(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 647 556 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
09.10.2013 Bulletin 2013/41

(21) Application number: **12163349.9**

(22) Date of filing: **05.04.2012**

(51) Int Cl.:
B62D 51/00 *(2006.01)* ***B62D 51/02*** *(2006.01)*
B62D 51/04 *(2006.01)* ***B66F 9/075*** *(2006.01)*

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(71) Applicant: **BT Products AB**
595 81 Mjölby (SE)

(72) Inventor: **Larsson, Henrik**
591 61 Motala (SE)

(74) Representative: **Johansson Webjörn, Ingmari**
Zacco Sweden AB
P.O. Box 5581
114 85 Stockholm (SE)

(54) Tiller arm truck and method for improvement of its ergonomics

(57) The invention relates to a tiller arm truck (10) designed so that the tiller arm (20) can be set in a first neutral steering position (20a) and in a second neutral steering position (20b), which differs with an angle α being less than 90° from each other. The invention also relates to a method for improving the ergonomics of a tiller arm truck (10), wherein the tiller arm (20) is set in a neutral steering position (20b) differing with an angle α being less than 90° from the longitudinal direction (80) of the truck.

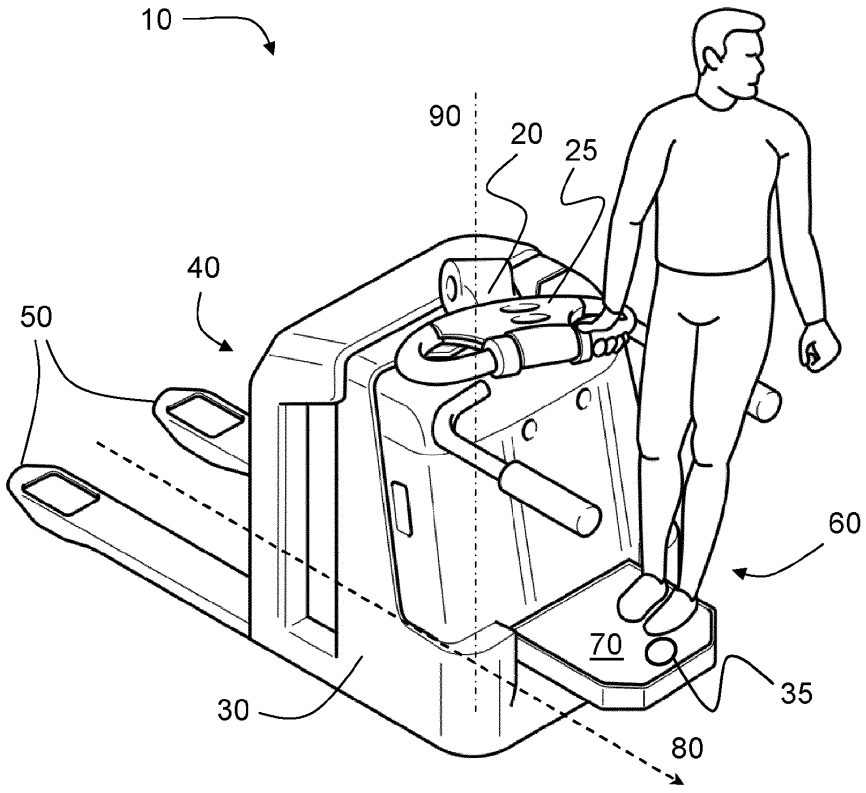

Fig 1

EP 2 647 556 A1

Description

TECHNICAL FIELD

[0001] The invention relates to the area of tiller arm trucks and a method for improvement of the ergonomics of tiller arm trucks.

BACKGROUND

[0002] A tiller arm truck is manoeuvred by means of a tiller arm which is mounted on the truck body and which can be rotated in right hand circuit or in left hand circuit by the operator. The truck can be driven onwards or backwards, i.e. in a direction from or towards the truck forks. The operator is usually turned away from the truck body, i.e. in the direction of travel, when the truck is driven in a direction from the forks.

[0003] Document WO2009009446 A1 describes a truck, which steering gear can be set in three steering positions. Two of the steering positions makes it possible to steer the truck from two operator positions P1, P2 being opposite to each other. The third steering position makes it possible to steer the truck from an operator's position beside the truck.

SUMMARY OF INVENTION

[0004] When an operator drives a tiller arm truck in a direction away from the truck forks, the operator is forced to take a relatively unergonomic posture. The operator must hold the tiller arm behind his body with his arm bent and simultaneously turn his body away from the truck body. In this position has the operator only limited possibility to steer the truck in the direction facing the operators back, because this means that the operator has to stretch his arm behind his back. Further, in this direction has the operator only a limited view. The present invention aims at solving these problems.

[0005] According to the invention the mentioned problem is solved by designing the tiller arm truck so that the tiller arm can be rotated around an essentially vertical axis and be set in a first neutral steering position and in a second neutral steering position, wherein the first neutral steering position and the second neutral steering position differ by a angle α being less than 90 ° from each other.

[0006] In this way the operator has the possibility to adjust the position of the tiller arm around an essentially vertical axis, so that a more natural posture can be taken. By adjusting the neutral steering position of the tiller arm, i.e. the position for straight on driving, the operator can hold the tiller arm with his arm stretched at his side. This makes it easier for the operator to turn the upper part of his body in the direction of travel.

[0007] The angle α between the first neutral steering position and the second neutral steering position is preferably in the interval of 5-45°, or more preferably 15-35°. The size of the angle depends on the form and dimensions of the tiller arm, and also on the length and personal preferences of the operator. The angle α is an angle of rotation around an essentially vertical axis. The axis is defined as being essentially vertical, since it can be understood that the axis will not be directed exactly vertical when the truck is driven on a sloping ground. Said axis runs vertically through the track body.

[0008] The angle α is preferably chosen so that the operator can take an ergonomically correct posture when driving the tiller arm truck in a direction away from the forks. The angle α is advantageously chosen so that the second neutral steering position makes it possible for an operator, who is turned away from the truck, to assign the tiller arm equally large deflection in both directions. In this way a good manoeuvrability is obtained.

[0009] The tiller arm truck can further comprise a platform on which the operator can stand. Once again can the angle α be chosen so that the second neutral steering position makes it possible for the operator, who is on the platform and is turned away from the truck, to assign the tiller arm equally large deflection in both directions. However, the invention is not limited to tiller arm trucks with a platform. It can also be used on tiller arm trucks without a platform or with a hinged platform, where the operator walks on the ground and steers the truck.

[0010] The tiller arm truck can be of the steer- by- wire type, wherein the tiller arm truck comprises an electronic steering circuit, which makes it possible to change the neutral steering position, i.e. the tiller arm can be set to a first neutral steering position and to a second neutral steering position. This implies a relatively simple implementation of the invention. For example, a software code steering the electronic steering circuit can be completed with instructions making it possible to change the neutral steering position. The invention can be applied to an existing tiller arm truck of the steer- by- wire- type by updating software, which is executed in a computer in the truck.

[0011] The electronic steering circuit or the computer can be designed so that the change of the neutral steering position is reset when the operator leaves said platform. Hereby, the risk is eliminated that the operator, or another operator, disregards the change of the neutral steering position and unintentionally steers the truck in a wrong direction.

[0012] The invention can also be applied to a tiller arm truck, which is not of the steer- by- wire- type. For example, the truck might comprise locking means, which renders it possible to change the neutral steering position by releasing said locking means temporarily when the neutral steering position is changed. Alternatively, the tiller arm can comprise hinge means, which makes it possible to change the neutral steering position by folding the tiller arm around the hinge means. An advantage with the last embodiment is that the change of the neutral steering position can be seen clearly by the operator.

[0013] The tiller arm truck can comprise indicating

means to indicate that he neutral steering position has been changed. Said indicating means can comprise one or several indicating lamps. The indicating means can be integrated in the tiller arm and be designed so that the operator can see and/or feel that the neutral steering position has been changed.

[0014] The invention also solves the said problem by a method for improving the ergonomics of a tiller arm truck, comprising the step of setting the tiller arm of the tiller arm truck in a neutral steering position, which differs with an angle α being less than 90° from the longitudinal direction of the tiller arm truck. This method offers the possibility to the operator to adjust the position of the tiller arm so that a more natural posture can be taken.

DESCRIPTION OF THE DRAWINGS

[0015] The invention is described here below by means of examples of embodiments and figures, in which

figur 1 is a perspective view of a tiller arm truck according to the present invention, with the tiller arm in a second neutral position,

figure 2 is a view seen from above of the tiller arm truck in figure 1,

figure 3 is a view seen from above of a conventional tiller arm truck,

figure 4 illustrates a method for improvement of the ergonomics of a tiller arm truck,

figure 5 is a view seen from above of a tiller arm truck according to a second embodiment of the invention, and

figure 6 is a view seen from above of a tiller arm truck according to a third embodiment of the invention.

DESCRIPTION OF EMBODIMENTS

[0016] Figure 1 illustrates a tiller arm truck 10 according to the invention and an operator, who drives the tiller arm truck by means of a tiller arm 20, which is attached to the body 30 of the truck. The tiller arm truck has on a first side 40 load carrying means 50, in the form of forks. The operator is positioned on a second side 60, opposite the first side 40, and holds the tiller arm 20 extending from the truck body 30 in a direction towards the second side 60.

[0017] The figure references that have been introduced in figure 1 are also valid for figures 2, 3, 5, and 6. Figure 2 shows a view seen from above the tiller arm truck according to the invention, with the tiller arm in a neutral position 20b, and figure 3 shows a conventional tiller arm truck. In figure 3 is the lengthwise direction of the tiller arm 20 parallel with the straight direction 80 of travel of the conventional truck, which means that the tiller arm 20 is in a neutral steering position 20a. Figure 3 shows clearly that the conventional tiller arm truck, when being driven in a direction 80 straight away from the load (nor shown) on the forks 50, forces the operator to take an unergonomical working posture. This is particularly relevant when the operator stands on the platform 70 and is positioned in front of the truck. Hence, the truck is moving in the direction 80, which the second side 60 is facing, and the operator is positioned on this second side 60.

[0018] It can be seen from figure 3 that the arm of the operator is bent behind the back of the operator. The right shoulder is withdrawn and the elbow is raised behind the back. The large angle between the head and the upper part of the operator, almost 90°, has the effect that the spinal is twisted. The operator has in this working position a limited possibility to manoeuvre the tiller arm truck. In order to be able to turn in a direction 80b (to the left in figure 3), the operator must stretch out his arm behind the body. Additionally, when turning in this direction 80b, the view of the operator is limited.

[0019] If the operator steer the truck and walks simultaneously, the operator has a possibility to walk at the side in front of the truck and therewith hold the arm in a more ergonomical way. However, in narrow passages the operator has to go straight in front of the truck, which leads to an unergonomical posture of the body.

[0020] Figure 2 illustrates the present invention. Here is the tiller arm 20 rotated from a first neutral steering position 20a (corresponding to what is shown in figure 3) to a second neutral steering position 20b. The second neutral steering position 20b differs with an angle α from the direction of travel 80 of the tiller arm truck, which during a drive straight ahead coincides with the longitudinal direction 80 of the truck. The tiller arm in figure 2 has a direction which differs with an angle α from the tiller arm in figure 3. Due to this change of the neutral steering position, the operator can take a more ergonomical working position.

[0021] It is clear from figure 1 and 2 that the operator, as a consequence of the change of the neutral steering position, holds his arm outstretched at his side, rather than behind his back (as in the case in figure 3). The operator can relatively freely turn the upper part of his body in the direction of travel 80. The spinal is less twisted since the angle between the head and the upper part of the body of the operator is less than in the case shown in figure 3. The working position of the operator is therewith ergonomical, while the operator has the possibility to turn the tiller arm truck in both direction 80a, 80b without being limited by an uncomfortable working posture or a bad view. The operator can, in this position, comfortably drive the truck 10 during a long time.

[0022] Figure 1, 2 as well as figure 3 illustrates as described neutral steering positions 20a, 20b, i.e. positions of the tiller arm, which result in a driving straight forwards

or straight backwards. In a neutral steering position is/are the steering wheel/wheels (not shown), which is/are mounted under the truck 10 and on which the truck is rolling, directed parallelly with the longitudinal axis 80 of the truck. The position of the tiller arm in figure 3 is here called a first neutral steering position 20a and the position in figure 1 and 2 is called a second neutral steering position 20b. As should be clear from a comparison of figures 2 and 3, the steering positions 20a, 20b differ from each other by an angle α.

[0023] The tiller arm 20 of the tiller arm truck can be rotated around a vertical axis 90, illustrated in figure 1, during the driving of the truck. Such a rotation leads to steering of the steer wheels of the truck. Hence the angle α is an angle of rotation around a vertical axis 90, or with other words around an axis extending in a vertical direction through the body 30 of the truck. The tiller arm can be raised or lowered relatively the body 30 of the truck, by means of a horizontal axis through which the tiller arm is attached to the truck body, as illustrated in figure 1. As being pointed out, the vertical axis 90 is not directed exactly axially when the truck is driven of a sloping ground.

[0024] The illustrated tiller arm truck 10 is of the steer-by-wire type, which means that there is no mechanical coupling between the steering wheel and the tiller arm 20. The steering of the steering wheel/wheels is achieved by means of electronics, which is affected by the operation of the tiller arm 20 and which affects the steering wheel, for example hydraulically or electrically. A truck computer 25, comprising a processor, a primary memory and a secondary memory is arranged in the tiller arm truck to receive signals from the operator and take care of the operation of the truck. Hence, the truck computer provides for the change of the neutral steering position 20a, 20b.

[0025] In the case that the tiller arm truck 10 is of the steer-by-wire type and comprises a platform 70 for the operator, the truck can be adapted to reset the change of the neutral steering position 20a, 20b when the operator leaves the platform 70. The tiller am truck can be provided with sensing means (not shown), which senses if an operator is positioned on the platform or not. The sensing means is connected to the truck computer 25 and sends a signal when the operator leaves the platform, whereafter the truck computer automatically resets the change of the neutral steering position 20a, 20b. The tiller arm truck 10 can also be adapted to indentify which operator is driving the truck 10, and to only automatically reset the change of the neutral steering position 20a, 20b when a new operator is identified.

[0026] A tiller am truck which is not of the steer-by-wire type, is normally steered by directly mechanically couple the tiller arm to a steering wheel. When the invention is applied on such a tiller arm truck, means for temporarily detaching this coupling can be arranged on the truck.

Figure 5 shows a tiller arm truck which is not of the steer-by-wire type. The change of the neutral steering position can be achieved by letting the fixing means 22 of the tiller arm around a vertical steering axis (not shown) be temporarily detachable. The steering axis extends from the steering wheel (not shown) to the fixing means 22 of the tiller arm above the truck body 30. The steering axis doesn't need to be directed exactly axially. The tiller arm truck can be designed with a slightly inclined steering axis, i.e. an essentially vertical axis. A locking means 24 in the form of a pin 24 of the fixing means 22 of the tiller arm can be displaced (as indicated by the double arrow in figure 5) in its longitudinal direction to in order to establish or release a positive fit between the fixing means 22 of the tiller arm and the steering axis. The steering axis can for example comprise a number of holes along its periphery, into which holes the pin 24 can be inserted. A non-positive fit can be used instead of a positive fit, in which case the tensioning means for example can be a wheel (not shown) on a threaded axis, which can be screwed through the fixing means 22 to abut the steering axis.

Figure 6 shows another example of how the change of the neutral steering position can be achieved. According to this example the tiller arm is folded. According to this purpose the tiller arm is provided with a hinge 26, around which the tiller arm can be folded. The hinge 26 comprises locking means 28, which can be temporarily released in order to fold the tiller arm and set a wished neutral steering position. The locking means 28 can achieve a positive fit or a non positive fit as above.

[0027] As can be realised from the figures 1-3, 4 and 5 the tiller arm 20 comprises in its distal end a handle with a grip being transversal to the longitudinal direction of the tiller arm. The handle comprises control means and different operating indicators, and can also comprise the truck computer 25. The operating means are designed as buttons and rotary controls, which are used to steer the truck and its forks. The operating indicators can be lamps and displays, which for example show the current velocity, charge level and height of lift.

[0028] According to the invention special indicators 35 are provided in order to detect that the neutral steering position 20a, 20b has been changed. These steering position indicators 35 are preferably designed so that an operator, who approaches the truck 10 from another task, easily can decide if the neutral steering position (20a, 20b) has been changed. For example, the truck body 30 and/or the tiller arm 20 can be provided with lightening means 35, such as light bulbs or LED's, which are easy to identify. The handle can also comprise a display on which the change of the neutral steering position 20a, 20b is shown.

[0029] The figures illustrate different examples of suitable steering position indicators 35. Figure 1 shows a steering position indicator 35 in the form of a lamp 35

provided in the platform 70. Right and left steering position indicators 35, arranged on each side of the upper side of the truck, are suggested in figure 2. In figure 5, right and left steering position indicators 35 in the form of lamps are integrated in the handle of the tiller arm, more precisely in the grip of the handle. Finally, figure 6 illustrates tactile steering position indicators 35 in the form of blunt pins within the grip of the handle, which can be adapted to protrude from the surface of the grip when the steering position has been changed. One or several of the shown steering position indicators 35 can be implemented one by one or several together, independent of if the truck is of the steer-by-wire type or not, and independent of on which way the truck is adapted to admit a change of the neutral steering position.

[0030] The method according to the invention is described here below. As already described, the neutral steering position of the tiller arm of the tiller am truck can be changed when an operator so wishes.

[0031] In a first step 100 the tiller arm is released from the steering wheel of the truck. This can be achieved through that operator activates an operating means, like for example presses a button, pulls out a locking pin or turns a wheel. If the truck is of the steer-by-wire type the release is handled by the truck computer 25. If the truck has a mechanical coupling between the tiller arm and the steering wheel, the release has as effect that said mechanical coupling is broken, for example by admitting the tiller arm to rotate freely around an axis extending to a steering wheel.

[0032] In a second step 110, the operator turns the tiller arm to a wished angle α. The turning is performed around an essentially vertical axis 90. This angle adjustment can be performed in discrete steps, or be performed continuously. A suitable angle adjustment is in the interval 5-45°, or more suitable in the interval 15-35°. In the showed example 25° is chosen. The size of the change which is needed in order for the operator to take a comfortable posture depends principally on the design of the tiller arm and on the length and preferences of the operator.

[0033] In a third step 120 the tiller arm is locked again relatively the steering wheel of the tiller arm truck, for example by the operator deactivating the operating means. If the truck is of the steer-by-wire type, the locking is handled by the truck computer. If the truck has a mechanical coupling between the tiller arm and the steering wheel, the locking leads to an re-insertion of said mechanical coupling means. In the case that indicators 35, which indicate that the neutral steering position 20a, 20b has been changed, have been provided on the truck, these indicators can be activated in the third step 120.

[0034] The tiller arm truck in the showed embodiments is provided with a platform 70. However, the invention is not limited to tiller arm trucks with a platform. It can also be used on tiller arm trucks without a platform or with a hinged platform, where the operator walks on the ground and steers the truck.

Claims

1. A tiller arm truck (10) comprising a truck body (30) and a tiller arm (20) for steering of said tiller arm truck (10), which tiller arm truck (10) is designed so that the tiller arm (20) can be rotated around an essentially vertical axis (90) and can be set in a first neutral steering position (20a) and in a second neutral steering position (20b),
characterized in that the first neutral steering position (20a) and the second neutral steering position (20b) differ with an angle α being less than 90° from each other.

2. The tiller arm truck (10) according to claim 1, wherein the angle α is in the interval 5-45°.

3. The tiller arm truck (10) according to claim 1 or claim 2, wherein the angle α is chosen so that the second neutral steering position (20b) makes it possible for an operator, who is turned away from the truck, to assign the tiller arm (20) equally large deflection in both directions (80a, 80b).

4. The tiller arm truck (10) according to any of the previous claims, further comprising a platform (70) for the operator, wherein the angle α is chosen so that the second neutral steering position (20b) makes it possible for the operator, who is on the platform (70) and is turned away from the truck body (30), to assign the tiller arm (20) equally large deflection in both directions (80a, 80b).

5. The tiller arm truck (10) according to any of the previous claims, wherein the truck is of steer-by-wire type, and wherein the tiller arm truck comprises an electronic steering circuit (25), which makes it possible to change the neutral steering position.

6. The tiller arm truck (10) according to claim 4 and 5, wherein the electronic steering circuit (25) is designed so that the change of the neutral steering position (20a, 20b) is reset when the operator leaves the platform (70).

7. The tiller arm truck (10) according to any of claims 1-4, comprising locking means (24, 28) making it possible to change the neutral steering position (20a, 20b) by said locking means (24, 28) being temporarily released when the neutral steering position (20a, 20b) is changed.

8. The tiller arm truck (10) according to claim 7, wherein the tiller arm (20) comprises hinging means (26), making it possible to change the neutral steering position (20a, 20b).

9. The tiller arm truck (10) according to any of the pre-

vious claims, comprising indicating means (35) for indicating that the neutral steering position (20a, 20b) has been changed.

10. A method for improving the ergonomics of a tiller arm truck (10), comprising the step (110) of setting the tiller arm (20) of the tiller arm truck in a neutral steering position (20b) which differs with an angle α being less than 90° from the longitudinal direction (80) of the tiller arm.

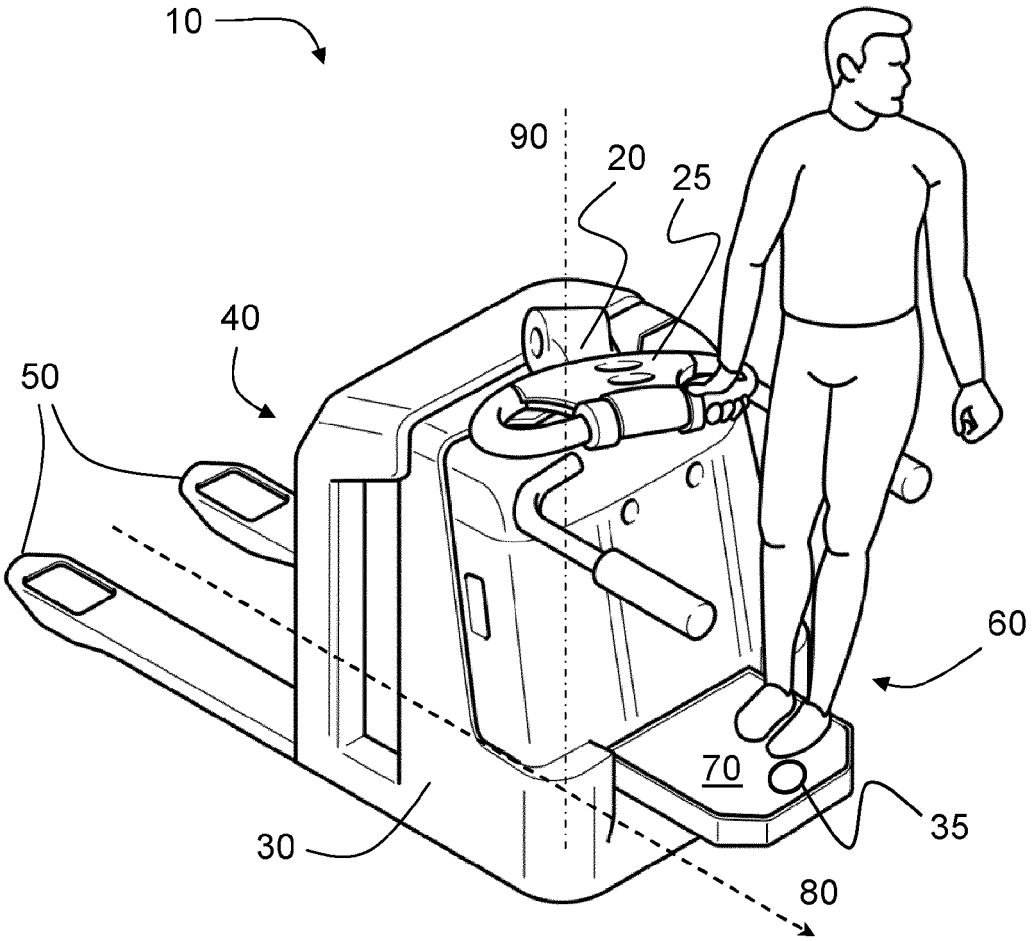

Fig 1

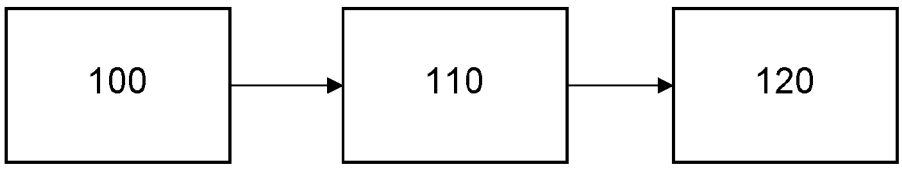

Fig 4

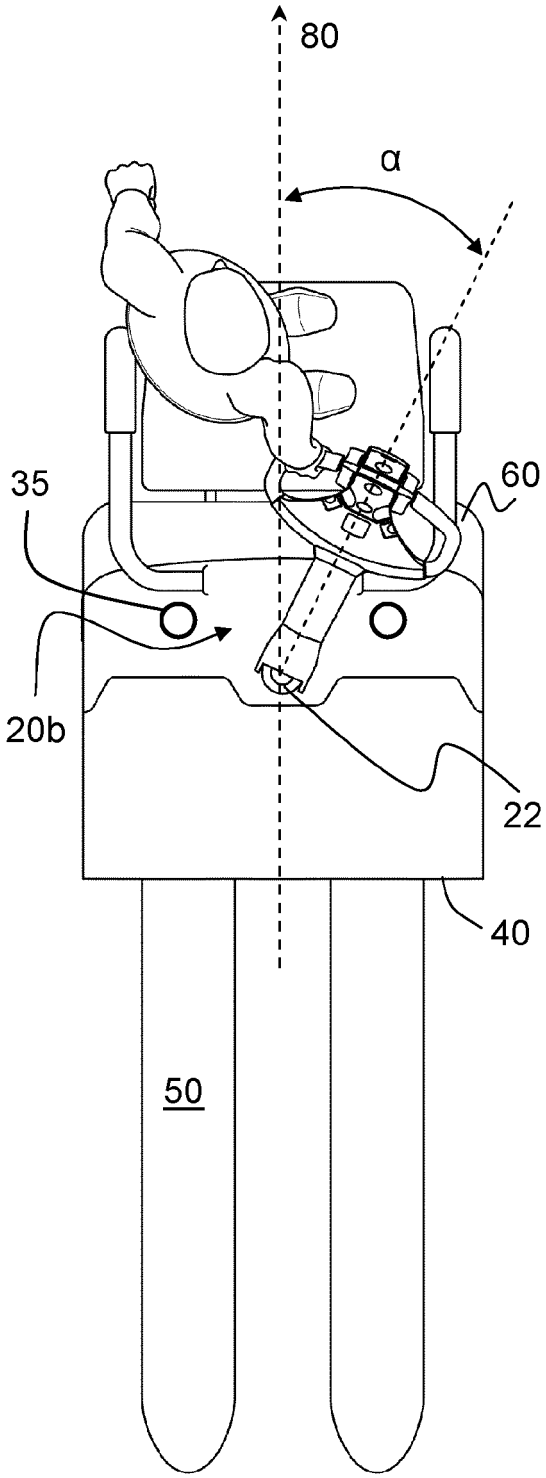

Fig 2

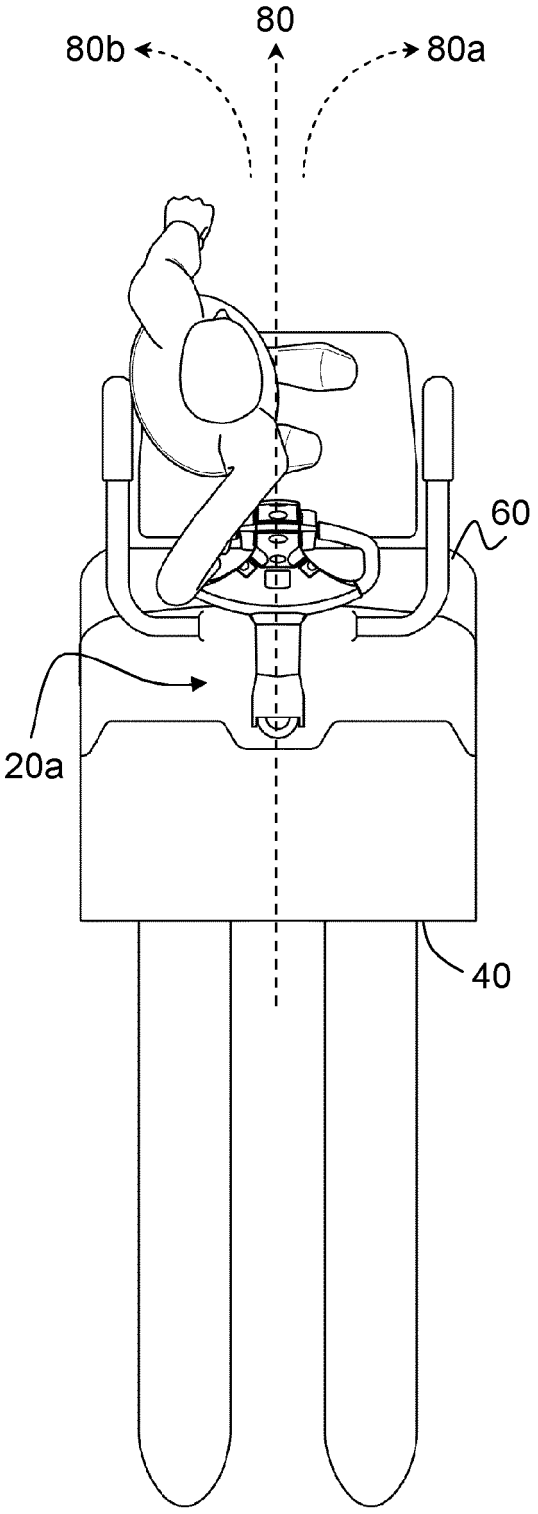

Fig 3

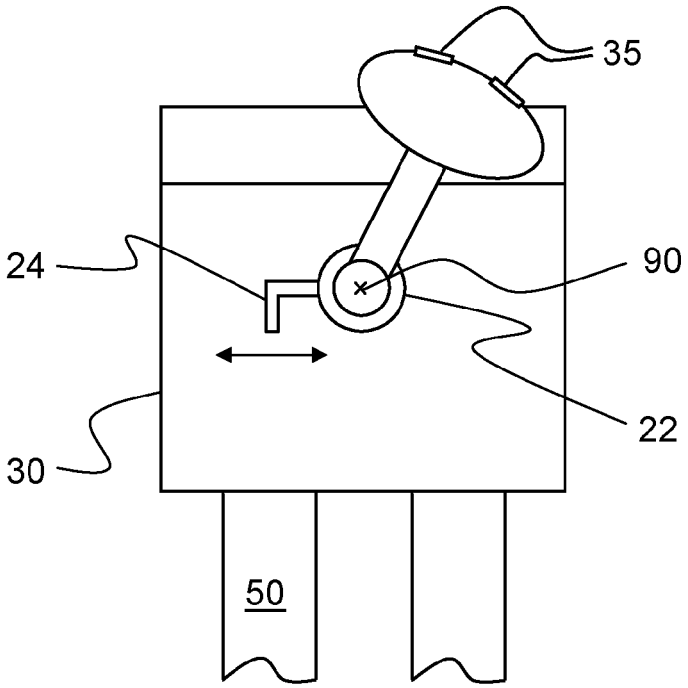

Fig 5

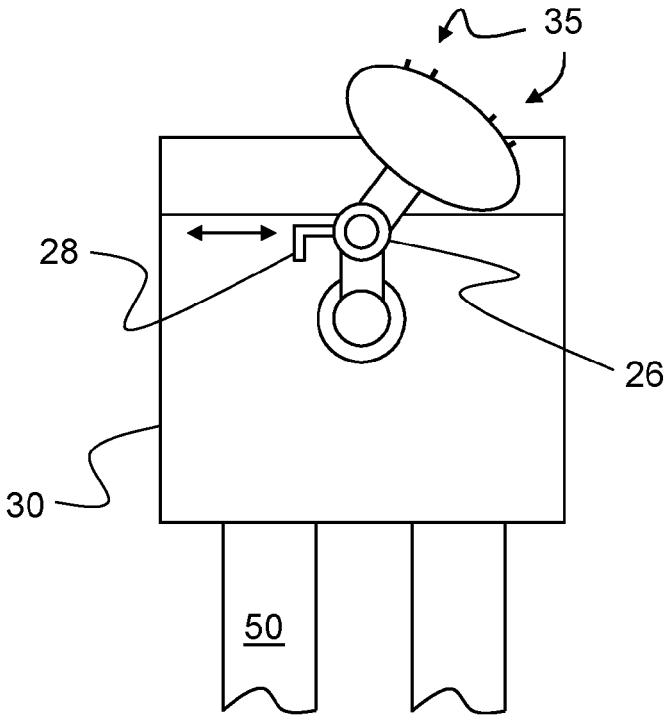

Fig 6

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 12 16 3349

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	WO 2009/009446 A1 (PASSERI GIANNI [IT] ET AL) 15 January 2009 (2009-01-15) * page 15, line 1 - page 17, line 3; claims; figures *	1-10	INV. B62D51/00 B62D51/02 B62D51/04 B66F9/075
A	WO 2010/079001 A1 (ALLCONSULT LTD [GB]; WEICH OTTO ROLAND [DE]; OPPERMANN RALF [DE]) 15 July 2010 (2010-07-15) * pages 2,3; claims; figures *	1-10	
A	US 2005/045409 A1 (FENELLI NICHOLAS EDWARD [US] ET AL) 3 March 2005 (2005-03-03) * paragraphs [0085], [0086]; claims; figures *	1-10	

TECHNICAL FIELDS SEARCHED (IPC)
B62D
B66F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	27 September 2012	Ducher, Alban

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

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 12 16 3349

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

27-09-2012

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2009009446 A1	15-01-2009	EP 2160318 A1	10-03-2010
		US 2009012677 A1	08-01-2009
		US 2012227533 A1	13-09-2012
		WO 2009009446 A1	15-01-2009
WO 2010079001 A1	15-07-2010	DE 102009004042 A1	15-07-2010
		EP 2373568 A1	12-10-2011
		WO 2010079001 A1	15-07-2010
US 2005045409 A1	03-03-2005	CA 2537215 A1	28-04-2005
		EP 1664956 A2	07-06-2006
		JP 2007504069 A	01-03-2007
		KR 20060054450 A	22-05-2006
		US 2005045409 A1	03-03-2005
		WO 2005038546 A2	28-04-2005
		ZA 200601645 A	30-05-2007

EPO FORM P0459

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

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- WO 2009009446 A1 **[0003]**