July 20, 1943. F. CHILSON ET AL 2,324,823

COUNTING AND FILLING MACHINE

Filed Sept. 25, 1941 5 Sheets-Sheet 1

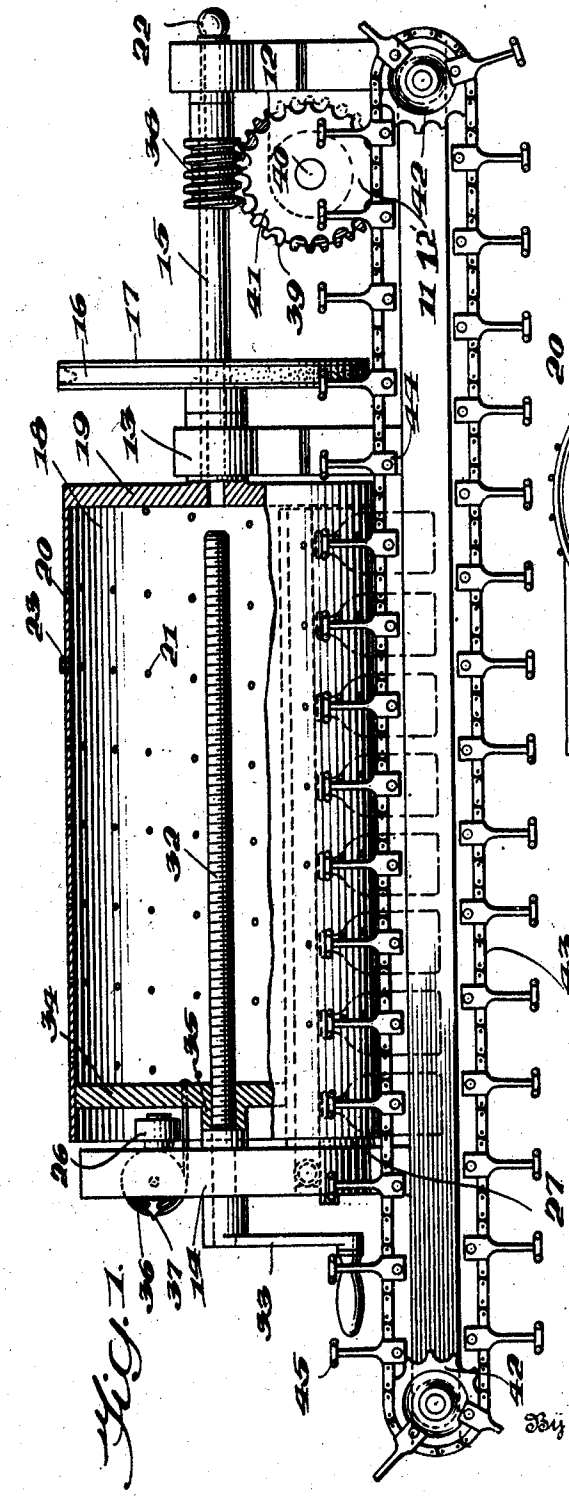


Fig. 1.

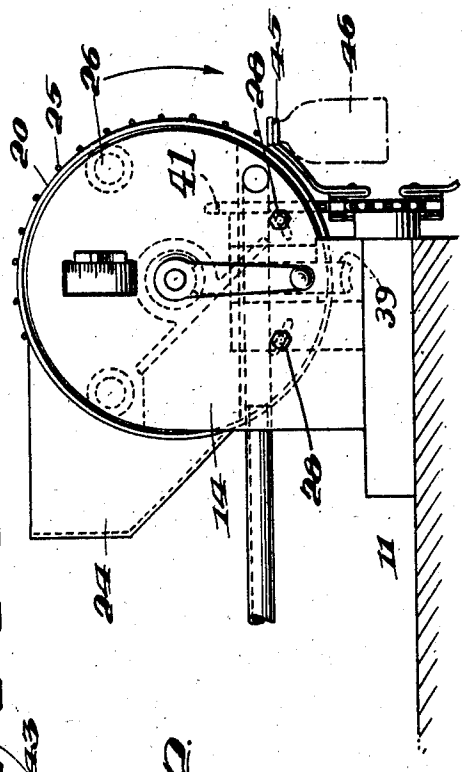


Fig. 2.

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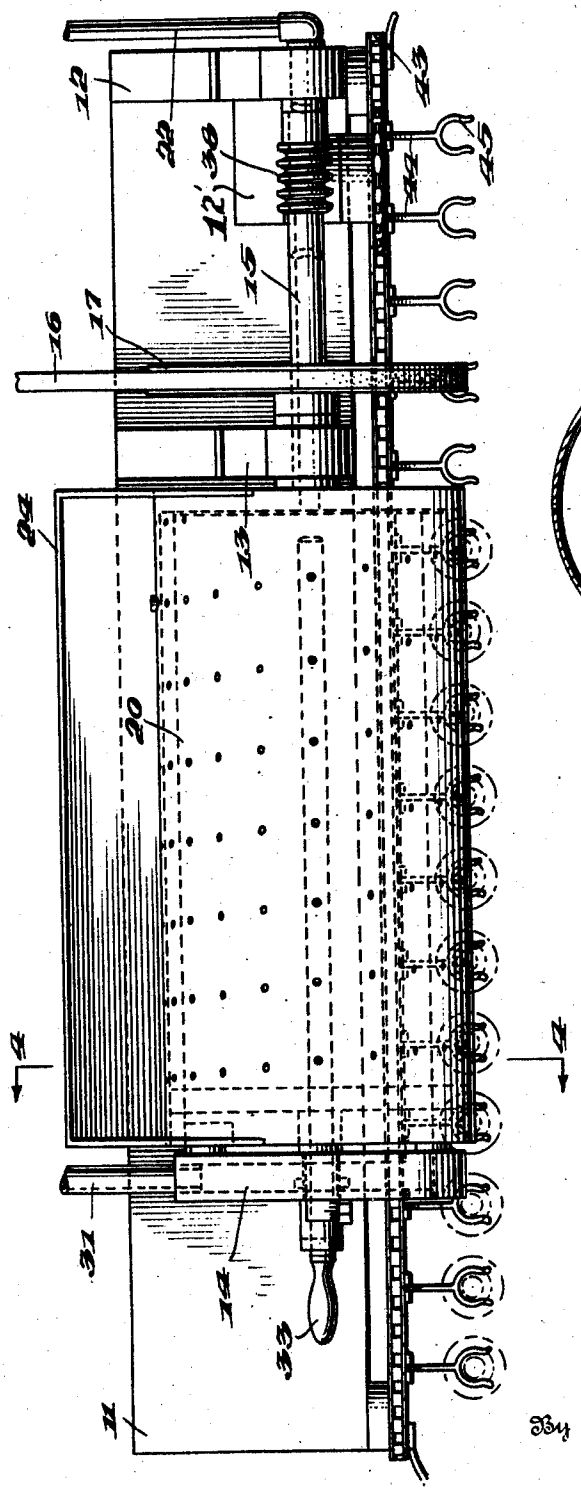


Fig. 3.

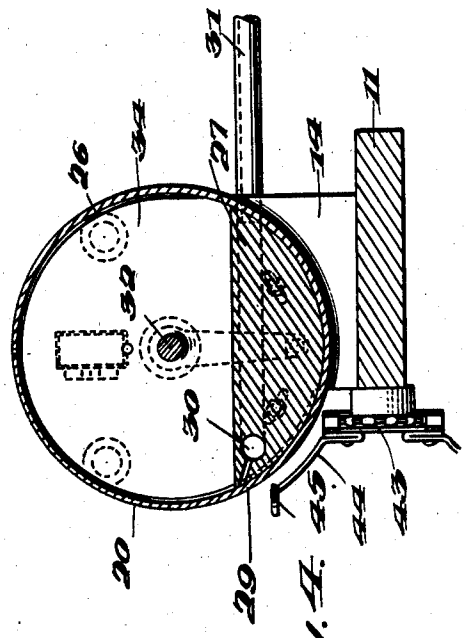


Fig. 4.

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COUNTING AND FILLING MACHINE

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Fig. 5.

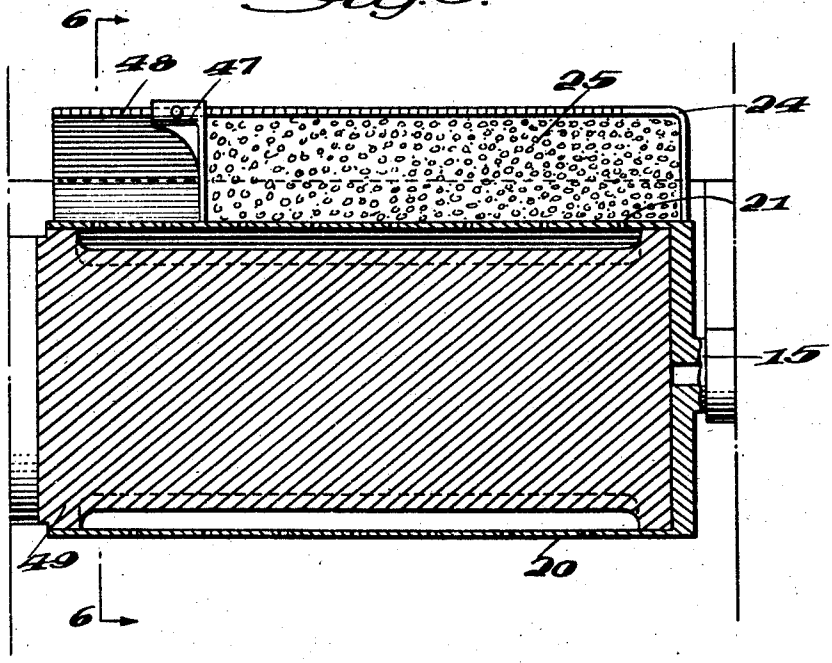
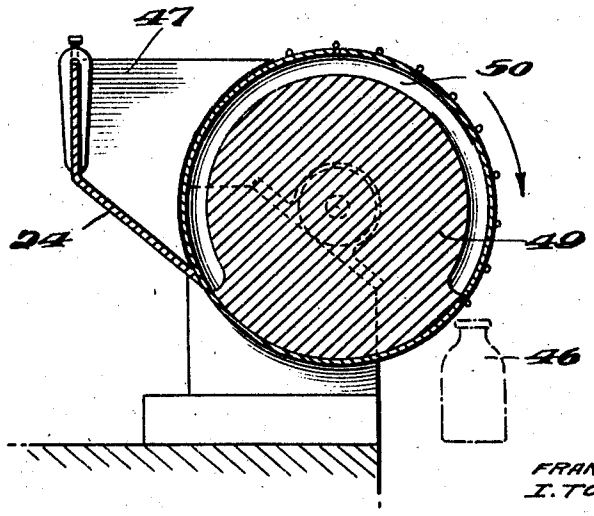


Fig. 6.



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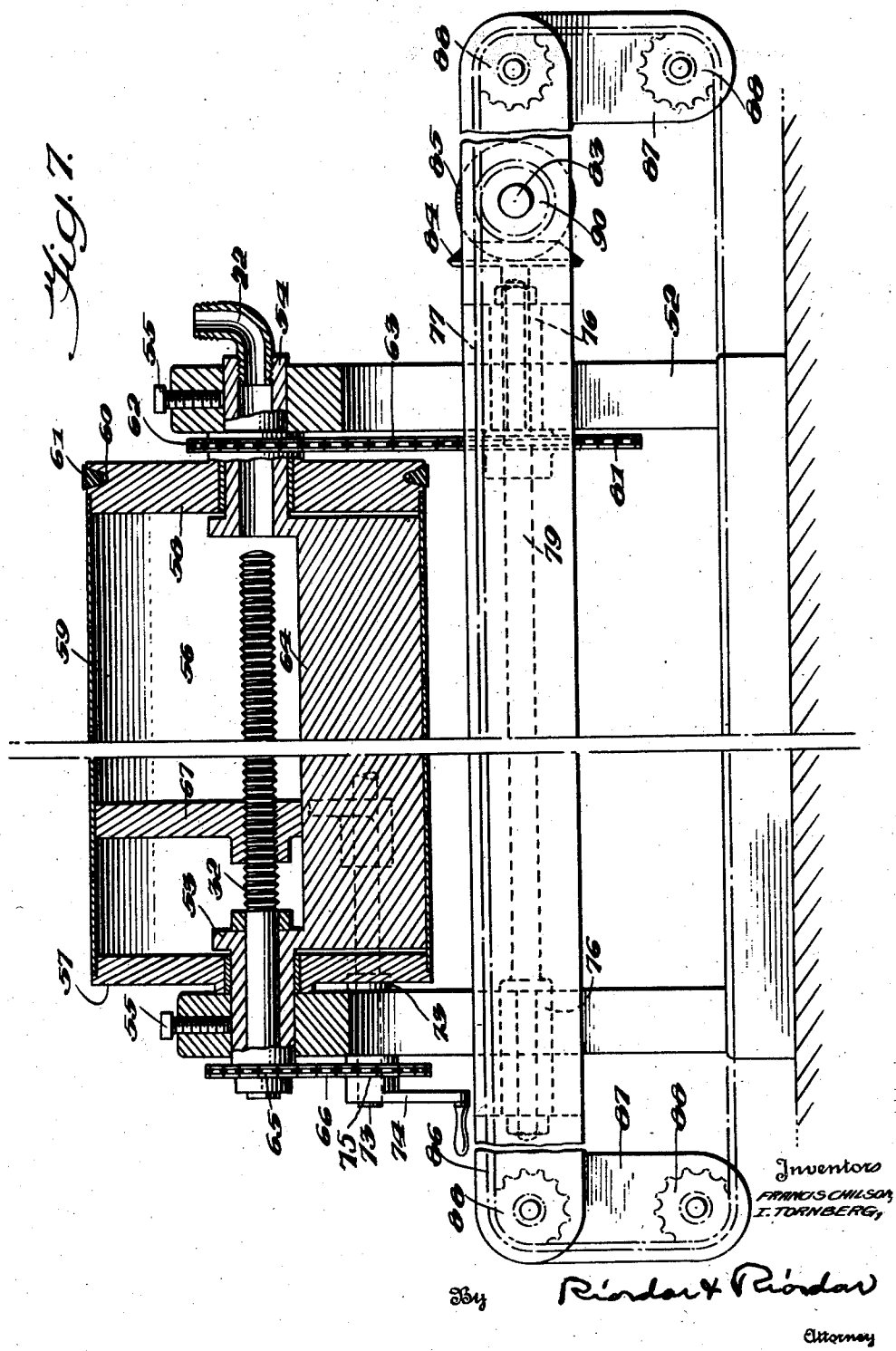
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COUNTING AND FILLING MACHINE

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Fig. 7.



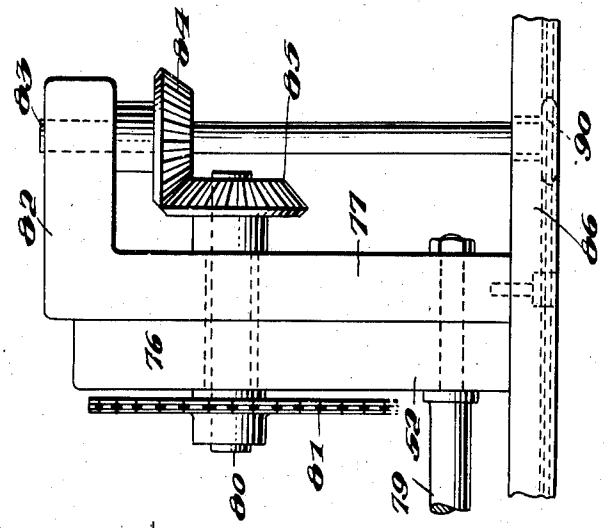
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COUNTING AND FILLING MACHINE

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Fig. 9.



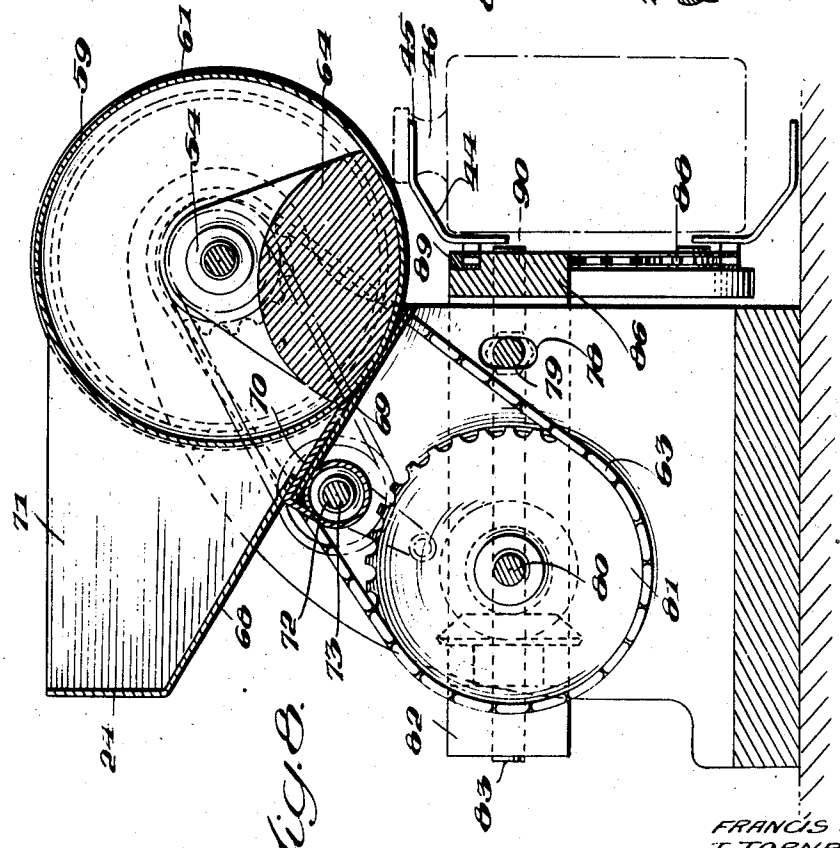


Fig. 8.

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Patented July 20, 1943 2,324,823

UNITED STATES PATENT OFFICE

2,324,823

COUNTING AND FILLING MACHINE

Francis Chilson, New York, N. Y., and Isidor Tornberg, Plainfield, N. J.

Application September 25, 1941, Serial No. 412,314

18 Claims. (Cl. 226—2)

Our invention which is set out in detail in the following description relates to counting and filling machines by which pills, pellets, tablets or other similar small objects may be individually picked up from a supply and delivered to containers in predetermined numbers. The invention is particularly applicable to filling bottles, vials and similar containers with a predetermined number of pills or the like. In carrying out such an operation it is important that the individual articles shall be packaged without suffering breakage or being spoiled. In many instances the individual articles such as pills may contain powerful medicine or poison which would create a distinct industrial hazard to any one handling them for packaging in large quantities.

It is an object of our invention to provide a counting and filling machine in which the individual articles are handled without breakage, deterioration or hazard to the operator.

It is also an object of our invention to handle the pills or other articles without causing the machine to be soiled or put out of condition by contact with the material handled. In this connection means are provided for constantly cleaning the counting and filling elements.

A further object of our invention is to provide means by which the number or quantity of the articles filled into the individual containers shall be positively and effectively predetermined. Incidental to this object it is our purpose to provide mechanism which will determine the number of pills or the like which are filled into each container.

A still further object of our invention is to provide features by which the operation of picking up is carried out regardless of the size, shape or regularity of the individual articles. Thus the machine will operate not only with round pills but also flat tablets and those having irregular shapes or all sizes within the capacity of the machine.

Among the objects of the invention is presenting the receiving containers in the best position relative to the feeding device so that the delivery of the articles (pills etc.) to the open mouths of the containers will be most certain and with a minimum of free drop.

In order to illustrate the preferred form of our mechanism for carrying out the above and other purposes of our invention we have illustrated it by way of example in the accompanying drawings in which

Fig. 1 is a side elevation, partly in section, of our counting and filling machine;

Fig. 2 is an end elevation of the same;

Fig. 3 is a top plan view of the machine;

Fig. 4 is a vertical section on the line 4—4 of Fig. 3;

Fig. 5 is a horizontal section of a modified form taken on the line 5—5 of Fig. 6;

Fig. 6 is a vertical section of the same taken on the line 6—6 of Fig. 5;

Fig. 7 is a vertical longitudinal section of another modified form of the invention taken on the line 7—7 of Fig. 8;

Fig. 8 is an end elevation of the same partly in section and

Fig. 9 is a plan view of the right hand end of Fig. 7.

The principle under which our invention operates is that a circular drum may be provided with perforations in a desired arrangement through which suction is applied to take hold of or engage small articles resting loosely in a hopper adjacent the drum. These small articles are seized without being damaged and are given a travel to a point where the suction is being released, whereupon the individual articles such as pills will drop by gravity into one or a series of containers held in the desired position to receive a definite predetermined number of the articles.

According to the form of the invention illustrated the machine is mounted upon a fixed base 11. At suitably spaced intervals the base supports three standards 12, 13 and 14. Standards 12 and 13 form journals for a hollow shaft 15. This shaft is rotated at the desired speed by means of a drive belt 16 and a pulley wheel 17. The inner end of the shaft 15 terminates in a drum 18, the end 19 of which forms a part of the shaft. The cylindrical side 20 of the drum is open at its opposite end.

The cylindrical side 20 has a number of small perforations 21. These are arranged in a continuous spiral running from one end of the drum to the other. In the example shown two hundred and fifty perforations are formed in ten revolutions of twenty-five perforations each. These perforations or apertures form passageways through which suction is applied by means of a suction connection 22 at the opposite end of the hollow shaft 15.

In order to make the engagement with the pills or other articles more certain, to protect the latter from damage and further to prevent the engagement of more than a single pill at each

aperture, the latter are provided with bushings 23. Such bushings are made of soft rubber or the like and project slightly above the surface of the cylinder 20.

Suitably supported upon the base 11 and fitting closely around one side of the cylinder 20 of the drum is a hopper 24. This hopper extends for the full length of the cylinder 20 and contains a quantity of the loose articles such as pills.

The hopper has an unrestricted open top permitting the individual pills 25 to be carried up and away from the mass by means of a suction applicable through the apertures 21 (see Fig. 2).

The third standard 14 in alignment with the standards 12 and 13 is substantially the same circular configuration and size as the drum 18. The standard carries three rollers 26 which serve to maintain the open end of the cylinder 20 in its proper axial position.

The lower portion of the standard 14 carries a cutoff block 27. This cutoff block fits closely within the cylinder 20 and occupies a minor sector of the space within the latter. As shown in Fig. 2 it is adjustable by means of nuts 28, 28 so that the inclination of its top surface and the position of its longitudinal edges may be adjusted to provide for proper timing of the release from suction. Thus the suction through the hollow pipe 15 will be applicable only to those apertures 21 no obscured or cut off by the block.

As shown in Fig. 4 the block 27 has a series of jets 29 in its forward edge and these jets are connected with a manifold 30 which in turn receives compressed air through pipe 31. The purpose of such jets is to forcibly disconnect the individual pills from their engagement with the bushed apertures 21 as soon as the suction is removed by the passage of the cylinder 20 along the block 27.

The standard 14 has a bearing which carries a threaded screw shaft 32 projecting inwardly on the axis of the shaft 15. This shaft may be turned in its bearing in standard 14 by means of the hand crank 33 to provide suitable adjustment in the feed or filling operation.

This adjustment is carried out by providing a partition 34. This partition as shown in Fig. 4 is part circular and occupies the cross-section of the cylinder 20 not filled by the block 27. The partition 34 has a screw-threaded hub 35 carried on the shaft 32. The shaft 32 has ten threads per inch so that a single rotation of the shaft serves to block off one aperture 21 of the spiral series. In this way close control can be given to the number of apertures subject to the force of the suction. The loss of suction around the edge of the disk or partition 34 is taken care of by the quantity of suction applied through pipe 22.

As a means of readily indicating the position of the partition 34 we have provided on standard 14 a spring-wound tape 36 the end of which is connected to the partition 34. The tape is graduated in tenths of an inch and thus reads directly for the number of exposed apertures. The appropriate number is indicated by the pointer 37 fixedly mounted on the standard 14 adjacent the tape 36.

The shaft 15 carries a worm 38 which is in engagement with a gear 39 on shaft 40 suitably journalled on a bracket 12' extending from the standard 12. The shaft 40 also carries the sprocket wheel 41. At each opposite end of the base 11 there is journalled a sprocket 42, 42. An endless conveyor 43 runs over the sprockets 42, 42. This endless conveyor is in the form of a sprocket chain and is driven by the sprocket 41.

Suitably spaced along the sprocket chain 43 is a series of brackets 44. The spacing indicated in the example taken would be two and one-half inches so that it will conform to the distance between successive convolutions of the spiral apertures.

Each bracket 44 has an upstanding lateral spring clip 45. As indicated in the drawings the spring clip 45 supports a container which may be a vial, bottle or the like 46 by suspending the latter beneath its neck.

As the shaft 15 is revolved by the belt 16 the drum 18 rotates along one side of the open hopper 24. The suction applied through the pipe 22 and the hollow shaft 15 is applicable through the apertures 21 not blocked off by the block 27 or the partition 34. Each aperture 21 engages a pill 25 or the like and the latter may be held firmly either against the smooth metallic surface of the cylinder 20 or preferably against the soft flexible bushing 23 around each aperture 21. As the pills are raised by the cylinder they are retained until the respective apertures 21 come beneath the forward edge of the cut off block 27. The suctin then being released pills 25 drop by gravity in the container 46. In order to facilitate this operation a jet of compressed air from the passageway 29 forcibly separates the pill from the cylinder 20. At the same time the air blast will clear the aperture and cylinder of any adhering particles.

The successive receptacles 46 pass along the drum in timed sequence so that each receptacle receives a pill from each of the effective apertures 21. Thus the filling of the receptacle is limited to the number of apertures in effective operation.

The control of the number of effective apertures can likewise be carried out by adjusting the length of the hopper 24 as indicated in Figs. 5 and 6. Here the hopper has a movable end 47 which may be selectively anchored along the graduated hopper edge 48. Thus the space occupied by the pills 25 is under control. In the form shown in these figures as in Figures 1 and 2, the successive receptacles 46 pass along the drum in timed sequence so that each receptacle receives a pill from each of the effective apertures 21. Thus the filling of the receptacles is limited to the number of apertures in effective operation.

Where this form of hopper is used the inner block 49 is substantially a cylinder closely fitting the cylinder 20. The periphery of the cylinder 49 is channeled out to form a suction passageway 50. This passageway is connected to the hollow shaft 15 while the opposite end of the cylinder 49 is mounted fixedly on the standard 14. The force of the suction is sufficient to provide adequate engagement to the effective apertures 21 as well as those opposite the unused portion of the hopper 24.

In Figs. 7, 8 and 9 we have shown additional improvement in a further modified form of the invention.

In this modification the base 11 has two standards 51 and 52. Each standard has a trunnion 53, 54 forming hollow journal bearings. These trunnions are held in adjusted rotary position by means of set screws 55, 55. Each trunnion is hollow. Trunnion 54 at its outer end has a suction connection 22.

The drum 56 is journalled upon the inner ends of the trunnions 53, 54. The drum comprises opposite heads 57, 58 journalled on trunnions 53, 54 respectively. The heads 57, 58 are connected by a cylinder 59 having a spiral series of perforations on a two and one-half inch pitch with twenty-five holes in each convolution. Each hole may be provided with a rubber engaging member as already described.

The cylinder head 58 has a pulley groove 60 in its periphery to receive a belt 61. The outer face of the head 58 has an axial boss forming a sprocket 62 on which the sprocket chain 63 is carried. The drum 59 is rotated by power from the chain 63.

Inside the drum 56 a cutoff block 64 is suspended from the inner ends of the trunnion 53, 54 and is in close sealing contact with the inner wall of the cylinder 59, as shown in Figs. 7 and 8. The shaft 32 extends inwardly of the trunnion 53 and is screw-threaded on a pitch of one-tenth of an inch. The outer end of the shaft 32 has a sprocket 65 which carries a chain 66. A cutoff disk 67 is threaded on the shaft 32 and fits closely on the cross-sectional area within the drum 56 not occupied by the cutoff block 64.

The hopper 24 has a stepped bottom with an upper portion 68 and a lower portion 69 slightly separated therefrom as shown in Fig. 8. A slide 70 rests upon the lower step of the hopper 69 between the adjacent portion of the drum cylinder 59 and the upper step 68. A hopper end or baffle 71 is attached to the slide 70 for the purpose of limiting the effective length of the hopper to be occupied by the pills or other articles treated.

Movement of the slide 70 and baffle 71 longitudinally of the hopper is effected by a threaded sleeve 72 attached to a depending portion of the slide 70. This threaded sleeve 72 travels on a screw-threaded shaft 73 which is suitably journalled in the opposite standards 51, 52. As shown in Fig. 7 the outer end of the shaft 73 carries a hand crank 74 for suitable longitudinal adjustment of the slide 70 and hopper end 71.

Shaft 73 also carries a sprocket 75 which connects by means of chain 66 to a sprocket 65. In this way the cutoff disk 67 and the hopper 71 are at all times in the same relative position with respect to the drum 56. This insures restricting the material in the hopper to that portion of the drum which is under the effective vacuum.

Each standard 51, 52 has a bushing 76 which is extended outwardly to form a pivot for a bracket 77. Toward the front, each standard 51, 52 has a vertical slot 78. A tie rod 79 extends into both standards and also the adjacent brackets 77, 77. The rods 79 are carried in holes in brackets 77 so that the latter may be simultaneously adjusted in a vertical direction as indicated in Fig. 8.

Bushing 76 of standard 52 forms a bearing for rotary shaft 80. This shaft has a sprocket 81. This bracket 77 has a lateral extension 82 and a rotary shaft 83 is journalled within this extension parallel to the main portion of the bracket 77 (see Fig. 9).

A miter gear 84 meshes with a miter gear 85 on the outer end of the shaft 80. The sprocket 81 carries chain 63 already described as supplying power to the rotary drum.

Across the front of the machine and connecting the ends of the brackets 77, 77 there is attached a bar 86. This bar has depending ends 87, 87. A series of four idle sprockets 88 are carried on the bar 86, with its ends 87 and thus form a quadrilateral support for a conveyor chain 89. This chain also passes over a drive sprocket 90 on the power shaft 83. Suitably spaced along the conveyor chain 89 is a series of brackets 44. One bracket is beneath each convolution of the drum 56. The brackets terminate in clips 45 which serve to hold the neck of bottles or other containers 46 regardless of the shape or size of the latter.

The operation of this form of the invention is similar to that already described. The effective length of the hopper is controlled simultaneously with the adjustment of the cutoff disk 67. Thus the suction is applied only to the holes of those convolutions of the drum surface 59 as are calculated to deliver the appropriate number of pills or other small articles to each successive container that is advanced.

Each pill or other object is engaged by one of the orifices of the cylinder 59 and held in place by the suction. The article is carried around the drum to a point where the cutoff block 64 breaks the vacuum and permits the pill to be dropped into the open mouth of the bottle. Angular adjustment of the cutoff block 64 determines the most satisfactory point of release for the individual pills.

In like manner the container such as the bottle may be lifted to a point close to the delivery point of the drum and thus minimize the possibility of the pill missing the mouth of the bottle or being required to fall more than is necessary. It is of course understood that the bottle is traversed along the drum so that it is beneath the point of delivery of each successive aperture in the spiral series. In this way the bottle after having passed the end of the drum will have received as many pills as there were effective apertures in the series.

It is of course obvious that the rotation of the drum and the travel of the conveyor is effected from a common power shaft 83 and at appropriate relative speeds.

It is to be understood that the particular embodiment of our invention as described herein is intended as illustrative, rather than limiting, and that many modifications within the scope of the invention may occur to those skilled in the art. Thus any changes may be made in proportion, details and materials within the spirit of the invention and without departing from the scope thereof as defined in the appended claims. For example, in the drum the holes or apertures may be disposed in parallel rows instead of spiral rows with means for rotating the drum intermittently or through a portion of its revolution instead of continuously. The containers in such a case might well be placed in front of the several rows of holes to receive the desired number of pills and then removed and replaced with a new set of containers. Such construction or modification eliminates the use of a continuously moving conveyor for the containers and substitutes an intermittent motion to the rotary drum instead of a continuous one.

What we claim is:

1. A machine for counting and handling articles comprising a hopper, a carrier constantly moving through the hopper, means on the carrier for engaging articles in the hopper, means for varying the number of articles engaged, pneumatic means for holding the articles so engaged, a traveling conveyor moving in syn-

chronism with the movement of the carrier and containers removably held on the conveyor.

2. In combination, a drum having a series of apertures on its surface arranged spirally about the drum, means for continuously rotating the drum, a hopper on one side of the drum, means for applying suction within said drum, and a cut-off block within the lower portion of the drum.

3. In combination, a drum having a series of apertures on its surface, means for continuously rotating the drum, a hopper on one side of the drum, means for applying suction within said drum, a cutoff block within the lower portion of the drum, a cutoff disk adjustable axially within the drum, a movable partition for the hopper and means for moving the disk and partition simultaneously.

4. In combination, a drum having a series of apertures on its surface arranged in the form of a spiral about said drum, means for continuously rotating the drum, a hopper on one side of the drum, means for applying suction within said drum, a cutoff block within the lower portion of the drum, a conveyor movable longitudinally of the drum and adapted to present open containers opposite the successive drum apertures, and means for adjusting said conveyor to and from the drum surface.

5. In combination, an open ended drum having a series of apertures on its surface arranged spirally about said drum, a shaft for rotating the drum, roller bearings for the open end of the drum, a hopper on one side of the drum, means for applying suction within said drum, a cutoff block within the lower portion of the drum, and means for adjusting the position of the block angularly.

6. In combination, an open ended drum having a series of apertures on its surface arranged spirally about said drum, a shaft for rotating the drum, roller bearings for the open end of the drum, a hopper on one side of the drum, means for applying suction within said drum, a cutoff block within the lower portion of the drum and means in the block for driving jets of compressed air outwardly through the apertures of the drum.

7. In combination, an open ended drum having a series of apertures on its surface arranged spirally about said drum, a shaft for rotating the drum, roller bearings for the open end of the drum, a hopper on one side of the drum, means for applying suction within said drum, a cutoff block within the lower portion of the drum, passageways along a longitudinal edge of the block, and means for driving jets of compressed air from said passageways against the interior surface of the drum.

8. In combination, an open ended drum having a series of apertures on its surface arranged spirally about said drum, a hollow shaft for rotating the drum, roller bearings for the open end of the drum, a hopper on one side of the drum, means for applying suction within the drum through the hollow shaft, a cutoff block within the lower portion of the drum and means in the edge of the block for driving jets of compressed air outwardly against the inner surface of the drum.

9. In combination, an open ended drum having a series of apertures on its surface, a hollow shaft for rotating the drum, roller bearings for the open end of the drum, a hopper on one side of the drum, means for applying suction within the drum through the hollow shaft, a cutoff block within the lower portion of the drum, an axially adjustable partition across the open end of the drum and means in the edge of the block for counteracting the suction.

10. In combination, an open ended drum having a series of apertures on its surface arranged spirally about said drum, a shaft for rotating the drum, a hopper on one side of the drum, means for applying suction within the drum, a fixed member within the drum forming a suction chamber and means on the side of the drum opposite the hopper to receive articles carried over from the hopper by the suction through the drum.

11. In combination, an open ended drum having a series of apertures on its surface, a shaft for rotating the drum, roller bearings for the open end of the drum, a hopper on one side of the drum, means for applying suction within the drum, means for interrupting the suction through the apertures during part of the rotation of the drum, and means to adjust the length of the drum through which the suction is effective to engage the articles in the hopper.

12. In combination, an open ended drum having a series of apertures on its surface arranged spirally about said drum, a shaft for rotating the drum, roller bearings for the open end of the drum, a hopper on one side of the drum, means for applying suction within the drum, means for interrupting the suction through the apertures during part of the rotation of the drum, a partition across the open end of the drum and means to adjust the partition axially of the drum.

13. In combination, an open ended drum having a series of apertures on its surface arranged spirally about said drum, a shaft for rotating the drum, roller bearings for the open end of the drum, a hopper on one side of the drum, means for applying suction within the drum, means for interrupting the suction through the apertures during part of the rotation of the drum, a partition across the open end of the drum and a threaded shaft carrying the partition axially of the drum.

14. In combination, an open ended drum having a series of apertures on its surface arranged spirally about said drum, a shaft for rotating the drum, roller bearings for the open end of the drum, a hopper on one side of the drum, means for applying suction within the drum, means for interrupting the suction through the apertures during part of the rotation of the drum, a partition across the open end of the drum, a threaded shaft carrying the partition, axially of the drum and indicating means to show the position of the partition relative to the end of the drum.

15. In combination, an open ended drum having a series of apertures on its surface arranged spirally about said drum, a shaft for rotating the drum, a standard beyond the open end of the drum, said open end of the drum being revolubly carried by the standard, a hopper on one side of the drum, means for applying suction within the drum, a cutoff member fixedly mounted on the standard and projecting within the drum and means axially adjustable of the drum to vary the extent of the effective suction through the apertures of the drum.

16. In combination, an open ended drum having a series of apertures on its surface arranged

spirally about said drum, a shaft for rotating the drum, a standard beyond the open end of the drum, said open end of the drum being revolubly carried by the standard, a hopper on one side of the drum, means for applying suction within the drum, a cutoff member fixedly mounted on the standard and projecting within the drum and a side wall of the hopper movable axially of the drum.

17. In combination, a drum having a spiral series of apertures on its surface, means for rotating the drum, a standard beyond the end of the drum, said end of the drum being revolubly carried by the standard, a hopper on one side of the drum, means for applying suction within the drum, a cutoff member fixedly mounted on the standard and projecting within the drum, means to vary the extent of the effective suction through the apertures of the drum, receptacle conveying means along the side of the drum opposite the hopper and means for rotating the drum and simultaneously advancing the conveyor to present each receptacle beneath every aperture successively as the latter reaches a discharging point in its angular travel.

18. A machine for counting and handling articles comprising a hopper, a movable carrier, means on the carrier for engaging articles in the hopper, means for varying the number of articles engaged, pneumatic means for holding the article so engaged, and means for discharging these articles into receptacles.

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