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54 **Apparatus for installing rivet nuts.**

57 Apparatus for installing rivet nuts comprises a body (9) having therein a spindle (5) which is drivable in the forward and reverse directions and a threaded mandrel (29) for receiving the rivet nut, and an anvil (35) against which the rivet nut abuts.

In order to avoid damaging of the rivet nut when crimping it in position, a clutch (45, 47) is disposed between

the spindle and threaded mandrel to prevent rotation of the latter when a predetermined torque is reached. The mandrel is engaged by a pull sleeve (21) and an axial load is applied to the mandrel and hence to the rivet nut by way of a pull nut (19) which is received threadingly on the spindle and which co-operates with the pull sleeve (21).

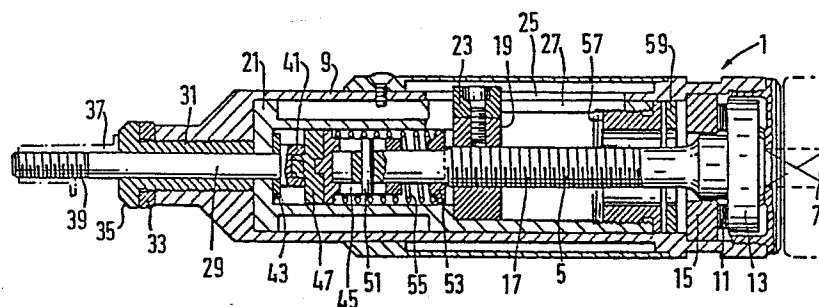


FIG. 2

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DESCRIPTIONAPPARATUS FOR INSTALLING RIVET NUTS

The present invention relates to apparatus for installing rivet nuts and in particular to apparatus for use with a power
5 tool.

There is a requirement for an apparatus which will instal rivet nuts quickly and with ease and without damaging either the rivet nut thread or the head of the rivet. The known manual apparatus for installing rivet nuts requires the mandrel on
10 which the rivet nut is threaded to be held against rotation whilst a thrust component is screwed along the mandrel so as to apply an axial load to the rivet between the threaded portion and the rivet head and so crimp it in position. The procedure utilising this manual apparatus is slow and awkward. One known power tool
15 utilises an air operated mandrel and a hydraulic intensifier to give the desired axial load. Such apparatus is large and expensive and is awkward to use. Another power operated tool uses a reversible motor to rotate the threaded mandrel whilst preventing rotation of the rivet by pressing it into contact with an anvil,
20 thus crimping the rivet in position. This latter method has the disadvantage that the mandrel threads abraid the nut threads rear flanks due to the forces exerted during turning the mandrel. This attacks any plated finish on the fastening and can cause stripping of the threads in some instance. In addition, the anvil
25 is provided with serrations in order to resist rotation on the rivet, and this disfigures the rivet nut head.

It is the aim of the present invention to provide apparatus for installing rivet nuts which overcomes the above disadvantages and which is simple and quick to operate.

30 According to the present invention there is provided apparatus for installing rivet nuts comprising a spindle drivable in the forward and reverse directions, a pull nut received threadingly on the spindle and non-rotatably guided with respect to a pull sleeve for movement in the axial direction of the spindle, and a

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threaded mandrel for receiving the rivet nut, which mandrel is drivable by the spindle in the forward and reverse directions by way of a clutch which is arranged to slip in the forward direction of rotation when the mandrel is subject to a predetermined torque, the pull sleeve being axially movable with respect to the spindle when the pull nut engages an end stop of the pull sleeve to transmit a pulling force to the mandrell to pull the rivet nut against an anvil and thereby deform the rivet nut.

The axial movement of the pull sleeve is limited by a thrust plate carried by a body of the apparatus. The spindle is guided for rotation in the body and carries a thrust flange which engages with the thrust plate of the body by way of a thrust bearing.

The drive to the spindle is preferably from an air operated prime mover with forward and reverse capability. Alternatively the prime mover can be an electrically or hydraulically driven motor.

Rotation of the spindle in the forward direction causes the pull sleeve to move in the axial direction towards the end stop of the pull sleeve by virtue of the threaded connection between the pull nut and spindle and because the pull nut is prevented from rotation by co-operating engagement with the pull sleeve.

Rotation of the spindle in the reverse direction causes the pull nut to be displaced in the opposite axial direction.

The clutch disposed between the spindle and mandrel is arranged to slip at a predetermined drive torque when driven in the forward direction whilst it transmits drive positively when driven in the reverse direction. The slipping drive ensures that rotation of the mandrel and hence of the rivet nut threaded thereon is prevented when the axial pull is applied to the mandrell. The clutch comprises a driving plate which is rotatably secured to the spindle and axially movable against a spring force. If necessary the spring force can be adjusted to vary the torque at which the clutch slips. The driving plate co-operates with a driven plate which is secured to the threaded mandrel. Preferably, the threaded

mandrel is a hexagon socket head cap screw to which the driven plate is secured using a cold setting glue. The driven plate is provided with a complementary shaped hexagon projection for engagement in the hexagon socket.

5 After the rivet nut has been installed, reversing the direction of the motor drives the mandrel by way of the clutch in a direction to unthread it from the installed rivet nut.

A number of different sized mandrels are available to suit the different diameters of rivet nut which are available.

10 The present invention will now be described further, by way of example only, with reference to the accompanying drawings, in which:-

Fig. 1 illustrates in outline the apparatus of the invention coupled to a prime mover, and

15 Fig. 2 illustrates a section through apparatus according to the present invention.

In Fig. 1, rivet nut installation apparatus is shown at 1 connected to a reversible air operated prime mover 3, shown in outline only. The prime mover 3 has a trigger with three positions; 20 off, forward and reverse, moving in a direction from left to right. Rotary motion of the motor is transmitted to a spindle 5 of the apparatus 1 by way of a square drive 7. The spindle 5 is accommodated within a body 9 in which it is journaled for rotation. A thrust bearing 11 is disposed between a thrust flange 13 of the 25 spindle and a thrust plate 15 disposed in the body.

The spindle 5 has a thread 17 with which a correspondingly threaded pull nut 19 engages. In the case of heavy duty applications the threaded connection may take the form of a recirculating ball screw. The spindle 5 is disposed within a pull 30 sleeve 21 which is axially displaceable within the body 9. A slide block 23 is secured to the pull nut and is received in respective slots 25, 27 in the body and pull sleeve. Thus, the pull nut is located non-rotatably with respect to the pull sleeve 21 and body 9.

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A mandrel 29 is journaled within a sleeve 31 threaded into a forward end of the body 9. A lock nut 33 is provided to secure the sleeve 31 in position. The sleeve 31 has a head 35 which serves as an anvil against which the head of the rivet nut shown dotted at 37 engages. The end of the mandrel 29 has a thread 39 for receiving the rivet nut. In order to cater for different sizes of rivet nut, i.e. different diameters, different sizes of mandrel and sleeve are available.

The mandrel 29 passes through a bore in the end of the pull sleeve 21 and a thrust washer is interposed between the end of the pull sleeve and a head 41 of the mandrel. The mandrel is preferably a hexagon socket head cap screw. A clutch is interposed between the spindle 5 and mandrel 29 and comprises a driving plate 45 and a driven plate 47. The driven plate has a hexagonal projection which is received in the complimentary shaped socket of the mandrel. A cold setting glue is used to secure the two parts together. The driving plate 45 is axially movable on the spindle 5 and rotary drive is transmitted from the spindle to the driving plate by a driving pin 51. The spindle carries an abutment plate 53 and a spring 55 is disposed between the abutment plate and driving plate and serves to bias the driving plate in a direction towards the driven plate. The clutch is arranged to transmit drive positively in the reverse direction of rotation of the spindle 5 and to slip at a predetermined torque when driven in the forward direction, clockwise when viewed from the righthand end in the illustrated embodiment. This is achieved by providing ratchet-type teeth on the clutch parts.

Fig. 2 illustrates the apparatus in its starting position with the pull nut 19 positioned to the left. When it is required to instal a rivet nut, the nut is offered up to the mandrel 29 and the motor operated in the forward direction, clockwise in the case of a right hand threaded nut. The rivet nut 37 is thus drawn into the threaded end of the mandrel until such time as the head of the rivet contacts the face of the anvil whereon a torque is generated

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which causes the clutch to slip, preventing further rotation of the mandrel. During this initial rotation, the pull nut is caused to be displaced axially to the right as illustrated. The rivet nut is now inserted into the hole into which it is to be

5 crimped and forward drive re-engaged. The clutch continues to slip and the pull nut 19 moves further to the right and into engagement with an end plug 57 of the pull sleeve. Continued rotation of the spindle 5 causes the pull nut to exert a thrust on the end plug and thus cause the pull sleeve 21 to move to the

10 right applying a thrust to the head of the mandrel. Thus a pulling force is exerted on the rivet nut as the mandrel is withdrawn into the body relative to the face of the anvil. The amount of axial movement of the pull sleeve is controlled by the clearance between the end plug 57 and the thrust plate 15. A spacer 59 in the form

15 of a C-shaped washer may be introduced therebetween to reduce the available clearance. The axial pull causes the rivet nut to deform, so crimping it in position. When the clearance is taken up the air motor ceases to drive the spindle. The clearance required varies in dependence upon the size of rivet nut being

20 installed.

Operating the air motor in reverse drives the spindle in reverse and thus unscrews the mandrel from the installed rivet nut.

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CLAIMS

1. Apparatus for installing rivet nuts, comprising a body (9) having therein a spindle (5) drivable in the forward and reverse directions, a threaded mandrel (29) for receiving the rivet nut, and an anvil (35) against which the rivet nut abuts, characterised in that a pull nut (19) is received threadingly on the spindle and is non-rotatably guided with respect to a pull sleeve (21) for movement in the axial direction of the spindle, and the threaded mandrel (29) is drivable by the spindle in the forward and reverse directions by way of a clutch (45, 47) which is arranged to slip in the forward direction of rotation when the mandrel is subject to a predetermined torque, the pull sleeve being axially movable with respect to the spindle when the pull nut engages an end stop (57) of the pull sleeve to transmit a pulling force to the mandrel to pull the rivet nut against the anvil and thereby deform the rivet nut.

2. Apparatus as claimed in claim 1 in which the axial movement of the pull sleeve is limited by a thrust plate (15) carried by the body (9) of the apparatus.

3. Apparatus as claimed in claim 2 in which the spindle is guided for rotation in the body and carries a thrust flange (13) which engages with the thrust plate of the body by way of a thrust bearing (11).

4. Apparatus as claimed in claims 1, 2 or 3 in which the clutch is arranged to slip at a predetermined drive torque when driven in the forward direction and to transmit drive positively in the reverse direction.

5. Apparatus as claimed in claim 4 in which the clutch comprises a driving plate (45) which is rotatably secured to the spindle and axially movable with respect thereto against a spring force, and a driven plate (47) secured to the threaded mandrel.

6. Apparatus as claimed in claim 5 in which the spring force is adjustable to set the predetermined torque at which the clutch slips.

7. Apparatus as claimed in claim 5 in which the driven plate is secured to the mandrel using an adhesive.

8. Apparatus as claimed in claim 5 in which the threaded mandrel is a hexagon socket head cap screw and the driven plate
5 has a complementary shaped hexagon projection for engagement in the hexagon socket.

9. Apparatus as claimed in any preceding claim in which the anvil has a threaded portion (31) which engages threadingly in the body of the apparatus and is locked against rotation by a lock nut (33).

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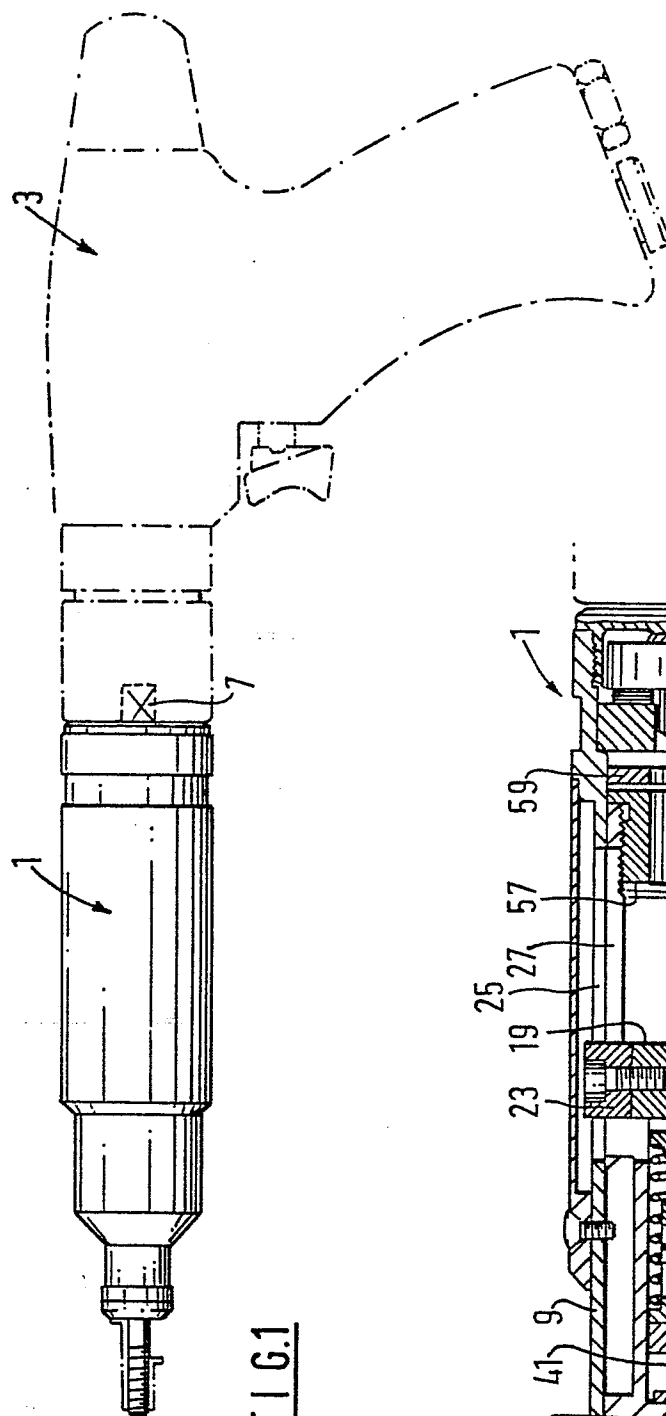


FIG. 1

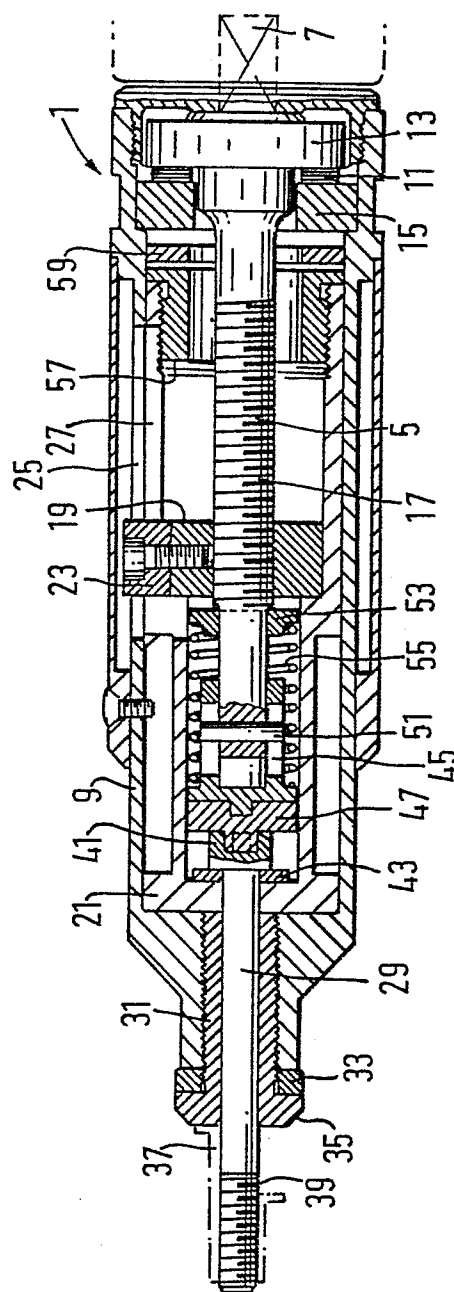


FIG. 2