April 22, 1958 A. C. HOLLIS 2,831,303

MACHINES ADAPTED FOR APPLYING WRAPPERS

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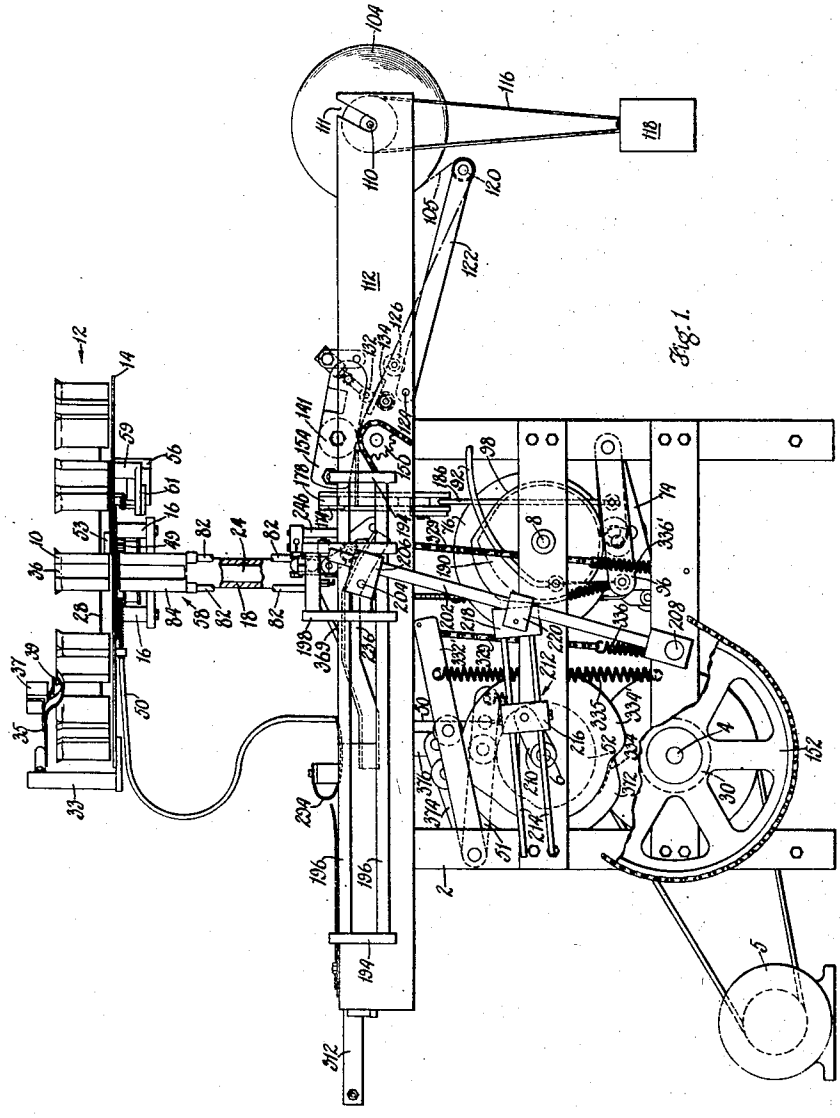


Fig. 1.

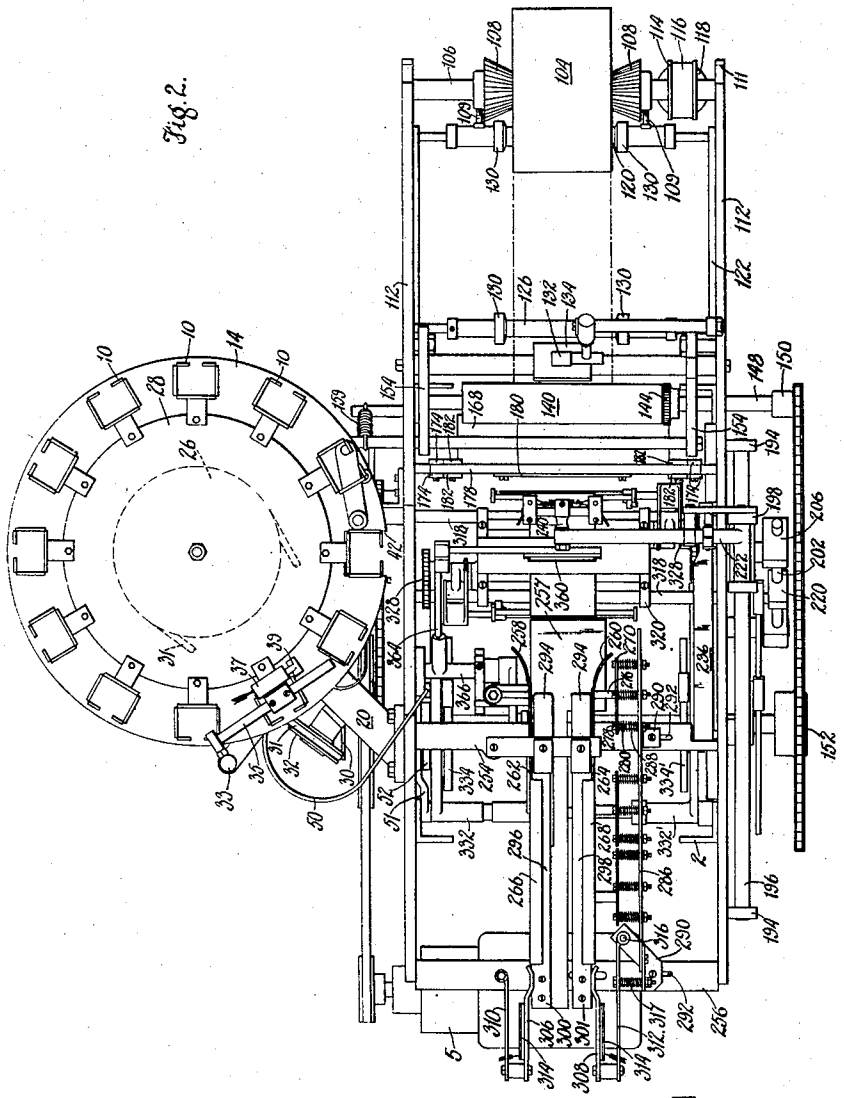
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MACHINES ADAPTED FOR APPLYING WRAPPERS

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Fig. 2.



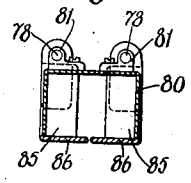
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MACHINES ADAPTED FOR APPLYING WRAPPERS

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Fig. 3A.



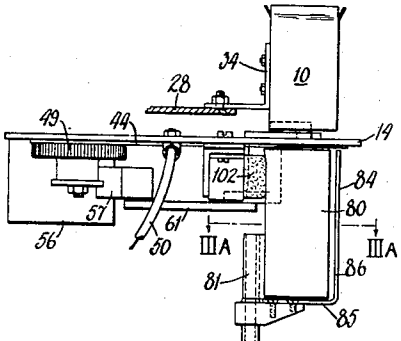


Fig. 3.

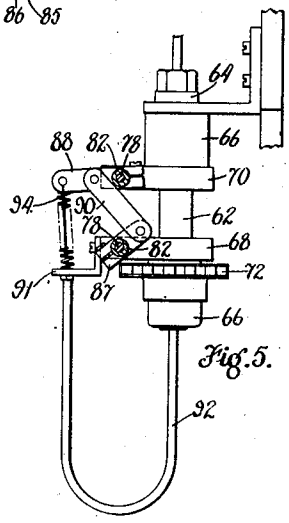
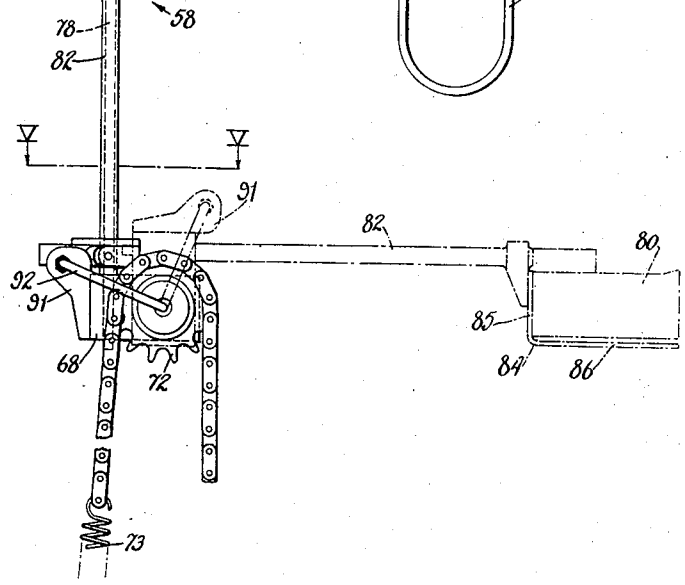


Fig. 5.



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MACHINES ADAPTED FOR APPLYING WRAPPERS

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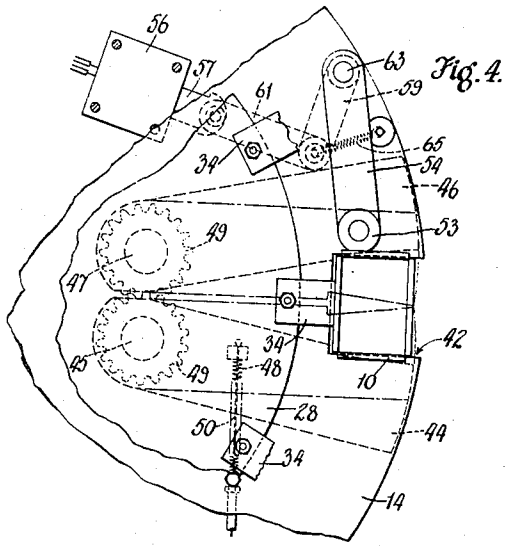
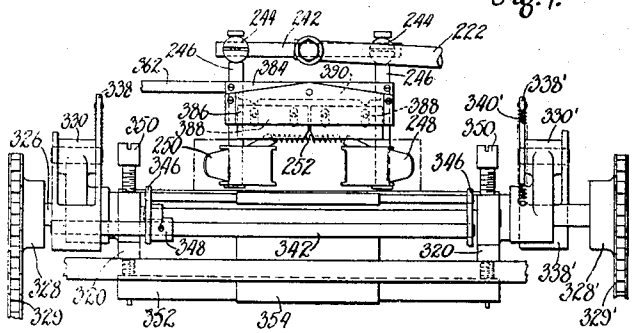


Fig. 4.

Fig. 7.



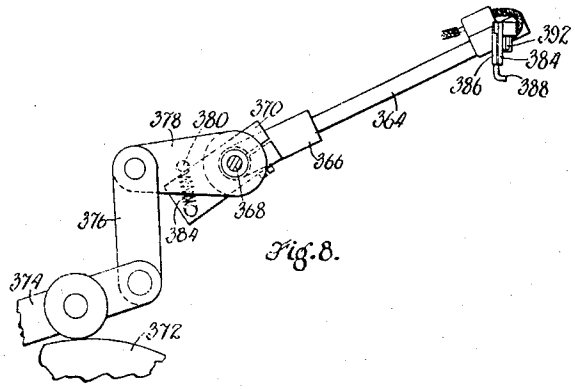


Fig. 8.

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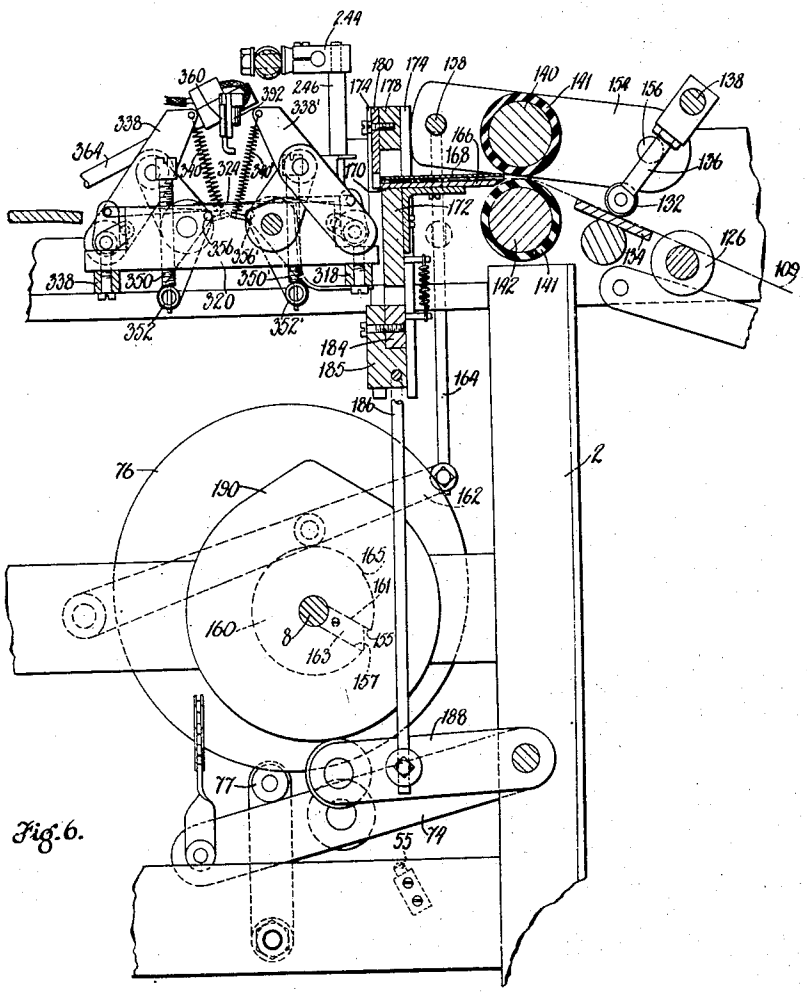


Fig. 6.

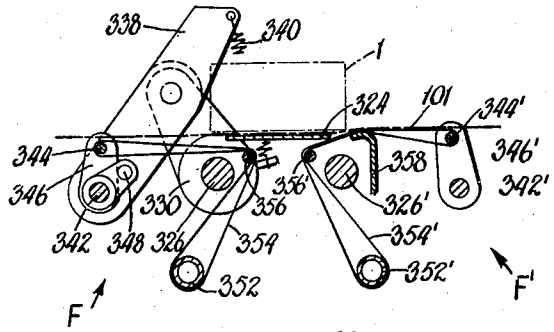
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MACHINES ADAPTED FOR APPLYING WRAPPERS

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Fig. 9.



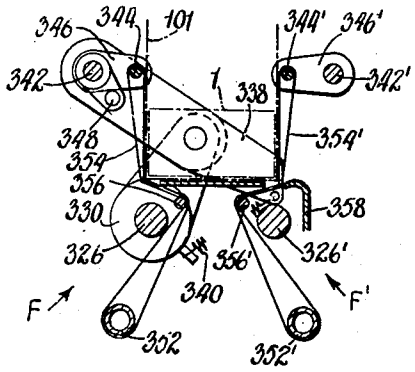


Fig. 10.

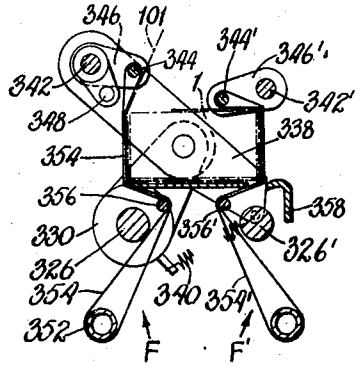


Fig. 11.

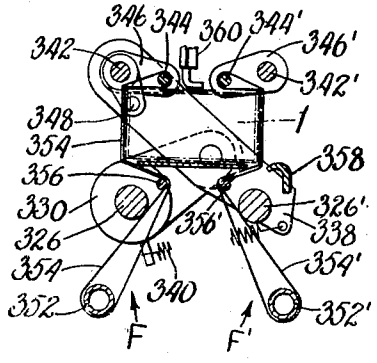


Fig. 12.

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MACHINES ADAPTED FOR APPLYING WRAPPERS

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Fig. 13.

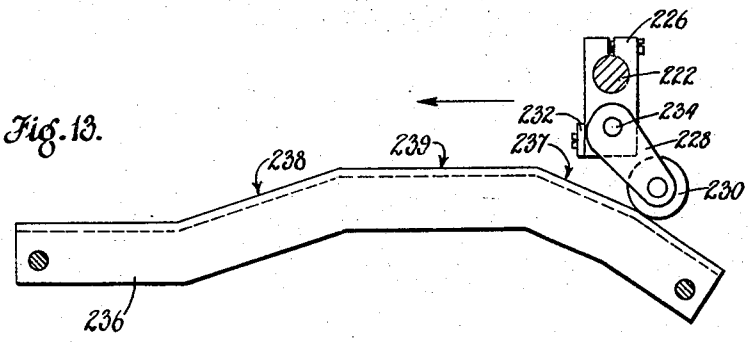
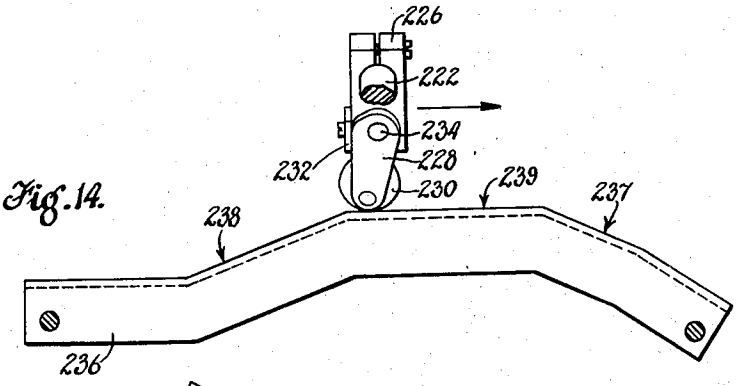


Fig. 14.



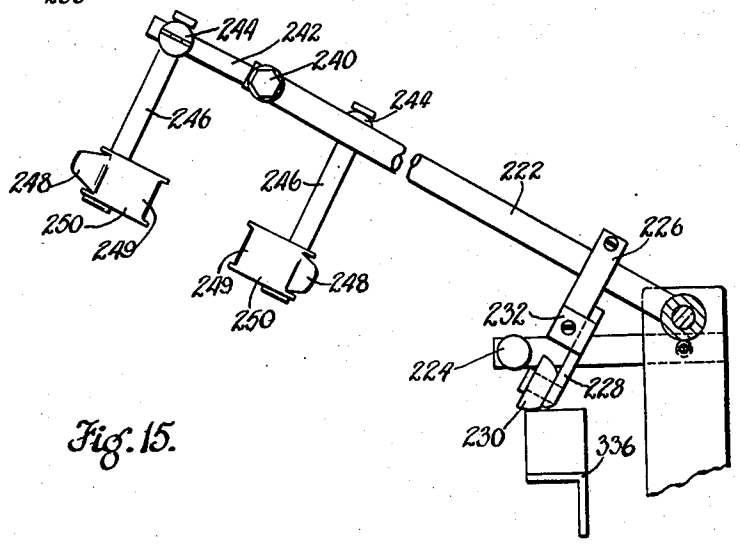


Fig. 15.

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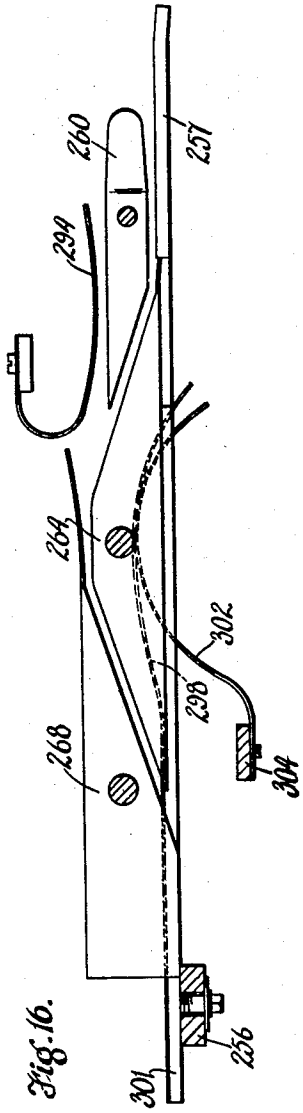


Fig. 16.

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Fig. 18.

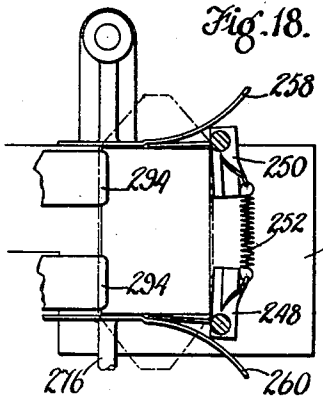
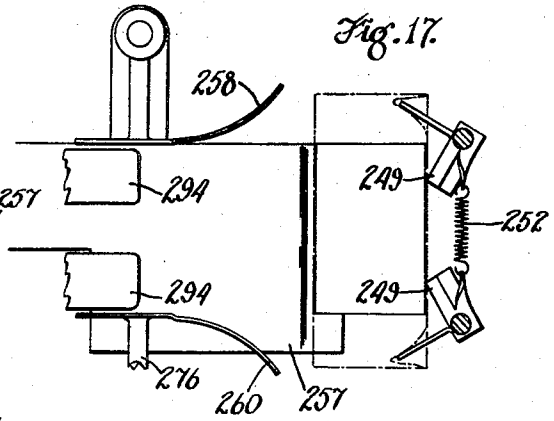


Fig. 17.



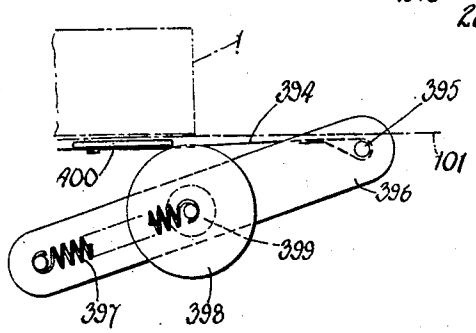


Fig. 20.

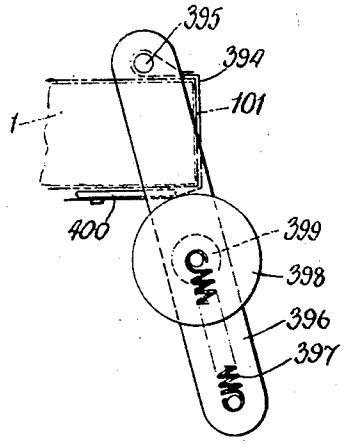


Fig. 21.

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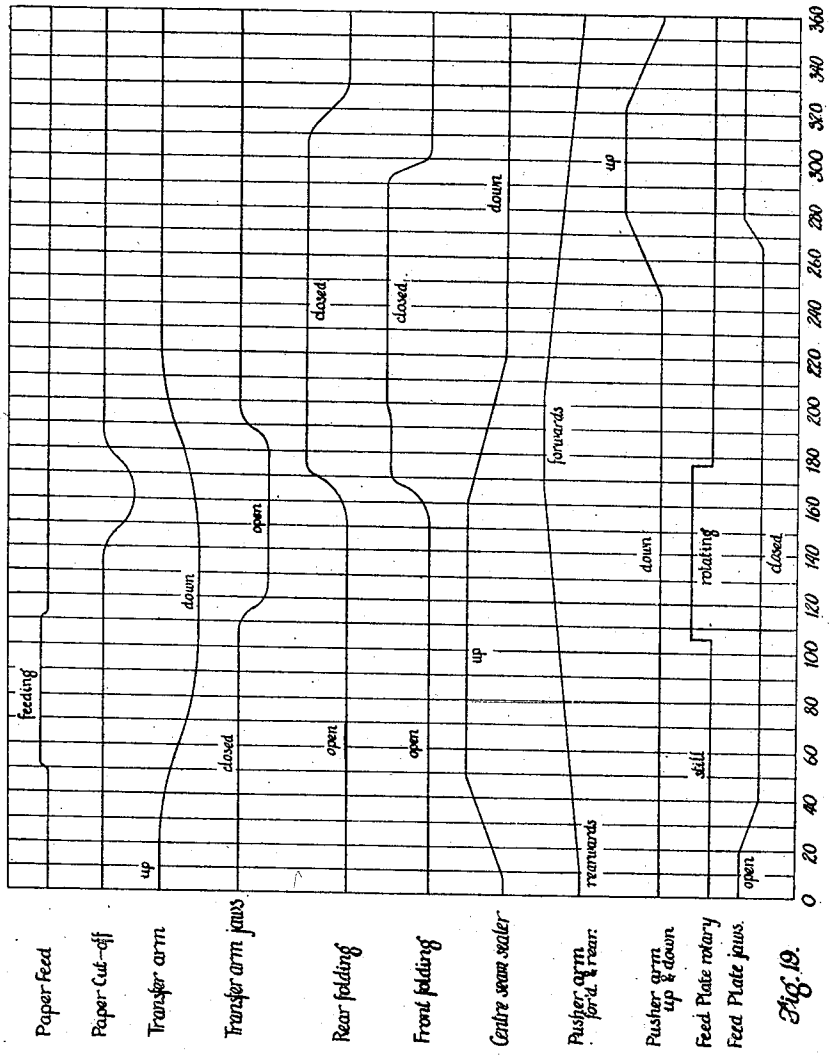


Fig. 19.

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United States Patent Office 2,831,303
Patented Apr. 22, 1958

2,831,303

MACHINES ADAPTED FOR APPLYING WRAPPERS

Albert Charles Hollis, Watford, England, assignor to B. U. Supplies & Machinery Company Limited, Leicester, England

Application December 16, 1954, Serial No. 475,695

5 Claims. (Cl. 53—210)

This invention is concerned with improvements in or relating to machines adapted for applying wrappers and is especially but not exclusively concerned with machines adapted for applying wrappers to small quantities of loose biscuits.

At the present time there is a demand for small packets of biscuits, say 4–6 ozs. and manufacturers have sold these small quantities wrapped in transparent foil providing packets having eye-appeal and in which the customer can see the biscuits. Biscuit manufacturers naturally wish to apply the foil to the biscuits, in the production of such packets, by machine, but biscuits customarily have two characteristics which make them awkward to handle by machine, viz., (i) lack of uniformity in shape and size even amongst a number of biscuits nominally all of the same shape and size, a characteristic which is pronounced in biscuits of the cream sandwich type, and (ii) lack of resistance to disfigurement, e. g. by crushing, when subjected to pressure by metal machine parts. These characteristics become prominent when it is desired to apply a transparent foil to a small quantity of biscuits by machine since it is usually desired that the foil shall be applied tightly around the biscuits, to prevent relative movement between individual biscuits and to improve the appearance of the packet, but if the machine is adjusted to apply the foil tightly to an undersize biscuit such adjustment may well cause undue pressure to be put upon an oversize biscuit, resulting in crushing which will be visible through the foil and spoil the appeal of the packet.

One of the various objects of the present invention is to provide an improved machine adapted for applying a wrapper to a small quantity of loose biscuits and in the operation of which due regard is paid to the customary characteristics of biscuits as indicated above.

Another of the various objects of the present invention is to provide an improved machine which will apply a wrapper tightly to an article of the shape of a rectangular paarllelepiped regardless, within limits, of the precise dimensions of the article.

A machine is hereinafter described in detail to illustrate the invention by way of example. This illustrative machine comprises a central horizontal table on to which a wrapper of transparent foil is fed in the operation of the machine, and two groups of mechanism respectively at opposite sides of the table.

Each group of mechanism comprises a carrier member mounted for turning movement about an axis, an arm pivoted to the carrier member, and a supporting bar mounted on the arm. Resilient means in the form of a spring interconnects the carrier member and the arm and tends to turn the arm about its pivot relative to the carrier member and so increase the distance of the supporting bar from said axis. Increase in such distance is checked by a band of flexible, comparatively inextensible, sheet material which is connected to the supporting bar and passes over one edge of the table, the axis about which the respective carrier member turns being adjacent this

edge of the table. There are thus two bands of flexible sheet material and each is kept taut, in the operation of the machine, by a spring.

In the operation of the machine articles, e. g. groups of loose biscuits, are transferred by a transfer arm one by one from a rotary turntable and placed upon a wrapper upon the central horizontal table. The carrier members are then turned in opposite directions to swing the bands of flexible material up at opposite sides of the article, applying the wrapper tightly to the article at opposite sides thereof. Where articles to be wrapped vary from one another in horizontal cross-section the bands will flex, and yield against the action of the springs, with pivotal movement of the arms relative to the carrier members, to accommodate such variation.

Next the supporting bars move towards one another over the top of the article, the bands flexing further and again yielding against the action of the springs in accordance with the precise shape of the article, and the bars then move downwards on top of the article one after another to press opposite end portions of the wrapper downwards against the top of the article in overlapping relation. As will be seen, the bars move in paths determined at least in part by the shape of the article to be wrapped and the bands flex at localities also determined by said shape; the article is subjected to the pressure of the bands which is yielding only and crushing of the work guarded against.

While opposite end portions of the wrapper are held in overlapping relation by the bands of flexible material the end portions are sealed together by heat.

The bars are then swung downwards to bring the bands into horizontal positions, allowing the wrapped article to be pushed off the table into end folding mechanism.

The above and other of the various objects of the present invention will become more clear from the following description, to be read with reference to the accompanying drawings, of the said illustratvie machine; it will be realised that this illustrative machine has been selected for description by way of example and not of limitation of the invention.

In the accompanying drawings:

Figure 1 is a side view of the illustrative machine with certain parts broken away to reveal the mechanism;

Figure 2 is a plan view of the illustrative machine;

Figure 3 is a view, partly in section of a feed plate and transfer mechanism as incorporated in the illustrative machine;

Figure 3A is a view in section along the line IIIA—IIIA in Figure 3, showing a detail of the transfer mechanism;

Figure 4 is a plan view of certain parts shown in Figure 3;

Figure 5 is a plan view, partly in section, along the line V—V in Figure 3;

Figure 6 is a view, partly in section, of certain of the parts shown in Figure 1;

Figure 7 is a front view of folding devices fitted in the illustrative machine;

Figure 8 is a view of a heat sealing device;

Figures 9, 10, 11 and 12 are side views of different stages of operation of web folding devices as incorporated in the illustrative machine;

Figures 13 and 14 are side views of a cam mechanism;

Figure 15 is a front view of a pusher arm and cam mechanism corresponding to Figure 14;

Figure 16 is a side view of an end folding mechanism;

Figures 17 and 18 are plan views of end folding devices in two stages of operation;

Figure 19 is a timing diagram of the various mechanisms incorporated in the illustrative machine;

Figures 20, 21 are side views of an alternative end folding device in two stages of its operation.

The illustrative machine comprises a main framework 2 (Figure 1) which supports operating parts of the machine and drives therefor. The machine has a main driving shaft 4 which is belt driven from a motor 5 (Figure 2) and two cam shafts 6, 8 which are chain driven from the shaft 4, both in a 1:1 ratio.

In the operation of the machine, articles to be wrapped are placed by hand in pockets 10 (Figures 1 and 2) of a rotary feed mechanism 12. This mechanism consists of a circular base plate 14 rigidly fixed by four pillars 16 to the top of a hollow vertical shaft 18, which is attached to the framework 2 by a horizontal arm 20. The shaft 18 has supported inside it a vertical feed table driving shaft 24 which is prevented from moving downwards by a collar which rests on a bearing positioned towards the upper end of the shaft 18. A driving pulley 26 is attached to the lower end of the shaft 24. The upper part of the shaft 24 passes through a hole in the base plate 14, and has rigidly attached to it parallel to and concentric with the base plate 14 the rotary feed plate 28. The pulley 26 is driven from a pulley 30 on the shaft 4 by a belt 31; a pair of tensioning pulleys one of which is shown at 32 (Figure 2) are resiliently attached to the arm 20, and serve to maintain the tension of the belt when it is required to drive the pulley 26, while allowing the belt to slacken when the pulley 26 is prevented from rotating, as will be described later.

Attached equidistantly around the outer circumference of the feed plate 28 by angle pieces 34 (Figure 3) are the feed pockets 10 of which there are twelve. The pockets 10 are rectangular in horizontal cross-section and are open at top and bottom. A slot 36 (Figure 1) is provided in each pocket to allow for easy removal of any article if necessary. The pockets 10 have outwardly flared top edges to facilitate the placing of articles therein. The feed plate 28 is smaller than the base plate 14, so that articles placed in the pockets 10 rest on the surface of the base plate 14.

The base plate 14 has a rectangular gap 42 (Figure 2) cut in its circumference. Two jaw blades 44, 46 (Figure 4) pivoted at 45, 47 upon the plate 14 and geared together by gears 49 are situated under this gap, and are so arranged that they are normally kept closed by a spring 48. A Bowden cable 50 is attached to the jaw blade 44, and is actuated by a cam lever 51 (Figure 2) operated by a cam 52 on the camshaft 6. In the operation of the machine the cam 52 depresses the lever 51, and the Bowden cable pulls the jaw blade 44 clockwise against the spring 48 and, because of the gears 49, 49 the jaw blade 46 will move similarly in the other direction, the gap 42 being thus uncovered.

The feed plate 28 is rotated step by step in an anticlockwise direction in the operation of the machine, one step for each cycle. Such rotation is controlled by an arm 54 (Figure 4) which carries a stop 53 arranged to engage each pocket 10 in succession and arrest rotation.

The arm 54 lies adjacent to the gap 42 and is mounted on a vertical spindle 63 which passes through the base plate 14. Attached to the lower end of the spindle 63 is a lever 59, pivoted to a link 61 which is itself pivoted to a solenoid bar 57. A micro switch 55 is attached to the framework 2 in such a position that at one point in the cycle, i. e. between the closing of the jaws 44, 46 and their subsequent reopening, it is contacted by a transfer arm operating cam lever 74, which, by closing the switch, activates the solenoid 56, and thus by causing the bar 57 to be drawn into the solenoid serves, through the lever 59 and link 61 to rotate the arm 54 clockwise. This movement, which is against a light spring 65 and is restricted by stops, moves the stop 53 to an inoperative position. The contact is made by the cam lever 74 for such a brief period that the arm 54 returns to its original position after one only feed pocket 10 has passed it.

The operation of the feed mechanism 12 is as follows. A pocket 10 containing an article to be wrapped rotates

until it abuts against the stop 53. While this stop prevents further rotation the belt 31 slips on the pulley 26. The article which was previously held in the pocket 10 by the base plate 14 is now resting on the jaw blades 44, 46 which are closed across the gap 42. Under the action of the cam 52 as described previously the jaw blades 44, 46 open, and the article falls into a framework of a transfer mechanism 58 (Figure 3), which removes it by a method to be described later, to a centre seaming station. Meanwhile the jaw blades 44, 46 are allowed to close and the stop 53 moves out of the way momentarily to allow the empty pocket to pass, and then returns to abut against the next (full) pocket; thus the feed plate 28 rotates one twelfth of a complete rotation and the next pocket is brought over the gap 42.

A pillar 33 attached to the base plate 14 carries hinged to it a trip bar 35. This has attached to it a microswitch 37, fitted with a trip lever 39. An end part of the trip bar 35 is bent downwardly and then upwardly into roughly the shape of a V, and the bar is so shaped and situated that it rides over the feed pockets 10 as they rotate intermittently with the feed plate 28. If an empty pocket passes under the bar 35, the V-shaped portion drops into the pocket, and the trip lever 39 contacts an innermost (i. e. furthest from the feed wheel circumference) edge of the pocket and operates the microswitch 37. The switch 37 is connected to an overload trip in a motor starting switch. In normal operation where the pockets are full the V-shaped portion of 35 rides over the top of the article in the pocket and the trip lever 39 thus rides clear. The parts described thus stop the machine whenever an empty pocket passes under the trip bar 35.

The transfer mechanism 58 is constructed as follows (Figures 3 and 5). A hollow shaft 62 is rotatably supported on another cantilever hollow shaft 64, and is prevented from moving axially by collars 66. To the shaft 62 are attached two rectangular blocks 68, 70 and a sprocket wheel 72. Over the sprocket wheel 72 passes a chain of which one end is attached to a spring 73, itself attached at its other end to the framework 2, and the other end to the cam lever 74 which is operated upon by a cam 76 on the cam shaft 8 (Figure 6). The blocks 68, 70 have attached to them two parallel shafts 78, to the ends of which is fixed a U-shaped box member 80, the member 80 having two bosses 81 one fixed to each of the shafts 78. Rotatably mounted on each shaft 78 is a swivel tube 82, which is restrained from axial movement by one of the bosses 81 at one end of the tube 82 (henceforth called the upper end) and by one of the blocks 68, 70 at the other, lower, end. At its upper end each tube 82 has attached to it an L-shaped member 84, such that a base part 85 of the L lies perpendicular to the swivel tube, and an arm 86 is an upward extension parallel to the tube. A supporting framework is thus joined by the two members 84 and the member 80—the two arms 86 together form one side of the framework, the member 80 the other three sides and the parts 85 of members 84 the base of the framework. The member 80 has a somewhat flared top edge to allow for the easy entry of articles to be wrapped. Perpendicularly to the lower end of one of the tubes 82 is attached a lever 87 which is linked by a crosspiece 90 to a similar but slightly longer lever 88 attached to the lower end of the other swivel tube. This linkage is so arranged that the two tubes 82 rotate together in opposite directions, and by doing so may cause the arms 86 to move outwardly away from each other thus opening one side of the framework.

A plate 91 attached to the block 68 has attached to it the sheath of a Bowden cable 92, the wire of which passes through a coil spring 94 and is attached to the end of the lever 88. The cable 92 passes loosely through the shaft 64 and at its other end is attached to a cam lever 96 (Figure 1) acted on by a cam 98 on the shaft 8 and it will be understood that as the cam 98 is rotated

so the arms 86 are caused to move outwardly away from each other.

The operation of the transfer mechanism 58 is as follows. The article is deposited as described above in the framework while the shafts 78 are in a vertical position. The cam 76 then operates on the lever 74 and through the chain causes the shaft 62 to rotate until the shafts 78 and tubes 82 have been brought into a horizontal position: the framework is then immediately above the centre seam forming station and the article is resting on the arms 86, 86. The cam 98, operating on the cam lever 96 and hence on the levers 87, 88, through the Bowden cable 92, causes the tubes 82 to rotate, and thus the arms 86 to move away from each other and deposit the article on a table 324 described hereinafter. The cam 76 then allows the spring 73 to reassert itself and thus the transfer mechanism 58 is brought back into a vertical position until it rests against a rubber locating stop 102 (Figure 3) attached to the underside of the base plate 14 on the inner edge of the gap 42; the arms 86 are allowed to close as the mechanism moves into a vertical position.

The cam 76 is an eccentrically mounted circular disc which acts positively on the lever 74 to cause the downward movement of the transfer mechanism 58. On the upward movement the lever follows the cam until the transfer mechanism 58 is against the stop 102. To prevent excessive strain on the mechanism from the spring 73 trying to rotate it still further the cam lever 74 is at this point brought up against a stationary stop 77 and the cam rides free of the lever until the latter is re-engaged during the next cycle when the transfer mechanism 58 is about to be brought again into the horizontal position.

The article is now resting on the centre seam forming station on top of a piece of cut web 101 (Figure 9) which has been previously placed there by the mechanism and procedure now to be described (Figure 6) and acts as a wrapper. Web 105 is supplied from a roll 104 (Figure 1) which is mounted on a freely rotatable shaft 106 by means of two toothed conical locating and securing members 108, which are adjustably fixed to the shaft by large knurled headed set screws 109. The shaft is supported at its ends by ball bearings 110 which rest in grooves 111 in arms 112 which are extensions of the framework 2. Also attached to the shaft 106 is a wide flanged pulley wheel 114 over which passes a canvas band 116 supporting a weight 118. From the roll 104 the web runs under a jockey roll 120, which is freely rotatable and is supported by arms 122 freely hinged to the framework 2 at 124. The web then passes over another freely rotatable roll 126, which is supported between the two arms 112. These rolls 120, 126 have broad flanges 130 (Figure 2) on them to control the edge of the web 105. From the roll 126 the web passes between a rubber covered stop 132 (Figure 6) and a stop plate 134. The stop 132 is attached to an upwardly extending arm 136 which is freely hinged about a horizontal spindle 138 which is fixed to the framework 2, and it rests on the web under its own weight. The plate 134 prevents the stop arm 136 from hanging vertically and the two together act as a one way feed control. The web 105 can feed forward freely, the stop 132 riding up under the frictional force between it and the web: if the web has a tendency to move in a rearward direction the frictional force between it and the stop 132 pulls the latter downwards onto the plate 134, the web being gripped tightly, and any further movement being prevented. From the one way feed control the web passes between upper and lower feed rolls 140, 142. These are similar in size and construction and are covered with a rubbery material 141, and both have gear wheels 144 (Figure 2) at one end. The lower feed roll 142 is mounted on a shaft 148 which can rotate in bearings in the framework 2. The shaft 148 extends clear of the framework 2 at one side of the machine, and has a sprocket wheel 150 attached to this extension; this wheel is driven by a chain drive off a large sprocket wheel 152 on the shaft 4. Thus when the machine is in operation the feed roll 142 is rotating continuously, and as long as the two gears 144 are enmeshed the roll 140 will also be in rotation. The roll 140 is supported in bearings in two short levers 154 (Figure 6) which are hinged at 156 on the arms 112 and held rigidly together by a tie rod 158. A spring 159 (Figure 2) attached to one end of this tie rod and also to the framework 2 urges the roll 140 towards the roll 142. A cam 160 (Figure 6) attached to the shaft 8 actuates a cam lever 162. Attached to one end of this lever and constrained to move in an approximately vertical direction is a rod 164 which abuts onto a flat near one end of the tie rod 158. The cam 160 has a slot 161 cut in it, in which is screwed a replaceable cam piece 163. The operating surface of the cam is made up of two arcs of constant but different radius: the arc of lesser radius extends from the leading edge 155 of the slot to a step 165, the arc of greater radius from the step to the trailing edge 157 of the slot. When a follower on the cam lever 162 rides on the latter arc of the cam, no feed takes place as the spring pressure between the feed rolls 140, 142 is relieved: when the follower rides on the former arc of the cam, the rolls are sprung together and gripping the web feed it forward. The replaceable cam piece 163 allows alteration in the length of feed, by making it possible to alter, within the limits of the width of the slot 161 the position in which feed of the web ceases owing to the aforementioned follower being forced to rise.

When the feed rolls 140, 142 are separated they will no longer grip the web, which will therefore have a tendency to move backwards under the weight of the jockey roll 120, this roll resting on the web under its own weight. This backward movement is prevented by the stop 132 as described above. Any tendency for the jockey roll 120 to pull the web forward off the roll 104 is counteracted by the canvas band 116 and weight 118 which act as a friction brake on the pulley wheel 114. The web 105 is thus maintained continually at a slight tension. The timing of the feed with respect to the cycle of operations of the machine as well as the amount of web fed, is controlled by the cam 160.

A bar 172 (Figure 6) of rectangular cross section is rigidly supported across the framework 2 of the machine forward of the feed rolls 140, 142. Attached to the bar 172 are two horizontal parallel plates 166, 168 which extend across the greater part of the width of the machine, the plate 168 being vertically above the plate 166, and separated from it by a narrow gap which is maintained uniform by spacing pieces (not shown). Rearward edges of the plates 166, 168 are level with each other, and are tapered to allow them to be introduced between the feed rolls 140, 142 without touching the rolls but approaching closely to the point of contact of the rolls and the web. If desired both plates may be made capable of slight horizontal adjustment. The lower plate 166 is a little longer than the upper one 168, and thus extends slightly further forward (i. e. to the left in Figure 6) providing a forward extension which serves as a stationary blade 170 for web cutting mechanism. The bar 172 has attached to it at each end next to the framework 2 two vertical brass plates 174, which project above and below it and form guideways for a knife carriage. The carriage consists of a rectangular framework comprising a horizontal cross bar 178, to which a knife 180 is attached, and whose ends run between the guide plates 174, four vertical parallel bars 182 which are attached to the cross bar 178, two near each end, and which have each a vertical surface in sliding contact with one of the guide plates 174, and which pass on either side of the bar 172, and a lower

cross bar **184**, which is attached to the four vertical bars **182**, under and parallel to the bar **172**. The ends of the bar **184** project beyond the bars **182** and slide between the guide plates **174**. The various rubbing surfaces between the members of the knife carriage on the one hand and the supporting bar **172** and guide plates **174** on the other are so arranged that relative movement in the vertical direction, within the limits of the construction, is free. A rod **186**, attached to the bar **184** by a block **185** is attached at its other end to a cam lever **188** actuated by a cam **190** on the cam shaft **8**. Two springs **192** urge the bar **184** toward the bar **172**. The cam **190** is thus capable of causing the knife **180** to descend and cut the web, and the springs **192** will urge it upwards out of the way the cutting action being completed. The knife **180** is set at a slight angle to the cutting edge of the blade **170**, thus giving a scissor-like action to the cut.

The web feeding action is thus, in outline, as follows. The web **105** passes between the rolls **140**, **142**, between the plates **166**, **168** and finishes level with the lower blade **170**. At the required moment the two feed rolls **140**, **142** are allowed by the cam **160** to approach one another. The requisite amount of web is fed forward between the knife blades onto the centre seam forming station and the feed rolls are then separated. The cam **190** then urges the knife **180** downward, the web is severed, and rests as required on the centre seam forming station.

The machine comprises centre seaming mechanism which is supported by two transverse bars **318**, **318** (Figure 2) across which are fixed longitudinally two end blocks **320**, **320**. Two web folding devices F, F' (Figures 9–12) form the seaming mechanism and are disposed respectively at front and back of a fixed transverse horizontal table **324** (Figure 6) fastened across the blocks **320**, **320**; the action of the front device F which acts to fold the leading portion of the wrapper **101** round an article **1** will now be described (Figures 9, 10, 11 and 12); the action and components of the other device F' are similar and corresponding parts are indicated in the figures by primed numerals.

The operation of the machine will be described with reference to the wrapping of articles, each of the shape of a rectangular parallelepiped, of size $1\frac{11}{16}$" by $1\frac{1}{2}$" by $3\frac{3}{16}$", these being of such a size as to fit loosely in one of the pockets **10** and in the member **80**.

An axle **326** (Figures 9, 10, 11 and 12) rotatably mounted in the two blocks **320** has a cantilever end on which is supported a sprocket wheel **328** (Figures 2 and 7) and an arm **330** (Figures 9–12). A chain **329** (Figure 1) passes over the sprocket wheel **328** and has one end attached to a cam lever **332**, which is urged by a spring **335** against a cam **334** on the shaft **6**. The other end of the chain is attached to a coil spring **336** fastened to the main framework **2**. A lever **338** is pivotally mounted on the arm **330** and is urged toward straight line relationship with it by a spring **340**. At one end the lever **338** has fixed thereto a horizontally extending transverse rod **342** which in turn supports another rod **344**, parallel to it, by means of two small rotatable arms **346**. A stop **348** is adjustably mounted on the rod **342** and is arranged to restrict the movement of the left hand one of the arms **346**. An endless flexible and inextensible canvas band **354** passes round the rod **344**, over a bar **356** which is fixed between the blocks **320**, and round a bar **352** which is situated below the table. This bar is capable of vertical movement on unthreaded extensions of two vertical screws **350**, **350** (Figure 6) which pass through the bars **320**, and is prevented from moving upwards by shoulders on the screws, and held against downward movement by tension in the band **354**, such tension being maintained by the spring **340**. The bar **356** acts as a pivot about which the band turns during the operation of the machine.

A cut wrapper **101** and an article **1** are placed centrally on the table **324** by the previously described mechanisms and processes with the large face of the article **1** in contact with the wrapper **101**. At this stage the band **354** lies horizontally at front and rear of the table, as shown in Figure 9. The shaft **326** is then caused to rotate by the cam **334** acting through the cam lever **332**, chain **329** and sprocket wheel **328** as described above, which, causing rotation of the arm **330** brings the band **354** and hence the wrapper **101** lying on it against the vertical front face of the artcle, the position being as shown in Figure 10. Further rotation of the shaft **326** causes relative angular motion of the members **338**, **330** against the spring **340**, and part of the band is brought by the rod **344** over the top of the article folding the cut wrapper down as shown in Figures 11 and 12.

The web folding device F' which operates on the trailing portion of the cut wrapper **101** is arranged to operate in a similar fashion, with the exception that the folding at the rear of the article is completed before that at the front (Figure 11). The cam **334** has a dwell on it which keeps the folding device F in the position shown in Figure 11 while the cam **334'** causes the device F' to operate in one continuous movement. This ensures that the leading edge of the wrapper **101** is folded over the trailing edge thereof.

In the machine described, the spring **335** is stronger than the spring **336** so that as the cam **334** rotates and lifts the lever **332** the spring **336** operates to move the shaft **326** anticlockwise (viewing Figure 9) whereas when the cam **334** allows the lever **332** to be lowered the shaft **326** is turned clockwise by the spring **335**. The spring **335** is effectively stronger than the spring **340** so that a position (like that of Figure 12) is reached, with the rod **344** holding the band **354** down on top of the wrapper **101** on top of the article, regardless, within a small range, of the height of the article, the left hand one of the arms **346** becoming disengaged from the stop **348**. As will be seen, the band **354** flexes at two localities, viz. localities adjacent to the bottom front edge of the article and adjacent to the top front edge, the precise position of the second locality varying with the actual height of the article.

In the open position as shown in Figure 9 the guide **358** pushes the band **354'** slightly upwards. When web is fed forwards over the centre seaming station this small rise prevents the leading edge of the web from becoming caught between the band **354'** and the rear edge of the table **324**.

When the folding devices F, F' are in the position shown in Figure 12 a centre seam sealer **360** (Figure 12) (Figures 7 and 8) descends between them, and, resting on top of the wrapper encircling the article seals it. The sealer **360** is mounted on a horizontal transverse shaft **362** (Figure 7), which is supported on an arm **364** (Figure 8) fixed to a sleeve **366** rotatable about a shaft **368** which is fixed to the main framework **2** of the machine.

The sleeve **366** has attached to it a block **370**. A cam **372** (Figure 1) on the shaft **6** has a cam lever **374** urged against it by a spring (not shown). Pivotally attached to the lever **374** is a substantially vertical link **376** (Figure 8) whose other end is pivotally attached to a substantially horizontal arm **378**. The arm **378** is able to rotate about the shaft **368** and has attached to it and projecting transversely from it a pin **380** against which the block **370** rests under the weight of the arm **364** and sealer **360**. A spring **382** ensures that the block **370** and pin **380** normally remain in engagement. Rotation of the cam **372** thus, by movement of the pin **380**, will allow the sealer **360** to descend, and also can raise it positively. On the sealer **360** striking the top of the article, the pin **380** will continue to move under the influence of the cam **372**, and only the effect of the spring **382** and the weight of the sealer **360** urge it against the wrapper: thus approximately the same pressure is obtained whatever the size of the article. The sealer **360** itself comprises a plate **384** between which and a cover plate **386**

are secured sealing members 388 of L-shaped cross section and which are capable of limited vertical movement between the plates 384, 386. A hinged cross piece 390 (Figure 7) rests loosely across these two sealing members 388 so that their vertical movements are not independent. Thus small irregularities in the contour of the article to be sealed can be allowed for. A thermostatically controlled heating element 392 attached to the plate 384 heats the sealing members 388 by conduction.

Attached to the framework 2 of the machine by blocks 194 (Figures 1 and 2) are two parallel horizontal slide rods 196, one vertically above the other. An H-shaped slide block 198 is bushed onto these and thus can slide in a horizontal direction backwards and forwards. A downwards extending operating lever 202 is hinged near its upper end to the cross bar of the slide block 198 through a spindle 204 and a block 206, and is hinged to the framework 2 near its lower end at 208. A crank 210 on the camshaft 6 has attached to it an adjustable link 212 consisting of two parallel rods 214, passing through two blocks 216, 218, being lengthwise adjustable in these blocks and secured in them by set screws: one of these blocks, 216, is hinged to the crank 210, the other, 218, to another block 220 which is attached to the lever 202, and is capable of adjustment lengthwise along that lever, being fastened to it by a set screw. It will be seen that as the cam shaft 6 rotates, the crank 210 acting through the link 212 and the lever 202 will cause the block 198 to move backwards and forwards along the rods 196, the amount and timing of the movement being controllable within limits by adjustment of the link 212 and movement of the block 220.

Between the upwardly projecting arms of the block 198 is hinged a pusher supporting arm 222 (Figures 2 and 13–15), which projects towards the centre of the machine, and is prevented from falling below the horizontal position by a stop 224 attached to one arm of the block 220 (Figure 15). A block 226 extends perpendicularly downwards from the arm 222, and has attached to it a spindle 234 (Figures 13 and 14). The spindle 234 has freely pivoted thereon an arm 228 on the end of which is a chamfered cam roll 230. Also attached to the block 226 is a stop 232 which restricts pivotal movement of the arm 228 about the spindle 234. The roll 230 rests on a cam way 236 which has inclined portions 237, 238 (Figure 13) joined by a horizontal portion 239. When the block 198 is in its rearmost position the roll 230 rests on the cam way as shown in Figure 13, and as the block 198 moves forwards the roll 230 trails along the cam way 236 and the end of the arm 222 follows a horizontal path. Trailing along the portion 239 the cam lever 228 is almost horizontal, but along the portion 238 is allowed to fall back under its own weight to a vertical position. The block 198 now begins to move rearwardly. The roll 230 comes up against the incline 238 and is pushed backwards until the arm 228 abuts against the stop 232. The roll 230 then rides up the cam way 236 and travels along the cam way as shown in Figure 14, along the portion 238 the arm 222 is being moved upwardly about its hinged joint with the block 198, along the portion 239 it is carried in an upwardly inclined position and along the portion 237 it is let down into a horizontal position again. The end of the pusher arm thus describes a closed path.

A horizontal arm 240 at the end of the arm 222 supports a rod 242, parallel to the arm 222. The rod 242 has two split blocks 244, 244 clamped to it, each of which supports a depending rod 246, 246. Pivotally mounted on these rods are pushing and rear tucking members 248, 250. Small projections at the rear of these members are joined by a light spring 252 (Figure 18) which thus causes them normally to adopt an open position shown in Figure 17.

When the article 1 is in position with the wrapper 101 on the centre seaming station, as previously described, the devices, F, F' are opened out so that the bands 354, 354' are horizontal, the arm 222 is in its most forward position, and the sealer 360 is in a retired position. As the devices F, F' wrap the wrapper 101 round the article in the way described, the sealer 360 descends and eventually contacts the wrapper 101 between the rods 344, 344' when the wrapping action is complete. The sealer 360 and the devices F, F' now remain stationary as the arm 222 travels in a rearward direction and is lifted over the centre seaming station by the action of the roll 230. As the arm 222 passes over the centre seaming station the folding devices F, F' open out into their horizontal position; when this is completed the arm 222 descends into a horizontal position behind the article so that the members 248, 250 are just above the now horizontal portion of the band 354'. As the members 248, 250 move forward the sealer 360 retires, and inner end portions 249 of the members 248, 250 engage the rear face of the article and carry it forward. The article is now encircled by a tube of web, sealed at the top, and extending beyond the article at each end. The article is carried forward off the table 324, over the forward band 354 and on to a horizontal platform 257 (Figures 2 and 17). As it moves forward the leading face of the article comes into contact with the rear face of the previous article wrapped, and the additional pressure causes the members 248, 250 to pivot about their supports inwardly against the spring 252 thus forming rear tucks, i. e. tucks in the rear parts of the extensions of the web. The forward movement brings the front parts of the extensions of the web into contact with forward tucking and folding members 258, 260, which as the article moves forward form forward tucks (Figure 18). The movement of the members 248, 250 carries them in between the members 258, 260 so that when the members 248, 250 retire, the members 258, 260 secure the rear tucks against springing outwards. As the article is being carried forward, the transfer mechanism 58, as previously described places another article on the centre seaming station on top of a piece of severed web, and the wrapping cycle recommences. The operation of the machine pushes a succession of articles one by one on to the platform 257 and between the two members 258, 260, and hence articles are pushed one by one into end folding mechanism now to be described.

Two cross bars 254, 256 (Figure 2) rigidly attached to the framework 2 support the platform 257. Arranged in pairs on either side of this platform are six end tucking and folding members 258, 260, 262, 264, 266, 268. The three members 258, 262, 266 are rigidly fixed to the left hand side of the platform. On the right hand side, the member 260 is rigidly attached to a base plate 270 by a shaft 276. The plate 270 has fixed to it three parallel pillars, each consisting of a screw 278 on which a sleeve 280 is secured by a nut 282 and a washer 284. The sleeves abut against the base plate 270 and pass slidably through holes in a longitudinal supporting bar 286; a spring 288 on each of the sleeves urges the base plate 270 away from the bar 286, the washers 284 forming a limit stop to movement in this direction. Thus the base plate 270 and hence the member 260 attached to it is capable of limited movement against the springs 288 in a direction substantially perpendicular to the plane of the base plate. The members 264, 268 are similarly mounted for movement to the right against the action of springs.

The supporting bar 286 has attached to it two angle pieces 290 which rest on the two cross bars 254, 256. Screws pass through holes in horizontal portions of each of these angle pieces, and through slots 292 in each of the cross bars 254, 256, and are secured by nuts on the underside; thus by the slackening of these nuts the bar 286 and all that it supports is capable of horizontal adjustment to alter the distance between the members 258, 262, 266 on the one hand and 260, 264, 268 on the other. The spring mounting of these members is provided to ensure that the members are pressed up against the articles, regardless of small variations in size.

The members 258, 260 are outwardly flared to receive the article and also to make the forward end tuck. They are arranged so that the horizontal sideways extensions of the wrapper may pass undisturbed over and under them. Lower end flaps are then folded upward by the action of a guideway formed between the members 262 and 258 on the left hand side and 264 and 260 (Figure 16) on the right hand side: upper end flaps are folded downwards by similar guideways formed between members 262 and 266 on the left and 264 and 268 on the right. While the lower flaps are being folded upwards the article is resiliently forced downwards by leaf springs 294, 294. The folding members 266 and 268 have horizontal flanges extending inwardly and backwardly, and as the upper flaps are being folded down the article is forced upwards against these flanges by leaf springs 296, 298. The spring 296 is attached to the platform 257 at 300, and the spring 298 to a small plate 301 which is attached to the bar 256, and being adjustable widthwise is normally maintained as close as possible to and parallel with member 268. Rear ends of the springs 296, 298 are free and pass under the platform, so that an article can slide smoothly onto them. The action of the springs 296, 298 is reinforced by two more leaf springs 302, attached to a bar 304 underneath the platform 257. The springs 302 bear up through the platform 257 under the springs 296, 298. The effect of the vertical spring pressure during the end folding operations is to allow considerable variation in the height of the article while maintaining a neat and tight end fold, without requiring any adjustment.

End sealers 306, 308 (Figure 2) are mounted forward of the members 266, 268 on arms 310, 312. The sealers 306, 308 have their ends bent to form a flat sealing portion, the edges of which are rounded, which portions are arranged to bear on the articles as they pass. The sealing portions are heated by conduction from heating elements 314. The arm 312 is hinged at 316 against a spring 317, and being attached to the bar 256 is moved with that bar on adjustment for various sizes of article. The arm 310 is rigidly fixed to the bar 256. When the machine is in correct adjustment the article is a little wider than the space between the two sealing plates and so sealing is carried out under pressure from the spring 317.

As described above, the articles are pushed one by one in a continuous line past the end folding members, having successively the lower flap folded upwards, the upper flap folded downwards and the ends sealed. Being pushed out one by one from the sealers 306, 308, the articles may be allowed to drop into a suitable container or removed on a conveyor if desired.

In a modified version of the web folding device (Figures 20, 21) a sheet of flexible and inextensible canvas 394 is attached to a table 400 and also to a transverse supporting bar 395. The bar 395 is fixed to an arm 396 which is slidably mounted in a member 398, and which is urged lengthwise in a direction so as to tension the sheet 394 by a spring 397. The member 398 is attached to a shaft 399 which can be rotated by means similar to those previously described for effecting the rotation of the shaft 326.

An article 1 is placed on the wrapper 101 on the table 400 by mechanism and processes previously described: the sheet 394 is held in a substantially horizontal position. On rotation of the shaft 399 the arm 396 is moved so that the sheet 394 applies the wrapper 101 to the vertical face of the article 1, and then, flexing at the upper edge of the article, presses the wrapper 101 down on to the upper face of the article (Figure 21).

It will be understood that two such devices will be required to perform a complete wrap and that the sealing and end folding operations follow as before.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A machine for applying wrappers to articles, comprising a horizontal support upon which a wrapper may be positioned, cooperating wrapping mechanisms oppositely disposed relatively to the support, each of said mechanisms comprising a pivot below the support, an arm mounted on the pivot for arcuate movement heightwise of the support, a lever pivotally mounted upon the arm, a flexible band one end of which is secured to the frame of the machine beneath the support, the other end of the band being secured to the lever, and resilient means for rotating the lever in a direction to maintain the band taut, together with means for rotating both arms upwardly and inwardly relatively to the support to cause the bands progressively to bend the wrapper into close engagement with the sides and top of an article located upon the wrapper.

2. A machine for applying wrappers to articles, comprising a horizontal support upon which a wrapper may be positioned, cooperating wrapping mechanisms oppositely disposed relatively to the support, each of said mechanisms comprising a pivot below the support, an arm mounted on the pivot for arcuate movement heightwise of the support, a lever pivotally mounted upon the arm, a flexible band one end of which is secured to the frame of the machine beneath the support, the other end of the band being secured to the lever, and resilient means for rotating the lever in a direction to maintain the band taut, together with means for rotating both arms upwardly and inwardly relatively to the support to cause the bands progressively to bend the wrapper into close engagement with the sides and top of an article located upon the wrapper, the means for moving the arms being constructed and arranged to move one of the arms in advance of the other thus to effect an overlapping of the ends of the wrapper on the top of the article.

3. A machine for applying wrappers to articles, comprising a horizontal support upon which a wrapper may be positioned, cooperating wrapping mechanisms oppositely disposed relatively to the support, each of said mechanisms comprising a pivot below the support, an arm mounted on the pivot for arcuate movement heightwise of the support, a lever pivotally mounted upon the arm, a flexible band one end of which is secured to the frame of the machine beneath the support, the other end of the band being secured to the lever, resilient means for rotating the lever in a direction to maintain the band taut, together with means for rotating both arms upwardly and inwardly relatively to the support to cause the bands progressively to bend the wrapper into close engagement with the sides and top of an article located upon the wrapper, the means for moving the arms being constructed and arranged to move one of the arms in advance of the other thus to effect an overlapping of the ends of the wrapper on the top of the article, and means for sealing the overlapping ends of the wrapper.

4. A machine for applying wrappers to articles, comprising a horizontal support upon which a wrapper may be positioned, a bar located beneath the support, a pivot below the support, an arm mounted on the pivot for arcuate movement heightwise of the plane of the support, a lever pivoted on the arm, a flexible band, one end of which is secured to the frame of the machine beneath the support, the band having a portion extending over the bar and outwardly from beneath the support, the other end of the band being secured to the lever, resilient means for rotating the lever relatively to the arm in a direction to maintain the band taut, and means for rotating the arm about its pivot upwardly and inwardly of the support to cause the band to bend the wrapper progressively about the side and top of an article located upon the wrapper.

5. A machine for applying wrappers to articles, comprising a horizontal support upon which a wrapper may be positioned, a bar located beneath the support, an arm pivotally mounted below the plane of the support for arcuate movement heightwise of the support, a lever pivotally mounted on the arm and having an end portion normally disposed outwardly of the support, a flexible band of sheet

material one end of which is secured to the frame of the machine beneath the support, a portion of the band being extended over the bar and secured to the end portion of the lever, resilient means for rotating the lever in a direction to maintain the band taut, and means for rotating the arm in a direction toward the support to effect movement of the band in progressively bending the wrapper about an article positioned upon the wrapper.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,831,303

April 22, 1958

Albert Charles Hollis

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

In the heading to the printed specification, between lines 6 and 7, insert

-- Claims priority, application Great Britain December 18, 1953 --.

Signed and sealed this 16th day of September 1958.

(SEAL)
Attest:
KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents