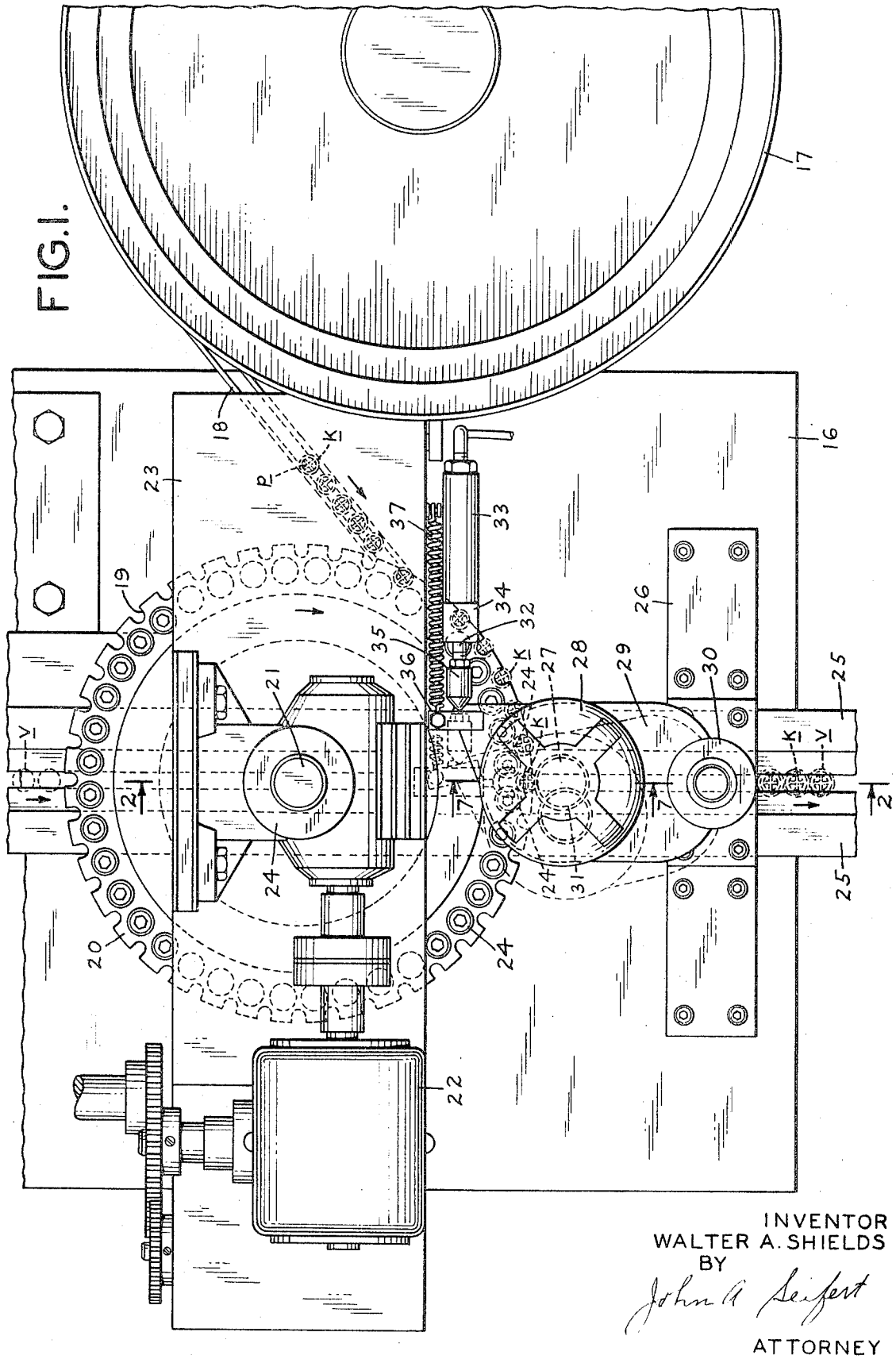
June 29, 1971 W. A. SHIELDS 3,588,985

APPARATUS FOR UNITING A PLUNGER AND A PISTON OF A FULLY ASSEMBLED HYPODERMIC NEEDLE SYRINGE

Filed Sept. 29, 1969 5 Sheets-Sheet 1

FIG. 1.



INVENTOR
WALTER A. SHIELDS
BY
John A Seifert
ATTORNEY

June 29, 1971 W. A. SHIELDS 3,588,985

APPARATUS FOR UNITING A PLUNGER AND A PISTON OF A FULLY ASSEMBLED HYPODERMIC NEEDLE SYRINGE

Filed Sept. 29, 1969 5 Sheets-Sheet 2

FIG.2.

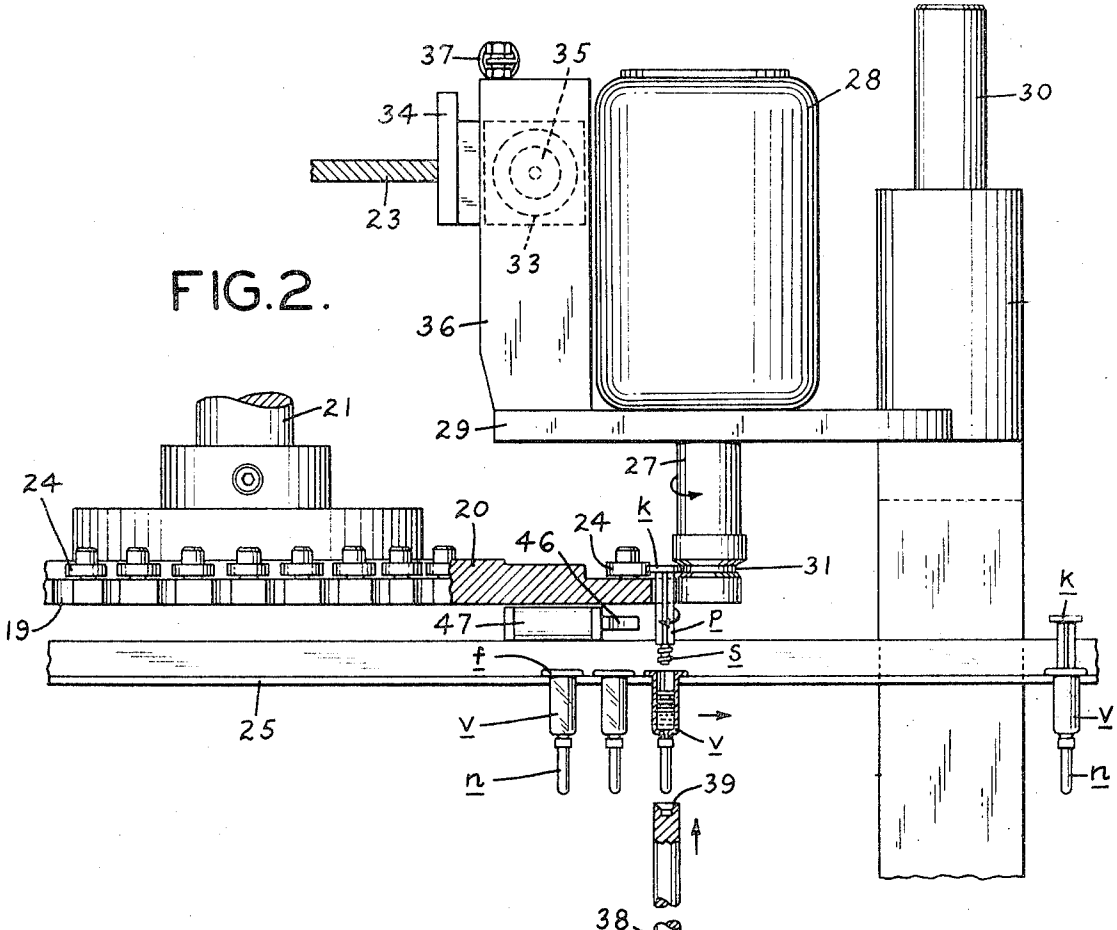
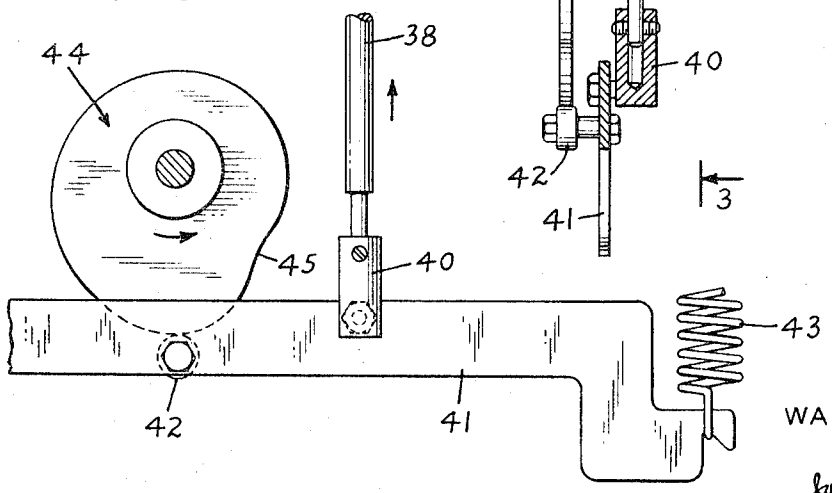


FIG.3.



INVENTOR
WALTER A. SHIELDS
BY
John A. Seifert
ATTORNEY

June 29, 1971 W. A. SHIELDS 3,588,985

APPARATUS FOR UNITING A PLUNGER AND A PISTON OF A FULLY ASSEMBLED HYPODERMIC NEEDLE SYRINGE

Filed Sept. 29, 1969 5 Sheets-Sheet 3

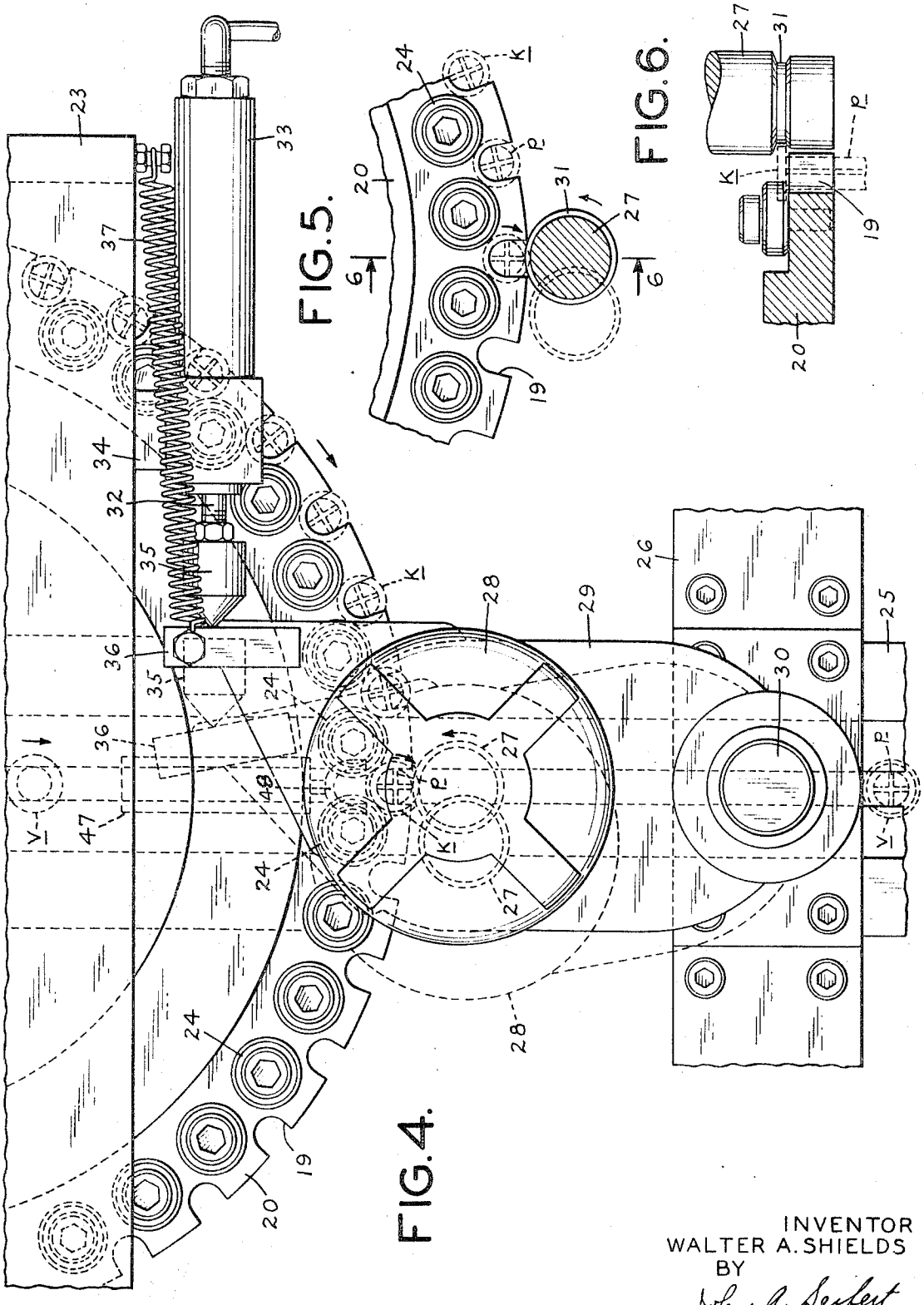


FIG. 4.

FIG. 5.

FIG. 6.

INVENTOR
WALTER A. SHIELDS
BY
John A. Seifert
ATTORNEY

June 29, 1971 W. A. SHIELDS 3,588,985

APPARATUS FOR UNITING A PLUNGER AND A PISTON OF A FULLY ASSEMBLED HYPODERMIC NEEDLE SYRINGE

Filed Sept. 29, 1969 5 Sheets-Sheet 4

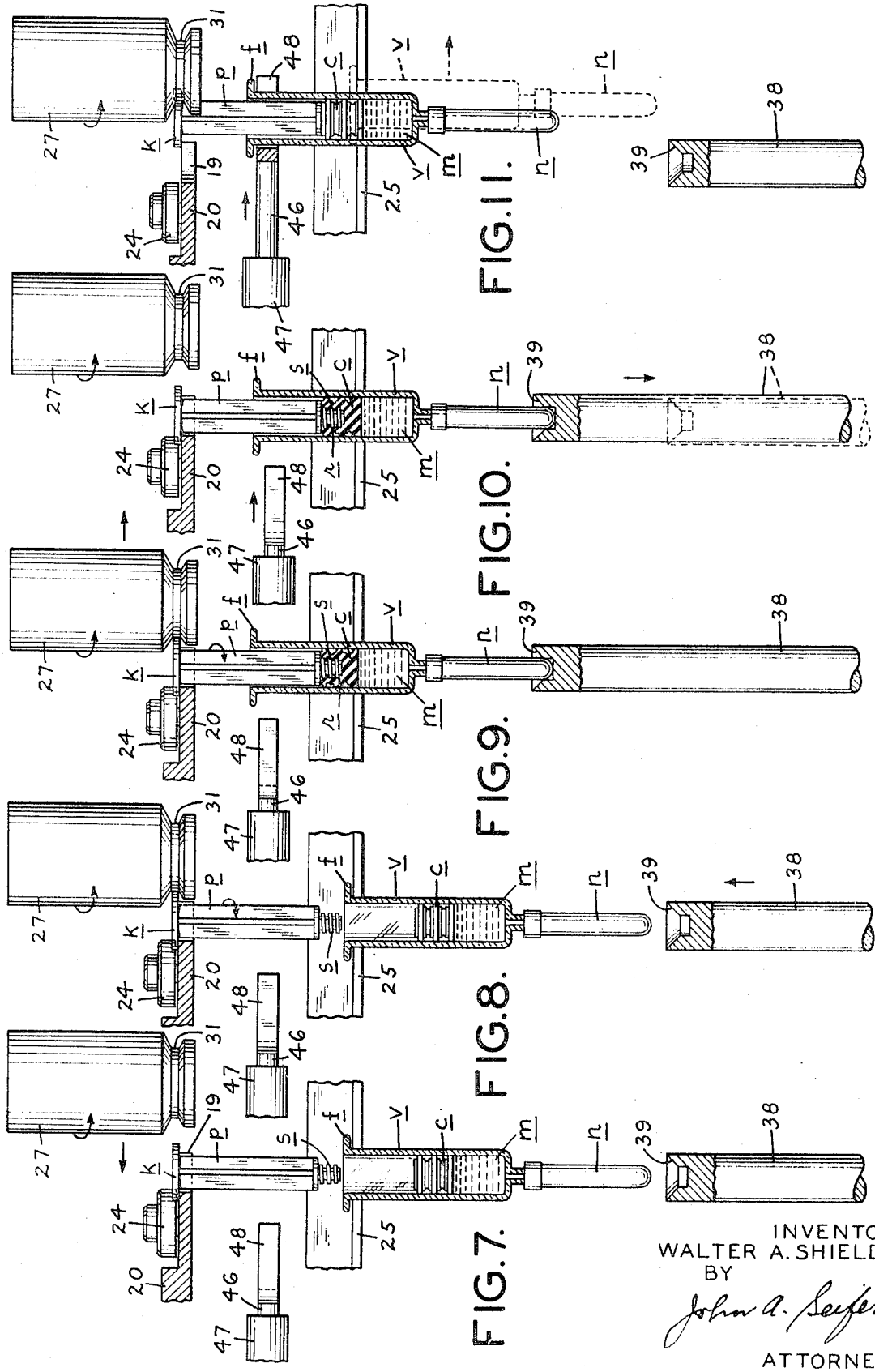


FIG. 11.

FIG. 10.

FIG. 9.

FIG. 8.

FIG. 7.

INVENTOR
WALTER A. SHIELDS
BY
John A. Seifert
ATTORNEY

June 29, 1971 W. A. SHIELDS 3,588,985

APPARATUS FOR UNITING A PLUNGER AND A PISTON OF A FULLY ASSEMBLED HYPODERMIC NEEDLE SYRINGE

Filed Sept. 29, 1969 5 Sheets-Sheet 5

FIG. 12.

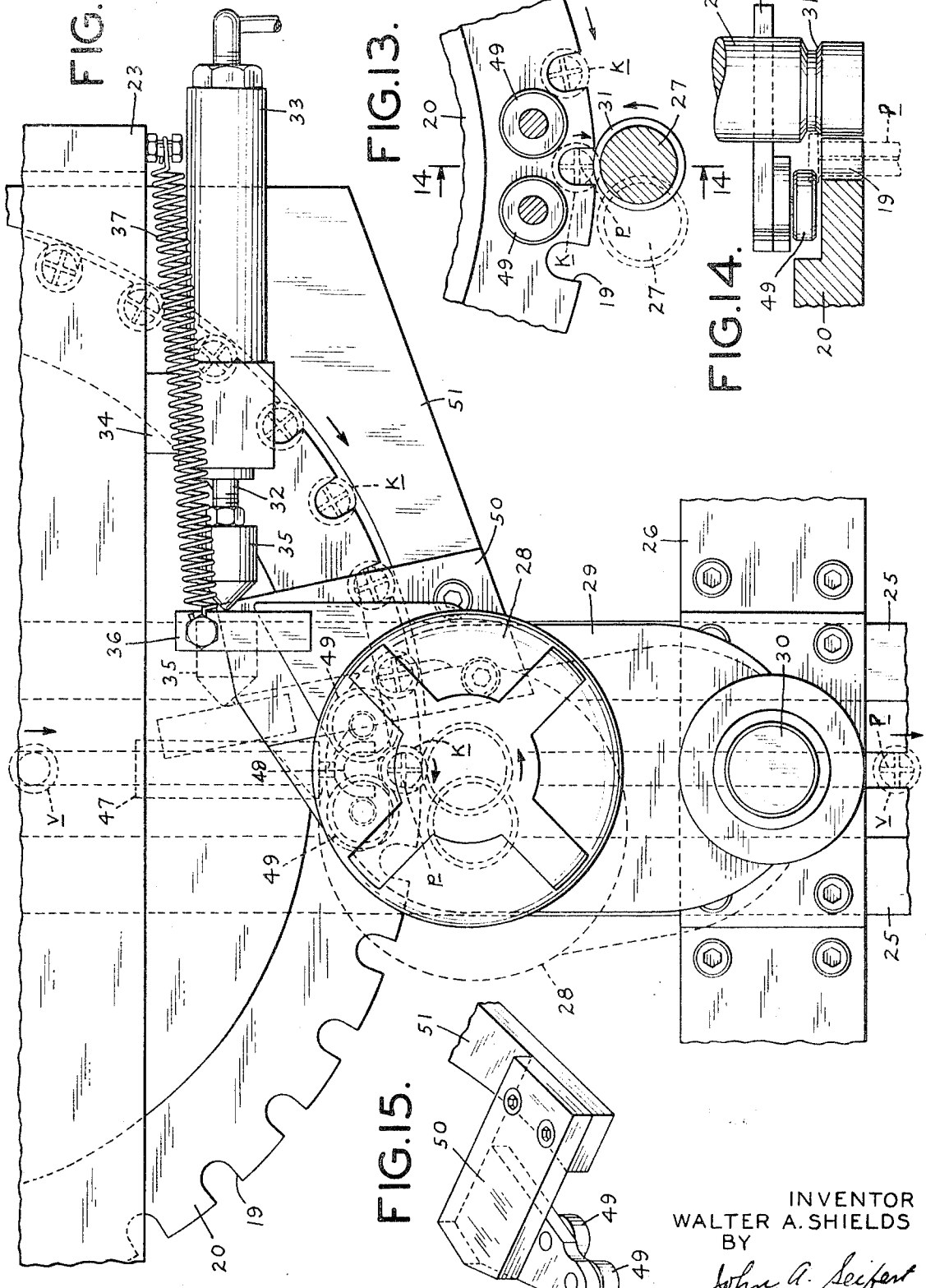


FIG. 13.

FIG. 14.

FIG. 15.

INVENTOR
WALTER A. SHIELDS
BY
John A. Seifert
ATTORNEY

United States Patent Office 3,588,985 Patented June 29, 1971

3,588,985

APPARATUS FOR UNITING A PLUNGER AND A PISTON OF A FULLY ASSEMBLED HYPODERMIC NEEDLE SYRINGE

Walter A. Shields, Jamaica, N.Y.
(38—09 24th St., Long Island City, N.Y. 11101)

Filed Sept. 29, 1969, Ser. No. 861,802
Int. Cl. B23p 19/04; B23g 7/10
U.S. Cl. 29—208 8 Claims

ABSTRACT OF THE DISCLOSURE

A plunger to actuate the piston of a fully assembled hypodermic needle is united to said piston by moving the syringe longitudinally toward a rotating plunger to engage the piston with said rotating plunger and the rotation of the plunger uniting the piston and the plunger.

This application discloses another method of uniting pistons of a fully assembled hypodermic needle syringe to plungers for actuating said pistons disclosed and claimed in my application for patent Ser. No. 845,419, filed July 28, 1969. The apparatus for carrying out the present method comprises means to intermittently convey spaced fully assembled hypodermic needle syringes below means to intermittently convey spaced plungers. The paths of conveyance of the syringes and the plungers intersect each other and at said point of intersection, a continuously rotating member engages and rotates a plunger in vertical alignment with a syringe. Subsequently a vertically reciprocating member below said syringe lifts the syringe from its conveying means to engage the piston with the rotating plunger whereby the piston and plunger are united. Subsequent to the uniting of the piston and the plunger, the rotating and reciprocating members are disengaged from the plunger and syringe and a horizontally reciprocating member engages the syringe and removes the plunger from its conveying means. The retrograde movement of the horizontally reciprocating member from the syringe permits the syringe with the plunger connected to its piston to return to its conveying means.

In the drawings:

FIG. 1 is a top plan view of the apparatus for carrying out the invention;

FIG. 2 is a sectional view taken on the line 2—2 of FIG. 1 looking in the direction of the arrows;

FIG. 3 is a fragmentary side view of the vertically reciprocating member and its actuating means looking from the line 3—3 of FIG. 2 in the direction of the arrows;

FIG. 4 is an enlarged plan view of the continuously rotating member and means for disengaging said member from the plunger;

FIG. 5 is a fragmentary plan view of the plunger conveying means and the rotating member;

FIG. 6 is a sectional view taken on the line 6—6 of FIG. 5 looking in the direction of the arrows;

FIGS. 7 to 11, inclusive, are sectional views taken on the line 7—7 of FIG. 1 looking in the direction of the arrows to show the progressive steps of uniting the aligned plunger and piston.

FIG. 12 is a view similar to FIG. 4 showing a modified method of rotating the plunger;

FIG. 13 is a view similar to FIG. 5 but showing the modified method of rotating the plunger;

FIG. 14 is a sectional view taken on the line 14—14 of FIG. 13 looking in the direction of the arrows; and

FIG. 15 is a perspective view of the member forming the modified method of rotating the plunger.

In carrying out the invention, there is provided a table

16, FIG. 1, for supporting the operating parts of the invention.

Plungers *p* having a manipulating knob *k* at one end and a screw-threaded plug *s* at the opposite end are delivered from a hopper 17 by a chute 18 to successive recesses 19 equidistantly spaced in the periphery of a turret 20 secured on a shaft 21 intermittently rotated by a pawl and ratchet machanism, not shown, mounted below the table 16 and actuating transmission mechanism 22 supported on a bridge 23 mounted on the table 16 and spanning the turret 20, as shown in FIG. 1. The upper end of the shaft 21 is rotatably supported by a bearing 24 mounted on the bridge 23. Between each recess 19, a roller 24 is mounted on the turret 20 in a circumference within the circumference formed by the recesses 19 for a purpose to be hereinafter described in connection with the structure shown in FIGS. 1 to 11, inclusive.

Syringes comprising a vial *v* having a sheathed hypodermic needle *n* in one end and a piston *c* arranged with a screw-threaded recess *r* and engaged in the opposite end of the vial *v* to seal a liquid medicament *m* in said vial *v*, as shown in FIGS. 7 to 11, inclusive, are supported by an annular flange *f* at the piston end of the vial *v* engaging a pair of spaced rails 25 supported by brackets 26 on the table 16 to extend below and diametrically of the turret 20. The syringes are intermittently moved along the rails 25 by rack-bars, not shown, actuated in a circular-reciprocal path.

At the point of intersection of the paths of conveyance of the plungers *p* and the syringes, the turret 20 is in its period of rest and the rack-bars are in retrograde movement, so that a plunger *p* is in vertical alignment above the flanged end *f* of the vial *v*, as shown in FIGS. 7 to 11, inclusive.

Also at this point of intersection, a continuously rotating member is engaged with the manipulating knob *k* and press said knob *k* against a pair of adjacent rollers 24. Said continuously rotating member comprises a shaft 27 connected to the drive shaft of an electric motor 28 mounted on a shelf 29 pivotally supported on a post 30 secured to the table 16. The lower end portion of the shaft 27 is provided with an annular groove 31 to engage the portion of the knob *k* extending beyond the periphery of the turret 20 with a pair of rollers 24 engaging equidistantly spaced portions of the knob, so that said knob is engaged by three rotating surfaces spaced 120 degrees from each other. The groove 31 is actuated into and out of engagement with the knob *k* in synchronism with the intermittent travel of the plungers *p* and the syringes, so that during the periods of rest in said intermittent travel, the groove 31 is engaged with the knob *k* and during the travel of said plungers and syringes, the grooves 31 is positioned out of engagement with the knob *k*. This is accomplished by a piston 32 of an air cylinder 33 secured to the bridge 23, as shown at 34 in FIGS. 1, 2, 4 and 12. The forward end of the piston 32 is provided with a pointed head 35 to engage a vertical projection 36 of the shelf 29 which is maintained in contact with the head 35 by a spring 37 connected to the projection 36 and to the bridge 23, as shown in FIGS. 1, 4 and 12. The air is intermittently supplied to the cylinder 33 during the intermittent movement of the turret 20 and the retrograde movement of the rack-bars of the conveying means for the syringes.

Subsequent to the engagement of the knob *k* by the groove 31 and the rollers 24, the syringe is lifted from the rails 25 and the screw-threaded recess *r* is engaged with the screw-threaded plug *s* by a vertically reciprocating member comprising a rod 38 having a recess 39 at one end to engage the sheathed hypodermic needle *n* and the opposite end of said rod 38 being pivotally connected by a coupling 40 to a lever 41 having a roller 42 yieldingly

urged by a spring **43** into engagement with a continuously rotating cam disc **44**, as shown in FIG. 3. The cam disc **44** is provided with a low portion **45** of sufficient length to permit the spring **43** to move the rod **38** and the syringe upward under sufficient force to unite the piston *c* with the plunger *p* by the rotation of said plunger.

After the piston *c* and the plunger *p* are united, air is supplied to the cylinder **33** to move the motor **28** and the shelf **29** to the dotted line position shown in FIGS. 1, 4 and 12 which will disengage the groove **31** from the knob *k*, as shown in FIG. 10.

Subsequent to the disengagement of the groove **31** from the knob *k*, the syringe is suspended from the turret **20** by said knob *k*, as shown in FIG. 10, and the roller **42** will engage the high portion of the cam disc **44** and move the rod **38** from the sheathed hypodermic needle *n*.

Subsequent to the disengagement of the recess **39** from the sheathed needle *n*, the plunger *p* is removed from its recess **19** in the turret **20** by a piston **46** in an air cylinder **47** mounted between the turret **20** and the rails **25** and intermittently supplied with air just prior to the intermittent movement of the turret **20**. The end of the piston **46** projecting from the cylinder **47** is bifurcated, as at **48** in FIGS. 7 to 10, inclusive, to engage the vial *v* below the flange *f* when air is supplied to the cylinder **47** and the continued outward movement of the piston **46** will remove the plunger *p* from the turret recess **19** and the syringe will be supported by the bifurcation **48**, as shown in FIG. 11.

Upon the retrograde movement of the piston **46** and after the removal of the plunger *p* from the turret recess **19**, the syringe with its attached plunger *p* will drop to the rails **25**, as shown in dotted lines in FIG. 11, and subsequently the rack-bars of the syringe conveying means will engage said syringe and move said syringe from the point of intersection of the travel of the turret recesses **19** and the rails **25**.

The process of uniting the pistons *c* and the plungers *p* is intermittently repeated.

FIGS. 12 to 15, inclusive, show a modified method of rotating the plunger *p* at the point of intersection in the paths of the plungers and the syringes. This modified method reduces the cost of manufacture by reducing the number of rollers **24** and only using two rollers **49** pivotally supported by a bracket **50** extended from a guide rail **51** extending around the periphery of the turret **20** from the chute **18** to a point short of the point of intervention of the paths of travel of the plungers *p* and the syringes. The rollers **49** are positioned so that the knob *k* will be engaged 180 degrees apart as in the structure shown in FIGS. 1 to 11, inclusive.

The operation of the structure shown in FIGS. 12 to 15, inclusive, is the same as that hereinbefore described in connection with the structure shown in FIGS. 1 to 11, inclusive, and therefore a repetitive description is not deemed to be necessary.

In the stucture shown in FIGS. 1 to 11, inclusive, a guide rail from the chute **18** to the point of intersection of the paths of travel of the plungers and the syringes is not necessary as the engagement of the knobs *k* at two points by the rollers **24** will retain the plungers *p* in the recesses **19**.

Having thus described my invention, I claim:

1. In apparatus for uniting a plunger and a piston of a fully assembled hypodermic needle syringe, said plunger having a screw-threaded plug and said piston having a screw-threaded recess for receiving said plunger plug and uniting the plunger and the piston, means to intermittently convey spaced hypodermic needle syringes, means to intermittently convey spaced plungers above and intersecting the path of conveyance of the hypodermic needle syringes,

whereby a syringe and a plunger are periodically positioned in vertical alignment with each other, a pair of rollers mounted to engage spaced portions of a plunger positioned in vertical alignment with a syringe, a continuously rotating member adjustably mounted to engage another spaced portion of said plunger, means to adjust the continuously rotating member into and out of engagement with the plunger and engage the plunger during the periods of rest of both conveying means to rotate said plunger, a vertically reciprocated member to engage and raise the syringe positioned in vertical alignment with the rotating plunger and engage the piston recess with the plunger plug, the rotating plunger uniting the plunger and the piston, and a horizontally reciprocating member actuated to engage the syringe subsequent to the engagement of the continuously rotating member with the plunger and prior to the retrograde movement of the vertically reciprocated member to remove the plunger united with the piston from the plunger conveying means, and said vertically reciprocated member and the horizontally reciprocating member being actuated from the syringe to permit said syringe to return to its conveying means.

2. Apparatus as claimed in claim **1**, wherein the pair of rollers are carried by the plunger conveying means.

3. In apparatus as claimed in claim **1**, a guide rail mounted to retain the plungers on their conveying means, and the pair of rollers is supported by said guide rail.

4. Apparatus as claimed in claim **1**, wherein the plunger conveying means comprises a turret provided with equidistantly spaced recesses to support the plungers in suspended position, and the pair of rollers comprises equidistantly spaced rollers rotatably mounted on the turret on opposite sides of each recess to engage and retain the plungers in the recesses.

5. Apparatus as claimed in claim **1**, wherein the continuously rotating member comprises motive means pivotally mounted on a vertical axis, and a shaft operatively connected to the motive means and arranged with a groove to engage and rotate the plunger being engaged by the pair of rollers.

6. In apparatus as claimed in claim **5**, a shelf pivotally mounted and supporting the motive means, and the means to adjust the continuously rotating member comprising an air cylinder provided with a piston actuated by air pressure in the cylinder to engage and pivot the shelf and position the groove out of engagement with the plunger, and a spring connected to the shelf and urging the groove into engagement with the plunger.

7. Apparatus as claimed in claim **1**, wherein the vertically reciprocated member comprises a rod having a recess in one end to engage the hypodermic needle of the syringe, a lever pivotally connected to the opposite end of the rod, and a cam disc continuously rotated and contacting the lever to reciprocate the rod.

8. Apparatus as claimed in claim **1**, wherein the horizontally reciprocating member comprises an air cylinder mounted in a horizontal plane between the syringe and the plunger conveying means and provided with a piston actuated by air pressure in the cylinder to engage the syringe and remove the plunger from its conveying means.

References Cited

UNITED STATES PATENTS

2,698,478	1/1955	Heisterkamp et al.	29—208
3,093,894	6/1963	Jurecka	29—240X
3,456,326	7/1969	Batten	29—211

THOMAS H. EAGER, Primary Examiner

U.S. Cl. X.R.

29—211, 240