Aug. 24, 1965 J. K. CAMERON ETAL 3,202,114

METHOD AND APPARATUS FOR THE PRODUCTION OF CRUMB SHELLS

Filed Dec. 4, 1962 6 Sheets-Sheet 1

FIG. 1

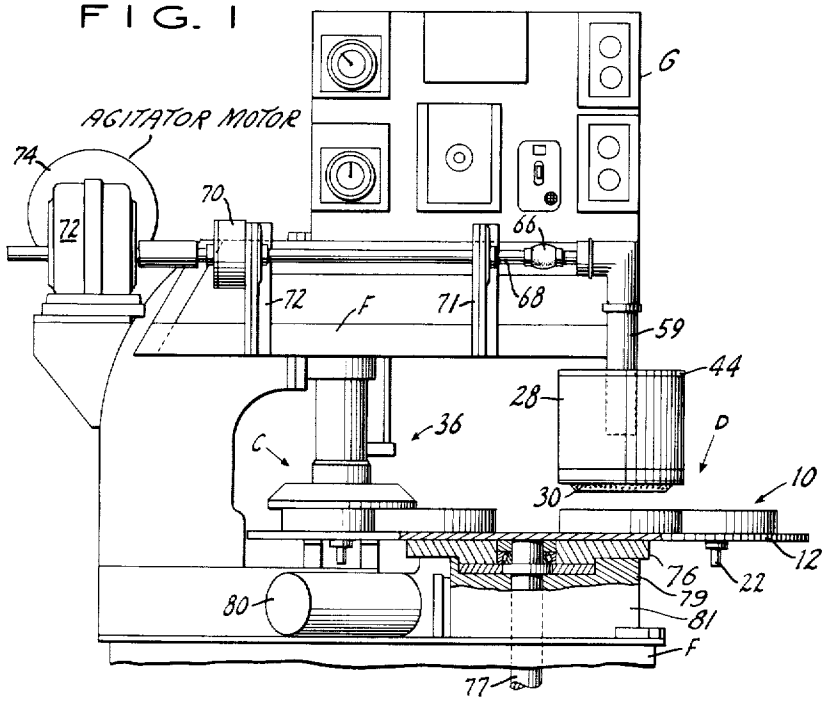
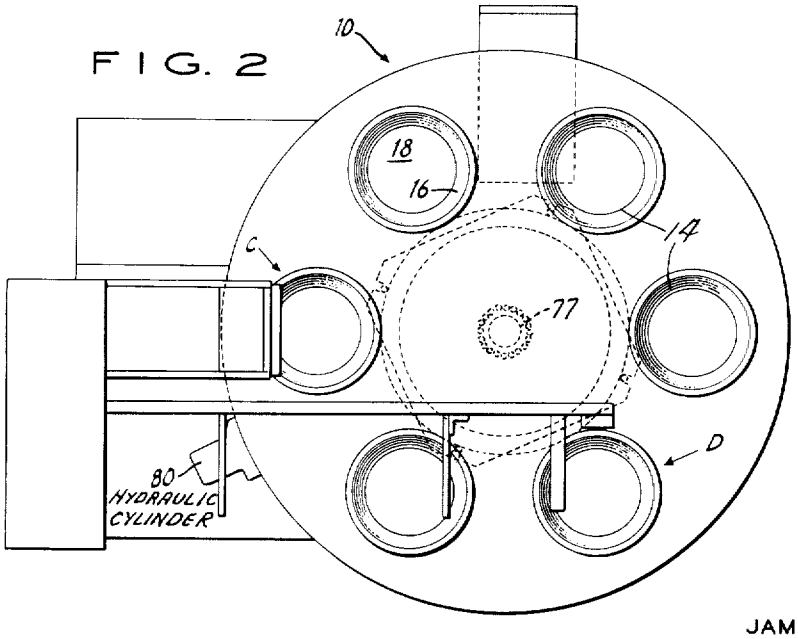


FIG. 2



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METHOD AND APPARATUS FOR THE PRODUCTION OF CRUMB SHELLS

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FIG. 3

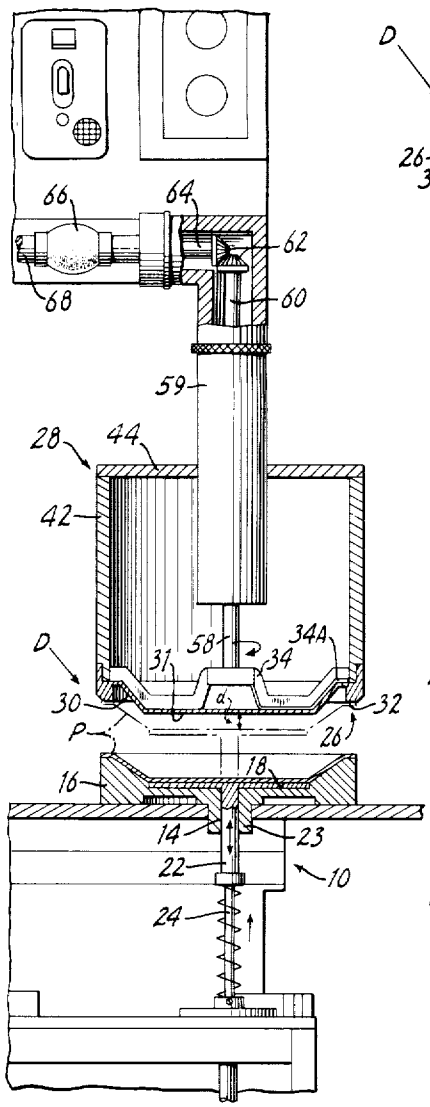


FIG. 4

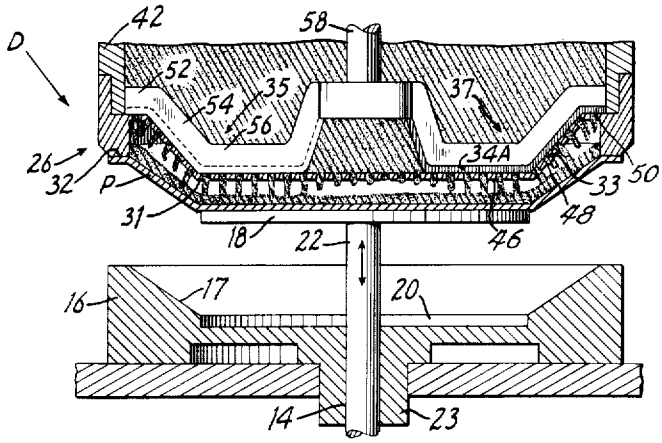


FIG. 5

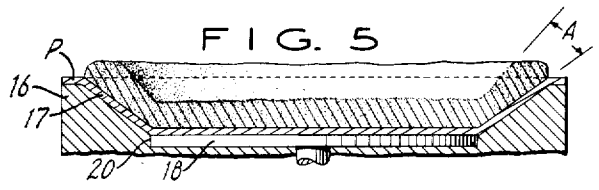


FIG. 6

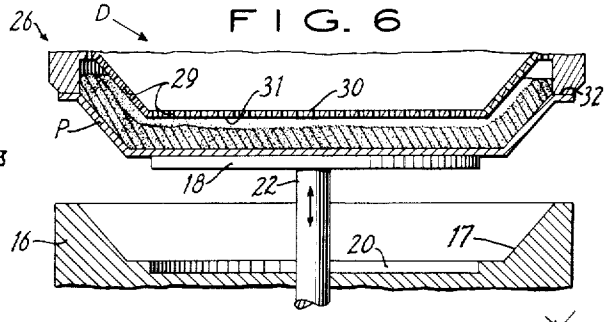


FIG. 7

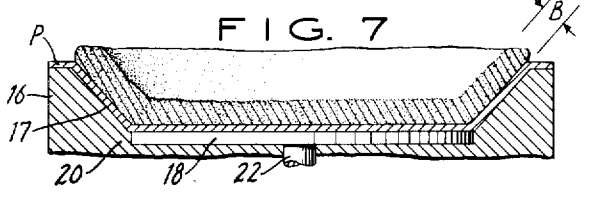


FIG. 9

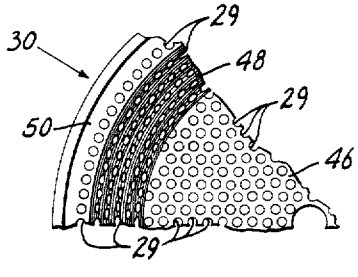
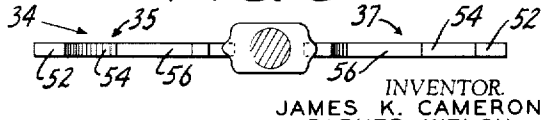


FIG. 8



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METHOD AND APPARATUS FOR THE PRODUCTION OF CRUMB SHELLS

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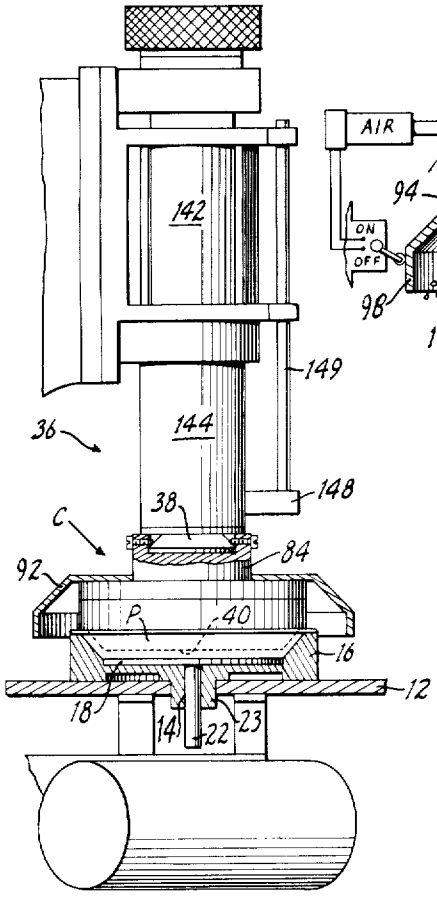


FIG. 10

FIG. 11

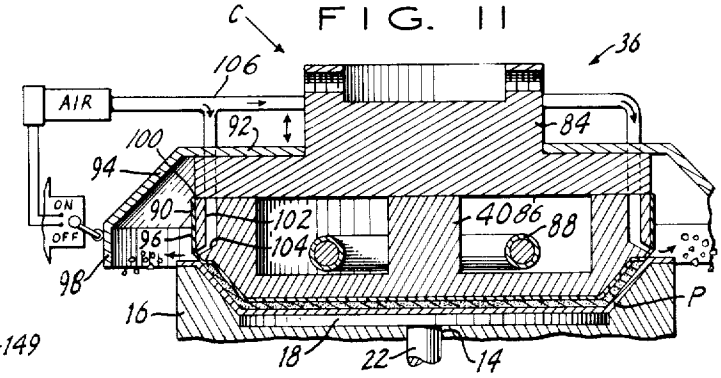


FIG. 12



FIG. 13

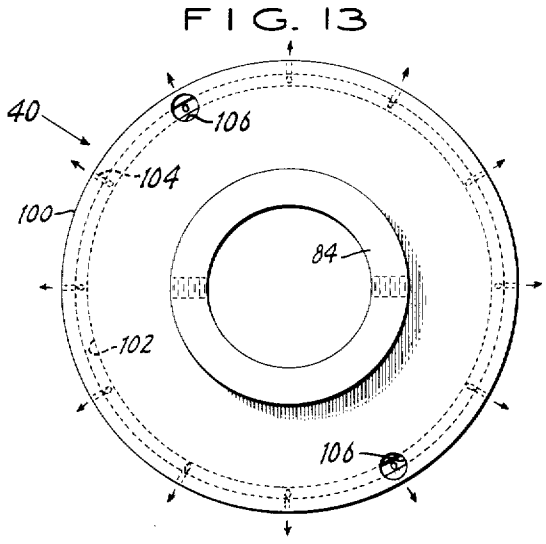
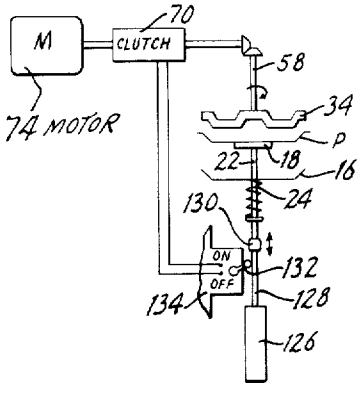


FIG. 14



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METHOD AND APPARATUS FOR THE PRODUCTION OF CRUMB SHELLS

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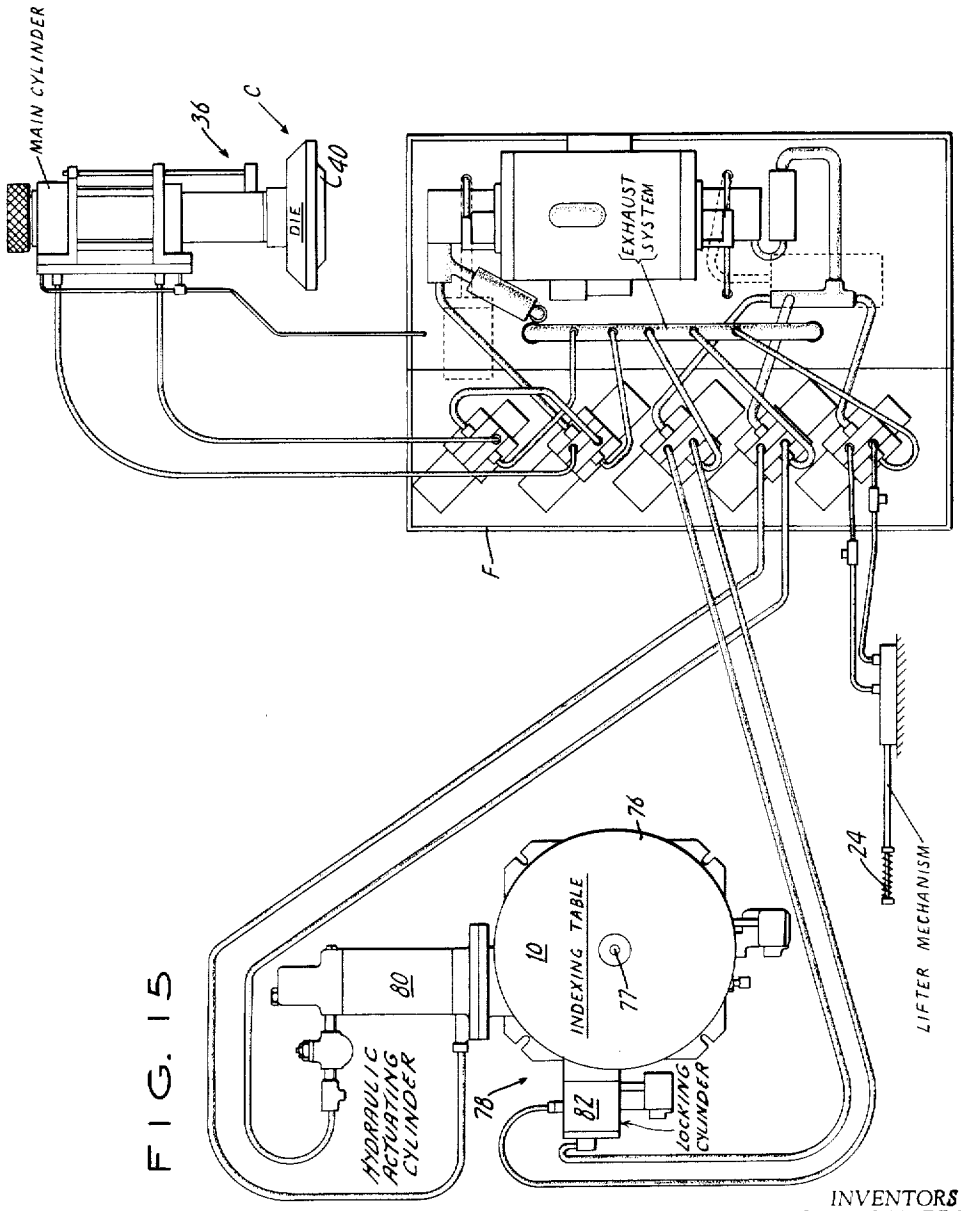


FIG. 15

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METHOD AND APPARATUS FOR THE PRODUCTION OF CRUMB SHELLS

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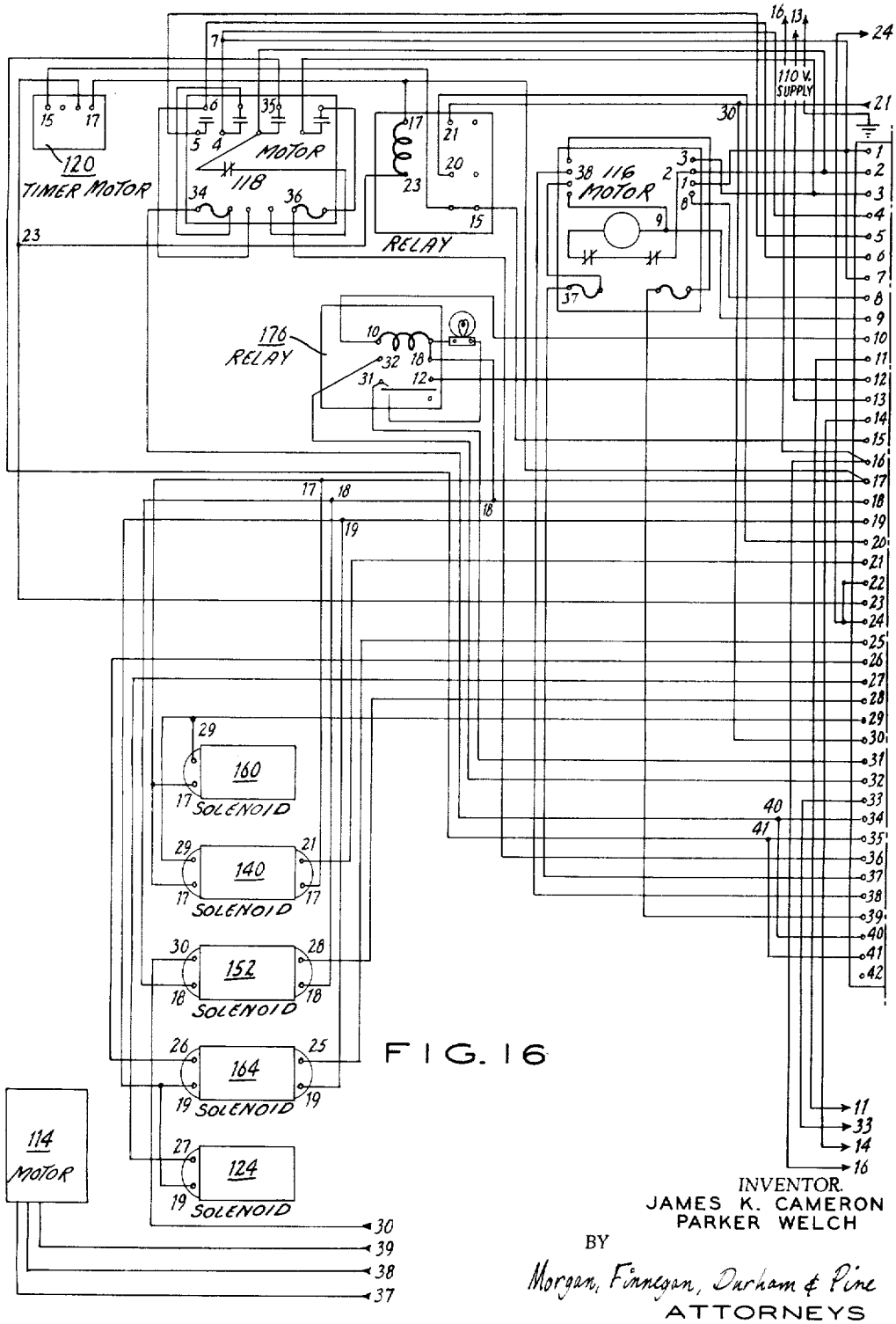


FIG. 16

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METHOD AND APPARATUS FOR THE PRODUCTION OF CRUMB SHELLS

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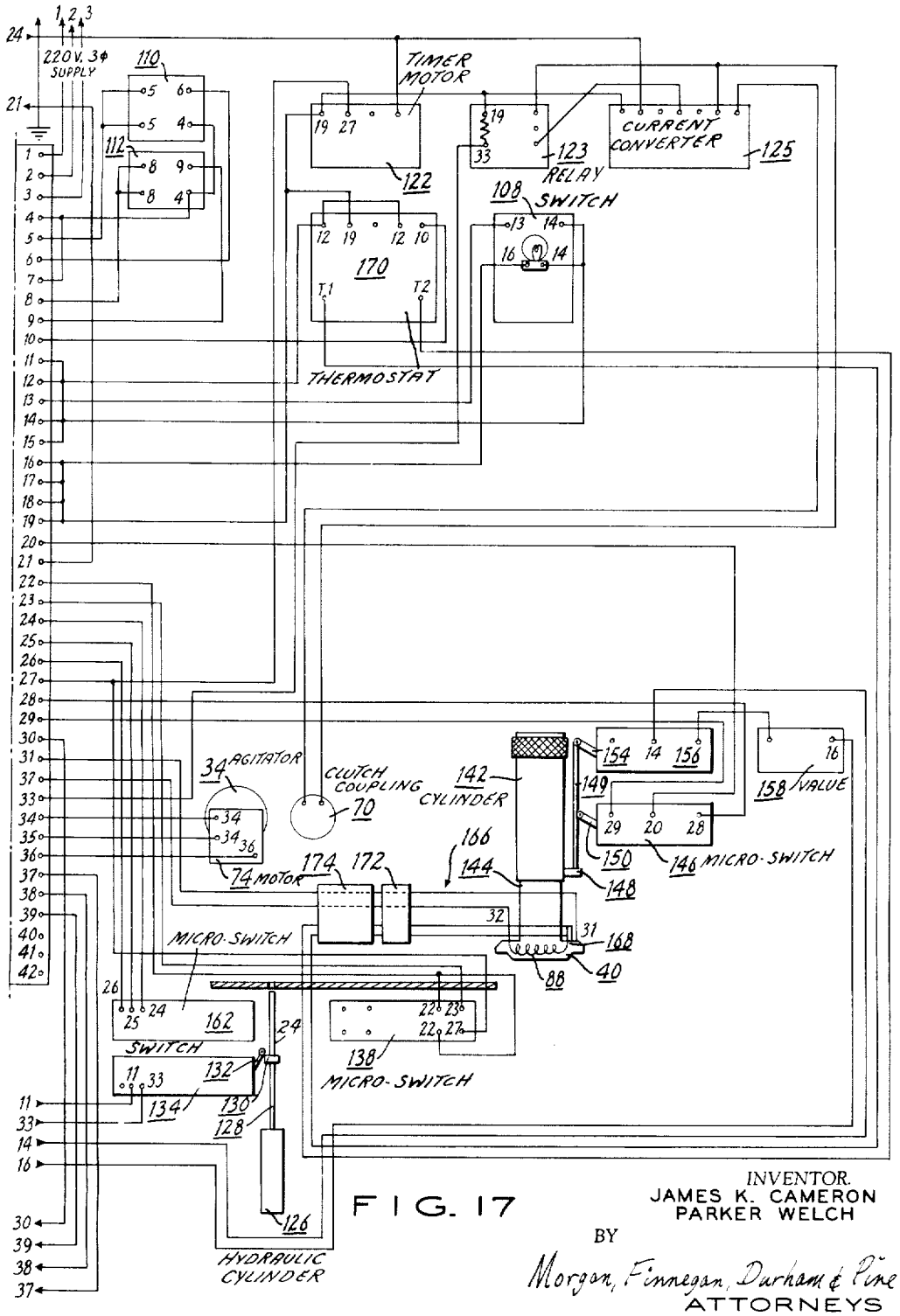


FIG. 17

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United States Patent Office 3,202,114
Patented Aug. 24, 1965

3,202,114

METHOD AND APPARATUS FOR THE PRODUCTION OF CRUMB SHELLS

James K. Cameron and Parker C. Welch, Charlottesville, Va., assignors to Continental Baking Company, Rye, N.Y., a corporation of Delaware

Filed Dec. 4, 1962, Ser. No. 242,306
25 Claims. (Cl. 107—54)

The present invention relates to a novel and improved method and apparatus for the production of baked goods, and, more particularly, to a novel method and apparatus for the production of a graham cracker pie crust.

Pies having graham cracker crust are becoming more popular with the general public, especially cream pies with a graham cracker crust. The significant feature of a good graham cracket crust is its crum-like texture. The problem, however, in connection with the commercial preparation of such graham cracker pie crusts, has been to produce a high quality crust which retains the crumbly texture of the graham crackers, but which is sufficiently knit together to withstand the successive handling and operations entailed in the mass production of pies.

Heretofore, commercial graham cracker pie crusts have been prepared by employing a flowable "wet" mix of graham, graham chacker crumbs shortening and water. The "wet" mix was plastic enough to be shaped into proper arrangement in the pie plate by conventional means. However, such a "wet" mix crust loses its crum-like quality and is a poor substitute for a good graham cracker pie crust.

Another method employed heretofore was the preparation of a dough-like mass of the type used for making the graham crackers themselves. This graham dough was sheeted or rolled thin and placed in its respective pie tins and then baked. The resultant crust, again, failed to have the crumb-like quality of a good graham cracker pie crust.

The present invention has for its object the preparation of a good, crumbly graham cracker pie crust, and is characterized by the preparation of a mixture of graham cracker crumbs and shortening in a relatively "dry" non-flowable mixture. The mixture is then distributed evenly in a predetermined amount over the bottom and side surfaces of an associated pie plate. The graham cracker mix thus disposed in an associated plate is subjected to a compression force which is operative to knit the graham cracker mix into a cohesive crust ready to withstand subsequent manufacturing operations.

To accomplish this object, the graham cracker mix is preferably placed in a supply hopper having a foraminous depositor grill at the bottom thereof, shaped in the general contour of a pie plate. A depositor blade, shaped for cooperative movement along the inner periphery of the depositor grill, is rotatably mounted in the hopper. With the pie plate disposed beneath the depositor grill and in spaced relation therewith, the depositor blade is rotated a predetermined number of revolutions to effect desposit of the required amount of graham cracker mix on the plate. The pie plate with graham mix thereon is withdrawn from deposit position adjacent the depositor grill in timed relationship with the rotation of the depositor blade, such that the plate moves away from the depositor grill just before the blade stops rotating. This ensures that no graham cracker mix will adhere to the bottom of the grill.

The finished crust should have a firmer texture at the top exposed edge of the crust than elsewhere to prevent damage to the crust at its edges during the manufacture of the finished pie. To accomplish this, the sides of the depositor grill are preferably slanted more steeply than the sides of the pie plate. This results in more graham cracker mix being deposited around the side edges of the plate than on the other portions thereof.

The pie plate, with the controlled amount of graham mix deposited thereon, is then subjected to a gentle compression force, preferably in a form of a hydraulic press. This compressive force completes the formation of the graham cracker pie crust by condensing the graham mix into the form of a pie crust. It will be understood that since more mix is disposed around the sides of the plate, when compressed, the sides and top portions of the crust will have the desired firmer texture.

In order to maintain a sufficient production rate for commercial operation, the apparatus for carrying out the invention includes a rotatable turret having a deposit station and a compression station. Pie plates are mounted on the turret at one station and passed intermittently through and to the deposit and compression stations to a discharge station, with the operations at the several stations being carried on generally concurrently on the plates travelled thereto, thus assuring high-speed commercial production of graham cracker crusts having the proper crumb-like texture heretofore only achieved in home-baked pies.

Objects and advantages of the invention will be obvious herefrom, or may be learned by practice with the invention, the same being realized and attained by means of the instrumentalities and combinations pointed out in the appended claims.

In the drawings:

FIG. 1 is a front view of an embodiment for the present invention.

FIG. 2 is a plan view of the turret table and associated mechanisms.

FIG. 3 is a detailed front elevation, partly in section, of the mixture deposit mechanism.

FIG. 4 is an enlarged, detailed view (partly in section) of the mixture deposit mechanism in operation with one configuration for the depositor grill.

FIG. 5 is a sectional view illustrating the mixture distribution from the configuration of depositor grill illustrated in FIG. 4.

FIG. 6 is an enlarged sectional detail view of another configuration of depositor grill.

FIG. 7 is a sectional view of the mixture distribution from the configuration of depositor grill shown in FIG. 6.

FIG. 8 is a plan view, partly in section, of the agitator member.

FIG. 9 is a plan view of a portion of depositor grill illustrating the spacing of the grill perforations.

FIG. 10 is a detailed front elevation, partly in section, of the compression die mechanism and associated elements.

FIG. 11 is an enlarged detailed sectional view of the die shown in operative compressing position.

FIG. 12 is a sectional view of a pie plate and finished crust produced by the present invention.

FIG. 13 is a plan view of the die and cap plate with deflector plate removed.

FIG. 14 is a schematic view of the plate lifter mechanism.

FIG. 15 is a schematic diagram of a suitable pneumatic control system for the present invention.

FIGS. 16 and 17 are schematic diagrams of a suitable electrical control system for the present invention.

General description

Referring specifically to FIGS. 1 and 2, there is disclosed a preferred embodiment for carrying out the steps of the invention which includes a rotatable indexing table designated generally **10**.

Table **10** is comprised of a support plate **12** having a

plurality of spaced openings **14** therein. In the embodiment illustrated, plate **12** is provided with six openings although this number may be varied without adversely affecting the operation of the invention.

Mounted on support plate **12**, concentric with each opening **14**, is a pie plate or cup holder **16** having an inner surface **17** corresponding to the general configuration of the conventional round pie plate, and adapted to hold an associated pie plate during the operations of forming a graham cracker pie crust therein.

Each cup holder **16** includes a bottom cup plate **18** upon which its associated pie plate rests. Cup plate **18** rests freely in a groove **20** formed in holder **16** and is provided with cup plate stem section **22** slidably carried in bottom hub **23** of holder **16** seated in opening **14** of plate **12**.

Conventional pie plates P are individually placed in each cup holder **16** by the machine operator for travel to and through the deposit station D and the compression station C on indexing table **10**.

When a cup holder **16** and associated pie plate are delivered to deposit station D, a lifter rod **24** is raised upwardly in the direction of the arrow, FIG. 4, engaging the terminal end of stem section **22** lifting bottom plate **18** and the pie plate P supported thereon from a position inside cup holder **16** as shown in full lines, FIG. 3, to an elevated position as shown in phantom, FIG. 3.

In this elevated position, plate P is positioned adjacent the bottom **26** of graham cracker mix supply hopper **28**. Hopper **28** is provided with a foraminous bottom grill section **30**, also formed in the general shape of a conventional pie plate. An abutment **32**, adapted to engage the lip of plate P in its raised position, maintains the interior of plate P in spaced relation with the outside face **31** of grill **30**.

With plate P in this raised position, an agitator member **34** rotatably mounted in hopper **28** is actuated, revolving in hopper **28** to force the graham cracker mix through perforations **29** in grill **30** and onto the interior surface of plate P (see FIG. 4). The number of revolutions of agitator **34** is controlled to effect the proper deposit of mix onto plate P.

Referring to FIG. 4, it will be noted that agitator **34** is so constructed that the surface **34A** thereof corresponds generally to the shape of grill **30** and is adapted for travel in close relationship with the several sections of the grill **30** to ensure proper deposit of the mix over the entire inside face of plate P to a controlled depth.

When the proper amount of mix has been deposited onto raised plate **P**, lifter rod **24** is lowered, returning bottom plate **18** and plate P to position in cup holder **16**, and the rotation of agitator **34** is interrupted.

Table **10** is then travelled stepwise to present the next successive cup holder **16** with a plate P thereon to station C while a plate P having graham mix deposited thereon is travelled to compression station C where the mix is formed by pressure into a cohesive pie crust.

At station C, a compression member **36**, comprising a hydraulically-operated piston **38** and crust-forming die **40**, is actuated upon delivery of a cup holder **16** and plate P thereto on table **10**. The die **40**, shaped in the general configuration of a conventional pie plate, is travelled as selected distance into cup holder **16** and against plate P therein. Die **40** thus exerts a compressive force on the graham mix deposited on the bottom and sides of plate P. This compressive pressure exerted by die **40** forms the mix into a cohesive pie crust strong enough to withstand subsequent pie manufacturing operations, yet having the desired crumbly texture.

When the crust has been so formed the die **40** is retracted and the plate P with the finished pie crust thereon is delivered by table **10** to a discharge station where the operator removes the plate P with the crust thereon from its holder **16** and replaces it with an empty plate P for the next cyclic operation of the machine. It will, of course, be understood that the operations at the several stations on table **10** occur substantially simultaneously so that after indexed movement thereof graham mix is being deposited at station D while a crust is being formed at station C and a finished product is being removed by the operator at the discharge station. This continuous sequence of operations produces the high-speed continuous flow of finished pie crusts required by large scale commercial baking operators.

Turret table mechanism

Table **10** comprises a support plate **12** fixed to indexing head **76** of indexing unit **78**. Head **76** is mounted for rotation about a central vertical axis. Shaft **77** rotatably supports head **76** and, in turn, is mounted in suitable bearings in base plate **79** seated on an extension **81** of the main machine frame F. To actuate unit **78** periodically to rotate head **76** in timed relationship to the machine, operator unit **73** is provided with a hydraulic actuating cylinder **80** and a position-locking cylinder **82**. Cylinder **80** effects intermittent rotation of head **76** and plate **12** in timed relationship with other portions of the invention, while cylinder **82** ensures that head **76** and plate **12** are stopped in precise, registered position at the several machine working stations so that the graham mix is properly deposited and compressed on an associated plate P.

Unit **78**, including head **76**, plate **79**, and the hydraulic actuating and locking cylinders **80** and **82**, is preferably utilized as a unit and is commercially available as a unit from Air Hydraulics Incorporated, Jackson, Michigan, as Model 1500 index table.

Mix deposit mechanism

At deposit station D, hopper **28** includes a generally cylindrical housing **42** with a suitable cover **44**. A "dry" nonflowable mix of graham cracker crumbs, shortening, some water and sugar is prepared and periodically placed in housing **42** by the operator when the supply becomes depleted somewhat. If desired, suitable flavoring may likewise be added to the mix. It has been found that a proper mix can be obtained by adding preferably about 2½% to 3% by weight of water to the mix. However, a suitable, non-flowable dry mix can be obtained by adding crumbs and shortening only, the only requirement being that the mix does not normally flow.

As described hereinabove, hopper **28** has a foraminous bottom grill section **30** with closely spaced openings **29** therein of about one-quarter inch diameter in the preferred embodiment. Section **30** is formed in the conventional pie plate shape or in the general form of an inverted, frustum of a right circular cone having a flat lowermost section **46** and an inclined lateral side surface **48** and a lip section **50** (see FIG. 4).

Since the graham mix in hopper **28** is non-flowable, the mix remains in hopper **28** and does not pass through openings **29** until urged therethrough by agitator **34**.

Agitator **34** in turn includes a pair of opposed elongated spider arms **35** and **37**, each having a top section **52** coacting with lip **50** of grill **30**, an inclined section **54** adapted for coaction with surface **48**, and a bottom section **56** cooperating with section **46** of grill **30**.

Supporting agitator **34** in hopper **28** for concentric rotation about a vertical axis in spaced relation with grill section **30** is an operating shaft **58** fixed at one end to agitator **34** at the point where arms **35** and **37** thereof are joined in common. A sleeve **59** enshrouds shaft **58** in hopper **28** to prevent contamination of the mix. The other end of shaft **58** is fixed to and rotates wtih output shaft **60** of right angle gear drive member **62**. The transverse input shaft **64** of member **62** is secured by flexible coupling **66** to a drive shaft **68** carried by suitable bearing mounts **71** and **72** on machine frame F. Drive shaft **68**, in turn, is connected through clutch coupling **70** to gear reducer **72** and a power source, such as, motor **74**.

Clutch coupling **70** is preferably of the SF–400 type manufactured by Warner Electric Brake and Clutch Co. of Beloit, Wisconsin.

In one embodiment of the invention, shown in FIG. 6, the side surface **33** of grill **30** is disposed at the same angle generally as is the inclined side surface of the conventional pie plate P. In this arrangement, a generally uniform depth B of mix is deposited over the entire inside surface of the plate (see FIG. 6).

In the embodiment illustrated in FIG. 4, the side surface **33** of grill **30** is inclined more toward the vertical than is the inclination of the sides of plate P. This configuration results in more mixture being deposited along the sides of plate P, and especially the top edges of the sides, as at A (FIG. 5). When this mixture distribution is compressed by die **40**, greater density of crust is realized along the top edges of the finished crust where the greater amount of mix was deposited. This produces a finished pie crust with a stronger top edge section, which is the portion of the crust most generally damaged in subsequent pie manufacturing operations.

Mix compressing mechanism

At station C, compression member **36** includes, in addition to inverted frustro-conical die member **40**, a cap plate **84** fixed to the top of die **40**. Die **40** is preferably formed with a hollow internal cavity **86**. An electrical heating element **88**, such as the type commercially known as "Cal-Rod" unit, is disposed in cavity **86** as shown in FIG. 11. Element **88** is suitably connected to a source of electrical potential. Element **88** is effective to heat die **40** to an elevated temperature, preferably about 130° F. This heating of die **40** assists in ensuring release of the die **40** and mix after the compaction cycle.

To further ensure release of the die **40** and mix so that none of the compacted crust adheres to the die **40** after wtihdrawal of the die **40** from the plate P positioned at station C, the outside operative surface **41** of die **40** is provided with a coating **90** of material having a low coefficient of friction. It has been found that a coating **90** of silicone rubber for die **40** provides satisfactory results. It will be understood that if any portion of the compacted crust clings to die **40** as the die moves out of the plate P, a defective crust will result. However, heating die **40** and providing the silicone rubber coating therefor ensures proper release without any adhering of the crust to the die.

Crumb excess remover

Die **40** is also provided with means for removing any excess crumbs after compaction. To accomplish this, there is provided a crumb deflector plate **92** seated on cap **84** with peripheral sections **94** extending beyond the outside edge **96** of die **40**. Sections **94** are provided at their outermost edges with a transverse lip section **98**.

The annular side wall **100** of die **40** is provided with a groove or slot **102** therein. A plurality of closely-spaced outlet openings **104** are formed in side wall **100** and extend through side wall **100** into edge **96** while communicating wtih slot **102** as shown in FIG. 11 and FIG. 13. In the preferred embodiment, for the nominal seven-inch diameter pie, there are approximately eighty openings **104** disposed about die **40**. For simplicity, FIG. 13 merely illustrates a selected few. Suitable spaced air inlet bores **106** through cap **84** connect slot **102** to a suitable regulated source of compressed air (not shown).

In operation, when, during the cyclic operation of the invention, die **40** has entered its associated plate P at station C, air under pressure is introduced into bores **106** and slot **102**, and thence through openings **104**. The air discharging through openings **104** blows away any excess graham crumbs onto support table **12** and/or against sections **94** of deflector plate **92** and thence onto plate **12**.

Pneumatic and electrical control system

FIGS. 15, 16 and 17 disclose a suitable schematic pneumatic and electrical control system for selectively actuating the several machine elements in predetrmined, timed cyclic operation.

At the start of the machine operations, the machine operator actuates line control switch **108** and two-pole start-stop buttons **110** and **112** to complete circuits to the hydraulic pump motor **114** and the agitator motor **74** through their appropriate starter motors **116** and **118**, respectively. The circuits energizing motors **114** and **74** remain completed until buttons **110** and **112** are suitably actuated by the machine operator at the end of the machine operations. It will be understood, therefore, that motors **114** and **74** remain energized at all times during the cyclic operation of the several machine elements.

The cyclic operations of the machine are effected by a pair of suitable timer motors **120** and **122**. Timer **122** controls the cyclic operation of lifter rod **24**, while timer **120** controls the cyclic operation of die member **40**. The machine operator sets timers **120** and **122** for the desired timed operation of their associated mechanisms.

At the start of the cyclic operation of the machine, agitator **34** is uncoupled from its associated motor **74**. During the timed operation thereof, timer **122**, through its associated relay **123** and current converter **125**, completes a circuit energizing hydraulic solenoid control valve **124**. This, in turn, actuates the hydraulic cylinder **126**, extending rod **128** thereof. Rod **128** at its terminal end is attached to lifter rod **24**, so that extension of rod **128** raises rod **24** upwardly to dispose a pie plate P in the elevated position shown in phantom in FIG. 4.

As lifter rod **24** is moved upwardly, a collar **130** thereon engages the actuating arm **132** of a normally open switch **134**, closing switch **134** and completing a circuit energizing clutch coupling **70**. The energizing of clutch coupling **70**, in turn, effects rotation of agitator member **34** to deposit mix on raised plate P.

At the end of the timing cycle, as determined by timer **122**, the circuit energizing solenoid valve **124** is interrupted, deactuating hydraulic cylinder **126** which is preferably of the spring-return type. Deactuation of cylinder **126** effects retraction of rod **128** and lifter rod **24**, returning plate P with mixture deposited thereon into its associated cup holder **16** on table **10**. The return or lowering of rod **24** effects disengagement of switch actuating arm **132** and collar **130**, opening switch **134** and thus interrupting the circuit energizing clutch coupling **70**. This, in turn, decouples agitator member **34** from motor **74** and stops rotation of member **34** in hopper **28**.

It will be noted from the foregoing that the control members are so constructed and arranged that agitator member **34** cannot be actuated until a plate P is in proper elevated position adjacent grill **30**. In like manner, agitator **34** continues to rotate as plate P moves away from its elevated position until arm **132** is completely released by collar **130**. This continued rotation of agitator **34**, as plate P is moving downwardly, ensures that no graham cracker mix intended to be deposited on the plate P will inadvertently adhere to the bottom of grill **30**.

It will be understood that while the foregoing operations are occurring at deposit station D, substantially simultaneously at station C the crust compression operations are occurring. At station C, die member **40** is moved downwardly as soon as table **10** has completed its indexing operation. At the end of the indexing stroke of the turret table indexing cylinder **80**, the piston rod thereof (not shown) activates a two-pole microswitch **138**. Activation of microswitch **138** completes a circuit energizing timer motor **120**. The relay **136** associated with timer **120**, in turn, completes a circuit actuating hydraulic solenoid control valve **140**, actuating hydraulic cylinder **142**. This, in turn, extends the piston rod **144** thereof to travel die member **40**, secured by cap plate

84 to the terminal end of piston 144, into operative compressing position in a filled plate P, positioned at station D on table 10. It will be noted that activation of switch 138 also energizes timer motor 122 to raise lifter rod 24 at station D.

To ensure that the table is in proper registered position during the compression and deposit operations, there is provided another microswitch 146, disposed in the path of travel of a bracket 148 and slidable rod 149 mounted for travel with piston 144. Bracket 148 and rod 149 are adapted to engage the actuating arm 150 of switch 146 (preferably two-pole), moving arm 150 thereof in the direction to complete a circuit energizing hydraulic solenoid control valve 152 to actuate the hydraulic locking cylinder 82, to retain head 76 and table 10 in fixed position, thus ensuring that the table 10 is in precise registry on the compression stroke of cylinder 142, thereby preventing any damage to the machine elements by misalignment. In like manner, this ensures that plate P and holder 16 are properly disposed for plate elevation at station D.

Adjacent the bottommost extent of travel of piston 144 and bracket 148 and rod 149, bracket 148 and rod 149 engage actuating arm 154 of a second microswitch 156. This completes a circuit energizing pneumatic solenoid control valve 158, admitting air under pressure to bores 106 to effect removal of excess crumbs.

In addition, the piston rod of locking cylinder 82 is adapted to activate a microswitch 162 upon movement of the locking cylinder piston rod toward locking position. Activation of switch 162 completes a circuit energizing hydraulic solenoid control valve 164 to activate hydraulic cylinder 80 for returning the piston thereof from its indexing stroke preparatory to the next movement of table 10.

At the end of the compression cycle, as determined by timer 120, the circuits energizing locking cylinder control valve 152 and hydraulic cylinder control valve 140 are interrupted while a circuit energizing hydraulic solenoid control valve 160 is completed. This circuit effects retraction of piston 144 of cylinder 142, preferably of the double-acting type, moving die 40 away from the plate P at station D.

Upon interruption of the circuit energizing valve 152, hydraulic locking cylinder 82 is deactuated, releasing table 10 for indexing. This also completes a circuit through switch 162 and valve 164 to effect indexing of table 10. By this arrangement, it is assured that table 10 does not index until die 40 has been retracted from operative compressing position in holder 16 at station C. Upon completion of the indexing stroke of cylinder 80, the timed operations controlled by switch 138 are repeated.

To control the temperature of heating element 88, there is provided a suitable detachable thermostatic control member 166, including a temperature sensing probe 168, an adjustable thermostat 170, electrical connector 172, which connects element 88 to the source of electrical potential through heater 174 and its associated control relay 176.

Probe 168 is adapted to respond to the temperature of die 40 and interrupt the current to element 88 when the temperature of die 40 exceeds the limit set on thermostat 170. When the temperature falls below this limit, the circuit to element 88 is re-established. Thus, the temperature of die 40 can be suitably maintained at the desired temperature.

For operator convenience, the several control elements are mounted on a control panel G on the main machine frame F, as shown in FIG. 1.

It should be understood that while the process and apparatus of the present invention are disclosed in connection with graham cracker pie crusts, other materials, such as other types of crackers, cookies, cereal flakes and the like, can be employed with the present process and apparatus with equal facility to form crumb shells for pies.

Thus, there is disclosed a novel method and mechanism for the high-speed production of graham cracker crusts having the desired crumbly texture not possible heretofore in commercially prepared baked goods.

It should be understood that the above description has been made with reference to the preferred embodiment illustrated in the drawings and that modifications and alterations can be made therein without departing from the invention, except as expressly limited hereinafter in the claims.

What is claimed is:

1. The method of preparing a graham cracker pie crust comprising the steps of preparing a relatively dry, nonflowable mixture of at least graham cracker crumbs, shortening, sugar and water, said water being added in an amount less than 3% by weight of the mixture, containing said mixture at a source of supply in a container, subjecting said contained mixture to a controlled discharge force and directing the same to effect deposit of a pre-selected amount of said mixture along the sides and on the bottom of an associated pie plate, and subjecting the entire surface of said deposited mixture at one time to a compressive force to form said crust.

2. The method as defined in claim 1, including the step of depositing more of said mix on the sides of said plate than on the bottom thereof whereby there is formed a firmer texture on the top edge of said finished crust.

3. The method of preparing a graham cracker pie crust as defined in claim 1, comprising the steps of withdrawing said pie plate from adjacent said container in timed relation to deposit to prevent adherence of the mix to the bottom of the container.

4. The method of preparing graham cracker pie crusts comprising the steps of preparing a relatively dry, nonflowable mixture of at least graham cracker crumbs, shortening, sugar and water, containing said mixture in a supply hopper having a foraminous bottom section, travelling a plurality of pie plates seriatim to and past said hopper, moving each of said pie plates positioned thereat and said hopper relatively toward each other to dispose said plate adjacent said foraminous bottom section of said hopper, urging a controlled amount of mixture through said foraminous bottom section and onto the sides and bottom of said pie plate, moving said plate and container relatively away from each other, travelling said filled plate intermittently to and past a compression station, and subjecting said plate to an axial compressive force to form said crust.

5. The method as defined in claim 4, wherein said plate at said compression station is subjected to both heat and an axial compressive force to form said crust.

6. The method as defined in claim 4, including removing any excess mixture from the formed crust upon application of said compressive force.

7. The method of preparing graham cracker pie crusts comprising the steps of preparing a relatively dry, nonflowable mixture of at least graham cracker crumbs, shortening, sugar and water, said water being added in an amount of 2½% by weight of the mixture, containing said mixture in a supply hopper having a bottom section, travelling a plurality of pie plates seriatim to and past the bottom of said hopper, moving each of said pie plate upwardly toward said hopper to dispose said plate adjacent said bottom section of said hopper, subjecting said contained mixture to a controlled amount of rotary action to discharge a selected amount of mixture through said bottom section and onto the sides and bottom of said pie plate, moving said plate downwardly away from said hopper, travelling said filled plate intermittently to and past a compression station, and subjecting said plates at said compression station to heat and an axial compressive force to form said crust.

8. Apparatus for the production of graham cracker pie crusts comprising a container for holding a supply of rela-

tively dry, non-flowable graham cracker mix, a grill, means mounting said grill on the bottom of said container with the openings in said grill communicating with the interior, means for disposing a plurality of pie plates seriatim in adjacent spaced relation with said grill, a travelling element, means mounting said element for travel in said container adjacent said grill to urge said mix in said container through said grill and onto said adjacent pie plates, means for travelling said element a pre-selected amount thereby controlling the amount of mix deposited onto said plate, means for operating said element in timed relation with the disposition of a pie plate adjacent said grill, and pressure means for cohesively binding said mixture in said plates into a formed pie crust.

9. The apparatus as defined in claim 8, including heat means associated with said pressure means for facilitating complete release of said pressure means and said formed crust.

10. Apparatus for the production of graham cracker pie crusts comprising a container for holding a supply of relatively dry, non-flowable graham cracker mix, a grill, means mounting said grill on the bottom of said container with the openings in said grill communicating with the interior, means for disposing a plurality of pie plates seriatim in adjacent spaced relation with said grill, a rotatable impeller element, means mounting said impeller for travel in said container adjacent said grill to urge said mix in said container through said grill and onto said adjacent pie plates, means for rotating said element a pre-selected number of revolutions for controlling the amount of mix deposited onto said plate, means for operating said impeller in timed relation with the disposition of a pie plate adjacent said grill, a die member, means for positioning said filled pie plates seriatim adjacent said die member, means mounting said die for travel into and out of said filled pie plates disposed adjacent thereto to cohesively bind said mixture on said plates into a finished pie crust.

11. The invention as defined in claim 10, including heat means operatively associated with said die member for maintaining said die at an elevated temperature to facilitate complete release of said die and finished crusts upon withdrawal of said die from said plates.

12. The invention as defined in claim 10, including a coating of plastic material on the mixture-engaging face of said die, said plastic material having a low coefficient of friction to coact with said heat means to ensure complete release of said die and finished crusts.

13. Apparatus for the production of graham cracker pie crusts comprising a container for holding a supply of relatively dry, non-flowable mixture of at least graham cracker crumbs, shortening, sugar and water, said water being added in an amount up to 3% by weight of said mixture, a grill, means mounting said grill on the bottom of said container with the openings in said grill communicating with the interior of said container, an intermittently-travelling turret member, means on said turret for loosely and individually holding a plurality of pie plates, means for indexing said turret about a central vertical axis to travel each of said plates individually to and through a plurality of work stations including a filling and a compression station, means for disposing a pie plate on said turret at said filling station in adjacent spaced relation with said grill, a rotatable impeller, means mounting said impeller for rotation in said container adjacent said grill to urge said mix in said container through grill and onto said adjacent pie plates, means for rotating said element a pre-selected amount for controlling the amount of mix deposited onto said plate, means for interrupting the operation of said impeller until the disposition of a pie plate adjacent said grill, a die member at said compression station, means mounting said die member for travel into and out of filled pie plates on said turret indexed to said compression station, said die member being operative to cohesively bind said mixture in said pie plates into a finished pie crust.

14. The invention as defined in claim 13, including operating means interrelating the movement of said turret, said plate disposing means, said impeller and said die for effecting high-speed production of said pie crusts.

15. Apparatus for the high-speed production of graham cracker pie crusts comprising in combination a container for holding a supply of relatively dry, non-flowable mixture of at least graham cracker crumbs, shortening, sugar and water, said water being added in an amount of 2½% by weight of said mixture, a pie-shaped grill, means mounting said grill on the bottom of said container with the openings in said grill communicating with the interior of said container, a rotatable turret member, means for indexing said turret about a central vertical axis, holders on said turret for loosely and individually retaining a plurality of pie plates contemporaneously on said turret, said turret being operative to travel each of said holders and an associated pie plate to and through a plurality of work stations, including a filling and a compression station, plate lifter means at said filling station for raising and lowering pie plates from and to their associated holders and into and out of adjacent spaced relationship with said grill, a rotatable impeller in said container, means for rotating said impeller to force said mixture from said container through said grill into an adjacent, elevated pie plate, control means for said impeller rotating means to control the amount of mixture deposited onto an elevated plate, means for interrupting the operation of said impeller until a plate is disposed adjacent said grill, operating means for said plate lifter means, a die member at said compression station, means mounting said die member for travel into and out of filled pie plates on said turret in their associated holders registered at said compression station, said die member being operative to cohesively bind said mixture in said plates into a finished pie crust.

16. The invention as defined in claim 15, including operating means interrelating the movement of said turret, said plate disposing means, said impeller and said die for effecting high-speed production of said pie crusts.

17. The invention as defined in claim 15, including heater means operatively associated with said die member for heating said die to facilitate release of said die and formed pie crust.

18. The invention as defined in claim 15, including a coating on said die of a plastic material, said plastic material having a low coefficient of friction to coact with said heat means to ensure complete release of said die and finished crusts.

19. The invention as defined in claim 15, including means for removing excess mixture from said finished pie crusts comprising a deflector plate mounted on said die member for movement therewith, extensions on said deflector plate extending beyond and spaced from the periphery of a plate holder at said compression station, air outlet means in said die directed to the periphery of said holder where said die is in operative compressing position, means for admitting air under pressure to said outlet means when said die is in operative position for blowing excess mixture particles against said deflector plate extensions and away from said finished pie crust.

20. The method of preparing crumb shells for pies from materials such as, crackers, cookies and the like comprising the steps of preparing a relatively dry, non-flowable mixture of at least said material crumbs and shortening, containing said mixture in a supply hopper having a foraminous bottom section, travelling a plurality of pie plates seriatim to and past said hopper, moving each of said pie plates positioned thereat and said hopper relatively toward each other to dispose said plate adjacent said foraminous bottom section of said hopper, urging a controlled amount of mixture through said foraminous bottom section and onto the sides and bot-

tom of said pie plate, moving said plate and container relatively away from each other, travelling said filled plate intermittently to and past a compression station, and subjecting said plate to an axial compressive force to form said crust.

21. The method as defined in claim 20, wherein said plate at said compression station is subjected to both heat and an axial compressive force to form said crust.

22. The method as defined in claim 20, including removing any excess mixture from the formed crust upon application of said compressive force.

23. The method of preparing a crumb shell for pies from materials such as crackers, cookies and the like comprising the steps of preparing a relatively dry, non-flowable mixture of material crumbs, depositing a controlled amount of said mixture along the sides and on the bottom of the pie plate, and subjecting the entire surface of said deposited mixture to heat and a compressive force at the same time to form said crust, said heat ensuring complete release of said finished crust and said compressive force.

24. Apparatus for the production of crumb shells for pies comprising a container for holding a supply of relatively dry, non-flowable crumb mix, a grill, means mounting said grill on the bottom of said container with the openings in said grill communicating with the interior,

means for disposing a plurality of pie plates seriatim in adjacent spaced relation with said grill, a travelling element, means mounting said element for travel in said container adjacent said grill to urge said mix in said container through said grill and onto said adjacent pie plates, means for travelling said element a pre-selected amount thereby controlling the amount of mix deposited onto said plate, means for operating said element in timed relation with the disposition of a pie plate adjacent said grill, and pressure means for cohesively binding said mixture in said plates into a formed pie crust.

25. The apparatus as defined in claim 24, incuding heat means associated with said pressure means for facilitating complete release of said pressure means and said formed crust.

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