June 10, 1969 A. F. VERHOEVEN 3,448,696

METHOD AND APPARATUS FOR FORMING AND ARRANGING WAFERS OR COOKIES

Filed Sept. 10, 1965 Sheet 1 of 4

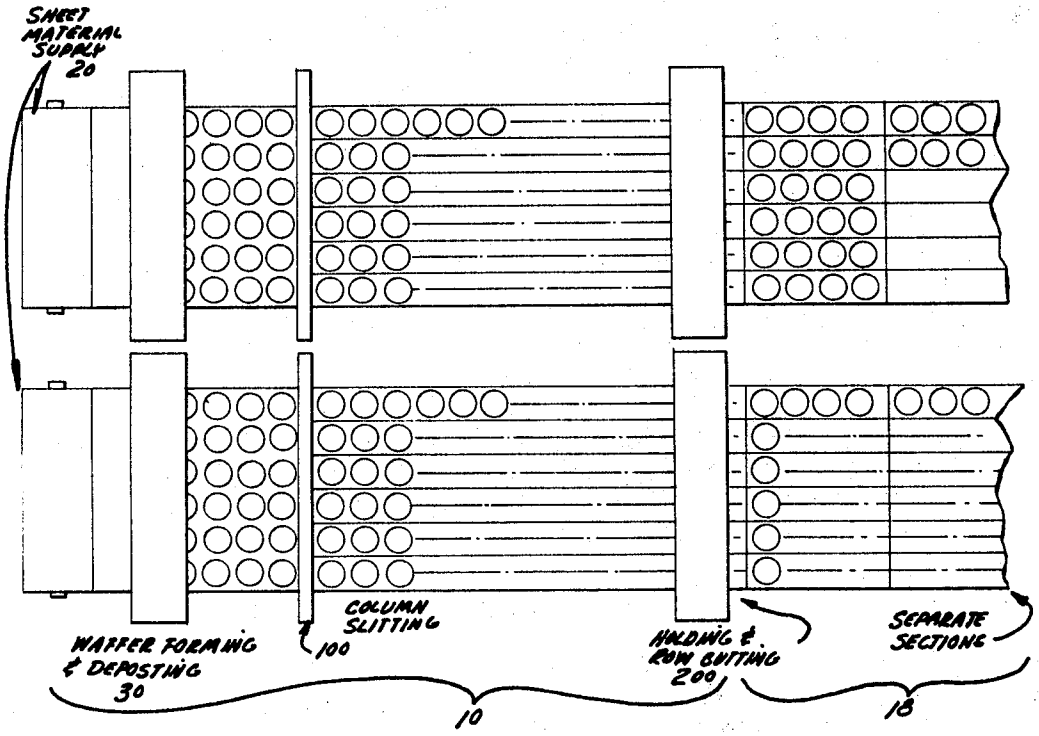


FIG. 1

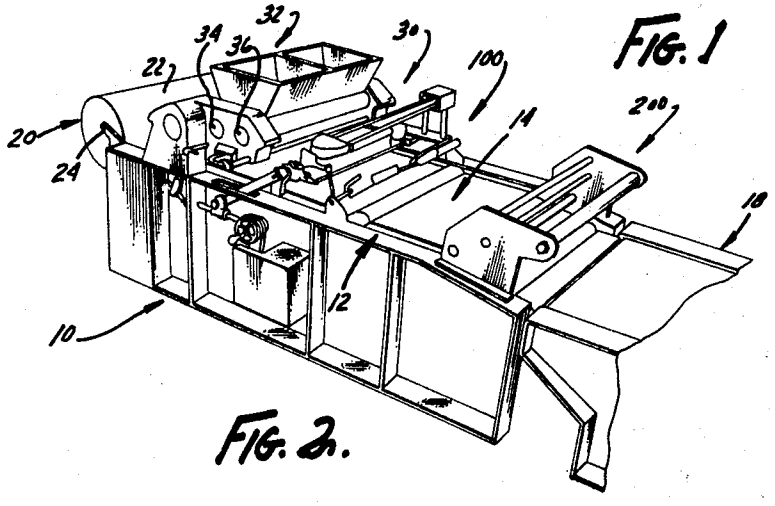


FIG. 2.

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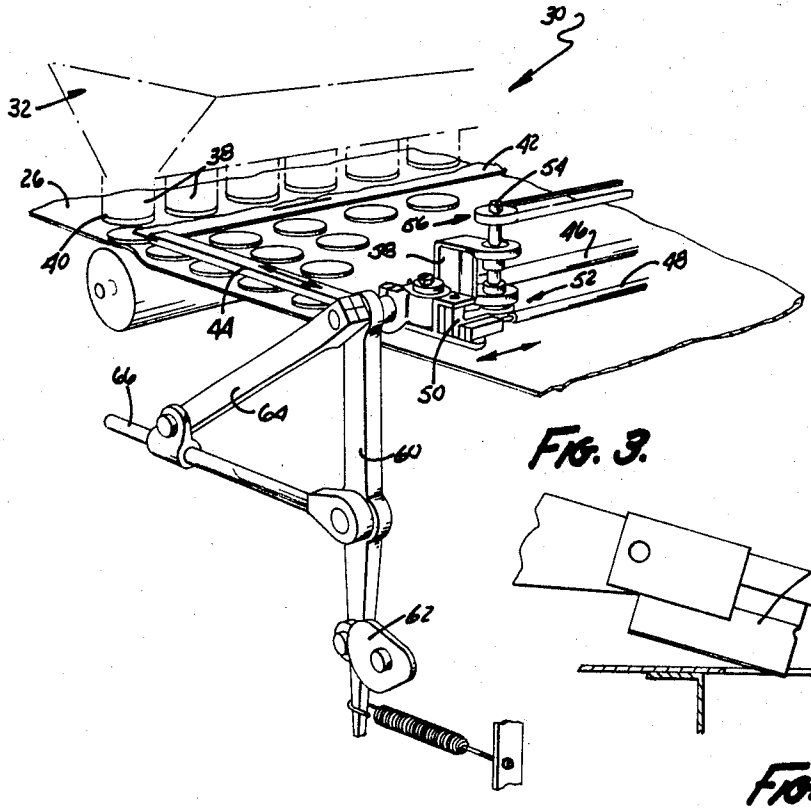


FIG. 3.

FIG. 5.

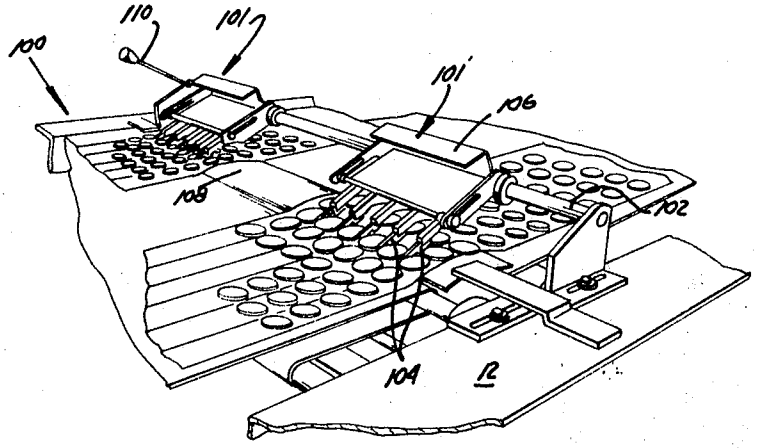


FIG. 4.

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METHOD AND APPARATUS FOR FORMING AND ARRANGING WAFERS OR COOKIES

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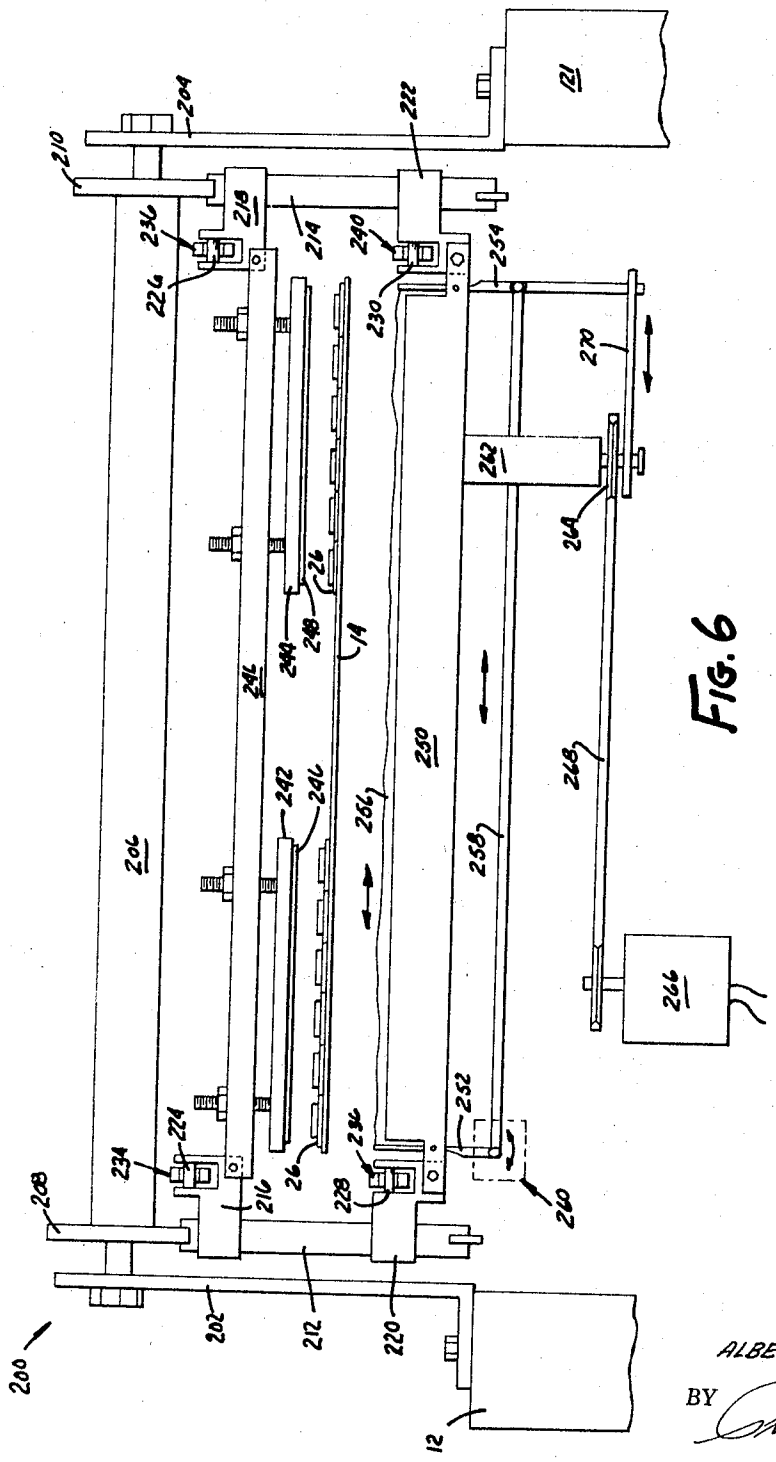


FIG. 6

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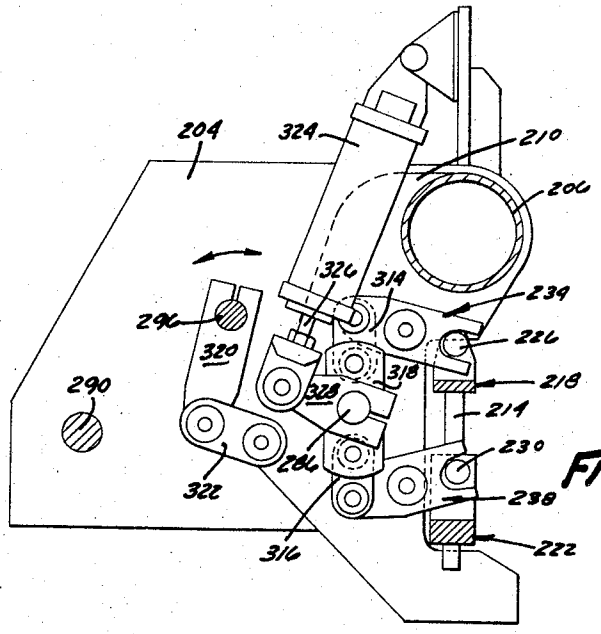


FIG. 8

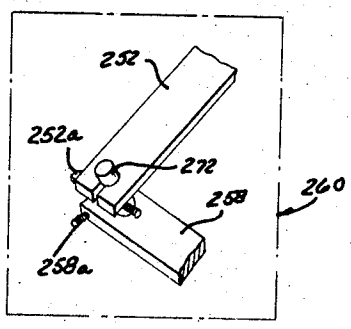


FIG. 6a

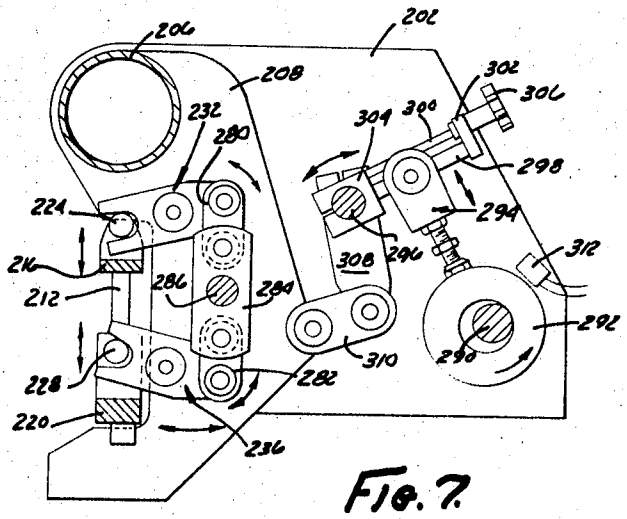


FIG. 7

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United States Patent Office 3,448,696 Patented June 10, 1969

3,448,696

METHOD AND APPARATUS FOR FORMING AND ARRANGING WAFERS OR COOKIES

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Int. Cl. A21c *3/00, 11/10;* A21d *8/02*
U.S. Cl. 107—4 12 Claims

ABSTRACT OF THE DISCLOSURE

A method and apparatus for arranging wafers such as cookies and the like for packaging wherein a plurality of wafers are deposited on an elongated sheet which is moving lengthwise. The wafers are deposited in columns running longitudinally of the sheet and slitting means is provided to slit the sheet between the columns into separate elongated strips, each bearing a column of wafers. The sheet strips are cut transversely at desired intervals determined by a predetermined selected number of wafers to produce a plurality of strips of supporting material each bearing a plurality of wafers.

This invention relates to the forming and arranging, as for packaging, of wafers such as cookies and the like, and more particularly to a method and apparatus for continuously forming wafers such as cookies, depositing the same upon a sheet of suitable supporting material, and automatically cutting the sheet into individual sections which each carry a predetermined number of the wafers, so that the individual sections may be stacked and packaged in a desired manner.

The automatic forming of wafer material such as cookie dough into individual cookies has been known in the past, and it has also been known to automatically deposit such wafers upon a moving sheet of paper or the like so that the wafers may subsequently be packaged. However, the separating of the supporting sheet of material and the wafers carried thereupon into individual segments has previously been a time-consuming and expensive operation. There are many problems involved in attempting to automatically cut the supporting paper or the like into individual portions, since the cookies are spaced very closely together and the sheet of supporting paper or the like is continuously moving. Consequently, no suitable equipment for automatically accomplishing this has previously existed.

It is therefore an important object of the present invention to provide a method of and apparatus for automatically cutting the supporting sheet into individual portions bearing a predetermined number of individual wafers while the sheet and wafers continuously move, and without interrupting such movement.

Another important object of the present invention is to provide apparatus for continuously accomplishing the complete operation for forming cookie dough or other wafer medium into desired wafers such as cookies, depositing the cookies upon a moving sheet of supporting material, and automatically separating the supporting sheet into individual segments which each carry a predetermined desired number of cookies.

A further object of the present invention is to provide wafer-forming and arranging apparatus of the character described, which initially separates the moving sheet into individual longitudinal columns by slitting the sheet between desired wafers as the sheet continuously moves.

A still further object of the present invention is to provide wafer-forming and arranging apparatus of the character described which separates the moving sheet of material transversely into individual portions by means of a cutting apparatus synchronized to the movement of the sheet.

Another object of the present invention is to provide wafer-forming and arranging apparatus of the type described which separates the moving sheet of supporting material into individual transverse portions by means of structure which first moves in synchronism with the moving wafers and sheet material, then holds the wafers upon the moving sheet so that there is no relative motion between the two, and which then cuts the sheet transversely adjacent predetermined ones of the wafers which are held in position.

Still another object of the present invention is to provide wafer-forming and arranging apparatus of the type described which first separates the moving support sheet into individual longitudinal columns by slitting the sheet as the same is moved, and which then separates the individual columns into predetermined sections by transversely cutting the same adjacent predetermined wafers.

A still further object of the present invention is to provide wafer-forming and arranging apparatus for longitudinally slitting the supporting sheet and then transversely cutting it in the manner noted, which includes a rapidly vibrating or oscillating cutting blade for making the transverse separations.

A still further object of the present invention is to provide wafer-forming and arranging apparatus having the vibrating or oscillating cutting blade noted, which incorporates a unique support mount for the pivot points of the oscillating cutting blade apparatus.

The foregoing important objects and advantages of this invention, together with other additional desirable features and attributes thereof, will become increasingly apparent to those skilled in the pertinent art following consideration of the ensuing specification and its appended claims, particularly when taken in connection with the accompanying drawings setting forth a preferred embodiment of the apparatus.

In the drawings:

FIG. 1 is an overhead plan view in diagrammatic block form showing the separate operations and the flow of the process involved;

FIG. 2 is a frontal perspective view showing general details of the complete apparatus of the invention;

FIG. 3 is a frontal perspective view of the wafer-forming and depositing portion of the apparatus;

FIG. 4 is an enlarged frontal perspective view of the longitudinal slitting structure involved, showing details thereof;

FIG. 5 is a further enlarged, fragmentary, side elevation, partially in section, of some of the structure shown in FIG. 4, showing further details thereof;

FIG. 6 is an end elevation of the apparatus, showing details of the structure for making transverse cuts;

FIG. 6*a* is an enlarged perspective view of the novel pivot joint utilized in the structure of FIG. 6;

FIG. 7 is an enlarged lateral perspective view showing further details of the structure for making transverse cuts; and

FIG. 8 is a second enlarged lateral perspective view showing additional details of the transverse cutting apparatus.

Briefly stated, the present invention provides apparatus for forming and arranging wafers such as cookies and the like, which most preferably includes means providing an elongate sheet of material for supporting the wafers, means for moving the sheet of supporting material lengthwise in a generally continuous manner, means for forming a desired wafer medium such as cookie dough into bar form of desired configuration, slicing means for sever-

ing the bars into individual wafers and depositing the wafers upon the moving sheet material, slitting means for passing through the moving sheet between desired wafers to slit the sheet into longitudinal columns carrying a sequence of the wafers, and means for making transverse cuts in the moving individual columns of wafers and support material to cut the latter transversely into predetermined individual sections which each carry a desired number of the wafers, so that the individual sections may then be stacked and packaged in a desired manner by known automatic means.

Referring now in more detail to the drawings, in FIG. 1 the complete wafer-forming and arranging portion of the invention is indicated generally at **10**, and a carry-off conveyor of a conventional nature is indicated at **18**. As the various labels indicate, the portion **10** includes a sheet material supply portion **20**, a wafer-forming and depositing section **30**, a slitting section **100**, and a holding and row-cutting section **200**. The final separate sections of sheet material and illustrative wafers are carried away by the carry-off conveyor **18**, positioned beyond the holding and row-cutting section **200**.

Some of the structural features of the complete apparatus **10** are shown in FIG. 2, where it will be seen that the complete apparatus embodies a frame structure **12** which supports a central conveyor bed portion **14**. As will be seen, the conveyor bed portion includes continuously movable conveyor belt members which move longitudinally or lengthwise of the frame structure **12**. Mounted upon the frame structure are the various component assemblies which provide the sequential operations already noted. The first such assembly is the sheet material supply portion **20**, which will be seen here to comprise rolls **22** of a suitable sheet stock such as paper for supporting the wafers subsequently formed. There are preferably two such rolls mounted for rotation upon appropriate mounting rod means **24** passing through their centers. The sheet stock from rolls **22** passes lengthwise of the apparatus **10** and is continuously moved in this direction upon the central conveyor bed portion **14** as the stock is unrolled from its supply **20**.

The wafer-forming and depositing section **30** is seen in FIG. 2 to include a hopper **32** into which the dough or other wafer medium is placed, and a pair of roller members **34** and **36**. The rollers are operated by rotating roller **34** in a clockwise direction while rotating roller **36** in a counterclockwise direction. Together, these rollers act upon the dough in hopper **32** to continuously pack it into a series of cylinders positioned immediately beneath the hopper, as is shown more specifically in FIG. 3, to form the dough into bars whose cross section conforms to the configuration of the cylinders. This structure and its operation are generally known to those skilled in the art, and consequently no further specific discussion is deemed to be necessary. The slitting assembly **100** of FIG. 1 is shown in FIG. 2, as is the holding and row-cutting structure **200**. These are shown in more detail in subsequent figures, however, and they are shown in FIG. 2 to illustrate their positioning and general coaction with the remainder of the complete apparatus **10**.

The wafer-forming and depositing section **30** depicted generally in the first two figures is seen in detail in FIG. 3, in which the hopper **32** is illustrated in phantom. As seen here, a plurality of forming tubes **38** depend from the hopper, and it is into these that the dough or other wafer medium from the hopper is packed by the action of the rotating cylinders **34** and **36** seen in FIG. 2, as persons skilled in the art will readily understand. As the dough is packed into the forming tubes, it attains a cross section comparable to that of the tubes, and is pushed out of the tubes as at **40** in this shape. A horizontally-disposed cutting blade **42** is mounted for reciprocating movements from left to right as seen in the drawing, such that the blade slices the tubes of formed dough **40** into individual generally flat wafers. These drop downward directly onto the moving sheet stock **26**, from the sheet supply portion **20** of the previous figures, which is positioned immediately therebelow. In this manner, a continuous succession of generally longitudinally aligned columns of wafers are deposited upon the moving sheet.

Inasmuch as both sides of the structure supporting and actuating the cutting blade **42** are the same, and also inasmuch as the general principles of this structure are known in the art, only one side is shown and discussed herein. This structure includes a support linkage **44** positioned lengthwise relative to the moving sheet stock, to which the end of the cutting blade is attached. The support linkage **44** is in turn suspended from a transverse support rod **46** for pivotal movement in the direction shown by the arrow, i.e., transversely relative to the sheet stock **26**. A tie rod **48** is pivotally connected to the rearward end of the support linkage **44**, and extends horizontally across the frame structure of the apparatus to connect in a similar manner to a like support linkage (not shown) attached to the opposite end of the cutting blade **42**, to transmit motion from one of the support linkages to the other. Also, a yoke **50** is pivotally connected to the support linkage **44** near its end, to impart reciprocating motion thereto. The yoke itself is reciprocated by an eccentric drive indicated at **52** which is driven in a rotary manner through a drive shaft **54** from a belt and pulley arrangement **56**. It is to be understood that the belt and pulley are driven by an appropriate electric motor or the like, which is not illustrated here but which is shown generally in FIG. 2. Drive shaft **54** is supported in place by an appropriate coupling member **58**.

The entire oscillating cutting blade **42**, together with its support linkages **44** and reciprocating drive members and the like, is driven forward and backward relative to the hopper **32** and forming tubes **38** through the action of a reciprocating drive rod **60**. This member is pivoted near its center, and is pivotally connected at its top to the transverse support rod **46**. At its bottom, the drive rod **60** is spring-loaded against a rotating cam **62**. From the configuration of the cam **62** illustrated, it will be apparent that the bottom portion of drive rod **60** will move sharply toward the right when it engages the lobe portion of cam **62**, and that consequently the top portion of the drive rod will move sharply toward the left, to carry the cutting bar **42** into and through the bars **40** of dough emerging from the forming tubes **38**. Conversely, the bottom of drive rod **60** will be moved sharply toward the left as it follows the surface of cam **62**, to bring the top of the rod back to the position shown in FIG. 3. A stabilizing bar **64** follows a guide rod **66** at its bottom and is pivotally coupled to the top of the drive rod **60** and the support linkage **44**. This serves to stabilize the forward and backward thrusting of the support linkage and cutting bar assembly.

The slitting assembly **100** indicated generally in FIGS. 1 and 2 is shown in more detail in FIGS. 4 and 5. As seen in FIG. 4, this assembly includes a pair of like units **101** and **101'**, which are mounted upon a pivotal support bar **102** mounted immediately above the moving sheets of paper or like support material from the rolls **22** seen in FIGS. 1 and 2. More specifically, each of the units **101** and **101'** includes a plurality of adjacent spaced cutting blades seen at **104** (FIG. 5). These are mounted upon independent arms rigidly secured to an appropriate connecting structure. A counterweight **106** is preferably included, and arranged in such a manner as to pass "over center" when the slitting apparatus is rotated upon support bar **102** into the position shown in the figures. As the figures illustrate, a raised guide surface **108** is affixed to each side of the frame structure **12** of the apparatus in such a manner that the two sheets of material pass over it. Guide surface **108** preferably has a series of spaced grooves or slots **109** aligned with each of the cutting blades **104**, such that when the slitting apparatus is pivoted to the position shown, each of the cutting blades **104**

passes through the sheet of material between adjacent longitudinal columns of wafers, to pass into the shallow grooves or slots **109** just noted (FIG. 5). Consequently, the moving sheet of material is automatically slit into a plurality of adjacent longitudinal slits, each carrying a single column of the wafers or cookies (see FIG. 4). Since the moving sheet is slit at the start of the operation and continuously thereafter, the slitting assembly **100** need not be automated, but may be operated at the commencement of each operating period by an appropriate control lever **110** secured to the support bar **102** to rotate it and the attached units **101** and **101'** into the cutting position shown.

The holding and row cutting assembly **200** illustrated generally in FIGS. 1 and 2 is shown in detail in FIGS. 6, 7 and 8. Referring first to FIG. 6, it will be observed that the frame structure **12** supports a pair of upstanding lateral support members **202** and **204**, which are secured to the frame and oriented at either side of the complete apparatus. Near the top of the two support members **202** and **204** and journaled within each of these members for rotary movement relative thereto is a transverse support rod **206**. Secured to each end of the support rod **206** for movement therewith are a pair of rocking plates **208** and **210**, and secured to each rocking plate for movement therewith is a downwardly-depending guide **212** and **214**, respectively. Telescoped over each of the two guides **212** and **214** for vertical sliding movement relative thereto are an upper pair of sliding mount blocks **216** and **218**, and a lower pair of sliding mount blocks **220** and **222**, respectively.

As will be observed, each of the mount blocks **216**, **218**, **220**, and **222** has its inwardly-directed portion formed to provide an upraised clevis arrangement, between whose spaced legs is located a cylindrical journal piece, designated **224**, **226**, **228** and **230**, respectively. Corresponding actuating members **234**, **236**, **238** and **240**, having extending spaced finger portions, are engaged with each of the journal pieces **224**, **226**, **228** and **230**, respectively, so that upward or downward movement of the actuating members imparts a corresponding movement to the associated sliding mount blocks, and to the structures secured thereto.

Rigidly secured to each of the upper sliding mount blocks **216** and **218** is a transverse support column **241**, which carries a pair of backing bar means **242** and **244**. These are generally rectangular weights, which are each preferably provided with a layer of polyurethane or other foam **246** and **248**, respectively, secured to the lower surface thereof. The backing bar means are preferably affixed to the support column **241** by a sliding interconnection which permits vertical movement of the backing bars relative to the column. As illustrated, this may be provided by a pair of studs secured to each of the backing bars which extend upward through the support column to receive retaining nuts which hold them loosely in place to permit the vertical movement described. It is to be noted that the central conveyor bed portion **14** and the moving sheet material **26** carried thereupon pass immediately under the backing bar means **242** and **244**, such that the latter are aligned directly over the wafers or cookies which move thereunder.

Secured to each of the lower sliding mount blocks **220** and **222** is a transverse cutting assembly support member **250**. At each end of this member is pivotally mounted a vibrating link **252** and **254**, respectively, which support at their upper extremity a cutting blade **256** extending transversely across the apparatus relative to the central conveyor bed portion **14** and the two sheets of paper **26** moving thereupon. The cutting blade **256** is a long thin blade with an undulating or serrated upper cutting edge, and the support member **250** preferably has an elongate transverse groove (not specifically shown) in its upper portion, in which the bottom of the cutting blade **256** is loosely positioned to be guided thereby. The lower ends of each of the vibrating links **252** and **254** are interconnected by a tie rod **258** which is pivotally mounted to each of the links. This tie rod serves to transmit motion from one link to the other, such that they move synchronously together. The specific preferred form for the pivotal connection between the vibrating links **252**, **254** and the tie rod **258** is illustrated within the dashed lines **260**, and this is enlarged and shown in detail in FIG. 6*a*, to be described subsequently.

A depending mounting bracket **262** is rigidly secured near one end of the support member **250**, and this bracket supports a rotating pulley **264** which is driven by a desired motor **266**, through a belt drive **268**. The driven pulley **264** drives a yoke **270** by means of a typical drive shaft and eccentric connection, such that the yoke **270** moves in a rapidly reciprocating manner in the direction shown by the arrow. The end of yoke **270** is connected to the lower extremity of vibrating link **254**, and consequently the reciprocating motion of the yoke is imparted first to the vibrating link **254**, and also to link **252**, through their interconnecting tie rod **258**. This will be observed to impart a corresponding reciprocation to the cutting blade **256** attached to the upper ends of the links **252** and **254**. Further, it will be apparent that since the drive pulley **264** is structurally connected by bracket **262** to support member **250**, the pulley, yoke, vibrating links, and blade will all be moved vertically in the event that the lower sliding mount blocks **220** and **222** are moved relative to guides **212** and **214**. It is for this purpose that the drive belt **268** is of a relatively long length, for this permits the pulley to be moved laterally relative to the motor **266** without materially interfering with the driving belt.

As indicated previously, a preferred form for providing the reciprocating pivotal connection between the vibrating links **252** and **254** and their interconnecting tie rod **258** is illustrated in FIG. 6*a*. As illustrated here, each of these members is preferably divided or bifurcated at its end extremity and has a corresponding machine screw such as **252***a* and **258***a* passing through the divided ends for varying the spacing therebetween. Each of the divided ends of the links and tie rod are bored to provide a cylindrical passage therethrough, and a rod **272** is passed through this bore and retained in place by tightening the adjusting screws **252***a* and **258***a*, such that both the link and the tie rod are securely and non-rotatably connected to the rod **272**. Thus, the typical rotating bearing previosuly found in applications such as this is completely eliminated, and instead when the link and tie rod are moved relative to each other, the rod **272** is twisted in a torsional movement. Then, on the opposite movement by the link and tie rod, the rod resiliently returns to its normal alignment and is twisted in the opposite direction. The desirability of such a connection will be immediately apparent, since all moving parts are eliminated and there is virtually no wear to the joint. Further, since friction is eliminated, practically no heat is generated even after the most prolonged periods of reciprocation, and due to the natural torsional springing of the rod, the mechanical efficiency of such a pivotal joint is very much greater than the typical frictional bearing. It will further be apparent that such a joint may be used to advantage at all points of such pivotal reciprocal motion, such as the connection of the vibrating links **252** and **254** to the support member **250**, and also in such applications as the reciprocating pivotal mountings seen in FIG. 3 in connection with the wafer-forming and depositing portion of the apparatus.

Further specific details of the holding and row-cutting assembly **200** seen in FIG. 6 are illustrated in FIGS. 7 and 8. In FIG. 7, the assembly **200** is viewed laterally from one side of the complete apparatus **10**, whereas in FIG. 8 the assembly **200** is viewed laterally from the other side thereof. Referring first to FIG. 7, the nature of the lateral support member **202**, the transverse support

rod **206**, the rocking plate **208**, and its depending guide **212**, which all were described in connection with FIG. 6, is all illustrated in more detail here. Thus, it will be observed that the actuating members **234** and **238**, whose extending fingers engage the journal pieces **224** and **228** of the upper and lower sliding mount blocks **216** and **220**, respectively, are connected medially to the rocking plate **208**. This connection is a pivotal one, and each of the actuating members **234** and **238** are also pivotally connected at their remaining ends to a pair of connecting links **280** and **282**, respectively. Further, these connecting links are also pivotally connected at their other ends to a tripping member **284**. The latter is pivotally connected to the rocking plate **208** by a partially rotatable central shaft **286**. Thus, as the arrows in this figure indicate, a rotary movement of shaft **286** will effect corresponding movement of the tripping member **284**. This movement is in turn coupled by connecting links **280** and **282** to the actuating members **234** and **238**, to pivot them upon the rocking plate and thereby impart downward motion to one of the mount blocks **216** and **218** while simultaneously imparting upward movement to the other.

As has been stated, the rocking plate **208**, together with all other structures associated therewith or attached thereto, rotates in a reciprocal manner about the support rod **206** as a center. This movement is put into operation by the following structure. First, a rotating drive shaft **290** is journaled in support member **202** and driven in a desired manner, to be noted subsequently. An eccentric drive means **292** is mounted over shaft **290** and driven thereby, to impart reciprocating motion to a coupling shaft unit **294** attached to the eccentric. A second shaft **296** is also journaled for rotary movement in support member **202**, and the reciprocating motion of coupling unit **294** is imparted thereto by a drive rod **298** which passes through unit **294** with a slip fit. An elongate threaded adjusting bolt **300** passes through an appropriate threaded passageway in a lateral extension **302** of the drive rod **298**, such that its end abuts the coupling **304** on shaft **296**, which slidably receives the end of drive rod **298**. An appropriate hand wheel **306** or other such member is provided for the end of adjusting bolt member **300**, such that by turning the threaded adjusting bolt, the effective distance between coupling unit **294** and shaft **296** may be varied to limit the stroke of the reciprocating rotary movement imparted to the shaft due to the action of the eccentric **292** and its coupling **294**.

The reciprocating rotary movement of shaft **296** is coupled through pivotally connected linkages **308** and **310** to the rocking plate **208**, linkage **308** being non-rotatably connected to the shaft **296**, and linkage **310** being pivotally connected to the rocking plate. Consequently, a clockwise rotation of shaft **296** causes the rocking plate to move to the left about rod **206** and a counterclockwise rotation of shaft **296** causes the rocking plate to move to the right, in rocking movements which correspond to the reciprocating motion of this shaft. It is to be pointed out that a micro-switch **312** is mounted to support member **202** to monitor the movements of drive shaft **290** and eccentric drive **292**, each revolution of the drive shaft bringing the eccentric drive into actuating contact with the switch. The purpose of this switch will appear subsequently. As for the means driving shaft **290**, it should be noted that this shaft is preferably coupled as by a direct chain drive to the means driving the rotating cam **62** seen in FIG. 3, so that each revolution of the cam and consequent actuation of the drive rod **60** and cutting blade **42** in the wafer forming section **30** is synchronized to a revolution of the drive shaft **290** and consequent reciprocating rocking motion of rocking plate **208** and all its attached structures.

As seen in FIG. 8, the side of the holding and row-cutting assembly **200** opposite from that seen in FIG. 1 includes a similar rocking plate **210** mounted adjacent lateral support **204** for rocking reciprocal motion about the same support rod **206**. The actuating members **236** and **240** which engage the journals **226** and **230** of upper and lower sliding mounts **218** and **222** are pivotally mounted upon the rocking plate **210** at a point intermediate the ends of the actuating members, and these members are connected at their remaining ends through pivotal connecting links **314** and **316** to a tripping member **318**, in the same manner as links **280** and **282** and tripping member **284** of FIG. 7. Tripping member **318** receives the opposite end of central shaft **286**, which also connects to tripping member **284** of FIG. 7. Consequently, it will be apparent that the movements of the tripping members, connecting links, actuating members, and sliding mount blocks of both FIGS. 7 and 8 are completely synchronized. Further, the same reciprocating shaft **296** seen in FIG. 7 is journaled in lateral support **204**, and is connected by pivotal links **320** and **322** to rocking plate **210**, in the same manner as is true of links **308** and **310** associated with rocking plate **208** of FIG. 7. Consequently, the rocking movements of both rocking plates are completely synchronized. Rotating drive shaft **290**, which serves to drive the eccentric **292** of FIG. 7, is journaled for rotary movement in lateral support **204**.

An electrically actuable pneumatic cylinder **324** is provided for the holding and row-cutting assembly **200**, and mounted for example upon lateral support **204** in the manner indicated. As the figure illustrates, the cylinder has a plunger member **326** which is pivotally connected through a linkage **328** to the central shaft **286** and the tripping member **318**. As will be understood, electrical impulses cause the cylinder **324** to sharply actuate by extending and retracting its plunger **326**. This in turn sharply reciprocates the tripping member **318** and its central shaft **286**. Inasmuch as this shaft is also connected to tripping member **284** of FIG. 7, corresponding sharp reciprocating motion is imparted to the latter. In this manner, both sets of upper and lower actuating members **234**, **236**, **238** and **240** and sliding mount blocks **218**, **216**, **220** and **222** are synchronously moved in unison upon actuation of the cylinder **324**.

The electrical impulses which actuate cylinder **324** are provided by micro-switch **312** of FIG. 7, and it will be readily understood that by using conventional impulse counting means such as a stepping relay for example, the cylinder may be actuated once per any desired number of revolutions of the rotating drive shaft **290**. As will be apparent, the actuation of the pneumatic cylinder is therefore directly related to the rocking movements of the rocking plates **208** and **210** and their associated structures, and further is directly related to the positions of the various wafers which are cut and deposited by section **30** of FIG. 3, due to the synchronized drive between these two sections which has been noted.

Operation

In operation, the hopper **32** in the wafer-forming and depositing section **30** seen in FIGS. 2 and 3 is filled with a desired wafer-forming medium such as cookie dough. The dough is continuously packed into the forming tubes **38** by the rollers **34** and **36**, and as the paper or other sheet support stock **26** from the rolls **22** passes beneath the forming tubes, cutting blade **42** is continuously reciprocated by the structures which have been described to continuously slice off wafers from the dough **40** protruding from forming tubes **38**, which wafers then fall directly onto the moving support stock **26** in a continuous succession of longitudinal columns. The slicing of the individual wafers is enhanced and facilitated through the rapid reciprocal movements imparted to cutting blade **42** through the pulley drive **56** and eccentric drive **52**, which have been described.

As the continuous successions of aligned wafers are continuously moved by the supporting sheet stock, they pass through the slitting assembly **100** of FIGS. 4 and 5, where the individual cutting blades **104** operate to slit

the separate sheets of stock into a plurality of separate adjacent elongated strips of material, each bearing a separate continuous column of wafers. These columns next encounter the holding and row-cutting assembly **200** of the invention, illustrated in FIGS. 6, 7, and 8. Inasmuch as each stroke of the cutting blade **42** in section **30** is synchronized to the drive shaft **290** of the row-cutting assembly, the two rocking plates **208** and **210** rock forward in synchronization with each wafer in the adjacent columns passing therebeneath, the rocking plates returning to their starting point with the approach of the next succeeding wafer in each column. This rocking motion of the rocking plates carries the transverse support column **241** and its depending backing bar means **242** and **244** seen in FIG. 6 in unison with it, and the individual members are arranged such that the backing bar means are positioned directly over each lateral row of adjacent wafers as the same pass directly under the backing bars. Also, the rocking movement of the rocking plates carries support member **250** of the transverse cutting assembly back and forth in unison with the movement of the support column **241** and backing bars **242** and **244**, the arrangement of the cutting blade **256** being such that it remains oriented adjacent the row of wafers in alignment with the backing bars. Thus, it will be seen that the separate longitudinal columns of wafers emerging from the slitting assembly **100** remain in laterally aligned rows, and as each such row moves past the holding and row-cutting assembly **200**, the backing bars move in unison with it directly overhead, while the cutting blade **256** moves in unison with it directly beneath.

As may be seen in FIG. 2, the central conveyor bed portion **14** of the complete apparatus **10** terminates immediately beyond the holding and row-cutting assembly **200**, and as has been noted, a carry-off conveyor means **18** is provided as an accessory structure to continue the orderly progression of the moving segments of the sheet stock **26** and the wafers thereupon. The forward rocking of the cutting assembly support **250** and cutting blade **256** carries the latter just beyond this extremity of the conveyor bed **14**, between it and the carry-off conveyor means **18**. The forward rocking movement of the backing bar means **242** and **244** is merely to the edge of the conveyor bed portion **14**, however.

In accordance with the micro-switch **312** (FIG. 6) and the particular impulse-counting arrangement being used, an actuating impulse is supplied to pneumatic cylinder **324** (FIG. 8) when a desired number of the adjacent wafers forming each longitudinal column thereof has passed beneath the backing bar means. When this occurs, not only are the backing bar means moved forward in synchronism with the particular row of wafers passing therebeneath due to the movement of the rocking plates **208** and **210**, but the actuation of the cylinder **324** initiates the movements of the actuating members **234**, **236**, **238**, and **240** and their associated upper and lower sliding mount blocks **216**, **218**, **220**, and **222** which have been described. Consequently, at this instant the support column **241** is suddenly lowered as it rocks forward, and this moves the backing bar means **242** and **244** downward so that their attached contact cushions **246** and **248**, respectively, come into contact with the selected moving row of laterally adjacent wafers.

The downward movement of the support column **241** is such that the entire weight of the backing bar means is taken up by the row of wafers, due to the clearance normally existing between the backing bars and the support column and the sliding fit of the stud members passing through the support column to secure the backing bars thereto. The weight of the backing bars upon the wafers serves to position that particular row and hold it relative to the moving sheet of stock **26** therebeneath. The forward movement of the sheet stock and wafers continues, directly in synchronism with the forward movement of the support column **241** and rocking plates **208** and **210**. At the same time, the oscillating or vibrating cutting blade **256** is raised sharply, and due to its orientation relative to the backing bars, it severs the sheet stock **26** transversely, immediately adjacent the row of wafers being held by the backing bars.

Thus, separate sections of the sheet stock are provided, each bearing a desired number of wafers forming a short column thereupon. As illustrated in FIG. 1, these separate sections then are moved by the carry-off conveyor means **18** to a desired location for the actual packaging operations, wherein the separate sections of wafers may be stacked upon each other and wrapped in a desired manner. The holding and cutting operation is a very rapid movement, and consequently immediately after the particular transverse cut has been made, the backing bars and cutting blade return to their positions as shown in FIG. 6, to continue to move in synchronism with succeeding rows of laterally adjacent wafers, and to effect a similar transverse cut upon receiving another actuating signal from the microswitch and pneumatic cylinder.

I claim:

1. A method of forming and arranging wafers such as cookies and the like, comprising the steps: providing an elongated sheet of material for supporting such wafers; forming a desired wafer medium into a bar of desired form; slicing individual wafers from said formed bars; moving said sheet under said wafers as they are being sliced whereby said individual wafers are deposited onto said sheet in spaced relationship in columns running longitudinally of said sheet and in rows running transversely of said sheet; moving said sheet and wafers together past slitting means to slit the sheet between the columns of said wafers into separate elongated strips of sheet material each bearing a column of said wafers; and thereafter cutting said strips transversely thereof at desired intervals between predetermined rows of wafers as the columns continue to move beyond the slitting means, to produce strips of supporting material each bearing a predetermined number of a plurality of wafers ready for packaging.

2. Apparatus for forming and arranging wafers such as cookies and the like, comprising in combination: means providing an elongated sheet of material for supporting such wafers; means for moving said sheet material lengthwise in a generally continuous manner; means for forming a desired wafer medium into bar form of desired configuration positioned above the moving sheet; slicing means for severing said bars into individual wafers such that the wafers drop onto said moving sheet material in generally aligned adjacent columns; cutting means for passing through the moving sheet between said adjacent columns to slit the sheet into elongated strips of said sheet each bearing a column of said wafers; means for holding particular wafers in place relative to the moving sheet material; and means for making transverse cuts in said sheet strips adjacent the said wafers which are held in place at desired intervals in said lengthwise movement determined by a predetermined selected number of a plurality of wafers between each cut to produce predetermined separate sections of sheet each bearing a desired number of a plurality of wafers.

3. The apparatus of claim **2**, wherein said means for holding wafers includes an overhead backing bar structure mounted for rocking movements in the direction of said lengthwise sheet movement and synchronized thereto, said rocking movement bringing said backing bar structure into register with particular wafers moving thereunder, and said holding means further including means for lowering said backing bar onto the wafers in register therewith as the wafers and sheet continue to move, to hold such wafers in place relative to the moving sheet.

4. The apparatus of claim **3**, wherein said means for making transverse cuts includes a cutting blade spaced below and positioned across the width of said sheet material to co-act with said backing bar to cut the sheet adjacent the wafers being held by the latter, and further in-

cludes means for vibrating said blade along its length to facilitate the cutting of said sheet material.

5. The apparatus of claim 4, wherein said means for making transverse cuts is mounted for rocking movements in unison with said backing bar structure.

6. The apparatus of claim 2, wherein said means for making transverse cuts includes a cutting blade spaced from and positioned across the width of said sheet material, and further includes means for vibrating said blade along its length to facilitate the cutting of said sheet material.

7. The apparatus of claim 6, wherein said means for vibrating the cutting blade includes pivotally movable support linkages, and the pivoting of at least some of said linkages is provided by a torsion shaft means secured against rotation to the linkages and to a source of rotary motion, such that the pivotal motion of the linkages is provided by the torsioning of the shaft means.

8. Apparatus for forming and arranging wafers such as cookies and the like, comprising in combination: means providing an elongate sheet of material for supporting such wafers; means for moving said sheet material lengthwise in a generally continuous manner; means for forming a desired wafer medium into bar form of desired configuration positioned above the moving sheet; slicing means for severing said bars into individual wafers such that the wafers drop onto said moving sheet material in generally aligned adjacent columns running longitudinally of said sheet and in rows running transversely of said sheet; cutting means for passing through the moving sheet between said adjacent columns to slit the sheet into elongated strips of said sheet each bearing a column of said wafers; and means for making transverse cuts in said strips at desired intervals in said lengthwise movement determined by a predetermined selected number of a plurality of wafers between each cut to produce predetermined separate sections of sheet each bearing a desired number of a plurality of wafers ready for packaging.

9. The apparatus of claim 8, wherein said means for making transverse cuts includes a cutting blade spaced from and positioned across the width of said sheet material, and further includes means for vibrating said blade along its length to facilitate the cutting of said sheet material.

10. The apparatus of claim 9, wherein said means for vibrating the cutting blade includes pivotally movable support linkages, and the pivoting of at least some of said linkages is provided by a torsion shaft means secured against rotation to the linkages and to a source of rotary motion, such that the pivotal motion of the linkages is provided by the torsioning of the shaft means.

11. A method of forming and arranging wafers such as cookies and the like, comprising the steps: providing an elongated sheet of material for supporting such wafers; providing a desired wafer medium and forming it above the moving sheet into individual wafers of desired configuration; dropping said individual wafers onto said sheet; moving said sheet under said wafers as they are being formed and dropped whereby said individual wafers are deposited onto said sheet in spaced relationship in columns running longitudinally of said sheet and in rows running transversely of said sheet; moving said sheet and wafers together past slitting means to slit the sheet between the columns of said wafers into separate elongated strips of sheet material each bearing a column of said wafers; and thereafter cutting said strips transversely thereof at desired intervals between predetermined rows of wafers as the columns continue to move beyond the slitting means, to produce strips of supporting material each bearing a predetermined number of a plurality of wafers ready for packaging.

12. Apparatus for forming and arranging wafers such as cookies and the like, comprising in combination: means providing an elongate sheet of material for supporting such wafers; means for moving said sheet material lengthwise in a generally continuous manner; means for providing a desired wafer medium positioned above the moving sheet; means for forming said medium into individual wafers of a form of desired configuration and in such a manner such that the wafers drop onto said moving sheet material in generally aligned adjacent columns running longitudinally of said sheet and in rows running transversely of said sheet; cutting means for passing through the moving sheet between said adjacent columns to slit the sheet into elongated strips of said sheet each bearing a column of said wafers; and means for making transverse cuts in said sheet strips at desired intervals in said lengthwise movement determined by a predetermined selected number of a plurality of wafers between each cut to produce predetermined separate sections of sheet each bearing a desired number of a plurality of wafers ready for packaging.

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