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

(11) **EP 3 502 043 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
26.06.2019 Bulletin 2019/26

(51) Int Cl.:
B66F 9/20 *(2006.01)*

(21) Application number: **18197725.7**

(22) Date of filing: **28.09.2018**

(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
Designated Validation States:
KH MA MD TN

(30) Priority: **02.10.2017 SE 1751213**

(71) Applicant: **Toyota Material Handling Manufacturing Sweden AB**
595 81 Mjölby (SE)

(72) Inventor: **Olofsson, Håkan**
584 22 Linköping (SE)

(74) Representative: **Ström & Gulliksson AB**
Box 5275
102 46 Stockholm (SE)

(54) **CONTROL UNIT FOR A LIFT-TRUCK**

(57) A control unit (1) for a lift-truck comprising a holder (2) for actuators (21, 22, 23, 24) for controlling functions of a lift-truck and,
- at least a two actuators (21, 22, 23, 24) configured to be operated by a hand of a human operator and arranged adjacent to each other on the holder (2) and;
- at least two carriages (31, 32, 33, 34) for supporting a respective actuator (21, 22, 23, 24) on the holder (2),wherein;
- the at least two actuators (21, 22, 23, 24) are arranged on a respective carriage (31, 32, 33, 34), wherein the carriages (31, 32, 33, 34) are arranged continuously movably on the holder (2, such that the at least two actuators (21, 22, 23, 24) are continuously movable apart from each other or towards each other on the holder (2).

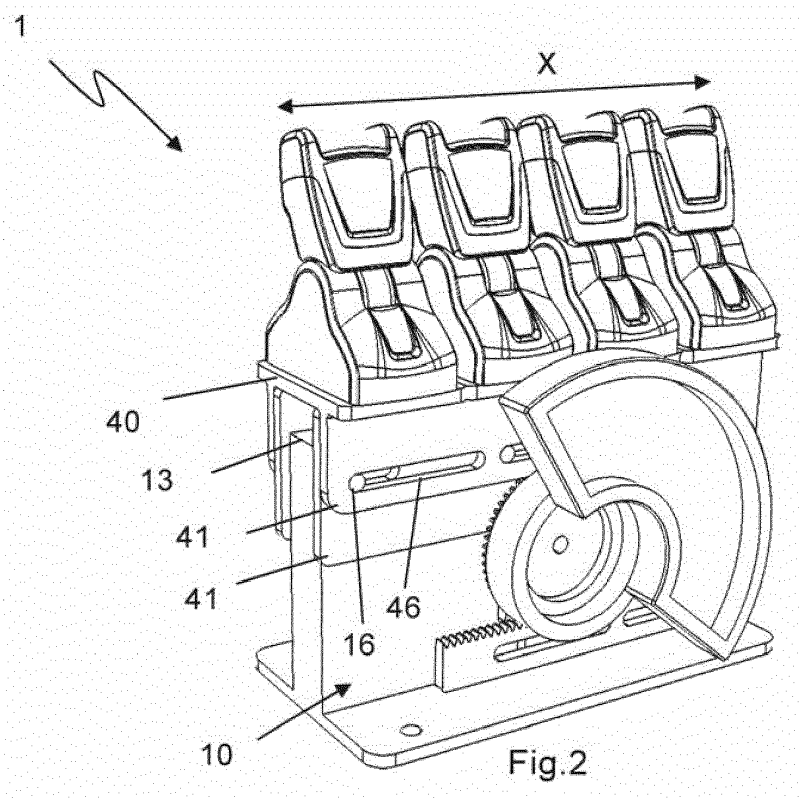

Fig.2

EP 3 502 043 A1

Description

Technical field

[0001] The present disclosure relates to a control unit for a lift-truck. The present disclosure also relates to a lift-truck comprising a control unit.

Background art

[0002] A lift-truck is a self-propelled vehicle that may be controlled by a human operator that rides on the lift-truck or that walks behind the lift-truck and thereby controls the lift-truck by a tiller arm. The lift-truck typically comprises load engagement means such as a lifting fork which may engage a load, raise the load from the surface and transport the load to a location. Examples of lift-trucks includes stacker lift-trucks, order picker lift-trucks, narrow aisle lift trucks, reach lift trucks or tiller arm lift-trucks.

[0003] A control interface is typically provided on the lift-truck, to allow the operator of the lift truck to drive the lift-truck and control the various functions of the lift-truck. The control interface may comprise various actuators such as buttons, levers, turnable knobs, joysticks etc. which may be actuated by hand by the operator. Often, multiple actuators are arranged together in a hand-control unit and configured to be operated by the fingers on one hand of the operator. This imposes a problem, since the actuators of the control unit typically are arranged in a standard set-up which is optimized to be manipulated by a bare hand. However, in certain operational situations such as in cold stores, the operator may wear heavy gloves to protect his hands from the cold. The gloves increase the hand size of the operator and may result in that the operator involuntarily manipulates other actuators of the control unit than intended.

[0004] WO2017136657 shows a control unit for a materials handling vehicle having a row of four control handles that may be used by the operator to control the vehicle. The control handles are respectively provided with two bottom holes that alternatively may receive a mounting stem of the control unit. By selectively mounting the control handle on the mounting stem through one of bottom holes it is possible to adjust the distance between the four control handles.

[0005] However, a problem with the control unit of WO2017136657 is that it only allows for a few discrete different distances between the control handles and therefore may not be suitable for the hands of some operators. It is also time consuming to remove and replace the control handles to adapt the control unit to different operators or operating conditions.

[0006] Thus, it is an object of the present disclosure to provide an improved control unit for a lift-truck that comprises hand operated actuators that solves or at least mitigates at least one of the problems discussed above. In detail, it is an object of the present disclosure to provide a control unit that comprises hand operated actuators for a lift-truck that allows for more flexible adjustment of the position of the hand operated actuators.

[0007] It is also an object of the present disclosure to provide a lift-truck having an improved control unit comprising hand operated actuators.

Summary of the disclosure

[0008] According to a first aspect of the present disclosure, at least one of these objects is achieved by a control unit 1 for a lift-truck comprising a holder 2 for actuators 21, 22, 23, 24 for controlling functions of a lift-truck and configured to be attached to the lift-truck, and; at least a two actuators 21, 22, 23, 24 configured to be operated by a hand of a human operator and arranged adjacent to each other on the holder 2, and; at least two carriages 31, 32, 33, 34 for supporting a respective actuator 21, 22, 23, 24 on the holder 2, characterized in that;

- the at least two actuators 21, 22, 23, 24 are arranged on a respective carriage 31, 32, 33, 34, wherein the carriages 31, 32, 33, 34 are arranged continuously movably at the holder 2, such that the at least two actuators 21, 22, 23, 24 are continuously movable apart from each other or towards each other on the holder 2.

[0009] The control unit according to the present disclosure provides the general advantage that the distance between the actuators may be varied step-less to a nearly infinite amount of settings. This greatly increases the adaptability of the control unit to a large number of different truck operators.

[0010] The holder 2 may comprise a support portion 10, which is configured to movably support the at least two carriages 31, 32, 33, 34 and that extends along an preferably longitudinal axis X. The at least two carriages 31, 32, 33, 34 are thereby slidable arranged at or on the support portion (10) so that the at least two carriages (31, 32, 33, 34) may be moved continuously, step-less, along the support portion 10. Typically, the at least two carriages 31, 32, 33, 34 may be moved back and forth in direction from one end of the support portion 10 towards the other end of the support portion 10. The at least two carriages 31, 32, 33, 34 may move axially along the support portion 10. The at least two carriages 31, 32, 33, 34 may thereby thus move linearly along the support portion 10 of the holder 2.

[0011] According to a preferred embodiment of the control unit according to the present disclosure, the at least two carriages 31, 32, 33, 34 comprises a respective carriage coupling means 50 and the control unit 1 comprises an operator coupling means 60 which is coupled to the respective carriage coupling means 50 of the at least two carriages 31, 32, 33, 34, wherein the carriage coupling means 50 and the operator coupling means 60 are configured such that:

- the distance between the at least two actuators 21, 22, 23, 24 increases when the operator coupling means 60 is moved in a first direction (A) and;
- the distance between the at least two actuators 21, 22, 23, 24 decreases when the operator coupling means 60 is moved in a second direction (B).

[0012] A main advantage with the control unit according to the this embodiment of the present disclosure is that the distance between all the actuators of the control unit easily may be changed by the operator of the lift-truck by manipulation of the operator coupling means. This in turn makes it possible for the operator of the truck to rapidly change the set-up of the actuators of the control unit when the driving conditions changes. For example when driving into an area where protective gloves are necessary.

[0013] Preferably, the carriage coupling means and the operator coupling means are intermeshing teeth since these allows for a precise adjustment of the position actuators with a minimum of skidding or play. More preferred the carriage coupling means are toothed racks and the operator coupling means is at least one toothed wheel. This is an effective way of displacing the carriages and thus the actuators along the holder since rotation of the toothed wheel is directly translated into a axial movement of the carriages.

[0014] Further alternatives and advantages of the present disclosure are disclosed in the appended claims and the following description.

[0015] By "continuous" movement of the carriages and the actuators is meant that the carriages and the actuators are moved step-less along the holder of the control unit. That is, between end positions, the carriages and the actuators may assume an essentially infinite number of positions along the holder. The expression "continuous" movement of the actuators should not be misinterpreted as if the actuators would move continuously without ever stopping along the holder. Consequently, the carriages are arranged stepless movably at the holder such that the at least two actuators are stepless movable apart from or towards each other on the holder.

Brief description of the drawings

[0016]

Figure 1: A schematic perspective exploded view of a control unit according to a preferred embodiment of the present disclosure.

Figure 2: A schematic perspective drawing of a control unit according to a preferred embodiment of the present disclosure.

Figure 3: A schematic planar view of a control unit according to a preferred embodiment of the present disclosure.

Figure 4a - 4c: Schematic drawings showing the control unit according to the present disclosure in operation.

Figure 5: A schematic drawing of a portion of a control unit according to an alternative the present disclosure.

Figure 6a, 6b: A schematic top view of alternative arrangements of actuators according to the present disclosure.

Detailed description of embodiments

[0017] The control unit according to the present disclosure will now be described more fully hereinafter. The control unit according to the present disclosure may however be embodied in many different forms and should not be construed as limited to the embodiment set forth herein. Rather, this embodiment is provided by way of example so that this disclosure will be thorough and complete, and will fully convey the scope of the present disclosure to those persons skilled in the art.

[0018] In particular it may be noted that in the following an embodiment is described in which the carriages comprises coupling means which are coupled with an operator coupling means on the control unit. However, while the provision of coupling means may be preferred for moving the actuators of the control unit along the holder it is not to be considered an essential feature of the present disclosure. Rather, when coupling means are not present in the control unit, the actuators may be moved manually by a human operator continuously along the holder. For example by the operator griping an actuator and pushing or pulling it along the holder.

[0019] In the following, the control unit 1 according to the present disclosure will be described mainly with reference to figure 1 which shows an exploded view of the control unit 1 according to one alternative. However, reference is sometimes made to figure 2 which shows the control unit 1 in an assembled state.

[0020] Turning to figure 1, the control unit 1 comprises a holder 2 for holding actuators 21, 22, 23, 24 that are intended for controlling functions of a lift-truck (not shown). The actuators 21, 22, 23, 24 may for example be levers or knobs or buttons or any other type of actuator that is suitable to be manipulated by the hand of an operator of the lift truck (see also figure 2). In the embodiment of figure 1, four actuators 21, 22, 23, 24 are shown, however control unit 1 may comprise any number of actuators, such as at least two actuators, at least three actuators or at least four actuators. The holder 2 may comprise an attachment portion 15 which is configured to be attached to a lift-truck, for example to a control interface or to a surface in a control booth of the lift-truck. The attachment portion 15 may be a flat plate. The holder 2 further comprises a support portion 10, which is configured to movably support at least two carriages 31, 32, 33, 34 onto which a respective actuator 21, 22, 23, 24 is arranged. The support portion 10, and thus the holder 2, extends along a longitudinal axis (X). The support portion 10 is thereby elongated and extends between a first and

a second end 14.1, 14.2 parallel with the upper surface 15.1 of the attachment portion 15 along a longitudinal axis (X). The support portion 10 extends perpendicular from the attachment portion 15 along a vertical axis (Y). The longitudinal axis (X) may thereby be a substantially straight longitudinal axis (X). The support portion 10 thereby has a length, defined by the longitudinal axis (X) and a height, defined by vertical axis (Y). In the embodiment shown in figure 1, the longitudinal axis (X) is a horizontal, preferably straight, longitudinal axis (X). The center of the support portion 10 is at half the height and parallel with the longitudinal axis (X). Preferably, the support portion 10 is of uniform thickness and may be rectangular. The support portion 10 comprises a back surface 12 (not visible) and a front surface 11 and a top surface 13 which is elongated and extends parallel with the longitudinal axis (X). Thus, in other words, the longitudinal axis (X) extends parallel with the top surface 13 of the support portion 10, in the middle of the support portion 10, between the first and the second end 14.1, 14.2 of the support portion 10. Preferably, the top surface 13 may be flat.

[0021] The support portion 10 may further comprise at least a first and a second guide pin 16 that extends from the front surface 11 and/or the back surface 12. In the embodiment of figure 1, four guide pins 16 extends from the front surface 11 and the back surface 12 respectively.

[0022] The control unit 1 further comprises an operator coupling means 60. The operator coupling means 60 may comprise at least a first operator coupling means 61, which may be in the form of a toothed wheel. The operator coupling means 60 may further comprise a second operator coupling means 62, which also may be in the form of a toothed wheel. The operator coupling means 60 may be rotationally attached, e.g. by central shaft 64, to the front surface 11 of the support portion 10 of the holder 2. In the embodiment shown in figure 1, one operator coupling means 60 is arranged on the front surface 11 of the support portion 10 and another operator coupling means 60 is arranged on the back surface 12. However, one operator coupling means 60 suffices. In the embodiment shown in figure 2, the first and the second operator coupling means 61, 62 are arranged concentrically around the central shaft 64. The second coupling 62 means is thereby arranged in front of the first coupling means 61 with respect to the axial direction of the central shaft 64. For reasons that will be explained hereinafter, the first and the second coupling means 61, 62 have different size. In the embodiment shown in figure 1, the radius of the first coupling means 61 is three times larger than the radius of the second coupling means 62. The operator coupling means 60 may be provided with a handle 63 which allows the human operator of the lift-truck to manually move, i.e. turn, the operator coupling means 60. It is also possible to connect the operator coupling means 60 to an electrical motor (not shown) that may be controlled by the human operator of the lift-truck to move the operator coupling means 60.

[0023] The control unit 1 further comprises at least two carriages 31, 32, 33, 34 which are continuously movably arranged on the holder 2. The at least two carriages 31, 32, 33, 34 are thereby movably arranged on the holder 2 along the longitudinal axis (X). In detail, the at least two carriages 31, 32, 33, 34 are slidable arranged at or on the support portion 10 of the holder 2 and may thus be moved step-less on the support portion 10 of the holder 2 along the longitudinal axis (X).

[0024] In the embodiment of figure 1, four carriages 31, 32, 33, 34 are shown. However, any number of more than one carriage may be arranged at the holder 2. For example at least two carriages or at least three carriages or at least four carriages. Moreover, in figure 1, only the features of the first carriage 31 are indicated with reference signs. However, it is appreciated that the other carriages 32, 33, 34 also comprises the features of the first carriage 31.

[0025] Returning, to figure 1, the carriages 31, 32, 33, 34 comprises a respective support means 40 onto which a respective actuator 21, 22, 23, 24 is arranged. The support means 40 may be a flat plate. The respective carriages 31, 32, 33, 34 further comprises a first and a second guide means 41, 42, which may be flat plates. The guide means 41, 42 are arranged parallel and spaced apart. The guide means 41, 42 further comprises an upper edge 43, onto which the support means 40 is arranged. The carriages 31, 32, 33, 34 are mounted onto the support portion 10 of the holder 2 such that the inner surfaces 44 of the guide means 41, 42 extend parallel with the respective front and back surfaces 11, 12 of the support portion 10 of the holder 2. The support means 40 of the carriages 31, 32, 33, 34 thereby extend parallel with the top surface 13 of the support portion 10 (see figure 2).

[0026] The carriages 31, 32, 33, 34 may be telescopically arranged on the support portion 10 of the holder 2. Thus, two carriages, 31, 32 (i.e. the first and the second carriage 31, 32) are telescopically arranged on a first end 14.1 of the support portion 10 and two carriages 33, 34 (i.e. the third and the fourth carriage 33, 34) are telescopically arranged on a second end 14.2 of the support portion 10.

[0027] Thus, on the first end 14.1 of the support portion 10 one carriage 31, (i.e. the first carriage 31) is arranged on another carriage 32, (i.e. the second carriage 32) such that the inner surfaces 44 of the guide means 41, 42 of the first carriage 31 are adjacent the outer surfaces 45 of the guide means 41, 42 of the second carriage 32 (see figure 2). The second carriage 32 is arranged on the first end 14.2 of the support portion 10 such that the inner surfaces 44 of the guide means 41, 42 of the second carriage 32 are adjacent the respective front and back surface 11, 12 of the support portion 10.

[0028] Accordingly, on the second end 14. 2 of the support portion 10, one carriage 34, (i.e. the fourth carriage 34) is arranged on another carriage 33, (i.e. the third carriage 33) such the inner surfaces 44 of the guide means

41, 42 of the fourth carriage 34 are adjacent the outer surfaces 45 of the guide means 41, 42 of the third carriage 33. The third carriage 33 is arranged on the second end 14.2 of the support portion 10 such the inner surfaces 44 of the guide means 41, 42 of the third carriage 33 are adjacent the respective front and back surface 11, 12 of the support portion 10.

[0029] The four carriages 31, 32, 33, 34 are configured such that the guide means 41, 42 of two carriages 31, 32 of the four carriages 31, 32, 33, 34 (i.e. the first and the second carriage 31, 32) extend along an upper portion of the support portion 10. That is, a portion between the top surface 13 and the center of the support portion. The four carriage 31, 32, 33, 34 are further configured such that the guide means 41, 42 of the other two carriages 33, 34 of the four carriages 31, 32, 33, 34 (i.e. the third and the fourth carriage 33, 34) extend along a lower portion of the support portion 10. That is, a portion between the upper surface 15.1 of the attachment portion 15 and the center of the support portion 10. The guide means 41, 42 of the third and the fourth carriage 33, 34 therefore comprises a stem 47, 48 which extends in vertical direction of the support portion 10. The height of the stem 47, 48 is configured such that the support means 40 of the third and the fourth carriage 33, 34 are arranged above the top surface 13 of the support portion 10.

[0030] The guide means 41, 42 of the carriages 31, 32, 33, 34 may comprise at least one elongated slot 46 which extends longitudinally on respective the guide means 41, 41. The elongated slots 46 receives the guide pins 16 on the support portion 10 and are arranged such that the carriages are supported in vertical direction on the support portion 10 of the holder 2 (see also figure 1). The engagement between the guide pins 16 and the elongated slots 46 guides the movement of the carriages 31, 32, 33, 34 on the holder along the longitudinal axis (X). The ends of the elongated slots 46 further provides predetermined limits for the movement of the carriages 31, 32, 33, 34 on the holder 2 along the longitudinal axis (X). However, the carriages 31, 32, 33, 34 may be supported directly onto the top surface 13 of the support portion 10 or directly onto the upper surface 15.1 of the attachment portion 15.

[0031] The carriages 31, 32, 33, 34 respectively comprises a carriage coupling means 50 in the form of a toothed rack. That is, a row of teeth extending longitudinally along at least one of the first and second guide means 41, 42 of the respective carriages. The carriage coupling means 50 are arranged such that the row of teeth on the respective carriages are directed towards the center of the support portion 10. Thus, the coupling means 50 of two carriages 31, 32 of the four carriages 31, 32, 33, 34 (e.g. the first and the second carriage 31, 32) are thereby directed towards the attachment portion 15 of the holder 2. The coupling means 50 of the other two carriages 33, 34 of the four carriages 31, 32, 33, 34 (e.g. the third and the fourth carriage 33, 34) are directed towards the top surface 13 of the holder portion 10. Thus, since the operator coupling means 60 is arranged on the front surface 11, preferably in the center, of the support portion 10, operator coupling means 61, 62 and carriage coupling means 50 will come into engagement.

[0032] Figure 3 shows a planar view of the control unit 1 according to the present disclosure in assembled state. It may be noted that figure 3 shows a view of the rear of the control unit whereas figure 1 and 2 shows front views of the control unit 1. To increase comprehension, the operator handle 63 has been omitted and the operator coupling means 60 has been made partially transparent.

[0033] Thus, in assembled state of the control unit 1 according to the present disclosure, the first operator coupling means 61 is coupled with the respective carriage coupling means 50 of two carriages of the four carriages 31, 32, 33, 34, (i.e. the first and the fourth carriage 31, 34). The second operator coupling means 62 is coupled with the respective carriage coupling means 50 of the other two carriages of the four carriages 31, 32, 33, 34 (i.e. the second and the third carriage 32, 33). Thus in detail, the teeth of the first operator coupling means 61, which is in the form of a toothed wheel, is in intermeshing engagement with the teeth of the carriage coupling means of the first and the fourth carriage 31, 34 which are in the form of toothed racks. Accordingly, the teeth of the second operator coupling means 62, which is in the form of a toothed wheel, is in intermeshing engagement with the teeth of the respective carriage coupling means 50 of the second and the third carriage 32, 33 which are in the form of toothed racks.

[0034] Thus, movement, e.g. rotation, of the operator coupling means 60 in a first direction, e.g. counter-clockwise will cause the first operator coupling means 61 to move two carriages 31, 34 of the four carriages 31, 32, 33, 34, (i.e. the first and the fourth carriage 31, 34) in opposite directions on the holder 2 along the longitudinal axis X. Simultaneously, the second operator coupling means 62 is caused to move the other two carriages 32, 33 of the four carriages 31, 32, 33, 34 (i.e. the second and the third carriage 32, 33) in opposite directions on the holder 2 along the longitudinal axis X. Accordingly, movement, e.g. rotation, of the operator coupling means 60 in a second direction, i.e. clockwise will cause the first and the fourth carriage 31, 34 to move towards each other and the second and the third carriage 32, 33 to move towards each other.

[0035] Or, in other words, movement, of the operator coupling means 60 in a first direction, e.g. counter-clockwise will cause the first and the second operator coupling means 61 to move two carriages 31, 32 of the four carriages 31, 32, 33, 34, (i.e. the first and the second carriage 31, 34) in a first direction on the holder 2 along the longitudinal axis X. Simultaneously, the first and second operator coupling means 62 is caused to move the other two carriages 33, 34 of the four carriages 31, 32, 33, 34 (i.e. the third and the fourth carriage 33, 34) in the opposite second direction on the holder 2 along the longitudinal axis (X) and vice versa.

[0036] Preferably, the transmission ratio (or gearing ratio) between the first and the second operator coupling means 61, 62 is greater than 1. To ensure that the distances between the carriages 31, 32, 33, 34 and thus also between the actuators 21, 22, 23, 24 increases uniformly, the outermost carriages 31, 34 needs to travel three times the distance of the innermost carriages 32, 33. Therefore, the transmission of the first coupling means 61 needs to be three times greater than the transmission of the second operator coupling means 62. In the described embodiment, the transmission of the first and the second operator coupling means 61, 62 is determined by the radiuses of the first and the second operator coupling means 61, 62, which are toothed wheels. Therefore the radius of the first coupling means 61 is three times the radius of the second operator coupling means 62. Thus, the transmission ratio, expressed as radius ratio, between the first and the second coupling means 61, 62 may be 3. However, should it be desirable to have different distances between the actuators 21, 22, 23, 24 of the control unit 1, it is possible to select other transmission ratios between the first operator coupling means 61 and the second operator coupling means 62. However, to ensure separation between all of the actuators 21, 22, 23, 24 the transmission ratio, i.e. the size ratio of the radiuses, between the first operator coupling means 61 and the second operator coupling means is greater than 1.

[0037] Figures 4a - 4c shows the control unit 1 in use.

[0038] Thus, in figure 4a the actuators 21, 22, 23, 24 are brought together adjacent to each other in a default position in which the distance between the actuators 21, 22, 23, 24 is the minimum distance d_{min}. The distance between two adjacent actuators may be measured from the center of one actuator to the center of the adjacent actuator.

[0039] With reference to figure 4b, turning of the operator coupling means 60 in anti-clockwise direction causes the carriages 31, 32, 33, 34 to move along the longitudinal axis X on the holder 2 which in turn causes the actuators 21, 22, 23, 24 to move apart from each other on the holder 2 such that the distances between the actuators 21, 22, 23, 24 increases.

[0040] In figure 4c, the actuators 21, 22, 23, 24 has been moved such that they are separated from each other by a maximum distance d_{max}.

[0041] Although a particular embodiment has been disclosed in detail this has been done for purpose of illustration only, and is not intended to be limiting. In particular it is contemplated that various substitutions, alterations and modifications may be made within the scope of the appended claims.

[0042] In particular, above an embodiment of the control unit 1 has been described in detail in which four carriages 31, 32, 33, 34 are arranged at the holder 2. However, it is appreciated that any number of more than one carriage may be arranged at the holder 2. For example two or three or more carriages. Thus, the following description of the carriages is valid also for embodiments in which the control unit 1 comprises at least two carriages 31, 32, 33, 34 or at least three carriages 31, 32, 33, 34 or four or more carriages 31, 32, 33, 34. For example (not shown), the above described embodiment of the control unit 1 may be modified such that is comprises two carriages which are arranged continuously movable at the holder 2. One carriage may thereby be the above described first carriage 31 and the other carriage may be the above described fourth carriage 34. In another alternative embodiment (not shown), the control unit 1 comprises three carriages which are arranged continuously movable at the holder 2. One carriage may thereby the above described first carriage 31, another carriage may be the above described third carriage 33 and a further carriage may be the above described fourth carriage 34. Advantageously, omission of one or two carriages from the embodiment described above require little or no redesigning of other features of the control unit according to the described embodiment.

[0043] According to a further example (not shown) the control unit 1 may comprise six carriages onto which a respective actuator is arranged. It is also possible to employ further operator coupling means to the control unit. For example, when the control unit comprises six carriages, the operator coupling means 60 may comprise a first and a second and a third coupling means in the form of toothed wheel. In that case it is possible to design the first, the second and the third coupling means with different radiuses.

[0044] Alternative arrangements of the operator coupling means are also possible. For example as shown in figure 5, in which a first and a second operator coupling means 61, 62, in the form of a toothed wheels are interconnected and driven by an intermediate gear wheel 65.

[0045] Other types of coupling means than toothed wheels and toothed racks may be used. For example, the coupling means may comprise belts that are driven by wheels.

[0046] Different arrangement of the actuators 21, 22, 23, 24 on the carriages 31, 32, 33, 34 is also possible. Figure 6a and 6b shows two different arrangements of actuators. Figure 6a shows schematically a top view of the embodiment described in figures 1 - 4. In this embodiment, the actuators 21, 22, 23, 24 are arranged on the carriages 31, 32, 33, 34 such that they form a row on the holder 2. That is, the actuators 21, 22, 23, 24 are aligned along the longitudinal axis (X). However, preferably, one or more of the actuators 21, 22, 23, 24 may be arranged on the respective carriage 31, 32, 33, 34 such that the actuator 21, 22, 23, 24 in question is off-set a predetermined distance zl - z4 from the longitudinal axis (X). Figure 6b shows an alternative in which the four actuators 21, 22, 23, 24 are off-set a respective distance zl - z4, from the longitudinal axis X such that the four actuators 21, 22, 23, 24 are aligned with a bow segment Z. The four actuators are thereby arranged ergonomically with respect to the fingers hand of the human operator.

It is obvious that the respective actuators 21, 22, 23, 24 may be off-set by any distance z1 - z4 from the longitudinal axis X. The off-set arrangement of the actuators 21, 22, 23, 24 may for example be achieved by appropriate designing of the support means 20 of the carriages 31, 32, 33, 34.

[0047] Moreover, in the embodiment disclosed above, the holder 2 has been described in terms of holder that extends along a longitudinal axis, such as a flat plate. However, the holder 2 may have other design, such as curved (not shown). In that case the holder 2 extend along a curved axis (X).

[0048] Moreover, although specific terms may be employed herein, they are used in a generic and descriptive sense only and not for purposes of limitation. Furthermore, as used herein, the terms "comprise/comprises" or "include/includes" do not exclude the presence of other elements. Finally, reference signs in the claims are provided merely as a clarifying example and should not be construed as limiting the scope of the claims in any way.

Claims

1. A control unit (1) for a lift-truck comprising a holder (2) for actuators (21, 22, 23, 24) for controlling functions of a lift-truck and configured to be attached to the lift-truck, and;

   - at least a two actuators (21, 22, 23, 24) configured to be operated by a hand of a human operator and arranged adjacent to each other on the holder (2) and;
   - at least two carriages (31, 32, 33, 34) for supporting a respective actuator (21, 22, 23, 24) on the holder (2), **characterized in that;**
   - the at least two actuators (21, 22, 23, 24) are arranged on a respective carriage (31, 32, 33, 34), wherein the carriages (31, 32, 33, 34) are arranged continuously movably on the holder (2), such that the at least two actuators (21, 22, 23, 24) are continuously movable apart from each other or towards each other on the holder (2).

2. The control unit (1) for a lift-truck according to claim 1, wherein the holder (2) comprises a support portion (10), which is configured to movably support the at least two carriages (31, 32, 33, 34) and that extends along an axis (X) and wherein the at least two carriages (31, 32, 33, 34) are slidable arranged at or on the support portion (10) so that the at least two carriages (31, 32, 33, 34) may be moved continuously along the support portion (10).

3. The control unit (1) for a lift truck according to claim 2, wherein the at least two carriages (31, 32, 33, 34) comprises a respective support means (40) for supporting an actuator (21, 22, 23, 24) extending parallel with a top surface (13) of the support portion (10) of the holder (2) and a first and a second guide means (41, 42) extending parallel with a front surface (11) and a back surface (12) of the support portion (10) of the holder (2).

4. The control unit (1) for a lift-truck according to claim 3, wherein, the guide means (41, 42) of the at least two carriages (31, 32, 33, 34) comprises a respective inner surface and outer surface (44, 45), wherein the inner surfaces (44) of the guide means (41, 42) of one carriage of the at least two carriages (31, 32, 33, 34) are arranged adjacent the outer surface (45) of the guide means (41, 42) of the other carriage of the at least two carriages (31, 32, 33, 34) and wherein the inner surfaces (44) of the guide means (41, 42) of said other carriage of the at least two carriages (31, 32, 33, 34) are arranged adjacent the front surface (11) and the back surface (12) of the support portion (10).

5. The control unit (1) for a lift-truck according to claim 3 or 4, wherein the guide means (41, 42) of the at least two carriages (31, 32, 33, 34) comprises at least one elongated slot (46) and wherein the support portion (10) of the holder (2) comprises at least one guide pin (16) extending from the front surface (11) or back surface (12) of the support portion (10) and into the elongated slot (46) of the guide means (41, 42), wherein the guide pin (16) and the elongated slot (46) are arranged to support the at least two carriages (31, 32, 33, 34) on the support portion (10).

6. The control unit (1) for a lift-truck according to anyone of claims 1 - 5, wherein the at least two carriages (31, 32, 33, 34) comprises a respective carriage coupling means (50) and the control unit (1) comprises an operator coupling means (60) which is coupled to the respective carriage coupling means (50) of the at least two carriages (31, 32, 33, 34), wherein the carriage coupling means (50) and the operator coupling means (60) are configured such that:

   - the distance between the at least two actuators (21, 22, 23, 24) increases when the operator coupling means (60) is moved in a first direction (A) and;
   - the distance between the at least two actuators (21, 22, 23, 24) decreases when the operator coupling means (60) is moved in a second direction (B).

7. The control unit (1) for a lift-truck according to claim 6 when dependent on claim 2, wherein the operator coupling means (60) is coupled to the respective carriage coupling means (50) of the at least two carriages (31, 32, 33, 34) such that:

- the at least two carriages (31, 32, 33, 34) are moved in opposite directions away from each other on the support portion (10) along the axis (X) when the operator coupling means (60) is moved in the first direction (A) and;
- the at least two carriages (31, 32, 33, 34) are moved in opposite directions towards each other on the support portion (10) along the axis (X) when the operator coupling means (60) is moved in the second direction (B).

8. The control unit (1) for a lift-truck according to claim 6 when dependent on claim 2 or claim 8, comprising at least three carriages (31, 32, 33, 34) comprising a respective carriage coupling means (50) and; at least a three actuators (21, 22, 23, 24) arranged on a respective carriage (31, 32, 33, 34), wherein the operator coupling means (60) is coupled to the carriage coupling means (50) of the at least three carriages (31, 32, 33, 34) such that:

- when the operator coupling means (60) is moved in the first direction (A) at least two carriages (31, 32, 33, 34) are moved in a first direction on the support portion (10) along the axis (X) and at least one carriage (31, 32, 33, 34) is moved in a second direction on the support portion (10) along the axis (X) and;
- when the operator coupling means (60) is moved in the second direction (B) said at least two carriages (31, 32, 33, 34) are moved in a second direction on the support portion (10) along the axis (X) and said one carriage (31, 32, 33, 34) is moved in a first direction on the support portion (10) along the axis (X).

9. The control unit (1) for a lift truck according to claim 8, wherein the operator coupling means (60) comprises a first operator coupling means (61) which is coupled to the carriage coupling means (50) of one carriage (31, 32, 33, 34) of the at least three carriages (31, 32, 33, 34) and a second operator coupling means (62) which is coupled to carriage coupling means (50) of the other two carriages (31, 32, 33, 34) of the at least three carriages (31, 32, 33, 34)

10. The control unit (1) for a lift-truck according to anyone of claims 6 - 9, wherein the carriage coupling means (50) and the operator coupling means (60) comprises intermeshing teeth.

11. The control unit (1) for a lift-truck according to anyone of claims 6 - 10, wherein the carriage coupling means (50) comprises toothed racks and the operator coupling means (60) comprises at least one toothed wheel.

12. The control unit (1) for a lift-truck according to claim 9, wherein a transmission ratio of the first operator coupling means (61) relative the second operator coupling means (62) is greater than one.

13. The control unit (1) for a lift-truck according to anyone of claims 6 - 12 when dependent on claim 3, wherein the operator coupling means (60) is rotationally arranged on the front surface (11) of the support portion (10) of the holder (2).

14. The control unit (1) for a lift-truck according to anyone of claims 6 - 13, when dependent on claim 4, wherein the guide means (41, 42) of the respective carriages (31, 32, 33, 34) comprises a carriage coupling means (50) comprising a toothed rack.

15. A lift-truck comprising a control unit (1) according to anyone of claims 1 - 14.

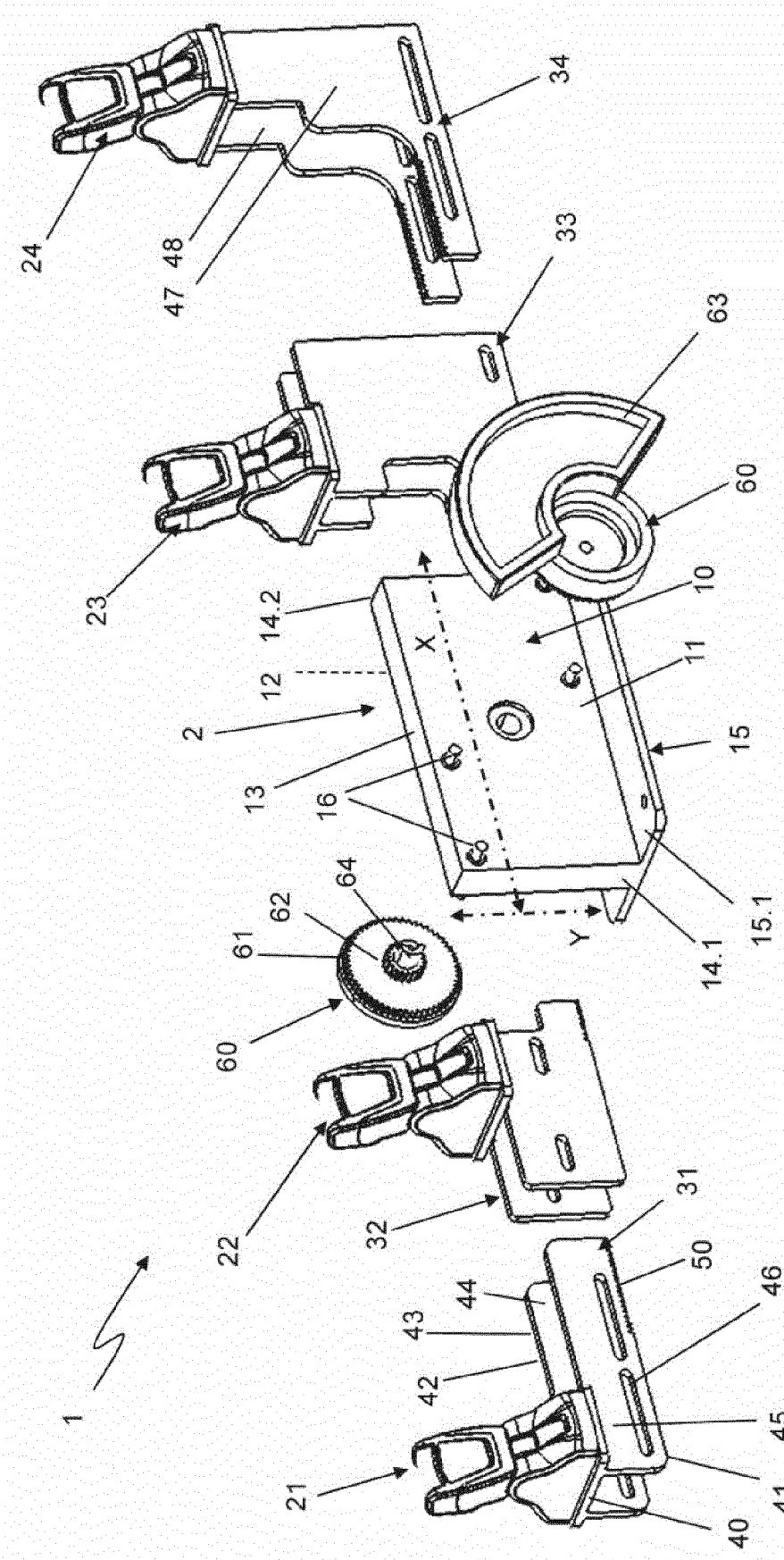
1
2
10
11
12
13
14.1
14.2
15
15.1
16
21
22
23
24
31
32
33
34
40
41
42
43
44
45
46
47
48
50
60
61
62
63
64
X
Y

Fig.1

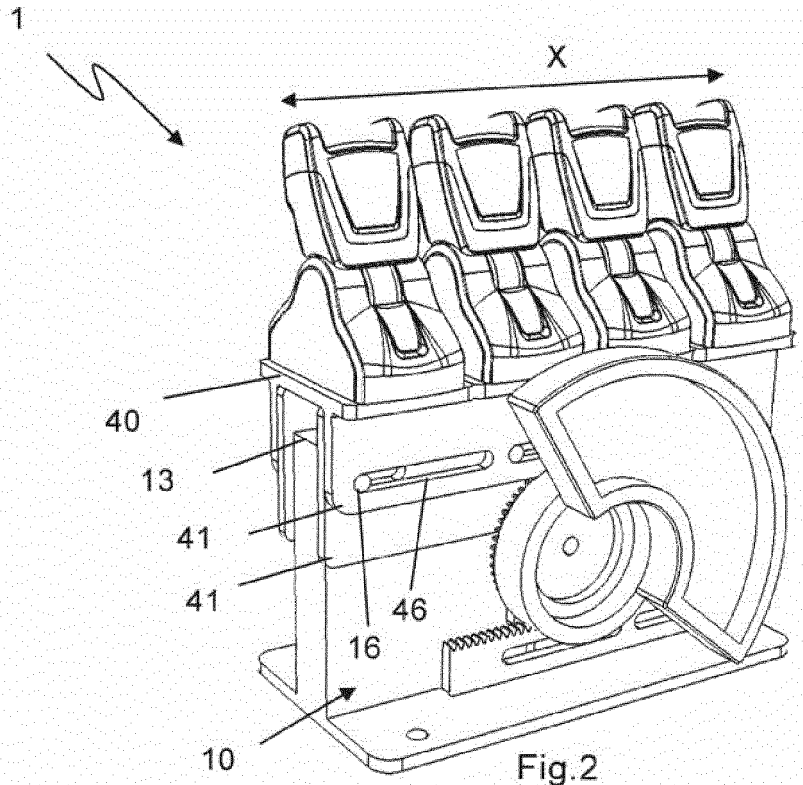

Fig.2

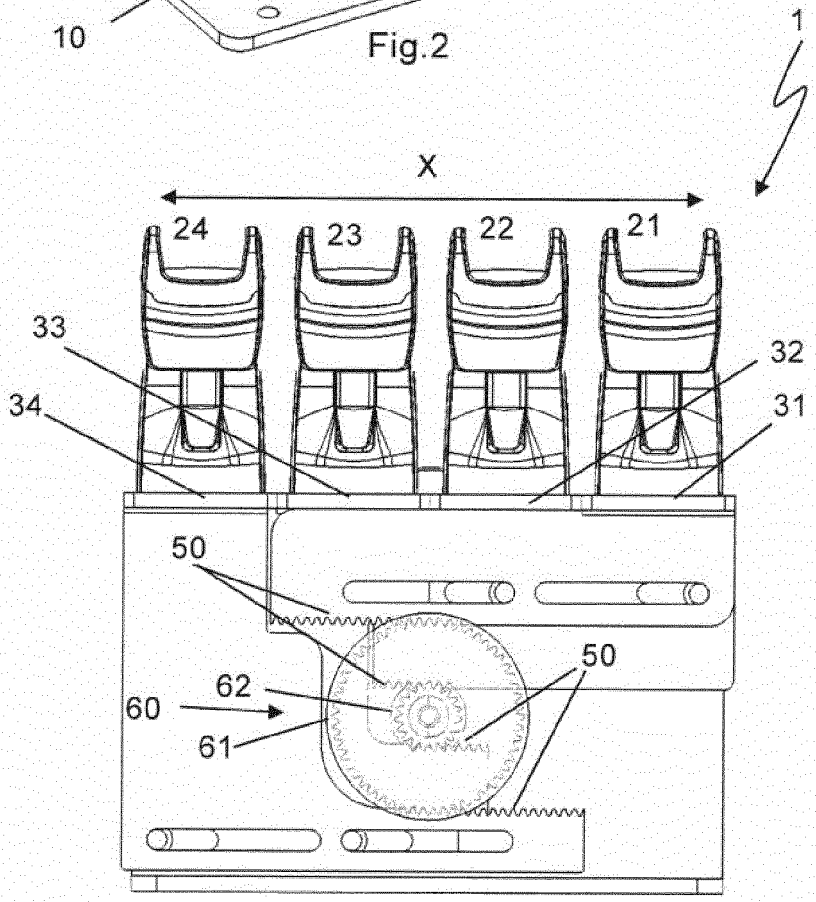

Fig.3

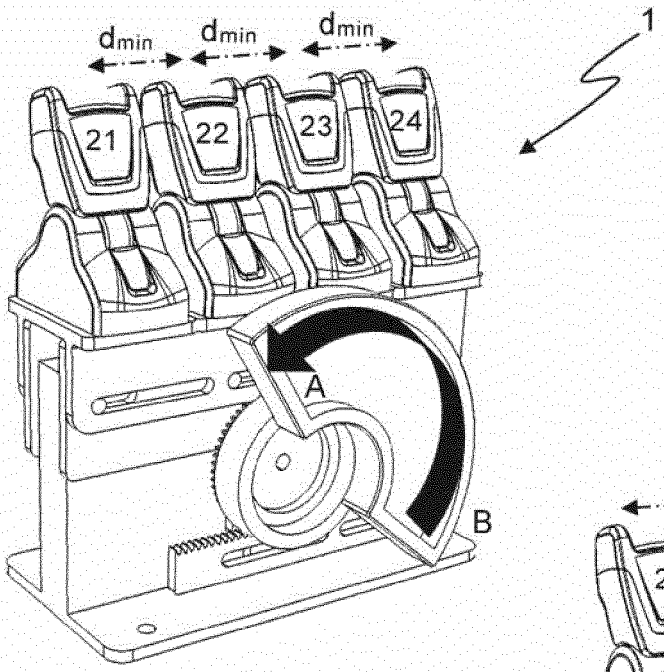

Fig.4a

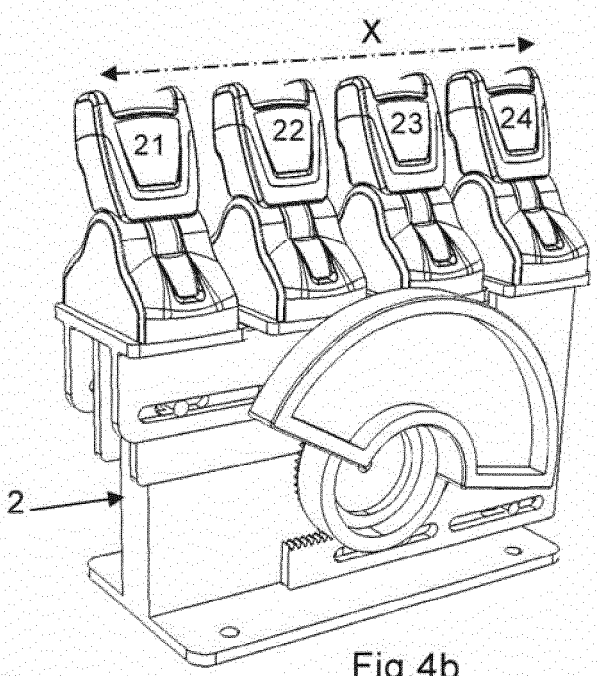

Fig.4b

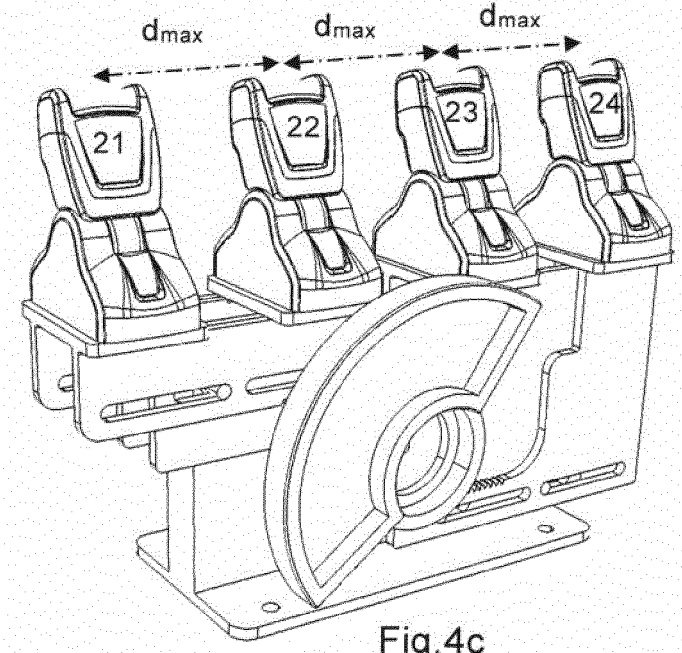

Fig.4c

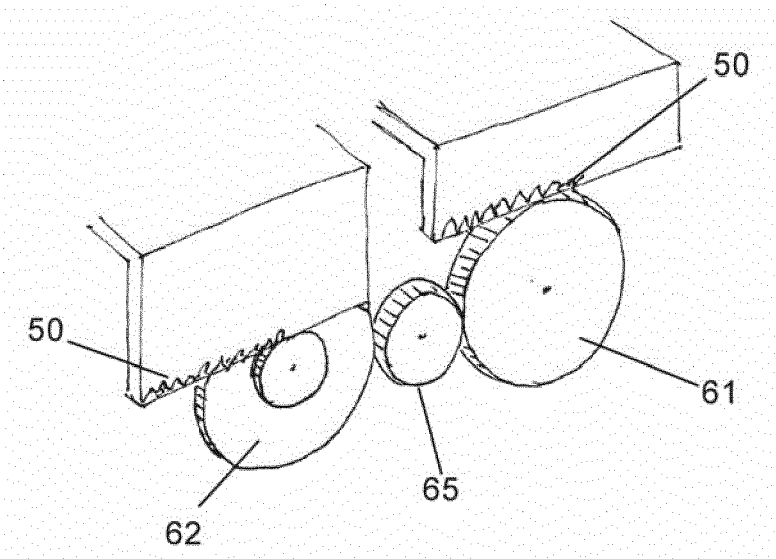

Fig.5

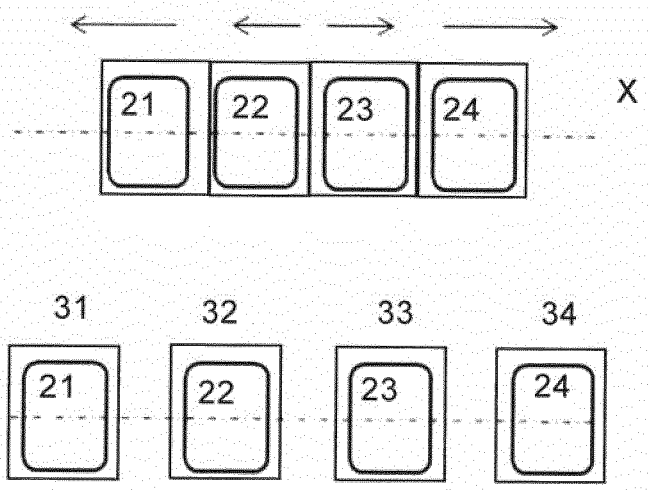
21
22
23
24
X
31
32
33
34
21
22
23
24

Fig.6a

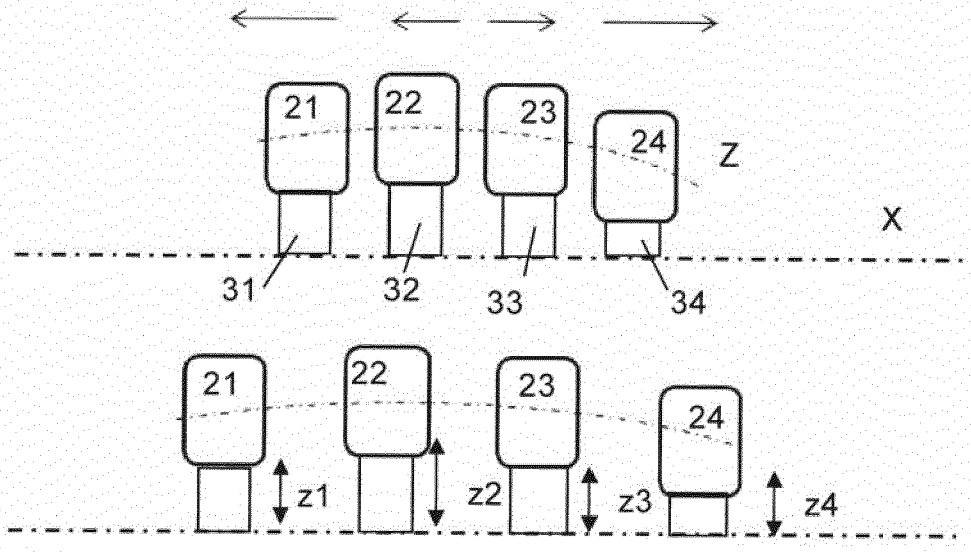
21
22
23
24
Z
X
31
32
33
34
21
22
23
24
z1
z2
z3
z4

Fig.6b

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 18 19 7725

DOCUMENTS CONSIDERED TO BE RELEVANT

	Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
7	X	US H 2024 H (KELLEY CRAIG B [US] ET AL) 4 June 2002 (2002-06-04) * abstract * * column 2, line 18 - line 61 * * figures *	1,15	INV. B66F9/20
2	A,D	WO 2017/136657 A1 (CROWN EQUIMENT CORP [US]) 10 August 2017 (2017-08-10) * abstract * * page 5 - page 7 * * figures *	1,15	

TECHNICAL FIELDS SEARCHED (IPC)

B66F
E02F
B66C
G05G

1 The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	30 January 2019	Sheppard, Bruce

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 18 19 7725

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.

30-01-2019

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US H2024 H	04-06-2002	NONE	
WO 2017136657 A1	10-08-2017	AU 2017213884 A1	14-06-2018
		BR 112018014057 A2	11-12-2018
		CA 3013339 A1	10-08-2017
		CN 108473291 A	31-08-2018
		EP 3411325 A1	12-12-2018
		KR 20180108681 A	04-10-2018
		US 2017225930 A1	10-08-2017
		WO 2017136657 A1	10-08-2017

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 2017136657 A **[0004] [0005]**