Aug. 17, 1937. H. S. GIPE 2,090,291

PRETZEL FORMING APPARATUS

Filed Oct. 9, 1935 11 Sheets-Sheet 1

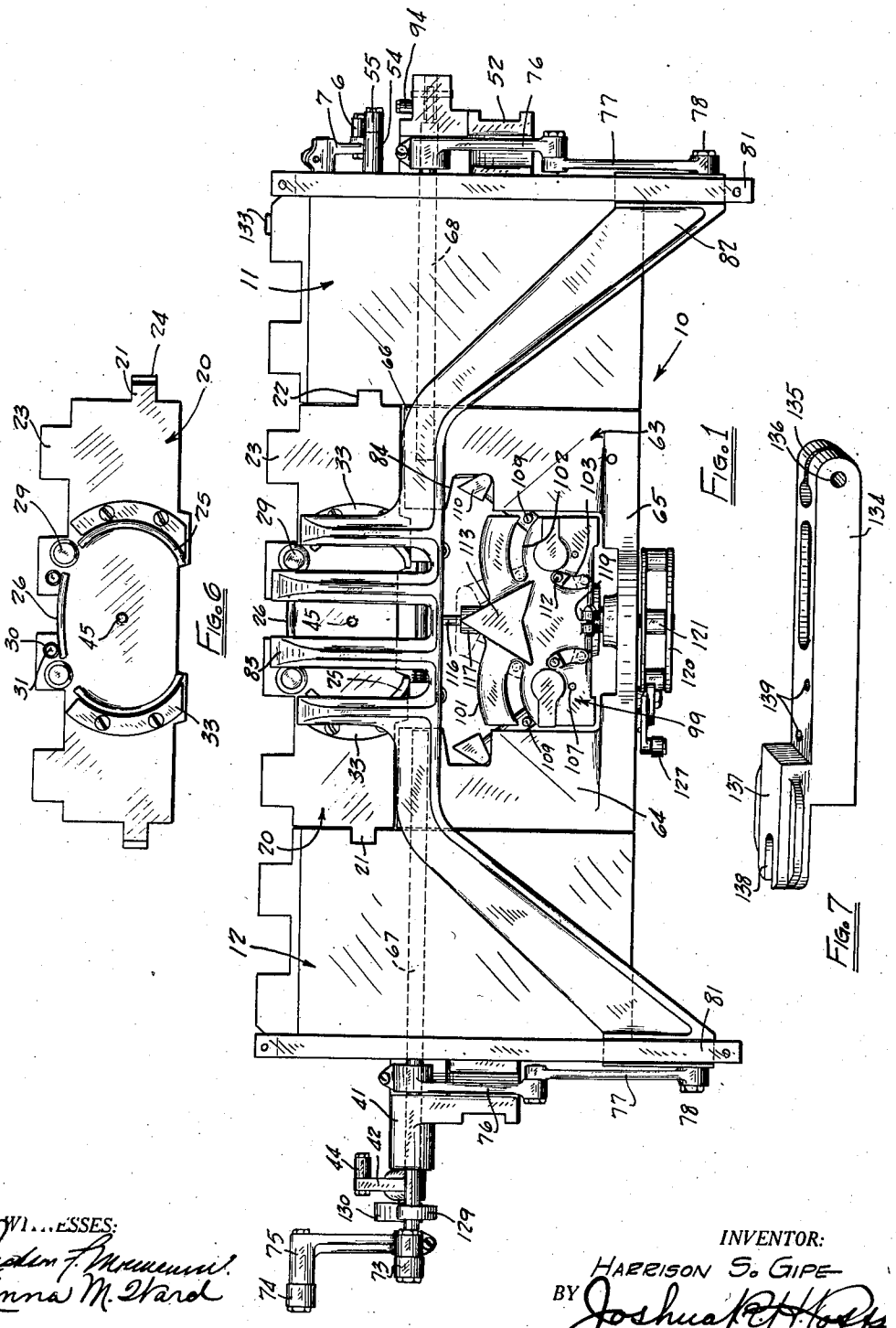


FIG. 1

FIG. 6

FIG. 7

WITNESSES:
Jaden F. Brennan
Anna M. Ward

INVENTOR:
HARRISON S. GIPE
BY Joshua R. H. Hooks
ATTORNEY

Aug. 17, 1937. H. S. GIPE 2,090,291

PRETZEL FORMING APPARATUS

Filed Oct. 9, 1935 11 Sheets-Sheet 2

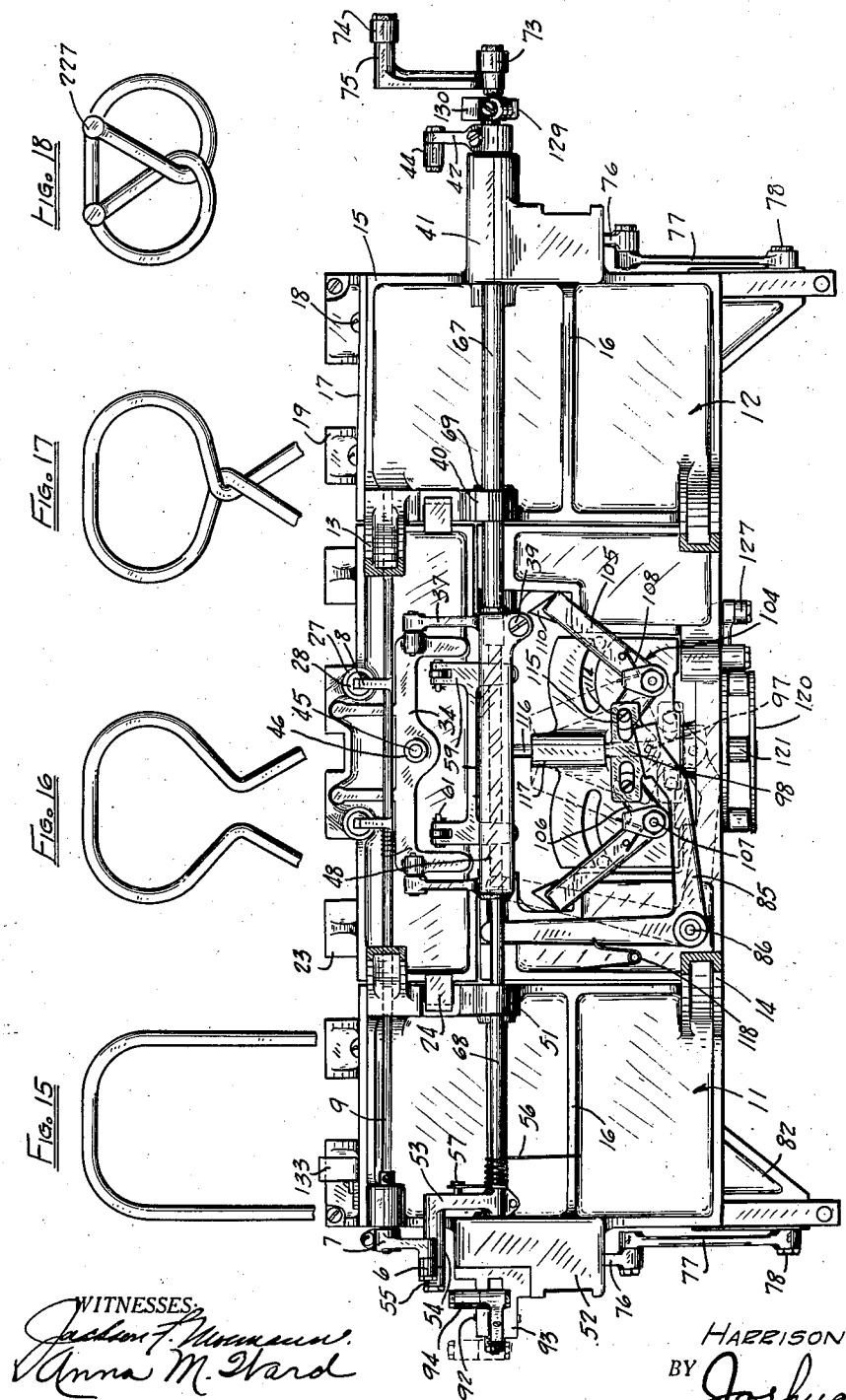


FIG. 18

FIG. 17

FIG. 16

FIG. 15

FIG. 2

WITNESSES:
Joshua T. Hammond
Anna M. Ward

INVENTOR:
HARRISON S. GIPE
BY Joshua T. Hammond
ATTORNEY

Aug. 17, 1937. H. S. GIPE 2,090,291

PRETZEL FORMING APPARATUS

Filed Oct. 9, 1935 11 Sheets-Sheet 3

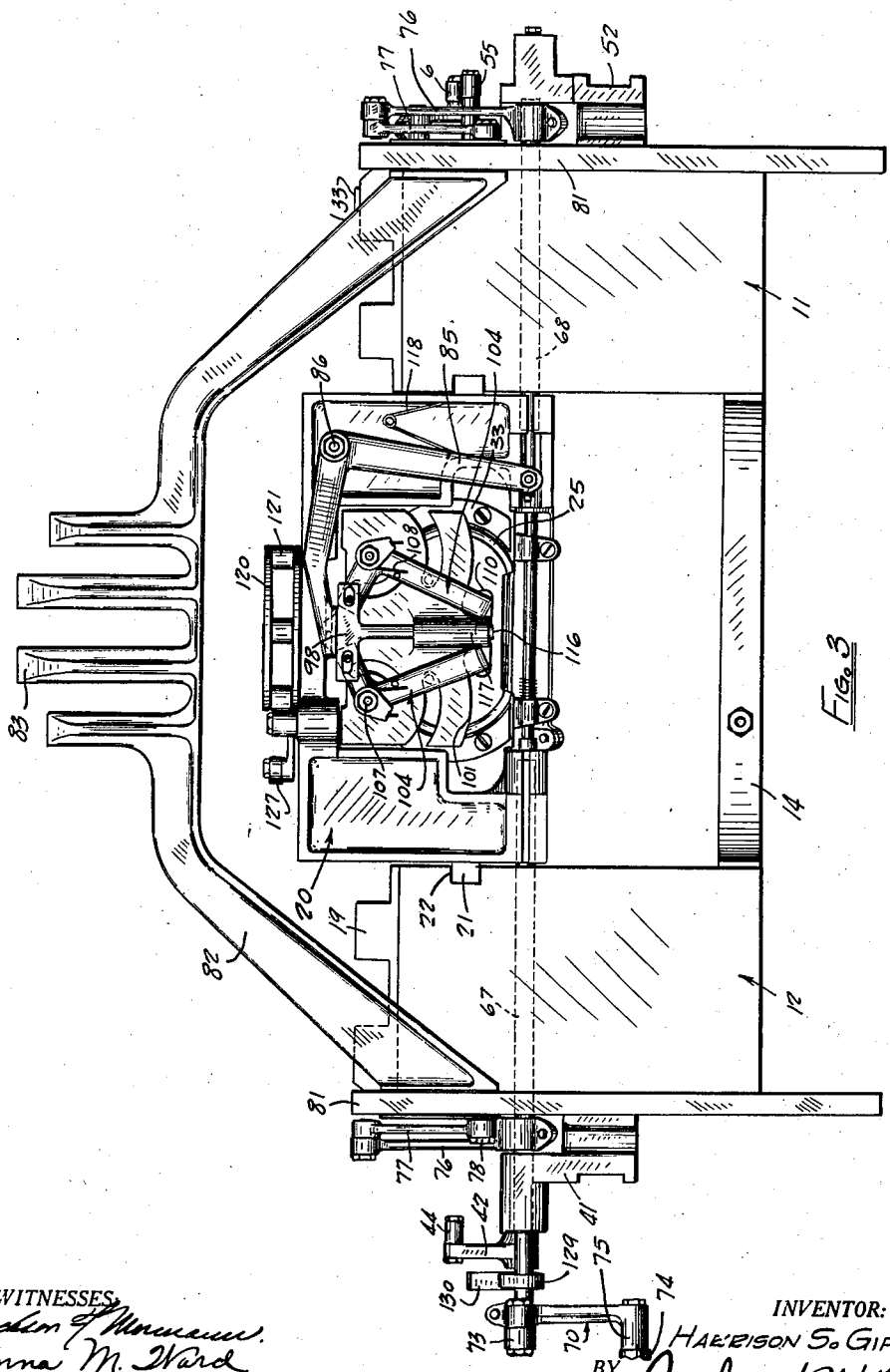


FIG. 3

WITNESSES:
Joshua R. Moncure
Anna M. Ward

INVENTOR:
HARRISON S. GIPE
BY Joshua R. Moncure
ATTORNEY

Aug. 17, 1937. H. S. GIPE 2,090,291

PRETZEL FORMING APPARATUS

Filed Oct. 9, 1935 11 Sheets-Sheet 4

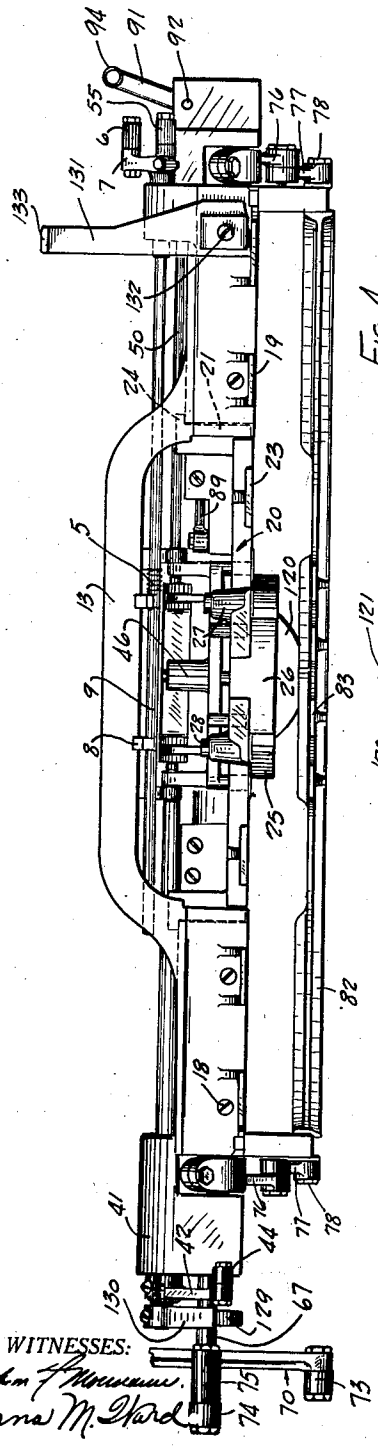


FIG. 4

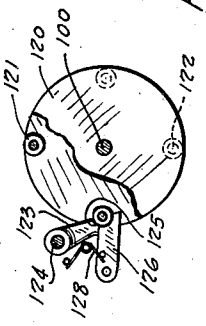


FIG. 8

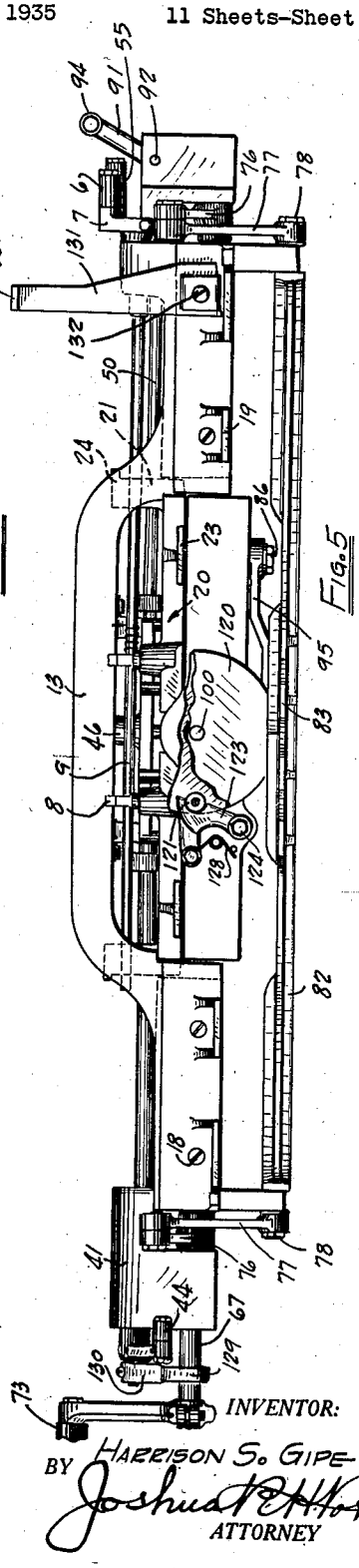


FIG. 5

WITNESSES:

Joshua H. Hoopes

Anna M. Ward

INVENTOR:

HARRISON S. GIPE

BY Joshua H. Hoopes

ATTORNEY

Aug. 17, 1937. H. S. GIPE 2,090,291

PRETZEL FORMING APPARATUS

Filed Oct. 9, 1935 11 Sheets-Sheet 5

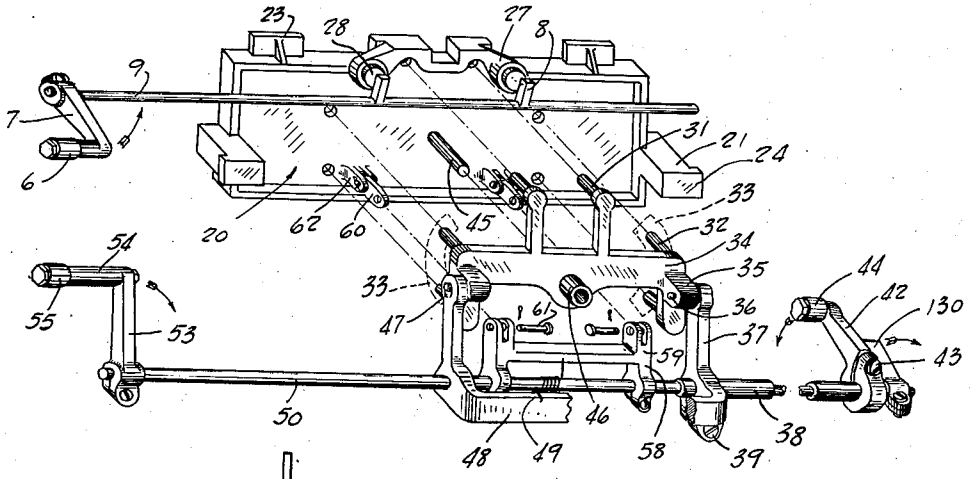


FIG. 9

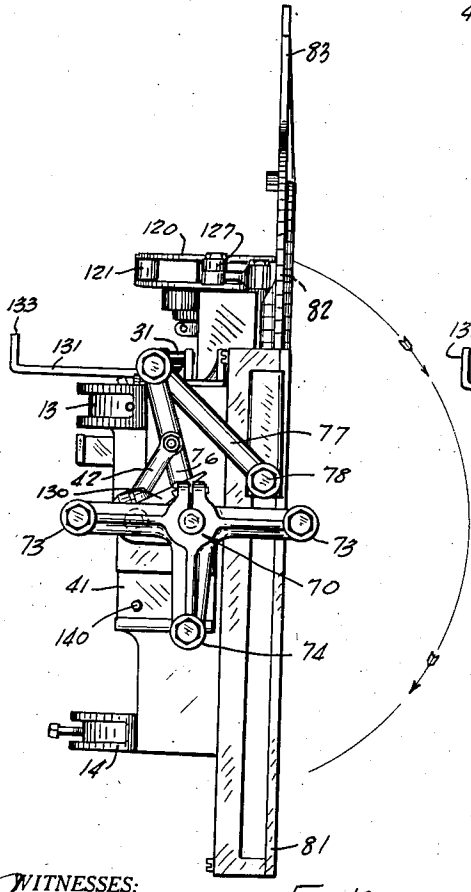


FIG. 10

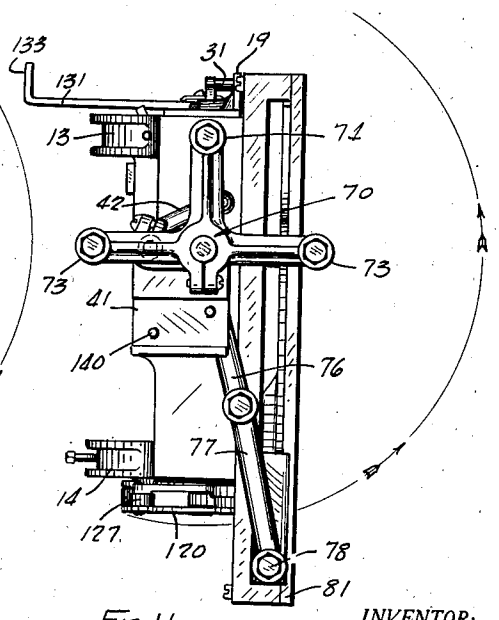


FIG. 11

WITNESSES:

Joshua F. Newman.

Anna M. Ward

INVENTOR:

HARRISON S. GIPE

BY Joshua R. H. Hall

ATTORNEY

Aug. 17, 1937. H. S. GIPE 2,090,291

PRETZEL FORMING APPARATUS

Filed Oct. 9, 1935 11 Sheets-Sheet 6

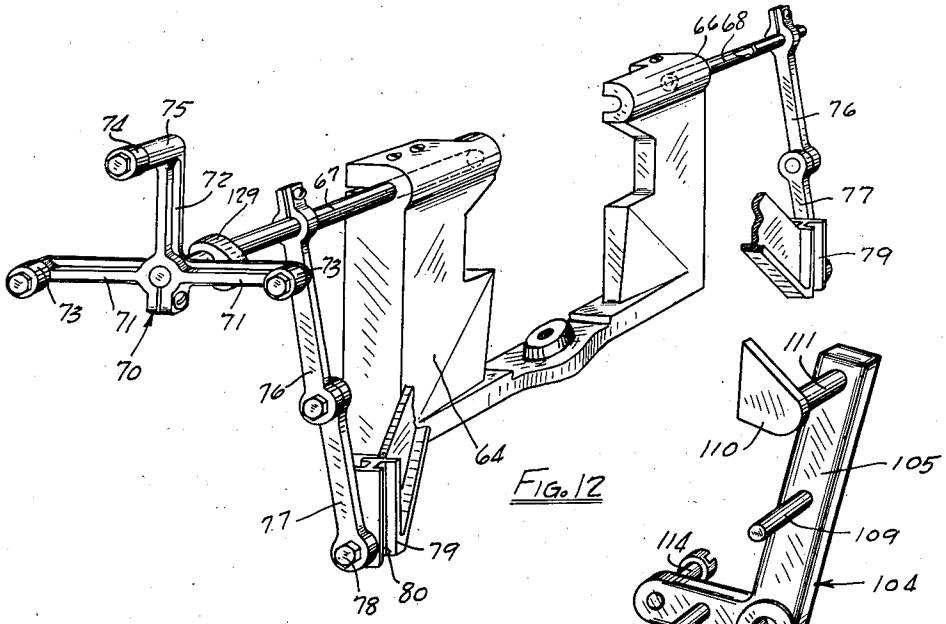
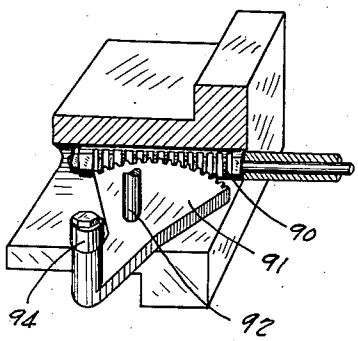


FIG. 12

FIG. 14



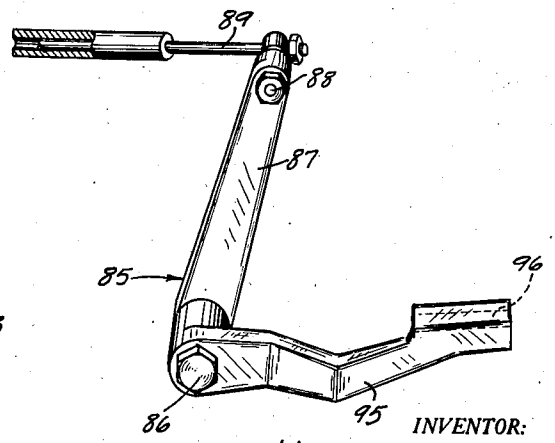


FIG. 13

WITNESSES:
Jackson F. Mossman
Anna M. Ward

INVENTOR:
HARRISON S. GIPE
BY Joshua R. H. Wotts
ATTORNEY

Aug. 17, 1937. H. S. GIPE 2,090,291

PRETZEL FORMING APPARATUS

Filed Oct. 9, 1935 11 Sheets-Sheet 7

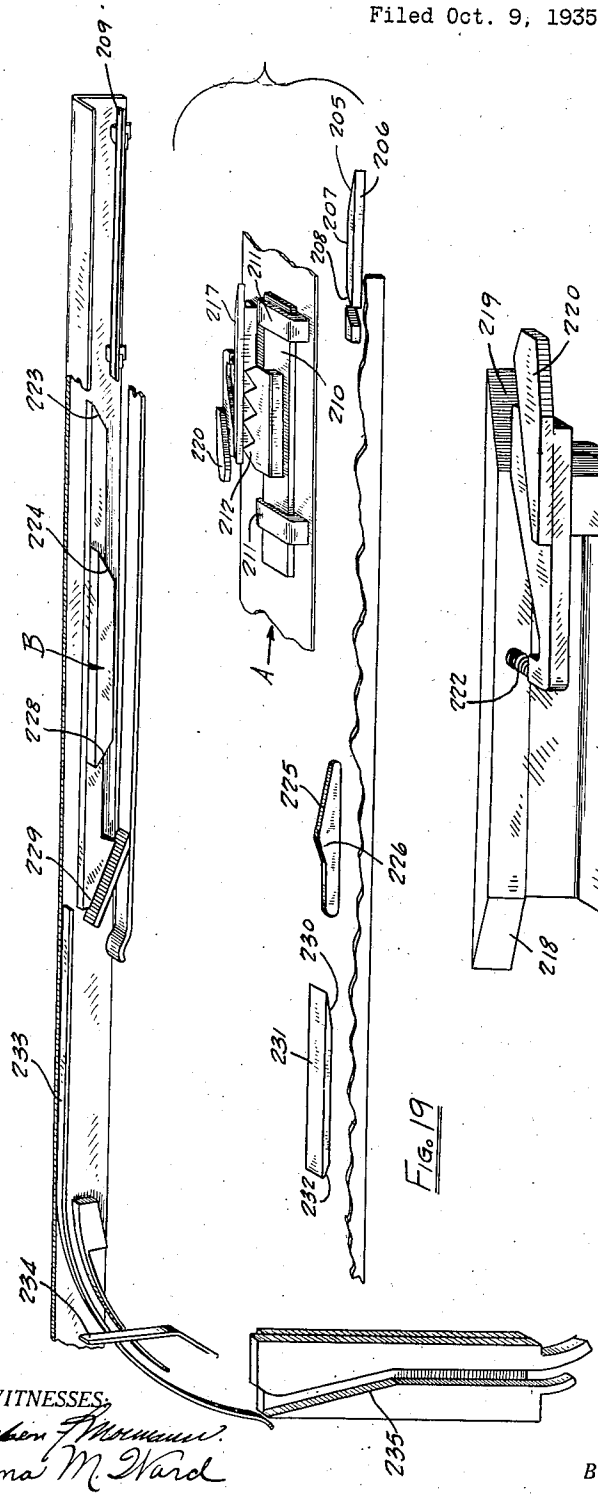


FIG. 19

FIG. 20

WITNESSES:
Jackson J. Mowmann
Anna M. Ward

INVENTOR:
HARRISON S. GIPE
BY Joshua R. H. Potts
ATTORNEY

Aug. 17, 1937. H. S. GIPE 2,090,291

PRETZEL FORMING APPARATUS

Filed Oct. 9, 1935 11 Sheets-Sheet 8

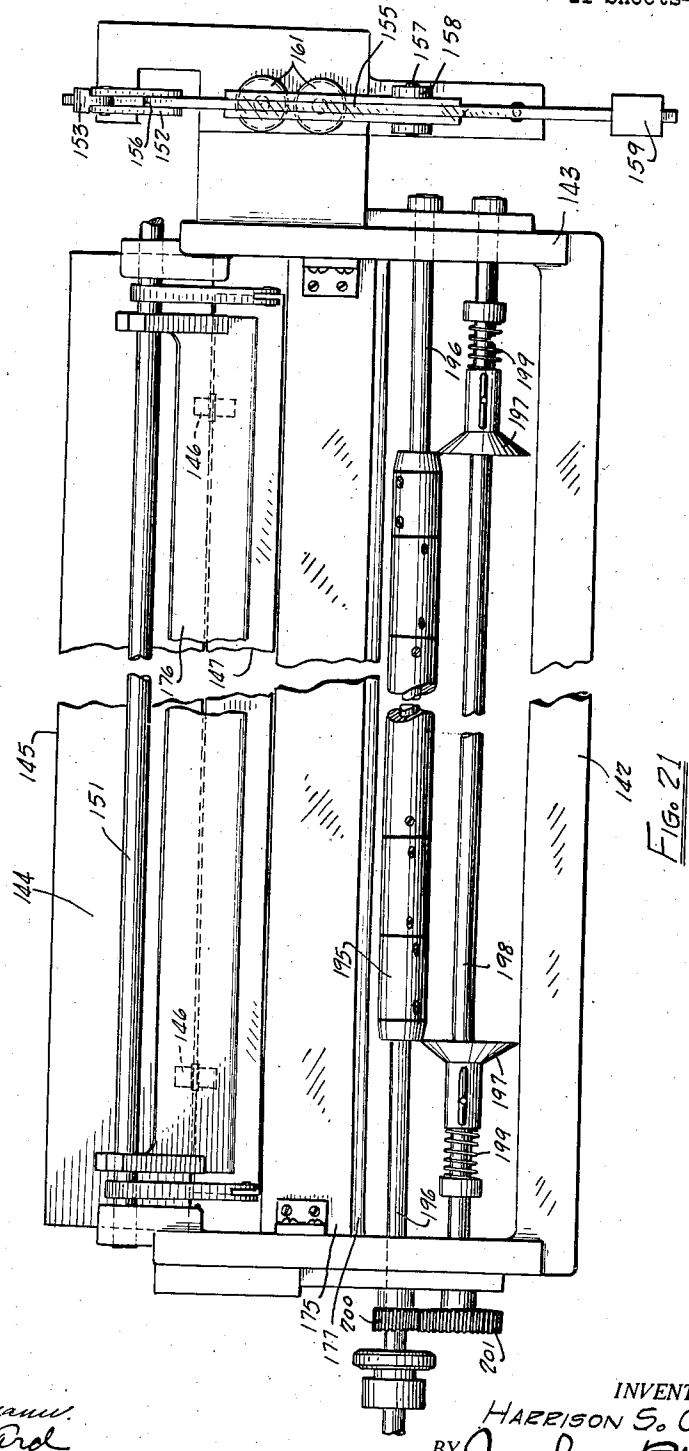


FIG. 21

WITNESSES:
Jackson J. Mermann.
Anna M. Ward

INVENTOR:
HARRISON S. GIPE
BY Joshua R. H. Potts
ATTORNEY

Aug. 17, 1937. H. S. GIPE 2,090,291

PRETZEL FORMING APPARATUS

Filed Oct. 9, 1935 11 Sheets-Sheet 9

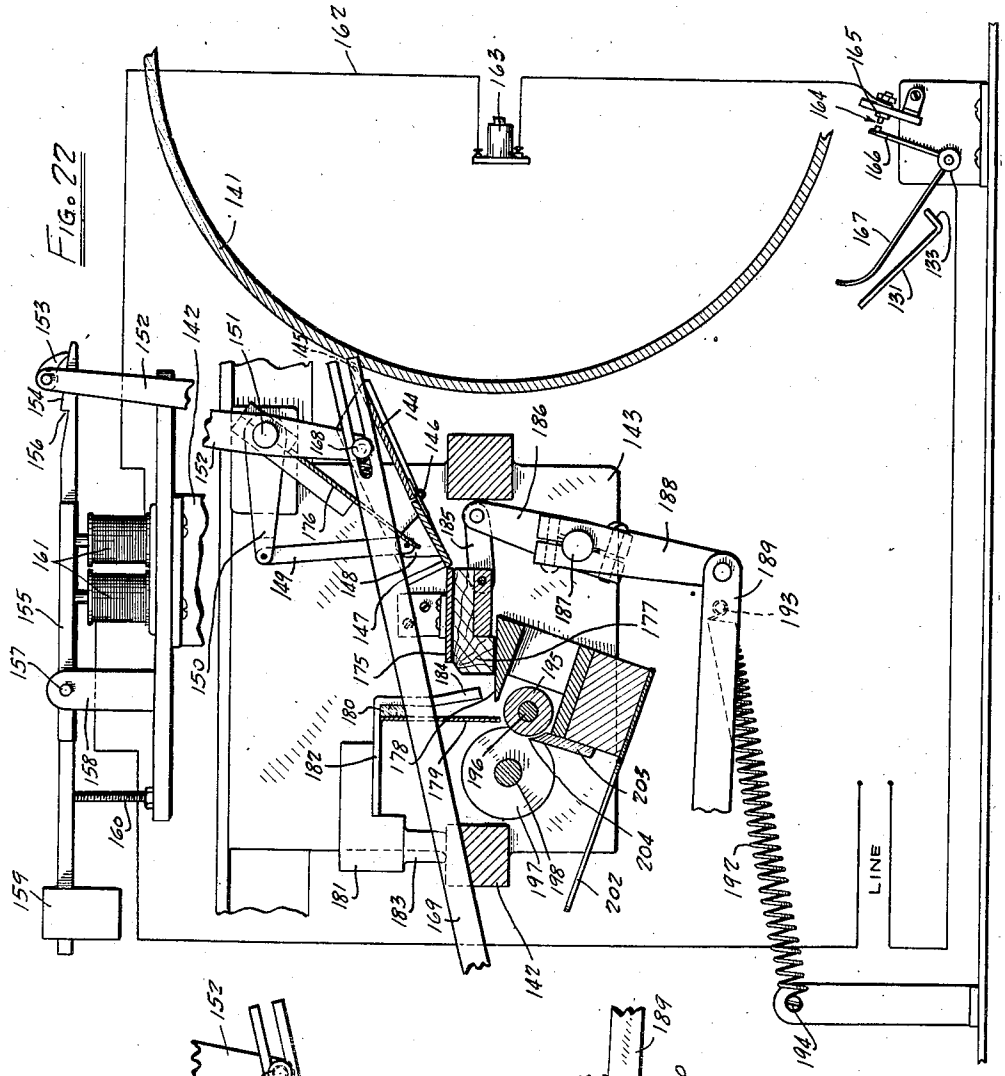


FIG. 22

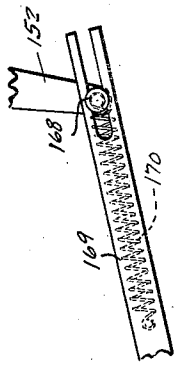


FIG. 23

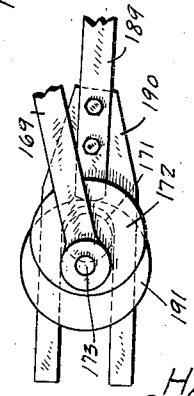


FIG. 24

WITNESSES:
Jacob F. Monmann.
Anna M. Ward.

INVENTOR:
HARRISON S. GIPE
BY Joshua R. H. Hopkins
ATTORNEY

Aug. 17, 1937. H. S. GIPE 2,090,291

PRETZEL FORMING APPARATUS

Filed Oct. 9, 1935 11 Sheets-Sheet 10

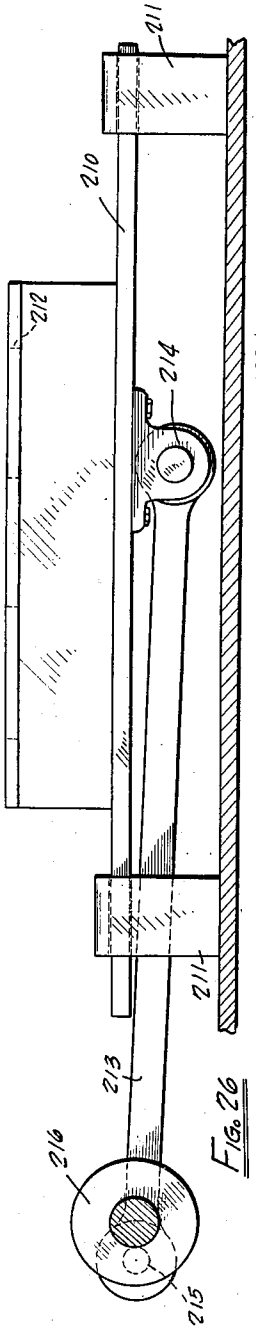


FIG. 26

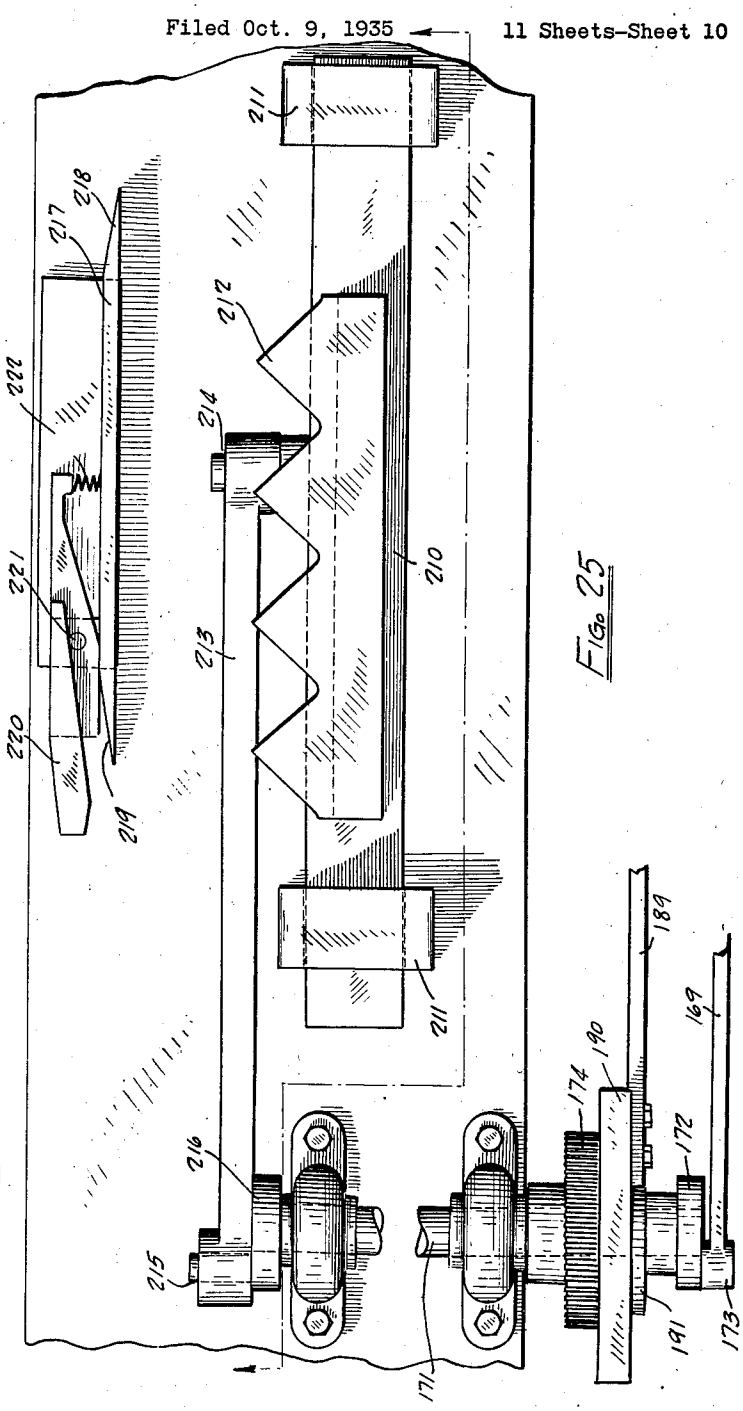


FIG. 25

WITNESSES:
Jackson F. Mannann.
Anna M. Ward

INVENTOR:
HARRISON S. GIPE
BY Joshua R. H. Potts
ATTORNEY

Aug. 17, 1937. H. S. GIPE 2,090,291

PRETZEL FORMING APPARATUS

Filed Oct. 9, 1935 11 Sheets-Sheet 11

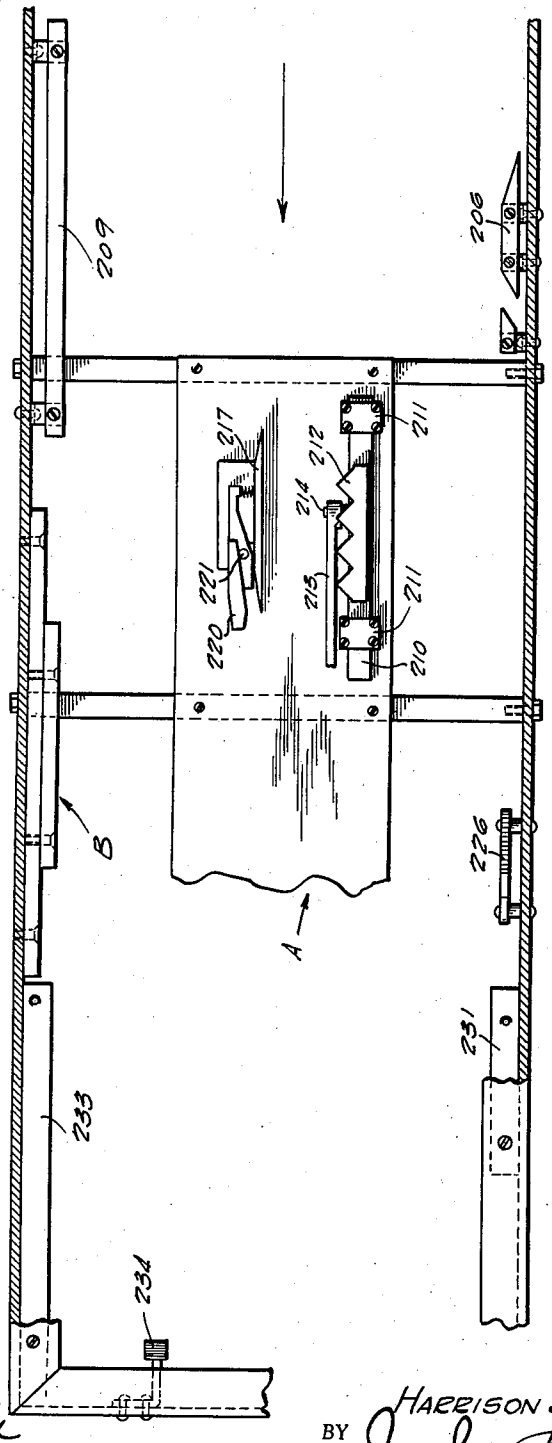


FIG. 27

WITNESSES:
Jackson F. Mannmann.
Anna M. Ward

INVENTOR.
HARRISON S. GIPE
BY Joshua R. H. Potts
ATTORNEY.

Patented Aug. 17, 1937 2,090,291

UNITED STATES PATENT OFFICE

2,090,291

PRETZEL FORMING APPARATUS

Harrison S. Gipe, York, Pa., assignor to Quinlan Pretzel Co., Reading, Pa.

Application October 9, 1935, Serial No. 44,216

20 Claims. (Cl. 107—8)

This invention relates to the art of pretzel forming machines, and is concerned primarily with a machine of that type illustrated and described in my copending application Serial No. 676,855, filed June 21, 1933, resulting in Patent No. 2,026,526.

This application is a continuation in part of the copending application above referred to.

In my copending application above referred to, there is set up a continuously operating machine which is characterized by the uninterrupted movement of dough strips therethrough during the various rolling, cutting, forming and handling operations. Such a machine includes suitable instrumentalities for cutting off individual pieces of dough and depositing the same at spaced intervals on an endless conveyor. Rolling mechanism then affects the pieces to roll the same out into elongated cylindrical strips. From the conveyor the strips are transferred to forming units, there being devices interposed between the conveyor and the forming units which straighten out the strips and cut them to the proper length. A plurality of the forming units are mounted between a pair of spaced sprockets which are endless, which cause the units to travel in an endless path to pick up the strips and form the same into pretzel shape as they are carried along.

The machine also includes devices for taking the pretzels from the forming unit after they have been completely shaped and arranging them on boards in an orderly arrangement.

With the foregoing i mind, this invention has to do with the provision of a forming unit of novel construction intended to operate in a machine of the above noted type. The invention is also concerned with those devices which handle the dough strips from the time they leave the endless conveyor until they are picked up by the forming units, and the invention is further concerned with mechanism included in the machine for causing proper operation of the forming units during their movement.

In a pretzel forming machine of the type above noted, which includes a large number of forming units, conditions of service inherently associated with the material being handled, namely, dough, very often arises in which the dough strip is not either properly deposited on the unit, in the first place, or for some other reason, is not properly handled by the forming mechanism of the unit. As the units make repeated trips around the path of travel, each time receiving an additional strip of dough, it becomes entirely inoperative, and it is necessary to stop the operation of the entire machine in order to clear out the clog of dough and correct the unserviceable conditions.

As each one of these machines includes a large number of units, which number may be in the neighborhood of thirty or more, it has been necessary to discontinue the operation of all the units in order to correct the unsatisfactory condition in only one of them. As a result, operating time for all of the units is lost, and as it is very often necessary to shut down many times during the day, at the end of a working period it is found that the manufacture of a large number of pretzels has been lost, due to this condition.

With this state of affairs in mind, this invention contemplates, as an important object, the provision of a pretzel forming unit which includes means for rendering it inoperative as occasion demands, which means is readily accessible to the operator of the machine, and may be operated while the units are still in motion.

In carrying this idea out in a practical embodiment, I have found that if the supply of dough strips to any one of the units is discontinued, the unsatisfactory condition of the unit will, in nearly all cases, correct itself by the continued movement and operation of the unit, if it is not impeded in such a corrective functioning by the feeding of additional strips thereto. Accordingly, I propose to avail of devices for transferring the dough strips from the endless conveyor to the forming units, and which devices include instrumentalities for diverting from any forming unit the strip of dough which would ordinarily be supplied thereto.

Cooperating with these instrumentalities is an operating member on each forming unit which may be moved into position at the will of the operator to render such interrupting instrumentalities effective as occasion demands.

Another important object of the invention is the provision of transferring devices of the type noted in the preceding paragraph, which also include mechanism for straightening out the dough strips and cutting the same to a proper length, a more particular feature of the invention residing in the provision of means for varying the length of the dough strips which emerge from the cutting mechanism.

Other more detailed objects and advantages of the invention are associated with the provision of interrupting instrumentalities in accordance with the above noted precepts in a practical working device.

A further important object of the instant invention is to provide a forming unit of the type above noted, which is characterized by positiveness of operation, and which includes mechanism for picking up a strip of dough, forming the same into pretzel shape, and then so positioning the formed pretzel that it may be picked up from the unit by other devices included in the pretzel machine; particular features and advantages of the invention are intimately associated to provide mechanism along these lines which will form the various pretzel-shaping functions.

A forming unit as above outlined ordinarily includes a twister yoke which, in the copending application referred to, is affected by cam means on the machine for causing twisting operations at the proper time. Inasmuch as the unit is moving and the cam means has heretofore been stationary, the meeting of the twister yoke with this particular cam means has been accompanied by certain undesirable results. Accordingly, this invention has in view, as another important objective, the provision of mechanism for operating the twister yoke, and which mechanism includes parts movable with the unit upon initial engagement of the twister yoke therewith.

Still another object is to provide locking means for the twister yoke so that during the greater time of travel of the unit, the yoke is immovably locked in position. Cam means are associated with the yoke operating means above referred to, to render ineffective the locking means when the yoke is to be twisted.

The invention, therefore, comprises a pretzel forming machine including a forming unit of novel design, feeding devices for the forming unit, which feeding devices include means for interrupting the supply of dough strips to the forming unit, and novel mechanism for causing operation of the forming unit.

For a full and more complete understanding of the invention, reference may be had to the following description and accompanying drawings wherein:

Figure 1 is a view in elevation looking from the front of one of the forming units made in accordance with the present invention,

Figure 2 is another elevational showing of the unit shown in Figure 1, but looking at the rear side thereof,

Figure 3 is a view somewhat similar to Figure 1, but showing the unit with the twister yoke folded over,

Figure 4 is a plan view of the unit in the position shown in Figure 1, while

Figure 5 is a plan view of the unit in the position illustrated in Figure 3,

Figure 6 is a detail showing in front elevation of the pickup plate and associated structure,

Figure 7 is a detail perspective of one of the bars which is used to mount the unit in the assembly,

Figure 8 is a bottom plan view of the operating part of the twister yoke and locking mechanism therefor; this view is also a detail,

Figure 9 is a perspective illustration bringing out in detail certain parts of the operating mechanism of the unit; this view is of the exploded type, showing the parts removed from one another, but in their relative positions,

Figure 10 is an end elevational showing of the forming unit with the twister yoke in its folded-up position, while

Figure 11 is a view similar to Figure 10, but with the twister yoke in its normal position, as shown in Figure 1,

Figure 12 is a perspective view bringing out in detail the mounting for the twister yoke,

Figure 13 is another perspective view showing the operating mechanism for certain of the pretzel-forming arms, one of the arms being shown in detail in

Figure 14, which is a detail perspective of one of the forming arms,

Figure 15 is an individual showing of one of the dough strips in the position it assumes just after it is picked up by the forming unit,

Figure 16 is a view similar to Figure 15, but showing the strip of dough after it has been affected by the forming arms,

Figure 17 is a view similar to Figures 15 and 16, but showing the condition of the dough after the twister has been turned,

Figure 18 shows a pretzel after it has been fully formed,

Figure 19 is a perspective illustration, largely diagrammatic, with most of the parts of the machine not shown; this view develops the operating instrumentalities and cams which are included in the construction of the machine for causing operation of the forming units,

Figure 20 is an enlarged detail perspective of the cam mechanism which cooperate with the locking device for the twister.

Figure 21 is a plan view of the feeding devices which take the dough from the conveyor and transfer it to the forming unit; in this view, parts are broken away, and some parts removed to more clearly bring out the details of construction,

Figure 22 is a side view, partly in elevation and partly in section of the feeding devices shown in Figure 21; this view is taken with certain parts of the machine removed to more clearly bring out the manner of operation thereof,

Figure 23 is an enlarged detail showing in elevation one of the operating parts of the feeding devices,

Figure 24 is another enlarged detail illustration of a part of the driving mechanism for the feeding devices,

Figure 25 is an enlarged detail plan view of the mechanism for operating the twister, and

Figure 26 is a view in side elevation of the mechanism shown in Figure 25.

Figure 27 is a plan view of the machine with the forming units removed. This view brings out the arrangement of the cam instrumentalities which are carried by the framework of the machine and which cause operation of the forming units.

Referring now to the drawings, wherein like reference characters denote corresponding parts, the apparatus of this invention comprises generally a forming unit, feeding devices, and mechanisms for operating the forming unit.

The forming unit

A unit made in accordance with this invention comprises a plate **10** which constitutes the main body of the unit. This plate comprises side pieces **11** and **12** which are connected into a unitary structure by bars **13** and **14**, which preferably are formed integrally with the side pieces. The bar **13** is disposed at the top of the unit, while the bar **14** is at the bottom. Attention is called to the fact that the main body portions of the bars **13** and **14** are disposed in a plane which is offset

from that of the side pieces 11 and 12. This arrangement provides a space intermediate the side plates in which the instrumentalities performing the various bending functions are located.

Referring to Figure 2, which develops a rear view of the plates 11 and 12, these plates are shown as formed with edge flanges 15 which extend entirely around each side plate and central flanges 16. This flange construction lends rigidity and strength, without unnecessary weight in the main body member of the unit. These flanges also readily adapt themselves to having other parts connected thereto.

Connected to the side plates 11 and 12, along the upper edges thereof, are top plates 17 which may be affixed to their respective side plates by the medium of screw members 18 which extend through the top flanges 15. These top plates 17 are formed with spaced fingers 19, which cooperate with similar fingers on a pickup plate, about to be described. This pickup plate, which is referred to as 20, is formed with guiding ribs 21 which are received in grooves 22 which are formed on the inner flanged edges of the side plates 11 and 12.

Referring particularly to Figures 6 and 9, this pickup plate 20 is shown in detail, and with the ribs 21 formed integrally therewith. Obviously, they might be formed as separate parts. The pickup plate 20 has at its upper edge pickup fingers 23 which, under certain conditions, align with the pickup fingers 19 to form a line of spaced pickup fingers extending substantially entirely across the unit. The ribs 21 are at their rear ends formed with end flanges 24 which constitute abutments to limit movement of the pickup plate with respect to the main body of the unit.

Still referring to Figures 6 and 9, the pickup plate 20 is formed on its front face with side arcuate flanges 25 and a top flange 26. These flanges may be integral with the plate, and constitute the structure around which a dough strip is bent as it is being formed. It is noted that the extremities of the top flange 26 are spaced from the adjacent ends of the side flanges 25, and the pickup plate 20 is formed with openings extending therethrough at the spaces.

These openings continue through the plate 20 to the rear thereof, where they are prolonged by cylindrical extensions 27 which are preferably integral with the plate 20, and these openings receive plungers 28 formed with paster heads 29 which are of slightly greater diameter than the plungers 28 to provide circular flanges to engage the front face of the pickup plate 20.

A shaft 9 has suitable bearing in the structure 13 and has upstanding therefrom lugs 8 designed for engagement with the plungers 28. At one end the shaft 9 has drivably connected thereto an arm 7 having cam engaging means in the form of a roller 6. A spring 5 normally maintains the lugs 8 in position in which they engage the structure 13. They are moved forward by rotation of the shaft 9 against the influence of the spring 5.

Just above the openings which receive the plungers 28 the central pickup fingers 23 are provided with openings 30 which receive the ejecting pins 31. Adjacent to the side flanges 25 the plate 20 is formed with additional openings corresponding to the openings 30, and these openings receive pins 32 shown more particularly in Figure 9. Attached to the pins 32 on the front face of the plate 20 are arcuate ejecting plates 33 that correspond in curvature to the flanges 25, these plates 33 fitting snugly about the flanges 25, as clearly shown in Figure 6.

Referring now again to Figure 9, the ejecting pins 31 and ejecting plates 33 are connected at the rear of the pickup plate 20 to a spider 34 which is formed at its rear extremities with ears 35 having openings which receive pivotal pins 36 carried by arms 37 that are non-rotatably connected to a sleeve 38, as by means of the clamping arrangement shown at 39.

The sleeve 38 finds bearing in a bossed formation 40, as shown in Figure 2, which bossed formation is an enlargement of the inner side flanges 15, and this sleeve 38 also is rotatably mounted in the tubular extension 41 extending from one side of the plate 12. At the extremity of the sleeve 38 an arm 42 is positively clamped thereto, as indicated at 43. At its upper end this arm 42 is provided with cam engaging means, shown in the form of a roller 44.

It is evident that when the roller 44 is affected by cam means, to be later described, the sleeve 38 will be rotated to cause a corresponding swinging of the arms 37, whereby the spider structure 34 is moved to cause a corresponding movement of ejecting pins 31 and ejecting plates 33. It is to the end of properly guiding its movement of the spider 34 relative to the pickup plate 20 that the latter is provided with a rearwardly extending pin 45, shown in Figures 2 and 9, which is received in an opening formed centrally of the spider 34 and which opening is continued through a cylindrical extension 46.

It is also notable that the openings which receive the pins 36 are somewhat elongated and non-circular in formation, as shown at 47; this is to accommodate the combination of rotative and rectilinear movements of the arms 37 and the spider 34, respectively.

Referring now to Figure 2, the arms 37 are integrally connected by a bar 48 which is offset from the sleeve 38. A spring shown at 49 has one end bearing against the bar 48 to normally maintain the ejecting plates 33 in engagement with the pickup plate 20. This spring 49 is coiled about a shaft 50 which extends through the sleeve 38, the shaft having bearing in the sleeve 38, an enlargement 51 of the inner side flange 15 of the side plate 11, and a side extension 52 which extends from the outer side flange 15 of the side plate 11. An arm 53 is drivably connected to the shaft 50, and has a crank arm 54 extending over the extension 52. At its extremity the crank arm 54 carries cam engaging means in the form of a roller 55. A spring 56 is coiled about the shaft 50 and has one end attached to a pin 57 on the arm 53, while its other end engages the flange 16 on the side plate 11.

Referring now again to Figure 9, the shaft 50 has positively clamped thereon a U-shaped structure designated 58, which structure includes a pair of slotted ears 59. Links 60 are connected to the slotted ears 59 by pins 61, and at their other ends are connected to slotted lugs 62 on the rear face of the pickup plate 20.

It is evident that the connections of the links 60, U-shaped structure 58, shaft 50 and arm 53 provide for movement of the pickup plate 20 under influence of crank arm 54. The spring 56 is effective to normally maintain the front face of the pickup plate 20 substantially flush with the front faces of the side plates 11 and 12.

Pivoted between the side plates 11 and 12 and below the pickup plate 20 is a twister yoke 63 which comprises side parts 64 connected by a

bottom part 65. The upper edges of the side parts 64 are enlarged, as shown at 66 in Figure 12. These enlargements 66 receive sleeves 67 and 68 which constitute a pivotal mounting for the twister yoke 63 as an entirety. The sleeve 67 extends through an ear 69 on the inner side flange 15 of the side plate 12, and also is formed through a part of the extension 41 having bearing in these parts.

At its extremity the sleeve 67 drivably carries a spider designated generally as 70, which consists of a pair of normally horizontally extending arms 71 and an upstanding arm 72. The extremities in the arms 71 carry cam engaging means in the form of rollers 73, while the arm 72 carries similar cam engaging means in the form of a roller 74, but which roller lies in a plane spaced from that in which the rollers 73 lie, this spaced arrangement being provided for by a crank arm 75 which maintains the roller 74 offset from the arm 72.

At the other side of the twister yoke 63 the sleeve 68 passes through enlargements similar to the ear 69 in the respective side flanges.

Referring to Figure 12, the sleeves 67 and 68 are shown as carrying toggle connections comprising arms 76, which are drivably connected to the respective sleeves. The arms 76 have pivotally connected to their free ends arms 77 that are in turn pivotally connected at 78 to slides 79. These slides 79 are of a channel bar construction, providing channels 80 which receive guides 81 which are carried on the front face by the side plates 11 and 12. The slides 79 are maintained spaced from the front face of the main body plate by the guide 81, and these slides constitute the integral extremities of a frame 82 which is formed with receiving fingers 83 that, under certain conditions, are positioned substantially opposite to the pickup plate 20, but spaced therefrom.

From the foregoing, it is evident that the sleeves 67 and 68 provide for the simultaneous movements of the twister yoke 63 and frame 82, that is, when the twister yoke 63 is folded on the sleeves as a fulcrum, the frame 82 is reciprocated in the guides 81. The side parts 64 of the twister yoke 63 are cut away, as indicated at 84, to accommodate forming members about to be described.

On its rear face one of the side parts 64 has a bell crank 85 pivotally mounted thereon, as shown at 86. The bell crank 85 has an upstanding arm 87 that is pivotally connected at 88 to a shaft 89 which extends through the sleeve 68. At its extremity the shaft 89 carries a rack 90 which cooperates with a toothed segment 91 that is pivotally mounted at 92 between spaced plates 93 carried by the extension 52. One end of the segment 91 carries cam engaging means in the form of a roller 94. It is apparent that when the roller 94 is affected by a cam to cause pivoting thereof on the mounting 92, it will cause movement of the shaft 89 to turn the bell crank 85.

This bell crank 85 has a second arm 95 which is provided with a groove 96 on its front face, which receives a pin 97 on a T-shaped member 98 that constitutes a part of the forming apparatus carried by a twister 99. The twister 99 is pivotally mounted at its center on a shaft 100 that extends through the bottom bar 65 of the twister yoke 63. This twister 99 has its upper edges in arcuate formation, as shown at 101, and spaced from these edges is formed with arcuate slots 102 which are concentric with respect to the arcs defining the upper edges 101. The twister is also formed with small somewhat vertically extending arcuate slots 103.

Pivotally mounted on the rear face of the twister 99 are a pair of bell cranks, referred to in their entirety by the reference character 104 which bell cranks have long arms 105 and short arms 106. These bell cranks 104 are pivotally mounted on pins 107 about which are wound coiled springs 108 which normally affect the bell cranks 104 and cause the long arms 105 thereof to be drawn towards one another. The arms 105 carry pins 109 which extend into and are movable in the arcuate slots 102 and at their extremities the arms 105 carry offset forming plates 110, these plates being maintained offset from the arms 105 by pins 111. The short arms 106 of the bell crank carry pins 112 which extend into and are movable in the arcuate slots 103.

Intermediate the upper edges 101 and the arcuate slots 102 the twister 99 is formed with an angularly shaped enlargement 113 which upstands from the front face of the twister. This upstanding part has inclined side surfaces which are designed for cooperation with the forming plates 110 in shaping the dough strips.

Extending rearwardly from the short arms 106 are pins 114 which are received in elongated slots 115 in the head of the T-shaped member 98. This T-shaped member has a stem 116 that is received in a cylindrical opening in an enlargement 117 integrally formed on the rear face of the twister 99.

A spring 118 is carried on the rear face of the twister yoke 63 and affects the arm 87 of the bell crank 85 to normally maintain the long arms 105 of the bell crank 104 in their contracted relation, this being carried out through the medium of the connections comprising the arm 95 of the bell crank 85, groove connection at 96, T-shaped chamber 98, and the connections to the respective bell cranks 104. It is evident that the bell crank 85 may be moved under the influence of the roller 94, as above described, to cause a spreading of the arms 105.

The shaft 100 extends through the bottom plate 65, which is enlarged at this place, as shown in Figure 1, and passes through a clamping arrangement designated 119, which is so disposed as to have the shaft positioned directly beneath the enlargement 113. This shaft 100 carries a pair of spaced disks 120 which are maintained spaced apart by sleeves 121, screw members 122 extending through the disks and the sleeves. In the illustrated embodiment I have shown the use of four of these sleeves, which are spaced apart 90°. Pivoted to the underface of the bottom part 65 is a locking member 123 which is pivoted at 124 and is formed with a recess 125, which is designed to receive one of the sleeves 121. Outstanding from the end of the locking member 123 adjacent to the recess 125 is an arm 126 which carries cam engaging means in the form of a roller 127.

A spring 128 is shown in Figure 8 as mounted on the bottom face of the twister yoke 63, and this spring affects the locking member 123 to maintain the same in locking engagement with one of the sleeves 121. It is evident that the roller 127 may be affected by cam means to swing the locking member 123 out of locking engagement, whereupon the disks 120 may be turned by engagement of other cam means with the sleeves 121 to cause turning of the twister 99.

In order to provide for movement of the pick-up plate 20 with respect to the main body unit, coincident to certain swinging movement of the twister yoke 63, the sleeve 67 carries adjacent to the spider 70 a cam 129 which cooperates with an arm 130 which is drivably connected to the shaft 50. When the spider 70 is turned sufficiently far, this cam 129 engages the arm 130 to cause rotation of the latter.

Secured to the top plate 17 which is carried by the side plate 12 is an arm 131 which is pivotally mounted, as indicated at 132, and which has a turned-over extremity 133 designed for engagement with certain instrumentalities in the feeding devices.

Referring now to Figure 7, there is illustrated one of the bars which are used to incorporate one of these forming units in the sprocket assembly in the machine. One of these bars is designated 134 and is bifurcated at one end, as shown at 135, and this bifurcated end is provided with an opening, as shown at 136.

The other end of the bar has an offset portion 137 shown with a U-shaped extremity 138, which is intended to cooperate with the next adjacent bar to provide the sprocket chain assembly. Fastening members pass through the openings 139 and corresponding openings 140 in the plate structure of the unit, as shown in Figures 10 and 11.

The manner in which the operations of the above noted mechanisms are interrelated will be described in connection with the description of the cam mechanisms which cause their operations.

Feeding devices

By reference to the copending application above identified, it will be noted that dough strips are supplied in spaced relation by an endless conveyor, a portion of which is illustrated in Figure 22 and designated 141. The feeding devices hereinafter described take the strips from this conveyor and position them at a point where they are picked up by the forming units. The feeding devices are mounted on the framework of the machine, as shown in the said copending application, and herein illustrated fragmentarily, as indicated at 142, and on side plates 143, which are connected to this frame of the machine on each side thereof. A chute 144 has a knife edge 145 in close proximity to the surface of the endless conveyor 141 so as to pick those strips therefrom. This chute 144 is mounted between the side plates 143 and at its lower edge has hingedly connected thereto, as indicated at 146, a shutter 147.

When the shutter is in the position as shown in Figure 22, it constitutes a continuation of the chute. The chute 147 has at each end an ear 148 to which is pivotally connected a link 149 that is in turn pivotally connected to an arm 150 that is non-rotatably carried by a shaft 151. This shaft 151 has proper bearing in the framework 142 of the machine. A lever, which is shown as broken away in Figure 22, is referred to as 152 and this lever is also drivably connected to the shaft 151.

At its upper end the lever 152 has pivotally mounted thereon a pawl 153 which is designed for cooperation with a tapered end 154 of a lever 155, notched as shown at 156. This lever 155 is pivotally mounted at 157 on a bracket 158, and at its free end carries a weight 159 which normally maintains the tapered end of the lever 155 in an upraised position. A set screw shown at 160 limits movement of the weighted end of the lever 155.

Electromagnets 161 are disposed beneath the lever 155 at the side opposite the weight, and are effective, when current is passing therethrough, to draw this end of the lever downwardly against the influence of the weight 159. The electric circuit for the electromagnets 161 is shown at 162, and includes a main switch 163 and a mechanically operated switch at 164.

This mechanically operated switch 164 comprises a stationary contact 165 and a movable contact 166 which is operated by a spring arm 167; the latter is affected by the turned-over end 133 on the arm 131 on the forming unit to close the circuit, whereby the electromagnetic devices are rendered effective.

The lower end of the lever 152 carries a headed pin 168 which is received in the bifurcated end of a link 169 (see Figure 23). A coil spring 170 has one end anchored to the link 169 and its other end to the pin 168. This spring provides a yielding connection between the link 169 and the lever 152. The link 169 extends to a drive shaft 171 to which it is operatively connected by a hub 172, the crank-like connection being obtained by pivotally connecting the link 169 to the hub 172 off the center of the shaft 171, as shown at 173. It is evident that rotation of the shaft 171 causes reciprocation of the link 169 which will in turn cause swinging of the lever 152 in a manner to be hereafter described.

It is noted that the shaft 171 carries a driving gear 174 which is connected by a sprocket chain (not shown) to a hand crank shaft of the machine. The rotation of the shaft 171 is so synchronized with the operation of the machine that it makes one complete revolution for each passage of the forming unit past the switch at 164.

When the shutter 147 is swung downwardly, the passage of the dough strips to the forming units is interrupted for in this position the dough strips are delivered to a conveyor (not shown) which takes them back to the source of the dough supply. In order for the strips to be delivered to the forming unit, the shutter must be in the position shown at 147, in which it constitutes a continuation of the chute 144.

The above described instrumentalities are effective to so position the shutter when the arm 131 on the forming unit engages the operating spring arm 167 to close the contacts 165 and 166, whereby the circuit is completed. Under this condition, the electromagnets 161 draw the lever 155 downwardly, whereupon the notch 156 is disengaged from the pawl 153 so as to permit swinging of the lever 152, which in turn rotates the shaft 151 to raise the shutter 147 into the illustrated position. In the event the arm 131 is swung outwardly so that it will not engage the spring arm 167, then the circuit remains open, and the notch 156 prevents rotation of the shaft 151 through the lever 152, whereby the shutter is maintained open so as to deliver that strip of dough which ordinarily would be delivered to the forming unit carrying the arm 131 to the return conveyor. It is evident that the time it takes a dough strip to travel from the shutter 147 to that point where it is picked up by the forming unit is the same as the time it takes the forming unit to pass from the position in which the arm 131 engages the spring arm 167 to that point where it picks up the strip. When the arm

131 is not swung outwardly, as will be the case during normal operation, it engages the spring arm 167 to close the circuit and move the shutter 147 upwardly into delivering position. In this latter position a strip of dough will cross the shutter and later be picked up by one of the forming units.

From the shutter 147 the dough strips pass onto and across a plate 175 which is carried by the side plates 143. In crossing the shutter 147 it has been straightened out by a baffle 176 which is movable with the shutter as it is carried by the shaft 151.

From the plates 175 the dough strip falls down in front of a pusher 177, the dough strip being positioned on a shelf 178 carried between side plates 143. A baffle 179 is pivotally mounted at 180 and is normally maintained in a substantially vertical position, as shown in Figure 22, by a weight 181 which is carried by an arm 182 extending rearwardly from the pivotal mounting of the baffle. Abutment means, indicated at 183, are interposed between the weight 181 and a part of the frame of the machine 142 to limit movement of the baffle 179.

A lever 184 extends downwardly from the pivotal mounting 180 of the baffle 179, and its lower end is spaced sufficiently far from the baffle for a strip of dough to be positioned between the lever and the baffle. This lever is adapted for engagement with the pusher 177 so as to cause a swinging of the baffle against the influence of the weight 181.

The pusher 177 is pivotally connected to a link 185 which is in turn pivotally connected to an arm 186 that is drivably connected to a shaft 187. Another arm 188 depends from the shaft 187 and is pivotally connected to a link 189. This link 189 carries at its free end a fork member 190 (see Figures 24 and 25). The prongs of this member 190 extend over the shaft 171 and a cam 191 is drivably connected to the shaft 171 and engages the extremity of the link 189, as clearly brought out in Figure 25.

A coil spring 192 has one end connected to the link 189, as indicated at 193, and its other end to the framework of the machine, as shown at 194. This spring affects the link 189 to maintain the end thereof in engagement with the surface of the cam 191. However, the rotation of the latter is effective to cause movement of the link 189 sometimes against the influence of the spring 192.

As above pointed out, the rotation of the shaft 171 is so timed with the remainder of the structure of the pretzel machine, as to provide for one rotation of the shaft for the passage of each unit past any given point.

The operation of the pusher is thereby synchronized with the movement of the shutter 147, and the travel of the units in their orbital movement.

From the shelf 178 the dough is pushed by the pusher onto a roller 195 which is carried by a shaft 196 mounted in the side plates 143. This roller is of a sectional construction, as shown in Figure 21, to provide for adjustability in its length. Disk cutters 197 cooperate with the roller 195 to cut the strips to the exact length of the roller. These cutters are spaced apart, as shown at Figure 21, and are slidably mounted on a shaft 198 and are yieldably urged against the extremities of the roller 195 by springs 199. The extremities of the shafts 196 and 198 carry pinions 200 and 201 which are in mesh so as to properly time the rotation of these disk cutters and the roller 195. The shaft 200 is driven from the driving source of the main machine, as disclosed in the said copending application.

After the strips are cut to the proper length by the disk cutters 197 they pass onto magazine fingers 202 which are of the design shown in the said copending application. From these fingers they are picked up by the forming unit.

A pickup plate 203 has a knife edge 204 which picks the dough strips off the roller 195 after it has been cut to the proper length. The strips fall down along the plate 203 onto the magazine fingers 202.

Mechanisms for operating the forming unit

The cam instrumentalities carried by the main table and which cause the operation of the forming unit, are very much the same as those set forth in the said copending application. However, I have departed from the arrangement set forth therein in certain instances as will hereinafter be described. The arrangement of these instrumentalities are shown diagrammatically in Figure 19.

Just prior to that point at which the forming unit picks up the strip of dough from the magazine fingers 202, a cam surface on a cam member 206, which is carried by the frame of the machine, engages the roller 94 to cause the arms 105 of the bell cranks 104 to spread apart so that when the ends of the dough strip fall about the flanges 25 and hang down therefrom, they will be received between the forming plates 64.

During that time in which the strips fall down, the roller 94 rides along the straight surface 207 of the cam 206, and then off the inclined edge 208. This riding off the cam 206 causes the arms 105 to contract under the influence of the spring 118 to bend inwardly the lower ends of the strip, that is, it bends into the formation shown in Figure 16; prior to being affected by the forming plate 64 the dough strip is in U-formation, shown in Figure 15.

During this time the arms 71 of the spider 70 have been maintained in a substantially horizontal position by a riding of the rollers 73 along the guide rail shown at 209. After the roller 94 leaves the cam 206, the disks 120 and associated locking mechanism, are affected by a rack, designated generally by the reference character A in Figure 19, and a cam 217, to cause the twister 99 to make a complete revolution to twist the dough strip into the position shown in Figure 17. The rack mechanism A comprises a slide 210 which is slidably mounted in brackets 211 and upraised from the slide are a series of rack teeth 212. These teeth are so designed that each of them will engage with one of the sleeves 121 of the disk members as they pass thereby.

A link 213 is connected at 214 to the slide 210 and at 215 to a hub member 216 that is carried by the shaft 171, the connection 216 being eccentric to the center of the shaft 171. This eccentric connection provides for reciprocation of the slide coincident to rotation of the shaft.

As before pointed out, rotation of the shaft 171 is timed with the mechanism causing movement of the units so that it makes one complete revolution for the passage of each unit past a given point, hence, the slide 210 will go through one complete cycle of reciprocation for each unit that passes thereby.

The rack 212 is so disposed that upon initial engagement of the first tooth thereof with one of the sleeves 121 of the disks 120, it will be moving

in the same direction as that in which the unit moves. However, movement of the rack is then quickly reversed to cause a substantially complete turning of the twister, whereupon the rack again moves in the same direction as the unit so that as the last sleeve 121 leaves the last tooth, it is again moving in the same direction as that in which the unit moves.

This arrangement has been found to be very satisfactory in that substantially no jars or shocks are imparted to the unit by engagement with the disks 120 with the rack.

In order to unlock the disks 120 so that the twister may be rotated, a cam 217 having inclined cam surfaces 218 and 219 is availed of. This cam 217 is mounted on the frame of the machine, and prior to that point where one of the sleeves 121 will engage the first tooth 212, the surface 218 affects the roller 127 to swing the locking arm 123 outwardly out of engagement with the sleeve 121 which had been received in the recess 125.

The roller 127 rides along the cam 217 during the turning of the twister 99. It then rides off the surface 219 whereupon the spring 128 moves the locking arm 123 into locking position. To insure of this locking operation taking place at exactly the right moment, I avail of a cam 220 which supplements the functions of the cam 219 and spring 128. This cam 220 is preferably pivotally mounted, as shown at 221, and is provided with a spring 222, which pivotal mounting and the spring arrangement, permits of a slight amount of play.

When the twister has been completely turned and locked in its turned position, the roller 74 on the long arm 75 of the spider 70 engages the cam surface 223 of the cam assembly, which is designated generally as B, this cam assembly being substantially the same as that illustrated and described in the said copending application.

The engagement of the roller 74 with the cam surface 223 depresses the arm 72 to cause a partial turning of the spider and the sleeve 67, together with the parts connected thereto, whereupon one of the rollers 73 engages the cam surface 224, the latter being effective to completely fold over the twister yoke 63. The last part of the turning of the yoke 63 into the position shown in Figure 3 is accompanied by an engagement of the cam 129 with the arm 130 (Figure 4) to cause the pick-up plate 20 to move a slight distance rearwardly from the front surface of the main body plate of the unit. This provides for space between the pick-up plate and the twister yoke to receive the strip of dough forming the pretzel.

At this time the roller 6 engages with the cam surface 225 on the cam 226 to cause operation of the pasters. This causes the paster heads 29 to flatten out the extremities of the dough strips, as shown at 227 in Figure 18, which develops the pretzel in its completely formed condition. The roller 6 now rides down off the cam 226 whereupon the spring 5 returns the lugs 8 to their normal position. The rollers 73 now ride off cam surface 228 and the roller 74 off the cam surfaces at 229 to fold the twister yoke 63 back to its normal position in which the fingers 83 are spaced from the pick-up plate 20 in front thereof.

At this point the roller 55 engages the cam surface 230 of the cam 231 to retract the pick-up plate 20. Further movement of the roller 55 along the cam 231 causes the same to roll off the surface 232 whereupon the pick-up plate resumes its normal position. During this movement the roller 74 on the long arm 72 of the spider 70 rides beneath the guide 233 and the forming units now begin to turn over to their downward path of travel. At this point the roller 44 engages a cam 234 to cause operation of the ejecting plates and pins, whereupon the formed pretzel is pushed off the flanges 25.

As the pretzel is ejected from the pick-up plate and flange 25, it is received by the receiving fingers 83. These are now advanced by the turning of the spider 70, which is caused by engagement of the roller 74 of the arm 72 in the cam slot shown at 235. When the fingers 83 are in their extended position, a flipper picks the formed pretzel therefrom in a manner described in the said copending application. The spider is then rotated to return the twister yoke to its normal position, whereupon the cycle is again repeated.

By reference to the preceding application it is noted that a plurality of these units are employed and are caused to travel in an orbital path by there being assembled in an endless sprocket arrangement in the complete machine.

While a preferred specific embodiment of the invention is hereinbefore set forth, it is to be understood that I am not to be limited to the exact constructions and mechanisms illustrated and described, because various modifications of these details may be made in putting the invention into practice, within the purview of the appended claims.

I claim:—

1. In a pretzel forming machine including a plurality of forming units, feeding devices for supplying dough strips to the forming units, said devices comprising a chute along which dough strips are adapted to pass, mechanism for diverting dough strips from the chute, and means for automatically rendering said diverting means inoperative whereby dough strips are delivered along the chute, said means including an essential element on each of the forming units.

2. In a pretzel forming machine including a plurality of forming units and a source of supply of dough strips, feeding devices for transferring dough strips from the source of supply to the forming unit independently, comprising a chute along which the strips are adapted to pass, means for diverting dough strips from the chute, and mechanism for rendering said diverting means inoperative, said mechanism including parts on the forming units which may be operated at the will of the operator of the machine to render said mechanism effective or not as occasion demands.

3. In a pretzel forming machine including a plurality of forming units and a source of supply of strips of dough, feeding devices for conveying strips of dough from a source of supply to the forming units individually comprising a chute, a pusher cooperating with the chute, a shutter included in the chute and operable to divert dough strips from the forming units, mechanical means for operating the shutter, and mechanical means for operating the pusher, mechanism whereby both the operations of said last mentioned mechanical means are interrelated whereby operation of the shutter and pusher are synchronized.

4. In a pretzel forming machine including a plurality of pretzel forming units, feeding devices for controlling the delivery of dough strips to the forming units including a shutter, mechanical means for operating the shutter, electrical mechanism for controlling operation of the mechanical

means, and a member on each of the forming units cooperating with the electrical mechanism to render the same effective.

5. In a pretzel forming machine, a forming unit comprising a main body member, a pickup plate movable with respect to the body member, a twister yoke carried by the body member and in pivotal relation to the pickup plate, means for causing swinging movement of the twister yoke, and means for causing movement of the pickup plate with respect to the main body unit, both said last mentioned means including cooperating parts whereby swinging movement of the twister yoke causes movement of the pickup plate.

6. In a pretzel forming machine, a forming unit comprising a main body member, a twister yoke pivotally mounted in the body member, a twister pivotally mounted in the twister yoke, means for causing twisting operation of the twister, means for positively locking the twister against twisting movement, yieldable means for holding said locking means in effective position, and a cam for moving the locking means into unlocking position against the influence of the yieldable means.

7. In a pretzel forming machine, a forming unit comprising a main body member, a twister yoke pivotally mounted in the body member, a twister pivotally mounted in the twister yoke, means for causing twisting operation of the twister, means for positively locking the twister against twisting movement, and cam means to render inoperative the said locking means whereby the twisting movement of the twister is permitted.

8. In a pretzel forming machine and in combination, a movable pretzel forming unit having a twister and operating means for the twister, of mechanism for causing operation of said operating means, said mechanism including a rack movable at certain times with the forming unit, said rack being movable at other times in a direction opposite to that in which the unit moves to effect twisting operations.

9. In a pretzel forming machine, the combination with a pretzel forming unit movable in the machine and including a twister, of a reciprocating rack for causing operation of the twister, the reciprocation of said rack being in a direction parallel to the path of movement of the forming unit.

10. In a pretzel forming machine, the combination with a pretzel forming unit movable in the machine and including a twister, of a reciprocating rack for causing operation of the twister, locking mechanism included in the forming unit for locking the twister against twisting movement, and cam means associated with the rack for rendering the locking means ineffective during operation of the rack.

11. In a pretzel forming machine including a pretzel forming unit and feeding devices therefor, a twister in the forming unit, a reciprocating rack for operating the twister, driving means for the rack, a swinging shutter in the feeding devices, and means to swing the shutter into position in which a dough strip is delivered to the forming unit, said last mentioned means being driven from the driving means on the reciprocating rack.

12. In a pretzel forming machine, a pretzel forming unit comprising a main body member, a pickup plate movable with respect to the body member, a twister yoke hingedly mounted in the body member and pivoted with respect to the pickup plate, a twister in the twister yoke, forming arms in the twister, pretzel ejecting means associated with the pickup plate, means for causing movement of the pickup plate, and means for causing operation of the ejecting means, both said operating means being interrelated.

13. In a pretzel forming machine, a pretzel forming unit comprising a main body member, a pickup plate movable with respect to the body member, a twister yoke hingedly mounted in the body member and pivoted with respect to the pickup plate, paster members in the pickup plate, operating means for causing swinging movement of the twister yoke, operating means for causing movement of the pickup plate, said last mentioned operating means being operable independently of movement of the twister yoke, and an operative connection between the operating means for the twister yoke and the pickup plate.

14. In a pretzel forming machine, a pretzel forming unit comprising a main body member, a pickup plate movable with respect to the body member, a twister yoke pivotally mounted in the body member, receiving fingers for receiving a formed pretzel, said receiving fingers being carried by a frame, said frame being movable with respect to the body member, means for causing simultaneous operation of the twister yoke and the said frame, means for causing movement of the pickup plate, and means for ejecting the pretzels from the pickup plate onto the receiving fingers.

15. A pretzel forming unit of the character described, comprising a main body member, means for including the main body member in a pretzel forming machine in an inclined position, a pickup plate, a twister yoke, a twister in the twister yoke, forming arms pivotally carried by the twister, yielding means for maintaining said forming arms in a contracted position, and means for spreading the arms to permit the positioning of the extremities of a dough strip therebetween.

16. A pretzel forming unit of the character described, comprising a pickup plate, a twister yoke, a twister in the twister yoke, forming arms carried by the twister, yielding means normally maintaining the forming arms in a contracted position, and operating means associated with the arms for spreading them apart against the influence of the yielding means.

17. A pretzel forming machine of the character described, comprising a main body member, a pickup plate movable with respect to the body member, a twister yoke hingedly mounted in the body member, a twister pivotally mounted in the twister yoke, forming arms carried by the twister, individual operating means causing individual operation of the pickup plate, twister yoke, twister and forming arms, respectively, pasters in the pickup plate, operating means for the pasters, and cam means carried by the forming unit for discontinuing the supply or dough strips thereto, said cam means being movable into and out of operative position.

18. A pretzel forming unit comprising a main body member carrying a plurality of pretzel forming mechanisms, and a cam member carried by the body member and movable into and out of operative position, said cam member being adapted to affect feeding instrumentalities to cause a dough strip to be delivered to the forming unit.

19. In a pretzel forming machine, the combination with a plurality of forming units, and feeding means for delivering strips of dough individually to the said units, of mechanism for rendering said feeding means effective to deliver the

dough strips to the forming units, said mechanism comprising a member carried by each of the forming units and a second member engageable therewith to render said feeding means effective, each of the members carried by the forming units being selectively movable into a position in which it will not engage the second member whereby the feeding means is rendered ineffective for that particular forming unit.

20. In a pretzel forming machine, a source of supply of dough strips, a plurality of forming units in spaced relation, feeding devices for transferring strips of dough from the source of supply to the forming units individually, a cam member carried by each of said forming units, and a second member engageable by said cam member to automatically render the feeding devices effective for each unit, the cam member of which engages said second member, each of said cam members being selectively movable into a position in which it does not engage the second member whereby the feeding devices are automatically rendered ineffective so far as the particular forming unit carrying the said cam member is concerned.

HARRISON S. GIPE.