

Oct. 25, 1966

G. E. MARTELL
ARTICLE PACKAGING MACHINE

3,281,012

Filed Aug. 13, 1963

4 Sheets-Sheet 1

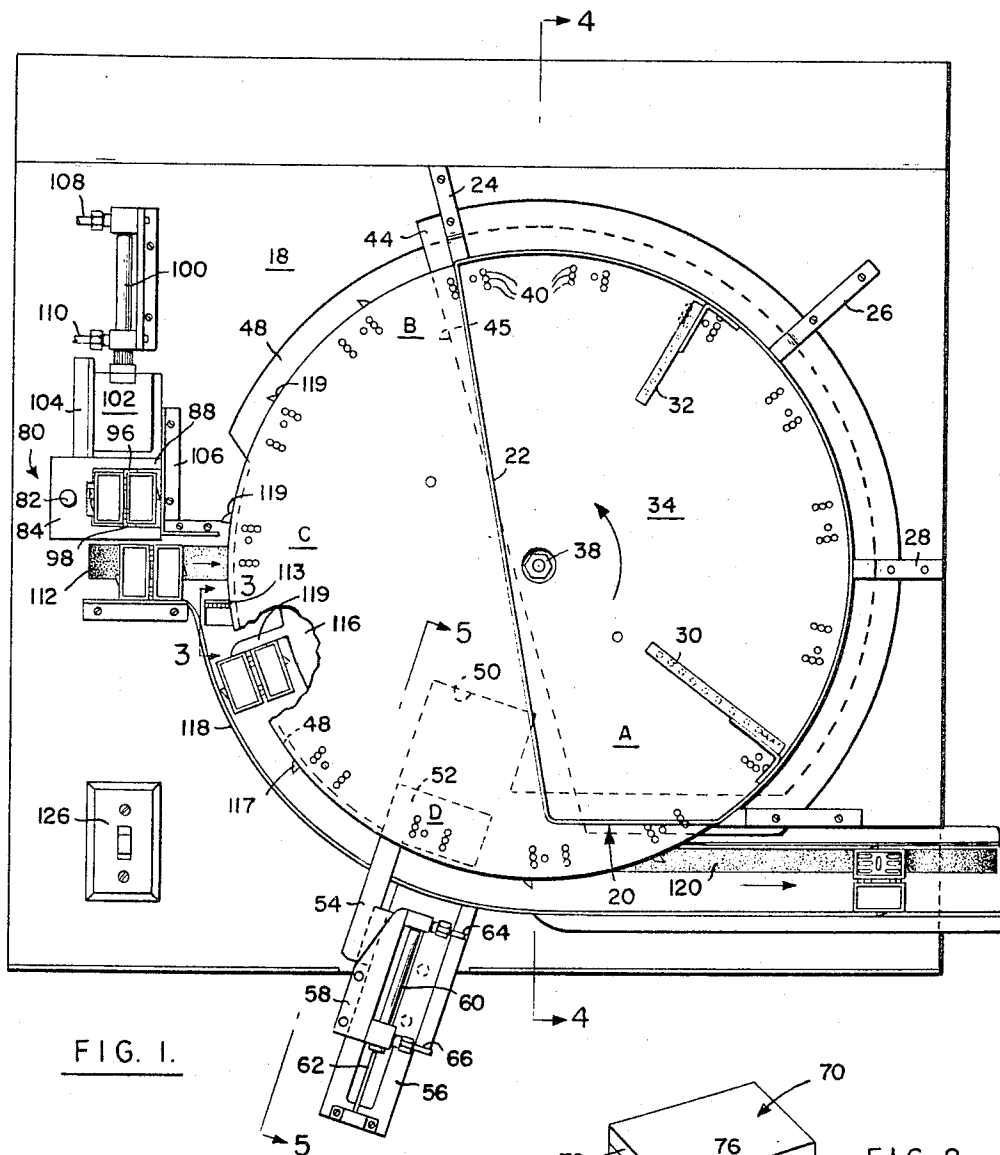


FIG. 1.

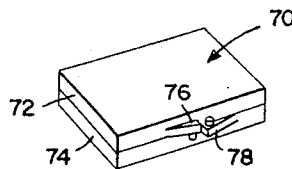


FIG. 2.

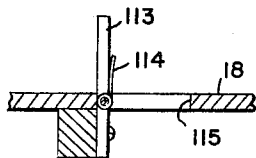


FIG. 3.

INVENTOR
GEORGE E. MARTELL
BY *Bussell Smith* Attending
ATTORNEYS

Oct. 25, 1966

G. E. MARTELL
ARTICLE PACKAGING MACHINE

3,281,012

Filed Aug. 13, 1963

4 Sheets-Sheet 2

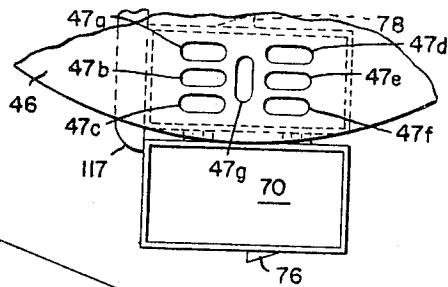


FIG. 9.

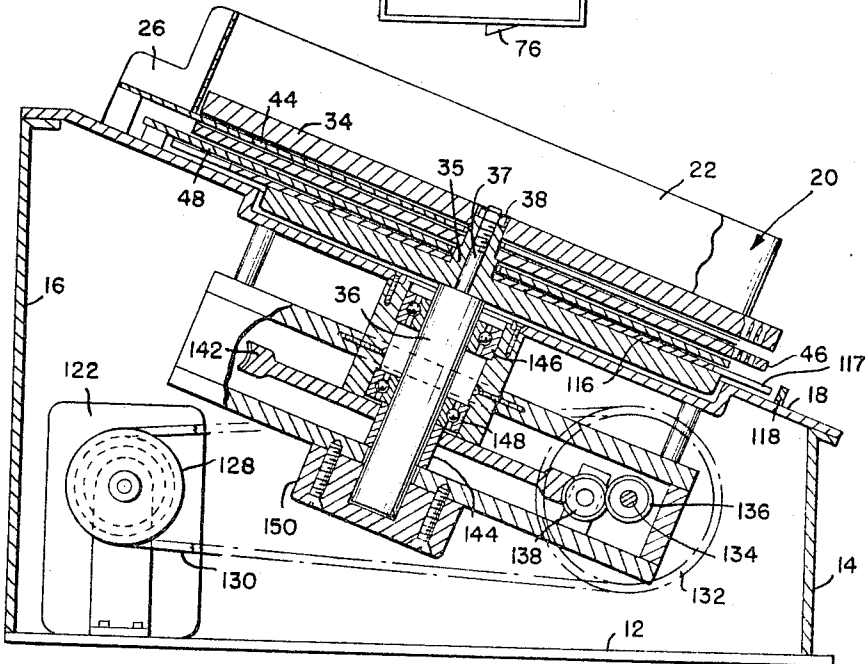
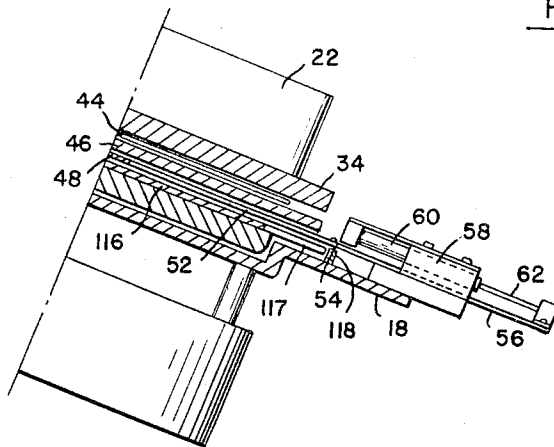


FIG. 4.

FIG. 5.



INVENTOR.
GEORGE E. MARTELL
BY *Boyer Smith & Harding*
ATTORNEYS

Oct. 25, 1966

G. E. MARTELL

3,281,012

ARTICLE PACKAGING MACHINE

Filed Aug. 13, 1963

4 Sheets-Sheet 3

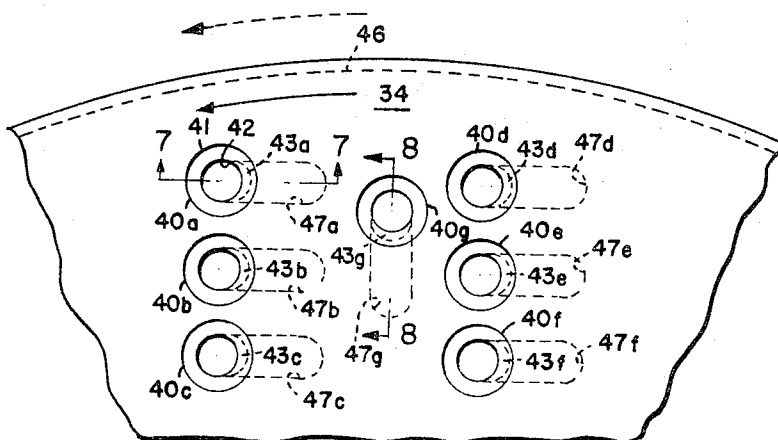


FIG. 6.

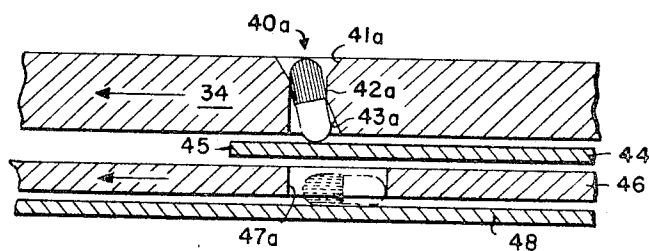


FIG. 7.

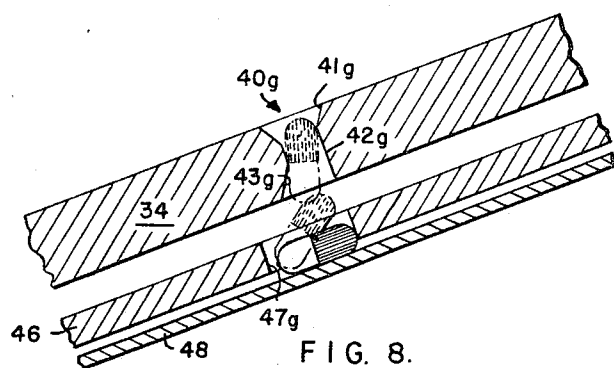


FIG. 8.

INVENTOR

GEORGE E. MARTELL

BY

Burton Smith & Hendry

ATTORNEYS

Oct. 25, 1966

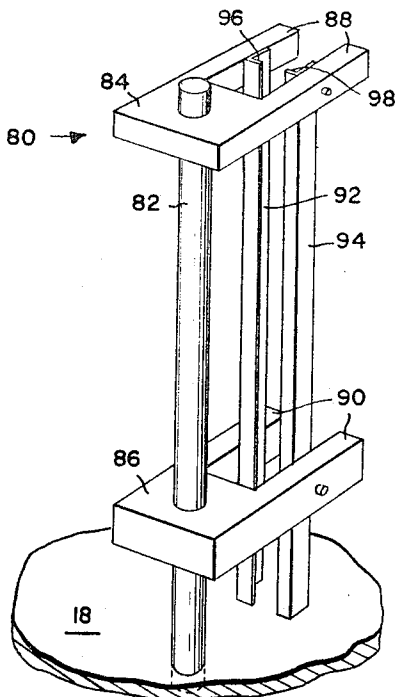
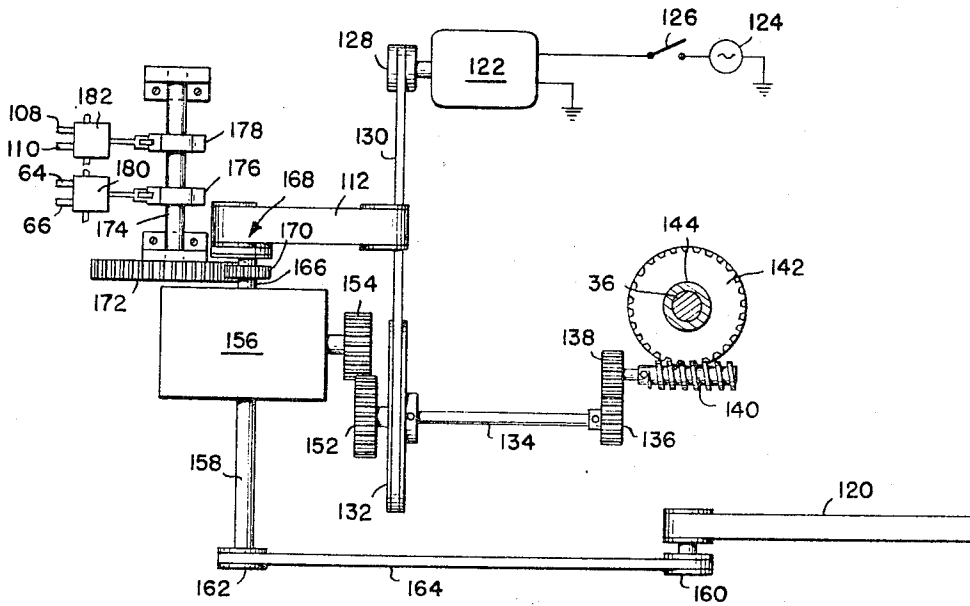
G. E. MARTELL

3,281,012

ARTICLE PACKAGING MACHINE

Filed Aug. 13, 1963

4 Sheets-Sheet 4



INVENTOR.
GEORGE E. MARTELL

BY *Bessie Franklin Ward*

ATTORNEYS

ARTICLE PACKAGING MACHINE

George E. Martell, Runnemede, N.J., assignor to Smith Kline & French Laboratories, Philadelphia, Pa., a corporation of Pennsylvania

Filed Aug. 13, 1963, Ser. No. 301,780

5 Claims. (Cl. 221-172)

The present invention relates to a machine for counting and grouping a plurality of articles into predetermined groups, orientating the articles of each group into predetermined positions and dispensing each group of articles into an individual container wherein the articles are arranged in predetermined positions.

Although the present invention has obvious utility for packaging various types of articles, the invention will be described in connection with the packaging of elongated tablets or capsules wherein it is desired to package a week's supply of one-a-day type capsules. Therefore, assuming that it is desired to dispense seven capsules into each container, it will be apparent that a minimum size container may be used if the capsules are arranged in two groups of three capsules each with the seventh capsule orientated in a position transverse to the parallel orientations of the other six capsules.

It is therefore one object of the present invention to provide a machine for grouping and orientating a plurality of articles in predetermined positions.

It is another object of the present invention to provide a machine for grouping, orientating and packaging a plurality of articles such that the articles occupy particular positions in the package.

It is a further object of the present invention to provide a machine for performing the above indicated functions in a purely automatic manner whereby the number of personnel required to perform the packaging operation is substantially reduced.

The above objects as well as others relating more particularly to the details of construction and operation will become more fully apparent from the following description when taken with the accompanying drawings in which:

FIGURE 1 is a top, plan view of the packaging machine;

FIGURE 2 is a perspective view of a container into which one group of capsules is to be packaged;

FIGURE 3 is a fragmentary, sectional view taken along line 3-3 of FIGURE 1;

FIGURE 4 is a sectional view of the machine taken along the plane indicated by line 4-4 of FIGURE 1;

FIGURE 5 is an enlarged, sectional view taken along line 5-5 of FIGURE 1;

FIGURE 6 is an enlarged, fragmentary view of a portion of the machine showing the alignment of certain components thereof;

FIGURE 7 is a sectional view taken along the plane indicated by line 7-7 of FIGURE 6;

FIGURE 8 is a sectional view taken along line 8-8 of FIGURE 6;

FIGURE 9 is an enlarged fragmentary view of a portion of the machine showing the alignment of other components thereof;

FIGURE 10 is a perspective view of an assembly for supplying empty containers to be filled with capsules; and

FIGURE 11 is a schematic view of the mechanism for driving and controlling the operation of the various components of the machine.

Referring first to FIGURES 1 and 4, the machine includes a base 12 supporting a front wall 14 and a rear wall 16 the latter of which is of greater vertical extent than the former. Walls 14 and 16 support a plate 18

which is preferably inclined at an angle of 22° with respect to the horizontal although it will be apparent that the angle of inclination is subject to considerable variation.

Plate 18 supports the operating components of the machine which include a bin 20 formed by a continuous wall 22 secured to plate 18 by means of brackets 24, 26 and 28. Bin 20 is adapted to contain a plurality of capsules to be packaged and, in view of the inclination of plate 18 and bin 20, it will be apparent that the capsules will be maintained in the lower right-hand corner of the bin hereinafter referred to as position A.

Wall 22 mounts a pair of brushes 30 and 32 which are adapted to sweep over the surface of a first rotating disc 34 which is secured on a hub 35 clamped to rotate with a drive shaft 36 by a stud 37 and a nut 38. Disc 34 rotates in a counterclockwise direction as viewed in FIGURE 1 and it will be noted that the peripheral portion of the disc is provided with fifteen groups of apertures 40 which are arranged in a particular array as shown in FIGURE 6. This array includes a first radially arranged row of apertures 40a, 40b and 40c each of which includes a conical portion 41 and a cylindrical portion 42 as most clearly shown in FIGURES 7 and 8. With regard to the diameters of the respective portions of each aperture, it will be noted that the diameter of portion 41 is slightly in excess of one-half the length of the capsule and that the diameter of portion 42 is slightly greater than the width of the capsule. Of course, the particular diameter and shape of the portions 41 and 42 are subject to considerable variation and, alternatively, these portions may be shaped so as to include an additional tapered portion interconnecting portions 41 and 42 as disclosed in copending application Serial No. 224,689 filed on September 19, 1962, now abandoned, and assigned to the assignee of the present invention.

Again referring to FIGURE 6, the array of apertures 40 further includes a second radially disposed row of apertures 40d, 40e and 40f. The first and second rows of apertures just defined are circumferentially spaced so that the first row leads the second row as disc 34 rotates in the counterclockwise direction as viewed in FIGURES 1 and 6. Intermediate the first and second rows, the disc is provided with a seventh aperture 40g and it will be noted that this aperture is positioned close to the second row of apertures and at a radial position between apertures 40d and 40e.

Each of the apertures also includes a beveled portion 43 and it will be noted that beveled portions 43a-43f are provided on the circumferentially trailing side of cylindrical portions 42a-42f, whereas, beveled portion 43g is positioned on the radially inner side of cylindrical portion 42g.

Again referring to FIGURES 1 and 4, a stationary plate 44 extends immediately beneath a portion of disc 34 and it will be noted that the periphery of the plate extends approximately 120° about the periphery of disc 34. The inner portion of plate 44 terminates beneath disc 34 in an edge 45 which is slightly advanced in the counterclockwise direction with respect to wall 22 of bin 20.

Immediately beneath stationary plate 44 there extends a second rotating disc 46 which is also secured to hub 35 so as to rotate in unison with disc 34. Disc 46 is provided with fifteen groups of oblong slots 47a-47g, each group of slots being directly beneath one array of apertures 40a-40g. As shown in FIGURE 6, one end of each slot 47 is aligned with one of apertures 40 and it will be noted that the elongated length of slot 47g extends radially, whereas, the elongated lengths of slots 40a-40f extend substantially circumferentially.

Immediately beneath rotating disc 46 there is positioned a second stationary plate 48 which, as shown in FIGURE 1, extends about the periphery of disc 46 except for a cut-out portion forming an enlarged slot 50 which permits reciprocating movement of a shutter 52 the upper surface of which is coplanar with the upper surface of plate 48.

As shown in FIGURES 1 and 5, shutter 52 includes an arm portion 54 which is secured to a crosshead 56 slidably mounted in a bracket 58 secured to plate 18. Bracket 58 also serves to mount a pneumatic cylinder 60 having an actuating rod 62 connected to crosshead 56. Cylinder 60 is preferably of the double acting type having reversible inlet and exhaust lines 64 and 66 although it will be readily apparent that a single acting cylinder having a return spring may be employed in the alternative.

Reference is now made to those portions of the machine which feed the individual containers into the machine, a preferred form of such container being illustrated in FIGURE 2 as comprising a rectangular box 70 having hinged upper and lower halves 72 and 74 which are adapted to be secured in closed position by interengaging snaps 76 and 78. A plurality of open containers are maintained in a hopper generally designated 80 which is mounted on plate 18 as shown in FIGURES 1 and 10. This hopper comprises an upright rod 82 rigidly supporting a pair of vertically spaced, U-shaped plates 84 and 86 having respective pairs of leg portions 88 and 90. A pair of vertically extending angle brackets 92 and 94 having mutually facing guide portions 96 and 98 are supported by leg portions 88 and 90 such that their lower ends terminate at a point spaced from the upper surface of plate 18 by an amount slightly greater than the individual thicknesses of open container halves 72 and 74. Thus, guide portions 96 and 98 of brackets 92 and 94 are adapted to be received in the space formed by the hinges between the open container halves so that a plurality of containers may be vertically stacked to form a column from which the bottommost container may be individually ejected.

The mechanism for ejecting the containers one at a time from the bottom of the stack includes a pneumatic cylinder 100 having an actuating arm connected to reciprocate a push plate 102 between a pair of guides 104 and 106. Cylinder 100 is illustrated as being of the double acting type having reversible inlet and exhaust lines 108 and 110 although it will be readily apparent that a single acting cylinder having a return spring may be utilized in the alternative.

The container feeding mechanism further includes a conveyor belt 112 which is adapted to convey each ejected container a short distance to the right as viewed in FIGURE 1. The upper surface of belt 112 is substantially coplanar with the upper surface of plate 18 so that each container is conveyed to a position C beneath stationary plate 48.

In order to prevent the container from sliding toward the front of the machine along the inclined surface of plate 18, a small door 113 is hinged to plate 18 and biased to a vertical position by a spring 114 as shown in FIGURE 3. Conversely, door 113 is adapted to fold into a horizontal position wherein it is received in an aperture 115 so that the door is flush with the upper surface of plate 18.

Movement of each container from position C over folding door 113 is accomplished by a rotating disc 116 which is also secured to hub 35 so as to rotate in unison with discs 34 and 46. Disc 116 includes projections 117 one of which engages each container and sweeps it along an arcuate path bounded by a guide 118, each container being positioned directly beneath a group of slots 47 as shown in FIGURE 9. Thus, each container is conveyed beneath shutter 52 and onto a second conveyor belt 120 which discharges the filled container from the machine.

Reference is now made to FIGURES 4 and 11 which illustrate the mechanism for driving each of the above

described components. This mechanism includes a drive motor 122 connected to a suitable power source 124 through a manually operated switch 126. Motor 122 rotates a pulley 128 which is connected through a drive belt 130 to a second pulley 132 which rotates a shaft 134. Shaft 134 carries a gear 136 meshing with a second gear 138 which, in turn, drives a worm shaft 140 which meshes with a gear ring 142 rigidly secured to a sleeve 144 connected to shaft 36. Shaft 36 is journaled in upper and lower radial bearings 146, 148 and the lower end of the shaft is supported in a thrust bearing 150.

Again referring to FIGURE 11, shaft 134 also carries a gear 152 which drives a second gear 154 providing an input to a speed change gear unit 156. Gear unit 156 includes a first output shaft 158 which drives conveyor belt 120 through a pair of pulleys 160, 162 interconnected by a drive belt 164. In addition, gear unit 156 includes a second output shaft 166 which drives conveyor belt 112 through a pulley and belt assembly generally indicated at 168.

In order to synchronize the operation of cylinders 60 and 100 with respect to the rotation of the discs, shaft 166 carries a drive gear 170 which meshes with a second gear 172 rigidly secured to a cam shaft 174 carrying a pair of cams 176 and 178, each cam preferably having two lobes. Cam 176 actuates the movable element of a valve 180 which controls the operation of cylinder 60 through lines 64 and 66. Similarly, cam 178 actuates the movable element of a valve 182 which controls the operation of cylinder 100 through lines 108 and 110. Of course, the various gear ratios and the number of lobes per cam are selected such that the cams actuate their respective cylinders fifteen times per revolution of the discs.

The operation of the machine is as follows. A constant supply of capsules is maintained in the lower right-hand portion of bin 20 in the area designated A. Thus, as each group of apertures 40 pass beneath area A, each of the apertures becomes filled with a capsule and the excess capsules are swept away and maintained in the area A by brushes 30 and 32. During the continued rotation of disc 34 from position A to position B, all of the capsules contained in apertures 40 are retained therein due to the engagement of their bottom portions with stationary plate 44. As shown in FIGURE 7, the capsules in each of apertures 40a-40f are inclined in the direction of rotation due to the dragging of the bottom portions of the capsules over plate 44 and the location of beveled edges 43a-43f. However, the capsule in aperture 40g is not inclined in the direction of rotation since beveled edge 43g is not positioned in the trailing side of this aperture and therefore does not permit such inclination. Of course, all of the capsules are inclined with respect to the vertical due to the inclination of disc 34.

Upon continued rotation of disc 34 in the counter-clockwise direction, the capsules in apertures 40a-40c pass over edge 45 of plate 44 and therefore drop into respective slots 47a-47c located in rotating disc 46. Since these capsules are inclined in the direction of rotation of the discs and since beveled portions 43a-43f provide the only clearance spaces whereby the capsules can turn from their initial, substantially vertical position to their substantially horizontal position, the alignment of the elongated lengths of the capsules and the elongated lengths of slots 40a-40f is insured. As a result, each of these capsules drops into the position shown in dotted line in FIGURE 8 wherein each capsule slides over plate 48 as it continues to rotate with disc 46.

Immediately after the first row of capsules has passed edge 45, the capsule contained in aperture 40g passes over edge 45 and, due to the inclination of disc 34 and the location of beveled portion 43g, this capsule drops into associated slot 47g of plate 46 as shown in solid line in FIGURE 8.

Upon continued rotation of disc 34, the capsules contained in apertures 40d-40f pass over edge 45 and there-

5

fore drop into slots 47d-47f in the same manner as described hereinabove with regard to the capsules in apertures 40a-40c. Thus, the capsule originally in aperture 40g becomes radially orientated in slot 47g, whereas, the capsules originally in apertures 40a-40f become orientated perpendicular thereto in slots 47a-47f.

Simultaneous with the above described operations, cylinder 100 is intermittently actuated by the operation of valve 182 so that push block 102 reciprocates beneath hopper 80 and thereby ejects containers 70 one at a time onto belt 112 which successively conveys each of them to position C beneath plate 48. At this position, one of projections 117 comes into engagement with each container and moves it in the counterclockwise direction against spring biased door 113 so that the door folds to a horizontal position and, thereafter, returns to its vertical position so as to retain the next container against sliding movement until it is engaged by the succeeding projection. Of course, each container engaged by a projection 117 is positioned directly beneath a group of slots 47 as shown in FIGURE 9 since discs 116 and 46 are locked on hub 35 so as to be driven in unison by shaft 36.

Continued rotation of discs 46 and 116 bring each container and the group of capsules associated therewith into position D, whereupon, valve 180 actuates cylinder 60 so as to move shutter 52 radially inwardly from beneath the capsules. Thus, the capsules drop into the container wherein they are aligned in two rows of three capsules with the seventh capsule positioned between the rows and perpendicular to the other capsules. Lastly, the continued rotation of disc 116 sweeps the filled container onto conveyor belt 120 which then discharges the container from the machine to the next station on the assembly line.

From the foregoing description it will be apparent that the present invention provides for the counting, grouping, orientating and dispensing of articles in a fully automatic manner which is substantially more rapid than the previously required hand operations. Of particular advantage is the fact that the machine is capable of automatically and rapidly orientating different capsules of each group in different directions relative to each other and it will be obvious that the number of capsules orientated in each direction is in no way limited to the specific six and one arrangement described hereinabove. Therefore, it is to be understood that the foregoing description is intended merely to illustrate the principles of the invention and the invention is not to be limited other than as specifically set forth in the following claims.

What is claimed is:

1. A machine for grouping and orientating elongated capsules comprising a first plate having upper and lower surfaces, means for moving said plate in a direction parallel to the planes of said surfaces, groups of apertures having individual axes extending through said plate from said upper to said lower surfaces, each of said apertures being of a size and a shape so as to receive a capsule with the elongated axis of the capsule extending transverse to the planes of said surfaces, a stationary plate underlying said moving plate and forming a closure for said apertures, each of said capsules being supported by said stationary plate and tilted at an angle with respect to the vertical due to frictional drag on the capsule as it is moved across said stationary plate by said moving plate, a second moving plate underlying said stationary plate, means mounting said second moving plate for movement in a plane parallel to the plane of movement of said first moving plate, said second moving plate having slots extending therethrough, said slots being elongated and having their elongated lengths extending parallel to the plane of movement of said second moving plate, each of said slots being aligned with one of said apertures so as to receive a capsule therefrom upon the movement of said apertures beyond said stationary plate, each of said apertures having enlarged portions forming clearance spaces whereby said tilted

6

capsule is permitted to drop out of said aperture only in the direction in which the elongated length of the capsule is aligned with the elongated length of an associated slot, means forming closures for said slots, and means for discharging said capsules from said slots.

2. The machine as claimed in claim 1 wherein said first moving plate is inclined at an acute angle with respect to the horizontal, the clearance space associated with a predetermined number of apertures being positioned on the trailing side of the respective aperture, and the clearance space associated with a predetermined number of different apertures being positioned along the direction of inclination of said first plate when the capsules in said different apertures are discharged whereby said first and second predetermined numbers of capsules drop out of their associated apertures with their elongated lengths extending in different directions.

3. A machine for grouping and orientating capsules comprising a first rotating disc having groups of apertures for receiving capsules, said apertures being of a size and shape so as to contain said capsules with their elongated axes extending transverse to the plane of rotation of said disc, a stationary plate extending parallel to and beneath a portion of said disc so as to initially retain the capsules in said apertures, said plate terminating in an edge beneath said first disc, a second rotating disc extending beneath said plate, said second disc having an elongated slot aligned with each of said apertures, the elongated lengths of some of said slots extending in non-parallel directions, and means operative upon the passage of said apertures over the edge of said plate for causing each of said capsules to drop into an associated slot with the elongated length of the capsule aligned with the elongated length of the slot associated therewith.

4. A machine in accordance with claim 3 having means for retaining capsules in said slots during a portion of the rotation of the disc.

5. A machine for grouping and orientating capsules comprising a first rotating inclined disc having groups of apertures for receiving capsules, said apertures being of a size and shape so as to contain said capsules tilted with their elongated axes extending transverse to the plane of rotation of said disc, each of said apertures having an enlarged portion forming a clearance space whereby the tilted capsule is permitted to drop out in only one direction, a portion of said enlarged portions being positioned on the trailing sides of the associated apertures and a portion of said enlarged portions being positioned with respect to the associated apertures substantially on a radius of said disc, a stationary plate extending parallel to and beneath a portion of said disc so as to initially retain the capsules in said apertures, said plate terminating in an edge beneath said first disc, a second rotating disc extending beneath said plate, said second disc having an elongated slot substantially perpendicular to a radius thereof aligned with each of said apertures having an enlarged portion on its trailing side to receive a capsule released from the associated aperture upon its passage beyond the edge of the plate and having an elongated slot substantially on a radius thereof aligned with each of said apertures having an enlarged portion positioned substantially on a radius of the first disc to receive a capsule released from the associated aperture upon its passage beyond the edge of the plate, means forming closures for said slots and means for discharging capsules from said slots.

References Cited by the Examiner

UNITED STATES PATENTS

2,930,509	3/1960	Hall	221-265
2,949,997	8/1960	Martell	221-265 X
3,123,959	3/1964	Carriere et al.	53-143

FRANK E. BAILEY, *Primary Examiner*.

P. H. POHL, *Assistant Examiner*.