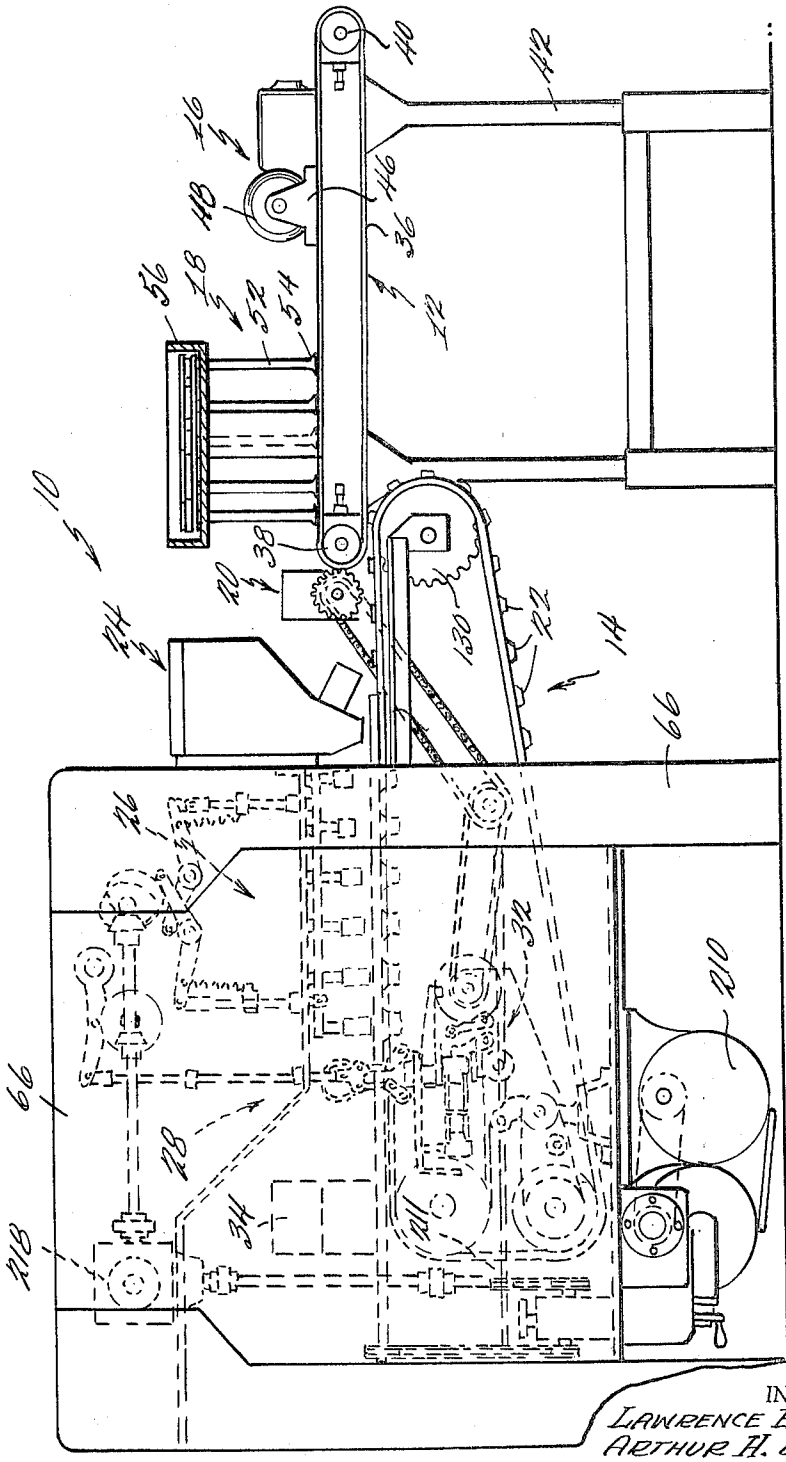
Nov. 1, 1966 L. E. STEIMEN ETAL 3,282,023

BISCUIT PACKAGING MACHINE

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FIG. 1



INVENTORS
LAWRENCE E. STEIMEN
ARTHUR H. BUCKLEY
GREGORY C. KEKOPOULOS

By Cushman, Darby & Cushman
ATTORNEYS

Nov. 1, 1966 L. E. STEIMEN ETAL 3,282,023

BISCUIT PACKAGING MACHINE

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FIG. 2

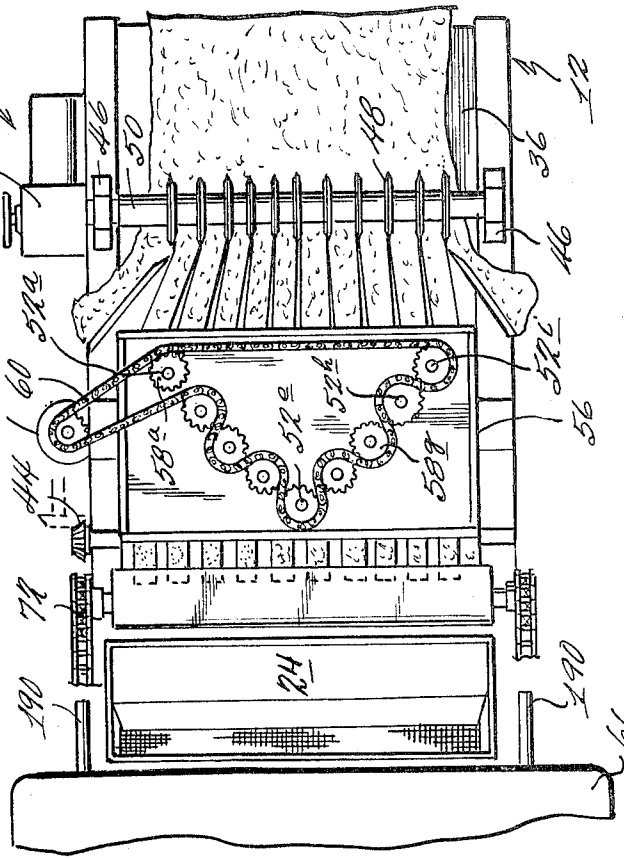
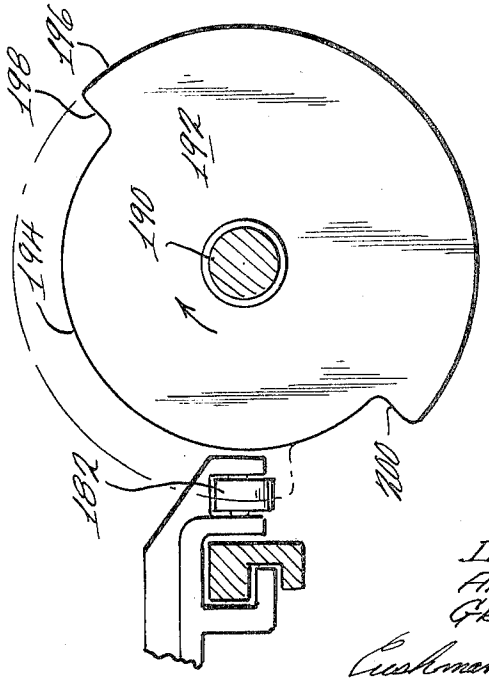


FIG. 18



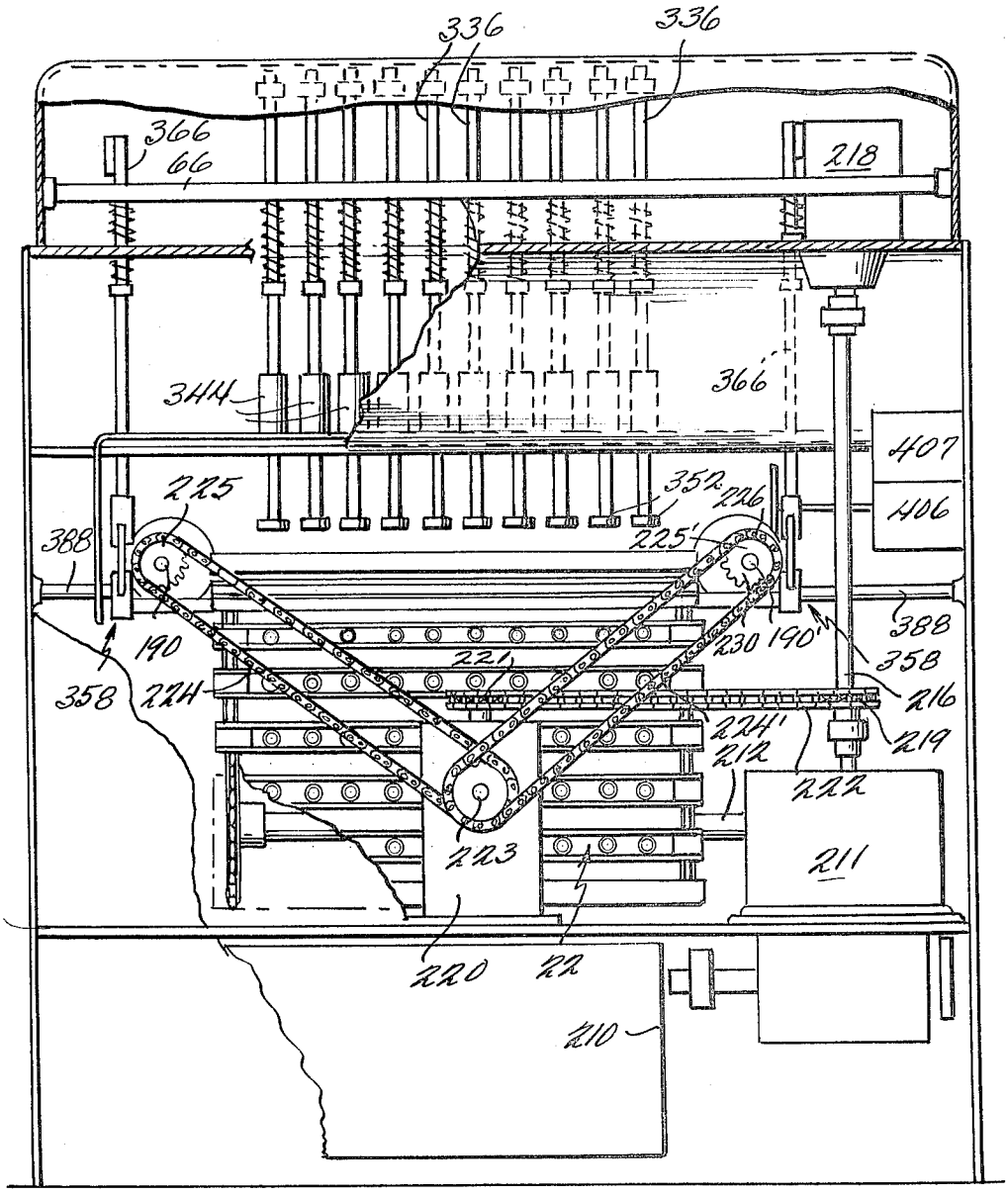
INVENTORS
LAWRENCE E. STEIMEN
ARTHUR H. BUCKLEY
GREGORY C. KEKOPOULOS
Cushman, Darby & Cushman
ATTORNEYS

Nov. 1, 1966 L. E. STEIMEN ETAL 3,282,023

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FIG. 3



INVENTORS
LAWRENCE E. STEIMEN
ARTHUR H. BUCKLEY
GREGORY C. KEKOPOULOS

BY Cushman, Darby & Cushman
ATTORNEYS

Nov. 1, 1966 L. E. STEIMEN ETAL 3,282,023

BISCUIT PACKAGING MACHINE

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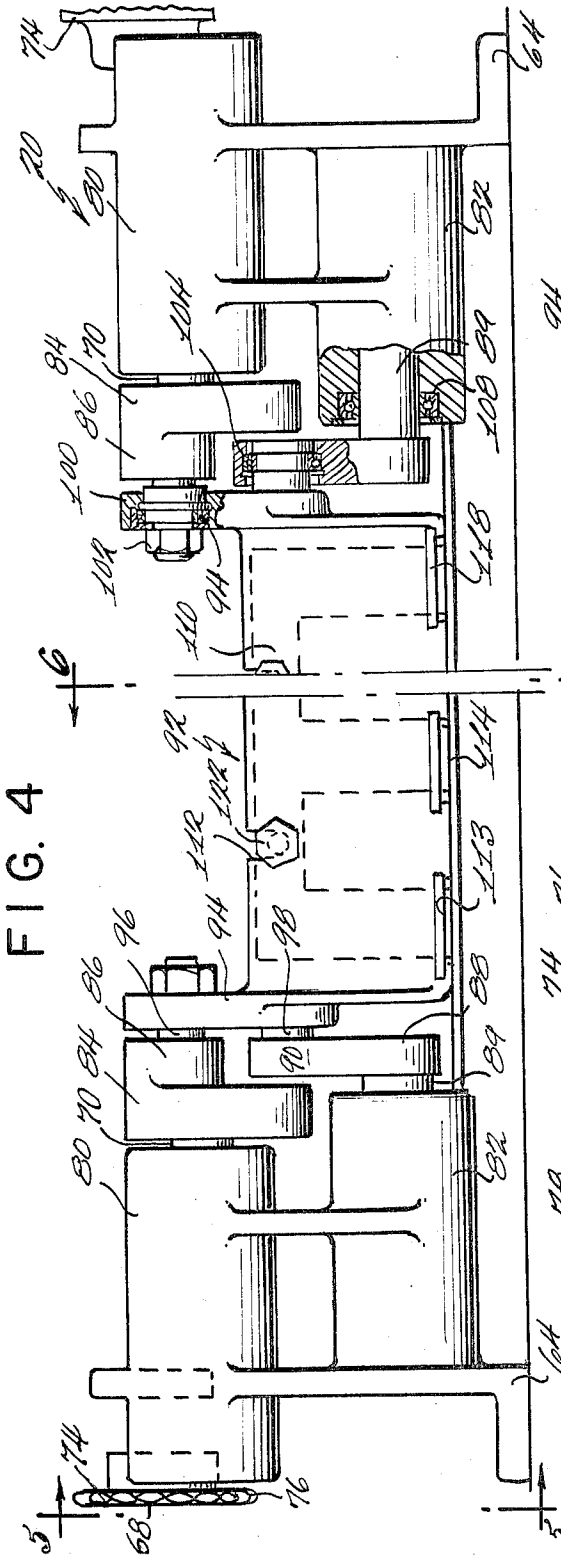


FIG. 4

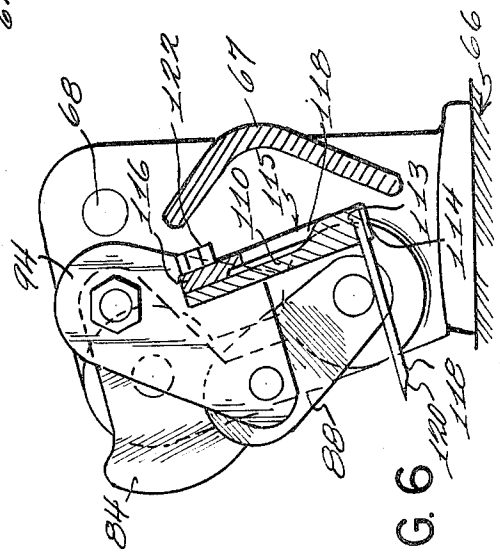


FIG. 6

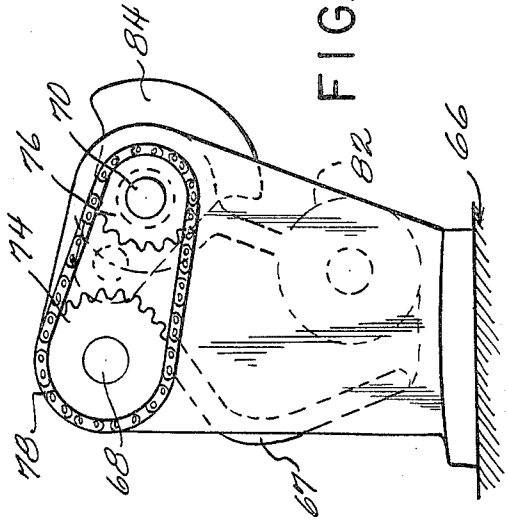


FIG. 5

INVENTORS
LAWRENCE E. STEIMEN
ARTHUR H. BUCKLEY
GREGORY C. KEKOPOULOS

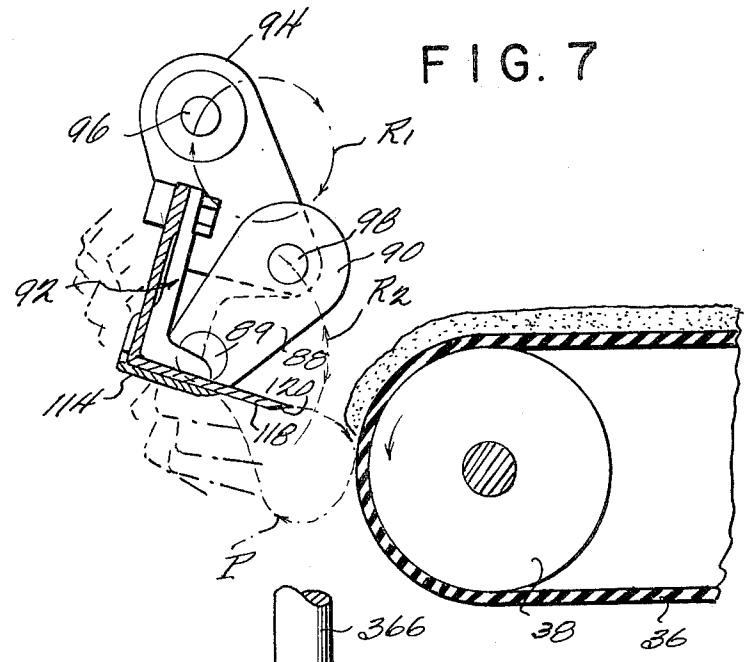
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BISCUIT PACKAGING MACHINE

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FIG. 7



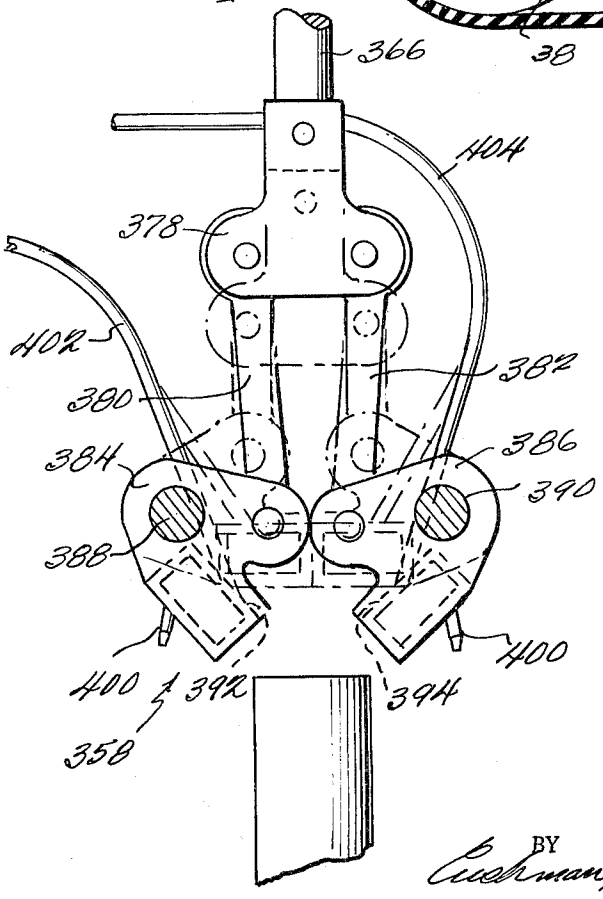


FIG. 17

INVENTORS
LAWRENCE E. STEIMEN
ARTHUR H. BUCKLEY
GREGORY C. KEKOPOULOS

BY
Cushman, Darby & Cushman
ATTORNEYS

Nov. 1, 1966 L. E. STEIMEN ETAL 3,282,023

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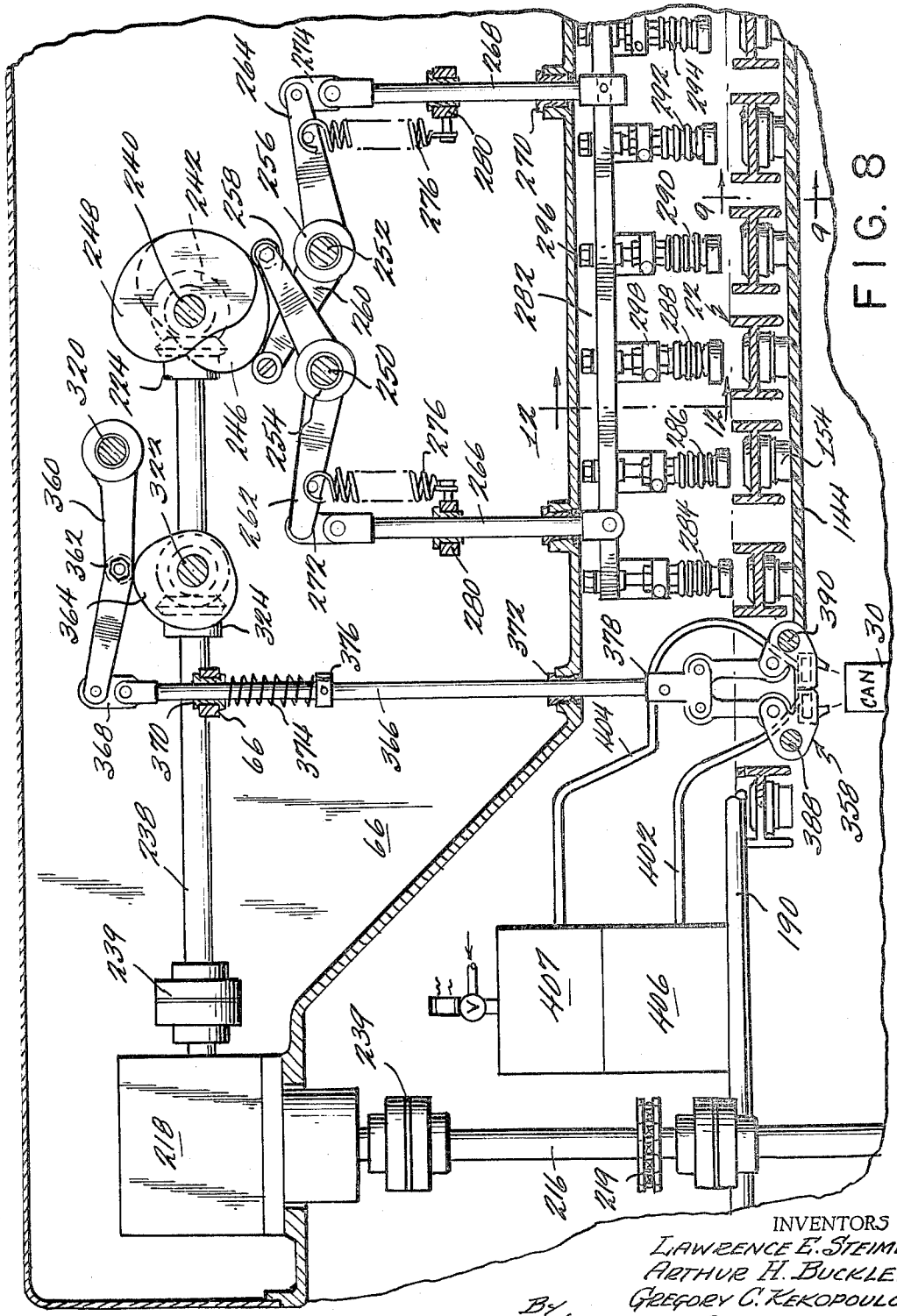


FIG. 8

INVENTORS
LAWRENCE E. STEIMEN
ARTHUR H. BUCKLEY
GREGORY C. KEKOPOULOS
By Cushman, Darby & Cushman
ATTORNEYS

Nov. 1, 1966 L. E. STEIMEN ETAL 3,282,023

BISCUIT PACKAGING MACHINE

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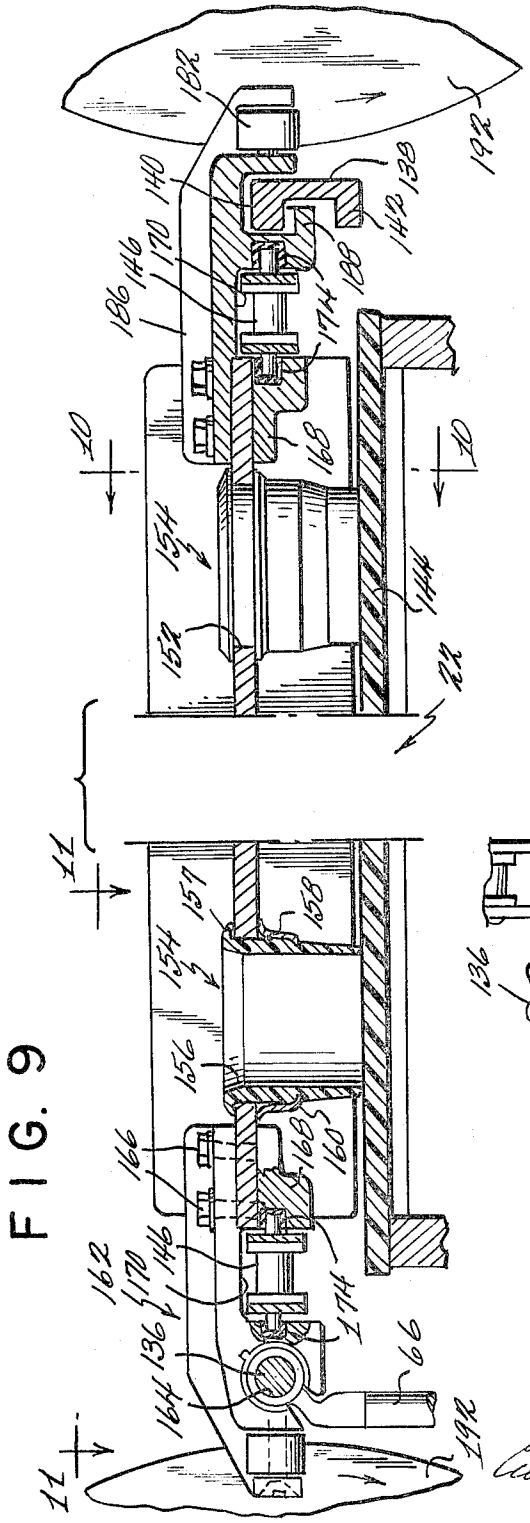


FIG. 9

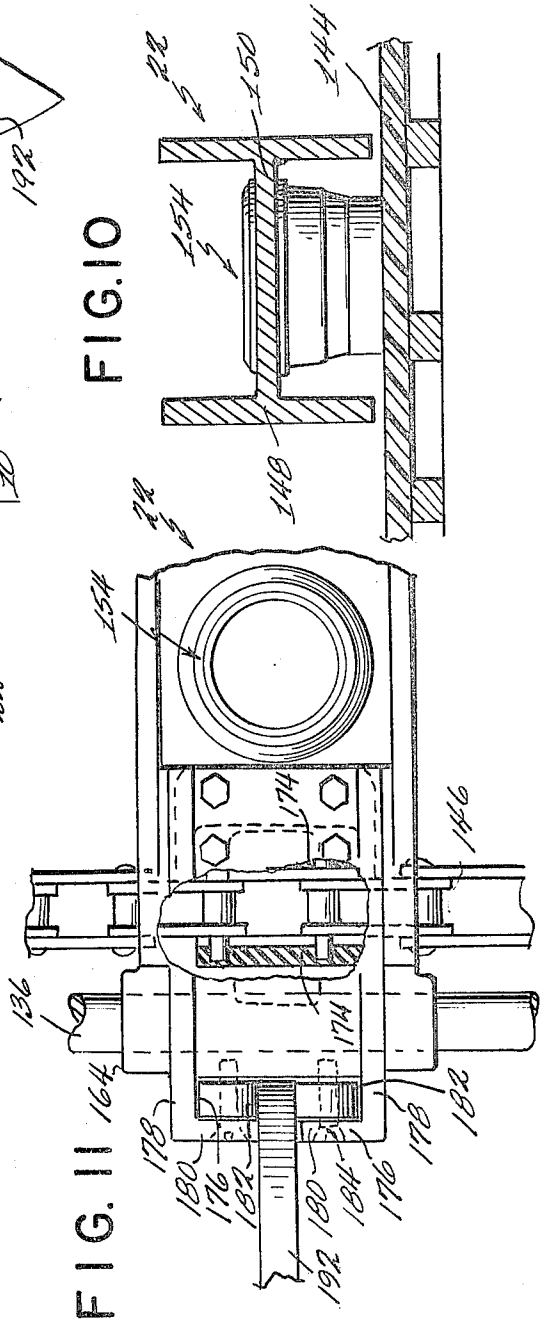


FIG. 10

FIG. 11

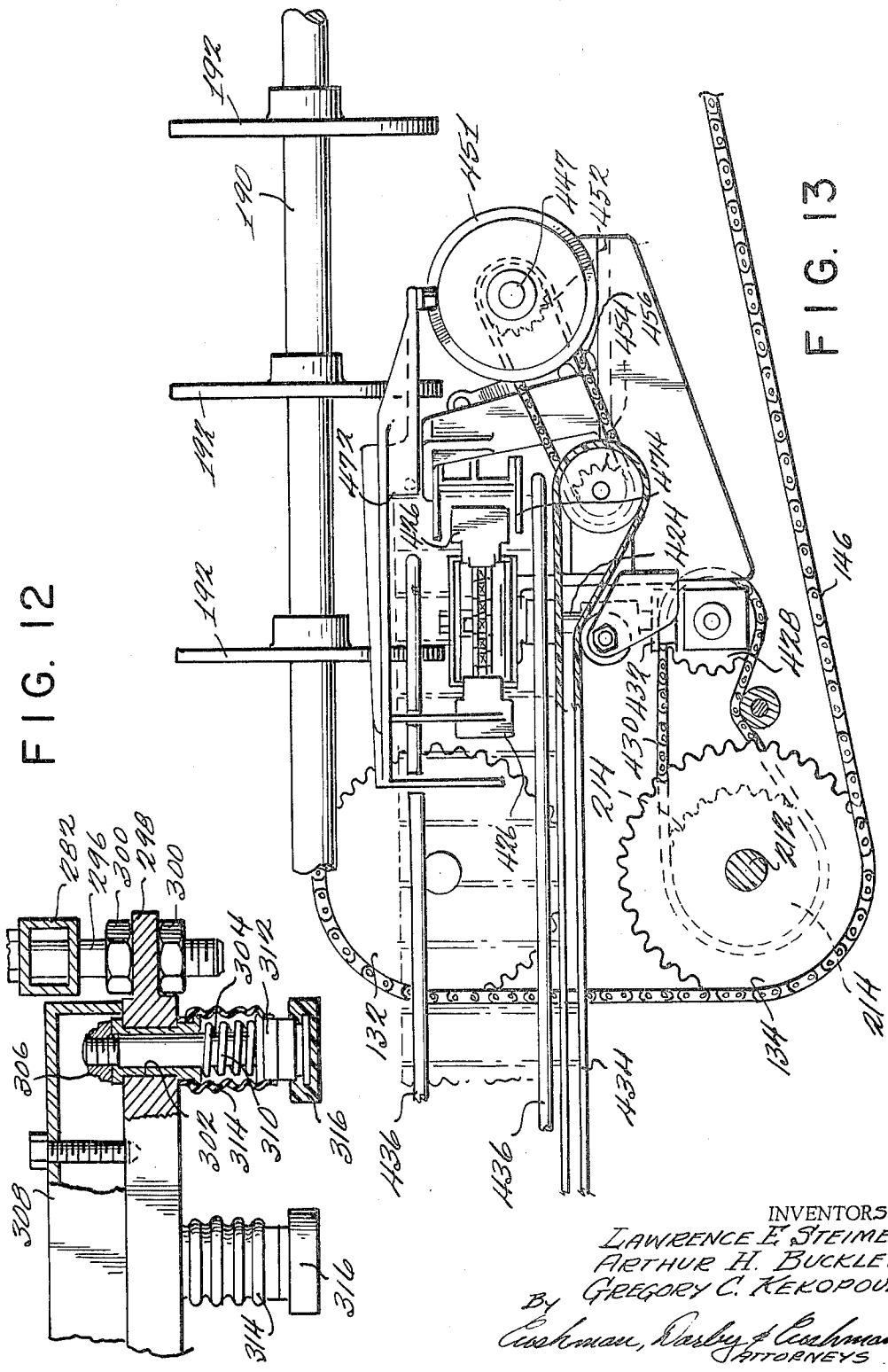
INVENTORS
LAWRENCE E. STEIMEN
ARTHUR H. BUCKLEY
GREGORY C. KEKOPOULOS

BY Cushman, Darby & Cushman
ATTORNEYS

Nov. 1, 1966 L. E. STEIMEN ETAL 3,282,023

BISCUIT PACKAGING MACHINE

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INVENTORS
LAWRENCE E. STEIMEN
ARTHUR H. BUCKLEY
GREGORY C. KEKOPOULOS
By Cushman, Darby & Cushman
ATTORNEYS

Nov. 1, 1966 L. E. STEIMEN ETAL 3,282,023

BISCUIT PACKAGING MACHINE

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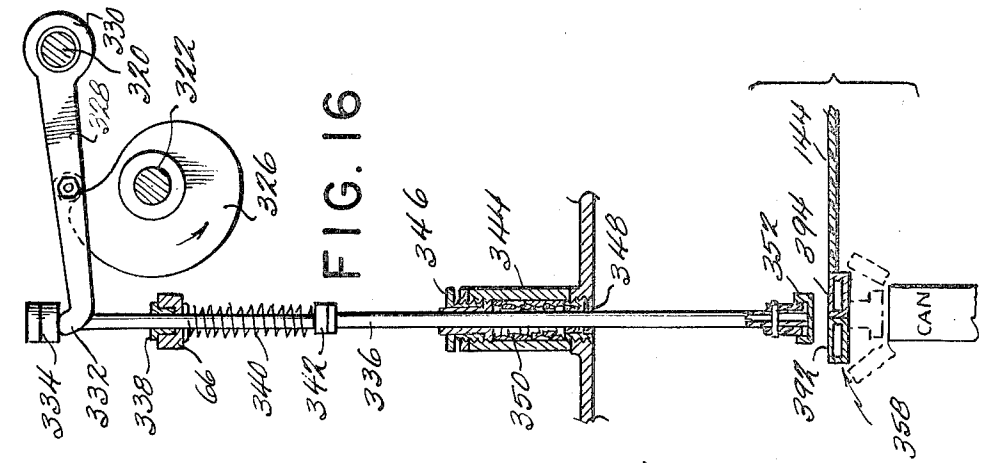


FIG. 16

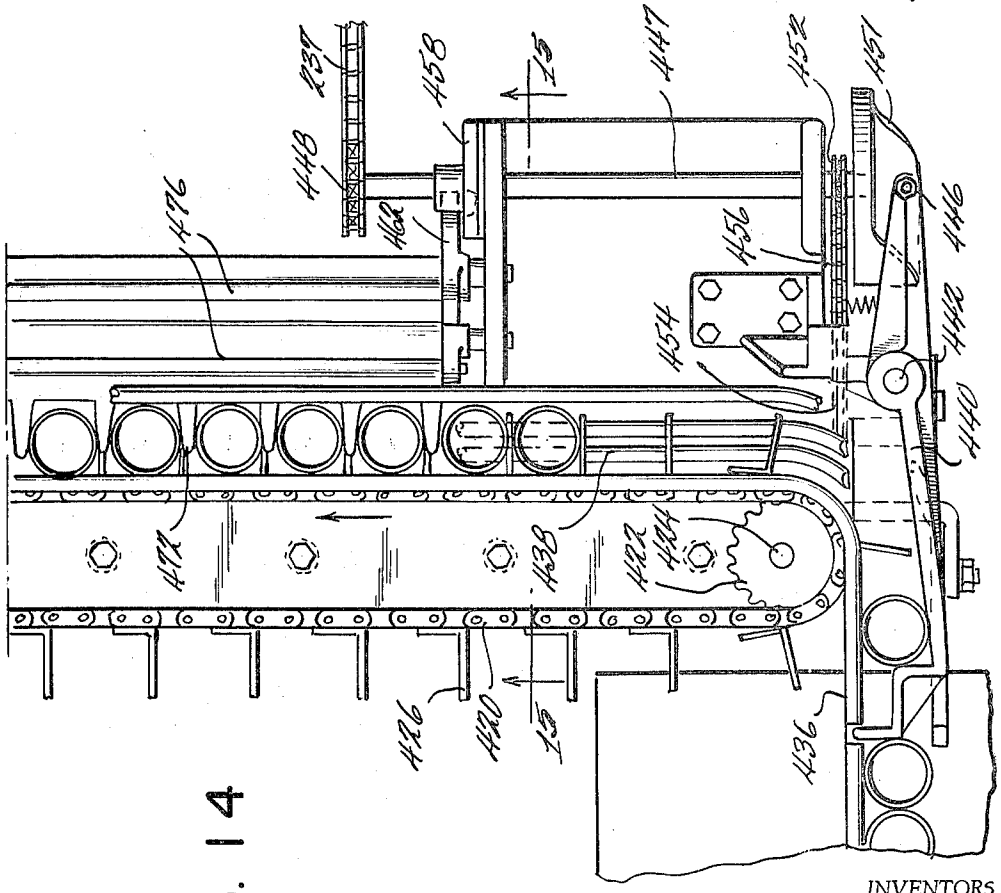


FIG. 14

INVENTORS
LAWRENCE E. STEIMEN
ARTHUR H. BUCKLEY
GREGORY C. KEKOPOULOS

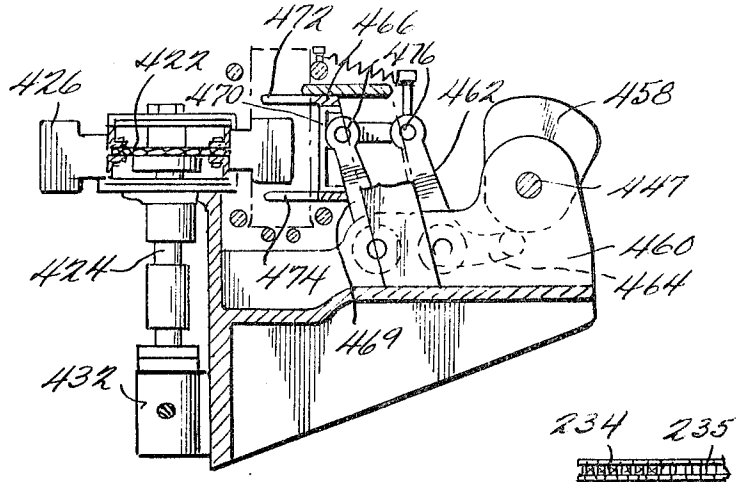
BY Cushman, Darby & Cushman
ATTORNEYS

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FIG. 15



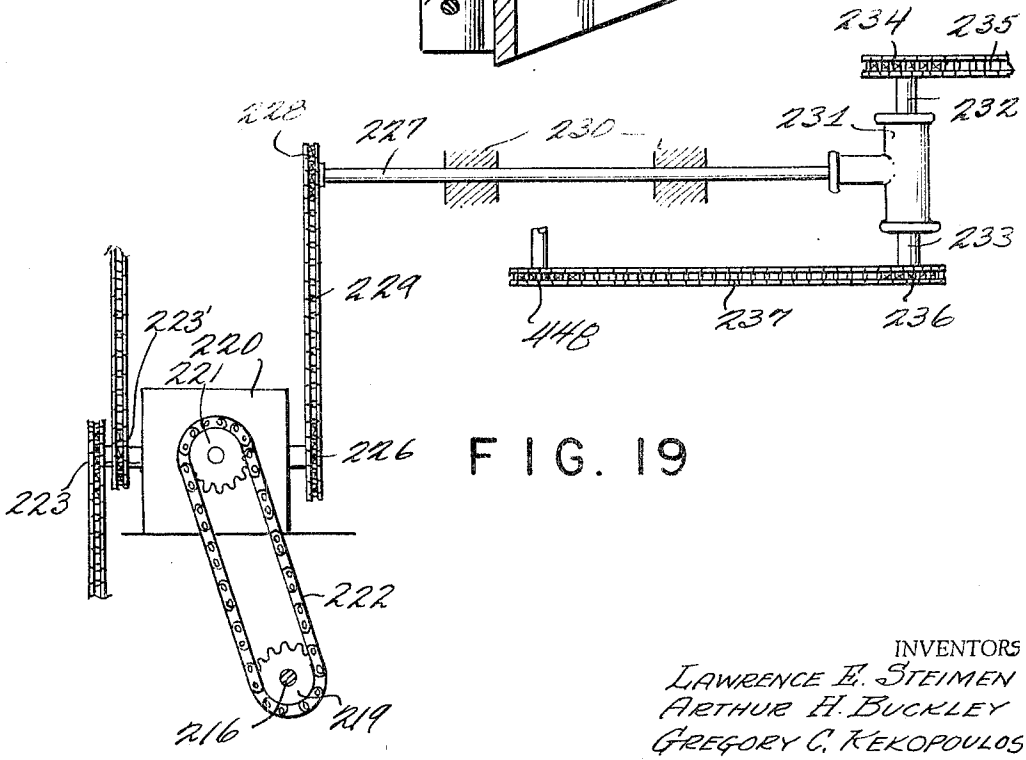


FIG. 19

INVENTORS
LAWRENCE E. STEIMEN
ARTHUR H. BUCKLEY
GREGORY C. KEKOPOULOS

BY
Cushman, Darby & Cushman
ATTORNEYS

Nov. 1, 1966 L. E. STEIMEN ETAL 3,282,023

BISCUIT PACKAGING MACHINE

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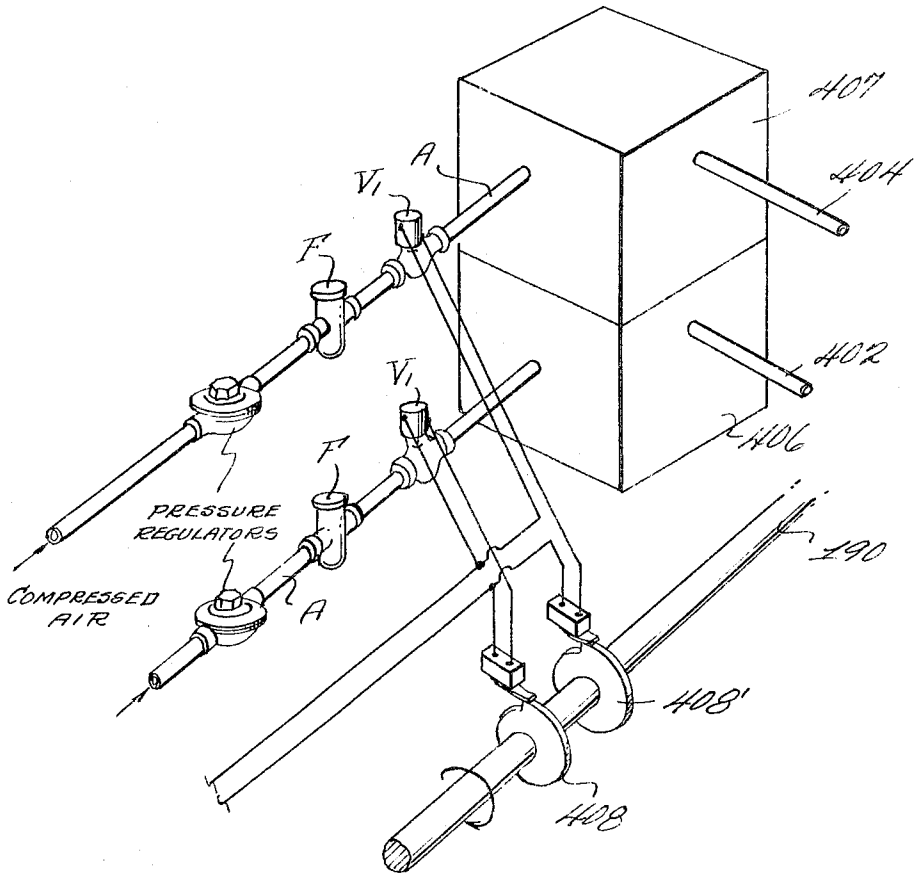


FIG. 20

INVENTORS
LAWRENCE E. STEIMEN
ARTHUR H. BUCKLEY
GREGORY C. KEKOPOULOS

BY
Cushman, Darby & Cushman
ATTORNEYS

United States Patent Office

3,282,023

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3,282,023

BISCUIT PACKAGING MACHINE

Lawrence E. Steimen, Topsfield, Arthur H. Buckley, Salem, and Gregory C. Kekopoulos, Ipswich, Mass., assignors to Arthur D. Little, Inc., Cambridge, Mass., a corporation of Massachusetts

Filed Apr. 17, 1963, Ser. No. 273,775
29 Claims. (Cl. 53—237)

The present invention has reference to a new and improved biscuit packaging machine having plunger-type forming and charging stations.

According to this invention, there is provided apparatus for consecutively filling cans with biscuit dough blanks indexed below a charging station on the upper flight of a conveyor. The conveyor is formed with transverse die-cup rows which receive unformed dough blanks via a feeding and cutting apparatus, these die-cup rows then being indexed to a forming station where a battery of plungers form the blanks into the desired shape; next, the conveyor is indexed to a charging station where another battery of plungers forces the dough blanks into the cans indexed therebelow.

One object of this invention is to provide a new and improved means for ensuring the dough blanks are deposited in the cans without undesirable tilting, as would tend to cause an uneven distribution of the formed dough blanks within the cans. To this end, there is provided a trap door arrangement at the charging station, opposed transverse pivoted plates receiving the dough blanks in symmetrical relationship with respect to the adjacent edges of the trap door plates; when these plates are then pivoted downwardly and away from one another, there is no uneven force imparted to the dough blanks as to cause tilting. Coupled with this trap door arrangement is an arrangement for operating the charging station plungers to provide a faster-than-gravity downward stroke to "shoot" the blanks into the cans. Preferably, the charging station plungers are spring-loaded to this desirable end. It has been found that such cooperative action on the dough blanks is highly effective in maintaining a horizontal orientation of the dough blanks in the cans, and thereby avoids the requirement for vacuum-type charging plungers and the like. By virtue of this charging operation, it is not necessary for the charging pistons to have a downward stroke which varies from one side of the machine to the other; indeed, the downward stroke need not even carry the charging station plungers into the can at all.

According to another feature of this invention, new and improved means for forming the dough blanks at the forming station are provided. It has been found that a superior dough blank is formed if the dough is not pressed by just one plunger acting thereon, but rather a more efficient working and forming of the dough is accomplished with a series of forming plungers consecutively working on each dough blank as it is indexed along the conveyor. To this desirable end, new and improved arrangement for forming the dough blanks carried in the die-cups is provided, which includes a number of transverse rows of forming plungers, together with means for operating such plungers in timed relationship.

This invention also contemplates: (a) new and improved means for oiling the biscuits during the charging operation so as to keep the blanks from sticking together after being deposited into the can; (b) new and improved cutter assembly for efficiently cutting the ends of the dough strips so as to deposit cut, unformed blanks into the die cups carried by the conveyor; (c) new and improved means for spreading out a continuous sheet of dough into laterally spaced apart strips to be fed to the cutter assembly; (d) new and improved conveyor means for indexing the cans in a row transversely across the charging station; and (e) an apparatus capable of efficiently handling dough blanks to the desirable end that the blanks are formed into biscuit shapes, and then deposited in stacked relationship in cans in a reliable, trouble-free and commercially acceptable manner.

These and still further objects, advantages, and novel features of the present invention will become evident in the specification and claims, taken in connection with the accompanying drawings.

In the drawings:

FIGURE 1 is a longitudinal side elevation view of the machine according to this invention;

FIGURE 2 is a partial plan view of the machine in FIGURE 1;

FIGURE 3 is a front elevation view of the machine in FIGURE 1;

FIGURE 4 is a transverse elevational view of the cutting mechanism as viewed facing the front of the machine;

FIGURE 5 is a view taken along line **5—5** in FIGURE 4;

FIGURE 6 is a sectional view taken along line **6—6** in FIGURE 4;

FIGURE 7 is a diagrammatic developed view of the knife path in the cutting mechanism;

FIGURE 8 is an enlarged longitudinal elevation view of the charging station and forming station;

FIGURE 9 is a transverse sectional view of the upper conveyor flight, taken along line **9—9** in FIGURE 8;

FIGURE 10 is a view taken along line **10—10** in FIGURE 9 showing a single row of die cups;

FIGURE 11 is a partial plan view of the die-cup row in FIGURE 9;

FIGURE 12 is a detail view of the forming station plungers, taken along line **12—12** in FIGURE 8;

FIGURE 13 is an enlarged side elevation view of the can feeding conveyor;

FIGURE 14 is a partial plan view of the can feeding conveyor in FIGURE 13;

FIGURE 15 is a view taken along line **15—15** in FIGURE 14;

FIGURE 16 is a detail elevation view of the charging-station plungers;

FIGURE 17 is an enlarged side elevation view of the trap door assembly in FIGURE 8;

FIGURE 18 is an enlarged detail view of the cam mechanism operative to align the die-cup rows in FIGURE 9–11;

FIGURE 19 is a diagrammatic plan view of a portion of the drawing mechanism for the machine; and

FIGURE 20 is a diagrammatic view of the oiling mechanism.

The general arrangement of the apparatus

Referring first to FIGURES 1, 2, 3, and 8, there is shown a biscuit packaging machine **10** which includes a dough-feed conveyor **12** and an aligned dough-packaging conveyor **14** downstream of the conveyor **12**. The dough-feed conveyor **12** has a cutter assembly **16** adapted to cut a single sheet of dough moving along the conveyor **12** into longitudinal strips; a spreading apparatus **18** transversely separates these cut dough strips so that as the dough strips are fed off the conveyor **12**, they pass a cutter knife assembly **20**. The packaging conveyor **14** moves in timed relationship with the cutter knife assembly **20** and the dough feed conveyor **12** so as to receive the cut ends of the dough strips in consecutive die-cup rows **22** which are spaced according to the transverse position of the spread dough strips. These cut dough blanks, which are unformed, are carried by the consecutive die-cup rows past a vibrating powdering station **24**, thence past a form-

ing station **26** where a series of plungers are adapted to co-act with the die cups to form the dough blank into a disc-shape in preparation for packaging.

Next, these formed dough blanks move to a charging station **28** where they are deposited into a row of cans **30** in stacked relationship, the cans **30** being indexed in a transverse line immediately beneath the charging station **30** via a can conveyor mechanism **32**. Cooperating with this charging operation (wherein a tall can will receive perhaps ten formed biscuit blanks) is an oiling mechanism **34** which is adapted to inject a metered amount of oil mist or spray into the can between each charging cycle so that the adjacent dough blanks will not stick together when ultimately removed from the can by the consumer.

Consideration will now be given to a description of the apparatus, from the dough-feed conveyor **12** to the ultimate removal of the stacked cans via the can conveyor mechanism **32**.

The dough feed conveyor

This conveyor **12** takes the form of an endless, continuous belt **36** mounted between opposed drive rollers **38** and **40**, the entire assembly being mounted by any convenient means on a suitable supporting frame **42**. The drive roller **38** carries opposed gears **44** to impart drive to the belt **36**, as will later be explained.

The cutter assembly **16** which is positioned across the upper flight of the belt **36** takes the form of opposed upright brackets **46** carrying spaced apart cutter discs **48** via a drive shaft **50**, which is journalled into the upright brackets **46**. Drive to the shaft **50** is imparted by a convenient drive motor **51**, this being a known expedient in the art.

The spreading apparatus **18** which is adapted to separate the cut dough strips in transversely spaced relationship from one another takes the form of a series of vertical rods **52***a*–**52***i*, which rods are positioned in the form of an isosceles triangle, with the apex rod **52***e* being spaced furthest from the cutter assembly **16**. These rods are adapted to receive dough strips therebetween so that the strips are spaced apart according to the diameter of these rods. Accordingly, the bottom ends of the rods are flared at **54** and are supported at their supper ends by a suitable frame **56**.

The rods **52***a*–**52***i* carry sprocket wheels **58***a*–**58***i* at their respective upper ends and a sprocket chain **60** is trained about these sprocket wheels **58***a*–**58***i* to impart a rotary movement thereto to facilitate the movement of the dough strips between adjacent rods and otherwise prevent binding of the dough strips as they move past the rods **52***a*–**52***i*. The sprocket **60** is driven by any suitable means, there being shown an electric motor and reduction gear **62** joined to the frame **56** in driving relationship with the sprocket chain **60**. This arrangement of the cutter assembly **16** and the spreading apparatus **18** thus serves to cut and divide a continuous dough sheet into spaced apart strips which are fed off the end of the dough-sheet conveyor **12** adjacent the drive roller **38** nearest the packaging conveyor **14**.

The cutter knife for forming dough blanks from the dough strips

Referring now to FIGURES 4–7, there is shown a cutter knife assembly **20** which is adapted to cut these dough strips into generally rectangular, unformed blanks, which, due to the cyclical operation of the machine **10**, fall into the consecutive die-cup rows **22** carried by the packaging conveyor **14**.

The cutter knife assembly **20** takes the form of opposed mounting castings **64** adapted to be secured to the frame **66** of the dough packaging conveyor **14**. These castings **64** are joined together along their front end (nearest the forming station **26**) by an integral arcuate reinforcing plate **67** for purposes of rigidity. The opposed castings **64** carry a drive shaft **68** at their upper forward end (FIGURES 4 and 5). Also, each casting **64** carries rearwardly and downwardly of the drive shaft **68** a stub shaft **70**. The drive shaft **68** receives drive via a sprocket wheel **72** and also this drive shaft **68** has a sprocket wheel **74** joined to each end. The outside of the stub shaft **70** carries an aligned sprocket wheel **76** and drive is transmitted to the stub shaft **70** via a sprocket chain **78**. The lower rearward end of each casting **64** (downwardly and slightly forward of a boss **80** which carries the stub shaft **70**) is an aligned inwardly-facing boss **82**. The inner end of the stub shaft **70** carries a first counterbalanced crank **84** in driving relationship, the opposite end of this crank **84** having an inwardly extending boss **86**.

The lower boss **82** carries a second crank **88** via a stub shaft **89**. The opposite end **90** of this crank together with the first-crank boss **86** being constructed and arranged to receive a cutter frame **92**.

This cutter frame **92** is an integral one-piece casting having opposed side walls **94**. The side walls **94** carry spaced apart stub shafts **96** and **98**, the stub shaft **96** being aligned for engagement with first crank boss **86**, while the stub shaft **98** is aligned for engagement with the opposite end **90** of the second crank. Conveniently, the stub shaft **96** is frozen into the first crank boss **86**, received by a roller bearing joint **100** in the side wall **94**, and properly secured by a bolt **102**. Likewise, the stub shaft **98** is frozen at its one end at the side wall **94**, the other end being connected to the second crank **88** via another roller bearing joint **104**. Similarly, the second crank is joined to the lower boss **82** via the stub shaft **89** and rotary bearing joint **108**.

The cutter frame **92** has an integrally depending front wall **110** with narrow slots **112** along its top edge, and long horizontal slots **113** along its bottom edge. The front wall **110** merges at its lower end with a short, rearwardly extending bottom wall **114**.

A cutter plate **115** is joined to the front wall **110**, this blade likewise having a front wall **116** and spaced-apart portions **118** at 90° thereto with a rearwardly extending spaced apart cutting edge **120**. Bolts **122** join the front wall **116** of the cutter blade **114** to the slots **112** in the cutter frame front wall **110**. The cutter plate **115** is slotted below the bolt-connecting region and the spaced apart portions or bottom plates **118** pass through cutter frame slots **113** so as to provide a yieldable but secure connection to the cutter frame **92**.

As drive is transmitted to the drive shaft **68** and thereby to the stub shaft **70**, rotary motion is imparted to the first crank **84** causing the stub shaft **96** to trace a circular path R_1 and during this path of movement, the bottom part of the cutter frame is confined by the second crank **88** and stub shaft connection **98** to an arcuate oscillating path R_2 thereby causing the knife edges **120** to trace the path P, as shown in FIGURE 7. This path P is of a tear-drop shape and the speed of the blade cutting edges **120** as they move downwardly adjacent the conveyor belt is so that a part of the movement tends to cut the dough strip and force the dough strip down into the die-cup row **22** due to the urging by the underside of the cutter blade bottom plates **118**. This movement is highly effective in positively cutting the dough strips into small, rectangular, unformed blanks for deposit into the die-cup rows **22** which are carried by the dough packaging conveyor **14**. Thus, the cutting edges **120** are of a width sufficient to cut a dough strip and are aligned therewith.

The dough packaging conveyor assembly

The dough packaging conveyor **14** has a conveyor wheel **130** positioned on the frame **66** beneath the dough-feed conveyor **12**, and the opposite end of the frame **66** carries upper and lower conveyor sprocket wheels **132**, **134**, respectively.

Referring now to FIGURES 9–11 and 18, it will be seen that one side of the conveyor frame **66** carries a longitudinally extending circular rod **136** while the other side carries a parallel, longitudinally extending U-shaped structural member **138**, with its upper and lower legs **140**, **142** horizontally oriented and facing towards the circular rod **136** on the opposite side of the frame. The rod **136** and opposed structural member **138** thereby trace contiguous paths defining the conveyor path. The frame **66** also carries a smooth table surface **144** of Teflon or the like which extends across the upper flight of the dough packaging conveyor **14** from a point below the dough feed conveyor **12** to the charging station **28**. This conveyor is formed of opposed sprocket chains **146** which trace identically opposed paths about the conveyor sprocket wheels **130**, **132**, **134** and thereby define the path of this conveyor. Spaced along these sprocket chains **146** are the die-cup rows **22** as will now be explained.

There is provided a side-wise oriented I-beam **148** (FIGURE 10) which defines each die-cup row **22** of horizontal web portion **150** having spaced apart apertures **152** which correspond to the position of the dough strips as they leave the dough sheet conveyor **12**, and are cut by the cutter knife assembly **20**. These apertures **152** carry die cups **154** or plastic material such as Teflon.

The die cups **154** are of generally cylindrical configuration but have an outwardly flaring upper end **156** and a flange **157** along the upper end which is adapted to rest on the I-beam web **150** by retaining rings **158**. The rings **158** resiliently engage the underside of the I-beam web **150** and are snapped into peripheral recesses **160** in the die cups **154**. These rings **158** serve to bias their respective die cups **154** towards the table surface **144**.

The end of the I-beam **148** adjacent the circular rod **136** is supported by a casting **162**. This casting **162** has a longitudinally extending boss **164** receiving the circular rod **136** in sliding relationship so that the casting slides along the rod throughout its entire path of movement. The inner end of the casting **162** is bolted to the end of the I-beam web **150** by bolts **166** and a plate **168** is carried on the underside of the I-beam web **150** for this purpose. This defines a downwardly facing space **170** between the boss **164** and the end of the I-beam web **150**. The chain **146** is positioned in this space.

The chain **146** is secured at its outer end to the boss **164** via a recessed resilient bushing **174** which receives an extended end of chain pins. The inner end of the chain likewise is joined to the plate **168** via another recessed resilient bushing **174**, receiving the inner end of extended chain pins. This resilient mounting of the chains affords a degree of flexibility, for reasons to become evident, and the chains remain flexible in order to pass around the conveyor sprocket wheels **130**, **132**, **134**.

The outside extremity of the casting **162** is of bifurcated construction having spaced apart, facing recesses **176** defined by opposed side and end walls **178**, **180**, respectively. Carried in these recesses **176** are rollers **182**, spaced apart from one another and conveniently mounted for rotation by machine bolts **184**.

The opposite end of each I-beam web plate **150** is secured to the longitudinally extending structural member **138** via a casting **186**, which is similar in many respects to the casting **162**, like numerals being used to identify similar parts. The only significant difference is that the casting **186** has a downwardly and outwardly extending leg **188** which is adapted to be received between the upper and lower legs **140**, **142**, of structural element **138** as is apparent. This casting **186** is joined to the sprocket chain **146** in the manner just described, and likewise carries spaced apart rollers **182**, for reasons now to be explained. It will become apparent that precise indexing of each I-beam **148** is necessary due to the close tolerances involved in accurately positioning each I-beam **148** at its filling station, forming station, and charging station. For this reason, means are provided which cooperate with the rollers **182** to accurately position the I-beam **148** in its precise longitudinal position.

Referring now to FIGURE 18, the frame **66** carries rods **190** in outwardly aligned relationship with the path of travel of the chains **146** along their upper flight. These longitudinal rods **190** carry cams **192** which have a minor diameter **194** and a major diameter **196** about their circumference, one intersection of these diameters **194** and **196** being a radial surface **198** while the other intersection is in the form of another radial surface **200**.

Each cam **192** is of a size so that the sector of the cam embracing only the major diameter **196** will pass between the rollers **182**. The rods **190** operate in timed relationship so that when the I-beams **148** are indexed forwardly toward the charging station, the minor diameter sector **194** of the cams is passing adjacent the rollers **182** so that their movement is uninterrupted. When the indexing stops, the major diameter sectors **196** of the cams **192** move between the rollers **182** and positively align the I-beam **148** so that the die cups **154** are positively fixed in the exact longitudinal position which is desired. The resilient mounting of the chains to the rollers **182** facilitates this coaction with the cams **192**.

At this point, the drive mechanism which operates the various elements will now be explained, reference being made to FIGURES 1, 3 and 8. Mounted to the underside of the frame **66** (beneath the conveyor wheels **132** and **134**) is a variable speed drive **210** of conventional construction. For example, a Reeves 5 H.P. variable speed drive Z-flow #331–1E–18, with a 1:5 reducer ratio, 1750 maximum r.p.m. output has been found to be quite satisfactory. This drive **210** is drivingly connected to a conventional continuous-intermittent drive transmission **211**, likewise of conventional construction. Typical drive transmissions of this type include, by way of example, a Ferguson 2H–2 housing model #6–5304T–120 manufactured by the Ferguson Machine and Tool Company, Inc.

The transmission **211** has a horizontally extending output shaft **212** transmitting an intermittent indexing drive to the conveyor wheel **134**, this shaft **212** also having another drive sprocket wheel **214** which is operative to transmit a like intermittent indexing drive to the can conveyor mechanism **32** as will be explained. A vertically positioned shaft **216** extends from the drive transmission **211** and transmits continuous rotary motion to a drive transmission **218** positioned on the frame **66** immediately above the drive transmission **211**.

The shaft **216** has a sprocket wheel **219**; and, a gear box **220** is positioned at the front center of the machine, forward of the packaging conveyor **14**.

The gear box **220** has an upright input sprocket **221** which receives continuous drive from the sprocket wheel **219** via an endless sprocket chain **222**. This gear box **220** has two forwardly extending output drive sprockets **223**, **223'** which transmit continuous rotary drive to the opposed drive rods **190** via endless sprocket chains **224**, **224'**. These chains **224**, **224'** are also trained about aligned sprocket wheels **225**, **225'** on the rods **190**, **190'**, respectively.

By this arrangement, it will be appreciated that a continuous rotary drive is imparted to the rods **190**, to thereby operate the cams **192** on both sides of the conveyor **14**.

The gear box **220** also has a rearwardly extending output sprocket wheel **226** which transmits continuous rotary motion to other parts of the machine, as will now be discussed.

Positioned longitudinally along the inner side of the dough packaging conveyor is a drive shaft **227** (FIGURE 19). This drive shaft **227** receives continuous rotary drive from the sprocket wheel **226** via an aligned sprocket wheel **228**, and an endless sprocket chain **229** trained therearound. The shaft **227**, of course, is journalled in the frame **66** via spaced apart bearings **230**. The rear-

ward end of the shaft **227** drives a transmission **231** having right-angled opposed output shafts **232**, **233**. The shaft **232** extends laterally beyond the side of the machine and carries a sprocket wheel **234**. This sprocket wheel **234** is aligned for driving the cutter knife assembly via the sprocket wheel **72** and an endless chain **235**.

The inwardly extending shaft **233** carries a sprocket wheel **236**. A forwardly extending endless chain **237** is trained about this wheel **236** and serves to provide a continuous rotary drive to the can conveyor mechanism **32**, as will be explained.

The transmission **218** has a rearwardly extending output shaft **238** likewise transmitting a continuous rotary drive. Suitable self-aligning couplings **239** are provided as necessary in the shafts **216** and **238**.

The dough feed conveyor is separately driven by gear **44** from the drive motor **51**.

The dough blank forming station

Reference is now made to FIGURES 8 and 12. The frame **66** of the dough packaging conveyor **14** carries a transversely extending horizontal drive shaft **240** journalled for rotation about its axis by any suitable means (not shown). This shaft carries a bevel gear **242** to thereby receive rotary drive from the shaft **238** by an aligned bevel gear **224** carried by the rearward end of this shaft **238**. Each end of this drive shaft **240** carries two cams **246**, **248** which are of identical configuration to be explained, but angularly offset from one another.

Positioned in transversely extending, longitudinally spaced relationship below the drive shaft **240** are two stationary shafts **250**, **252** joined to the frame **66** at its opposite ends, these shafts carrying opposed identical bell cranks **254**, **256**, respectively. These bell cranks have arms **258**, **260** extending upwardly towards the cams **246** and **248**, and constitute cam followers, one for the cam **246** and the other for the cam **248**. In view of the fact that bell cranks extend towards one another, the like angular offset relationship of the cams **246**, **248** allows an identical motion to be transmitted to the bell cranks **254**, **256** as the shaft **240** is rotated.

The bell crank **254** has a forwardly extending link **262** while the bell crank **256** has a rearwardly extending link **264**. The frame **66** carries in alignment with these links **262** and **264** vertically movable front and rear rods **266**, and **268** which are journalled in the frame **66** at their lower ends by bushings **270** to thereby allow the rods to slide vertically upward and downward. The upper extent of the front rod **266** is connected at the forward end of the link **262** by a pivot joint **272**; in a like manner, the rear rod **268** is connected to the rearwardly extending link **264** by a similar pivot joint **274** so that the oscillation of the bell cranks **254** and **256** operates to transmit the oscillation to a simultaneous vertical reciprocation of the rods **266** and **268**.

The cam follower arms **258** and **260** are biased against the respective cams **246** and **248** via a tension spring **276** pinned at its upper end to the link where the lower end is connected to the rod via an adjustable collar **280**. Thus, the rods **266**, **268** move in unison as the bell cranks faithfully follow an oscillating path determined by the configuration of the cams **246**, **248**.

The lower ends of these rods **266**, **268** carry a longitudinally extending bar **282** which is adapted to carry six sets of forming station plungers or pistons **284**, **286**, **288**, **290**, **292** and **294**, respectively. These pistons **284–294** are in rows across the die-cup rows **22** and aligned with the die cups **154** so as to be movable in and out of the die cups **154** which will be indexed therebelow. Also, the bottom surface of these pistons **284–294** are of progressively increasing height from the forwardmost row **284** rearwardly so that upon a downward stroke, the row of pistons **284** moves in the die cups further than the opposite row of pistons **294**. This allows a consecutive sequence of dough working as the die-cup rows **22** are consecutively indexed under each row of pistons and advantageously works the dough to form the same into a circular disk from the original rectangular shape obtained when the dough strip was cut by the cutter knife assembly **20**. Otherwise, these pistons are of the same construction and a detailed discussion of one piston sufficies to describe the construction of all of these pistons.

Referring to FIGURE 12, the bar **282** carries a bolt **296** which in turn carries a transversely extending bar **298**, fixed along the bolt by lock nuts **300** above and below the bar **298**. By this arrangement, it will be evident that the bar **298** can be vertically adjusted in order to provide variable spacing of the pistons in the manner just described. Each transverse bar **298** has a series of vertical apertures **302** which are precisely aligned with the vertical axis of each die cup **154** to be indexed precisely therebelow. Carried in each of these vertical apertures **302** is a piston rod **304** threaded at its upper end and carrying a retaining bolt **306** to limit its downward movement. The upper part of the bar **298** carries a cover plate **308** for purposes of sanitation and to limit the upward movement of the rod **304**. The rod **304** carries a compression spring **310** below the transverse bar **298** and is retained in place by a collar **312** at the lower end of the rod **304**. This spring is conveniently covered by a flexible boot **314** for sanitation purposes, and the bottom end of this rod carries a molded piston **316** of Teflon or the like of a size to move in the die cup **154** each rod of which is consecutively indexed below the piston **316**. By this arrangement, one piston is positioned in alignment above each die cup **154** in each row **22**. For example, as ten die cups are positioned across each row, ten pistons likewise will be carried by each transverse bar **298** and these bars **298** are connected to the opposite side of the frame **66** in an identical manner.

The spring loading of each piston **316** allows the piston to yield in response to any binding which might occur, for example, due to mechanical failure or improper alignment of the die cups **154** therebelow. Likewise, this prevents excessive downward force on the dough blank carried in the die cup beyond what is necessary and sufficient for forming of the blank into a disk shape.

The dough blank charging station

Referring now to FIGURES 8 and 16, the frame **66** carries a transverse shaft **320** forward and above the drive shaft **240**; a drive shaft **322** is journalled for rotation in the frame **66** forward and below the transverse shaft **320** in axially parallel relationship. This shaft **322** receives drive from the rearwardly extending shaft **238** via a bevel gear drive **324**. The drive shaft **322** carries therealong spaced apart cams **326** which cooperate with cam follower links **328** pivotally joined at their one end via bosses **330** to the transverse shaft **320**. The other end **332** abuts the underside of a collar **334** carried by the upper end of a piston rod **336**. This piston rod **336** is mounted for vertical reciprocation in the frame **66** by an upper bushing **338**. Carried about the piston rod **336** beneath the bushing **338** is a compression spring **340**, the bottom end of the compression spring **340** being retained by collar **342** on the rod **336**. The lower end of the piston rod **336** is carried in a sleeve collar **344** having upper and lower bushings **346**, **348**, the lower bushing **348** likewise being carried by the lower part of frame **66**. The bushing **346**, however, is slidably mounted in the upper end of the sleeve collar **344** and a beveled-ring spring **350** is carried therein for shock absorbing purposes.

The bottom end of the piston rod **336** carries a plunger or piston **352** of Teflon or the like adapted to pass through the die cup **154** indexed therebelow carrying a formed biscuit blank. In this regard, it will be noted that the table **144** ends immediately before this charging station below these pistons **352** so as not to

interfere with the downward movement of the piston 352 therethrough.

According to an important feature of this invention, the compression spring 340 is adapted to be compressed as the cam rotates counter-clockwise in FIGURE 16, raising the piston rod 336 to its upper extent, and the cam 326 is so shaped as shown in FIGURE 16 to then release the compression spring 340. By virtue of compression developed in the spring 340, the piston 352 is rapidly accelerated in a downward direction at a velocity faster than gravity so that it passes through the die cups 154 and forces the dough blank into the can. By virtue of this substantial downward velocity of the piston 352 it will thereby be moving faster than the falling dough blank so that the botton face of the piston 352 will prevent undesirable tilting of the biscuit blank. By virtue of this arrangement in cooperation with a trap door assembly to be discussed, the undesirable tilting of the disk-shaped dough blank is prevented in a highly reliable manner. Commercially acceptable stacking of the biscuit blanks in the cans which are indexed immediately below this row of pistions 352 in the charging station, is thereby obtained.

Now to be discussed is a trap door arrangement 358 positioned at the forward end of the table surface 144 which cooperates with the charging station pistons 352 to insure an accurate deposit of the biscuit blank. Referring to FIGURES 8, 16, and 17, the opposite ends of the shaft 320 (outside of the cam follower links 328) carry cam links 360 which have follower rollers 362 intermediate their length. The drive shaft 322 carries opposed aligned cams 364 and the forward end of the links 360 are pivotally connected to a vertically movable operating rod 366 via a link plate 368. The operating rod 366 is mounted in upper and lower bushings 370, 372 for vertical movement, and a compression spring 374 is confined by a collar 376 below the upper bushing 370. The lower end of the rod 366 carries a connecting plate 378 having depending links 380, 382 (FIGURE 17) pivotally connected thereto, the lower end of these links 380, 382 being pivotally connected to opposed trap doors 384, 386 which are of a bell crank construction as viewed from the ends. There are provided stationary mounting shafts 388, 390 for the respective trap doors. In order not to obstruct the movement of the die cup rows 22, these mounting shafts 388, 390 are short stub shafts fiixed at the opposed sides of frame 66.

The trap doors have top surfaces 392, 394, respectively, which coincide with the end of table surface 144 when in their upper closed position, as shown in FIGURE 8, so that the die-cup rows 22 can be indexed onto this top surface immmediately below the charging-station pistons 352.

Rotation of the two opposed cams 364 forces the operating rods 366 downwardly, thereby pivoting the trap doors 384, 386 away from one another. This movement is in timed relationship with the downward movement of the charging-station pistons 352 (as they are all operated off the dirve shaft 322) so that as the piston 352 is moving through the die cup 154, the supporting surface of the biscuit blank is symmetrically removed upon downward pivotal movement of the trap doors 384, 386 away from one another. This arrangement in cooperation with the faster-than-gravity movement of the piston 352 prevents tilting of the blank due to the fact the supporting surface is not removed from one side of the blank as would cause a tilting, due to the unsymmetrical removal of the supporting surface for the blank.

It has been found that the pistons 352 need only move downwardly to the final position to a point slightly above the top of the can, and the high velocity imparted to this dough blank is sufficient to prevent tilting. Moreover, the charging-station pistons 352 need not be staggered from one side of the conveyor 214 to the other but all may move downwardly to the same general elevation.

For reasons to become evident, these trap doors 348, 386 are hollow from one end to the other. These trap doors 384, 386 are used in conjunction with the oiling mechanism as will now be discussed.

The oil mechanism at the charging station

It has been found desirable to provide an arrangement for oiling the top surface of each dough blank after it is deposited in the can indexed below the charging station 28 so that the blanks will not stick together when removed from the can by the consumer. As previously stated in general terms, the unformed blanks were powdered as they were carried beneath the conventional vibrating powdering station 24 and the oiling mechanism 34 is adapted to squirt a mist spray into the can after the blank is deposited therein at the charging station. To this end, the underside of the trap doors 384, which as stated are also manifolds, have nozzles 400 joined thereto and oriented to transmit a mist spray into each can immediately after the trap doors 384, 386 move back up to a horizontal table position. One end of each trap door 384, 386 has connected thereto flexible hose pressure lines 402, 404, respectively, and the other ends of these hose lines are connected to mist generators 406, 407, respectively.

Each mist generator is of conventional construction, for example, a Bijur Model ZAA Solenoid-Actuated Mist Lubricator manufactured by the Bijur Lubricating Corporation. Referring to FIGURE 20, a compressed air line A is connected to the inlet of each mist generator; each air line has a solenoid valve V1, an air filter F, and a pressure regulating valve V2. In order to provide timed impulses of compressed air for injection into each mist generator 406, 407, the one drive rod 190 carries two cams 408, 408'. Suitable microswitches 409, 409' are mounted for engagement with the cams 408, 408' as the cams rotate through a selected portion of 360°. Thus, the microswitches 409, 409' are adapted to close during a portion of each cycle. Each microswitch 409, 409' is connected in an appropriate circuit to one of the solenoid valves V1 to thereby actuate the latter in cyclical fashion. Impulses of compressed air are thus injected into the mist generators 406, 407 to thereby atomize the oil and pulse the same out through the hose lines 402 and 404, during the appropriate portion of each cycle.

The can conveyor mechanism

As previously pointed out, the cans are indexed in a row immediately beneath the charging station 28 where dough blanks are consecutively deposited in the cans. FIGURE 14 shows a one-half plan view of a symmetrical conveying mechanism. This view shows the input of the cans while the identical opposite side (not shown) takes the cans away after they are filled.

As shown in FIGURES 13 and 14, a transverse sprocket chain drive 420 is trained about sprocket wheels 422 mounted on vertical shafts 424. Links of the chain 420 carry angle plates 426 which are spaced apart from one another according to the can diameter, so that one can is received between adjacent angle plates 426. The sprocket wheel 214 which takes an intermittent drive from the intermittent drive transmission 211 transmits an intermittent drive to the vertical shaft 424 via an aligned sprocket wheel 428, a chain 430 interconnecting the two sprocket wheels, and a gear box 432 having as its output the vertical shaft 424.

Cans are fed up to the angle plates 426 by a narrow can conveyor 434 and driven by a continuous drive off the shaft 188 as will be explained. Guide rails 436 keep the cans in an upright position and have a transverse path 438 immediately adjacent the chain drive 420 to carefully guide the cans transversely of the conveyor 14 beneath the charging station 28.

In order to prevent clogging of the cans upon delivery of the cans from the continuously operated narrow conveyor 434 to the intermittently operated chain drive 420, there is provided a vertically pivoted, spring biased gate 440 which moves back and forth across the path of the narrow conveyor 434 at its end in cooperation with the chain drive 420 to allow one can to move between adjacent angle plates 426. This gate 440 is pivoted intermediate its ends about a vertical shaft 442, while the opposite end carries a cam follower 446.

A horizontal, transversely extending shaft 447 is adapted for continuous rotary drive. To this end, the inner end of the shaft 447 carries a sprocket wheel 448 which is aligned to receive the endless chain 237 in driving engagement, as best shown in FIGURE 19. The outside end of this shaft 447 carries a cup-shaped cam gear 451 which coacts with the cam follower 446 to cause the gate 440 to pivot back and forth across the path of the conveyor 434. This shaft 447 also has a sprocket gear 452 which is alinged with a sprocket wheel 454 on the rearward end of the forwardly extending narrow can conveyor 434 so that a drive is transmitted to the conveyor 434 via a sprocket chain 456. The follower, 446, of course, is biased against the cam surface of the cup-shaped cam 450 via any suitable means such as a spring. The shaft 447 at its opposite end carries another cam plate 458 (FIGURE 15). A bracket plate 460 adjacent the cam plate 458 carries a bell crank 462, one arm 464 being so aligned with the cam plate 458 while the other arm is connected to a guide bracket 466 horizontally movable towards and away from the drive chain 420. This guide bracket 466 also carries another bell crank link 469, which is pivotally connected to the guide bracket 466 and bracket plate 460 for stabilizing purposes, acting like a parallel linkage. The guide bracket 466 takes the shape of a web plate 470 having spaced apart upper and lower fork teeth 472, 474, which also are spaced relative to one another to engage a can therebetween when oscillated towards the chain drive. These teeth 472, 474 precisely align each can in axial relationship with the axis of each die cup 154 which has been positioned thereabove at the charging station 28. An identical bracket and link arrangement (not shown) is carried by the opposed side of the conveyor mechanism and transverse rods 476 connecting these links together.

The opposite side of the can conveyor (not shown) is identical with the construction here disclosed. However, it is not necessary to provide a gate and the narrow can conveyor would operate in the opposite direction to take the filled cans away.

Description of operation of the machine.

A dough sheet is fed unto the dough-feed conveyor 12 where it is flattened and sized by any suitable means (not shown). The dough sheet moves beneath the cutter assembly 16 where the cutter disks 48 cut the dough sheet into longitudinally extending transverse dough strips according to the number of biscuits that will ultimately be deposited in each can. After the dough strips are so cut, they move past a spreader assembly 18 where the rods 52, driven by the prime mover 62, serve to spread the dough strips apart from one another and otherwise align the dough strips in tranversely spaced relationship. As these spread-apart dough strips move to the end of the dough feed conveyor 12 adjacent the drive roll 38 (FIGURE 7) where a cutter knife assembly 20 (FIGURES 4–7) operates to cut unformed dough blanks from the ends of the strips, this cutter knife assembly operates in timed relationship to deposit these cut unformed blanks into die cups 154 carried in rows therebelow. The dough-packaging conveyor 14, which carries these die-cup rows 22 indexes the rows from the position below the cutter knife assembly 20 to a forming station 26.

The forming piston rows 284–294 are driven off the angularly offset cams 246, 248 on opposite sides of the dough-packaging conveyor 14 so that these pistons move on a downward stroke into the die cups 154 and work on the dough. This action forms the dough blank in each die cup 154 into a disk shape as each die-cup row 22 is indexed consecutively beneath each row of forming station pistons. The forming station piston rows progressively enter into the die cups 154 a greater distance so that there is a consecutive working of the dough to a greater degree.

In order to align each die-cup row 22 in a precise longitudinal position, the cam follower rollers 182 on the opposite ends of each die-cup row 22 engage a cooperative rotating cam 192 during a portion of their cam cycle after indexing, so that precise alignment is effected by the major diameter 196 of the cam 192 passing between the rollers 182.

After the dough biscuit blanks are so formed, the die-cup rows 22 are indexed to a charging station 28 where a row of pistons 352 are constructed and arranged to move on a downward stroke faster than gravity to force the dough blank downwardly out of each die cup 154. In cooperation with this faster-than-gravity movement of the charging station pistons, a trap door assembly 358 is positioned immediately below the charging station pistons and at the end of a table 144 along the upper flight of the dough-packaging conveyor 14. The trap door assembly 358 includes opposed trap doors 384, 386, which pivot downwardly away from one another to thereby symmetrically remove the supporting surface of the dough biscuit blank and otherwise prevent tilting thereof.

These blanks are then discharged into cans indexed beneath the charging station by a conveyor mechanism 32. This conveyor mechanism 32 indexes the cans to consecutive positions along the charging station by an intermittently driven drive chain 420, and precise alignment of the cans beneath each charging station piston is obtained by an oscillating guide bracket 466 with teeth 472, 474 serving this desirable end. A pivoted, cam operated gate 440 lets one can pass into the can conveyor path defined by the guide rails 436 as the cans are fed to this path from the can conveyor 434.

During the charging cycle mist generators 406, 407 are constructed and arranged to inject a mist of vegetable oil or the like into the can as each cycle is completed, this action being effected by a manifold construction of the trap doors 384, 386 which connect with the mist generators 406 and 407 via hose lines 402 and 404, respectively, to discharge the pulsed mist spray into the cans in cyclical fashion (see FIGURE 20).

Continuous rotary drive from the shaft 216 is transmitted to the drive rods 190 alongside the packaging conveyor 14 via sprocket wheels 219, 221 and chain 222, providing an input to the transmission 220. Output sprocket wheels 223, 223′ drive the sprocket wheels 225, 225′ on the drive rods 190, 190′ via chains 224, 224′, respectively. Another output sprocket wheel 220 on the transmission 220 drives a rearwardly extending shaft 227 (FIGURE 19). The output of this shaft 227 transmits drive to the cutter knife assembly 20 via the shaft 232, the sprocket wheel 234, chain 235 and the sprocket wheel 72. Drive to the can conveyor aligning mechanism is received via the output shaft 233, sprocket wheel 236, chain 237 and another sprocket wheel 448 (FIGURES 14 and 19).

The forming station 26 and the charging station 28 operate in a continuous cycle off shaft 238 (FIGURE 8) which is drivingly connected to the shaft 216.

Intermittent drive for indexing the dough packaging conveyor 14 forward along its upper flight is received from shaft 212; and the cans conveyor mechanism 32 receives intermittent drive also from shaft 212 (FIGURE 13).

Preferably, the dough-feed conveyor is powered by a separate conventional prime mover means 51 which engages the gear 44.

What is claimed is:

1. A dough-biscuit packaging machine comprising: endless conveyor means having an upper flight and a lower flight and including transverse rows of die cups extending along said conveyor means; a forming station and a charging station successively spaced along the upper flight of said conveyor means; means for indexing cams across said charging station below said upper flight; means for indexing said conveyor means in cooperative relationship with said can indexing means; means for depositing dough blanks into the rows of die cups before said forming station; a battery of pistons at said forming station operative to form said dough blanks in said die cups into the shape of a biscuit; and a battery of pistons at said charging station, and means to move said last mentioned pistons in a downward stroke at a velocity faster than gravity to accelerate the formed dough blanks carried thereby into the cans indexed therebelow and prevent tilting of the blanks as they are deposited in the cans.

2. Machine defined in claim 1 wherein said charging station includes a trap-door assembly comprising opposed transversely extending plates pivotally mounted at their opposed ends for downward movement away from one another; means for indexing each successive row of die cups to a position symmetric to the adjacent edges of said trap-door plates when said plates are pivoted upwardly adjacent one another to define a generally horizontal surface, whereby downward movement of said plates prevents unbalanced force on the dough blanks positioned thereover by the rows of die cups.

3. Apparatus defined in claim 1 wherein said forming-station pistons include a plurality of longitudinally spaced, transversely extending rows of pistons, the row of pistons furthest from said charging station having a downward stroke towards said die cups less than the row of pistons nearest said charging station.

4. Machine defined in claim 1 including manifold means extending across said charging station with outlets oriented at openings of said cans indexed therebelow; and an oil mist generator to inject oil into the cans via said manifold.

5. Machine defined in claim 2 wherein said trap-door plates have longitudinal passages to define a manifold with outlets oriented to the position of the cans indexed therebelow; and means for generating an oil mist and intermittently pulsating a quantum of oil mist into said cans via said trap-door manifolds.

6. Machine defined in claim 1 including spring means carried by said charging station pistons and means for actuating said spring means to accelerate said charging-station pistons to said velocity.

7. Machine defined in claim 1 wherein said charging station pistons have a downward stroke terminating short of the top of the cans indexed therebelow.

8. Machine defined in claim 1 including means for longitudinally aligning said rows of die cups below said forming-station pistons.

9. Machine defined in claim 8 wherein said longitudinal aligning means includes drive-rod means positioned along said conveyor means; aligning cams positioned along said drive rods according to the longitudinal indexing positions of said die-cup rows; follower means carried by said die-cup rows cooperative with said aligning cams to align said rows, said cams having a major diameter engageable with said follower means and a minor diameter not engageable with said follower means whereby said die-cup rows can be indexed as the minor diameter of said cams rotate past said follower means, and the major diameter of said cams then engages said follower means to effect precise longitudinal alignment of said die-up rows.

10. Machine defined in claim 9 wherein said drive-rod means includes opposed drive rods carried adjacent the upper flight of said conveyor means, said follower means being carried by each end of said die-cup rows.

11. Machine defined in claim 1 wherein said dough-blank depositing means includes means for conveying spaced apart dough strips to said conveyor flight upstream of said forming station in alignment with die cups in each of said rows, and a cutter knife assembly operative in timed relationship with said conveying means to slit said dough strips to thereby deposit the latter into the row of die-cups indexed therebelow.

12. Machine defined in claim 11 wherein said cutter knife assembly includes a first rotatably driven crank having first shaft means extending therefrom in spaced relationship to the axis of rotation; a second oscillating crank positioned below said first crank and including second shaft means in spaced relationship to the axis of oscillation; a cutter frame extending across said conveyor means and joined at its one end to said first and second shaft means, and cutter blade means carried by said cutter frame in cutting alignment with said dough strips.

13. Machine defined in claim 12 including opposed first and second crank means having a first rotatable shaft means and a second oscillatable shaft means, respectively; the opposite end of said cutter frame also being operatively joined to said last-mentioned first and second shaft means.

14. Machine defined in claim 12 wherein said cutter blade means is mounted for yieldable movement in a direction opposite to the direction of cutting.

15. Machine defined in claim 12 wherein said cutter blade means is mounted to effect a downward pushing movement of the cut dough strip.

16. Machine defined in claim 1 including means providing a symmetrically removable supporting surface for biscuit blanks carried by said die-cup rows at said charging station operative in timed relationship with the downward stroke of said charging-station pistons.

17. Machine defined in claim 1 wherein said can conveyor means includes can guide means defining a path below said charging station; endless drive means for engaging cans and indexing cans below successive charging station pistons; and means movable into and out of said path to position said cans precisely beneath said charging station pistons.

18. Machine defined in claim 17 including a continuously movable second can conveyor aligned with said path for feeding cans thereto, and gate means movable into and out of said path adjacent the end of said second can conveyor to prevent binding of the cans as they move from said second can conveyor into engagement by said endless drive means.

19. Machine defined in claim 10 including means resiliently joining said die-cup rows to said conveyor means to enhance coaction of said follower means with said cams.

20. Machine defined in claim 19 wherein said can conveyor means include endless sprocket chains, and said resilient mounting means receives extended pin ends of said chains.

21. A biscuit packaging machine comprising endless conveyor means carrying transverse rows of die cups; means for forming a dough biscuit blank in consecutive rows of die-cups; a charging station positioned along said conveyor means for forcing biscuit blanks downwardly out of said die cups, said charging station including pistons movable downwardly through said die cups, and means providing a symmetrically removable supporting surface for biscuit blanks carried by said row of die cups operative in timed relationship with the downward stroke of said charging station pistons.

22. A biscuit packaging machine comprising endless conveyor means; transverse members carried across said endless conveyor means in consecutive relationship; die cups carried in said transverse members; guide means positioned along the sides of said conveyor means and defining the path of travel thereof; means connecting said

transverse members to said guide means for sliding movement therealong; cam follower means carried by the ends of said transverse members; opposed guide rods positioned for rotation along the upper flight of said conveyor means; cam means carried by said rods selectively movable into engagement with said follower means to accurately position said transverse members in longitudinal positions along the upper flight of said conveyor means; and biscuit blank forming and charging stations positioned along the upper flight of said conveyor means.

23. A dough biscuit packaging machine comprising: endless conveyor means having an upper flight and a lower flight and including transverse rows of die cups extending along said conveyor means for communicating with both sides thereof; forming station and charging station successively spaced along the upper part of said conveyor means; said forming station including a plurality of longitudinally spaced transverse rows of pistons; retaining bar means joining said pistons for movement as a group providing a stroke into said die cups to form a dough blank and thence outwardly from said die cups to allow said conveyor to be indexed therepast; spaced apart rods joined to said retaining bar and vertically movable therewith; spaced apart bell cranks, each bell crank having a link operatively connected to one of said vertically movable rods; shaft means carrying cams of similar configuration but angularly offset from one another, said bell cranks having opposed links constituting cam followers, one for each cam; means biasing said cam follower links against said cams, said cams operative to transmit a cyclical stroke to said forming-station pistons via said rods and retaining bars, said rows of forming-station pistons having successively reduced minimum space between the bottom of said die cups during said downward stroke to thereby successively work the dough blanks into the shape of a biscuit as said rows of die cups are successively indexed past the consecutive rows of forming-station plungers, and a table surface means positioned along said upper flight below said forming station for supporting said die-cup rows during movement therealong.

24. A dough-biscuit packaging machine comprising: endless conveyor means having an upper flight and a lower flight and including transverse rows of die cups extending along said conveyor means and communicating with both sides thereof; a forming station and a charging station successively spaced along the upper flight of said conveyor means; means for indexing cans across said charging station below said upper flight; means for indexing said conveyor means in cooperative relationship with said can indexing means; means for depositing dough blanks into the rows of die cups before said forming station, said last-mentioned means including means for conveying spaced apart dough strips to said conveyor flight upstream of said forming station in alignment with die cups in each of said rows, and a cutter knife assembly operative in timed relationship with said conveying means, to slit said dough strips to thereby deposit the latter into the row of die-cups indexed therebelow, said cutter knife assembly including a first rotatably driven crank having first shaft means extending therefrom in spaced relationship to the axis of rotation; a second oscillating crank positioned below said first crank and including second shaft means in spaced relationship to the axis of oscillation; a cutter frame extending across said conveyor means and joined at its one end to said first and second shaft means, cutter blade means carried by said cutter frame in cutting alignment with said dough strips.

25. Machine defined in claim 24 including opposed first and second crank means having a first rotatable shaft means and a second oscillatable shaft means, respectively; the opposite end of said cutter frame also being operatively joined to said last-mentioned first and second shaft means.

26. Machine defined in claim 24 wherein said cutter blade means is mounted to yieldable movement in a direction opposite to the direction of cutting.

27. Machine defined in claim 24 wherein said cutter blade means is mounted to effect a downward pushing movement of the cut dough strip with the underside thereof.

28. A dough-biscuit packaging machine comprising: endless conveyor means having an upper flight and a lower flight and including transverse rows of die cups extending along said conveyor means and communicating with both sides thereof; a forming station and a charging station successively spaced along the upper flight of said conveyor means; means for indexing cans across said charging station below said upper flight; means for indexing said conveyor means in cooperative relationship with said can indexing means; means for depositing dough blanks into the rows of die cups before said forming station; and means operative at said charging station for injecting into cans therebelow a lubricating mist spray.

29. Machine defined in claim 28 wherein said last-mentioned means includes a mist generator; manifold means along said charging station in communication with said mist generator and including nozzle means operative in timed relationship with said indexing means for injecting the spray into the cans.

No references cited.

GRANVILLE Y. CUSTER, JR., *Primary Examiner.*