United States Patent

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[54] **PIN SETTER**
10 Claims, 3 Drawing Figs.

[52] **U.S. Cl.** **227/114,** 227/130
[51] **Int. Cl.** **B25c 5/06**
[50] **Field of Search** 227/107, 109, 114, 119, 130, 138, 139

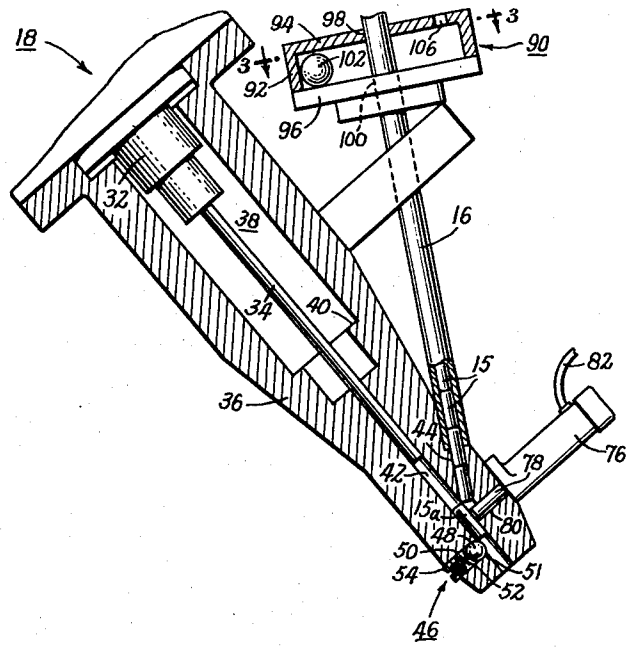
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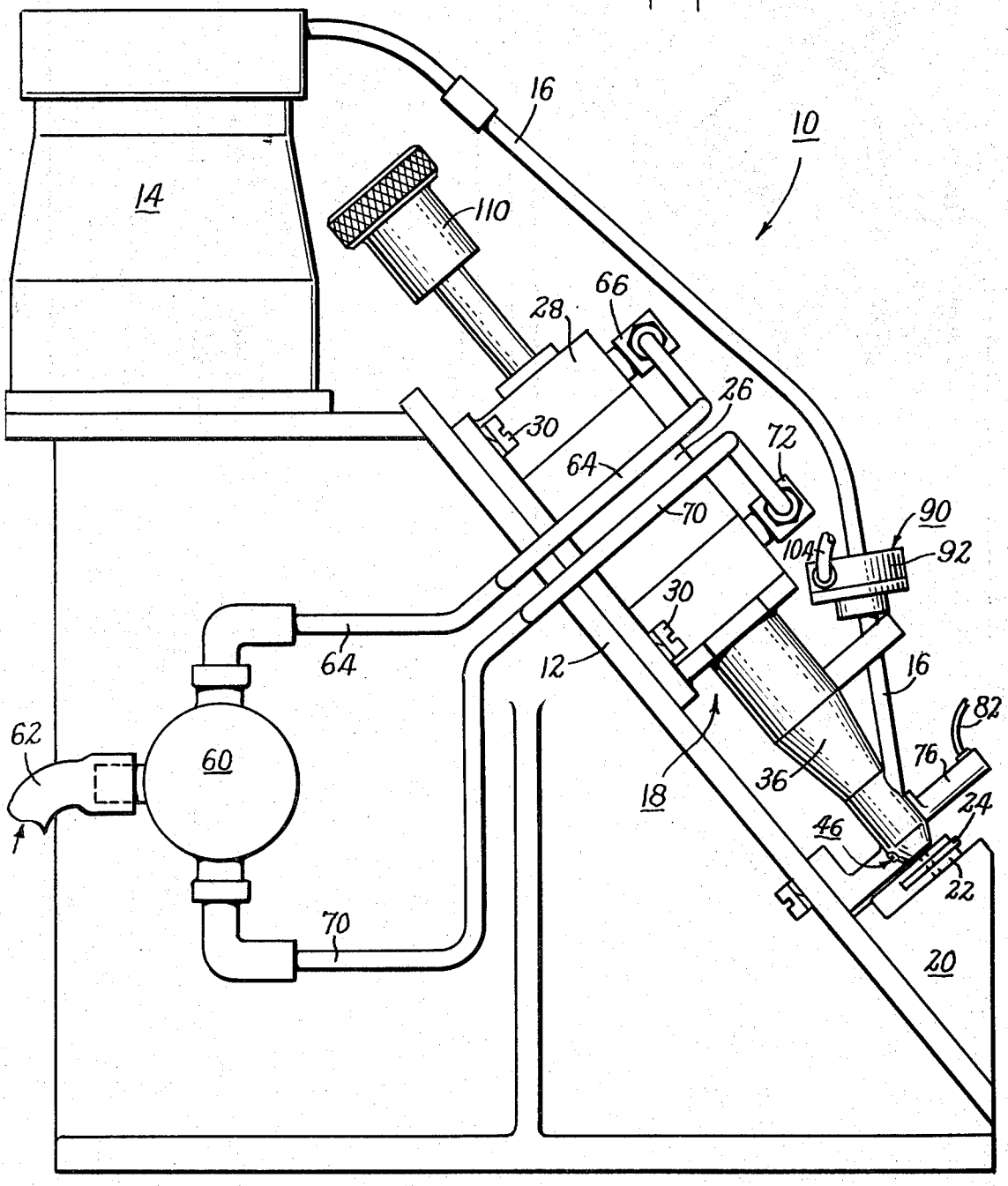
Primary Examiner—Granville Y. Custer, Jr.
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ABSTRACT: An automated high-speed pin setter which directs spring pins, dowel pins and the like from a vibratory continuous feed hopper through a delivery tube to a nose piece where an air actuated plunger drives the pins into the work piece. Provision is made to preclude binding of the pins in the delivery tube and in the loading magazine.



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Fig 1



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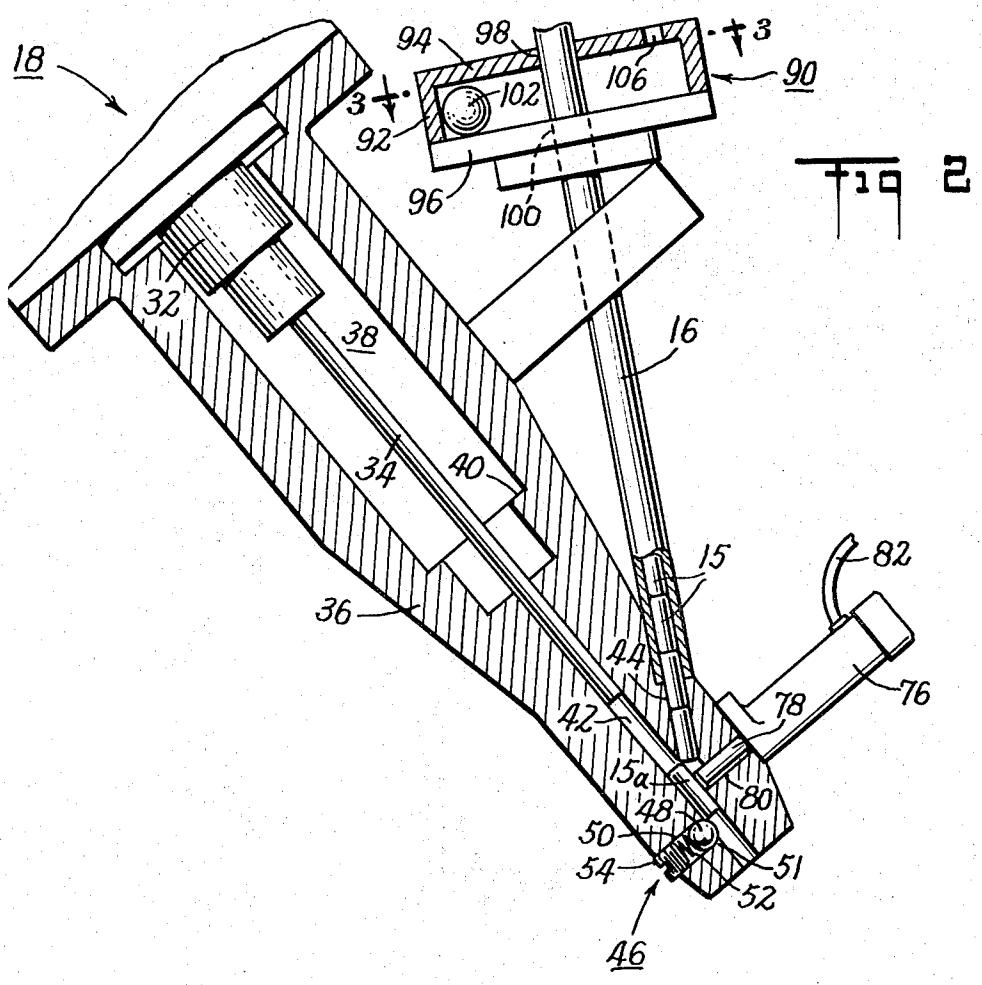
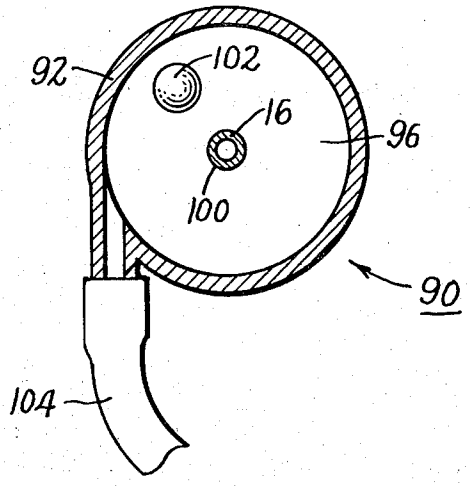

18
94
98
3
3
90
102
106
92
96
100
32
38
16
34
40
15
82
36
44
78
76
42
15a
80
48
50
51
54
52
46

Fig 2

Fig 3


92
102
16
96
100
90
104

PIN SETTER

This invention relates to pin setters and more in particular to an automated continuous feed pin setter. While the apparatus of the invention will be described in connection with the setting of spring pins, it will be apparent that other types of pins, such as dowel pins, also may be set by this apparatus.

Spring pins, which are cylindrical tube segments having a slit running the length of the segment, find a wide commercial application as a convenient and economical pivot pin or locating pin in mass produced commercial product lines, *i.e.*, where mating parts designed to move relative to each other are made from materials such as plastics, phenolics or light metal stampings. Each part has a bore to receive the spring pin with the bores in mating segments being alined to receive the spring pins. Once the pin is inserted, either as a locating pin, or to provide a pivot pin so that the two mating parts can rotate relative to each other, the operation is repeated. Heretofore, the inserting of spring pins in mating parts has been accomplished by a manual operation wherein the operator picks up the two mating parts, alines them, and manually inserts the spring pin. Since the use of spring pins in this manner is a volume operation, the manual procedure is unnecessarily slow and tedious and results in inordinately high labor costs.

In a preferred embodiment of the present invention pins are fed from a continuous feed hopper, such as a vibratory feed hopper, through a delivery tube to a nose piece. A single pin is alined in the magazine and is fed by an air actuated plunger to the work piece held in a jig below the plunger. The plunger is actuated on command by the operator and the speed of operation is limited only by the speed with which the operator can place the mating parts in the jig, actuate the plunger, remove the parts and insert a new assembly.

The construction of such a preferred embodiment as well as the advantages thereof, which include provision to insert pins in a work piece in a rapid and efficient manner, adaptability to handle spring pins, dowel pins and the like of different sizes, and uniformity of operation to insure a uniform work product, will become further apparent from the following specification when considered in conjunction with the accompanying drawings wherein:

FIG. 1 is an elevational view of the apparatus of the present invention;

FIG. 2 is an enlarged sectional view of the nose piece and plunger assembly; and

FIG. 3 is a secton sectional view taken on line 3–3 of FIG. 2.

With reference to the accompanying drawings a spring pin setter **10** includes a supporting frame **12**, a vibratory, parts feeding hopper **14** which feeds the spring pins **15** through a gravity feed delivery tube **16** to the lower end of a pneumatically operated spring pin setter **18**. The spring pin setter **18** is mounted on the frame structure **12** just above a work holding fixture of jig **20** which is machined to accurately retain and aline the mating parts **22** and **24** through which the spring pins are inserted.

The pin setter **18** includes a barrel portion **26** which is mounted to the frame **12** by means of a bracket assembly **28** and bolts **30**. As shown in FIG. **2**, within the barrel **26** is a reciprocating plunger **32** which has an elongated pin inserting rod **34** at one end. At the lower end of the barrel **26** is a nose piece **36** which includes a chamber **38** with a shoulder portion **40**. In the lower end of the nose piece **36** is a driver receiving bore **42** which accommodates the reciprocating inserting rod **34** and provides a barrel chamber to receive the single spring pin which is to be inserted on the next driving stroke of rod **34**.

The spring pins **15** are fed through feeding tube **16** into a pin receiving aperture **44** at the lower end of the nose piece **36** and are deposited in the driver receiving bore **42** where they are restrained from further downward travel by means of a spring urged ball plunger assembly **46**. The spring plunger assembly **46** includes a detent ball **48** which is housed in a bore **50** which as at right angles to, and communicates with, the driver receiving bore **42**. The bore **50** has a lip **51** which prevents ball **48** from entering driver receiving bore **42**. The ball **48** is urged so that it protrudes slightly into the driver receiving bore **42** by means of a spring **52** which is retained by an adjustment screw **54**. Thus, when the plunger rod **34** is in a raised position, as shown in FIG. **2**, a single spring pin **15***a* is allowed to fall into the driver receiving bore **42** where it is stopped from further movement by the spring urged ball plunger. The next spring pin in feed tube **16** rests against the top of the pin **15***a* in driver receiving bore **42** and the other pins in tube **16** back up end to end in the tube **16** to the hopper **14**. When the plunger **34** is actuated, the spring pin **15***a* alined in the driver receiving bore **42** is pushed downward, first forcing the spring ball plunger **48** back into the bore **50** and then moving out of the nose piece **36** into the mating parts **22** and **24** (FIG. 1).

As shown in FIG. 1, the plunger **32** is actuated by a double acting air supply from air valve **60**. The valve **60** receives an air supply from line **62** and on a driving stroke directs the air through line **64** and air supply nipple **66** to the upper portion of the barrel **26**. The plunger **32** within barrel **26** is constructed so that it operates as an air piston and thus the upper portion of the barrel **26** is sealed from the lower portion by means of an air seal, such as an O-ring (not shown), carried by the plunger **32**. To retract the plunger, the air from line **64** is cut off by valve **60** and air is directed by valve **60** through line **70** and air supply nipple **72** into the lower portion of barrel **26** thus forcing the plunger back up the barrel **26** where it is ready to receive air from line **64** on the next cycle. The plunger **32**, through actuation of valve **60** is operated under control of the operator, *i.e.*, by a foot pedal (not shown), or any other suitable actuating device.

Pin receiving aperture **44** is oriented at an acute angle with respect to driver receiving bore **42** with the diameter of bore **42** being large enough with respect to the spring pin diameter to allow the pins to fall freely into bore **42**. The oversized driver receiving bore diameter also allows the use of spring pins of varying diameter within a specified range, the only limitation being the ability of the spring pin to enter driver receiving bore **42** from pin receiving aperture **44** and still be able to orient itself along the axis of bore **42**.

Since the spring pins **15** are relatively light and the diameter of driver receiving bore **42** is greater than the pin diameter, the weight of the line of spring pins in the delivery tube **16** has a tendency to cause the spring pin **15***a* in bore **42** to cock to one side and, therefore, be out of alinement when the plunger rod **34** is actuated on a driving stroke. To preclude this tendency, an air actuated plunger assembly **76** is mounted on magazine **36** which includes a plunger **78** adapted to extend into and retract from driver receiving bore **42** within a driver receiving bore **80** in the wall of nose piece **36**. The plunger **76** is mounted on the nose piece **36** in a position so that when plunger **78** is extended, it positively retains the spring pin **15***a* in proper alinement within the driver receiving bore **42** and prevents the pin from tilting or cocking to one side. As shown in FIG. **1**, power for the plunger is supplied through an air line **82** from valve **60** (actual connection to valve **60** not shown) during the same cycle that air is supplied to the barrel **26** through line **70**. There is a time delay mechanism in line **82** (not shown) which delays the actuation of plunger **78** until the plunger rod **34** is withdrawn and the next spring pin **15***a* has descended into position in driver receiving bore **42**. The plunger **78** is outwardly biased by a spring (not shown) so that when air from line **82** is shut off the plunger retracts. Thus, when rod **34** is retracted preparatory to inserting a spring pin, the next spring pin in the delivery tube **16** drops into the driver receiving bore **42** and is retained by the extending ball member **48**. At this point air is supplied to line **82** and plunger **78** extends to engage the spring pin in driver receiving bore **42**. On the driving stroke of rod **34**, the air supply to the plunger assembly **76** is shut off by valve **60**, plunger **78** retracts under the spring force and rod **34** is forced downward to contact the spring pin and push it out of the nose piece to the work piece.

The spring pins are fed from vibratory hopper 14 to delivery tube 26 and form a continuous line in tube 16 to the nose piece 36. The vibratory hopper provides a pushing force on the pins and there is a tendency for the pins to become cocked and misaligned while in the tube. This causes a binding in the tube which prevents a free flow of pins and an interruption in the continuous stream of delivery. As shown in FIGS. 1, 2 and 3, an agitating mechanism 90 is provided which comprises a cylindrical housing 92 having a closed top and bottom portion 94 and 96, respectively, with apertures 98 and 100 therein to receive the delivery tube 16. A ball 102 is provided in the housing 92 of such a size as to roll freely within the confines of the agitator 90. A continuous air supply from tube 104 is directed to the interior of the agitator 90 to keep the ball constantly in motion while air exhaust aperture 106 in the top portion 94 allows the air to escape. The continuously rolling ball within the agitator 90 creates a gentle vibratory motion which is communicated to the delivery tube 16 and keeps the spring pins therein from binding thereby maintaining a smooth, uninterrupted delivery of pins.

The apparatus of the present invention can be adapted to handle spring pins of varying lengths within a specified design range. For this purpose a micrometer adjustment 110 is provided which adjusts the length of the stroke of piston 32 to accommodate spring pins of varying lengths.

It is thus seen that an apparatus is provided which feeds a continuous stream of spring pins from a vibratory hopper through a delivery tube to a loading station. There the pins are individually fed to a nose piece, alined and ejected by a reciprocating plunger rod and inserted in a work piece. Pins of varying lengths can be accommodated by varying the length of the plunger stroke by a micrometer adjustment, and the speed of operation is limited only by the operator's speed in placing the work piece in the work holding fixture.

We claim:

1. An apparatus for setting spring pins in a work piece comprising:

means to deliver a continuous supply of spring pins to a load station;

a nose piece at said load station to receive a single spring pin from said continuous supply means;

means to drive said single spring pin from said nose piece into a work piece comprising an air cylinder having a reciprocating plunger;

said plunger including a rod extending therefrom and adapted to engage said single spring pin during a portion of its stroke thereby to drive said spring pin from said nose piece;

said nose piece being positioned at one end of said cylinder and including a housing having a bore therethrough, said bore being positioned in alinement with said reciprocating rod;

said nose piece housing having a pin receiving aperture therein which intersects said bore whereby said pins are fed into said bore in said nose piece through said aperture; and

intermittently operable means operatively associated with said nose piece to aline said single spring pin in said nose piece to preclude binding of said spring pins during operation of said apparatus.

2. The apparatus as defined in claim 1 wherein said means to aline said intermittently operable single pin includes a plunger assembly mounted on said nose piece wherein said plunger is operable to extend and retract, said plunger in said extended position being adapted to engage said single pin to retain said single pin in proper alinement

3. The apparatus as defined in claim 2 wherein said plunger assembly on said magazine is operable to engage said single pin during that portion of the cycle of operation beginning with the seating of said single pin in said nose piece and ending with the beginning of said driving stroke of said plunger.

4. The apparatus as defined in claim I wherein said means to supply a continuous supply of pins comprises a tube having one end adapted to be operably connected to a continuous feed hopper and wherein said tube includes means mounted on said tube to agitate said tube thereby to prevent binding of said pins therein.

5. The apparatus as defined in claim 4 wherein said means mounted on said tube includes a housing having a top surface and a bottom surface defining a cavity therein, at least one element in said cavity which is free to move within said cavity and an air supply to said cavity thereby to continuously agitate said element to provide a shaking effect on said tube to keep said pins from binding.

6. The apparatus as defined in claim 1 wherein said nose piece includes a receiving aperture therein: said receiving aperture being adapted to receive said pins and said aperture is oriented at an acute angle with respect to said bore thereby to allow said pins to fall freely into said bore.

7. The apparatus as defined in claim 1 including means on said air cylinder to vary the length of the stroke of said plunger thereby to accommodate pins of varying lengths.

8. An automated spring pin setter comprising:

an air actuated plunger mechanism adapted to extend and retract;

a nose piece mounted at one end of said plunger mechanism;

said nose piece adapted to receive a supply of spring pins from a continuous spring pin feeding means;

said nose piece being constructed to chamber a single spring pin in alinement with said plunger mechanism whereby when said plunger extends said single spring pin is ejected from said magazine and set in a work piece; and

said nose piece includes means to positively aline said single spring pin including an air actuated rod mounted on said nose piece, said rod being adapted to extend to positively engage said single spring pin in said nose piece.

9. The apparatus as defined in claim 8 wherein said plunger mechanism includes a barrel, an air piston member within said barrel, air supply means to each end of said barrel, said air supply means controlled by a double acting valve operable to cyclically direct air to each said end of said barrel thereby to extend and retract said plunger.

10. The apparatus as defined in claim 9 wherein said spring pin feeding means includes a delivery tube adapted to deliver a supply of spring pins held end to end in said tube to said nose piece, said tube including means mounted thereon to agitate said tube to prevent binding and misalinement of said pins therein.