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(54) Pressure fluid cylinder and position indicating device

(57) A pressure fluid cylinder (1) including an indicating device (8,10) for indicating the piston position inside a cylinder tube, said indicating device (8,10) including on the one hand a piston position sensor fastenable in a chosen position along the length of the cylinder tube for detecting that the piston is present in said position, on the other hand a light source, which is activated so as to indicate when the piston is present in said position. The cylinder is distinguished in that the light source is connected to the piston position sensor for forming a sensor unit (8), that the sensor unit (8) is fastenable in an axial position in an axially extending channel (7) in the wall of the cylinder tube, and that the channel (7) has a light transmitting element (10,16), located in a position along the channel for emitting light from the sensor unit to the outside of the pressure fluid cylinder.

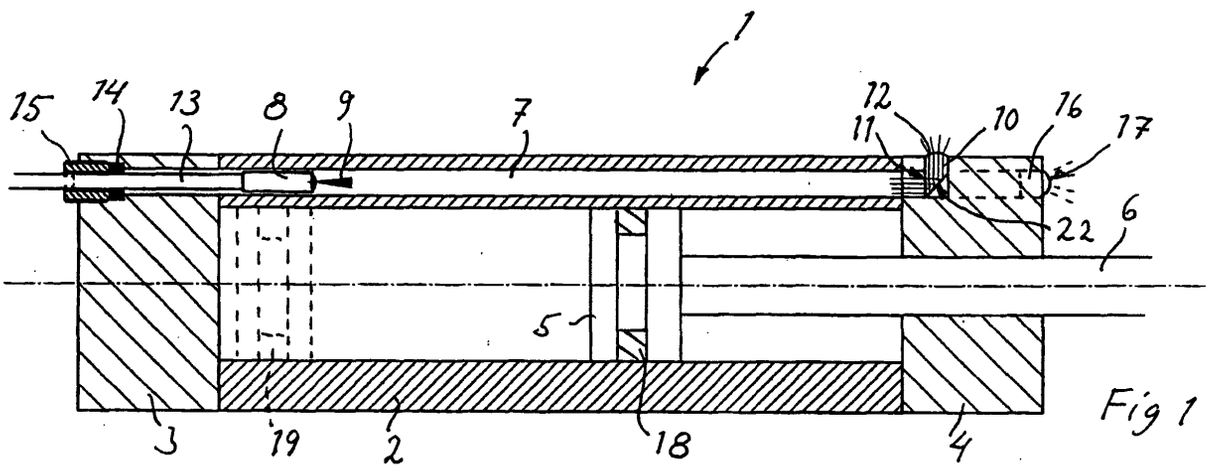

Fig 1

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Description

FIELD OF THE INVENTION

[0001] The invention concerns a pressure fluid cylinder according to the preamble of claim 1. The invention also concerns an indicating device according to the preamble of claim 9.

DESCRIPTION OF PRIOR ART

[0002] It is previously known from pressure fluid cylinders, of the kind including a cylinder tube and a moveable piston, to arrange sensors for detecting, for example, an end position of the piston inside the cylinder. As a response to a signal from the piston position sensor, for example, the supply to the cylinder may be controlled so that the piston is brought to a stop or be reversed. It is also known to visually indicate when the piston is positioned near the piston position sensor by the sensor also controlling a light source, which is activated by the sensor and may be perceived by an operator in order to facilitate adjustment etc.

[0003] A device according to the above is previously known from WO 00/68579, wherein switches may be installed in axial channels in the cylinder tube wall and over cables be arranged to activate a light source, which is positioned in a cylinder end wall as a response to the presence of a piston with a built-in magnet. This device is complicated as to its construction and necessitates drawing of cables to the fixed light source.

[0004] In another previously known pressure air cylinder which is described in DE-A1-41 37 586, a control lamp is arranged on a housing which is movable outside the cylinder tube wall. This solution is unsuitable in many applications where hygiene is important, since the outside positioned housing collects dirt and makes cleaning seriously difficult.

THE AIM AND MOST IMPORTANT FEATURE OF THE INVENTION

[0005] It is an aim of this invention to overcome the problems of the known art and to provide a pressure fluid cylinder, which with simple means provides a visual indication of a piston position, which allows high hygienic standard and is uncomplicated.

[0006] These aims are achieved in a pressure fluid cylinder according to the above through the features of the characterizing portion of claim 1. Corresponding aims are achieved in an indicating device as above through the features of the characterizing portion of claim 9.

[0007] Hereby the number of units to be assembled is reduced; drawing of cables is simplified and gives possibilities of high hygienic standard with respect of the outside of the pressure fluid cylinder. Adjustment of the piston position sensor is simplified and the pressure fluid cylinder may be produced to a relatively low cost.

[0008] By the light source being a light emitting diode, a solution which saves space and current is achieved.

[0009] By constructing the light transmitting element sealingly against the wall of the pressure fluid cylinder is also ensured, besides high hygienic standard, protection of the sensor unit against the influence of water or the like.

[0010] By the light transmitting element including a reflecting mirror surface for the transmission of light at an angle to the extension direction of the channel, it is achieved that the indication will be clearly visible from the side of the cylinder at a right angle to its axis, which is normally the prevailing looking direction when controlling the cylinder.

[0011] Further advantages are achieved with further features of the invention and will become evident from the following detailed description of embodiments at the background of the annexed drawing.

BRIEF DESCRIPTION OF THE DRAWING

[0012] The drawing shows:

Fig. 1 a section through a pressure fluid cylinder according to the invention, and

Fig. 2 a side view of the cylinder in Fig. 1 with details indicated with interrupted lines.

[0013] In Fig. 1 is shown a pressure fluid cylinder 1 including a cylinder tube 2 and two cylinder end walls 3 and 4. Inside the cylinder tube 2 a piston 5 is axially moveable, and is attached to a piston rod 6, which is sealingly extending through the cylinder end wall 4.

[0014] In the wall of the cylinder tube 2 there is arranged an axial channel 7 for receiving a sensor unit 8, which includes on the one hand a piston position sensor in the form of an electrical or mechanical switch (per see known and therefore not shown) with the ability to sense when the piston 5 is in a close position, on the other hand a light source in the form of a light emitting diode. Light emanating from the light source is indicated at 9 and radiates axially through the axial channel 7 when the piston position sensor is activated. At the end of the channel 7, which also has a continuation in the cylinder end wall 4, the light 9 meets a light transmitting element 10, which has an essentially plane entrance surface 11 for light and a reflecting prism surface 22 at essentially 45° with respect to the extension direction of the channel 7. Light entering through the surface 11 and meeting the prism surface 22 will be reflected at the angle of 90° and led through the light transmitting element 10 to the outside of the pressure fluid cylinder 1 over a convex surface 12, which operates so as to spread light. The element 10 is mounted sealingly in the end wall 4 with the aid of a per se known sealing device or possibly direct sealing against the end wall.

[0015] At the other side of the pressure fluid cylinder, the axial channel 7 continues also through the cylinder end wall 3, through which cabling 13 to the sensor unit 8 extends, so as to penetrate a packing at the mouth of the channel, said packing 14 on the one hand operating as a sealing device for the channel, on the other hand may be functioning as a fixation device for the sensor unit 8. This may be obtained by having a pressing screw 15 being arranged outside the packing 14, said screw when screwing it inwards pressing the packing 14 such that it will sealingly and fixingly adjoin to the cable comprising the cabling 13. If the sensor unit 8 is to be adjusted, the screw 15 is loosened, whereby the packing 14 is relieved, allowing displacement of the cable comprising the cabling 13 and thereby axial adjustment of the sensor unit 8.

[0016] At the right side, as seen in Fig. 1, there is indicated with interrupted lines an alternative embodiment with a light transmitting element 16 being position in an axial continuation of the channel 7. Light emanating from the light source in the sensor unit will in this case be emitted essentially axially, let be scattered, over a convex surface 17 belonging to the light transmitting element 16, so as to be best visible from the end of the pressure fluid cylinder, but to a certain degree, due to the convex surface 17, also from the side of the cylinder.

[0017] In Fig. 1 there is also indicated a ring shaped magnet 18, which is of a per se previously known kind, and which is positioned centrally as seen axially and at the outer portion of the piston 5 as seen radially. At 19 is indicated that the piston with the associated magnet is located in a position adjacent to the sensor unit 8, in which position this piston position sensor with the associated micro-switch and light source is activated.

[0018] In the side view in Fig. 2 it is shown, and which must be considered as normal, that the pressure fluid cylinder 1 is provided with two channels 7 and 7', whereof the latter receives a second piston position sensor 8', which is provided with an associated cabling 13' and associated light transmitting element 10'. This embodiment allows for the pistons two end positions to be detected and indicated.

[0019] The invention may be modified within the scope of the annexed claims and in particularly the separate elements such as switch and light source be otherwise and also be assembled otherwise than what is indicated above. As an example, the light source must not be mounted with the piston position sensor to a sensor unit, these means may be connected to each other but be separated axially and sideways. The light transmitting elements may be constructed otherwise and as an example also come from lead-through holes in the cylinder tube itself. It is also possible to use light-guides of fibreglass for directing light as an alternative to the shown embodiment.

[0020] The cable should be rigid in order to facilitate positioning in the channel and its thickness should not deviate too much from the dimension of the channel so as to avoid sideways movements of the cable inside the channel. Also other methods for positioning the sensor unit inside the channel than what is shown are within the scope the invention, for example with a displacement tool in order to press the sensor unit in an axial direction.

[0021] Finally, it may be mentioned that the invention is applicable in all kinds of pressure fluid cylinders, also with rod-less slot cylinders. The magnet may be position otherwise than axially central in the piston, for example at one axial end of the piston. It may be mentioned that the cylinder tube 2 is made from a non magnetic material such as aluminium or an aluminium alloy for allowing the magnetic field from the magnet in the piston to have effect through the material. An advantage with aluminium or the like is that light emanating from the light source without greater losses will be reflected in the walls of the axial channel if the cylinder tube is manufactured through a extrusion procedure, wherein shiny channel walls will be obtained.

Claims

1. Pressure fluid cylinder (1) including a cylinder tube (2) with a piston (5) moveable therein along an axis of the cylinder tube and including an indicating device (8,10) for indicating the piston position inside the cylinder tube, said indicating device (8,10) including on the one hand a piston position sensor fastenable in a chosen position along the length of the cylinder tube for detecting that the piston is present in said position, on the other hand a light source, which is activated so as to indicate when the piston is present in said position, **characterized in**

   - **that** the light source is connected to the piston position sensor for forming a sensor unit (8),
   - **that** the sensor unit (8) is fastenable in an axial position in an axially extending channel (7) in the wall of the cylinder tube, and
   - **that** the channel (7) has a light transmitting element (10,16), located in a position along the channel for emitting light from the sensor unit to the outside of the pressure fluid cylinder.

2. Cylinder according to claim 1, **characterized in that** the light source is a light emitting diode.

3. Cylinder according to claim 1 or 2, **characterized in that** the light transmitting element (10,16) is comprised of an element, which is sealingly applied to the wall of the pressure fluid cylinder.

4. Cylinder according to claim 1, 2 or 3, **characterized in that** the light transmitting element (10) includes a reflecting surface (22) for transmitting light in directions at an angle to the extension direction of the

channel (7).

5. Cylinder according to claim 4, **characterized in that** the reflecting surface (22) is a prism surface.

6. Cylinder according to any of the claims 1 - 5, **characterized in** a packing (14) for sealing between a wall (3) of the pressure fluid cylinder and cabling (13) associated with the sensor unit (8).

7. Cylinder according to any of the claims 1 - 6, **characterized in that** the piston (5) is provided with at least one permanent magnet (18) and that the sensor unit (8) includes a magnetically operated switch.

8. Cylinder according to any of the claims 1 - 7, **characterized in that** it includes plural indicating devices (8,10;16) for indicating different piston positions.

9. Indicating device for indicating the position of a piston (5) inside a cylinder tube (2) of a pressure fluid cylinder (1), said indicating device including on the one hand a piston position sensor for fastening in a chosen position along the length of the cylinder tube for detecting the presence of the piston in said position, on the other hand a light source for activation and indicating when the piston is present in said position, **characterized in**

- **that** the light source is connected to the piston position sensor for forming a sensor unit (8),
- **that** the sensor unit (8) is arranged to be fastenable in an axially extending channel (7) in the wall of the cylinder tube, and
- a light transmitting element (10;16) for placement in a position along the channel for emitting light from the sensor unit to the outside of the pressure fluid cylinder.

10. Device according to claim 9, **characterized in that** the light source is a light emitting diode.

11. Device according to claim 9 or 10, **characterized in that** the light transmitting element (10;16) is comprised of an element to be sealingly applied to the wall of the pressure fluid cylinder.

12. Device according to claim 9, 10 or 11, **characterized in that** the light transmitting element (10) includes a reflecting surface (22) for transmitting light in directions at an angle to the extension direction of the channel.

13. Device according to claim 12, **characterized in that** the reflecting surface (22) is a prism surface.

14. Device according to any of the claims 9 - 13, **characterized in that** the sensor unit (8) includes a magnetically operated switch.

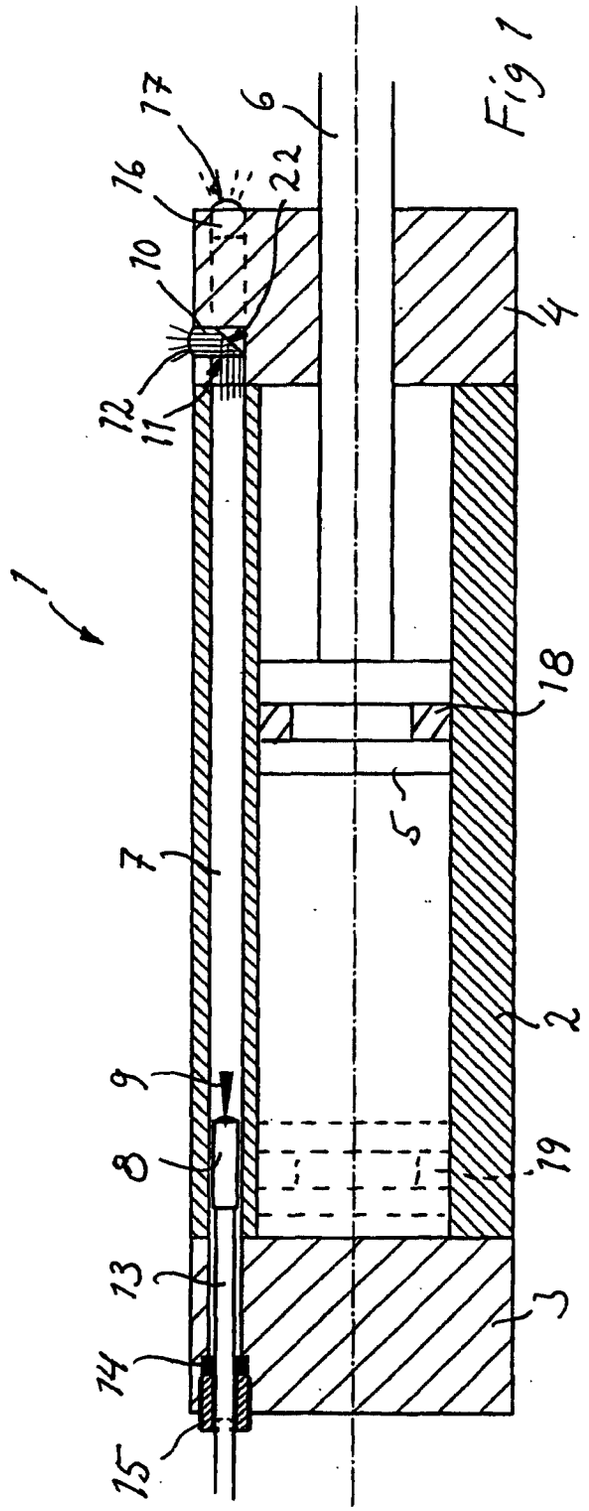

Fig 1

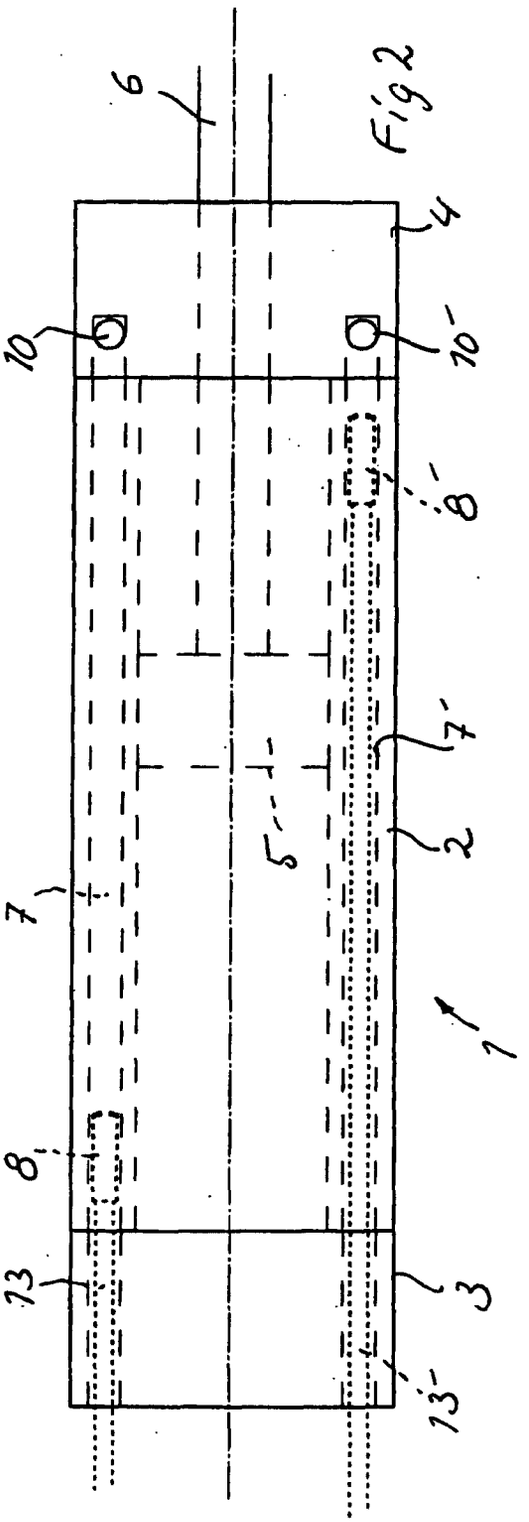

Fig 2

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 02 44 5099

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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Y		6,7,14	
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A	DE 40 27 199 A (SIEMENS AG) 3 January 1991 (1991-01-03) * column 2, line 6-40; figure 1 *	1,4,5,9, 12,13	TECHNICAL FIELDS SEARCHED (Int.Cl.7) F15B
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	28 November 2002	Busto, M

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 02 44 5099

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