

March 14, 1961

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2,974,406

PIPE PLUG FEEDER AND COMPOUND APPLICATOR

Filed March 11, 1957

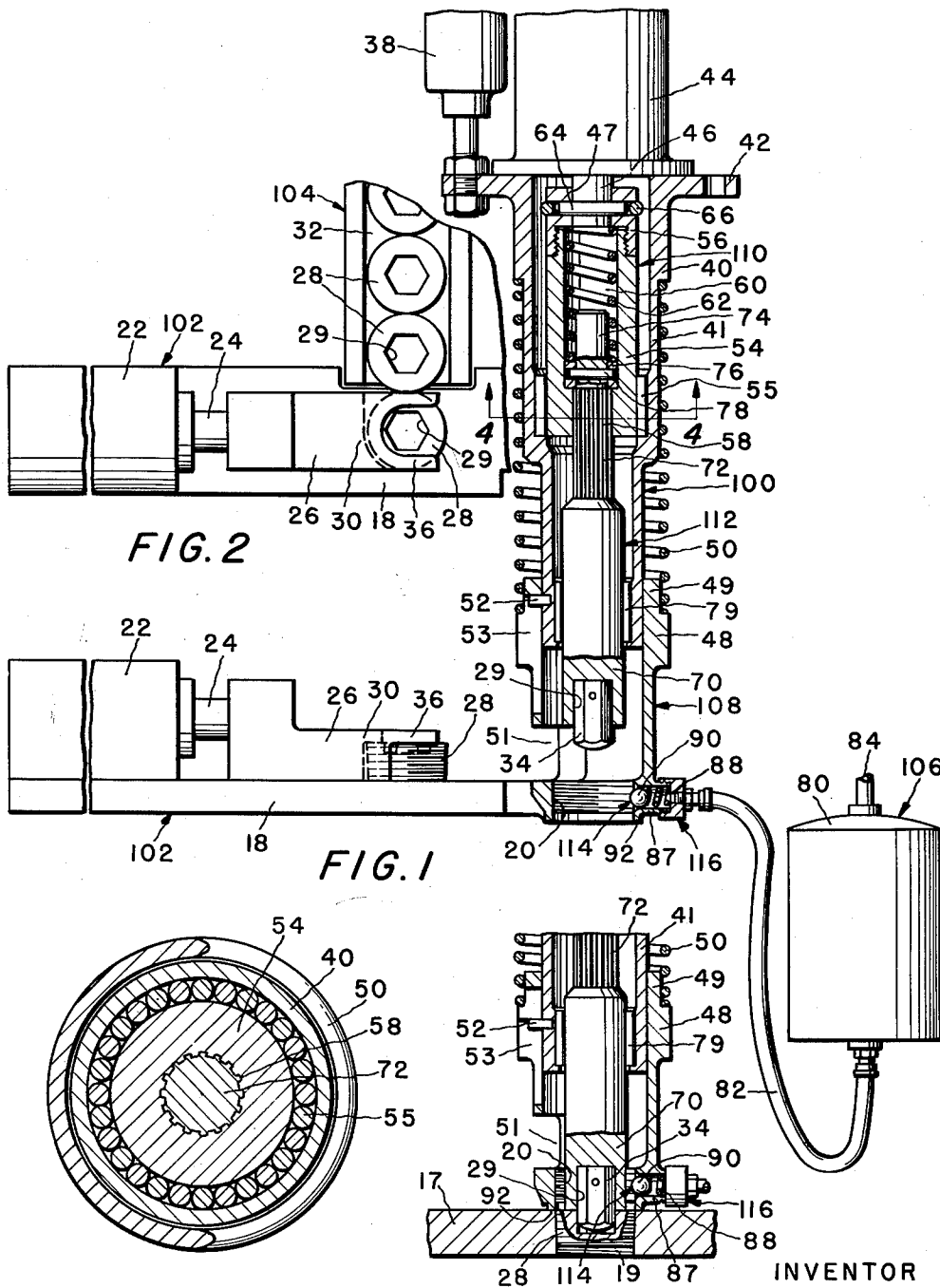


FIG. 2

FIG. 1

FIG. 4

FIG. 3

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PIPE PLUG FEEDER AND COMPOUND APPLICATOR

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Filed Mar. 11, 1957, Ser. No. 645,189

4 Claims. (Cl. 29—211)

This invention relates to a new and useful system of mechanically screwing threaded plugs in a work piece.

One object is to provide a machine for simplifying operations in screwing a threaded plug in a work piece.

Another object is to provide a plug screwing machine of simple construction combining the operations of different mechanisms.

Another object is to provide a machine with means for automatically applying compound to the threads of a plug before it is screwed in the work piece.

Another object is to provide a machine for coordinating operations of the various mechanisms to obtain a continuous operation in plugging and sealing a threaded hole.

An object is to provide a machine that accomplishes a tight and leak-proof seal of a hole in a work piece.

Other objects and advantages will be apparent from the following description.

In the drawings:

Fig. 1 is a general side view of the invention showing a part of the screwing mechanism in longitudinal section.

Fig. 2 shows a top view of the plug feeder and the plug supplied in working position with respect to each other.

Fig. 3 shows a plug in a position screwed down in the work piece by the screwing mechanism after compound has been applied to the threads of the plug.

Fig. 4 shows a cross section of the screwing mechanism taken along the line 4—4 of Fig. 1, looking in the direction of the arrows.

Referring to the drawings, Fig. 1 shows an assembly of parts forming the plug screwing machine comprising, in general, a screwing mechanism 100 for holding and lowering the plug 28 over the hole 19 in the work piece 17 and screwing it therein, a plug feeder 102 for feeding a plug at predetermined intervals into the screwing mechanism 100 after in turn being supplied plugs by the plug supplier 104. Furthermore, the plug screwing machine is provided with a compound supplied 106 for automatically applying compound to the threads of the plug 28 before it is screwed in the work piece 17. This simplifies operations and guarantees leakproof sealing of the holes.

In the arrangement shown, the plug feeder 102 comprises a base plate 18 which is positioned in the same horizontal plane with regard to the receiving portion of the plug retainer 108 of the screwing mechanism 100. On the base 18 is mounted a power operated cylinder 22 housing a reciprocating piston (not shown) for actuating a piston rod 24 on the free end of which is connected a forked member 26. The forked member 26 serves to hold the plug 28 in position and to move it into the receiving portion of the screwing mechanism 100 at predetermined intervals. In furtherance to this end the forked member 26 is provided with a receiving portion 30 having one side open to receive the plugs, one at a time, supplied by the plug supplier 104.

The plug supplier 104 comprises a channel shaped slide 32 for holding the plugs in position which are fed through the slide 32 by any conventional means, such as

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gravity or spring force, constantly urging the plugs in the direction of the plug feeder 102. The slide 32, is shown positioned in the same horizontal plane and at right angles with regard to the base plate 18 of the plug feeder

102 and in alignment with the receiving portion 30 when this is in the retracted position as shown in Fig. 1. The adjacent side of the forked member 26 holds the plugs in the slide 32 while the plug feeder 102 feeds a plug into the screwing mechanism 100. The stroke of the piston (not shown) of the power operated cylinder 22 is such that, when the forked member 26 is in the extended position, the plug 28 in the receiving portion 30 is positioned in the screwing mechanism 100 and in axial alignment with the head 34.

To permit the head 34 to engage the plug 28 while the receiving portion 30 is in the extended position, the receiving portion 30 is provided with a slotted flange 36 overlying the receiving portion 30. The plugs used are of the conventional type having a hexagonal bore 29 and the head 34 is adapted to fit in these bores.

The function of the screwing mechanism 100 includes the lowering of the plug 28 in screwing position with regard to the hole 19 in the work piece 17 and comprises a power cylinder 38 (partly shown) which is adapted to move the entire screwing mechanism 100 upward or downward. The plug retainer 108, a part of the screwing mechanism 100, is mounted on the casing 40 which houses a spindle 112 and a spindle actuator 110. The casing 40 is provided with a flange shaped top 42 on which is mounted a rotary motor 44 (partly shown) having a shaft 46 extending in the casing 40.

The lower end of the casing 40 is adapted to be guided by the plug retainer frame 48 fitting slidably over the outside of said lower end to permit the casing 40 to be moved upward or downward relative to the plug retainer 108 when the latter is abutting a work piece. The casing 40 and the frame 48 each have a reduced portion, 41 and 49, respectively, in line with each other and of approximately the same diameter. A spring 50 biased between these shoulders resiliently hold down the plug retainer 108 over the hole 19 in the work piece 17 while the plug 28 is being screwed in the work piece 17.

Inside the casing 40, at the upper part, the spindle actuator 110 is mounted and comprises a longitudinally bored cylindrical member 54 rotatably mounted in a bearing 55 and having at its upper end a cap 56 screwed thereon. The shaft 46 extends through a hole 47 drilled through the cap 56 and is connected to rotate said cap 56 by a pin 64 radially disposed through the cap 56 and the shaft 46 and held therein by a ring 66.

The spindle 112, rotatably and slidably mounted in a bearing 79, is connected to the spindle actuator 110 to be rotated thereby, however, this connection is adapted also to permit the spindle 112 to be moved upward and downward relative to the spindle actuator 110 while it rotates for reasons to be explained hereafter. The aforementioned connection comprises a splined portion 72 of the spindle 112 fitting in the splined fitting 58 of the spindle actuator 110. The upper end 74 of the spindle 112 extends in the spring chamber 60 positioned in the spindle actuator 110. A spring 62, disposed in the spring chamber 60 and supported by a collar 76 connected to the spindle 112 through a pin 78 serves for constantly urging the spindle 112 in a downward direction.

Mounted at the lower end 70 of the spindle 112 is a hexagonal head 34 adapted to fit in the hexagonal bore 29 of the plug 28.

The plug retainer 108 comprises the generally cylindrical frame 48 having a threaded bore 20 in axial alignment with the head 34 and is provided with a side opening 51 in the side facing the plug feeder 102 to permit the

plug 28 to be fed therethrough and positioned over the threaded bore 20.

In order to prevent the plug retainer 108 from rotating, due to friction while the plug 28 is threaded through the threaded bore 20, a pin 52, fixedly connected to the side of the lower end of the casing 40, is provided to extend into a slot 53 longitudinally positioned in the side of the plug retainer 108. The pin 52 in cooperation with the slot 53 also prevents the plug retainer 108 from being moved out of its slidable engagement with the lower end of the casing 40.

As a means for automatically applying compound to the threads of the plugs before being screwed in the work piece 17, a compound supplier 106 is provided comprising a compound applicator 116 disposed in the side of the wall of the threaded bore 20. The compound is supplied by a tank 80, suitably positioned with regard to the retracted and extended positions of the screwing mechanism 100, connected to the compound applicator 116 by a flexible hose 82 through which the compound is conducted. The tank 80 is pressurized by a pressure fluid supply (not shown) to which it is connected by means of a pipe connection 84 (partly shown).

As the threads of the plug 28 have to be coated with compound before it is screwed in the work piece 19, this coating is accomplished automatically while the plug 28 is being threaded through the threaded bore 20, one of the features of the screwing machine.

The compound applicator 116 comprises a ball valve 114 disposed in a housing 87 radially positioned with regard to the threaded bore 20 of the plug retainer 108. The ball valve 114 is positioned such that a spring 88 constantly urges a ball 90 towards a closed position in the direction of the center of the threaded bore 20. The ball valve housing 87 is adapted to permit the ball 90 to project in the path of the plug 28 in the threaded bore 20.

In operation, assuming that the hole 19 of the work piece 17 is in operable position with the screwing mechanism 100 and in particular with the plug retainer 108, the sequence of operations of the various parts of the screwing machine is as follows:

The plug supplier 104 supplies a plug 28 into the receiving portion 30 of the plug feeder 102. The plug 28 is then moved by the plug feeder 102 into the plug retainer 108 over the threaded bore 20 and in axial alignment with the head 34. It is to be noted that the plug 28 is prevented from being moved out of its screwing position over the threaded bore 20 by the proper positioning of the head 34 with regard to the height of the plug 28 and the rounded tip of the head 34. When the plug 28 is moved forward it pushes head 34 upward against the spring 62 and when the plug 28 is over the threaded bore 20 the head 34 snaps into the hexagonal bore 29 of the plug 28, thus holding the plug 28 in screwing position.

The receiving portion 30 of the plug feeder 102 is now retracted into the receiving position with regard to the plug supplier 104 and then the entire screwing mechanism 100 is moved downward by the power cylinder 38 into screwing position with regard to the hole 19 to abut the work piece 17.

When the plug retainer 108 abuts the work piece 17 and as the casing 40 of the screwing mechanism 100 continues to move downward, the screwing operation of the spindle 112 starts, screwing down the plug 28 through the threaded bore 20 and fully into the hole 19. The downward movement of the casing 40 while the plug retainer 108 is stationary, causes the spring 50 to be compressed for firmly holding the plug retainer 108 abutted over the hole 19. During its screwing operation the spindle 112 moves downward, its head 34 constantly engaging and following the plug 28. As this constant engagement depends on the ability of the head 34 to follow the plug 28 throughout the screwing operation, the downward movement of the casing 40 is desirably over a

greater distance and at a higher speed than the distance to be covered and the vertical speed of the spindle 112.

This will cause the upper end 74 of the spindle 112 to extend in the spring chamber 60, compressing the spring 62 therein and forcing the head 34 to follow and constantly engage the plug 28.

When the plug 28 is threaded approximately halfway through the threaded bore 20, the plug 28 engages the ball 90 of the ball valve 114 forcing it into the open position and permitting the compound to be applied on the threads of the plug 28 as long as the plug 28 engages the ball 90. The ball valve 114 will be closed automatically as soon as the plug 28 has been screwed down so far that its upper part has passed the threads in the threaded bore 20 through which the ball 90 extends, losing engagement with the ball 20 and permitting the spring 88 to press the ball 90 in the closed position.

A circular shaped abutment 92, having an inner diameter larger than that of the threaded bore 20, is connected to the bottom of the plug retainer 108 to insure that the screwing mechanism 100 will not be connected to the work piece 17 by the plug 28 in the event the plug 28 is not screwed flush or below the surface of the work piece 17.

After the plug 28 is screwed tightly in the work piece 17, properly sealing the hole 19, the motor 44 (partly shown) is stopped and the screwing mechanism 100 is retracted into the receiving position with regard to the plug feeder 102 as shown in Fig. 1 to receive the next plug. The operation as explained before is then repeated.

It is to be understood that the form of my invention herein shown and described is to be taken as a preferred example of the same, and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of my invention or the scope of the claims.

I claim:

1. In a machine for screwing threaded plugs in a work piece, the combination of a screwing mechanism for screwing plugs in a work piece including a rotary and reciprocatory spindle, said spindle provided with a head adapted to engage and rotate the plug, a plug feeder positioned at an end of the screwing mechanism adapted to feed plugs one at a time at predetermined intervals in the screwing mechanism in a position to be engaged by said spindle head, a plug supplier for supplying plugs to the plug feeder and cooperating therewith to permit the plug supplier to feed plugs one at a time to the plug feeder, a compound supplying device for supplying compound to the screwing mechanism including a compound applicator connected to the screwing mechanism, said compound applicator adapted to be actuated by said plugs to apply compound to the threads of the plugs before said plugs are screwed in the work piece, and means for supplying compound to said compound applicator.

2. In a machine for screwing threaded plugs in a work piece, the combination of a screwing mechanism for screwing plugs in a work piece including a rotary and reciprocatory spindle, said spindle provided with a head adapted to engage and rotate the plug, said screwing mechanism including a plug retainer for holding the plug in axial alignment with the spindle head, said plug retainer provided with a threaded bore positioned to permit a plug to be threaded therethrough by said spindle, said screwing mechanism adapted to thread the plug through the threaded bore of said plug retainer and into said work piece without interruption, a plug feeder positioned at an end of the screwing mechanism adapted to feed plugs one at a time at predetermined intervals in the plug retainer in a position to be engaged by said spindle head, a plug supplier for supplying plugs to the plug feeder, a compound supplying device comprising a compound applicator connected to the screwing mechanism for supplying compound to the plug while the plug is threaded through the threaded bore of said plug re-

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tainer, said compound applicator adapted to be actuated by said plug to apply compound to the threads of said plug before the plug is screwed into the work piece, and means for supplying compound to said compound applicator when the screwing mechanism is operating.

3. A machine for screwing threaded plugs into threaded holes of a workpiece comprising, a threaded guide adapted to be positioned in registry with one of said holes in the workpiece, means to transfer a plug into position to be screwed into said guide, means to engage said plug to feed the plug through said guide and into the hole of said workpiece, a compound applicator connected to said guide adapted to apply compound to the interior of said guide when said plug is screwed through said guide, and valve means actuated to apply compound to said plug as the plug passes through said guide.

4. A machine for screwing threaded plugs into threaded holes of a workpiece comprising, a threaded guide adapted to be positioned in registry with one of said holes, means to transfer a plug into position to be

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screwed into said guide, means to engage said plug to screw the plug through said guide and fully into the hole of said workpiece, the forward end portion of the interior of said guide having a minimum diameter larger than the largest diameter of said plug to prevent said guide from being connected to said workpiece by said plug when said plug is screwed through said guide and partly into the hole of said workpiece.

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