

[54] **DISCRETE ARTICLE SEPARATING AND DISPENSING APPARATUS, PARTICULARLY FOR MEASURED COUNTS OF PILLS, CAPSULES AND THE LIKE**

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[57] **ABSTRACT**

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A discrete article separating and dispensing apparatus having a drum, sub-divided by row and column dividers to form receiving receptacles for articles, such as pills. Further included is a feeding grid having a plurality of feeding receptacles which are selectively in registration with the receiving receptacles which are selectively in registration with the receiving receptacles of the drum for receiving articles from interior of the drum and feeding the articles to the drum receptacles. The feeding grid extends over a lower portion of the drum and is located interior of the drum and is preferably vibrated to enhance the feeding of articles to the receiving receptacles in the drum.

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[51] **Int. Cl.**.....B65g 65/32

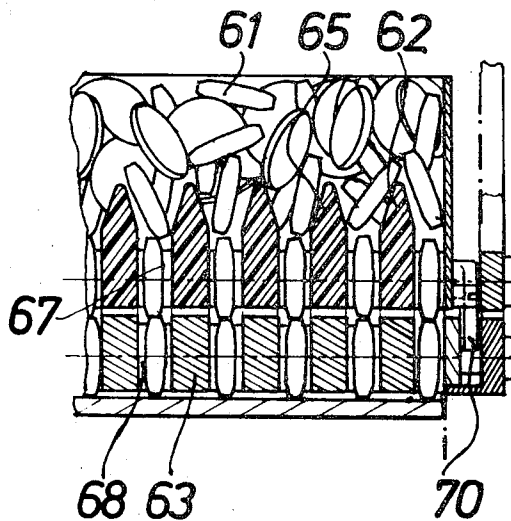
[58] **Field of Search**.....221/7, 6, 2, 169, 265, 81, 221/10, 167, 168; 53/57, 78, 154, 166, 51, 52

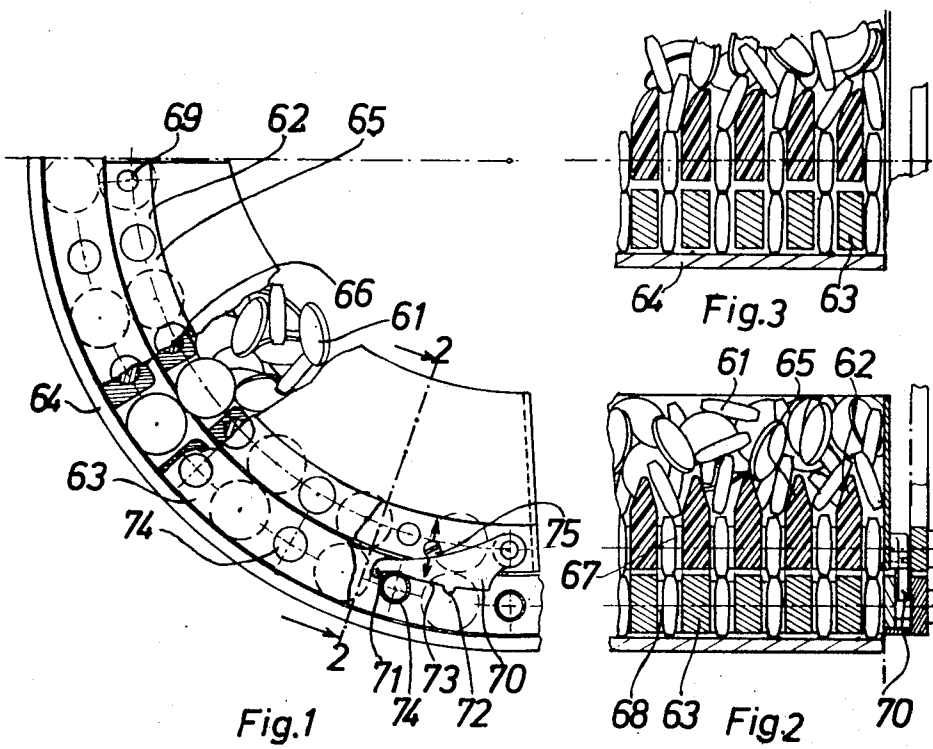
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38 Claims, 34 Drawing Figures

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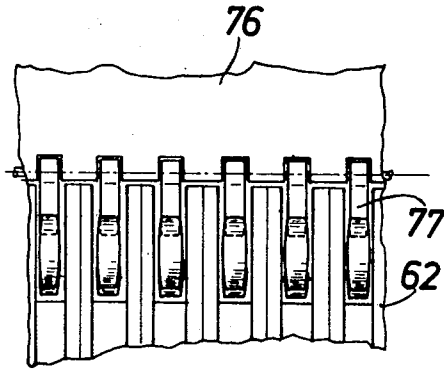


Fig.6

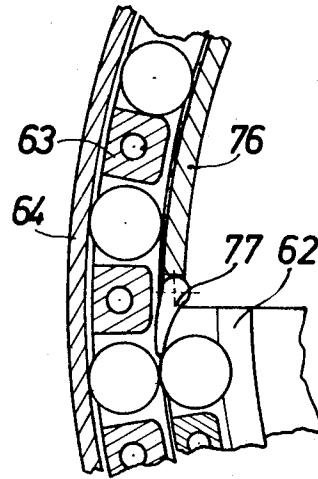


Fig.5

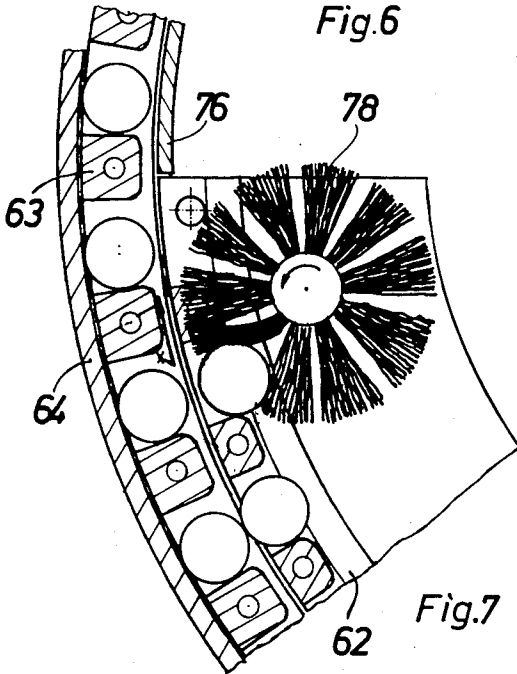


Fig.7

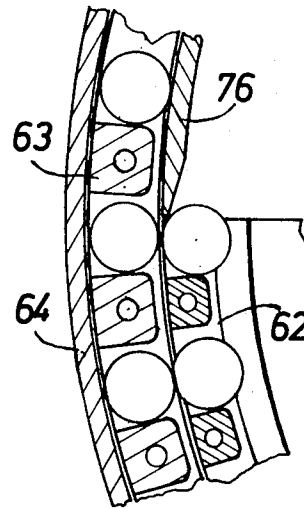
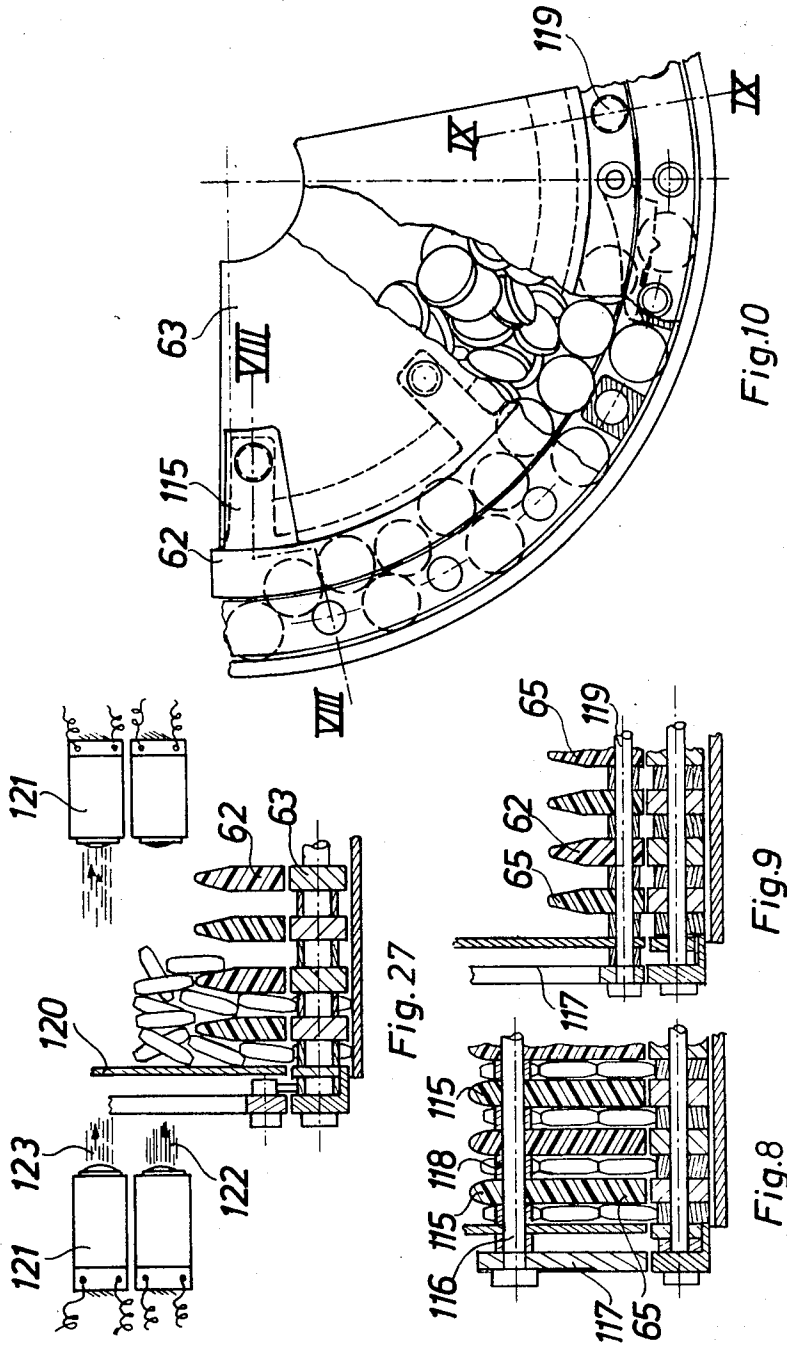


Fig.4



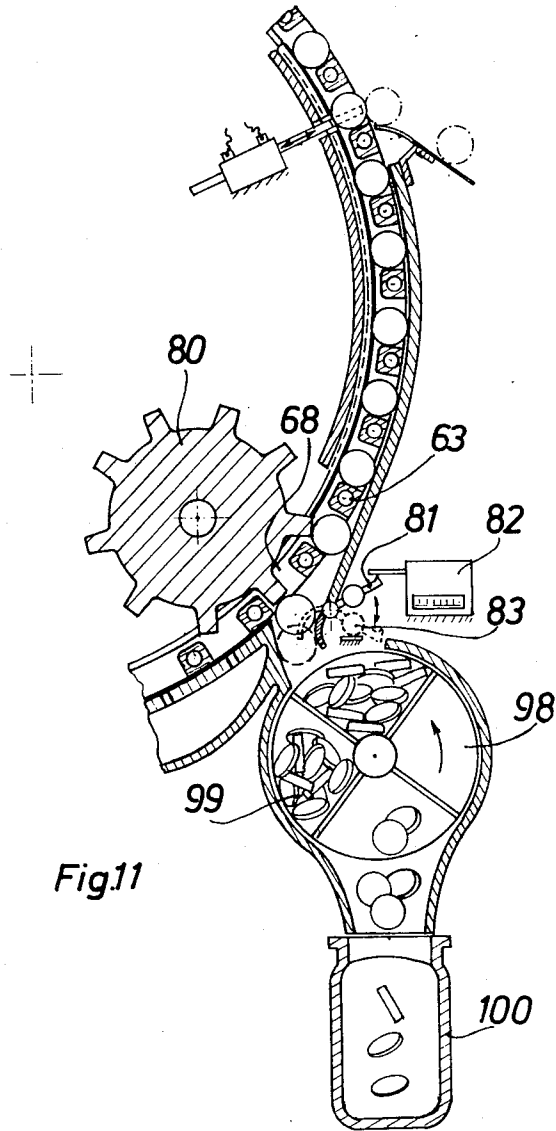
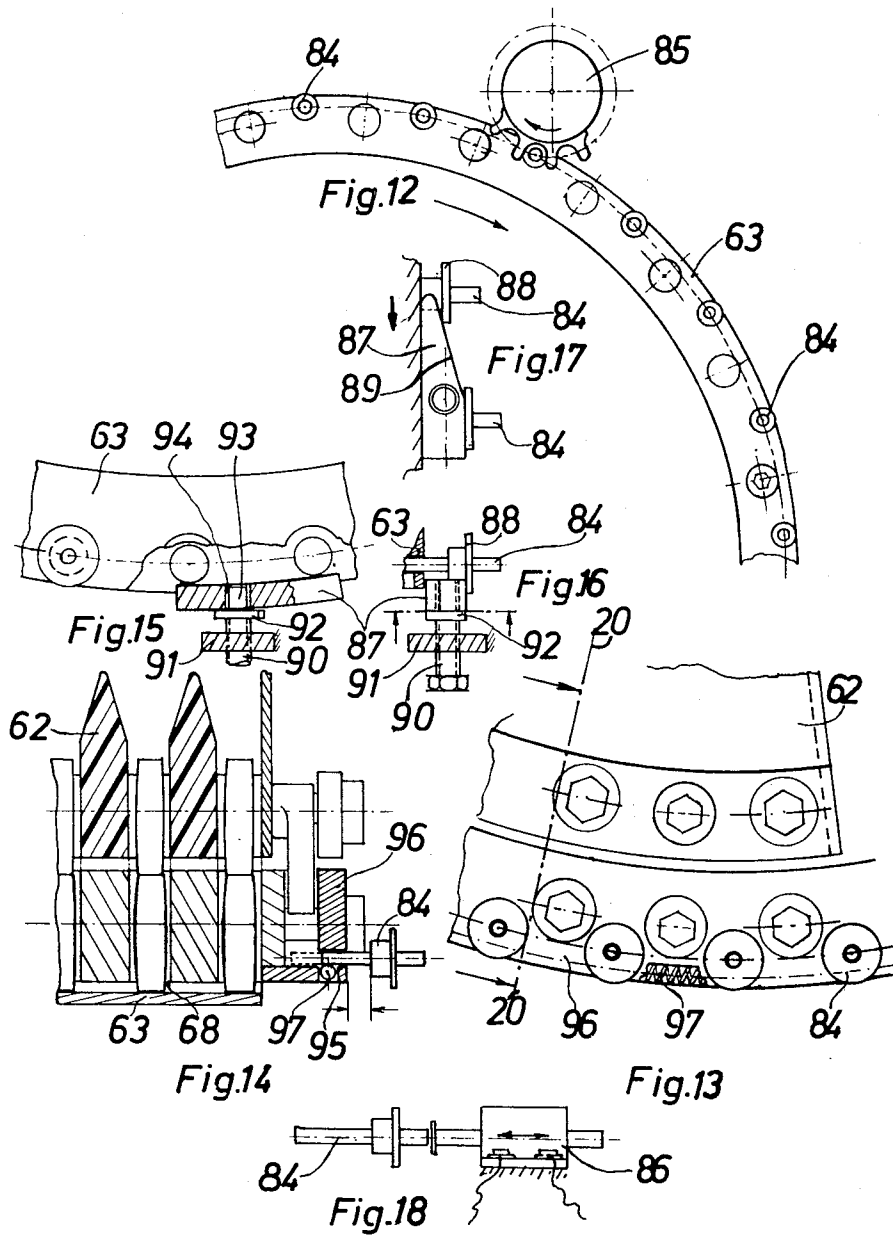


Fig.11



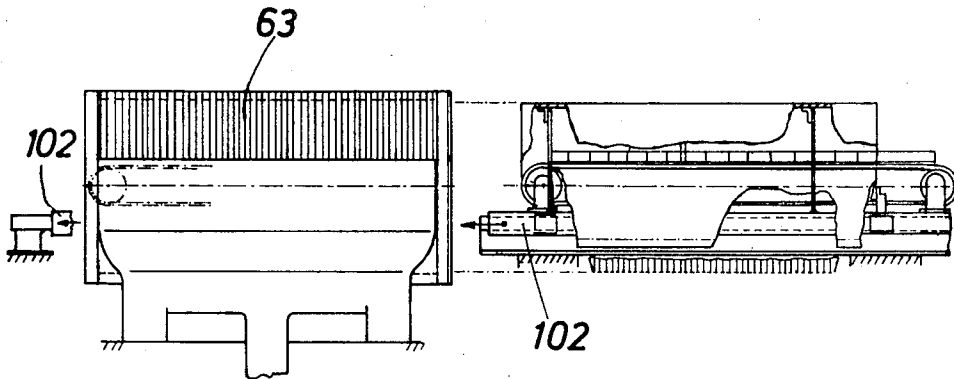


Fig. 19a

Fig. 20

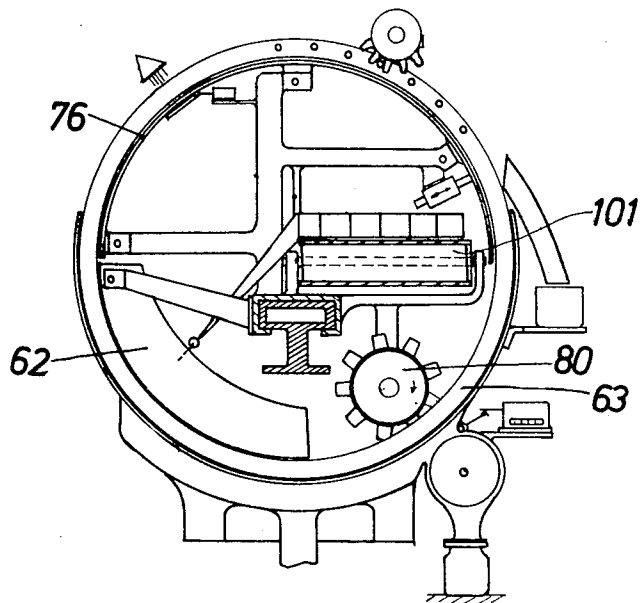


Fig. 19

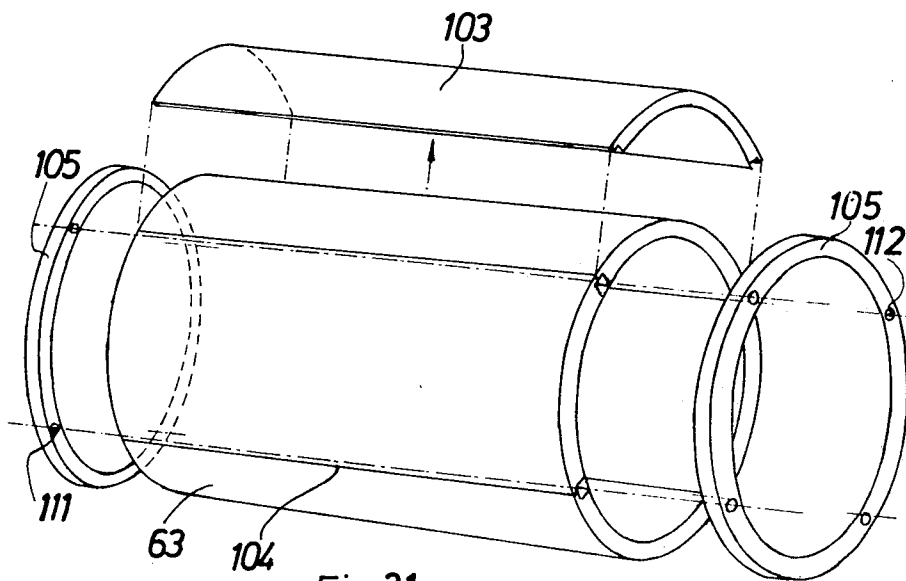


Fig. 21

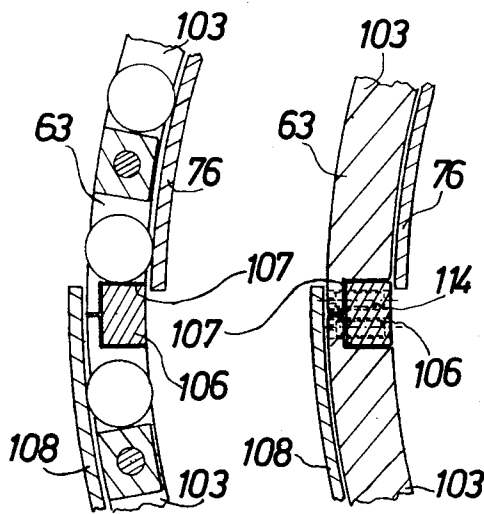


Fig. 22

Fig. 23

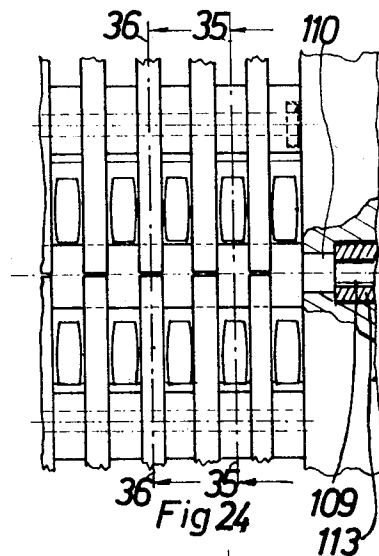


Fig. 24

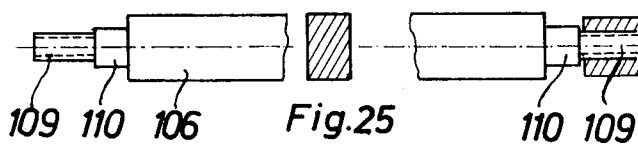


Fig. 25

Fig. 26

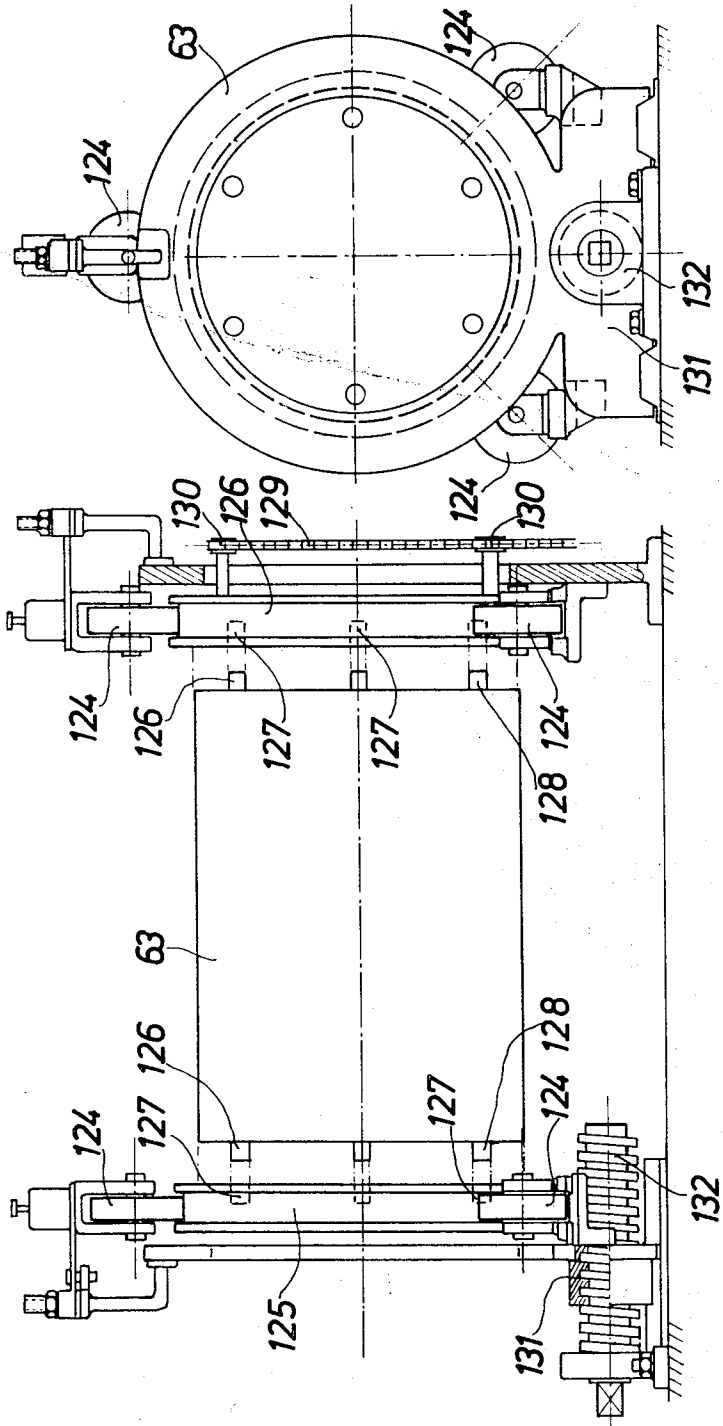


Fig.29

Fig.28

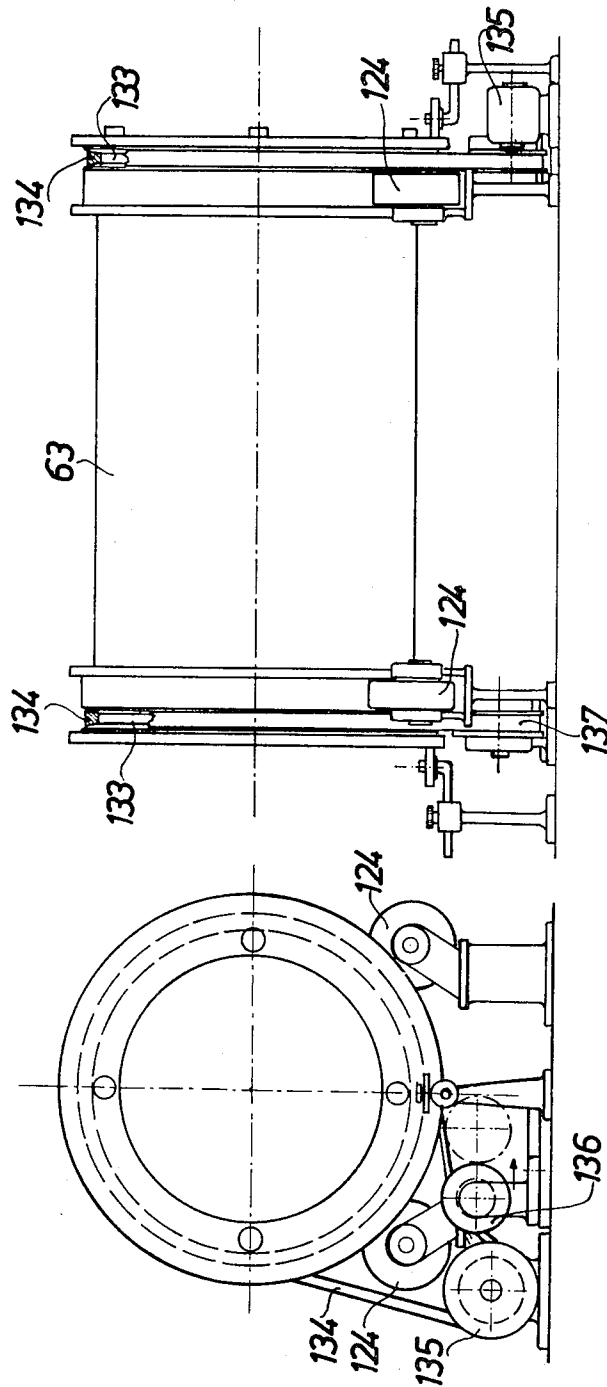


Fig.31

Fig.30

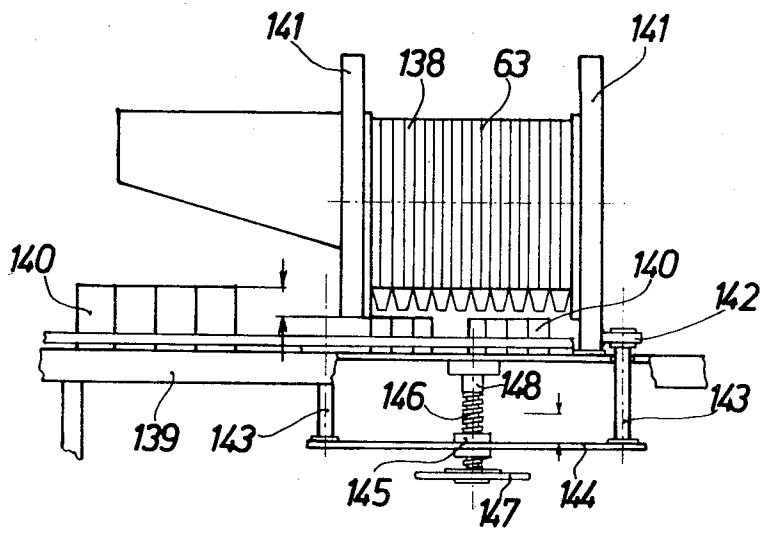


Fig. 32

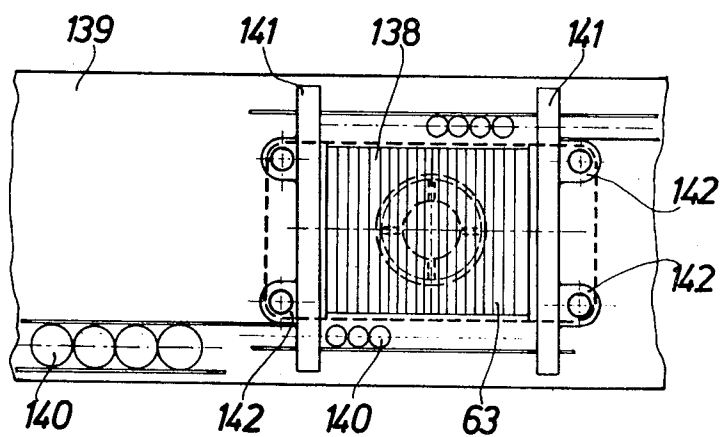


Fig. 33

DISCRETE ARTICLE SEPARATING AND DISPENSING APPARATUS, PARTICULARLY FOR MEASURED COUNTS OF PILLS, CAPSULES AND THE LIKE

The present invention relates to improvements in apparatus to separate and then dispense measured counts of discrete small articles, such as pills, capsules, troches, and the like, particularly designed to prevent damage to the articles being handled.

The present invention is related to a device which is similar to that disclosed in U.S. Pat. application Ser. No. 877,316, filed Nov. 17, 1969, now abandoned and assigned to the same assignee as the present application. The present invention is primarily intended as a simplification and operational improvement of the device described therein.

The main object of the present invention is to provide an improved apparatus for separating and dispensing measured counts of discrete small articles which more reliably and safely feeds the articles to a dispensing drum.

A further object of the invention is to provide such a system having improved counting and article detection arrangements.

SUMMARY OF THE INVENTION

In accordance with the present invention, a discrete article separating and dispensing apparatus includes a horizontal, rotatable drum having horizontally extending and circumferentially extending dividers which define article receiving receptacles therebetween, article supply means, at least a portion thereof being located interior of the drum to supply articles to the lower part of the interior of the drum, a lower covering shell located beneath the drum for preventing articles from falling through the receiving receptacles of the drum, an upper shell part located interior of the drum for preventing articles from falling out of the receiving receptacles and means receiving articles from the receiving receptacles of the drum. In accordance with the present invention, the improvement comprises a part-cylindrical feeding grid which is located just above a lower portion of the drum and which extends lengthwise of the drum, the feeding grid having horizontally extending and partly circumferentially extending dividers which define a plurality of guide receptacles therebetween. The guide receptacles are selectively in registration with the receiving receptacles of the drum, at least one of the dividers of the feeding grid having an inclined surface thereon to facilitate guiding of the articles into the receiving receptacles in a predetermined position.

In accordance with a further feature of the invention, the feeding grid is vibrated or periodically shaken to enhance the feeding of the articles, and to prevent jamming. In accordance with a further feature of the invention, a toothed wheel having teeth engaging with the receiving receptacles of the drum is located at the lower portion of the drum for pushing articles out of the receiving receptacles into a discharge duct, and a counter device being contacted by the pushed out articles for counting the articles fed to the discharge duct. The invention also contemplates various other specific features which are discussed in detail hereinbelow.

The invention will be described by way of example with reference to the accompanying drawings, in which:

FIG. 1 is a fragmentary side elevational view, partly in cross-section of a drum for sorting, counting and filling in accordance with the present invention;

FIG. 2 is a cross-sectional view along line 2—2 of FIG. 1;

FIG. 3 is a view similar to FIG. 2 of a drum with a differently formed grid;

FIG. 4 is a fragmentary cross-sectional view of the drum and the feeding grid in a section perpendicular to the axis;

FIG. 5 is a view similar to FIG. 4 of a modified drum;

FIG. 6 is a fragmentary view from the inside of the drum of FIG. 5;

FIG. 7 is a fragmentary cross-sectional view of the drum and the feeding grid with a roll brush in a section perpendicular to the axis;

FIG. 8 is a fragmentary cross-sectional view of the drum and the feeding grid along the line VIII—VIII of FIG. 10;

FIG. 9 is a fragmentary cross-sectional view of the drum and the feeding grid along the line IX—IX of FIG. 10;

FIG. 10 is a fragmentary side elevational view of the drum and the feeding grid with the wall of the fixed housing partially cut away;

FIG. 11 illustrates the drum with a toothed roller wheel and a filling drum partially represented in a section perpendicular to the axis;

FIG. 12 is a fragmentary front view of the drum with counter pins and a counter wheel;

FIG. 13 is a fragmentary enlarged scale view of the drum of FIG. 12 showing the feeding grid in enlarged scale;

FIG. 14 is a sectional view of the drum of FIG. 12 along line 20—20 of FIG. 19;

FIG. 15 is a fragmentary front view, partially in section, of the drum with a diverter for the counter pins;

FIG. 16 is a sectional view of the drum and the diverter of FIG. 15 taken through the drum axis;

FIG. 17 is a side view of the diverter of FIGS. 15 and 16;

FIG. 18 is a side view of an electromagnetic device for moving or sliding the counter pins;

FIG. 19 is a side elevation of a drum in accordance with the present invention, in which wall, feeding grid, and toothed roller wheel as well as shaker device are shown;

FIG. 19a shows the drum of FIG. 19 in reduced scale in a side view;

FIG. 20 shows the combination of FIG. 19 removed from the drum;

FIG. 21 is a disassembled perspective view of a drum in accordance with the present invention;

FIG. 22 is a section of the drum along the line 35—35 of FIG. 24;

FIG. 23 is a section of the drum along the line 36—36 of FIG. 24;

FIG. 24 is a partial inside view of the drum of the present invention;

FIG. 25 is a side view of a rod used in the drum;

FIG. 26 is a front view of the rod of FIG. 25;

FIG. 27 is a fragmentary axial section of the drum and a feeding grid with a schematic illustration of supervisory equipment for the filling level;

FIG. 28 is a schematic side view of a drum mounted on support rolls which is detachably secured to two outer rolls;

FIG. 29 is a front view of the drum of FIG. 28;

FIG. 30 is a front view of a drum mounted on support rolls, and which is continuously driven by V-belts;

FIG. 31 is a side view of the drum of FIG. 30;

FIG. 32 is a side view of a counting device for use with the invention; and

FIG. 33 is a top view of the counting device of FIG. 32.

The filling drum of FIGS. 1 and 2 includes guide surfaces 60 for the alignment of the bodies 61, such as pills, which are to be sorted and counted, located on a feeding grid 62 which is fixed to a rigid holder and which lies inside of ribbed drum 63 and of outside shell 64. Feeding grid 62 extends over the lower left-hand quadrant of ribbed drum 63 which moves upwards with reference to FIG. 1. Grid 62 is comprised of individual guide members 65 in the form of divider strips or ribs which are held together through appropriately formed rodlike members 66 which also spaces the members 65 from each other. The guide rib members 65 must be connected in such a way that the guide receptacles 67 formed by rib members 65 of feeding grid 62 lie precisely on top of (i.e., in registration with) the pickup receptacles of drum 68. The drum receptacles are defined by spaced ring members or projections 63.

Feeding grid 62 is secured to a rigid holder at 69. At its bottom end a ratchet 70 is swingably mounted, and its operational surface 73 which carries cams 71 and 72 has a length such that it continuously rests on one of the many pins 74, which are fixed on the circumference of drum 63. Pins 74, during the rotation of drum 63, slide past cams 71 and 72, ratchet 70 is lifted so that when ratchet 70 lies against the head of a screw 75 set in feeding grid 62, the feeding grid is also correspondingly moved, to effectively shake the pills. The shaking frequency is thereby dependent on the number of pins 74 and of cams 71 and 72, while the magnitude or strength of the shaking is dependent on the length of cams 71 and 72. The diameter of the head of screw 75 determines the clearance between feeding grid 62 and drum 63.

Guide members 65 which make up feeding grid 62 have such height that over and above the sorted bodies (pills) in pickup receptacle 68 of drum 63, there is always yet another unaligned body led by the feeding grid 62 into the corresponding guide receptacle 67. In this way security is increased that all of the pickup receptacles 68 of drum 63 will actually always be filled with corresponding bodies (pills). This prevents counting errors and improves efficiency.

Under certain circumstances it can, depending on the form of the bodies to be sorted and counted, be useful to slope, incline or taper only one of the two guide surfaces 60 of the guide members 65 forming the guide receptacles 67. This modification is illustrated in FIG. 3.

The shaking motion imparted to feeding grid 62 accelerates the passage of the bodies out of guide receptacles 67 of the forming grid into the pickup recepta-

cles 68 of drum 63 and prevents the possibility of any of them somehow getting stuck in the guide receptacles 67.

As may be seen from FIG. 4, the wall 76 which is connected to feeding grid 62 and forms a fixed arc-shaped covering of the inside of the upper portion of drum 63, is tapered at its forward or leading end. In this manner, bodies which may come against wall 76 in consequence of the shaking of grid 62 and the relative rotation of drum 63 and grid 62 are not damaged by wall 76, but are enucleated by it, and are brought back into the mainstream.

In accordance with another modified embodiment of the invention as shown in FIGS. 5 and 6, a special tapered extension 77 is movably connected to the forward end of the fixed, arc-shaped, inner wall 76. This extension 77, because of its mobility, is easily designed to be compatible for use with constant form bodies, and especially round bodies, such as pills being sorted.

As shown in FIG. 7, a roll brush 78 can be arranged at the end of the feeding grid 62 so as to engage it, the roll brush 78 being driven in an opposite direction to that of drum 63. This roll brush 78 prevents bodies from reaching and contacting the lower edge of wall 76, and thereby prevents jamming or shearing of the bodies against the lower edge of wall 76.

The feeding grids 62 represented in FIGS. 1-7 are preferably formed of plastic. This eliminates the possibility that traces of corrosion might come off on the tablets, troches, capsules or the like. However, the stability of plastic is not so great as that of steel or stainless steel, and there is the necessity to hold and secure the feeding grids 62 which are made of plastic.

As shown in FIGS. 8 and 10, feeding grid 62 has on all of its rib members 65 extensions 115 (FIG. 8) which protrude radially into the interior of the drum 63 and which are connected with one another by pins 116. Pins 116 are connected to the side wall 117 of the fixed housing or shell of the drum. Between extensions 115 of feeding grid 62 spacing rings 118 are connected. The lower portions of the divider rib members 65 of feeding grid 62 are connected together only through a single security pin 119 which is adjacent to wall 117, as shown in FIGS. 9 and 10.

As may be seen in FIG. 11, a counter contact 81, against which the body pushed out is pressed, is arranged underneath the discharge duct of drum 63. A toothed wheel 80 engages the pickup receptacles 68 to push pills out to prevent jamming. Counter contact 81 is displaced by an ejected pill and closes a circuit which generates a counter impulse in counter device 82. After the passage of the body being pushed out, the counter contact 81 returns to its rest position under the influence of attached weight 83.

In accordance with the apparatus disclosed in co-pending U.S. Ser. No. 877,316, alongside the sorting, counting and filling device, there is provided a control device which supervises the numerical completeness of the bodies in the individual series of drum receptacles and which prevents a receptacle series that has not been fully loaded from being attempted to be unloaded. In accordance with FIGS. 12 through 18, such a control device according to the present invention contains on one side of drum 63 counter pins 84 which are each assigned to a pickup receptacle 68 of drum 64. Counter

pins 84 protrude out of the drum wall and in their operational position while passing against counter wheel 85 they push the counter wheel 85 to advance counter wheel 85 by one step. If, for example, it is determined through photoelectric control of the numerical completeness of the bodies in the receptacles of the drum, such as carried out in U.S. Ser. No. 877,316, that bodies or pills are lacking in one or more receptacles so that the required number is not present, through return pressure of the counter pin 84 connected to this receptacle series, for example, by means of an electromagnet 86 (FIG. 18) the counter pin 84 in question is made non-operational for counting. Also, as has already been described at length in U.S. Ser. No. 877,316, the control device may operate so that incomplete series are collected and used for a subsequent filling to insure an accurate count.

As is clearly seen from FIGS. 15-17, a diverter 87 is rigidly fixed in the path of counter pins 84. The diverter 87 moves the pins 84 that are in a non-operational position back into the operational position. For this purpose, pins 84 have a flange 88, which slides along the oblique surface 89 of diverter 87 whereby pins 84 are drawn out.

In accordance with FIGS. 15 and 16, the diverter 87 is movable relative to counter pins 84. Diverter 87 is mounted by means of a screw 90 which is engaged in the rigid part 91. Diverter 87 rests by the action of its own weight on a fixed flat boss 92 of screw 90, the non-threaded end 93 of the screw projecting into a corresponding passage hole 94 in the diverter 87. This arrangement permits adjustment of the diverter to the particular shape and position of the counter pins 84. So that the counter pins 84 are properly maintained in the appropriate bores of outer ring 96 of drum 64 (FIG. 13), a spiral ring 97 is laid underneath pins 84 in ring 96, said spiral ring pressing with a light pressure against pins 84 and generating a certain frictional pressure between pins 84 and their bores.

In FIG. 11 a filler drum 98 is arranged underneath the discharge duct, said filler drum being divided into several radially extending receptacles 99, of which each picks up one or more receptacle series of the drum 63. Drum 98 can for example be driven by the counter pins 84 of FIGS. 18 through 24 over an interchangeable counter wheel. The drive may however also be supplied by electrical means, preferably by means of counter-generated impulses. Beneath filler drum 98 a pill-bottle 100 is arranged to receive the tablets.

In the embodiment of FIGS. 19 and 20, the inner wall 76, the feeding grid 62, and the toothed wheel 80 are in such a way connected with the charging apparatus 101 that they form a unified integrated unit and may be taken out of drum 64 together. To this purpose, this integrated unit is movably arranged on a slide 102, as is more clearly seen in FIG. 20.

The arrangement of FIGS. 19 and 20 makes it possible to adjust for sorting and counting of bodies of other formats or shapes, and after removal of the integrated unit, the drum 63 and even in appropriate cases the feeding grid 62 may be exchanged. Also, repair and cleaning of the entire apparatus is considerably simplified by this arrangement, because the inside of the drum and the individual components of the integrated unit may be laid bare in the aforementioned manner.

In accordance with FIGS. 21 through 26, drum 63 is comprised of several outward-removable sections 103, whose seams 104 run parallel to the drum's axis. At both ends of drum 63 holder rings 105 are provided, by means of which the drum is driven by pressure rollers (not shown in the drawings). Holder rings 105 are connected together by means of rods 106 to which drum the sections 103 are detachably fixed, as seen in FIGS. 22 and 23. The drum sections 103 have recesses 107 at their ends, in which rods 106 of square cross-section rest when the drum is assembled. Because the frame formed by rods 106 is rotatable by itself, it can always be displaced in such a way that drum sections 103 may be taken apart unhindered by wall 108 which partially covers the bottom portion of the resulting drum 63.

Rods 106 have at their ends threaded pins 109 and guide pins 110, as shown in FIGS. 25 and 26. By means of guide pins 110 they engage in corresponding boreholes 111 of holder ring 105. Threaded pins 109 project into a bigger bore hole 112 on the other side of holder ring 105, where it is engaged with a mating threaded member 113 to secure rod 106 and holder rings 105 together.

Also, the ends of drum 103 are preferably fastened to rods 106 by means of screws 114, as shown in FIG. 23.

The above-described arrangement permits a particularly simple exchange of drum when the bodies to be sorted or counted change in format or shape. It furthermore permits simpler repair and cleaning of the drum. Finally, also, the overall apparatus arrangement is greatly simplified.

If it has been previously determined that bodies of various different formats or certain different shapes are to be counted or sorted, it is useful to provide the device with several dismountable drums 63 for different body sizes or shapes. This enables operation to be easily optimized for each type of body being operated on.

In order to prevent the introduction from above of dust or other foreign bodies in the drum, covering layers, preferably transparent, may be provided, which for example are connectable to the device or can be laid on it. The covering layers may have corresponding hand grips. They must be made and arranged in such a way that when they are removed the drums can be taken out to be cleaned or cleaned.

Referring to FIG. 27, in order to maintain the level of the bodies in the fixed storage vat 120 containing feeding grid 62 at a constant level, a supervisory apparatus 121 is provided which provides two light beams 122 and 123, one above the other. If the supply of bodies to be counted falls below the lower light beam 122, a single is generated by the presence of the complete light beam and the introduction of new bodies into the storage vat 120 is actuated. If the upper light beam 123 is reached and interrupted, the introduction of new bodies is automatically switched off.

In the embodiment of FIGS. 28 and 29, drum 63 as described in Ser. No. 877,316 rotates on support rolls 124. It is detachably connected on both of its sides to two outer barrel rings 125 and 126. Barrel ring 126 is connected to the drive by means of a gear chain 129 and sprockets 130, and thereby sets drum 63 in rotation. Barrel ring 125, which is not connected with the drive, is together with support rolls 124 axially displaceable, so as to facilitate changing of a drum 63, for

example when a change of format or shape of the bodies being counted may be desirable. For this purpose a manually displaceable worm gear 132 engages in the base support 131 of barrel ring 125 which is provided with inner mating threading. Gear 132 is turned to axially displace the support 131 for removal of a drum 63.

In the embodiment of FIGS. 30 and 31, drum 63 has ring-shaped pulleys 133 at both of its ends, in which V-belts 134 are engaged. On one side of the drum the V-belt 134 is driven by a motor 135 and tightened by a tensioning pulley 136, which can be laterally displaced to regulate the tension on the V-belt 134. On the other side of drum 63, the V-belt runs over an undriven roll 137.

As has been experienced in practice, the containers in which the bodies must be placed after sorting and counting are of greatly varying size, especially in the pharmaceutical industry. In the embodiment of FIGS. 32 and 33, accordingly, the counter device 138 is vertically adjustable relative to the table or platform support 139 on which containers 140 are arranged. The containers 140 receive the counted bodies. Drum 63 is rotatably set in rigid side walls 141, which on their lower ends have outwardly projecting flanges 142. Downwardly projecting pins 143 are inserted through bores in the flanges and at their lower ends are connected to a plate 144. Plate 144 has a threaded insert 145 in its central portion in which a threaded screw 146 is engaged. By means of a handwheel 147, screw 146 is tuned. The end of screw 146 is axially immovably and rotatably mounted to an extension piece 148 of table 139.

By turning hand wheel 147 the counter device 138 can be raised or lowered at any time, as is apparent from FIG. 32, so that the system is easily adjusted to a desirable level or size of containers 140 into which the bodies are to be deposited.

It should be clear that various modifications can be made without departing from the inventive concepts set forth in the claims.

I claim:

1. In a discrete article separating and dispensing apparatus, particularly for dispensing of measured quantities of articles, such as pills, capsules, and the like, comprising

- a horizontal, rotatable drum having end walls and horizontally extending row dividers and circumferentially extending column dividers and defining article receiving receptacles therebetween, said receiving receptacles being located at the interior surface of the drum between said end walls;
- article supply means, at least a portion thereof being located interior of the drum and supplying the articles to the lower part of the interior of the drum;
- means forming a lower covering shell located beneath said drum and extending lengthwise thereof, and located close to said row and column dividers to prevent articles from falling through said receiving receptacles;
- an upper shell part located inside of said drum, close to said row and column dividers and extending lengthwise of said drum, and covering at least a portion of the upper half of the drum from the interior thereof to prevent articles from falling out of said receiving receptacles; and

means receiving articles from the receiving receptacles of a row;

the improvement comprising a part-cylindrical feeding grid (62) located just above a lower portion of said drum and extending lengthwise of said drum, said feeding grid having horizontally extending row dividers and partly-circumferentially extending column dividers which define a plurality of guide receptacles (67) therebetween, said guide receptacles being selectively in registration with said receiving receptacles of said drum, at least one of the dividers of said feeding grid having inclined surfaces thereon to guide the articles into the receiving receptacles in a predetermined position.

2. Apparatus according to claim 1, wherein said feeding grid extends over the lower quadrant of the drum which corresponds to the quadrant in which the drum is upwardly moving during rotation thereof.

3. Apparatus according to claim 1, wherein the column dividers (65) of said feeding grid (62) are partly ring-shaped ribs having divergent, inclined guide surfaces and the row dividers are transversely extending members which include means for spacing adjacent column dividers from each other.

4. Apparatus according to claim 1, wherein said column dividers (65) of said feeding grid (62) have a height such that the guide receptacles (67) always contain an article for guiding said article to an emptied receiving receptacle (68) located in registration with and below said guide receptacle.

5. Apparatus according to claim 1, wherein said column dividers (65) have at least one inclined or tapered guide surface (60) for facilitating guiding said articles into said guide receptacles.

6. Apparatus according to claim 1, wherein said feeding grid (62) is connected to a rigid holding means, and including means for imparting a shaking motion to said feeding grid to facilitate feeding said articles to said receiving receptacles.

7. Apparatus according to claim 6, wherein said feeding grid (62) is pivotally mounted at its upper end to said rigid holder and said means for imparting said shaking motion is coupled to said feeding grid at its lower end.

8. Apparatus according to claim 7, wherein said feeding grid extends over the lower quadrant of said drum which corresponds to the quadrant in which said drum is upwardly moving.

9. Apparatus according to claim 7, wherein said feeding grid includes at least one cam at the lower end thereof adjacent said drum.

10. Apparatus according to claim 9, wherein said means for imparting said shaking motion includes a ratchet (70) pivotally mounted at the lower end of said feeding grid, the ratchet having said at least one cam thereon, and pin-like means (74) extending from the circumference of said drum for engaging the cammed surface of said ratchet, said shaking motion being imparted to said feeding grid as said pin-like means engage and disengage said at least one cam during rotation of said drum relative to said feeding grid.

11. Apparatus according to claim 1, wherein said upper shell part (76) extends to said feeding grid and a portion thereof adjacent said feeding grid is tapered towards said feeding grid.

12. Apparatus according to claim 11, wherein said tapered portion of said upper shell part is a tapered extension member connected to said upper shell part.

13. Apparatus according to claim 1, including a roll brush (78) engaging said feeding grid at the uppermost portion, with respect to the direction of movement of said drum, of said feeding grid, said roll brush rotating in an opposite direction to the direction of rotation of said drum for preventing articles for contacting said upper shell part.

14. Apparatus according to claim 1, wherein said feeding grid is formed of plastic column dividers which are connected together by means of pins arranged longitudinally with respect to said drum, said plastic column dividers projecting radially from said connecting members in a direction towards the center of the drum.

15. Apparatus according to claim 14, wherein said longitudinally extending connecting members are rigidly connected to an end wall of said drum.

16. Apparatus according to claim 14, wherein said longitudinally extending connecting means includes spacer members located between said column dividers of said feeding grid to space adjacent column dividers from each other.

17. Apparatus according to claim 1, further comprising a toothed wheel (80) interior of said drum, the teeth of said wheel engaging successive receiving receptacles of said drum for pushing an article out of said drum; a discharge duct located below said toothed wheel and receiving articles pushed out of said drum by said toothed wheel; and a counter means arranged in the path of said article being pushed through said discharge duct and against which said article is pushed for counting the number of articles passing out of said drum and through said discharge duct.

18. In a discrete article separating and dispensing apparatus, particularly for dispensing of measured quantities of articles, such as pills, capsules, and the like, comprising

a horizontal, rotatable drum having end walls and horizontally extending row dividers and circumferentially extending column dividers and defining article receiving receptacles therebetween, said receiving receptacles being located at the interior surface of the drum between said end walls;

article supply means, at least a portion thereof being located interior of the drum and supplying the articles to the lower part of the interior of the drum; means forming a lower covering shell located beneath said drum and extending lengthwise thereof, and located close to said row and column dividers to prevent articles from falling through said receiving receptacles;

an upper shell part located inside of said drum, close to said row and column dividers and extending lengthwise of said drum, and covering at least a portion of the upper half of the drum from the interior thereof to prevent articles from falling out of said receiving receptacles; and

means receiving articles from the receiving receptacles of a row;

the improvement comprising a discharge duct located underneath said drum; a toothed wheel (80) located interior of said drum and having teeth

which engage respective successive receiving receptacles of said drum during rotation of said drum to push articles out of said receiving receptacles into said discharge duct; and a counter means arranged in the path of article discharge of said drum and against which said articles are pushed by said toothed wheel for counting the number of articles pushed out of said drum and into said discharge duct.

19. Apparatus according to claim 1, further comprising a control device coupled to at least one side of said drum and including counter pins (84) coupled to a circumferential series of said receiving receptacles (68), photoelectric means for detecting the presence of an article in a receptacle, and means responsive to said photoelectric means for moving the counter pin corresponding to a given receiving receptacle when said photoelectric means detects the absence of an article in said given receiving receptacle.

20. Apparatus according to claim 19, including counter wheels (85) coupled to said counter pins, said counter pins causing said counter wheels to move in a step-wise manner, each step corresponding to a counter pin passing a given location.

21. Apparatus according to claim 20, wherein said counter wheels are toothed wheels which engage said counter pins for said step-wise movement.

22. Apparatus according to claim 19, including a diverter (87) rigidly mounted in the path of movement of said counter pins for restoring said counter pins to their operational position from a non-operational position caused by absence of an article in a given receiving receptacle.

23. Apparatus according to claim 1, including control means sensing the presence or absence of articles in receiving receptacles of said drum and controlling the emptying of complete circumferential columns of articles into said means for receiving articles, and controlling completion of a non-completely charged column prior to emptying of same into said means for receiving articles from said receptacles.

24. Apparatus according to claim 1, comprising a filling drum (98) having radially subdivided compartments (99), each of said compartments receiving the articles of at least one circumferential series of receiving receptacles.

25. Apparatus according to claim 1, wherein said upper shell part, said feeding grid and said article supply means are coupled together to form an integral unit which is removable from said drum.

26. Apparatus according to claim 25, including track means engaging said integral unit to facilitate removal thereof.

27. Apparatus according to claim 1, wherein said drum is comprised of a plurality of sections (103) which are removably coupled together, said drum sections being generally in the form of cylindrical sectors removably connected together.

28. Apparatus according to claim 27, wherein said drum comprises holder rings (105) at both ends thereof and means for removably attaching said drum sections (103) to said holder rings (105).

29. Apparatus according to claim 1, wherein said drum is removably mounted to said apparatus.

30. Apparatus according to claim 1, comprising at least one transparent cover surrounding at least a portion of said drum.

31. Apparatus according to claim 1, including a pair of barrel rings (125, 126) coupled to said drum and engaged by support and drive rolls.

32. Apparatus according to claim 31, wherein said drum includes pins (128) extending from both sides thereof and engaging bores (127) of respective barrel rings.

33. Apparatus according to claim 31, wherein at least one of said barrel rings together with its support roll is axially displaceable, and including a threaded screw means threadably engaged with said displaceable barrel ring and support roll for axially displacing said barrel ring and support roll by rotation of said threaded screw.

34. Apparatus according to claim 1, wherein said drum has a pulley at each end thereof, and including drive means having a belt engaging at least one of said pulleys.

35. Apparatus according to claim 1, wherein said article supply means includes a detecting means providing a pair of vertically spaced light beams (122, 123) and means responsive to said light beams for causing introduction of new articles to said drum when the level

of said articles falls below the lowermost of said light beams and for stopping the introduction of new articles to said drum when the level of articles reaches the level of the uppermost of said light beams and interrupts said uppermost light beam.

36. Apparatus according to claim 1, wherein said article receiving means includes a table which is upwardly and downwardly displaceable relative to said drum on which a plurality of containers are arranged, said containers receiving said articles from said drum.

37. Apparatus according to claim 6, including a threaded member rigidly mounted with respect to a drum-support means and arranged beneath said table, a threaded screw means threadably engaged in said rigidly mounted threaded member and engaging the lower surface of said table, said table height being adjusted by turning of said threaded screw means relative to said fixed threaded member.

38. Apparatus according to claim 37, including rod means coupled to the support means for said drum and projecting through bores in said table, said threaded member being fixedly coupled to the lower portion of said rod means, said table being slidable on said rods in response to turning of said threaded screw means.

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