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(54) Tensile testing and stretching apparatus for a bolt projecting from a surface

(57) A traction nut 59 is screwed onto the bolt 19 to be tested. The nut 59 is gripped by jaws 20*a* which can be separated for placement over the nut by squeezing together handles 42 and 46 to disengage conical surface of part 34 from jaw members 20. Tension is applied by a hydraulic cylinder 48, 50 through a flange 24 on a tie rod 26 to the jaw members 20 and the extension is measured by a dial gauge 54 through a sensor 56. The cylinder 48, 50 reacts against the surface by way of a bracing ring 38.

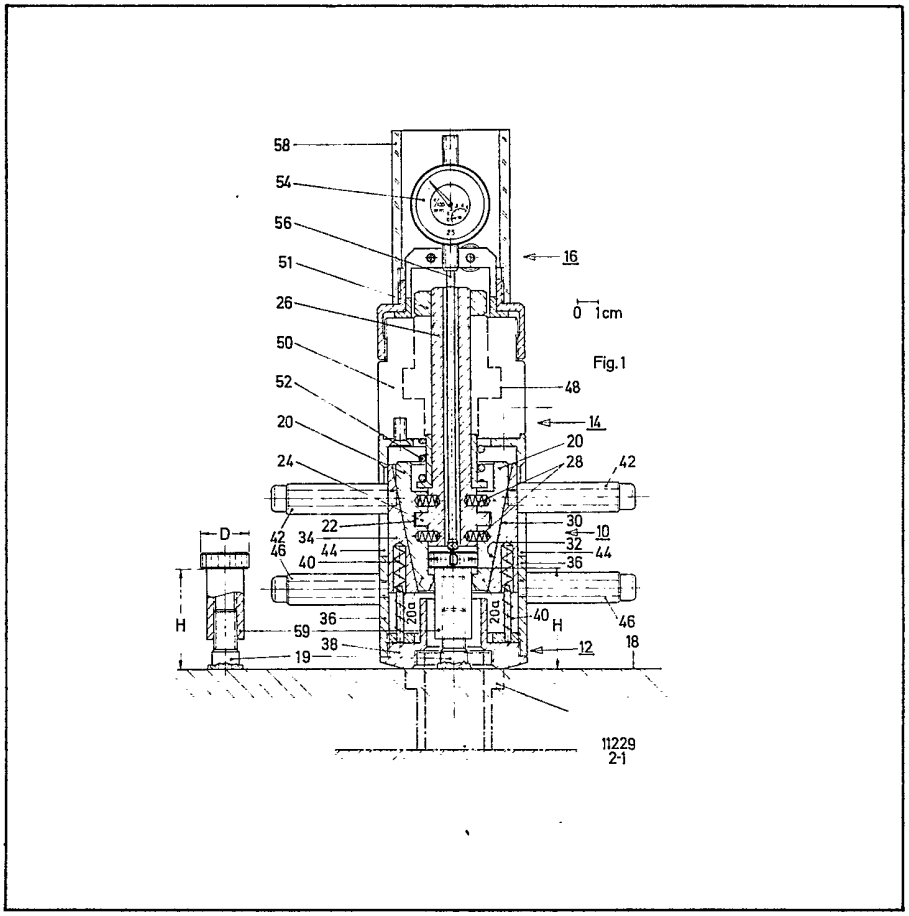


Fig.1

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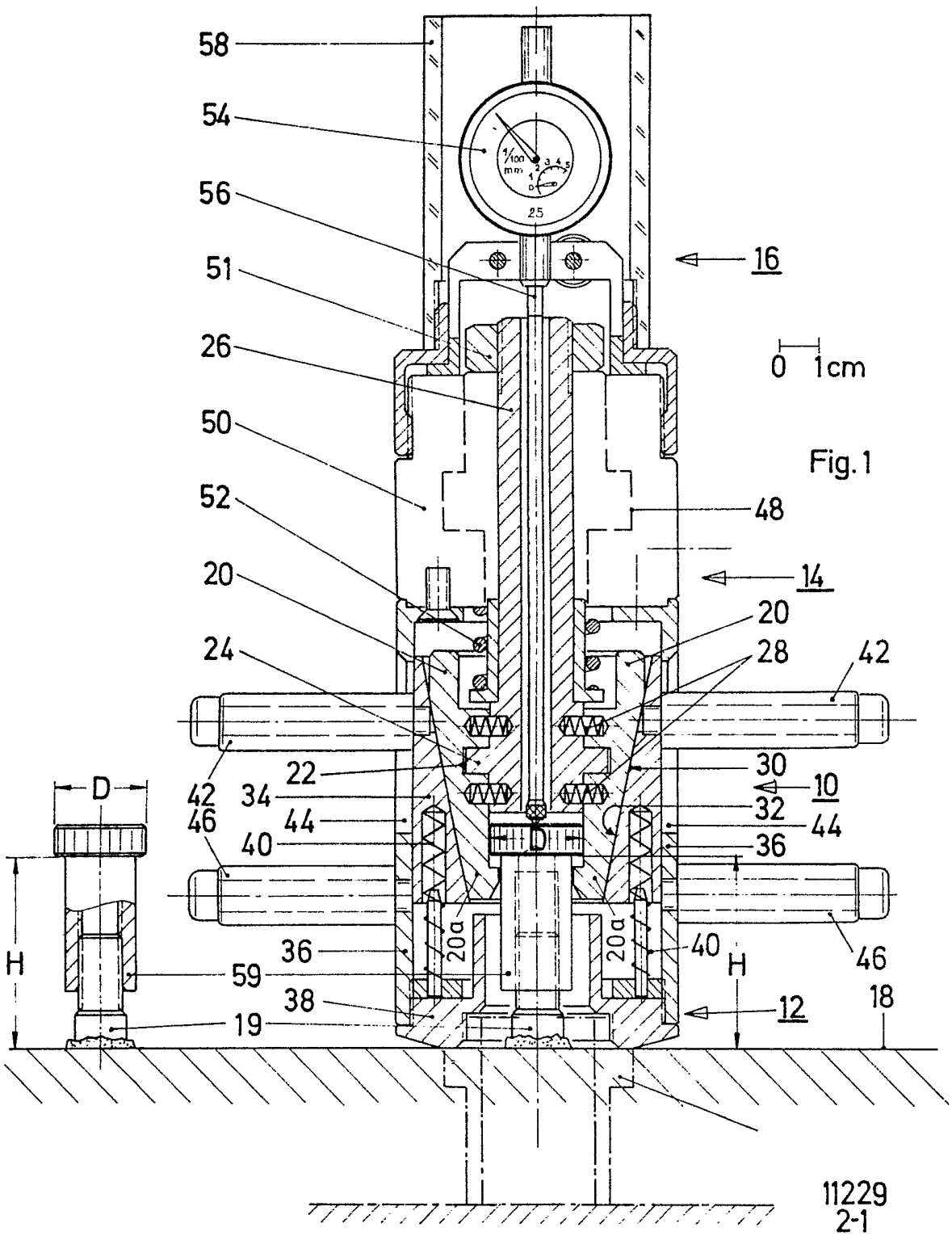


Fig.1

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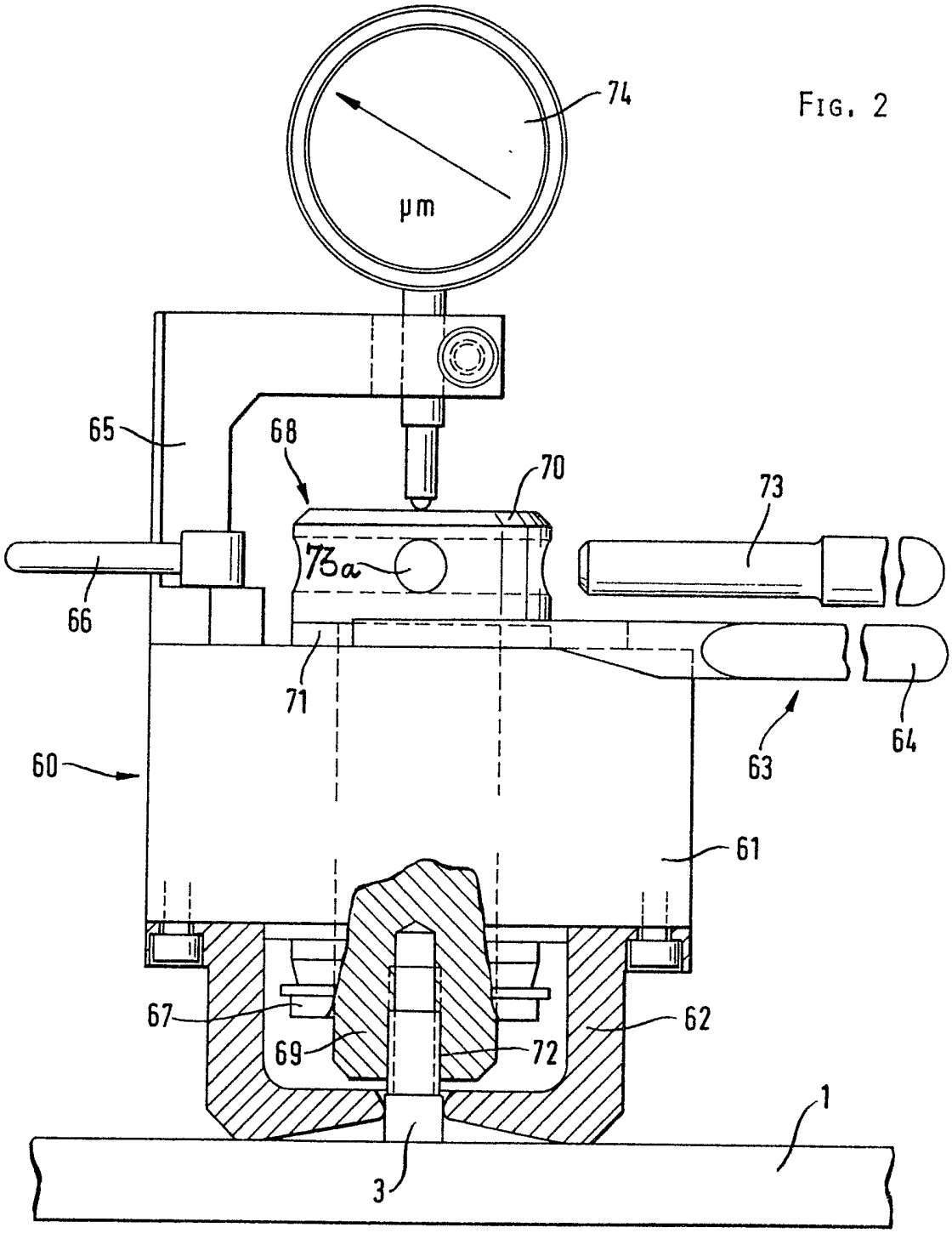


FIG. 2

SPECIFICATION

Tensile testing and stretching apparatus for a bolt projecting from a surface

The present invention relates to a tensile testing and stretching apparatus according to the precharacterising clause of Patent Claim 1.

In the manufacture of apparatus, screwbolts are frequently butt-welded by electric arc welding or the like to a surface of an apparatus. Set bolt dowels and concrete anchorages are also fitted in similar manner. In many such cases it is necessary for the strength of the joint to be tested. The test methods hitherto customary are inaccurate, complicated and time-consuming.

It is the underlying aim of the present invention to disclose a tensile testing apparatus which permits a rapid, simple and reliable trouble-free testing of the strength of the attachment of a bolt projecting from a surface.

This aim is achieved by the tensile testing apparatus characterized in Claim 1.

The present tensile testing apparatus makes it possible to test the strength of the attachment of projecting bolts, which are to be understood to include any rod-shaped or pin-shaped components. The present tensile testing apparatus particularly makes it possible to test welded screwbolts directly on the component for their tensile strength in a rational way, without subjecting them to a torsional flexure which would falsify the test values.

The present apparatus also permits

– welded set bolt dowels and concrete anchorages to be tested for their tensile strength;

– screwed, welded, soldered, glued and clamped connections of pin-shaped elements to be tested for their bearing strength;

– pin-shaped components to be stretched in a controlled manner, in order e.g. to cold consolidate welded and soldered joints and compensate length tolerances, or to shape a beaded edge on plates etc.;

– tensile and extension measurements, which customarily are only performed in the laboratory with stationary tensile testing machinery, to be executed directly on the component.

The subordinate claims relate to advantageous further developments and elaborations of the tensile testing and stretching apparatus according to Claim 1.

Exemplary embodiments of the present tensile testing and stretching apparatus are explained in more detail below with reference to the drawings, wherein:

Figure 1 shows a preferred embodiment of the present tensile testing and stretching apparatus and

Figure 2 shows a second, simpler embodiment of the present tensile testing and stretching apparatus.

The tensile testing and stretching apparatus illustrated in Figure 1 consists essentially of a gripping head 10, a bracing apparatus 12, a traction element 14 and a gauge attachment 16.

The gripping head 10 ensures a reliable and rigid frictional connection of the tensile testing apparatus to a test object, e.g. to a screwbolt 19 butt welded to a surface 18.

In the embodiment illustrated in Figure 1 the gripping head 10 contains gripping segments 20 which exhibit internally grooves 22 into which a collar 24 of a traction mandrel or tie bolt 26 engages. The gripping segments 20 are pressed outwards by springs 28 which are inserted between them and the tie bolt 26. The gripping segments 20 have an oblique male surface 30, which engages a correspondingly obliquely oriented female surface 32 of a sleeve 34 which is mounted with axial mobility in a cylindrical housing 36 of the tensile testing apparatus. A bracing ring 38, by which the tensile testing apparatus is braced against the surface 18 on both sides of the test object, or surrounding the latter, is located at the lower end of the housing 36. Springs 40 which press the sleeve into a locked position are provided between the bracing ring and the sleeve 34.

The sleeve 34 is provided with rod-shaped handles 42 which extend outwards through axially oriented slits 44 provided in the housing 36. Two further rod-shaped handles 46 are fitted on the housing between the slits 44 and the bracing ring 38.

The tie bolt 26 is inserted into an axial bore of a piston 48 of a hydraulic cylinder 50, secured by a screwed-on solid nut 51 and is pressed into its extended position by a compression spring 52.

The gauge attachment 16 which can be screwed onto the upper end of the hydraulic cylinder 50 contains a distance dial gauge 54 which exhibits a rod-shaped sensor 56 which extends through a bore of the tie bolt 26 into the space between the gripping segments 20. The dial gauge 54 is protected by a hollow cylinder 58 made of transparent plastic, which is plugged or scrwed onto the gauge attachement 16.

The gripping segments have claw-like ends 20a by which they can be connected to the test object directly if the latter has a corresponding head, or as shown, via a traction nut 59 screwed onto the test object.

The hydraulic cylinder 50 may be a customary commercial hydraulic hollow piston cylinder which has a load capacity of 500 bars pressure and can deliver a tensile force of a maximum of approximately 70 kN. The return spring 52 installed ensures that the maximum stroke of, in this case, 12 mm is fully available at each testing operation.

Instead of the hydraulic cylinder, another apparatus for generating the required tensile force may also be used, e.g. a pneumatic cylinder or mechanical apparatuses with spindles, scissors joints, knee levers etc. Instead of the dial gauge, or additionally thereto, an inductive distance recorder may be used and a pressure recorder may be connected to the pressurised medium circuit for the hydraulic cylinder in order to be able to measure and further process the tensile and extension values electronically, e.g. in order to plot a tension/extension graph.

The drawing(s) originally filed was/were informal and the print here reproduced is taken from a later filed formal copy.

The following description of the manipulation of the apparatus according to Figure 1 relates to the testing and stretching of a screwbolt 19.

First of all, a traction nut 59 is screwed onto the screwbolt 19 to be tested, having a head of larger diameter D which can be gripped by the claw-like ends 20a and such an axial length that the underside of the head is at a distance H, specific for the gripping head 10, from the surface 18 onto which the apparatus is placed by the bracing ring 38. The tensile testing apparatus connected to a suitable pressurised medium source (not shown) is then gripped with both hands by the handles 42 and 46. By pulling these handles together the gripping segments 20 are separated concentrically so that the tensile testing apparatus can be placed on the screwbolt 19 provided with the traction nut 59. By releasing the handles 42 the tensile testing apparatus becomes anchored to the test object. The anchorage (locking) can be checked by pulling on the tensile testing apparatus or by checking the position of the handles 42 with reference to a mark, not shown, on the housing 36.

The hydraulic test pressure, which is found from the test tensile force divided by the effective piston surface, is marked on a pressure indicating instrument which measures the pressure of the pressurised medium. The hydraulic cylinder is then loaded with e.g. 10% of the test pressure and the dial gauge 54 is set to "zero". The actual testing operation, in which the hydraulic pressure is increased up to the test pressure, can now take place. The dial gauge 54 now shows the extension of the test object between the initial traction (10% of the test tensile force in our example) and the text tensile force.

In the unloaded state of the traction element and with the handles drawn together, the apparatus can be removed and placed upon the next test object.

For adaptation to test objects of varying length, tubular extension pieces may be provided which, as shown by dashed lines, can be screwed into the bracing ring 38 and extend the latter in the axial direction.

The tensile testing apparatus 60 illustrated in Figure 2 contains a hydraulic cylinder 61, which is designed e.g. for a pressure of 1,000 bars. A bracing pot 62 is screwed to the hydraulic cylinder at the bottom, and a fork 63 with a handle at the top. A dial gauge bracket 65 is also attached releasably to the top end of the hydraulic cylinder 61 by means of a clamp toggle 66. The hydraulic cylinder 61 contains a piston 67 with an axial bore into which a tie bolt 68 is inserted. The tie bolt 68 has a shank 69 which extends through the bore of the piston 67, and a head 70 of enlarged diameter which rests by means of an interposed washer 71 upon the upper end of the piston 67.

The tensile testing and stretching apparatus 60 according to Figure 2 is used as follows:

After a bolt 3 has been welded to the workpiece 1, the hydraulic cylinder 61 is placed by the bracing pot 62 upon the bolt 3 to be tested. The dial gauge bracket 65 is not yet in position at this time. The tie bolt 68 is now inserted from above into the bore of the hydraulic piston 67 and screwed by a screw-threaded hole 72 provided in the bottom of the shank 69 onto the bolt 3; this is effected by means of a lever 73 which is inserted into a hole 74 in the head 70 of the tie bolt 68. Then the dial gauge bracket 65, on which a dial gauge 74 is present, is positioned and firmly clamped by a toggle 66. A pressuised medium is now fed (not shown) into the hydraulic cylinder 61, whereby the piston 67 is pressed upwards and a corresponding tensile force is exerted via the washer 71 and the tie bolt 68 upon the screwbolt 3. The amount of the plastic deformation (stretching) which then occurs can be read off on the dial gauge 74. After the tensile testing and/or stretching of the screwbolt 3, the apparatus 70 is removed again by unscrewing the tie bolt 68 from the screwbolt 3 and removing the apparatus.

Here again, instead of the apparatus comprising the hydraulic cylinder 61 and the piston 67, another e.g. mechanically or pneumatically actuated apparatus for generating a force between the tie bolt 68 and the workpiece 1 may be used.

CLAIMS

1. Tensile testing and stretching apparatus for a bolt projecting from a surface, characterised by a traction apparatus (20, 26) connectable to the bolt (19); a bracing apparatus (36, 38) placable on the surface (18) and a device (48, 50) to generate a force between the traction apparatus and the bracing apparatus.

2. Tensile testing and stretching apparatus according to Claim 1, characterised in that the force-generating device (48, 50) contains a pressureised medium cylinder.

3. Tensile testing and stretching apparatus according to Claim 1 or 2, characterised in that the traction apparatus contains a tie bolt (26) connected to the force-generating device (48, 50) and gripping elements (20), coupled with radial mobility to this bolt, which are connectable to a test object (19, 59).

4. Tensile testing and stretching apparatus according to Claim 3, characterised in that the tie bolt (26) exhibits a projecting collar (24) which engages in grooves (22) of the gripping elements; that the gripping elements (20) are mounted by oblique male surfaces (30) in a sleeve (34) slidable axially in a housing (36) and exhibiting corresponding obliquely oriented female surfaces and pretensioned by a spring arrangement (40) into a closed position of the gripping elements; and that a spring arrangement (28) which pretensions the gripping elements into an open position is provided between the gripping elements (20) and the tie bolt (26).

5. Tensile testing and stretching apparatus according to Claim 4, characterised in that the slidable sleeve (34) is connected to handles (42) which project through axially oriented slits (44) in the housing (36), and that further handles (46) are fitted on the housing (36) between the handles (42) connected to the sleeve and a bracing ring (38) arranged at the end of the housing.

6. Tensile testing and stretching apparatus according to any of the previous Claims, characterised by a gauge (54) to measure the stroke of the traction apparatus.

7. Tensile testing and stretching apparatus

according to Claim 6, characterised in that the gauge contains a distance dial gauge (54) with a rod-shaped sensor (56) which extends through an axial recess in the traction apparatus as far as the test object.

8. Tensile testing and stretching apparatus according to Claim 6 and 7, characterised by a transparent hollow cylinder surrounding the gauge (54).

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