Jan. 20, 1970 G. V. CREMIEUX 3,490,197

TABLET COUNTING AND BOTTLING MACHINE

Filed April 15, 1968 4 Sheets-Sheet 1

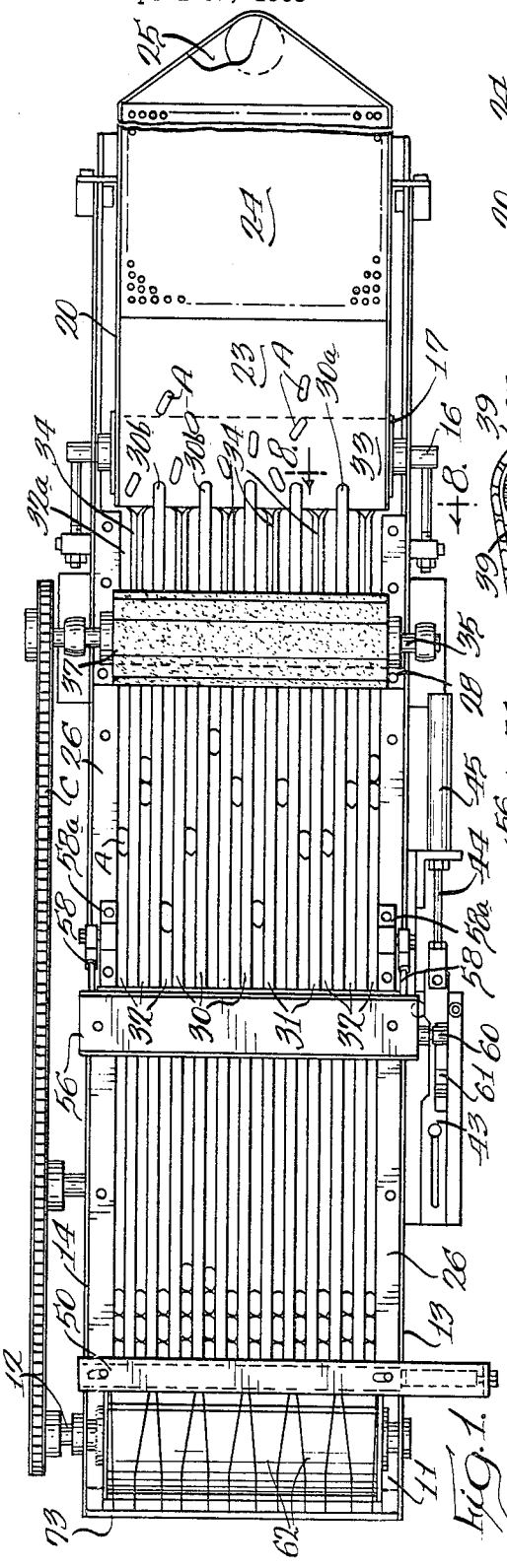


FIG. 1.

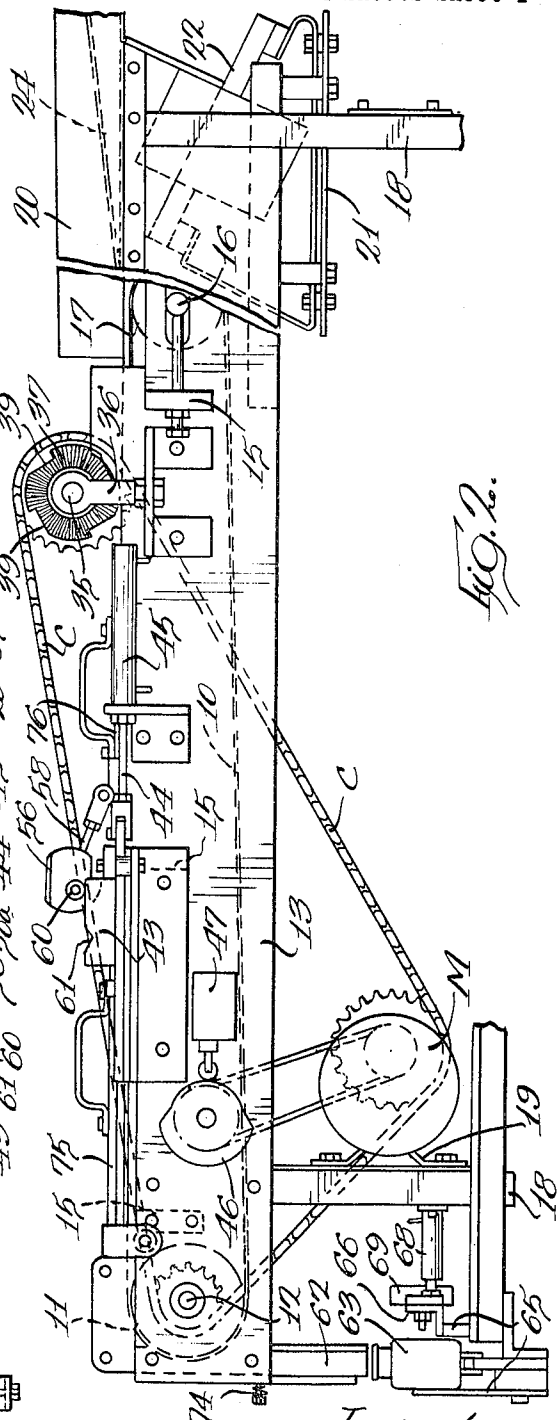


FIG. 2.

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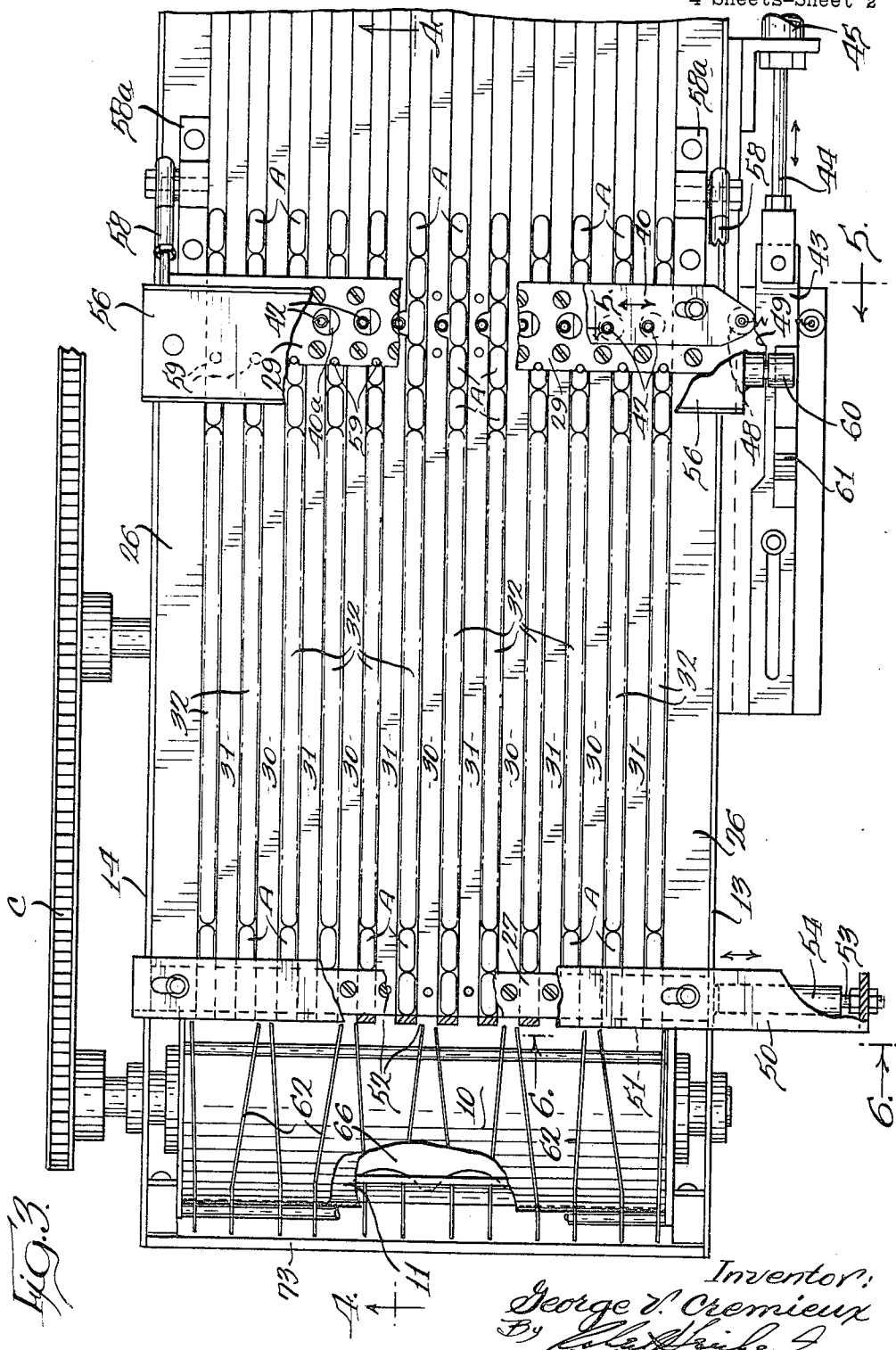


Fig. 3.

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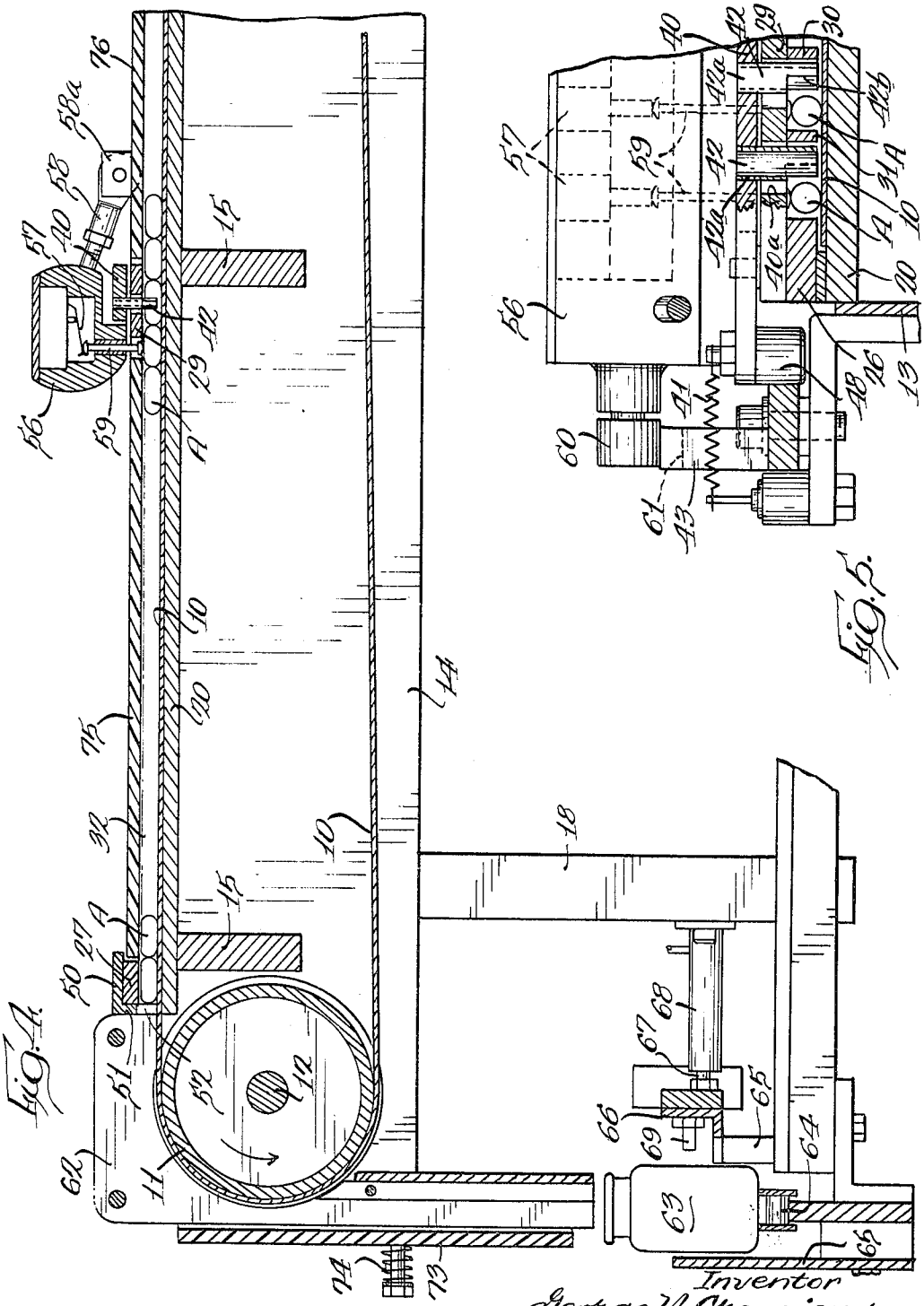


Fig. 4.

Fig. 5.

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Fig. 6.

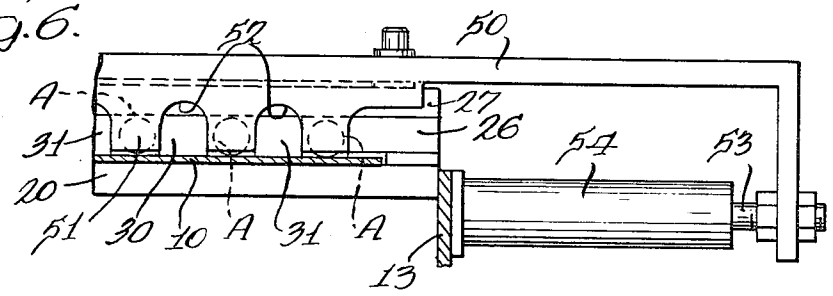


Fig. 7.

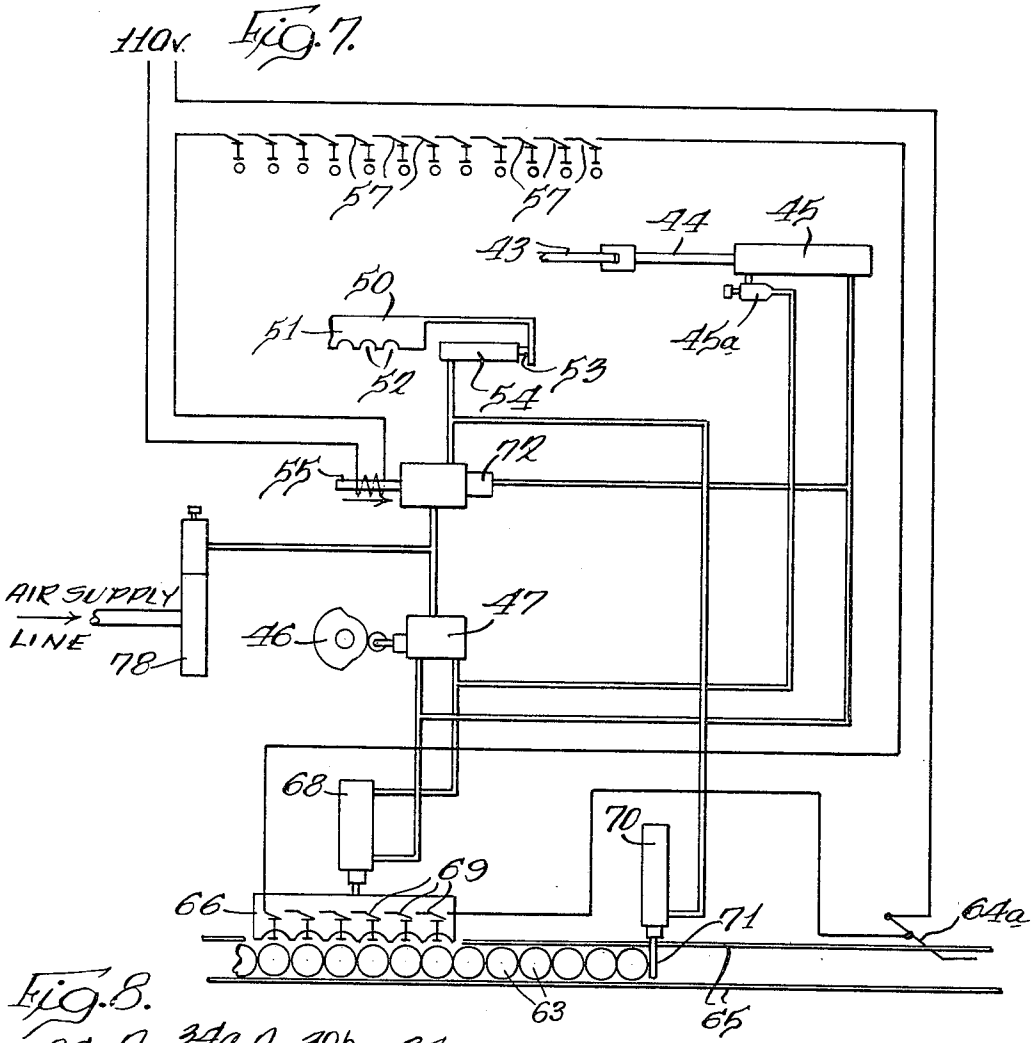
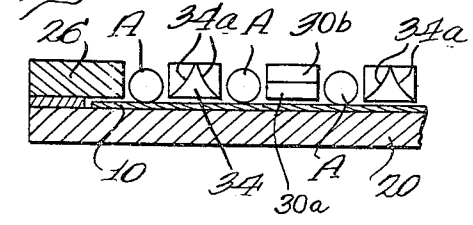


Fig. 8.



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United States Patent Office 3,490,197
Patented Jan. 20, 1970

3,490,197

TABLET COUNTING AND BOTTLING MACHINE

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Int. Cl. B65b 35/44, 43/52, 57/20
U.S. Cl. 53—55 12 Claims

ABSTRACT OF THE DISCLOSURE

In a machine for counting and bottling articles of similar shape, such as oblong medicinal tablets, the horizontally extending upper flight of a continuously moving smooth endless belt in conjunction with spaced apart parallel stationary guide strips in overhead relation to the belt define channels in which tablets are propelled from a vibrating tablet supply tray at the entrance end of said channels to a discharge station in overhead relation to a bottling station containing bottles in vertical alignment with said channels. The tablets drop one at a time from the discharge station via a release gate. A holding gate between the tablet supply tray and the release gate occupies a position at a distance from the release gate commensurate with the lineal dimension of the desired per bottle number of tablets.

An electric circuit controlling operation of pneumatic actuating means for moving the release gate between open and closed positions contains a series of microswitches at the bottling station which close in response to full quota of bottles at the bottling station and a series of microswitches which respond to the presence of full quota of tablets in the area of the channels between the holding gate and the release gate. A normally closed switch in the advance line of travel of said bottles from said bottling station is opened to interrupt the circuit containing said microswitches if there is no room for accepting said bottles on leaving the bottling station.

Bottles are supported on a continuously moving chain while at said bottling station and while enroute to and from said station. Pneumatic means which operate to intermittently stop movement of the bottles while occupying the bottling station and pneumatic means which operate to intermittently move the holding gate to open position are controlled by a rotating cam driven by the belt driving means.

This invention relates to a machine for counting and bottling articles of uniform size and shape and more particularly relatively soft fragile articles such as medicinal tablets.

It is an object of this invention to provide a machine of this type wherein the articles have greater protection against breakage as an incident to the counting and bottling operation while accomplishing this operation quickly and automatically.

It is also an object of this invention to provide a machine of this type wherein a continuously moving endless belt provides a horizontally extending upper flight on which the articles are propelled along fixed parallel paths in single file relation between a supply station and a discharge station in overhead relation to upwardly open bottles occupying positions in alignment with said paths.

A still further object is the provision of novel means for avoiding discharge of short counts of articles incident to the bottling operation.

Another object resides in providing improved means for controlling the flow of articles of oblong shape so as to eliminate jams while enroute to the bottling station.

Other objects and many of the attendant advantages

of this invention will be more readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings, wherein:

FIG. 1 is a top plan view of a machine incorporating the features of this invention.

FIG. 2 is a side elevational view thereof.

FIG. 3 is an enlarged fragmentary top plan view of the area of the machine containing the article count control means and the discharge station in overhead relation to the bottling station.

FIG. 4 is a vertical sectional view taken along line 4—4 of FIG. 3.

FIG. 5 is an enlarged fragmentary vertical sectional view taken along line 5—5 of FIG. 3.

FIG. 6 is an enlarged fragmentary vertical sectional view taken along line 6—6 of FIG. 3.

FIG. 7 is a schematic diagram illustrating the electrical and piping interconnections between the various elements of the machine embodying the features of this invention.

FIG. 8 is an enlarged fragmentary detail section taken along line 8—8 of FIG. 3.

The invention is illustrated as embodied in a machine for feeding articles from a conveyor comprising a smooth horizontally moving endless belt **10**. The articles conveyed, designated A in the drawings, are shown as cylindrical medicinal tablets. It will be understood, of course, these particular articles are shown by way of illustration only since the invention may be embodied in machines for handling articles of other sizes and shapes. The conveyor belt **10** moves continuously, being driven by a drive roll **11** secured to a shaft **12** which derives its power from a motor M via drive chain C.

A rigid framework defined by a pair of side rails **13** and **14**, joined in spaced apart parallel relation by cross bars **15**, provides support for the belt drive roll shaft **12** as well as a shaft **16** on which a belt roll idler **17** is mounted. Legs **18** secured to and extending downwardly from the side rails **13** and **14** provide a clearway below the area occupied by the conveyor belt in which the motor M is suitably confined via a bracket **19** secured to one of the legs. A top plate **20** of suitable composition, such as Formica, supported on the cross bars **15**, provides a smooth base for the upper flight of the conveyor belt **10**.

The tablets are supplied to the upstream end of the upper flight of the belt **10** via a feeder tray **20**. A shelf **21** attached to the side rails **13** and **14** supports a vibrator unit **22** on which the tray **20** is mounted for vibratory movement under control of said vibrator unit. The bottom wall **23** of the tray **20** occupies a horizontal plane in slightly upwardly offset relation to the upper surface of the belt **10** except for a supplemental bottom wall portion defined by a perforated plate **24** which is fixed to the tray in rearwardly spaced relation to the beltward edge of the bottom wall **23** and which slopes downwardly in the direction of the belt **10**. A vacuum cleaner unit **25** applies suction to the underside of the plate **24** whereby dust from the tablets following on the plate **24** is collected and discharged from the tray.

Strips **26** fixed to the top plate **20** provide guides with which opposite longitudinal edges of the upper flight of the belt **10** have sliding engagement to maintain the belt within the confines of said strips **26** as it travels away from the tray **20**. A pair of bridge bars **27** and **28** are secured to the strips **26** in overhead relation to the leading and trailing end portions respectively of the upper flight of the belt **10** and a third bridge bar **29** is secured to the strips **26** in overhead relation to an area of the belt **10** approximately midway of the distance between the bridge bars **27** and **28**. Secured to the underside of the bridge bars **27**, **28** and **29** in uniformly spaced apart relation

parallel to the strips **21** are a series of rails **30** which have end portions **30***a* extending to a position confronting the beltward or forward end of the bottom wall **23** of the tray **20**. The area between each of the rails **30** and the area between each strip **26** and the rail **30** facing said strip **26** is centrally divided by a rail **31** secured to the underside of the bridge bars **27, 28** and **29** which extends a distance short of the tray **20**.

The rails **30** and **31** are so spaced from the surface of the belt opposite thereto as to avoid contact therewith except to control any possible bulging of the belt. The dimension of the rails **30** and **31** measured lengthwise of the distance between the strips **26** is such as to provide a channel **32** between each rail **30** and **31** and between each strip **26** and rail **31** facing said strip **26** in each of which the tablets are maintained in single file lengthwise of the line of travel of the belt **10**.

A plate **33** secured to the front portion of bottom wall **23** of tray **20** is provided with extensions which define fingers **34** in spaced apart longitudinal alignment with the rails **31** and overlapping the area between the end portions **30***a* of each rail **30**. The fingers **34** in conjunction with the end portions **30***a* of the rails **30** accordingly define channels **32***a* in alignment with the channels **32** in downstream relation thereto. The end portions **30***a* are built up by a supplemental strip **30***b* which overhangs the front marginal portion of the bottom wall **23** of the tray **20** so as to pilot tablets on the tray **20** toward a channel **32***a* between an end portion **30***a* of rails **30** and the finger **34** facing said end portion **30***a* while the tray **30** undergoes vibration to "walk" the tablets in the direction of the belt **10**. As shown in FIG. 8, the fingers **34** are of triangular cross sectional contour so as to present uniformly downwardly diverging faces **34***a* whereby the tablets entering the area opposite said faces **34***a* are deflected toward a straight line position lengthwise of the channel **32***a* by the face **34***a* engaged thereby. The faces **34***a* extend the full length of the fingers **34** except for a vertical wall section at the end of each finger **34** which leads to the end face of a rail **31** longitudinally aligned therewith.

The bridge bar **28** forms a baffle at the entrance to the channels **32** which are coterminous with the rails **31**. The edge of the bar **28** facing in the direction of the tray **20** is beveled downwardly toward said tray. A shaft **35** having bearing support in a pair of upright arms **36** secured to the side rails **13** and **14** of the machine frame provides an axis for a rotating brush **37** positioned for engagement with tablets which may be "shingled" over tablets within a channel **32***a*. The brush is driven by a sprocket on the shaft **35** under power supplied to the belt pulley **11** via drive chain C and motor M so as to rotate counter clockwise as viewed in FIG. 2. Cut outs defining notches **39** in the brush **37** provide shoulders which act to push back tablets which might remain across the fingers **34**. The brush turns at approximately 13 r.p.m. so as to effectively maneuver the tablets into single file alignment with the channel **32***a* preparatory to entering the confines of channel **32** between the brush and the discharge end of the belt **10**.

A holding gate **40** is mounted on the bridge bar **29** for limited sliding movement transversely of the channels **32** between an open position and a closed position and biased by a spring **41** to occupy a closed position.

Upright tubular sections **42** of Neoprene or other suitable composition are secured to the holding gate **40** at spaced apart intervals corresponding to the spacing of the channels **32**. Each section **42** is confined within a metallic sleeve **42***a* which has a press fit with a hole formed in the gate **40**. Each sleeve **42***a* is notched as at **42***b* so as to expose the surface of the section **42** facing the line of travel of the tablets A in the channel **32** associated therewith. Each sleeve and the section confined therein extend downwardly from the gate **40** via a slot **40***a* in the bridge bar **29** so as to occupy a position inwardly of the channel **32** in vertical alignment therewith when the gate **40** is in closed position. Each sleeve **42***a* is notched as at **42***b* so as to expose the lower end of the section **42** facing the line of travel of the tablets A in the channel associated therewith through an arc of 180 degrees having its chordal limits in alignment with a line parallel to the line of travel of said tablets. The surface of the section **42** thus exposed by the notch **42***b* in the sleeve **42***a* containing such section has yieldable engagement with a tablet A opposite thereto so as to arrest movement of the tablet when the gate **40** is in advanced position and pending movement of the gate **40** to its initial retracted position. In the retracted position of the gate **40** recesses provided in the rails **30** and **31** in alignment with the slots **40***a* in bridge bar **40** provide areas into which the sleeves **42***a* may be confined so as to avoid interference with the line of travel of the tablets A. Means for operating the holding gate **40** from closed position to its open position includes a cam bar **43** which is supported for guided movement in a fixed path parallel to the line of travel of the belt **10** under power supplied by the operating shaft **44** of an air cylinder **45**. A cam **46** driven by motor M actuates a 4-way valve **47** which operates to pull the cam bar **43** to the right as viewed in FIG. 2. As thus pulled from left to right, a follower **48** on the end of the holding gate **40** facing the cam bar **43** moves into a notch **49** on the latter which allows the spring to return the gate **40** to its normally biased position effective to hold a tablet against a rail facing the tablet. The flexibility of the sections **42** avoids any damage to the tablet engaged thereby.

Tablets entering channels **32** of the area downstream of the holding gate **40** are momentarily halted by a release gate **50** which is mounted on the bridge bar **27** for limited sliding movement transversely of the channels **32** between an initial or closed position in relation to the channels **32** and an advanced or open position. A lip **51** extending downwardly from one longitudinal edge of the gate is provided with notches **52** which are lined up with the channels **32** to release the tablets therefrom for delivery to a bottle filling station when the gate is in advanced or open position. Areas of the lip separating said notches define barriers which are lined up with the channels to prevent release of the tablets between the gates **40** and **50** when the gate **50** is in initial or closed position. Sliding movement of the release gate between closed and open positions is controlled by an operating rod **53** of an air cylinder **54**. Actuation of the rod **53** is obtained via a solenoid unit **55** which when energized by an electric circuit (to be detailed hereinafter) operates a 3-way valve **55***a*.

A switch supporting head **56** of suitable insulating material, such for example of Formica, carries a series of micro switches **57** which are connected together in spaced apart relation in such a way as to require the presence of a tablet in each channel **32** immediately forward of the holding gate **40** in order to close an electrical circuit for energizing the solenoid unit **55**. As shown in FIG. 3 opposite ends of the head **56** have pivotal connection to the strips **26** via arms **58** hinged to a bracket **58***a* so as to permit the head **56** to swing about an axis parallel to the line of travel of the holding gate **40** between raised and lowered positions in overhead relation to the area of the channels **32** immediately forward of the holding gate **40**. When the head **56** is in lowered position, an actuator rod **59** associated with each switch **57** extends into the area of the channel **32** through which the tablets must travel when enroute to the release gate **50**. Thus a tablet while positioned opposite the actuator rod **59** of the microswitch aligned with the channel **32** containing such tablet will be contacted by the actuator rod **59** so as to close the contacts of the switch associated therewith. However, absence of a tablet in any channel **32** opposite an actuator rod **59** within said channel will prevent closing of the switch with which said rod **59** is associated and thereby prevent closing of the circuit to the solenoid unit **55** pending arrival of a tablet in a position opposite said actuator rod **59**. A follower **60** at one end of the head

56 rides on an upwardly facing horizontal surface of the cam bar 43 so as to maintain the head 56 in an elevated position in which the actuator rod 59 of the micro switches are clear of the path travelled by the tablets in the area of the channel facing said actuator rods 59. When the follower 60 falls into a notch 61 as the cam bar 43 is operated to move the holding gate 40 to open position, the arms 58 and the head 56 are lowered to render the switches carried thereby sensitive to the presence or absence of a tablet in the area of the channel 32 opposite such switch. As shown in FIG. 7, a needle valve 45*a* in the line which delivers air pressure in the cylinder 45 to pull the cam bar 43 in a direction to open the holding gate 40 provides means for obtaining desired time delay required between actuations of the holding gate 40 and the switch supporting head 56 and thereby allow tablets between the holding gate and the release gate to accumulate toward the release gate and leave an empty space under the switch facing the channel 32 which contains less than a full quota of tablets when the head 56 is lowered. Accordingly, if the full quota of each channel 32 between the gates 40 and 50 is established, for example, at 15 tablets, the holding gate will retain the sixteenth tablet and the actuaor 59 of the micro switch will touch the fifteenth tablet opposite thereto.

Operation of the solenoid unit 55 to move the release gate 50 to open position allows the belt 10 to carry the tablets into funnels 62 which, as shown in FIG. 4, follow the curvature of the belt from horizontal to vertical and thereby guide the tablets into bottles 63 occupying positions at a bottle filling station in vertical alignment with said funnels while said bottles are supported on a continuously moving chain 64. While thus positioned for reception of the tablets via the funnels, the bottles 63 are confined between rails 65 which straddle the line of travel of chain 64. A switch supporting head 66 has bottle engaging recesses with which bottles at the bottle filling station have engagement under pressure exerted on said head 65 by the operating rod 67 of an air cylinder 68 when the rod 67 is in advanced position. A series of normally open microswitches 69 mounted on the head 66 in alignment with the bottles occupying the bottle filling station as well as a normally closed microswitch 64*a* located along the line of travel of the chain 64 ahead of the area occupied by the bottle filling station are wired in series with the normally open microswitches 57 on the switch supporting head 56 whereby the electric circuit for energizing the solenoid unit 55 to operate the valve 55*a* is also controlled by said microswitches 69 and 64*a*. Each of the microswitches 69 is in circuit closing position only when the bottle filling station is occupied by a bottle in tablet receiving position below each of the funnels 62. Microswitch 64*a* remains in circuit closing position only if there is room available on the chain 64 for receiving the filled bottles preparatory to movement of said filled bottles from the bottle filling station so as to accommodate a fresh supply of unfilled bottles at the bottle filling station.

As the valve 55*a* is actuated by the solenoid unit 55 to open release gate 50, a cylinder 70 acts on a rod 71 to retract the rod 71 from a bottle stopping position in the path of bottles on the chain 64 which have been filled and thereby allow said filled bottles to move away from the bottle filling station.

Accordingly, as the cam 46 driven by motor M opens the 4-way valve 47, rod 67 of cylinder 68 is extended so as to press the head 66 against bottles 63 facing said head at the bottle filling station and thus hold the bottles in vertical alignment with the funnels 62. This action of the valve 47 also causes the rod 44 of cylinder 45 to retract and thereby pull the cam bar 43 in a direction to position its notch 49 in receiving relation to the follower 48 on the end of holding gate 40 so as to allow said gate to close under force of the spring 41 and to lower and raise the switch supporting head 56. If the area of each channel 32 between the release gate 50 and holding gate 40 is occupied with a full quota of tablets so as to maintain the microswitches 57 on the head 56 in circuit closing position, and the bottle filling station has its full quota of empty bottles and the area of the chain 64 ahead of the bottle filling station is clear so as to maintain the microswitch 64*a* in circuit closing condition, the circuit is completed to the solenoid 55 so as to open the 3-way valve 55*a* in response to such retracting movement of the rod 44 of cylinder 47.

When the cam 46 is in a rotated position which allows the valve 47 to close, cylinder 68 is acted on to retract rod 67 so as to free the filled bottles for movement by the chain 64 toward rod 71 of cylinder 70. Cylinder 45 is likewise acted on to extend its rod 44 so as to push the cam bar 43 to a position effective to open the holding gate 40 against the resistance of spring 41 and to close the 3-way valve 55*a* via operation of the pilot 72 and thereby cause the cylinder 54 to retract rod 53 and thus close the release gate 50 and to act on cylinder 70 to extend rod 71 into bottle stopping position in the path of the filled bottles on the chain 64.

It will be understood from the foregoing that the cylinders 54 and 70 cycle only when the electrical circuit actuates solenoid unit 55 while the cylinders 45 and 68 are continuously cycling under control of the rotating cam 46 and the 4-way valve 47.

Reference numeral 73 designates a transparent panel mounted so as to face the path of the tablets while travelling through the funnels to the bottles in alignment with said funnels. A spring mounting 74 allows the panel 73 to be pulled away from the funnels a distance sufficient to relieve any jamming of the tablets while undergoing movement to the bottles.

Plexiglass cover 75 over channels 32 between holding gate 40 and release gate 50 and Plexiglass cover 76 over channels 32 between holding gate 40 and brush prevent shingling of the tablets while confined in said channels. As shown in FIG. 7, which illustrates diagrammatically the electrical and the piping interconnections between the various elements in accordance with the invention, reference numerals 77 and 78 respectively designate a pressure regulator and a filter in the air supply line.

What is claimed is:

1. An automatic tablet counting and bottling machine, said machine including a series of guide members supported on said frame in fixed uniformly spaced apart relation, means cooperating with said guide members to define a series of channels in each of which said tablets are aligned in single file relation including an endless continuously moving conveyor operable to advance said tablets in said channels from a supply station to a discharge station, a release gate movable between open and closed position relative to said channels at said discharge station, a holding gate movable between open and closed positions relative to a portion of said channels located at a distance away from the release gate in the direction of the supply station corresponding to the minimum lineal dimension of the channel required to accommodate a pre-selected quota of tablets, and means operable to control movement of the release gate so as to prevent movement of said gate to open position unless each of the channel portions between said release gate and said holding gate contains a full quota of said tablets including a tablet sensor disposed in each of said channel portions between said holding gate and said release gate.

2. An automatic tablet counting and bottling machine according to claim 1 wherein said conveyor includes a drive pulley and an idler pulley having axes of rotation in horizontally spaced apart parallel relation and the section of said conveyor cooperating with said guide members to define said channels includes the upper flight of a continuous belt driven by said drive pulley and passing over said idler pulley.

3. An automatic tablet counting and bottling machine

according to claim 1 wherein said supply station includes a vibratory tray having fingers extending toward and in alignment with certain of said guide members and each of said fingers in cooperation with certain other guide members in paired straddling relation to each of said fingers form extensions of said channels in the direction of said supply station.

4. An automatic tablet counting and bottling machine according to claim 1 wherein means for controlling alignment of said tablets at the entrance to the area of the channels between the holding gate and the supply station includes a constantly revolving brush operable about an axis in overhead transverse parallel relation to the line of travel of tablets in said channels, and having engagement with tablets which are shingled over a tablet in the channel below said brush via surfaces of said brush which are moving in a direction upwardly from the channel and toward the supply station.

5. An automatic tablet counting and bottling machine according to claim 1 wherein a cam member is operable lengthwise of the line of travel of the conveyor between an advanced position and a retracted position, under control of pneumatic driving means, and said holding gate is moved to open position by said cam member when the latter is operated from retracted to advanced position, and said holding gate is normally biased to occupy a closed position when said cam member is in retracted position.

6. An automatic tablet counting machine according to claim 1 wherein said tablet sensor means is defined by a series of microswitches in overhead aligned relation to areas of the channel immediately downstream of the position occupied by the holding gate.

7. An automatic tablet counting machine according to claim 1 wherein said tablet sensor means is defined by a areas of the channel immediately downstream of the position occupied by the holding gate and movement of the release gate from close to open position is obtained via pneuthe release gate from close to open position via pneumatic drive means actuated by a solenoid unit which is energized by an electric circuit containing said microswitches of tablet sensor means.

8. An automatic tablet counting machine according to claim 1 wherein a bottle filling station is provided in the path of tablets dropped from said conveyor when the release gate is opened, and means operable to control movement of the release gate to open position from closed position so as to prevent movement of said gate to open position unless said bottle filling station contains a full quota of bottles including a bottle sensor opposite the area occupied by each bottle while in said bottle filling station.

9. An automatic tablet counting machine according to claim 1 wherein a bottle filling station is provided in the path of tablets dropped from said conveyor when the release gate is open and bottles at said station are supported on a second conveyor on which bottles are moved toward and away from said station and means operable to prevent movement of said bottles away from said station, unless the area of the conveyor ahead of said bottles is vacant, is controlled by a solenoid unit which is electrically operated by an electric circuit containing switches which are closed only when the bottle filling station contains a full quota of bottles and the channels between the release gate and the holding gate each contain a full quota of tablets.

10. An automatic tablet counting and bottling machine according to claim 1 wherein a cam member is operable lengthwise of the line of travel of the conveyor between an advanced position and a retracted position in timed relation with the speed of travel of the conveyor and wherein said tablet sensor means includes a switch supporting head supported for swinging movement between upper and lower positions about an axis parallel to the line of travel of said holding gate between open and closed positions and movement of said holding gate from closed to open position and movement of said switch supporting head from upper to lower positions is sequentially effected during movement of said cam member from said retracted to said advanced position, and an electric circuit containing normally open switches carried by said switch supporting head in overhead aligned relation to areas of the channels immediately downstream of the position occupied by the holding gate, each of said switches being actuated to close in response to the presence of a tablet in the channel opposite thereto when the switch supporting head is in its said lower position.

11. An automatic tablet counting and bottling machine according to claim 1 wherein resilient tablet engaging means are secured to the holding gate at spaced apart intervals corresponding to the spacing of said channels, and said tablet engaging means are movable toward and away from a position within the line of travel of tablets in the channel associated therewith in accordance with movement of the holding gate between closed and opened positions.

12. An automatic tablet counting and bottling machine according to claim 1 wherein means for controlling alignment of said tablets at the entrance to the area of the channels between the holding gate and the supply station includes a constantly revolving brush operable about an axis in overhead transverse parallel relation to the line of travel of tablets in said channels, said brush having axially extending notches formed therein spaced apart circumferentially of the line of rotation of said brush, said notches defining shoulders which have engagement with tablets which are shingled over a tablet in the channel below the brush.

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TRAVIS S. McGEHEE, Primary Examiner

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53—78