June 17, 1969 CHUNG-CHIN KAO 3,450,067

AUTOMATIC EGG ROLL MACHINE

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Fig. 1a.



Fig. 1b.

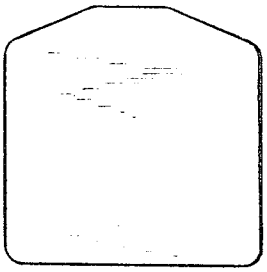


Fig. 2a.

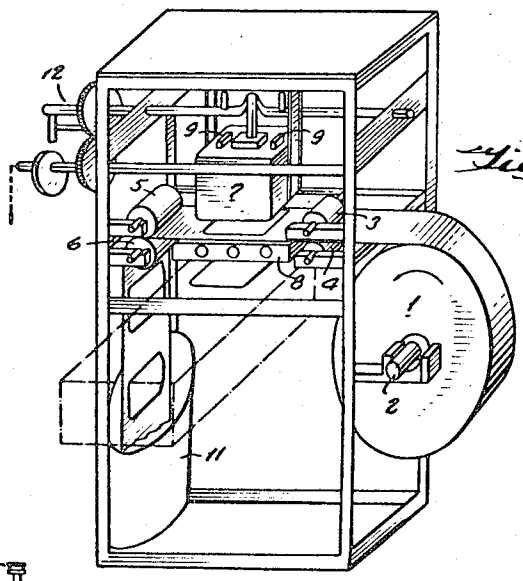


Fig. 2b.

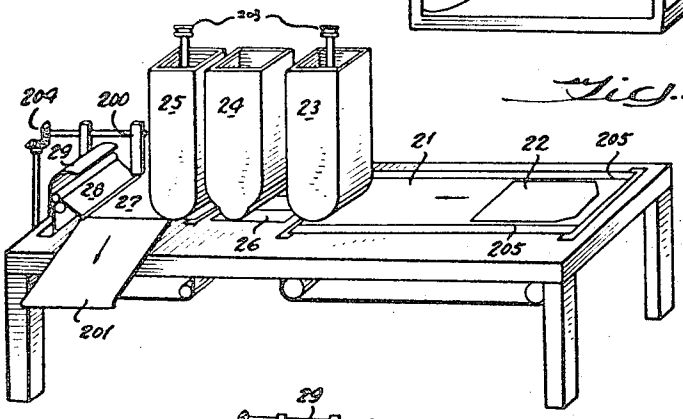


Fig. 2c.

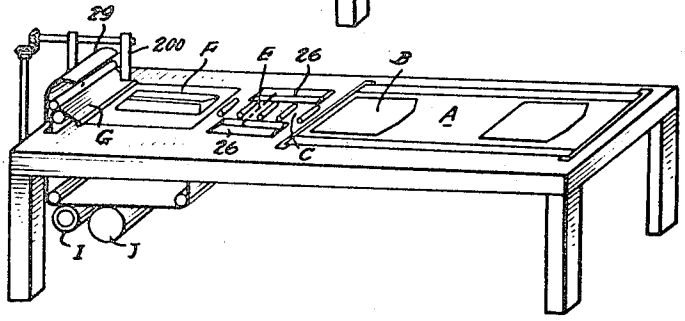
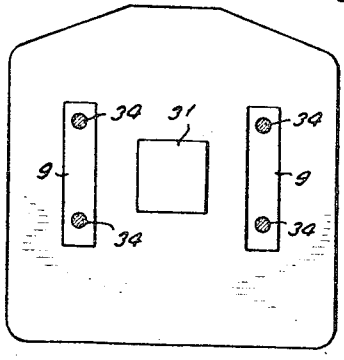


Fig. 3.



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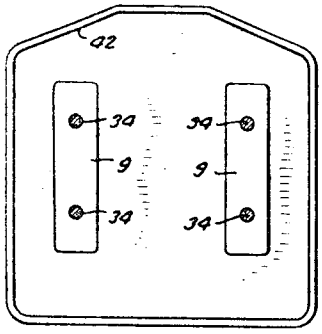


Fig. 4.

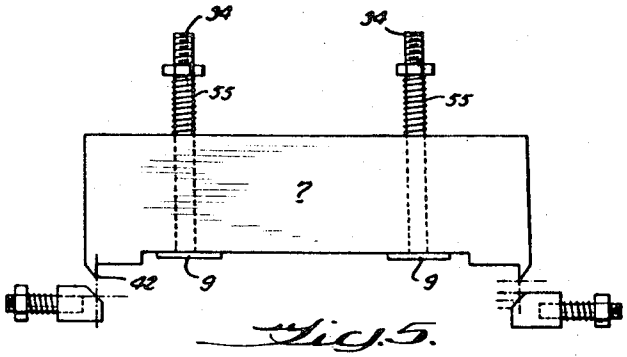


Fig. 5.

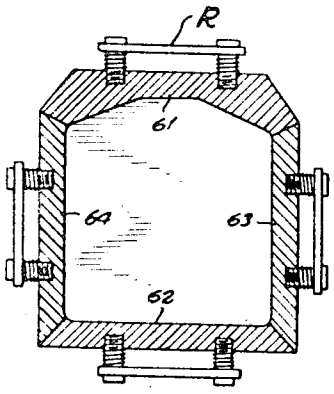


Fig. 6.

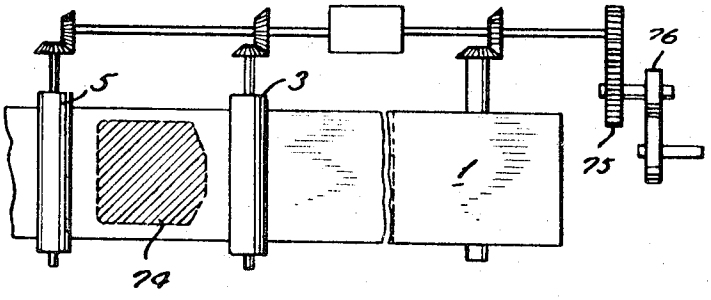


Fig. 7.

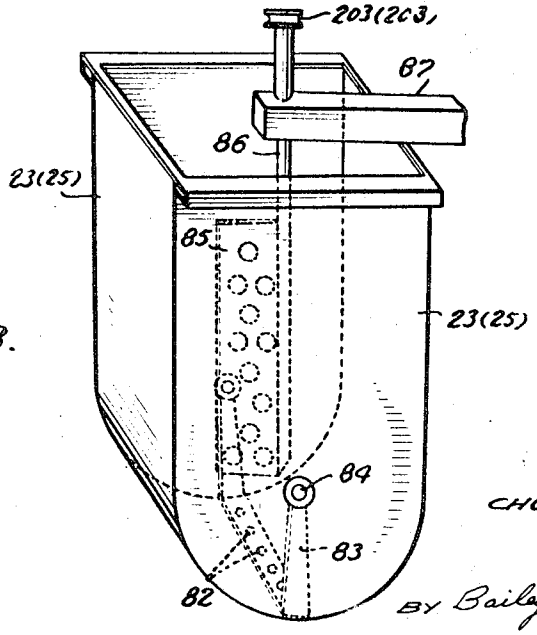


Fig. 8.

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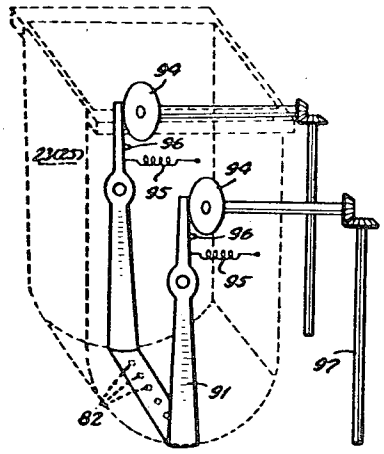


Fig. 9.

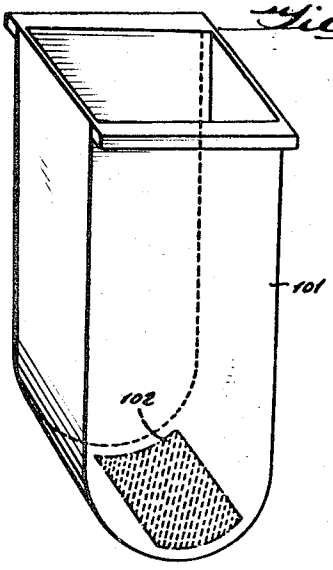


Fig. 10.

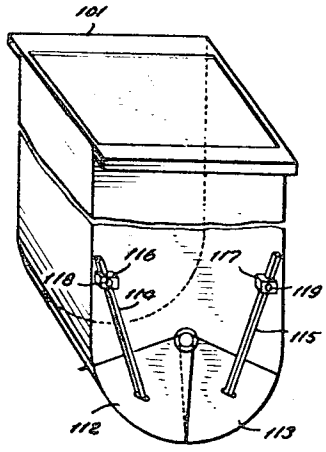


Fig. 11.

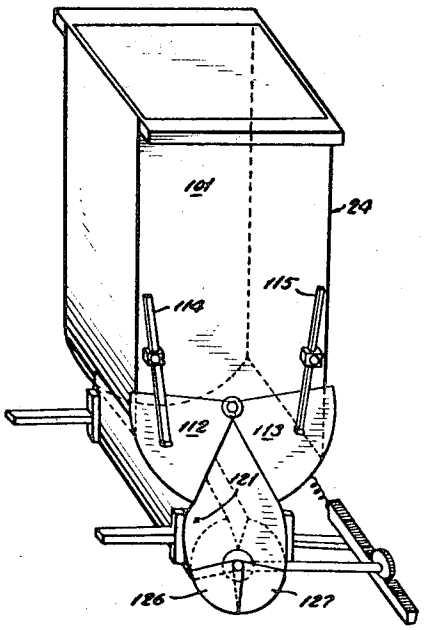


Fig. 12.

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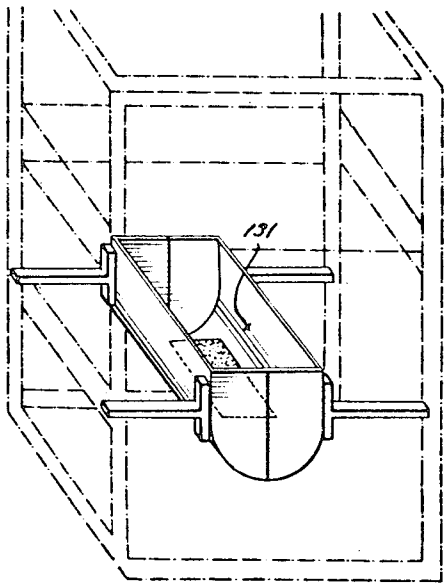


Fig. 13.

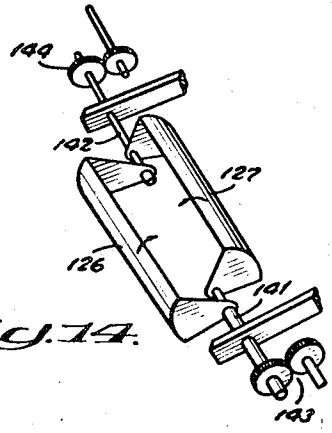


Fig. 14.

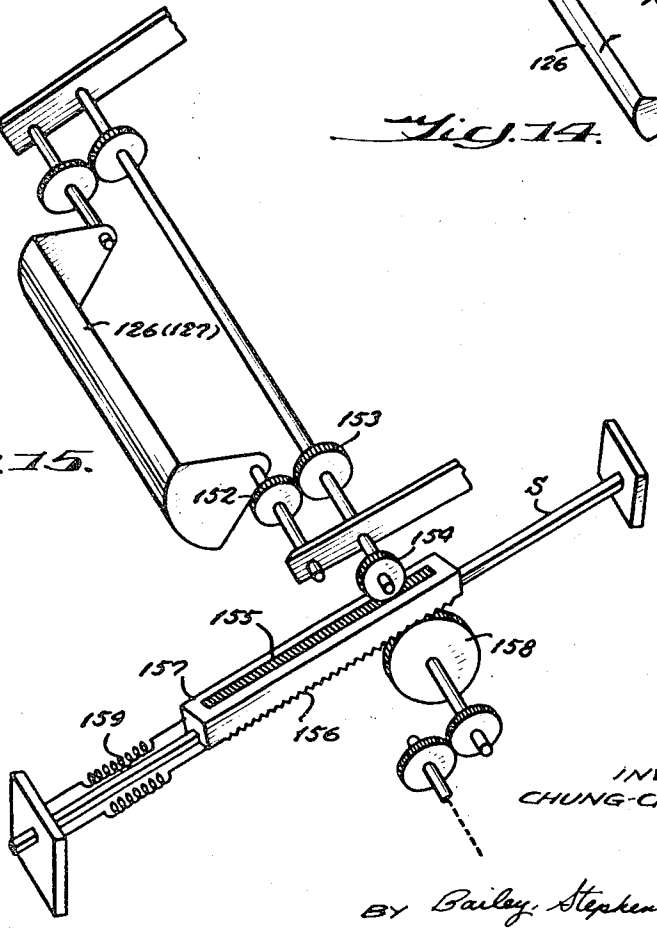


Fig. 15.

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Fig. 16.

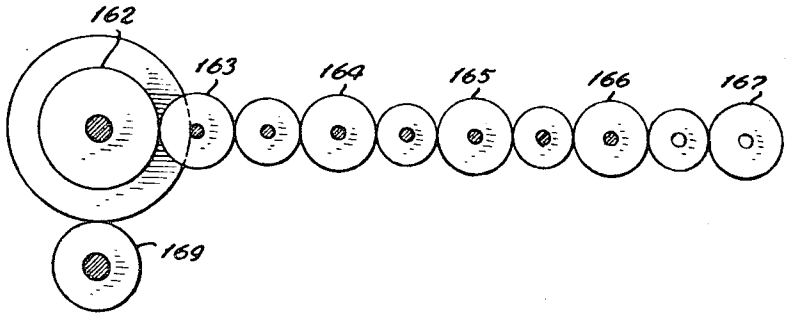
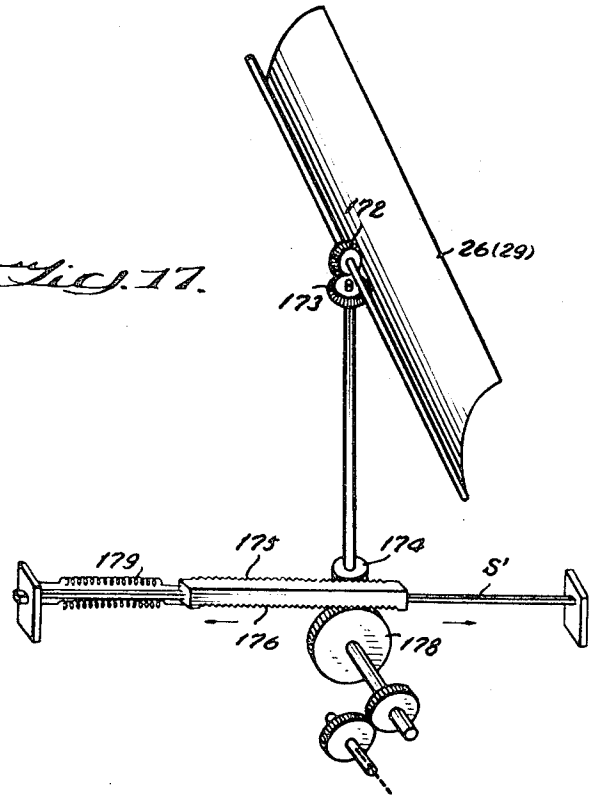


Fig. 17.



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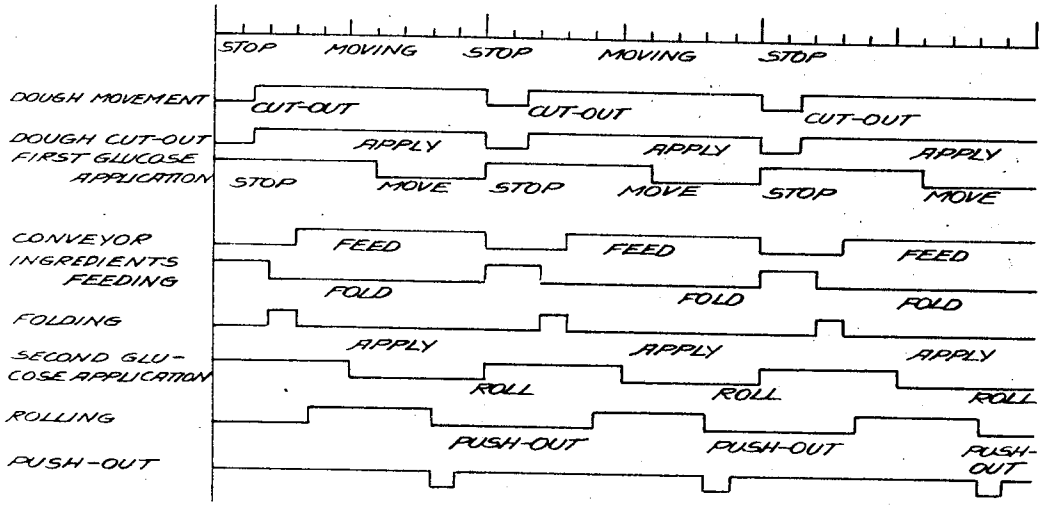
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Fig. 19.



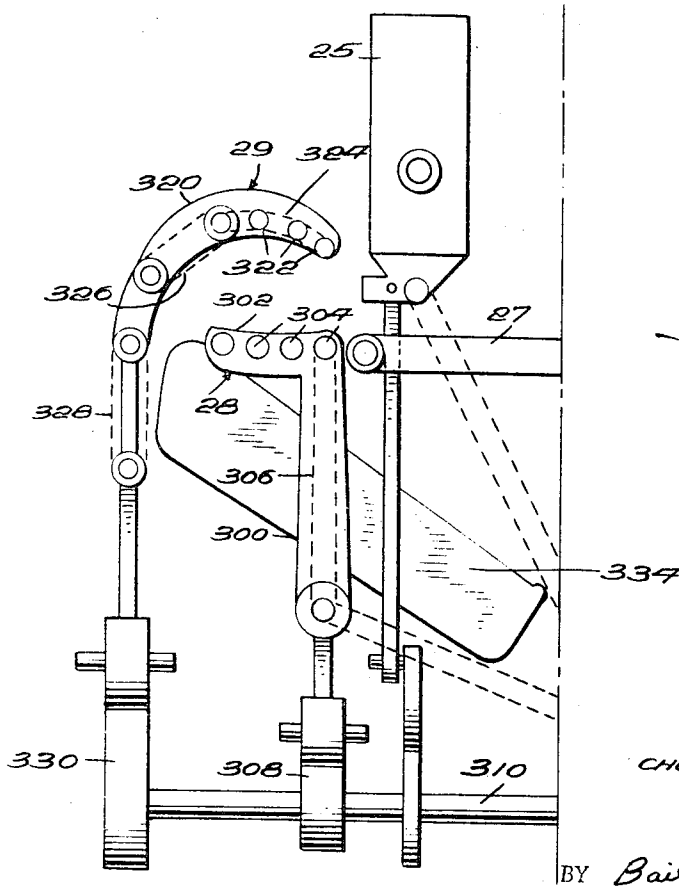


Fig. 18.

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United States Patent Office 3,450,067
Patented June 17, 1969

3,450,067

AUTOMATIC EGG ROLL MACHINE

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Filed Feb. 3, 1967, Ser. No. 613,942
Int. Cl. A21c 9/04
U.S. Cl. 107—1 2 Claims

ABSTRACT OF THE DISCLOSURE

In an egg roll making machine, an upper curved conveyor cooperates with a lower conveyor to turn and roll a partially formed egg roll into final shape.

This invention consists of a new machine which will make Chinese egg rolls automatically. It includes an improvement of my machine disclosed in my Japanese Patent No. 1594, published Feb. 5, 1966. Known in Chinese restaurants as egg rolls or spring-rolls, this Chinese food is consumed widely in the Far East and in the U.S. Egg rolls are made of a filler of one or two kinds of grated vegetables, ground beef, pork or shrimp inside a wrapping of a flattened dough. The finished egg roll is cylindrical in shape and both ends of the roll are folded inside the cylindrical wrapping. This is fried and served as hors d'oeuvres.

Egg rolls are made by hand at present and because of this the cost is high. The aim of this invention is to make egg rolls automatically and mechanically. This machine pursues the following processes in making egg rolls automatically.

A. By means of a press mechanism, flattened dough is made into a required size and sent into the next section at the speed of about 2.5 cm. per second.

B. Glucose liquid is applied to the surface of the dough. In the meantime, the dough is transferred into the next section.

C. When the dough reaches the prescribed spot beneath the ingredients container, the movement of the dough is stopped for 3 seconds to add filler ingredients into the flat dough for about 2.0 seconds. Both ends are then folded inside within one second. Roller conveyors then push the folded egg roll into the fourth section.

D. Glucose liquid is applied to the top section of the folded egg roll once more and then sent to the fifth section.

E. Folded egg roll is rolled so that it will be finished in 5 seconds.

F. The push-out plates push out the finished egg roll.

Since this automatic egg roll making machine is designed to make 360 egg rolls per hour, it will save the egg roll maker's time considerably.

A control mechanism feeds an equal amount of ingredients into each egg roll.

This machine will herewith be described with reference to the accompanying drawings in which:

FIG. 1*a* shows the shape of an egg roll;

FIG. 1*b* shows the shape of a flattened dough for making an egg roll;

FIGS. 2*a*, 2*b* and 2*c* display various sections of the egg roll making machine. FIG. 2*a* shows the press machine section and FIGS. 2*b* and 2*c* show the other sections of the egg roll making machine;

FIG. 3 shows the top surface view of the die;

FIG. 4 depicts the bottom surface view of the same die;

FIG. 5 shows the side surface cross-section of the die and the location of the blades between the die and the die-set which is located at the bottom section of the die;

FIG. 6 is the die-set located at the bottom section of the die;

FIG. 7 shows the dough roller and the driving mechanism of the roller conveyors which move the roller;

FIGS. 8 and 9 show the glucose liquid container equipped with operating mechanism;

FIGS. 10 to 15 show the filler ingredients (vegetables, beef, pork shrimp) container structure and its controlling mechanism;

FIG. 16 displays a set of roller conveyors installed beneath the ingredients container;

FIG. 17 shows the operating mechanism of the folding plates as indicated in FIG. 2*c*;

FIG. 18 is an enlarged view of the final rolling mechanism;

FIG. 19 gives the time table for each process in making egg rolls by my automatic egg roll making machine.

FIG. 1*a* shows the external view of an egg roll; FIG. 1*b* shows the flattened dough section which is about 0.8 mm. thick. FIGS. 2*a*, 2*b* and 2*c* show the different sections of the egg roll making machine.

FIG. 2*a* shows the press equipped with dough roller. The job of this press is to cut out a thin and flattened dough section in one movement. Since the dough sheet tears easily, the tensile force applied by the transfer roller is reduced and the gears are driven so that they will stop the dough roller when the flattened dough section is being cut out.

1 in FIG. 2*a* is the roll of dough made from a standard dough-making machine. **2** is the axle for the dough roller. **3**, **4**, **5** and **6** are the two sets of roller conveyors which facilitate the transfer of the flattened dough and safeguard the equipment during the cut-out. The movement speed of the above-mentioned dough sheet is about 2.5 cm. per second. **7** is the cut-out die and **8** is the bottom section of the die. **9** shows two push-out plates which push out the flattened dough outside of the die and gravity drops the dough sheet. This dough sheet drops through the bottom section of the die. This bottom section of the die **8** is of the type which opens on four sides to let out the cut-out dough. **11** is the waste-catching basket to catch the remains of the cut-out dough. **12** is the standard operating mechanism and the cam is used to move once in a 10-second period.

FIGS. 2*b* and 2*c* depict other sections of the egg roll making machine. As already shown in FIG. 2*a*, these sections are located at a right angle to and below the sections shown in FIG. 2*a*. **21** is the moving belt which transfers the severed dough section. The flattened dough **22** moves in the direction of the arrow shown in the FIG. 2*b* to the next section below the first glucose liquid container **23**. At this point, the glucose, liquid is applied on the surface of the severed dough. The flattened dough is then moved to the next section. **24** is the ingredients container. When the severed dough arrives below this spot, the roller conveyors are stopped for 3 seconds to allow ingredients to feed into the severed dough. As soon as this process is completed, folding plates **26** rise to fold over the side edges of the dough. The roller conveyors again begin moving the long and slender unfinished egg roll. The folded dough then passes under the second glucose container **25** where a second application is made on the dough. The dough then goes into **28**. **27** is the second roller conveyor. By means of this roller conveyor, the semifinished egg roll is lifted up into **29** where rolling plates roll the egg roll. This process takes 5 seconds. Next, the rolling plates release the egg roll and the push-out rod **200** pushes out and down (as shown by the arrow) into the tray **201**. **203** shows two belt-driven pulleys. The pulleys are used to stir glucose liquid inside the two glucose containers **25** and **23**. Glucose liquid is stirred constantly since it will harden if left standing.

204 is the driving mechanism which drives the push-out plate **200**. This mechanism moves at the rate of 6 revo-

lutions per minute. Egg roll, however, is pushed out every 10 seconds. **205** shows two guide rails of the conveyor. These help the moving dough to remain in proper position.

In FIG. 2*c*, A is the conveyor belt which receives the severed dough pushed out from the section shown in FIG. 2*a*. C is a set of roller conveyors controlled and regulated so that they can be stopped for 3 seconds. **26** shows two folding plates which fold the dough. E shows the spot where ingredients are dropped into the dough. F indicates the spot where the second coating of glucose liquid is applied to the top section of the dough sheet. Folded egg roll goes from G into the rolling plates **29** to finish the above-mentioned rolling process.

Also scraper I in FIG. 2*c* cleans the surface of the roller conveyors. Its function is to remove glucose liquid remains from the belt surface. J is the belt dryer. **200** is the push-out plate operated by a gear-controlled driving mechanism **204**.

FIGS. 3 and 7 depict an open-type cut-out or stamp-out die for making severed dough. FIG. 3 shows the top surface of a die. **31** is the die holder firmly attached to the punch shaft. **9** shows the push-out plates held in position by pins **34** held retracted by springs **55**.

FIG. 4 shows the bottom surface of a die. Blades **42** are located about 3.2 mm. from the edges of the die.

FIG. 5 shows the side view of a die and the die bottom. **55** shows the springs which restore the push-out plates into original positions after each push-out. **42** is the blade shown in FIG. 4.

The same figure also shows the cutting-out position located between the die **7** and the die bottom. After the cutout, the bottom section of the die expands, the upper section of the die is made to move downward slightly, and if the dough does not readily drop through gravity, the dough is pushed out by means of the above-mentioned push-out plates **9**.

FIG. 6 shows the entire bottom section of the die. It consists of four sections **61**, **62**, **63** and **64** and each of which has a retractable spring holder R. This operation conforms to the general die operating technique.

FIG. 7 shows the driving mechanism of the rollers and the conveyors. These move at the same speed and are operated so that the flattened dough will not be pulled and stretched. **1** is the roll of dough roller. **3** and **5** are a pair of feed rollers. **74** shows the spot where press-out is conducted. **75** is the cam which controls the movement of roll of the dough and a pair of feed rollers. **76** is the gear train from **75** to the driving motor.

FIGS. 8 and 9 give the operating mechanism and glucose liquid containers **23** and **25**. As shown in FIG. 2*b*, the glucose containers located in front of and in back of the ingredients container. Each operates 6 seconds during a 10-second interval. Since glucose liquid is then and readily dispersible, small holes are sufficient even though the dispersion takes a long period of time. To be more specific, the first glucose liquid container **23** disperses glucose liquid to the area which is about 15 cm. x 15 cm., and the second container, to the area which is about 7.5 cm. x 15 cm.

In FIG. 8, **23** is the glucose liquid container shown in FIG. 2*b*, **82** shows the holes at the bottom of the container, **83** is the front end of the cover which covers the holes **82** to keep the liquid inside the container before operation. This cover is fixed inside the container. **84** shows a pair of nuts which hold the cover and help to open or close the holes.

FIG. 8 also shows an agitating mechanism **85**, **86**, **87** and **203** which constantly keeps the glucose mixture stirred up to prevent its hardening. This mechanism is operated by a belt connected to the driving mechanism.

91 in FIG. 9 shows that the bottom of the glucose liquid container is equipped with automatic cover.

Since the holes at the bottom of the container are very small, this cover is required to scrape off excessive liquid from the bottom side so that the liquid will flow out more easily. This cover can be easily controlled by the cam **94**.

In FIG. 9, **91** shows a pair of bottom cover arms. The above-mentioned agitating mechanism installed in a support frame of the container can be removed without affecting the driving mechanism. The two cams **94** are driven by motive power mechanism through the linkages **97**. **95** shows two springs which support the cover **91** in an immobile position by means of stop pins **96**. In both positions, the glucose liquid container operates 6 seconds during a 10-second cycle.

FIGS. 10 to 15 show the ingredients feeding mechanism. The ingredients container **24** feeds the ingredients into the dough and also is controlled so that it can feed an equal amount of ingredients into each egg roll. For this purpose, the ingredients container **24** is equipped with a four-sided cage **131**, a small ingredients container **121**, and a pair of cover plates. The right amount of ingredients is placed inside the small container **121**. While this amount of ingredients is being put into the dough, the ingredients from the main container will drop into the small container at the same time.

In FIG. 10, **101** has the openings at the bottom just like the main ingredients container. This container is attached to a frame, and as will be described later, it is isolated from the driving mechanism. It can therefore be readily removed without inflicting any damage to the driving mechanism.

FIG. 11 shows the main ingredients container **101**, and **112** and **113** are the covers to cover the container openings **102**. The movement of the handles **114** and **115** manually will open or close the covers. The downward push of the handles will close the covers **112** and **113**. Covers can also be closed with the tightening of the screws **118** and **119** against the posts **116** and **117**. Obviously, the cover plates remain closed when the container is being prepared to dish out the ingredients.

For the purpose of operation, if the container is installed into the equipment, the two cover plates **112** and **113** will be left open and the small automatic system container **121** will be operated.

FIG. 12 shows that the container **121** is situated below the main container **101** by means of a pair of butterfly plates **126** and **127**. The two plates revolve upward at a distance of 10 degree distance from each other. During operation, the right amount of ingredients is kept inside the small container. When the ingredients are to be fed into the dough, the two plates **126** and **127** will revolve to open the bottom section so that the ingredients from the small conainer will drop down into the front end of the dough. The dropping down of the ingredients is then stopped. Each of the plates **126** and **127** revolves downward and receives ingredients from the cage **131**. In this way, an equal amount of ingredients is fed into each egg roll.

FIG. 13 shows the cage **131** located between the main cotnainer **101** and the small container **121**. This cage works as a part of the small container.

FIG. 14 indicates the method of controlling the two movable plates **126** and **127** of the small container **121**. As shown in the drawings, the two plates move in opposite direction from each other. This necessitates two driving mechanisms **143** and **144** to drive the two plates.

With the container's thin axle **142** on the inside and thick axle **141** on the outside, each of the two plates is operated independently by the driving mechanism coaxially as shown by the arrows in the drawing. The plates, axles, etc., are located outside of the small container and independent from it.

FIG. 15 is a perspective view of the working mechanism of the two ingredients feeding plates **126** and **127** and one side of the two movable plates driven by two gears **152** and **153**. The two gears are driven by a revolving gear **154** which is located above a horizontally moving gear **155** which, in turn, is situated above a gearshaft **157**. The horizontally moving gear **155** moves above a square shaft S and slides forward and backward during operation.

Cam **158** engages gear teeth **156** in the shaft **157** to drive shaft **157** forward and opens the plates to feed the ingredients onto the dough.

When the shaft gear **156** reaches the stopped position of the cam **158**, two springs **159** pull the shaft **157** backward and shut the door **126** immediately. This door should be closed as rapidly as possible to prevent the redropping of the ingredients while the initial ingredients are being dropped from the main container into the small container.

FIG. 16 shows a series of conveyor rollers C, FIG. 2*c*, which constitute the second roller conveyor **27**, and which are located beneath the ingredients container. These rollers **163** to **167** are driven intermittently by gear **162** which is meshed with drive gear **169**. The conveyors move the dough and stop during the ingredients feeding and folding processes. The conveyor rollers start moving again after dough is folded into a thin and long shape to push the semifinished egg roll into the next section.

FIG. 17 shows the working mechanism of the folding plates **26** as shown in FIGS. 2*b* and 2*c*. The operational mechanism is same as the above-mentioned small container plates. However, since the driving length of each of the two folding plates **26** is about 15 cm., they must be located in the center and beneath the ingredients container.

Similar operational mechanism is used to operate the rolling plate **29** which is shown in FIG. 2*c*.

The rolling plate **29** is located at the extreme end of the conveyors. The rolling process starts when the folded egg roll's extreme front end reaches the top end of the rolling plate by means of a continuous movement of the conveyor.

As soon as the rolling plate **29** starts moving, the top end of the semifinished egg roll is folded after passing the ingredients feeding section. The conveyor belt continues its movement and glucose liquid is applied at the front end of the egg roll and the belt keeps on moving until egg roll rolling is completed. This rolling process consumes 5 seconds.

The operational mechanism **204** of the push-out plate **200** and the control mechanism of the cleaning devices I and J are the same as those used hitherto in other machinery.

In the improved roller mechanism of FIG. 18, the conveyor **28** is composed of a frame having a vertical leg **300** and a slightly concaved horizontal portion **302**. Elongated rollers **304** are mounted in horizontal portion **302**. These rollers are connected by a chain, for example, and rotated by being driven by a belt **306** connected to a suitable power source. The frame **300** is lifted and lowered by a cam system **308** connected to a drive shaft **310**.

Rolling plate **29** is composed of a curved frame **320** which holds a plurality of elongated rollers **322**. These rollers are rotated by a belt **324** which in turn is driven by a train of belts **326** and **328** connected together and joined to a suitable power source. Rolling plate **29** is lifted and lowered by a cam system **330** mounted on shaft **310**.

In operation, horizontal portion **302** is initially at the same level as conveyor **27**. The partially formed egg roll slides from conveyor **27** onto rollers **304**. Portion **302** immediately rises and plate **29** moves down. The egg roll is moved by rollers **304** so that its leading edge strikes frame **320** and is curled upwardly into contact with rollers **322**. The combined driving force of rollers **304** and **322** thus causes the egg roll to rotate and turn over and be rolled into final shape. Plate **29** then rises and conveyor **28** drops to release the egg roll so that rollers **304** again advance the egg roll, and the completed egg roll is discharged into chute **334**.

FIG. 19 shows the time table for each process in making egg rolls by means of the automatic egg roll making machine. The figure divides each process into a 10-second cycle. This machine therefore can make 360 egg rolls per hour at the standard speed.

Since the time required for each process is controlled, since each plate has similar operational mechanism, since the component parts of the machine operate through linkage with an ordinary motor, and since mechanical trouble is minimal, the automatic egg roll making machine based on this invention will help cut down the manufacturing cost.

Moreover, because of the machine's high speed, it cuts down labor cost. By this process, the size of each egg roll will be the same and from the health viewpoint, this way of making the egg rolls is highly desirable.

Having now described the means by which the objects of the invention are obtained, I claim:

1. An egg roll rolling device for an egg roll machine comprising lower conveyor means for receiving and advancing a partially formed egg roll, upper conveyor means curved toward said lower conveyor means for cooperating with said lower conveyor means to turn and roll the partially formed egg roll therebetween to form the egg roll into final shape, means for lifting and lowering said upper conveyor means, and means for lifting and lowering said lower conveyor means.

2. An egg roll rolling device for an egg roll machine comprising lower slightly concave conveyor means for receiving and advancing a partially formed egg roll, and upper conveyor means curved toward said lower conveyor means for cooperating with said lower conveyor means to turn and roll the partially formed egg roll therebetween to form the egg roll into final shape.

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JOSEPH SHEA, *Assistant Examiner.*

U.S. Cl. X.R.

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