

ABSTRACT

A tool for supporting and displacing at least one component to and from housing is disclosed. The tool includes at least one guiding element, a wheeled trolley, at least one carriage and an adjustment means. The wheeled trolley is disposed on the guiding element and moves on the guiding element. The at least one carriage is disposed on and connected to the wheeled trolley and moves along with the wheeled trolley. The carriage receives the at least one component for facilitating support and displacement of the at least one component in the inoperative configuration out of the housing. The adjustment means is disposed on the wheeled trolley for facilitating horizontal, vertical and axial adjustment of the carriage with respect to the wheeled trolley for maintaining alignment between the component and the housing.

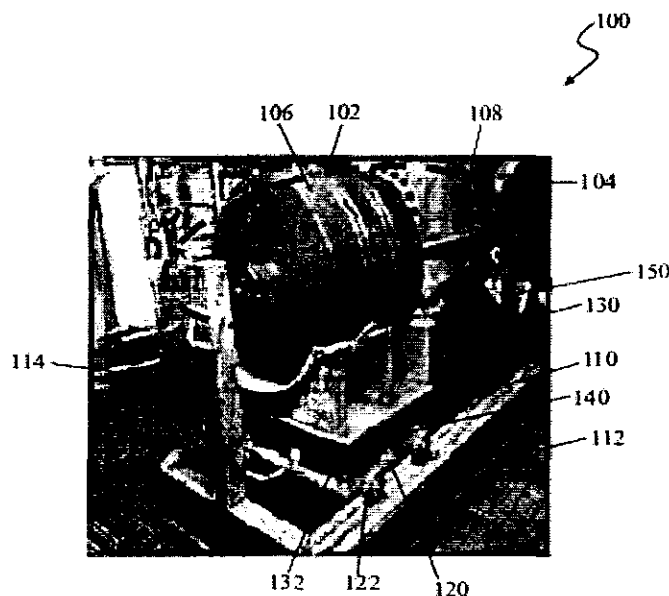


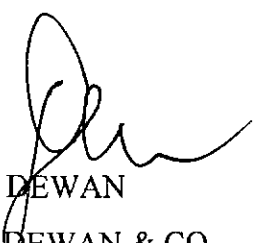
FIGURE 1

We Claim:

1. A tool for supporting and displacing at least one component to and from a housing; said tool comprising:
 - a. at least one guiding element;
 - b. a wheeled trolley disposed on said guiding element and adapted to move on said guiding element;
 - c. at least one carriage disposed on and connected to said wheeled trolley and adapted to be moved along with said wheeled trolley; said carriage adapted to receive said at least one component for facilitating support and displacement of said at least one component in an inoperative configuration out of the housing; and
 - d. an adjustment means disposed on said wheeled trolley for facilitating horizontal, vertical and axial adjustment of said carriage with respect to said wheeled trolley for maintaining alignment between said component and said housing.
2. The tool as claimed in claim 1, further includes at least one additional support for supporting at least a portion of said at least one component.
3. The tool as claimed in claim 1, wherein said guiding element is a flat surface.
4. The tool as claimed in claim 1, wherein said guiding element is a pair of rails.
5. The tool as claimed in claim 1, wherein said wheeled trolley is manually moved on said guiding element.

6. The tool as claimed in claim 1, wherein which includes motorized means to displace said wheeled trolley on said guiding element.
7. The tool as claimed in claim 1, wherein said carriage is adapted to be interchangeable with another carriage for facilitating receiving, supporting and displacing a variety of components.
8. The tool as claimed in claim 1, wherein said carriage surface is profiled to contour receive said component.
9. The tool as claimed in claim 1, wherein said adjustment means is mechanically operated or hydraulically operated or pneumatically operated.
10. The tool as claimed in claim 1, wherein said at least one component is a piston and said housing is a cylinder of a piston-cylinder assembly.
11. The tool as claimed in claim 2, wherein said at least one additional support is adapted to provide support to at least a portion of a piston rod of a piston supported and displaced by said tool.

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FIELD OF THE DISCLOSURE

The present disclosure generally relates to a tool. Particularly, the present disclosure relates to a tool for supporting and displacing at least one component in a confined or an inaccessible area.

BACKGROUND

Mechanical equipment such as compressors, pumps, turbines, piston-cylinder assemblies, gear assemblies and the like are most critical and capital intensive equipment used at production plants such as gas transmission pipelines, petrochemical plants, refineries, food-products producing plants, and the like. Sudden breakdown of such mechanical equipment may result to stoppage of production in production plants that may lead to huge capital losses. Owing to its criticality and being capital intensive equipment, such mechanical equipment periodically needs overhauling activities and maintenance activities to prevent sudden breakdown.

Overhauling activities and maintenance activities includes routine or preventive maintenance, diagnostic testing and the like that requires the mechanical equipment housed inside an enclosure or a component disposed inside a housing to be removed from a confined or inaccessible area. For example, a piston - piston rod assembly in its inoperative configuration out of a cylinder of a piston-cylinder assembly is required to be supported and displaced for conducting inspection, routine or preventive maintenance thereof. However, supporting and displacing of at least one component of the mechanical equipment in a confined or inaccessible area is time-consuming, tedious and difficult task as at least one component of the mechanical equipment needs to be slowly removed so as to prevent damage to other components of the mechanical equipment. Also, the

component needs to be supported as soon as the component is being dis-assembled from the assembly of the mechanical equipment so as to prevent structural damages to the component.

Conventionally, heavy machine lifting tools such as cranes like an Electrical Overhead Travelling (EOT) are installed and used for supporting and displacing the components in an inoperative configuration. However, movement of the Electrical Overhead Travelling (EOT) cranes is restricted because of production plant pipelines and other equipment that are installed nearby the mechanical equipment. Typically, the pipelines may be an inlet pipeline or an outlet pipeline connected to the mechanical equipment or any other pipelines connecting any equipment with other equipment. These pipelines cause obstruction for easy movement of the Electrical Overhead Travelling (EOT) cranes nearby the mechanical equipment thereby increasing overhauling and maintenance time. Further, supporting and displacing of the at least one component of the mechanical equipment by using the Electrical Overhead Travelling (EOT) crane requires skilled labor and is also labor intensive.

Also, raising or lowering of the at least one elongate component by the Electrical Overhead Travelling (EOT) cranes during dis-assembly from the mechanical equipment may cause structural damages such as bending of the component or damages to other components of the mechanical equipment installed nearby or production plant pipelines and the like.

Accordingly, there is a need of a tool that supports and displaces at least one component from the mechanical equipment. Still further, there is a need for a tool for supporting and displacing at least one component that can be used for supporting and displacing components of different size and configuration with few modifications. Further, there is a need of a tool that enables easy movement

of at least one component towards and away from the mechanical equipment. Still further, there is a need of a tool that supports and enables horizontal, vertical and axial adjustment of the at least one component in an inoperative configuration during dis-assembling or after dis-assembly from the mechanical equipment without causing any damage to the at least one component. Further, there is a need of a tool that requires less set-up time for supporting and displacing the at least one component. Still further, there is a need of a tool that safely supports and displaces the at least one component in an inoperative configuration without causing damage to other component of mechanical equipment or nearby equipment or production plant pipelines in nearby vicinity. Further, there is a need of a tool that is easily operated for supporting and displacing at least one component in an inoperative configuration for facilitating removing the at least one component in a confined or an inaccessible area without any obstructions. Furthermore, there is a need of a tool that requires less labor for supporting and displacing the at least one component. Further, there is a need of a cost-effective tool for supporting and displacing the at least one element.

OBJECTS

Some of the objects of the present disclosure, which at least one embodiment herein satisfies, are as follows:

It is an object of the present disclosure to ameliorate one or more problems of the prior art or to at least provide a useful alternative.

An object of the present disclosure is to provide a tool that supports and displaces at least one component for facilitating removing or dis-assembling of the at least one component in a confined or an inaccessible area from a mechanical equipment.

Another object of the present disclosure is to provide a tool for supporting and displacing at least one component that can be used for supporting and displacing components of different size and configuration with few modifications.

Another object of the present disclosure is to provide a tool that enables easy movement of the at least one component towards and away from the mechanical equipment.

Also, an object of the present disclosure is to provide a tool that supports and enables horizontal, vertical and axial adjustment of the at least one component during dis-assembling or after dis-assembly from the mechanical equipment without causing any damage to the at least one component.

Additionally, an object of the present disclosure is to provide a tool that requires less set-up time for supporting and displacing the at least one component in an inoperative configuration.

Another object of the present disclosure is to provide a tool that safely supports and displaces the at least one component without causing damage to other components of mechanical equipment or nearby equipment or production plant pipelines in nearby vicinity.

An object of the present disclosure is to provide a tool that is easily operated for supporting and displacing the at least one component for facilitating removing the at least one component in a confined or an inaccessible area without any obstructions.

Another object of the present disclosure is to provide a tool that requires less labor for supporting and displacing the at least one component in an inoperative configuration.

Also, an object of the present disclosure is to provide a cost-effective tool for supporting and displacing at least one component in an inoperative configuration out of the mechanical equipment.

Another object of the present disclosure is to provide a tool for supporting and displacing the at least one component that is reliable.

SUMMARY

A tool for supporting and displacing at least one component to and from housing is disclosed. The tool includes at least one guiding element, a wheeled trolley, at least one carriage and an adjustment means. The wheeled trolley is disposed on the guiding element moves on the guiding element. The at least one carriage is disposed on and connected to the wheeled trolley and moves along with the wheeled trolley. The carriage receives the at least one component for facilitating support and displacement of the at least one component in the inoperative configuration out of the housing. The adjustment means is disposed on the wheeled trolley for facilitating horizontal, vertical and axial adjustment of the carriage with respect to the wheeled trolley for maintaining alignment between the component and the housing.

In one embodiment, the tool further includes at least one additional support for supporting at least a portion of the at least one component.

Typically, the guiding element is a flat surface.

Alternatively, the guiding element is a pair of rails.

In one embodiment, the wheeled trolley is manually moved on the guiding element.

In another embodiment, the tool includes motorized means to displace the wheeled trolley on the guiding element.

In one embodiment, the carriage is interchangeable with another carriage for facilitating receiving, supporting and displacing a variety of components.

Alternatively, the carriage surface is profiled to contour receive the component.

In one embodiment, the adjustment means is mechanically operated or hydraulically operated or pneumatically operated.

In accordance with a preferred embodiment, the at least one component that the tool supports and displaces relative to a housing is a piston and the housing is a cylinder of a piston-cylinder assembly.

Typically, the at least one additional support is provided for supporting at least a portion of a piston rod of a piston supported and displaced by the tool.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

The tool for supporting and displacing at least one component in an inoperative configuration for moving the component from a confined and inaccessible area is disclosed, the tool of the present disclosure will now be explained in relation to the non-limiting accompanying drawings, in which:

FIGURE 1 illustrates a perspective view of a tool in accordance with one embodiment of the present disclosure, wherein the tool is supporting a piston sub-assembly in an inoperative configuration out of a cylinder of a piston-cylinder assembly;

FIGURE 2 illustrates another perspective view of the tool of **FIGURE 1**;

FIGURE 3 illustrates a perspective view depicting the tool of **FIGURE 1**;

FIGURE 4 illustrates a side view of the tool of **FIGURE 1**;

FIGURE 5 illustrates a perspective view depicting a base frame and a piston rod stay of the tool of **FIGURE 1**;

FIGURE 6 illustrates a perspective view depicting a closer view of the piston rod stay of **FIGURE 5**;

FIGURE 7 illustrates a perspective view depicting a wheeled trolley with a plurality of jacks and a plurality of locating sleeves of the tool of **FIGURE 1**; and

FIGURE 8 illustrates a perspective view depicting a carriage of the tool of **FIGURE 1**.

DETAILED DESCRIPTION

A tool for supporting and displacing at least one component in a confined or an inaccessible area is disclosed. The tool in accordance with an embodiment of the present disclosure will now be described with reference to the embodiments

which do not limit the scope and ambit of the disclosure. The description provided is purely by way of example and illustration.

The embodiments herein and the various features and advantageous details thereof are explained with reference to the non-limiting embodiments in the following description. Descriptions of well-known components and processing techniques are omitted so as to not unnecessarily obscure the embodiments herein. The examples used herein are intended merely to facilitate an understanding of ways in which the embodiments herein may be practiced and to further enable those of skill in the art to practice the embodiments herein. Accordingly, the examples should not be construed as limiting the scope of the embodiments herein.

The description hereinafter, of the specific embodiments will so fully reveal the general nature of the embodiments herein that others can, by applying current knowledge, readily modify and/or adapt for various applications such specific embodiments without departing from the generic concept, and, therefore, such adaptations and modifications should and are intended to be comprehended within the meaning and range of equivalents of the disclosed embodiments. It is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation. Therefore, while the embodiments herein have been described in terms of preferred embodiments, those skilled in the art will recognize that the embodiments herein can be practiced with modification within the spirit and scope of the embodiments as described herein.

The tool of the present disclosure provides support and displaces the at least one component towards or away from the mechanical equipment particularly a confined or an inaccessible area of the mechanical equipment. The tool for

supporting and displacing at least one component may be used for supporting and displacing at least one component of different size and configuration with few modifications. The at least one component may be a payload. Further, the tool as disclosed in present disclosure supports the at least one component in an inoperative configuration for easy movement of the at least one component towards and away from the mechanical equipment. The tool, as disclosed, supports and enables horizontal, vertical and axial adjustment of the at least one component in an inoperative configuration during dis-assembling from the mechanical equipment without causing any damage to the at least one component. The tool safely supports and displaces the at least one component in an inoperative configuration without causing damage to other elements of mechanical equipment or nearby equipment or production plant pipelines in its vicinity. The tool is easily operated for supporting and displacing the at least one component in an inoperative configuration in a confined or an inaccessible area.

The tool supports and displaces the at least one component in inoperative configuration for facilitating removing of the at least one component in a confined or an inaccessible area. The tool includes at least one guiding element, a wheeled trolley, at least one carriage and an adjustment means. In one embodiment, the guiding element, the wheeled trolley, the at least one carriage and the adjustment means are detachably connected to each other. The at least one component is a heavy machinery, a tool and the like. In accordance with one embodiment and as illustrated in **Figure 1** to **Figure 8**, the tool **100** is used for supporting and displacing a piston assembly **102** in inoperative configuration for moving the piston assembly **102** out of the cylinder **104**. Although, the tool **100** as illustrated is uses for handling a piston assembly, particularly, for supporting and displacing a piston assembly in an inoperative configuration out of a piston-cylinder assembly. However, the tool **100** of the

present disclosure is not limited to support and displace the piston assembly in an inoperative configuration out of the cylinder, and may be used for handling other component(s).

The piston assembly includes a piston **106** and a piston rod **108**. In accordance with one embodiment of the present disclosure and as illustrated in **Figure 1**, **Figure 2**, **Figure 3** and **Figure 4**, the tool **100** includes at least one guiding element **110**, a wheeled trolley **120**, a carriage **130**, a first adjustment means **140** and at least one piston rod stay **150**.

In one embodiment of the present disclosure, the guiding element **110** is a flat surface. In accordance with another embodiment the guiding element **110** is a pair of rails. Typically, the pair of rails is disposed on a flat surface. Alternatively, the pair of rails is disposed on a base frame **112**. The base frame **112** is rigidly mounted on the ground and is adapted to take load of the entire tool **100** in operative condition and non-operative configurations. Typically, the base frame **112** is fabricated by using channels or angles of variable sizes according to various site or production plant conditions. More specifically, width of the base frame **112** is determined by diameter of the piston **106** to be installed, length of the base frame **112** is determined by total length of the piston **106** and piston rod **108** and height of base frame **112** is determined by the site or production plant conditions. In accordance with another embodiment of the present disclosure, the guiding element **110** is disposed on the ground.

In one embodiment and as shown in **Figure 1** to **Figure 4**, the wheeled trolley **120** is disposed on the guiding element **110** is the pair of rails and is adapted to move on the guiding element **110**. In one embodiment, the wheeled trolley **120** is manually moved on the guiding element **110**. In another embodiment, the wheeled trolley **120** is automatically moved on the guiding element **110**. The

movement of the wheeled trolley **120** on the guiding element **110** is restricted by a rod **114** mounted either on the base frame **112** or on the ground thereby allowing the movement of the wheeled trolley **120** in a pre-determined space frame. Typically, the wheeled trolley **120** has at least a pair of bearings or rollers **122** for facilitating movement of the wheeled trolley **120** on the guiding element **110**. The at least a portion of wheels **122** of the wheeled trolley **120** are complementary mating with at least a portion of the guiding element **110** to facilitate guided movement of the wheeled trolley **120** on the guiding element **110**. The size of the wheeled trolley **120** is determined by the size of the base frame **112** and the weight of the piston **106** and piston rod **108**. Typically, the wheeled trolley **120** is fabricated from a plate of thickness ranging from 16 milli-meter (mm) to 30 milli-meter (mm).

The carriage **130** is disposed on and connected to the wheeled trolley **120** and adapted to be moved along with the wheeled trolley **120**. In one embodiment, the carriage **130** is interchangeable with another carriage for facilitating receiving, supporting and displacing another object. Accordingly, the tool **100** for supporting and displacing at least one component can be used for supporting and displacing components of different size and configuration with few modifications, particularly, by replacing a carriage **130** corresponding to a first component with another carriage corresponding to another component so that the tool is ready to be used for supporting and displacing a variety of components having different shape, size and configuration. Typically, the carriage **130** has at least one protrusion **132** disposed on the operating bottom of the carriage **130** and is adapted to be inserted in at least one cavity **124** disposed on operating top of the wheeled trolley **120**. In one embodiment, the at least one cavity **124** is a hole configure within the wheeled trolley **120**. In another embodiment and as shown in **Figure 6**, the at least one cavity **124** is a sleeve connected to the wheeled trolley **120**.

In one embodiment, the carriage **130** has flat shaped surface to receive the at least one component. In another embodiment, the carriage **130** surface is profiled to contour receive the at least one component. The carriage **130** is adapted to receive and support at least a portion of the piston **106** and longitudinal moves the piston **106** either on the base frame **112** or the ground thereby enabling movement of the piston **106** towards and away from the cylinder **104**. The size of the carriage **130** is determined by the diameter of the piston **106** and the wheeled trolley **120**. Typically, the carriage **130** is fabricated from plates and pipes. More specifically, the carriage **130** is made up of semi-circular pipes connected to the plates.

The at least one adjustment means **140** is disposed in between the wheeled trolley **120** and the carriage **130** for facilitating horizontal, vertical and axial adjustment of the carriage **130** with respect to the wheeled trolley **120**. In one embodiment and as shown in **Figure 7**, the adjustment means **140** vertically raises and lowers the carriage **130** for facilitating adjustment of height of the carriage **130** such that the piston assembly **106** remains in line with respect to the cylinder **104** as the piston assembly **106** is being dis-assembled or dis-assembled from the cylinder **104**. Typically as shown in **Figure 7**, the adjustment means **140** is a jacking arrangement that includes 6 to 8 jacks disposed on the wheeled trolley **120**. In one embodiment, the adjustment means **140** is mechanically operated. In another embodiment, the adjustment means **140** is hydraulically operated. In still another embodiment, the adjustment means **140** is pneumatically operated.

At least one piston rod stay **150** for supporting a piston rod **108** of the piston assembly **102** in inoperative extended position out of the cylinder **104**, thereby preventing structural damages like bending. In accordance with one embodiment, the piston rod stay **150** is connected to the base frame **112**. In

accordance with another embodiment, the piston rod stay **150** is mounted the ground. Typically, the piston rod stay **150** is detachably attached to the base frame **112** or the ground. Alternatively, the piston rod stay **150** is movable on the base frame **112** or the ground. In one embodiment, the piston rod stay **150** may be removed and kept aside if the piston rod **108** is within the cylinder **104**. The size of the piston rod stay **150** is determined by the diameter of the piston rod **108**. Typically, the piston rod stay **150** is fabricated from plates and angles. Typically as shown in **Figure 5** and **Figure 6**, the piston rod stay **150** has a curvature plate **152** and further includes a teflon pad **154** disposed on the operating top of the curvature plate **152**. In one embodiment, the operating bottom of the curvature plate **152** of the piston rod stay **150** has a second height adjustment means like a stud **156** for facilitating vertical adjustment of the piston rod stay **150**.

The method for supporting the piston assembly **102** in an inoperative configuration out of the cylinder **104** is by moving the wheeled trolley **120** on the guiding element **110** towards the cylinder **104**, placing the piston **106** of the piston assembly **102** on the carriage **130** mounted on the wheeled trolley **120**, adjusting the vertical height between the carriage **130** and the wheeled trolley **120** as desired, moving the wheeled trolley **120** on the guiding element **110** away from the cylinder **104**, placing the piston rod stay **150** to support the piston rod **108** of the piston assembly **102** and adjusting the vertical height as desired.

TECHNICAL ADVANCEMENTS AND ECONOMIC SIGNIFICANCE

The tool for supporting and directing at least one component for moving the at least one component within a confined or an inaccessible area, in accordance

with the present disclosure described herein above has several technical advantages including but not limited to the realization of:

- a tool that supports and displaces at least one component for facilitating removing or dis-assembling of the at least one component in a confined or an inaccessible area from a mechanical equipment;
- a tool for supporting and displacing at least one component that can be used for supporting and displacing components of different size and configuration with few modifications;
- a tool that enables easy movement of the at least one component towards and away from the mechanical equipment;
- a tool that supports and enables horizontal, vertical and axial adjustment of the at least one component during dis-assembling or after dis-assembly from the mechanical equipment without causing any damage to the at least one component ;
- a tool that requires less set-up time for supporting and displacing the at least one component in an inoperative configuration;
- a tool that safely supports and displaces the at least one component without causing damage to other components of mechanical equipment or nearby equipment or production plant pipelines in nearby vicinity;
- a tool that is easily operated for supporting and displacing the at least one component for facilitating removing the at least one component in a confined or an inaccessible area without any obstructions;
- a tool that requires less labor for supporting and displacing the at least one component in an inoperative configuration;
- a cost-effective tool for supporting and displacing at least one component in an inoperative configuration out of the mechanical equipment; and
- a reliable tool for supporting and displacing the at least one component.

Throughout this specification the word “comprise”, or variations such as “comprises” or “comprising”, will be understood to imply the inclusion of a stated element, integer or step, or group of elements, integers or steps, but not the exclusion of any other element, integer or step, or group of elements, integers or steps.

The use of the expression “at least” or “at least one” suggests the use of one or more elements or ingredients or quantities, as the use may be in the embodiment of the disclosure to achieve one or more of the desired objects or results.

Any discussion of documents, acts, materials, devices, articles or the like that has been included in this specification is solely for the purpose of providing a context for the disclosure. It is not to be taken as an admission that any or all of these matters form part of the prior art base or were common general knowledge in the field relevant to the disclosure as it existed anywhere before the priority date of this application.

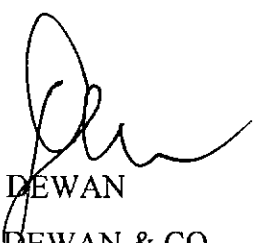
The numerical values mentioned for the various physical parameters, dimensions or quantities are only approximations and it is envisaged that the values higher/lower than the numerical values assigned to the parameters, dimensions or quantities fall within the scope of the disclosure, unless there is a statement in the specification specific to the contrary.

We Claim:

1. A tool for supporting and displacing at least one component to and from a housing; said tool comprising:
 - a. at least one guiding element;
 - b. a wheeled trolley disposed on said guiding element and adapted to move on said guiding element;
 - c. at least one carriage disposed on and connected to said wheeled trolley and adapted to be moved along with said wheeled trolley; said carriage adapted to receive said at least one component for facilitating support and displacement of said at least one component in an inoperative configuration out of the housing; and
 - d. an adjustment means disposed on said wheeled trolley for facilitating horizontal, vertical and axial adjustment of said carriage with respect to said wheeled trolley for maintaining alignment between said component and said housing.
2. The tool as claimed in claim 1, further includes at least one additional support for supporting at least a portion of said at least one component.
3. The tool as claimed in claim 1, wherein said guiding element is a flat surface.
4. The tool as claimed in claim 1, wherein said guiding element is a pair of rails.
5. The tool as claimed in claim 1, wherein said wheeled trolley is manually moved on said guiding element.

6. The tool as claimed in claim 1, wherein which includes motorized means to displace said wheeled trolley on said guiding element.
7. The tool as claimed in claim 1, wherein said carriage is adapted to be interchangeable with another carriage for facilitating receiving, supporting and displacing a variety of components.
8. The tool as claimed in claim 1, wherein said carriage surface is profiled to contour receive said component.
9. The tool as claimed in claim 1, wherein said adjustment means is mechanically operated or hydraulically operated or pneumatically operated.
10. The tool as claimed in claim 1, wherein said at least one component is a piston and said housing is a cylinder of a piston-cylinder assembly.
11. The tool as claimed in claim 2, wherein said at least one additional support is adapted to provide support to at least a portion of a piston rod of a piston supported and displaced by said tool.

Dated this 22nd day of July, 2013


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