United States Patent

Shields

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[54] **CONVEYING VIALS IN A STRAIGHT PATH**

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[52] **U.S. Cl.** **198/106**

[51] **Int. Cl.** **B65g 37/00**

[58] **Field of Search** 198/106, 24

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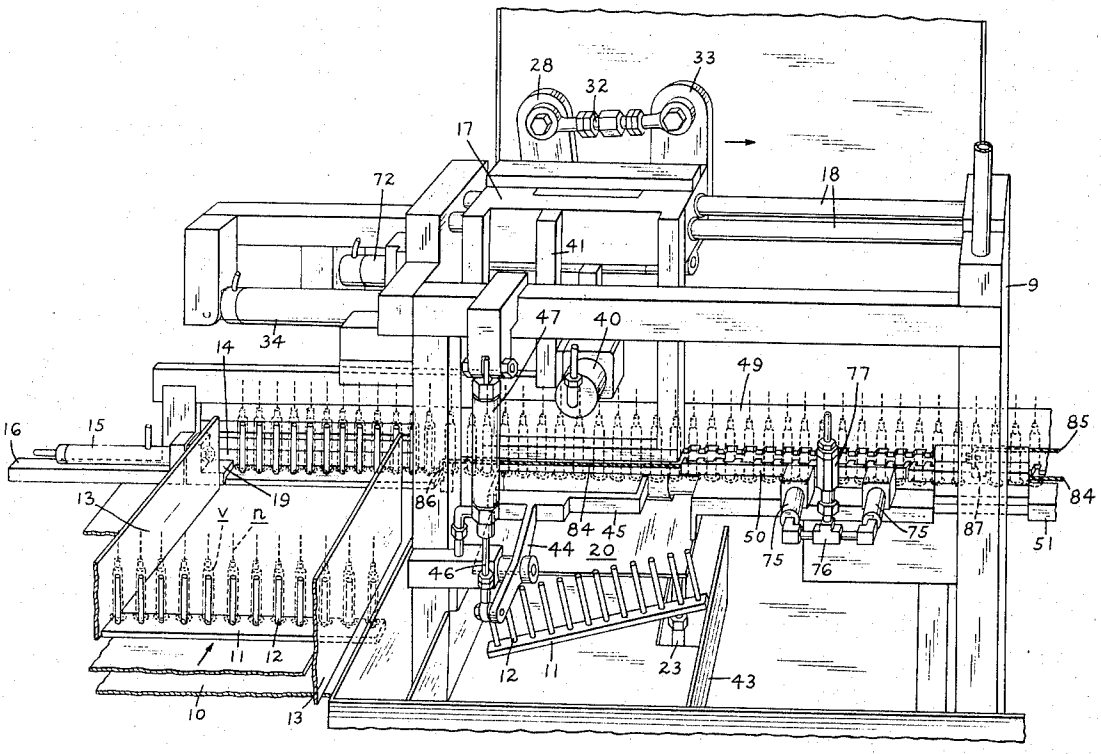
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[57] **ABSTRACT**

A predetermined number of vials are supported by a carrier and the carriers are delivered to a path of conveyance and while in the path of conveyance, the vials are removed from the carrier by removing the carrier from the path of conveyance while retaining the vials against vertical movement. After the removal of the vials from the carrier the vials are advanced by the retaining means to a walking beam mechanism including a member actuated in a delayed or omitted sequence to advance the vials in predetermined numbers less than the number originally on the carrier.

13 Claims, 10 Drawing Figures



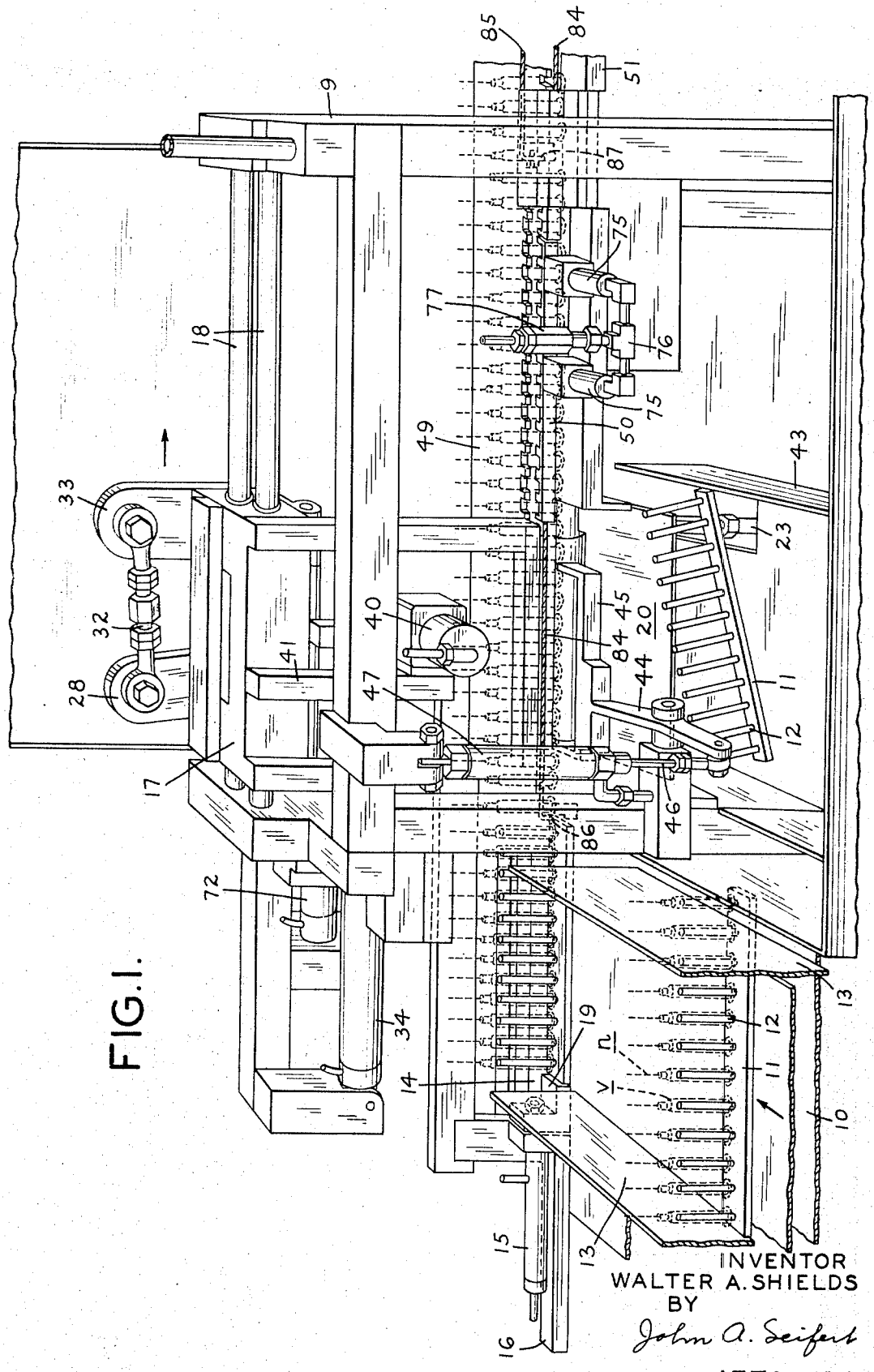


FIG. 1.

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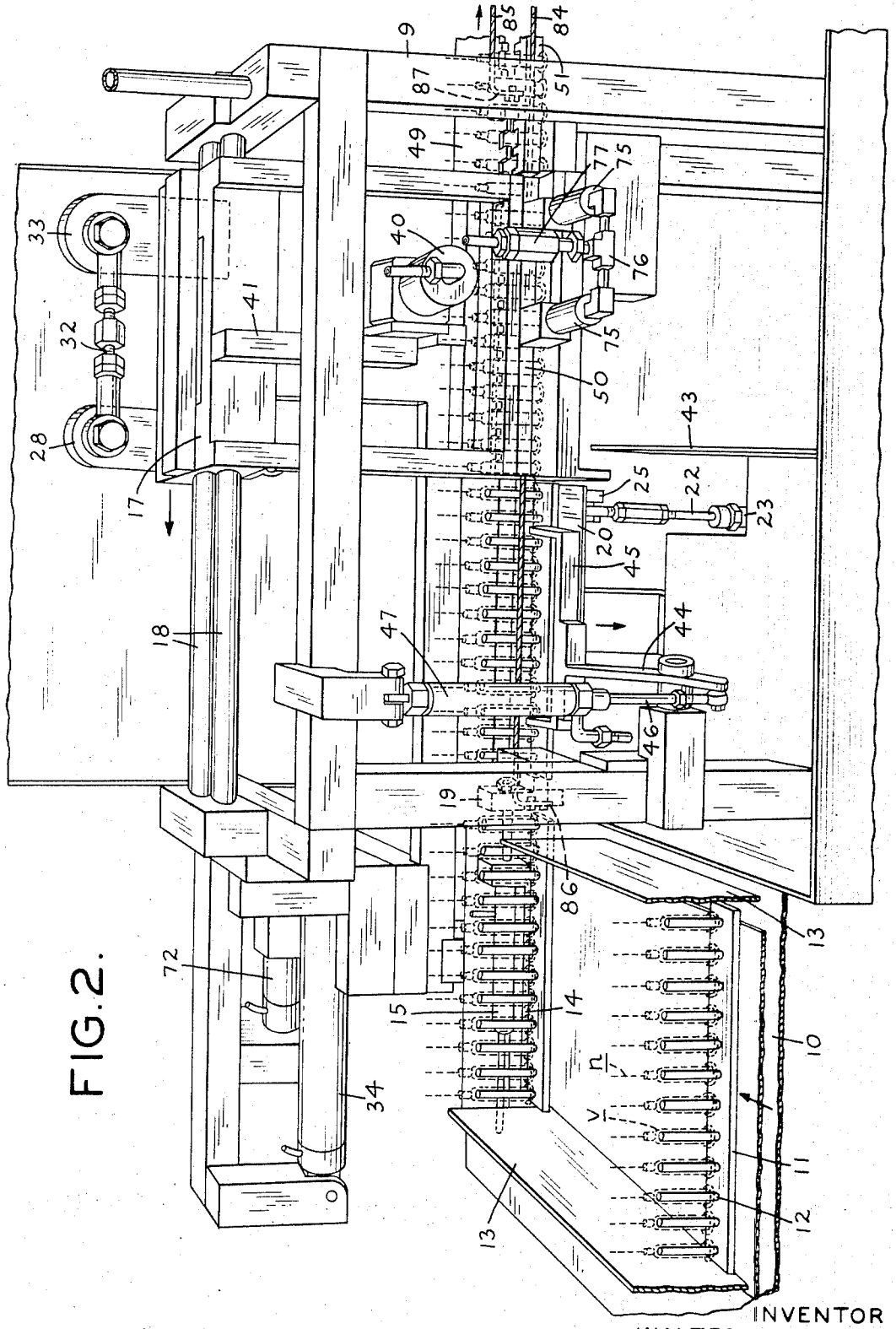


FIG. 2.

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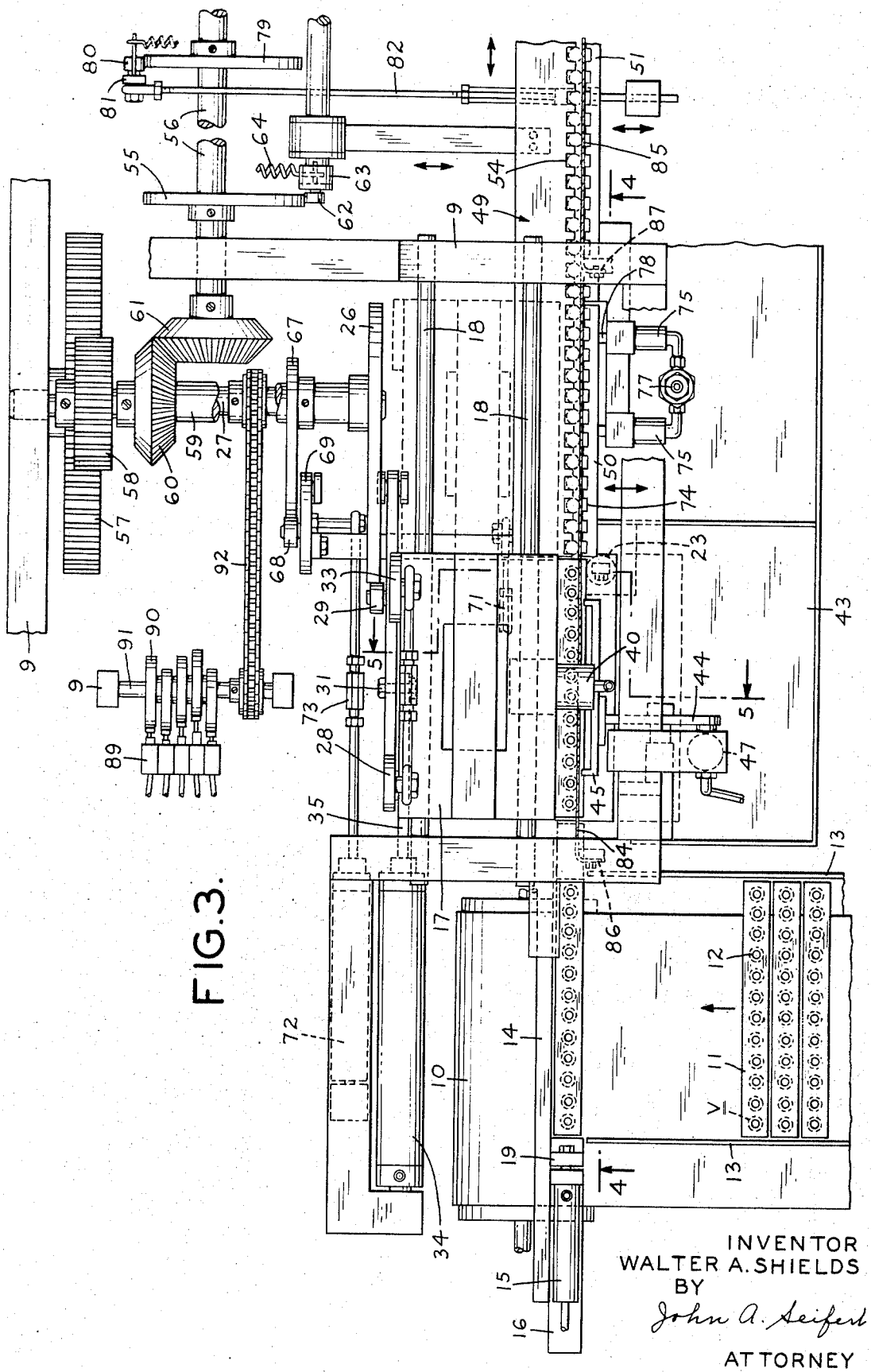


FIG. 3.

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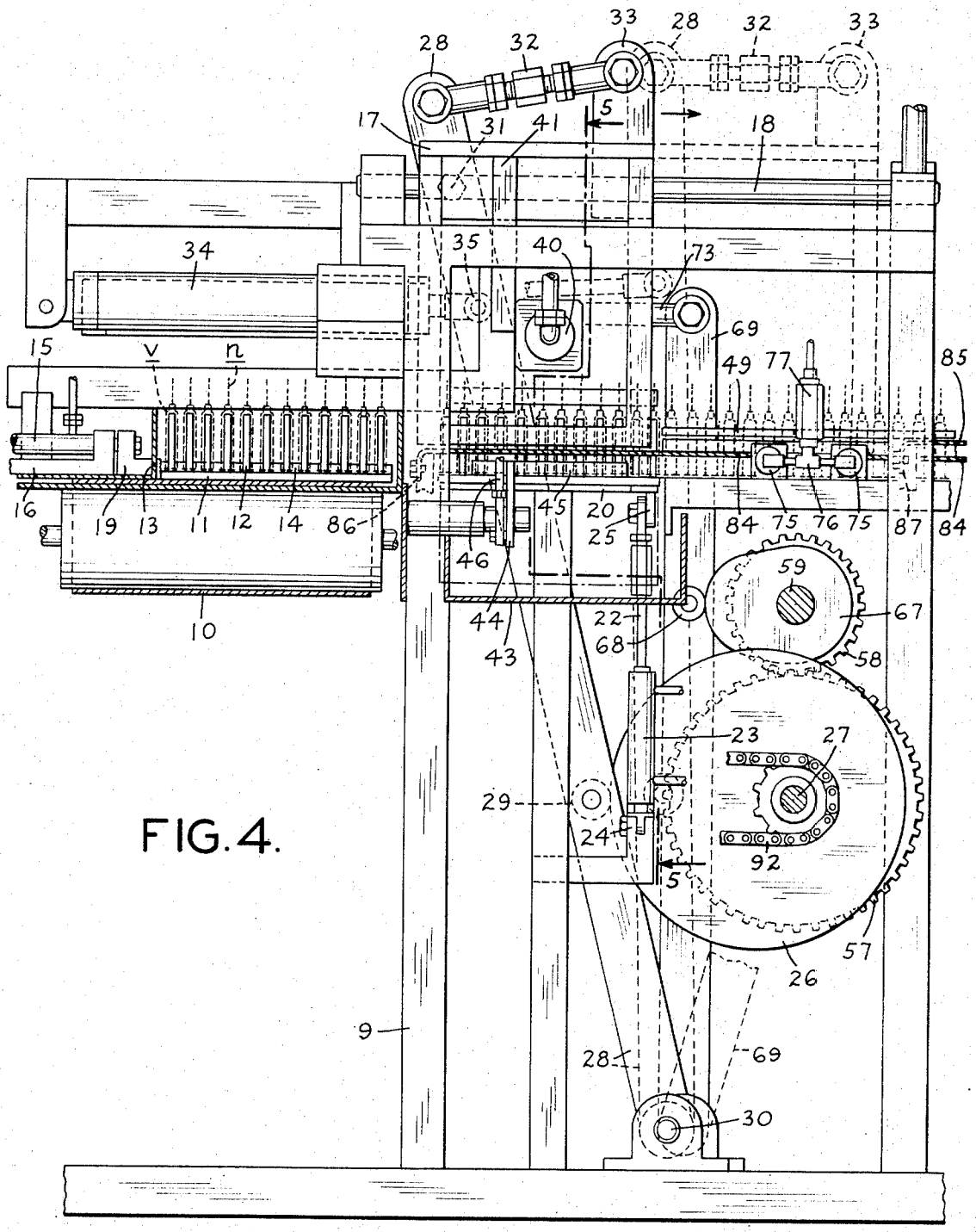
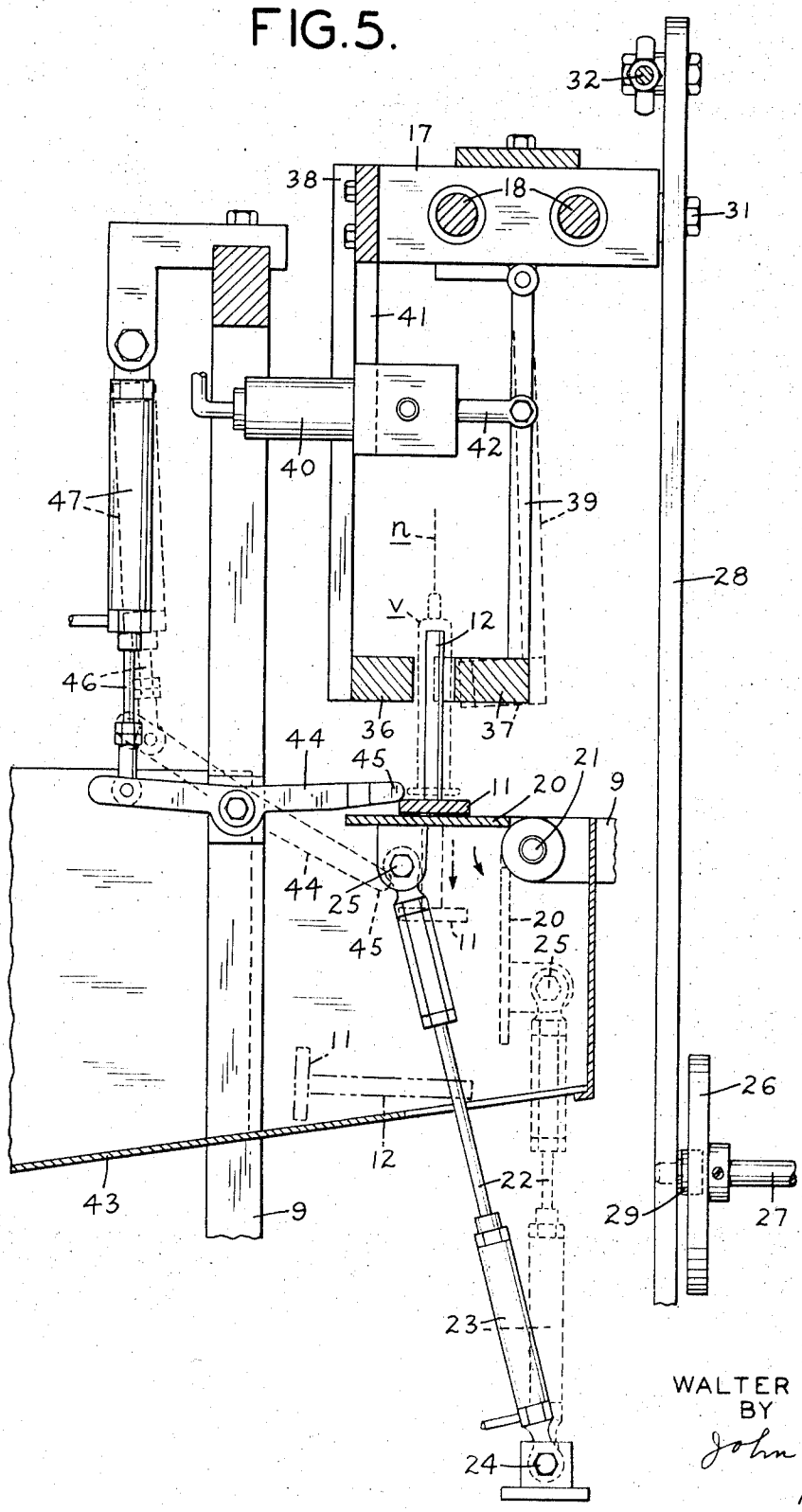


FIG. 4.

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FIG.5.



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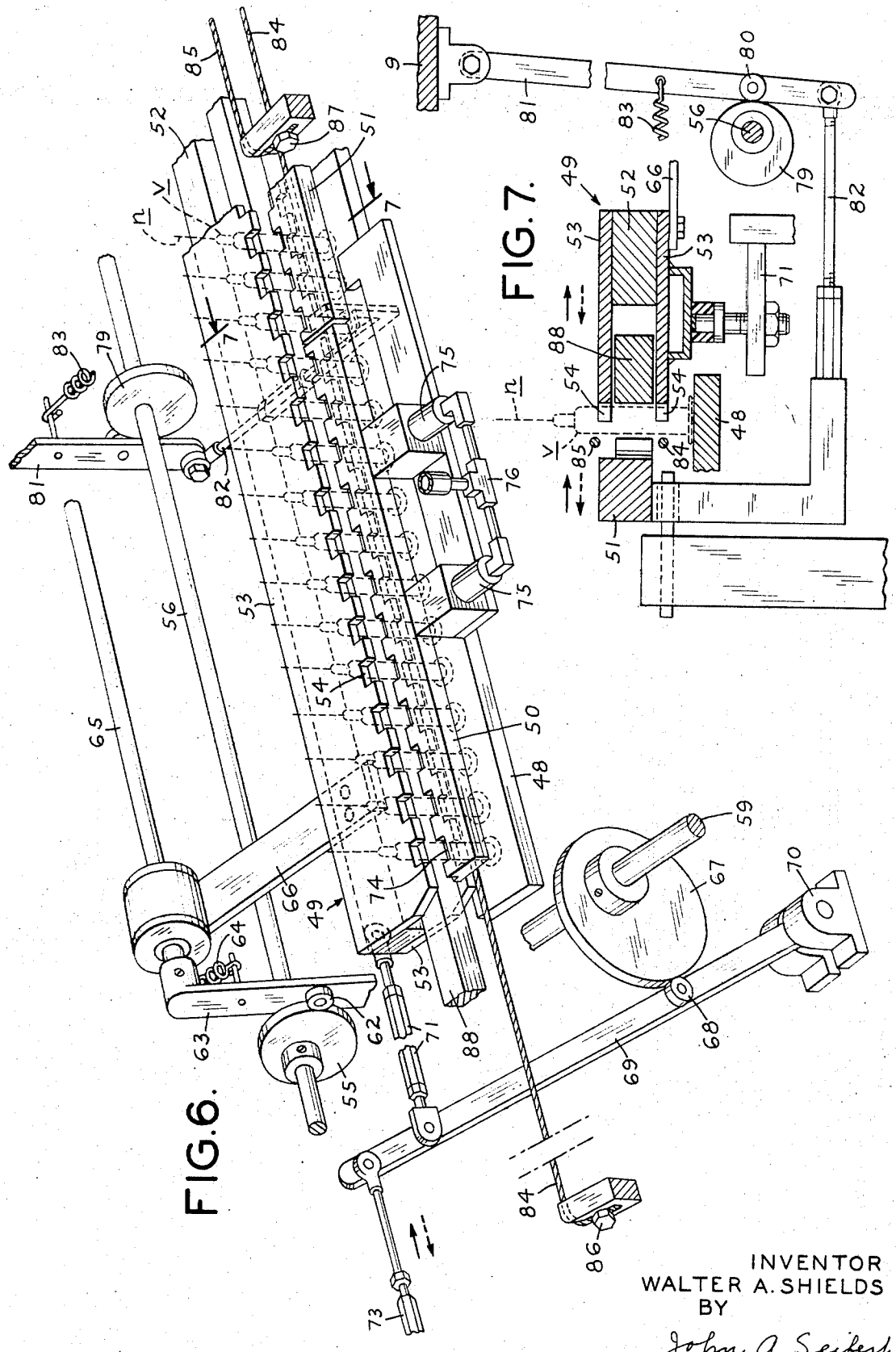
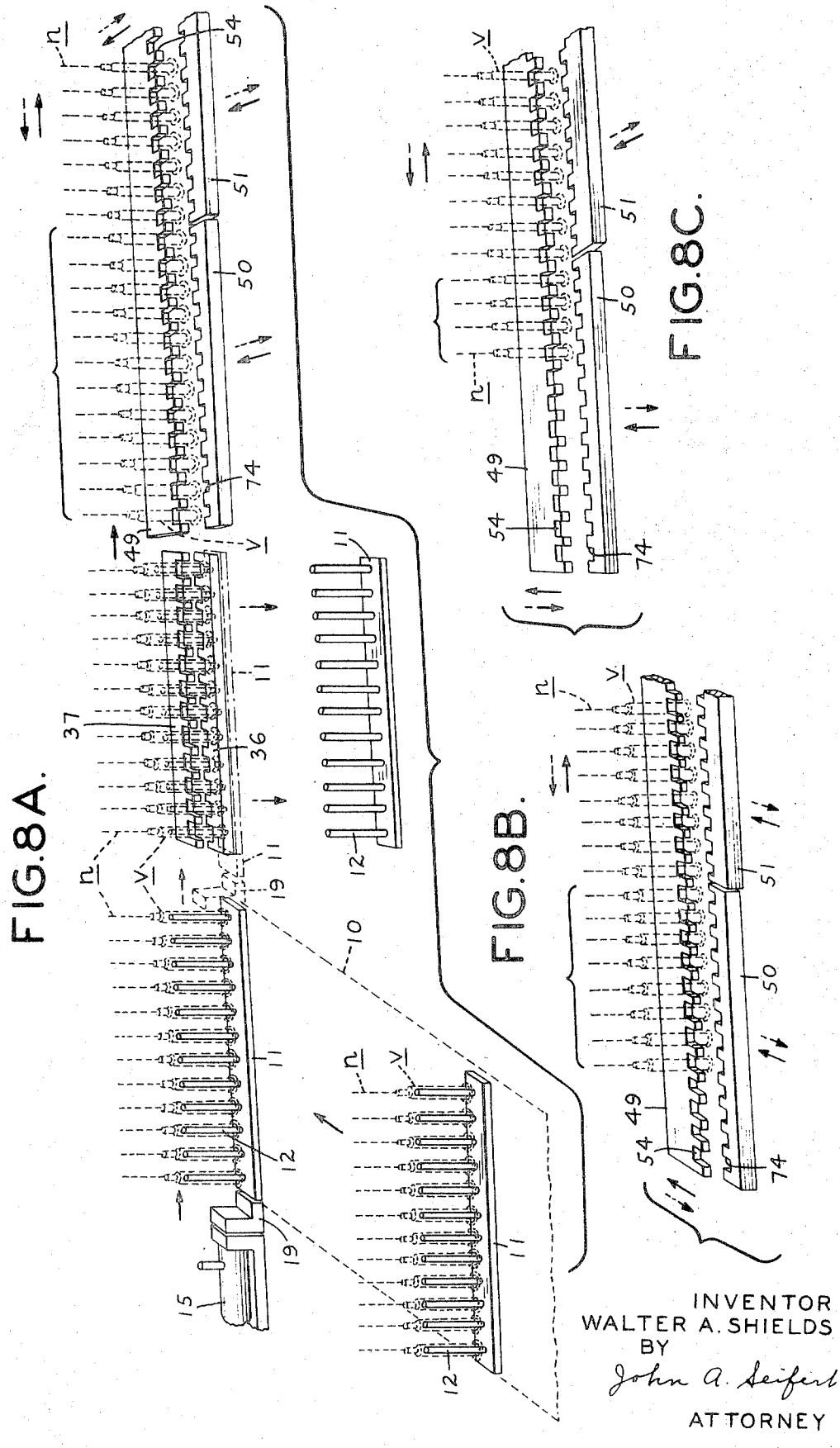


FIG. 6.

FIG. 7.

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FIG.8A.
FIG.8B.
FIG.8C.
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CONVEYING VIALS IN A STRAIGHT PATH

This invention relates to apparatus for conveying vials in a straight path to devices for applying a sheath on the hypodermic needles mounted in the vials, brushing washing vials with a liquid flush and inserting a lubricating plunger into the filler end of the vials. The devices are arranged to operate on predetermined number of vials at the same time and in the present illustration of the invention the number is four. To provide a steady and uniform supply of vials to said devices, twelve vials are simultaneously delivered to the path of conveyance by supporting said twelve vials on a carrier and placing the carriers on an endless belt conveyor which successively presents the carriers to a stop which positions the foremost carrier in alignment with a pneumatically operated piston to advance the carrier a predetermined fraction of an inch in the path of conveyance. The vials on the slightly advanced carrier are fully removed from the conveyor belt onto a pivotally mounted platform pneumatically actuated from a horizontal to a vertical position to permit the carrier to drop from the vials while the vials are retained against vertical movement by gripping jaws movable as a unit with the pneumatically operated piston. A pneumatically actuated kicker is provided to assure the removal of the carrier from the vials. The gripping jaws and the piston are further advanced along the path of conveyance to position the vials onto a stationary platform and relative to a walking beam co-operating with two rails. The walking beam is reciprocated toward and away from the vials on the stationary platform and longitudinally of the path of conveyance so that when the walking beam is out of engagement with the vials it is moved in a retrograde direction and when the walking beam is engaging the vials it is moved in an advancing direction. The first rail co-operating with the walking beam is arranged to engage the vials delivered by the gripping jaws, that is twelve vials originally supported by the carrier and is reciprocated simultaneously with the walking beam toward and away from the vials on the stationary platform for three consecutive times and is retained against movement on each fourth reciprocation of the walking beam toward and away from the vials on the stationary platform. The second rail will continuously reciprocate toward and away from the vials on the stationary platform in synchronism with the walking beam. The walking beam and the second rail will continue to intermittently move the vials relative to the assembling devices. The non-movement of the first rail on every fourth reciprocatory movements of the walking beam and the second rail will produce the advancement of the original twelve vials delivered by the gripping jaws to the walking beam and the first rail in groups of four vials and assure that the first rail will be empty and ready to receive 12 more vials from the gripping jaws.

In the accompanying drawings:

FIG. 1 is a front perspective view of the apparatus including delivery of vials on the carrier to the path of conveyance, the disposal of the carrier and the first rail associated with the walking beam;

FIG. 2 is a view similar to FIG. 1 showing the positioning of the vials relative to the first rail and the walking beam;

FIG. 3 is a top plan view of the apparatus and showing timing devices for controlling the operation of the

apparatus and the actuating means for the gripping of the vials and for the walking beam and the two rails;

FIG. 4 is a sectional view taken on the line 4—4 of FIG. 3 looking in the direction of the arrows;

FIG. 5 is a sectional view taken on the line 5—5 of FIG. 3 looking in the direction of the arrows;

FIG. 6 is a perspective view of the walking beam, its associated rails and actuating means therefor;

FIG. 7 is a sectional view taken on the line 7—7 of FIG. 6 looking in the direction of the arrows;

FIG. 8A is an exploded perspective view of the operations of the apparatus;

FIG. 8B is a perspective view of the result of the first reciprocations of the walking beam and the second rail with the first rail retained against movement during the fourth reciprocation;

FIG. 8C is a view similar to FIG. 8B showing the result of the second fourth reciprocations of the walking beam and the second rail while the first rail is idle.

In carrying out the invention, there is provided a frame 9, as shown in FIG. 4, arranged to support an endless belt conveyor 10 continueously rotated from a source of power, not shown, to deliver to the apparatus a predetermined number of vials *v* having a hypodermic needle *n* secured in the upper end. Said vials *v* are supported by a carrier comprising a plate 11 provided with equidistantly spaced pins 12 projecting from the upper face of the plate. The vials *v* are positioned on the pins 12 with the hypodermic needles *n* uppermost. In the present illustration, each plate 11 is provided with twelve pins 12. The carriers 11, 12 are restricted on the conveyor belt 10 in a single stack formation by guide walls 13 supported by the frame 9.

The forward movement of the plates 11 is arrested by a stop in the form of a bar 14 extending transversely of the upper stretch of the conveyor belt 10 and supported by the frame 9.

The carrier 11, 12 abutting the bar 14 is initially moved a fraction of an inch by a piston of an air cylinder 15 mounted on a beam 16 suspended from a carriage 17 slidable on rods 18 supported by the frame 9 above the path of conveyance. The cylinder 15 is connected to a supply of air controlled in a manner to be hereinafter described. The piston of the air cylinder 15 is provided with a head 19 to abut the carrier plate 11 and an increase in the air pressure in the cylinder 15 will initially move the carrier 11, 12 and its vials *v* a fraction of an inch transversely of the conveyor belt 10.

The carrier 11, 12 and its vials *v* are completely removed from the conveyor belt 10 onto a platform 20 pivotally mounted at 21, FIG. 5, to a part of the frame 9. The platform 20 is adjustably positioned in a horizontal plane to receive the carrier plate 11 by a piston 22 of an air cylinder 23 pivotally mounted at 24 on the frame 9 and the projecting end of the piston 22 is pivotally connected to the bottom of the platform 20, as at 25 FIGS. 2, 4 and 5. The supply of air to the cylinder 23 is also regulated in a manner to be hereinafter described.

The carrier 11, 12 and its vials *v* are removed from the conveyor belt 10 with the head in extended position by the forward reciprocatory movement of the carriage 17 by a cam disc 26 secured on a drive shaft 27 rotatably supported by the frame 9 and driven by suitable motive power, not shown. The cam disc 26

reciprocates a lever **28** by engaging a roller **29** on an intermediate part of the lever **28**. The lever **28** is pivotally mounted at **30** on the frame **9** below the roller **29**, as shown in FIGS. **3** and **4**, and an intermediate portion of the lever **28** is pivotally connected to the carriage **17**, as at **31**. The upper end of the lever **28** above the carriage **17** is adjustably and pivotally anchored by a turnbuckle link **32** pivotally connected to the lever **28** and an ear **33** projected from the carriage **17**. The roller **29** is maintained in contact with the cam disc **26** by regulated pneumatic pressure in an air cylinder **34** pivotally supported by a part of the frame **9** and having a piston **35** pivotally connected to the lever **28** below the connection **31**, as shown in FIGS. **3** and **4**.

After the carrier plate **11** has been positioned on the platform **20**, the carriage **17** is reciprocated to its retrograde position with the air cylinder **15** in its initial position and the head **19** advanced to prevent the succeeding carrier **11**, **12** and its vials *v* from advancing into the path of travel of the beam **16**. The beam **16** will prevent the forward movement of the carrier **11**, **12** and their vials *v* on the conveyor belt **10** while the air cylinder **15** and the head **19** are in their advanced position and the initial carrier **11**, **12** and its vials *v* are on the platform **20**.

When there is a carrier **11**, **12** with its vials *v* on the platform **20**, and the carriage **17** is in its retrograde position, said vials are engaged by two gripping jaws **36**, **37**, the jaw **36** being fixedly suspended from the carriage **17** by hangers **38** and the jaws **37** pivotally suspended from the carriage **17** by an arm **39**. The jaws **36** and **37** are positioned just below the neck portions of the vails *v*, as shown in FIG. **5**, for a purpose to be hereinafter described. The jaw **37** is actuated toward and away from the jaw **36** by pneumatic means comprising an air cylinder **40** suspended from the carriage **17** by a bracket **41** and having a piston **42** pivotally connected to the arm **39**. The supply of air to the cylinder **40** is controlled in a manner to be hereinafter described. The air pressure in the cylinder **40** is decreased to move the jaw **37** toward the vials *v* to grip the vials v between the jaws **36**, **37**. While the vials *v* are gripped by the jaws **36**, **37**, the air pressure in the cylinder **23** is decreased to permit the platform **20** to drop to the vertical position shown in broken lines in FIG. **5**. Upon the dropping of the platform **20**, the carrier **11**, **12** will fall into a chute **43** supported by the frame **9** where it is recovered and used again. To assure the falling of the carrier **11**, **12** into the chute **43**, there is provided a kicker in the form of a lever **44** pivoted on the frame **9** and having a forked end **45** extending over the front edge portion of the carrier plate **11**. The other end of the lever **44** is pivotally connected to a piston **46** of an air cylinder **47** pivotally suspended from the frame **9**. The air pressure is increased in the air cylinder **47** simultaneously with the decrease in the air pressure in the cylinder **23**. The air pressure to the cylinder **47** is also controlled in a manner to be hereinafter described.

After the carrier **11**, **12** is removed from the vials *v* gripped between the jaws **36**, **37**, the carriage **17** is again advanced to position the vials *v* carried by the jaws **36**, **37** onto a platform **48** fixedly supported by the frame **9**. The platform **48** extends in a horizontal plane from a walking beam **49** and co-operating rails **50**, **51** to the operating devices. The walking beam **49** and the co-operating rails **50**, **51** extend in a horizontal plane above the platform **48** and below the horizontal plane of the jaws **36**, **37** so that the jaws **36**, **37** can position the vials *v* on the platform **48** and between the walking beam **49** and its co-operating rails **50**, **51** without interference. When the vials *v* are positioned on the platform **48** between the walking beam **49** and the rails **50**, **51** by the jaws **36**, **37**, the jaw **37** is moved away from the vials *v* by increasing the air pressure in the cylinder **40**. Upon the movement of the jaws **37** from the vials *v*, the carriage **17** is actuated to its retrograde position.

The walking beam **49** comprises a beam **52** and two horizontally spaced plates **53** extended from the opposite faces of the beam **49** and having recesses **54** in the free edges to engage spaced horizontal portions of the vials *v*, as shown in FIGS. **6** and **7**. Reciprocatory movement toward and away from the vials *v* is imparted to the walking beam **49** by cam discs **55**, only one being shown, secured on a shaft **56** rotatably supported by the frame **9** and continuously rotated from the drive shaft **27** through a gear **57** secured on a countershaft **59** rotatably supported by the frame **9** and having a bevel gear **60** fixed thereon and meshing with a bevel gear **61** secured on the shaft **56**, as shown in FIG. **3**. The cam discs **55** engage a roller **62** on levers **63**, only one lever being shown in FIGS. **3** and **6**, pivotally supported by the frame **9** and the roller **62** is yieldingly urged into engagement with the cam disc **55** by a spring **64**. The levers **63** are connected to each other by a rod **65** having straps **66**, only one strap being shown in FIGS. **3** and **6**, connected to the opposite end portions of the lower plate **53** of the walking beam **49**. Reciprocation is imparted to the walking beam **49** in a direction to advance the vials *v* on the platform **48** when the walking beam **49** is engaging the vials *v* and in a retrograde direction when the walking beam is disengaged from the vials *v*. This is accomplished by a cam disc **67** secured on the shaft **59** and engaging a roller **68** on a lever **69** pivotally supported by the frame **9**, as indicated at **70** in FIG. **6**, and connected by a turnbuckle link **71** to the walking beam **49**. The roller **68** is maintained in contact with the cam disc **67** by a regulated pneumatic pressure. This is accomplished by providing an air cylinder **72** having its piston connected by a turnbuckle link **73** to the upper part of the lever **69**, as shown in FIGS. **3** and **6**. The air cylinder **72** is supported by the frame **9** and connected to a source of pneumatic pressure, not shown, regulated to produce a predetermined pressure regardless of the position of the lever **69**.

The co-operating rail **50** is provided with recesses **74** of the same number as the number of vials *v* supported by the carrier **11**, **12** which in the present illustration is 12, to engage the vials simultaneously with the engagement of said vials by the walking beam **49** for three consecutive reciprocation of the walking beam **49** and the co-operating rail **50**, and during the fourth reciprocation of the walking beam **49**, the rail **50** is retained against reciprocation, so that the vials will be advanced by the walking beam a distance equal to four recesses **54** leaving the first four recesses **74** empty, as shown in FIG. **8B**. This is accomplished by a pair of air cylinders **75** connected to the same source of air pressure by a coupling **76** provided with a flow regulator **77** adjusted to shutoff the air pressure every fourth reciprocation of

the rail **50** toward the vials *v* on the platform **48**, as shown in FIGS. **1**,**2** and **3**. This interruption of every fourth reciprocation will finally clear the recesses **74** of vials *v* as shown in FIGS. **8B** and **8C**. The air cylinders **75** are provided with pistons connected to the rail **50**, as indicated at **78** in FIG. **3**.

The rail **51** is continuously reciprocated in synchronism with the walking beam **49** by a cam disc **79** secured on the shaft **56** and engaging a roller **80** on a lever **81** pivotally suspended from the frame **9** and connected by a link **82** to the rail **51**. The roller **80** is yieldingly urged into engagement with the cam disc **79** by a spring **83**. There are more than one cam discs **79** and lever **81**.

The vials *v* are retained in a row during their conveyance by the a pair of cables **84**, **85** extending in front of the vials, cable **84** being anchored at **86**, FIG. **4**, to extend transversely of the lower portions of the vials, as shown in FIGS. **1**, **2** and **4**, and the cable **85** being anchored at **87** in FIG. **4** to extend in a higher horizontal plane than the cable **84** and transversely of the higher portions of the vials *v*. The rear of the vials *v* are guided by a rail **88** fixedly supported by the frame **9** to extend between the walking beam plates **53**, as shown in FIGS. **6** and **7**.

The air pressure to the air cylinder **15**, **23**, **40**, **47** and **75** are regulated by individual solenoid switches **89** actuated by cam discs **90** secured on a shaft **91** supported by the frame **9** and driven through a sprocket chain **92** by the drive shaft **27**, as shown in FIG. **3**.

The operation of the apparatus is as follows: A plurality of carriers **11**, **12** with vials *v* are manually placed on the conveyor belt **10** and forward movement of said carriers **11**, **12** imparted thereto by the conveyor belt **10** is arrested by the bar **14**. The carrier **11**, **12** and the vials *v* are advanced along the bar **14** by an initial movement of the head **19** and the carriage **17** moving the cylinder **15**, beam **16** and head **19** transversely of the conveyor **10** to a pivoted platform or trapdoor **20** which is dropped or sprung after the vials *v* are retained against vertical movement by the jaws **36**, **37**. The springing of the platform **20** will permit the carrier **11**, **12** to drop to the chute **43** while the vials *v* are advanced by the carriage **17** while being held by the jaws **36**, **37**. The jaws **36**, **37** will present the vials to the walking beam **49** and the co-operating rails **50**, **51**. The walking beam **49** is actuated in a rectangular path while the rails **50**, **51** are reciprocated toward and away from walking beam **49** and the vials *v* on the platform **48**. The rail **50** is reciprocated three consecutive times and retained against movement every fourth time to permit advancement of the predetermined number of vials from the rail **50** by the walking beam until the rail **50** is empty to receive the vials *v* from a succeeding carrier **11**, **12** on the conveyor belt **10**.

Having thus described my invention, I claim:

1. In apparatus fro conveying vials in for straight path, first means arranged to support a plurality of spaced vials, second means to deliver said first means to the path of conveyance, third means reciprocating in the path of conveyance to move the first means form the second means into the path of conveyance, a platform pivotally supported in the path of conveyance to receive and support the first means, fourth means mounted above the platform and arranged to grip the vials on the first means supported by the platform and supported by the third means, fifth means to actuate the platform toward and away from the path of conveyance, said fourth means being moved by the reciprocation of the third means to advance the vials after the platform is actuated away from the path of conveyance and while the vials are engaged by the fourth means, and walking beam mechanism extending on opposite sides of the path of conveyance and in a different horizontal plane than the plane of the fourth means to receive the vials from the fourth means in its advanced position and having a member actuated in delayed sequence to advance the vials in predetermined numbers less than the number originally on the first means.

2. In apparatus for conveying vials in a straight path as claimed in claim **1**, a kicker pivotally mounted and actuated to move the first means in a downward direction during the actuation of the platform from the path of conveyance and after the gripping of the vials by the fourth means.

3. Apparatus for conveying vials in a straight path as claimed in claim **1**, wherein the first means comprises a plate provided with equidistantly spaced pins projecting from one face of the plate to vertically support the vials.

4. Apparatus for conveying vials in a straight path, as claimed in claim **1**, wherein the second means comprises an endless belt conveyor.

5. Apparatus for conveying vials in a straight path as claimed in claim **1**, wherein the second means comprises a carriage reciprocally mounted and actuated longitudinally of the path of conveyance, and an air actuated piston supported by the carriage to extend in the path of conveyance.

6. Apparatus for conveying vials in a straight path as claimed in claim **5**, wherein the piston is actuated to move the first means prior to the forward movement of the carriage.

7. Apparatus for conveying vials in a straight path as claimed in claim **5**, wherein the carriage in reciprocated by a lever having an intermediate portion pivotally connected to the carriage, one end pivotally anchored to the carriage and the opposite end pivotally mounted, a continuously rotating cam disc acting on another intermediate portion of the lever, and an air cylinder having a piston actuated by a regulated supply of air and pivotally connected to the lever to maintain positive action between the lever and the cam disc.

8. Apparatus for conveying vials in a straight path as claimed in claim **5**, wherein the fourth means comprises two mating jaws having corresponding recesses in the mating edges, one jaw being fixedly suspended from the carriage and the other jaw being pivotally suspended from the carriage.

9. In apparatus for conveying vials in a straight path as claimed in claim **8**, an air cylinder suspended from the carriage and having a piston pivotally connected to the pivotally suspended jaw to reciprocate said jaw toward and away from the fixed jaw in synchronism with the reciprocation of the carriage.

10. Apparatus for conveying vials in a straight path as claimed in claim **1**, wherein the fifth means comprises an air cylinder pivotally mounted below the path of conveyance and having a piston pivotally connected

to the platform whereby increased air pressure in the cylinder actuates the platform toward the path of conveyance and a decreased air pressure in the cylinder actuates the platform away from the path of conveyance.

11. Apparatus for conveying vials in a straight path as claimed in claim 1, wherein the walking beam mechanism comprises a pair of horizontally spaced plates having recesses in corresponding edges to engage the vials, cam actuated levers pivotally connected to the plates to impart reciprocatory movement to the plates toward and away from the path of conveyance, and a second cam actuated lever pivotally connected to the plates to impart reciprocatory movement to the plates parallelly of the path of conveyance.

12. Apparatus for conveying vials in a straight path as claimed in claim 11, wherein the member of the walking beam mechanism actuated in delayed sequence comprises two rails reciprocally mounted in opposed space relation to the walking beam plates, the first rail in the advancement of the vials having a predetermined number of recesses corresponding to the number of vials supported by the first means, and actuating means connected to said first rail and arranged to reciprocate said first rail toward the vials in synchronism with the walking beam plates for three consecutive times and on every fourth movement toward the vials the first rail is retained against such movement so that one third of the number of vials in the recesses in the first rail are advanced after each third movement of the first rail from the vials.

13. Apparatus for conveying vials in a straight path as claimed in claim 12, wherein the second rail is reciprocated regularly in synchronism with the walking beam plates toward and away from each other.

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