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(54) **Lifting device with means for holding and releasing an object**

(57) Lifting device (1) with means (40) for holding and releasing an object (3). The lifting device comprises a body (5) with a space (7) adapted to receive a lifting element (9), and a control unit (11) adapted to control the holding and releasing of the object from the lifting device. The lifting device comprises a displaceable part (20) arranged in the space and indicating means (22). The displaceable part is adapted, at an interaction with a certain force from the lifting element, to be displaced from a first

position to a second position and at ceasing of mentioned force be displaced from the second position to the first position. The indicating means is adapted to detect the position of the displaceable part and to create at least one signal that indicates if the lifting device is in a lifting state or a non-lifting state based on the detected position. The control unit is adapted to control the holding and releasing of the object from the lifting device in dependency of mentioned at least one signal.

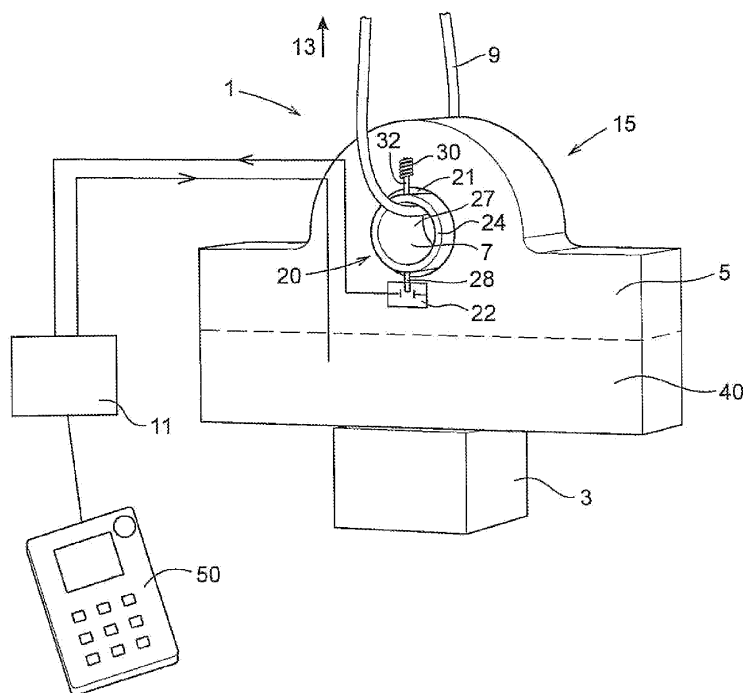


Fig. 1

Description

TECHNICAL FIELD

[0001] The present invention relates to a lifting device with means for holding and releasing an object. The lifting device comprises a body with a space adapted to receive a lifting element, and a control unit adapted to control the holding and releasing of an object from the lifting device. The lifting element is arranged to affect the lifting device with a force so that the lifting device with possible object is lifted from a support.

PRIOR ART

[0002] The lifting device is used for lifting and moving an object between different position on the ground or on the support. By means of the means for holding and releasing the object the object can be held and released from the lifting device. The control unit controls the means for holding and releasing the object.

[0003] The space in the body is adapted to receive the lifting element. The lifting element is arranged to be connected to a lifting unit, such as a crane a traverse, or similar. The lifting element is for example a lifting hook, a lifting strap, or similar.

[0004] The lifting device is used for moving the object by means of that the object is held to the lifting device in a first position in contact with a first support. Thereafter the object is lifted and moved to a second position in contact with a second support, after which the object is released from the lifting device. For example, the lifting device is used in a storage, at an assembly line, etc.

[0005] A problem with lifting devices according to the state of art is that it is possible to release the object from the lifting device before the object is positioned on the arranged support by means of that the control unit sends a releasing signal to the lifting device. For example, an operator of the lifting device can by mistake order the control unit to release the object from the lifting device before the object is positioned at the arranged support.

[0006] If the object is released from the lifting device before the object is in contact with the arranged support, there is a risk that the operator or person in the surrounding is injured. Furthermore, there is a risk that the object is damaged or that the damages arises on surrounding objects. Accordingly, it is desirable to avoid that the object is released from the lifting device when the lifting device is in a lifting state.

SUMMARY OF THE INVENTION

[0007] The object of the present invention is to provide an improved lifting device that solves the problem with non intentional releasing of the object.

[0008] This object is achieved with the previously mentioned lifting device that is **characterized in that** the lifting device comprises:

a displaceable part arranged in the space of the lifting device, wherein the displaceable part is adapted to, at an interaction with a certain force from the lifting element, be displaced from a first position to a second position and at ceasing of mentioned force be displaced from the second position to the first position,

indicating means adapted to detect the position of the displaceable parts and to create at least one signal that indicates if the lifting device is in a lifting state or in a non-lifting state based on the detected position,

wherein the control unit is adapted to control the holding and releasing of the object from the lifting device in dependence of mentioned at least one signal.

[0009] The position of the displaceable part indicates if the lifting device is in the lifting state or in the non-lifting state. When the displaceable part is in the first position the lifting device is in the non-lifting state. When the displaceable part is in the second position the lifting device is in the lifting position.

[0010] The indication means is adapted to detect which of a first and a second position the displaceable part is located in. Based on the position of the displaceable part, the indicating means creates mentioned signal that indicates the position.

[0011] The control unit is adapted to prevent releasing the object from the lifting device if the signal indicates that the lifting device is in the lifting state, and to allow releasing the object from the lifting device if the signal indicates that the lifting device is in the non-lifting state.

[0012] The control unit is adapted to receive the signal from the indicating means and based on the information on the position of a displaceable part control the holding and releasing of the object from the lifting device. Thereby, the control unit can for example be arranged so that the releasing of the object at the lifting state is prevented.

[0013] The lifting device comprises a simple and inexpensive solution of detecting and indicating if a lifting device is in the lifting state or in the non-lifting state.

[0014] According to an embodiment of the invention, the lifting device is adapted to by means of the lifting element be lifted in a lifting direction, wherein the displaceable part comprises a relative to the space movable contact member with a contact surface directed away from the lifting direction, the contact surface is adapted to be in contact with the lifting element and to receive mentioned force from the lifting element.

[0015] By means of that the contact surface is directed away from the lifting direction the lifting element and the contact member are adapted to be in contact with each other. Thereby the displaceable part is affected when the lifting element is lifted in the lifting direction from the non-lifting state to the lifting state.

[0016] According to an embodiment of the invention, the contact member is ring formed with an opening adapted to receive the lifting element.

[0017] According to an embodiment of the invention, the indicating means comprises a switch arranged to in one of the first and the second position be turn on and in the second of the first and the second position be turn off, wherein the displaceable part comprises a first protruding member adapted to act on the switch.

[0018] The switch is switched between the turned on state and the turned off state by means of interaction from the first protruding member. The switch is switched between turned on state and turned off state when the displaceable part is displaced between the first and the second position.

[0019] According to an embodiment of the invention, the lifting device comprises a re-displacing means adapted to act on the displaceable part so that the displaceable part is re-displaced from the second position to the first position at ceasing of mentioned force from the lifting element.

[0020] By means of the re-displacing means, it is assured that the displaceable part is re-displaced from the second position to the first position at ceasing of mentioned force from the lifting element.

[0021] According to an embodiment of the invention, the displaceable part comprises a second protruding member, the second protruding member is connected to the re-displacing means, wherein the second protruding member and the re-displacing means are adapted to in co-operation re-displace the displaceable part.

[0022] According to an embodiment of the invention, the re-displacing means comprises a resilient element arranged to act on the displaceable part with a re-displacing force.

[0023] The re-displacing force from the resilient element exceeds possible friction force that counteract the re-displacement of the displaceable part from the second position to the first position at absence of the force from the lifting element. The resilient element is for example a coil spring, a pneumatic spring, an elastic part, etc.

[0024] According to an embodiment of the invention, the first protruding member and the second protruding member protrudes in opposite direction from the contact member.

[0025] According to an embodiment of the invention, the means for holding and releasing the object comprises an electromagnet wherein the control unit is adapted to control activation and deactivation of the electromagnet.

[0026] According to an embodiment of the invention, the means for holding and releasing the object comprises a electro-permanent magnet.

[0027] The electro-permanent magnet only requires power when it is switched on and off. Thereby, the energy consumption of low in comparison to an electromagnet. Furthermore, the use of electro-permanent magnet in lifting devices has the benefit that the lifting device will maintain its magnetic properties even at a power failure. Accordingly, the object will remained held to the lifting device even in the event of an interruption if power.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028] The invention will now be explained in detail by means of descriptions of different embodiments of the invention and with reference to the enclosed figures.

Figure 1 discloses an embodiment of a lifting device for holding and releasing an object according to the invention.

Figure 2a discloses a part of a lifting device in an enlargement, where the displaceable part is located in the second position.

Figure 2b discloses the lifting device in Fig. 2a, where the displaceable part is located in the first position.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

[0029] Fig. 1 discloses an embodiment of a lifting device 1 for holding and releasing an object 3 according to the invention. The lifting device 1 comprises a body 5 with a space 7. In the disclosed embodiment the space 7 has the form of a through circular hole. The space 7 can also be of other forms.

[0030] The space 7 is adapted to receive a lifting element 9, such as a lifting hook, a lifting strap, or similar, so that the lifting device 1 and the lifting element 9 interact with each other in lifting the lifting device 1 and possible object 3.

[0031] The lifting device 1 comprises means 40 for controllable holding and releasing the object 3, such as an electromagnet, a transferring arm, a vacuum gripper, etc. In the disclosed embodiment the lifting device 1 comprises an electromagnet.

[0032] A control unit 11 is connected to the means 40 for holding and releasing an object 3, wherein the control unit 11 controls holding and releasing of the object 3. In the disclosed embodiment the control unit 11 controls activation and de-activation of an electromagnet, wherein the holding and releasing of the object 3 is controllable. The control unit comprises essential electronic for controlling the means 40, for example a microprocessor or similar electronic circuits.

[0033] The lifting element 9 is connected to a lifting device, such as a crane, traverse or similar (not shown in Fig. 1). The lifting device affects the lifting element 9 with a force in a lifting direction 13, wherein the lifting device 1 is lifted in the lifting direction 13. Thereby, the lifting device 1 is adapted to be lifted and moved between different locations.

[0034] The lifting device 1 comprises further more a device 15 for preventing releasing of the object 3 before the object has reached contact with the support. The device 15 comprises a displaceable part 20, an indication means 22 and a control unit 11.

[0035] The displaceable part 20 is positioned in the

space 7. The displaceable part 20 is displaceable between a first position and a second position. The displaceable part 20 separates from the space 7 by a gap 21 which allows the displacement of a displaceable part 20 between the first and the second position.

[0036] Figure 2a discloses a part of a lifting device 1 in an enlargement, where the displaceable part 20 is located in the second position. The lifting element 9 influences the displaceable part 20 with a force in the lifting direction 13. When the displaceable part 20 is located in the second position the lifting device 1 is in a lifting state.

[0037] Figure 2b discloses the lifting device 1 in Fig. 2a where the displaceable part 20 is located in the first position. The displaceable part 20 lacks influence from the lifting element 9. When the displaceable part 20 is located in the first position, the lifting device is in a non-lifting state.

[0038] The displaceable part 20 is adapted to be displaced in the lifting direction 13 from the first position to the second position, when the lifting element 9 affects the displaceable part 20 with a certain force.

[0039] The displaceable part 20 is adapted to be displaced in the opposite direction of the lifting direction 13 from the second position to the first position, when the force from the lifting element 9 on the displaceable part 20 ceases.

[0040] The indicating means 22 is adapted to detect the first and the second position of a displaceable part 20. The indicating means 22 is adapted to create and transmit at least one signal to the control unit 11 that indicates if the displaceable part 20 is in the first or the second position.

[0041] In an alternative embodiment, the indicating means 22 creates a signal for each of a first position and second position. For example, a signal of 0 V indicates that the displaceable part 20 is in the first position, wherein a signal of +5 V indicates that the displaceable part 20 is in the second position.

[0042] The displaceable part 20 comprises a contact member 24 and a contact surface 26. The contact member 24 has an opening 27 that is adapted to receive the lifting element 9. The contact surface 26 is directed away from the lifting direction 13. Thereby, the contact surface 26 is adapted to be in contact with the lifting element 9 and to abut with each other.

[0043] The contact member 24 is in the disclosed embodiment a ring enclosed along the circumference of the space 7. The contact surface 26 is accordingly a part of a rings inner envelop surface that is directed away from the lifting direction 13.

[0044] The displaceable part 20 comprises a first protruding member 28 that protrudes from the contact member 24. The first protruding member 28 is adapted to be displaced at displacement of the displaceable part 20 between the first and the second position, wherein the first protruding member 28 is adapted to act on the indication means 22 so that at least one signal is created.

[0045] In the disclosed embodiment of invention, the

indication means 22 comprises a switch, such as a micro switch, an optical switch, a relay, etc. In an embodiment, the switch is arranged to interrupt the current when the first protruding member 28 is in the first position and to turn on the current when the first protruding member 28 is in the second position. In an alternative embodiment, the switch is adapted to interrupt the current when the first protruding member 28 is in the second position and to turn on the current when the first protruding member 28 is in the first position.

[0046] The displaceable part 20 comprises a re-displaceable means 30 adapted to re-displace the displaceable part 20 from the second position to the first position, when the force from the lifting element 9 ceases.

[0047] The displaceable part 20 comprises a second protruding member 32 that protrudes from the contact member 24. The second protruding member 32 is adapted to be displaced at displacement of the displaceable part 20 between the first and the second position, wherein the second protruding member 32 is adapted to be affected by the re-displacement means 30. The first protruding member 28 protrudes in an opposite direction of a lifting direction 13. The second protruding member 32 protrudes in a direction along the lifting direction 13.

[0048] In the disclosed embodiment of the invention, the re-displacement means 30 comprises a resilient element, such as a coil spring, pneumatic spring, an elastic part, etc. The resilient element is adapted to act on the second protruding member 32 with a re-displacement force directed away from the lifting direction 13. Thereby it is assured that the displaceable part 20 is re-displaced from the first position to the second position when the force from the lifting element 9 is absent. The re-displacement force from the resilient element is arranged to exceed possible friction force that counteracts the re-displacement of displaceable part 20 from the first position to the second position when the force from the lifting element 9 is absent.

[0049] The control unit 11 is arranged to receive at least one signal from the indication means 22. Thereby, the control unit 11 receives information on if a lifting device is in the lifting or the non-lifting state.

[0050] The control unit 11 is arranged to prevent releasing of the object 3 from the lifting device 1 when the displaceable part 20 is located in the second position. The control unit 11 is arranged to allow releasing of the object 3 from the lifting device 1 when the displaceable part 20 is located in the first position.

[0051] The control unit 11 is adapted to be controlled by a control unit 50, such as a remote control, wherein the holding and releasing of object 3 is controllable by the operator.

[0052] The invention is not limited to the enclosed embodiments but can be modified and varied within the scope of following claims.

[0053] The contact member 24 can be of different forms which allow the contact member 24 to be received by the space 7 in the lifting device 1 and which forms

allow a contact between the contact member 24 and the lifting element 9. For example, the contact member 24 may comprise a section of a ring, a flat part, a T-formed part, etcetera.

[0054] The displaceable part 20 can furthermore, in the second position, be adapted to create a mechanical locking that prevents the release of the object 3 from the lifting device 1, and in the first position release mentioned mechanical locking so that the releasing of the object 3 from the lifting device 1 is allowed. The mechanical locking occurs independent if the indication means 22 and the control unit 11 is present or not. By means of the mechanical locking of the displaceable part 20, an automatic locking occurs that prevents the releasing of the object. Thereby, the mechanical locking created by the displaceable part 20 can replace possible manual mechanical locking. Such manual mechanical locking is present, for example, on manual maneuvered lifting device according to the state of the art.

[0055] The indicating means 22 and the re-displacing means 30 can both be connected to any of the first protruding member 28 or the second protruding member 32.

Claims

1. Lifting device (1) with means (40) for holding and releasing an object (3), wherein the lifting device (1) comprises a body (5) with a space (7) adapted to receive a lifting element (9), and a control unit (11) adapted to control the holding and releasing of the object from the lifting device (1), wherein the lifting element (9) is adapted to influence the lifting device (1) with a force so that the lifting device (1) with possible object (3) is lifted from a support, **characterized in that** the lifting device (1) comprises:

- a displaceable part (20) arranged in the space (7) of the lifting device (1), wherein the displaceable part (20) is adapted, when being influenced with a certain force from the lifting element (9), to be displaced from a first position to a second position and at ceasing of mentioned force be displaced from the second position to the first position,
- indicating means (22) adapted to detect the position displaceable part (20) and to create at least one signal that indicates if the lifting device (1) is in a lifting state or in a non-lifting state based on the detected position, wherein the control unit (11) is adapted to control the holding and releasing of the object from the lifting device (1) in dependence of mentioned at least one signal.

2. Lifting device (1) according to claim 1, **characterized in that** the lifting device (1) is adapted to by means of the lifting element (9) be lifted in a lifting

direction (13), wherein the displaceable part (20) comprises a relative to the space (7) movable contact member (24) with a contact surface (26) directed away from the lifting direction (13), the contact surface (26) is adapted to be in contact with the lifting element (9) and receive mentioned force from the lifting element (9).

3. Lifting device (1) according to claim 2, **characterized in that** the contact member (24) is ring-formed with an opening (27) adapted to receive the lifting element (9).

4. Lifting device (1) according to claim 1, **characterized in that** the indicating means (22) comprises a switch adapted to in one of the first and the second position be turn on and in the other of the first and the second position be turn off, wherein the displaceable part (20) comprises a first protruding member (28) adapted to act on the switch.

5. Lifting device (1) according any of the previous claims, **characterized in that** the lifting device (1) comprises a re-displacing means (30) adapted to act on the displaceable part (20) so that the displaceable part (20) is re-displaced from the second position to the first position at ceasing of mentioned force from the lifting element (9).

6. Lifting device (1) according to claim 5, **characterized in that** the displaceable part (20) comprises a second protruding member (32), the second protruding member (32) is connected to the re-displacing member (30), wherein the second protruding member (32) and the re-displacing member (30) is adapted to in co-operation re-displace the displaceable part (20).

7. Lifting device (1) according to claim 5 or 6, **characterized in that** the re-displacing means (30) comprises a resilient element arranged to act on the displaceable part (20) with a re-displacing force.

8. Lifting device (1) according to claim 4 and 6, **characterized in that** the first protruding member (28) and the second protruding member (32) protrude in opposite directions from the contact member (24).

9. Lifting device (1) according to any of the previous claims, **characterized in that** the control unit (11) is adapted to prevent releasing of the object (3) from the lifting device (1) if the signal indicates that the lifting device (1) is in the lifting state, and to allow releasing of the object (3) from the lifting device (1) if the signal indicates that the lifting device (1) is in the non-lifting state.

10. Lifting device (1) according to any of the previous

claims, **characterized in that** the means (40) for holding and releasing the object (3) comprises an electromagnet, wherein the control unit (11) is adapted to control activation and de-activation of the electromagnet.

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11. Lifting device (1) according to any of the previous claims, **characterized in that** the means (40) for holding and releasing the object (3) comprises a electro-permanent magnet.

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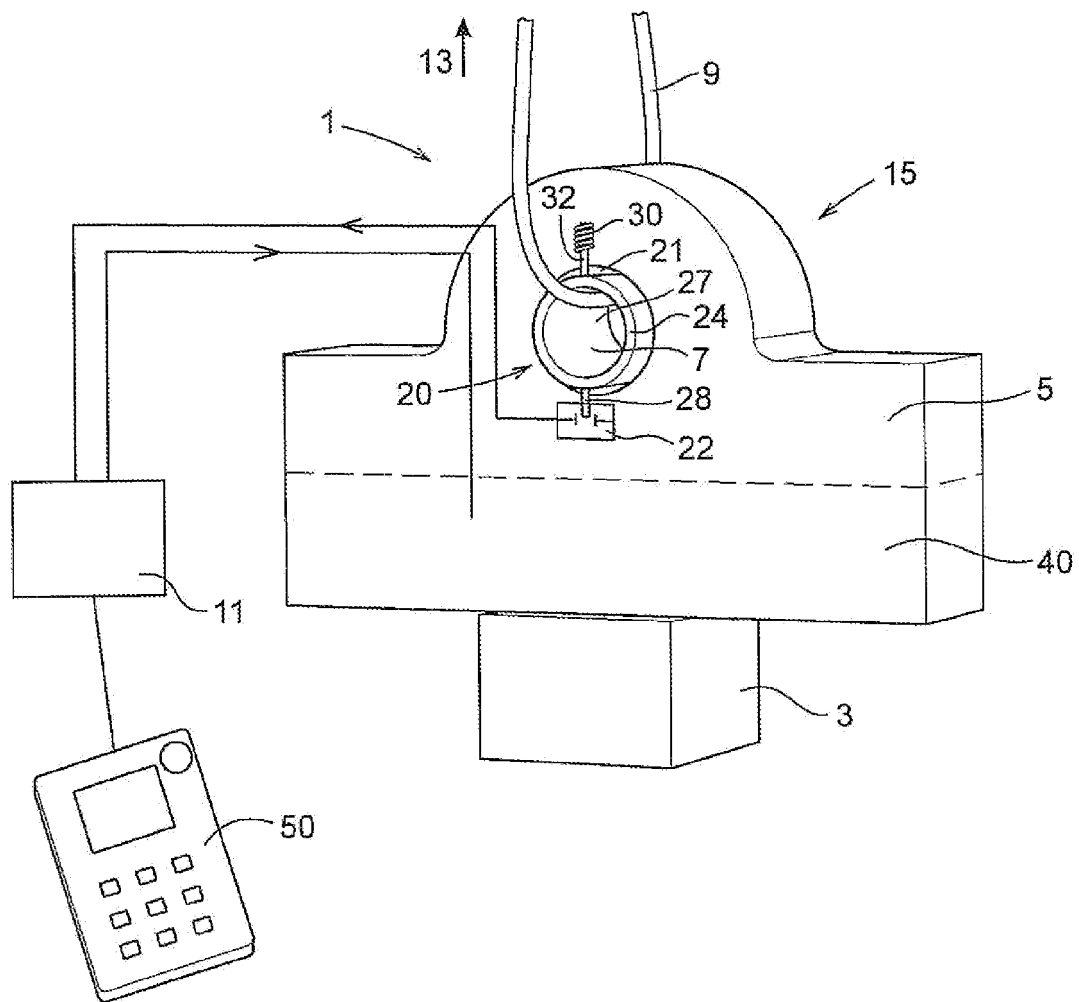


Fig. 1

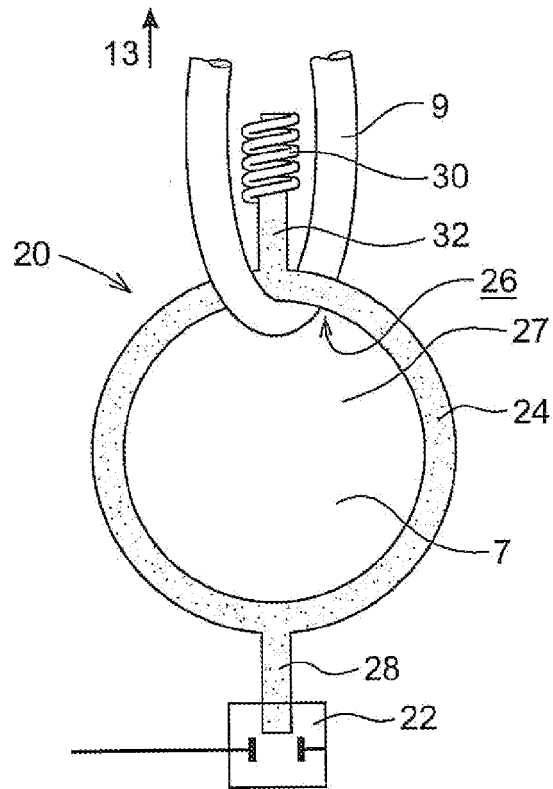


Fig 2a

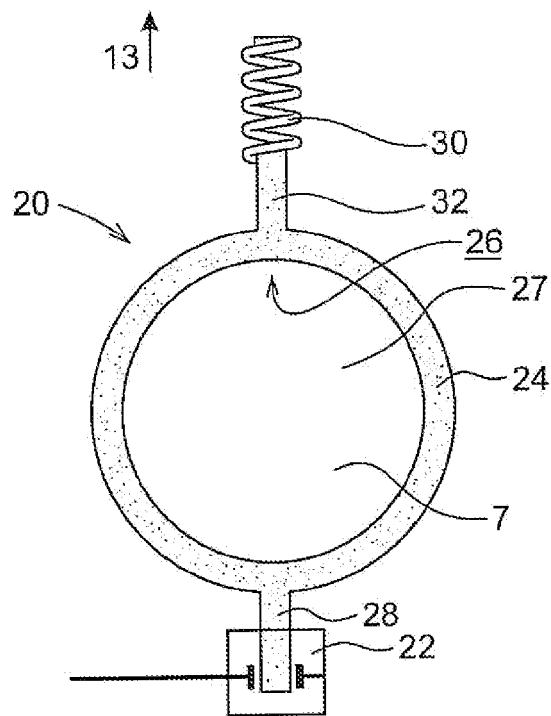


Fig 2b



EUROPEAN SEARCH REPORT

Application Number
EP 10 17 8020

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2007/013199 A1 (HALL DAVID R [US] ET AL) 18 January 2007 (2007-01-18) * paragraphs [0034] - [0037], [0049] - [0052]; figures *	1,2,9-11	INV. B66C13/16
A	JP 57 145440 U (UNKNOWN) 13 September 1982 (1982-09-13) * figures *	1,4	
A	JP 50 017959 U (UNKNOWN) 27 February 1975 (1975-02-27) * figures *	1	
A	US 2007/200032 A1 (EADIE WILLIAM J [US] ET AL) 30 August 2007 (2007-08-30) * abstract; figure 2 *	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			B66C
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 17 February 2011	Examiner Verheul, Omiros
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 10 17 8020

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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17-02-2011

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82