Dec. 16, 1958 J. K. BRUCE 2,864,212

PACKAGING METHOD AND APPARATUS

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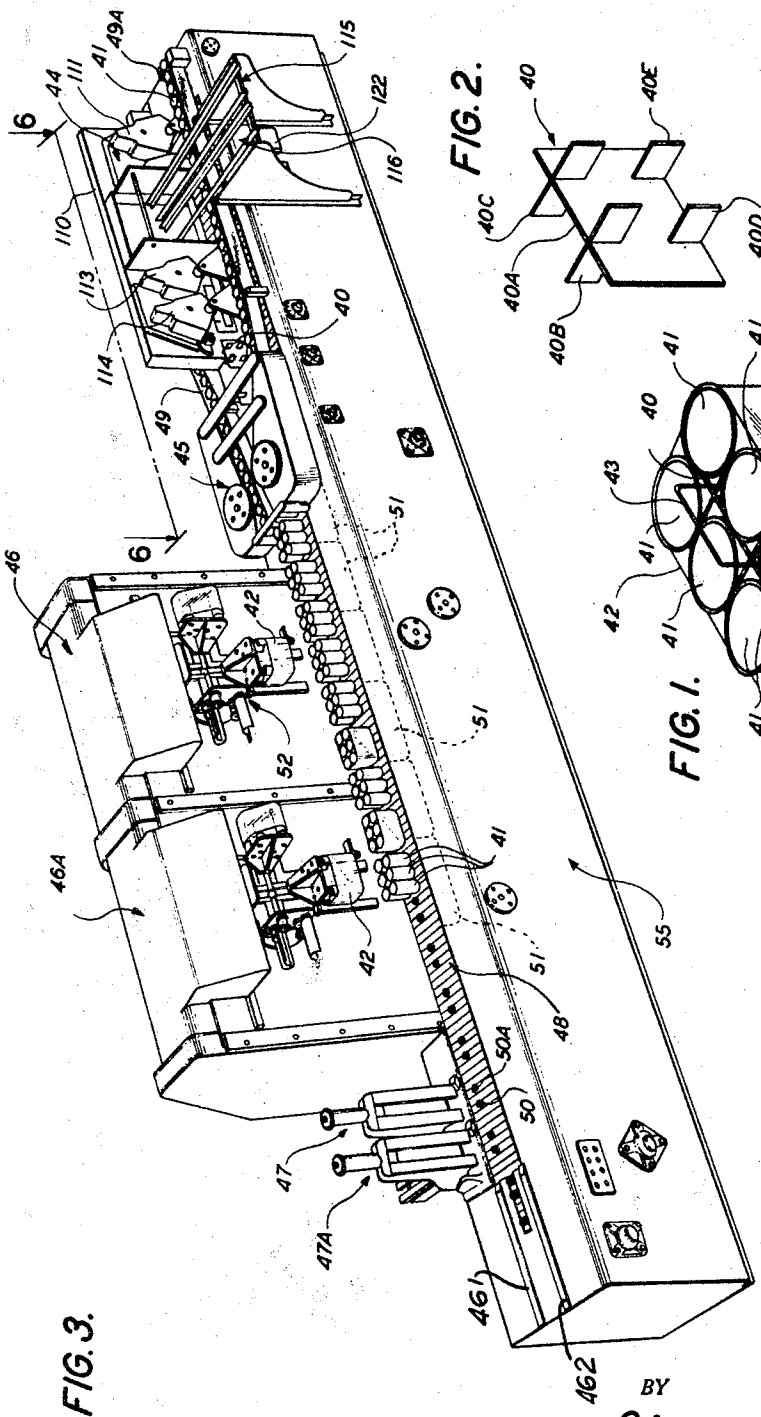


FIG. 3.

FIG. 2.

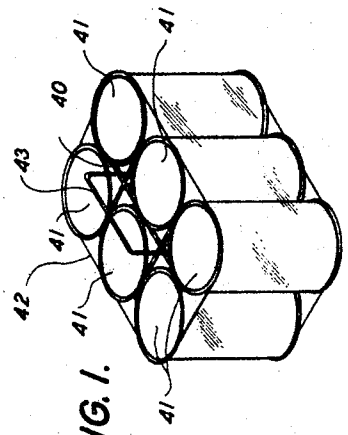


FIG. 1.

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PACKAGING METHOD AND APPARATUS

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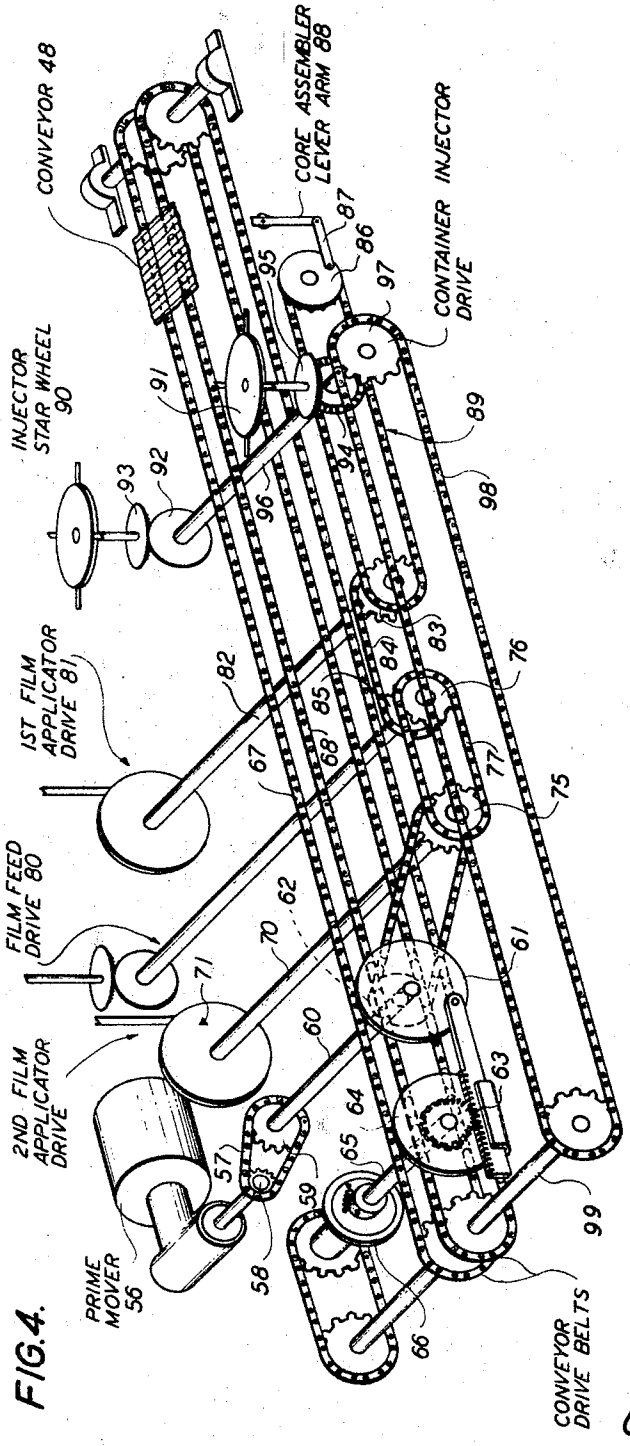


FIG. 4.

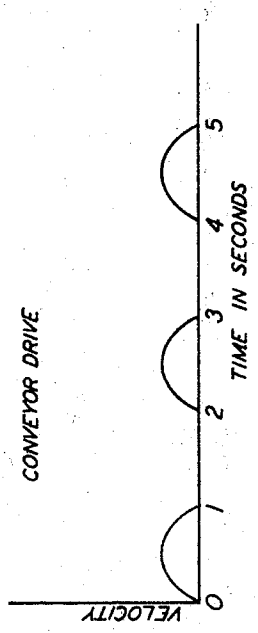


FIG. 5.

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Dec. 16, 1958 J. K. BRUCE 2,864,212

PACKAGING METHOD AND APPARATUS

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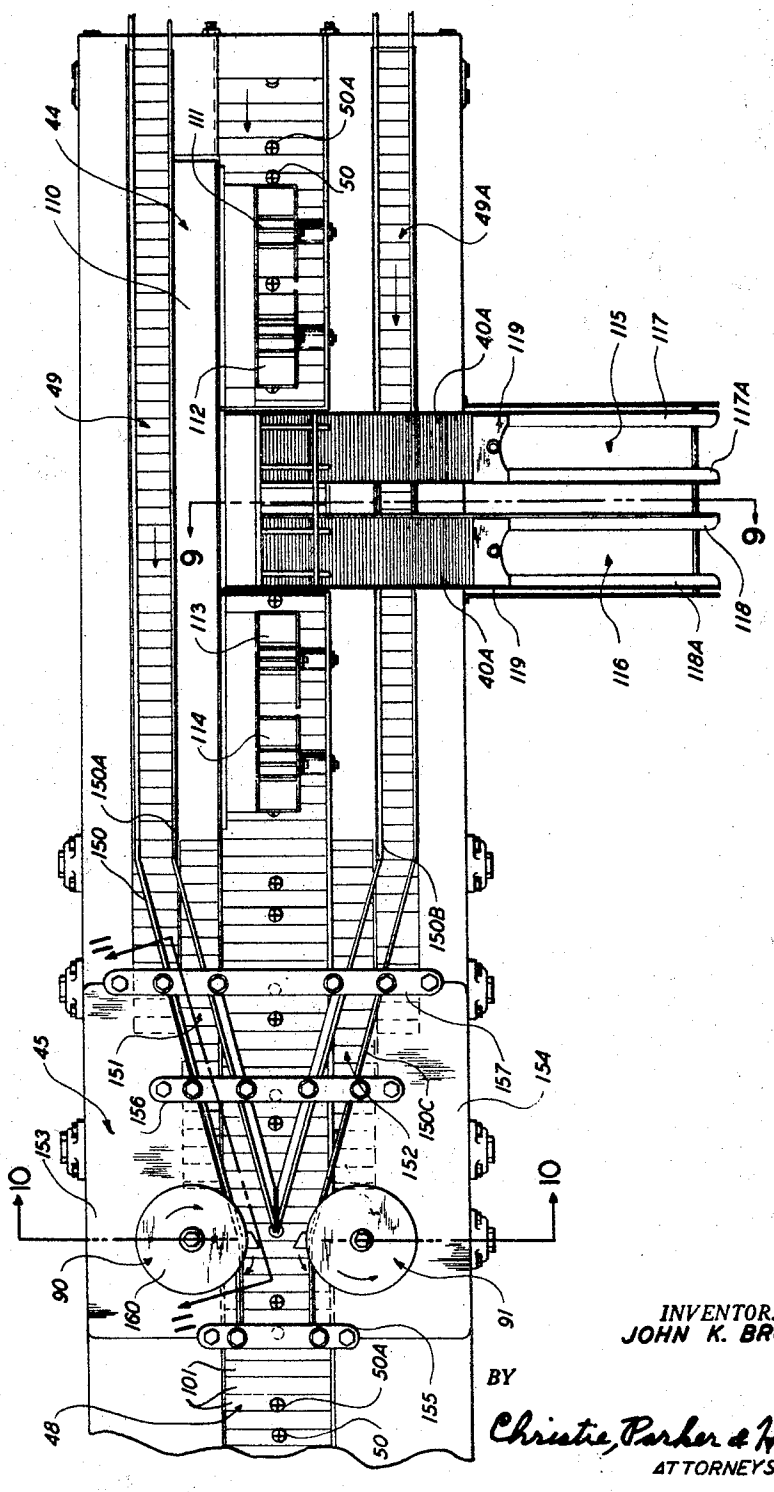


FIG. 6.

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PACKAGING METHOD AND APPARATUS

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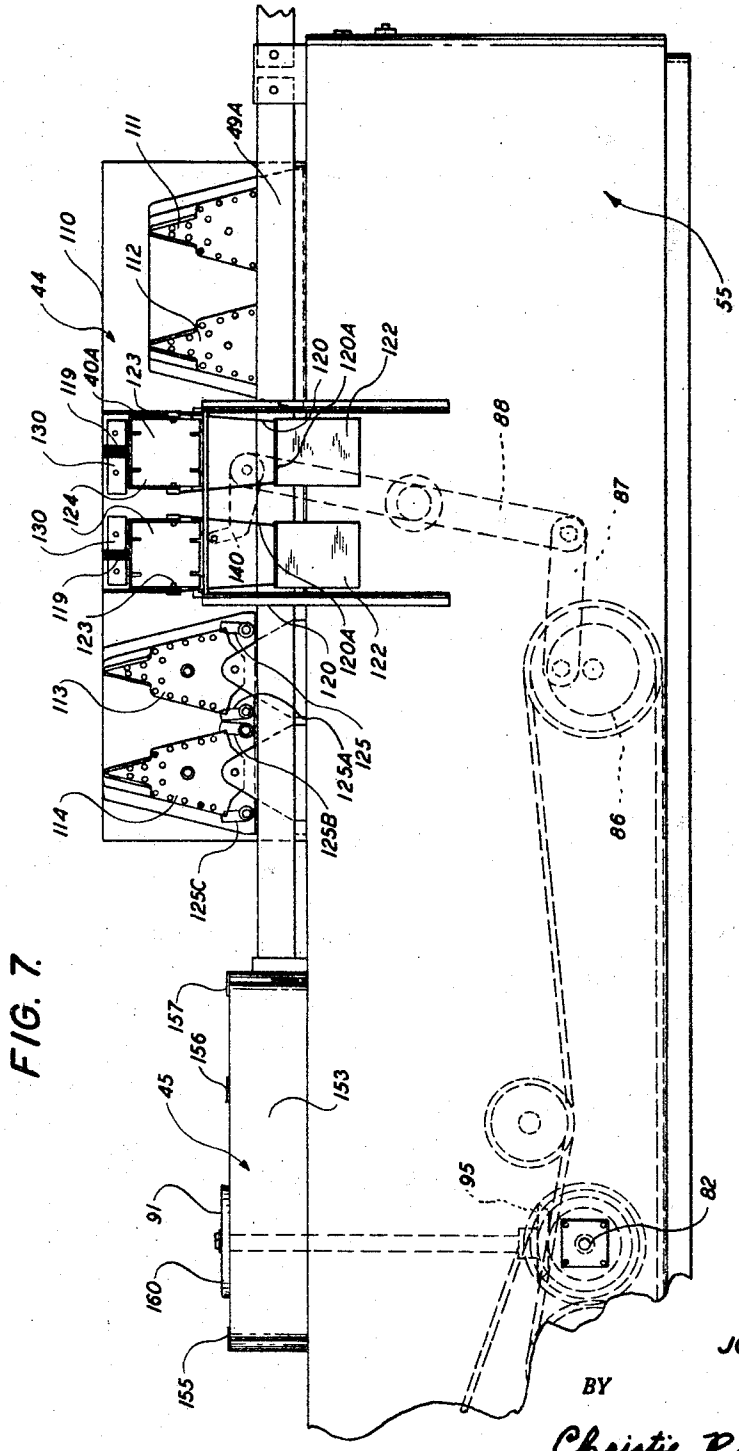


FIG. 7.

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Dec. 16, 1958 J. K. BRUCE 2,864,212

PACKAGING METHOD AND APPARATUS

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FIG. 8.

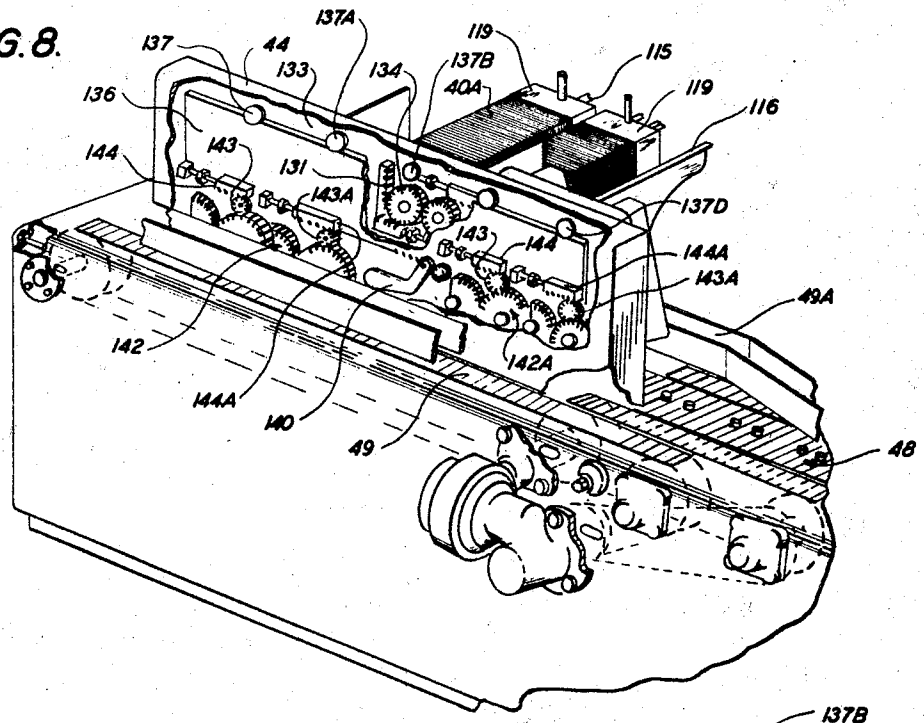
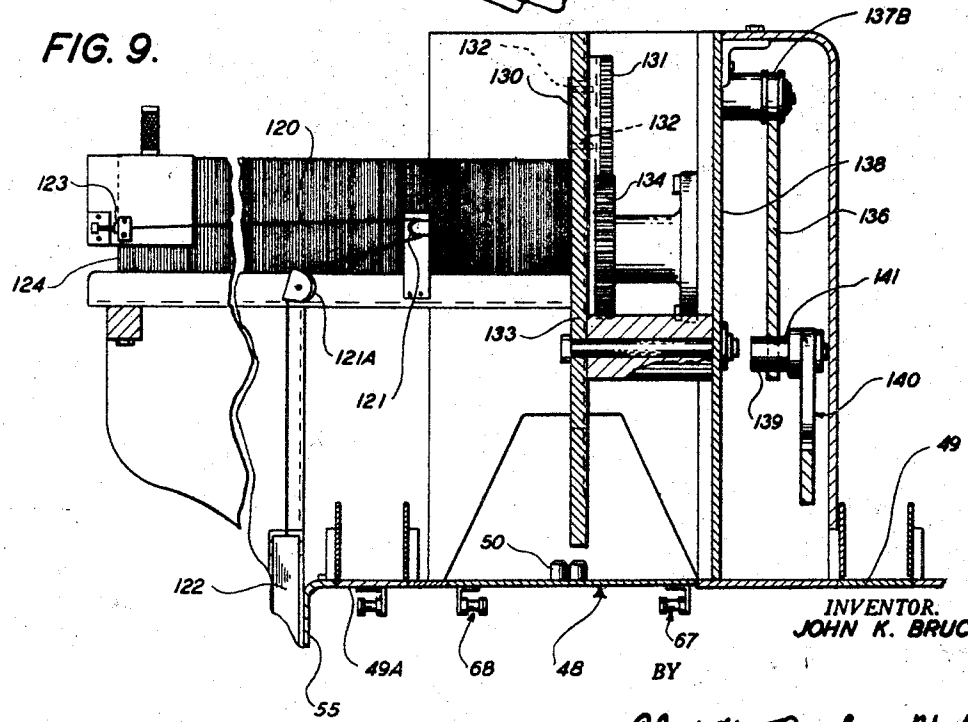


FIG. 9.



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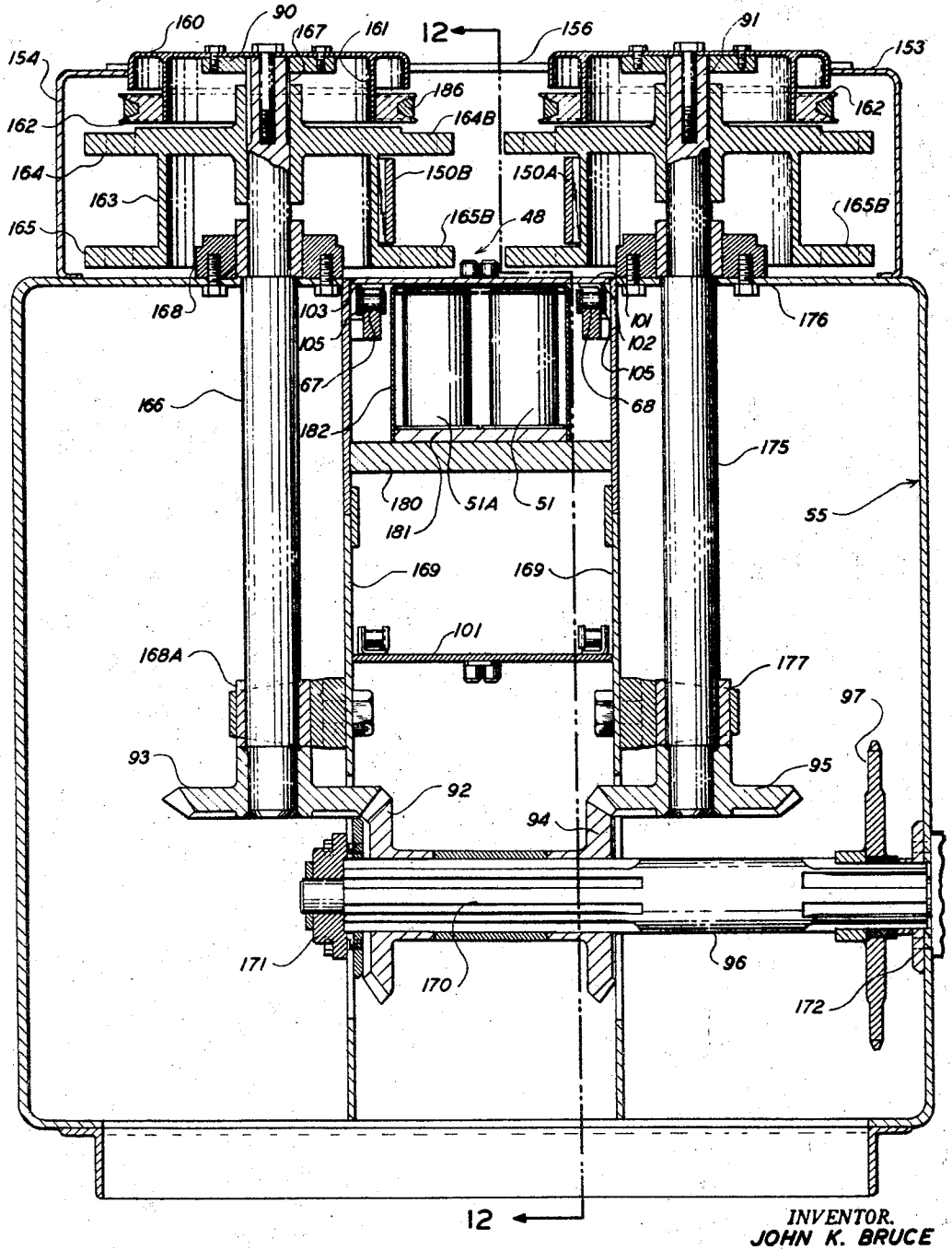


FIG. 10.

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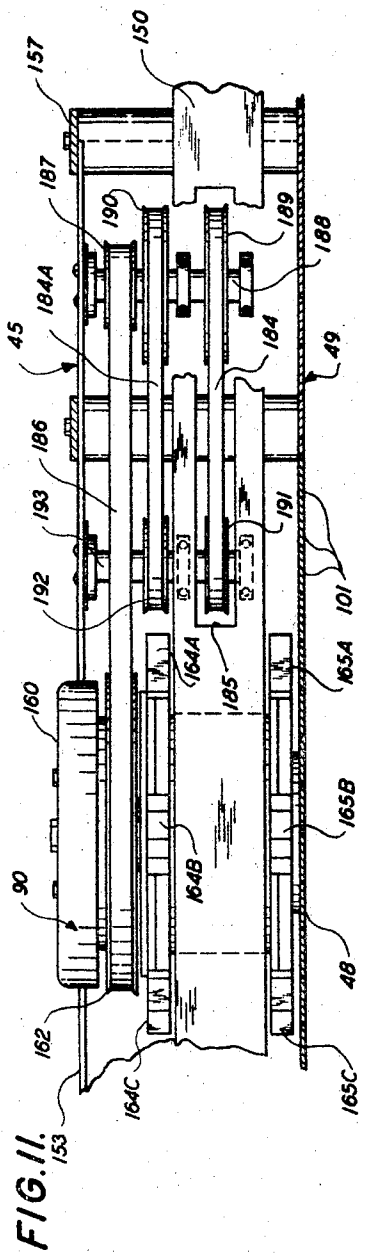


FIG. 11.

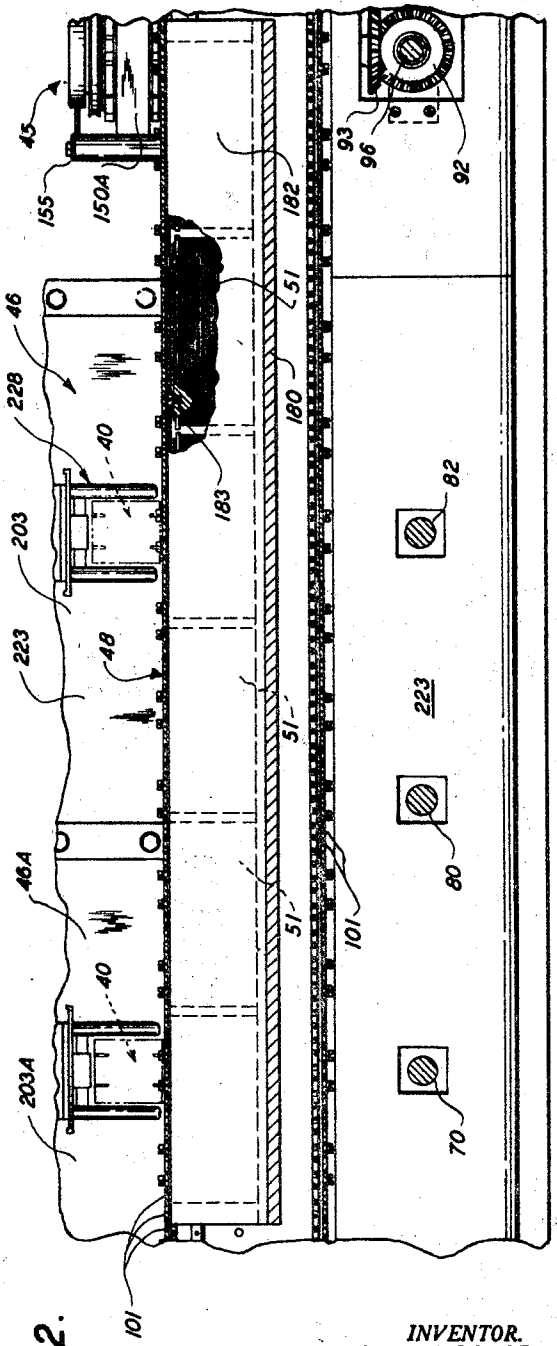


FIG. 12.

INVENTOR.
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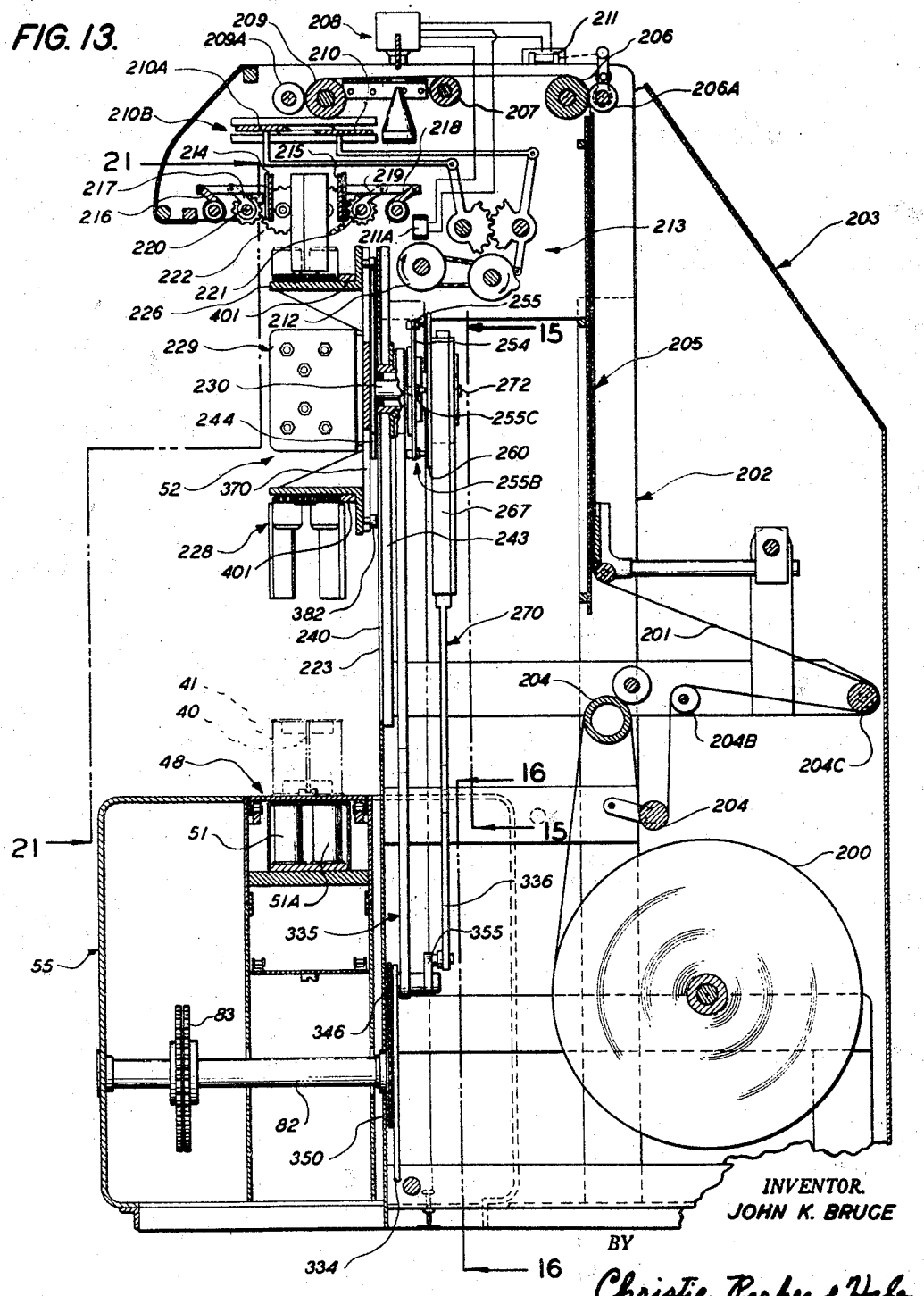
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FIG. 13.



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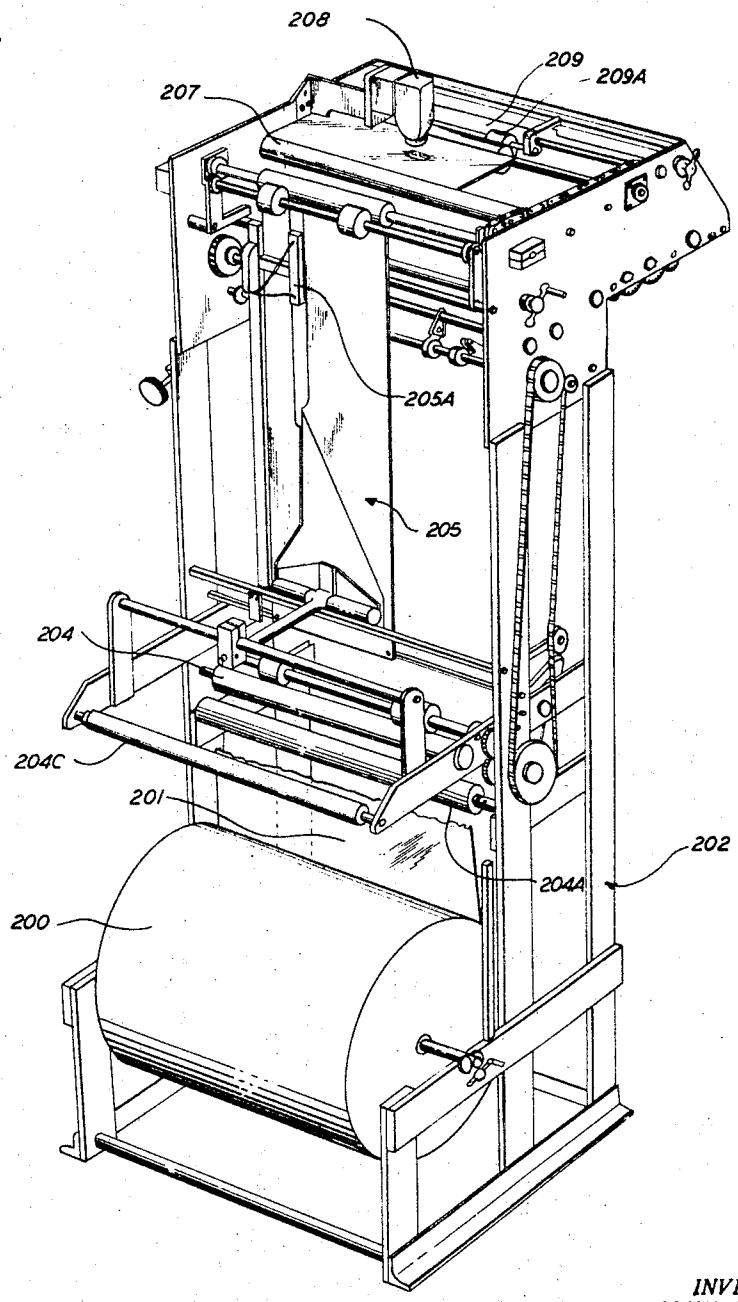
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PACKAGING METHOD AND APPARATUS

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FIG. 14.



INVENTOR.
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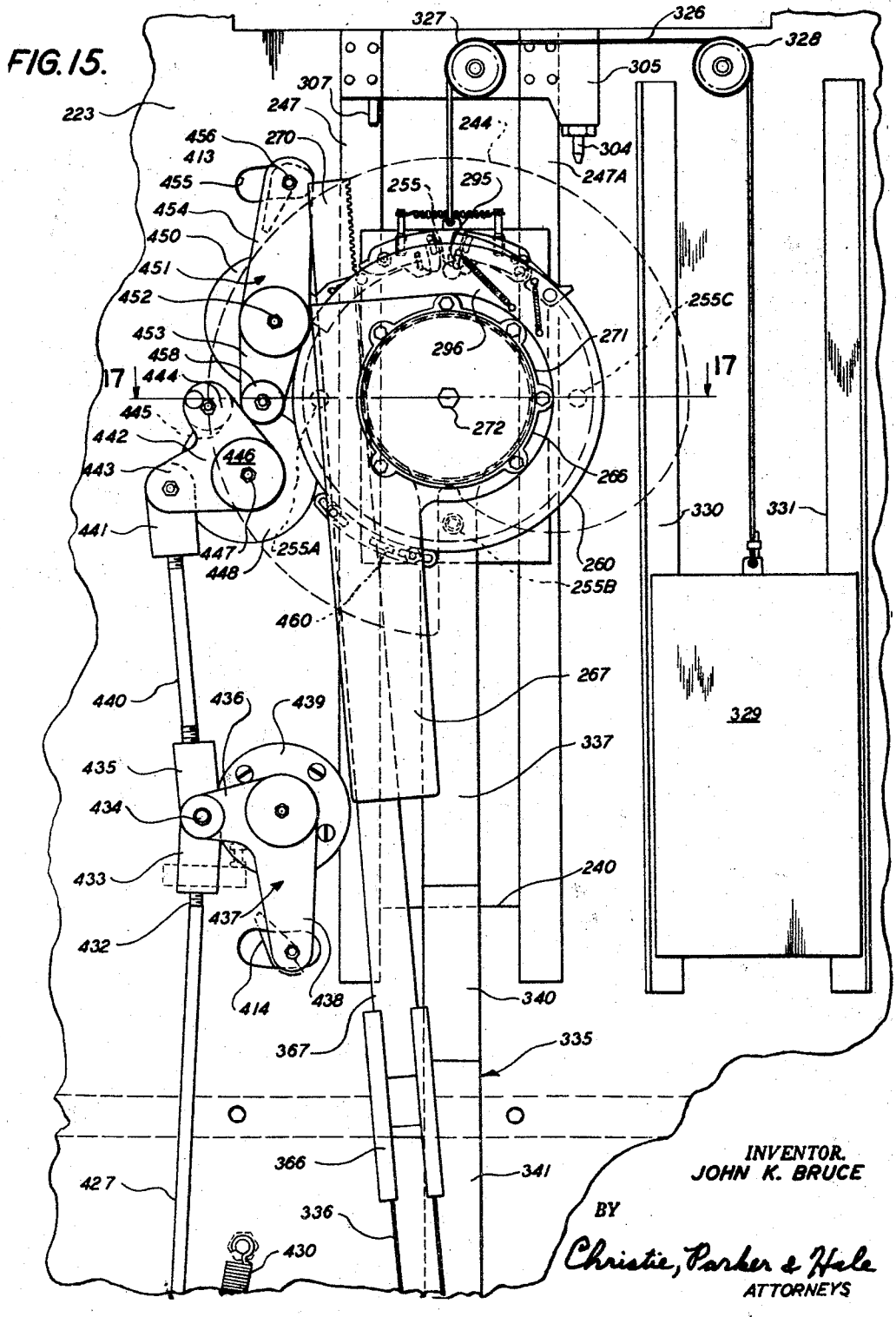
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FIG. 15.



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FIG. 16.

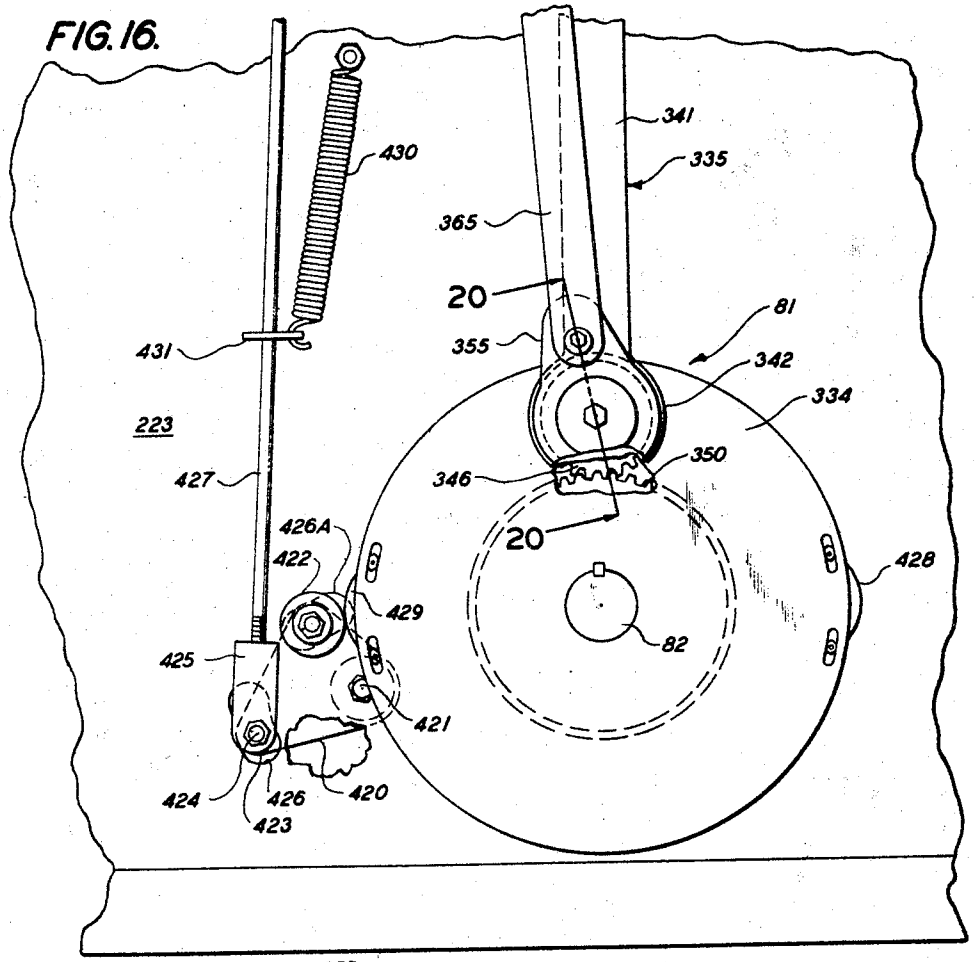
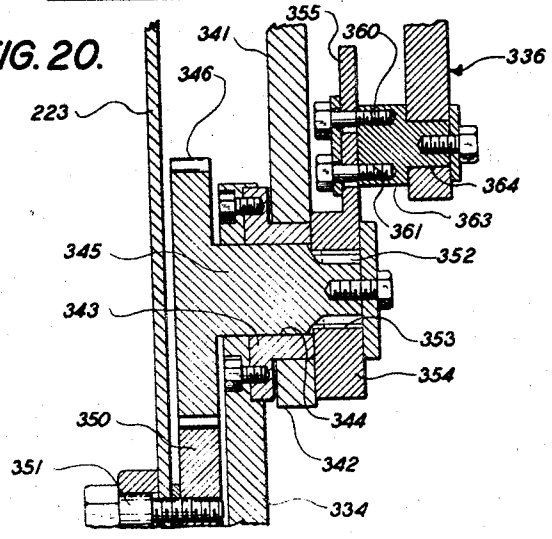


FIG. 20.



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Dec. 16, 1958 J. K. BRUCE 2,864,212

PACKAGING METHOD AND APPARATUS

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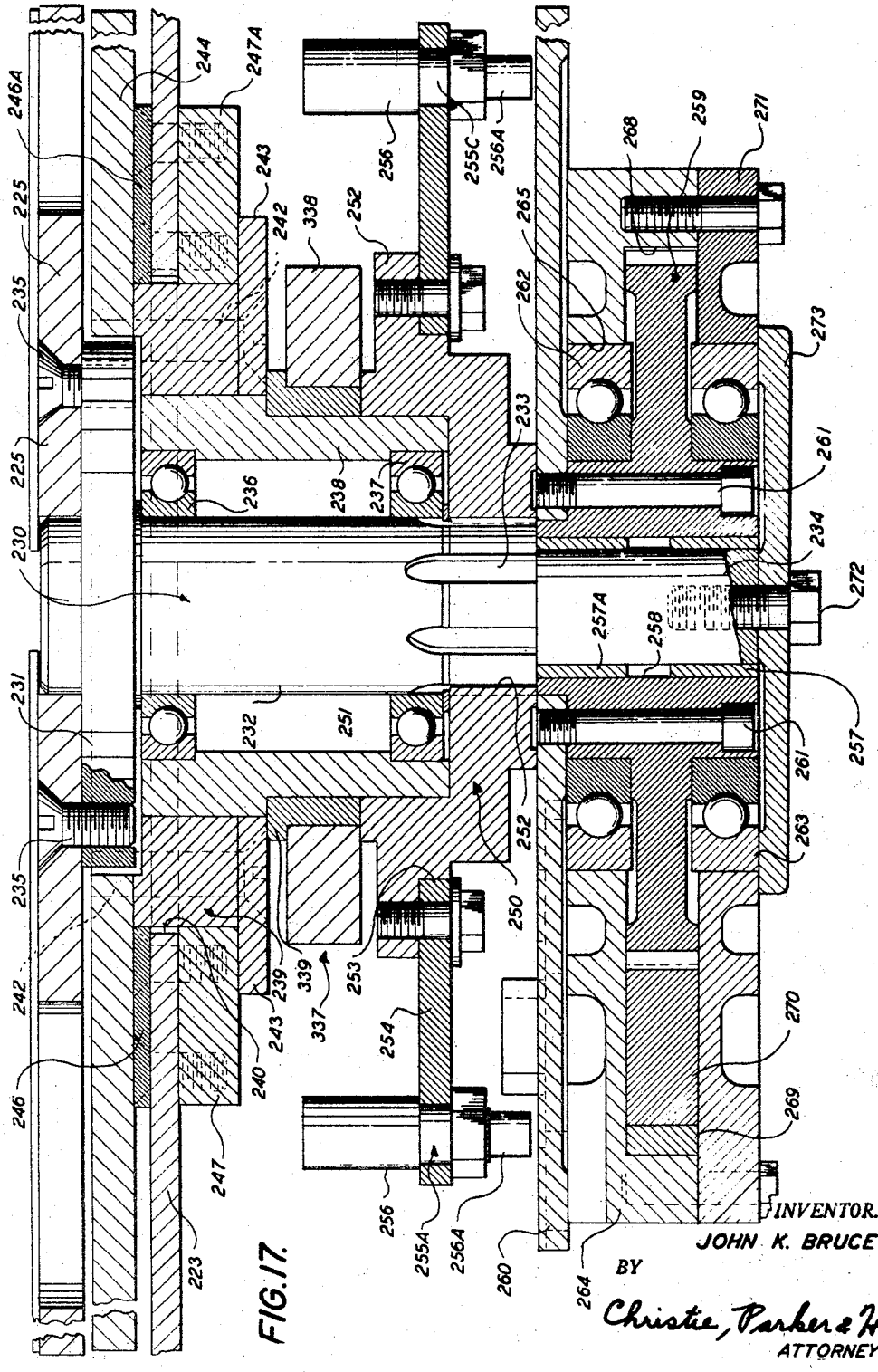


FIG. 17.

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Dec. 16, 1958 J. K. BRUCE 2,864,212

PACKAGING METHOD AND APPARATUS

Filed May 31, 1955 17 Sheets-Sheet 13

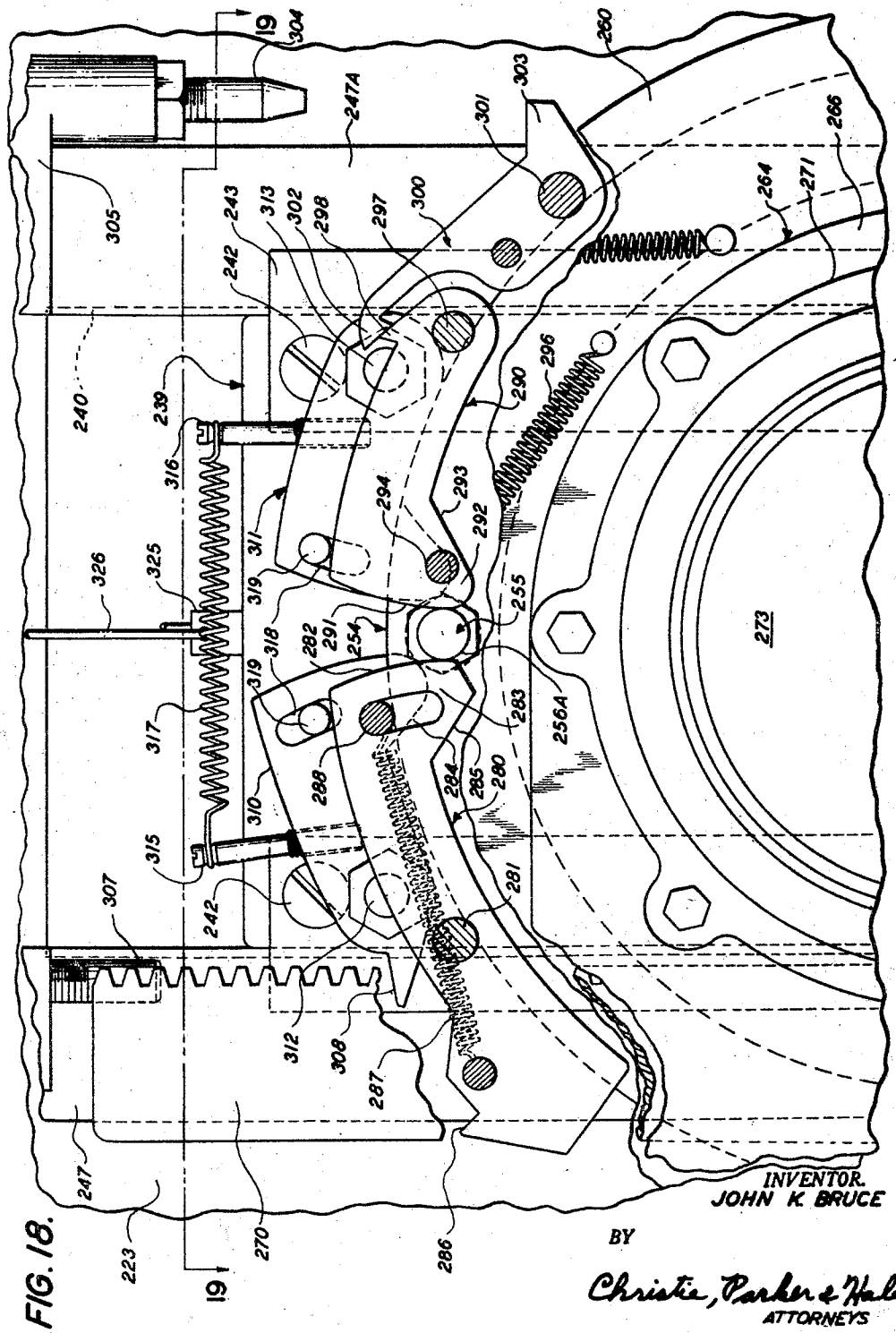


FIG. 18.

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PACKAGING METHOD AND APPARATUS

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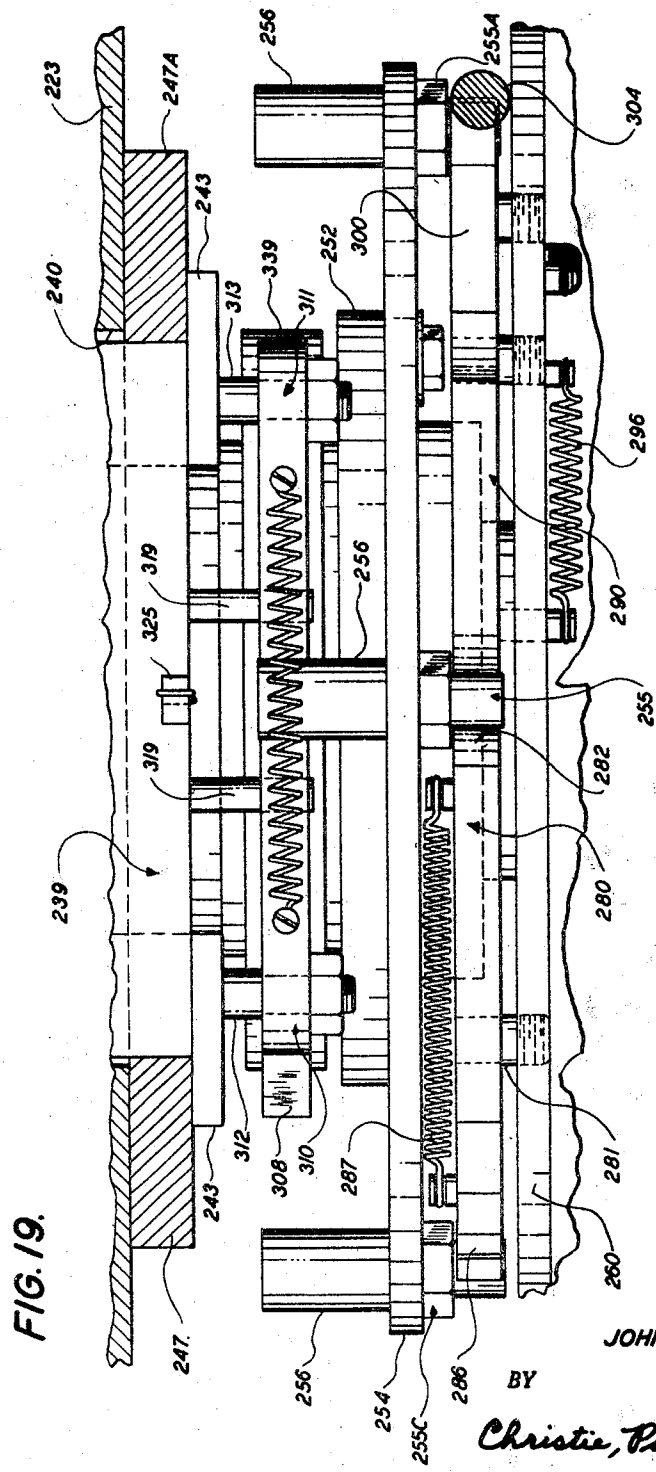


FIG. 19.

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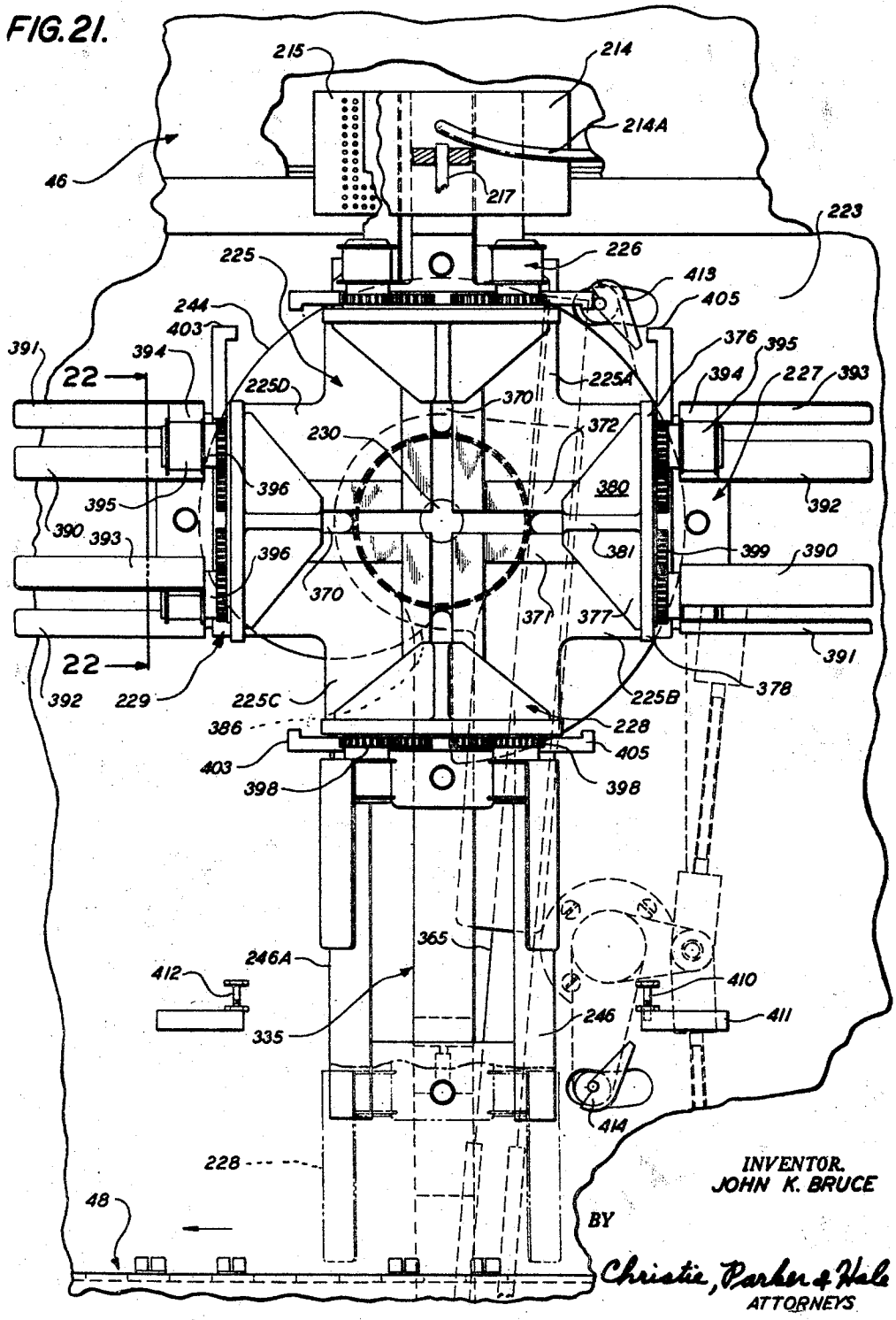
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FIG. 21.



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FIG. 22.

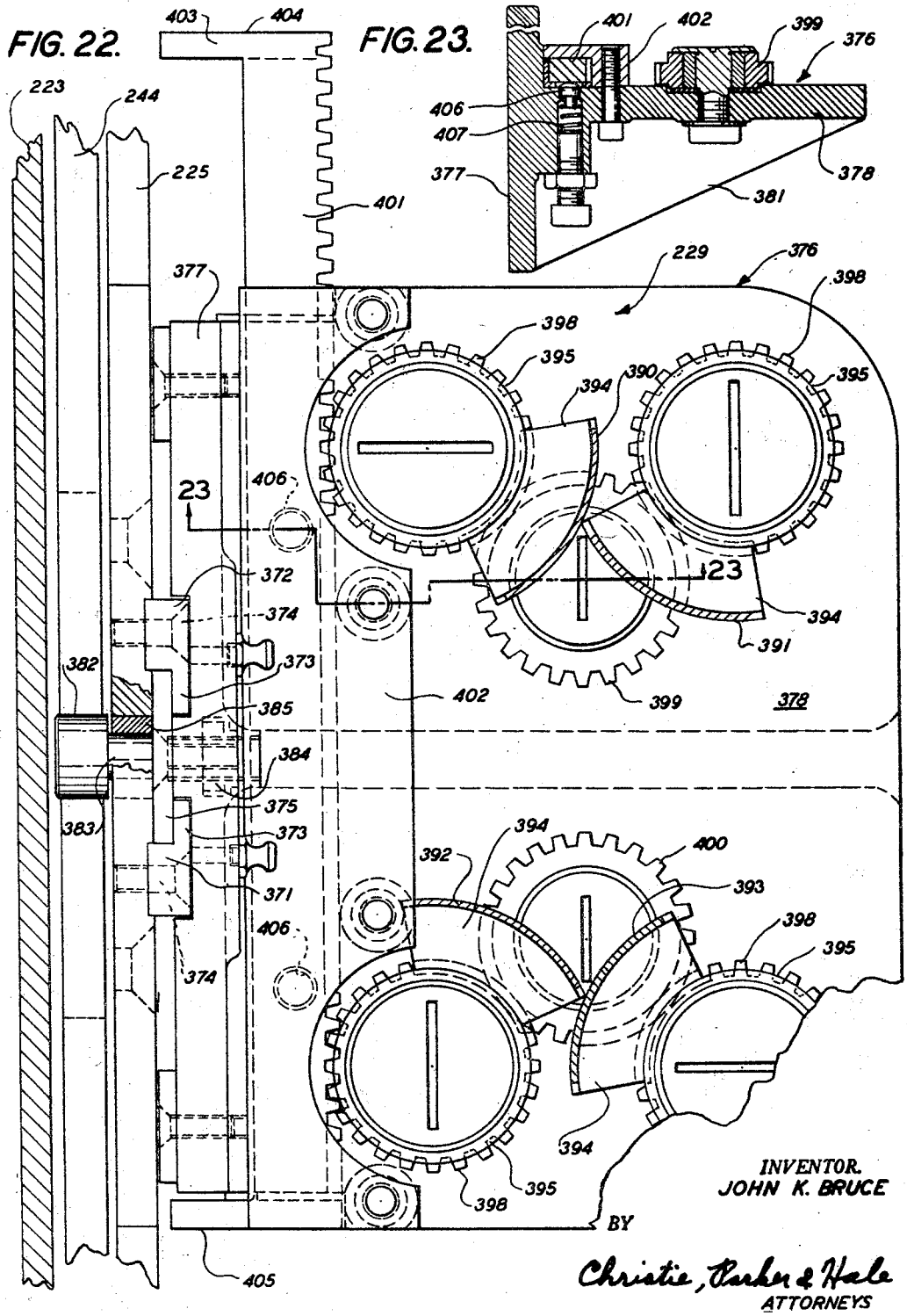


FIG. 23.

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Dec. 16, 1958 J. K. BRUCE 2,864,212

PACKAGING METHOD AND APPARATUS

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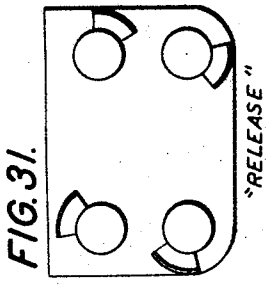


FIG. 31.

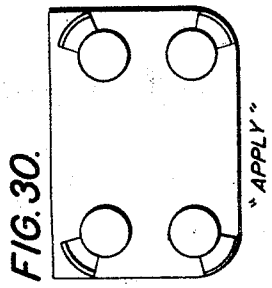


FIG. 30.

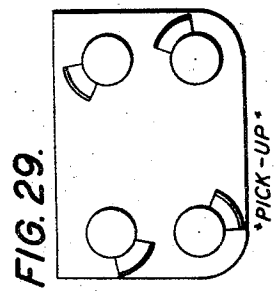


FIG. 29.

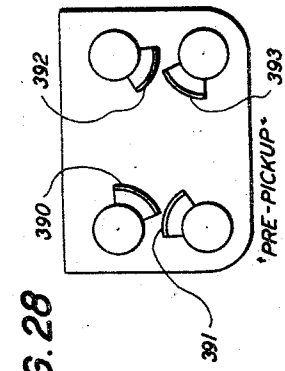


FIG. 28

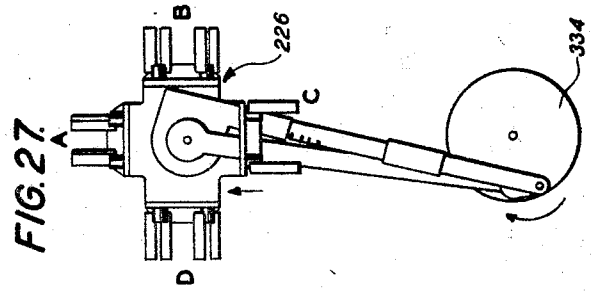


FIG. 27.

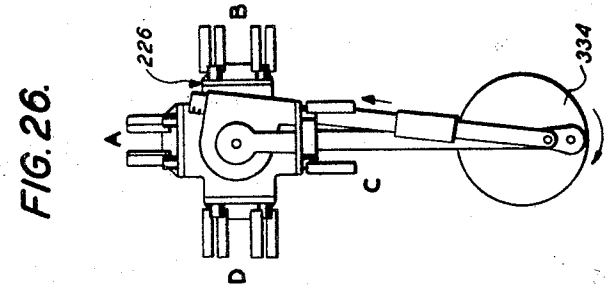


FIG. 26.

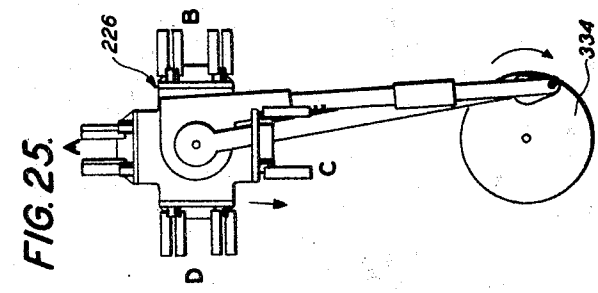


FIG. 25.

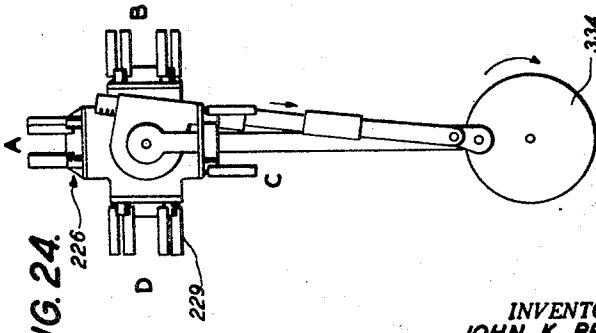


FIG. 24.

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United States Patent Office 2,864,212 Patented Dec. 16, 1958

2,864,212

PACKAGING METHOD AND APPARATUS

John K. Bruce, South Pasadena, Calif., assignor to Bruce Engineering Corporation, Pasadena, Calif., a corporation of California

Application May 31, 1955, Serial No. 511,948

55 Claims. (Cl. 53—3)

This invention relates to a process for packaging containers and to apparatus suitable for performing the process in a continuous operation so as to meet volume requirements of commercial packaging operations. This application is a continuation in part of my co-pending application Serial No. 361,723, filed June 15, 1953, now abandoned.

The invention is directed to the fabrication of packages of the type described in United States Patent No. 2,667,995, issued February 2, 1954, to Thomas H. Davis and myself. The package illustrated and claimed in this patent comprises a plurality of beaded containers as exemplified by conventional tin cans, and which, for the purpose of this description, will be assumed to be six in number, arranged about a core and held in bead to bead coplanar relation about the core by a tensioned band. The band forms a package wall. The package is characterized by the absence of bottom and top closures, the structural independence of the core and tensioned band, and, in preferred embodiment, actual spatial separation of core and band. By constructing the core to be confined between and to engage opposite end beads of each of the cans in the package group, the package is structurally stable and may be suspended from the core in spite of the independence of core and wall member. Although the present invention is described with relation to a six container pack, it is to be understood that a greater or lesser number of containers may be packaged in like manner.

The core, in one embodiment, comprises a longitudinal vane which may be composed of relatively stiff cardboard and which extends longitudinally between two adjoining rows of three cans each. The longitudinal vane is notched at spaced and vertically aligned points in its upper and lower edges to receive transverse vanes. The transverse vanes may be in the form of relatively narrow strips, each strip being symmetrically disposed in one of the respective notches in the longitudinal vane to extend between adjoining cans of each row and to engage respectively the top abutting and bottom abutting beads of such adjoining cans.

The longitudinal vane may be shorter than the can rows, i. e., shorter than three times the container diameter, and the transverse vanes may be shorter than twice the diameter of each container. As a consequence the extremities of the core may be spaced inwardly from the wall member to avoid any engagement between the two.

Alternatively, the core may comprise an integral element, say of cast plastic, of substantially the same configuration as defined above, including a longitudinal vane and transverse vanes extending outwardly at spaced and transversely aligned points from both faces of the longitudinal vane.

The package is unique in that the containers themselves are not only supported and confined thereby, but form an integral and necessary part of the package providing structural unity and stability to the otherwise structurally unrelated core and resilient wall band. As a consequence of this interrelation, the containers are in effect packaged simultaneously with the fabrication of the package, and fabrication and packaging must be carried out in the same process. The containers are a necessary component of the package before the package can assume any reality as such.

Because the containers are, in fact, part of the package and impart structural unity to the otherwise disassociated elements, a special method of assembly or fabrication of the package is required. The conventional procedure of forming containers, cartons, or carrying forms, and thereafter inserting suitable numbers of containers therein, cannot be followed in a package of the type described.

The invention contemplates a process of fabricating a package of the type having a plurality of beaded containers confined about a core by a resilient encircling band, the core having longitudinal and transveres vanes confined between and engaging the opposite end beads of each container. The process comprises the sequentially carried out steps of inserting a container into each core compartment formed by the longitudinal and transverse vane members and with the several containers in coplanar bead to bead abutting relationship so that the container beads lie respectively above and below the upper and lower edges of the core. A resilient wall band is enlarged to encompass an area larger than the area of the container group and is placed around the exterior of the container group. The band is then caused to contract about the container group in frictional binding relation to the portion of the wall surface of the corner containers of the group.

The resilient wall band may be of the type that is stretchable within an elastic limit for applying to the container group and thereafter allowed to contract about the containers. Alternatively, the band may be of a type which is contracted by an applied stimulus such as heat. Under this circumstance it is applied to the container group in the expanded form and thereafter contracted under the influence of such stimulus.

In a preferred embodiment of the method as described, the core is supported in vertical orientation, and in this orientation it is caused to move past container feed means adapted to simultaneously position containers on opposite sides of the central vane and with the container beads overhanging and underhanging the upper and lower edges of the core, i. e., the upper and lower edges of the central vane, the upper edges of the upper transverse vanes and the lower edges of the lower transverse vanes.

If an articulated core is employed, the above described method is modified to include the initially carried out step of assembling such a core. A preferred method of assembling an articulated core is described in detail with relation to the drawing.

The method as described above can be carried out by hand in exactly the sequence and manner set forth. However, such manual fabrication is obviously economically impractical for commercial application, and semi-automatic or automatic machinery is definitely required. I have developed apparatus for packaging containers in the manner set forth and adapted to automatically carry out the process steps outlined above. Whereas, the application in its preferred form is completely automatic, commencing with the assembly of the core and carrying through to the final insertion of suspension means in the core, any portion of the apparatus is replaceable by manual operation or by non-automatic machine operation.

The invention therefore contemplates apparatus for fabricating a package of the type described comprising a conveyor, means for supporting the core in an upright position on the conveyor, serially arranged means for feeding containers onto the conveyor simultaneously on

opposite sides of the core, means for urging a group composed of the correct number of containers inwardly and into bead to bead abutting relation about the central and transverse vane members of the core, means for supporting the resilient band to encompass an area larger than the area of the container group and of similar shape, and means for positioning the means for supporting the resilient band to allow the band to restrict about the container group.

When employing an articulated core, the apparatus includes means for assembling such core and specifically for engaging the transverse vanes in the appropriate manner with the longitudinal vane. Preferably the core is assembled on the conveyor in the desired vertical orientation.

Complete apparatus for package assembly in accordance with the method of the invention comprises a conveyor, a core assembler, container injector, film feeder (the term "film" being used with reference to the band), a band applicator, and a bailer. One form of apparatus of this general type is described in my co-pending application Serial Number 361,723. The present apparatus differs structurally from that described in said co-pending application, although the ultimate formation and objective remain unchanged. These differences will become apparent from the detailed description and drawings.

The method and apparatus of the invention will be more clearly understood with reference to the following detailed description thereof taken in conjunction with the accompanying drawing:

Fig. 1 is a perspective view of a package according to the invention;

Fig. 2 is a perspective view of a core as embodied in the package of Fig. 1;

Fig. 3 is a perspective view of a complete embodiment of apparatus in accordance with the invention;

Fig. 4 is a schematic perspective view of the drive mechanism of the apparatus of Fig. 3;

Fig. 5 is a graph of conveyor veocity as a function of time;

Fig. 6 is a plan view of the core assembly and container feed means portion of the apparatus taken along line **6—6** of Fig. 3;

Fig. 7 is a front elevation of the core assembly and container feed means portion of the apparatus of Fig. 3;

Fig. 8 is a rear perspective view partly broken away of the core assembly portion of the apparatus of Fig. 3;

Fig. 9 is a fragmentary vertical transverse section taken along line **9—9** of Fig. 6;

Fig. 10 is a transverse vertical section taken along line **10—10** of Fig. 6;

Fig. 11 is a fragmentary vertical section taken on line **11—11** of Fig. 6;

Fig. 12 is a fragmentary longitudinal section taken along line **12—12** of Fig. 11;

Fig. 13 is a transverse vertical section of a film feed and band applicator portion of the apparatus of Fig. 3 viewed in the direction of conveyor travel;

Fig. 14 is a perspective view of the film feed unit, isolated from the band applicator apparatus;

Fig. 15 is a fragmentary rear elevation taken along line **15—15** of Fig. 13;

Fig. 16 is a fragmentary rear elevation taken along line **16—16** of Fig. 13;

Fig. 17 is a plan section taken on line **17—17** of Fig. 15;

Fig. 18 is an enlarged fragmentary rear elevation partly broken away of the band applicator driving means;

Fig. 19 is a fragmentary plan section taken along line **19—19** of Fig. 18;

Fig. 20 is a sectional elevation taken along line **20—20** of Fig. 16;

Fig. 21 is a front elevation, partly broken away, of the applicator and film feed portion of the apparatus, taken along line **21—21** of Fig. 13;

Fig. 22 is an elevation, partly in section, taken along line **22—22** of Fig. 21;

Fig. 23 is a sectional view taken along line **23—23** of Fig. 22;

Figs. 24 through 27 are schematic representations of the positions of the band applicator during one revolution of the driving means; and

Figs. 28 through 31 are schematic representations of the applicator finger positions at successive stages of the band application process.

The package shown in plan view in Fig. 1 comprises a core **40** shown separately in perspective in Fig. 2. The core comprises a central vane **40A** and transverse vanes **40B**, **40C**, **40D**, **40E**. The four transverse vanes are arranged in vertically aligned pairs and each extends symmetrically from opposite sides of the central vane, i. e., extends approximately equidistant from opposite faces of the central vane. The core may be articulated with the transverse vanes residing in appropriately positioned notches in the upper and lower edges of the central vane. No bond is required between the vanes inasmuch as they are held in position by the containers in the final package. Alternatively, the core may be produced as an integral unit in the illustrated shape, as for example from plastic. Plastic can be cast or molded for this purpose.

The core **40** in effect forms six container receiving compartments, three on either side of the central vane **40A**, each container being partially confined between the central vane and one or more of the transverse vanes. Containers **41** are shown as thus positioned in the package of Fig. 1 and forming a rectangular group comprising two parallel rows of three containers each. The core member is sized so as to be confined between the opposite end beads of the containers **41** and so that the upper and lower edges of the core engage against the respective end beads of each of the containers.

A band of film **42** encircles the group of containers under tension serving to hold them in snug bead to bead engagement with the core as described. In preferred practice, as illustrated in Fig. 1, the central vane is shorter than the major axis of the rectangular group of containers and the transverse vanes are shorter than the minor axis of the rectangular group of containers, resulting in spatial separation between the extremities of the core and the band **42**. A bail **43** engages under the upper transverse vanes on respectively opposite sides of the longitudinal vane. The package itself is described and discussed in considerable detail in the co-pending application referred to above.

The invention is described and illustrated as utilized to fabricate a six unit package. Packages of lesser or greater number of containers can be fabricated with equal facility by the described method and with the illustrated apparatus with suitable modification thereof to accommodate the desired number of containers. Continued reference to a six container package does not imply any limitation to such effect.

The complete embodiment of automatic continuously operating apparatus for carrying out the package process herein described is illustrated in the perspective view of Fig. 3. The apparatus is too extensive to show all of its details in this figure, and the detailed description thereof is taken in relation to succeeding figures of the drawing. The apparatus is logically divided into functional sections and is illustrated and described herein in such manner.

As illustrated in Fig. 3, the basic units in the preferred embodiment are a core assembler **44**, a container injector **45**, film applicator units **46** and **46A** and bailers **47**, **47A**. These units are arranged in association with a conveyor system **48** which receives a supply of beaded containers **41** from a source not shown. The containers are delivered to the container injector by means of auxiliary conveyors **49** and **49A** arranged on either side of the core assembler. For better understanding of the over-all operation of the machine a brief description of the function of each unit follows.

The core assembler supplies in sequence lower transverse vanes 40D and 40E, longitudinal vane 40A, and upper transverse vanes 40B and 40C to the conveyor. The conveyor carries the assembled core 40 to container injector 45 which laterally injects three containers into the core on either side of the longitudinal vane. The containers are held in position within the core and against paired bosses 50, 50A provided at spaced intervals along conveyor 48 by a series of adjacent paired magnets 51, 51A, which are shown in detail in Figs. 10 and 12. The containers, held in the core by the magnetic means, are moved into position beneath a band applicator turret 52 forming part of the film applicator 46. The applicator including the turret cuts a band from a tubular film length, expands the band to an area greater than that of the grouped containers, applies the band around the containers and core, and allows the band to contract about the containers. The operation of the film applicator 46A is identical with that of film applicator 46, the travel of the conveyor being controlled to position alternate filled cores beneath each of the applicator turrets. The banded containers are conveyed to the bailers 48 and 48A, and wire handles 43 are installed in respectively alternate packages by each of the bailers.

The conveyor is housed in a substantially U-shaped base 55 and is synchronously driven with respect to the rest of the units by linkage means best described with reference to Fig. 4. A single source supplies power for the operation of the entire apparatus of the preferred embodiment with the exception of the auxiliary conveyors 49, 49A. As illustrated in Fig. 4 a prime mover 56 is linked by a conventional chain link belt 57 and sprockets 58, 59 to a transverse shaft 60 carrying a first wheel and pitman drive system 61 and a conventional sprocket 62 (broken lines). The pitman arm is provided with a gear rack 63 which drives a spur gear 64. The spur gear is fixed to a shaft 65 which carries a unidirectional clutch 66. The drive unit drives conveyor chain link belts 67, 68 and imparts to the conveyor intermittent unidirectional motion of changing velocity as pictured in the graph of Fig. 5 and described in detail in the above-mentioned copending application.

The chain sprocket 62 fastened to shaft 60 drives a second transverse shaft 70 to which a second wheel and pitman drive system 71 is fastened. The second wheel and pitman drive system actuates film applicator 46A. Sprockets 75, 76 and chain link belt 77 connect the second wheel and pitman drive system to a film feed drive 80. Film applicator 46 is actuated by a third wheel and pitman drive system 81 deriving its motion from a third transverse shaft 82, a sprocket 83, a chain link belt 84 driven by a sprocket 85 fixed to the shaft of the film feed drive. The core assembler responds to the revolutions of a disk 86 to which the assembler mechanism is connected by a crank 87 and a pivoted lever arm 88. The disk is revolved by a conventional chain and sprocket system 89 that couples the disk to shaft 82 of the first film applicator.

A pair of star wheels 90, 91 of the container injector are driven by respective pairs of bevel gears 92, 93 and 94, 95 which are in turn driven by a shaft 96 coupled by a sprocket 97 and chain link belt 98 to a driven shaft 99 of the conveyor system. This positively linked drive system powered from a single prime mover eliminates the need for intricate electrical and mechanical timing and interlocking systems which would otherwise be necessary to synchronize the separate procedures of the various units. As will become apparent, synchronization is essential to operation of the system.

The conveyor itself is composed of a plurality of narrow metal strips 101 (see Fig. 12), each of which is fastened by L-shaped clips 102, 103 at its outer ends to links 104, 105 (Fig. 10) of chain link belts 67, 68 which are driven from the described elliptical drive. At uniform intervals along the conveyor thus formed bosses are fastened to the strips in spaced pairs with bosses 50, 50A of each pair being spaced in the direction of the movement of the conveyor by a distance equal to the diameter of the containers. The bosses are slotted in the direction of and transversely to conveyor travel to accommodate respectively the longitudinal and transverse vanes of the core. The depth of the slots is such that the vanes when inserted will be spaced from the upper surface of the conveyor by a distance not less than the depth of the bead on the container.

The core assembler, which supplies the cores to the conveyor belt, is illustrated in detail in Figs. 6 through 9. The core assembler comprises a housing 110 situated at the upstream end of the conveyor housing between the pair of auxiliary container conveyors. Since the embodiment of Fig. 3 has duplicate units to increase package output, the core assembler has paired components of identical function. The lower and upper transverse vanes of the core are inserted into the slotted bosses of the conveyor respectively from a pair of supply magazines 111, 112 mounted to the core assembler housing near its upstream end and a similar pair of supply magazines 113, 114 mounted at the downstream end of the core assembler housing. The upstream pair of magazines are designed each to supply the two lower transverse vanes for a core and are mounted with their vane delivery ends only a short distance from the surface of the conveyor, allowing clearance for the slotted bosses. The downstream supply magazines are spaced upwardly from the conveyor to perform their function of delivering the upper transverse vanes of the core.

The longitudinal vanes are supplied from a pair of horizontal tracks 115, 116 comprised of pairs of upwardly and inwardly opening angle iron strips 117, 117A and 118, 118A, respectively, which support the longitudinal vanes in a vertical position. The longitudinal vanes are fed into insertion position by means of an impelling frame 119 positioned at the supplying end of each stack of longitudinal vanes. To each impelling frame is fixed a pair of cables 120, 120A which run over pulleys 121, 121A mounted respectively to the track frame and the track angle iron strips and fasten at their bottom ends to a counterweight 122. The pulleys and cables are illustrated in Fig. 9. Spring-loaded ratchet dogs 123 on either side of the frame engage a back face 124 of the last longitudinal vane in the supply stack and directly impart a loading force against the stack.

The lower and upper transverse vanes are fed from the supply magazines into the slotted bosses and the longitudinal vane notches respectively by pivoted ejector arms (not shown) substantially identical to ejector arms 125, 125A, 125B, 125C associated with supply magazines 113, 114 (see Fig. 7). The longitudinal vanes are impelled into place from each supply magazine by a vertical ejector plate 130 carried by a vertical rack 131 linked to the plate by means of flat head machine screws 132 guided in a groove (not shown) in a vertical support plate 133. Motion is imparted to the vertical rack by a gear 134 which derives its motion in turn from a horizontal rack 135 mounted on a reciprocating drive plate 136. The drive plate is supported in a vertical position between a plurality of rollers 137, 137A, 137B, etc., mounted to a rear housing wall 138 shown in Figs. 8 and 9 and a roller 139 pivotally mounted to the upper end of an L-shaped crank 140 pivotally connected to the upper end of lever arm 88 (see Fig. 4). Roller 139 engages in a slot 141 in the drive plate. The ejector arms of Fig. 7 are given their pivoting motion by a chain of intermeshed segmental gears 142, 142A, which are driven by spur gears 143, 143A meshed with horizontal gear racks 144, 144A fastened to the drive plate. The drive plate is reciprocated by the crank and lever system which is linked at its lower end to the chain driven wheel 86 whose power source was described in conjunction with the description of Fig. 4. Thus, for every cycle of mo-

tion of the drive plate the vane components for a pair of cores are assembled in place on the conveyor.

Referring again to Fig. 6, the assembled cores are carried by the conveyor into container injector unit **45**. Containers are supplied to the injector unit by auxiliary conveyors **49** and **49A** which impel the containers between pairs of guide strips **150, 150A** and **150B, 150C** onto secondary auxiliary conveyor belts **151, 152,** which transfer the containers onto main coveyor **48**. The container injector unit has substantially L-shaped housing members **153, 154** rising from either outer edge of the conveyor housing and turning inwardly to shield the transversely aligned pair of converger star wheels **90, 91**. Three transverse braces **155, 156, 157** connect the tops of the L-shaped housing members and also provide support for the pairs of guide strips.

Fig. 10 shows in considerable detail the construction of the converger star wheels which aid the lateral movement of the containers into the cells of the core and meter the flow of containers onto the conveyor in synchronism with the entire apparatus. Each star wheel comprises an upper hood **160** having an inner annular skirt **161** mounting a V-belt pulley **162**, and a lower star drum **136** carrying four upper equally spaced radial arms **164, 164A, 164B, 164C** and four lower equally spaced radial arms **165, 165A, 165B, 165C**. The shape of the radial arms is indicated in Fig. 6. A vertical shaft **166** having a splined upper end **167** supplies power to star wheel **90**. The upper hood and the lower drum of the star wheel are fastened to the splined section of the shaft. A first journal **168** mounted on the upper surface of the conveyor housing and a second journal **168A** bolted to an inner wall **169** of the conveyor housing support the shaft. The lower end of the shaft has bevel gear **93** of Fig. 4 fixed to it below the second journal, and the bevel gear engages matching gear **92** fixed to a splined section **170** of horizontal shaft **96** carried on journals **171, 172** mounted on the conveyor housing and having the chain sprocket **97** of Fig. 4 fastened to its outer end. This sprocket is connected as described with relation to Fig. 4 to the drive shaft of the conveyor. The second star wheel is driven in similar manner from bevel gear **94**, also fastened to the splined section of shaft **96**, and matching gear **95** fixed to a vertical shaft **175** rotatably mounted in journals **176, 177**.

The gearing of the star wheels revolves the wheels at a fixed speed with respect to the movement of the conveyor, because the wheels are directly linked mechanically with the conveyor drive shaft. The intermittent movement of the conveyor is thus matched by the intermittent rotation of the star wheels. The diameter of the star wheels is such that the extreme chord distance from one radial arm to the next following radial arm as they rotate is substantially equal to the combined diameters of three containers. The motion ratio between the conveyor and the star wheels insures a half turn of the star wheels for each forward motion of the conveyor. The conveyor moves forward the equivalent of two container groups within each travel period. Therefor the container injector must supply containers to two cores for each motion of the conveyor. Six cans are moved onto the main conveyor from either side of the conveyor during each travel period of the main conveyor. The radial arms interpose into the line of containers traveling between guide strips **150, 150A** and **150B, 150C** and intercept three cans between each pair of adjacent arms. The width of each arm equals the spacing between successive container groups on the main conveyor so that each star wheel meters two groups of three cans each onto conveyor **48** with each half revolution of the wheel and each forward movement of the conveyor.

Starting from the point at which the containers converge from the auxiliary conveyors onto the main conveyor, a plurality of electromagnets mounted in pairs beneath the main conveyor are used to register the containers about the slotted bosses and keep the containers in such registry until the resilient band is applied. The electromagnets are supported on either side of the longitudinal center line of the conveyor by a plate **180** extending longitudinally between inner walls **169** of the conveyor housing. The plate extends from beneath the point of container injection to a point just beyond the central portion of the second film applicator. (See Fig. 3.) Many electromagnetic arrangements may be utilized to give the desired effect, but in this embodiment it is preferred to use six pairs of elongated electromagnets **51, 51A** as described with relation to Fig. 3 to achieve the registry of the containers. Each pair mounts on a base plate **181** fixed to longitudinal plate **180** and is surrounded by a metallic sheath **182** of substantially inverted U-shaped cross-section. Electromagnetic poles **183** should be in close proximity to the under surface of the narrow strips which make up the conveyor to prevent dissipation of magnetic strength. The electromagnets are mounted so that the slotted bosses form magnet poles with the conveyor urging the containers inwardly against the bosses.

The auxiliary conveyors are aided in their delivery of the containers into the field of magnetic influence by vertically spaced pairs of V-belts **184, 184A** (Fig. 11) which contact the sides of the containers adjacent the outermost strip of either pair of guide strips. Lower belt **184** of each pair of V-belts protrudes through a longitudinal slot **185** in the outer guide strip **150** of Fig. 11 and upper belt **184A** overhangs the upper edge of the guide strips. The two belts combine to urge the containers toward the convergence point at a speed which is synchronized with the revolutions of the star wheel. This synchronous speed for both upper and lower V-belts of each pair is achieved by driving the V-belts by means of V-belt pulley **162** fixed to the upper hood of each star wheel. A drive belt **186** passes over a smaller pulley **187** fixed to a first vertical support shaft **188** which mounts upstream pulleys **189, 190** of the container driving V-belts. Downstream V-belt pulleys **191, 192** of the drive belts are fastened to a second vertical shaft **193** which is journalled at its upper end to the injector housing and at its lower end by bearings fastened to the outer guide strip (see Fig. 11). The drive belts are desirable to insure proper movement of the containers as they move obliquely from the longitudinally moving auxiliary conveyors to the longitudinally moving main conveyor and to the cores the conveyor carries. As described above and illustrated in the graph of Fig. 5, conveyor travel is intermittent. As the conveyor stops a separate unit of grouped containers is positioned in required alignment with each of the film applicators. The pauses are of only the duration required for the applicator to apply a film band around the group.

Although it is best to form the resilient wall member of the package of the invention from tubular material, it has been found more practical from a commercial standpoint to form the tube by heat sealing means from a roll of film of single thickness. The supply roll **200** of such film **201** is shown mounted in Figs. 13 and 14 at the back of the film feed frame **202**. The frame is enclosed within a film applicator housing **203**, which forms a part of film applicator **46**. A similar housing, **203A** forms a part of film applicator **46A**, which contains a substantial duplication of the film feed frame **202** and the other parts to be described as implementing the film feed process and film applicator process of film applicator **46**.

The path of the film is from the supply roll over a series of tensioning rolls **204, 204A, 204B, 204C** and then upwardly through a generally conventional folder **205** used in this instance as a tube former and for this purpose provided with an electrically heated sealing mandrel **205A** (Fig. 14) to heat seal overlapping longitudinal edges of the formed tube. The sealed tube passes through a pair of pinch drive rollers **206, 206A,** across

an idler roller 207, beneath an electronic scanning eye 208 and thence downwardly between a second pair of pinch drive rollers 209, 209A and between blades 210, 210A of a shearing unit 210B.

The electronic scanning eye is part of a shear synchronizing system. A first solenoid 211 and a second solenoid 211A are schematically represented in Fig. 13 and shown linked electrically to the scanning eye. The first solenoid adjusts the tension of the pinch drive rollers to maintain a constant feed of the newly formed flat tube of film in response to light impulses caused by indexing bands printed on the film.

The second solenoid is mechanically linked to a clutch 212 which is powered from film feed drive 80 (Fig. 4) and drives a cam energized shearing mechanism 213. The second solenoid actuates the engaging mechanism of the clutch so that the shear is operated only when an indexing band is so registered relative to the scanner that the proper length of tubular film depends beneath the shearing line.

The tubular film depends beneath the line of shear a distance equal to the desired width of the resilient band of the package. The depending film length is gripped pneumatically by a pair of opposing vacuum plates 214, 215. The inner surface of each plate is perforated and each plate is connected to a vacuum source (not shown) by a flexible tube such as tube 214A shown in Fig. 21. The shearing blades cut the film while the film is held between the vertical plates which are moved into contact with the flat tubular film length by pairs of crank arms 216, 217 and 218, 219. Shafts 220, 221 to which are affixed arms 217 and 219, respectively, turn the arms in response to the motion of a gear train 222. The gear train is linked to film feed drive 80 (Fig. 4) by a series of bevel gears, chains and sprockets not illustrated in this disclosure.

The vacuum plates move apart when the rotation of the gear train is reversed and a flat tubular film band assumes a substantially rectangular shape as its opposing sides are pulled apart by the divergence of the vacuum plates by which each side of the film is held. At the instant that the sheared tubular film band assumes the substantially rectangular shape, band applicator turret 52 moves upwardly into the position shown in Figs. 13 and 21 to pick up the band, and then the vacuum plates are opened to atmosphere by a valving mechanism synchronized with the movement of the turret, and release the band to the turret.

As previously explained, the applicator turret receives the film band and expands the band so that it may be applied around the grouped containers. The turret is suspended on the outside of a vertical front wall 223 of the applicator housing.

Referring to Figs. 13 through 21, the applicator turret comprises an index plate 225, four applicator finger carriages 226, 227, 228, 229 and a pivot shaft 230. The shaft has in axial sequence, a flange 231 near its outside end (end closest to housing wall 223), an intermediate portion 232 of substantially lesser diameter than the flange, a splined portion 233 near the inside end of the intermediate portion, and a stub end 234 of further reduced diameter. A plurality of bolts 235 secure index plate 225 to the outer surface of the pivot shaft flange (as viewed in Fig. 17) so that motion of the pivot shaft results in a corresponding motion of the index plate. The pivot shaft mounts two spaced roller bearings 236, 237 on its intermediate portion to whose outer periphery is fastened a cylindrical carriage hub 238. The hub is press-fit on or otherwise secured in a sliding carriage block 239 which reciprocates in a vertical direction in a slot 240 within front wall 223 of the film applicator housing. A plurality of bolts 242 shown in dotted lines in Fig. 17 secure a pair of vertical binding strips 243 to one face of the sliding carriage block and continue through the carriage block to affix a cam plate 244 to the block. The cam plate and the binding strips bear respectively against pairs of vertical ways 246, 246A, 247, 247A bordering the slot on opposite faces of the front wall. The clamping tension of the cam and strips against the ways is adjusted so that carriage block 239 moves freely vertically within the slot. At the inner end of hub 238 a cylindrical collar 249 having a large annular bore 250 and a smaller splined bore 251 fits onto the hub and the pivot shaft. A flange 252 of the collar has a reduced section 253 to which is fitted a circular drive disc 254. The disk is also bolted to the flange. Four indexing lugs 255, 255A, 255B, 255C are affixed in the drive disc at 90° intervals near its outer edge. Each lug is mounted so that a first cylindrical boss 256A protrudes from the opposite or inside face of the disc. These second bosses are the engaging means for rotating the pivot shaft and the applicator turret.

The periphery of the stub end of the pivot shaft carries two spaced bushings 257, 257A upon which an internal bore 258 of a spur gear 259 rides. The hub of the spur gear is reduced in diameter at the end adjacent the splined portion of the pivot shaft to receive a circular driving plate 260. The plate is further secured to the gear by a plurality of bolts 261 of which two are illustrated in Fig. 17.

A pair of ball bearings 262, 263 are mounted on the hub of the spur gear, one on each side of the web of the gear. A gear housing segment 264 has an annulus 265 which is fitted about the ball bearing 262. As viewed in Fig. 15 the gear housing segment has a semi-circular portion 266 extending from a rectangular rack housing portion 267 whose vertical dimension greatly exceeds its horizontal dimension. The semi-circular portion has a recess 268 housing the spur gear and opening into a longitudinal recess 269 in the rectangular portion of the housing so that the spur gear may mesh with a gear rack 270 which is slidably mounted within the recess of rectangular portion. A substantially flat housing cover 271 similar in outer configuration to gear housing segment 264 is bolted to the gear housing. A bolt 272 threadably engaged in the stub end of the pivot shaft fastens a circular retaining plate 273 so as to retain the gear housing and driving plate 260 on the pivot shaft.

The driving plate carries three latching members pivotally mounted against the outer face of the plate. A first drive latch 280, pivoted about a pin 281 fixed in the driving plate, has a generally longitudinal shape, as viewed in Fig. 18, substantially concentric with the driving plate. A curvilinear latch face 282 contacts the periphery of boss 256A and extends downwardly from the main body of the latch to form one side of a wedge-shaped head portion 283. The head portion has a slot 284, whose walls are defined by arcs centered at pivot pin 281. A ramp 285 forms the second side of the wedge. The body of the drive latch extends away from the head portion beyond the pivot pin to form a tail portion having a tang 286 at the upper side of its extreme end. A spring 287 extends from a pin in the tail portion to a stop pin 288 which extends through the slot and is fixed in the driving plate. The spring tends to urge the head of the drive latch downwardly about the pivot pin.

The drive plate also carries a shorter second drive latch 290 having a curvilinear face 291 in contact with boss 256A opposite to latch 280. The second latch has a wedge-shaped head 292 having a ramp 293 forming the second side of the wedge. A limit pin 294 is fixed in the head 291 so that it extends through a radial slot 295 (Fig. 16) which extends through the driving plate near the plate's outer edge. One end of a spring 296 is fixed to the limit pin and its other end is fixed to the driving plate so that the head of the second latch is urged downwardly about a pivot pin 297 fixed in the driving plate.

As shown in the enlargement of Fig. 18, the second

latch has a tang 298 on its upper surface adjacent the pivot pin. A locking dog 300 is pivotally journaled on a pin 301 fixed in the driving plate 260, and has a locking tang 302 which fits tang 298 to prevent downward motion of second latch 290. At its end opposite the locking tang a truncated lever arm 303 projects from the locking dog. A first fixed trip stud 304 depends from a mounting block 305 in line with the lever arm so that upward travel of the carriage brings the arm into contact with the bottom surface of the first trip stud.

A similar second trip stud 307, mounted at the upper end of the guide strip 247, aligns with a tang 308 on the extreme end of a first locating dog 310.

Dog 310 and a second cooperating locating dog 311 are pivotally mounted by pins 312, 313 respectively, to the inside face of the sliding carriage block symmetrically with respect to the vertical center line of the carriage block. A pair of vertical posts 315, 316 each screwed into a locating dog hold a tension spring 317 which pulls the dogs downwardly so that the locating dogs (Fig. 18) register the drive disk in exact position with respect to its rotary motion by pressing against opposite sides of projecting boss 256 of the successively presented indexing lugs 255, 255A, etc. A radial slot 318 and a pin 319 projecting through the slots and fixed in the carriage block limit the arcuate travel of each dog.

The carriage block also has an upwardly projecting tab 325 fixed to its top surface, affording attaching means for a cable 326 which is threaded over guide pulleys 327, 328 (Fig. 15) and fixed to a carriage counterweight 329. The pulleys pivot on pins fixed in wall 223 and the counterweight slides in vertical ways 330, 331 also fixed to the wall. The counterweight allows a substantially smaller prime mover to be used as it has the effect of reducing the inertia of the carriage block and band applicator turret 52.

Since the various moving components of the apparatus of the invention are driven from the same prime mover and are consequently linked mechanically in one power system, the downward momentum of the band applicator turret would ordinarily impose an additional power thrust on the system. The additional thrust could cause the conveyor, for instance, to overtravel a minute distance during each travel period and result eventually in a cumulative overtravel that would disrupt the operation of the apparatus. By reducing the inertia of the band applicator turret with a counterweight, imposed overtravel is eliminated as well as reducing the drive load on the prime mover.

As described with relation to Fig. 4, the film applicator and consequently the band applicator turret and its carriage block derive their motion from transverse shaft 82 and a third pitman drive system 81, including a wheel 334. As illustrated in Figs. 15 and 16, a jointed pitman arm 335 links the carriage block to the drive system. A rack arm 336 links rack 270 to the drive system. These two arms 335, 336 constitute the drive links of a unique motion system serving to impart unidirectional rotation to the band applicator turret at fixed intervals with respect to the vertical reciprocating motion of the turret and serving also to impart the reciprocating motion of the turret through the same system of linkages. Pitman arm 335 reciprocates the band applicator turret vertically with each revolution of wheel 334. Since the spur gear which rotates the turret reciprocates with the turret, as does the rack which drives the spur gear, means for displacing the the rack with respect to the reciprocating turret are necessary. This relative motion is accomplished by the application of the planetary gear principal in driving the rack from an additional eccentric arm whose center of throw coincides with the path of eccentricity of the drive end of the pitman arm which reciprocates the turret.

Referring again to Figs. 15 and 16 for a more detailed description of this motion system, an upper link 337 of the pitman arm has a yoke 338 fitted about an annular bushing 339 which is mounted on an intermediate portion of the periphery of carriage hub 238. The bushing allows the yoke to pivot freely about the hub. Link 337 extends downwardly from the yoke to an adjustable joint 340. The adjustable joint joins the link to a lower extension 341 of the pitman arm. The bottom end of the extension expands into a circular yoke 342 whose inner periphery (Fig. 20) rides on a bushing 343 bolted to pitman wheel 334 of drive system 81. The bushing has an internal bore 344 which journals a hub 345 of a spur gear 346. The hub projects through wheel 334 so that the spur gear rotates in the space between the face of the wheel and the inner face of wall 223 of the film applicator housing. Wheel 334 is keyed to transverse shaft 82 and revolves in a counterclockwise direction as viewed in Fig. 16 in response to the roller chain and sprocket linkage between shaft 82 and the prime mover (see Fig. 4). Spur gear 346 meshes with a larger spur gear 350 fixed to the inner surface of wall 223 by means of a plurality of screws such as screw 351 shown in Fig. 20. Gear 350 is twice the diameter of gear 346 and is mounted concentrically with shaft 82 which passes through a clearance hole (not shown) in the larger gear. Thus, smaller gear 346 revolves in planetary fashion about large fixed gear 350.

The hub of gear 346 extends inwardly beyond the bushing in a splined section 352 which mates with an internal spline 353 in a hub 354 of an eccentric arm 355. A pair of bolts 360, 361 extend through eccentric arm 355 and affix a cylindrical boss 363 to the arm. A reduced portion 364 of the cylindrical boss journals the bottom end of rack arm 336 which extends upwardly to an adjustable joint 366 which joins the rack arm to a lower end 367 of rack 270 (see Fig. 15).

The applicator turret and its components, which are driven by the foregoing motion system, are illustrated in detail in Figs. 21 through 23. In addition to the turret shaft components described in detail in conjunction with the description of Fig. 17 before, the turret comprises previously mentioned applicator finger carriages 226 through 229, index plate 225 and cam plate 244. The index plate, as viewed in Fig. 21, has the shape of a cross having arms 225A, 225B, 225C and 225D of equal extension. Each arm has a slot 370 located centrally of the arm. Each slot is bordered by a pair of bearing strips 371, 372 which extend from the outer end of each arm and meet at the center of the cross. In the turret position of Fig. 21 the slots and strips are located about the horizontal or the vertical center lines of the turret. The cross-sectional configuration of the bearing strips (see Fig. 22) is substantially L-shaped with a stem 373 of the L of each strip being spaced from the outer surface of the index plate. The strips are held to the plate by a plurality of recessed flat-head screws, such as screws 374 shown in dotted lines in Fig. 22. The applicator finger carriages are slidably held to the index plate by means of the bearing strips which overlap a key strip 375 bolted to a T-shaped finger carriage base 376 whose shape is best shown in Fig. 23. The base comprises a head plate 377 to which the key strip is bolted and a leg 378 which projects from the central portion of the head plate and at right angles to the plate. The leg is substantially rectangular in configuration while the head plate has an inner end 380 of substantially triangular shape (Fig. 21). An integral web 381 extends between triangular portion 380 and leg 378 to give rigidity to the base. Head plate 377 carries a cam roller 382 at its outer end. The cam roller is journaled in the end of a stub shaft 383 which has a threaded portion 384 (dotted lines Fig. 22) which is threaded into the head plate. A bushing 385 is mounted on the stub shaft adjacent the cam roller and rides in slot 370 in the index plate. The roller is mounted so that it extends from the applicator finger carriage base through the index plate so that the cam roller contacts the periphery of cam 244. The cam is susbtantially circular in shape with

the exception of a peripheral notch **386** at its bottom edge in line with the vertical center line of the turret. The action of the bushing in the slot is such that the motion of each carriage with respect to the center of rotation of the turret is limited to the length of the slots **370**.

The weight of each carriage carries it to the limit of slot **370** when the turret rotates the carriage into the downward position of carriage **228** in Fig. 21. The cam notch **386** is a safety measure to allow the carriage to remain stationary with respect to the downward movement of the turret during the applying of the film band should the fingers of the carriage be jammed by a misaligned container group.

Referring now to Figs. 21 through 23, the leg of each finger carriage base carries four parallel applicator fingers **390, 391, 392** and **393** of arcuate cross-section. Each finger is fixed to a wedge-shaped block **394** which in turn is fixed to a hub **395** of a shaft **396** journaled in the base leg. A spur gear **398** is fixed coaxially to the shaft near its journaled end. Fingers **390** and **391** form an operative pair whose respective spur gears are connected by an idler gear **399**. Fingers **392** and **393** form a similar pair whose respective spur gears are connected by an idler gear **400**. The spur gear of each pair nearest the index plate (see Fig. 22) meshes with a reciprocating gear rack **401** riding in a housing **402** fixed to carriage base leg **378**. Each gear rack has an integral tang **403** at one of its ends which extends inwardly toward the index plate beyond the body of the rack and also extends toward the center line of the turret to form a cam surface **404** broader than the transverse cross-sectional area of the gear rack. A similar tang **405** is an integral part of the opposite end of the gear rack.

Motion of the rack causes rotation of the applicator fingers. This motion may be controlled so that the applicator fingers will assume the various positions illustrated in Figs. 28 through 31. A detent pin **406** (see Fig. 23) urged by spring **407** against the underside of the gear rack serves as a registry means to fix the various positions of the rack and hence the fingers.

A bumper bolt **410** adjustably mounted in a block **411** fixed to the front face of the film applicator housing above the conveyor contacts tang **403** of the gear rack when the finger carriage is carried downwardly by the reciprocating motion of the turret. A similarly mounted bumper bolt **412** mounted on the opposite side of the vertical center line of the turret from bolt **410** contacts tang **405** of the gear rack when the finger carriage has rotated to the position of carriage **229** in Fig. 21. A first movable cam **413** near the upper limit of turret travel and a second movable cam **414** adjacent the lower limit of turret travel position the gear rack to meet the operational demands of the machine sequences. The actuating mechanism for the movable cams is best described with reference to Figs. 15 and 16.

In Fig. 16 a substantially triangular roller plate **420** pivots about a journal **421** fixed in forward wall **223** of the film applicator housing so that it suspends the roller plate on the outside of the wall within the space formed between the wall and conveyor housing **55**. The roller plate pivots about its journal in a vertical plane and carries with it in its motion a roller **422** so journaled in the upper corner of the triangular plate that it moves in an arc on the opposite side of the wall from the plate. A third corner **423** of the roller plate holds a pin **424** at right angles to the plate to which a clevis **425** is pivotally attached. Both the pin **424** and the shaft which holds roller **422** pass through arcuate slots **426, 426A** respectively, cut in the wall. Vertical motion is imparted to a slender connecting rod **427** threaded into the top of clevis **425** and extending vertically therefrom, by the action of cam segments **428, 429** adjustably mounted at 180° spacing to the periphery of the pitman wheel. Each complete revolution of the wheel imparts two distinct downward movements to the connecting rod. A spring **430** fixed at one of its ends to the wall and at its opposite end to the connecting rod by means of a clip **431** acts to return the roller plate and the connecting rod to their normal positions.

As illustrated in Fig. 15 an upper end **432** of the connecting rod threads into a first block **433** which is coupled by a pin **434** to a similar second block **435** and to a short lever arm **436** of a rack actuator **437**. The actuator has a long arm **438** extending at substantially right angles to the short lever arm and carrying movable cam **414** at its outer end. The rack actuator is rotatable at the juncture of the two arms in a first journal block **439** bolted to the inner surface of wall **223**.

A short connecting rod **440** extends upwardly from its threaded union with block **435** to a third block **441** which is linked to a substantially V-shaped transfer plate **442**. The transfer plate comprises a lower arm **443** to which third block **441** is attached, an upper arm **444** having a circular boss **445** at its outer end and a cylindrical pivot area **446** centered near the apex of the V. A shaft **447** extends through the pivot area into a second journal, block **448** fixed to the wall. Immediately above journal block **448** is a third journal block **450** mounting a second rack actuator **451**. The second rack actuator has a pivot shaft **452**, a short lower arm depending downwardly from the pivot shaft, and a longer upper arm **454** extending upwardly to a slot **455** in the wall. The end of the upper arm carries movable cam **413** which is fixed to a pin **456** carried by the upper arm and extends through the wall so that cam **413** operates along the outer face of the wall. The extreme end of arm **453** has a cylindrical boss **458** extending inwardly from the surface of the arm so that it can contact boss **445**.

This arrangement of connecting rods and actuators provides for the simultaneous motion of both movable cams **413** and **414** so that applicator finger carriage racks **401** are positioned with exactitude at the desired instant in time in the operation of the machine.

The operation of the machine with respect to the formation of the central core of the package and the loading of the beaded containers into the core of the package and the delivery of the container groups to points beneath the applicator turrets has been described in detail in the preceding portion of the description. The following is a description of the operation of the machine from the moment of delivery of the container groups to the applicator turrets, through the application of the film band the delivery of the banded containers to the balers and the removal of the package containers from the conveyor.

As explained with reference to Fig. 5, the conveyor drive imparts an intermittent motion to the conveyor. Because of the elliptical drive principle, acceleration and deceleration of the conveyor between each dwell period goes from zero to peak velocity and back to zero in a gradual curve so that the inertia of the containers with respect to the motion of the conveyor is overcome gradually. This minimizes any tendency for the containers to tip over or move out of registry with respect to the paired bosses **50, 50A**.

The rack of each applicator finger carriage is moved into four different positions and therefore rotates the band applicator fingers of each carriage into a like number of positions relative to each other. In Figs. 22 and 28 the fingers of a carriage are illustrated in the "pre-pickup" position. Figs. 29, 30 and 31 illustrate schematically the fingers in "pickup," "apply" and "release" positions respectively. The position designations are functional titles and relate to the handling of the resilient band forming the outer wall of the package of Fig. 1.

The rack moves the fingers into "pickup" and "release" position in response to the action of the movable cams against the tang of the carriage rack. The "pre-pickup" and "apply" positions result from the tang of the rack

being arrested by the bumper bolts during the latter stage of downward travel of the band applicator turret, while the carriage continues its downward travel.

A resilient band is applied around a container and core group upon each downward stroke of the band applicator turret. During the first half of each downward stroke of the turret the turret is revolved 90° clockwise (as viewed in Fig. 21) so that during the operational sequence of the apparatus of the invention each of the carriages **226**, **227**, **228** and **229** assumes each of the carriage positions indicated by "A," "B," "C," "D" and illustrated schematically in Figs. 24 through 27. For example, applicator finger carriage **229** of Fig. 21 is shown with the applicator fingers in the "pre-pickup" position and the carriage is shown to the left in position "D," having already applied a band around a container group not shown in that figure. The band applicator turret in Fig. 21 has reached the top of its upward travel. The immediately following downward stroke of the turret applies the film band (not shown) held by carriage **227** about a container and core group (not shown). During the first half of the downward stroke the turret rotates clockwise 90° so that carriage **227** moves from position "B" and occupies the downwardly pending position (position "C") above the conveyor that carriage **228** holds in Fig. 21 and carriage **229** rotates into position "A," replacing carriage **226**.

The continuing downward stroke of the turret enables carriage **227** to apply a band to a container group. Also, the rack of carriage **226**, which has rotated to position "B," contacts bumper bolt **410** and turns its applicator fingers into "apply" position (Fig. 30). The next reciprocating cycle of the turret rotates the turret 90° thus moving carriage **226** into the bottom position "C" as viewed in Figs. 24 through 27, and since the resilient film band has been expanded by the movement of the applicator fingers into the "apply" position, the volume enclosed by the band and the fingers exceeds the volume of the container and core group registered in position beneath the applicator turret during the brief dwell period of the conveyor. Therefore, the succeeding downward stroke of the turret will carry the resilient band to a position about the containers. The limit of the downward stroke is adjusted so that the top and bottom edges of the band are respectively below and above the top and bottom beads of the containers. Movable cam **414** is urged against the tang of the carriage rack at this instant, causing the applicator fingers to rotate into the "release" position. In this position the fingers are revolved so that they are no longer in contact with the resilient band.

This inward movement of the fingers permits the band to contract about the containers so that the band exerts an inward pressure securing the containers against the vanes of the core. The inward motion of the applicator fingers is limited so that no vertical edge of the fingers contacts the bead of a container. This limiting permits the immediately succeeding upward travel of the turret to withdraw the fingers from the banded package without disturbing the relationship of the containers to core or containers to band.

On the following upward stroke of the band applicator turret, carriage **228** is in position to pick up the resilient film band. In this position the applicator fingers extend vertically upward between the vacuum plates of Fig. 13 into the space between the walls of the distended film band.

At the extreme of the upward turret stroke, the tang of the carriage track is motivated by movable cam **413**, and the rack is moved sufficiently to shift the applicator fingers from "pre-pickup" to "pickup" position wherein the band released at that instant from the vacuum plates by the opening of the plates to atmosphere is contacted by the applicator fingers and held in a rhomboid cross-sectional pattern by them.

Functionally, applicator finger carriage **227** is idle during the next reciprocating cycle of the applicator turret. During this cycle the band held by carriage **226** is applied to the container group. However, during the first portion of the downward stroke of the next cycle the 90° rotation of the turret moves carriage **227** into the position "A" of Fig. 25. Thus, at the limit of the next upward stroke, carriage **227** will be in position to pick up the film band from the vacuum plates.

Lest the involved details of the forgeoing description of the function of the band applicator give the impression that the operation is of prolonged duration, reference is made to Fig. 5 in which the graph demonstrates that the conveyor travel period and the dwell period consumes two seconds. It is during this two-second period that the applicator turret accomplishes its upward stroke, 90° rotation of the turret, positioning of the carriage racks and fingers, and its downward stroke applying the band around a container group.

The smooth operation of the applicator turret is achieved because of the unique motion system whose component parts were described with reference to Figs. 15 through 20. The sequential operation of this motion system can best be understood by again referring to these figures. The reciprocating motion of the applicator turret derives from the revolution of the wheel **334** (Fig. 16). The wheel revolves continuously because of its linkage to the continually rotating shaft **60**. Since this same shaft supplies the motive force for the unidirectional drive mechanism of the conveyor, the reciprocating motion of the applicator turret is always in direct synchronism with the motion of the conveyor, and in the preferred embodiment of the invention the turret is in direct synchronism with all other moving portions of the apparatus. Cam segments **428**, **429** deliver motion pulses to cams **413**, **414** with each revolution of wheel **334** so that the impelled motion of the carriage racks also occurs in direct synchronism with the conveyor motion. The mechanical arrangement imparting unidirectional rotational motion to the applicator turrent and the carriages mounted thereon originates also with the revolution of wheel **334**. One revolution of the wheel results in two revolutions of eccentric arm **355** so that with respect to the pivot point of the pitman arm connected to the applicator turret, gear rack **270** completes two reciprocating cycles.

Spur gear **259** and driving plate **260** complete two oscillatory cycles for each revolution of wheel **334** due to their direct linkage with eccentric arm **355**. The unidirectional mechanism linking the driving plate to the band applicator turret translates the two oscillatory movements into one 90° rotation of the turret. Thus, the planetary motion of spur gear **346** about fixed gear **350** results in a 90° rotation of the turret during the first half of the downward stroke of the turret.

Referring now to Fig. 18, the band applicator turret is illustrated at the beginning of its downward stroke. The latching dogs carried by driving plate **260** grip indexing lug **255** at the start of the rotational motion of the turret. The locking dog **310** has been moved into unlocked position by contact against stud **308**, which contact occurred at the top of the upward stroke of the turret. Locking dog **300** at this same instant was unlatched from contact with latching dog **290** so that dog **290** could be pulled by its spring downwardly into contact with the indexing lug. Further downward travel of the turret rotates the driving plate and its latching members until they have carried lug **255** into the position occupied by lug **255A** in Fig. 15.

At this point arm **355** has reached the position shown in Fig. 25 and the relationship between gears **346** and **350** causes the arm thereafter to impel rack **270** upwardly, although the carriage is still traveling downwardly. Thus, the rotational direction of the driving plate is reversed. Prior to the reversal of the driving plate, tang **286** overrides a lug **460** adjustably mounted

to the inner face of rack housing portion 267 (Fig. 15). On the reversing stroke tang 286 engages lug 460 so that latching dog 280 pivots about its mounting pin 281 away from indexing lug 255 so that the reversing motion of the driving plate does not impart similar motion to the band applicator turret. Near the limit of the reversing phase of the drive plate rotation, ramp 293 of latching dog 290 strokes the periphery of indexing lug 255A. Since the lug is held firmly between locking dogs 310, 311, latching dog 290 overrides the indexing lug and is locked in this overriding position by engagement with dog 300. These relative positions of the latching and locking dogs occur at the bottom of the travel of the applicator turret, which position is illustrated in Fig. 26, wherein wheel 334 has completed one-half a revolution. At this juncture eccentric arm 355 is in its extreme upward position so that further movement of the wheel causes the rack to move downwardly, turning the driving plate once again in a counterclockwise position as viewed in Fig. 18. This second counterclockwise motion during the revolution of wheel 334 constitutes an idling stroke because latching dog 290 is locked in its overriding position and cannot urge indexing lug 255A in that same direction. Further, locking dog 310, by reason of its spring-loading, tends to hold lug 255A in registry. During the last 90° of rotation of the wheel the travel of rack 270 is again reversed and the driving plate is returned to the position of Fig. 18. This second return, however, is made during the last portion of the upward travel of the applicator turret and studs 307, 308 trip dogs 300 and 310 respectively, so that the indexing lug can once more be mechanically linked to the driving plate and rotated 90°.

In résumé, for each motion and dwell period of the conveyor, wheel 334 makes a complete revolution, the applicator turret makes a reciprocating cycle applying a band and the driving plate makes one drive cycle and one idling cycle.

The construction and operation of the second film applicator 46A is substantially identical to the operation just described for film applicator 46. Therefore, for each motion and dwell period of the conveyor 48, two container and core groups are provided with resilient outside walls.

After the containers are banded the conveyor carries them into registry with pneumatically operated bailers 47, 47A which insert into each package wire bail 43. The operation of the bailers is substantially identical to that of the bailers in my abandoned co-pending application, Serial No. 361,723, filed June 15, 1953, and entitled "Packaging Method and Apparatus." After the bails are inserted, the packages are removed from the conveyor by means of parallel ramp strips 461, 462 and conveyed by suitable means to cartoning apparatus.

Although the described embodiment of the invention has the same object as the apparatus of my abandoned co-pending application No. 361,723, it differs from that apparatus in several ways. The present unit, for instance, powers all of the basic components, such as the core assembler, container injector, film feed and band applicator by direct linkage to the drive system of the conveyor. Other differences are apparent from the foregoing description.

The present apparatus produces container packages in accordance with the process of the invention at a very high unit rate with a mechanism which requires a relatively small area and very little power input for the results achieved. The economic advantages of such a mechanism are obvious.

Many modifications in the illustrated apparatus and many alternative forms of apparatus may be employed in the accomplishment of the described process. In addition, any of the steps of the process may be carried out by hand, although the economic advantages of the present apparatus would be substantially diminished by substitution of manual methods at any stage of the process.

I claim:

1. Apparatus for assembling package cores having longitudinal and transverse vanes comprising a progressing conveyor, support means on the progressing conveyor for receiving and holding the cores in an upright position, rotary ejector means for engaging transverse vanes with the support means in an upright position, ejector means for engaging longitudinal vanes with the support means in an upright position, rotary ejector means for engaging transverse vanes with the longitudinal vanes in an upright position, and magazines supplying core vanes to the ejector means.

2. Apparatus for assembling package cores having longitudinal and transverse vanes comprising a progressing conveyor, support means on the progressing conveyor for receiving and holding the cores in an upright position, rotary ejector means for engaging transverse vanes with the support means in an upright position, reciprocating ejector means for engaging a longitudinal vane with the support means in an upright position, magazines supplying transverse vanes to the rotary ejector means, and magazines supplying longitudinal vanes to the reciprocating ejector means.

3. Apparatus for assembling package cores having longitudinal and transverse vanes comprising a conveyor, a source of power for driving the conveyor, means on the conveyor for receiving and holding the cores in an upright position, geared rotary ejector means for engaging transverse vanes with the support means, geared reciprocating ejector means for engaging a longitudinal vane with the support means, magazines supplying transverse vanes to the rotary ejector means, magazines supplying longitudinal vanes to the reciprocating ejector means, a shuttle plate, gear racks mounted to the shuttle plate in meshing engagement with the geared rotary ejector means and the geared reciprocating ejector means, and means joining the shuttle plate to the source of power for driving the conveyor.

4. Apparatus for grouping beaded containers about package cores comprising a conveyor, means for supporting the package cores on the conveyor, feed means supplying beaded containers to be grouped about the package cores, control means metering the flow of containers to be grouped about the package cores, and injector means urging the containers onto the conveyor about the package cores.

5. Apparatus for grouping beaded containers about package cores comprising a conveyor, means for supporting the package cores on the conveyor, feed means supplying beaded containers to be grouped about the package cores, control means metering the flow of containers to be grouped about the package cores, and magnetic means urging the containers onto the conveyor about the package cores.

6. Apparatus for grouping beaded containers about package cores comprising a conveyor, a source of power for driving the conveyor, means for supporting the package cores on the conveyor, feed means supplying beaded containers to be grouped about the package cores, control means metering the flow of containers to be grouped about the package cores, drive means mechanically linking the control means to the source of power for driving the conveyor, and injector means urging the containers onto the conveyor about the package cores.

7. Apparatus for grouping beaded containers about package cores comprising a conveyor, a source of power for driving the conveyor, means for supporting the package cores on the conveyor, feed means supplying beaded containers to be grouped about the package cores, control means metering the flow of containers to be grouped about the package cores, drive means mechanically linking the control means to the source of power for driving

the conveyor, and magnetic means urging the containers onto the conveyor about the package cores.

8. Apparatus for grouping beaded containers about package cores comprising a conveyor, means for supporting the package cores in an upright position on the conveyor, feed means supplying beaded containers to be grouped about the package, and magnetic means urging the containers onto the conveyor about the package cores.

9. Apparatus for grouping beaded containers about package cores comprising a conveyor, means for supporting the package cores in an upright position on the conveyor, feed means supplying beaded containers to be grouped about the package cores, a first star wheel metering the flow of containers to be grouped adjacent one side of the package core, a second star wheel metering the flow of containers to be grouped adjacent an opposite side of the package core, and magnetic means located adjacent the surface of the conveyor urging the containers onto the conveyor about the package core.

10. Apparatus in accordance with claim 9 wherein the feed means supplying beaded containers to be grouped about the package cores comprises a first feeding means substantially parallel to the run of the conveyor located along one side of the conveyor, a second feeding means substantially parallel to the run of the conveyor located along the opposite side of the conveyor, a first spaced pair of parallel guide strips extending obliquely across the first feeding means inwardly toward the middle of the conveyor, a second spaced pair of parallel guide strips extending obliquely across the second feeding means inwardly toward the middle of the conveyor, each pair of guide strips tending to guide the beaded containers to the star wheels and toward the center of the conveyor.

11. Apparatus in accordance with claim 9 wherein the feed means supplying beaded containers to be grouped about the package cores comprises a first container feeding means substantially parallel to the run of the conveyor located along one side of the conveyor, a second container feeding means substantially parallel to the run of the conveyor located along the opposite side of the conveyor, a first pair of guide strips having an inner rail and an outer rail parallel to and spaced from the inner rail, said first pair of guide strips extending obliquely from the first feeding means inwardly to the first star wheel and toward the middle of the conveyor, a second pair of guide strips having an inner rail and an outer rail parallel to and spaced from the inner rail, said second pair of guide strips extending obliquely from the second feeding means inwardly to the second star wheel and toward the middle of the conveyor, and auxiliary friction drive belts in frictional contact with that portion of the periphery of each container within each pair of guide strips nearest the outer rail of each pair so as to urge the containers toward the center of the conveyor.

12. Apparatus in accordance with claim 11 wherein auxiliary frictional drive belt associated with the first pair of guide strips is driven by the first star wheel, and the auxiliary frictional drive belt associated with the second pair of guide strips is driven by the second star wheel.

13. Apparatus for grouping beaded containers about package cores comprising a conveyor, a source of power for driving the conveyor, means for supporting the package cores in an upright position on the conveyor, feed means supplying beaded containers to be grouped about the package cores, a first star wheel metering the flow of containers to be grouped adjacent one side of the package core, a second star wheel metering the flow of containers to be grouped adjacent an opposite side of the package core, both of said star wheels being synchronously driven with respect to the travel of the conveyor, and magnetic means located adjacent the surface of the conveyor urging the containers onto the conveyor about the package core.

14. Apparatus in accordance with claim 13 wherein the feed means supplying beaded containers to be grouped about the package cores comprises a first feeding means substantially parallel to the run of the conveyor located along one side of the conveyor, a second feeding means substantially parallel to the run of the conveyor located along the opposite side of the conveyor, a first spaced pair of parallel guide strips extending obliquely across the first feeding means inwardly toward the middle of the conveyor, a second spaced pair of parallel guide strips extending obliquely across the second feeding means inwardly toward the middle of the conveyor, each pair of guide strips tending to guide the beaded containers to the star wheels toward the center of the conveyor.

15. Apparatus in accordance with claim 13 wherein the feed means supplying beaded containers to be grouped about the package cores comprises a first container feeding means substantially parallel to the run of the conveyor located along one side of the conveyor, a second container feeding means substantially parallel to the run of the conveyor located along the opposite side of the conveyor, a first pair of guide strips having an inner rail and an outer rail parallel to and spaced from the inner rail, said first pair of guide strips extending obliquely from the first feeding means inwardly to the first star wheel and toward the middle of the conveyor, a second pair of guide strips having an inner rail and an outer rail parallel to and spaced from the inner rail, said second pair of guide strips extending obliquely from the second feeding means inwardly to the second star wheel and toward the middle of the conveyor, and auxiliary friction drive belts in frictional contact with that portion of the periphery of each container within each pair of guide strips nearest the outer rail of each pair so as to urge the containers toward the center of the conveyor.

16. Apparatus in accordance with claim 15 wherein the auxiliary frictional drive belt associated with the first pair of guide strips is driven by the first star wheel, and the auxiliary frictional drive belt associated with the second pair of guide strips is driven by the second star wheel.

17. Apparatus for grouping beaded containers about package cores comprising a conveyor, a source of power for driving the conveyor, means for supporting the package cores at spaced intervals in an upright position on the conveyor, an auxiliary container feeder belt paralleling the conveyor on each side of the conveyor, control means metering the flow of containers to be grouped about the package cores, each feeder belt supplying beaded containers to be grouped about the package cores at a point in substantially transverse alignment with the control means, drive means mechanically linking the control means to the source of power for driving the conveyor, and magnetic injector means urging the containers onto the conveyor about the package cores.

18. Apparatus for applying a resilient wall band around a group of beaded containers arranged about a package core which comprises a conveyor, slotted bosses on the conveyor for supporting the package cores on the conveyor, magnetic means securing the beaded container groups in an upright position about a package core during the application of the band, and means for placing the band around the container group and allowing the band to contract about the container group.

19. Apparatus for applying a resilient wall band around a group of beaded containers arranged about a package core which comprises a conveyor, a source of power for driving the conveyor, means on the conveyor for supporting the beaded container groups in

an upright position and about the package core, means for placing the band around the container group and allowing the band to contract about the container group, and mechanical means linking the means for placing the band around the container group to the source of power for the conveyor.

20. Apparatus for applying a resilient wall band around a group of beaded containers arranged about a package core which comprises a conveyor, means on the conveyor for supporting the beaded container group in upright position and about the package core, a vertically reciprocating band applicator turret, at least one band applicator finger carriage slidably mounted to the turret, means for rotating the turret, and means for reciprocating the turret so that a finger carriage places a band around a container group each time the turret reciprocates.

21. Apparatus for applying a resilient wall band around a group of beaded containers arranged about a package core which comprises means for supporting the beaded container group in upright position and about a package core, a vertically reciprocating band applicator turret, at least one band applicator finger carriage slidably mounted to the turret, means for rotating the turret, and means for reciprocating the turret so that a finger carriage places a band around a container group each time that the turret reciprocates.

22. Apparatus for applying a resilient wall band around a group of beaded containers arranged about a package core which comprises a conveyor, means on the conveyor for supporting the beaded container groups in an upright position and about a packaged core, a vertically reciprocating band applicator turret, at least one band applicator finger carriage slidably mounted to the turret, means for rotating the turret, means for reciprocating the turret, and means for presenting a resilient wall band to be picked up by a finger carriage so that a finger carriage places a band around a container group and allows the band to contract about the group each time that the turret reciprocates.

23. Apparatus in accordance with claim 22 wherein the means for rotating the band applicator turret and the means for reciprocating the band applicator turret are driven synchronously with respect to the travel of the conveyor.

24. Apparatus in accordance with claim 22 wherein the means for reciprocating the band applicator turret comprises a rotatable drive wheel, a pitman arm pivotally fastened at one of its ends near the circumference of the drive wheel and fastened pivotally at its opposite end to the band applicator turret.

25. Apparatus in accordance with claim 24 wherein the means for rotating the band applicator turret comprises a rotatable first gear coaxially mounted with respect to the center of rotation of the band applicator turret, means for intermittently linking the first gear to the turret so that the turret revolves in response to the rotation of the first gear, a second gear fixed in position and concentric with respect to the drive wheel engaging the fixed gear in planetary fashion and having a hub projecting beyond the face of the drive wheel, the end of the pitman arm being pivotally mounted thereto, an eccentric arm fixed to the hub so that it rotates with the third gear so that the center of throw of the eccentric arm coincides with the path of rotation of the pivot of the pitman arm, a gear rack engaging the first gear, and a rack arm linking the gear rack to the eccentric arm at a point near the outer end of the eccentric arm.

26. Apparatus for applying a resilient wall band around a group of beaded containers arranged about a package core which comprises means for supporting the beaded container groups in an upright position and about a package core, a vertically reciprocating band applicator turret, at least one band applicator finger carriage slidably mounted to the turret, means for rotating the turret, means for reciprocating the turret, and means for presenting a resilient wall band to be picked up by a finger carriage so that a finger carriage places a band around a container group and allows the band to contract about the group each time that the turret reciprocates.

27. Apparatus for fabricating a package of the type comprising a plurality of beaded containers confined about a package core by an encircling resilient wall band, the core having a longitudinal vane and upper and lower transverse vanes extending at longitudinally spaced points with respect to the longitudinal vane and in transverse and vertical alignment with each other, the apparatus comprising a conveyor, means on the conveyor for supporting the package core in an upright position on the conveyor, means for grouping the containers about the assembled package core, means for applying the resilient wall band around the containers grouped about the package core, and magnetic means adjacent the surface of the conveyor for securing the beaded container groups in an upright position about the package core while the containers are grouped about the core and during the application of the band.

28. Apparatus for fabricating a package of the type comprising a plurality of beaded containers confined about a package core by an encircling resilient wall band, the core having a longitudinal vane and upper and lower transverse vanes extending at longitudinally spaced points with respect to the longitudinal vane and in transverse and vertical alignment with each other, the apparatus comprising a conveyor, means on the conveyor for supporting the package core in an upright position on the conveyor, means for assembling the package core on the conveyor, means for grouping the containers about the assembled package core including feed means supplying containers to be grouped about the package core, control means metering the flow of containers to be grouped about the package core, and injector means urging the containers onto the conveyor about the package core, and magnetic means securing the beaded container groups in an upright position about the package core prior to the application of the band.

29. Apparatus for fabricating a package of the type comprising a plurality of beaded containers confined about a package core by an encircling resilient wall band, the core having a longitudinal vane and upper and lower transverse vanes extending at longitudinally spaced points with respect to the longitudinal vane and in transverse and vertical alignment with each other, the apparatus comprising a conveyor, means on the conveyor for supporting the package core in an upright position on the conveyor, means for assembling the package core on the conveyor including rotary ejector means for engaging the lower transverse vanes with the support means, ejector means for engaging the longitudinal vane with the support means in an upright position, rotary ejector means for engaging the upper transverse vanes with the longitudinal vanes in an upright position, and magazines supplying core vanes to the ejector means, means for grouping the containers about the assembled package core, means applying the resilient wall band around the containers grouped about the package core, and magnetic means securing the beaded container groups in an upright position about the package core prior to the application of the band.

30. Apparatus for fabricating a package of the type comprising a plurality of beaded containers confined about a package core by an encircling resilient wall band, the core having a longitudinal vane and upper and lower transverse vanes extending at longitudinally spaced points with respect to the longitudinal vane and in transverse and vertical alignment with each other, the apparatus comprising a conveyor, means on the conveyor for supporting the package core in an upright position on the conveyor, means for assembling the package core on the conveyor including rotary ejector means for engaging the

lower transverse vanes with the support means, ejector means for engaging the longitudinal vane with the support means in an upright position, rotary ejector means for engaging the upper transverse vanes with the longitudinal vanes in an upright position, and magazines supplying core vanes to the ejector means, means for grouping the containers about the assembled package core including a feeder supplying containers to be grouped about the package core, a controller for metering the flow of containers to be grouped about the package core, and an injector urging the containers onto the conveyor about the package core, means for placing the resilient wall band around the container group and allowing the band to contract about the container group, and magnetic means securing the beaded container groups in an upright position about the package core prior to the application of the band.

31. Apparatus for fabricating a package of the type comprising a plurality of beaded containers confined about a package core by an encircling resilient wall band, the core having a longitudinal vane and upper and lower transverse vanes extending at longitudinally spaced points with respect to the longitudinal vane and in transverse and vertical alignment with each other, the apparatus comprising a conveyor, a source of power for driving the conveyor, means on the conveyor for supporting the package core in an upright position on the conveyor, means driven by the source of power for driving the conveyor for assembling the package core on the conveyor, means for grouping the containers about the assembled package core including a feeder supplying containers to be grouped about the package core, control means driven by the source of power for driving the conveyor metering the flow of containers to be grouped about the package core, and injector means urging the containers onto the conveyor about the package core, means driven by the source of power for driving the conveyor for placing the band around the container group and allowing the band to contract about the container group, and magnetic means securing the beaded container groups in an upright position about the package core during the application of the band.

32. Apparatus for fabricating a package of the type comprising a plurality of beaded containers confined about a package core by an encircling resilient wall band, the core having a longitudinal vane and upper and lower transverse vanes extending at longitudinally spaced points with respect to the longitudinal vane and in transverse and vertical alignment with each other, the apparatus comprising a conveyor, means on the conveyor for supporting the package core in an upright position on the conveyor, means for assembling the package core on the conveyor, means for grouping the containers about the assembled package core including a feeder supplying containers to be grouped about the package core, a controller metering the flow of containers to be grouped about the package core, means for placing the resilient wall band around the container group and allowing the band to contract about the container group, and magnetic means urging the containers onto the conveyor about the package core and securing the container groups in an upright position about the package core during the application of the band including magnetic means adjacent the conveyor surface and extending continuously from a point upstream of the control means to a point downstream of the apparatus for applying the resilient wall band.

33. Apparatus for fabricating a package of the type comprising a plurality of beaded containers confined about a package core by an encircling resilient wall band, the core having a longitudinal vane and upper and lower transverse vanes extending at longitudinally spaced points with respect to the longitudinal vane and in transverse and vertical alignment with each other, the apparatus comprising a conveyor, slotted bosses on the conveyor for supporting the package core in an upright position on the conveyor, means for assembling the package core on the conveyor, means for grouping the containers about the assembled package core, means for placing the band around the container group and allowing the band to contract about the container group, and means extending continuously from a point upstream of the means for grouping the containers about the assembled package core to a point downstream of the means for placing the band around the containers and located adjacent the surface of the conveyor so that the slotted bosses on the conveyor form magnet poles which tend to urge the containers onto the conveyor about the package cores and secure the containers in an upright position about the package core during the application of the band.

34. Automatic apparatus for fabricating a package of the type comprising a plurality of beaded containers confined about a core by an encircling resilient band, the core having a longitudinal vane and upper and lower transverse vanes extending at longitudinally spaced points from the longitudinal vane and in transverse and vertical alignment, the apparatus comprising means supporting the core in upright position, means for urging groups of containers inwardly on each side of the longitudinal vane in bead to bead abutting relation about the longitudinal and transverse vanes, means for placing the band around the container group, and means for positioning the means for placing the band to allow the band to restrict about the container group.

35. Automatic apparatus for fabricating a package of the type comprising a plurality of beaded containers confined about a core by an encircling resilient band, the core having a longitudinal vane and upper and lower transverse vanes extending at longitudinally spaced points from the longitudinal vane and in transverse and vertical alignment, the apparatus comprising a conveyor, means supporting the assembled core in upright position on the conveyor to travel with the conveyor, injector means for simultaneously urging groups of containers inwardly on each side of the longitudinal vane of successive cores and in bead to bead abutting relation about the longitudinal and transverse vanes, serially arranged applicator means for placing the resilient band around the container group, and means for positioning the means for placing the band to allow the resilient band to restrict about the container group.

36. Apparatus according to claim 35 wherein the conveyor comprises a plurality of individual end to end supported platens, each platen having a shallow recess in its exposed face approximately conforming in shape to the area of the plurality of containers confined about the core, and means disposed on the longitudinal center line of the platen to support the core in vertical orientation, and with its lower edge above the bottom of the recess.

37. Apparatus according to claim 36 wherein each platen of the conveyor includes a pair of grooves in the face thereof extending longitudinally from end to end of the platen and aligned with like grooves in adjacent platens, the two grooves being spaced approximately equidistant from and on opposite sides of the center line of the platen and within the confines of the recess and being deeper than the recess, and scoop means adjacent an end of the conveyor extending into said grooves for disengaging packages from the platen recesses.

38. Automatic apparatus for fabricating a package of the type comprising a plurality of beaded containers confinded about a core by an encircling band, the core having a longitudinal vane and upper and lower transverse vanes extending at longitudinally spaced points from the longitudinal vane and in transverse and vertical alignment, the apparatus comprising a conveyor, a core feeder operable to dispose separate cores on the conveyor at spaced intervals and in upright position, a serially arranged container feeder operable to feed containers ad-

jacent opposite sides of the conveyor, a serially arranged injector operable to simultaneously urge groups of containers inwardly on each side of the longitudinal vane of successive cores and in bead to bead abutting relation about the longitudinal and transverse vanes, and a serially arranged applicator operable to place bands around successive container core combinations and to allow the band to contract about the container group.

39. Apparatus according to claim 38 including means driving the conveyor intermittently and in uniform repetition, and means synchronizing the core feeder, container feeder, injector and applicator with the conveyor travel so that each of these means functions once each time the conveyor is stationary between motion periods.

40. Automatic apparatus for fabricating a package of the type comprising a plurality of beaded containers confined about a core by an encircling resilient band, the core having a longitudinal vane and upper and lower transverse vanes extending at longitudinally spaced points from the longitudinal vane and in transverse and vertical alignment, the apparatus comprising a conveyor, a core feeder operable to dispose separate cores on the conveyor at spaced intervals and in upright position, serially arranged injector means operable to simultaneously urge groups of containers inwardly on opposite sides of the longitudinal vane of successive cores and in bead to bead abutting relation about the longitudinal and transverse vanes, serially arranged applicator means operable to place a band around successive container core combinations, means for positioning the means for placing the band to allow the resilient band to restrict about the container group, and means for cutting bands from a roll of band material and presenting bands for application by the applicator.

41. Automatic apparatus for fabricating a package of the type comprising a plurality of beaded containers confined about a core by a resilient encircling band, the core having a longitudinal vane and upper and lower transverse vanes extending at longitudinally spaced points from the longitudinal vane and in transverse and vertical alignment, the apparatus comprising a conveyor, means for disposing separate cores on the conveyor at spaced intervals and in upright position, means for simultaneously urging groups of containers inwardly on opposite sides of the longitudinal vane of successive cores and in bead to bead abutting relation about the longitudinal and transverse vanes, means for stretching a resilient band to encompass an area larger than the container-core combination and for applying it over and releasing it about the group.

42. Automatic apparatus for fabricating a package of the type comprising a plurality of beaded containers confined about a core by a resilient encircling band, the core having a longitudinal vane and upper and lower transverse vanes extending at longitudinally spaced points from the longitudinal vane and in transverse and vertical alignment, the apparatus comprising a conveyor consisting of separate abutting platens, means for assembling cores on the conveyor and in upright position, serially arranged means for feeding containers adjacent opposite sides of the conveyor, means for urging containers inwardly on opposite sides of the longitudinal vane of successive cores in bead to bead abutting relation about the longitudinal and transverse vanes, and means for placing bands around succeeding container groups and means for positioning the means for placing the band to allow the resilient band to restrict about the container group.

43. Automatic apparatus for fabricating a package of the type comprising a plurality of beaded containers confined about a core by a resilient encircling band, the core having a longitudinal vane and upper and lower transverse vanes extending at longitudinally spaced points from the longitudinal vane and in transverse and vertical alignment, the apparatus comprising a conveyor consisting of separate end to end abutting platens, means for assembling cores on each platen of the conveyor and in upright position, serially arranged means for feeding containers adjacent opposite sides of the conveyor, means for urging containers inwardly on opposite sides of the longitudinal vane of successive cores and in bead to bead abutting relation about the longitudinal and transverse vanes, means for placing bands around succeeding container groups and for allowing the resilient band to contract about the container group, and means for engaging suspension means with the core and extending between confined containers.

44. The method of confining a plurality of beaded containers about a divider having longitudinal and transverse members by means of an encircling resilient wall member, which method comprises the steps of supporting the divider in upright position, inserting the cans laterally inwardly into engagement with the divider with the longitudinal and transverse members interspersed respectively between each pair of adjacent containers, the upper and lower beads of each container abutting the upper and lower beads of adjacent containers respectively above and below the divider, encircling the group of containers arranged about the divider with the resilient wall member, and removing the package including the divider from the divider support means.

45. The method of confining a plurality of beaded containers about a divider having longitudinal and transverse members by means of an encircling resilient wall member, which method comprises the steps of supporting the divider in upright position, inserting the containers on each side of the longitudinal divider laterally inwardly into engagement with the divider with the longitudinal and transverse members extending respectively between each pair of adjacent containers, the upper and lower beads of each container abutting the upper and lower beads of adjacent containers respectively above and below the divider, supporting the resilient wall member to encompass an area just larger than the area of the plurality of containers arranged about the divider, applying the thus supported band around the exterior of the plurality of containers and contracting the band in binding relation about the containers.

46. The method of confining a plurality of beaded containers about a divider having longitudinal and transverse vane members by means of an encircling resilient wall member, which comprises the steps of supporting a first pair of transverse vanes in spaced vertical orientation, press-fitting a longitudinal vane over the first pair of transverse vanes in vertical orientation, press-fitting a second pair of transverse vanes into the upper edge of the longitudinal vane in spaced vertical orientation and in vertical alignment with the first pair of transverse vanes, inserting the containers laterally inwardly into engagement with the divider with one container residing in each divider compartment formed by the longitudinal and transverse vanes so that the upper and lower beads of each container abuts the upper and lower beads of adjacent containers respectively above and below the divider, and encircling the group of containers arranged about the divider with the resilient wall member.

47. The method of confining a plurality of beaded containers about a divider having longitudinal and transverse vane members by means of an encircling resilient wall member, which comprises the steps of supporting a first pair of transverse vanes in spaced vertical orientation, press-fitting a longitudinal vane over the first pair of transverse vanes in vertical orientation, press-fitting a second pair of transverse vanes into the upper edge of the longitudinal vane in spaced vertical orientation and in vertical alignment with the first pair of transverse vanes, inserting the containers laterally inwardly into engagement with the divider with one container residing in each divider compartment formed by the longitudinal and transverse vanes so that the upper and lower beads of each container abuts the upper and lower beads of adja-

cent containers respectively above and below the divider, encircling the group of containers arranged about the divider with the resilient wall member, and springing a U-shaped bale over the upper pair of spaced transverse divider members with the legs of the bale lying on opposite sides of the longitudinal divider member below the bottoms of said upper pair of transverse members.

48. The method of confining six beaded containers in two rows of three each about a divider by an encircling resilient wall member, the divider having a longitudinal vane lying between the rows and transverse vanes extending between constituent containers of each row, which method comprises supporting the divider in vertical orientation, inserting three containers laterally inwardly into engagement with each side of the longitudinal vane so that several containers lie in coplanar bead to bead abutting relation with the container beads lying and abutting respectively above and below the upper and lower edges of the divider, and encircling the group of containers arranged about the divider with the resilient wall member.

49. The method of confining a plurality of beaded containers about a divider having longitudinal and transverse members by means of an encircling resilient wall member, which method comprises the steps of supporting the divider in upright position, inserting the cans laterally inwardly into engagement with the divider with the longitudinal and transverse members interspersed respectively between each pair of adjacent containers, the upper and lower beads of each container abutting the upper and lower beads of adjacent containers respectively above and below the divider, cutting a tubular band narrower than the height of the containers from an elongated length of tubular resilient material to form said wall member and stretching the wall member around the group of containers.

50. Automatic apparatus for fabricating a package of the type comprising a plurality of beaded containers confined about a core by an encircling resilient band, the core having a longitudinal vane and upper and lower transverse vanes extending at longitudinally spaced points with respect to the longitudinal vane and in transverse and vertical alignment with each other, the apparatus comprising means supporting the core in upright position, means for urging containers inwardly on each side of the longitudinal vane in bead to bead abutting relation about the longitudinal and transverse vanes, means for supporting the band around the container group, and means for releasing the band to permit it to contract about the container group.

51. Apparatus according to claim 35 wherein the conveyor comprises a plurality of individual platens and means disposed at spaced intervals on the longitudinal center line of the conveyor to support the core in vertical orientation and with its lower edge above the adjacent face of the conveyor.

52. Automatic apparatus for fabricating a package of the type comprising a plurality of beaded containers confined about a core by an encircling resilient band, the apparatus comprising a conveyor, means on the conveyor to support separate cores at spaced intervals and in upright position, a serially arranged injector operable to urge containers inwardly on each side of successive cores and in bead to bead abutting relation respectively above and below the top and bottom edges of the cores, and a serially arranged applicator operable to place bands around successive container-core combinations and to release the band to permit it to contract about the container group.

53. Apparatus for assembling package cores comprising conveyor means, support means on the conveyor means for receiving and holding the cores in an upright position, rotary ejector means for engaging transverse vanes with the support means in an upright position, reciprocating ejector means for engaging a longitudinal vane with the support means in an upright position, first magazines supplying transverse vanes to the rotary ejector means, and second magazines supplying longitudinal vanes to the reciprocating ejector means, said second magazines including a substantially horizontal track transverse to the conveyor, an impelling frame, a depending weight, pulley and cable means linking the impelling frame to the weight so that the weight urges the impelling frame along the horizontal tract toward the ejector.

54. Apparatus for assembling package cores having longitudinal and transverse vanes comprising a conveyor, support means on the moving portion of the conveyor for receiving and holding the cores, ejector means for engaging transverse vanes with the support means, ejector means for engaging longitudinal vanes with the support means, ejector means for engaging transverse vanes with the longitudinal vanes, and magazines supplying core vanes to the ejector means.

55. Apparatus for applying a resilient wall band around a group of beaded containers arranged about a package core which comprises a conveyor, means on the conveyor for supporting the package cores thereon, magnetic means securing the beaded container groups in an upright position about a package core during the application of the wall band, and means for placing the band around the container group and allowing the band to contract about the container group.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,864,212 December 16, 1958

John K. Bruce

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 3, line 39, for "veocity" read -- velocity --; column 4, line 37, for "of", first occurrence, read -- or --; column 15, line 69, for "track" read -- rack --.

Signed and sealed this 31st day of March 1959.

(SEAL)

Attest:

KARL H. AXLINE
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