

[54] **TORQUE WRENCH WITH A NUT RUNNER**

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[58] Field of Search 81/52.4, 52.5, 58.1

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[57] **ABSTRACT**

Torque wrench, characterized in provision of system for rotating a screw-fastening ratchet driven by power source in combination with manually operative ratchet type torque wrench, said ratchet is driven at high speed in the movement of rotation by low torque exerted from said power source to be effective enough for settling screw, subsequent thereto the settled screw is adapted to be fastened securely at a predetermined torque by manual operation of said torque wrench.

1 Claim, 2 Drawing Figures

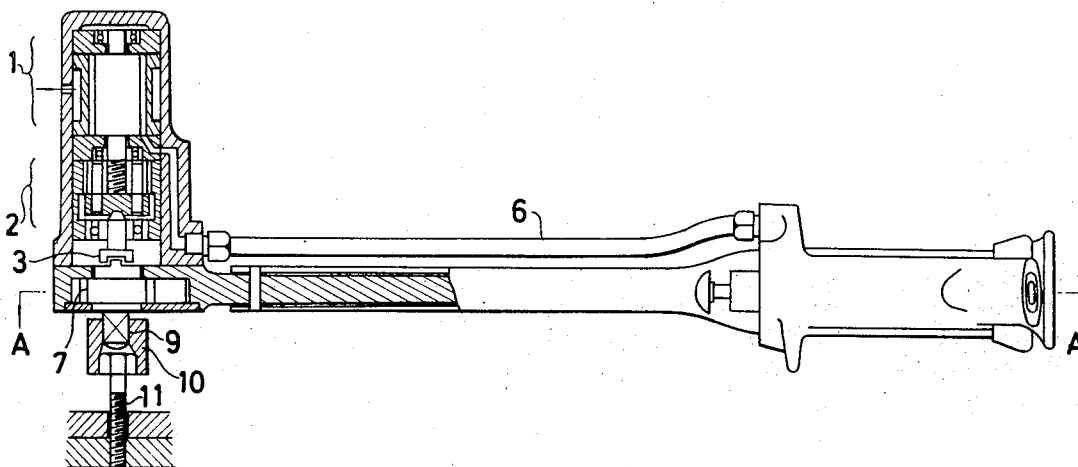


FIG. 1

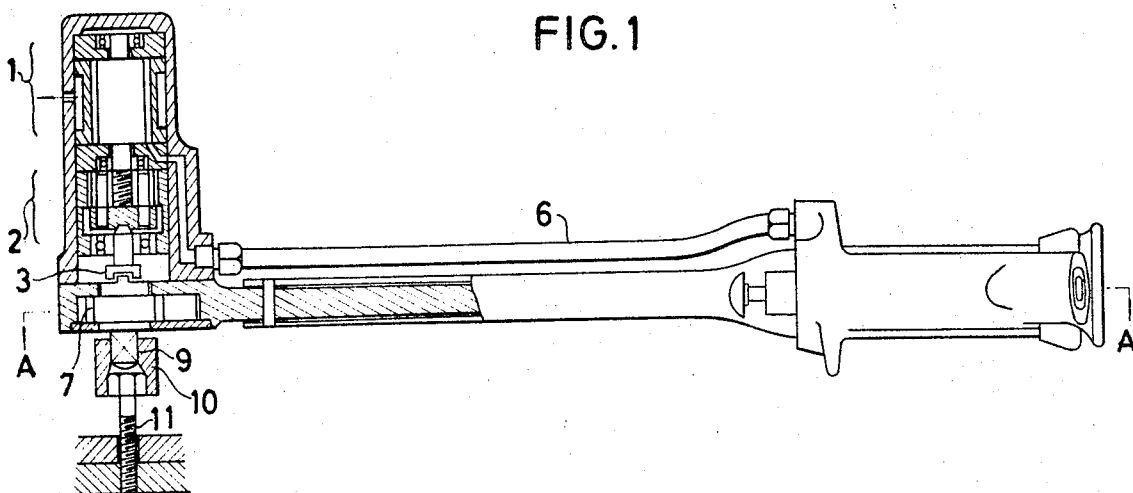
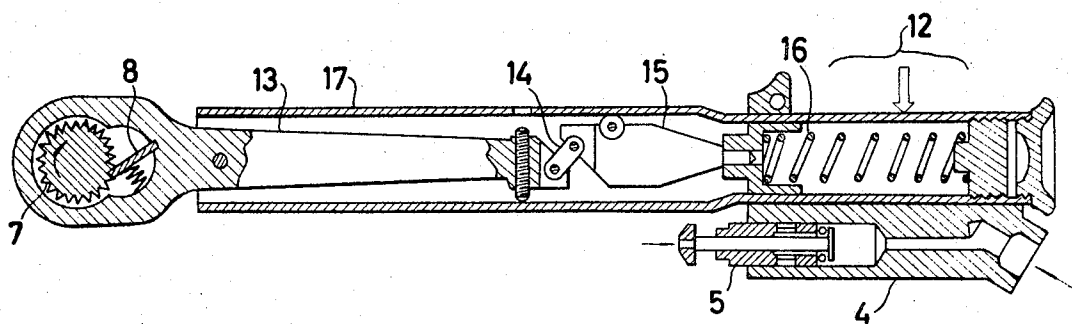


FIG. 2



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TORQUE WRENCH WITH A NUT RUNNER

The present invention relates to a torque wrench with nut runner providing effective fastening of screws efficiently under the condition of optimum torque.

Generally in the process of fastening screws, it can be divided into two stages, the first stage of which is carried out to turn nuts or bolts up to an extent of settling said screw to be fastened and the second stage of which is carried out by turning said nuts or bolts further for securing steadily the body to be fastened.

In the first stage as usual, a very little torque is required in revolving nuts or bolts, but it has to be revolved with high degree of revolving angle for about 10 rounds. On the other hand, the second stage subsequent to settling nuts or bolts to the body being fastened, a rather remarkably large torque is required for revolving nuts or bolts comparing with torque required in the former stage, furthermore, due to the magnitude of torque, the force for pressing against the body to be secured may be variable, so that it is necessary to stop fastening said body at a certain magnitude of torque in order to make uniform for fastening the same wherein, in ordinary case, it will be available for about half round of rotation with low degree of revolving angle.

In other words, two different characteristics of rotational torque are required for fastening screws. A conventional torque wrench generally used is most suitable to be utilized for the above-mentioned purpose in the rotary movement with a constant high magnitude of torque having low degree of revolving angle, however, it is not preferable for such a case wherein nuts or bolts have to be turned for a multiple number of rounds in small magnitude of torque before settling said nuts or bolts to the body being fastened.

The present invention is to provide torque wrench for fastening screws efficiently in reasonable magnitude of torque.

The present invention will now be described with reference to the accompanying drawings by way of example in form of an embodiment.

The drawings illustrate a torque wrench in the form of an embodiment with respect to the present invention wherein:

FIG. 1 is a front view of torque wrench with nut runner connected to an air motor power source, showing principal parts thereof in section; and

FIG. 2 is a sectional view of said torque wrench taken along the line A-A of FIG. 1.

FIGS. 1 and 2 show a ratchet type torque wrench provided at the upper part thereof, as viewed in FIG. 1, with a compact vane-type air motor 1 generating low motive power which is adapted to actuate a ratchet 7 in automatic movement of rotation through a clutch 3 after retarding said air motor by means of a planetary gear 2.

The foregoing air motor 1 is driven for movement of rotation by compressed air fed through a valve 5 fixed to the handle 4 and a flexible connecting pipe 6. The ratchet 7 is also constructed as to be able to turn in one direction only by means of a ratchet saw 8 and a drive head 9 is fixed within a properly shaped box spanner 10 in order to revolve screws 11 at high speed.

Upon settling the screws 11, the magnitude of torque is rapidly increased for the operation to revolve screws as mentioned above and, as a result it is impossible for the output torque imparted by said compact air motor

exerting low motive power to turn screws any further.

In addition to the foregoing stages, the handle 12 is moved by hand in the direction indicated by an arrow note FIG. 2, thereby said ratchet 7 is actuated in movement of rotation by means of rotary force in a manner similar to conventional ratchet type torque wrench for additionally rendering a normally applied rotatable torque to screws 11.

According to the principles identical with that of an ordinary limit-type torque wrench, torque loaded on the head portion 13 is effected as an axial force to a spring 16 through a toggle 14 and a thruster 15, and when said axial force becomes larger than the spring force, the case 17 slightly moves until its inside wall contacts the head portion 13 simultaneously with the action of the toggle 14, whereby it will easily be understood by feeling of touch that the predetermined torque has been achieved.

Torque wrench in accordance with the present invention, as is explained above, operates in such a manner that the valve 5 is held initially for revolving the screw 11 in high speed by means of an air motor in order to settle said screw, subsequently said screw attached to be secured to a desired position is fastened securely by predetermined torque.

Accordingly, the present invention is to provide most effective and efficient operation for fastening screws by utilizing the driving power of an air motor in combination with the fastening force of human power. Moreover, it is greatly advantageous in practical use to afford an air motor in compact size and light weight, since low output torque of said motor is sufficient enough to rotate a screw.

It has been described with respect to the present invention by way of example in the form of an embodiment shown in the accompanying drawings wherein an air motor may be substituted by some other motive power to be suitably utilized and torque wrench may also be available in such kinds of torque wrench of beam type with scale. The air motor may be connected to the ratchet through a vee gear so as to be arranged in parallel with the torque wrench. In this case also, similar effects can be obtained and the height of the whole device can be reduced.

Also in order to increase the output torque of the air motor an impact mechanism may be used, and other power sources such as an electric motor may be used instead of the air motor.

What is claimed is:

1. A torque wrench comprising an elongated hollow case open at one end, a handle secured to the opposite end of said case from its open end, a wrench member positioned adjacent the open end of said case for tightening screws and nuts on a bolt and the like, a head portion mounting said wrench member and extending into the open end of said case and through said case for a portion of the length thereof toward and in spaced relation from said handle, a thruster located within said case between said head portion and said handle and having its end spaced from said handle disposed in spaced relation to the end of said head portion closer to said handle, a toggle secured to and extending between the adjacent ends of said head portion and said thruster, a spring mounted within said handle and extending in the elongated direction of said case, said spring disposed in contact at one end against the end of said thruster remote from said toggle and at its other

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end against said handle, said wrench member comprising a housing mounted on the end of said head portion which extends outwardly from said case and the axis of said housing extending approximately perpendicularly to the elongated direction of said case, a vane-type air motor positioned within said housing, a planetary gear connected to said motor, a ratchet and drive head secured to said ratchet mounted in said housing and spaced from said motor, a clutch positioned between and arranged to interconnect said planetary gear and said ratchet, a ratchet saw positioned within said housing and disposed in engagement with said ratchet so

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that said ratchet can turn in one direction only, a box spanner secured to said drive head and shaped to fit the head of a screw or a nut so that the screw or nut can be tightened by low output torque when said air motor drives said ratchet and drive head, which low output torque is insufficient for finally tightening the screw or nut to a predetermined torque and applying the predetermined torque by manually turning said box spanner by applying force to said handle, a valve secured to said handle and a flexible connecting tube extending between said valve and said air motor.

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