Nov. 7, 1967 W. C. BELK 3,351,473

FILLING APPARATUS

Filed Nov. 6, 1964 8 Sheets-Sheet 1

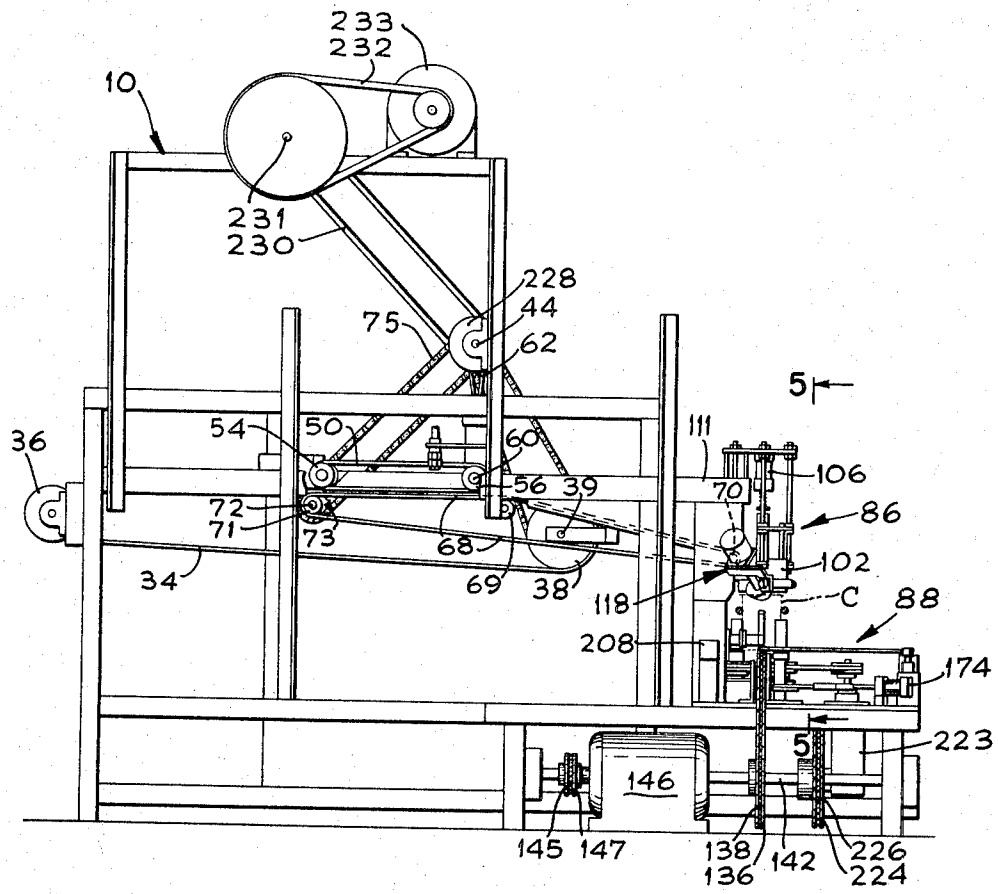


FIG_1

INVENTOR
WILBER C. BELK

BY Hans G. Hoffmeister

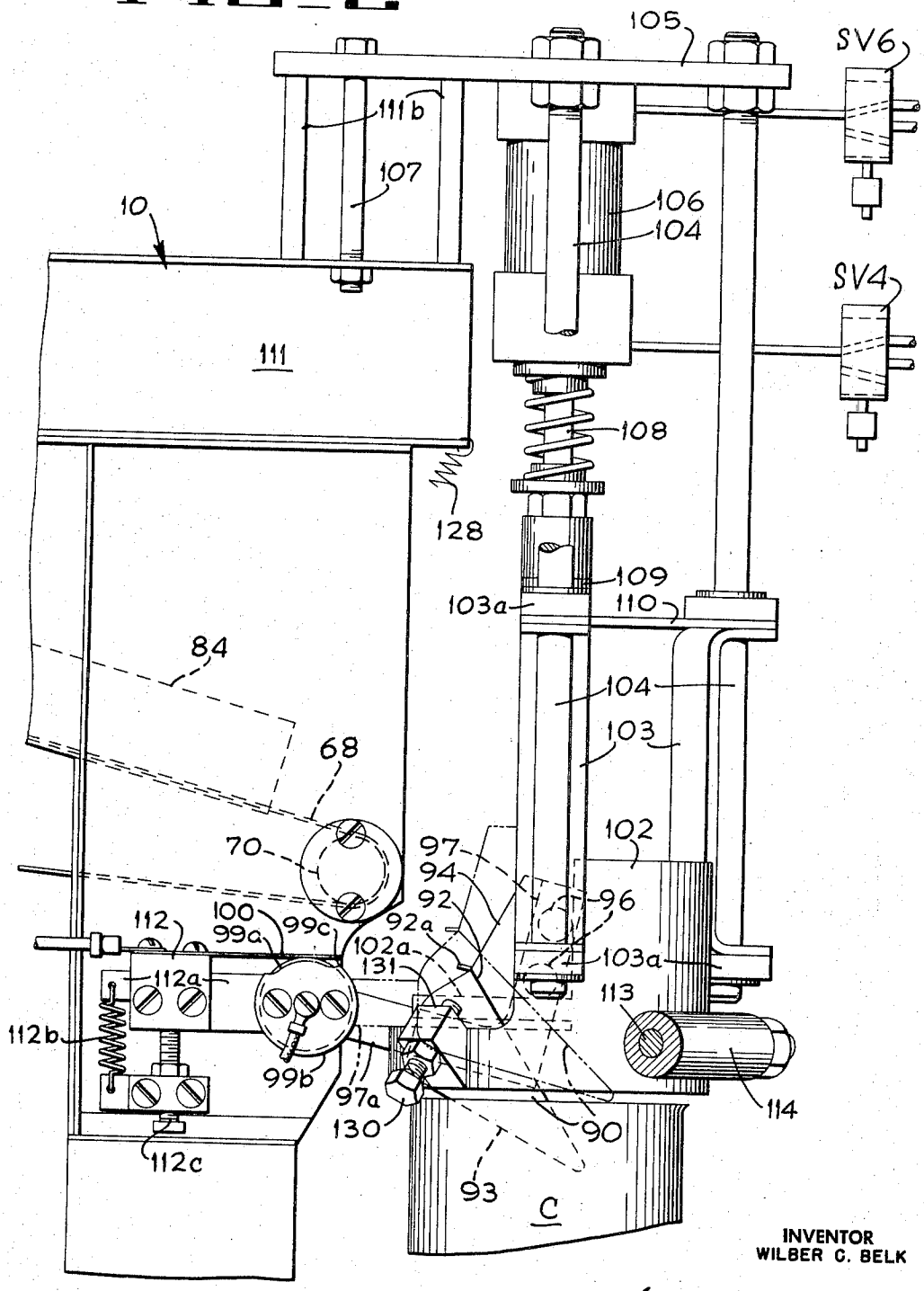
ATTORNEY

Nov. 7, 1967 W. C. BELK 3,351,473

FILLING APPARATUS

Filed Nov. 6, 1964 8 Sheets-Sheet 2

FIG_2



INVENTOR
WILBER C. BELK

BY Hans G. Hoffmeister

ATTORNEY

Nov. 7, 1967 W. C. BELK 3,351,473

FILLING APPARATUS

Filed Nov. 6, 1964 8 Sheets-Sheet 3

FIG_3

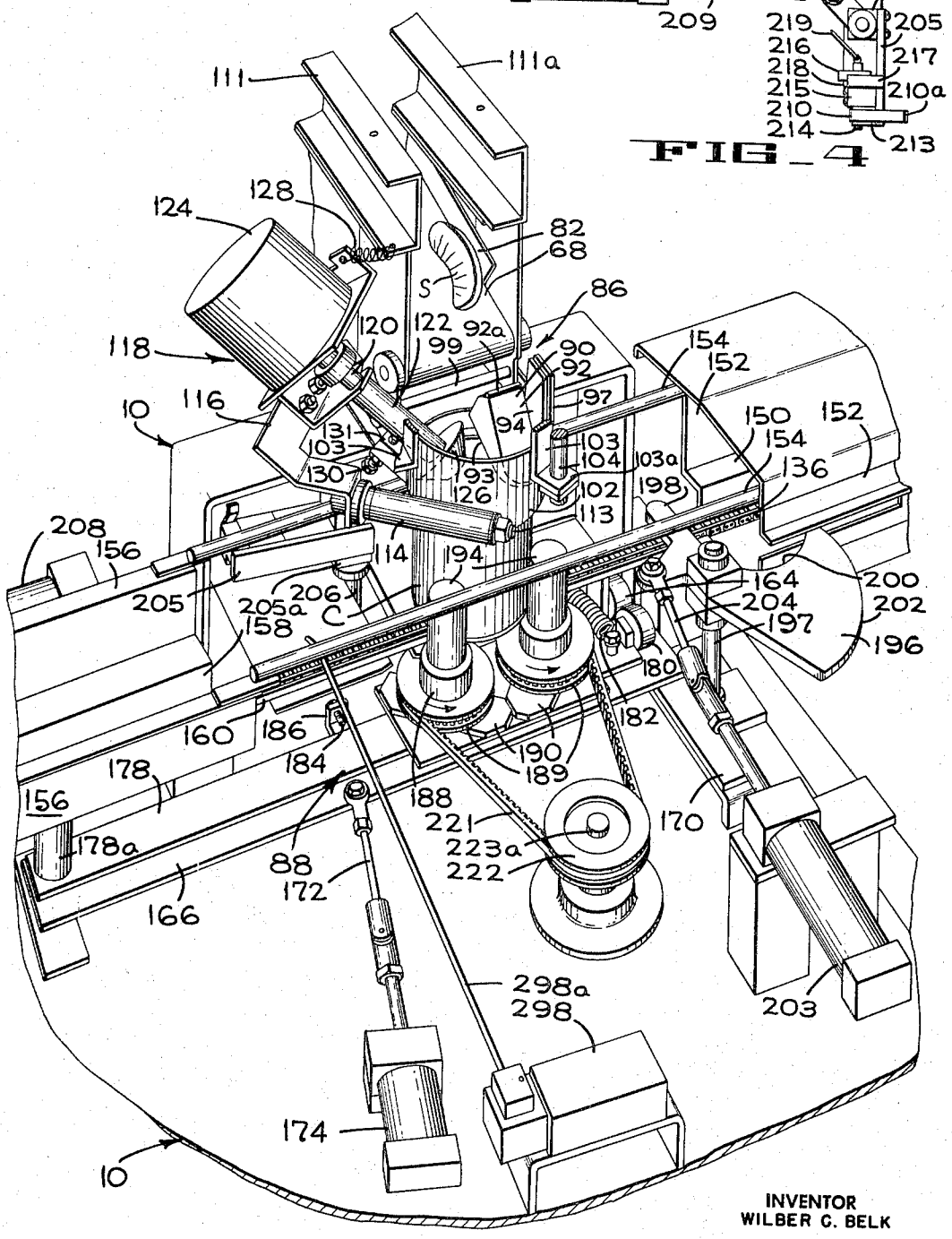


FIG_4

INVENTOR
WILBER C. BELK

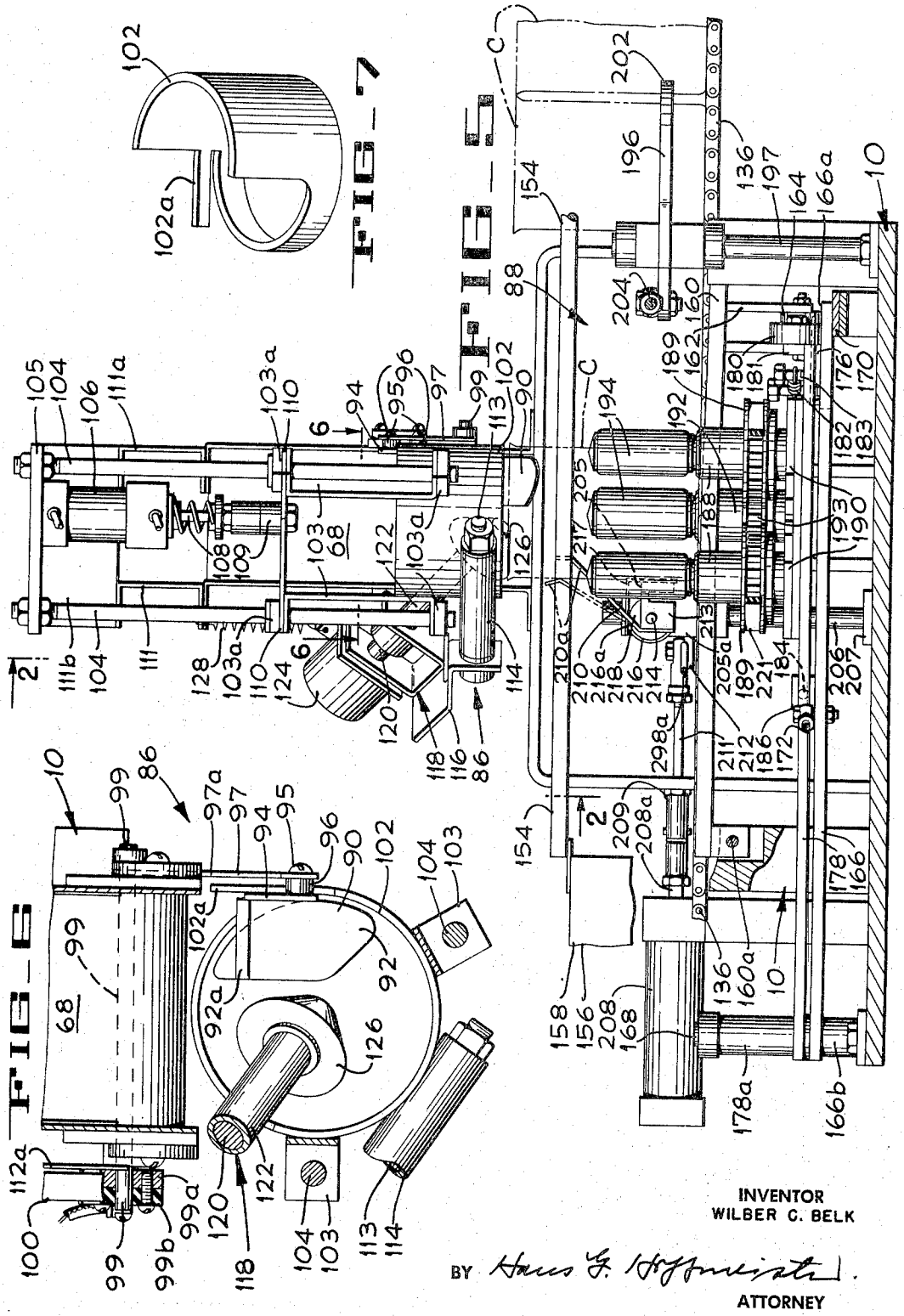
BY Hans F. Hoffmeister

ATTORNEY

Nov. 7, 1967 W. C. BELK 3,351,473

FILLING APPARATUS

Filed Nov. 6, 1964 8 Sheets-Sheet 4



Nov. 7, 1967 W. C. BELK 3,351,473

FILLING APPARATUS

Filed Nov. 6, 1964 8 Sheets-Sheet 5

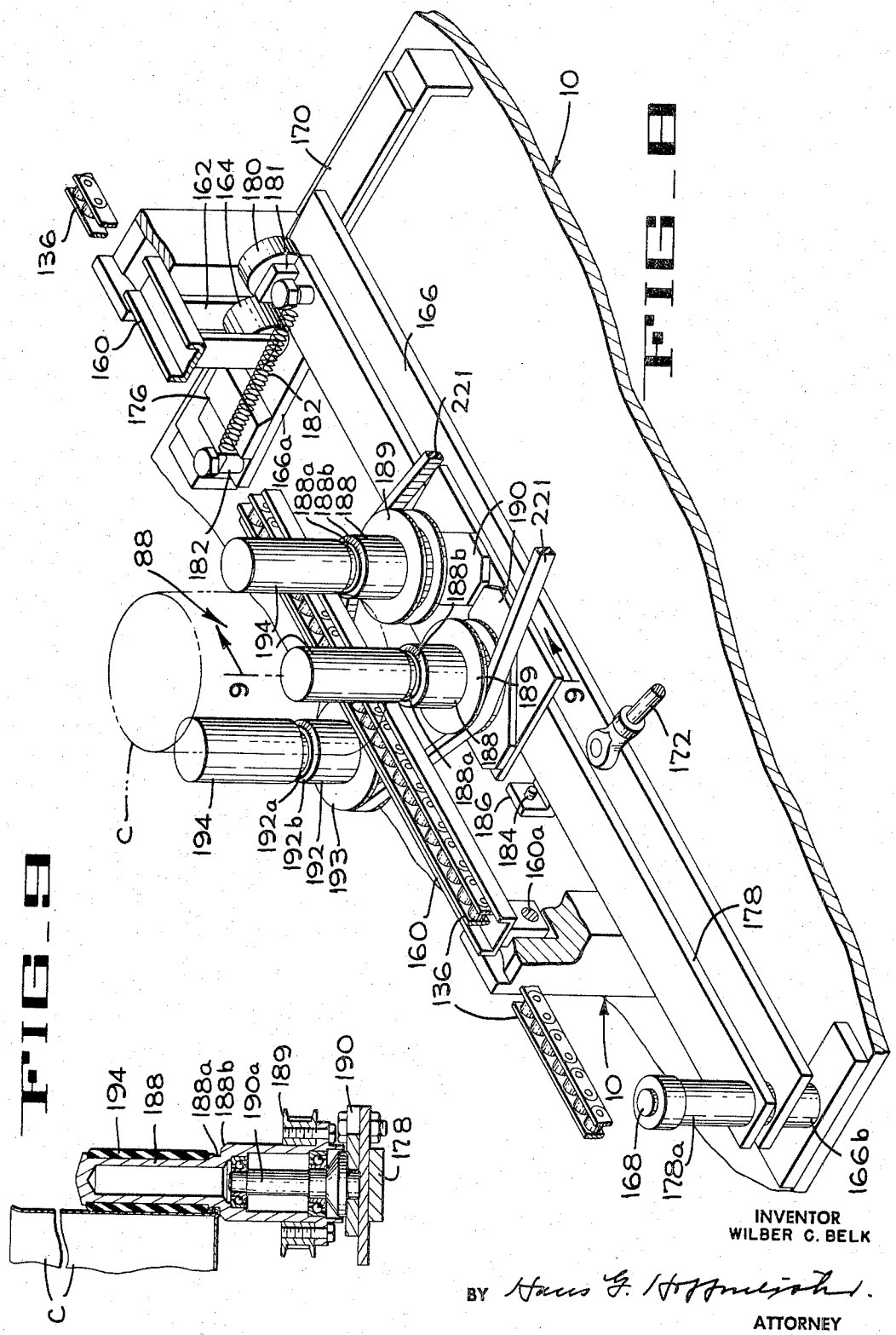


FIG. 8

FIG. 9

INVENTOR
WILBER C. BELK

BY Hans G. Hoffmeister

ATTORNEY

Nov. 7, 1967 W. C. BELK 3,351,473

FILLING APPARATUS

Filed Nov. 6, 1964

8 Sheets-Sheet 6

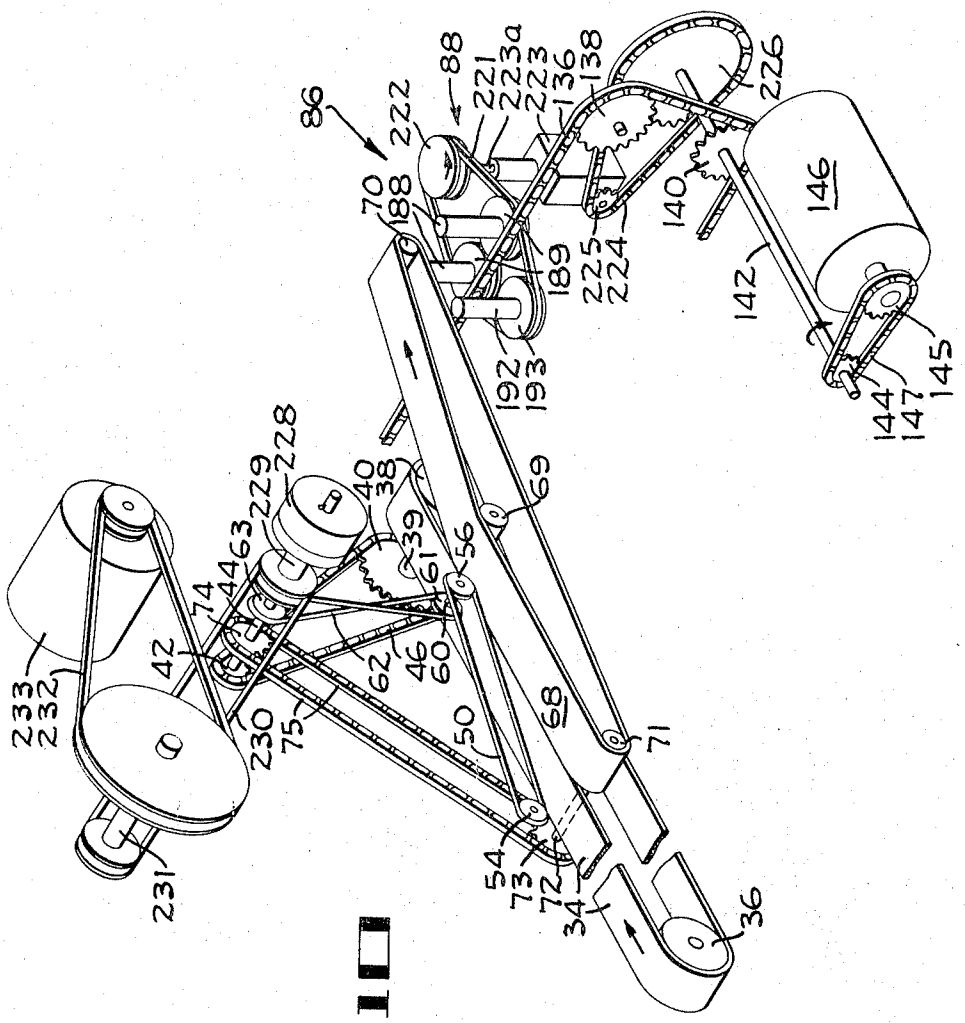


FIG. 10

INVENTOR
WILBER C. BELK

BY Hans G. Hoffmeister.
ATTORNEY

Nov. 7, 1967 W. C. BELK 3,351,473

FILLING APPARATUS

Filed Nov. 6, 1964 8 Sheets-Sheet 7

FIG_11

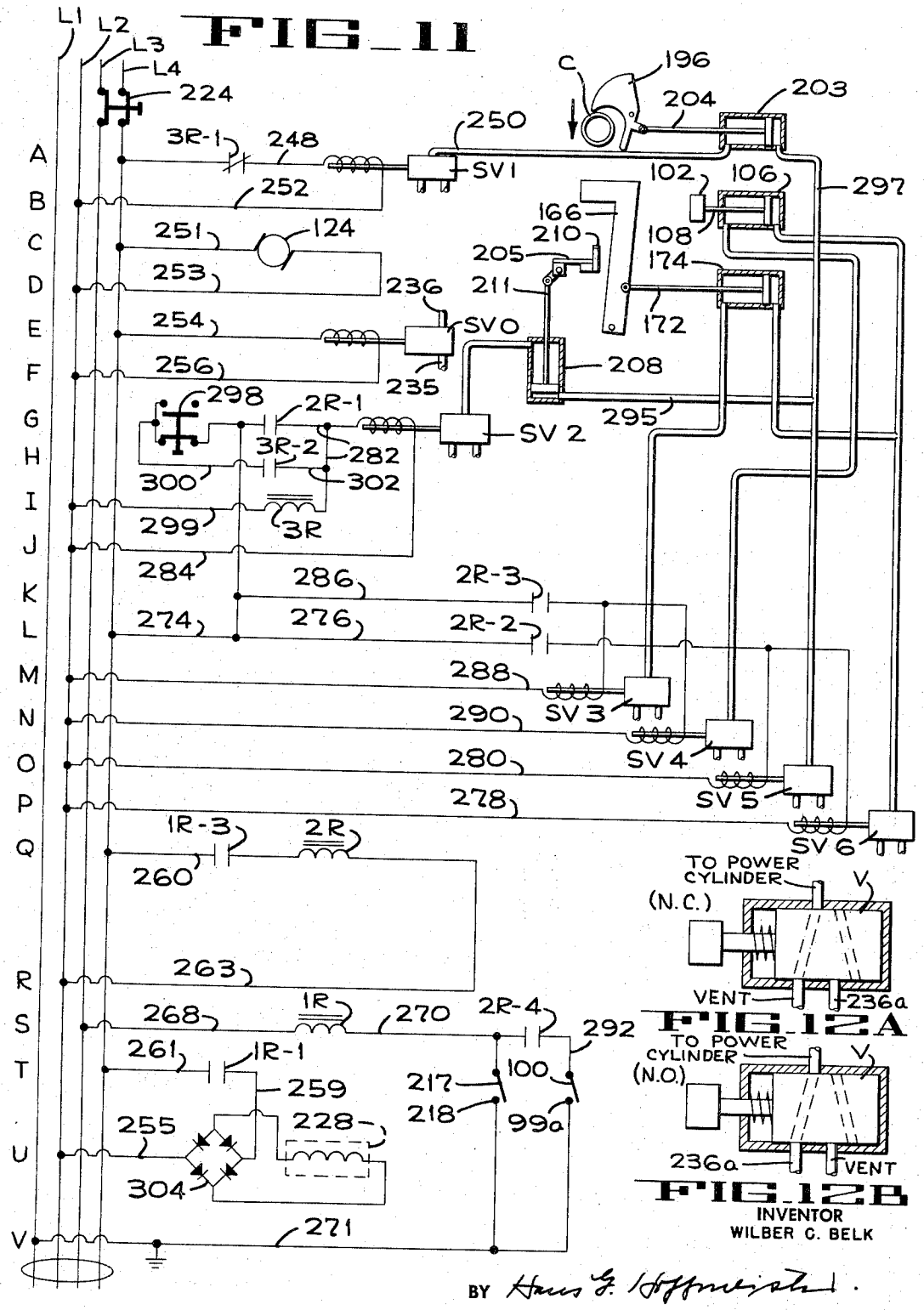


FIG_12A

FIG_12B

INVENTOR
WILBER C. BELK

BY Hans G. Hoffmeister

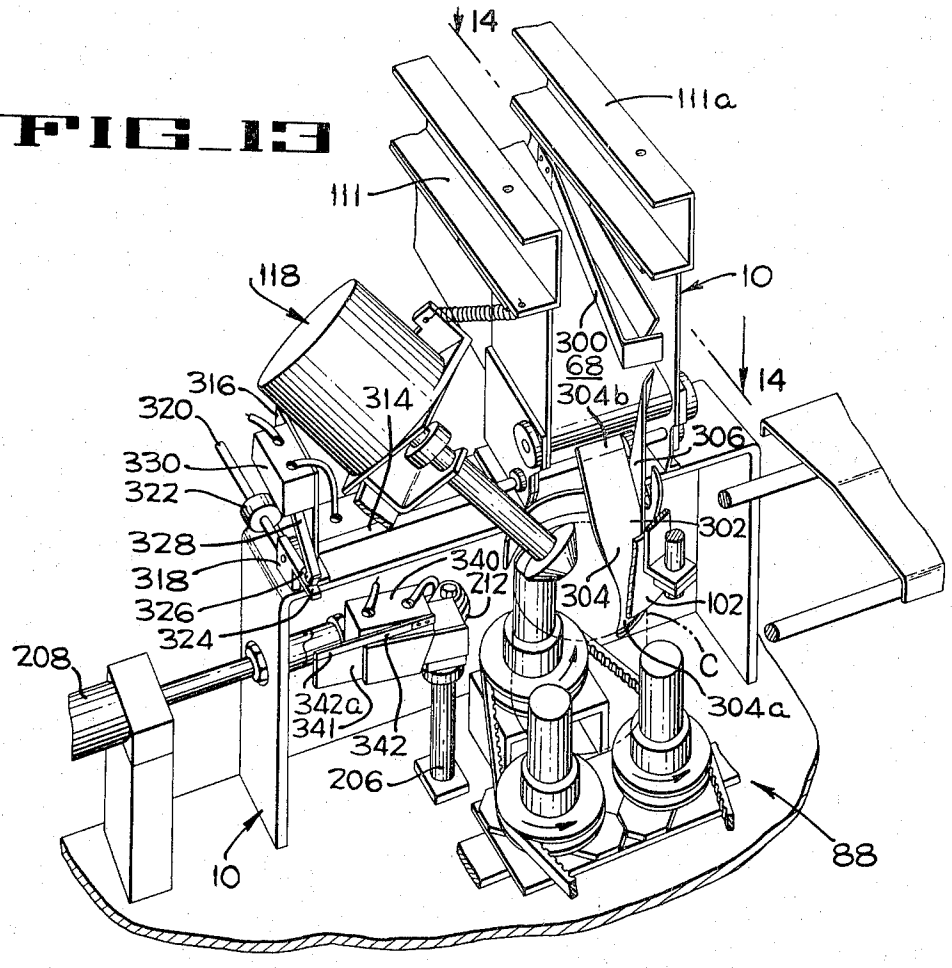
ATTORNEY

Nov. 7, 1967 W. C. BELK 3,351,473

FILLING APPARATUS

Filed Nov. 6, 1964 8 Sheets-Sheet 8

FIG_13



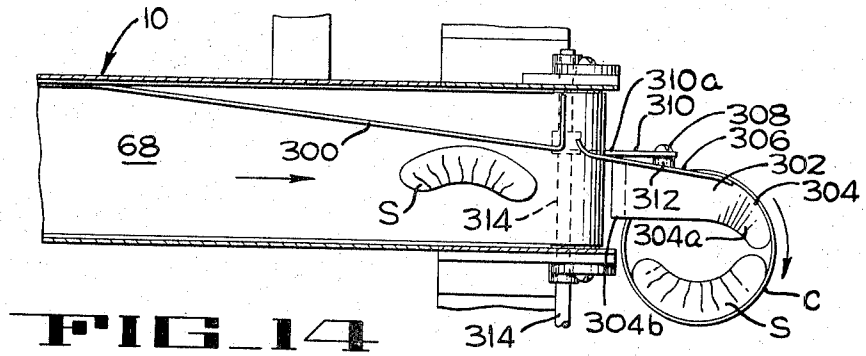


FIG_14

INVENTOR
WILBER C. BELK

BY Hans G. Hofmeister
ATTORNEY

United States Patent Office 3,351,473 Patented Nov. 7, 1967

3,351,473

FILLING APPARATUS

Wilber C. Belk, Lakeland, Fla., assignor to FMC Corporation, San Jose, Calif., a corporation of Delaware

Filed Nov. 6, 1964, Ser. No. 409,472
20 Claims. (Cl. 99—186)

ABSTRACT OF THE DISCLOSURE

An apparatus for filling cylindrical cans with crescent-shaped grapefruit segments comprising a feed belt to feed oriented segments to a filling station, three spaced rotating spools which support and spin the cylindrical can located at the filling station, the spools being elliptical in cross-section to vibrate the can while it is spinning, a combination guide and height-sensing switch to direct the segments into the can and control the filling operation by being raised when the segments fill-up the can, a rotating roller which presses the segments downwardly in the can to compress the "pack," and a penumatic-electric control circuit.

This invention relates to the packing of products into containers and more particularly to apparatus for filling containers with citrus fruit sections or the like.

Numerous obstacles have theretofore been encountered in automatically packing articles into cylindrical containers. Particularly, when packing citrus fruit sections, which are are crescent shaped, have tapered cross-section, and are relatively fragile by nature, previous machine packs have not achieved an orderly arrangement of the sections or uniform weight of the filled containers. By "pack" is meant an assemblage of sections within a filled container. If the sections are merely dropped into the container, the fragile sections will break and a non-uniform pack will result causing the containers to vary greatly in weight.

It is an object, therefore, of this invention to provide a pack of citrus fruit sections of substantially uniform weight and density in a cylindrical container.

Another objection of this invention is to provide a method and apparatus for filling a container with a plurality of crescent shaped articles having tapered cross-sections.

Another object of this invention is to provide a device for automatically sequentialy filling a plurality of cylindrical containers with crescent shaped articles having tapered cross-sections.

These and other objects and advantages will be more apparent from the following description wherein:

FIGURE 1 is a side elevation of part of a food processing line with which the filling apparatus of the present invention is employed.

FIGURE 2 is an enlarged side elevation, with parts broken away and parts in section, of a portion of the filling apparatus shown in FIGURE 1.

FIGURE 3 is an enlarged perspective of the filling apparatus and a portion of the machine associated therewith.

FIGURE 4 is an enlarged plan of the container-stopping portion of the filling apparatus, shown disconnected from the machine.

FIGURE 5 is an enlarged section taken on line 5—5 of FIG. 1.

FIGURE 6 is an enlarged horizontal section of another portion of the filling apparatus taken generally along the lin 6—6 of FIG. 5.

FIGURE 7 is an enlarged isometric of a portion of the container guard in the filling apparatus shown in FIG. 5.

FIGURE 8 is an enlarged isometric of the container

positioning portion of the filling apparatus, parts being broken away and shown in section.

FIGURE 9 is an enlarged vertical section taken on line 9—9 of FIG. 8.

FIGURE 10 is an enlarged isometric schematic of the drive arrangement for the filling apparatus and a portion of the drive arrangement for the processing line shown in FIGURE 1.

FIGURE 11 is a schematic circuit diagram used for controlling the operation of the filling apparatus.

FIGURES 12A and 12B are schematic sections showing solenoid actuated air valves, FIG. 12A showing a valve in a normally closed position, FIG. 12B showing a valve in a normally open position.

FIGURE 13 is an enlarged schematic perspective of a second embodiment of the filling appartus, with parts broken away.

FIGURE 14 is an enlarged horizontal section taken generally along line 14—14 of FIG. 13.

In general the filling appartus of the instant invention comprises an endless article supply belt **68**, a filling unit **86** and a container-positioning unit **88** all of which are mounted on a support structure **10**. Crescent-shaped articles are deposited on the belt in any suitable manner, as by a diverter belt **50** that is disposed transversely over a feed belt **34** as seen in FIG. 10. The feed belt **34** is trained around an idler roller **36** and around a drive roller **38** that is driven from a main drive shaft **44** by means of a countershaft **39**, sprocket **40**, chain **46**, and sprocket **42**. The diverter belt **50** is disposed around an idler pulley **54** and around a drive pulley **56** that is driven from main shaft **44** through a shaft **60**, a pulley **61**, belt **62**, and pulley **63**. The diverter belt **50** is arranged to intercept articles advancing on belt **34** and transfer them to belt **68**. The feed belt **34** and diverter belt **50** are part of a conveying, spacing and orienting system that is disclosed in the patent application of Thomas G. Cox et al., entitled Container Filling Machine, Ser. No. 409,529, which is assigned to the assigne of the present invention. It will be evident of course that articles may be manually placed directly in suitably spaced relation on the belt **68** in the desired oriented position by an operator. The belt **68** delivers the sections to the filling unit **86** where they are directed into a rapidly spinning container C positioned beneath the filling unit by the container positioning unit **88**. When the container C is filled, the supplying conveyor **68** is stopped, the filled container is replaced by an empty container, and the filling cycle repeated.

The articles are fed onto the supplying belt **68** with substantially all of them being positioned with their thin concave edges near the center of the belt **68** and their thick edges toward the outer edge of the belt **68** substantially as shown by section S in FIG. 3. Near the discharge end of belt **68**, a slanted guide **84** (FIG. 2) that overlies the inner edge of the belt intercepts the sections and directs them toward a guide **82** (FIG. 3) adjacent the outer edge. As best shown in FIG. 10, the belt **68** is trained about a pair of idler rollers **69** and **70** and a driven roller **71**, respectively. A shaft **72** is journalled in the frame **10** and is fixed to the roller **71** at one end and to a sprocket **73** at its other end. A chain **75** is trained about the sprocket **73** and a second sprocket **74** which is fixed to a main drive shaft **44**.

The container filling unit **86** is mounted on the frame **10** adjacent the discharge end of the supplying conveyor **68** and comprises a sensing member or chute **90**, best shown in FIGS. 2 and 3 in the shape of a wedge having a top wall **92**, a bottom wall **93** and an upstanding side plate **94**. The top wall **92** is bent as at **92***a* and provides a wall portion which prevents sections from falling between the chute **90** and the belt **68**. A lever **97** is secured to plate

94 by capscrews 95 and is spaced therefrom by spacers 96. The lever 97 has a rearwardly extending arm 97*a* that is setscrewed to a switch rod 99 pivotally journalled on the frame 10 as seen in FIG. 6.

The chute 90 is disposed almost entirely inside a container guard 102 which, as seen in FIG. 7 is a generally cylindrical member having a large part of one side wall cut away and having an arm 102*a* projecting generally tangentially to the main cylindrical portion of the guard. Referring to FIG. 2, it will be noted that the lowermost one of the spacers 96 abuts the upper edge of the tangential arm 102*a*. Accordingly, when the guard 102 is moved upwardly, the arm 102*a* engages the spacer and pivots the chute 90 upwardly.

The cylindrical container guard 102 has laterally projecting tabs that are welded to a pair of vertical bars 103 that are secured to hubs 103*a* mounted for vertical reciprocal movement on a pair of guide rods 104 (FIGS. 2 and 5). The guide rods 104 are fixed at their upper ends to a horizontal plate 105 which is mounted on two spaced, longitudinally extending channels 111 and 111*a* (FIG. 3) of the frame 10 by bolts 107 (FIG. 2) which clamp two vertical transverse plates 111*b* between the plate 105 and the longitudinal channels 111 and 111*a*. Vertical movement of the cylindrical container guard 102 is provided by any conventional double acting pneumatic power cylinder or actuator 106 which is energized by solenoid controlled air valves and is identical to all of the double acting pneumatic actuators hereinafter referred to. In general, each actuator includes a piston slidably mounted in a cylinder and having a piston rod projecting outwardly of the cylinder. A solenoid actuated air valve admits high pressure air to one end of the cylinder while the other end of the cylinder is vented. The pneumatic actuator 106 associated with the cylindrical guard 102 is secured by capscrews to the underside of the support plate 105, with its piston rod 108 fastened at its lower end to a hub 109 that carries two rigid horizontal support straps 110. As seen in FIG. 5, the straps 110 are also secured to the hubs 103*a* so that when air under pressure is directed to the cylinder 106, the can guard will be raised or lowered depending upon which end of the cylinder receives the air.

The switch rod 99 which, as aforementioned, is rotatably journalled in the frame 10, has a rotary contact 99*a* (FIGS. 2 and 6) setscrewed thereto at the opposite side of the belt 68 from the point of attachment of lever arm 97*a*. A cam 99*b* which is made of insulating material is secured in coaxial relation to the rotary contact 99*a*. The cam 99*b* has a lobe 99*c* which is arranged to engage a leaf spring contact member 100 to raise it away from the rotary contact member 99*a* or to permit the member 100 to move down into contact with the periphery of the member 99*a*. The leaf spring contact member 100 is mounted on an insulated block 112 that is secured to a support lever 112*a* which has an end portion rotatably supported on the rod 99. A spring 112*b* urges the lever 112*a* in a counterclockwise direction (FIG. 2) to hold the block 112 against an adjustable stop screw 112*c*.

A cylindrical support shaft 113 (FIGS. 2 and 3) is rotatably journalled in a horizontal tube 114 fixed to the outside of the container guard 102. A support strap 116 is fixed at one end to the shaft and at its other end to a rotary presser mechanism 118. The presser mechanism 118 comprises a shaft 120 journalled in a tube 122 mounted in fixed position on the strap 116 and fastened at its upper end to a small electric motor 124 and at its lower end to a frusto-conical presser roller 126. The lowermost surface of the roller is maintained in a horizontal plane when in its operative position. As is best seen in FIG. 3, a small spring 128 is fastened to the presser mechanism 118 and to the channel 111 to help support the roller 126 in its horizontal position since the weight of the pressing mechanism 118 tends to pivot it downwardly about the longitudinal axis of the horizontal support shaft 113. The size and strength of the spring 128 is dependent upon the amount of pressure to be applied by the roller. A stopscrew 130 is adjustably threaded into a boss 131 (FIG. 2) integral with the container guard 102 and provides a stop to arrest the downward pivotable movement of the roller 126. By adjusting the stopscrew 130, the roller 126 can be extended into the open top of the container guard 102 a desired amount. When a container C is positioned beneath the container guard 102, a switch, later to be described, energizes a circuit to operate a solenoid valve and energize the pneumatic actuator 106, causing the container guide 102 to be lowered and allowing the chute 90 to pivot downwardly into the open upper end of the container C as shown in FIG. 2. The roller 126 also moves downwardly until the lowermost surface of the roller 126 lies slightly below the top of the container C at the side of the container guide 102 opposite to the chute 90 as seen in FIG. 3. Grapefruit sections S, which are discharged from the filler conveyor 68 at a rate of approximately 140 feet per minute, strike the upper surface 92 of the wedge shaped chute 90 and are guided into engagement with the inner cylindrical wall of the rotating container C. Substantially all of the sections are orientated such that their thick edges abut the wall of the container.

The container positioning unit 88 (FIGS. 4, 5 and 8) is disposed just below the filling unit 86 and comprises a horizontal container carrying chain 136 continuously driven in a direction normal to the direction of travel of the delivery belt 68. In the embodiment shown, the chain 136 is trained about a plurality of idler sprockets 138, only one shown, (FIG. 10) and a drive sprocket 140 mounted on a rotary shaft 142. A sprocket 144 is also keyed to shaft 142, said sprocket being connected to a sprocket 145 mounted on the shaft of a motor 146 by a chain 147. The container conveying chain 136 is mounted at one end in an intake guide track 150 (FIG. 3) which includes a pair of side walls 152 that assure proper alignment of the containers C on the container carrying chain 136 as they approach the filling station directly below the guard 102. Fastened to the side walls 152 of the intake guide track 150 in the iimmediate vicinity of the filling unit 86 are two parallel horizontal guide rods 154 which are spaced apart the same distance as walls 152 and assure proper alignment of the containers C on the carrying chain 136 through the area beneath the filling unit 86. The horizontal guide rods are fastened at their other ends in a like manner to two side walls 156 of a discharge guide track 158 similar to the intake guide track 150 to assure proper alignment of the containers C on the carrying chain 136 after being filled at the filling station.

A chain support bar 160 (FIGS. 5 and 8) is pivotably connected at one end to the frame 10 by a horizontal pin 160*a*. A post 162 projects downwardly from the chain support bar 160 near its free end, and a freely rotatable roller 164 is mounted on the lower end of the post 162. The roller 164 rests on a leg 166*a* of an L-shaped cam support lever 166 which has a hub 166*b* pivotably mounted on a pivot post 168 which is fastened to the frame 10 beneath the discharge guide track 158. The leg 166*a* rests on a horizontal bearing strip 170 also fastened to the frame 10. A link 172 is pivotally fastened to the cam support lever 166 approximately midway between its ends and is fastened to a double acting pneumatic actuator 174 (FIG. 3) fastened to the frame 10. The actuator 174 is operated by solenoid controlled air valve which will be described presently. A cam plate 176 is mounted on the upper surface of the leg 166*a* of the support lever 166 in alignment with the roller 164 supporting the chain support bar 160. Energization of the pneumatic actuator 174 to swing the lever 166 clockwise (FIG. 15) brings the cam plate 176 into engagement with the support roller 164 and swings the chain support bar 160 upward to raise the chain to its container carrying position. Conversely, when the pneumatic actuator 174 moves the L-shaped cam support lever 166 counterclockwise, the cam plate 176 moves out of engagement with the

support roller **164**, lowering the chain support bar **160** into a position in which the carrying chain **136** is below its normal container-supporting position. As will appear presently, this chain lowering action takes place when the container arrives at the filling station so that it is no longer moved forwardly by the continuously moving chain.

A spool-carrying arm **178**, which is disposed above lever **166** and also has a hub **178***a* mounted on the pivot post **168** for pivotable movement in a horizontal plane, is supported at its free end by a roller **180** journalled in a block **181** fastened to the free end of the arm **178**. The roller **180** rolls along the upper surface of the L-shaped cam support lever **166** and the arm **178** is biased to pivot in a counterclockwise direction by a spring **182** that is fastened to a peg **183** on the cam support lever **166**. Intermediate its length, the lever **166** is provided with a stopscrew **184** that is mounted on an angle tab block **186** which is fastened to the inner edge of the lever **166**. The stopscrew **184** lies in the same plane as the spool-carrying arm **178** so that clockwise pivoting of the cam support lever **166** will bring the stopscrew **184** into engagement with the spool-carrying arm **178** causing both to move simultaneously in a clockwise direction. A pair of rotary can-spinner spools **188** are journalled on posts **190***a* (FIG. 9) projecting upwardly from plates **190** fixed on the upper surface of the spool-carrying arm **178** and a toothed pulley **189** is secured concentrically on each spool. A third rotary spool **192**, which carries a toothed pulley **193**, is rotatably journalled on a similar, fixed upstanding post. The two spools **188** (FIG. 5) are circular in cross-section and form the corners of the base of a triangle (when viewed from above) while the spool **192** is elliptical in horizontal cross-section and is positioned at the apex of the triangle. The spools are circumscribed by traction sleeves **194** which provide a highly frictional surface for engaging the outer cylindrical surface of the cylindrical container C. The cam plate **176** and the stopscrew **184** mounted on the L-shaped cam support lever **166** are adjusted so that, when a container is carried by the chain to a position directly under the container guard **102**, and the support lever **166** is pivoted counterclockwise (FIG. 8), the cam plate **176** will become disengaged from the support roller **164**, lowering the chain support bar **160**, while the two outer spools **188** move inwardly toward the empty container C due to the biasing action of the spring **182**. The L-shaped cam support lever **166** continues to swing inwardly, disengaging the stopscrew **184** from the spool-carrying arm **178** and leaving the spools **188** firmly biased by the spring **182** against the container C. The arrangement is such that the chain **136** is lowered, immediately after the spinner spools move into engagement with the container.

The spools **188** have annular grooves **188***a* adjacent a beveled edge **188***b*, and spool **189** has a groove **192***a* adjacent a beveled edge **192***b*. The edges **188***b* and **192***b* provide container contacting surfaces which are slightly above the level of the conveyor chain to aid in lifting the container from the container carrying chain **136**, since the biasing of the two outer spools **188** against the container forces the chime of the container against the inner spool **192** to cause the can to move upward on the beveled edges. When the chime has risen to the top of the beveled edge, it fits snugly within the grooves **188***a* and **192***a* in the spools with the wall of the container firmly held by the sleeves **194** on the spools. The engagement of the chime of the can in the grooves **188***a* and **192**a prevents the can from moving upward during spinning. It should be noted that, whereas the embodiment described shows the two spools **188** moveable to engage the container C and force it against the single stationary spool **194**, a single spool could be moveably positioned to engage the container and force it against two stationary spools. Since the stop bar **205** stops the container C at a point such that the center of the container lies on a line which is perpendicular to the base line of the triangle formed by the three spools, it is immaterial whether a single spool is moved inwardly by the spool support bar **178** or a pair of spools are moved inwardly as in the embodiment shown.

Empty containers C enter the filling station one at a time and in timed relation. This movement of the cans from the intake guide track **150** is controlled by a gate member **196** (FIG. 3) that is pivotably mounted on a post **197** for horizontal movement above the can carrying chain **136**. The gate member **196** is a generally flat member and is provided with a container stopping arm **198** that is arranged to halt a row of containers carried by the continuously moving container carrying chain **136**. Adjacent the container stopping arm **198** is a first curved extension **200** which has a concave surface of a radius slightly larger than the radius of the container. Adjacent the first curved extension **200** is a second curved extension **202** having a convex surface of a radius much greater than the first. A connecting link **204** is connected at one end to the gate member **196** near the container stopping arm **198** and is connected at its other end to a double acting pneumatic actuator **203** (of the type previously described) connected to the frame **10**. The pneumatic actuator **203** is energized by solenoid controlled air valves. Thus, when the first empty container engages the container stopping arm **198**, the row of empty containers following the first container in abutting relation are halted with the container carrying chain **136** sliding under the containers. When the pneumatic actuator **203** retracts the link **204** and swings the container stopping arm **198** counterclockwise (FIG. 3), the first curved extension **200** is also swung counterclockwise, engaging the first empty container and causing the corner surface of the second curved extension **202** to abut the empty container next in line and prevents it from being advanced. Further pivotal movement of the gate member **196** completely retracts the container stopping arm **198**, freeing the trapped container and permitting it to move with the container carrying chain **136** toward the container filling unit **86** while the second curved extension **202** halts the remaining row of containers. Reversing the direction of movement of the link **204** withdraws the second curved extension **202** from its engagement with the row of containers and permits the first container in the row to move into abutment with the container stopping arm **198**.

The container C released from the row is carried by the container carrying chain **136** toward a position under the cylindrical can guard **102** until it engages against a stop bar **205** (FIGS. 3 and 5) which, at this time projects outwardly over the endless chain **136** in the path of movement of the can. The stop bar **205** (FIG. 4) is mounted on a block **205***a* that is pivotally supported between set-collars on a cylindrical post **206** projecting upwardly from a fixed plate **207**. The piston rod **208***a* of a double acting pneumatic power cylinder **208** is connected by a universal joint **209** to a link **211** that is pivoted to a lever **212** projecting from the block **205***a*. When the piston rod **208***a* is moved inwardly of the cylinder **208**, the stop bar **205** is swung counterclockwise (FIG. 5) to its can-intercepting position of FIG. 5; when the piston rod **208***a* is moved out of the cylinder, the stop bar is swung clockwise permitting the arrested can to advance on the chain.

A switch control rod **210** (FIG. 5) is mounted on a block **213** that is keyed to a shaft **214** journalled in a support block **215** (FIG. 5) secured to the stop bar **205**. The control rod **210** has an end portion **210***a* (FIG. 5) that projects over the path of the oncoming can and is so positioned that it is engaged by the can before the can engages the stop bar. The shaft **214** has a rotary cam **216** keyed thereto, said cam having a lobe **216***a* adapted to hold a contact strip **217** in spaced relation above the periphery of a rotary contact **218** that is mounted on the shaft **214**. The shaft **214** is connected to ground through a conductor **219** and the contact strip **217**, which is mounted on the stop bar **205** has a con-

ductor, not shown, connected thereto. The stop bar **205** is made of any conventional non-conducting material so that the strip **217** is insulated from the machine. Referring to FIG. 5, it will be seen that, when a can engages the end **210***a* of the control rod **210**, it swings the shaft **214** counterclockwise, permitting the can to move into engagement with the stop bar and causing the rotary cam **216** to allow the contact strip **217** to lower into engagement with the periphery of the rotary contact **218**. The closing of these contacts starts a control operation which will be described presently.

All three spinner spools (FIG. 10) are driven by a timing belt **221** which is trained about a toothed drive pulley **222** mounted on a rotatable, vertical shaft **223***a* and around the spool pulleys **189** and **193**. The shaft **223***a* is mounted in a gear box **223** fastened to the frame of the machine, the gears of which are driven by a drive chain **224** that is trained around a sprocket **225** and around a second drive sprocket **226** mounted on the shaft **142** driven by the motor **146**. Since the amount of friction between the articles being fed into a container and the container wall varies depending on the article being handled and the material of the container, the rotational speed required will also vary depending upon the article being handled. The rotational speed must be such that the centrifugal force acting on the article which is imparted by the rotating container will result in a frictional resistance force between the article and the wall of the container which will be slightly less than the gravitational force acting on the article thus causing the article to slide down the container wall. The embodiment shown is for filling grapefruit sections into a No. 301 tin container, which has an outside diameter of approximately 3 1/16 inches. This embodiment is shown for illustrative purposes only, it being understood that the principle of the invention is also applicable for other articles and different size containers made of different materials. Accordingly, the chain drive to the gear box **223** can be modified as desired to obtain the desired speed of rotation of the spools. The spools in the embodiment shown are rotated at a rate of approximately 420 r.p.m. The resultant container rotation is approximately 140 r.p.m., which was found to be the speed required to have a grapefruit section slowly slide down the wall of the tin container, and the lateral shake due to the elliptical shape of the inner spool **192** results in the container being shaken or vibrated at a frequency of approximately 840 vibrations per minute.

Further drive arrangements, as best shown schematically in FIG. 10 show the supplying belt **68**, the transfer belt **50**, and feed belt **34** being driven from the main shaft **44** through an electromagnetic slip clutch **228** which has a driven element attached to the shaft **44** and a drive element attached to a large tubular shaft **229**. The shaft **229** is driven through a belt and pulley mechanism **230** by a shaft **231** which, in turn, is driven through a belt and pulley device **232** by an electric motor **233**. Accordingly, while the spool drive and the drive for the container-carrying chain **136** are operated continuously, the drive to the article supply belt **68**, the feed belt **34**, and the transfer belt **50** may be halted by virtue of the electromagnetic clutch **228**. As mentioned above, the container-carrying chain **136**, the spools, and the drive to the electromagnetic clutch are started and remain continously driven during normal operations.

Referring to the control diagram of FIG. 11, it will be noted that seven solenoid-operated, air flow control valves **SV0–SV6** are shown. Valve **SV1** in line A of the diagram is associated with the air conduit to one end of the pneumatic actuator of power cylinder **203** that actuates the gate **196**, valve **SV5** in line O being connected in the conduit leading to the other end of the cylinder **203**. Valve **SV0** in line E controls the flow of air from a conduit **235** connected to a source of air under pressure to a supply conduit **236** that is connected to each of the valves **SV1–SV6**. Valve **SV2** in line G is connected in a conduit leading to one end of the power cylinder **208** associated with the can stop bar **205**, valve **SV5** in line O being connected in the conduit leading to the other end of the cylinder **208**. Valve **SV3** in line M is connected in the air conduit leading to one end of power cylinder **174** which controls the cam support lever **166**, valve **SV6** in line P being connected in the conduit leading to the other end of the cylinder **174**. Valve **SV4** in line N is connected in the conduit leading to one end of cylinder **106** that raises and lowers the container guard **102**, valve **SV6** in line P being connected in the conduit leading to the other end of cylinder **106**.

Each of the valves **SV1–SV6** is of the type, shown in FIGS. 12A and 12B, in which a solenoid is effective when energized to shift the spool of the valve toward the left to a position communicating the conduit that directs air to the associated power cylinder with either a vent connection or with a conduit **236***a* that is connected to the supply conduit **236** connected to the master valve **SV0**.

In referring to the valves in the control diagram, the term "normally closed" will be used to refer to a valve which has its inlet and vent connections located as shown in FIG. 12A which illustrates a "normally closed" valve. When the solenoid is in a normal or de-energized condition, the conduit leading to the power cylinder communicates through a slanted passage in a valve element V with a vent connection. When the solenoid is energized, the valve element V is shifted to the left to communicate the power cylinder conduit with one of the supply conduits **236***a*.

A "normally open" valve is shown in FIG. 12B and it will be noted that it differs from a "normally closed" valve only in that the vent connection and the air supply conduit **236***a* are reversed. Thus, when the solenoid is in a normal, de-energized condition, the power cylinder communicates through the valve element V with the air supply conduit **236***a* and, when the solenoid is energized, the power cylinder is vented.

In the control diagram of FIG. 11 conductors **L1–L4** are connected to a source of electric power in such a manner that a circuit between **L1** and **L3** will be subjected to 23 volt AC current and a circuit between **L2** and **L4** carries 115 volt AC current. To begin a cycle of operation a selector switch **244** is turned to ON position to close contacts in the lines **L3** and **L4**, and a valve (not shown) is opened to direct air under pressure to the master air valve **SV0**. The normally closed, solenoid-operated air valve **SV1** in line A is energized through conductors **248** and **252**, whereupon the valve is opened and air is directed through conduit **250** to one end of power cylinder **203**. Since the other end is vented through **SV5** in line O, the piston is moved in a direction to rotate the gate member **196** and retract the container stopping arm **198**, releasing one container while the remainder are halted by the second curved extension **202**. Simultaneously therewith, the rotary presser motor **124** in line C is started through circuit **251**, **253** for continuous operation. Also, through circuit **254** and **256**, the normally closed main air valve **SV0** in line E is opened to supply air to the other valves **SV1–SV6** including: the normally open valve **SV2** in line G which energizes the pneumatic actuator **208** to swing the stop bar **205** and switch rod **210** over the container-carrying chain **136** to a container stopping position; the normally open valve **SV3** in line M which energized the pneumatic actuator **174** which retracts the cam support lever **166** to raise the chain carrying bar **160** and moves the spool-carrying bar **178** away from the filling unit **86**; and the normally open valve **SV4** in line N which energizes the pneumatic actuator **106** to raise the cylindrical guard **102**, the rotary presser **118**, and the sensing member or chute **90**. Hence an empty container C is free to travel on the carrying chain **136** to a position beneath the cylindrical guard **102**. At this time, the contact points **99***a* and **100** in line

V that are associated with the sensing member or chute **90** are also opened.

When an empty container C reaches the filling station beneath cylindrical guard **102**, it moves into engagement with the stop bar **205**, while actuating the switch rod **210** to cause the contact points **217** and **218** in line T to close and simultaneously start the following operations: the time delay relay **1R** in line S is energized through the 24 volt circuit **268, 270, 271** closing relay contacts **1R–1** in line T and **1R–3** in line Q; the clutch **228** in line U is energized through the circuit **255, 259, 261** to start the operation of the article supply belt **68**, the feed belt **34**, and the orientator belt **50**; and the four-pole relay **2R** in line Q is energized through circuit **260** and **263**. The four-pole relay **2R** in line Q being energized, the contacts **2R–1** in line G. **2R–2** in line L, **2R–3** in line K, and **2R–4** in line S are closed and the following simultaneous operations occur: the solenoids of the normally open valves **SV2** (line G), **SV3** (line M), and **SV4** (line N) are energized through circuits **274, 282, 284**; **274, 286, 288** and **274, 286, 290**, respectively, and the valves are closed; also, the solenoids of the normally closed valves **SV5** (line O) and **SV6** (line P) are energized to open through circuits **274, 276, 280** and **274, 276, 278**, respectively, and these valves are opened. Opening of valve **SV6** causes the pneumatic actuator **174** to move the cam support arm **166** inwardly, permitting the spring-biased spool-carrying bar **178** to move the beveled spools **188** under the container and lift it off the chain **136** and lower the chain. With the valve **SV4** now closed and valve **SV6** open, air also energizes the pneumatic actuator **106**, lowering the cylindrical guard **102**, the rotary presser roller **126**, and the chute **90** into an operative position. When the chute **90** is lowered, the contacts **99*a*** and **100** are closed and set up a holding circuit through the circuit **268, 270, 292, 271** to keep relay **1R** energized. Since valve **SV2** is now closed or vented and valve **SV5** is opened, air is directed through conduit **295** to the pneumatic actuator **208** to retract the stop bar **205** and the switch rod **210** carried by bar **205** to a position parallel to the container carrying chain **136**, and air is directed through conduit **297** to the pneumatic actuator **203** for rotating the gate member **196** and returning the container stopping arm **198** to its operative position permitting the row of empty containers to move into engagement therewith. Retraction of the switch rod **210** opens the contacts **217** and **218**; however, since the holding circuit through contacts **99*a*** and **100** is still closed, the relay **1R** remains energized.

Simultaneously with the preceding operation, the two-pole relay **3R** in line I is energized through circuit **274, 282, 299** and the following operations occur: contact **3R–1** in line A is opened, breaking the circuit **248, 252** to the solenoid of valve **SV1**, and valve **SV1** returns to its normally closed position, permitting the pneumatic actuator **203** to be moved by air admitted through conduit **297** and valve **SV5**, as mentioned above; contact **3R–2** in line H is closed and the circuit **274, 300, 302, 282, 299** forms a holding circuit for the two-pole relay **3R** through normally closed contacts of a reset switch **298** which, as seen in FIGURE 3, has an actuator rod **298*a*** disposed in the path of movement of a can toward the can discharge section **158**.

The container C is now being filled with grapefruit sections S leaving the supply **68** at a velocity of approximately **140** feet per minute and are guided by the chute **90** against the inside cylindrical wall of the shaking and rotating container C where the orientated sections slowly slide downward in a pack with their thick edges adjacent the container wall. Smaller pieces and unorientated sections do not remain against the wall since they tend to topple to the center of the container due to their thin edges losing contact with the spinning wall. In other words, since thin sections or broken pieces are unorientated, they strike the container wall in random positions, such as, at the points of their crescent shaped thin edges, and fall to the center of the container.

As the container is filled, the sections build up and raise the sensing member or chute **90**. When the chute **90** is raised it pivots the rod **99** (FIG. 2) and at a predetermined level opens the contact points **99*a*** and **100** (line T). This breaks the holding circuit **268, 270, 292, 271** and thereby deenergizes the time delay relay **1R**. The time delay relay **1R** may be of any commercial type, for example, the type manufactured by the Allen-Bradley Company, Milwaukee, Wis., Mod. BX, having an Off-Delay with one set of auxiliary points. The set of contacts **1R–3** in line Q are delayed-action contacts that are closed after the ½ second delay, the other set of contacts **1R–1** in line T is not delayed-action contact and it acts immediately upon energization or de-energization of relay **1R**.

Once the time delay relay **1R** is de-energized the following simultaneous operations occur on the non-time relay side; contacts **1R–1** in line T are opened and the circuit **255, 259, 261** is broken and the rectifier **304** and electromagnetic clutch **228** are de-energized, disengaging the clutch **228** to stop the orientator belt **50**, the feed belt **34** and the supply belt **68**. For the duration of a pre-set time delay, approximately equal to the time for one rotation of the container or ½ second, the contacts **1R–3** remain closed, relay **2R** remains energized, and the filled container C is held at the filling station for further pressing with the presser roller **126**. At the end of the delay period, contacts **1R–3** open and relay **2R** is de-energized, permitting the filled container to be carried away from the filling station.

The time delay contacts **1R–3** of relay **1R** are effective to prevent the container from being carried out of the machine before it is filled, as when one section S extends higher than any of the others, in a partially filled container, and lifts the chute **90** to open the contacts **99*a*** and **100**. Since this one section will pass out from under the chute and allow the contacts **99*a*** and **100** to close before the ½ second time delay, the container will not be discharged and the filling process will continue until the sections S in a properly filled container again raise the sensing chute and re-open the limit switch points **99*a*** and **100**. When the chute **90** is raised to a desired elevation, as for example, the elevation shown in phantom lines in FIGURE 2 and held there for the one full rotation of the container (in other words, after the pre-set delay period has expired), the contacts **1R–3** are also opened and the circuit **260, 263** is broken, de-energizing the four-pole relay **2R** and the following simultaneous operations occur: the contacts **2R–2** in line L are opened and the circuit **274, 276, 280** is broken, the solenoid of valve **SV5** is de-energized and the valve returns to its normally closed position; circuit **274, 276, 278** is also broken and the solenoid of valve **SV6** is de-energized and the valve returns to its normally closed position; the contacts **2R–3** in line K are opened and the circuit **274, 286, 288** is broken to de-energize the solenoid of valve **SV3** and return the valve to its normally open position. Air is fed to the pneumatic actuator **174** to retract the spool carrying arm **178** and the cam support lever **166**, and lift the container carrying chain **136** causing the filled container C to be moved toward the discharge guide track **158** and the re-set switch rod **298*a***; the circuit **274, 286, 290** also is broken and the solenoid of valve **SV4** is de-energized to return it to its normally open poistion. Air is fed thus to the pneumatic actuator **106** to raise the cylindrical container guard **102**, the presser roller **126**, and the chute **90**. The contacts **2R–1** are opened and the circuit **274, 282, 299** is broken, but the solenoid of valve **SV2** remains energized through the circuit **274, 300, 302, 282, 284** and the stop bar **210** and contacts **217** and **218** remain in retracted position. The circuit **248, 252** remains broken due to the holding circuit **274, 300, 302, 299** holding the relay **3R** energized to keep contacts **3R–1** open, thus, valve **SV1** remains in the normally closed position, and the pneumatic actuator **203**

keeps the gate **196** in its extended position with the arm **198** stopping the row of containers.

When the filled container, now travelling toward the discharge guide track, **158** deflects rod **298***a* and actuates the re-set switch **298** the following simultaneous operations occur: the holding circuit **274, 300, 302, 282, 299** is broken and the two-pole relay **3R** is de-energized; with relay **3R** de-energized contacts **3R–1** in line A are closed to close the circuit **248, 252**, and energize the solenoid of valve **SV1**, whereby air is admitted to pneumatic actuator **203** to retract the gate **196** and release another container; the circuit **274, 300, 302, 282, 284** is broken, the solenoid of valve **SV–2** is de-energized, and the valve **SV2** returns to its normally open position. The pneumatic actuator **208** is energized to extend the stop arm **205** and the switch rod **210** again into the path of the oncoming empty container. Thus the processing line is again started on another filling cycle.

A modified form of the filling apparatus is shown in FIGURES 13 and 14. Generally the apparatus is identical to the embodiment previously described except that the container C is positioned in an off-set position to receive sections tangentially admitted into the container from the supplying belt **68** and certain other elements have been slightly changed. The tangential admission of the sections into the container is accomplished by guiding the sections along a line tangent to the container wall. A deflector plate **300** is mounted on the frame **10** closely confronting the upper surface of the supplying belt **68** and is angled so as to contact the thick edge of the citrus fruit sections and divert the sections toward the center of the belt **68**. The contanier guard **102** is mounted for reciprocating movement in a vertical plane in a position off-set from the center line of the supplying belt **68** and is otherwise identical to the previously described embodiment. A modified sensing member or chute **302** having a bottom wall **304** and an upstanding side wall **306** is disposed almost entirely in the guard **102** and is pivotably mounted for movement into the container C a distance such that the lower tip of the bottom wall **304** is approximately ¾ inch below the upper edge of the container. The bottom wall is bent as at **304***a* to provide a surface which prevents articles from falling between the chute **302** and the belt **68**, and a lower end **304***a* that is bent to conform to the inner surface of the wall of the container and is twisted so that its surface is inclined downwardly and inwardly toward the center of the container. The sidewall **306** has secured thereto by capscrews **308**, a lever **310** spaced from the wall **306** by spacers **312**. The lever **310** has a rearwardly extending arm **310***a* that is setscrewed to a switch rod **314** pivotably journalled on the frame **10**.

The switch rod **314** which, as aforementioned, is rotatably journalled in the frame **10**, extends away from the belt **68** and is also journalled in an upstanding plate **316** mounted on the frame **10**. A block **318** is setscrewed to the end of the rod **314** farthest from the belt **68** and has a shaft **320** fixed thereto which extends rearwardly therefrom. A small weight **322** is slidably mounted on the shaft **320** which tends to pivot the rod **314** and block **318** in a counterclockwise direction. Thus, the weight **322** serves to partially offset the weight of the chute **302** and makes the chute sensitive to upward pressure causing it to readily pivot the rod **314** in the frame **10**. Also, fastened to the top of the block **318** is a cam arm **324** which extends forwardly of the block **318** and supports a cam follower roller **326** journalled to one end of an actuator **328**. The actuator **328** is pivotably mounted at its opposite end in a switch **330** which houses a pair of contacts. The actuator **328** is fastened to one of said contacts in a manner such that pivotable movement of the block **318** in a counterclockwise direction will cause the cam follower to roll on the cam arm **324** and cause the actuator **328** to pivot upwardly and close the contacts in the switch **330**. Thus, when the chute **302** pivots downwardly into the container, the contacts in the switch **330** are allowed to close whereas upward movement of the chute **302** will open the contacts. Adjustment of the contacts to open and close at a predetermined position of the chute **302** in the container is provided by the setscrew mounting of the block **310** to the rod **314**. Thus, by releasing the block **318**, the chute **302** can be raised to a predetermined position without rotating the block **318**. When the position is reached the block is again securely fastened to the rod **314** whereby further upward movement of the chute **302** will open the contacts. Closing of the contacts in the switch **330** starts a control operation identical to the operation in the embodiment previously described.

Since the container guard **102** and its associated structure is off-set with respect to the center of the supplying belt **68**, the container positioning unit **88** is likewise off-set an equal amount. The container positioning unit **88** is identical to the previously described embodiment with the exception of a modified switch **340** and a modified bar **341**. The switch **340** has a switch control rod **342** pinned thereto at one end and has an end portion **342***a* that projects over the path of the oncoming container and is so positioned that it is engaged by the container before the container engages the stop bar **341**. When the container engages the end **342***a* of the rod **342**, it closes a pair of contacts in the switch **340** and starts a control operation identical to the operation in the embodiment previously described.

The main advantage in the modified apparatus is in the manner of admitting sections S into the container C. As best shown in FIG. 14, a section S travels on the belt **68** and is deflected by the plate **300** toward the center of the belt. Since most of the sections on the belt **68** are in an orientated position, only the thick edges of these sections will engage the deflector plate **300**.

As the deflector plate **300** is disposed along a line which is tangent to the container, the sections deflected by the plate **300** are discharged from the belt **68** and admitted tangentially into the container. The tangential admission assists in guiding the sections against the inside cylindrical wall of the spinning container wherein the section slowly slides downwardly in the container in the same manner as was described in the previous embodiment.

From the foregoing description it should be apparent that the invention provides an advantageous apparatus for effectively filling a cylindrical container with a plurality of articles and is particularly adapted for placing crescent shaped fruit sections in a container in an orderly manner whereby a "pack" is formed of substantially uniform density with very little breakage or damage to the sections. Although the machine has been described for use with citrus fruit sections, it should be noted that the principles embodied in the invention are equally applicable for filling containers with a variety of other objects, particularly those having crescent shapes defined by convex and concave surfaces.

It will be evident, of course, that the present filling machine can be effectively used with the article orientating mechanism which is disclosed in the above-mentioned Cox et al. application and includes the feed belt **34** and the diverter belt **50**. Although said orientating mechanism is not disclosed completely herein, it should be understood that reference may be had to said application for a complete disclosure of the orientating mechanism and that said disclosure is incorporated by reference herein.

While a preferred apparatus for carrying out the invention has been shown and described, it will be understood that it is capable of modification and variation while still operating according to the principles of the invention. It is to be understood, therefore, that the scope of the invention should be limited only by the scope and proper interpretation of the claims appended hereto.

Having thus described the invention, that which is believed to be new and for which protection by Letters Patent is desired is:

1. A method for filling containers with food products comprising the steps of supplying a row of spaced food products, feeding said products into a container and

against the inside cylindrical wall of the container, and while so feeding rotating said container at a speed such that the centrifugal force acting on said products results in a frictional resistance force between the products and the container wall which is just less than the gravitational force acting on the products so that the products slowly slide down the wall of the container.

2. A method for filling containers with a plurality of citrus sections having crescent shapes defined by convex and concave edges comprising the steps of supplying said sections in a spaced row with substantially all of said convex edges orientated in the same positions and at a predetermined linear velocity, guiding said sections into a cylindrical container with the convex edges of said sections abutting the concave inside wall of said container, and rotating said container at a speed such that the linear velocity of the container wall is approximately equal to said linear velocity of said sections.

3. Apparatus for filling a cylindrical container with a plurality of crescent-shaped articles having convex and concave edges comprising means for supplying said articles at a predetermined velocity, means for positioning a cylindrical container for receiving the articles, means for guiding the articles into the container with said convex edges abutting against the inside wall of the container, and means for rotating the container at a speed such that the centrifugal force applied to the articles by the rotation of the container results in a frictional resistance between the articles and the container wall which is slightly less than the gravitational force applied to the articles so that the articles slowly slide down the container wall.

4. Apparatus for filling a cylindrical container with a plurality of citrus fruit sections having convex edges comprising means for supplying said sections in a single row and in spaced relation at a predetermined velocity with substantially all of said sections having their convex edges orientated in the same positions, means for positioning a cylindrical container for receiving said sections, means for guiding the sections into the container with their convex edges abuttng the inside wall of the container, and means for rotating the container at a speed which results in the wall of the container having a tangential velocity equal to the predetermined velocity of the sections leaving said supplying means.

5. Apparatus for filling a cylindrical container with a plurality of fruit sections having crescent shapes defined by convex and concave edges comprising means for supplying said articles in a single spaced row, means for positioning a cylindrical container for receiving said articles, means for guiding said articles into said container with said convex edges abutting the inside wall of said container, and means for rotating said container at a speed which results in a linear velocity at the periphery of the container of approximately 140 feet per minute.

6. Apparatus for filling a container with a plurality of food products comprising means for supplying said products at a predetermined speed, means for guiding said products into said container and against the inside wall thereof, means for rotating said container at a speed such that the centrifugal force imparted to the products by the rotating container results in a frictional resistance force between the container wall and the product which is just less than the gravitational force acting on said products, and wherein the peripheral speed of the container is approximately equal to the predetermined speed of said products leaving said supplying means.

7. Apparatus for filling containers with a plurality of food products, means for supplying said food products, means for guiding said food products into a cylindrical container, means for rotating said container, a sensing device arranged to be actuated when said products reach a predetermined height in said container, and means for removing said container responsive to said sensing device

after a delay equal to the time required to rotate said container substantially one revolution.

8. Container filling apparatus comprising means for positioning a container at a filling station, drive means movable into and out of rotating engagement with the container at the filling station, actuating means for moving said drive means, a sensing device projecting into the container at the filling station and arranged to be raised in the container to a cut-off position by articles in the container, and a control circuit for said actuating means and having contacts responsive to movement of said sensing device to said cut-off position and including a time delay means for moving said drive means out of rotating engagement with the container when a predetermined interval has elapsed after said sensing device reaches cut-off position.

9. In container filling apparatus, a conveyor for positioning a container at a filling station, rotatable spinner members at said station, some of said spinner members being disposed on one side of said conveyor and the remainder of said members being mounted on the other side of the conveyor, each spinner having a container support surface adapted to be moved to a position underlying a container at said filling station, means for effecting relative movement between the spinner members on opposite sides of said conveyor to move said members into container supporting relation with the container on said conveyor, and means for rotating said spinner members.

10. Apparatus for filling a cylindrical container with a plurality of articles comprising means for supplying articles at a predetermined velocity, means for positioning a cylindrical container for receiving said articles, means for guiding said articles against the inner wall of said container, means for rotating said container at a speed whereby the articles slowly slide down the container wall, sensing means arranged to be actuated when said articles reach a predetermined height, and means responsive to said sensing means for stopping said supply means when said articles reach said height.

11. Apparatus for filling a container with a plurality of food products comprising means for supplying said products in a single row and in spaced relation, a filling unit positioned for receiving said products and for guiding said products into a cylindrical container, said filling unit including a chute positioned for guiding said products against the inside wall of said container, a roller positioned within said container for compacting said products within said container, and a container positioning unit for supporting and for rotating said container while said products are guided into said container.

12. Apparatus for filling a series of containers with a plurality of articles comprising means for supplying a plurality of articles in a row and in spaced relation; means for sequentially positioning a series of cylindrical containers to be filled into positions for receiving the articles; means for guiding the articles against the inside cylindrical walls of the containers to be filled; means for rotating the containers at a speed such that the articles slide slowly down the cylindrical wall; switch means arranged to be actuated by a container positioned at said article receiving position; said supplying means, said guiding means, and said positioning means being actuated for operation in response to said switching means.

13. Apparatus for filling a cylindrical container with a plurality of articles having crescent shapes defined by convex and concave surfaces comprising means for supplying the articles in a spaced row and at a predetermined velocity, means for positioning a cylindrical container for receiving said articles, means for guiding articles into the container with the convex surfaces abutting the inside wall of the container, means for rapidly rotating said container at a speed such that the articles are held against said container wall and permitted to slowly

slide down the container wall, and means for shaking said container.

14. In container filling apparatus, a conveyor chain having a container support surface, means mounting said chain for movement from a container supporting elevation to a lower elevation, a plurality of rotatable spinner members having container support surface adapted to underlie and support a container and having container rotating surfaces adapted to engage the side surface of a container to rotate the container incident to rotation of said spinner members, means mounting at least one of said spinner members for movement between a projected position in supporting and rotating engagement with a container on said chain and a retracted position, power means for sequentially moving said spinner member to said projected position and moving said chain to said lower elevation, and means for rotating said spinner members.

15. Container filling apparatus comprising a conveyor chain having a container support surface, means mounting said chain for movement from a container supporting elevation to a lower elevation, container support means having support surfaces movable from a retracted position spaced from said chain to a projected position adjacent said chain and in supporting relation to a container on said chain, and power means for sequentially moving said support means to said projected position and moving said chain to said lower elevation whereby the container is supported solely by said container support means.

16. Apparatus for filling a cylindrical container with a plurality of food products comprising means for supplying said products in a single spaced row, a filling unit positioned for receiving said products and for guiding said products into a plurality of cylindrical containers, a container-positioning unit for sequentially feeding each of a plurality of containers from an abutting row of containers, said container-positioning unit including a container-carrying chain supporting said containers and mounted for movement beneath said filling unit, a gate member positioned for pivotal movement over said chain into and out of a position abutting said row for sequentially releasing said containers, a first air powered mechanism for moving said gate member, a stop bar moveable into and out of a position over said chain for intercepting a container released by said gate member in a position for filling, a second air powered mechanism for moving said stop bar into and out of said intercepting position, a plurality of spools positioned for pivotal movement into and out of engagement with said container for supporting said container when in said filling position, means for rotating said spools when in said container supporting position, a third air powered mechanism for pivoting said spools into and out of said container supporting position, and a control circuit for operating said air powered mechanisms in a manner such that said containers are moved into said filling position and removed therefrom when filled.

17. In container filling apparatus, a support structure, a conveyor chain mounted for movement in a horizontal path, a track in supporting relation to said chain at a filling station, means mounting said track for movement from a raised position holding said chain at a predetermined elevation and a lowered position, a first spinner member mounted on one side of said chain, a plurality of moveable spinner members mounted on the opposite side of said chain, each of said spinners having a container support surface adapted to underlie and support a container on said chain and a frictional drive surface arranged to drivingly engage the side surface of the container, a first lever supporting said plurality of moveable spinner members, a second lever pivotally mounted on said structure, power means for moving said second lever from a retracted to a projected position, spring means connected between said first and second levers and operable during movement of said second lever to projected position for pivoting said first lever in a direction to move said moveable spinner members into supporting and driving engagement with a container, cam means operatively connected between said second lever and said chain track to lower said track to said lowered position as said second lever moves to projected position and subsequent to the engagement of the container by said moveable spinner members, and means for rotating said spinner members.

18. Apparatus for filling a cylindrical container with a plurality of articles comprising means for supplying a plurality of spaced articles in a single row and at a predetermined velocity, means for positioning a cylindrical container for receiving the articles, means for guiding each article against the inside cylindrical wall of the container as it is fed into the container, and means for rotating the container at a speed such that the centrifugal force applied to each article by the rotation of the container results in a frictional resistance between the article and the container wall which is slightly less than the gravitational force applied to the article so that the article slowly slides down the container wall.

19. In a container filling device having a conveyor for supplying a plurality of citrus fruit sections and a filling unit for guiding the sections into engagement with the inside surface of a spinning cylindrical container, the improvement comprising means for continuously rotating and shaking the cylindrical container including first rotatable spool means having a toothed pulley mounted thereto, second rotatable spool means having toothed pulleys mounted thereto, a timing belt operatively connected to said pulleys for continuously driving said spools, and means for alternately moving said spools into a container engaging position or into a container releasing position while said spools are being continuously driven by said timing belt.

20. In a container filling device having a conveyor for supplying a plurality of citrus fruit sections and a filling unit for guiding the sections into engagement with the inside surface of a cylindrical container, the improvement comprising means for rotating and shaking the cylindrical container including a first rotatable spool having an elliptical horizontal cross-section, a pair of rotatable spools having circular horizontal cross-sections, toothed pulleys mounted on said spools, a belt connected to said pulleys and to a drive means for continuously driving said spools, and means for biasing said spools into a container-engaging position wherein said container is simultaneously rotated and vibrated by said driven spools.

References Cited

UNITED STATES PATENTS

2,775,268	12/1956	Eckart	141—168 X
3,119,215	11/1964	Polk	53—239 X

TRAVIS S. McGEHEE, *Primary Examiner.*