Nov. 3, 1959 S. E. RYD 2,910,901

PNEUMATIC BOLT APPLYING AND TIGHTENING TOOL

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Fig. 1

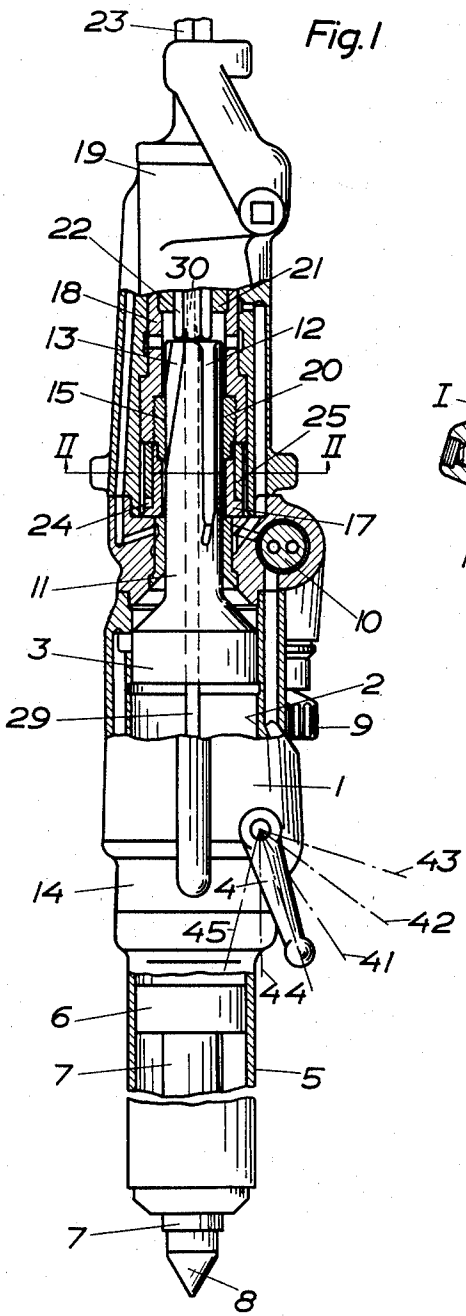
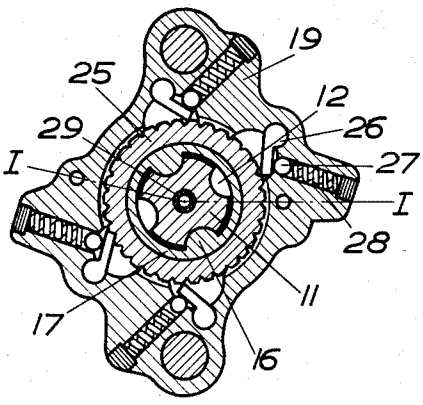


Fig. 2



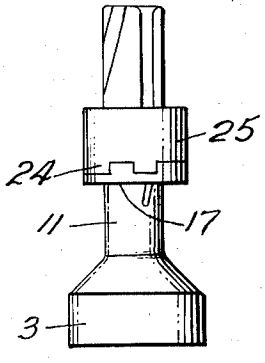


Fig. 1a

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PNEUMATIC BOLT APPLYING AND TIGHTENING TOOL

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Fig.4

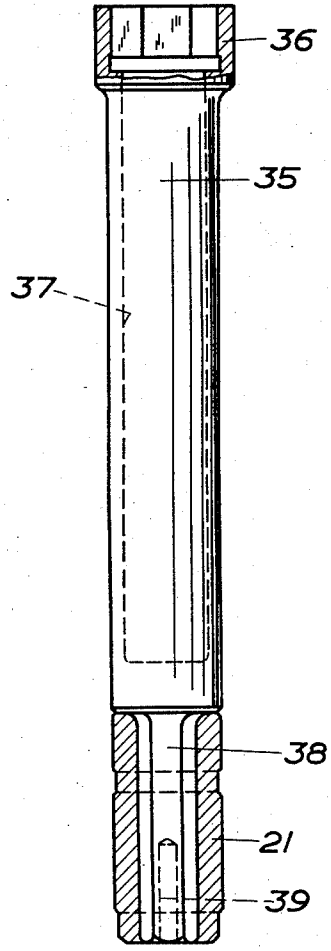


Fig.3

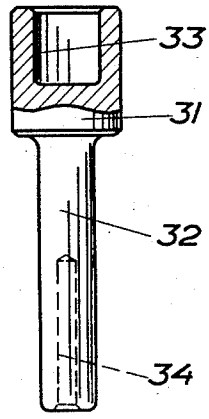
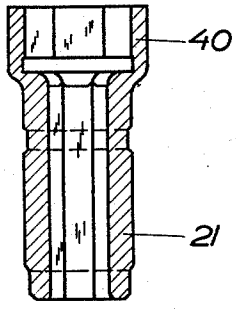


Fig.5



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Fig. 6.

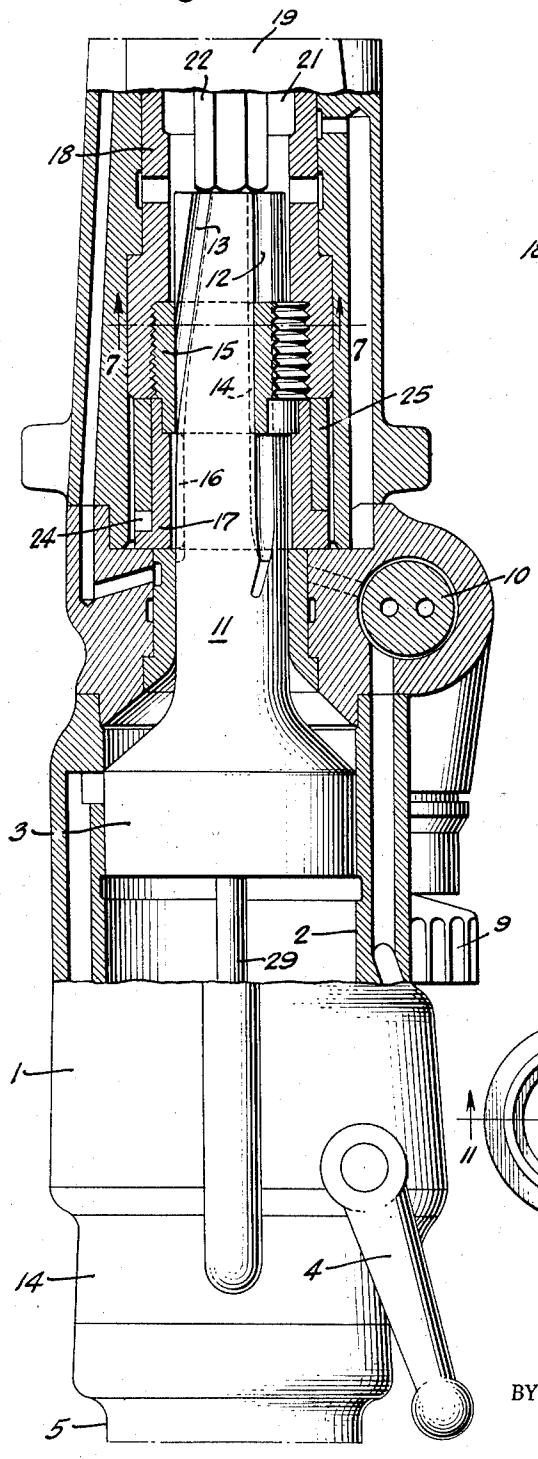


Fig. 7.

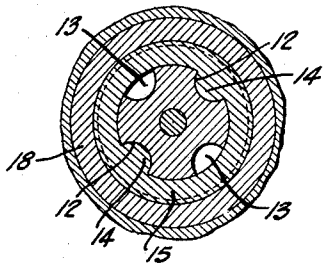


Fig. 8.

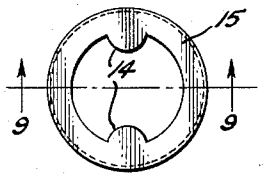


Fig. 9.

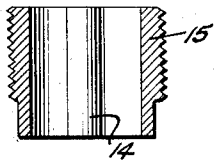


Fig. 10.

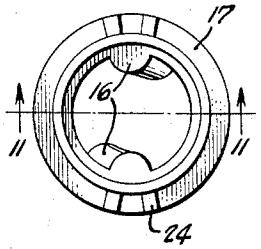
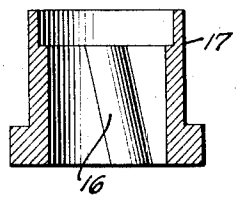


Fig. 11.



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2,910,901

PNEUMATIC BOLT APPLYING AND TIGHTENING TOOL

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Application April 11, 1955, Serial No. 500,579

Claims priority, application Sweden April 15, 1954

7 Claims. (Cl. 81—52.3)

This invention relates to anchor bolting mechanism comprising a hammer tool provided with means for drilling in rock or the like and for tightening nuts or bolts used in roof bolting or other anchor bolting in rock or similar material.

It has previously been common practice in anchor bolting to use conventional rock drills by means of which holes were at first drilled in the rock to accommodate the anchor bolts. The anchor bolts were then driven into the holes with hand hammers or machine hammers or with the rock drills and anchor plates or anchor bands were provided on the bolts. Nuts were then provided on the bolts and tightened down by means of ordinary wrenches or impact wrenches.

It has also been suggested to provide a wrench attachment for an ordinary stopper drill for reversing the direction of rotation of the drill and for producing the necessary torque for tightening a roof bolt or nut with the aid of the ordinary rotation mechanism of the drill.

One object of the invention is to provide a light and easily handled mechanism for drilling holes in rock, for driving anchor bolts into said holes, and for tightening the bolts or nuts provided on the bolts onto roof plates, anchor bands, or the like. The invention eliminates the use of separate wrenches for tightening the nuts or bolts and provides a mechanism which is much lighter and consequently much easier to handle than other similar mechanism known so far.

According to the invention the mechanism comprises a hammer tool having a back head and a front head, a drill steel chuck rotatable in said front head in said tool, means for imparting a clockwise rotation to said chuck when looking from said back head towards the front head, and a socket associated with said chuck and formed to fit a nut or bolt head for turning the same upon rotation of the chuck in said clockwise direction. In order to operate in the desired manner the rotation mechanism of the tool in arranged in such a manner that the drill steel chuck is turned during the working forward stroke of the hammer piston in a right hand direction, i.e. in a clockwise direction when looking from the back head towards the front head of the tool, whereas ordinary rock drills are designed for rotation in the opposite direction. Furthermore, all parts and the turning mechanisms of the tool are preferably interlocked in such a manner that they cannot get loose during the operation of the tool. The tool is preferably provided with a feeding device and the mechanism preferably includes a suitable bolt driving member fitting the chuck so that it can be hit by the hammer piston to drive the bolts into the holes. Furthermore, the mechanism includes a wrench member which may be a separate detachable member fitting the chuck and having a suitable socket for receiving a nut or bolt head. Said wrench member may, however, also be formed by the chuck itself.

In the accompanying drawings one embodiment of a rock anchor bolting mechanism according to the invention is illustrated by way of example. Fig. 1 is a side

view and partial longitudinal section of a hammer tool forming a part of the invention. Fig. 1*a* is an elevational view showing the ratchet sleeve coupled to the turning nut and mounted on the shank of the piston. Fig. 2 is a section on line II—II in Fig. 1. Fig. 3 illustrates a bolt driving member partially in section, and Fig. 4 illustrates a detachable wrench member in side elevation and partial section. Fig. 5 is a longitudinal section of a combined drill chuck and wrench member. Fig. 6 is a fragmentary side elevational view partially in section and to an enlarged scale and showing the particular relationship between the axial grooves and ribs and between the inclined grooves and ribs. Fig. 7 is a sectional view taken on the line 7—7 of Fig. 6 and showing the relationship between the sleeve, the axial ribs thereon and the axial grooves in the piston. Fig. 8 is a top plan view of the sleeve showing the axial ribs thereon. Fig. 9 is a sectional view taken on the line 9—9 of Fig. 8. Fig. 10 is a top plan view of the turning nut showing the inclined ribs thereon. Fig. 11 is a sectional view taken on the line 11—11 of Fig. 10.

The anchor bolting mechanism illustrated in the drawings comprises a hammer tool, a bolt driving member and a wrench member. The hammer tool has a casing **1** in which a cylinder **2** is formed. A compressed air driven hammer piston **3** is reciprocable in the cylinder **2**. Compressed air is supplied to the cylinder **2** in a manner which is conventional in percussion tools of this type and controlled by a main valve operating handle **4**. Valves and ducts for controlling and distributing the compressed air to the cylinder are described only so far as such details differ from the conventional arrangement in hammer rock drills. The casing **1** is provided with a back head **14** to which a feed cylinder **5** is attached. Said feed cylinder contains a piston **6** and a piston rod **7** extending from the feed cylinder and in conventional manner provided with a foot piece **8**. The compressed air supply to and the exhaust from the feed cylinder is controlled by means of a valve actuating means **9** and a valve device **10** which may be of conventional design and which makes it possible to regulate the supply of air as well as the air pressure in the feed cylinder, and which also makes possible a quick venting of the feed cylinder as may be desired. The valve device **10** may, for instance, be of the same type as described in the assignee's United States Patent 2,617,388.

The hammer piston **3** has a piston shank **11** provided with axial and inclined grooves **12, 13**, respectively, cooperating with axial ribs on a sleeve **15** and inclined ribs **16** of a turning nut **17**. The sleeve **15** is screw threaded into a sleeve **18** which is rotatable in the front head **19** of the tool. The sleeve **18** is press fitted on a sleeve **21** having internal hexagonal opening and forming a drill chuck of the tool in which a shank **22** and a drill steel **23** may be introduced, as illustrated in Fig. 1. The turning nut **17** is by means of interengaging teeth **24** coupled to a ratchet sleeve **25** as shown in Fig. 1*a*. A number of pawls **26** cooperate with said ratchet sleeve **25** and are mounted in the front head **19** and kept in engagement with the ratchet sleeve by means of balls **27** loaded with springs **28**. The pawls **26** are arranged in such a way that the ratchet sleeve **25** can only rotate in a clockwise direction when looking from the back head of the tool towards the front head, as is obvious from Fig. 2 so that the hammer piston turns on the forward stroke. Through the illustrated device the piston **3, 11** is forced to turn during the forward working stroke in a clockwise direction. Through the sleeve **15**, the sleeve **18** and the chuck **21** the piston turns the drill steel in a clockwise direction. In other words, during the forward stroke of the piston **3** and shank **11**, the turning nut **17** is held against rotation in a counter-clockwise direction by engagement of the pawls **26** with the

ratchet sleeve 25 and the inter-engagement of teeth 24 on ratchet sleeve 25 and turning nut 17. The engagement of the inclined ribs 16 on turning nut 17 with inclined grooves 13 in the shank 11 will cause clockwise rotation of the shank 11 upon forward movement thereof and will, through the engagement of axial grooves 12 on the shank 11 with axial ribs on the sleeve 15, cause clockwise rotation of the sleeve 18 and sleeve 21 forming the drill chuck. Since the pawls 26 do not prevent clockwise rotation of the ratchet sleeve 25 and turning nut 17, backward movement of the shank 11 and piston 3 will result in turning the ratchet sleeve 25 and turning nut 17 in a clockwise direction without imparting rotary movement to the shank 11 and piston 3.

In Figs. 1 and 2 there is shown a water flushing tube 29 which in the same manner as in conventional rock drills extends through the cylinder 2, through the piston 3 and piston shank 11 and whose front end projects into a flushing medium duct 30 in the shank 22 of the rock drill steel 23.

When used to drill holes in rock or similar material the above described tool operates in the same manner as a conventional rock drill with the only difference that the direction of rotation of the rock drill steel is opposite to the conventional direction of rotation in rock drills. The main valve operated by the handle 4 may preferably be used in such a manner that said valve upon adjustment from the illustrated neutral position to the position 41 admits compressed air to the feed cylinder 5, then upon movement to the position 42 opens the flushing water supply, and finally upon movement to the position 43 admits compressed air to the working cylinder 2 so that in the position 43 the tool operates as a conventional stopper rock drill with water flushing. The main valve handle 4 may, furthermore, be used in such a manner that the valve upon movement to a position 44 admits compressed air to the feeding cylinder 5, and upon movement to the position 45 admits compressed air to the working cylinder 2 so that the tool in the position 45 operates as a percussion tool or nut runner without water flushing.

After having drilled a suitable number of holes anchor bolts are fitted in the holes and the rock drill steel 23 is removed from the tool and replaced by a bolt driving member 31 illustrated in Fig. 3. The bolt driving member 31 has a shank 32 and a socket forming a recess 33 which fits over the end of a bolt. The shank 32 is provided with a bore 34 in which the flushing medium tube 29 of the tool extends when the shank 32 is inserted in the chuck 21. The shank 32 has the same length as the shank 22 of the rock drill steel, and with the aid of the hammer piston the bolt driving member 31 with the main valve in the position 45 may be used for driving an anchor bolt into its hole in which it is fixed by means of a wedge or in any other conventional manner.

After having fitted a suitable number of anchor bolts the bolt driving member 31 is replaced by a wrench member 35, illustrated in Fig. 4. The wrench member 35 is at one end provided with a hexagonal socket 36 formed at the end of an intermediate portion which is bored from the socket as indicated at 37 in order to accommodate the free end of a bolt. At the end opposite to the socket 36 the wrench member 35 is provided with a hexagonal shank 38 which fits the opening in the chuck 21 but which has such a length that it does not extend beyond the chuck 21 at the inner end thereof, as is obvious from Fig. 4. It will, therefore, be obvious that during use of the wrench member 35 the same will not be engaged by the piston shank 11 and consequently, during this phase of operation, the piston provides only a turning force. The shank 38 is provided with a bore 39 similar to the bore 34 in shank 32 for receiving the front end of the flushing medium tube 29.

When roof plates or anchor bands and nuts have been provided on the anchor bolts the tool is fed towards the nut by means of the feed cylinder 5 and piston 6, 7. For this purpose the main valve operated by the handle 4 is moved to the position 44 and the wrench socket 36 of member 35 is brought into engagement with the nut. The percussion mechanism of the tool is then brought into operation by moving the main valve handle 4 to the position 45. In this position no water is supplied to the flushing water tube and the turning mechanism of the tool operates to turn and tighten the nut with great force by transforming the kinetic energy of the hammer piston 3, 11 into turning motion.

Instead of the wrench member illustrated in Fig. 4 a special chuck 21 may sometimes be used, as illustrated in Fig. 5. In this case the chuck 21 is formed at the front end with a hexagonal socket 40 with such gap that it fits the heads of anchor bolts of the type provided with bolt heads.

The mechanism above described and illustrated in the drawings should be considered only as an example and the details of the invention may be modified in several different ways within the scope of the claims.

What I claim is:

1. A pneumatic bolt applying and tightening tool comprising a cylinder casing, a back head and a front head, a hammer piston in said casing, a drill steel chuck rotatable in said front head, means in said casing for imparting a clockwise rotation to said chuck when looking from said back head towards the front head, and a detachable wrench member having a socket at one end formed to fit a nut or bolt head for turning the same and having a shank fitting the chuck at its opposite end for rotation by said chuck, the length of said chuck being at least as great as the length of said shank to preclude engagement of said hammer piston with said shank.

2. A tool according to claim 1, in which the detachable wrench member comprises a hollow intermediate portion carrying said nut or bolt head socket at one end and communicating with said socket for receiving a bolt end and carrying said shank at the opposite end, said intermediate portion, socket and shank forming a rigid unit.

3. A tool according to claim 1, in which said tool is provided with a flushing medium tube projecting into the chuck and an axial bore is provided in the shank to receive said flushing medium tube when the shank is inserted in the chuck.

4. A pneumatic bolt applying and tightening tool comprising a cylinder casing, a back head and a front head, a hammer piston in said casing, means for supporting said tool and for feeding the tool towards a rock face, a drill steel chuck rotatable in said front head, means in said casing for imparting a clockwise rotation to said chuck looking from the back head towards said front head, and a rigid detachable wrench member having a socket at one end formed to fit a nut or bolt head for turning the same and having a shank fitting the chuck at the opposite end for rotation by said chuck, the length of said chuck being at least as great as the length of said shank whereby said shank cannot receive axial blows originating from the hammer piston when the shank is inserted in the chuck.

5. A pneumatic bolt applying and tightening tool comprising a cylinder casing, comprising a hammer tool having a back head and a front head, a drill steel chuck rotatable in said front head, a hammer piston reciprocable in said casing having straight axial grooves and inclined grooves, means engaging said inclined grooves locked against rotation in a counterclockwise direction looking forwarding along the tool during the forward working stroke of said piston, said grooves having such incline as to produce a clockwise rotation of said chuck when looking from said back head towards the front head, and a detachable wrench member having a socket at one end formed to fit a nut or bolt head for turning the same and having a shank fitting the chuck at the opposite end for rotation by said chuck.

6. A pneumatic bolt applying and tightening apparatus comprising a hammer tool having a back head and a front head, a drill steel chuck rotatable in said front head, means in said tool for imparting a clockwise rotation to said chuck when looking from said back head towards the front head, and a socket associated with said chuck and formed to fit a nut or bolt head for turning the same upon rotation of the chuck in said clockwise direction to rotate said socket.

7. A tool according to claim 6, in which said socket is made with a polygonal opening and is integral with said chuck at the front end thereof and has a larger opening diameter than the chuck opening diameter.

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