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(54) Title: HYDRAULIC TEST BENCH

(57) Abstract: According to embodiments of the invention a test bench is disclosed. The test bench have a test bed and a load cell arrangement. The test bed has a cylinder mounting end and a load cell arrangement mounting end. The cylinder mounting end is configured to hold a barrel side of the hydraulic cylinder. The load cell arrangement mounting end is configured to detachably mount the load cell arrangement and has a passage for a rod of the hydraulic cylinder. According to an embodiment, the passage is available only when the load cell arrangement is not mounted on the test bed.

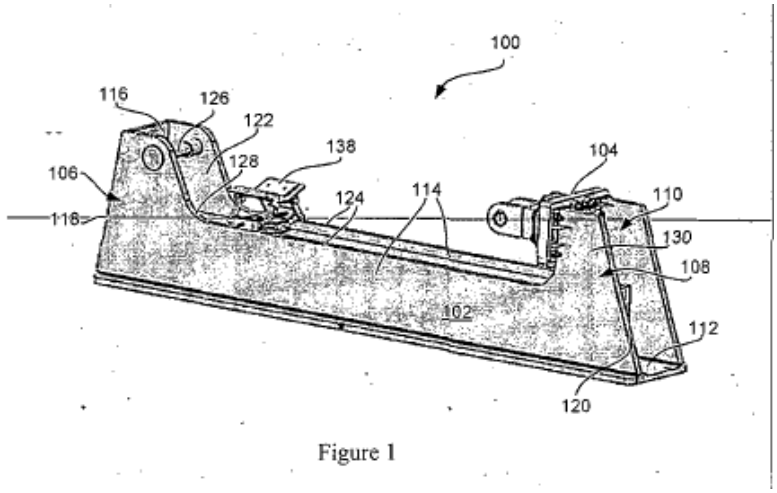
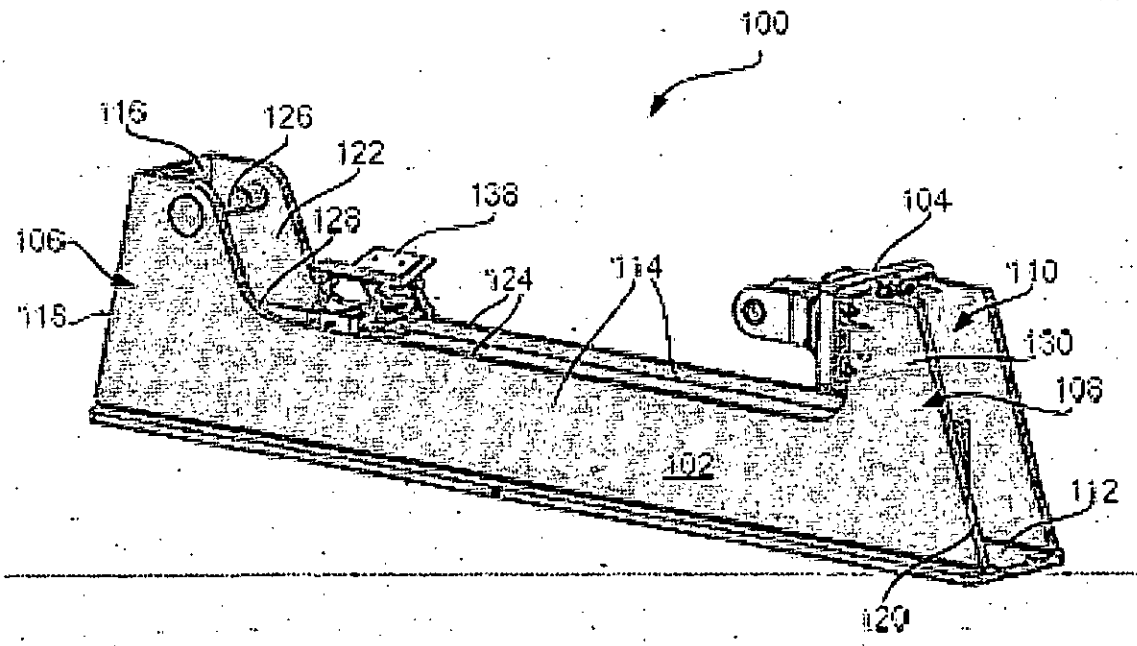


Figure 1

HYDRAULIC TEST BENCH

ABSTRACT

According to embodiments of the invention a test bench is disclosed. The test bench have a test bed and a load cell arrangement. The test bed has a cylinder mounting end and a load cell arrangement mounting end. The cylinder mounting end is configured to hold a barrel side of the hydraulic cylinder. The load cell arrangement mounting end is configured to detachably mount the load cell arrangement and has a passage for a rod of the hydraulic cylinder. According to an embodiment, the passage is available only when the load cell arrangement is not mounted on the test bed.



We Claim:

1. A test bench 100 for conducting one or more test on a hydraulic cylinder 10, the test bench 100 comprising:

a test bed 102; and

a load cell arrangement 104;

the test bed 102 has a cylinder mounting end 106 and a load cell arrangement mounting end 108, the cylinder mounting end 106 being configured to hold a barrel side 12 of the hydraulic cylinder 10, the load cell arrangement mounting end 108 being configured to detachably mount the load cell arrangement 104 and has a passage 110 for a rod 14 of the hydraulic cylinder 10.

2. The test bench 100 as claimed in claim 1, wherein the test bed 102 comprises a base 112 and at least two horizontal side walls 114 provided substantially parallel to each other and substantially perpendicular to the base 102.

3. The test bench 100 as claimed in claim 2, wherein one or more mechanical linkages are provided between the horizontal walls 114.

4. The test bench 100 as claimed in claim 2, wherein the walls 114 have a first slant support member 118, provided at cylinder mounting end 106 and a second slant support member 120, provided at the load cell arrangement mounting end 108.

5. The test bench 100 as claimed in claim 1, wherein the load cell arrangement mounting end 108 comprises at least one holding plate 134 horizontal to the plane of the wall 114 at each wall for holding the load cell arrangement 104.

6. The test bench 100 as claimed in claim 1, further comprising a cylinder fixing and lifting arrangement 138.

7. The test bench 100 as claimed in claim 1, wherein the load cell arrangement 104 comprises a base plate 140 and an adjustable linkage arrangement 142.

8. The test bench 100 as claimed in claim 7, wherein the adjustable linkage arrangement 142 includes a fastening means 144 and a length adjustable arrangement 146.

Dated this 3rd day of January 2014

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FIELD OF INVENTION

The invention generally relates to hydraulic test apparatus and methods for a hydraulic testing and more particularly to a hydraulic cylinder test bench.

BACKGROUND

Hydraulic cylinders are widely used in various industrial products and equipment's such as in construction equipment, manufacturing machinery, automobiles etc. It is normal practice to test such components under simulated working conditions. These tests may be for a new product or a repaired to ensure that they meet the rated specifications. The hydraulic cylinders may be tested on a test bench. Test bench is typical arrangement for conduction predefined test on a hydraulic cylinder under simulated working conditions. Typically a test bench may have an arrangement for holding the cylinder, a hydraulic actuator, a motor to drive the actuator, an arrangement for supplying fluid to the cylinder and arrangement for performing one or more predefined test such as Internal leakage test, Stroke length measurement test etc.

These test benches commonly have robust built and have various exposed components. Moreover such benches are restricted to conduct only one type of test such as the test bench that can perform stroke length test and leakage test is not capable of performing tensile and compressive load capacity test for hydraulic cylinder. As such different test benches are required for conducting different tests. The present invention is directed to overcoming one or more of the problems as set forth above.

SUMMARY OF THE INVENTION

According to embodiments of the invention a test bench is disclosed. The test bench have a test bed and a load cell arrangement. The test bed has a cylinder mounting end and a load cell arrangement mounting end. The cylinder mounting end is configured to hold a barrel side of the hydraulic cylinder. The load cell arrangement mounting end is configured to detachably mount the load cell and has a passage for a rod of the hydraulic cylinder. According to an embodiment, the passage is available only when the load cell arrangement is not mounted on the test bed.

BRIEF DESCRIPTION OF DRAWINGS

Other objects, features, and advantages of the invention will be apparent from the following description when read with reference to the accompanying drawings. In the drawings, wherein like reference numerals denote corresponding parts throughout the several views:

Figure 1 illustrates an isometric view of an exemplary test bench according to an embodiment of the invention;

Figure 2 illustrates an isometric view of an exemplary test bench according to another embodiment of the invention;

Figure 3 illustrates a partial isometric view of a load cell arrangement mounting end according to an embodiment of the invention; and

Figure 4 illustrates an isometric view of the load cell arrangement according to an embodiment of the invention.

DETAILED DESCRIPTION OF DRAWINGS

According to an embodiment of the invention, a test bench for conducting one or more test on a hydraulic cylinder is disclosed. Hydraulic cylinder is a mechanical actuator that gets its power from pressurized hydraulic fluid to generate unidirectional strokes. The hydraulic cylinder consists of a cylinder barrel, in which a piston connected to a piston rod moves back and forth. The barrel is closed on one end by the cylinder bottom that is called cap and at the other end the cylinder has an opening from where the piston rod comes out of the cylinder barrel. The cap has a mounting arrangement through which the cylinder can be mounted on a compatible assembly at one end. The piston rod, at one end is connected to the piston in the cylinder barrel and on the other end, piston rod have a mounting arrangement.

Figure 1 and figure 2 illustrates an isometric view of an exemplary test bench 100 for conducting one or more test on a hydraulic cylinder 10. The disclosed test bench 100 have a test bed 102 and a load cell arrangement 104. The test bed 102 has a cylinder mounting end 106 and a load cell arrangement mounting end 108. The cylinder mounting end 106 is configured to hold a barrel side 12 of the hydraulic cylinder 10. The load cell arrangement mounting end 108 is configured to detachably mount the load cell arrangement 104 and has a passage 110 for a rod 14 of the hydraulic cylinder 10. According to an embodiment, the passage 110 is available only when the load cell arrangement 104 is not mounted on the test bed 102.

The test bed 102 may has a base 112 and at least two horizontal side walls 114 provided substantially parallel to each other and substantially perpendicular to the base 102. The

horizontal walls 114 may has mechanical linkages (not shown) arranged between the horizontal walls 114 to provide more strength to the bench 100. According to an embodiment, the mechanical linkages may be arranged in a cross shape between the walls 114. According to another embodiment, the horizontal walls 114 may be connected to each other by one or more horizontal wall(s) 116 provided substantially close to cylinder mounting end 106. The walls 114 have a first slant support member 118, provided at cylinder mounting end 106 and a second slant support member 120, provided at the load cell arrangement mounting end 108. The first and second slant members are provided at outer side of the walls 114. According to an embodiment, the first slant support member 118 form an angle between 30 degree to 85 degree with respect to the base. According to another embodiment, the second slant support member 120 form an angle between 95 degree to 150 degree with respect to the base. The angles being measured in an anticlockwise direction from the horizontal. According to an embodiment, the slant support members are extension of the horizontal walls 114.

The cylinder mounting end 106 has mounting arrangement to hold the barrel side 12 of the hydraulic cylinder 10. According to an embodiment, the mounting arrangement includes a first vertical extension 122 of the walls 114 beyond a level surface 124. The walls 114 at the first vertical extension 122 have slots to accommodate a rod 126. According to another embodiment, the slots may have bushes installed therein for bearing the contact stresses. According to another embodiment, the first vertical extension 122 is configured at an angle of greater than 90 degree with respect to the level surface 124. According to yet another embodiment, the contact point between the first vertical extension 122 and the level surface 124 forms a curve surface 128.

Figure 3 illustrates a partial isometric view of load cell arrangement mounting end 108 end according to an exemplary embodiment of the invention. The load cell arrangement mounting end 108 have a second vertical extension 130 of the walls 114 beyond the level surface 124. According to another embodiment, the second vertical extension 130 is configured at an angle of 90 degree with respect to the level surface 124. According to yet another embodiment, the contact point between the second vertical extension 130 and the level surface 124 forms a curve surface 132. The second vertical extension 130 has arrangement for detachably mounting the load cell arrangement 104. According to an embodiment the mounting arrangement includes providing a holding plate 134 horizontal to the plane of the wall 114 at each wall for holding the load cell arrangement 104. According to an embodiment the mounting arrangement includes providing fastening arrangements in each wall for holding the load cell arrangement 104. According to another embodiment, the holding plate 134 may be provided at the inner end of the second vertical extension 130. According to another embodiment, the holding plate 134 may be provided anywhere between the inner and outer end of the second vertical extension 130. The holding plates 134 have provisions 136 for holding fasteners. According to yet another embodiment, the holding plates 134 are so configured to provide a passage 110 for the rod 14 of the hydraulic cylinder 10. The passage 110 enables specific test such as stroke length test to be conducting without dismantling the hydraulic cylinder 10 from the test bench 100.

According to another embodiment a cylinder fixing and lifting arrangement 138 may be provided on the test bench 100. An exemplary cylinder fixing and lifting arrangement 138 is illustrated in figure 1 and figure 2. According to an embodiment the cylinder fixing and lifting arrangement 138 may include one or more hydraulic lift system that may be operated electronically or manually.

Figure 4 illustrates an isometric view of the load cell arrangement 104 according to an exemplary embodiment. The load cell 104 includes a base plate 140 and an adjustable linkage arrangement 142. The base plate is configured to be mounted on the mounting arrangement provided on the second vertical extension 130. According to an embodiment, the base plate 140 may be fastened to the holding plate 134 provided on the second vertical extension 130. According to yet another embodiment, the base plate 140 may be fastened directly on the second vertical extension 130. The adjustable linkage arrangement 142 have a fastening means 144 that may be attached to the rod 14 of the hydraulic cylinder 10. The adjustable linkage arrangement 142 further has a length adjustable arrangement 146 to adjust the distance between the base plate 140 and the cylinder rod 14. The adjustable arrangement enables testing of hydraulic cylinder of variable length in a single test bench.

It is understood that the above description is intended to be illustrative, and not restrictive. It is intended to cover all alternatives, modifications and equivalents as may be included within the spirit and scope of the invention as defined in the appended claims. Many other embodiments will be apparent to those of skill in the art upon reviewing the above description. The scope of the invention should, therefore, be determined with reference to the appended claims, along with the full scope of equivalents to which such claims are entitled.

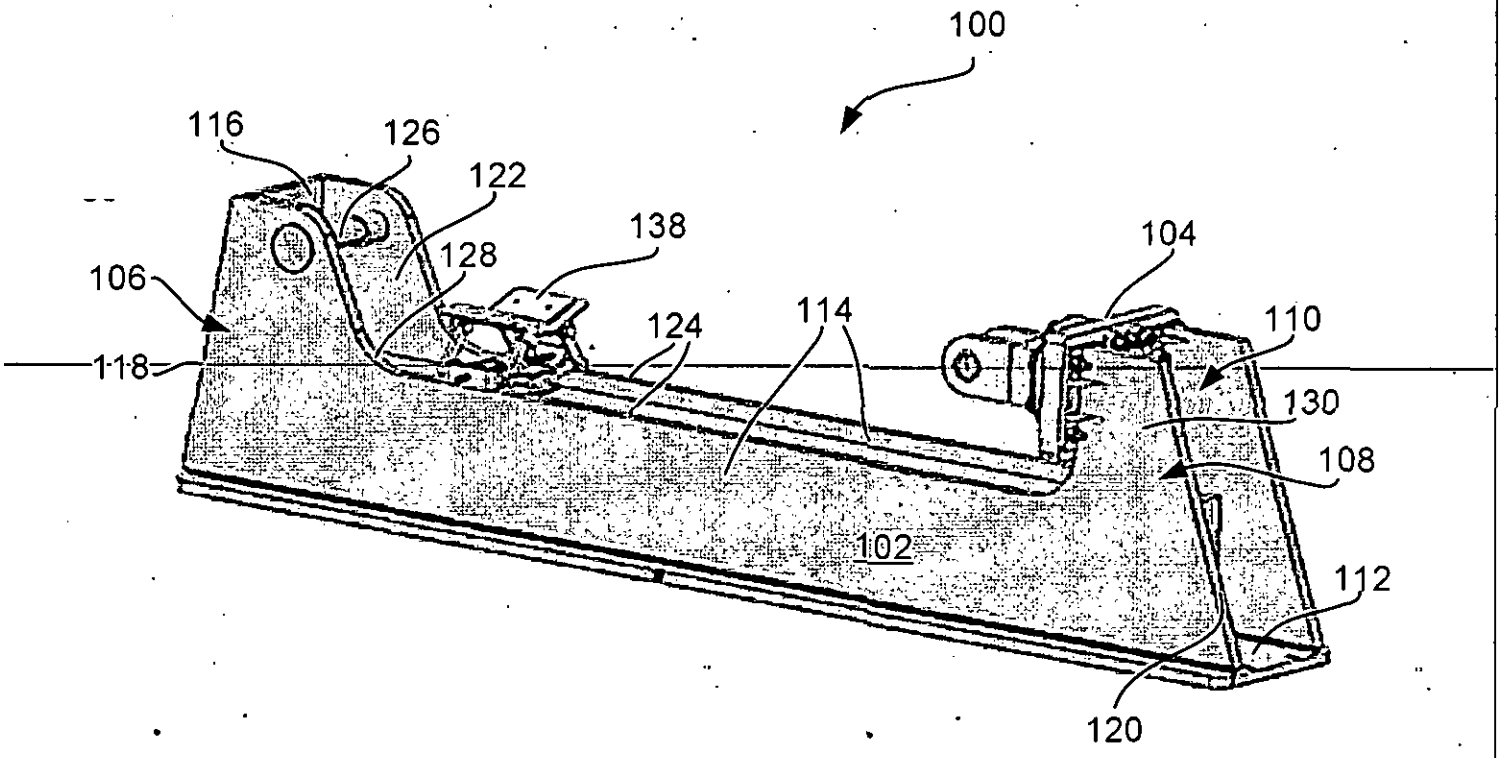

Figure 1

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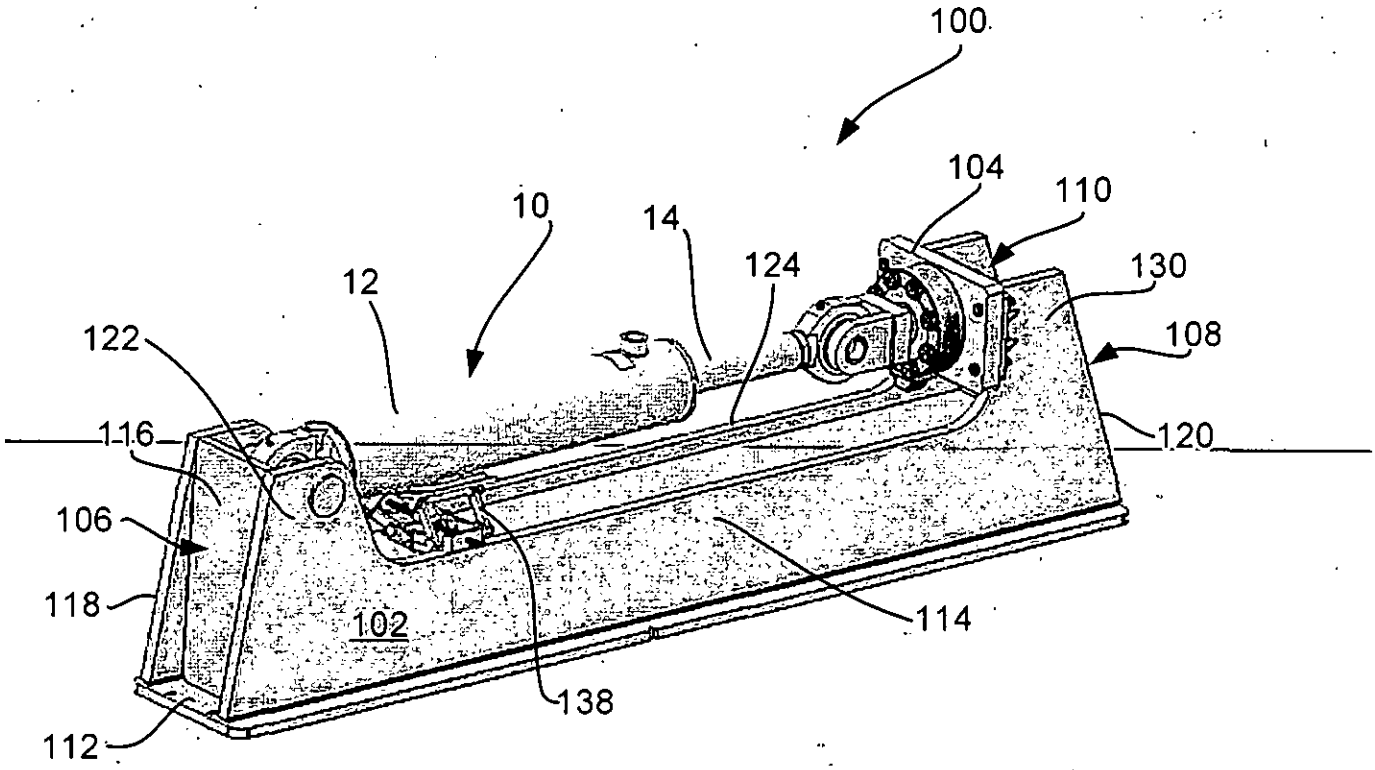

Figure 2

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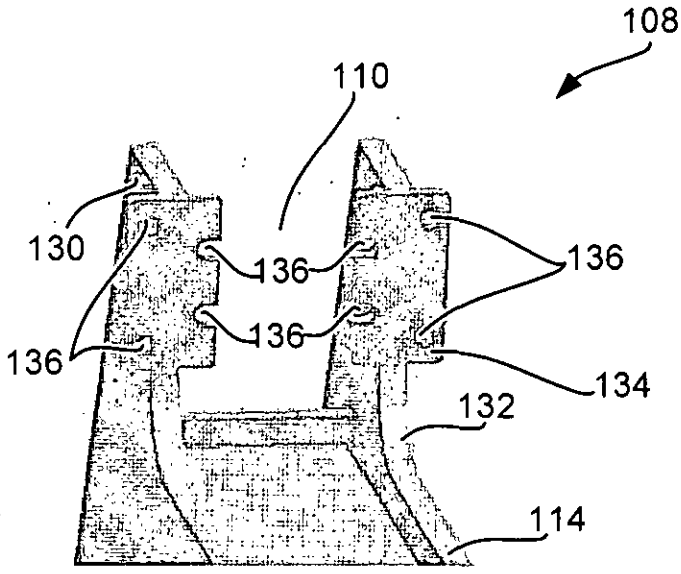

Figure 3

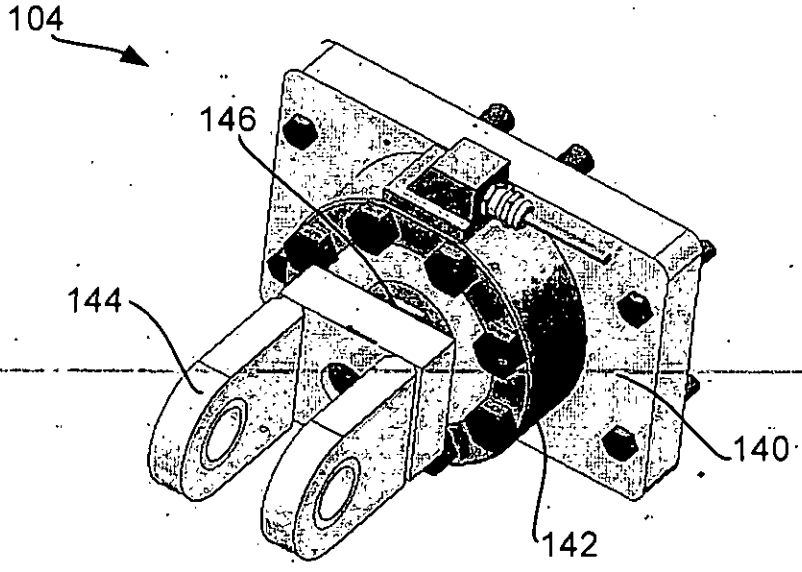

Figure 4

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