Oct. 11, 1966 J. M. COZZOLI ETAL 3,277,629

FILLING AND CAPPING MACHINE

Filed May 20, 1963 5 Sheets-Sheet 1

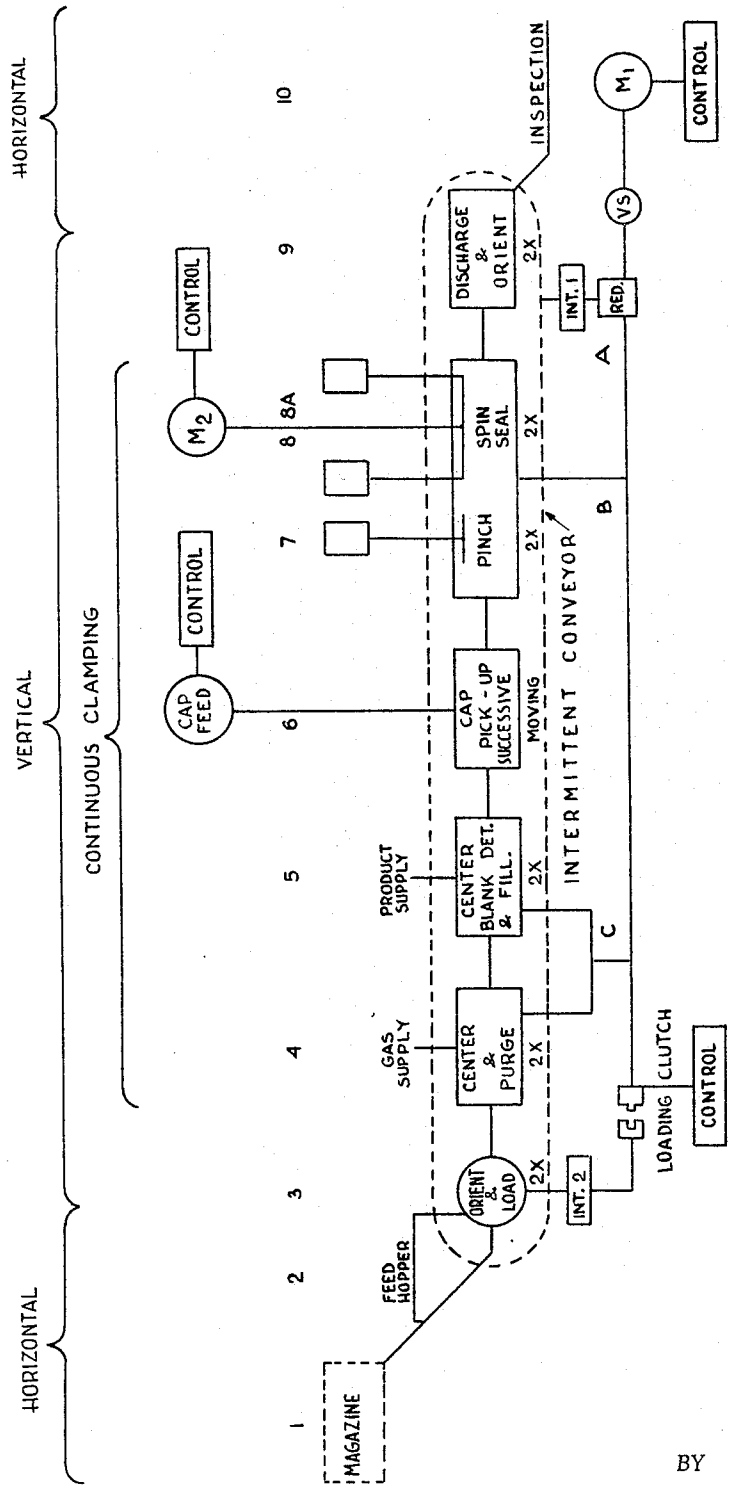



FIG. 1

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FILLING AND CAPPING MACHINE

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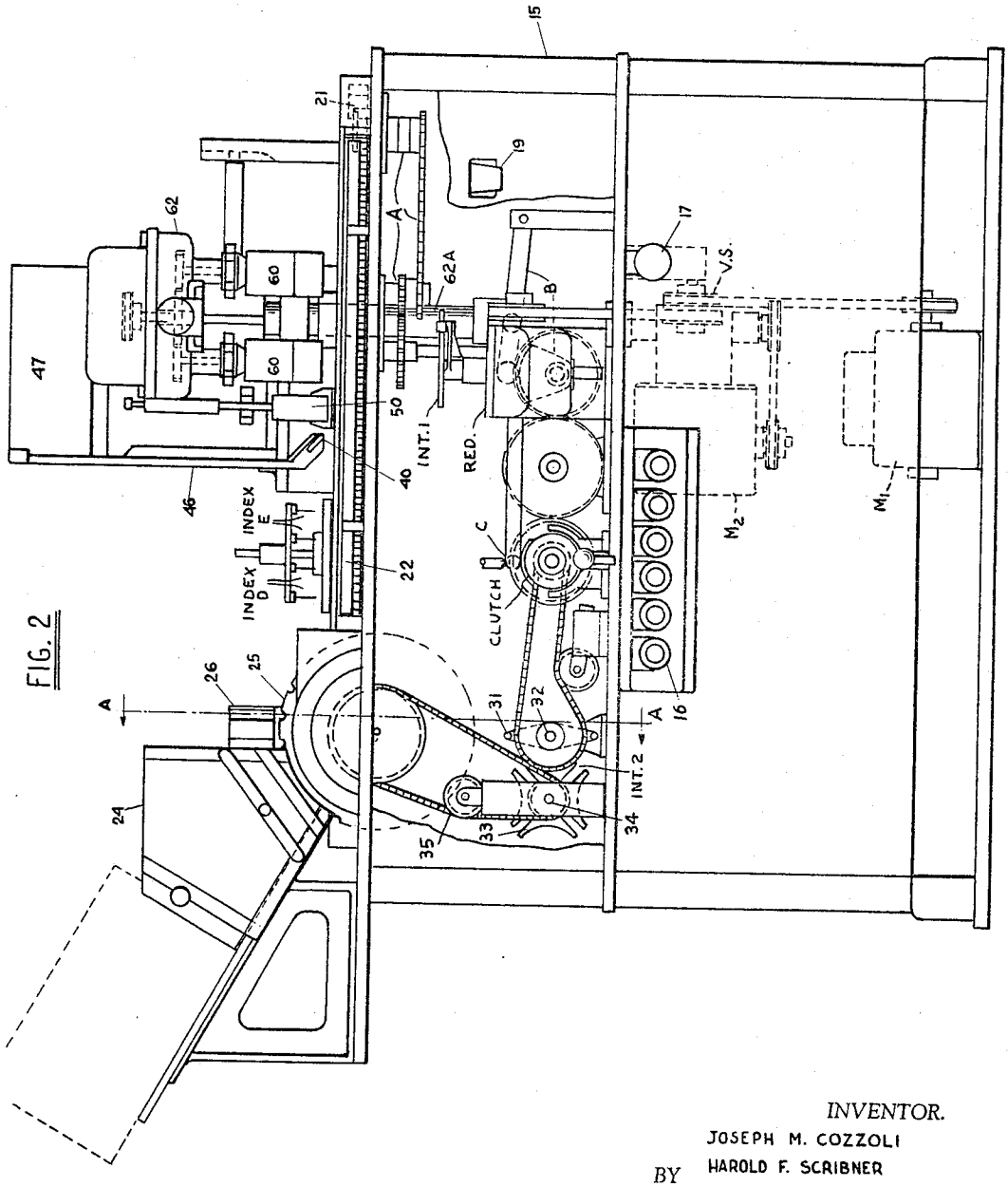



FIG. 2

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FILLING AND CAPPING MACHINE

Filed May 20, 1963

5 Sheets-Sheet 3

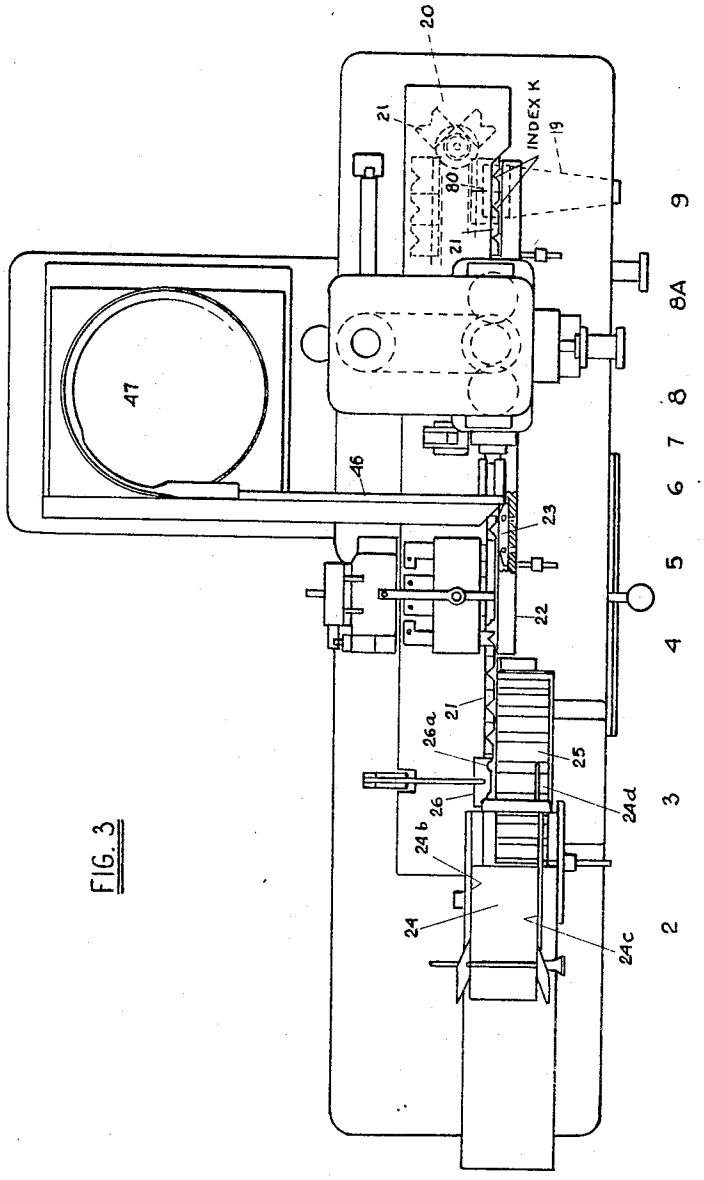



FIG. 3

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FILLING AND CAPPING MACHINE

Filed May 20, 1963 5 Sheets-Sheet 4

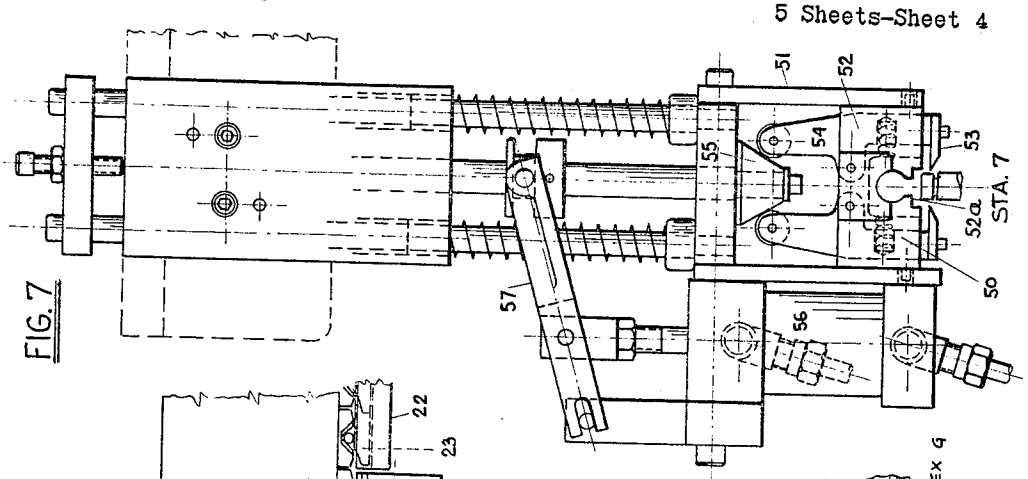



FIG. 7

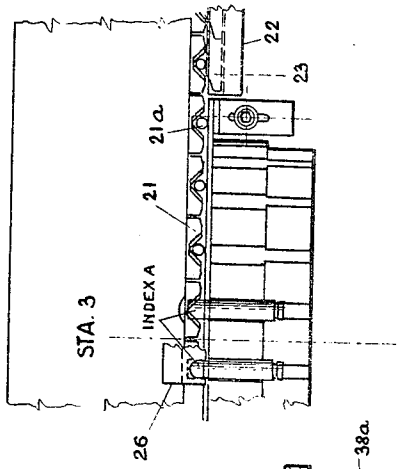



FIG. 5

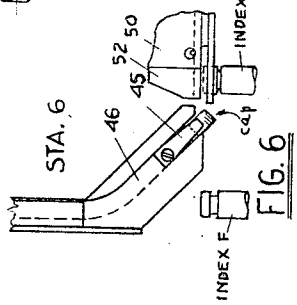



FIG. 6

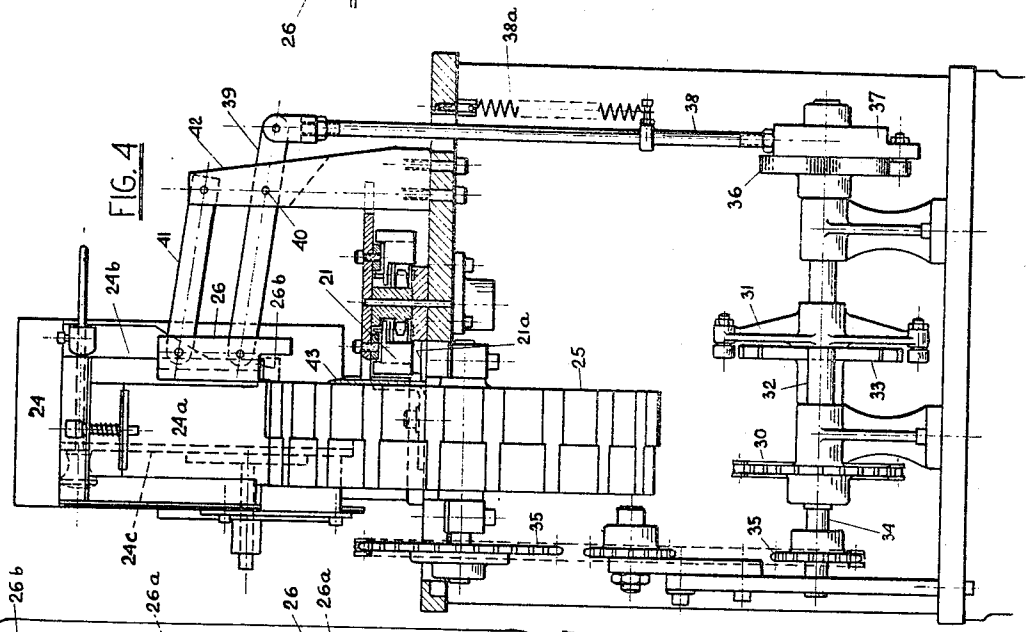



FIG. 4

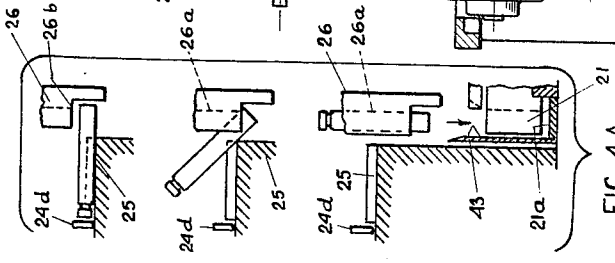



FIG. 4A

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FILLING AND CAPPING MACHINE

Filed May 20, 1963 5 Sheets-Sheet 5

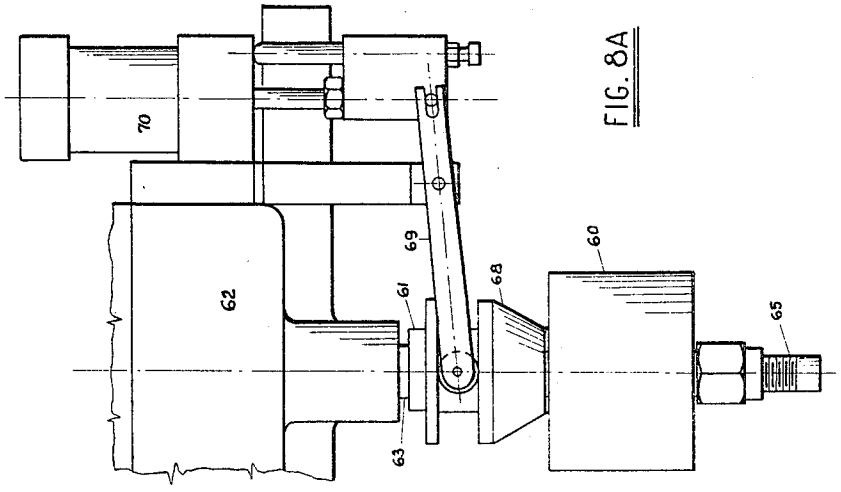



FIG. 8A

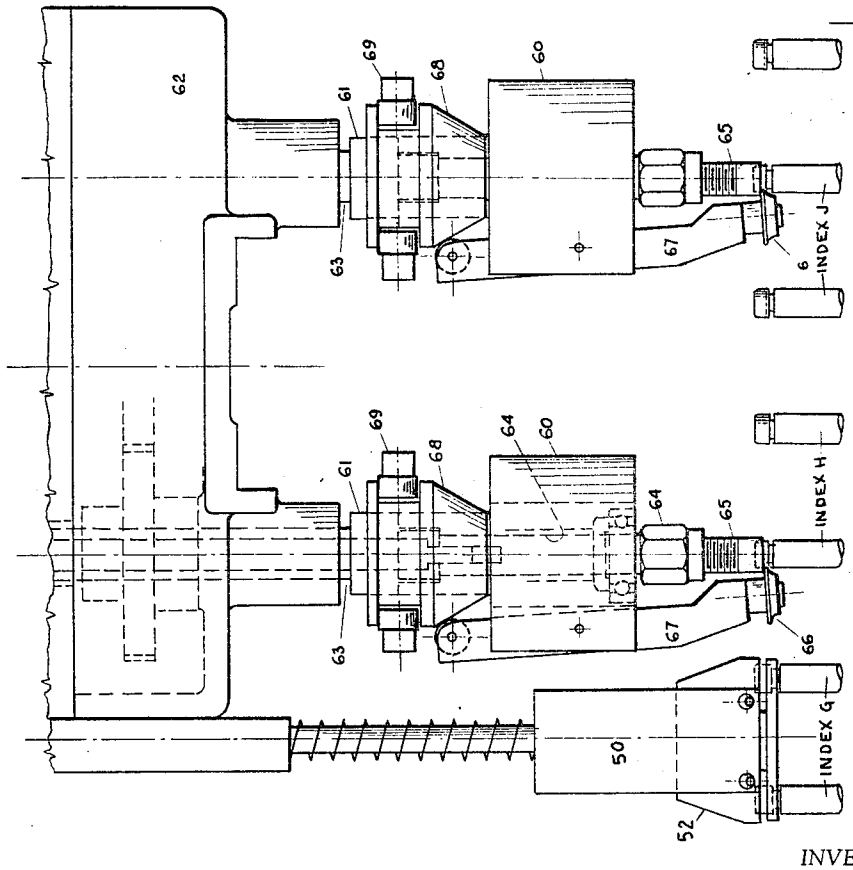



FIG. 8

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United States Patent Office

3,277,629

Patented Oct. 11, 1966



3,277,629

# FILLING AND CAPPING MACHINE

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Filed May 20, 1963, Ser. No. 281,564
14 Claims. (Cl. 53—37)

This invention concerns improvements in an apparatus for handling cartridges or other small cylindrical vials with the least possible manual contact. In its more specific aspects the invention undertakes to provide apparatus having the capacity for magazine loading of cartridges in horizontal position, followed by orientation to vertical position and placed in spaced pockets of a conveyor. The conveyor causes the cartridges to move intermittently to and through purging and filling stations after which the cartridges have caps successively loosely applied. After the placing of the caps, the cartridges are moved to an adjacent preliminary pinching station where the caps are given a light pinch sufficient to retain them in place while being moved to a spin-sealing station. At the spin-sealing station the skirt of the cap is rolled in under the lip of the cartridge to produce the finished seal, upon completion of which, the filled and sealed cartridges are successively discharged from the conveyor and again oriented to horizontal position for convenient inspection.

A further aim of the invention is to provide cartridge handling apparatus having one or more of the above characteristics with additional features of adjustability to process cartridges of different diameters and/or different height, adjustability as to quantity of fill, adjustability for accepting caps of different styles, and with automatic compensation for variations in the nominal dimensions of the cartridges in any given lot or run.

Still a further objective of the invention is to construct a machine that will mechanically orient and load, fill, cap, and seal cartridges at production rates greater than has been possible heretofore, and to that end we propose an apparatus for loading cartridges two-at-a-time, centering the necks of the cartridges and detecting for blanks two-at-a-time, successively applying caps to the cartridges while in motion, securing the caps two-at-a-time, spin-seal two-at-a-time followed by successive discharge in groups of two.

Another purport of the invention is the provision of a drive transmission constructed and arranged to afford continuous motion to certain components of the system, intermittent motion to other components of the system, disconnect means for certain components so that they may be stopped while other components continue their particular functions in the sequence, and with segregated controls for main machine operation, for the loading operation, for cap feed, and for the spin-seal operation.

Other objects and advantages will be in part indicated in the following description and in part rendered apparent therefrom in connection with the annexed drawings.

To enable others skilled in the art so fully to apprehend the underlying features hereof that they may embody the same in the various ways contemplated by this invention, drawings depicting a preferred typical construction have been annexed as a part of this disclosure and, in such drawings, like characters of reference denote corresponding parts throughout all the views, of which:

FIGURE 1 is a flow sheet illustrating schematically the primary components of the organization, the sequence of the operation identified by stations numbered 1 to 10, the drive transmissions and their respective controls.

FIG. 2 is a front elevation of a machine incorporating the invention and which includes the mechanisms illustrated in FIG. 1 that are essential to the operational sequence. The specific structure of the various mechanisms within the machine has not been illustrated as they consist of standard parts such as motors, gears, shafts, cams, Geneva mechanisms, etc. which, in themselves, to detail would tend more to obscure than clarify the real invention and they have not, in the interests of clarity, been completely illustrated.



FIG. 3 is a plan view of the machine of FIG. 1.

FIG. 4 is a transverse sectional view of the loading mechanism taken in a vertical plane substantially along line A—A of FIG. 2.

FIG. 4A is an action diagram of the orienting and loading principle.

FIG. 5 is a plan view of the area adjacent the loading station.

FIG. 6 is a detail view of the delivery end of the cap-placing means.

FIG. 7 is a detail view of the cap-pinching means at station 7.

FIGS. 8 and 8A are detail views of the cap spin-sealing heads located at stations 8 and 8A.

The invention is illustrated schematically in the block diagram FIG. 1 in which the stations are numbered 1 through 10 and wherein the legends $2x$ mean two cartridges are processed simultaneously at the stations identified. The "Magazine" at station 1 may be a portable case, is preloaded with empty cartridges, horizontally disposed with their open ends toward the viewer. The magazine is placed into the "Feed Hopper" at station 2 and a door in the front end of the case slid open to allow the cartridges to roll into the hopper and rest against the surface of a notched pick-up wheel at station 3. When the wheel is indexed the cartridges find their way into the notches and are brought from the hopper to the top of the wheel (marked INDEX A in FIG. 5) where a tipper block applies downward pressure on the projecting ends of the cartridges and tips them to a vertical position. Upon being tipped to vertical position the cartridges fall into spaced pockets of an intermittently movable conveyor (here represented by the dotted line oval). On a succeeding cycle of operation two cartridges are moved to a "center and purge station" #4 (marked INDEX D in FIG. 2) where the necks are centered with jets that descend into the cartridges and discharge an inert gas to displace the air. Thereafter the pair of cartridges move to a "Center, Blank Detector, and Fill" station #5 (marked INDEX E in FIG. 2) where the pair is filled with a measured charge of a medicinal product. As before, each cartridge is centered and a filling needle descends into the open end and delivers its charge. If either or both conveyor pockets or chucks should be empty on arrival at the filling station, there will be no centering and the filling mechanism will be latched out of operation.

After filling a pair of cartridges move through a "Cap Pick-Up" station #6 (marked INDEX F and INDEX G in FIG. 6) where each cartridge picks up an inverted cup-shaped cap while it is moving from filling station #5 to "Pinch" station #7. At the latter station (marked INDEX G in FIG. 8) the caps are pressed down on the vitals with an equalizing presser foot (which automatically compensates for vital height vibrations) and given a preliminary pinch to hold the caps captive on the cartridges during their travel to the "Spin-Seal" stations #8 and 8A. Because the spinning heads rotate and reciprocate vertically and include radically movable rollers, and it has been found desirable to space the spinning heads apart and operate upon alternate ones of alternate pairs on each cycle (as illustrated in FIG. 8 marked INDEX H and INDEX J). Each spinning head is constructed to have a limited endwise float and will automatically compensate for any variation in

vial height and a common actuator may be employed to impart the vertical movement of both heads in cyclic manner.

At the "Spin-Seal" stations the caps are pressed down more firmly on the cartridges and the lower skirt portions of the caps rolled neatly under the lips of the vials. In this particular embodiment the closing-in of the spinning rolls is air-actuated whereas their rotation is effected by a separate motor M2. By suitably controlling the air pressure, the tightness of the seal may also be controlled. After spin-sealing the cartridges are indexed in pairs to a "Discharge and Orient" station #9 (marked INDEX K in FIG. 3) where they fall in rapid succession out from the bottom of the conveyor chucks onto a curved chute. The chute delivers the filled and sealed cartridges to a suitable support, basket, or moving conveyor for inspection. Steps following inspection, such as sterilization, coding, affixing other elements, packaging, etc. are not intended to be a part of this invention of automatic loading, filling, capping and sealing of cartridges containing pharmaceutical preparations.

The diagram, FIG. 1, also illustrates the several transmission trains to the components of the sequence. Motor M1 drives the main machine through a variable speed mechanism VS and reduction unit RED. A first branch transmission A operating through an intermittent motion producing mechanism INT. 1 propels the conveyor chucks intermittently in a closed path represented by the oval shown in dotted lines. A second branch transmission B operating through a continuously rotating cam, raises and lowers the pinching and spinning heads in timed relation with the indexing movements imparted to the conveyor. A third branch C operates the centering, blank detecting, and filling mechanisms including needle elevating and lowering. These components are cam operated and also timed with the indexing movements of the conveyor. The main drive continues through a disconnect clutch means identified as "Loading Clutch" to a second intermittent motion-producing means "INT. 2" to the cartridge pick-up wheel and tipping mechanism, identified generally as "Orient and Load" at station 3. The orienting and loading mechanisms are thus driven intermittently and in timed relation with the movements of the conveyor so that two cartridges are inserted into the chucks during the dwell period and two picked up from the feed hopper during the moving period of the conveyor. Disconnecting the drive by opening the Loading-Clutch will suspend loading and will allow the remainder of the mechanisms to function.

As will be understood from the block diagram, FIG. 1, the main motor M1 has its own control means such as a start-stop switch, the cap-sealing motor M2 has its control means, the cap-feeding mechanism at station #6 has its control means, and the loading-clutch has its control means. Selective operation of the several components is thereby possible. It will also be evident from the diagram that an adjustment made to the variable-speed mechanism changes the speed of the conveyor, the operation of the centering and filling units, the operation of raising and lowering of the filling needles and spinning heads, and the loading mechanisms, all in like ratio without effecting their relative timing. The spinning heads at stations 8 and 8A are caused however to revolve at a constant speed and have their own motor drive, and a cap feeding mechanism when operating, also operates to supply caps at a constant rate and has its own power unit.

It may be noted at this point that while the cartridges are guided during their orientation to vertical position at station #3, they fall freely and are loosely confined in the pockets or chucks of the conveyor. As they index into the purging station #4 the bodies of the cartridges become clamped in the chucks and their tops are steadied for centering and needle penetration. The cartridges remain so clamped throughout the remaining processing operations until they arrive at the discharge station #9 where they are released for free fall into an underlying delivery chute.

Referring more particularly to FIGS. 2 and 3 the machine comprises a main frame **15** which houses the power transmission elements. The On-Off switches that control the motors M1 and M2 and the cap feeding unit is illustrated at **16**. The variable speed control knob is illustrated at **17**, the loading-clutch control handle is **18** and the delivery chute is **19**.

The top of the main frame supports the instrumentalities that perform the processing operations, in which **20** is an endless conveyor made up of a chain of V-shaped, open-sided chucks **21**. The open sides of the chucks on the forward run of the conveyor are effectively closed by a guide rail **22** that houses a succession of overlapping spring-loaded pressure applying shoes **23**. The pressure shoes project slightly into the cartridge runway and serve continuously to press the cartridge bodies firmly into the V-pockets of the respective chucks.

The conveyor and conveyor-drive and filling mechanism of this invention is a carrying forward of the arrangement shown in the patent to Cozzoli No. 2,749,688. In this instance however, open-sided V-blocks **21** of the conveyor replace the rollers **31** of the patent. V-pockets **21*a*** herein function as the roller V-pockets **31*a*** of the patent, to hold the cartridges upright. Also, in the present disclosure, the conveyor chain which carries the V-block type of chuck Geneva-indexed a distance to move the pockets **21*a*** of two (2) chucks into a given station (or out of a given station as the case may be) on each operational cycle, whereas in the patent the conveyor movement is Geneva-indexed to move one repectacle at a time into or out of a given position. In the present invention the spacing of the several pairs of processing devices along the line has been made as compact as possible, having regard to the bulk and physical requirements of such devices. In any event, however, each index movement positions two (2) untreated cartridges into the proper respective positions to be operated upon by the device at the respective stations.

The feed hopper, indicated at **24**, is open at its upper end for the reception of cartridges and also at its lower end to receive a portion of a notched pick-up wheel **25**. The notches or grooves are in the rim of the wheel parallel to the wheel axis and in pairs whose spacing equals the spacing of the V-pockets in the conveyor. The depth of each of the grooves is approximately half the diameter of the cartridges and will receive cartridges from the bottom of the pile in the hopper as the wheel is indexed. The captive cartridges are drawn out of the hopper from beneath an adjustable gauge-gate **24*a*** and brought to an upper position where the pair of cartridges straddle the vertical centerline of the wheel and there momentarily dwell. As shown in FIG. 4, the rear wall **24*b*** of the feed hopper extends beyond the end of the pick-up wheel so that the cartridges trapped in the grooves of the wheel overhang the end of the wheel as illustrated more clearly in FIG. 4A. When so positioned the overhanging ends underlie a ledge **26*b*** provided by a vertically movable tipper block **26**. The tipper block is also provided with a pair of vertical grooves **26*a*** whose function is to receive the bodies of the cartridges. As the block descends the ledge **26*b*** engages the overhanding ends of a pair of cartridges and with downward pressure tips the cartridges from horizontal position to vertical position off the wheel. The cartridges are received by the vertical grooves **26*a*** and drop vertically into the V-shaped pockets of the conveyor chucks **21** which at that moment are directly beneath and standing stationary. The action diagram represented by FIG. 4A illustrates the sequence of the operation. The upper figure of the group represents a cartridge is stopped position at the top of the wheel and its overhanging end underlying the ledge **26*b*** of the tipper block **26**. The

center figure represents the cartridge in partially tipped up position, and the bottom figure represents the cartridge in vertical free-falling position about to be received by the conveyor chuck **21** directly below. On the next cycle the tipper block moves upwardly and rests, the main conveyor indexes to take the standing cartridges out of the position just described and to bring another pair of empty chucks into cartridge-receiving position beneath the tipper block. Meanwhile the pick-up wheel **25** has indexed to bring another pair of cartridges to the tipping station at the top of the wheel. The front wall **24***c* of the hopper **24** is inwardly adjustable and carries a gauge finger **24***d* that overlays the wheel rim. The gauge finger serves to guide the cartridges endwise to assume uniform or constant overhang and also acts as a barrier to restrain movement of the cartridges endwise in the opposite direction.

A portion of the pick-up wheel-and-tipper drive is shown in FIG. 2 and in FIG. 4 wherein a chain sprocket **30** receives power from motor M1 at a take-off point beyond the "Loading Clutch" and drives a two-arm Geneva crank **31** on a shaft **32**. The Geneva crank drives its complementary star-wheel **33** on another shaft **34** which through a chain and sprocket drive **35** indexes the pick-up wheel one station (two cartridges picked up) each half revolution of the crank shaft **32**. The other end of the crank shaft **32** carries a two-lobe cam **36** which is tracked by a cam follower mounted to a yoke piece **37**. The yoke piece **37** mounts an adjustable connecting rod **38** whose upper end is pivotally connected to one end of a tipper-block link **39**. The link **39** is fulcrumed at **40** and is pivotally connected to the tipper block **26**. A second parallel link **41** is pivotally connected to the tipper block and to the support **42** and maintains the tipper block in vertical position during its slightly arcuate movement. A pull spring **38***a* connected between the rod **38** and the top of the machine causes the cam-follower on the yoke-block **37** to track the cam **36** and which also allows the tipper block to yield during downward movement if there should be any jamming at the wheel.

As also seen in FIGS. 4 and 4A a normally-stationary but laterally-adjustable guide fence **43** stands between the end face of the pick-up wheel **25** and the fronts of the conveyor chucks **21** for regulating the size of the receiving pocket in the chucks and also for preventing the standing cartridges from leaning against the wheel during their indexing movements.

As above indicated the cartridges, now upstanding in the chucks, move intermittently along an underlying track **21***a* to the gassing and filling stations where they become clamped by the rail **22** and pressure shoes **23** and are centered and gassed two-at-a-time. (Gassing may be omitted if the package product will tolerate air in the cartridges.) After gassing, that pair of cartridges are moved into the filling station #5 where they are detected, centered, and filled in a known manner (see for example the filling structure in Patent No. 2,749,688 issued June 12, 1956, to Frank J. Cozzoli and No. 2,827,997 issued Mar. 25, 1958, to the same inventor). In the present machine we use and actuate two sets of detectors and centering fingers, and filling units in the same manner as the single units shown in the aforementioned patents.

After filling, the cartridges are moved through a cap-pick-up station #6 and each picks up a cap from the spring fingers **45** at the delivery end of the chute **46**. The chute **46** extends rearwardly and upwardly to a bowl feeder **47** which may be of the vibratory type that continuously supplies the chute with caps properly oriented as to position for proper pick-up. The feeder operation is individually controlled as previously mentioned. FIG. 6 illustrates in greater detail the picking up action and it is believed self-explanatory. Each of the pair of cartridges picks up its cap as it indexes into a preliminary pinching head **50** at station #7. The pinching head comprises, essentially, a vertically movable carrier **51**, carried by the spinning assembly, that pivotally supports a tunnel-like block **52**. Ledges **52***a* formed within the tunnel, press downwardly on the tops of the caps on two standing cartridges. The block **52** also carries a pair of opposed pinch blades **53** that cyclically are caused to move inwardly against the cap skirts and pinch opposite sides thereof against the cartridge necks. The pinch blades **53** are mounted to pivoted levers **54** that are spring-loaded to open position. The upper ends of the levers carry rollers that ride the surface of an endwise-movable cone **55**. The cone is actuated by an air cylinder **56** and lever **57** and is timed with the machine to effect the pinch operation during the dwell period of the cartridges at that station after the pinching head has moved down and has applied a yielding equalizing pressure on the cap tops.

After pinching the caps, the pinch fingers are caused to open, the head **51** lifts away and the pair of cartridges are indexed to the spin-sealing stations 8 and 8A. In this embodiment of the invention the spinning heads **60**, of which there are two, are spaced apart a distance equal to four conveyor-chuck spaces. Accordingly, the lead cartridge of the pair leaving the pinch station will skip the first spinning head at station #8 and the second cartridge of that pair will come to a stop in axial alignment with the spinning head at station #8. On the next index movement the aforesaid lead cartridge will move and come to a stop under the second spinning head at station #8A. The second or trailing cartridge that was acted upon at station #8 will be missed at station #8A. With a full complement of cartridges in the pockets of the conveyor, a cartridge and cap to be spin-sealed will be positioned under each spinning head on each operating cycle and two cartridges with their caps finished-sealed will move out of the spinning stations on each index. The pressure shoes **23** in the front guide rail terminates just past the second spin-seal station 8A and thereafter cartridges stand loosely in the chucks of the conveyor. In this loose state they are indexed to the end of the underlying supporting track and drop through a hole **80** in the top plate into the delivery chute **19** positioned therebeneath (see FIG. 3). The chute leads to the front of the machine where the cartridges discharge two-at-a-time in horizontal position upon a suitable support, moving or stationary, that may be provided ready for individual inspection or other processing steps.

The spinning heads **60** are detachably connected to continuously rotating spindles **61** journaled in a housing **62** and belt driven by motor M2 located in the base of the machine. The housing is supported upon a vertically movable column **62***a* (FIG. 2) and is reciprocated vertically by means such as a continuously rotating cam (part of transmission B) in the base of the machine, driven by motor M1.

Referring to FIG. 8, each spinning head **60** is mounted as to have a limited axial float, herein indicated by the gap **63** between the axially movable drive spindle **61** and housing **62** and this allows for independent vertical movement to compensate for minor variations in cartridge height. In brief, each head **60** is constructed to revolve around a central non-rotating spindle **64** that carries at its lower end an adjustable cap-seating head **65** contoured at its end to fit the top of the particular cap. The cap-seating head **65** applies downward pressure on the cap and keeps it from rotating and from being dragged around by the pressure of the spinning rollers **66**. The spinning rollers, preferably three in each head, are journaled at the lower ends of levers **67** pivotally mounted in each spinning head body. The upper ends of the levers **67** carry anti-friction rollers that ride the surface of an axially shiftable cone **68**. Each cone is shifted axially by means of a yoke lever **69** that is connected to and responds to the action of an air cylinder **70**. The air cylinder is controlled by a cam-actuated valve in the base of the machine,

the cam being driven continuously and in timed relation with the required operational cycle, as follows: the cartridges are indexed into the spin-sealing stations, the spinning heads **60** lower together and settle on the caps of their respective cartridges, after which the air cylinders **70** are actuated to bring the revolving spinning rollers **66** radially into engagement with the skirts of the caps. Continued inward movement of the revolving rollers **66** causes a rolling-in of the cap skirt neatly under the lip at the neck of the cartridge to form the finished seal. By appropriately controlling the air pressure to cylinder **70**, the degree of down pressure applied to the cap of the cartridge may be controlled as well as the radial pressure on the rolled-in portion of the cap skirt. The relation of the down pressure to radial pressure is in part a function of the angle of the cone **68** and the line pressure, and as modified by the axial float provided at the point **63** of each drive spindle.

The foregoing presupposes a machine set-up for processing cartridges of a particular dimension as to height and diameter. Cartridges of a different height may be processed by shifting the gauge finger **24***d* at the feed hopper laterally to suit the length of the cartridge, and by raising and lowering the filling needles and centering devices at stations #4 and #5; the cap chute and bowl feeder at station #6; and the drive housing that carries the pinching head and spinning heads on its supporting columns at stations #7, 8 and 8A. If a different diameter cartridge is to be run, the fence **43** and guide rail **22** are adjusted laterally, as well as the filling needles and centering devices at stations #4 and #5, the cap chute and feeder mechanisms at station #6 and the drive housing at stations #8 and 8A so that these components may function properly with relation to the changed centerline of the new cartridges confined in the V-pockets of the conveyor.

Without further analysis, the foregoing will so fully reveal the gist of this invention that others can, by applying current knowledge, readily adapt it for various utilizations by retaining one or more of the features that, from the standpoint of the prior art, fairly constitute essential characteristics of either the generic or specific aspects of this invention and, therefore, such adaptations should be, and are intended to be, comprehended within the meaning and range of equivalency of the following claims.

Having thus revealed this invention, we claim as new and desire to secure the following combinations and elements or equivalents thereof, by Letters Patent of the United States:

**1.** Apparatus for orienting cylindrical cartridges from a horizontal position to a vertical position comprising a feed hopper adapted to contain a quantity of cartridges in contiguous relation and in horizontal position, said hopper having a downwardly slanted bottom wall leading to a discharge opening, a pick-up wheel positioned with a portion of its periphery adjacent the hopper opening and rotatable on an axis parallel to the axis of the cartridges in the hopper, said wheel having spaced notches in its periphery paralleling its axis, means mounting the pick-up wheel so that said portion of the wheel closes the discharge opening in the hopper and whereby cartridges within the hopper are caused to lie against the wheel, means for rotating the wheel in a direction to cause individual cartridges to fall into the respective notches and to be drawn from beneath the mass inside the hopper to an elevated position outside the hopper, said wheel lying in a plane relative to the horizontal position of the cartridge in the hopper such that one end of the cartridges entrained in the notches of the wheel project unsupported from one end face of the wheel, means for stopping wheel rotation when at least one of the entrained cartridges reaches said elevated position, a tipper block mounted for vertical movement adjacent the said end of the wheel, said tipper block having a ledge portion overlying the projecting end of the cartridge when the latter is in said elevated position, and means for actuating said block in a downward direction when said wheel is stopped to cause the ledge therein to engage the projecting end of the cartridge and tip it to a vertical position out of the horizontal notch in the wheel so that it may fall in a vertical position across the end of the wheel.

**2.** The combination of claim **1** including a receptacle underlying the tipper block and adjacent the said end face of the wheel for receiving the falling cartridge.

**3.** The combination of claim **1** in which the wheel and tipper block movements are intermittent and repetitious and their timing coordinated to remove cartridges from the hopper and orient them successively to vertical position.

**4.** The combination of claim **1** in which the tipper block has a vertical groove formed therein aligned with the notch in the wheel when the latter is in said elevated position and in which the tipper block functions on its downward movement to transfer the cartridge from the horizontal notch in the wheel to the vertical groove in the tipper block.

**5.** The combination of claim **1** in which two cartridges entrained in the wheel notches are brought to an elevated position, and in which the tipper block is formed with two vertical grooves each aligned with one of the cartridges which function on the downward movement of the block to transfer two cartridges from the grooves in the wheel to the grooves in the block, and in which two receptacles underlie the tipper block and aligned with the grooves thereof to receive the cartridges as they are tipped two-at-a-time from horizontal to vertical position by the downward movement of the tipper block.

**6.** A machine for orienting, filling, capping, and spin-sealing cartridges brought to the machine in bulk lots horizontally disposed comprising:

(A) a feed hopper for storing a quantity of cartridges in horizontal position,

(B) an endless conveyor composed of a series of chucks adapted to hold the cartridges vertically and to move them through the processing stations to an exit chute,

(C) cartridge orienting and conveyor loading means for removing cartridges singly from the hopper in horizontal position and for placing them vertically in the respective conveyor chucks,

(D) a filling station and means thereat for filling the cartridges with a product,

(E) a capping station whereat caps adapted to be spin-sealed to the cartridges are applied to the cartridges,

(F) a pinching station and means thereat for pinching the caps to retain them on the cartridges,

(G) a spin-sealing station and means thereat to form a finished seal of the caps on the cartridges by rolling in the lower skirt portion of the caps about the necks of the cartridges,

(H) and means for moving the conveyor and the orienting and loading means intermittently whereby to effectuate automatic loading of the conveyor with cartridges and the transporting thereof through the said processing stations.

**7.** The combination of claim **6** in which the means at the spin-sealing station is mounted for vertical movement, and means provided for effecting said vertical movement cyclically and in timed relation with the movement of the conveyor.

**8.** A machine for orienting, filling, capping, and spin-sealing cartridges brought to the machine in bulk lots horizontally disposed comprising:

(A) a feed hopper for storing a quantity of cartridges in horizontal position,

(B) an endless conveyor composed of a series of chucks adapted to hold the cartridges vertically and to move them through the processing stations to an exit chute,

(C) cartridge orienting and conveyor loading means for removing cartridges two-at-a-time from the hopper in horizontal position and for placing them ver-

tically two-at-a-time in the respective conveyor chucks,

(D) a filling station and means thereat for filling the cartridges two-at-a-time with a product,

(E) a capping station whereat caps adapted to be spin-sealed to the cartridges are applied to the cartridges,

(F) a pinching station and means thereat for pinching the caps two-at-a-time to retain them on the cartridges,

(G) a spin-sealing station and means thereat to form a finished seal of the caps on the cartridges two-at-a-time by rolling in the lower skirt portion of the caps at the necks of the cartridges,

(H) and means for moving the conveyor and the orienting and loading means intermittently two-at-a-time whereby to effectuate automatic loading of the conveyor with cartridges and the transporting thereof through the said processing stations.

**9.** The combination of claim **8** in which the means for spin-sealing the caps on the cartridges comprise two rotatable spinning heads, each mounted for limited axial float operative automatically to compensate for variations in the nominal height of the two cartridges being spin-sealed on any one cycle.

**10.** The combination of **8** in which the means at the pinching station for pinching the caps two-at-a-time includes a carrier member mounted for limited pivotal movement about a horizontal axis lying between the two capped cartridges that are to be pinched so that compensation is automatically made for variations in the nominal height of the two capped cartridges to be pinched on any one cycle.

**11.** In a machine of the character described the combination of:

(A) a feed hopper adapted to contain a quantity of cartridges in horizontally disposed position,

(B) an intermittently moveable pick-up wheel mounted on a horizontal axis and having axially extending grooves in its periphery a portion of which extends within the hopper in engagement with the cartridges so that individual cartridges may find their way into the individual grooves of the wheel and intermittently moved thereby to an elevated position outside the hopper, said wheel lying in a plane slightly to one side of the hopper so that the cartridges entrained in the wheel extend beyond one end face of the wheel,

(C) an intermittently moveable tipper device positioned above and beyond the said one end face of the wheel adapted when actuated and when the wheel is stopped with entrained cartridges in said elevated position



to engage the tops of the extending portions of the cartridges and on downward movement of the device to tip the cartridges out of the wheel grooves and into vertical position said device having parallel vertically disposed grooves facing the said end face of the wheel for receiving the cartridges as they are tipped up into vertical position out of the grooves in the wheel and for guiding the downward fall of the cartridges across the said end face of the wheel,

(D) a conveyor means adjacent said end face of the wheel including a series of cartridge-receiving chucks positioned under the tipping device and intermittently moved thereby to an elevated position outside the hopper, so as to catch the cartridges after they are up-ended,

(E) and means to actuate the pick-up wheel, the tipping device and the conveyor intermittently in a manner such that the wheel and conveyor move during the dwell period of the tipping device, and the tipping device moves and tips the cartridges from horizontal to vertical position during the dwell periods of the wheel and of the conveyor.

**12.** The combination of claim **11** in which the tipping device includes means for limiting the extent the cartridges project beyond the end face of the wheel and in which the feed hopper includes a gauge piece for guiding the cartridges in an endwise direction toward said limiting means of the tipping device.

**13.** The combination of claim **11** in which the conveyor receptacles comprise a series of vertically disposed, open-sided, V-shaped openings in blocks secured to a chain and in which the open sides thereof are effectively closed by an opposed relatively stationary fence means thus forming individual triangular shaped pockets for the individual cartridges.

**14.** The combination of claim **13** in which the fence means beginning at a zone beyond, in the direction of travel of the conveyor, the zone at which the chucks receive the cartridges, is constructed to apply a yielding pressure to the cartridges whereby to clamp them to their respective chucks.

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