May 28, 1968 R. G. WITTEMANN ET AL 3,385,261

APPARATUS FOR APPLYING LIQUID TO THE INTERIOR OF PARTS

Filed Dec. 16, 1965

FIG. 1

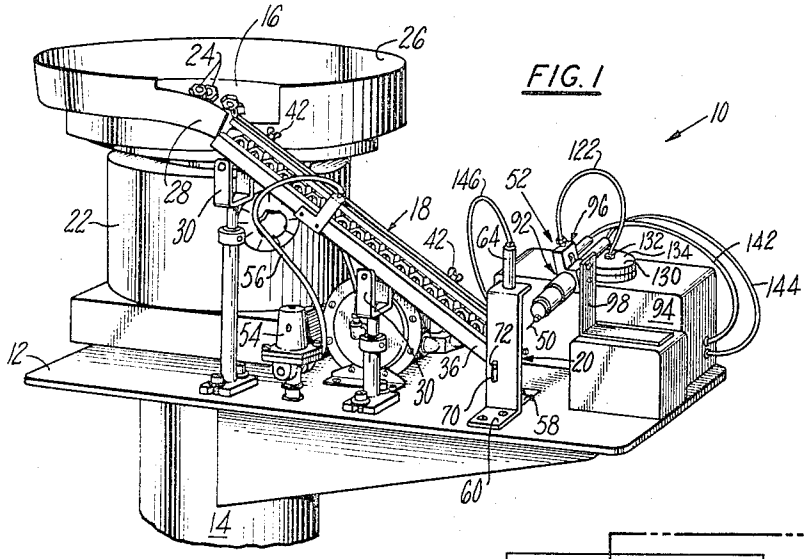


FIG. 2

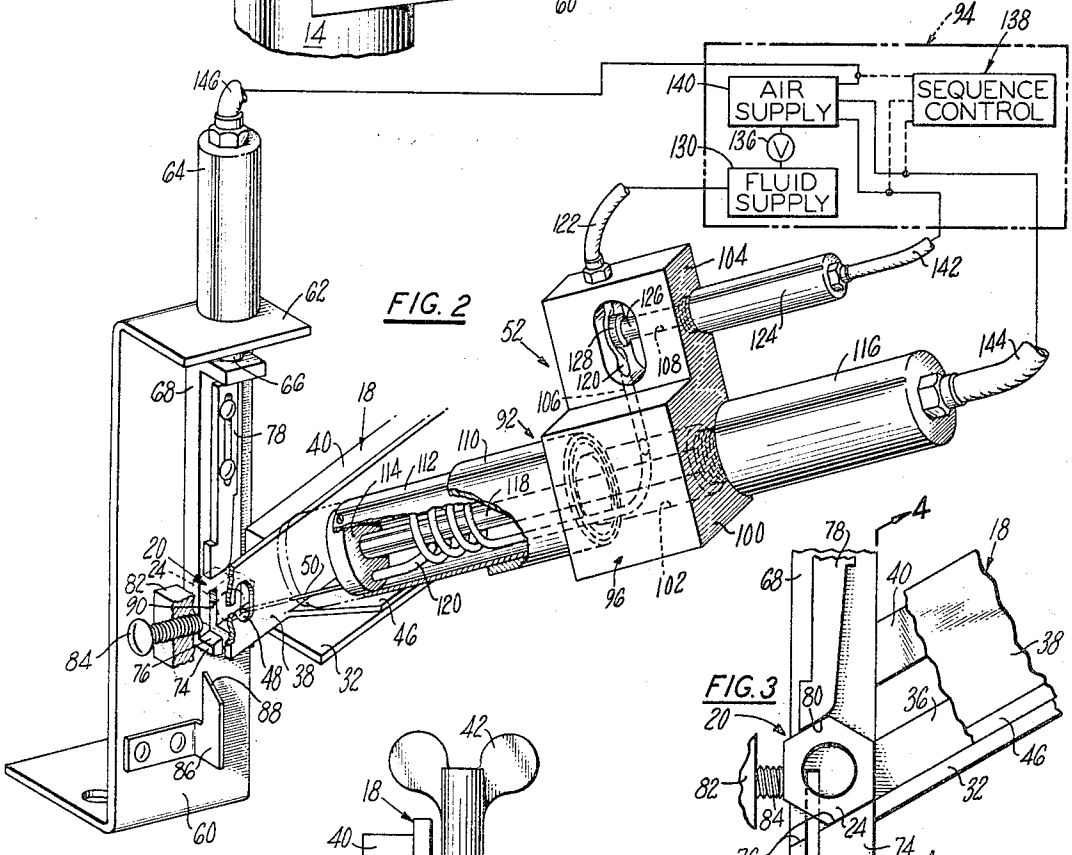
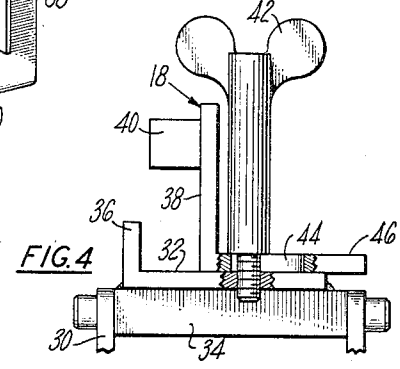


FIG. 3

FIG. 4



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APPARATUS FOR APPLYING LIQUID TO THE INTERIOR OF PARTS

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ABSTRACT OF THE DISCLOSURE

A system for the application of liquid to the interior portions of parts advancing in series is provided by the use of a reciprocating liquid discharge nozzle which moves into and out of the interior of the parts; an operating sequence control (*a*) times the periodic opening of a liquid control valve to disperse liquid only when the nozzle is in the forward position and (*b*) upon movement of the nozzle to the retracted position, activates an ejector to positively and rapidly remove the treated part.

The present invention relates to a fluid dispensing system and more particularly is directed to an automatic fluid dispenser and system for the rapid sequential delivery of a metered amount of liquid sealant to the surface of a part to be treated.

A primary object of the present invention is to provide a new and improved automatic fluid dispenser and system capable of applying a precisely metered quantity of fluid to an exact location offset from the location of the dispenser.

Another object of the present invention is to provide a new and improved automatic fluid dispenser well suited to assembly line usage and adapted to provide in an accurate and dependable manner the discharge of fluid within the interior of a part to be treated.

Still another object of the present invention is to provide a new and improved fluid dispenser and system for the precise and rapid sequential delivery of controlled quantities of a wide variety of fluids having different viscosities, which system exhibits the requisite flexibility to permt ease of installation and ready adaptability to a variety of fluid metering uses.

A further object of the present invention is to provide a new and improved fluid dispensing system for the rapid discharge of measured quantities of liquid sealants to the inner surfaces of a series of threaded nuts, which system incorporates a sealant applicator capable of advancing a discharge nozzle into the interior of the nut at an exact location removed from the applicator and to retract the nozzle for permitting ejection of the treated nut and advancement of the nuts within the series.

Other objects will be in part obvious and in part pointed out more in detail hereinafter.

The invention accordingly consists in the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereafter set forth and the scope of the application which will be indicated in the appended claims.

In the drawing:

FIG. 1 is a perspective view of a fluid dispensing system incorporating an embodiment of the present invention;

FIG. 2 is an enlarged isometric view of the fluid delivery station of the system shown in FIG. 1 including a fluid dispenser and a schematic diagram of the flow lines and controls associated therewith;

FIG. 3 is an enlarged side view, partially broken away, of the fluid delivery station of FIG. 2; and

FIG. 4 is a sectional view of the feed track of the system taken along the line 4—4 of FIG. 3.

Referring now to the drawing in greater detail wherein like referenced characters indicate like parts throughout the several figures, there is shown an embodiment of a fluid dispensing system for the treatment of threaded fasteners and the like such as threaded hex nuts. The nut treater generally designated **10** is provided with a substantially flat generally rectangular supporting platform **12** mounted on the pedestal **14** and comprises a hopper **16** for supplying nuts or other parts to the gravity feed chute or track **18** which terminates at a fluid delivery station generally designated **20**. The circular hopper **16** is raised above the platform **12** and is supported thereon by the upstanding cylindrical housing **22**. The hopper receives a supply of untreated nuts **24** and by vibratory force moves the nuts toward and around the interior of the peripheral fender **26** until they reach the downwardly tapered hopper exit **28**.

Positioned adjacent the exit **28** and sloping downwardly therefrom at an acute angle is the narrow, substantially straight, gravity feed track **18**. The track is suitably supported by a number of track supporting brackets **30** secured to the platform **12** and, as best shown in FIG. 4, comprises a flat, generally rectangular slide **32** which rests on the cross bar **34** of the bracket. The slide **32** has along one edge an integral leg **36** upstanding therefrom at a right angle thereto for providing a fixed side barrier for the track. An adjustable side rail **38** supporting the top guide bar **40** is adjustably secured to the slide base **32** by the wing bolt **42** which abuts the edge of the adjustment slot **44** in the base **46** of the rail **38**. The adjustable side rail **38** is further provided with a single side aperture **48** adjacent the lower extremity thereof at the fluid delivery station **20**. As best shown in FIG. 2 the aperture **48** readily permits the insertion and withdrawal of a discharge nozzle **50** of the fluid applicator assembly, generally designated **52**. The side **38** is adjustably positioned so that the untreated nuts **24** are fed down the track **18** in a vertical manner whereby upon reaching the fluid delivery station **20** they present to the aperture **48** free access to their interior threads. The top guide bar **40** and fixed side **36** also assist in maintaining the nuts in proper orientation during their gravity feed along the track.

Positioned intermediate the ends of the track is a part detector for sensing an interruption in the feed of the nuts therealong. The detector comprises a sensing control **54** supported on the platform **12** and an air line **56** which extends from the control to a fixed position adjacent the track. Thus, if the supply of nuts within the gravity chute is interrupted or otherwise inadequate to fill the chute to the point of detection, the sensing control **54** will automatically stop the operation of the machine.

The platform **12** at the fluid delivery station **20** is provided with an aperture **58** through which the treated parts may drop after application of the sealant or other liquid thereto. Adjacent the aperture **58** is secured a bracket **60** upstanding from the platform **12** and terminating in an integral flange **62** protruding over the fluid delivery station **20** and a portion of the gravity feed track **18**. Supported by the flange is a pneumatic or air cylinder **64** whose plunger **66** passes through the flange and is secured to a generally rectangular slide member **68** positioned contiguous the flat face of the bracket **60** and adapted for reciprocal longitudinal movement along the body thereof. As shown in FIG. 1 the body of the generally rectangular bracket **60** is provided with a longitudinal slot **70** which receives a key **72** projecting rearwardly from the slide **68** for controlling the longitudinal reciprocal movement of the slide during actuation by the air cylinder **64**. The slide **68** is additionally provided at

its bottom end with a perpendicular flange **74** of rectangular cross section whose uppermost surface **76** is slanted at the same acute angle as the track **18** and is aligned with the top surfaces of the slide **32** so as to provide an uninterrupted continuation thereof.

Spaced above the flange **74** is an ejector ram **78** which is adjustably secured to the slide **68** in face-to-face relationship therewith. The ram **78** is provided with a lower surface **80** which contacts the top of the nut **24** within the fluid delivery station **20** and cooperates with the top surface **76** of the flange for properly positioning the nut therein. Adjacent the slide **68** at the delivery station **20** is block **82** affixed to the bracket **60**. As shown the block supports the adjustable stop screw **84** which prevents sliding movement of the nuts beyond the station **20**. Positioned below the fluid delivery station is a nut ejector **86** comprising a thin vertically disposed body member secured to bracket **60** and extending outwardly therefrom at substantially a right angle thereto. The ejector **86** is provided with a tapered top surface **88** which cooperates with the flange bifurcating slot **90** of the slide to cam the nut outwardly from the flange **74**. During the downward movement of the slide the ejector ram acts as a barrier to the nut and continuously pushes it against the surface **88** until it falls by gravity through the aperture **58** into a suitable collector not shown.

The fluid applicator assembly **52** is supported by the platform **12** adjacent the delivery station **20** and includes a fluid dispensing head **92** and a control console **94** associated therewith. The dispensing head comprises a generally L-shaped head block **96** fixedly secured to the platform by the bracket **98** in a slightly inclined position. The head block consists of a generally square body portion **100** having a cylindrical bore **102** extending therethrough and an integral generally rectangular side portion **104** having a first through passage **106** communicating directly with the bore and a second side passage **108** intersecting the first passage intermediate its point of exit from the block and the bore **102**.

Supported within one end of the bore and coaxially aligned therewith is a cylindrical tubular sleeve **110** within which is telescopically received a movable nozzle carrier **112** having fixedly secured to the forward end thereof a disk-like front plate **114** supporting the discharge nozzle **50**. Threadably received within the opposite end of the bore is the carrier actuating air cylinder **116**. The pneumatic cylinder is provided with a plunger **118** extending forwardly therefrom through the block and carrier to the front plate **114**. The forwardmost end of the plunger is affixed to the plate **114** for reciprocally driving the carrier and discharge nozzle toward and away from the fluid delivery station. A flexible tubular fluid flow line **120** communicates with the discharge nozzle **50** through the front disk **114** and extends rearwardly within the dispensing head, through the passage **106** to the point of exit thereof where it is connected in a suitable manner to a fluid supply conduit **122**. As shown in FIG. 2 the tubular fluid flow line **120** is spiraled about the plunger **118** in order to provide sufficient slack for the reciprocal movement of the nozzle carrier **112** thereby preventing disruption of the interconnection with the nozzle.

Secured to the side portion **104** of the block **96** is a smaller air cylinder **124** having a plunger **126** extending through the side passage **108** and terminating in a plunger head **128**. The plunger head cooperates with the wall of the block at the intersection of passages **106**, **108** to valve or control the fluid flow within the line **120**. Accordingly the force of the plunger against the line is effective to squeeze or collapse the line thereby interrupting the flow of fluid from the control console **94** to the discharge nozzle **50**.

The control console shown in FIG. 1 as resting on the platform **12** adjacent the dispensing head **92** is a generally rectangular enclosure or cabinet provided with a centrally located storage compartment **130** suitable for receiving a supply of liquid sealant or the like. In accordance with the preferred embodiment of the invention a suitable container, such as a plastic bottle containing the liquid sealant, is placed in the compartment and the conduit **122** immersed in the liquid after first passing through the central hole **132** in the cover **134** of the compartment. The storage compartment or tank is adapted to receive air under pressure through the control valve **136** and to remain airtight thereby forcing the liquid sealant through the supply conduit **122** to the dispensing head **92**. The control console is further provided with suitable valves and electrical circuitry, generally designated by the numeral **138**, for controlling the operating sequence of the applicator assembly **52** and particularly the pneumatic cylinders **64**, **116** and **124**.

In operation the storage compartment or fluid reservoir **130** is provided with a suitable supply of liquid to be dispensed and the cover **134** is securely affixed to provide the necessary pressure-tight environment. A suitable supply of nuts or other parts to be treated are then placed in the hopper **16** from which they are fed to the chute **18** and along the chute to the fluid delivery station **20**. Compressed air supplied by a remote compresser is fed to the air supply distributor, generally designated **140**, in the control console **94** and through suitable valving to the pneumatic cylinders and the storage compartment, the compressed air forcing the fluid within the storage compartment to flow through the supply conduit **122** to the dispensing head **92**. The operating sequence control **138** upon actuation opens the air line **142** permitting compressed air flow to the pneumatic cylinder **124**. The cylinder actuates the plunger **126** and moves the plunger head **128** against the flow line **120** thereby closing the fluid flow line and preventing further flow of the liquid to the dispensing nozzle **50**. The applicator assembly **52** is then ready for continuous cyclic automatic operation. The operating sequence control **138** initiates the automatic cycle by opening line **144** to the flow of compressed air, causing operation of the pneumatic cylinder **116** and forward movement of its plunger together with the telescoping nozzle carrier **112** and the discharge nozzle **50**. The tip of the thin, hypodermic type nozzle thereby is positioned within the interior of the threaded nut **24** and is ready to deposit the liquid sealant or other fluid therein. As the nozzle tip reaches position, the operating sequence control **138** closes air line **142** for a short predetermined time interval thereby causing retraction of plunger **126** and permitting the flow of liquid from the storage supply compartment **130** through the line **120** to the tip of the discharge nozzle **50**. The period of time the valve is held open will vary depending on the pressure applied to the storage compartment and the flow characteristics of the liquid, i.e., its viscosity. After discharge of the measured amount of liquid sealant on the interior threads of the nut **24** the operating sequence control reactivates the pneumatic cylinder **124** to close the valve and deactivates the cylinder **116** so as to retract the nozzle carrier **112**. Upon clearance of the nozzle from the fluid delivery station **20** the air line **146** is opened permitting actuation of the air cylinder **64**. As mentioned hereinbefore the cylinder **64** causes the slide **68** to move downwardly carrying the treated nut **24**. The tapered surface **88** of the deflector **86** passes into the slot **90** of the slide and cooperates with the ejector ram **78** to force the nut outwardly of the slide, causing it to fall through the aperture **58** within the support platform **12**. The air cylinder **64** is then deactivated so as to return the slide to a nut receiving position. A short delay is programed into the control **138** at this stage of the cycle to permit the next adjacent nut within the slide to move into the fluid delivery station whereupon the pneumatic air cylinder **116** is activated to initiate another cycle of the operating sequence.

As can be seen from the foregoing description the pres-

ent invention provides an improved fluid dispensing system incorporating an automatic fluid dispenser which can be employed to apply precisely measured amounts of fluid to an exact location remote from the dispensing head. Additionally, the system is well suited for assembly line use and provides and accurate, dependable and rapid means for depositing metered amounts of various liquid materials to the interior of a series of progressively advanced parts.

As will be apparent to persons skilled in the art, various modifications and adaptations of the structure above described will become readily apparent without departure from the spirit and scope of the invention, the scope of which is defined in the appended claims.

We claim:

1. A system suitable for the rapid, sequential delivery of metered quantities of liquid to the interior portion of a series of parts which comprises: a liquid dispensing station; a liquid dispensing mechanism comprising a liquid discharge nozzle, a pressure actuated nozzle carrier for moving the liquid discharge nozzle into and out of a liquid dispensing position within the liquid dispensing station, and a pressure actuated valve for controlling the flow of liquid to the nozzle; a part delivery mechanism comprising track means for delivering the series of parts in abutting relation to the liquid dispensing station, stop means associated with the track means for stopping the parts in the liquid dispensing station in general registration with the liquid discharge nozzle, and pressure actuated ejection means for positively removing the liquid treated part from the liquid dispensing station; and an operating sequence control to: (a) upon movement of a part into the liquid dispensing station, activate the pressure actuated nozzle carrier to advance the liquid discharge nozzle into the liquid dispensing position; (b) open the pressure actuated valve to allow a metered quantity of liquid to be delivered through the liquid discharge nozzle to the interior portion of the part; (c) close the pressure actuated valve to stop the flow of liquid, and deactivate the pressure actuated nozzle carrier to move the liquid discharge nozzle from the liquid dispensing position; and (d) activate the pressure actuated ejection means to rapidly remove the part from the liquid dispensing station and permit a subsequent part to enter the liquid dispensing station.

2. The system of claim 1 wherein the track means for delivering the series of parts is an inclined gravity feed track having an adjustable side member for slidably confining the parts during movement thereof toward the liquid dispensing station, and the ejecting means includes a reciprocating slide member for moving the liquid treated parts away from the liquid dispensing station.

3. The system of claim 2 wherein the ejection means includes a pneumatically actuated reciprocating slide for moving the treated part out of the liquid dispensing station and a part camming surface for assisting in the removal of the part from the slide, the movement of the slide being controlled by the operation sequence control in relationship to the movement of the nozzle into and out of the liquid dispensing position.

4. The system of claim 3 wherein the liquid is liquid sealant, and the parts are threaded nuts.

5. The system of claim 1 wherein the liquid is liquid sealant, and the parts are threaded nuts.

6. The system of claim 1 wherein the liquid dispensing mechanism includes a dispensing head having a fixed sleeve adapted for telescopically receiving the nozzle carrier during reciprocal movement into and out of the liquid dispensing position.

7. The system of claim 1 including a liquid storage compartment adapted for pressurized liquid delivery via a flexible conduit to the liquid dispensing nozzle.

8. The system of claim 1 including a liquid storage compartment adapted for pressurized liquid delivery via a collapsible, flexible conduit, and the pressure activated valve is a plunger adapted to collapse the conduit and stop fluid flow therethrough while the carrier is out of the liquid dispensing position.

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