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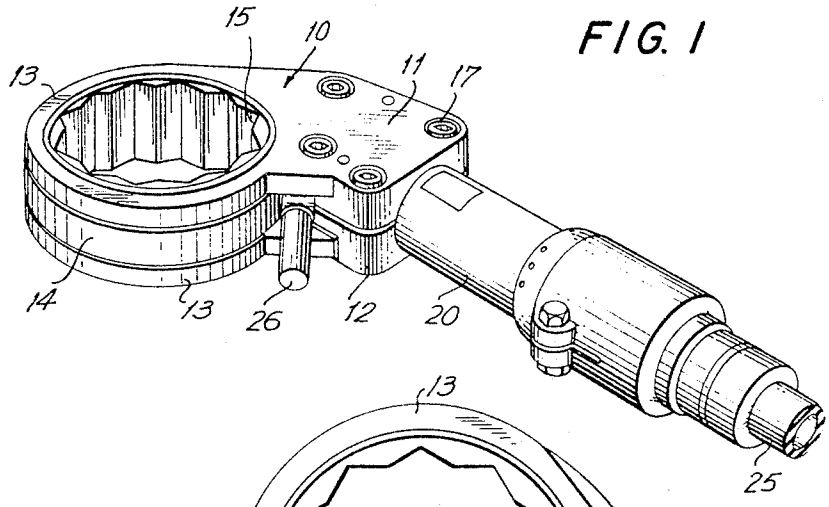
MECHANICAL NUT DRIVING WRENCH

Filed Nov. 4, 1963

FIG. 1



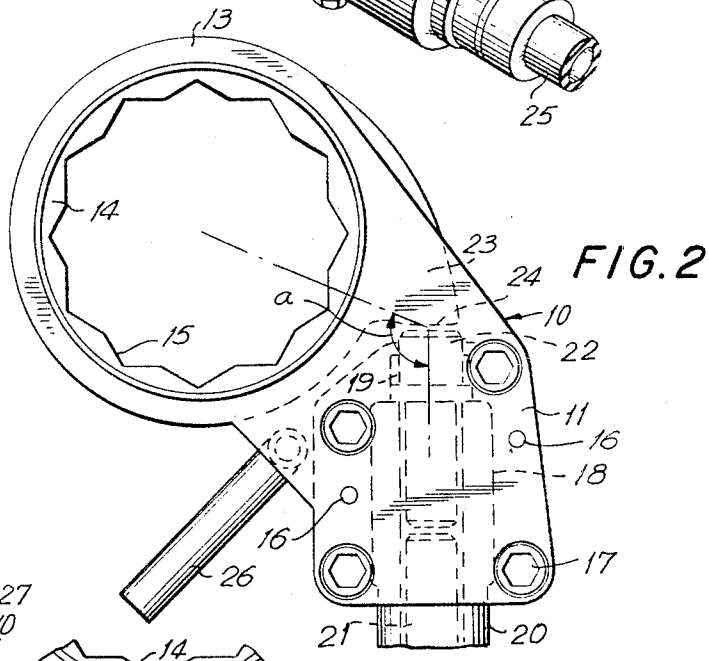


FIG. 2

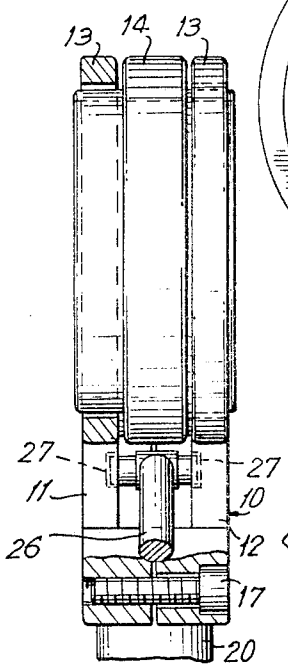


FIG. 3

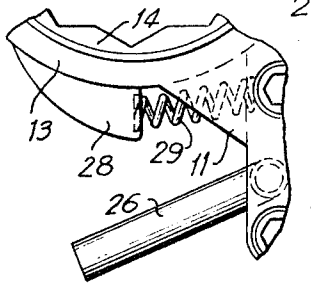


FIG. 4

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MECHANICAL NUT DRIVING WRENCH

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11 Claims. (Cl. 81—52.3)

This invention relates to mechanical nut driving wrenches operated by the impacts delivered by power operated reciprocating hammer means and primarily intended for tightening and loosening of very large sized nuts or bolts. Such large sized nuts are for example the tightly set nuts used for connecting marine diesel engine cylinder covers and cylinders to the engine frame and these and similar applications often call for wrenches which can be used in the very restricted space between the cylinders and also can be conveniently used while the ship is at sea. For driving these heavy nuts there have hitherto usually been used fixed jaw wrenches and annular socket wrenches provided with long handles and long extension shafts, but the long handles and shafts are cumbersome in use and it is sometimes difficult or impossible to produce by their aid a high enough torque for obtaining the intended tension and tightness in the connection. There have on the other hand also been suggested power operated impact wrenches for similar use but the known impact wrenches are usually complicated and expensive and furthermore are not designed in a manner to be effectively operable in restricted spaces.

It is a primary object of the invention to provide a mechanical nut driving wrench operated by impacts and able to produce a high torque while being applicable on nuts disposed in a restricted space. A further object of the invention is to provide a mechanical nut driving wrench of the above character having a sturdy, compact and effective construction. For these and other purposes there is provided a mechanical nut driving wrench operated by impacts and including power operated reciprocating hammer means for delivering a series of rotational blows to a wrench body.

The above and other objects of the invention will become obvious from the following description and from the accompanying drawing in which one embodiment of the invention and a modification thereof are illustrated by way of example. It should be understood that these embodiments are only illustrative of the invention and that various further modifications may be made within the scope of the claims without departing from the scope of the invention.

In the drawings FIG. 1 shows a nut driving wrench according to the invention in a perspective view. FIG. 2 shows on a somewhat larger scale the head portion of the nut driving wrench in a plan view and FIG. 3 is a partly sectional side view of FIG. 2. FIG. 4 is a fragmentary view of a portion of the wrench head in FIG. 2 showing a modification in which a spring arrangement is added to the wrench.

Referring to the drawing the nut driving wrench includes a head portion **10** including two separate plate shaped members **11** and **12** extending in parallel relation to one another and forming two coaxially spaced journals or guiding rings **13**. Between the rings there is carried for partial free rotation therein an annular open ended socket wrench body **14** internally provided with the usual flat walled opening **15** adapted to fit over the hexagonal nut to be driven. The end of the head portion **10** opposite the rings **13** is formed by massive portions of the two plate shaped members **11**, **12** and these massive portions are centered one on the other by means of centering pins **16** and are firmly connected by means of screws **17**. By removing the screws **17** the two members **11**, **12** may be taken apart permitting removal of the wrench body **14** and insertion of a wrench body of different internal size in between the rings **13**. The massive portions of the members **11**, **12** are furthermore provided with an opening therethrough formed by two pairs of partly cylindrical coaxial bores **18** and **19**, the larger pair **18** forming a socket for receiving and clamping by means of the screws **17** the forward end of an impact tool **20**, which has a reciprocating hammer piston **21** therein adapted to deliver blows to an anvil block **22** protruding from the opening in said massive portions. The anvil block **22** performs its stroke in the smaller sized bore **19** in the massive portions of the members **11**, **12**.

The wrench body **14** has an outer lug **23** centrally thereon having an impact face or shoulder **24** which preferably is suitably rounded and extends substantially radially in outward direction from the wrench body **14**. The shoulder **24** is intended for cooperation with the impact of the anvil block **22** and adapted to receive impacts therefrom. The impact tool **20** can be of any known type and may be driven pneumatically, hydraulically or electrically depending on the available power. The socket or bores **18**, **19** extend in such manner as to keep, as soon as the shoulder **24** abuts the anvil block **22**, the longitudinal central axis of the impact tool **20**, i.e. the axis of the anvil block **22**, at an obtuse angle a to a plane extending through the axis of rotation of the wrench body **14** and the point of contact between the anvil block **22** and the impact face **24**. The curvature of the impact face **24** is preferably such as to keep the point of contact between said face **24** and the anvil block **22** substantially on the longitudinal central axis of the impact tool **20** during the entire stroke of the anvil block **22**.

In operation the nut is screwed on the bolt manually or if necessary by the aid of a suitable tool until the resistance will be large enough to arrest the nut. Hereupon the impact tool **20** is used as a handle means and manipulated to place the wrench body **14** on the nut and the impact tool **20** is then turned until the anvil block **22** abuts the impact face **24** and then started. In the example shown the impact tool **20** is a conventional pneumatic hammer receiving compressed air from a suitable source, not shown, through a hose **25** and by means of the conventional distributing valve mechanism include therein and likewise not shown, the hammer piston **21** will be reciprocated delivering impacts to the anvil block **22** and the impact face or shoulder **24**. The impacts on the lug **23** will produce stepwise angular displacement of the wrench body **14** together with the nut. Simultaneously herewith or subsequently hereto the head portion **10** and the impact tool or handle means **20** are swung manually in the direction of the impacts whereby the anvil block **22** will follow and again abut the lug **23**. For purposes of easy manipulation and carrying of the tool an additional handle **26** may be fixed to the head portion **10** for example pivotally in opposed bores **27** in the members **11**, **12**. In case the swing of the entire tool proves to be too large with respect to the available space around the nut, the wrench body **14** obviously can be lifted off the nut and repositioned thereon in another angular position thereby providing the necessary full angular movement by increments.

Thanks to the above mentioned obtuse angle of attack of the anvil block **22**, the head portion **10** can likewise be formed at an obtuse angle with respect to the impact tool or handle means **20** so that the space necessary for operation of the tool will be kept at a minimum.

For loosening the nut the wrench body **14** is turned

upside down and in other respects operation thereof proceeds in a manner analogous with the above described.

In many cases it may be convenient to provide the wrench body **14** with an additional outward lug **28** and to insert a compression spring **29** between said lug **28** and a suitable dimple in the members **11**, **12**, FIG. 4. By this arrangement the spring **29** always tends to return the face **24** of the lug **23** into abutting engagement with the anvil block **22**. The spring **29** prevents undesirable wide angle recoil of the lug **23** and the wrench body **14** in the journals **13** subsequently to an impact in case the resistance should be too small.

What I claim is:

1. A mechanical nut driving wrench operated by impacts and including power operated reciprocating hammer means for delivering a series of rotational blows to a wrench body, said nut driving wrench comprising a pair of spaced apart parallel annular journals forming a head portion, a pressure fluid operated hammer connected at the forward end thereof to said head portion, an impact transmitting anvil block at said forward end of said hammer, an open ended annular socket wrench body coplanar with, but offset from the longitudinal central axis of said anvil block and rotatably carried between said journals for bidirectional rotation therein, a radially directed shoulder on said wrench body abutting said anvil block with the point of abutting contact between said shoulder and said anvil block always defining an obtuse angle between the central axis of said anvil block and a plane through the axis of rotation of said wrench body and said point, with said wrench body rotatable between a position with said anvil block abutting said shoulder and a position with said anvil block remote from said shoulder for permitting a substantial angular displacement of said shoulder relative to said head portion upon an impact delivered by said anvil block and for re-establishing abutting contact between said shoulder and said anvil block subsequently to said impact by manual turning of said hammer.

2. A mechanical nut driving wrench operated by impacts and including power operated reciprocating hammer means for delivering a series of rotational blows to a wrench body, said nut driving wrench comprising a head portion, an elongated pressure fluid operated hammer connected at the forward end thereof to said head portion, an impact delivering surface disposed concentrically with respect to the longitudinal central axis of said hammer and at said forward end thereof, an open ended annular socket wrench body co-planar with but offset from said central axis, a lug integral with and on said wrench body, said lug having an impact face directed substantially radially outwardly from said wrench body, cooperating annular journals on said head portion and around said wrench body and coaxial with said wrench body for rotatably carrying said wrench body on said head portion, and said head portion mounted for bidirectional partial rotation on said journals relative to said wrench body between a position with said surface abutting said face and a position with said surface remote from said face for permitting a substantial angular displacement of said impact face portion relative to said head upon an impact delivered by said impact delivering surface and for enabling the abutting contact between said face and said surface to be re-esablished subsequently to said impact by manual turning of said elongated pressure fluid operated hammer.

3. A mechanical nut driving wrench as set forth in claim **2** in which said head is provided with opposed flat outer surfaces parallel with said central axis and perpendicular to the axis of rotation of said wrench body.

4. A mechanical nut driving wrench operated by impacts and including power operated reciprocating hammer means for delivering a series of rotational blows to a wrench body, said nut driving wrench comprising a head portion, elongated impact delivering means forming a handle and connected at one end thereof to said head portion, an impact delivering surface disposed concentrically with respect to the longitudinal central axis of said impact delivering means and at said one end thereof, a wrench body, a lug fixedly connected to said wrench body, said lug having an impact face directed substantially radially outwardly from said wrench body, and said head portion mounted for bidirectional partial rotation on said wrench body for permitting a substantial angular displacement of said impact face relative to said head portion upon an impact delivered by said impact delivering surface and for enabling the abutting contact between said face and said surface to be maintained subsequently to said impact by movement of said impact delivering means relative to said lug.

5. A mechanical nut driving wrench as set forth in claim **4** in which resilient means are provided between said wrench body and said head for biasing said surface and said face into abutting relationship.

6. A mechanical nut driving wrench as set forth in claim **1** in which the point of abutting contact between said face and said surface always defines an obtuse angle between the central axis of said impact delivering means and a plane through the axis of rotation of said wrench body and said point.

7. A mechanical nut driving wrench operated by impacts and including power operated reciprocating hammer means for delivering a series of rotational blows to a wrench body, said nut driving wrench comprising an open ended annular socket wrench body having bearing surfaces thereon and coaxial therewith, a radially directed outer shoulder centrally on said wrench body, handle means coplanar with said wrench body and having annular journals at one end thereof and around said bearing surfaces for providing partial bidirectional rotatability of said handle means relative to said wrench body, said handle means including a head portion and a shaft portion at an obtuse angle to one another and with the longitudinal axis of said shaft portion intersecting said shoulder, and said shaft portion consisting of a pressure fluid operated hammer in abutting contact with said shoulder and operable for imparting blows to said shoulder for turning said wrench body in one direction and for being manually turned in the same direction therewith for maintaining said abutting contact between said hammer and said shoulder.

8. A mechanical nut driving wrench as set forth in claim **7** in which resilient means are provided between said wrench body and said head portion for biasing said shoulder into abutting relationship with said hammer.

9. A mechanical nut driving wrench operated by impacts and including power operated reciprocating hammer means for delivering a series of rotational blows to a wrench body, said nut driving wrench comprising an open ended annular socket wrench body, a radially directed outer shoulder centrally on and integral with said wrench body, pivot means on said wrench body, handle means coplanar with said wrench body and mounted for partial bidirectional rotation thereon on said pivot means, said handle means including a head portion and a shaft portion the latter substantially tangential to said wrench body and with the longitudinal axis of said shaft portion intersecting said shoulder, said shaft portion consisting of a pressure fluid operated hammer in abutting contact with said shoulder and operable for imparting blows to said shoulder for turning said wrench body in one direction, said shaft portion being rotatably disposed with respect to said wrench body resilent means disposed between said wrench body and said handle means for maintaining said abutting contact between said hammer and said shoulder.

10. In mechanical nut driving apparatus of the character described having a circular open socket wrench body for fitting a nut to be driven and power operated reciprocating hammer means connected to said wrench

body for delivering a series of blows thereto and for forming a handle extending from one side thereof, the combination which comprises a lug fixedly disposed on said wrench body and having an impact face extending radially outwardly from said wrench body for receiving said blows, an impact delivering surface disposed on said hammer means at one end thereof and adjacent said impact face, and means rotatably interconnecting said wrench body and said hammer means for providing angular displacement of said impact face from said impact delivering surface upon delivery of a blow thereto and for re-establishing abutting contact between said face and said surface after an impact thereon, said means rotatably interconnecting said wrench body and said handle providing for relative rotation therebetween in either direction, the axis of said handle being disposed substantially tangentially to said wrench body, and said wrench body being symmetrically open at either side for inserting a nut therein from either side thereof, and the entire thickness of said apparatus along the axis of said wrench body being substantially no greater than the thickness of said wrench body.

11. In mechanical nut driving apparatus of the character described having a circular open socket wrench body for fitting a nut to be driven and power operated reciprocating hammer means connected to said wrench body for delivering a series of blows thereto and for forming a handle extending from one side thereof, the combination which comprises a lug fixedly disposed directly on said wrench body and having an impact face

extending radially outwardly from said wrench body for receiving said blows, an impact delivering surface disposed on said hammer means at one end thereof and adjacent said impact face, pivot means rotatably interconnecting said wrench body and said hammer means for providing angular displacement of said impact face from said impact delivering surface upon delivery of a blow thereto and for providing bi-directional rotation of said handle with respect to said wrench body, and said wrench body being symmetrically open at either side for inserting a nut therein from either side thereof, and the entire thickness of said apparatus along the axis of said wrench body being substantially no greater than the thickness of said wrench body, and resilient means disposed between said wrench body and said hammer means for re-establishing abutting contact between said surface and said face after an impact thereon.

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