June 11, 1940. F. E. DOMKE 2,204,126

MACHINE FOR FEEDING, COUNTING, AND PACKAGING ARTICLES

Filed June 5, 1935 9 Sheets-Sheet 1

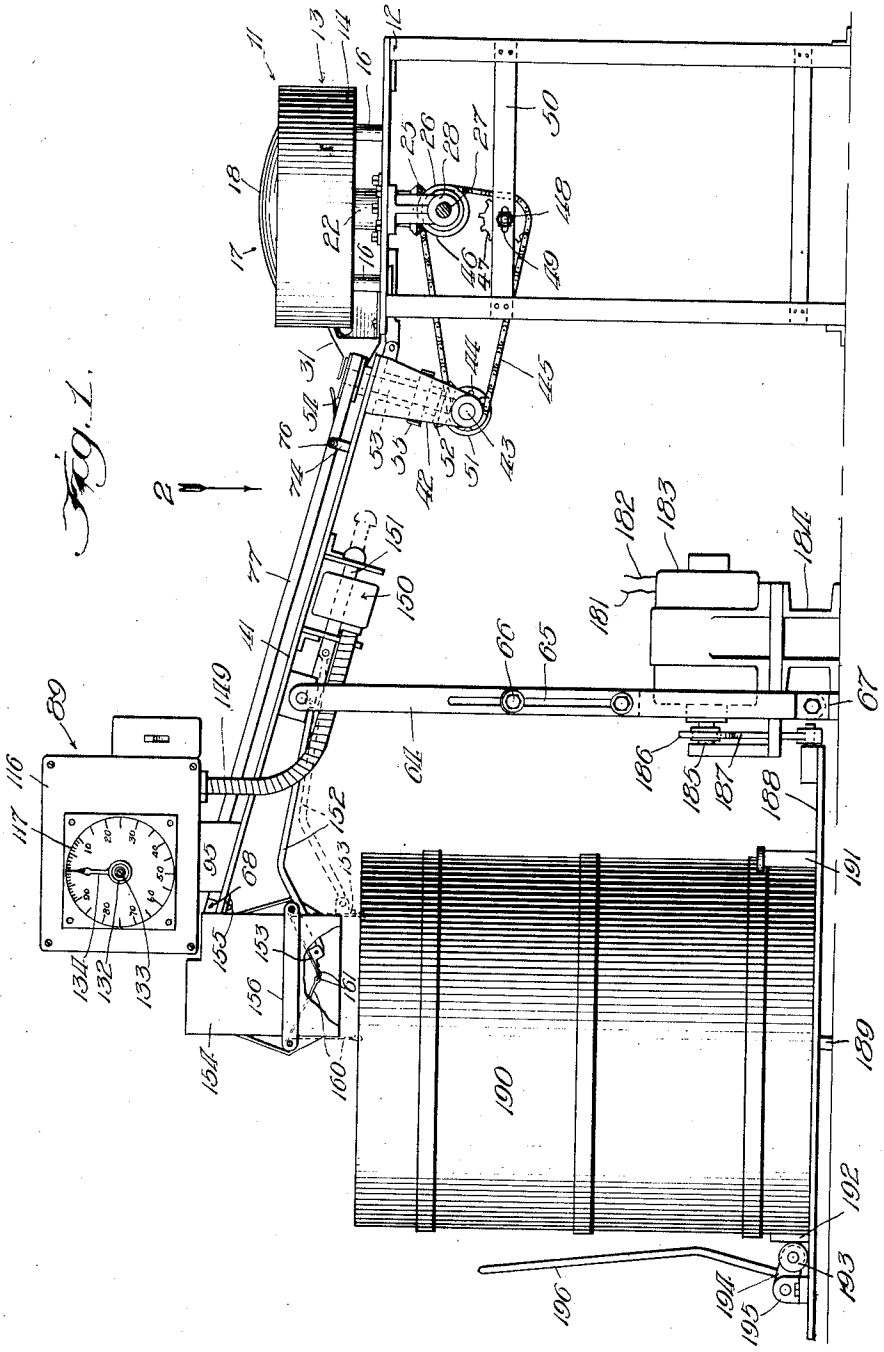


Fig. 1.

Inventor:
Fred E. Domke

By Davis, Macauley, May, Lindsey & Smith
Attys.

June 11, 1940. F. E. DOMKE 2,204,126

MACHINE FOR FEEDING, COUNTING, AND PACKAGING ARTICLES

Filed June 5, 1935 9 Sheets-Sheet 2

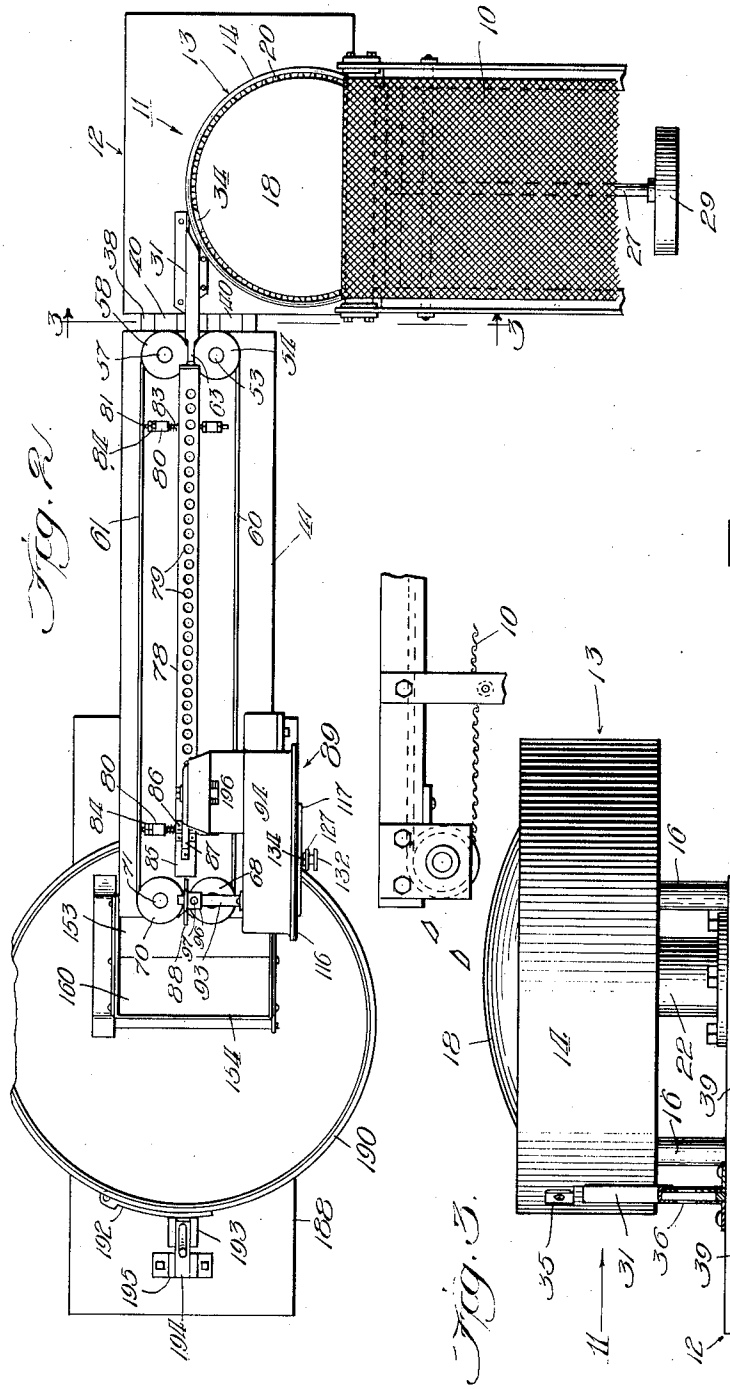


Fig. 4.

Fig. 5.

Inventor:
Fred E. Domke
by Davis, Macauley, Mary, Lindsey & Smith
Attys.

June 11, 1940. F. E. DOMKE 2,204,126

MACHINE FOR FEEDING, COUNTING, AND PACKAGING ARTICLES

Filed June 5, 1935 9 Sheets-Sheet 3

Fig. 4.

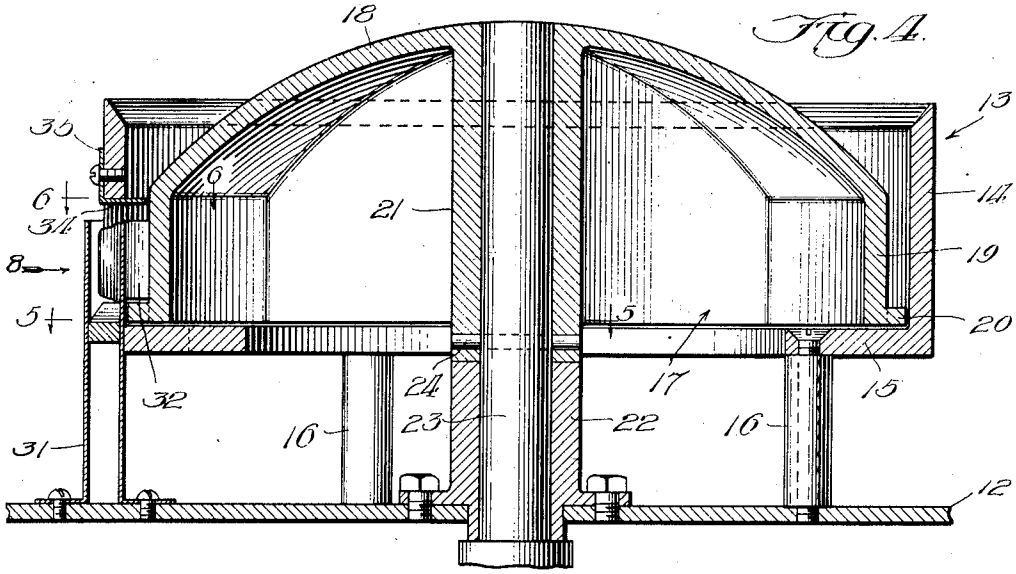


Fig. 5.

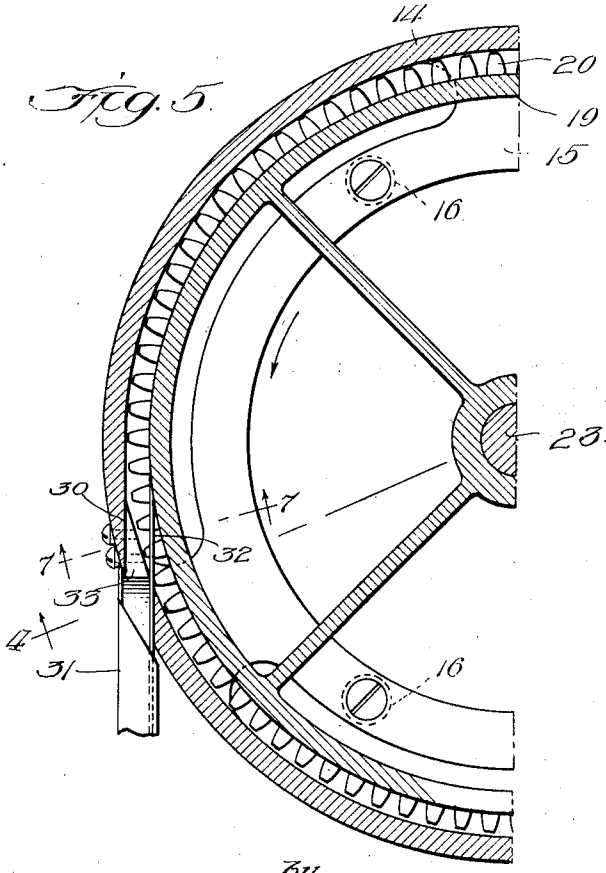


Fig. 6.

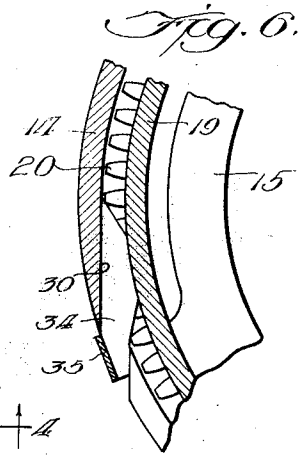
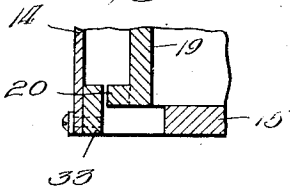


Fig. 7.



Inventor:
Fred E. Domke

By Davis, Macauley, May, Lindsey & Smith
Attys.

June 11, 1940. F. E. DOMKE 2,204,126

MACHINE FOR FEEDING, COUNTING, AND PACKAGING ARTICLES

Filed June 5, 1935 9 Sheets-Sheet 4

Fig. 8.

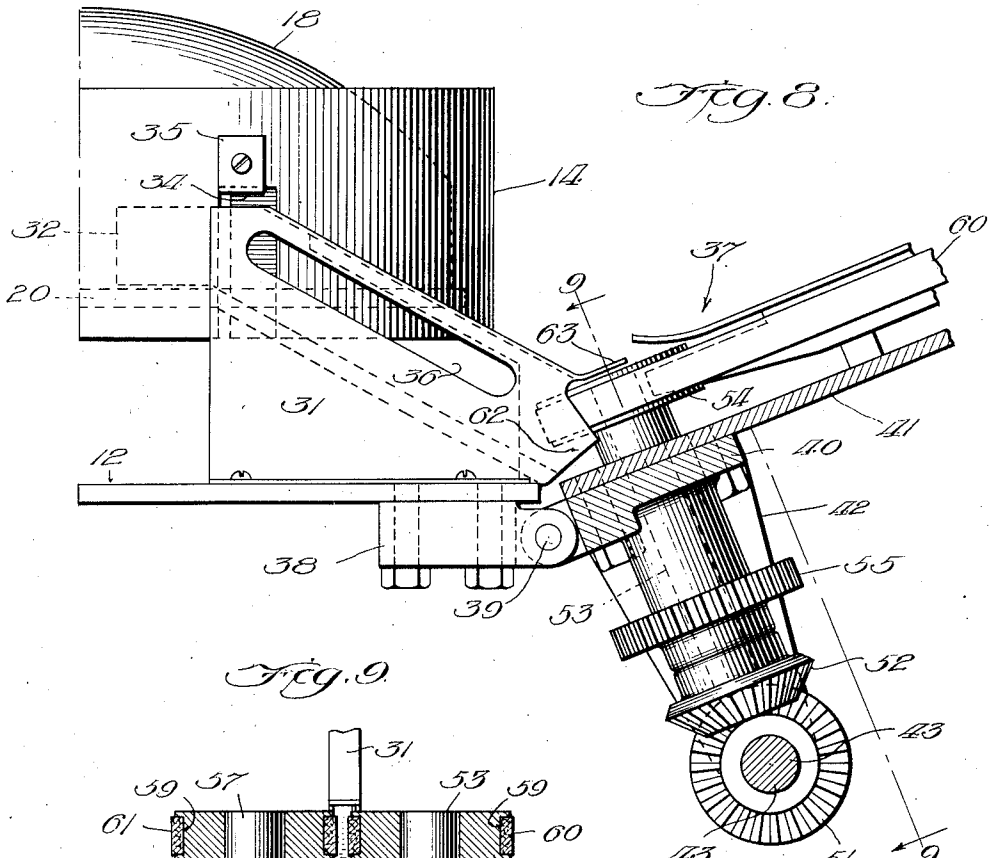
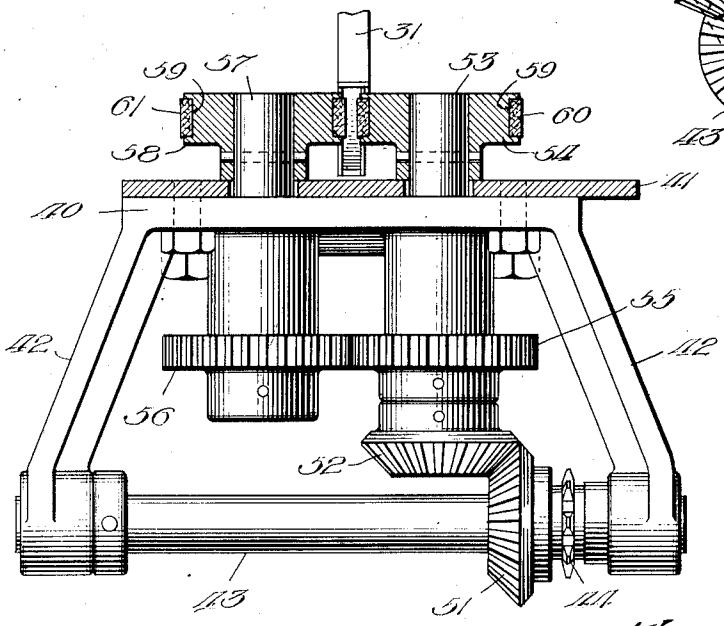


Fig. 9.



Inventor:
Fred E. Domke

By Davis, Macauley, Mary, Lindsey & Smith
Attys.

June 11, 1940. F. E. DOMKE 2,204,126

MACHINE FOR FEEDING, COUNTING, AND PACKAGING ARTICLES

Filed June 5, 1935 9 Sheets-Sheet 5

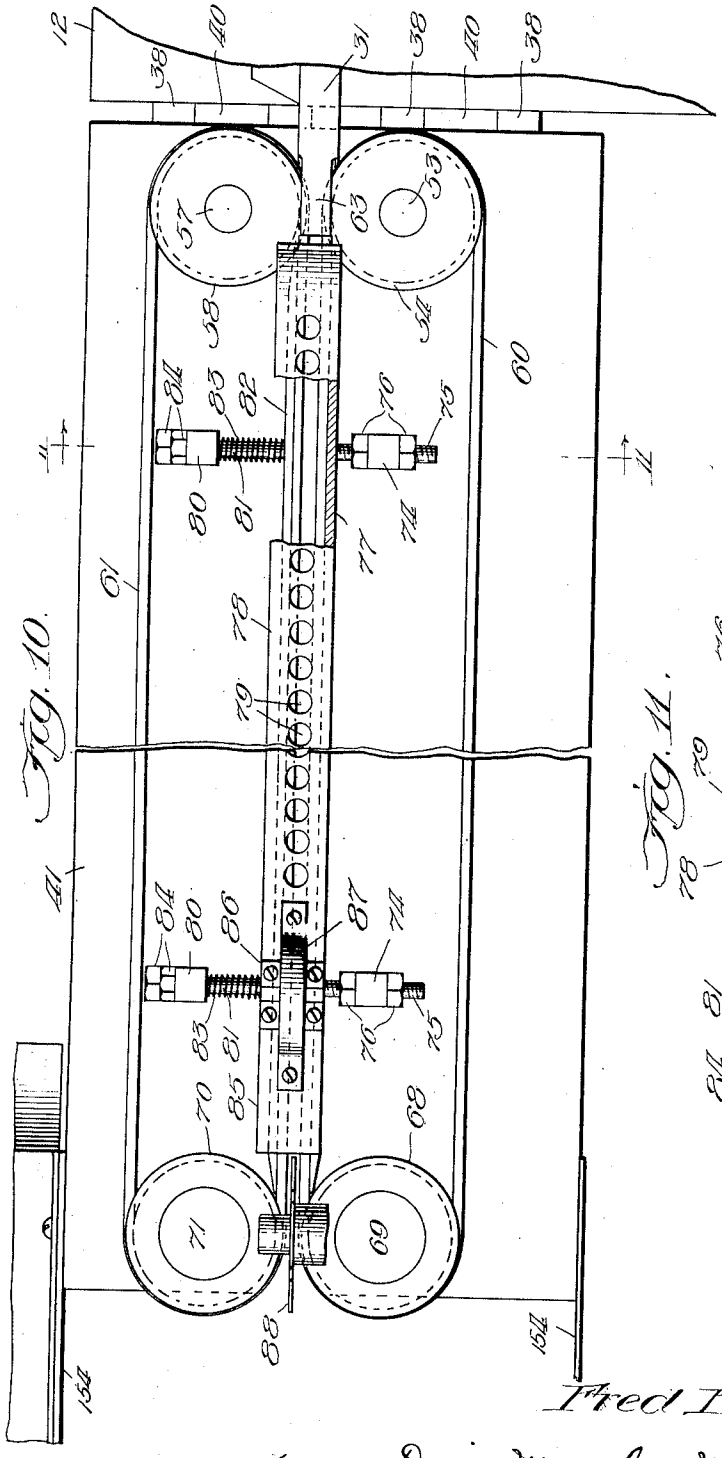


Fig. 10.

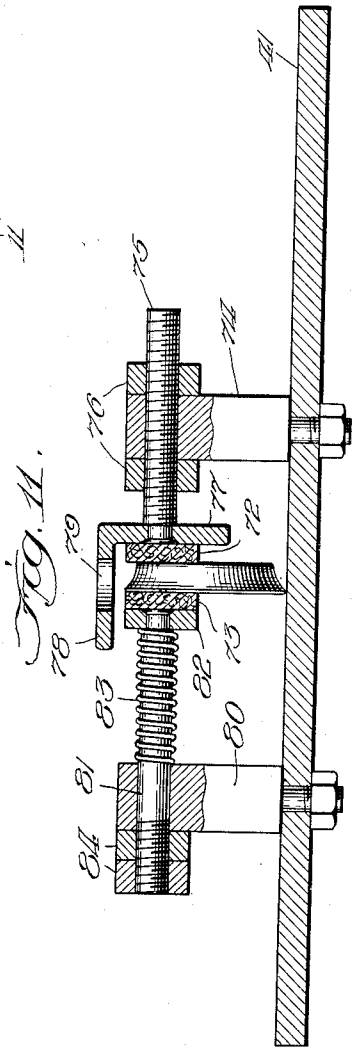


Fig. 11.

Inventor:
Fred E. Domke

by Davis, Macauley, Mary, Lindsey & Smith
Attys.

June 11, 1940. F. E. DOMKE 2,204,126

MACHINE FOR FEEDING, COUNTING, AND PACKAGING ARTICLES

Filed June 5, 1935 9 Sheets-Sheet 6

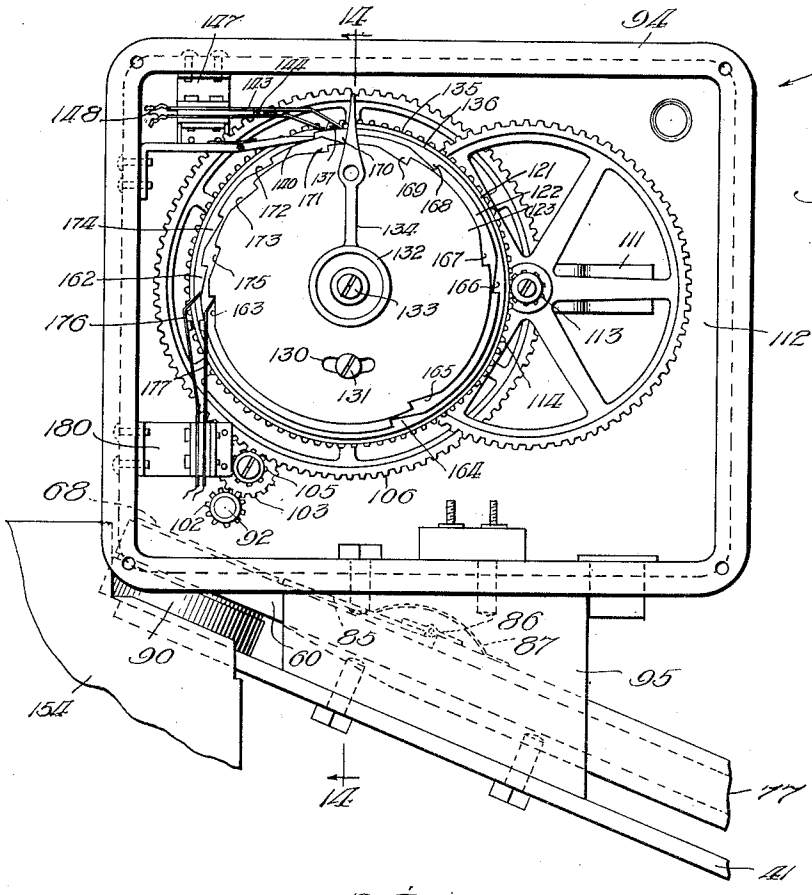
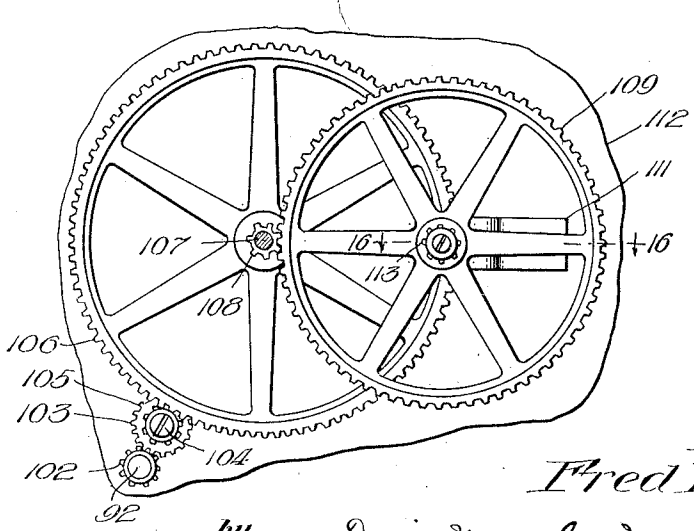


Fig. 12.

Fig. 13.



Inventor:
Fred E. Domke

by Davis, Macauley, Way, Lindsey & Smith
Attys.

June 11, 1940. F. E. DOMKE 2,204,126

MACHINE FOR FEEDING, COUNTING, AND PACKAGING ARTICLES

Filed June 5, 1935 9 Sheets-Sheet 7

Fig. 14.

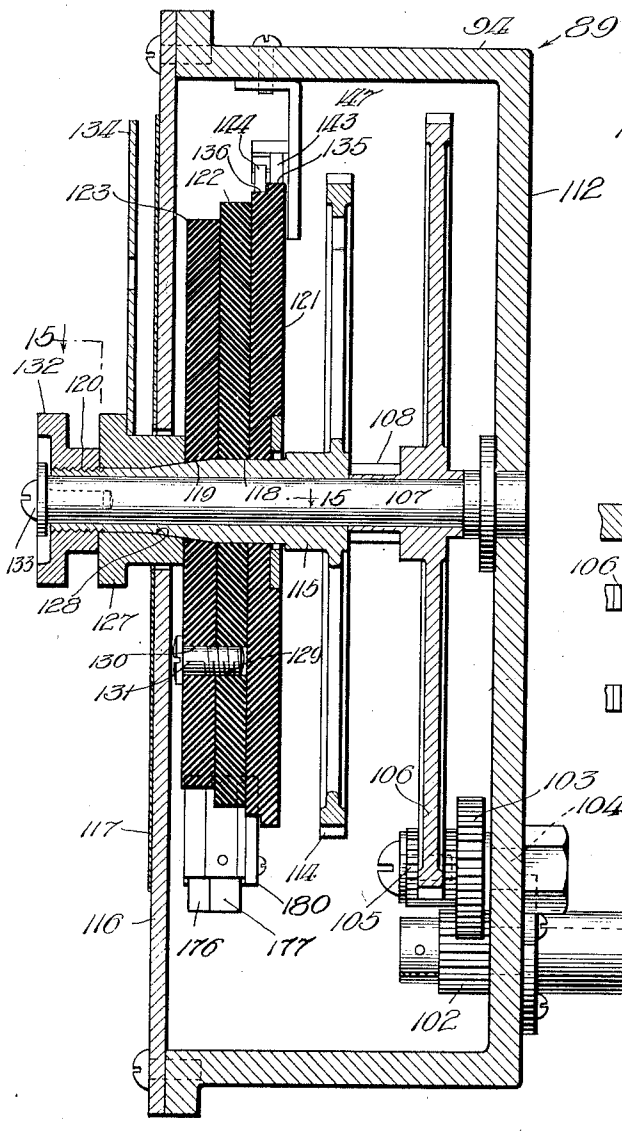


Fig. 15.

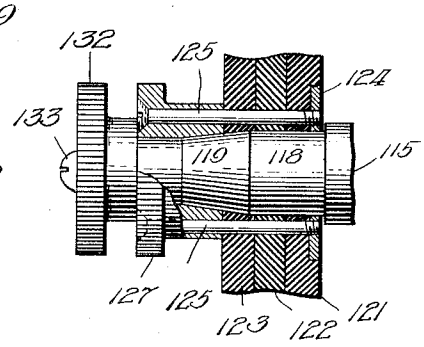
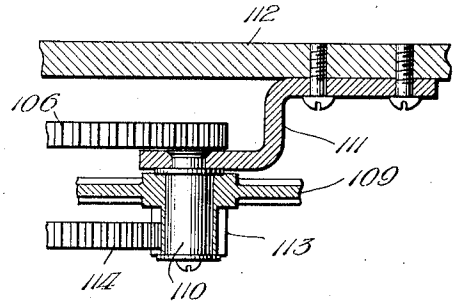
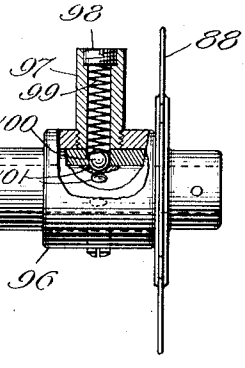


Fig. 16.





Inventor:
Fred E. Domke

By Davis, Macauley, May, Lindsey & Smith
Attys.

June 11, 1940. F. E. DOMKE 2,204,126

MACHINE FOR FEEDING, COUNTING, AND PACKAGING ARTICLES

Filed June 5, 1935 9 Sheets-Sheet 8

Fig. 17.

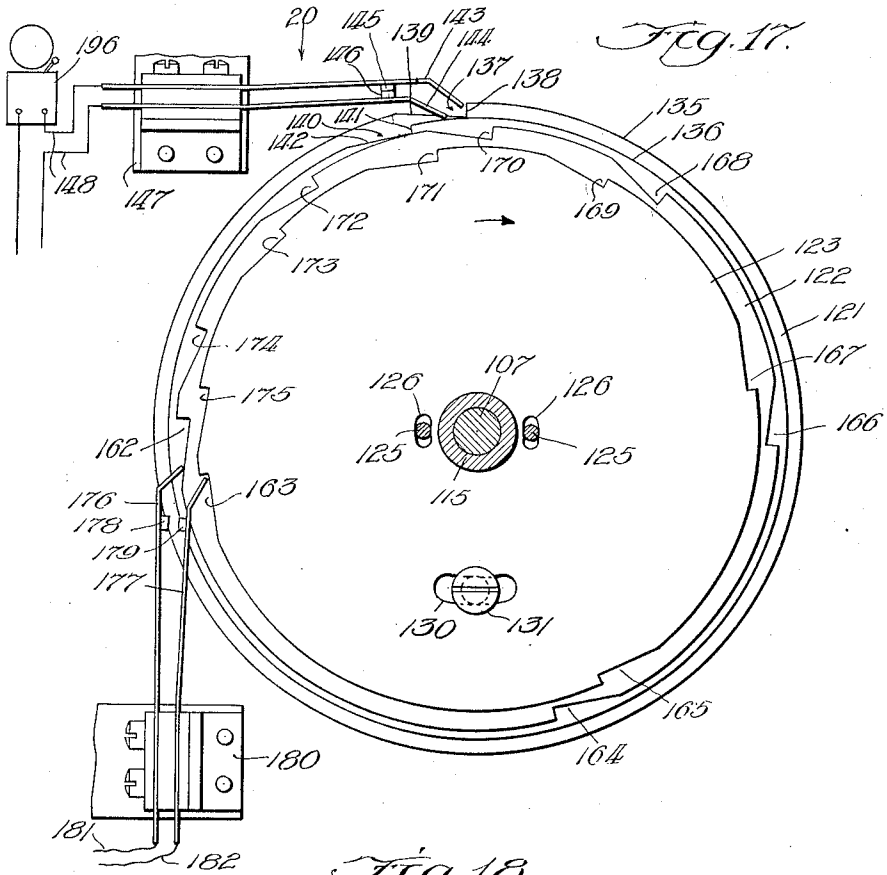


Fig. 18.

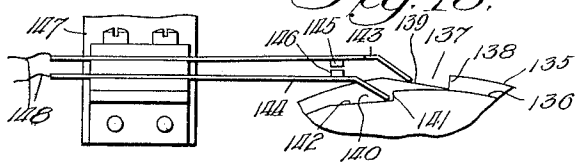


Fig. 19.

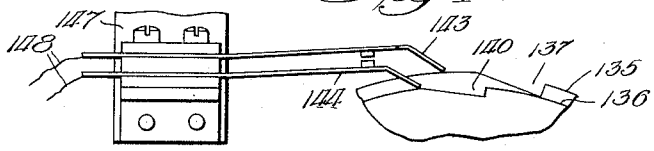
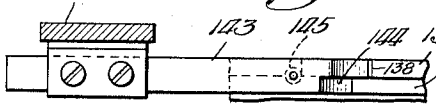


Fig. 20.



Inventor:
Fred E. Domke
by Davis, Macauley, May, Lindsey & Smith
Attys.

June 11, 1940. F. E. DOMKE 2,204,126

MACHINE FOR FEEDING, COUNTING, AND PACKAGING ARTICLES

Filed June 5, 1935 9 Sheets-Sheet 9

Fig. 21.

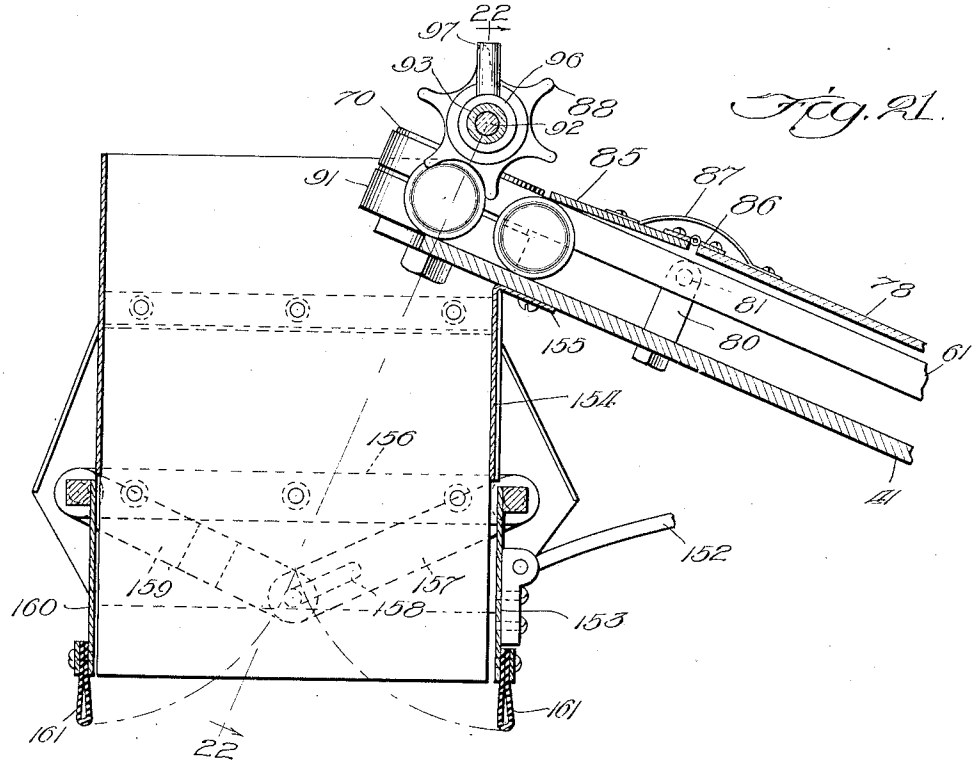
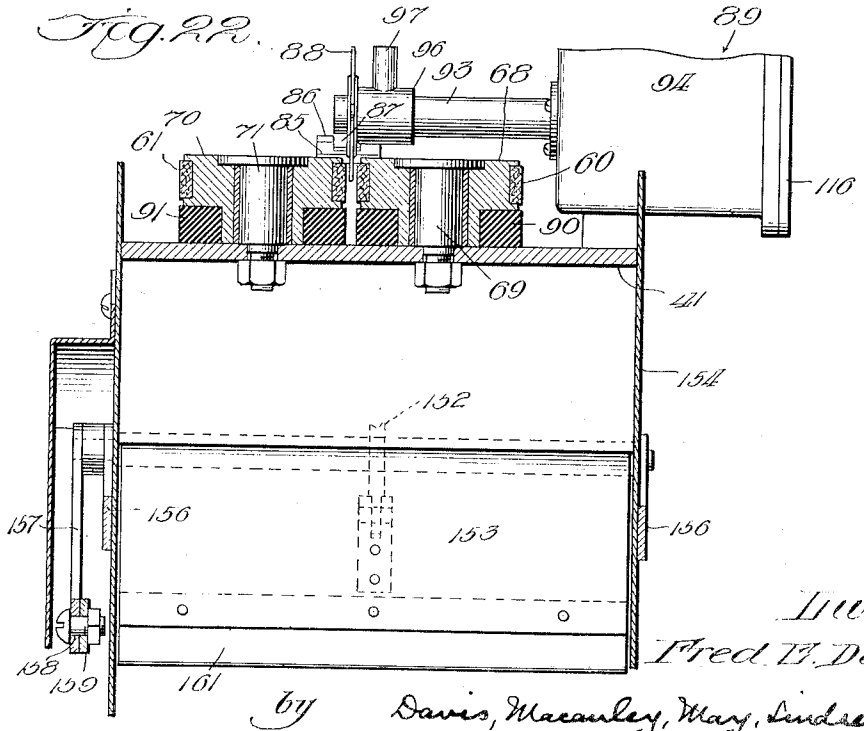


Fig. 22.



Inventor:
Fred E. Domke
by Davis, Macauley, Mary, Lindsey & Smith
Attys.

Patented June 11, 1940 2,204,126

UNITED STATES PATENT OFFICE

2,204,126

MACHINE FOR FEEDING, COUNTING, AND PACKAGING ARTICLES

Fred E. Domke, Chicago, Ill., assignor to W. H. Hutchinson & Son, Inc., Chicago, Ill., a corporation of Illinois

Application June 5, 1935, Serial No. 25,052

14 Claims. (Cl. 226—2)

My invention relates to a machine for feeding, counting, and packaging articles and more particularly to a machine for accomplishing these operations with respect to closure devices, such as, for example, bottle caps and crowns, which are customarily packed in lots containing predetermined amounts.

Owing to the rapidity of manufacture of articles of this character and the fact that they are bought and sold on a number, as distinguished from a weight, basis, it is important that the number in any lot shipment be accurately determined. Counting by hand is slow, laborious and expensive, while a weight comparison of one filled receptacle with another containing a known quantity of articles is inaccurate and unsatisfactory. Both of these methods have been commonly employed in the past in the packaging of such articles, as well as certain counting mechanisms which, however, were characterized by certain inaccuracies in the feed and by a tendency to damage the articles.

Closure devices of the foregoing character are usually manufactured with a desired finish. It is, therefore, of the utmost importance that the devices be handled previous to packaging in such a manner as to avoid any possibility of the closures becoming deformed or defaced, since the former defects might lessen the possibility of securing a satisfactory and permanent seal, while the latter would injure the finish.

It is, therefore, one object of my invention to provide a machine which is adapted for the rapid and accurate feeding, counting, and packaging of closure articles without damage of the finish surface thereof and without deformation of the same.

A further object is to provide an improved mechanism for arranging and delivering the closures in orderly succession to a counting mechanism, the arrangement being such that each closure is positioned similarly to all other closures and the closures are given a positive feed movement independently of each other.

A further object is to provide a machine which incorporates a distributing mechanism for arranging the closures in an orderly manner and a feeding mechanism for precisely presenting the closures so arranged in succession to a counting mechanism, the three mechanisms being associated together for the automatic and continuous handling of a supply of closures which are constantly or intermittently fed to the distributing mechanism.

A further object is to provide a machine of the character indicated which is additionally provided with a shaker mechanism for rocking or otherwise agitating the packaging receptacle to more closely pack the closures, the shaker mechanism being controlled by the counting mechanism and operable at determined times during the filling of the receptacle.

A further object is to provide the aforesaid machine with a hopper into which the closures are delivered during the interval of substituting one receptacle for another, the hopper being thereafter automatically dumped by a device controlled by the counting mechanism.

A further object is to devise a machine having a distributor mechanism in which the closures are delivered in an indiscriminate mass and from which the closures proceed in an orderly succession of the individual closures which are correctly positioned for subsequent presentation to a counting mechanism, and further in which the closures are so handled as to obviate any damage thereto, either by way of deformation or surface marring.

A further object is to provide in a machine of the class indicated a distributing mechanism wherein the closures are carried bodily to the delivery opening thereof and which incorporates a self-cleaning feature for removing dust, cork particles and foreign material and also a provision for cooling or ventilating the mechanism and closures that is useful in instances where the closures are delivered in a heated condition to the mechanism.

A further object is to provide a counting mechanism which is associated with and determines the operation of electrically controlled devices that effect the shaking of the receptacle being filled and which further insures the counted collection of the closures while the receptacle is being replaced, the arrangement being such that the devices operate in timed relation to each other and with respect to predetermined quantities of closures.

Additional objects are to provide signal means electrically controlled by the counting mechanism in timed relation to the interruption of feed to the packaging receptacle for the purpose of warning the operator of the machine that a predetermined number of closures has been fed to the receptacle and thus enabling the operator to substitute an empty for a filled receptacle during the feed interruption; to provide improved conveyor means yieldably engaging the opposite sides of the closures and bodily carrying the same without relative movement; to provide means for identically positioning each closure at the moment of feed to the counting mechanism; to provide a closure feeding arrangement whereby clogging of the closures is avoided so that the feeding and packaging of the closures proceeds in a continuous and uniform manner, regardless of the speed with which the closures are fed; and to provide mechanism for accomplishing all of the foregoing objects in a highly efficient manner.

These and further objects of my invention will be set forth in the following specification, refer-

ence being had to the accompanying drawings, and the novel means by which said objects are effectuated will be definitely pointed out in the claims.

In the drawings:

Figure 1 is a side elevation of one form of a machine embodying my invention.

Fig. 2 is a plan view of the machine, looking in the direction of the arrow 2 in Fig. 1, and showing a portion of the conveyor for delivering the closures to the distributing mechanism.

Fig. 3 is an enlarged section along the line 3—3 in Fig. 2, looking in the direction of the arrows, the view being enlarged and showing the drive for the distributing mechanism.

Fig. 4 is an enlarged, sectional elevation of the distributing mechanism, as viewed along the line 4—4 in Fig. 5, looking in the direction of the arrows, showing the manner in which the closures are discharged singly through the side thereof.

Fig. 5 is a section along the line 5—5 in Fig. 4, looking in the direction of the arrows, and showing the relation of the discharge chute to the toothed carrier flange of the distributor.

Fig. 6 is a section along the line 6—6 in Fig. 4, looking in the direction of the arrows, and showing the guard which prevents movement of any closures through the discharge opening except those resting on the carrier flange of the distributor.

Fig. 7 is a sectional view along the line 7—7 in Fig. 5, looking in the direction of the arrows, and illustrating a detail of the distributor adjacent the discharge opening thereof.

Fig. 8 is a side elevation, looking in the direction of the arrow 8 in Fig. 4, showing the hinged relation of the discharge chute to the feeding mechanism which presents the closures to the counting mechanism, the discharge chute being here shown in elevation and the feeding mechanism being shown in longitudinal section.

Fig. 9 is a section along the line 9—9 in Fig. 8, looking in the direction of the arrows.

Fig. 10 is an enlarged plan view of the feeding mechanism as viewed in Fig. 2.

Fig. 11 is a section along the line 11—11 in Fig. 10, looking in the direction of the arrows and showing the manner in which the closures are yieldably gripped by the feeding mechanism.

Fig. 12 is an enlarged elevation of the counting mechanism, as viewed in Fig. 1, the cover plate of the casing which encloses the mechanism being removed to show the relation of the gear train and the relation of the disks which play a part in the automatic control of certain devices.

Fig. 13 is an elevation, partly in section, of the gear train illustrated in Fig. 12.

Fig. 14 is an enlarged, sectional elevation of the counting mechanism taken along the line 14—14 in Fig. 12, looking in the direction of the arrows.

Fig. 15 is a section taken along the line 15—15 in Fig. 14, looking in the direction of the arrows, and showing the mounting of the controlling disks on their associated hub.

Fig. 16 is an enlarged section taken along the line 16—16 in Fig. 13, looking in the direction of the arrows, and showing a detail relating to the support of certain portions of the gear train of the counting mechanism.

Fig. 17 is an enlarged elevation of the controlling disks of the counting mechanism and their associated electrical contacts, as viewed in Fig. 12, and showing the warning signal which is included in the electrical circuit which controls the operation of the hopper.

Figs. 18 and 19 are elevations showing successive positions of the electrical contacts and their relation to the associated controlling disks which effect the operation of a hopper into which the closures are discharged by the counting mechanism.

Fig. 20 is a plan view of the structure shown in Fig. 17 looking in the direction of the arrows 20 in said figure.

Fig. 21 is an enlarged sectional elevation showing the relation of the delivery and of the feeding mechanism, the star wheel forming a part of the counting mechanism, and the hopper into which the closures are discharged by the counting mechanism.

Fig. 22 is a section along the line 22—22 in Fig. 21, looking in the direction of the arrows, and showing the arrangement for insuring the correct positioning of the closures to the star wheel.

The specific embodiment of my invention, as set forth in the present application, relates to a machine for the counting and packaging of bottle caps or crowns. It will be understood, however, that although the specific disclosure of my invention is particularly adapted for handling bottle caps, the broader phases of the invention are likewise applicable to articles in general, inclusive of screw caps and the like, which it is desired to handle under comparable conditions.

Generally speaking, in the structure illustrated, the caps are indiscriminately fed to a distributing mechanism which arranges the caps in an orderly succession of the individual caps that are presented to a counting mechanism and then loosely discharged into a receptacle, provision being made for shaking this receptacle at definite times in order to more closely pack the caps, and to stop the flow of caps, as well as to give a warning thereof to the operator, when the receptacle has been filled with a predetermined number of caps.

Referring to Figs. 1 to 7, inclusive, the numeral 10 designates an endless conveyor of any suitable construction which at one end is located adjacent a corking machine (not shown) for receiving therefrom the individual caps that have had applied thereto the customary cork sealing disks. These caps which are then in a rather hot condition are delivered by the conveyor 10 to a distributor mechanism 11 (see Fig. 3), which is supported on a table 12.

The distributing mechanism comprises an open top drum 13 (see Fig. 4) which is provided with an upstanding, annular wall 14 and a skeleton or open framework bottom 15 that is supported in spaced relation to the top of the table 12 by legs 16. A distributor 17 is rotatably mounted within the drum 13 and it is provided with a dome-shaped top wall 18 that preferably extends above the upper edge of the drum wall 14 and which is also preferably highly polished in order that it will not mar or scratch the caps that are dumped thereon by the conveyor 10.

A depending, annular wall 19 extends downwardly from the top 18 in concentric relation to the drum wall 14 and spaced therefrom a distance slightly greater than the width of a bottle cap so that the cap will be supported in a vertical plane by a toothed flange 20 which projects outwardly from the lower end of the wall 19 into slightly spaced relation to the inner periphery

of the drum wall 14, the latter spacing being such as to just provide working clearance.

The distributor 17 is supported by means of a sleeve 21 that is located centrally thereof and whose lower end bears against the upper edge face of a bearing 22 that is supported on the top of the table 12. A shaft 23 is journaled in the bearing 22 and its upper end extends through the sleeve 21 for affixation thereto by a pin 24. The lower end of the shaft extends down below the top of the table 12 and has secured thereto a bevel gear 25 which meshes with a bevel gear 26 that is secured to a shaft 27. The shaft 27 is journaled in a pair of hanger bearings 28 that depend from the top of the table 12 and the shaft extends beyond the table for securement to a driving pulley 29 that may be connected to any suitable source of power.

At a convenient location, a slot 30 (see Fig. 5) is cut in the drum wall 14 in such a manner that the opposite, parallel faces thereof are substantially tangentially disposed to the inner and outer peripheral surfaces of the drum wall 14 and the distributor wall 19, respectively. One end of a delivery chute 31 is located adjacent the outer end of the slot 30 and this chute is provided with a guide plate 32 that extends across the annular space between the drum and distributor walls. The inner edge of this guide plate may be appropriately beveled in order to place the same in almost touching relation to the peripheral surface of the distributor wall 19, so that this guide plate will exercise a "peeling" action on the caps as they are successively brought adjacent the guide plate, thereby directing the caps gently and without any danger of deformation into the chute 31.

Because of the circular construction of the drum and distributor, it will be noted in Fig. 5 that, in the region of the delivery slot 30, the toothed flange 20 moves away from the left wall of the slot 30 in its rotation and the opening that would otherwise be formed is closed by a filler block 33 having in plan view the marginal outline of a right-angled triangle, the base of which fits against the entering end of the chute 31 to provide a smooth and continuous surface over which the caps may pass.

As noted in Fig. 3, the caps are delivered indiscriminately on the upper wall of the distributor and thereafter slide by gravity into the annular space between the drum wall and distributor wall. In order to prevent the direct movement of any of the freshly delivered caps through the delivery slot 30, a guard plate 34 having substantially the marginal outline shown in plan view in Fig. 6 extends inwardly under the top wall of the slot 30, as clearly indicated in Fig. 4, and sufficiently across the annular space between the drum and distributor walls to prevent the movement of any caps into the delivery chute 31, except those resting directly on the toothed flange. The plate 34 has an ear part 35 which is affixed to the outer surface of the drum wall (see Fig. 4). The delivery chute 31 inclines downwardly toward the top of the table 12 and in one or both of the opposite sides thereof may be provided sight openings 36 through which the movement of the caps can be observed.

The lower end of the chute 31 terminates in delivery relation to one end of a feeding mechanism designated generically by the numeral 37 (see Fig. 8), which will now be described.

A pair of brackets 38 (see Figs. 3 and 8) are secured to the underside of the top of the table 12 and pivoted thereto, as by the pins 39, is a bracket 40 which is bolted to the underside of one end of a bedplate 41 that supports the feeding mechanism. A pair of spaced hangers 42 depend from the bracket 40 and journaled in the lower ends thereof is a shaft 43. A sprocket 44 is secured to the shaft 43 and operating over this sprocket is a chain 45 which also engages with a sprocket 46 fixed to the driving shaft 27 and the same chain also passes around an adjustable idler sprocket 47 which is secured to a shaft 48 that is adjustably mounted in a slot 49 provided in a strut 50 (see Fig. 1) that is bridged between a pair of the legs of the table 12. The shaft 43 is accordingly driven by the main drive shaft 27 and the adjustment of the chain 45 may be effected from time to time by suitably positioning the sprocket 47.

A bevel gear 51 is fixed to the shaft 43 and meshes with a bevel gear 52 that is pinned to the lower end of a shaft 53 that extends upwardly through the bedplate 41 and has affixed thereto a pulley 54. A spur gear 55 is also pinned to the shaft 53 above the bevel gear 52 and it meshes with a spur gear 56 that is secured to the lower end of a shaft 57 that projects upwardly through the bedplate 41 for affixation to a pulley 58.

Each of the pulleys is provided on its periphery with a channel-shaped groove 59 and operating in this groove on the pulley 54 is an endless belt 60, while a similar belt 61 operates on the pulley 58. By referring to Figs. 8 and 9, it will be apparent that the delivery end of the chute 31 delivers the caps successively into engaging relation with the innermost or cooperating portions of the belts 60 and 61 (see Fig. 9), and to facilitate this movement, each side wall of the chute is extended as at 62, while the top wall of the chute is extended and bent above the pulleys, as indicated by the numeral 63 in Fig. 8.

The bedplate 41 is supported by a pair of standards 64 whose upper ends are connected to the bedplate by a suitable pivotal connection and whose lower ends have a slot and bolt connection, designated by the numerals 65 and 66, respectively, (see Fig. 1) with a pair of standards 67 that rest on the floor. The purpose of these standards and the pivotal connection between the table 12 and bedplate 41 is to accommodate the machine to different heights of receptacles, as hereinafter described.

Referring to Figs. 2, 10 and 22, the belt 60 also operates over a pulley 68 which is journaled upon a bearing pin 69 mounted in the bedplate 41, while the belt 61 operates over a similar pulley 70 that is journaled in a bearing pin 71 also mounted in the bedplate. The pulleys 68 and 70 bear the same position relationship as do the pulleys 54 and 58, respectively, and the former pair is located a sufficient distance from the latter pair so that the caps may be correctly presented to the counting mechanism, as hereinafter described by the cooperating or work-gripping portions of the endless belts, designated by the numerals 72 and 73 in Fig. 11, respectively.

In order to insure that the last noted belt portions will suitably grip the particular cap throughout its travel therebetween and to accomplish this result without damaging or marring the caps in any manner, certain guiding and yieldable devices are employed and these will now be described.

A pair of spaced uprights 74 are fixedly mounted in and extend upwardly from the bed-

plate 41 between the pulleys 54 and 68 and threaded in each upright is a stud 75 whose axis is parallel to the upper surface of the bedplate and whose endwise position relative to the supports 74 may be adjusted and the adjustment held by lock nuts 76. A back plate 77 is carried on the ends of the studs 75 nearest the belt portion 72 and in length it extends from the pulley 54 to the pulley 68. Formed with the back plate 77 is a top plate 78 that extends over the belt portions 72 and 73 for almost the full length of the back plate and this top plate serves to prevent the upward movement of any cap and it is also provided with a series of perforations 79 through which the passage of the caps may be observed.

A similar pair of uprights 80 is mounted on the bedplate 41 between the pulleys 58 and 70 and preferably opposite to the uprights 74. A pin 81 is slidably mounted in each upright 80 and on the ends of these pins adjacent the belt portion 73 is carried a presser bar 82 and between this bar and each upright 80 a coil spring 83 encircles the pin 81, thus tending to move the presser bar 82 into contact with the adjacent belt portion 73. This movement obviously moves the belt portion 72 against the back plate 77 so that the cooperating belt portions apply a yieldable gripping engagement to the bottle cap located therebetween. The position of the presser bar 82 and the force applied by the springs 83 can be adjusted by the nuts 84.

From the foregoing, it will be understood that the caps are delivered from the distributing mechanism by the chute 31 to the gripping belt portions between the pulleys 54 and 58, each cap occupying an upright position and resting on the peripheral edge of its crimped skirt. The position of these caps while engaged by the belt portions is clearly illustrated in Fig. 11 and it will be particularly noted that the caps are not only guided on their opposite sides, but also on the bottom edge and are prevented from moving upwardly by the top plate 78. The contact of the skirt edge of each cap with the bedplate is very slight so that there is no possibility of this important part of the cap being damaged; further, it will be noted that the carriage of the cap by the feeding mechanism is in the nature of a definite body movement thereof, being one of a motion of translation as distinguished from a motion of rotation which might otherwise cause the caps to move along the bedplate with a "bumping" action.

As indicated in Fig. 10, the top plate 78 terminates short of the back plate 77 and the gap thus formed is closed by a guide plate 85 which is connected by a hinge 86 to the top plate 78. An arcuate spring 87 has its opposite ends attached to the top plate 78 and guide plate 85, respectively, and the purpose of the latter is to move any cap that may be then occupying a higher position into one wherein the edge of the skirt rests on the bedplate 41, so that so far as the position of the cap transversely of the bedplate is concerned, it will be correctly positioned to engage between a pair of the teeth of a star wheel 88 forming part of a counting mechanism 89. The cap is prevented from assuming a canted position with reference to the plane of the star wheel by means of annular rubber rings 90 and 91 which are mounted in appropriate recesses provided in the pulleys 68 and 70, respectively, and so disposed that the working surfaces of these rings lie in the same planes as the working surfaces of the belts 60 and 61, that is with respect to the caps gripped therebetween. The relation of these belts and annular rings is clearly shown in Fig. 22.

The movement of each cap into engagement with the star wheel 88 effects a rotation of the latter and therefore an actuation of the counting mechanism which will now be described.

Referring to Figs. 12 and 16, inclusive, and more particularly to Fig. 14, the star wheel 88 is fixedly mounted upon a shaft 92 that is journaled in a bearing 93 carried by a casing 94 that encloses the principal elements of the counting mechanism. This casing is carried by a support 95 that is bolted to the bedplate 41 (see Fig. 12). In order to avoid any inaccuracies in the counting of the caps such as might be caused by a tendency of the star wheel to "overrun" after being rotated by any particular cap, a suitable braking or retarding mechanism is employed. To this end, the bearing 93 is provided with an enlarged hub 96 adjacent the star wheel and threaded in the peripheral surface of this hub is a hollow sleeve 97 that is closed at its outer end by a plug 98. Within the sleeve 97, one end of a coil spring 99 abuts against the plug 98 and the opposite end against a ball 100 which seats in one of a plurality of depressions 101 provided in the surface of the shaft 92, after each cap has passed the star wheel. These depressions are spaced around the periphery of the shaft 92 and in such a location that a movement of the ball 100 from one depression to the next succeeding depression corresponds to the counting of one cap.

The shaft 92 extends within the casing 94 and has mounted thereon a spur gear 102 which meshes with a spur gear 103 that is rotatably supported on a stub shaft 104 that is also carried by the casing. Integrally formed with the gear 103 is a spur gear 105 that meshes with a considerably larger spur gear 106 that is rotatably mounted upon a fixed axle 107 that is supported in and extends across the width of the casing 94 (see Fig. 14). A spur gear 108 is formed on the hub portion of the gear 106 and meshes with a spur gear 109 that is rotatably supported on a stud axle 110 which is carried by a bracket 111 that is bolted to the rear wall 112 of the casing 94 (see Fig. 16). The hub of the gear 109 is also formed as a spur gear 113 which meshes with a spur gear 114 (see Figs. 12 and 14) which is also freely rotatable on the axle 107. The whole purpose of the gear train described above is to suitably modify the movement imparted to the star wheel into a movement capable of being indicated upon a suitably calibrated dial, as hereinafter described.

As noted in Fig. 14, the axle 107 is supported at one end in the rear wall 112 of the casing 94 and its opposite end extends through a front plate 116 that is attached to the open side of the casing 94 and which carries a dial 117 which, in the present instance, is calibrated so that one complete rotation of the dial is equal to a counting of 100 gross of caps (see Fig. 1), each division on the dial therefore measuring one gross.

Referring more particularly to Fig. 14, the hub 115 of the gear 114 revolves on the axle 107 and also extends beyond the cover plate 116. This hub is provided with a concentric surface 118 and a tapering surface 119 which terminates in a threaded portion 120 located on the end of the hub. Carried on the surface portions 118 and 119 and in closely fitting relation thereto are

disks 121, 122 and 123 which are arranged side-by-side and with their faces contacting, and these disks are made of some suitable insulating material, such as fiber and the like. In order to hold these disks in the compact relation illustrated in Fig. 14, the exposed surface of the disk 121 is recessed to receive a plate 124 in which is threaded a pair of screws 125 that are located on opposite sides of the hub 115 (see Fig. 15). Within the disks 121, 122 and 123, the screws 125 pass through arcuate and elongated slots 126 (see Fig. 17) in order to permit relative rotation and adjustment of the disks as hereinafter explained, and these screws also pass through and have their heads mounted in a cap 127 which encircles and closely fits the hub 115 and which is also provided with a tapering portion 128 that is intended to wedgingly engage with the surface 119. In order to permit the relative adjustment of the disks 122 and 123 for a purpose presently explained, these disks are provided with arcuate and elongated slots 129 and 130, respectively, (see Figs. 14 and 17) within which is mounted a cap screw 131 that is threaded in the disk 122. By loosening this screw, it is obvious that the disks 122 and 123 may be shifted rotarily with respect to each other.

A nut 132 is threaded on the part 120 of the hub 115 and presses the cap 127 into wedging engagement with the hub 115, thus causing all three disks to partake of the motion of rotation of the hub 115. A cap screw 133 mounted in the end of the axle 107 prevents movement of the nut 132 toward the left, as viewed in Fig. 14. A pointer 134 is mounted on the cap 127 and operates across the face of the calibrated dial 117.

Referring to Figs. 14 and 17, it will be noted that the peripheral surface of the disk 121 is stepped in profile to provide peripheral surfaces 135 and 136. The surface 135 is provided with a ratchet notch 137 defined by a shoulder 138 and a surface 139. Similarly, the disk surface 136 is provided with a ratchet notch 140 that is defined by a shoulder 141 and a surface 142. Since the disk 121 rotates in a clockwise direction, as viewed in Fig. 17, the notch 137 is rotarily in advance of the notch 140 and this arrangement is utilized, in conjunction with certain electrical devices presently described, to effect a very important function in the operation of the machine. A pair of metallic spring arms 143 and 144 bear continually against the peripheral surfaces 135 and 136, respectively, and these arms are provided with the electrical contacts 145 and 146, respectively, which engage for a certain period during the rotation of the disk 121 and remain disengaged for the remaining period of rotation. The spring arms are carried by a bracket 147 fastened to the interior of the casing 94 and they are connected by means of a pair of electrical conductors 148 that pass through a conduit 149 (see Fig. 1) with the winding of a solenoid 150 that is secured to the underside of the bedplate 41. A bell 196, generally representative of a warning signal of any type, is also included in the solenoid circuit, as indicated in Fig. 17.

The core 151 of the solenoid is connected by a link 152 with a wing 153 (see Fig. 21) forming part of the dump bottom of a hopper 154 which is also carried by the bedplate 41, as by means of a flange 155 screwed thereto. The wing 153 is pivotally mounted upon one end of a brace bar 156 that is secured to and extends across one side of the hopper 154 and the wing is rigidly connected to a link 157 having within the margin thereof an elongated slot 158 within which operates a pin forming a pivotal connection of the link 157 with a second link 159 that is pivoted on the opposite end of the bar 156 and rigidly connected to a second wing 160 which cooperates with the wing 153 to form the dump bottom of the hopper. The lower ends of the wings are provided with flexible aprons 161, formed of rubber and the like, which provide a yielding contact between the lower edges of the wings when moved to a closed position, thus preventing damage to any cap that might be inadvertently caught therebetween.

In Fig. 21, the bottom of the hopper 154 is shown in dumping position in full lines, while in Fig. 1, the dump bottom is shown in closed position in full lines and in open position in dotted lines. The general purpose of this hopper arrangement and the electrical control therefor is to provide an arrangement for temporarily collecting the caps without interrupting the counting operation, while the filled receptacle is being removed and an empty one substituted. When the hopper has been filled with a predetermined number of caps, it is automatically dumped under the control of the counting mechanism to deposit its mass of caps into the then empty receptacle.

Because the counted caps are delivered loosely into the receptacle or container, it is important in order to economize in the size of these containers to shake the same at certain intervals while the container is being filled. The automatic control therefore, as governed by the counting mechanism, is the function of the disks 122 and 123.

Referring then to Fig. 17, the disks 122 and 123 are provided on their peripheral surfaces with cooperating pairs of ratchet notches 162—163, 164—165, 166—167, 168—169, 170—171, 172—173, and 174—175, respectively, or, in other words, the even numbered notches are located on the disk 122, while the odd numbered notches are located on the disk 123, with the notches on the former disk being disposed rotarily in advance of the notches on the latter disk, as clearly indicated in Fig. 17.

The ends of a pair of spring arms 176 and 177 are located to wipe over the peripheral surfaces of the disks 122 and 123, respectively, including the notches thereof, and these arms are composed of metal and are respectively provided with electrical contacts 178 and 179 which are periodically engaged as the disks rotate. The arms 176 and 177 are supported in a bracket 180 which is secured to the casing wall and the arms are respectively connected by means of electrical conductors 181 and 182 with a motor 183 that is supported upon a base 184 resting on the floor, it being understood that the electrical connections between the arms 176 and 177 and the motor 183, as well as between the arms 143 and 144 and the solenoid 150 and bell 196, also include a source of electrical power (not shown).

The purpose of the motor 183 is to agitate or shake the receptacle into which the caps are loosely discharged by the counting mechanism in order to more closely pack the caps and therefore economize in the size of the containers. To this end, the motor shaft 185 has fixed to one end thereof an eccentric 186 that drives a connecting rod 187 that is secured to one end of a receptacle support plate 188 that is intermediately supported on a narrow fin 189 and therefore rockable thereon. Resting on the plate 188 is a cap receptacle 190 and in order to hold this receptacle in

position during the shaking movement, a pair of stop pins 191 extend upwardly from the face of the plate 183 and at a convenient distance therefrom and properly located with respect thereto is a pivoted, arcuate presser plate 192 (see Figs. 1 and 2) which is adapted to be engaged by a roller 193 carried in one end of a link 194 that is pivoted on a bracket 195 attached to the support plate 188. A lever 196 is secured to the link 194 so that when swung to the position illustrated in Fig. 1 and assuming the receptacle 190 in position, the latter will be moved against the pins 191 by the plate 192 and therefore locked in position.

The operation of my improved machine will now be described.

Before the caps are delivered to the conveyor 10, they may, for example, have had cork seals applied to the interiors thereof and are then indiscriminately dumped on the smooth and polished surface of the dome wall 18 of the distributor 17 by the conveyor 16. At this time, the caps are ordinarily in a rather warm condition and after falling on the dome wall 18, they slide into the annular space defined by the drum and distributor walls 14 and 19, respectively, (see Fig. 4). In this position the caps are supported in an upright position with their skirt edges resting on the toothed flange 20, with some caps facing in one direction and other caps in an opposite direction owing to the fact that the caps are indiscriminately dropped onto the flange 20. Because of the open construction of this flange, any foreign particles, such as dirt, pieces of cork or metal, etc., are evacuated through the openings between the teeth and these openings also serve an additional purpose in possibly cooling to some extent the hot caps. The distributor 17 rotates at constant speed and carries the caps bodily to the delivery slot 30 where the caps are successively directed by the guide plate 32 into the delivery chute 31. As already noted and because of the provision of the guard plate 34, only those caps will be directed into the delivery chute which are actually resting on the flange 20. The operation of the distributor therefore arranges the caps in an orderly succession of the individual caps and there is no possibility of more than one cap being presented to the delivery opening of the drum at the same time, or of any clogging of the caps. If the distributor is completely or partially filled with caps, those caps which are not resting directly on the flange 20 will be carried around the drum over the submerged caps and over the guard plate until they drop by gravity into vacant places on the flange created by the discharge of caps into the delivery chute.

The width of the delivery chute 31 is such as to maintain the upright position of each cap which is therefore presented in this position between the cooperating belt portions 72 and 73 as they pass around the pulleys 54 and 58.

Each cap is therefore gripped immediately as it passes from the delivery end of the chute 31 and this grip is maintained throughout the movement of any particular cap until it reaches the star wheel 88. During the transfer of the caps by the feeding mechanism, they are yieldably gripped by means of the back plate 77 and the presser bar 82, but in such a manner that the caps cannot be damaged and it will be particularly noted by reference to Fig. 11 that the upright position of the caps is maintained and that they are delivered in a straight line to the star wheel 88 (see Fig. 10). During this transfer, the uniformity of the feed to the star wheel is not affected by the indiscriminate facing of the caps in opposite directions.

It is contemplated that in the packaging of some types of caps, such as certain forms of screw caps, the caps may be fed directly to the feeding mechanism for carriage to the counting mechanism, thus eliminating the distributor. Moreover, the feeding mechanism may be arranged so that the caps will be moved in horizontal or any other position to the star wheel, it being understood that the star wheel and the distributor, if used, would be relocated and rearranged to accommodate and effect the different feed position.

Just before reaching the star wheel, each cap is further subjected to the downwardly acting pressure of the plate 85 in order to insure that it will correctly engage between a pair of teeth of the star wheel and any tendency of any particular cap to assume a canted position is prevented by means of the cooperation of the belt portions 72 and 73 with the rings 90 and 91, respectively, on the pulleys 58 and 70. Accordingly, each cap is presented to the star wheel in substantially the same plane as this wheel. The movement of each cap past the star wheel 88, as caused by the movement of the belts 60 and 61, actuates the counting mechanism and the rotary movement of the star wheel 88 is so related and proportioned to the members of the gear train in the casing 94 that the passage of 144 caps past the star wheel will move the pointer 134 across one division on the dial 117, thus indicating the counting of one gross of caps. Of course, it will be understood that the counting mechanism may be calibrated in other units. Any tendency of the star wheel 88 to "overrun", after being actuated by each cap is effectively prevented by the seating of the ball 100 successively in the depressions 101 (see Fig. 14).

In considering the action of the counting mechanism with respect to its control of the solenoid 150 and the shaking motor 183, it will be assumed that the positions of the disks 121, 122 and 123 are as illustrated in Fig. 17. At this time, the contacts 178 and 179 are separated so that the motor 183 is at rest, while the contacts 145 and 146 are in engagement, because the end of the arm 143 has just dropped into the notch 137 while the arm 144 is still riding on the circumference of the disk surface 136. The circuit through the solenoid 150 will therefore be closed so that the wings 153 and 160 (see Figs. 1 and 2) will be swung to close the bottom of the hopper 154, as shown in full lines in Fig. 1, and the bell 196 will commence ringing, thus warning the operator to change receptacles. However, the caps continue to be discharged by the end of the feeding mechanism and are collected by the hopper 154 and this operation continues during the interval of replacing the previously filled receptacle 190 with an empty container.

The disks continue to rotate until the end of the spring arm 144 drops into the notch 140, thus separating the contacts 145 and 146 and breaking the solenoid circuit. The wings 153 and 160 then drop of their own weight to the position illustrated in Fig. 21, whereupon the caps then held by the hopper are dumped into the receptacle 190. Thereafter the ends of the arms 143 and 144 simply bear on the circumferences of the disk surfaces 135 and 136 and the contacts 145 and 146 remain disengaged. In the particular machine disclosed in the drawings, the interval dur-

ing which the contacts 145 and 146 remain in engagement corresponds to a counting of two gross of caps, or a movement of the pointer over two subdivisions of the dial.

During the foregoing action, the ends of the arms 176 and 177 have moved along the flat surfaces of the notches 162 and 163, respectively, (see Fig. 17) and subsequently wipe over the curved portions of the disks 122 and 123 between the notches just noted and the notches 164 and 165. During this movement, the contacts 178 and 179 remain separated and the caps are being continually discharged into the receptacle 190.

Eventually, the disks rotate sufficiently to cause the end of the arm 176 to drop into the notch 164, thus causing the contacts 178 and 179 to engage and thereby completing the electrical circuit through the shaking motor 183 which thereupon rocks the plate 188 and agitates the caps then in the receptacle 190 sufficiently to more closely pack the same. The contacts 178 and 179 remain in engagement until the end of the arm 177 drops into the notch 165, whereupon the contacts are disengaged and the motor 183 stops. The interval between the positions of the disks 122 and 123, as illustrated in Fig. 17, and when the arm 176 drops into the notch 164 corresponds roughly to the counting of 30 gross, for the arrangement of the machine as shown.

The action of the arms 176 and 177 with respect to the notches 164 and 165, respectively, is repeated successively for the remaining cooperating pairs of notches on the indicated disks, it being understood that the contacts 178 and 179 engage when the end of the arm 176 falls into one of the notches on the disk 122 and remains in engagement until the end of the arm 177 falls into one of the notches on the disk 123, and further that these contacts remain out of engagement at all other times.

The interval between the notches 164 and 166 corresponds roughly to the counting of 20 gross of caps; that between the notches 166 and 168 to 15 gross; that between the notches 168 and 170 to 10 gross; that between the notches 170 and 172 to 10 gross; that between the notches 172 and 174 to 10 gross; while that between the notches 174 and 162 corresponds to 5 gross.

Accordingly, it will be understood that, as the receptacle is gradually filled, the periods between the shaking movements of the receptacle 190 are decreased because of the gradually accumulating mass of caps in the receptacle.

When the disks have again returned to the relative positions shown in Fig. 17, the counting mechanism will have counted 100 gross of caps and the contacts 145 and 146 will thereupon engage to close the bottom of the hopper 154 and operate the bell 196, thus permitting the removal of the filled container.

At certain times, it may be desirable to vary the time of the shaking, either increasing or decreasing this period, and this result can be readily accomplished by rotarily shifting the disks 122 and 123 with respect to each other. This adjustment, dependent upon the direction in which the disks are moved with respect to each other, results in lengthening or shortening the time during which the contacts 178 and 179 remain in engagement.

The machine is entirely automatic in operation and continues to arrange and count caps as long as they are supplied to the distributing mechanism and automatically interrupts the flow of caps to the receptacle at determined times, dependent upon the capacity of the receptacle and the number of caps which it is desired the receptacle to hold. The distributing mechanism handles the caps in such a manner that they are not marred or damaged in the slightest degree and they are fed gently to the delivery chute in a position for precise gripping by the feeding mechanism and for subsequent presentation to the counting mechanism in such a manner that no strain is applied to the caps or to the star wheel.

The precise calibration of the counting mechanism is not important, as the same may be arranged to take care of units comprising any number of articles by appropriately proportioning the parts of the gear train and suitably arranging the controlling disks with respect to each other. In normal operation, the machine as disclosed will arrange, feed and count caps at the rate of 600 caps per minute, approximately, which is markedly in excess of the customary 300 caps per minute as handled by comparable existing machines. The handling rate of the machine can be increased several times by using a relatively larger distributor.

I claim:

1. In a counting mechanism, the combination of a counter, a hopper having a dump bottom through which the counted articles pass for deposition in a receptacle, and means controlled by the counter for closing the bottom to interrupt the flow of articles when a predetermined number thereof has been deposited in the receptacle.

2. In a counting mechanism, the combination of a counter, a hopper having a dump bottom through which the counted articles pass for deposition in a receptacle, and means controlled by the counter for closing the bottom to interrupt the flow of articles when a predetermined number thereof has been deposited in the receptacle and for opening the bottom when a predetermined number of articles has been deposited in the hopper.

3. In a counting mechanism, the combination of a counter, hopper means movable into the path of the counted articles to interrupt the flow thereof when a predetermined number of articles has been deposited in a receptacle, and means for dumping the hopper when a predetermined number of articles has been deposited in the hopper means.

4. In a counting mechanism, the combination of a counter, hopper means movable into the path of the counted articles to interrupt the flow thereof when a predetermined number of articles has been deposited in a receptacle, means for dumping the hopper means when a predetermined number of articles has been deposited in the hopper means, and a device controlled by the counter for actuating the hopper means.

5. In a counting mechanism, the combination of a counter, hopper means movable into the path of the counted articles to interrupt the flow thereof when a predetermined number of articles has been deposited in a receptacle, means for dumping the hopper means when a predetermined number of articles has been deposited therein, a device controlled by the counter for actuating the hopper means, and means controlled by the counter for shaking the receptacle at predetermined times to more closely pack the articles, said device and last named means operating in timed relation.

6. In a counting mechanism, the combination of a counter comprising a pair of insulated disks

adapted to rotate together and a device actuable by the articles to be counted for rotating the disks, a pair of electrical contacts, means on the disks adapted to cause the contacts to engage at predetermined times during the rotation of the disks and to maintain them separated at all other times, and electrically controlled means operable when the contacts are engaged to shake a receptacle for the articles to more closely pack the articles.

7. In a counting mechanism, the combination of a counter comprising a pair of insulated disks adapted to rotate together, each disk having cam depressions disposed around the periphery thereof in predetermined locations, each depression on one disk being cooperatively related to a depression on the other disk, a device actuable by the articles to be counted for rotating the disks, a pair of electrical contacts bearing on the disk peripheries, respectively, and adapted to engage when one contact moves into a depression on one disk and to separate when the other contact moves into the cooperating depression on the other disk and to be separated at all other times, and electrically controlled means operable when the contacts engage for shaking a receptacle for the articles to more closely pack the articles.

8. In a counting mechanism, the combination of a counter comprising a pair of insulated disks adapted to rotate together and each disk having cam depressions disposed around the periphery thereof in predetermined locations, each depression on one disk being cooperatively related to a depression on the other disk, a device actuable by the articles to be counted for rotating the disk, a pair of electrical contacts bearing on the disk peripheries, respectively, and adapted to engage when one contact moves into a depression on one disk and to separate when the other contact moves into the cooperating depression on the other disk and to be separated at all other times, and electrically controlled means operable when the contacts engage for shaking a receptacle for the articles to more closely pack the articles, and means whereby one disk can be rotarily shifted relative to the other disk to vary the interval of shake.

9. In a counting mechanism, the combination of a counter comprising a pair of insulated disks adapted to rotate together and each disk having ratchet shaped notches disposed around the periphery thereof in predetermined locations, each notch on one disk being cooperatively related to a notch on the other disk, a device actuable by the articles to be counted for rotating the disks, a pair of electrical contacts bearing on the disk peripheries, respectively, and adapted to engage when one contact moves into a notch on one disk and to separate when the other contact moves into the cooperating notch on the other disk and to be separated at all other times, electrically controlled means operable when the contacts engage for shaking a receptacle for the articles to more closely pack the articles and means for rotarily shifting one disk relative to the other to thereby change the relation of the flat surfaces of the cooperating notch pairs and vary the interval of shake.

10. In a counting mechanism, the combination of a counter comprising an insulated disk having a pair of peripheral surfaces located at different radial distances from the center thereof and a device actuable by the articles to be counted for rotating the disk, a pair of electrical contacts bearing on the peripheral surfaces, respectively, means on the surfaces adapted to cause the contacts to engage at predetermined times during the rotation of the disk and to maintain them separated at all other times, hopper means movable into the path of the counted articles to interrupt the flow thereof when a predetermined number has been deposited in a receptacle, means for dumping the hopper means when a predetermined number of articles has been deposited therein, and a device electrically controlled by the engagement of the contacts for actuating the hopper means.

11. In a counting mechanism, the combination of a counter comprising an insulated disk having a pair of peripheral surfaces located at different radial distances from the center thereof, a pair of insulated disks, all of said disks being adapted to rotate together, and a device actuable by the articles to be counted for rotating the disks, a pair of electrical contacts, a second pair of electrical contacts, means on the disks adapted to cause the pairs of contacts, respectively, to engage at predetermined times during the rotation of the disks and to maintain them separated at all other times respectively, electrically controlled means operable when said first pair of contacts engage for shaking a receptacle for the articles to more closely pack the articles, hopper means movable into the path of the counted articles to interrupt the flow thereof when a predetermined number of articles has been deposited in the receptacle, means for dumping the hopper means when a predetermined number of articles has been deposited therein, and electrically controlled means for actuating the hopper means when said second pair of contacts engage.

12. In a counting mechanism, the combination of a counter, a hopper having flow control means, and means controlled by the counter for moving the hopper means to interrupt the flow of articles to a receptacle for accumulation in the hopper when a predetermined number thereof has been deposited in the receptacle.

13. In a counting mechanism, the combination of a counter, a hopper having means adapted for movement to interrupt the flow of the counted articles to a receptacle, means controlled by the counter for moving the hopper means to interrupting position when a predetermined number of articles has been deposited in the receptacle for accumulating articles in the hopper, and a warning signal operably controlled by the counter when the hopper means is moved to interrupting position.

14. In a counting mechanism, the combination of a counter, a hopper having means adapted for movement to interrupt the flow of the counted articles to a receptacle and for movement away from interrupting position, means controlled by the counter for moving the hopper means to interrupting position when a predetermined number of articles has been deposited in the receptacle for accumulating articles in the hopper and for subsequently dumping the hopper when a predetermined number of articles has been deposited in the hopper means, and a warning signal operably controlled by the counter during the time the hopper means is in interrupting position.

FRED E. DOMKE.