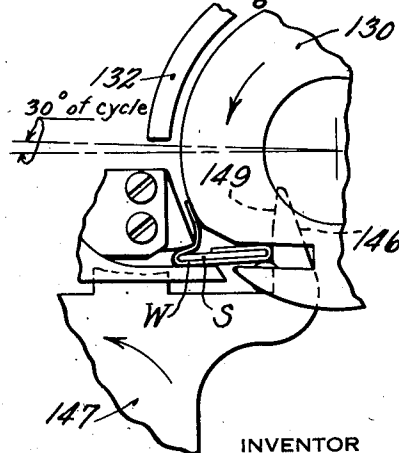


Fig. 45.



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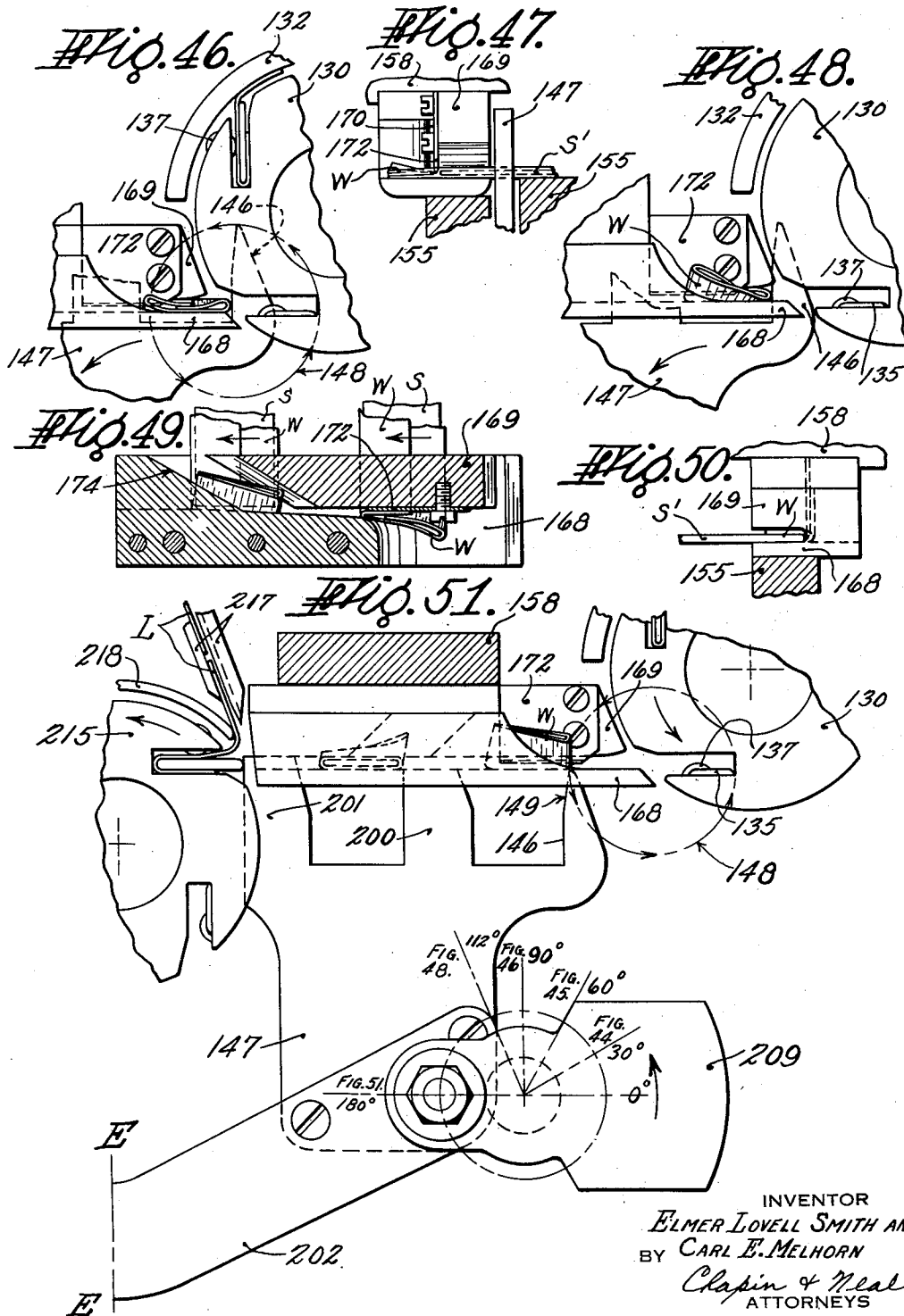
E. L. SMITH ET AL

2,276,744

GUM WRAPPING MACHINE

Filed Dec. 7, 1939

27 Sheets-Sheet 15



March 17, 1942.

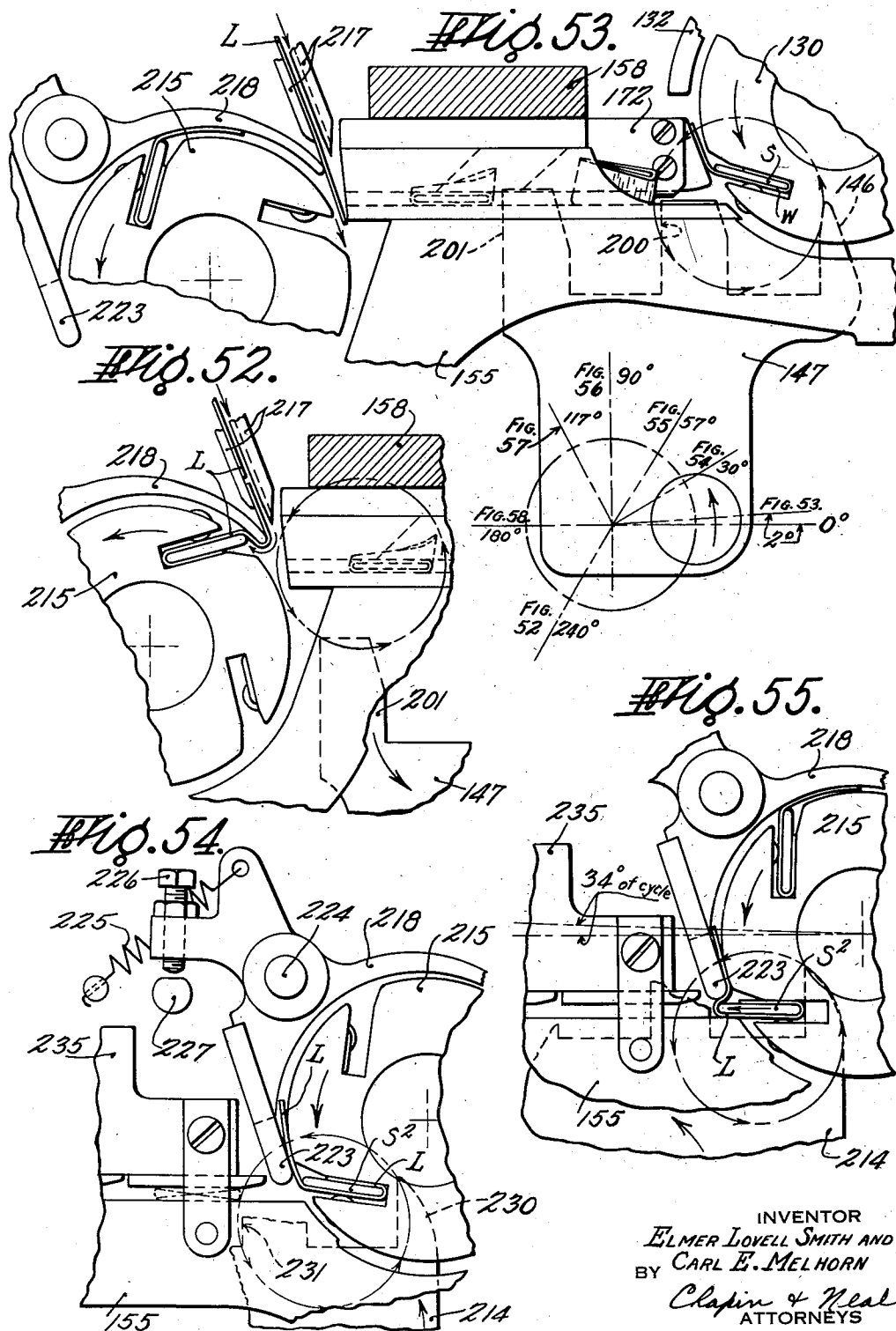
E. L. SMITH ET AL

2,276,744

GUM WRAPPING MACHINE

Filed Dec. 7, 1939

27 Sheets-Sheet 16



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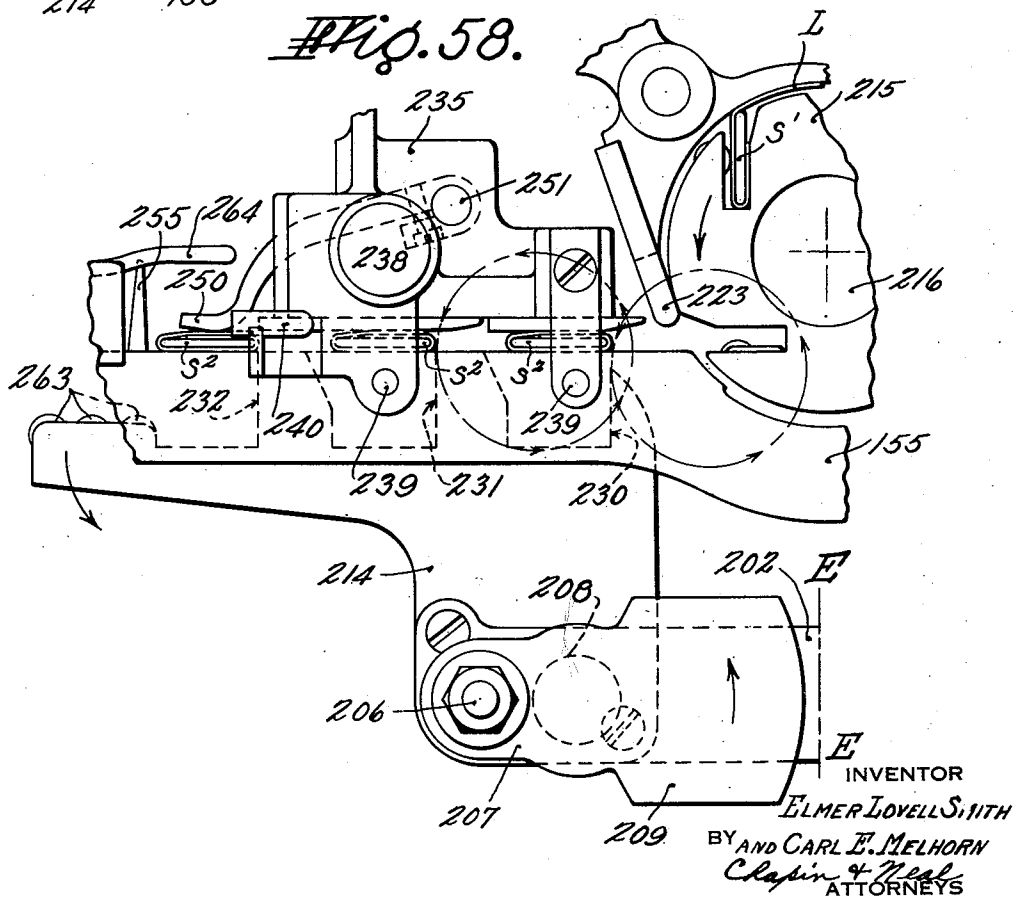
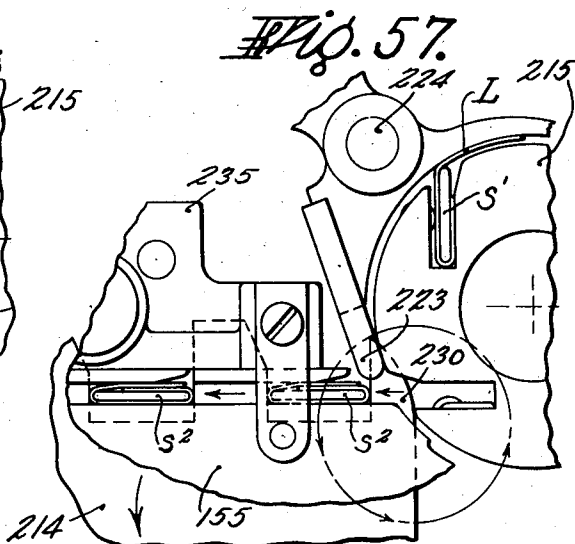
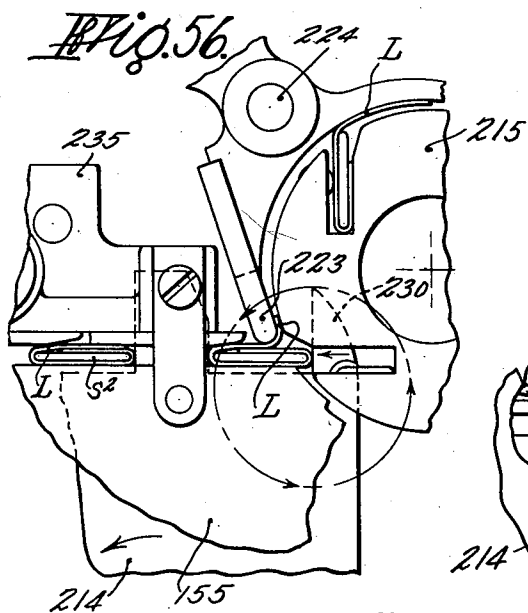
E. L. SMITH ET AL

2,276,744

GUM WRAPPING MACHINE

Filed Dec. 7, 1939

27 Sheets-Sheet 17



March 17, 1942.

E. L. SMITH ET AL

2,276,744

GUM WRAPPING MACHINE

Filed Dec. 7, 1939

27 Sheets-Sheet 18

Fig. 59.

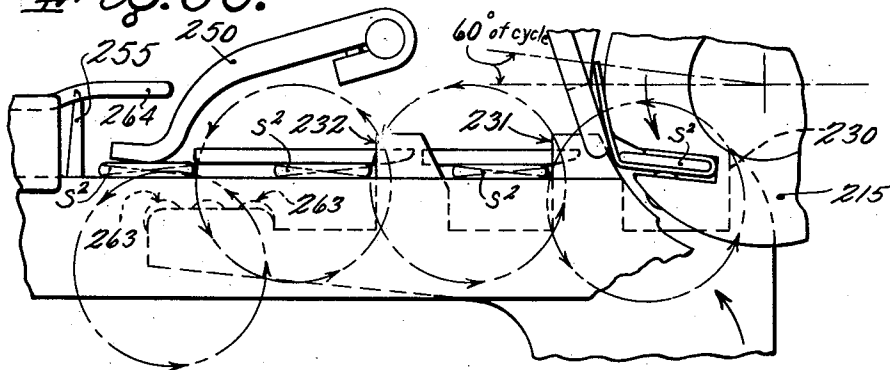


Fig. 60.

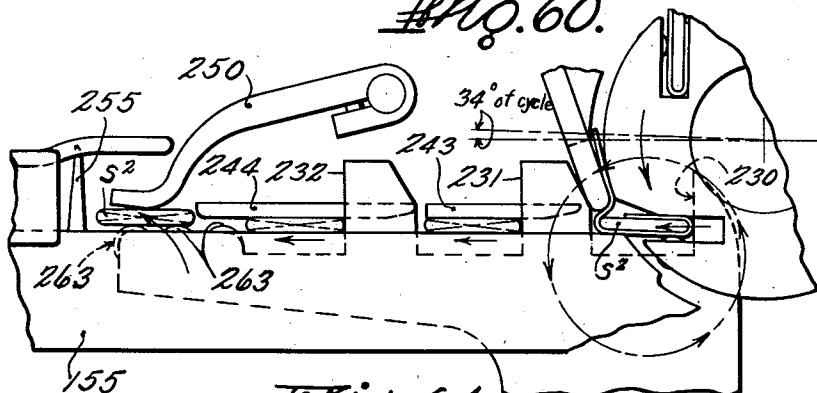
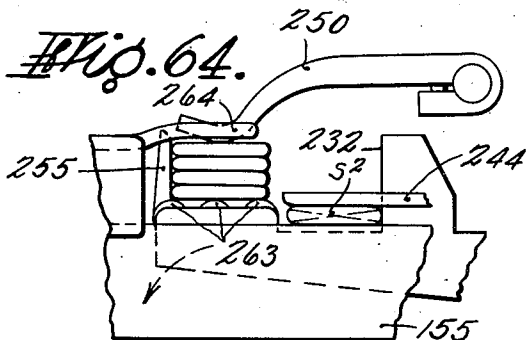
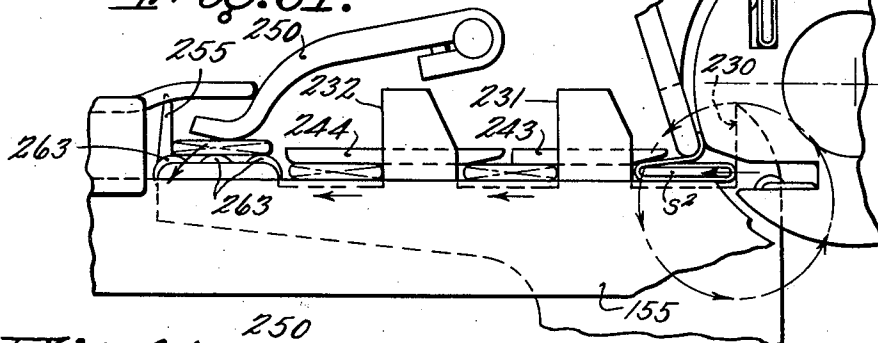


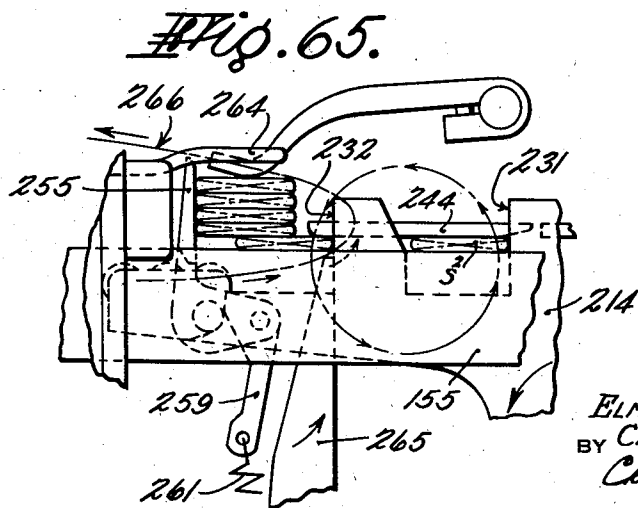
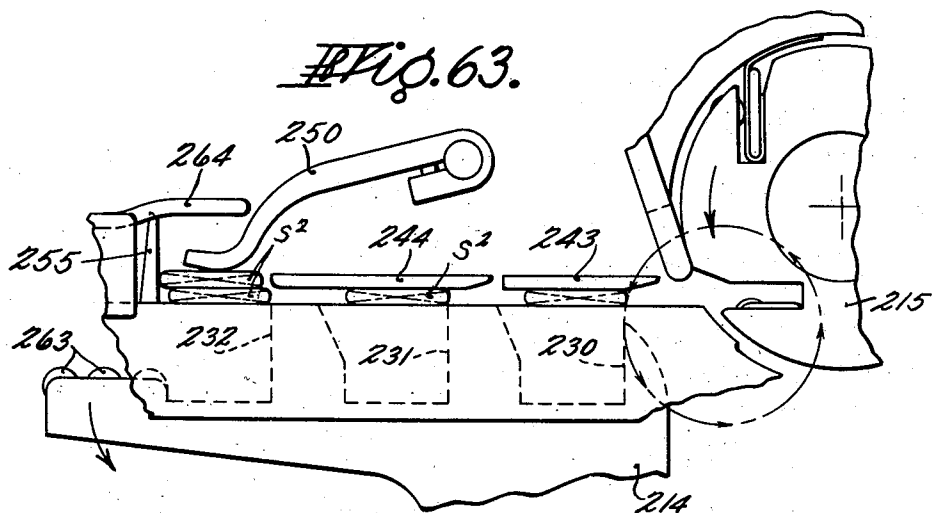
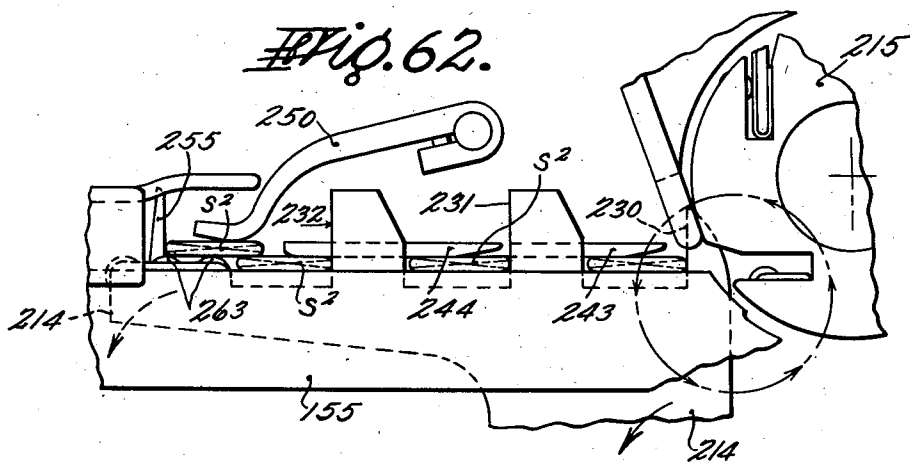
Fig. 61.



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2,276,744

27 Sheets-Sheet 19



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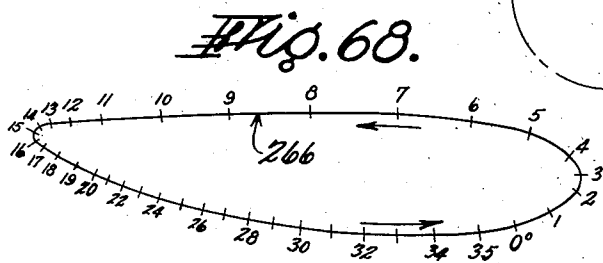
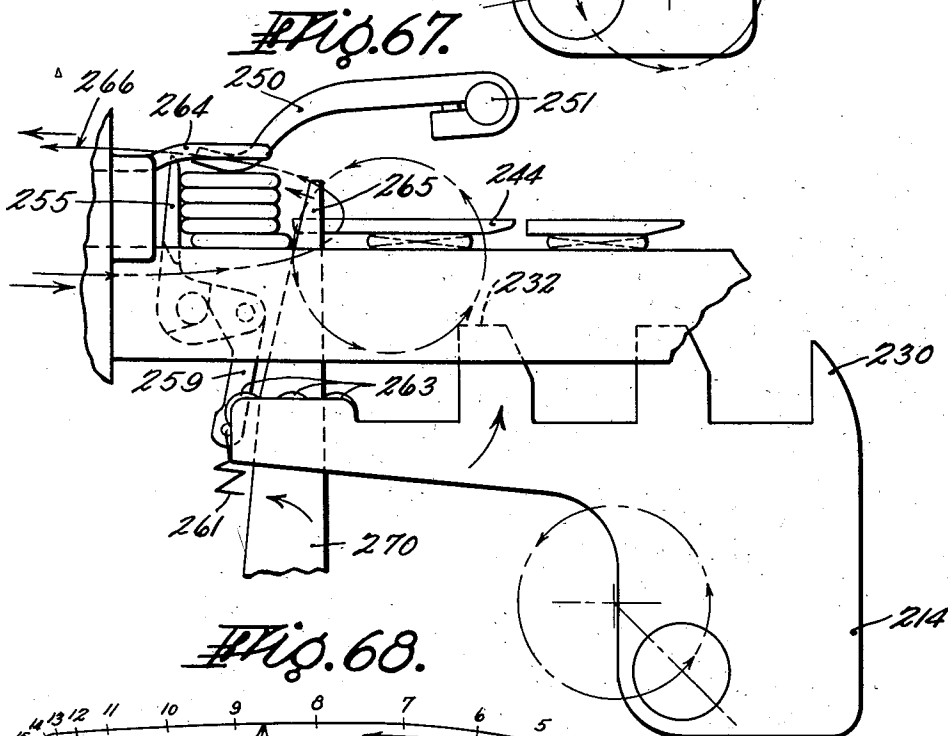
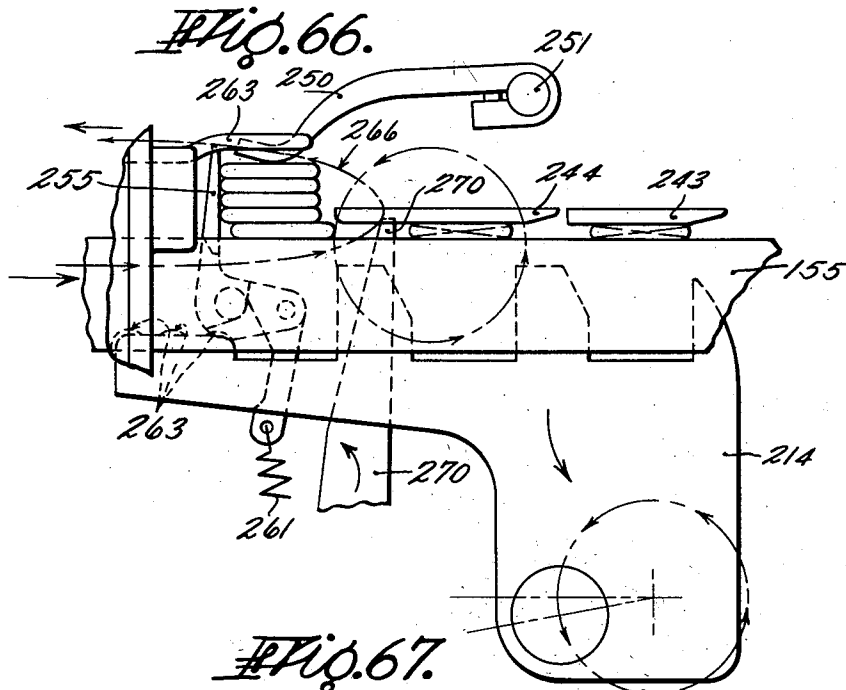
March 17, 1942.

E. L. SMITH ET AL
GUM WRAPPING MACHINE

2,276,744

Filed Dec. 7, 1939

27 Sheets-Sheet 20



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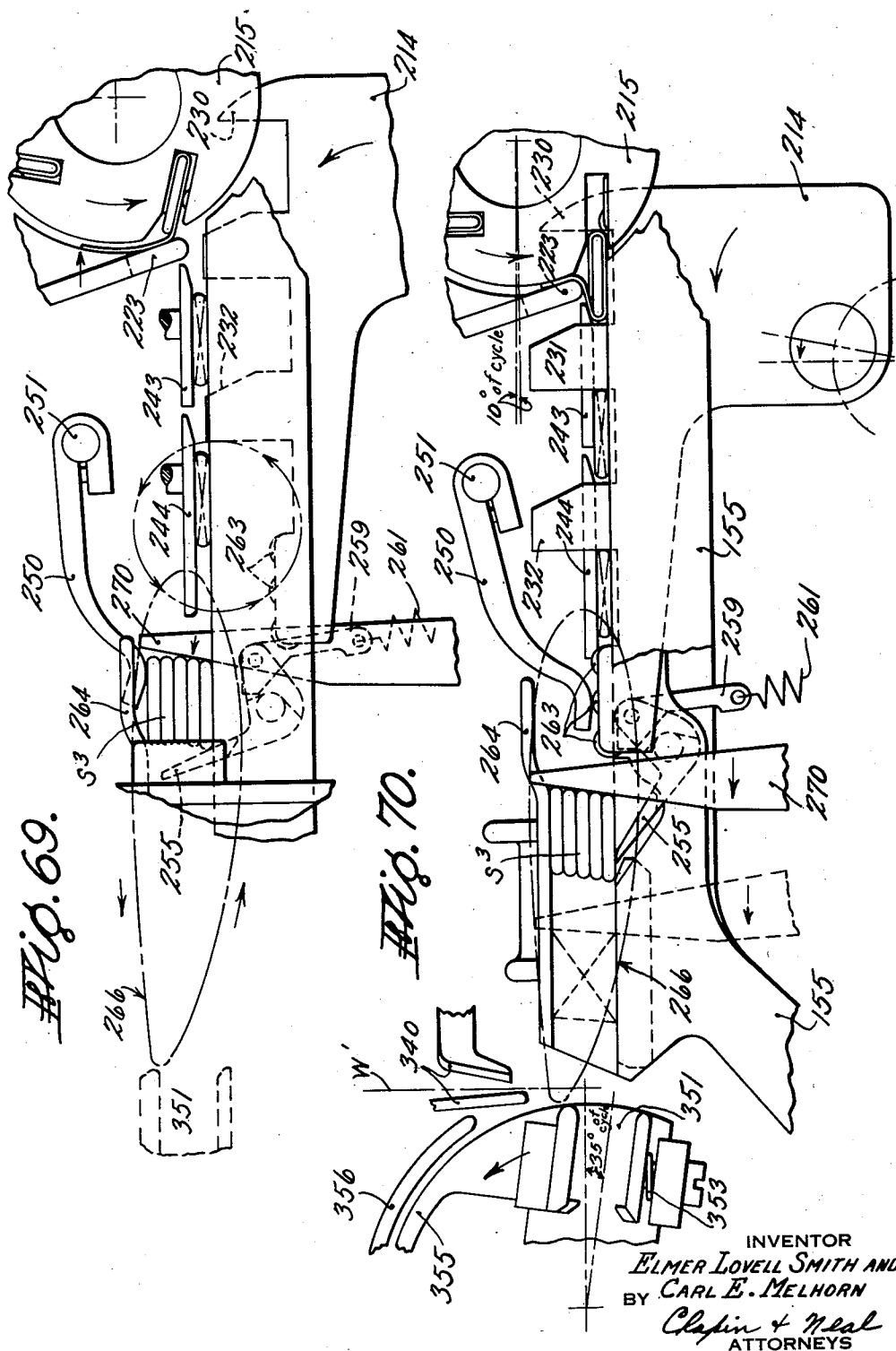
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2,276,744

GUM WRAPPING MACHINE

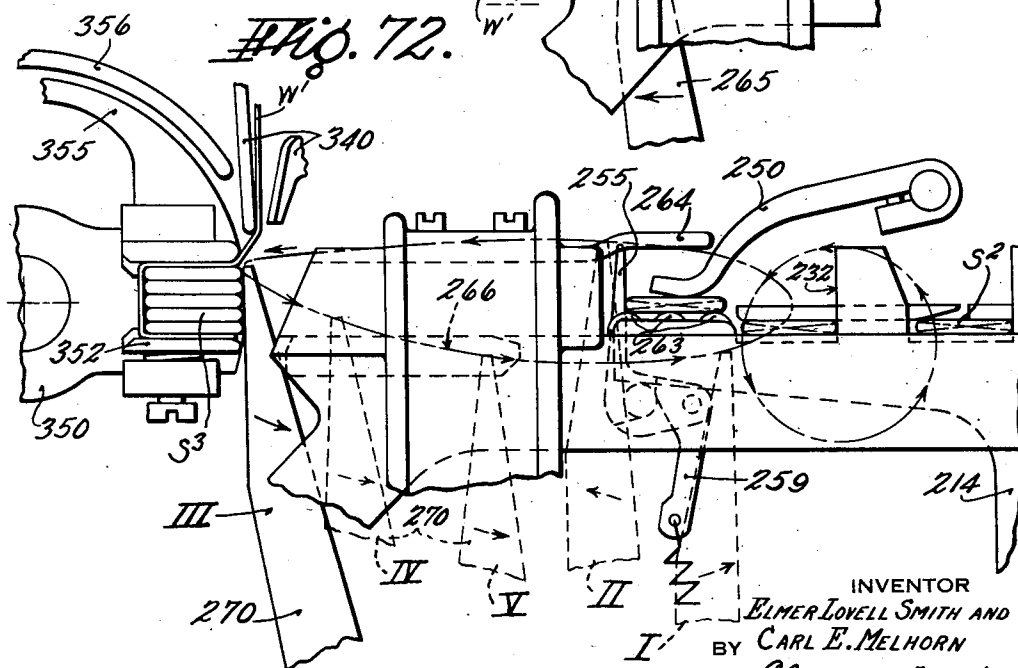
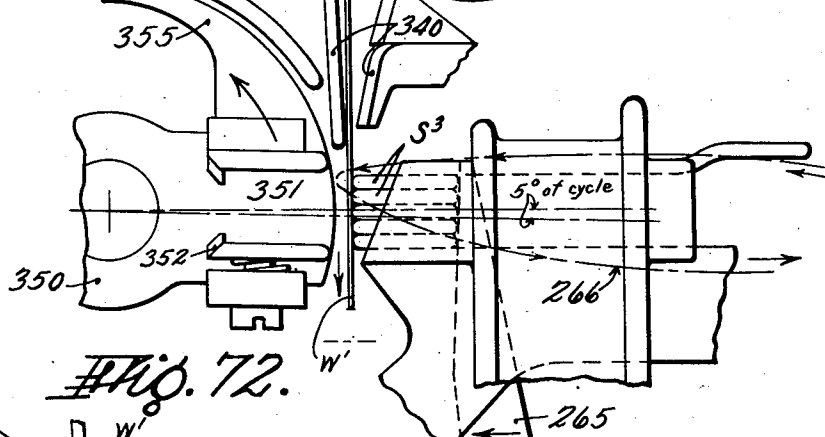
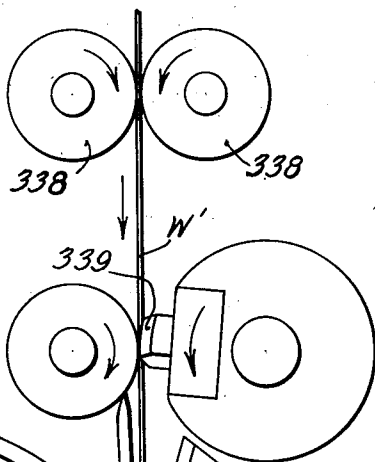
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27 Sheets-Sheet 21



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27 Sheets-Sheet 22



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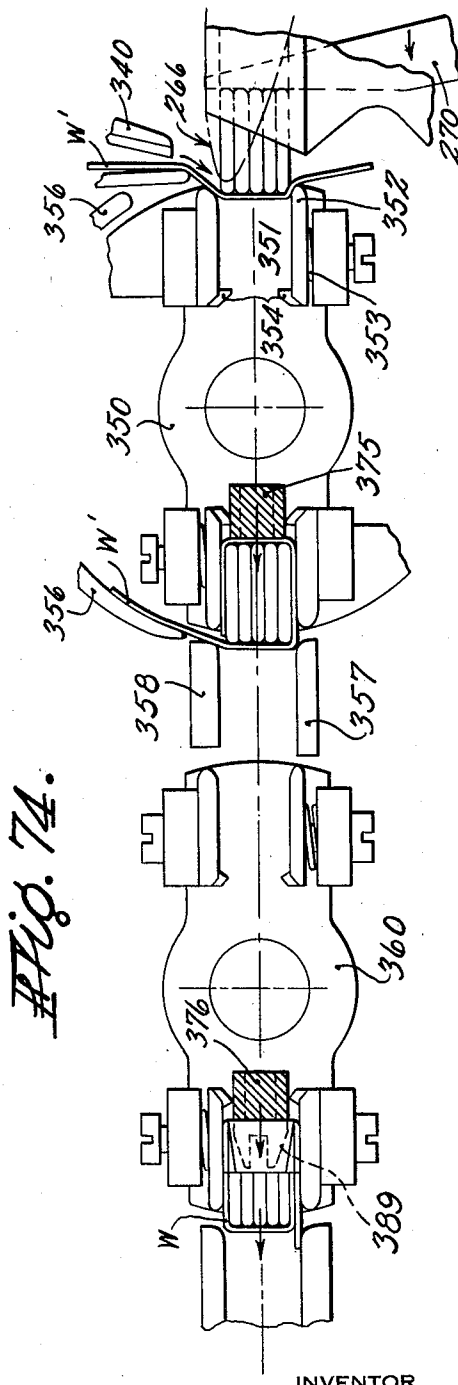
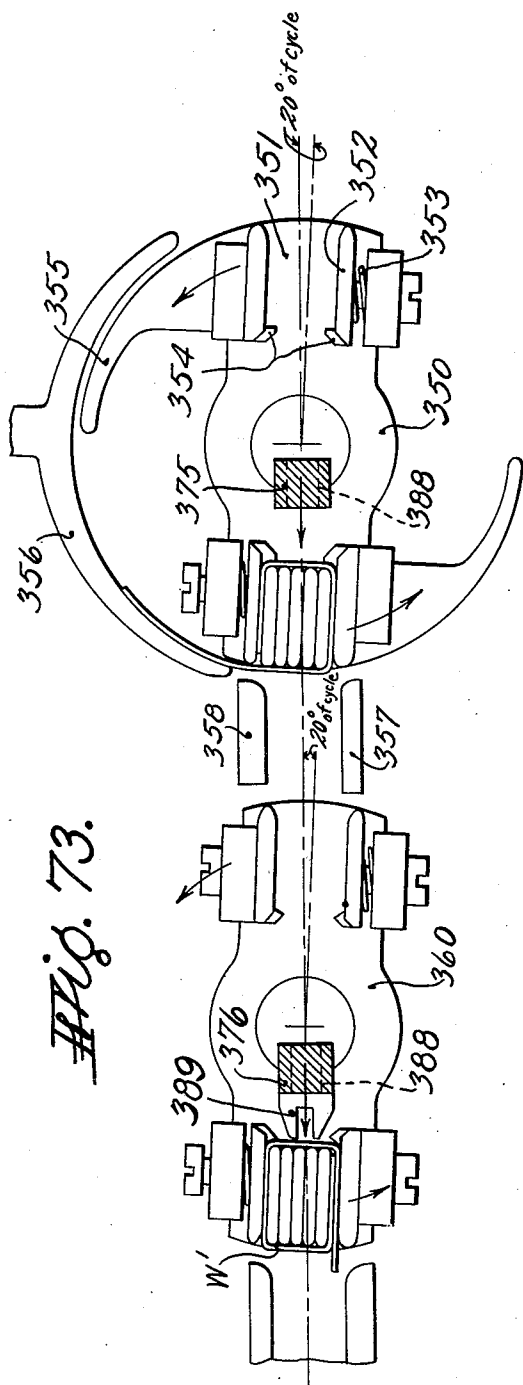
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2,276,744

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Filed Dec. 7, 1939

27 Sheets-Sheet 23



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March 17, 1942.

E. L. SMITH ET AL

2,276,744

GUM WRAPPING MACHINE

Filed Dec. 7, 1939

27 Sheets-Sheet 24

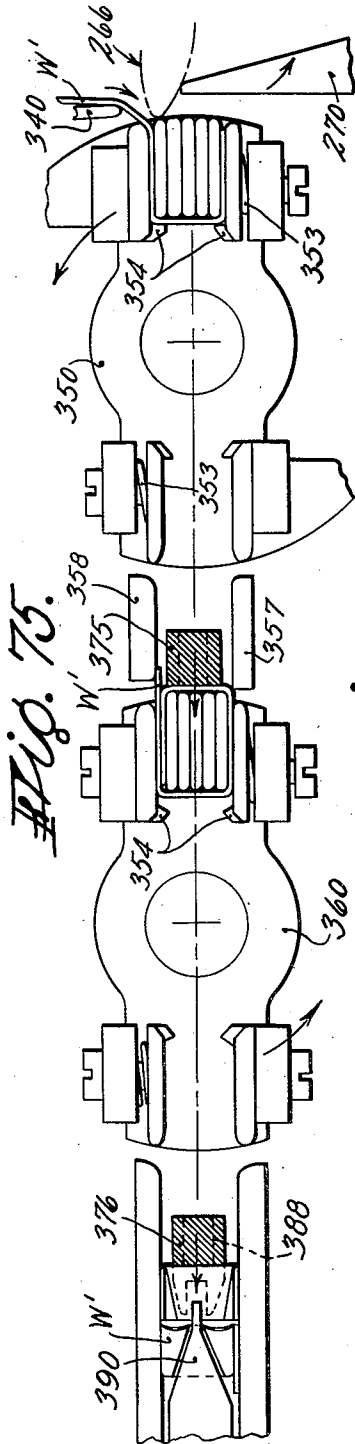
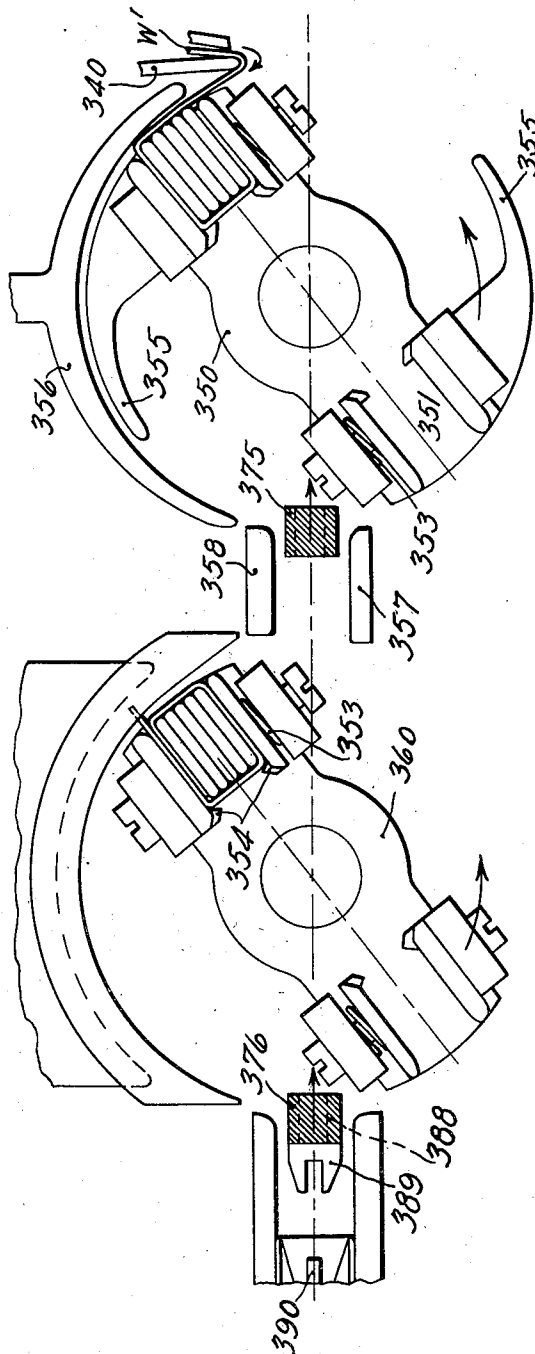


Fig. 76.



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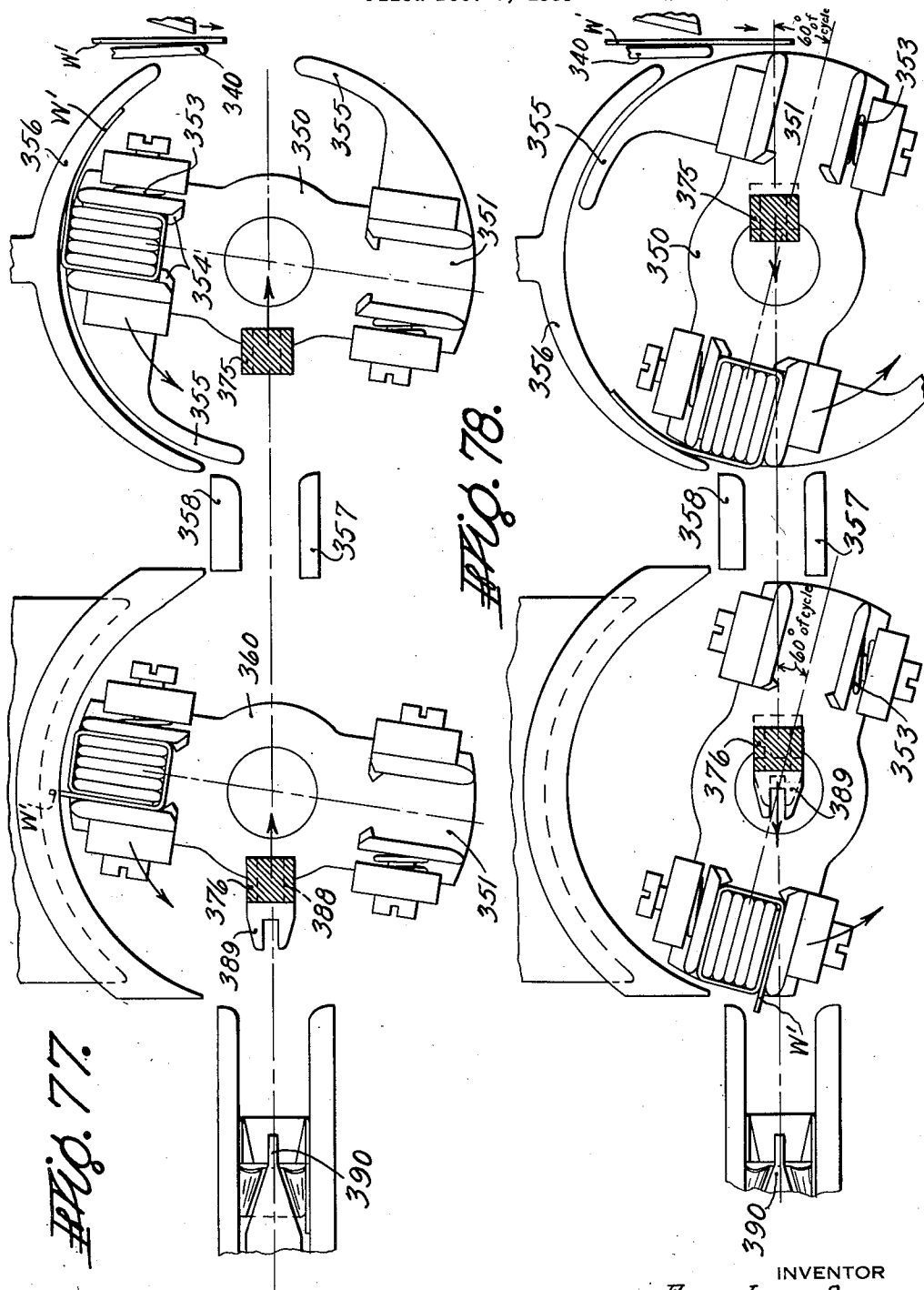
E. L. SMITH ET AL

2,276,744

GUM WRAPPING MACHINE

Filed Dec. 7, 1939

27 Sheets—Sheet 25



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2,276,744

27 Sheets-Sheet 26

27 Sheets-Sheet 26

A diagram of a beam with various internal structures and forces. The beam is shown in cross-section with a top flange and a bottom flange. Inside the beam, there are several vertical and diagonal lines representing internal structures. Four forces, labeled f , are applied to the bottom flange at different points. The diagram illustrates the internal forces and structures within the beam.

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March 17, 1942.

E. L. SMITH ET AL

2,276,744

GUM WRAPPING MACHINE

Filed Dec. 7, 1939

27 Sheets-Sheet 27

Fig. 82.

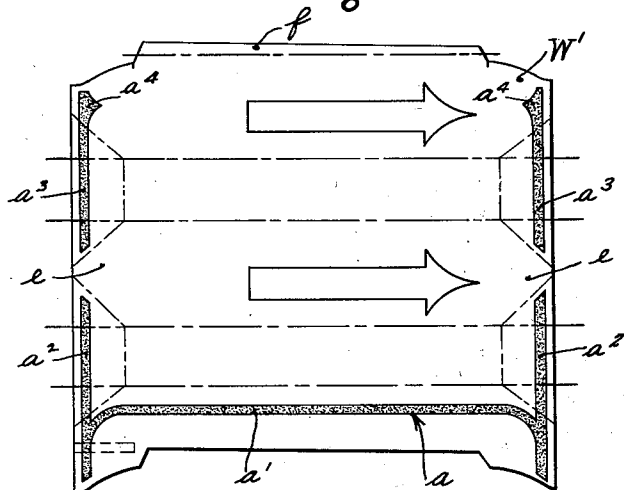


Fig. 85.

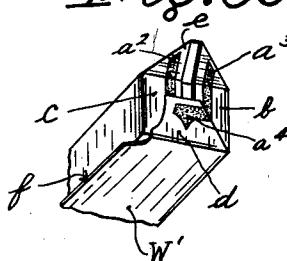


Fig. 83.

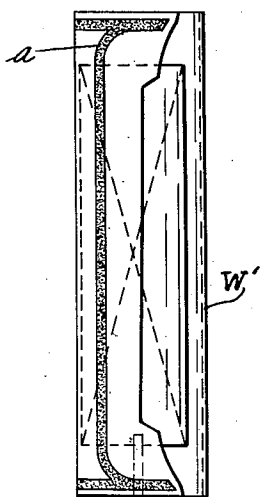


Fig. 84.

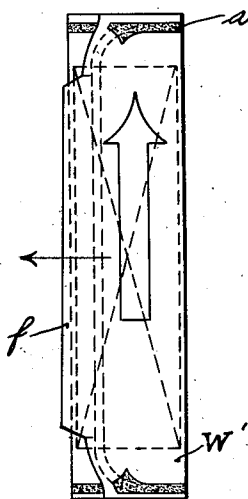
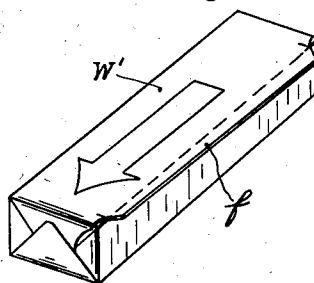


Fig. 86.



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UNITED STATES PATENT OFFICE

2,276,744

GUM WRAPPING MACHINE

Elmer Lovell Smith, Longmeadow, and Carl E. Melhorn, Springfield, Mass., assignors to Package Machinery Company, Springfield, Mass., a corporation of Massachusetts

Application December 7, 1939, Serial No. 307,996

33 Claims. (Cl. 93—4)

This invention relates to wrapping machines, and particularly to machines intended for wrapping at a very high speed such articles as gum sticks.

While gum wrapping machines have in the past been among the fastest of all wrapping machines, this invention has succeeded in more than doubling their previous output. The present machine applies an inner wrapper to single sticks of gum, with the wrapper ends folded over on the body of the stick, folds and adhesively secures a label around the wrapped stick to hold the folded wrapper ends, assembles the wrapped and labeled sticks into groups of five, and applies and seals a wrapper around each group to produce the final package. While these operations, and the general character of the machine itself, are somewhat similar to prior practice as shown for example in the Price Patent 1,491,970, April 29, 1924, the changes made in the construction and operation of the various parts, and in the coordination and timing of these parts with respect to each other, enable the present machine to operate at the unprecedented speed of over 1200 single gum sticks per minute, or 20 each second.

While the nature of the specific improvements can best be considered as the construction of the machine is being described, a few preliminary statements may be made. Instead of replacing the usual intermittent movement of the machine parts with a continuous movement, as has sometimes been attempted in order to increase the output, this intermittent movement has been so coordinated with other functions that is advantages are retained while achieving a practically continuous movement of the articles. For example, the introduction of the articles from the gum magazine into the intermittently driven tumble box in which the first wrapper is applied is commenced before the tumble box has come to rest, and the article is held positively by its forwarding pusher until after the tumble box has recommenced its rotation. Similarly, the ejection of the article from the tumble box is begun and largely completed before the tumble box has come to rest. Furthermore, the movements of the article and wrapper, and the direction of rotation and timing of the tumble box, are so coordinated that the wrapper web may be fed continuously without interference with the trailing end of the wrapper previously cut off from it and in process of being wrapped around the article. Other improvements relating to the manner of handling and assembling the articles

and to the various wrapping steps will appear from the following description and claims.

Referring to the drawings:

Fig. 1 is a fragmentary side elevation of the machine, Figs. 1, 2, 3, 8 and 10 together constituting a complete side elevation;

Fig. 2 is a fragmentary side elevation connecting with Fig. 1 along the line A—A;

Fig. 3 is a fragmentary side elevation connecting with Fig. 2 along the line B—B;

Fig. 4 is a detail looking from the opposite side of the machine from that appearing in Fig. 3 and showing a portion of the glue roll separating device;

Figs. 5 and 6 are details of the glue transfer roll taken respectively on lines 5—5 and 6—6 of Fig. 7;

Fig. 7 is a section through the outer wrapper gluing mechanism taken on lines 7—7 of Fig. 11;

Fig. 8 is a partial side elevation connecting with Fig. 1 along the line A—A and with Fig. 2 along the line C—C, its relative position respective to Fig. 2 appearing from lines A—A and B—B;

Fig. 9 is a fragmentary end view of the machine showing details of the package discharge conveyor;

Fig. 10 is a side elevation of the mechanism shown in Fig. 9 and is a continuation of Fig. 3 on the line D—D;

Fig. 11 is a transverse section through the discharge conveyor and the gluing mechanism for the outer wrapper, taken on the line of 11—11 of Fig. 3;

Fig. 12 is a section on line 12—12 of Fig. 11 showing the overload release mechanism for the glue roll;

Fig. 13 is a top plan view of the discharge conveyor for the finished packages, certain parts being broken away;

Fig. 14 is a section on line 14—14 of Fig. 13;

Fig. 15 is a front elevation of the gum magazine and associated mechanism looking on line 15—15 of Fig. 1 but taken on a larger scale;

Fig. 16 is a section on line 16—16 of Fig. 15;

Fig. 17 is a section on line 17—17 of Fig. 15 illustrating the operation of the single stick pusher and its association with the first tumble box;

Fig. 18 is a view similar to Fig. 17 but showing the single stick pusher and the tumble box at a later stage;

Fig. 19 is a section on line 19—19 of Fig. 18;

Fig. 20 is an end view looking into the entrance

of the first folding channel along line 20—20 of Fig. 1 but taken on a larger scale;

Fig. 21 is a top plan view of the mechanism shown in Fig. 20;

Fig. 22 is a section on line 22—22 of Fig. 21;

Fig. 23 is a section on line 23—23 of Fig. 22;

Fig. 24 is a section on line 24—24 of Fig. 21;

Fig. 25 is an extension of Fig. 21 showing part of the mechanism permitting quick removal of the folder;

Fig. 26 is a side view of the first tumble box;

Fig. 27 is a section on line 27—27 of Fig. 26;

Fig. 28 is a plan view showing the receiving and stacking channel for wrapped and labeled single gum sticks;

Fig. 29 is a partial section taken along the longitudinal center line of Fig. 28 showing the positively positioned stop against which the successively wrapped single sticks are assembled to form a stack and its yielding mounting.

Fig. 30 is a side elevation of the five stick pusher;

Fig. 31 is a detail of the transporters for forwarding the sticks through the first and second channels and for stacking them in the latter channel;

Fig. 32 is a top plan view of the third tumble box taken on the same scale as Fig. 2 but with the parts in the position of Fig. 73;

Fig. 33 is an end view looking into the receiving end of the stacking channel taken on line 33—33 of Fig. 28;

Fig. 34 is a section on line 34—34 of Fig. 28;

Fig. 35 is a section on line 35—35 of Fig. 2 showing the third tumble box;

Fig. 36 is a detail of the drive of the third and fourth tumble boxes;

Fig. 37 is a view of the entrance end of the transfer bridge between the third and fourth tumble boxes, taken on the line 37—37 of Fig. 2;

Fig. 38 is a view looking into the entrance end of the final folding channel taken on the line 38—38 of Fig. 2;

Fig. 39 is a detail, with the parts intermediate their positions of Figs. 17 and 18, illustrating the initial contact of a single gum stick with its first wrapper;

Fig. 40 is a detail showing the parts in the position of Fig. 39 and illustrating the action of the jogger in the gum magazine;

Figs. 41 to 46 are successive views illustrating the handling of the single stick by the first tumble box and its ejection into the first folding channel;

Fig. 47 is a detail looking into the entrance of the first folding channel and showing the method of creasing the wrapper adjacent the end of the gum stick;

Fig. 48 is a detail similar to Fig. 46 showing a later stage of the folding operation;

Fig. 49 is a sectional detail showing the position in which two successive single sticks will be left in the first folding channel by the transporter;

Fig. 50 is a detail looking into the discharge end of the first folding channel;

Fig. 51 is a side elevation of the first and second tumble boxes, the first folding channel, and the first transporter;

Fig. 52 is a detail of the second tumble box at a slightly later stage than that shown in Fig. 51;

Fig. 53 is a view similar to Fig. 51 but at a still later stage;

Figs. 54 to 57 are similar to Fig. 52 illustrating successive stages of the handling of an article

by the second tumble box and its discharge into the second folding channel;

Fig. 58 is a similar view showing the complete discharge of one single stick into the second folding channel and the transfer of a preceding stick into the assembling position, this view being a continuation of Fig. 51 along the line E—E;

Figs. 59 to 65 are successive views illustrating the stacking of five sticks of gum;

Figs. 66 to 72 are views illustrating the action of the five stick pusher which transfers the assembled stack into the third tumble box;

Figs. 73 to 78 are details illustrating the action of the third and fourth tumble boxes;

Figs. 79 to 81 are details illustrating successive stages in the passage of the gum packages through the final folding channel, alternate packages being omitted for clearness;

Fig. 82 is a view of the outside wrapper blank cut and glued for wrapping around one of the five stick assemblies, the folds to be made subsequently being indicated by dot and dash lines; and

Figs. 83 to 86 are successive views illustrating the formation of the five-stick package.

The machine has a gum magazine from the bottom of which sticks S of gum are removed one at a time and inserted together with an

inside wrapper into a first tumble box. The tumble box inverts the position of the partially wrapped gum stick in the usual manner, leaving it in position to be transferred to a first folding channel; in which the folding of the wrapper around the stick is completed, the wrapper ends are creased, and the flaps folded over on the top of the gum stick. This singly wrapped gum stick S' is forced into a second tumble box together with a previously gummed label which is completely folded around the stick and its overlapped portions sealed together upon its ejection into the second folding channel. The gum stick S² now has a first wrapper and a label, the latter holding in place the folded ends of the first wrapper. The gum sticks S² are collected in groups of five and the assembled group is moved into a third tumble box together with a wrapper which has been previously cut, printed with hot adhesive, and chilled. Upon its ejection from the third tumble box the wrapper is circumferentially folded around the stack S³ of individually wrapped packages. The stack in this form is pushed through a bridge, passing into a fourth and final tumble box which inverts the package so that its folds will come in the desired relation. The rear end tucks are made upon ejection from the fourth tumble box and the remaining folds are made in a folding channel by stationary folders of standard character.

The packages, which have been wrapped in a wrapper printed with a cement capable of being softened by heat, are carried down a delivery channel between steel belts which are heated in order to fuse and seal this cement. The several mechanisms will now be considered separately.

The gum sticks S are received in a gum magazine 100 (Figs. 1 and 15-19) mounted on the frame 101 of the machine. The front wall of this magazine is cut away at 102 to form flanges permitting fresh gum pieces to be inserted, while the rear wall of the magazine is cut away at 103 to permit the ejection of the lowermost gum stick. The gum sticks rest upon rails 104 carried by a bracket 105 as shown in Figs. 15, 16 and 19. The single stick ejector is specially designed

for high speed work. It comprises a four-part finger 106 fastened to a bent arm 107, the shape of which is best shown in Fig. 1. This arm is pivoted to a crank pin 108 secured to a shaft 109 and provided with a counterweight 110. At the bend of the arm 107 it is pivoted at 111 to a freely swinging link 112 mounted on the machine at 113. The shaft 109 is coupled by gearing 114 and a chain 115 to the main drive shaft 116.

The path of the upper front corner of one of the pusher fingers 106 is shown in dot and dash lines at 117 in Figs. 17 and 18. The finger moves steadily against the lowermost gum stick in a substantially horizontal line having a slight rise 118 near the end of its forward movement for a purpose to be described below. The pusher then returns along the lower curved path 119 to its initial position, passing well underneath the magazine so that the sticks have ample opportunity to drop down firmly upon the rails 104. Due to the nature of the linkage the motion of the pusher is much smoother than has been the case with prior devices, and more chance is given the articles to settle into position in the magazine. Further assistance in this regard is given by the novel shape of the pusher, the gum-contacting part of which is narrow and rounded, instead of being wide and flat as in the usual case. Because of its path of movement and its shape the pusher, after pushing out one gum stick, is almost instantaneously out of the way of the next stick descending in the magazine.

Throughout the operation of the machine, and in particular during the return stroke of the pusher along the lower path 119, a jogging finger 120 (Figs. 1, 15, 16 and 19) is constantly tapping one end of certain of the lower sticks in the magazine to cause them to descend smoothly in the magazine and to preserve accurate alignment. The finger does not touch the lowermost stick, and thus will not slow down its fall upon rails 104. This finger is pivoted at 121 and has a slanting upper portion which contacts a cam roll 122 as shown in Fig. 15. The cam roll is mounted upon a bell crank 123 (Fig. 1) having its other end forked to embrace a cam 124 mounted on a shaft 125 driven by any suitable source of power. A spring 126 maintains the jogger in contact with the cam roll, and an adjustable stop 127 prevents excessive travel of the lower part of the finger away from the magazine.

The gum stick removed from the magazine as just described above is carried (Figs. 39 and 41) into the first tumble box 130 together with the inside wrapper W, which is of a length to go around the stick with a slight overlap and of a width to extend beyond the ends of the stick sufficiently to permit the margins being folded over on the top of the stick as will be described. The wrapper is fed continuously down a chute 131 by any suitable wrapper feeding mechanism not illustrated in detail herein but of a known type which severs the wrapper from the original web and has feed rolls 129 which release the severed web when it is grasped between the gum stick and the tumble box pocket. The tumble box is provided with an arcuate cover 132 which assists in the handling of the wrapper as will be described below.

The construction of the tumble box 130 is best shown in Figs. 26 and 27. It comprises a generally cylindrical body portion slotted at 133 to form gum receiving pockets. Grooves 134 are cut in this cylindrical body to receive dogs 135, each pivoted on a pin 136 and carrying a gum con-

tacting roller 137. Each dog is pressed in a direction to carry its roller against a gum stick by a spring 138 and carries a pin 139 to limit its motion in case no gum stick is present. The side portions 141 of the tumble box are separated slightly from its main body in order to permit the passage of the transporter mechanism to be described below. The entire tumble box is keyed at 142 to a shaft 140 and is held in place on the shaft by a bolt 143.

The tumble box shaft is rotated intermittently so as to bring the tumble box to rest four times during each revolution. It is preferred to drive the tumble box by a wobble gear drive as illustrated in Fig. 36, which is preferably provided with a locking mechanism described in the Smith application Serial No. 265,890, filed April 4, 1939, and not shown herein. This type of intermittent drive has the great advantage of possessing sufficient smoothness of operation to permit its use at very high speeds while being positively locked during rest periods. In the present instance the machine is designed to be operated at speeds from 1,000 to 1,200 gum sticks per minute, and it is highly important that a drive of the type described be used in order to permit the rotating parts to start and stop without shock.

The operation of delivering a single stick from the magazine into the tumble box and associating it with its wrapper will now be described in connection with Figs. 17, 18 and 39 to 42. As previously described, the pushing finger 106 travels along the path 117 initially in a horizontal direction. During the first part of the travel of a gum stick out of the magazine the tumble box, while slowing down, is still moving and the gum stick will start to enter one of the pockets before the tumble box has come completely to rest. The tumble box has a dwell of about 90°, or about a fourth of the cycle during which one individual gum stick is fed, but the parts are so timed that the transfer of the gum stick is spread over a larger fraction of the cycle than this. Since the gum stick has started to enter the pocket before the tumble box has come completely to rest, the initial contact of the gum stick with the tumble box pocket will take place at the level at which the gum stick is traveling from the magazine on the rails 104. It follows that the position in which the tumble box pocket stops will be slightly higher than the level of the top of the rails 104. As is clearly shown in Fig. 18 it is for this reason that the slight rise in the travel of the pusher 106 is provided at the point 118, the final positioning travel of the pusher being in line with the stationary pocket and pushing the gum stick firmly into place within it.

The advancing gum stick contacts the wrapper W and carries it into the pocket as shown in Fig. 41, folding the wrapper across the top and bottom of the stick. During the passage of the gum stick into the pocket the trailing end W (Fig. 41) of the wrapper travels out of the chute 131 extremely rapidly, moving well away from the leading end of the wrapper which is following it. During the initial movement of the tumble box from its rest position, however, the motion of the trailing wrapper end would normally tend to slow down, and in order to preserve the necessary high speed of web travel it is necessary to make provision for keeping the trailing end W clear at all times of the leading end of the next oncoming wrapper. This is accomplished by means of the arcuate cover 132

which, in distinction to prior machines, projects well into the angle formed by the path of a gum stick advancing from the magazine and the path of the advancing wrapper. As the tumble box accelerates, the trailing end W (Fig. 42) of the wrapper will be dragged around the edge of the cover 132 and its rear end will be caused to travel rapidly away from the leading end W' of the wrapper behind it. The snubbing of the wrapper around the edge of the cover 132 also has the effect of tightening the wrapper around the article.

The partly wrapped gum stick is carried around within the cover 132 as shown in Fig. 43, and is finally brought into adjacency with the throat 145 of the first folding channel as is shown in Fig. 44. Here again the high speed of the machine necessitates the use of a mechanism different from that which is standard in this type of machine. In the present instance it will be noted from Fig. 44 that the gum stick is striking the forward edge of a finger 146 carried by a transporter 147. Even before the tumble box has come to rest the finger 146 which is given a generally circular motion along the path 148 by mechanism to be described below; has made contact with the stick and has initiated its discharge from the pocket. The front edge of the finger is preferably beveled at 149 to ease the initial contact with the gum stick.

As can be seen from the position of the transporter finger in its circular path in Fig. 44 (the path being that of the upper left-hand corner of the finger), it has already moved beyond the strict mid-point of its travel and has started to move forwardly. In Fig. 45 the tumble box has still not reached its rest position by 30° of the individual stick cycle; and yet, as will be seen, the partly wrapped gum stick is half-way ejected from the pocket. The dwell position of the tumble box has just started in the position shown in Fig. 46 and it will be observed that in this position the package has been completely removed from the tumble box pocket and that the transporter still has about half of its forward movement to go. In the various positions in the cycle referred to for the tumble box, the degrees referred to are indicative of elapsed time and not angles, the entire process of manipulating each single gum stick being considered as divided into 360 equal intervals as is customary.

Upon its ejection from the first tumble box in the manner described the partially wrapped gum stick S' is received in a first folding channel best shown in Figs. 20 to 24 and 46 to 51. This folding channel has novel characteristics in that it may be removed bodily from the machine carrying with it the partially wrapped packages within it. Any defectively wrapped package may be removed without disturbing in any way the other package which is within the channel, it being understood that there are two packages within the channel at all times. The folding channel overlies a transporter bridge 155 mounted by its ends on bearing 156 (Figs. 1 and 2) so that this bridge serves as a partial support for both the first and second wrapping channels. The bridge is formed in three sections laterally spaced by slots 157 through which the transporter fingers pass.

Overlying the three sections of the transporter bridge is a member 158 extending into a vertical slot 158' in a projecting portion of the main frame 101. The member carries a cross

pin 159 slidable into a transverse slot 160 formed in the same frame extension. By this mounting the inner end of the member 158 is held firmly during normal operation of the machine but may be disconnected readily if it is desired to remove the folding channel. At the other end of the member 158 is a handle 161 through which passes a pin 162, the inner rounded end of which is adapted to pass through a hole 163 in a small bracket attached to the transporter bridge. A spring 164 (Fig. 25) bears on the end of the pin 162. The pin may be thrown outwardly or clamped in its inner position by a thumb screw 165 passing through a slot 166 in the handle 161 and threaded through the rod.

To the member 158 at opposite sides of the folding channel are secured members 167 having inwardly extending bottom supports 168 for the gum stick. As will be seen in Fig. 20, these bottom supports rest upon the two outer sections of the transporter bridge and their upper faces are on the same level as that of the center section of this bridge. The supports 168 engage the ends of the gum sticks and, when the folding channel is removed from the machine, form the supports which prevent the partially wrapped sticks from falling out. Also carried by the member 158 and overlying the bottom supports 168 are blocks 169 spaced as at 170 from the members 167 and flared as at 171 (Fig. 22) to guide the incoming package. It is into the throat formed between the flared portion 171 and the bottom supports 168 that the partially wrapped gum sticks are delivered from the first tumble box as the latter is coming to rest.

Each of the blocks 169 carries a stationary creasing plate 172 which engages the wrapper just beyond the end of the gum stick and forms a crease upon which the wrapper may be folded. The members 167 and 168 are formed in the usual way with curved folding surfaces 173 and 174 by which the ends of the wrapper are first turned vertically as at the right in Fig. 49 and are then turned over on the body of the gum stick in the manner indicated as being partially completed at the left on Fig. 49 and as being completely finished in Fig. 50.

The central portion of the top of the folding channel is formed by a plurality of top plates 175 shown as being two in number. Each plate has its side formed as hooks 176 which engage in channels 177 formed in the sides of members 178 suitably secured to the member 158. These top plates are pressed downwardly by springs 179 located in recesses 180 in the member 178.

One of the members is preferably provided with a hole 181 through which passes a pin 182 having its upper ends screw threaded as shown at 182 in Fig. 20 and clamped in the forked end of a lever 183 by a screw 184. This lever is pivoted at 185 to the member 158 and is pressed by a spring 186 in a direction to cause the pin 182 to press downwardly on the top plate 175. At its end remote from the pin the lever has a flat portion 187 adapted to engage the operating pin 188 of a switch 189. This mechanism is adapted to prevent any injury to the machine in case articles become jammed in the folding channel, and for this purpose the switch 189 is so connected to the driving motor that the machine will be stopped in case the top plate 175 is elevated abnormally by the pressure of articles under it. It will be observed that the lever 183 will be removed from the machine along with the member 158 without the necessity of

making any adjustment of switch 189. The plates 175 have guide pins 190 passing freely into holes 191 in the members 178 and 158.

The articles are carried through the first folding channel by a succession of fingers on the transporter 147. The first finger 146 has been described previously. The intermediate finger 200 is of the usual construction and needs no special description except that it may be beveled on its rear side to prevent interference with the oncoming package. The last finger 201 is similar in shape to finger 200 but is somewhat longer, so that its contact with the partially wrapped stick, when it forces the latter into the second tumble box, will be prolonged somewhat in the manner of the gum stick pusher 106 previously described. The transporter 146 is secured as best shown in Fig. 31 to an arm 202 pivoted at 203 to a crank 204 on a shaft 205 (Fig. 1), and pivoted at 206 to a crank 207 on a shaft 208. Each of these cranks is provided with a counterweight 209 so that the parts may operate at the high speed required without bringing unbalanced forces into play. As shown in Fig. 1 the shaft 205 is provided with a sprocket 210 around which passes the chain 115 previously mentioned. Gearing 211, 212 and 213 connects the shaft 205 to the shaft 208. The second transporter 214 (Fig. 31) is likewise connected with the arm 202 and therefore moves in unison with the first transporter. The detailed construction of its transporting fingers will be described below.

It may be mentioned at this point that different figures are taken at different points in the cycle, and since the timing of the parts is of such great importance due to the high speed for which the machine is designed a brief reference will be made to the points in the cycle at which various views are taken. The zero degree position of the transporter may be taken as that in which the crank pin 204 is on a horizontal line directly to the right of the center of the shaft 205. Using this basis, Fig. 53 is taken with the crank having revolved counterclockwise 2°; Fig. 54, 30°; Fig. 55, 57°; Fig. 56, 90°; Fig. 57, 117°; Fig. 58, 180° (bringing the transporter to its most completely advanced position); and Fig. 52, 240°. These various positions are indicated on Fig. 53.

The partially wrapped articles S' are delivered from the first folding channel by the transporter finger 201 into a pocket of the second tumble box 215 in somewhat the same manner as that in which the single gum sticks were placed in the pockets of the first tumble box. This tumble box may be made in the same manner as the first and as illustrated in Figs. 26 and 27. The articles are supplied with labels L at the entrance of the second tumble box by any suitable form of label feeder. As in the case of the first wrappers the labels come down a chute 217 and are released as the article comes in contact with them. Also in a similar manner the labels are drawn around the edge of the cover 218 to cause their trailing ends to move rapidly out of the chute.

The label L goes around the body of the gum stick only, not extending beyond the ends of the stick, and holds the folded over ends of the inner wrapper firmly in place. For this purpose the wrapper is gummed on the inside of its trailing edge by a dauber 230 (Fig. 1) rotated in any suitable way in timed relation to the wrapping machine and bearing against a roll 221 extending into a glue pot 222. The wrapper chute and the tumble box are suitably cut away so

that the glued portions will not contact them. Since it is the function of the label to hold the inner wrapper tightly in place it must be drawn snugly around it. For this purpose a tension plate 223, the function of which is best shown in Figs. 54, 55 and 56, is attached to the cover 218 adjacent the delivery point of the tumble box. The cover 218 is pivotally mounted on a shaft 224 (Fig. 1) and is rocked counter-clockwise as viewed in that figure by a tension spring 225. An adjustable screw 226 contacts a stationary stop 227 to limit the amount of motion which can be given by the spring. As will be seen in Figs. 54 and 55, the initial operation of the tension plate is to hold the label snugly against the surface of the tumble box and insure that it will be tightly held around the corner of the gum stick as the latter is ejected from the pocket. It also continues this tension and irons the label down upon the gum stick during its ejection as shown in Fig. 56.

The wrapped and labeled package S² is ejected from the tumble box by a finger 230 mounted on the transporter 214 in substantially the same manner as that in which the stick was ejected from the first tumble box. Here again the ejection of the gum stick is begun and very largely completed before the tumble box has come to rest. For example, Fig. 55 shows the tumble box with 34° of its cycle still to be completed before it comes to rest and starts its dwell of about 90°. It may be pointed out again that the 34° referred to does not relate to the angular position of the tumble box but to the time in the cycle at which the particular view is taken. Since the tumble box is accelerated and decelerated nearly harmonically, it is moving relatively slowly in the position of Fig. 55 and although it has a considerable time to go before coming to rest the angle to be moved through is not great. Throughout the views the angle of the cycle has been used in this way to denote the position of the tumble box. The transporter having a simple movement, position and time are interchangeable with respect to it.

The channel into which the gum sticks are delivered from the second tumble box presses the label to cause its ends to be sealed together, and is provided with mechanism to be described below for assembling the gum sticks into stacks of five. The first part of the channel is composed of the transporter bridge 155, the parallel portions of which are in this case on the same level and support the sticks directly. The top part of the channel is formed by a carrier 235 best shown in Figs. 28 and 33. This carrier is mounted upon a shaft 236 extending through the frame and supported both at some point in the rear thereof and in a bearing 237 in an extension at the front of the frame. The carrier is adapted to be removed from the machine by means of a handle 238 which in this case pulls straight out, causing the shaft 236 to be withdrawn. The carrier is held in place by dowels 239 (Fig. 58) and it is locked by a trigger 240 having a hook 241 engaging a latch 242 on the transporter bridge. The carrier is provided with yieldable top plates 243 and 244 and with an arm 245 operating a switch 246 as in the case of the first folding channel.

Projecting forwardly along the channel are a pair of spaced fingers 250, each secured to a shaft 251 mounted in the carrier 235. A collar 252 is secured to this shaft and serves as an anchor for

one end of a helical spring, the other end of which rests on some non-rotating part as shown in Fig. 28. By means of this spring the fingers 250 are urged constantly toward the transporter bridge 155 and against a limit stop 254 so that the fingers may serve to hold in place the several gum sticks during the process of stacking.

The individually wrapped gum sticks S^2 are fed by the finger 232 against a yielding stop, the construction of which is shown in detail in Fig. 29, and except for the points to be mentioned in Fig. 34 of Patent 1,185,822. The stop finger 255 is formed as a bell-crank pivoted at 256 to the transporter bridge 155. The lower arm of this bell-crank has a slot terminating in a flat face 257 adapted to make contact with the flat face 258 of a latch piece 259 mounted within the slot and pivoted therein by a pin 260. A spring 261 is fastened between the latch piece and a stationary part of the machine and in the present case is arranged at such an angle that when the two flat faces 257 and 258 are in contact as in Fig. 29 the center line of the spring will pass nearly through the pivot 256. It will be seen that by this arrangement the spring will exert a tendency to hold the stop finger 255 in the vertical position of Fig. 29 and yet as soon as contact between the flat faces is broken as in Fig. 69 and 70 the spring acts substantially directly upon the pivot pin 260 to hold the stop finger in its raised position with a flange 262 thereon resting against the sides of the transporter bridge. This construction gives the same facility of passage to the stack as in the former case but with more positive positioning during the stacking operation. The spring 261 is adjustably secured on a rod 261' as best shown in Fig. 1 so that the desired balance of the parts may be obtained.

The operation of assembling a stack of five gum pieces will now be considered with particular reference to Figs. 58 to 70. In Fig. 58 a wrapped gum stick has been delivered almost up to the stop finger 255 by the transporter finger 232 and left in that position as the transporter makes its return stroke. On the next forward stroke of the transporter, rolls 263 on the front end of the second transporter 214 ride underneath this advanced gum stick and raise it against the spring pressure of the fingers 250 as shown in Figs. 59 to 61. As the transporter goes forward the rolls 263 pass underneath the gum stick, carrying it firmly against the stop finger 255 and at the same time holding it at a height sufficient to permit finger 232 to deliver a second gum stick underneath it (Fig. 62). The second gum stick is left underneath the first in the same position as that shown in Fig. 63 but with the original gum stick on top of it, the finger 250 being raised against its spring pressure to hold the two sticks firmly in place (Fig. 63). The same operation continues until four gum sticks are elevated by the rollers in which case they come practically underneath the top guide 264 of the stack transfer channel (Fig. 64). The next forward stroke of the transporter finger 232 (Fig. 65) will introduce a fifth gum stick underneath the stack and will leave it in this position as indicated in Fig. 66. From this position the stack is fed as a unit by a five-stick pusher 265 having a cycle five times as long as that of the transporter and traveling through a path 266 shown in Fig. 68 and in various other figures. The driving mecha-

nism by which the five-stick pusher is given this motion will now be described.

The five-stick pusher 265 is composed of side pieces 270 fitting, as shown in Fig. 28, in the space between adjacent members of the transporter bridge. These side pieces are secured at 271, Fig. 30, to a yoke 272 forming the upper end of a lever 273. The lower end of the lever is pivoted at 274 (Fig. 1) to a rocker 275 which is itself pivoted at 276 to the frame. A link 277 straddles the lever 273 and is pivoted to it at 278. One end of the link is pivoted at 279 to a rocker 280 (Fig. 2) swinging on the frame, and its other end is pivoted to a crank pin 281 secured to a shaft 282 and provided with a counterweight 283. This shaft is driven by elliptical gearing 284 from a shaft 285 geared at 286 to the shaft 208 previously referred to.

The motion of the five-stick pusher is shown in Fig. 68, each of the numbered divisions in this figure indicating 10° rotation of the constantly driven shaft 208. The latter shaft rotates once for each cycle of the two transporters and the gearing 330 is of a one to five ratio, so that the five-stick pusher travels through the path of Fig. 68 once for every five cycles of the first two transporters. This fact has been illustrated in Fig. 72 in which five successive positions of the five-stick pusher have been shown. Each of these positions corresponds to that at which the first two transporters are at the top of their travel.

Due partly to the nature of the linkage by which the five-sticker pusher is driven and partly to the elliptical gears 284 the travel of the five-stick pusher is non-uniform, picking up the stack as shown in Figs. 66 and 67 and then advancing very rapidly to clear the stack from the assembling station before another stick is brought into place to form the basis for a new stack. From then on the pusher moves at a continued high speed until the stack is received in the next tumble box, then slows down to position the stack accurately, and finally recedes at a very low rate of speed. In the position shown by I in Fig. 72 the last stick of a stack is being delivered into place as shown in Fig. 65 and the five-stick pusher is just rising to take the assembled stack away, just barely clearing the next advancing stick. In the position shown by II the stack has been moved away out of the way of the stick being advanced by finger 232, this being the one shown in Fig. 72 as resting upon the rolls 263. The full line position III of Fig. 72 shows the assembled stack positioned in the tumble box and the second stick of a new stack on its way into place. The remaining positions of the five-stick pusher are idle and of no significance except to note the slowness of the travel of the pusher during its return stroke. It should also be noted that the first operation of the five-stick pusher is to push the lowermost stick into line (Figs. 67 and 69), and that while the stack is tilted during its transfer it is straightened up as the pusher leaves it in the tumble box pocket (Figs. 70 to 72).

The direction of rotation of the second tumble box has a direct bearing on the stacking operation. In the older machines, typified by Patent 1,185,822, the labeled single sticks were delivered to the stacker with their overlapping folds on the bottom, and with the outer lap pointing towards the oncoming sticks. The friction of a stick sliding under the partially formed stack was therefore liable to loosen the label on the stick above it. In accordance with the present

invention the overlapping folds are on top, so that as a stick is pushed into position the tendency is to tighten the label around it without disturbing the label on the stick above it.

As stated above, the final wrapper is printed with fused cement or wax and then cooled; and is wrapped around the article while the cement is in this cooled condition and is therefore non-adhesive. The mechanism for printing the fused cement upon the web W' is best shown in Figs. 3 to 7, 11, and 12. The web is supplied from any suitable source to a roll 300 mounted in blocks 301 vertically slidable in ways 302 formed in a bracket 303. A spring 304 tends to force the blocks upwardly, this upward movement being limited by contact of an adjustable post 305 on the top of each block with a cam 306 on a cross shaft 307 best shown in Fig. 4. This shaft carries a stop arm 308 which may contact with either side of a stop piece 309. It also bears an arm 310 connected to a toggle spring 311 which will hold the shaft in either extreme position. By means of a handle 312 the shaft may be rocked to permit the springs 304 to raise the roll for the purpose of facilitating the feeding in of the paper web. A set screw 313 may hold the posts 305 in their adjusted position so that the proper degree of contact between the web and the glue applying roll may be maintained.

The cement or wax applying roll 315 is provided with a raised printing surface 316, the general nature of which is best shown in Fig. 82 where the stippled portions *a* show the pattern of adhesive printed upon the wrapper. The raised portion 316 bears against the web W' carried upon the roll 300, the latter being cut away at 317 in order to prevent transfer of adhesive to the roll 300 in case no web is present. The roll 315 receives its adhesive from a pick-up roll 318 dipping into a tank 319. The top of tank 319 is closed except for the rolls, and electric heaters 320 are provided to keep the adhesive in molten condition. Similarly a heater 320' is mounted within the roll 315 to keep it warm by radiant heat; both heaters being conveniently controlled by a suitable unit 321. The various rolls are suitably geared together and are driven by a chain 322 forming a connection to a shaft 323 (Fig. 2) coupled by chain 324 to a shaft 325, which in turn is driven by a series of gears 326, 327, 328, 329 and 330 from the shaft 285 previously described. An overload release 331 (Fig. 12), is preferably interposed between the shaft 332 of roll 318 and its driving gear 333, to prevent breakage if the machine is started with the cement cold.

The coated web after leaving the roll 300 passes underneath and in contact with a cooling plate 335 (Fig. 8) having a hollow interior and provided with connections 336 for the circulation of water or other refrigerant. With the adhesive on it now hardened so that it can easily be handled the web is passed over a guide roll 337 and between suitably driven feed rolls 338 and cutting rolls 339 into a guideway 340. For the same purpose roll 300 is preferably chilled by an inlet pipe 341 and a discharge pipe 342 connected to the piping 336. The roll turns on a stationary sleeve 343, oil wicks 344 providing lubrication.

By inspection of Figs. 82 to 85 it will be apparent that, by the method of applying the cement to the wrapper above described, it is possible to locate the cement in places where contact will be made with it by the various folders. Since the cement has been reduced by cooling to a non-adhesive condition contact with the fold-

ers does no harm and it is thus possible to locate by a single printing operation areas of adhesive in places where it would be otherwise impossible. A much tighter sealed package may thus result. The location of the cement strip, being independent of the necessity for avoiding parts of the machine, it is possible to secure a hermetically sealed package without any exposed adhesive. The stip, as shown in Fig. 82, extends across the wrapper at *a*¹, and along each side in two segments *a*² and *a*³ separated sufficiently to avoid getting any adhesive on the outside of the last triangular end flap *e*. The segments *a*³ have enlargements *a*⁴ which insure adequate cement for the center of flap *e*.

The wrapper W' is delivered through the guideway 340 into a position in the path of a stack of gum being advanced by the pusher 265 and adjacent the third tumble box 350. This tumble box is provided with diametrically opposed pockets 351 (Fig. 73), outstanding longitudinally from the hub of the tumble box, and each having one side 352 supported by a spring 353 and each provided with stop ledges 354. Each side of the tumble box is open between the pockets except for a curved wrapper guide or horn 355 which as shown in Figs. 77 and 78 precedes the pocket and acts as a guide for the advancing web W'. The tumble box is also provided with a cover 356. In this case the side of the wrapper guideway 340 acts as an abutment to cause rapid travel of the trailing end of the wrapper out of the guideway in the same manner as the cover 132 of the first tumble box.

The article with the wrapper folded circumferentially around it is ejected from the third tumble box onto a bridge plate 357 about which a top plate 358 is secured as by screws 359 (Fig. 37). The bridge plate serves to perform the final step of the circumferential wrapping operation (Fig. 74), acts as a guide along which the wrapped stack travels into the fourth tumble box 360, and separates the tumble boxes sufficiently to permit the return of the ejector. The tumble box 360 is similar in construction to the third tumble box except that the horns 355 are omitted, and need not be described in detail. It is used primarily to invert the article so that the projecting tearing tab *f* will lie on the bottom, but also permits the folding operation to be divided between first and the third tumble boxes so that tucks are formed only after the circumferential wrapping is completed.

As stated above, the travel of the various tumble boxes is preferably accomplished by a wobble gear mechanism to the type described in the Smith application Serial No. 265,890, in which the tumble box is positively locked at each rest period. For completeness a simple wobble gear mechanism has been shown in Figs. 35 and 36 but without the locking mechanism. The shafts 361 and 362 which support the third and fourth tumble boxes respectively are connected by gearing 363. To the shaft 361 is secured a gear 364 which meshes with an idle gear 365 engaging a gear 366 fixed on a crank pin 367 rotating about the shaft 368 which carries the gear 327 previously described. The shaft on which the gear 365 rotates is connected with shaft 361 by a link 369 and to the crank pin 367 by a link 370. The gear 364 being twice as large as the gears 365 and 366, the tumble boxes will be rotated a half a revolution at a time with an intermittent dwell of about 90° as fully described in the Smith application.

Both the third and fourth tumble boxes are

served by a single ejecting mechanism having ejectors 375 and 376 mounted on a carrier 377. This carrier is slidable on a rod 378 and has its lower end forked at 379 to straddle a bar 380. It is connected by a link 381 to an arm 382 (Figs. 2 and 35) extending from a rocking sleeve 383. This sleeve also carries an arm 384 connected by a link 385 with a crank 386 rotating about the shaft 368 and provided with a counterweight 387. Each ejector is provided with notches 388 (Fig. 35) to clear the stops 354 and the ejector 376 is provided with tucking plates 389 notched to interfit with the tucker 390 in the final folding channel. The final end folding operations as shown in Figs. 85 and 86 are performed by stationary folders 410 and 411 (Fig. 80) of the usual type.

The articles are pushed along in the folding channel by contact of one package with the next (alternate packages being omitted from Figs. 79 to 81 for clarity) until they reach opposed belts 391 (Fig. 3) extending about pulleys 392 connected by gearing 393 to a shaft 394 of a motor 395. The belts are preferably driven at a slightly higher speed than that at which the packages are moving so that the latter will be separated as shown in Fig. 3. At the other end of their run the belts pass over the pulleys 396 mounted on a slide 397 adjustable longitudinally by screws 398 (Figs. 9 and 10). The pulley shaft mounting is fastened to the slide 399 and is provided with an arm 400 adjustable by a screw 401 to vary the tilt of the pulley shaft and thus insure true running of the belt. The slides 397 are pressed by a spring 415 in a direction to keep the belt tightened in case it expands due to the heat of sealing. The belts, which are preferably formed of steel, pass over electrically heated members 405 and the packages pass over an electrically heated plate 406, being pressed down against the latter by a roll 407 carried on a swinging arm 408 pressed downwardly by a torsion spring 409. By this means the fusible cement or wax previously printed upon the wrapper is sealed. The belts are preferably provided with a cover 412 to retain the heat. They deliver the packages to the usual discharge channel 413, having side plates 414.

A few mechanical details may be grouped together at this point. It will be observed that all of the package handling parts project from the frame 101 while the gearing is behind it. The gearing is preferably enclosed by a cover (not shown in Fig. 35) so that an oiling system of any desired type may be used. Any bearings located outside the frame are preferably of the oilless type.

The stack assembling station is preferably made so that the stack can readily be removed in case of trouble. One side of the station is provided with a side plate 419 and an overhanging plate 420 (Fig. 34). At the other side is a side plate 421 and a top plate 422 carried by a swinging arm 423. This arm is carried by a pivot 424 and has a latch 425 engaging a stationary pin 426. A lug 427 holds the arm in open position. The final folding channel is similarly adapted to be opened up, its top plate 430 (Figs. 2 and 37) being carried on an arm 431 pivoted at 432 and provided with a handle 433, an adjustable stop 434, and a spring pressed detent 435 engaging either of two notches in a plate 436.

We claim:

1. In a wrapping machine, an intermittently rotatable pocketed tumble box, an article maga-

zine located in close adjacency to the tumble box, means for locating a wrapper between the magazine and the tumble box, a pusher for conveying articles from the magazine into a pocket of the tumble box and having a width substantially less than that of the articles, and mechanism for moving the pusher in a substantially straight path to carry an article from the magazine into the tumble box and then in a curved return path below the magazine to its initial position.

2. In a wrapping machine, an intermittently rotatable pocketed tumble box, an article magazine located in close adjacency to the tumble box, means for locating a wrapper between the magazine and the tumble box, a pusher for conveying articles from the magazine into a pocket of the tumble box and having a width substantially less than that of the articles, and mechanism for moving the pusher in a looped path having a substantially flat top, said feed mechanism comprising a bent arm upon one end of which the pusher is mounted, crank means for moving the end of the arm remote from the pusher in a circular path, and a swinging arm pivoted to the bent arm at the bend thereof.

3. In a wrapping machine, an intermittently rotatable pocketed tumble box having non-radial pockets, mechanism for rotating the tumble box, a feed channel adjacent the tumble box, a wrapper feed for inserting a wrapper between the feed channel and the tumble box, means to bring the tumble box gradually to rest with a pocket in line with the feed channel and to start it gradually in rotation after a definite dwell, a feed member for carrying articles along the feed channel and into the tumble box, and mechanism for moving the feed member along the feed channel to carry the article partially into the tumble box pocket before the tumble box has come completely to rest.

4. In a wrapping machine, an intermittently rotatable pocketed tumble box, article feeding means to introduce an article into a pocket of the tumble box at a rest position thereof, wrapper feeding mechanism continuously delivering wrapping material into a position between the tumble box and the article feeding means, mechanism timed to release the wrapper as the forward end thereof is engaged between an article and the tumble box, mechanism for rotating the tumble box intermittently in a direction towards the advancing wrapper, and an abutment located sufficiently close to the tumble box and to the feeding path of the article to cause the trailing end of the wrapper to be bent around it upon the initiation of rotation of the tumble box and thus to cause said trailing end to be moved rapidly away from the incoming end of the oncoming wrapper.

5. In a wrapping machine, an intermittently rotatable pocketed tumble box, an article magazine located close to the tumble box adjacent a rest station of the pocket thereof, wrapper feeding mechanism continuously delivering wrapping material into a position between the tumble box and the article magazine, mechanism timed to release the wrapper as the forward end thereof is engaged between an article and the tumble box, mechanism for rotating the tumble box intermittently in a direction towards the advancing wrapper, a pusher for conveying articles from the magazine into a pocket of the tumble box, mechanism for moving the pusher in a substantially straight line to convey articles

from the magazine to the tumble box and then in a curved path below the bottom of the magazine to return to its initial position, and an abutment located sufficiently close to the tumble box and to the feeding path of the article to cause the trailing end of the wrapper to be bent around it upon the initiation of the rotation of the tumble box and thus to cause said trailing end to be moved away from the end of the oncoming wrapper.

6. In a wrapping machine, an intermittently rotated tumble box, an article magazine located in close adjacency to the tumble box, means for locating a wrapper between the magazine and the tumble box, an article support below the magazine, a pusher for conveying articles from the magazine along the support into a pocket of the tumble box, mechanism for moving the pusher in a substantially straight path to carry an article from the magazine to the tumble box and then in a curved return path to its original position sufficiently below the support to avoid interference with an article on said support, and means for jogging articles in the magazine during the return stroke of the pusher to cause the lowermost article to settle squarely upon said support.

7. In a wrapping machine, a tumble box rotatable on a fixed axis and having a plurality of non-radial pockets, an article feeding guide positioned adjacent the tumble box, mechanism for rotating the tumble box intermittently with the dwell positions of the pockets approximately in line with said guide and on that side of the fixed axis toward which the pocket rotates, an article pusher, and mechanism timed with the tumble box for moving the pusher in a direction to feed an article into a pocket both during that part of the rotation of the tumble box just prior to the pocket coming to rest and during the rest period.

8. In a wrapping machine, an intermittently rotatable tumble box having non-radial pockets, an article feeding station in line with a rest position of the pockets, a pusher at said station operable to carry an article into a pocket, a delivery station angularly spaced about the tumble box from the feeding station, mechanism for rotating the tumble box intermittently in the direction in which the article is moved into the pocket and towards the delivery station, and mechanism for operating said pusher timed to introduce a stick partially into a pocket before the rotation of the tumble box towards the delivery station starts.

9. In a wrapping machine, an intermittently rotatable tumble box having non-radial pockets, an article feeding station in line with a rest position of the pockets, a pusher at said station operable to carry an article into a pocket, mechanism for rotating the tumble box intermittently in the direction in which the article is moved into the pocket, and mechanism for operating said pusher timed to introduce a stick partially into a pocket before the rotation of the tumble box starts, and coordinated to move in part in the direction in which the pocket moves when the tumble box is near its rest position.

10. In a wrapping machine, a tumble box having article receiving pockets, mechanism for rotating the tumble box intermittently, and means for discharging an article from a pocket operable on the article at least in part during the rotation of the tumble box.

11. In a wrapping machine, an article feeding device, a rotating pocketed tumble box, continuously operating means for feeding a wrapper be-

tween the device and the tumble box so timed as to release a wrapper as the article contacts it, with the wrapper extending a lesser distance beyond the article than on that side adjacent the wrapper feeding means, means for rotating the tumble box intermittently in a direction towards the wrapper feed, and a folding abutment located adjacent the rest position of the pocket so that the wrapper will be bent sharply around it during the movement of the tumble box.

12. In a wrapping machine, an intermittently rotatable tumble box having a plurality of non-radial pockets, means for delivering articles successively into said pockets at one rest station thereof, a discharge channel located near another rest station thereof, an ejector interfitted with the tumble box and movable towards the discharge channel, means for rotating the tumble box intermittently in a direction to move the articles towards contact with the ejector by the rotation of the tumble box, and means to feed wrappers between the tumble box and said delivered articles in a direction opposite to the rotation of the tumble box.

13. In a wrapping machine, a folding channel, a pair of tumble boxes each having a plurality of non-radial pockets and each being located adjacent an end of the channel in a position to bring the pockets successively into alignment therewith, a multi-fingered transporter interfitted with the channel and the tumble boxes and movable in an endless path into, along, and back out of the channel, said transporter including a finger engaging an article in one tumble box to remove it to the channel and another finger engaging an article in the channel to shift it into the second tumble box, means to rotate the two tumble boxes intermittently in the same direction about their axes, and means to drive the transporter through its path in the same direction as the common direction of rotation of the tumble boxes.

14. In a wrapping machine, an intermittently rotatable tumble box having non-radial pockets, an article receiving channel in line with a rest position of the pockets, an ejector interfitted with the tumble box and movable toward and from the receiving channel, said ejector having an article contacting face, and mechanism for rotating the tumble box intermittently in a direction to bring a pocket-contained article across that diameter of the tumble box parallel to the receiving channel and to a rest position in line therewith, whereby during the latter part of the rotation of the tumble box the article moves toward said face of the ejector in a direction opposite to the direction in which the ejector moves during ejection.

15. In a wrapping machine, an intermittently rotatable tumble box having non-radial pockets, an article receiving channel in line with a rest position of the pockets, an ejector interfitted with the tumble box and having an article contacting face at substantially right angles to the line of the pocket when at rest, mechanism for moving the ejector toward and away from the receiving channel in a looped path, and mechanism for rotating the tumble box intermittently in a direction to bring the article toward said face of the ejector by the rotation of said tumble box, said ejector having that portion of its face which first makes contact with the article beveled to permit said initial contact to more closely approach a normal to the line of the pocket in its then position.

16. In a wrapping machine, a tumble box having non-radial pockets, a receiving channel located to one side of the axis of rotation of the tumble box, an ejector interfitting with the tumble box and having an abutment surface adapted to contact with the rear face of an article in a pocket of the tumble box, mechanism for rotating the tumble box intermittently in a direction to bring a pocket-contained article toward said face of the ejector by the rotation of the tumble box, and means for moving the ejector toward the receiving channel in such timed relation with the tumble box that contact with the article is made substantially before the coming to rest of the tumble box, whereby the discharge of the article from the tumble box will be accomplished in part by the rotation of the tumble box and in part by the movement of the ejector.

17. In a wrapping machine, a tumble box having non-radial pockets, a receiving channel located to one side of the axis of rotation of the tumble box, an ejector interfitting with the tumble box and having an abutment surface adapted to contact with the rear face of an article in a pocket of the tumble box, mechanism for rotating the tumble box intermittently in a direction to bring a pocket-contained article toward said face of the ejector by the rotation of the tumble box, and mechanism for moving said ejector in a closed path having an initial movement across the line of the receiving channel and opposed to the direction in which the article is carried by the tumble box and a subsequent movement along the receiving channel.

18. In a wrapping machine, means for partially wrapping an article, a folding channel receiving said partially wrapped article and comprising a carrier, supporting members for the bottom of the article mounted on said carrier, and folding members mounted on said carrier, and means for mounting said carrier detachably in the wrapping machine whereby it may be removed therefrom with the partially wrapped articles supported therein.

19. In a wrapping machine, a folding channel comprising a stationary central support, a removable member overlying said support, wrapper folding means carried by the member, supporting members for the end portions of the article, and means for holding the member releasably in position.

20. In a wrapping machine, a frame, a folding channel including a top plate removable from the frame, a displaceable member carried by the top plate and removable therewith, said member being mounted for movement under the influence of a misplaced article, and stop mechanism mounted on the frame for actuation by said member.

21. In a wrapping machine, means for wrapping single sticks, means for forwarding the wrapped sticks with their overlapping folds on top and with the outer fold pointing away from the direction towards which the sticks are moving, and stacking means for elevating the sticks so advanced to permit the forwarding means to insert a stick under those so elevated.

22. In a wrapping machine having means for wrapping articles individually and stacking them one upon another in groups, a guideway, a yielding stop against which the articles are stacked comprising a bell crank having one vertical and one horizontal arm, interengaging connections between the vertical arm and the guideway, a member pivoted to the horizontal arm of the bell

crank, said member and bell crank having interengaging flat surfaces, a spring connected to the member and strained in a direction to cause engagement of both sets of interengaging surfaces, and means for pushing stacks of articles past said stop.

23. In a gum wrapping machine, mechanism for wrapping individual gum sticks, mechanism for stacking a plurality of said individually wrapped gum sticks, a tumble box positioned to receive an assembled stack, a support upon which the stack travels from the stacker to the tumble box, and a pusher engageable with the stack from below the support and movable in a substantially straight line along the support to convey the stack into the tumble box.

24. In a gum wrapping machine, mechanism for wrapping individual gum sticks, a support along which said sticks may travel, a transporter having a substantially circular motion and movable upwardly from below said support to forward the individual gum sticks one step at a time along the support, a releasable stop for arresting the travel of said gum sticks, a lifter carried by the transporter for stacking individual sticks against the support, a stack pusher for conveying assembled stacks along the support, mechanism for operating said pusher constrained to elevate it from below the table to impart to it a substantially straight line motion along the table and to return below the table, and driving mechanism for the transporter and for said stack pusher coordinated so that the stack pusher completes its cycle once for each assembly of a stack.

25. In a gum wrapping machine, means for wrapping individual sticks and assembling them into stacks, a support along which the stacks are forwarded, a pusher for said stacks comprising a substantially vertical arm extending below the support, a substantially horizontal rocking lever pivoted to said arm at its lower end, a rocker pivoted to said arm at a point intermediate its ends, a substantially vertical rocking lever supporting one end of said rocker, and means for moving the second end of said rocker in a substantially circular path.

26. In a gum wrapping machine, means for wrapping individual sticks and assembling them into stacks, a support along which the stacks are forwarded, a pusher for said stacks comprising a substantially vertical arm extending below the support, a substantially horizontal rocking lever pivoted to said arm at its lower end, a rocker pivoted to said arm at a point intermediate its ends, a substantially vertical rocking lever supporting one end of said rocker, means for moving the second end of said rocker in a substantially circular path, and elliptical gearing for driving the last named means at a non-uniform rate.

27. In a gum wrapping machine, means for individually wrapping gum sticks and assembling them into stacks, a support along which the stacks may be moved, means for feeding a wrapper into the path of said stacks from one side of said support, a tumble box positioned to receive a stack and said wrapping material, means for rotating the tumble box in a direction toward said wrapper feed, a pusher carrying the stacks along the support and positioning them in the tumble box, and mechanism for moving said pusher in an endless path having a direction of travel opposite to that of the tumble box at the period when the stack has been fully positioned in said tumble box.

28. In a wrapping machine, a pair of tumble

boxes each having a plurality of circumferentially separated pockets movable in an annular path, a support intermediate said tumble boxes, an ejector having a normal position interiorly of the path of the pockets of one tumble box, means for moving said ejector from its normal position to a position within the bounds of said support, and mechanism for rotating the tumble boxes intermittently, said ejector operating means and the tumble box rotating means being so coordinated that the ejector moves through a pocket of the tumble box into the support to transfer an article from one tumble box to the other, remains within the support during the initial movement of rotation of the tumble box, and passes back to its normal position between the pockets of the tumble box.

29. In a wrapping machine, a pair of adjacent tumble boxes, mechanism for delivering an article and a wrapper into one tumble box, an ejector for moving the article with the wrapper circumferentially wrapped about it from the first tumble box into the second, an ejector for delivering the article from the second tumble box, said last-named ejector carrying tucking elements for making a first tuck in the ends of the wrapper folded about the article by the first tumble box and second tucking means operable on the wrapper upon its delivery by said last-named ejector.

30. In a wrapping machine, means for wrapping individual gum sticks, means for assembling the wrapped sticks into stacks, mechanism for partially wrapping said stacks leaving a trailing tearing tab at the top rear edge thereof, means for inverting the partially wrapped stack and completing the wrapping, and means for forwarding said wrapped stacks one adjacent another with said tearing tabs projecting at the forward lower corner thereof.

31. In a wrapping machine, an intermittently rotatable pocketed tumble box, means for delivering wrappers continuously in registration with a rest position of said pockets, mechanism for delivering articles into said pockets at said rest position, and mechanism for rotating the tumble box intermittently in a direction toward the direction of wrapper feed comprising a gear coupled to the tumble box, a driven shaft, a gear eccentrically mounted on the driven shaft, an

idler engageable with both said gears, and linkage connecting the axes of said gears to permit relative angular movement while preserving the engagement of the idler with the other two gears.

32. In a wrapping machine, a wrapper printing mechanism comprising a die shaped to apply adhesive to a wrapper web in a repeated pattern comprising a bar extending transversely of the web and bars adjacent the margins, joined to a transverse bar at one end of the pattern and separated at the other end of the pattern from the next transverse bar, said marginal bars having a gap intermediate their lengths, means for severing the web between transverse bars in the space between one of the transverse bars and the marginal bars, mechanism for folding the wrapper circumferentially around the article with its adhesive pattern on the outside and with the end of the wrapper carrying the transverse bar overlapped by the opposite end, means for folding the ends of the wrapper in a two-point fold with the gaps intermediate the marginal bars in the center of the final fold, and means for sealing the overlapped folds to each other.

33. In a wrapping machine, an intermittently rotated tumble box, an article magazine located in close adjacency to the tumble box, means for locating a wrapper between the magazine and the tumble box, an article support below the magazine, a pusher for conveying articles from the magazine along the support into a pocket of the tumble box, mechanism for moving the pusher in a substantially straight path to carry an article from the magazine to the tumble box and then in a curved return path to its original position sufficiently below the support to avoid interference with an article on said support, and means for jogging articles in the magazine during the return stroke of the pusher to cause the lowermost article to settle squarely upon said support, said jogging means being positioned out of contact with that article which is lowermost in the magazine after the forward movement of the pusher so as not to interfere with the descent of said article.

ELMER LOVELL SMITH.
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