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Description

The invention relates to a screw tensioning device for stretching a threaded bolt carrying a nut, said screw tensioning device comprising a support tube and a cylinder member provided in the axial extension of the support tube, said cylinder member including an axially moveable piston section, and comprising a tensioning bolt extending through the piston section and arranged in engagement with the piston so as to be axially entrained thereby.

Screw tensioning devices are known for the purpose of tightening and releasing highly stressed screw connections. A screw tensioning device has the function of exerting a precisely predetermined biasing force onto the screw connection in order to allow for the tightening or releasing of the nut of the screw connection that had been threaded onto a threaded bolt. For tightening or releasing the nut, the screw tensioning device will be screwed onto the thread - projecting beyond the nut - of the threaded bolt and then be subjected to hydraulic pressure. The screw-in depth of the threaded bolt into the tensioning bolt must have a length of at least $1 \times D$, with D being the diameter of the threaded bolt, for ensuring that the threaded bolt will not be damaged by the tensioning process. Failure to maintain a projecting length of $1 \times D$ of the bolt will entail the danger that the screw tensioning device tears off, resulting in hazard to persons and objects.

In DE 10 2005 015 922 B4, a screw tensioning device is described which is provided with a measurement rod for measuring the relative displacement of the thread end of the threaded bolt relative to the hydraulic cylinder and casing, respectively, of the screw tensioning device. Thereby, however, one will merely obtain a measure of the respective stretch of the threaded bolt but no information yet on whether the tensioning bolt has been screwed onto the threaded bolt to a sufficient extent. GB 2 272 741 A and DE 30 47 674 A1 disclose similar devices wherein the tensioning of the threaded bolt is detected by means of a dial gauge.

It is an object of the invention to provide a screw tensioning device wherein the screw-in depth is visualized in a simple manner so that the checking of the minimum projecting length of the bolt will not require additional tools or working steps.

The screw tensioning device of the invention is defined by claim 1.

WO 2006/027060 A1 discloses a screw tensioning device wherein the projecting length of the screw over the housing and respectively the projecting length of the threaded bolt over the nut can be measured.

DE 93 16 464 U1 discloses a screw tensioning device according to the precharacterizing part of claim 1.

The invention makes it possible, without additional provisions on the screw tensioning device, to detect whether the required projecting length of the bolt is maintained. Thereby, handling the screw tensioning device is facilitated and the time required for correctly tightening or releasing the screw connection is reduced. The interior depth measuring device is encapsulated in a manner keeping it free from external influences which might cause damage or might impair the functioning of the device. In the process of screw-mounting the hydraulic tensioning device, the projecting length of the thread will be automatically measured and respectively checked and will be visually indicated.

According to a preferred embodiment of the invention, it is provided that the tensioning bolt comprises an axial threaded bore for screwing the threaded bolt thereinto, and that the threaded bore terminates at an end-side edge of the tensioning bolt. The lower end of the threaded bore has the function of a reference position, forming the basis from where the screw-in depth of the threaded bolt will be measured.

Said depth measuring device preferably comprises a measurement rod, arranged to be axially movable in a channel of the tensioning bolt, which on one end is provided with an abutment portion and on the other end is provided with a marking adapted to project from a casing of the screw tensioning device. Said measurement rod can project from the casing of the screw tensioning device. On this end of the measurement rod, said marking is arranged, e.g. in the form of a green area. If the marking is visible from the outside, this will indicate a correct projecting length of the bolt. If, however, the acceptance marking is not visible, the projecting length is too short.

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The measurement rod can also be provided with a marking indicating an incorrect state, e.g. in red color, which, if visible, will signal an insufficient projecting length.

According to a preferred embodiment of the invention, it is provided that the tensioning bolt is equipped with a spring biasing the measurement rod toward said second end. Under the effect of the spring, the measurement rod is forced in the direction toward the threaded bolt and into tight abutment on the end face of the threaded bolt.

An exemplary embodiment of the invention will be explained in greater detail hereunder with reference to the drawings.

In the drawings, the following is shown:

Figure 1 is a view of the screw tensioning device, and

Figure 2 is a longitudinal sectional view of the screw tensioning device.

The hydraulic screw tensioning device illustrated herein comprises a casing 10 which is substantially cylindrical and has an upper end wall 11, while the lower end is formed by a support tube 12 with an open bottom. A hydraulic connector 13 is arranged laterally on casing 10. Further provided is a gear transmission 14 which can be rotated by use of a tool for thus rotating the nut seated on the threaded bolt.

Above said support tube 12, casing 10 comprises a cylinder member 15 with a plurality of hydraulic cylinders 16, all of them being arranged hydraulically parallel and connected to said hydraulic connector 13. An axially moveable piston section 17 includes the pistons 18 which can be moved within the cylinders 16. Piston section 17 is supported against said upper end wall 11 by means of a spring device 19. The spring device 19 urges the pistons 18 into the lower end position. By hydraulic pressure within the cylinders 16, the pistons 18 are pushed upward against the effect of spring 19.

Piston section 17 has an annular shape. A tensioning bolt 20, comprising a shaft portion 21 and a coupling portion 22, is arranged to extend coaxially through the piston section. Said coupling portion 22 is arranged internally of support tube 12 and includes an axial threaded bore 23 terminating at an end face.

Further illustrated in Fig. 2 is the screw connection 30. The screw connection comprises a threaded bolt 31 with an outer thread, and a nut 32 screwed onto said outer thread and provided with an underlying washer 32a. Said threaded bolt 31 is a component part of the workpiece on which the support tube 12 is supported by its end face 25. The hydraulic tensioning device serves for axially stretching the threaded bolt 31 in order to allow the nut 32 to be rotated without larger resistance. This rotating movement can be performed via the gear transmission 14 or by manual engagement of the nut via slits in support tube 12. The support tube is provided with a wrench ring 33 whose inner contour is adapted to the hexagonal contour of nut 32 and which can be rotated by transmission gear 14. Said wrench ring 33 is rotatable relative to support tube 12. In this manner, nut 32 can be rotated while the threaded bolt 31 remains fixed.

For the tensioning process, it is important that a specific minimum screw-in depth of threaded bolt 31 into said threaded bore 23 is maintained. This screw-in depth ET normally has to be at least equal to D, with D being the thread diameter of the threaded bolt. For measurement of the screw-in depth ET, a depth measurement device 35 is provided. The latter comprises a measurement rod 36 extending through an axial channel 37 of shaft portion 21. Said measurement rod 36 extends into threaded bore 23. Its end forms an abutment portion 38 for abutment against the end 39 of threaded bolt 31. The opposite end is provided with a marking 40, e.g. a color marking, which can be moved out of the end wall 11 of the casing and will then be visible from outside.

Arranged internally of tensioning bolt 20 is a spring 42 which by one of its ends is supported on the tensioning bolt and by its other end engages the measurement rod 36 and presses the same toward the threaded bolt 31.

When using the screw tensioning device, one will first screw the nut 32 loosely onto the threaded bolt 31. Then, the screw tensioning device will be placed onto the

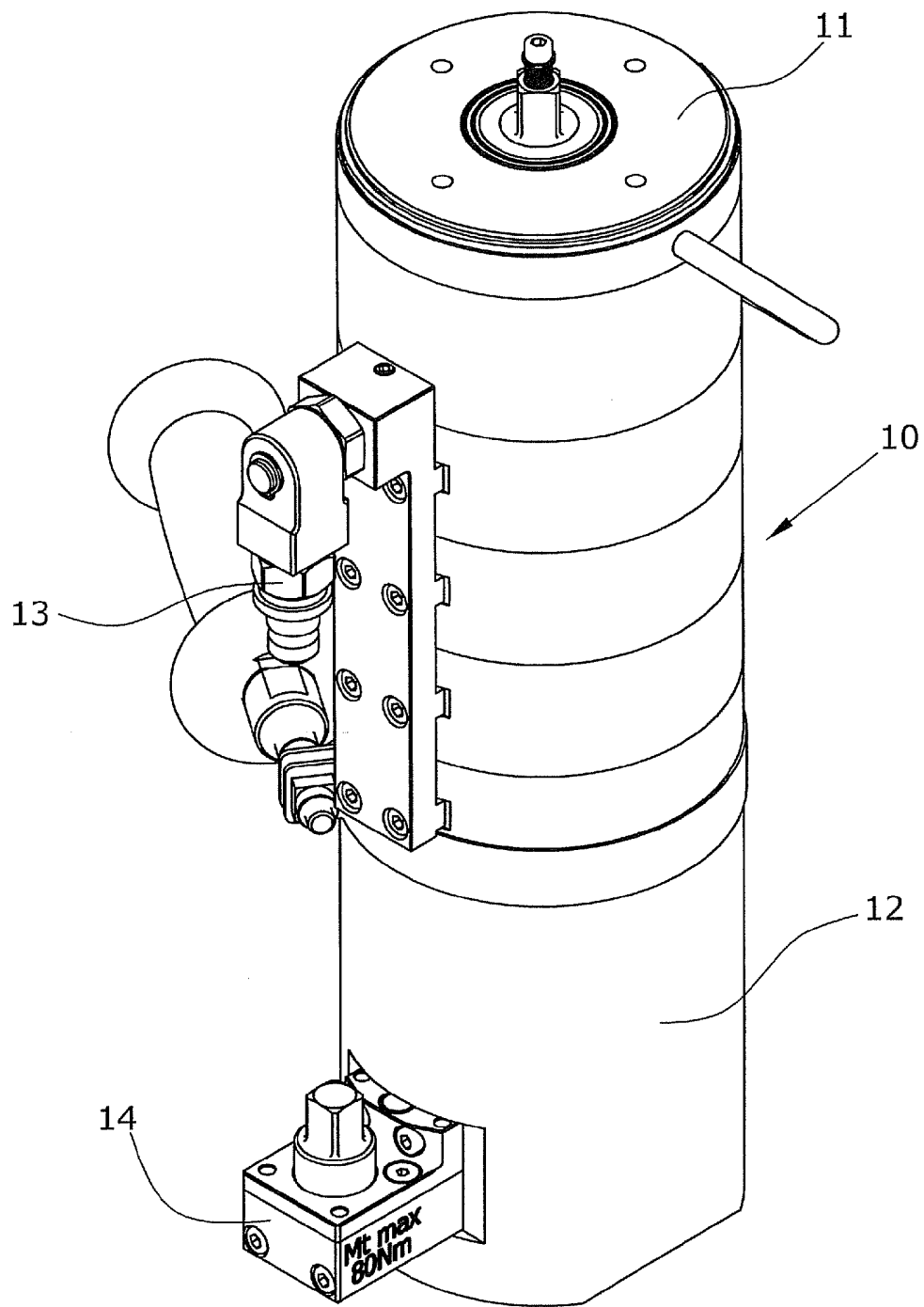
screw connection 30 and be rotated about its axis, thus screwing the tensioning bolt 20 onto the threaded portion of threaded bolt 31. With the aid of the depth measurement device 35, it will be detected whether the projecting length U of the threaded bolt beyond the nut 32 is sufficiently large for pressing the marking 40 out from the casing. The depth measurement device 35 is encapsulated within the screw tensioning device and thus accommodated in a well-protected manner, preventing it from exposure to external influences. In the process of screwing the screw tensioning device onto the threaded bolt 31, the measurement rod 36 is pressed upward against the pressure of spring 42 so that the marking 40, which in the unused state is sunk within the casing, will be moved outward and thus become visible. Thereby, the user is informed that the projecting length of the threaded bolt 31 beyond nut 32 is sufficient to allow for the pressurization of cylinder member 15.

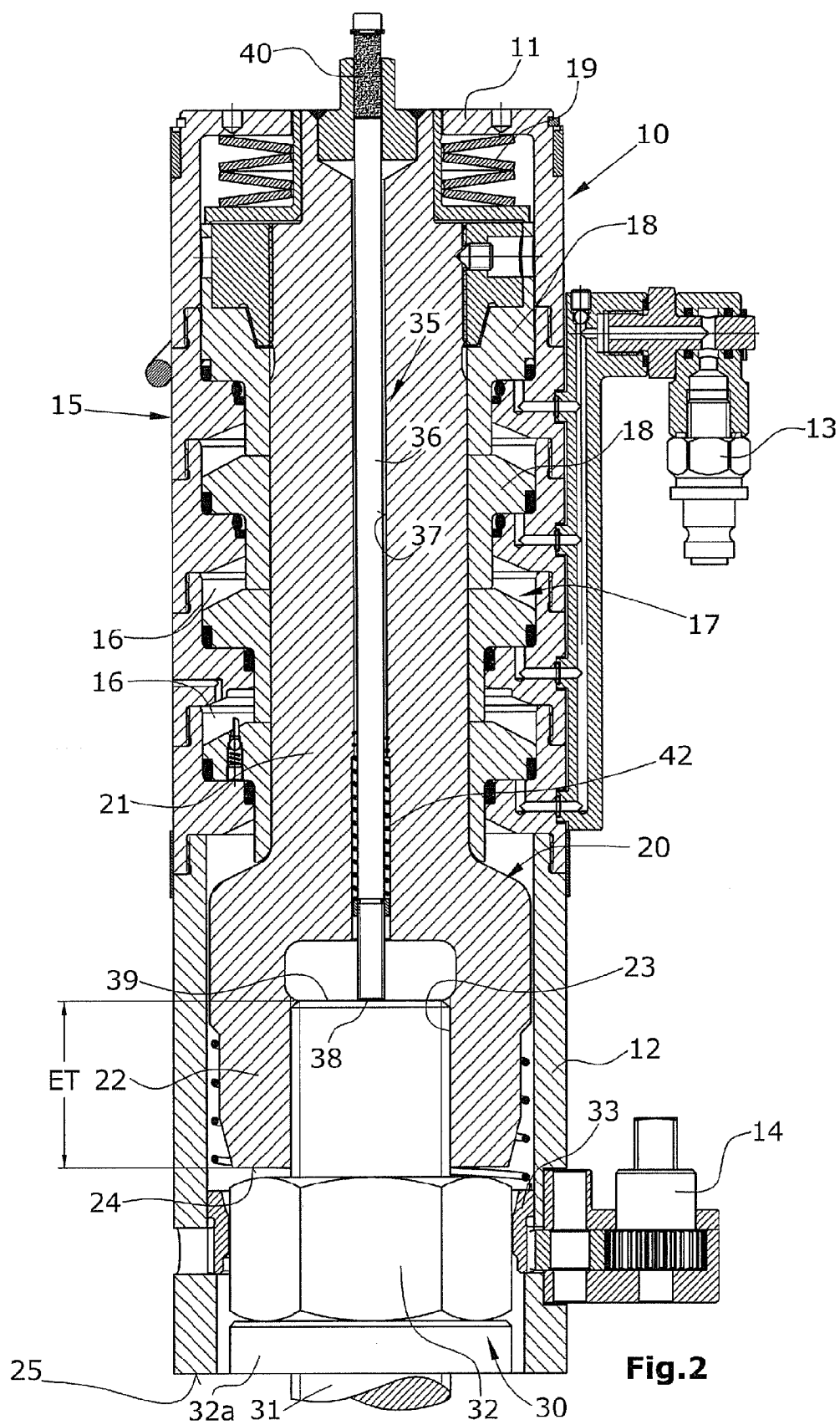
In the present invention, the marking 40 will present an optical signal. Alternatively or additionally, it can be provided, according to a preferred embodiment of the invention, that an acoustic acceptance signal is generated when the measurement rod 36 is in the acceptable range. The user will then not need to focus his/her gaze to the tensioning device.

Patentkrav

1. Skruespændingsindretning til at stramme en gevindbolt (31) bærende en møtrik (32), omfattende et støtterør (12) og et cylinderelement (15) tilvejebragt i den aksiale forlængelse af støtterøret (12), hvilket cylinderelement omgiver et aksialt bevægeligt stempelafsnit (17), og omfatter en trækbolt (20), der strækker sig igennem stempelafsnittet (17) og er anbragt i indgreb med stempelafsnittet for således at blive aksialt medbragt, hvilken trækbolt (20) omfatter en aksial kanal (37) forsynet med en dybdemålingsindretning (35) til at indikere den aksiale position af enden (39) af gevindbolten (31) i forhold til trækbolten (20),
- kendetegnet ved at**
- dybdemålingsindretningen udsender et optisk og/eller akustisk signal, når indskruningsdybden (ET) af gevindbolten (31) er i et forudbestemt område.
2. Skruespændingsindretningen ifølge krav 1, **kendetegnet ved at** trækbolten (20) omfatter en aksial gevindboring (23) til at skrue gevindbolten (31) deri, og at gevindboringen (23) slutter ved en endesidet kant af trækbolten.
3. Skruespændingsindretningen ifølge krav 1 eller 2, **kendetegnet ved at** dybdemålingsindretningen (35) omfatter en målestang (36) anbragt til at være aksialt bevægelig i kanalen (37) af trækbolten (20), hvilken målestang på en ende deraf er forsynet med en anslagsdel (38) og på den anden ende er forsynet med en markering (40) indrettet til at fremspringe fra et hus (10) af skruespændingsindretningen.
4. Skruespændingsindretningen ifølge krav 3, **kendetegnet ved at** trækbolten (20) er forsynet med en fjeder (42), der forspænder målestangen (36) i retning mod den anden ende.
5. Skruespændingsindretningen ifølge et hvilket som helst af kravene 1-4, **kendetegnet ved at** dybdemålingsindretningen (35) er konfigureret til at vise en

acceptmarkering (40), når enden (39) af gevindbolten (31) har en afstand mindst lig med D fra anslagsfladen (24), hvor D er gevinddiametere af gevindbolten (31).

**Fig.1**

**Fig. 2**