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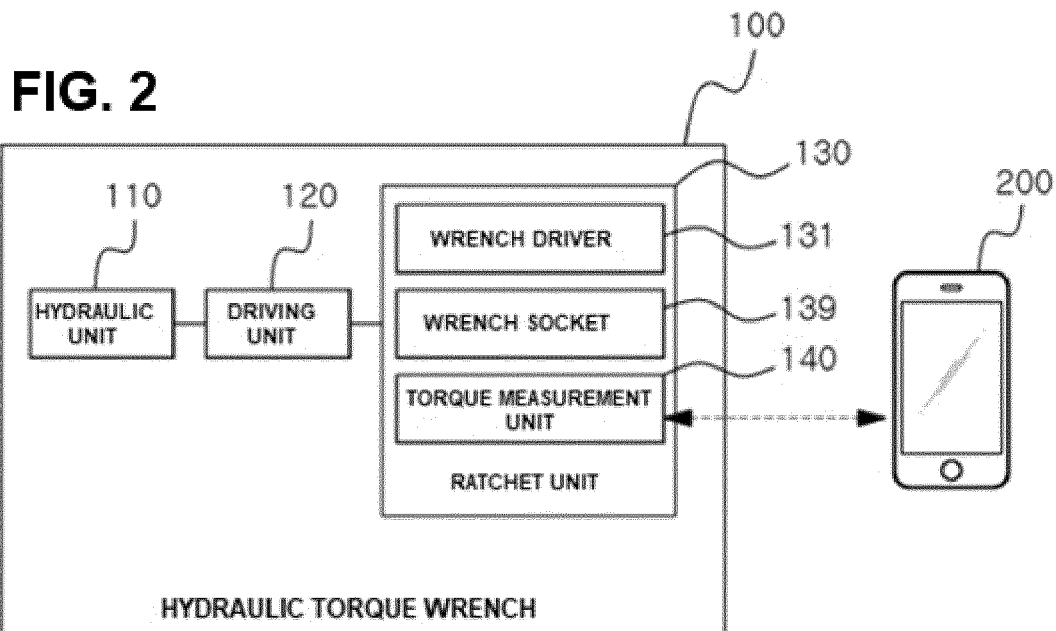
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(54) **HYDRAULIC TORQUE WRENCH**

(57) The present invention relates to a hydraulic torque wrench which includes: a hydraulic unit into which hydraulic pressure applied from the outside is input; a driving unit providing driving force by the hydraulic pressure applied through the hydraulic unit; and a ratchet unit

including a wrench driver which is rotated by the driving force and a wrench socket coupled to the wrench driver, in which the ratchet unit includes a torque measurement unit installed in the wrench driver and providing data of measured torque.



## Description

### CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims under 35 U.S.C. §119(a) the benefit of Korean Patent Application No. 10-2020-0046885 filed on April 17, 2020, the entire contents of which are incorporated herein by reference.

### BACKGROUND

#### (a) Technical Field

[0002] The present invention relates to a hydraulic torque wrench, and more particularly, to a hydraulic torque wrench capable of providing an output torque value in real time.

#### (b) Background Art

[0003] A hydraulic torque wrench as a tool that fastens bolts with a target torque value by the power of hydraulic pressure sent from a hydraulic pump is essentially widely used for bolts fastened in various structures such as a power plant, petrochemical, construction, automobile, shipbuilding, railway, etc.

[0004] A method for tightening the bolt of the hydraulic torque wrench includes a torque method, a rotation angle method, and a torque inclination method, but the torque method is most commonly used, and the torque method requires that a tightening area is an elastic range of the bolt and does not exceed a yield tightening axial force. In industrial sites, the torque value for each facility, determined by trial and error for a long time based on standard and theoretical calculations, is set as the target torque value when tightening the bolts, and the bolting work is carried out under thorough management.

[0005] However, the hydraulic torque wrench is continuously exposed to changes in output torque values due to friction-based variables and changes in working conditions at the site, but because the exposure cannot be solved by checking the output torque values in real time, it is very important to carry out regular or irregular examination and calibration in order to overcome the problem and in general, the examination and calibration are carried out at a period of 3 months, 6 months, 12 months or special schedule depending on work contents and a frequency of use.

[0006] In addition, the examination and calibration for maintaining the accuracy and reliability of the output torque value of the hydraulic torque wrench requires a lot of budget and downtime, but it is a reality that it is inevitable for the life of work equipment and accident prevention.

[0007] As such, there is an urgent need for technology development to ensure that loosening or destruction of bolts caused by an inaccurate output torque value of the hydraulic torque wrench used for a predetermined period

of time can be a disaster in financial and environmental aspects of the industrial site, so the output torque value is checked in real time, thereby maintaining safety and durability of a facility and a product in which the work is performed.

[0008] In addition, changes in the output torque value may occur as the work environment changes such as hydraulic pump replacement and operator change, and even in this case, the torque value output from the hydraulic torque wrench should be checked in real time to respond and it also necessary to develop a technology that can acquire the output torque value as real-time digital data in preparation for the use of product service.

### SUMMARY OF THE DISCLOSURE

[0009] The present invention is to solve the problem, and the present invention has been made in an effort to mount a sensor and an electronic circuit device capable of sensing an output torque value in a hydraulic torque wrench and provide a measured torque value to an external terminal in real time or display or provide the measured torque value through a display.

[0010] Accordingly, the present invention has been made in an effort to allow a worker to check the output torque value in real time at the time of tightening a bolt or nut by using the hydraulic torque wrench to enable a immediate site response so as to maintain the output value to be the same as a target torque value set differently according to a work facility.

[0011] Therefore, the present invention has been made in an effort to acquire the torque value measured in real time as digital data and apply the acquired torque value for a product utilizing IoT.

[0012] According to an embodiment of the present invention, a hydraulic torque wrench includes: a hydraulic unit into which hydraulic pressure applied from the outside is input; a driving unit providing driving force by the hydraulic pressure applied through the hydraulic unit; and a ratchet unit including a wrench driver which is rotated by the driving force and a wrench socket coupled to the wrench driver, in which the ratchet unit includes a torque measurement unit installed in the wrench driver and providing data of measured torque.

[0013] According to an embodiment of the present invention, it is possible to mount a sensor and an electronic circuit device capable of sensing an output torque value in a hydraulic torque wrench and provide a measured torque value to an external terminal in real time or display or provide the measured torque value through a display.

[0014] Accordingly, it is possible to allow a worker to check the output torque value in real time at the time of tightening a bolt or nut by using the hydraulic torque wrench to enable a immediate site response so as to maintain the output value to be the same as a target torque value set differently according to a work facility.

[0015] Therefore, it is possible to acquire the torque value measured in real time as digital data and apply the

acquired torque value for a product utilizing IoT.

## BRIEF DESCRIPTION OF THE DRAWINGS

[0016] The above and other features of the present invention will now be described in detail with reference to certain exemplary embodiments thereof illustrated the accompanying drawings which are given hereinbelow by way of illustration only, and thus are not limitative of the present invention.

FIG. 1 is a perspective view illustrating an exterior of a hydraulic torque wrench according to an embodiment of the present invention.

FIG. 2 is a configuration diagram of a hydraulic torque wrench according to an embodiment of the present invention.

FIGS. 3 and 4 are diagrams illustrating a wrench driver of the hydraulic torque wrench according to an embodiment of the present invention.

FIG. 5 is a configuration diagram of a torque measurement unit of the hydraulic torque wrench according to an embodiment of the present invention.

[0017] It should be understood that the appended drawings are not necessarily to scale, presenting a somewhat simplified representation of various preferred features illustrative of the basic principles of the invention. The specific design features of the present invention as disclosed herein, including, for example, specific dimensions, orientations, locations, and shapes will be determined in part by the particular intended application and use environment.

[0018] In the figures, reference numbers refer to the same or equivalent parts of the present invention throughout the several figures of the drawing.

## DETAILED DESCRIPTION

[0019] The present invention may have various modifications and various embodiments and specific embodiments will be illustrated in the drawings and described in detail in the detailed description. However, this does not limit the present invention within specific embodiments, and it should be understood that the present invention covers all the modifications, equivalents and replacements within the idea and technical scope of the present invention.

[0020] In describing the present invention, a detailed description of related known technologies will be omitted if it is determined that they unnecessarily make the gist of the present invention unclear. In addition, numeral figures (for example, first, second, and the like) used during describing the specification are just identification symbols for distinguishing one element from another element.

ment.

[0021] Further, throughout the specification, if it is described that one component is "connected" or "accesses" the other component, it is understood that the one component may be directly connected to or may directly access the other component but unless explicitly described to the contrary, another component may be "connected" or "access" between the components. In addition, unless explicitly described to the contrary, the word "comprise" and variations such as "comprises" or "comprising", will be understood to imply the inclusion of stated elements but not the exclusion of any other elements.

[0022] Hereinafter, embodiments of the present invention will be described in detail with reference to the accompanying drawings.

[0023] Here, FIG. 1 is a perspective view illustrating an exterior of a hydraulic torque wrench according to an embodiment of the present invention, FIG. 2 is a configuration diagram of a hydraulic torque wrench according to an embodiment of the present invention, FIGS. 3 and 4 are diagrams illustrating a wrench driver of the hydraulic torque wrench according to an embodiment of the present invention, and FIG. 5 is a configuration diagram of a torque measurement unit of the hydraulic torque wrench according to an embodiment of the present invention.

[0024] Referring to FIGS. 1 to 5, a hydraulic torque wrench 100 according to an embodiment of the present invention is configured to include a hydraulic unit 110, a driving unit 120, and a ratchet unit 130.

[0025] The hydraulic unit 110 may include a hydraulic port unit having an input port and an output port for applying hydraulic pressure. That is, as a hose of an external hydraulic generating device (e.g., a hydraulic pump, etc.) is coupled to the hydraulic port unit, the hydraulic pressure generated from the external hydraulic generating device may be applied through the hydraulic unit 110.

[0026] The driving unit 120 is a component for providing driving force by the hydraulic pressure applied through the hydraulic unit 110, and may include a driving motor and a driving driver.

[0027] The ratchet unit 130 includes a wrench driver 131, a wrench socket 139, and a torque measurement unit 140 as illustrated in FIG. 2. Here, the wrench driver 131 is rotated by the driving force applied through the driving unit 120. One surface of the wrench socket 139 is coupled to a square driver unit 132 of the wrench driver 131 and the other surface is manufactured by a shape and a size corresponding to the shape and the size of a circumferential surface of a nut used for tightening a bolt to be fastened to be utilized for fastening the nut to the bolt to be tightened according to the rotation of the wrench driver 131. The torque measurement unit 140 as a component capable of measuring an output torque value (actual torque value) at the time of driving fastening between the bolt and the nut is installed in the wrench driver 131 in the ratchet 130.

[0028] More specifically, the wrench driver 131 may be

manufactured to include a square driver portion 132, a body portion 133, and a receiving portion 135. A gear 134 is formed on the surface of the body portion 133 so that the driving force of the driving portion 120 is applied. Further, the receiving portion 135 for receiving a circuit portion A in the torque measurement unit 140 may be formed in the body portion 133.

**[0029]** The torque measurement unit 140 may be configured to a torque sensor 141 and a predetermined circuit portion (amplifier 142, A/D converter 143 and a communication module 144, a battery (not illustrated), etc.). In this case, as the torque sensor 141, a strain gauge capable of measuring a torque value may be used.

**[0030]** According to the above-described configuration, the torque sensor 141 may be installed in the wrench driver 131 to measure the output torque during fastening driving between the bolt and the nut, and the amplifier 142 may amplify the measured torque signal, the A/D converter 143 may convert the amplified torque signal into a digital signal, and the communication module 144 may transmit the digital signal to an external terminal 200. As a result, the external terminal 200 such as a smart phone, a tablet, a notebook, a PC, etc., may receive torque data measured by the torque sensor 141 in real time (see FIG. 2). Besides, according to another embodiment of the present invention, as illustrated in FIG. 7, a display may be manufactured to be installed on the hydraulic torque wrench 100, and in this case, the measured torque value may be directly disposed in the hydraulic torque wrench 100 itself.

**[0031]** As described above, when the hydraulic torque wrench 100 according to an embodiment of the present invention is used, it is possible to allow a worker to check the output torque value in real time at the time of tightening a bolt or nut by using the hydraulic torque wrench to enable an immediate site response so as to maintain the output value to be the same as a target torque value set differently according to a work facility.

**[0032]** Further, referring to FIGS. 3 and 4, arrangement positions of the torque sensor 141 and the circuit portion A will be described in more detail as follows.

**[0033]** The torque sensor 141 may be installed on the surface of an intermediate space (i.e., a portion (hereinafter, referred to as a sensor mounted portion 136) where the gear 134 is not formed in the body portion 133) between a portion where the square driver unit 132 and a portion where the gear 134 is formed in the wrench driver 131. Here, the sensor mounted portion 136 is provided to be recessed inside a circumference than the portion where the gear 134 is formed so that a height when the torque sensor 141 is installed may be lower than a thread height of the gear 134 when considering a thickness of the torque sensor 141.

**[0034]** Further, in FIGS. 3 and 4, a case where one torque sensor 141 is installed in the sensor mounted portion 136, but two or more torque sensors 141 may be installed, of course. In this case, the torque sensors 141 may be arranged at a predetermined interval along the

circumference of a cylindrical body portion 133 of the wrench driver 131 (for example, four torque sensors may be arranged in the sensor mounted portion 136 of the cylindrical body portion 133. After the torque sensor 141 is installed, the entirety of the sensor mounted portion 136 may be taping-processed for fixing and sealing the torque sensor 141.

**[0035]** Further, the circuit portion A in the torque measurement unit 140 except for the torque sensor 141 is installed in the receiving portion 135 inside the body portion 133 of the wrench driver 131 and in this case, a through-hole is provided at a predetermined position of the body portion 133 for connecting wires between the circuit portion A and the torque sensor 141.

**[0036]** In this case, the through-hole extends up to the receiving portion 135 by penetrating the surface of the body portion 133 and to this end, one end of the through-hole may be formed at a predetermined position of a boundary between the gear 134 and the sensor mounted portion 136 on an outer circumferential surface of the body portion 133 and the other end may be formed at a predetermined position of an inner circumferential surface of the receiving portion 135. The torque sensor 141 installed on the surface of the outer circumferential surface of the body portion 133 and the circuit portion A mounted inside the receiving portion 135 are electrically connected by wires through the through-hole.

**[0037]** By the aforementioned scheme, when the torque sensor 141 and the circuit portion A are electrically connected, the circuit portion A is completely inserted into a space of the receiving portion 135 and thereafter, a predetermined sealing cap (not illustrated) may be hermetically coupled to an upper surface of the receiving portion 135 in order to seal the circuit portion A. To this end, a coupling portion (e.g., threads for screw coupling) for coupling the sealing cap may be provided on the upper end of the inner circumferential surface of the receiving portion 135.

**[0038]** The present invention has been described with reference to the embodiments. However, it will be able to be easily appreciated by those skilled in the art that various modifications and changes of the present disclosure can be made without departing from the spirit and the scope of the present disclosure which are defined in the appended claims and their equivalents.

#### [Explanation of Reference Numerals and Symbols]

#### [0039]

100: Hydraulic torque wrench  
110: Hydraulic unit  
120: Driving unit  
130: Ratchet unit  
131: Wrench driver  
132: Square driver unit  
133: Body portion  
134: Gear

135: Receiving portion  
 136: Sensor mounted portion  
 139: Wrench socket  
 140: Torque measurement unit  
 141: Torque sensor

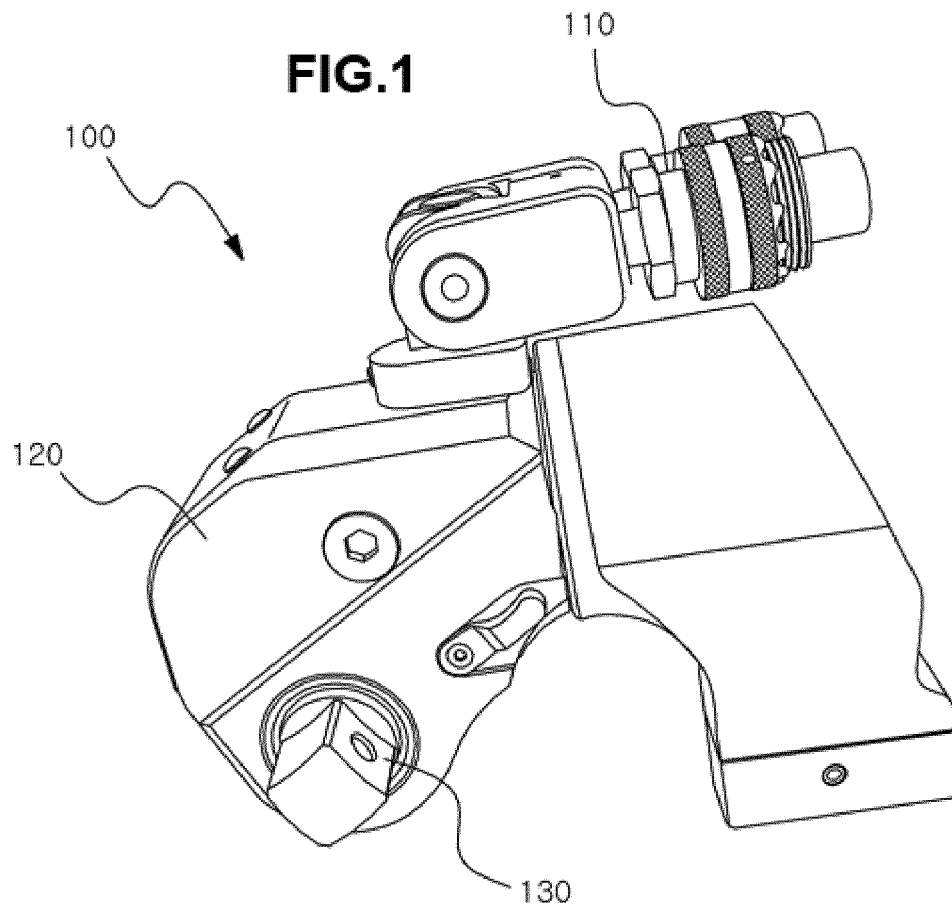
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nal to display the data of the torque through the external terminal.

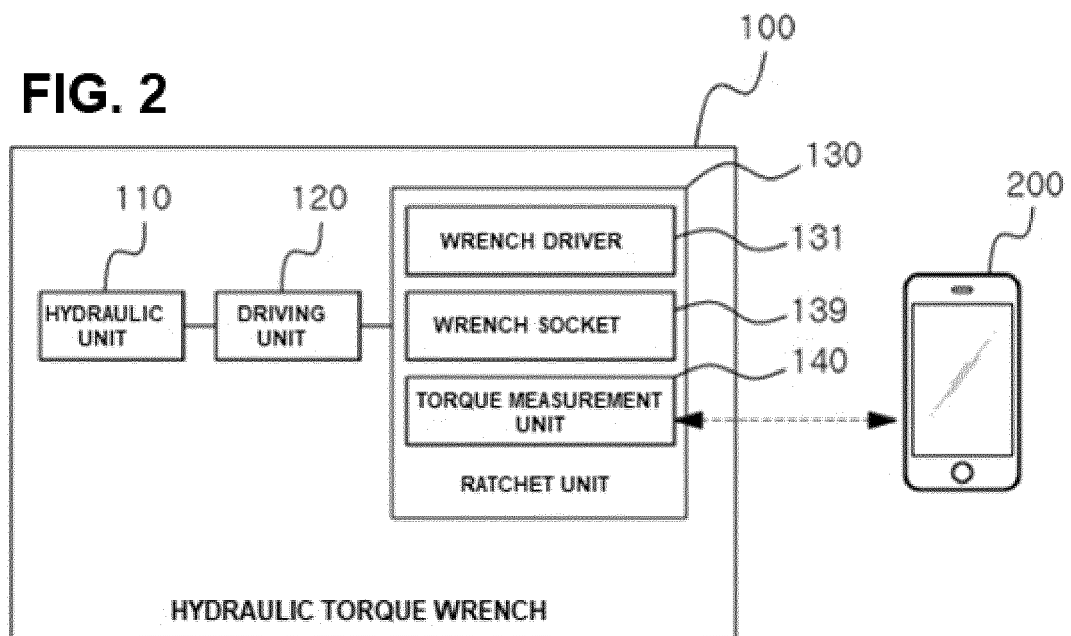
## Claims

1. A hydraulic torque wrench comprising: a hydraulic unit into which hydraulic pressure applied from the outside is input; a driving unit providing driving force by the hydraulic pressure applied through the hydraulic unit; and a ratchet unit including a wrench driver which is rotated by the driving force and a wrench socket coupled to the wrench driver, wherein the ratchet unit includes a torque measurement unit installed in the wrench driver and providing data of measured torque. 10  
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2. The hydraulic torque wrench of claim 1, wherein the torque measurement unit includes a torque sensor installed in the wrench driver and measuring the torque, and a circuit portion including a communication module transmitting data of the torque measured by the torque sensor. 25
3. The hydraulic torque wrench of claim 2, wherein the wrench driver includes a square driver unit to which the wrench socket is coupled, a body portion in which a gear to which the driving force of the driving unit is applied is formed on the surface, and a receiving portion formed inside the body portion and inserted with the circuit portion. 30  
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4. The hydraulic torque wrench of claim 3, wherein the torque sensor is installed in a sensor mounted portion corresponding to an intermediate space in which the square driver unit and the gear are formed in the wrench driver, one end is formed at a boundary portion of the gear and the sensor mounted portion on the surface of an outer circumferential surface of the body portion and the other end has a through-hole formed at a predetermined position of an inner circumferential surface of the receiving portion inside the body portion and penetrates up to the inner circumferential surface of the receiving portion from the surface of the outer circumferential surface of the body portion, and the torque sensor and the circuit portion are connected by wires through the through-hole and a coupling portion for coupling a sealing cap for sealing the circuit portion received in the receiving portion is formed on an upper portion of the inner circumferential surface of the receiving portion. 40  
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5. The hydraulic torque wrench of claim 2, wherein the communication module transmits data of the torque measured by the torque sensor to an external terminal.

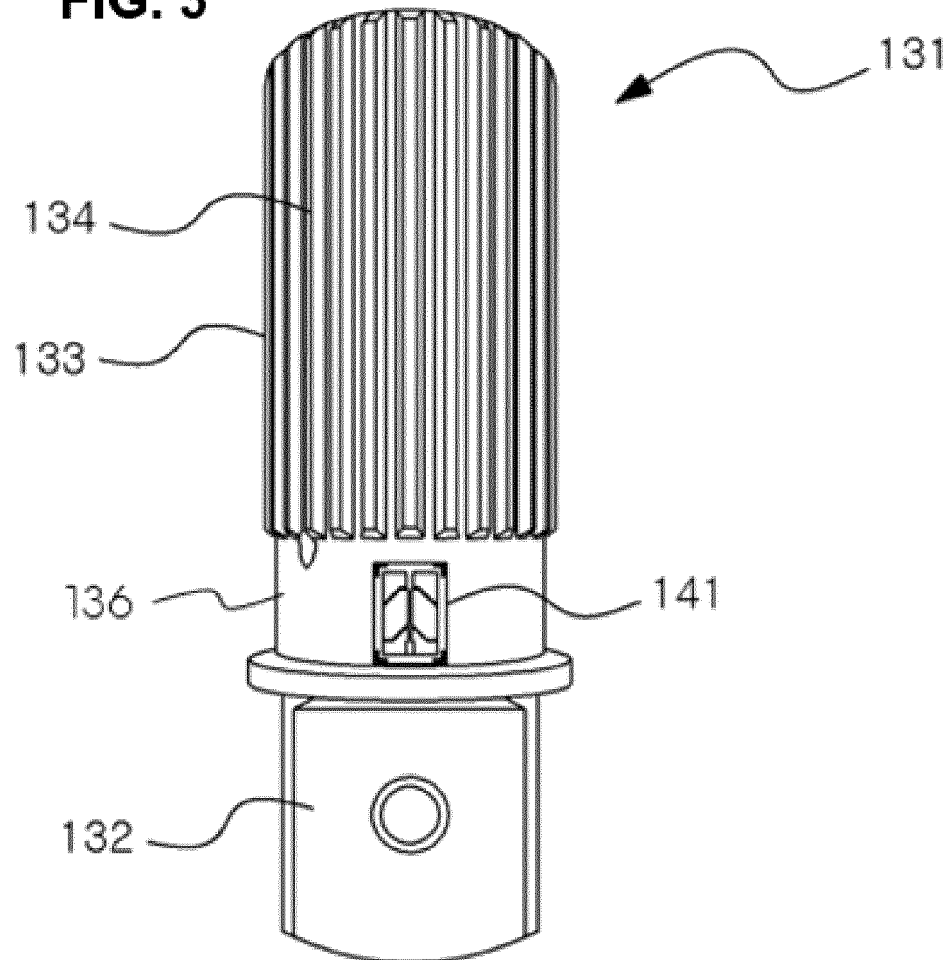
**FIG. 1**



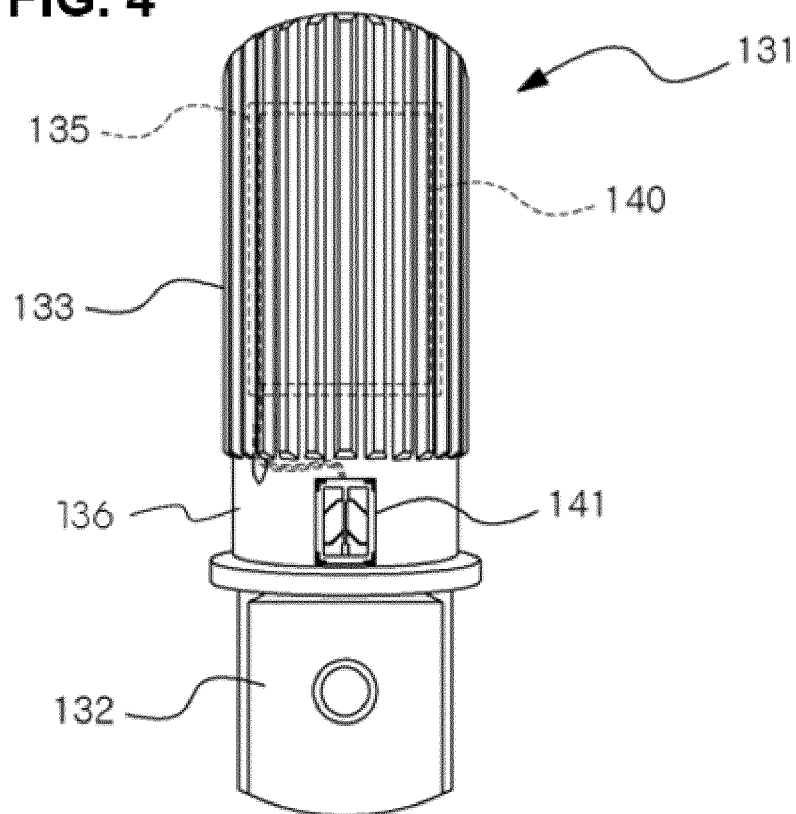
**FIG. 2**



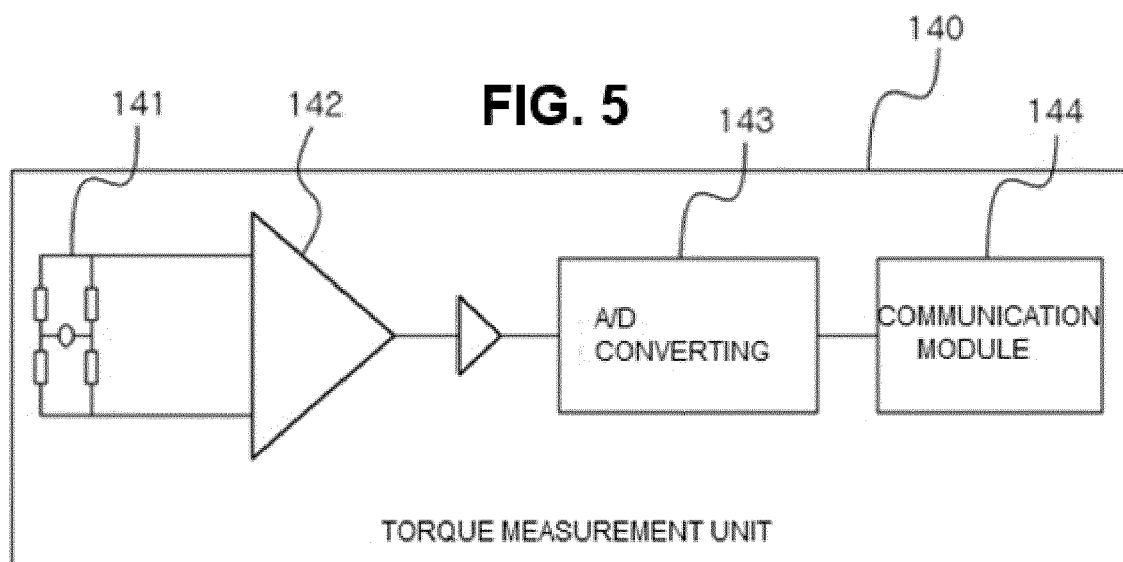
**FIG. 3**



**FIG. 4**



**FIG. 5**





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Application Number  
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**ANNEX TO THE EUROPEAN SEARCH REPORT  
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