

Dec. 6, 1966

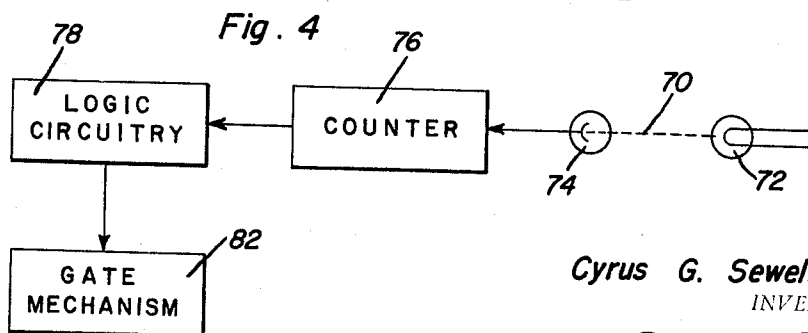
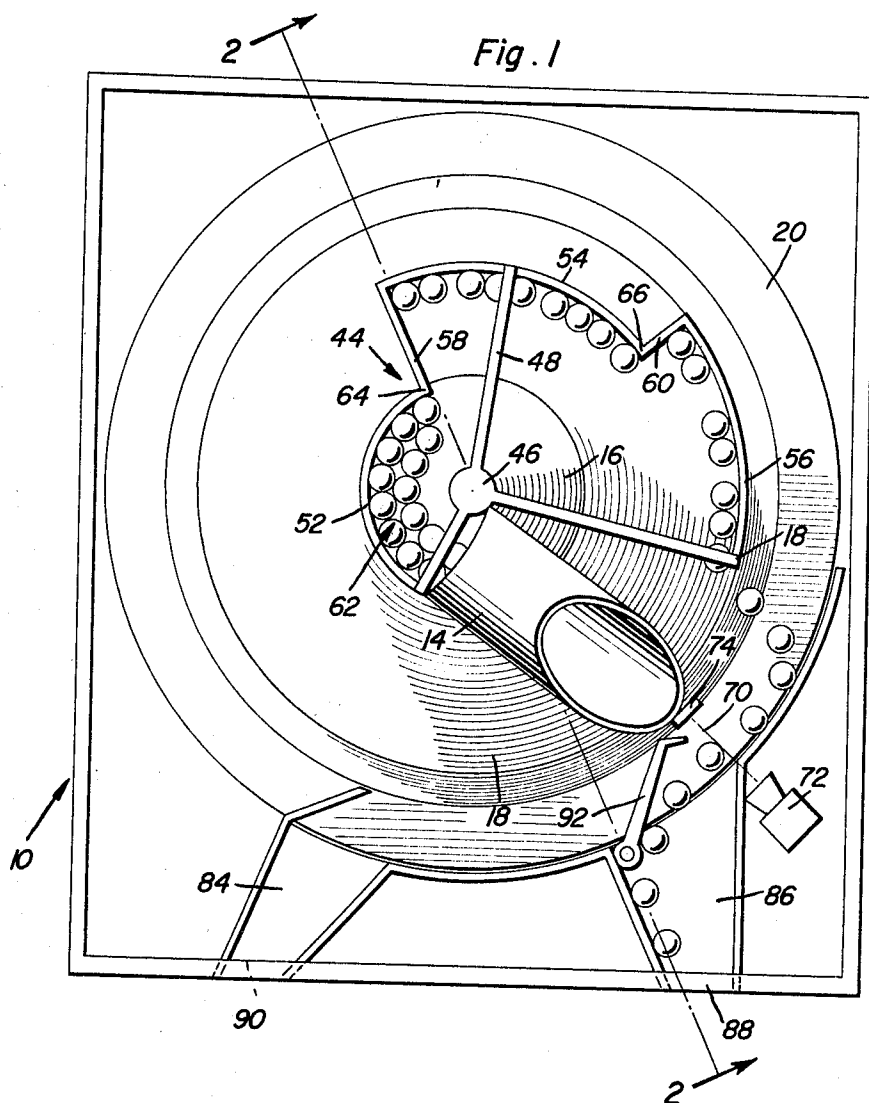
C. G. SEWELL

3,290,488

PILL COUNTER

Filed July 24, 1963

2 Sheets-Sheet 1



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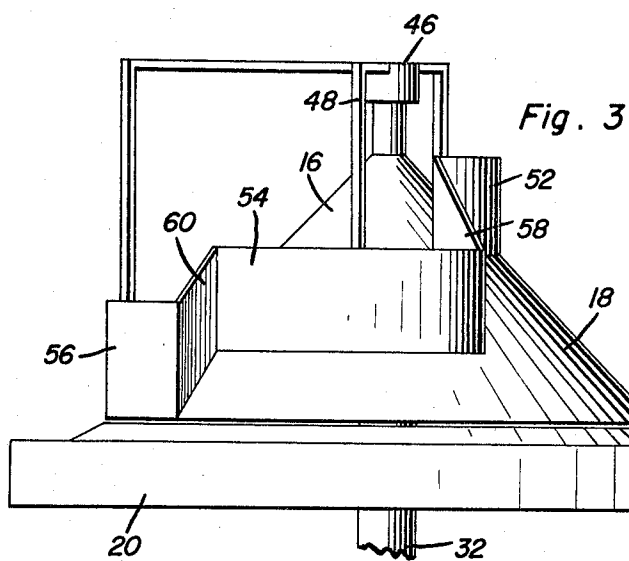
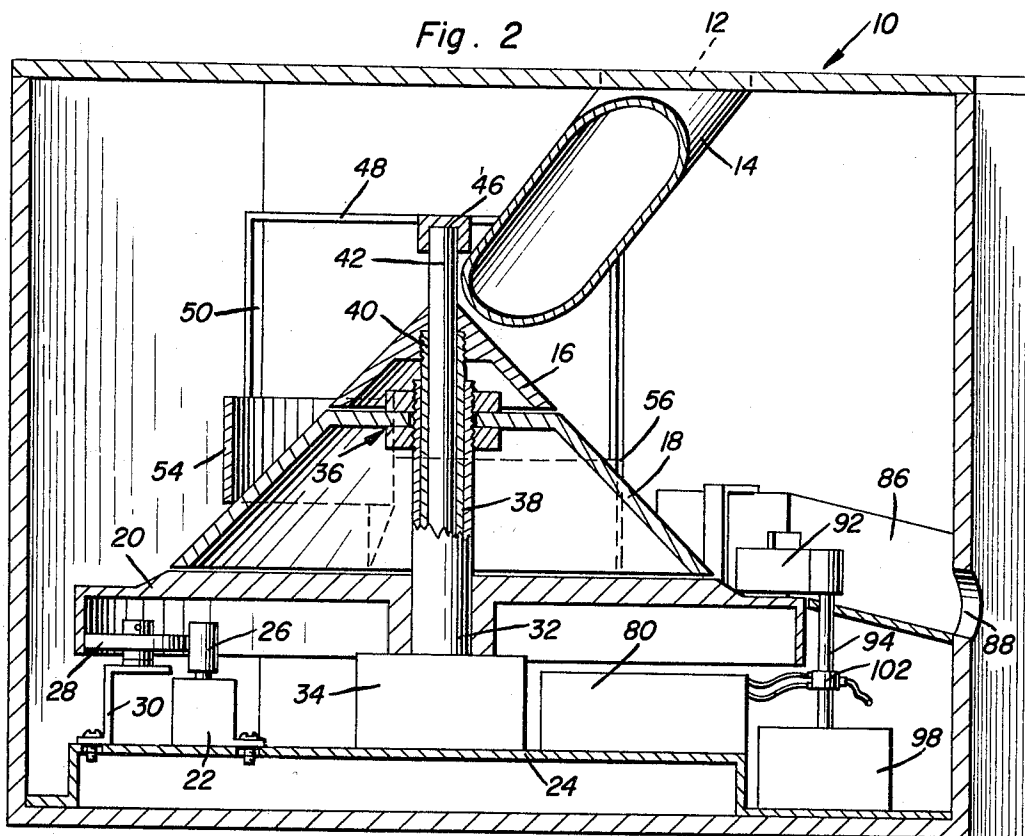
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PILL COUNTER

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2 Sheets-Sheet 2



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3,290,488

PILL COUNTER

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Filed July 24, 1963, Ser. No. 297,342
10 Claims. (Cl. 235-92)

This invention primarily relates to a device for quickly and accurately counting the components of a drug prescription.

The counter herein described completely eliminates the counting time in filling a prescription which calls for capsules or pills. Using the mechanical separating means of this invention and a high speed electronic counter the pills or capsules called for in any prescription of one hundred or less can be counted and separated before the druggist can prepare a label for the container in which the capsules or pills will be ultimately placed.

Accordingly, it is the primary object of this invention to disclose a pill counting device into which a random batch of pills may be introduced and which will perform the operation of counting and separating a predetermined quantity of said pills in a matter of seconds.

In order to accomplish the preceding object, an additional object of this invention resides in the provision of stationary pill aligning means for stringing said random batch of pills into single file and rotatable pill spacing means operatively cooperating with said pill aligning means for spacing said pills a predetermined distance apart in said single file whereby a photoelectric type counter can be employed in the invention.

A further object of this invention resides in the provision of a mechanical maze with divergent geometry employed as a portion of the pill aligning means whereby the conformation of the random batch of pills deposited in the device is controlled in such a way that they will roll out and line up due to the acceleration forces of gravity.

Yet another object of this invention resides in the specific construction of the pill spacing means which comprises a plurality of stacked rotatable surfaces rotating at different speeds whereby the pills can be caused to fall from one surface to the next and due to the different speeds of rotation of the surfaces will be effectively spaced from one another.

Still another object of this invention is found in the provision of an electronically controlled gate mechanism responsive to the storage of a predetermined number of pulses emanating from the counter for segregating a predetermined quantity of pills from the random batch introduced into the device and further including means for recovering all pills not so segregated by said gate mechanism.

Another object of this invention resides in the novel drive and transmission means for accomplishing the aforementioned purposes.

A final object of this invention resides in its relative simplicity of construction and ready adaptability for commercial production.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is a top plan view of the mechanism used in the present invention as seen with the top of the housing removed.

FIGURE 2 is a cross sectional view taken substantially along the plane indicated by the line 2-2 of FIGURE 2 with certain parts however shown in elevation for the purposes of description.

FIGURE 3 is a side view in elevation of the pill align-

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ing and spacing mechanism used in the present invention.

FIGURE 4 is a schematic diagram illustrating the counting and segregating operation of the device.

Referring to the drawings in detail, the mechanism for accomplishing the hereinbefore enumerated objects is housed within a housing generally indicated by the numeral 10 which comprises a rectangular parallelepiped having an off-center aperture 12 for the introduction of a batch of pills or capsules into the device to be counted and segregated. These pills are adapted to slide down a tubular cylinder 14 positioned at an angle of approximately 45° to a first rotating conical surface such as 16. The entrance and exit from the cylinder 14 is cut at an angle to the axis of the cylinder and more particularly in a plane parallel to the top and bottom walls of the housing. This insures that the pills will slide down the tube and not jam at the exit since the tube is cut in such a fashion as to have a larger area of opening than the vertical projection of the exit.

A plurality of stacked rotating surfaces are supported within the housing 10 and includes the first rotating conical surface 16, a conical frustum 18 comprising an intermediate rotating surface and a high speed wheel 20 comprising the last of said stacked rotating surfaces. The surfaces 16, 18 and 20 rotate at increasing speeds in the order just enumerated. In order to accomplish this purpose, a suitable electric motor such as 22 mounted upon a base plate 24 in the housing 10 is adapted to directly drive the high speed wheel 20 by means of a friction drive. A driving friction roller 26 mounted on the output shaft of the motor 22 frictionally drives a friction wheel 28 carried by a bracket 30 which is also mounted upon the base 24. The friction wheel 28 in turn imparts rotation to the high speed wheel 20 by contact with the inner circumference of the hollowed high speed wheel 20. This wheel is adapted to rotate relative to a rotating spindle 32 defining the axis of the wheel 20. The wheel 20 in turn is adapted to drive the spindle 32 at a slower relative speed through the intervention of a transmission means 34 drivingly connecting the wheel to the spindle 32. The spindle 32 is drivingly connected to the intermediate frustum 18 by means of a suitable clamping connection thereto as shown at 36. The spindle 32 is tubular in cross-section and has telescoped therein another tubular spindle 38 which is adapted to rotate at still a slower speed than the spindle 32. The last named spindle is also driven by the high speed wheel 20 through the intervention of the transmission 34, and is rigidly secured to the first rotating conical surface 16 by a threaded connection as shown at 40. Telescopically mounted within the rotating spindle 38 is a stationary spindle 42 defining the axis of rotation of the first rotating cone 16 and the intermediate frustum 18 and properly aligning said rotating components relative to the high speed 20.

The foregoing rotating surfaces serve to effectively space the pills after they have been formed in single file which is accomplished as hereinafter described. A stationary mechanical maze generally designated by the numeral 44 may be suspended, for example, from the stationary spindle 42 by means of an end cap 46 including a plurality of radiating arms 48 and vertically oriented arms 50 attached thereto for supporting the maze. The maze includes three arcuate portions 52, 54 and 56. The first arcuate portion 52 is positioned co-terminus with the juncture of the cone 16 and the frustum 18 and substantially enshrouds the cone 16 for approximately a third of its circumferential extent. Said portion 52 terminates at one end adjacent the exit portion of the cylinder 14 and at its other end in a lateral stepped portion 53 connected to the second arcuate portion 54 of the maze. This second portion is lower than the first arcuate portion 52 and encompasses a portion of the frustum 18 as shown

in FIGURE 2. The arcuate portion 54 in turn is connected by means of a lateral stepping portion 60 to the third arcuate portion 56 of the maze. Again, the latter portion 56 is lower than the preceding arcuate portion 54 and is co-terminus with the juncture of the frustum and the high speed wheel 20.

In the connection of the device, a batch of pills such as 62 is deposited within the cylindrical tube 14. The pills slide down the cylinder 14 until they rest at the exit of the cylinder on the rotating surface of the cone 16. The pills are substantially confined by the first arcuate portion 52 of the maze. The cone 16 turns and slides the pills from the exit of the tube 14 to the first edge 64 of the maze between the first arcuate portion 52 and the lateral stepping portion 58. The pills drop off the first edge of the maze 64 and slide down the frustum 18 until they hit the second arcuate portion 54 of the maze 44. Since the pills drop off the first edge 64 substantially one at a time, they will be aligned in single file along the second arcuate portion 54. Also, due to the fact that the frustum is rotating at a higher speed than the cone 16 a slight spacing is induced in said file of pills. To insure that the pills line up in single file, a second edge or step 66 between the arcuate portion 54 and the second lateral stepping portion 60 is supplied whereby substantially all of the pills will be in a single line along the arcuate portion 56. For pills with very low coefficient of friction, extra maze edges and conical portions with differential speeds can be provided to insure that the pills all line up in a single file. Finally, the pills positioned along the arcuate portion 56 of the maze drop off the edge or step 68 thereof onto the high speed wheel 20 wherein due to the greater speed of rotation of said wheel, the pills are substantially strung out in a spaced single file.

The high speed wheel 20 conducts the pills through a light beam 70 between a lamp 72 and a photo-cell 74. The leading edge of each of the pills initiates an electrical pulse which is registered in an electronic counting device 76 which information is passed on to a binary logic circuit 78 wherein it is stored. The counter and logic circuitry may be housed within a suitable container such as 80 mounted on the base plate 24. Controls are also provided to sum any number of binaries, so that any number of pills, limited by the number of binaries, can be preset. It should also be understood that the trailing edge of each pill also generates an electrical pulse with opposite polarity to the leading edge thereby defining a characteristic wave shape having finite dimensions which can be utilized by the logic circuitry. When the last pill of the preset quantity is counted, the logic circuit is so biased that a silicon controlled rectifier can be fired by the pulse generated by the trailing edge of the last counted pill to activate a suitable gating mechanism 82 for segregating the requisite number of pills counted from the rest of the batch.

A pair of exit conduits 84 and 86 are positioned adjacent the periphery of the high speed wheels to conduct counted pills to a suitable collection receptacle through an opening 88 in the housing 10 and conduct uncounted pills of the batch to another collection receptacle through the aperture 90 also formed in the housing 10. The gate mechanism includes a horizontal arm 92 normally positioned across the high speed wheel 20 which blocks the path of pills on said wheel and directs the prerequisite counted pills into the conduit 86 for collection through the aperture 88. The arm 92 is swingingly mounted so that it may be positioned across the mouth of the conduit 86 after the predetermined number of pills have been collected whereby the remaining pills of said batch will pass through the conduit 84 and out the opening 90. The arm 92 is mounted upon a vertical shaft 94 adapted to be rotated at a high rate of speed by a motor 98. Upon actuation of the motor 98, the shaft 94 will swing the arm 92 to the position closing the entrance to the conduit 86. Current generated by the logic circuitry after the pre-

determined pill count has been reached actuates motor 98 through contact 102.

The quantity of pills to be counted may be set by a suitable switch assembly mounted upon the housing, which assembly will preset the binary logic circuitry. Also, the circuitry may be reset and the gate mechanism repositioned for another counting edge by any suitable means. The transmission 34 may also be provided with a speed change control to allow various rates of speed for the stacked rotating surfaces depending upon the size of the pills to be counted or the number thereof.

The operation of the device should now be apparent. The random batch of pills 62 are deposited in the entrance of the cylinder 14 and slid down until they rest at the exit thereof and contact the cone 16. As this cone turns, the pills slide from the entrance of the cylinder 14 to the first edge or step 64 of the maze 44. The pills drop off the first step of the maze and slide down the frustum 18 until they hit the arcuate portion 54 of the maze 44 wherein they are substantially aligned in single file. A second step or edge 66 of the maze 44 is supplied as a safety factor to insure that the pills are in single file line when they descend from the edge 68 of a third arcuate portion 56 of the maze 44 to the high speed wheel 20. Due to the increasing speed of rotation of each of the stacked surfaces, the pills are suitably spaced in single file as they go past the light beam 70 wherein interruption of the beam will produce a pulse which will cause a counter mechanism to send pulses to a logic circuit to be stored. After a predetermined number of said pulses have been stored in the logic circuit, said circuit will actuate an arm 92 to close the conduit 86 so that only a predetermined number of said pills are collected at the opening 88 in the housing 10. The rest of the pills in the batch 62 leave the mechanism through a conduit 84 in an opening 90 in the housing 10.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. A device for counting a predetermined quantity of pills from a random batch comprising housing means, stationary pill aligning means within said housing means for stringing said random batch of pills into a single file, rotatable pill spacing means in said housing means operatively cooperating with said pill aligning means for spacing said pills a predetermined distance apart in said single file, means for counting the pills in said file and information storage means operatively connected to said counting means for electrically storing a predetermined number of counts, said pill spacing means including a plurality of stacked rotatable surfaces, each succeeding surface in the stack rotating at a greater speed than a preceding surface.

2. A device for counting and segregating a predetermined quantity of pills from a random batch comprising housing means, stationary pill aligning means within said housing means for stringing said random batch of pills into a single file, rotatable pill spacing means in said housing means operatively cooperating with said pill aligning means for spacing said pills a predetermined distance apart in said single file, means for counting the pills in said file, and information storage means operatively connected to said counting means for electrically storing a predetermined number of counts, said pill spacing means including a plurality of stacked rotatable surfaces, each succeeding surface in the stack rotating at a greater speed than a preceding surface, pill delivery means entering into said housing means for depositing the random batch

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of pills upon the first surface in said stack, and pill segregating means adjacent said last surface in the stack for dividing the pills in said random batch into a group containing a number of pills corresponding to the predetermined counts stored in said information storage means and a group containing all the other pills in said random batch.

3. The device of claim 2 wherein said pill segregating means includes spaced pill collection means connecting said last stacked surface with accessible portions of said housing means, swinging gate means normally spanning the last stacked surface for directing pills into a first pill collection means, said swinging gate means being retractable to a position closing said first pill collection means and permitting pills to pass thereby into a second pill collection means in response to a signal from said information storage means that a predetermined number of counts have been received and stored.

4. The device of claim 1 wherein each succeeding stacked surface is of a larger diameter than a preceding surface, said stationary pill aligning means including a continuous maze having stepped portions positioned at the edge of each preceding stacked surface, said steps permitting only one pill at a time to drop onto a succeeding one of said stacked surfaces whereby the pills are aligned in single file.

5. The device of claim 4 wherein the first stacked surface comprises a cone and the last stacked surface is a high speed wheel, each stacked surface intermediate the first and last comprising a frustum of a cone whereby the pills are gravity propelled from the steps of the maze.

6. The device of claim 5 including drive means for rotating the last surface in the stack, transmission means mounted within said housing means operatively con-

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nected to each of said stacked surfaces for driving all the stacked surfaces except the last at different speeds, said transmission means being driven by said last stacked surface.

7. The device of claim 3 wherein each succeeding stacked surface is of a larger diameter than a preceding surface, said stationary pill aligning means including a continuous maze having stepped portions positioned at the edge of each preceding stacked surface, said steps permitting only one pill at a time to drop onto a succeeding one of said stacked surfaces whereby the pills are aligned in single file.

8. The device of claim 7 wherein the first stacked surface comprises a cone and the last stacked surface is a high speed wheel, each stacked surface intermediate the first and last comprises a frustum of a cone whereby the pills are gravity propelled from the steps of the maze.

9. The device of claim 8 including drive means for rotating the last surface in the stack, transmission means mounted within said housing means operatively connected to each of said stacked surfaces for driving all the stacked surfaces except the last at different speeds, said transmission means being driven by said last stacked surface.

10. The device of claim 9 wherein said pill delivery means includes a cylinder depending from the top of said housing means at an angle with respect to the first stacked surface.

No references cited.

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