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Burgess, Jr.

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[54] **VIBRATORY QUANTIFYING APPARATUS**

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[52] **U.S. Cl.** ..... **221/7**, 133/8 R, 221/13, 221/200

[51] **Int. Cl.** **B65g 51/42**

[58] **Field of Search** ..... 221/2, 9, 10, 12, 221/13 X, 200 X, 156–161, 163, 167, 168, 13, 7; 133/8; 194/1 H, 10, 16, 9

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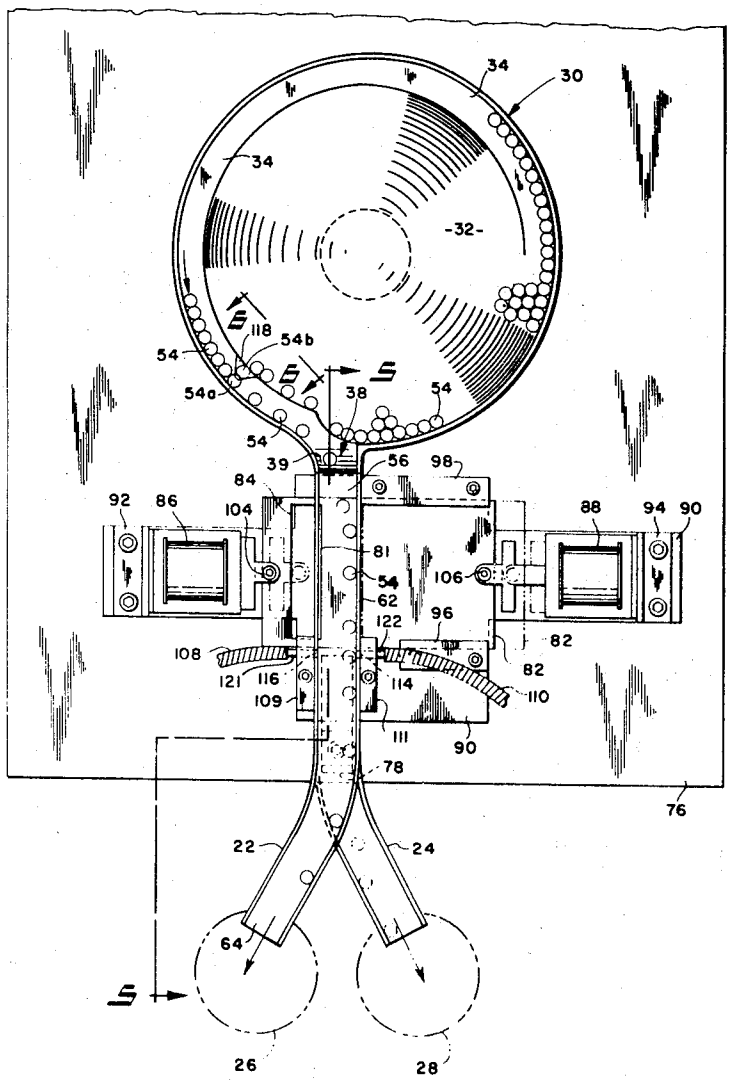
Attorney—Harold F. McNenny, Robert A. Sturges et al.

[57] **ABSTRACT**

There is provided a vibratory quantifying or counting apparatus which includes a vibratable receptacle for parts or individual items of common geometrical configuration and a discharge opening leading from the receptacle to a chute system composed of a pair of chutes. Counting means are provided for coaction with one of the chutes. Gate means operative in response to the counter means are provided for diverting any excess over a predetermined quantity to the other of said chutes.

19 Claims, 9 Drawing Figures



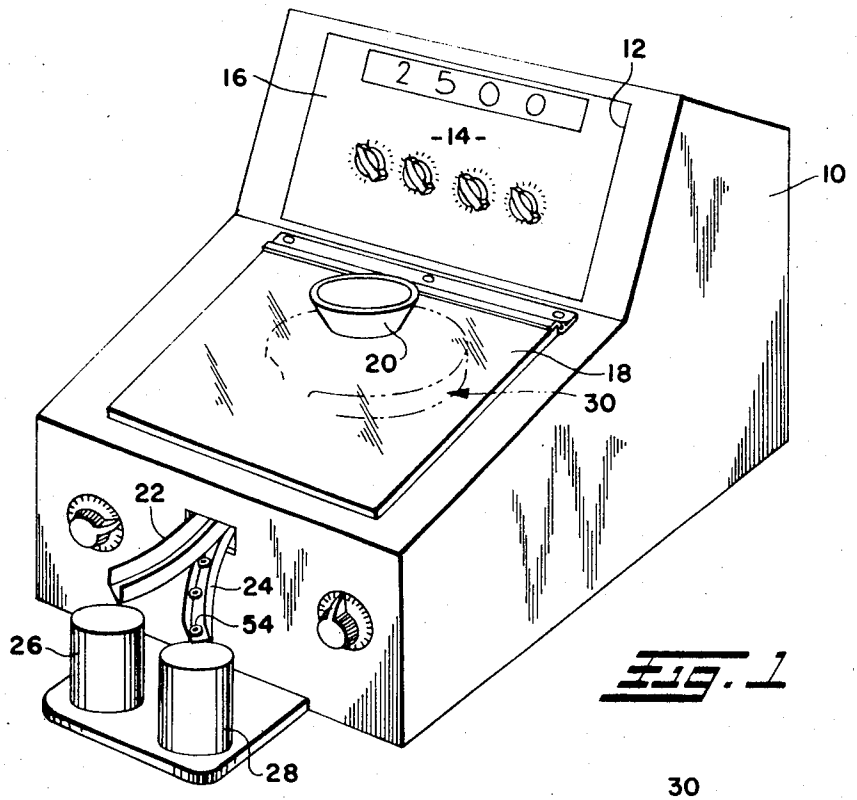

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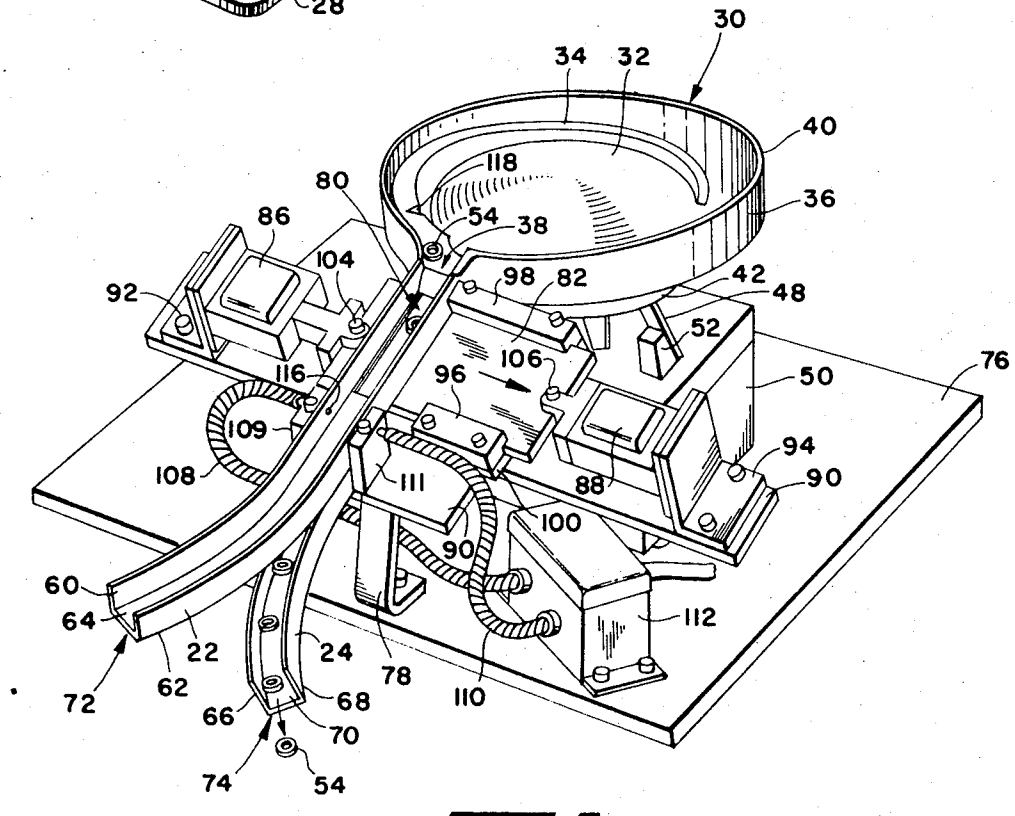
Fig. 1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88
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Fig. 2

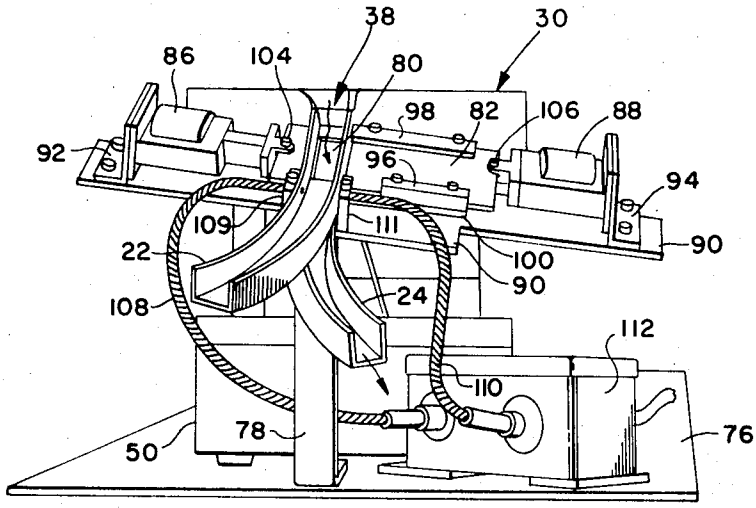


Fig. 3

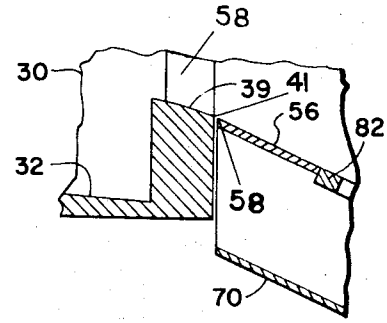


Fig. 7

Fig. 5

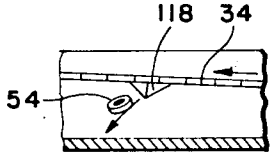
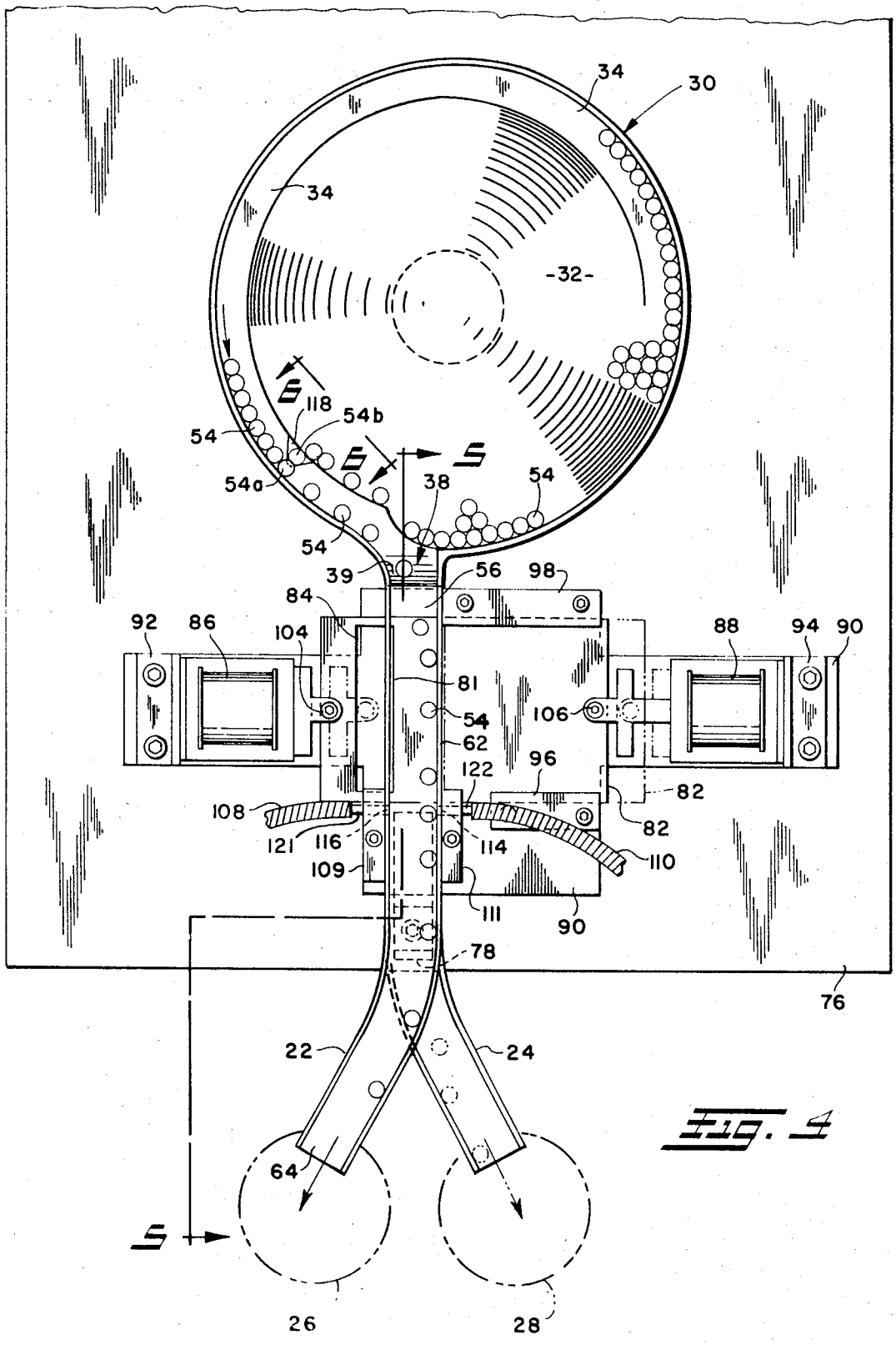


Fig. 6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39
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62
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122
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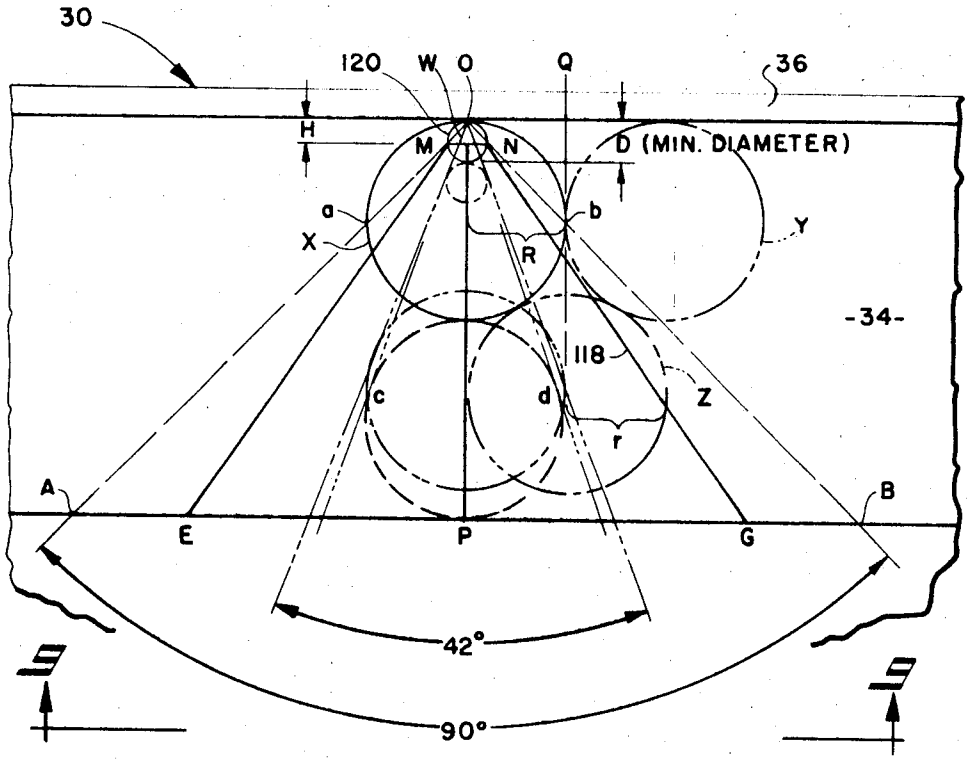
Fig. 4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90°

Fig. 8

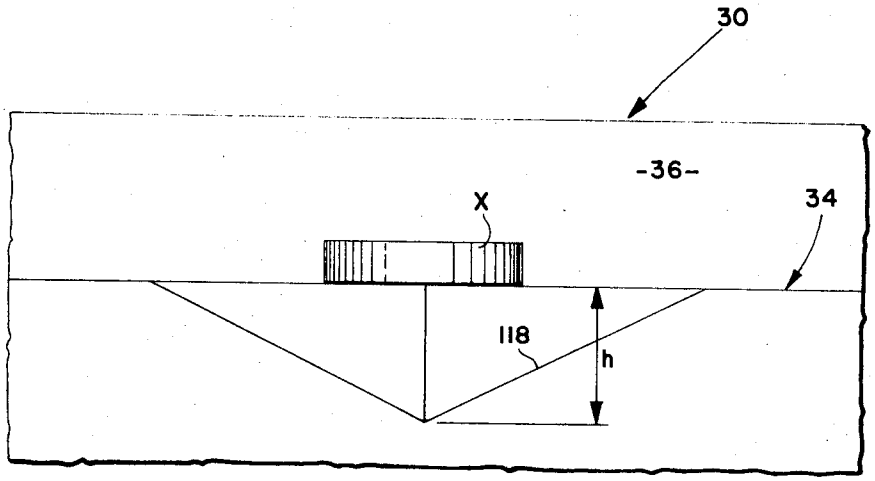
30
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Fig. 9

VIBRATORY QUANTIFYING APPARATUS

BACKGROUND OF THE INVENTION AND PRIOR ART

The present invention relates to apparatus for determining a numerical quantity of items or articles of similar geometric configuration. More specifically, the present apparatus finds specific utility as a means for counting drugs in the form of pills or capsules. The invention will be discussed, therefore, in reference to this particular utility although it will be clearly understood that the principles of this invention are applicable as well to the counting of parts such as transistors, washers, bolts, other mechanical devices, closures, etc.

In the dispensing of pills or capsules pursuant to order or prescription, the druggist or pharmacist is familiarly seen pouring a quantity of the pills or capsules from a supply container into a counting tray provided along one marginal edge with a semi-cylindrical depression having a funnel-shaped portion at one extremity thereof and a closure at the opposite end thereof, and a hinged cover for mating coaction with the plate. When the hinged portion is closed, a closed tubular body is formed having a funnel portion at one extremity. In using the device, a quantity of pills in excess of that desired is poured onto the plate portion and with a knife or other suitable instrument, the pharmacist counts out the desired number of pills and moves them into the semi-cylindrical depressed portion of the tray. When the desired number is reached, the hinged portion is closed over the pills confined in the depression, the balance of the unused pills then being returned to the supply container by pouring over a suitably formed lip on the opposite marginal edge of the tray. Thereafter, the tray is inverted and the counted pills discharged through the funnel portion of the tube into a prescription bottle or container. While this operation is simple enough in itself, when performed many times in the course of the day, it becomes excessively time-consuming.

The present invention provides an automatic, accurate and rapid means for dispensing a predetermined quantity of pills or capsules (or other parts having a uniform configuration) as well as a means for counting such items as will be explained hereinafter.

The present invention combines in a unique manner the principles of a vibratory parts feeding apparatus, digital counting means, preferably of electronic operation, and novel chute and gating means. Vibratory parts feeders utilizing a fabricated or cast vibratable receptacle formed, for example, of a generally circular bowl having upstanding walls and a spiral track leading from the bottom upwardly along the wall surface to a discharge point are well known. In general, these devices are mounted upon a plurality of leaf spring elements which serve to support and guide the receptacle for vibratory movement along a path. Vibration may be induced by electromagnetic means or by pneumatic means, or by mechanical means. A typical example of a pneumatically driven vibratable receptacle of the type described is shown in my U.S. Pat. No. 2,985,280 dated May 23, 1961. A further example of a bowl-type parts feeder utilizing, however, an electromagnetic drive means is shown in U.S. Pat. No. 2,799,383.

Solid-state electronic predetermining counters are well known and readily available on the market. While the structure of these devices forms no part of the present invention and the details thereof will not, therefore, be discussed, the location of the counting means after the gating means is believed unique in unit-counting devices.

The chutes and their arrangement in the present invention are novel in combination with the gate means for diverting parts or items or pills after a predetermined figure has been reached. Also, there is provided a novel bowl exit having a sloped side delivery to provide controlled initial start of the items or pills into the chute structure. To control the discharge of items or pills a novel notch in the spiral track is provided having a geometry able to reduce the items or pills to a single file over a substantial range of part diameters or shapes, e.g. disc-type pills and capsules over the size ranges in which each type is currently available.

BRIEF STATEMENT OF THE INVENTION

Briefly stated, the present invention is in a vibratory quantifying apparatus which comprises in combination a vibratable receptacle, means for counting associated with a discharge chute, and gate means responsive to the counting device for diverting any excess over a predetermined quantity to another chute. More particularly, the vibratable receptacle includes means for supporting and guiding the receptacle for oscillatory movement. Means are provided for inducing vibration of the receptacle whereby items deposited in the bottom of the receptacle are moved along a path to a discharge point. In the course of movement along the path, novel notch means are provided to assure a single file of parts to be counted. The discharge leading from the vibrating receptacle is located with respect to a pair of stationary chutes disposed for selective operative communication with the discharge opening. Gate means coact between the chutes and in response to the counter means located after the gate means so that when the predetermined figure set in the counter has been reached, the gate is actuated and any excess over the predetermined quantity is diverted into the second chute. In the case of the dispensing of pills, the first chute may lead to the prescription bottle, and the second chute diverges and leads to the supply bottle.

In a preferred embodiment, the chutes are in superimposed relationship for at least a part of the pathway, and they are desirably of generally U-shaped cross-sectional configuration having upstanding sidewalls and flat bottom surfaces. The gate is a plate-like member disposed between the chutes and forming a movable bottom portion of the upper chute way. An opening is provided in the movable plate such that when the plate is moved laterally in response to the electronic counting apparatus, the movable bottom portion of the upper chute is withdrawn, and the pills are allowed to fall through the opening into the second chute.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an illustration in perspective of a counting apparatus in accordance with the present invention showing an arrangement suitable for use in counting pills or capsules. The chutes are shown leading first to one container and secondly to a supply container.

FIG. 2 is an illustration of the apparatus shown in FIG. 1 with the cover and electronic counting apparatus removed and showing the details of the vibratory parts feeding apparatus, the discharge opening, the pair

of chutes, and the gate apparatus coacting therebetween.

FIG. 3 is a front view of the gating and counting apparatus shown in FIG. 2 and showing a preferred disposition of the chutes for best results.

FIG. 4 is a top view on an enlarged scale of the apparatus shown in FIG. 2.

FIG. 5 is a fragmentary cross-sectional view of the apparatus shown in FIG. 4 as it appears in the plane indicated by the lines 5—5 in FIG. 4.

FIG. 6 is a fragmentary elevation of a portion of the trackway as it appears in the plane indicated by the line 6—6 in FIG. 4.

FIG. 7 is a fragmentary cross-section through the discharge opening showing the transition from the vibratory bowl to the stationary track.

FIG. 8 is a fragmentary portion of a trackway showing the mode of determining notch geometry.

FIG. 9 is an edge view from the inboard side of the trackway of the portion shown in FIG. 8.

DETAILED DESCRIPTION OF THE DRAWINGS

Referring now more particularly to FIG. 1, there is here shown a pill-counting apparatus embodying the principles of the present invention. There is illustrated a cover 10 formed of sheet metal or plastic, for example, having an opening 12 adapted to display the selector and number-exhibiting panel 14 of a commercially available electronic predetermining counter 16. The cover 10 may be provided with a hinged clear plastic or glass cover 18 having a wide mouth funnel 20 positioned therein for admission of items to be counted into the vibratable receptacle just beneath the funnel 20. The hinged glass or plastic cover when opened allows ready access to a bowl 30 for cleaning purposes. The cover 10 and funnel 20 are optional. Emerging from the forward wall of the cover 10 is an upper chute 22 and a lower chute 24. Upper chute 22 has disposed in pill-receiving position a suitable container 26, for example a graduated container with markings indicating the size of the prescription bottle required. The chute 24 is positioned above another container 28, which may be a supply container. Chutes 22 and 24, as will be explained in greater detail hereinafter, are isolated from each other.

FIG. 2 is a further illustration in perspective with the shroud or cover 10 and funnel 20 removed along with the electronic counting device 16 to reveal a parts feeder bowl 30 of generally cylindrical configuration having a conically shaped bottom 32 and a spiral trackway 34 leading from the bottom 32 upwardly along an upstanding wall 36 toward a discharge opening 38 adjacent the top marginal edge 40 of the upstanding wall 36. The bowl 30 is integral with or secured to a mounting base 42. The mounting base 42 is supported on a plurality of spaced, circumferentially located springs such as spring 48 which serves as means for supporting and guiding the receptacle or bowl 30 for oscillation along a given path. The springs 48 are of conventional design and secured to the mounting base 42 and to a base 50 by conventional means, such as a mounting lug 52. Usually there are provided four spring stations composed of lugs, such as lug 52, integrally cast with or secured on the mounting base 42 and on the base 50 at 90° intervals. The springs are bolted to the lugs which are sloped (as shown in FIG. 2) a suitable angle such as 75° to the horizontal. In designing this apparatus, it is desired that weight be minimized insofar as possible. Thus, integrally cast spring mounting lugs are preferred, for example.

To achieve accurate counting, it is desired that the items to be counted are presented at the discharge outlet 38 in single file. To the achievement of this objective, the trackway 34 is provided with tooling whereby the succession of items moving along the track is reduced to a single file. Such tooling may be very inexpensive as is the novel notch 118 hereinafter described.

The novel discharge opening 38 and its configuration is important if it is desired to minimize undue bouncing of the parts as they leave the vibrating bowl in single file, or one at a time, and enter into a relatively stationary chute portion. As is best shown in FIG. 4, the upstanding wall portion 36 is desirably flared outwardly adjacent the opening 38 to facilitate the transition movement of the parts, for example pills 54, from a circular path to a linear path. It is desired to prevent extraneous unstable movement of the parts 54 beyond the flared portion before entry onto a stationary slide portion 56 which is secured to or integral with the chute 22. If on leaving the vibrating bowl the pills 54 impact against any obstacle such as the vibrating edge 58 (FIG. 7), an instability may be imparted to the pill 54 that may interfere with the accuracy of the count. As shown in FIG. 7, the stationary discharge slide portion 56 is desirably tangential to the downwardly curved trackway portion 39 which in use is vibrating. The lip or edge 41 is desirably located such that it is even with or slightly above (0.0000 to 0.002 inch) the leading edge 43 of the stationary bottom portion 56 of chute 22.

Also shown in FIG. 2 are the pair of chutes 22 and 24 which are disposed for selective operative communication with the discharge opening 38 and the stationary slide portion 56 (FIG. 7). Chutes 22 and 24 are sloped downwardly at an angle to the horizontal as best shown in FIG. 5. This angle is desirably approximately 22.5°. The angle itself is not critical except insofar as it is capable of causing acceleration of the parts 54 as they move downwardly along the chute. For most purposes, an angle of from 15° to 45° is useful. The parts as they leave the discharge opening 38 are often quite close together, and for purposes of accuracy in detection for counting purposes, it is desirable that the parts 54 be spaced farther apart. A 22.5° slope has been found to be satisfactory for this purpose.

In a preferred embodiment as shown in FIGS. 2 and 3, the chutes 22 and 24 are in superimposed relation, one above the other. Chutes 22 and 24 preferably, although not essentially, have a generally U-shaped cross-section with a flat bottom. Thus, in chute 22 the channel is formed by upstanding parallel walls 60 and 62 joined along their lower marginal edges by a flat bottom portion 64. In like manner, the channel of the lower chute 24 is formed by upstanding walls 66 and 68 joined together by bottom portion 70. It has also been found that the lower chute 24 should be somewhat deeper than chute 22 to minimize the chances of any parts or items falling through the gate (hereinafter described) and bouncing back up into chute 22. While the paths of chutes 22 and 24 adjacent the discharge opening 38 coincide with one another, they diverge approaching their distal extremities indicated at 72 and 74, respectively. The extent of divergence is, of course, optional; but it must be sufficient to enable separate

collection of the counted parts or pills **54** and those to be returned to the supply.

The chutes **22** and **24** are supported from a base plate **76** by means of a bracket **78.** The base plate **76** also underlies the base **50** on which the vibratable receptacle **30** is supported. As indicated above, the chutes are "relatively" stationary with respect to the vibrating receptacle. Because the base **50** is of finite mass, it will move slightly in response to vibratory impulses imparted to the vibratable receptacle **30** by the vibratory drive means, be they pneumatic, electromagnetic, or mechanical, or any combination thereof. Thus, slight movement of the base **50** will be transmitted through the base plate **76** to the bracket **78.** The stationary slide portion **56** is an extension of the bottom portion **64.**

FIG. **5** shows in cross-section the chute assembly including superimposed chutes **22** and **24.** The bottom **70** of chute **24** is continuous from a position spaced from and beneath the vibrating slide portion **56** to the distal extremity **74.** The bottom **64** of chute **22** is continuous for only a portion of the pathway from the distal extremity **72** toward the discharge opening **38.** A portion **56** of bottom **64** is a continuation thereof and is tangential to the trackway portion **39** as above described. An intermediate portion of the bottom **64** is cut out to provide an opening **80** (FIGS. **2** and **3**). This portion is replaced in a preferred embodiment with a sliding gate **82** which is also provided with an opening **84** of substantially equal size to the opening **80.** Gate **82** is operated by means of conventional solenoids **86** and **88** mounted upon a suitable plate **90** by means of brackets **92** and **94,** respectively. Suitable guideways, such as gibs **96** and **98** fastened to each other by a suitable plate **100,** control the path of movement of gate **82.** Such gibs may be stamped from the plate **100** itself as a convenient mode of fabrication of this part. Solenoids **86** and **88** operate in opposing relation and are secured to the gate **82** by any suitable means such as pins **104** and **106.** When solenoid **86** is energized, solenoid **88** is simultaneously deenergized and the normal position of the gate is as shown in FIG. **4** during the counting operation. When the predetermined number dialed into the predetermining counter **16** is reached, solenoid **88** is activated and solenoid **86** deactivated, holding the gate to the position shown in dotted lines in FIG. **4** and disposing the opening **84** fully across the space between the upstanding walls **60** and **62** of upper chute **22.** Pills **54** then fall through the opening **84** into the lower chute **24** for return to a supply vessel **28.** As is best shown in FIG. **4,** the disposition of the gate **82** during the counting operation is desirably fully closed. The combination of a properly designed trackway **34** with tooling as later described and a slope in the discharge surface **39** sloping from tangent to track surface **34** to tangent to the slope of chute surface **56** provides reliable counting. Generally, such slope is in the range of from 5° to 15°. The purpose of these design parameters is to ensure spacing with precise acceleration to minimize instability of the pills **54** or piling up of the pills **54** in traversing the chute **22** and ensure that they will be reduced to a single file for accurate counting. The sensing device, hereinafter described, will therefore not be led into error by two pills moving side by side along the chute **22.**

Counting occurs in upper chute **22.** In the embodiment shown in the drawings, counting is conveniently and accurately effected by intercepting a light beam. Thus, there is provided as shown in FIG. **4** a light source **121,** e.g. an electric light bulb, and sheathed electric wires **108,** the assembly being supported in mounting block **109.** Instead of a bulb being located for transmission of light through the sidewall **60,** the light may be conducted thereto by means of light conductors, e.g. a plexiglass light conduit or a fiber optics conduit. A light receptor opening **114** is provided in the sidewall **62** of upper chute **22.** The disposition of the light source **121** and the receiver **122** (which may be a photoelectric cell) is such that even the thinnest pills or items traversing the chute **22** will intercept enough of the light beam to activate the photocell located behind the opening **114.** The impulse from the photocell is carried to a convenient connection box **112** by a conduit **110.** Mounting blocks **109** and **111** are in turn supported by the plate **90.**

Referring now more particularly to FIGS. **2, 3,** and **5,** it will be observed that the plate **90** and the parts associated with and mounted thereon are disposed at a slight angle which, for most purposes, is between 5° and 15°, for example 10°. This provides, therefore, a lateral slope to the bottom portions **64** and **70** of chutes **22** and **24,** respectively (see FIGS. **2** and **5**). Such a disposition of the bottom of the upper chute **22** in particular forces the items or pills **54** to move by gravity toward the upstanding wall **62** in which the light receiver opening **114** is disposed. This provides for a more nearly accurate count. The width of the chute **22** or chute **24** is determined, of course, in large measure by the size of the items or pills being counted. An important consideration affecting the accuracy of the apparatus is the length of the straight section between the exit surface **39** and the opening **84** in the plate **82.** This portion which is identified as **56** in FIG. **7** is considered as having a length "*l*" and has an influence on the length of the opening **84** in the gate plate **82.** If too great a distance is traveled by the item being counted, it will accelerate to a relatively high speed and, therefore, require a much greater length of the opening **84.**

The length of the straight section or portion **56** between the surface **39** at the end of the vibrating trackway **34** and the opening **84** in the plate **82** is an important consideration. As will be pointed out hereinafter more particularly, it influences the length of the opening **84** in the gate **82.** If too great a distance is traveled over the portion **56** and/or the slope is quite steep, the items being counted accelerate to a higher speed and therefore require a much greater length of opening **84** to fall through due to their flatter trajectory. Thus it is desirable for purposes of practical size in installation for use in pharmacies, for example, that the length of the stationary portion **56** should be held to a minimum. For general purposes, the ratio of the length *l* to the length "L" (the length of the opening **84**) is approximately 1:4. In a typical embodiment, the length of the portion **56** is ⅝ inch.

As previously indicated, the edges encountered by the part or pill as it moves down the pathway from the vibrating bowl exit **38** and through the chute **22** are important. These edges may cause instability in the parts or pills and therefore could adversely affect the accuracy of the count. Thus, the edge of the portion **56** of the bottom **64** which is first encountered by the part should be absolutely tangential to or preferably slightly below the adjacent edge of the surface **39.** As the part leaves the portion **56** and enters onto the upper surface

of the movable gate **82**, this surface should be absolutely in the same plane as the portion **56** or preferably slightly below the plane of the portion **56**. In practice, there will always be a certain amount of freedom of movement of the gate in a slot such as provided by gibs **96** and **98**. Thus, it is advantageous to place a small spring (not shown) bearing down upon the edge of the plate **82** closest to the portion **56**, and a small spring bearing up on the edge of the plate **82** farthest away from the bowl. This provides assurance of the elimination of instability introduced by reason of a part striking an edge that enables the provision of a practical high production design and a high degree of accuracy. Normally, accuracy can be achieved in the range of from 0.2 to 1.5 percent for shapes with inherent instability such as spheres that roll and ovals that slide and bounce in an irregular fashion.

It is important that there be acceleration of the parts or pills **54** as they move down the stationary exit chute structure. This causes the parts to space themselves apart from each other for more accurate counting. It is also desirable to use a photocell which has a wide band of light-to-dark response. Such devices are capable of detecting any change in the intensity of the light. If the band is narrow, then it requires considerable care to prevent input from external transient signals which may cause count irregularities. It has also been found that another consideration affecting the accuracy of the count is the depth of the lower chute **24**. The chutes are normally disposed at an angle in the range of from 20° to 45° to the horizontal. Because of the nature of some parts, there is a problem of bouncing of the parts from the bottom of the lower chute **24** and, in some cases, a part may bounce back up through the gateway opening **80** onto the bottom **64** of the main chute **22**. If the depth of the lower chute is inadequate, this may create a problem in the accuracy of the count.

An unusual factor in this counting circuit with regard to other counting circuits is the fact that the counting system is located below the gating or after the gating mechanism. In other circuits, it has been the reverse—the counter has been located immediately ahead of a diverter or some other means for diverting the parts that have been counted. Because of the extreme speed available in solid-state counting and solid-state switch gear for energizing and deenergizing solenoids, it has been found possible to place the light path (**114 – 116**) in such close proximity to the botom edge of slot **84** that, for the most part, the pill or capsule which reaches the preset count and triggers the counting system to shift the solenoids actually actuates the circuit while it is still in a position of instability with regard to the edge of the slot **84** farthest from the bowl. In other words, if the gate **82** were activated instantaneously, this pill or capsule would continue on past the light path only because of its speed, inertia, and trajectory. A part following closely behind this part would therefore fall through the opening **84**. To place the light source before a diverter or opening would mean that the speed with which the parts traverse the chute would become a very critical part of the calculation and would severely limit the accuracy obtainable with the mechanism. Also, diverters often crush items as they are passing from one chute entrance to another. This creates a design problem. When the accuracy of speed of movement of parts down the chute becomes an important factor, the mere change in atmospheric humidity from one day to another can cause problems. Thus there is provided a unique relationship of gating and light path. The effectiveness of this relationship is, of course, enhanced with the recently developed high speed solid-state counting equipment. High speed solid-state switch gear equipment coupled with the improved counting equipment and the location thereof also improves the reliability.

In operation, then, a pharmacist desiring to count out a predetermined number of pills in the filling of a prescription and utilizing a device in accordance with the present invention will dial into the predetermining counter a number, for example **100**. He will then discharge into the bowl **30** a number of pills in excess of **100**. He will then turn on the electromagnetic vibration-inducing device, causing the pills resting on the conical bottom **32** to enter onto the trackway **34** for movement upwardly therealong in a known manner to the discharge gate **38**. A notch **118** is formed in the trackway **34** adjacent the discharge opening **38**. The fixed notch **118** is shaped and sized to be effective for any diameter pill **54** which will be counted by the device. If the pills should traverse the track **34** in a side-by-side relation as shown in FIG. **4** as **54***a* and **54***b*, pill **54***b* will drop off the trackway through the notch **118**, and only a single file of pills **54** will progress past that point. Pill **54***b* will be returned to the supply in the bottom **32** of the bowl **30** for recycling. The width of the track **34** as it appraches the discharge opening **38** is also calculated to be insufficient to support two of the largest diameter pills to be metered by the device.

In FIGS. **8** and **9** there is shown in several positions a large disc representing a typical pill, for example, and having diameter 2R. With the disc tangential to the side surface which is the vertical wall **36** of the bowl **30**, the disc tangential points *a* and *b* and surface point **0** are located. A center line of the disc parallel to the wall through ab locates the geometric balance points of this disc. Angle AOB is described by drawing lines through *a*O and *b*O. This angle becomes one theoretical limit for the extremities of the notch **118**. Now, two discs X and Y are drawn side-by-side and against the side surface **36**, and a third disc Z is drawn with the center of the disc Z on a line *b*Q perpendicular to the wall **36** and passing between discs X and Y at point *b*. This is an arbitrary selection of what might be present on the track and might desirably be eliminated with regard to parts passing down the track in side-by-side relation. The disc with diameter *r* is then drawn tangential to the other two discs X and Y with the center of the disc on the center line *b*Q mentioned above. Moving this disc across so the center lies on the center line OP of the original disc X passing through O and perpendicular to the wall **36**, one is able to describe through the balance points *c* and *d* of the disc the angle COD which works out to be approximately 42°. This has been found to be a good practical lower limit for the included angle of the notch **118**. For purposes of fast dropping and elimination of parts passing along the trackway **34** in side-by-side relation, it is advisable to approach the 90° angle AOB as closely as possible. However, since the trackway **34** is a vibrating surface, and the transient imbalances set up on convex surfaced discs (pills) do not permit approaching AOB exactly, experimental work has indicated that something in the order of EOG is practical for the included angle of notch **118**. This works out to be about 70°. Other practical considerations dictate that it is advisable to cut the notch short

and run a line across at a distance from the wall equal to the minimum diameter 2*r* of the smallest discs divided by two plus a little something extra. This is also shown in FIG. **8.** It is clear from this construction that almost any ratio of small to large diameter may be handled by the notch **118.** Actually, a track of one-inch width is found capable of handling a range in diameters of approximately 20 to 1. The center line or center of balance of the largest part would be slightly inboard of the edge of the track with the small part of a disc hanging out over the edge. And yet, no technological knowledge on the part of the operator is required nor is any expensive adjustment feature such as has been commonly used prior to this. The depth *h* of the notch **118** is desirably about one-fourth the full width at the inboard edge of the trackway **34.** This depth is not critical since any depth is sufficient whereby edges ME and NG create a sufficient instability in the undesired part or pill to cause it to fall off the trackway **34** and allow a single file to pass by notch **118.**

It has also been found that the notch **118** aids in the removal of capsules which are traversing the trackway **34** in side-by-side relation. However, it is quite normal to find that capsules tend to align themselves in a single file well in advance of arrival at the discharge opening **38** due to the vibratory effects imposed upon the capsules by the vibrating surfaces of the bowl.

After depositing into the bowl an excess over the predetermined number **100,** the druggist or pharmacist activates the electromagnetic vibration-inducing device causing the pills to traverse the trackway toward the discharge opening **38.** As indicated above, the pills encounter a cut-out obstacle in the trackway **34** so that only a single file of pills or capsules passes the notch **118.** As the pills begin to move through the discharge opening **38** onto the upper chute **22,** the gate **82** is in the closed position as shown in FIG. **4.** Pills cascade down over the sloped portion **56** onto the surface of the gate **82** and, because of the lateral slope of the gate and the bottom portion **64** of the upper chute **22,** tend to assume a position along the sidewall **62** of chute **22.** Also, because of the downward slope of approximately 22°, the pills **54** are accelerated along the chute and thus become spaced apart. The counter apparatus **16** is adapted and arranged by conventional means so that when the number of impulses sensed by the light-sensing means **122** reaches the predetermined number, for example **100,** then the solenoid **88** is actuated to drive the gate **82** so that the opening **84** lies fully across the bottom of the chute **22.** Pills **54** now representing an excess over the predetermined number fall through the opening **84** onto the bottom **70** of lower chute **24** and are thus diverted into a storage receptacle such as receptacle **28.** While the pills are traversing the bottom **64** of chute **22,** they are directed to a separate receptacle such as receptacle **26** in FIG. **1.**

The speed of operation is such that a quantity of 100 pills can easily be counted in as little as five seconds. The usual time is about thirty seconds. In the meantime, any excess is being diverted back into the supply vessel **28.**

It is also possible to use the apparatus for the purpose of counting the number of units in a supply vessel. Thus, if a number is inserted into a display counter which is well in excess of the anticipated number of pills in the supply container, a counter equipped with display tubes will record digitally and visually the number of interruptions of the light beam, each interruption corresponding to one unit. Where the predetermined number exceeds the anticipated number in a given container, the gate **82** will remain in a position enabling the counting of the parts rather than isolation of a predetermined number of parts.

What is claimed is:

1. A vibratory quantifying apparatus comprising in combination:

a. a vibratable receptacle;

b. means for supporting and guiding the receptacle for oscillatory movement;

c. means coacting with said receptacle for inducing oscillatory movement thereof;

d. a discharge opening leading from said receptacle;

e. a pair of downwardly sloped chutes disposed for selective operative communication with said discharge opening;

f. counting means settable to a predetermined quantity coacting with one of said chutes;

g. gate means operative in response to said counter means and coacting between said chutes to divert any excess over said predetermined quantity to the other of said chutes, said gate means comprising a plate movable between the chutes and lying in the plane of the bottom of one of said chutes and movable laterally to remove a bottom portion of one of said chutes to allow access to the other of said chutes.

2. A vibratory quantifying apparatus in accordance with claim **1** wherein the vibration-inducing means is electromagnetic.

3. A vibratory quantifying apparatus in accordance with claim **1** wherein the chutes are stationarily mounted.

4. A vibratory quantifying apparatus in accordance with claim **1** wherein said plate includes an opening therein, said opening having a width for at least a portion thereof equal to the width of the chute.

5. A vibratory quantifying apparatus in accordance with claim **4** wherein the gate means includes a pair of solenoids on opposite sides thereof connected to said plate and operating in push-pull relationship to shift the plate laterally.

6. A vibratory quantifying apparatus in accordance with claim **1** wherein at least one of said chutes includes a light source and a light-sensing member in opposed relationship and intersecting the path along said chute.

7. A vibratory quantifying apparatus in accordance with claim **6** wherein said light means is disposed across the width of said chute and downstream from said gate.

8. A vibratory quantifying apparatus in accordance with claim **1** wherein the vibratable receptacle comprises a circular bowl having upstanding walls and a closed bottom and a spiral trackway extending from the bottom upwardly along the upstanding wall toward said discharge opening.

9. A vibratory quantifying apparatus in accordance with claim **8** wherein the discharge opening includes a lip having a sloped surface for smooth transition into said chutes.

10. A vibratory quantifying apparatus in accordance with claim **8** wherein the sloped surface of the lip is tangential to the surface of the trackway.

11. A vibratory quantifying apparatus in accordance with claim 8 wherein the trackway includes notch means for limiting the width of the track.

12. A vibratory quantifying apparatus in accordance with claim 1 wherein the means for supporting and guiding the receptacle include a base and a plurality of leaf springs extending between the base and the receptacle.

13. A vibratory quantifying apparatus in accordance with claim 12 wherein the receptacle is a circular bowl and wherein the springs are disposed circumferentially between the bowl and the base.

14. A vibratory quantifying apparatus in accordance with claim 12 wherein the bottoms of said chutes are sloped downwardly from said bowl toward the plane of said base.

15. A vibratory quantifying apparatus in accordance with claim 14 wherein the bottoms of the chutes are sloped downwardly from 20° to 45′ to the plane of said base.

16. A vibratory quantifying apparatus in accordance with claim 1 wherein the chutes comprising said pair are disposed one above the other.

17. A vibratory quantifying apparatus in accordance with claim 16 wherein the bottom of the upper chute is flat and laterally sloped relative to the horizontal.

18. A vibratory quantifying apparatus in accordance with claim 16 wherein each of the chutes comprises a channel having parallel upstanding walls and a planar bottom.

19. A vibratory quantifying apparatus in accordance with claim 18 wherein the angle of the lateral slope to the horizontal is from 5° to 15°.

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